

# RESTEK®

Pure Chromatography

## 2015/16

30  
YEARS

1985-2015

RESTEK

CHROMALYTICs™

in AUSTRALIA : Contact +81 3 9762 2034

Distributor

SHOPPE

[www.chromalytic.net.au](http://www.chromalytic.net.au)

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## What do you do for a living?

How do you usually answer that question? While some of our customers are true kindred spirits specializing in LC or GC, we have found that a majority do not consider themselves “chromatographers.” In fact, few people in our customer database have provided a job title that even references the technique.

Chemist, analyst, technician, researcher, lab manager, director, buyer, method developer... For whatever it is that you are and do, chromatography is just as likely a means to an end as an area of focus. And either way, it is a technique that needs to work now, needs to work the right way, and needs to generate indisputable results. That is where Restek can help you.

We *are* chromatographers. Chromatography is what Restek does, and chromatography is who we are. We are an independent, international, and diverse team of employee-owners that is not bound to a specific brand of instrument or geographic region. We live and breathe phase chemistry, peak separations, resolution, and inertness because while chromatography may be a necessary tool in your business, it is our business. And it is a business that we directly serve across 100 countries and six continents.

Restek creates and supports innovative, integrated chromatographic solutions for the global scientific community and makes them work in your lab for your analyses. We are dedicated to understanding your technical, procurement, and troubleshooting problems like no one else, and we apply our chromatographic expertise to solve them. In short, we will help you do your job better, faster, and easier. This catalog is packed with industry-leading products backed by optimized applications, real-world achievement, and an unrivaled Plus 1 experience to do just that.

From sample prep to columns, reference standards to accessories, Restek is your first and best choice for chromatography.

## Restek is Pure Chromatography.

As we enter our 30<sup>th</sup> year, we invite you to turn the page and turn to us, your personal support network of colleagues and experts. Whether your LC or GC is out-of-date or state-of-the-art, we will help keep it performing with the highest accuracy, precision, and speed possible—no matter what your title, skill level, or location.

Your work touches people’s lives every day. Eliminate your risk and find peace of mind by putting Restek® Pure Chromatography to work so that you can get back to concentrating on what it is that you do for a living.

**Bryan Wolcott**  
President

**RESTEK**<sup>®</sup>  
Pure Chromatography

**RESTEK** *CHROMALYTICs*® in AUSTRALIA : Contact +81 3 9762 2034  
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# Table of Contents

Alphabetical Product Index.....612-623



The Accurate Data  
You Need, The Speed  
and Ease You Want

Look inside this book for these  
and other great Restek® brands:



**Rxi® GC Columns**..... 24-39

- Accurate data.
- The right results fast.
- Maximized instrument uptime.

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**Raptor™ SPP  
LC Columns** .....155-159

- Drastically faster analysis times.
- Substantially improved resolution.
- Increased sample throughput with existing instrumentation.
- Dependable reproducibility.

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**Sky® Inlet Liners** ..... 193-202

- Increased accuracy and precision.
- Lower detection limits.
- Ensured liner-to-liner reproducibility.

[www.restek.com/sky](http://www.restek.com/sky)



**Resprep® Sample  
Preparation** .....396-417

- Proven quality.
- Superior cleanliness.
- Method-specific performance.

[www.restek.com/resprep](http://www.restek.com/resprep)



**Certified Reference  
Materials (CRMs)** ..... 458-585

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- Easy-to-find documentation.

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**EZGC® Method  
Development Suite**

- Model interactive chromatograms.
- Get column recommendations and conditions. [www.restek.com/ezgc](http://www.restek.com/ezgc)
- Translate methods and calculate flows.

**COLUMNS** ..... 6-191

GC Capillary Columns ..... 6-103

GC Metal MXT® Capillary Columns ..... 104-115

GC PLOT Columns ..... 116-129

GC Packed/Micropacked Columns ..... 130-151

LC Columns ..... 152-191

**SUPPLIES & ACCESSORIES** ..... 192-349

GC Inlet Liners ..... 192-217

GC Instrument Supplies ..... 218-283

Gas Management ..... 284-319

LC Accessories ..... 320-349

**VIALS & SYRINGES** ..... 350-395

Vials ..... 350-371

Syringes ..... 372-395

**SAMPLE HANDLING** ..... 396-457

Sample Preparation ..... 396-417

Air Sampling ..... 418-453

Gas Sampling ..... 454-457

**REFERENCE STANDARDS** ..... 458-585

Detailed Overview ..... 458-465

Single-Component Solutions ..... 466-471

Column & Detector Test Mixes & Reagents.... 472-475

Clinical, Forensic & Toxicology ..... 476-481

Environmental ..... 482-561

Foods, Flavors & Fragrances ..... 562-575

Petroleum & Petrochemical ..... 576-581

Pharmaceutical ..... 582-585

**INDICES** ..... 586-623

Compound Index for Reference Standards.... 586-592

Catalog # Product Index ..... 593-611



# Restek Global

## Connecting You to World-Class Products & Service Through a Local Source

At Restek, we are committed to providing superior, cutting-edge chromatography products and a world-class Plus 1 experience. In order to give our global customer base more convenient access, we maintain a distributor network that covers over 100 countries across six continents. Whether you live in Maine or California, Albania or Zimbabwe, contact your local representative today to learn for yourself how we gained the trust of analysts around the world.



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**RESTEK** *CHROMALYTICs* in AUSTRALIA : Contact +81 3 9762 2034  
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## Pure Satisfaction

As a Restek customer, you deserve to be completely satisfied with your Restek® products and service, which is why we offer an unbeatable guarantee. We also understand, however, that while problems are rare, they will still arise. As part of your Plus 1 experience, we have made it easy and painless to resolve any issue you may encounter. Simply follow the instructions below:

### 1) Are you prepared to provide the following information?

- Name, company name, address, and phone number.
- Product name, catalog number, lot and/or serial number, and quantity.
- Purchase order and/or invoice number.
- Detailed description of the problem.

### 2) How did you place your order?

- *If you ordered from a distributor or from outside the U.S., contact your distributor.*
- *If you ordered directly from Restek and from within the U.S., continue reading.*

### 3) Is the problem with a product's function or with your order?

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(e.g., won't perform properly, results do not match our literature, instructions are unclear), contact Technical Service. Call 1-800-356-1688 / 1-814-353-1300, ext. 4 or e-mail [support@restek.com](mailto:support@restek.com)
- *If you have a problem with your order*  
(e.g., wrong part or quantity, broken or damaged item, missing items), contact our Returns Coordinator. Call 1-800-356-1688 / 1-814-353-1300, ext. 2146 or e-mail [returns@restek.com](mailto:returns@restek.com)

### 4) Did you get a return material authorization (RMA) number?

- (You *must* be given an RMA before you may send any product back to Restek.)
- *If the product has been used, you must include a completed, signed Health & Safety Declaration ([www.restek.com/health-safety](http://www.restek.com/health-safety)).*
- Send the product back following the instructions you were given by Restek.

#### Important Notes

- Do not return any product without first contacting us. We cannot accept returns without an RMA and prior authorization.
- Reference standards must be returned within ten (10) days from the shipment date; all other products must be returned within thirty (30) days. Restek can refuse to accept late returns.
- Returns made due to error by the customer placing the order may be charged a 10% restocking fee.
- To qualify for credit in the event of an order error, you must notify Restek within ten (10) days of shipment. Product must also be returned unused and in restockable condition.
- Restek will honor the original warranty of resale electronics; however, if the item is not under warranty, you are responsible for all repair costs.
- Returned columns and consumables will normally be evaluated within seven (7) working days after receipt.
- If you need replacement product immediately, ask for details when you contact us. Special invoicing and additional costs may apply.

#### General Warranty Information

Restek warrants the products it manufactures, except those specifically exempted, to be free from defects in materials and workmanship for ninety (90) days from the date of shipment. This warranty is limited to the original purchaser of the product and is not transferrable. During the warranty period, Restek will, at its option, either repair or replace a defective product or return to purchaser the price of the item. This limited warranty does not extend to any products that have been damaged as a result of accident, misuse, abuse, or service or modification by anyone.

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This warranty shall not be applicable to the extent that any provision of this warranty is prohibited by any federal, state, or municipal law that cannot be preempted.

## important note

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For more information and to register for upcoming seminars, visit [www.restek.com/education](http://www.restek.com/education) or contact your local Restek® distributor.

# GC Columns

Detailed Table of Contents.....	7-9
Selecting a GC Column .....	10-15
Stationary Phase Cross-References.....	16-17
Guard/Retention Gap Columns Overview .....	18-19

## Fused Silica Capillary

Guard/Retention Gap Columns .....	21-23
High-Performance Rxi® Columns .....	24-39
General Purpose Columns.....	40-59
GCxGC Columns.....	60-62
Fast GC.....	63
Application-Specific Columns .....	64-103

## Metal MXT® Capillary

Overview .....	105
Guard/Retention Gap Columns.....	106
General-Purpose Columns.....	107-110
Application-Specific Columns .....	111-115

## PLOT

PLOT Column Selection .....	117-119
Rt®-Silica BOND Columns.....	120
Alumina BOND Columns.....	121-124
Molecular Sieve 5A Columns.....	125
Porous Polymer Columns.....	126-128
PLOT Column Particle Trap .....	128
Metal MXT® PLOT Columns.....	129

## Packed/Micropacked

Overview .....	131
Bonded Stationary Phases.....	132-133
Packed Column Tubing .....	134
Stock Packed Columns.....	135-136
Stock Micropacked Columns .....	137
Application-Specific Columns.....	138-141
Packed/Micropacked Column Installation Kits ....	142
Packed Column Packing Materials .....	143-145
Liquid Phases for Custom Columns.....	146
USP Cross-Reference .....	147
Custom Coated Packing Materials .....	148
Custom Packed/Micropacked Columns.....	149-150
Column Configurations .....	151





**GC Columns**

Selecting a GC Column.....	10-15
Stationary Phase Cross-References.....	16-17
Guard/Retention Gap Columns Overview.....	18-19

**Fused Silica Capillary Columns (WCOT)****Guard/Retention Gap Columns**

Overview .....	18-19
Rxi <sup>®</sup> , Intermediate-Polarity, Polar, Base, Hydroguard <sup>®</sup> Water-Resistant, Integrated.....	21-23

**High-Performance Rxi<sup>®</sup> Columns**

Overview .....	24-28
Guard Columns .....	28
Rxi <sup>®</sup> -1ms.....	29
Rxi <sup>®</sup> -5ms.....	30
Rxi <sup>®</sup> -XLB.....	31, 71
Rxi <sup>®</sup> -5Sil MS.....	32-33, 67, 75, 77, 85-86
Rxi <sup>®</sup> -35Sil MS.....	34, 82
Rxi <sup>®</sup> -17 .....	35
Rxi <sup>®</sup> -17Sil MS.....	36, 76
Rxi <sup>®</sup> -PAH.....	37, 84
Rxi <sup>®</sup> -624Sil MS .....	38, 81, 87-88, 94
Rxi <sup>®</sup> -1HT.....	39
Rxi <sup>®</sup> -5HT.....	39

**General Purpose Columns**

Rtx <sup>®</sup> -1 .....	41
Rtx <sup>®</sup> -5 .....	42-43, 96
Rtx <sup>®</sup> -5MS.....	44
Rtx <sup>®</sup> -20.....	45
Rtx <sup>®</sup> -35.....	46
Rtx <sup>®</sup> -50.....	47
Rtx <sup>®</sup> -65.....	47
Rtx <sup>®</sup> -200, Rtx <sup>®</sup> -200MS.....	48-49
Rtx <sup>®</sup> -440.....	50
Rtx <sup>®</sup> -1301.....	51
Rtx <sup>®</sup> -624.....	52
Rtx <sup>®</sup> -1701.....	53
Rtx <sup>®</sup> -225.....	54
Rtx <sup>®</sup> -2330.....	55
Rt <sup>®</sup> -2560.....	56, 83
Rtx <sup>®</sup> -Wax.....	57
Stabilwax <sup>®</sup> .....	58, 95
Stabilwax <sup>®</sup> -MS.....	59

**GCxGC Columns**

GCxGC .....	60-62
-------------	-------

**Fast GC**

Fast GC.....	63
--------------	----

**Application-Specific Columns****Clinical, Forensic, & Toxicology**

Blood Alcohol Analysis.....	65
Rtx <sup>®</sup> -BAC Plus 1, Rtx <sup>®</sup> -BAC Plus 2	

**Environmental**

Brominated Flame Retardants Analysis.....	66
Rtx <sup>®</sup> -1614	
Dioxin & Furan Analysis .....	67-68
Rxi <sup>®</sup> -5Sil MS, Rtx <sup>®</sup> -Dioxin2	
Mineral Oils/Extractable Petroleum Hydrocarbon Analysis .....	69
Rtx <sup>®</sup> -Mineral Oil	
PCB Congeners Analysis.....	70-71
Rtx <sup>®</sup> -PCB, Rxi <sup>®</sup> -XLB	
Pesticides Analysis (Chlorinated) .....	72-73
Rtx <sup>®</sup> -CLPesticides, Rtx <sup>®</sup> -CLPesticides2	
Pesticides Analysis (Organophosphorus) .....	74
Rtx <sup>®</sup> -OPPesticides, Rtx <sup>®</sup> -OPPesticides2	



Can't find the  
column you're  
looking for?

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For an alphabetical listing of phases,  
please see the Alphabetical Index  
on pages 612–623.

Polycyclic Aromatic Hydrocarbons (PAHs) Analysis .....	75-76
Rxi®-5Sil MS, Rxi®-17Sil MS	
Semivolatiles Analysis .....	77
Rxi®-5Sil MS	
Volatile Organics Analysis.....	78-81
Rtx®-VMS, Rtx®-VRX, Rtx®-502.2, Rtx®-Volatiles, Rxi®-624Sil MS	
<b>Foods, Flavors, &amp; Fragrances</b>	
Cannabis Potency Analysis.....	82
Rxi®-35Sil MS	
FAME Analysis ( <i>cis/trans</i> ) .....	83
Rt®-2560	
FAME Analysis (Polyunsaturated).....	83
FAMEWAX	
PAHs in Foods Analysis .....	84
Rxi®-PAH	
Pesticide Analysis in Cannabis .....	85
Rxi®-5Sil MS	
Pesticide Residues in Food Analysis .....	86
Rxi®-5Sil MS	
Residual Solvent Analysis for Cannabis Concentrates.....	87
Rxi®-624Sil MS	
Terpenes Analysis for Cannabis and Hops .....	88
Rxi®-624Sil MS	
Triglycerides in Foods Analysis .....	89
Rtx®-65TG	
<b>Petroleum &amp; Petrochemical</b>	
Aromatics & Oxygenates in Gasoline Analysis .....	90
Rt®-TCEP	
Biodiesel Fuels Analysis .....	91
Rtx®-Biodiesel TG	
Detailed Hydrocarbon Analysis (DHA).....	92
Rtx®-DHA, Rtx®-5 DHA (Tuning Column)	
Simulated Distillation Analysis (C5-C44).....	93
Rtx®-2887	
<b>Pharmaceutical</b>	
Organic Volatile Impurities (OVI) Analysis .....	94-97
Rxi®-624Sil MS, Stabilwax®, Rtx®-5, Rtx®-G27, Rtx®-G43	
<b>Specially Deactivated</b>	
Acidic Compounds Analysis .....	98
Stabilwax®-DA	
Basic Compounds Analysis.....	99-102
Rtx®-Volatile Amine, Rtx®-5 Amine, Rtx®-35 Amine, Stabilwax®-DB	
Chiral Analysis .....	103
Rt®-γDEXsa, Rt®-βDEXm, Rt®-βDEXsm, Rt®-βDEXse, Rt®-βDEXsp, Rt®-βDEXsa, Rt®-βDEXcst	

For an alphabetical listing of phases, please see the Alphabetical Index on pages 612–623.

## Metal (MXT®) Capillary Columns

Overview .....	105
<b>Guard/Retention Gap Columns</b>	
Intermediate-Polarity, Hydroguard®-Treated .....	106
<b>General Purpose Columns</b>	
MXT®-1.....	107
MXT®-5.....	108
MXT®-50.....	109
MXT®-1301 .....	109
MXT®-1701 .....	109
MXT®-200 .....	110
MXT®-WAX .....	110
<b>Application-Specific Columns</b>	
<b>Environmental</b>	
Volatile Organics Analysis.....	111
MXT®-502.2, MXT®-Volatiles, MXT®-624	
<b>Foods, Flavors, &amp; Fragrances</b>	
Triglycerides in Foods Analysis .....	112
MXT®-65TG	

**Petroleum & Petrochemical**

Biodiesel Fuels Analysis .....	113
MXT®-Biodiesel TG .....	
Simulated Distillation Analysis (C5-C44) .....	113
MXT®-2887 .....	
Simulated Distillation Analysis (C5-C110) .....	114-115
MXT®-1HT SimDist, MXT®-500 SimDist .....	

**PLOT Columns**

PLOT Column Selection .....	117-119
-----------------------------	---------

**Silica BOND Columns**

Rt®-Silica BOND .....	120
-----------------------	-----

**Fused Silica Alumina Columns**

Rt®-Alumina BOND .....	121-124
Rt®-Alumina BOND/Na <sub>2</sub> SO <sub>4</sub> , Rt®-Alumina BOND/KCl, Rt®-Alumina BOND/CF <sub>3</sub> , Rt®-Alumina BOND/MAPD .....	

**Fused Silica Molecular Sieve 5A Columns**

Rt®-Msieve 5A .....	125
---------------------	-----

**Fused Silica Porous Polymer Columns**

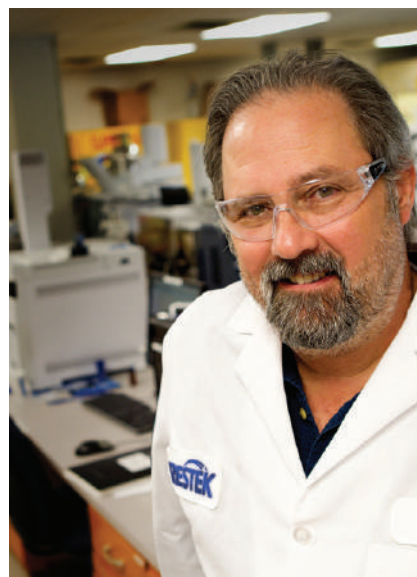
Rt®-Q-BOND .....	126
Rt®-QS-BOND .....	127
Rt®-S-BOND .....	127
Rt®-U-BOND .....	128
PLOT Column Particle Trap .....	128

**Metal MXT® PLOT Columns**

MXT®-Msieve 5A, MXT®-Alumina BOND/ Na <sub>2</sub> SO <sub>4</sub> , MXT®-Alumina BOND MAPD, MXT®-Q-BOND, MXT®-S-BOND .....	129
--	-----

**Packed/Micropacked Columns & Packing Materials**

Overview .....	131
Bonded Stationary Phases .....	132-133
Packed Column Tubing .....	134
Stock Packed Columns .....	135-136
Chromosorb-Based (Bonded and Non-Bonded), Porous Polymers, CarboBlack, Molecular Sieves .....	
Stock Micropacked Columns .....	137
Application-Specific Packed/Micropacked Columns	
Aromatics Analysis .....	138
D3606 Application Column Set .....	
Light Hydrocarbon Analysis .....	139
<i>n</i> -Octane on Res-Sil® C, OPN on Res-Sil® C, 2abc Refinery Gas Set .....	
Permanent Gases & Hydrocarbon Analysis .....	140
ShinCarbon ST .....	
Sulfur Analysis .....	141
Rt®-XLSulfur .....	
Packed/Micropacked Column Installation Kits .....	142
Packed Column Packing Materials .....	143-145
CarboBlack, Res-Sil®, Porapak, HayseSep®, Tenax® .....	
Liquid Phases for Custom Columns .....	146
USP Liquid Phase & Solid Support Cross-Reference .....	147
Custom Packed/Micropacked Columns	
Custom Coated Packing Materials .....	148
Custom Packed/Micropacked Columns .....	149
Custom Order Form .....	150
Column Configurations .....	151



At Restek, we are dedicated to your success.



## Selecting a GC Column

Strategic column choices can improve lab productivity by assuring that speed and resolution are optimized. While the number of choices available can be daunting, consideration of the resolution equation variables—separation factor, retention (capacity) factor, and efficiency—simplifies the decision. Separation factor determines which stationary phase is most appropriate. Once the phase has been chosen, physical dimensions (inner diameter, film thickness, length) can be selected based on retention factor and efficiency. Understanding how separation factor, retention factor, and efficiency influence separations allows analysts to make effective, informed choices and quickly select the best column for specific separations.

$$R = \frac{1}{4} \sqrt{N} \times \left( \frac{k}{k+1} \right) \times (\alpha - 1)$$

A measure of **Efficiency**.  
This term is affected by:

- Length
- Inner diameter
- Carrier gas type and linear velocity

A measure of **Retention**.  
This term is affected by:

- Inner diameter
- Film thickness
- Temperature

A measure of **Peak Separation**.  
This term is affected by:

- Stationary phase composition
- Temperature

$N = L/H$  = Effective theoretical plate number

$L$  = Column length

$H$  = HETP = Height equivalent to a theoretical plate

$k$  = Retention factor

$\alpha$  = Separation factor

Baseline resolution ( $R = 1.5$ ) is the goal.

## Speed Up and Simplify GC Method Development with Restek's EZGC® Online Suite



- Model chromatograms
- Translate methods **NEW!**
- Get column recommendations
- Calculate flows **NEW!**

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## Separation Factor ( $\alpha$ )

Choosing the right stationary phase is the first step toward optimizing your GC separation. It is the most important decision you will make because separation factor ( $\alpha$ ) has the greatest impact on resolution, and it is strongly affected by stationary phase polarity and selectivity.

Stationary phase polarity is determined by the type and amount of functional groups in the stationary phase. Structures for Restek stationary phases are presented in order of polarity on page 15. When choosing a column, consider the polarity of both the stationary phase and your target analytes. If the stationary phase and analyte polarities are similar, then the attractive forces are strong and more retention will result. Greater retention often results in increased resolution. Stationary phase polarity strongly influences column selectivity and separation factor, making it a useful consideration when selecting a column.

Stationary phase selectivity is defined by IUPAC as the extent to which other substances interfere with the determination of a given substance. Selectivity is directly related to stationary phase composition and how it interacts with target compounds through intermolecular forces (e.g., hydrogen bonding, dispersion, dipole-dipole interactions, and shape selectivity). As methyl groups in the stationary phase are replaced by different functionalities, such as phenyl or cyanopropyl pendant groups, compounds that are more soluble with those functional groups (e.g., aromatics or polar compounds, respectively) will interact more and be retained longer, often leading to better resolution and increased selectivity. In another example of the effect of stationary phase-analyte interactions, an Rtx®-200 stationary phase is highly selective for analytes containing lone pair electrons, such as halogen, nitrogen, or carbonyl groups, due to interactions with the fluorine pendant group in this phase. Selectivity can be approximated using existing applications or retention indices (Table I), making these useful tools for comparing phases and deciding which is most appropriate for a specific analysis.

**Table I:** Retention Indices for Restek Phases

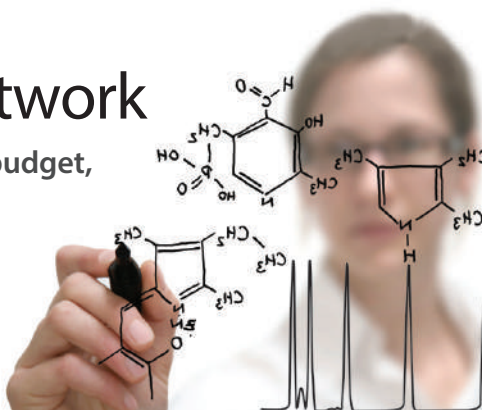
Phase	Benzene	Butanol	Pentanone	Nitropropane
Rtx-1	651	651	667	705
Rtx-5/Rtx-5MS	667	667	689	743
Rtx-20	711	704	740	820
Rtx-1301/Rtx-624	689	729	739	816
Rtx-35	746	733	773	867
Rtx-200	738	758	884	980
Rtx-50	778	769	813	921
Rtx-1701	721	778	784	881
Rtx-65TG	794	779	825	938
Rtx-225	847	937	958	958
Stabilwax	963	1,158	998	1,230

Stationary phase polarity and selectivity also affect how much sample loading capacity the column will have for a particular analyte; the more soluble an analyte is in the stationary phase, the greater the sample loading capacity will be for that analyte. For example, a nonpolar stationary phase will have higher sample loading capacity for a nonpolar compound (e.g., pentane) than for a polar compound (e.g., ethanol).

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The relationship between polarity, selectivity, and sample loading capacity can be illustrated using an example. Consider the analysis of benzene and butanol, which have nearly the same boiling point, on an Rtx®-20 column (diphenyl dimethyl polysiloxane stationary phase). Since the benzene molecule is structurally more similar to the diphenyl phase than butanol is, benzene will solvate into the stationary phase more readily than butanol based on the concept that “like dissolves like.” Since benzene solvates more readily with the stationary phase, it has more interaction with the stationary phase as it elutes through the column and will be retained longer. Since butanol solvates less with the stationary phase, it has fewer interactions with the stationary phase and less will be retained. Therefore, the elution order of these two compounds on an Rtx®-20 column will be butanol first and benzene second. In addition, since benzene is more soluble in the diphenyl phase, the column has more capacity for benzene. This results in a more symmetrical peak shape for benzene than for butanol. A more polar column, such as a polyethylene glycol (PEG) column, will provide retention and better peak shape for butanol compared to benzene.

Due to their influence on separation factor, polarity and selectivity are primary considerations when selecting a column. However, temperature limits must also be considered. In general, highly polar stationary phases have lower maximum operating temperatures, so choosing a column with the appropriate maximum operating temperature, as well as optimal polarity and selectivity for the type of compounds being analyzed, is crucial.

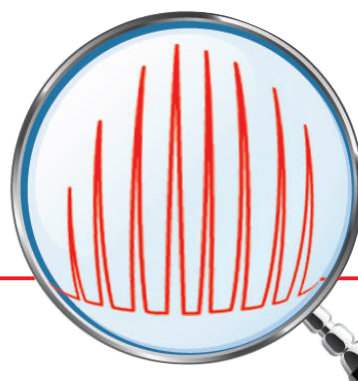
### Retention Factor (k)

The retention factor (k) of a column is based on the time an analyte spends in the stationary phase relative to the time it spends in the carrier gas. It is influenced primarily by column inner diameter (ID), phase film thickness, and temperature. Retention factor is sometimes referred to as capacity factor, which should not be confused with sample loading capacity. As a general rule, the thicker the film and the smaller the inner diameter, the more an analyte will be retained. Note that as temperature increases, k decreases; therefore, at higher temperatures analytes stay in the carrier gas longer and are less retained.

## Chromatogram Search Tool

Search by **compound name**,  
**synonym**, **CAS #**, or **keyword**

[www.restek.com/chromatograms](http://www.restek.com/chromatograms)







When selecting column ID, consider the type of injection, the detector being used, and the concentration of sample (amount on-column). The injection technique is important because the column ID may need to be selected based on whether a split, splitless, direct, cool on-column injection, or other sample transfer method is being used. For example, 0.53 mm ID columns are ideal for cool on-column injections since the syringe needle (26 gauge) will fit into the large column ID. In addition to column ID, the detector and its flow requirements must be considered. For example, some MS detectors can only operate under column flow rates of up to 1.5 mL/min; therefore, a 0.53 mm ID column, which requires higher flows for proper chromatography, is not an option for MS work. Table II shows typical column characteristics for columns of various inner diameters.

Fused Silica Capillary & PLOT Column Ferrule Guide

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8

**Table II:** General Column Characteristics Based on ID

Characteristic	Column Inner Diameter (mm)					
	0.10	0.15	0.18	0.25	0.32	0.53
Nitrogen flow (mL/min)	0.2	0.3	0.3	0.4	0.6	0.9
Helium flow (mL/min)	0.6	0.8	1.0	1.4	1.8	3.0
Hydrogen flow (mL/min)	0.7	1.1	1.3	1.8	2.3	3.7
Sample loading capacity (ng)	2.5	10	20	50	125	500
Theoretical plates/meter	11,000	7,000	6,000	4,000	3,000	2,000

Note: Flows listed are for maximum efficiency. Sample loading capacities are estimates only. Actual sample loading capacity varies with film thickness and analyte.

Film thickness has a direct effect on the retention and elution temperature for each sample component. Extremely volatile compounds should be analyzed on thick film columns to increase the time the compounds spend in the stationary phase, which allows them to better separate. High molecular weight compounds must be analyzed on thinner film columns. This reduces the length of time that the analytes stay in the column and minimizes phase bleed at higher elution temperatures. Film thickness also affects the amount of material that can be injected onto the column without overloading it. A thicker film column can be used for higher concentration samples.

## Technical Service

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Phone: 1-800-356-1688, ext. 4  
e-mail: [support@restek.com](mailto:support@restek.com)

#### Hours of operation (Eastern Time):

Monday - Thursday, 8:00 a.m. to 6:00 p.m.  
Friday, 8:00 a.m. to 5:00 p.m.

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Checking for leaks, using a Restek® electronic leak detector, is an easy way to protect your instrument and column from damage.

Film thickness also directly affects phase ratio ( $\beta$ ), which must be accounted for when changing to a column with a different inner diameter. When inner diameter increases, film thickness ( $d_f$ ) must also increase in order to provide comparable resolution and retention. Table III shows  $\beta$  values for common column dimensions; similar values indicate similar separations on different ID columns.

**Table III: Phase Ratio ( $\beta$ ) Values for Common Column Dimensions\***

Column ID	Film Thickness ( $d_f$ ) / $\beta$ Value						
	0.10 $\mu\text{m}$	0.25 $\mu\text{m}$	0.50 $\mu\text{m}$	1.0 $\mu\text{m}$	1.5 $\mu\text{m}$	3.0 $\mu\text{m}$	5.0 $\mu\text{m}$
0.18 mm	450	180	90	45	30	15	9
0.25 mm	625	250	125	63	42	21	13
0.32 mm	800	320	160	80	53	27	16
0.53 mm	1325	530	265	128	88	43	27

\* $\beta = r/2d_f$  ( $r$ =internal radius of tubing;  $d_f$ = phase film thickness)

### Efficiency (N)

Column efficiency (N) is the column length divided by the height equivalent of a theoretical plate (HETP). The effective number of theoretical plates is affected by how well the phase has been coated onto the column walls, and it is measured by how narrow the peaks are when they elute out of the column. Higher column efficiency (N) results in greater resolution between peaks. Inner diameter also influences efficiency; a simple rule of thumb is the smaller the column ID, the more efficient the column.

Capillary columns are made in various lengths, typically 10, 15, 30, 60, and 105 meters. Longer columns provide more resolving power, but will also increase analysis time and cost more. When column length is doubled, analysis time will increase by as much as a factor of two. However, doubling the column length increases resolution by only approximately 40% since the column length term is under the square root function in the resolution equation. When selecting column length, the increase in resolution obtained in a longer column must be weighed against the increase in cost and analysis time.

### Conclusion

A basic understanding of the resolution equation allows analysts to make more effective column choices. Phase choice should be influenced primarily by separation factor, which can be approximated by considering the structures of both the phase and the analyte, as well as by referencing retention indices or existing applications. Retention factor and efficiency also affect peak separations and should be considered when choosing column inner diameter, film thickness, and length. By better understanding these factors, analysts can simplify the column selection process, optimize separations, and increase lab productivity.

### What Do the Temperature Limits Mean?

All Restek columns have published minimum and maximum operating temperatures that establish the working range for the stationary phase. Note that these ranges vary with the thickness of the coating.

#### Rxi®-5Sil MS Columns (fused silica)

ID	$d_f$ ( $\mu\text{m}$ )	temp. limits
0.25 mm	0.25	-60 to 320/350 °C
0.32 mm	0.50	-60 to 320/350 °C
0.53 mm	1.50	-60 to 320/330 °C

The second temperature is the **maximum temperature-programmed operating temperature**, the temperature to which the column can be heated for short periods of time (i.e., during a temperature-programmed analysis). If only one temperature is listed, it is both the isothermal and the maximum temperature.

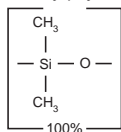
The **minimum operating temperature** defines the lowest usable temperature before the stationary phase solidifies. Operating the column below the minimum temperature will not harm the phase, but poor peak shape and other chromatography problems may occur.

Many phases list two maximum operating temperatures. The first temperature is the **maximum isothermal operating temperature**. This is the temperature to which the columns are guaranteed to meet the minimum bleed specification (i.e., lowest bleed level).



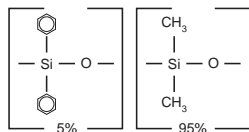
Structures, Polarities, Properties, and Uses for Restek® Capillary Column Phases, in Order of Increasing Polarity

**Rxi®-1ms,  
Rxi®-1HT, Rtx®-1**  
Dimethyl polysiloxane



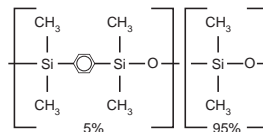
Similar to: (100%-methyl)-polysiloxane  
Polarity: nonpolar  
Uses: solvents, petroleum products, pharmaceutical samples, waxes  
[G1] [G2] [G38]

**Rxi®-5ms, Rxi®-5HT,  
Rtx®-5, Rtx®-5MS**  
Diphenyl dimethyl polysiloxane



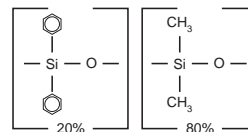
Similar to: (5%-phenyl)-methylpolysiloxane  
Polarity: slightly polar  
Uses: flavors, environmental, aromatic hydrocarbons  
[G27] [G36]

**Rxi®-5Sil MS**  
1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane



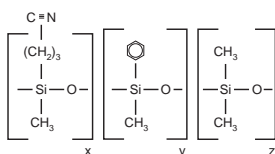
Similar to: (5%-phenyl)-methylpolysiloxane  
Polarity: slightly polar  
Uses: flavors, environmental, pesticides, PCBs, aromatic hydrocarbons

**Rtx®-20**  
Diphenyl dimethyl polysiloxane



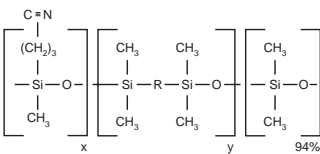
Similar to: (20%-phenyl)-methylpolysiloxane  
Polarity: slightly polar  
Uses: volatile compounds, alcohols  
[G28] [G32]

**Rtx®-1301, Rtx®-624,  
Rtx®-G43**  
Cyanopropylmethyl phenylmethyl polysiloxane



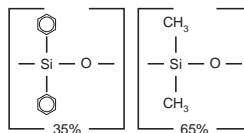
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: volatile compounds, insecticides  
[G43]

**Rxi®-624Sil MS**



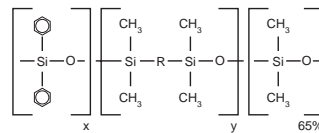
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products

**Rtx®-35**  
Diphenyl dimethyl polysiloxane



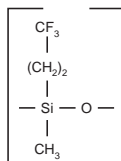
Similar to: (35%-phenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides  
[G42]

**Rxi®-35Sil MS**



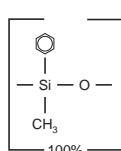
Similar to: (35%-phenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides

**Rtx®-200**  
Trifluoropropylmethyl polysiloxane



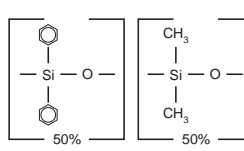
Similar to: (trifluoropropyl)-methylpolysiloxane  
Polarity: selective for lone pair electrons  
Uses: environmental, solvents, Freon® gases, drugs, ketones, alcohols  
[G6]

**Rtx®-50**  
Phenyl methyl polysiloxane



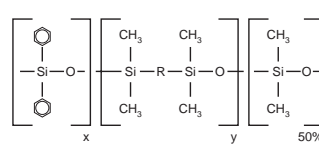
Similar to: (50%-phenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: FAMES, carbohydrates  
[G3]

**Rxi®-17**  
Diphenyl dimethyl polysiloxane



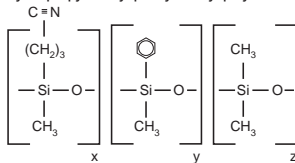
Similar to: (50%-phenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: triglycerides, phthalate esters, steroids, phenols  
[G3]

**Rxi®-17Sil MS**



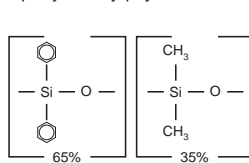
Similar to: (50%-phenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: triglycerides, phthalate esters, steroids, phenols  
[G3]

**Rtx®-1701**  
Cyanopropylmethyl phenylmethyl polysiloxane



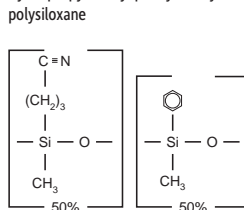
Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: pesticides, PCBs, alcohols, oxygenates  
[G46]

**Rtx®-65, Rtx®-65TG**  
Diphenyl dimethyl polysiloxane



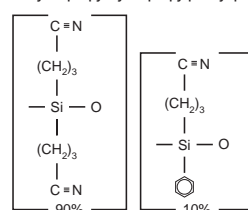
Similar to: (65%-phenyl)-methylpolysiloxane  
Polarity: intermediately polar  
Uses: triglycerides, rosin acids, free fatty acids  
[G17]

**Rtx®-225**  
Cyanopropylmethyl phenylmethyl polysiloxane



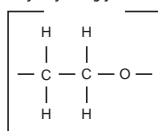
Similar to: (50%-cyanopropylmethyl)-phenylpolysiloxane  
Polarity: polar  
Uses: FAMES, carbohydrates  
[G7] [G19]

**Rtx®-2330**  
Biscyanopropyl cyanopropylphenyl polysiloxane



Similar to: (95%-cyanopropyl)-phenyl polysiloxane  
Polarity: polar  
Uses: cis/trans FAMES, dioxin isomers, rosin acids  
[G8] [G48]

**Stabilwax®, Rtx®-Wax,  
Stabilwax®-MS**  
Polyethylene glycol



Polarity: polar  
Uses: FAMES, flavors, acids, amines, solvents, xylene isomers  
[G14] [G15]

**note**

Structures, polarities, and properties also apply to metal MXT® stationary phases.

## Columns by Phase

Restek	Phase Description	USP		SGE	Phenomenex	Macherey-Nagel	Supelco	Alltech	Quadrex
		Nomenclature*	Agilent						
Rtx-1 (p. 41) MXT-1 (p. 107)	dimethyl polysiloxane	G1, G2, G38	HP-1, DB-1, CP-Sil 5 CB	BP1	ZB-1	OPTIMA 1	SPB-1	AT-1, EC-1	007-1
Rxi-1HT (p. 39)	dimethyl polysiloxane		DB-1ht		ZB-1HTInferno			AT-1ht	
Rxi-1ms (p. 29)	dimethyl polysiloxane (low bleed)	G1, G2, G38	HP-1ms, HP-1msUI, DB-1ms, DB-1msUI, VF-1ms, Ultra 1	BP1	ZB-1, ZB-1ms	OPTIMA 1 MS, OPTIMA 1 MS Accent	SPB-1, Equity-1	AT-1ms	007-1
Rtx-5MS (p. 44) Rtx-5 (p. 42-43, 96) MXT-5 (p. 108)	diphenyl dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP-Sil 8 CB	BP5	ZB-5	OPTIMA 5	SPB-5	EC-5, AT-5	007-5
Rxi-5HT (p. 39)	diphenyl dimethyl polysiloxane		DB-5ht, VF-5ht	HT5	ZB-5HTInferno	OPTIMA 5HT			
Rxi-5ms (p. 30)	diphenyl dimethyl polysiloxane (low bleed)	G27, G36	HP-5msSV, HP-5ms, HP-5msUI, DB-5, Ultra-2, CP-Sil 8 CB	BP5ms	ZB-5, ZB-5msi	OPTIMA 5, OPTIMA 5 MS	SPB-5, Equity-5	AT-5ms	007-5
Rxi-5Sil MS (p. 32, 67, 75, 77, 85)	1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane		DB-5ms, DB-5msUI, VF-5ms	BPX5	ZB-5ms, ZB- SemiVolatiles	OPTIMA 5MS Accent	SLB-5ms		007-5MS
Rxi-XLB (p. 31, 71)	proprietary phase		DB-XLB, VF-Xms		MR1, ZB-XLB	OPTIMA XLB			
Rtx-20 (p. 45)	diphenyl dimethyl polysiloxane	G28, G32					SPB-20	EC-20, AT-20	007-20
Rtx-35 (p. 46)	diphenyl dimethyl polysiloxane	G42	HP-35, DB-35	BPX35, BPX608	ZB-35		SPB-35, SPB-608	AT-35, AT-35ms	007-35
Rxi-35Sil MS (p. 34, 82)	proprietary phase		DB-35ms, DB35msUI, VF-35ms	BPX35	MR2	OPTIMA 35 MS			
Rtx-50 (p. 47) MXT-50 (p. 109)	phenyl methyl polysiloxane	G3	HP-50+, CP-Sil 24 CB				SPB-50	AT-50	007-17
Rxi-17 (p. 35)	diphenyl dimethyl polysiloxane	G3	HP-17, DB-17, DB-17ht, DB-608		ZB-50	OPTIMA 17	SPB-17		
Rxi-17Sil MS (p. 36, 76)	proprietary phase	G3	DB-17ms, VF-17ms	BPX50		OPTIMA 17 MS			
Rtx-65 (p. 47)	diphenyl dimethyl polysiloxane								007-65HT
Rxi-624Sil MS (p. 38, 81, 87, 94)	proprietary phase	G43	DB-624, VF-624ms, CP-Select 624 CB	BP624		OPTIMA 624 LB			
Rtx-1301 (p. 51) Rtx-624 (p. 52) MXT-1301 (p. 109)	cyanopropylmethyl phenylmethyl polysiloxane	G43	DB-1301, DB-624, DB-624UI, VF-1301ms, VF-624ms, CP-1301	BP624	ZB-624	OPTIMA 1301, OPTIMA 624	SPB-624	AT-624, AT-1301	007-1301, 007-624
Rtx-1701 (p. 53) MXT-1701 (p. 109)	cyanopropylmethyl phenylmethyl polysiloxane	G46	DB-1701P, DB-1701, CP-Sil 19 CB, VF-1701ms, VF-1701 Pesticides	BP10	ZB-1701, ZB-1701P	OPTIMA 1701	Equity-1701	AT-1701	007-1701
Rtx-200 (p. 48) MXT-200 (p. 110)	trifluoropropylmethyl polysiloxane	G6	DB-210, DB-200, VF-200ms			OPTIMA 210		AT-210	
Rtx-200MS (p. 48-49)	trifluoropropylmethyl polysiloxane (low bleed)	G6	VF-200ms						
Rtx-225 (p. 54)	cyanopropylmethyl phenylmethyl polysiloxane	G7, G19	DB-225ms, CP-Sil 43 CB	BP225		OPTIMA 225	SPB-225	AT-225	007-225
Rtx-440 (p. 50)	proprietary phase					<b>Restek innovation</b>			
Rtx-2330 (p. 55)	biscyanopropyl cyanopropylphenyl polysiloxane	G8, G48	VF-23ms	BPX70			SP-2330, SP-2331, SP-2380	AT-Silar90	007-23
Rt-2560 (p. 56, 83)	bicyanopropyl polysiloxane		HP-88, CP-Sil 88				SP-2560		
Rtx-Wax (p. 57)	polyethylene glycol	G14, G15, G16, G20, G39	DB-Wax, CP-Wax 52 CB	BP20	ZB-Wax	OPTIMA WAX		AT-WAXms, EC-WAX	007-CW
Stabilwax (p. 58, 95) Stabilwax-MS (p. 59) MXT-WAX (p. 110)	polyethylene glycol	G14, G15, G16, G20, G39	HP-INNOWax, CP-Wax 52 CB, VF-WAX MS		ZB-WAXplus	OPTIMA WAXplus	Supelcowax-10	AT-WAX	

See page 117 for Restek PLOT Column Phase Cross-Reference chart.

\*See page 147 for our USP Liquid Phase and Solid Support Cross-Reference.





### Application-Specific Columns by Industry

Restek	Applications	Agilent	Supelco	Macherey-Nagel	SGE	Alltech	Phenomenex
<b>Chiral Columns</b>							
Rt-βDEXm, Rt-βDEXsm, Rt-βDEXse, Rt-βDEXsp, Rt-βDEXsa, Rt-βDEXcst, Rt-γDEXsa (p. 103)	Chiral compounds						
<b>Clinical, Forensic, &amp; Toxicology</b>							
Rtx-BAC Plus 1 (p. 65)	Blood alcohol testing	DB-ALC1					ZB-BAC1
Rtx-BAC Plus 2 (p. 65)		DB-ALC2					ZB-BAC2
<b>Environmental</b>							
Rxi-5Sil MS (p. 67, 75, 77)	Semivolatiles - EPA Methods 8270, 625, 525	DB-5ms, DB-5msUI, VF-5ms	SLB-5ms	OPTIMA 5MS Accent	BPX5		ZB-5ms, ZB-SemiVolatiles
Rtx-VMS (p. 78)	Volatiles - EPA Methods 8260, 624, 524	<b>Restek innovation</b>					
Rxi-624Sil MS (p. 81)	Volatiles - EPA Method 624	DB-624, VF-624ms, CP-Select 624 CB		OPTIMA 624 LB	BP624		
Rtx-502.2 (p. 80)	Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602	DB-502.2	VOCOL			AT-502.2	
Rtx-Volatiles (p. 80)			VOCOL				
Rtx-VRX (p. 79)		DB-VRX					
Rtx-CLPesticides (p. 72)	Organochlorine pesticides -	DB-CLP1					ZB-CLP1
Rtx-CLPesticides2 (p. 72)	EPA Methods 8081, 8082, 608, 505, 508	DB-CLP2					ZB-CLP2
Rtx-1614 (p. 66)	Brominated flame retardants	<b>Restek innovation</b>					
Rtx-PCB (p. 70)	Polychlorinated biphenyl -	<b>Restek innovation</b>					
Rxi-XLB (p. 71)	EPA Methods 8082, 608, PCB congeners	DB-XLB, VF-XMS					MR1, ZB-XLB
Rtx-OPPesticides (p. 74)	Organophosphorus pesticides -	<b>Restek innovation</b>					
Rtx-OPPesticides2 (p. 74)	EPA Method 8141	<b>Restek innovation</b>					
Rtx-Dioxin2 (p. 68)	Dioxin & Furans - EPA Methods	<b>Restek innovation</b>					
Rtx-Mineral Oil (p. 69)	DIN EN ISO 9377-2	Select Mineral Oil					
Rxi-17Sil MS (p. 76)	Polycyclic aromatic hydrocarbons	DB-17ms, VF-17ms		OPTIMA 17 MS	BPX50		
<b>Foods, Flavors, &amp; Fragrances</b>							
Rt-2560 (p. 83)	cis/trans FAMES	HP-88	SPB-2560				
FAMEWAX (p. 83)	Marine oils	Select FAME	Omegawax			AT-AquaWax, AT-FAME	
Rxi-PAH (p. 84)	PAHs	<b>Restek innovation</b>					
Rtx-65 TG (p. 89)	Triglycerides	<b>Restek innovation</b>					
<b>Petroleum &amp; Petrochemical</b>							
Rt-Alumina BOND/CFC (p. 123)	Chlorinated fluorocarbons (CFCs)						
Rtx-DHA (p. 92)	Detailed hydrocarbon analysis	HP-PONA, DB-Petro, CP-Sil PONA CB	Petrocol DH		BP1PONA		
Rtx-2887 (p. 93)	Hydrocarbons - ASTM 2887	DB-2887	Petrocol 2887, Petrocol EX2887			AT-2887	
MXT-2887 (p. 113)				<b>Restek innovation</b>			
D3606 (p. 138)	Ethanol - ASTM 3606						
Rt-TCEP (p. 90)		CP-TCEP	TCEP				
MXT-1HT SimDist (p. 114)	Simulated distillation	DB-HT-SimDis, CP-SimDist, CP-SimDist Ultimet			BPX1	AT-3710	ZB-1XT SimDist
MXT-500 SimDist (p. 115)		<b>Restek innovation</b>					
Rtx-Biodiesel TG (p. 91)	Triglycerides in biodiesel	Biodiesel, Select Biodiesel		OPTIMA Biodiesel			ZB-Bioethanol
MXT-Biodiesel TG (p. 113)		<b>Restek innovation</b>					
<b>Pharmaceutical</b>							
Rtx-G27 w/IntegraGuard (p. 97)	Organic volatile impurities (OVI) - USP 467		OVI-G43				
Rtx-G43 w/IntegraGuard (p. 97)							
Rxi-624Sil MS (p. 94)		DB-624, VF-624ms, CP-Select 624 CB		OPTIMA 624 LB	BP624		
Rtx-5 (G27) (p. 96)		HP-5, DB-5, CP-Sil 8 CB	SPB-5	OPTIMA 5	BP5	EC-5, AT-5	ZB-5
Stabilwax (G16) (p. 95)		HP-INNOWax, CP-Wax 52 CB, VF-WAX MS	Supelcowax-10	OPTIMA WAXplus		AT-WAX	ZB-WAXplus
<b>Specially deactivated phases</b>							
Rtx-Volatile Amine (p. 99)	Volatile amines	CP-Volamine					
Rtx-5Amine (p. 100)	Amines			OPTIMA 5 Amine			
Rtx-35Amine (p. 101)		<b>Restek innovation</b>					
Stabilwax-DB (p. 102)		CAM, CP-WAX 51 for Amines	Carbowax Amine	FS-CW 20 M-AM		AT-CAM	
Stabilwax-DA (p. 98)	Free fatty acids	HP-FFAP, DB-FFAP, CP-WAX 58 FFAP CB	NUKOL	PERMABOND FFAP, OPTIMA FFAP, OPTIMA FFAP Plus	BP-21	AT-AquaWax DA, AT-1000	ZB-FFAP

## did you know?

We test our guard columns/transfer lines with a comprehensive test mix to ensure high inertness.

## please note

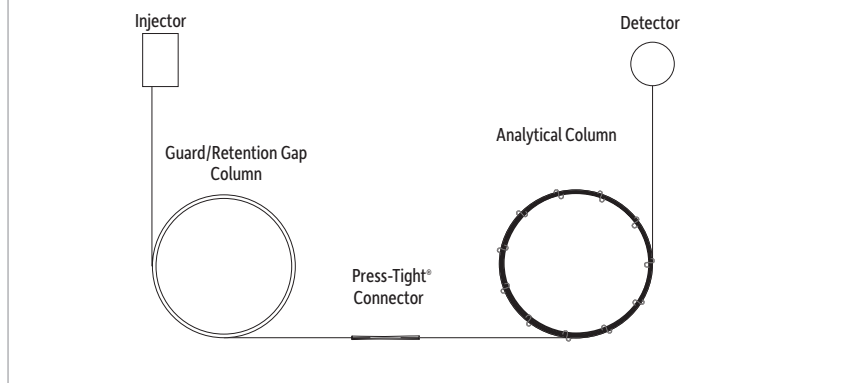
Having trouble making a leak-free connection? Try our "built in" Integra-Guard® columns!

See page 23 for details.

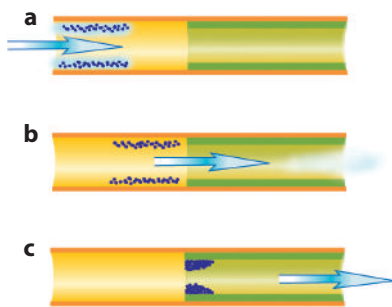
## Guard Columns and Retention Gaps

Guard columns and retention gaps are widely used in gas chromatography. The concept of the guard column is to trap nonvolatile material at the head of the column, not allowing the material to reach the analytical column. The concept of the retention gap is to help focus the compounds transferred from the inlet to a small band at the head of the analytical column in order to reduce chromatographic peak broadening. Both concepts (trapping nonvolatile material and refocusing the target analytes) may take place when a piece of deactivated tubing is connected to an analytical column as in Figure 1.

**Figure 1:** A guard/retention gap column connected to an analytical column



**Figure 2:** Retention gaps are used to focus components in a tight band at the beginning of the analytical column.



- Sample introduction: a liquid film of solvent and sample is deposited in the first length of capillary.
- As oven temperature increases, the solvent evaporates and the target compounds elute unretained through the retention gap until they contact the analytical column.
- When target compounds come in contact with the stationary phase, they are refocused on the analytical column, resulting in a narrow initial band width.

### Analyte Focusing

There are two injection techniques where the retention gap is used to help focus target analytes at the beginning of the analytical column: cool on-column injection and splitless injection.

For cool on-column injection, the purpose of a retention gap is to help focus the sample components when introducing a liquid sample directly into the retention gap. The cool on-column injection is performed by inserting the syringe needle into the retention gap (this can be accomplished with a 0.53 mm ID retention gap and a 26s gauge syringe) and transferring the liquid sample directly into the retention gap. The injection is made with the injector and column oven set below the boiling point of the solvent. As the solvent is evaporated, the volatile target analytes migrate in the solvent towards the analytical column, and the heavier analytes will be distributed over the retention gap. As the oven temperature increases, the target analytes vaporize and move unretained down the retention gap column until the compounds reach the liquid stationary phase of the analytical column. At this juncture, the target analytes are trapped/focused by the liquid phase forming a narrow injection band.

The retention gap may also be useful in hot vaporization injections when the transfer of the compounds from the inlet to the column does not form a focused band. Typical applications include water injections or injections using small ID columns, where split or tailing peaks would indicate an unfocused band. In these applications, the target analytes are trapped in a nonuniform or longitudinally diffuse band at the head of the retention gap (Figure 2a). As the oven temperature is increased, the solvent and target compounds are vaporized and move unretained through the retention gap (Figure 2b). When the target compounds come in contact with the stationary phase, they are refocused in a narrow band (Figure 2c), improving the chromatography.

### Protecting the Analytical Column

The concept of a guard column is to protect the analytical column from becoming contaminated with nonvolatile compounds. The guard column is used to retain non-volatile material, usually in the first 10-20 cm, and not allow it to elute onto the liquid phase of the analytical column. As the oven temperature increases, the more volatile target compounds vaporize, elute down the guard column, and refocus at the head of the analytical column without interference from the nonvolatile material left behind.

Using guard columns is advantageous because they prevent contamination from being introduced onto the column. Contaminants can cause active sites as well as change the conditions of the focusing zone of the analytical column. Another advantage is that the resolution of closely eluting compounds will not be affected when the column is trimmed during maintenance because the guard column does not contribute to the resolving power of the analytical column. Using guard columns is a simple, cost-effective way to extend analytical column lifetime.

In summary, the retention gap and guard column are essentially the same products, but are used for different purposes. The deactivated tubing provides an inert pathway, helps focus target analytes at the head of the analytical column for on-column and splitless injections, and also prevents nonvolatile material from contaminating the head of the analytical column.

### What type of guard column should be used?

When using a guard column, it is important to match the polarity of the solvent and the polarity of the surface deactivation. Rxi® guard tubing is good for a wide variety of applications and allows most common solvents (methylene chloride, hexane, isooctane, toluene) to easily wet and create a uniform film on the tubing surface.

If more polar solvents such as methanol or water are used, a polar-deactivated guard column is recommended to allow the solvent to wet the tubing surface. However, polar-deactivated guard columns are not resistant to harsh "water vaporization," which occurs when water in the liquid state is injected into the tubing and rapidly vaporizes (such as in steam cleaning). Hydroguard® deactivation is an alternative for direct aqueous injections. However, a Hydroguard®-deactivated guard column will not allow polar solvents to wet the tubing surface and may cause solvent beading if the oven temperature is 20 °C below the solvent boiling point. Base-deactivated guard columns reduce adsorption and tailing for amines and other basic compounds.

### How is a guard column connected to the analytical column?

To connect the guard column to the analytical column, Vu2-Union®, Press-Tight®, and other connectors are available. MXT® unions, typically used for connecting metal columns together, are now available for fused silica columns. (See pages 227 to 233 for information about these connectors.)

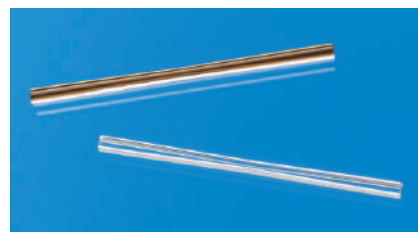
### it's a fact

To eliminate leaky connections and to ensure longer column lifetime, use our unique Integra-Guard® column. (See **page 23.**)

### Connectors for Fused Silica Columns



Vu2 Union® Connector  
(See page 229.)



Press-Tight® Connectors  
(See pages 227–228.)



MXT® Union Connector Kit  
for Fused Silica  
(See page 231.)

# GC Columns

## Fused Silica Capillary Columns

### Guard/Retention Gap Columns .....18-23

Overview..... 18-19

### Rxi® Columns .....24-39

Overview.....24-28

Rxi® Guard/Retention Gap Columns ..... 28

Rxi®-1ms, Rxi®-5ms .....29-30

Rxi®-XLB,..... 31

Rxi®-5Sil MS.....32-33

Rxi®-35Sil MS ..... 34

Rxi®-17, Rxi®-17Sil MS .....35-36

Rxi®-PAH, Rxi®-624Sil MS.....37-38

Rxi®-1HT, Rxi®-5HT ..... 39

### General-Purpose Columns .....40-59

Rtx®-1 ..... 41

Rtx®-5, Rtx®-5MS .....42-44

Rtx®-20, Rtx®-35.....45-46

Rtx®-50, Rtx®-65.....47

Rtx®-200, Rtx®-200MS .....48-49

Rtx®-440 ..... 50

Rtx®-1301, Rtx®-624 .....51-52

Rtx®-1701, Rtx®-225 .....53-54

Rtx®-2330, Rtx®-2560.....55-56

Rtx®-Wax ..... 57

Stabilwax® ..... 58

Stabilwax®-MS ..... 59

GCxGC.....60-62

Fast GC..... 63

### Application-Specific Columns ..... 64-103

Clinical, Forensic, & Toxicology ..... 65

Environmental.....66-81

Foods, Flavors, & Fragrances .....82-89

Petroleum & Petrochemical.....90-93

Pharmaceutical .....94-97

Specially Deactivated ..... 98-103



**Rxi® Guard/Retention Gap Columns** (fused silica)

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360 °C.

Nominal ID	Nominal OD	5-Meter cat.#	5-Meter/6-pk. cat.#	10-Meter cat.#	10-Meter/6-pk. cat.#
0.25 mm	0.37 ± 0.04 mm	10029	10029-600	10059	10059-600
0.32 mm	0.45 ± 0.04 mm	10039	10039-600	10064	10064-600
0.53 mm	0.69 ± 0.05 mm	10054	10054-600	10073	10073-600

**Intermediate-Polarity Deactivated Guard/Retention Gap Columns/Transfer Lines** (fused silica)

- Tested with a comprehensive test mix to ensure high inertness.
- Useful for a wide range of applications.
- Use with most common solvents.
- Maximum temperature: 325 °C.

Nominal ID	Nominal OD	1-Meter cat.#	5-Meter cat.#	5-Meter/6-pk. cat.#
0.025 mm	0.363 ± 0.012 mm	10097		
0.05 mm	0.363 ± 0.012 mm	10098		
0.075 mm	0.363 ± 0.012 mm	10099		
0.10 mm	0.363 ± 0.012 mm	10100	10041	
0.15 mm	0.363 ± 0.012 mm	10101	10042	
0.18 mm	0.37 ± 0.04 mm	10102	10046	10046-600
0.25 mm	0.37 ± 0.04 mm		10043	10043-600
0.32 mm	0.45 ± 0.04 mm		10044	10044-600
0.53 mm	0.69 ± 0.05 mm		10045	10045-600

Nominal ID	Nominal OD	10-Meter cat.#	10-Meter/6-pk. cat.#	30-Meter* cat.#	60-Meter*† cat.#
0.25 mm	0.37 ± 0.04 mm	10049	10049-600	10012	10013
0.32 mm	0.45 ± 0.04 mm	10048	10048-600	10022	10023
0.53 mm	0.69 ± 0.05 mm	10047		10032	10033

\*30- and 60-meter lengths are banded in 5-meter sections.

†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

**Polar-Deactivated Guard/Retention Gap Columns** (fused silica)

(polar polyethylene glycol deactivation)

- Tested with a comprehensive test mix to ensure high inertness.
- Polyethylene glycol deactivation layer provides optimum wettability for polar compounds.
- Minimize peak splitting when using polar solvents such as methanol or water.
- Compatible with Stabilwax®, Rtx®-225, and Rt®-2330 capillary columns.
- Maximum temperature: 280 °C.

Nominal ID	Nominal OD	5-Meter cat.#	10-Meter cat.#	30-Meter* cat.#
0.25 mm	0.37 ± 0.04 mm	10065	10068	10014
0.32 mm	0.45 ± 0.04 mm	10066	10069	
0.53 mm	0.69 ± 0.05 mm	10067	10070	10034

\*30-meter lengths are banded in 5-meter sections.

**it's a fact**

To eliminate connections, use an Integra-Guard® column. (See **page 23**.)

**it's a fact**

Use guard columns to:

- Reduce effects of dirty samples on column performance.
- Reduce downtime and maintenance.

Certificates of analysis for 5 m and 10 m Restek® guard columns are now provided electronically. To view and download your 5 m or 10 m guard column certificate, simply visit [www.restek.com/documentation](http://www.restek.com/documentation) then enter your catalog # and serial #.

**Fused Silica Capillary & PLOT Column Ferrule Guide**

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8



### did you know?

We test our guard columns/transfer lines with a comprehensive test mix to ensure high inertness.

### also available

#### Metal MXT® Guard/ Retention Gap Columns

Rugged, flexible, Siltek®-treated stainless steel tubing for use with MXT® columns; inertness comparable to fused silica tubing.

See **page 106**.



### Base-Deactivated Guard/Retention Gap Columns (fused silica)

- Tested with a basic amine test mix.
- Excellent inertness for basic compounds.
- Recommended for use with Rtx®-5 Amine, Rtx®-35 Amine, Rtx®-Volatile Amine, and Stabilwax®-DB capillary columns.
- Batch test chromatogram included.
- Maximum temperature: 315 °C.

Chemists using guard columns in the analyses of basic compounds frequently observe peak tailing and low recovery. This happens because conventionally deactivated tubing surfaces can be adsorptive to basic compounds. Restek offers base-deactivated guard columns, as well as base-deactivated inlet liners, for completely inert sample pathways.

Nominal ID	Nominal OD	5-Meter cat.#	5-Meter/6-pk. cat.#
0.25 mm	0.37 ± 0.04 mm	10000	10000-600
0.32 mm	0.45 ± 0.04 mm	10001	10001-600
0.53 mm	0.69 ± 0.05 mm	10002	10002-600

### Hydroguard® Water-Resistant Guard/Retention Gap Columns/ Transfer Lines (fused silica)

- Extend analytical column lifetime by preventing degradation from harsh “steam-cleaning” water injections.
- Tested with a comprehensive test mix, to ensure high inertness.
- Maximum temperature: 325 °C.

When transfer lines from purge-and-trap systems, air monitoring equipment, or other instruments carry condensed water vapor, deactivated column tubing quickly becomes active because of the creation of free silanol groups. These silanol groups adsorb active oxygenated compounds, such as alcohols and diols.

Restek chemists have addressed this concern and found a solution—Hydroguard® deactivated tubing. A unique deactivation chemistry creates a high-density surface that is not readily attacked by aggressive hydrolysis. The high-density surface coverage of the Hydroguard® deactivation layer effectively prevents water vapor from reaching the surface beneath. Use Hydroguard® tubing for connecting GCs to these devices:

- Headspace analyzers.
- Air analysis equipment and concentrator units.
- Purge-and-trap systems.

Nominal ID	Nominal OD	5-Meter cat.#	5-Meter/6-pk. cat.#	10-Meter cat.#	30-Meter* cat.#	60-Meter*† cat.#
0.05 mm	0.363 ± 0.012 mm	10075				
0.10 mm	0.363 ± 0.012 mm	10076				
0.15 mm	0.363 ± 0.012 mm	10077				
0.18 mm	0.37 ± 0.04 mm	10078				
0.25 mm	0.37 ± 0.04 mm	10079	10079-600	10082	10085	
0.32 mm	0.45 ± 0.04 mm	10080	10080-600	10083	10086	
0.53 mm	0.69 ± 0.05 mm	10081	10081-600	10084	10087	10090

\*30- and 60-meter lengths are banded in 5-meter sections.

†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

### also available

Press-Tight connectors.

See **pages 227-228**.



**Innovative Integra-Guard® Columns**

Get the protection without the connection!

- No leaks for a more robust method.
- No column connections for easier, faster maintenance.
- No peak distortions due to connector dead volume and thermal capacity.

For analysts who find it inconvenient to make a leak-free connection between the guard column and the analytical column, we offer Integra-Guard® columns. These innovative columns incorporate both a guard column and an analytical column in a continuous length of tubing, eliminating the connection and all connection-associated problems! The guard column section is marked separately from the analytical column using high-temperature string.

A wide variety of our Integra-Guard® capillary columns are listed here. The Integra-Guard® column is so economical that we challenge you to compare our price against that of a conventional connection, even if you assemble it yourself. If you are currently using a guard column, or are considering using one, call today and ask about Integra-Guard® columns.

Description	qty.	cat.#
<b>Rtx-1</b>		
30 m, 0.25 mm ID, 0.25 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10123-124
30 m, 0.53 mm ID, 1.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10155-126
30 m, 0.53 mm ID, 5.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10179-126
<b>Rtx-5</b>		
30 m, 0.25 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10223-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5 w/10 m Integra-Guard Column	ea.	10223-127
30 m, 0.25 mm ID, 1.00 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10253-124
30 m, 0.32 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10224-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10254-125
30 m, 0.53 mm ID, 5.00 µm Rtx-5/Rtx-G27 w/5 m Integra-Guard Column	ea.	10279-126
60 m, 0.32 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10227-125
<b>Rtx-5MS</b>		
15 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12620-124
15 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12635-127
30 m, 0.25 mm ID, 0.10 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12608-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12623-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12623-127
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12638-124
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12638-127
30 m, 0.32 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12624-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12654-125
<b>Rxi-5Sil MS</b>		
15 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13620-127
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13623-127
15 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13635-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13638-127
30 m, 0.32 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13639-125
30 m, 0.32 mm ID, 1.00 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13654-125
<b>Rtx-624</b>		
30 m, 0.25 mm ID, 1.40 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10968-124
30 m, 0.32 mm ID, 1.80 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10970-125
30 m, 0.53 mm ID, 3.00 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10971-126
<b>Rtx-1301</b>		
30 m, 0.53 mm ID, 3.00 µm Rtx-1301 w/5 m Integra-Guard Column	ea.	16085-126
<b>Rtx-1701</b>		
30 m, 0.25 mm ID, 0.25 µm Rtx-1701 w/5 m Integra-Guard Column	ea.	12023-124
<b>Stabilwax</b>		
30 m, 0.25 mm ID, 0.25 µm Stabilwax w/5 m Integra-Guard Column	ea.	10623-124
30 m, 0.32 mm ID, 1.00 µm Stabilwax w/5 m Integra-Guard Column	ea.	10654-125
30 m, 0.53 mm ID, 1.00 µm Stabilwax w/5 m Integra-Guard Column	ea.	10655-126

Integra-Guard® columns are available for all phases listed for columns with 0.25, 0.32, or 0.53 mm ID.

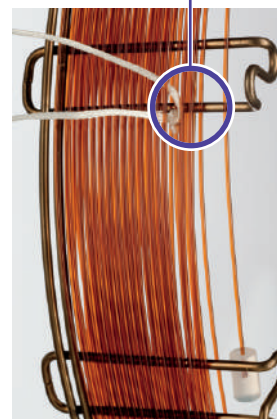
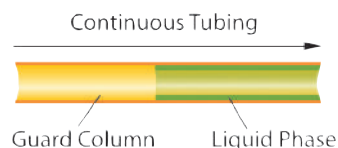
If you don't see what you need here, contact Customer Service.

**Restek innovation!**

Integra-Guard® columns: guard columns WITHOUT connections—protecting your analytical column has never been this easy!

**similar guards**

DuraGuard, EZ-Guard, Guardian

**Integra-Guard® Built-In Guard Column**

String indicates where the analytical column begins.



Tag indicates guard column end.



# High-Performance Rxi<sup>®</sup> GC Columns

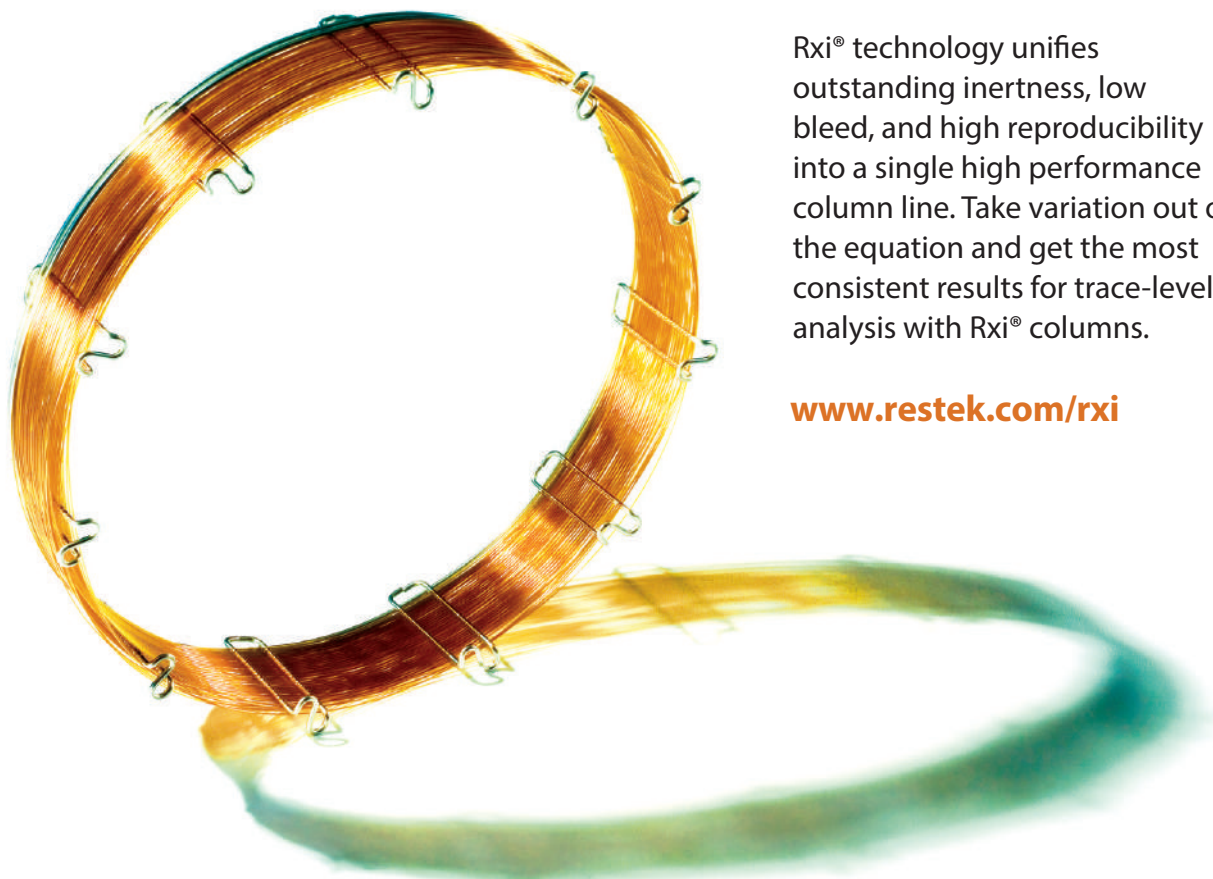
Overview .....	24–28
Rxi <sup>®</sup> Guard/Retention Gap Columns.....	28
Rxi <sup>®</sup> -1ms, Rxi <sup>®</sup> -5ms.....	29–30
Rxi <sup>®</sup> -XLB.....	31
Rxi <sup>®</sup> -5Sil MS.....	32–33
Rxi <sup>®</sup> -35Sil MS.....	34
Rxi <sup>®</sup> -17, Rxi <sup>®</sup> -17Sil MS.....	35–36
Rxi <sup>®</sup> -PAH, Rxi <sup>®</sup> -624Sil MS.....	37–38
Rxi <sup>®</sup> -1HT, Rxi <sup>®</sup> -5HT.....	39



## Lower Detection Limits with Groundbreaking Rxi<sup>®</sup> Column Technology

Rxi<sup>®</sup> technology unifies outstanding inertness, low bleed, and high reproducibility into a single high performance column line. Take variation out of the equation and get the most consistent results for trace-level analysis with Rxi<sup>®</sup> columns.

[www.restek.com/rxi](http://www.restek.com/rxi)





## Lower Detection Limits with Groundbreaking Column Technology

Rxi® columns deliver more accurate, reliable trace-level results than any other fused silica column on the market. To ensure the highest level of performance, all Rxi® capillary columns are manufactured and individually tested to meet stringent requirements for exceptional inertness, low bleed, and unsurpassed column-to-column reproducibility.

### Highest Inertness

Inertness is one of the most difficult attributes to achieve in an analytical column, but it is one of the most critical as it improves peak shape, response, and retention time stability. Rxi® technology produces the most inert columns available, providing these benefits:

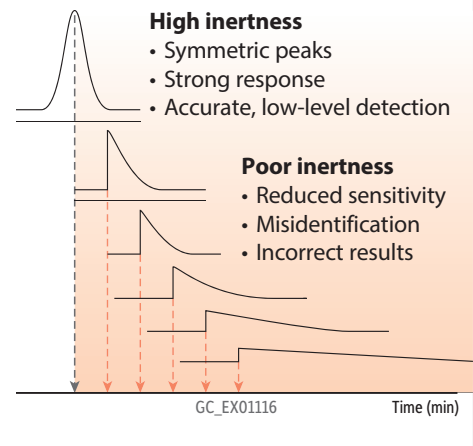
- Increased signal-to-noise ratios to improve low-level detection.
- Reproducible retention times for positive identifications.
- Improved response for polar, acidic, and basic compounds.

### Increased Signal and Reproducible Retention Times

When capillaries are not sufficiently deactivated, peaks become asymmetric, resulting in reduced signal and unpredictable retention times. As column activity increases, peak tailing becomes more pronounced, reducing peak height and causing retention time to drift (Figure 1). In practice, this means that sensitivity is lost and trace-level analytes cannot be reliably determined. In addition, even compounds at higher concentrations may be misidentified due to retention time shifting.

A more significant problem for sample analysis is that retention time can vary with analyte concentration if the column is not highly inert. Since the amount of target analyte in samples is unknown, retention times on a poorly deactivated column can easily vary enough to move compounds outside the retention time window (Figure 2). This can result in inaccurate identifications, the need for manual integration, and additional review or analysis before results can be reported. Using inert Rxi® columns ensures that compounds elute with good signal-to-noise ratios at expected retention times, regardless of analyte concentration.

**Figure 1:** As column activity increases, signal decreases and retention time shifts.



### free literature

#### Rxi® GC Columns

To learn more, download your free copy from

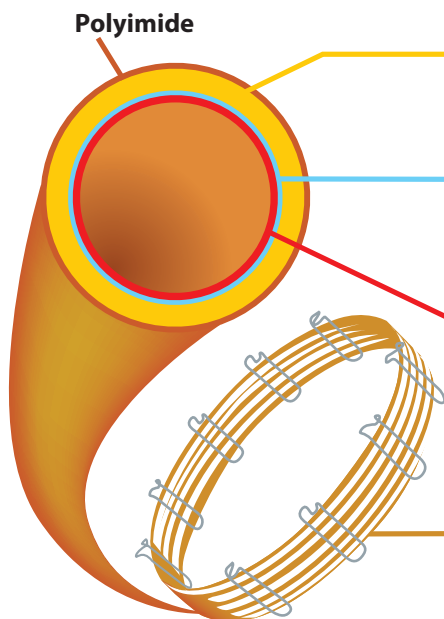
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lit. cat.#  
GNBR1843-UNV



## How did we Create the Rxi® Column Family?

We've optimized phase chemistry, column deactivation, and our manufacturing process to ensure exceptional performance.



### Restek® Fused Silica

We make our own tubing to ensure high quality and an uninterrupted supply!

### Rxi® Deactivation

- Effectively shields reactive silanols.
- Ensures comprehensive inertness (acids, bases, and diols).
- Provides symmetric peaks for higher sensitivity.

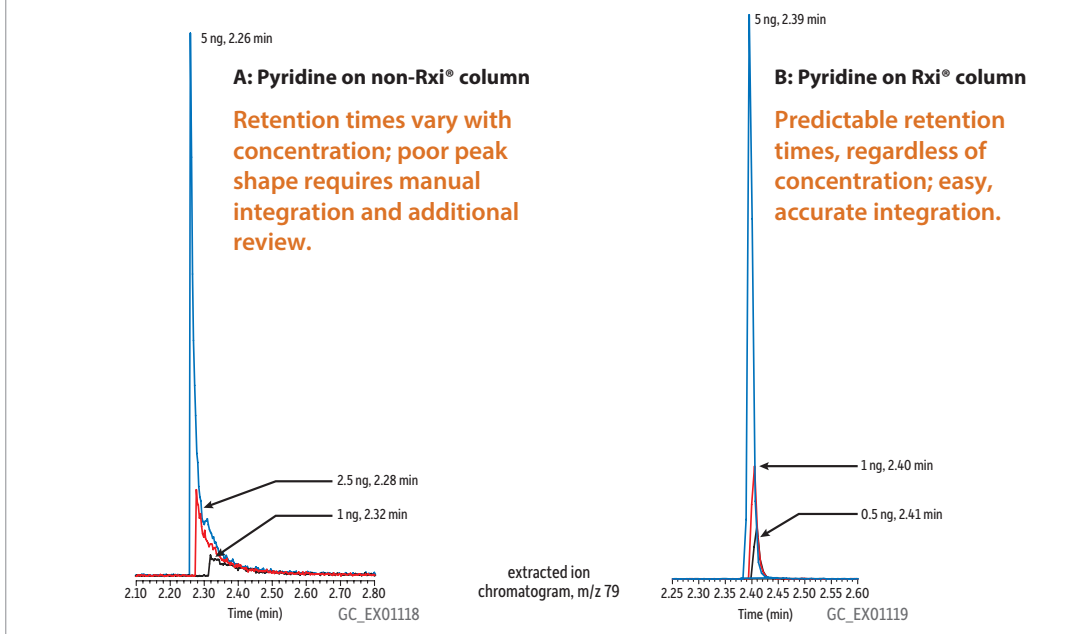
### Rxi® Phase Chemistry

- Enhances selectivity for challenging separations.
- Increases thermal stability, widening the application range.
- Lowers bleed for MS compatibility.
- Surface bonding increases durability and ensures reproducible retention times.

### Rxi® Manufacturing

Tighter quality controls for better performance and reliable column-to-column reproducibility.

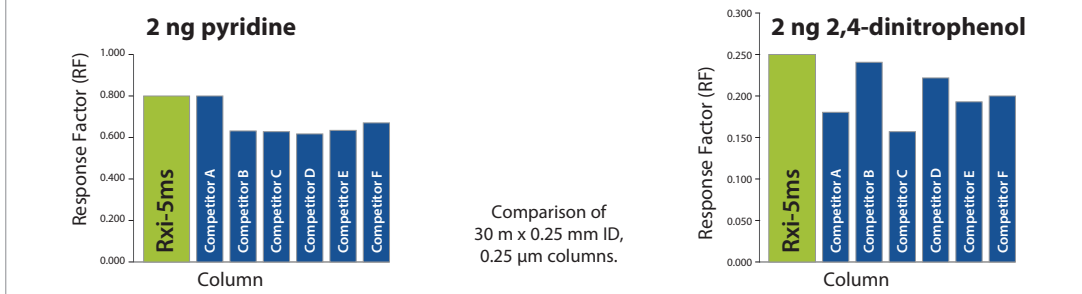
**Figure 2:** Compared to conventional GC columns, Rxi® columns show excellent inertness and produce good peak shape and reproducible retention for challenging compounds.



### Improved Response for Difficult Compounds

Another reason column inertness is important for trace-level analysis is that many acidic, basic, and polar compounds will tail significantly and become difficult to analyze if the column contains active sites. The remarkable neutrality of Rxi® columns solves this problem and allows a wide range of compounds to be analyzed with high sensitivity, often on a single column. All Rxi® columns are exceptionally inert as demonstrated in Figure 3 by high response factors for both pyridine (basic) and 2,4-dinitrophenol (acidic). Rxi® columns reliably produce highly symmetric peaks and improved responses for difficult compounds, indicating greater inertness than columns produced by other manufacturers (Figure 4).

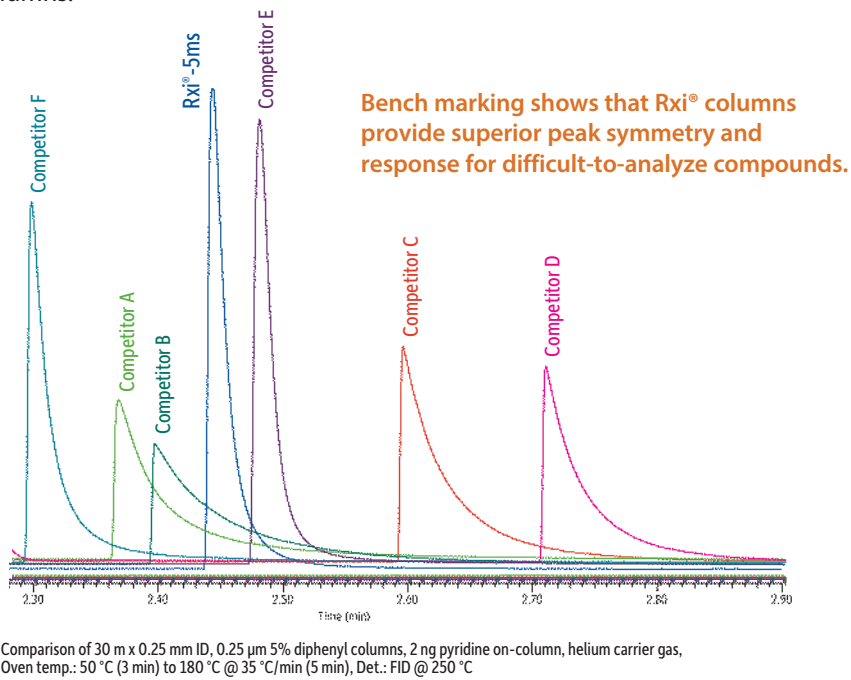
**Figure 3:** An Rxi® column gives the best overall performance for both basic and acidic compounds.



### What are “Sil” Rxi® Columns?

By combining arylene chemistry with Rxi® technology, Restek has developed a subgroup of Rxi® columns with exceptional thermal stability. These columns are produced by incorporating phenylene groups into the polysiloxane backbone, forming silarylene copolymers. As a result of this modification, these columns, which are distinguished by a “Sil” naming convention, have greater thermal stability than their conventional counterparts. Four Sil columns are currently available: Rxi®-5Sil MS, Rxi®-624Sil MS, Rxi®-35Sil MS, and Rxi®-17Sil MS; these columns have the same polarity as their conventional counterparts, but differ in selectivity. Higher thermal stability results in lower bleed, which can make these columns useful for MS applications or when increased sensitivity is required.

**Figure 4:** Peak shape comparison of a basic compound on various brands of GC columns.



### Innovation & Service

“When my research group needed a GC column for a chiral separation, Restek was the only company that offered to provide us with test columns to evaluate. The willingness of Restek to work with us to find a solution to our separation problem is exceptional.”

**Joe Dinnocenzo,**  
*Professor of Chemistry  
Director, Center for  
Photoinduced Charge Transfer  
University of Rochester*

### How can we help you today?

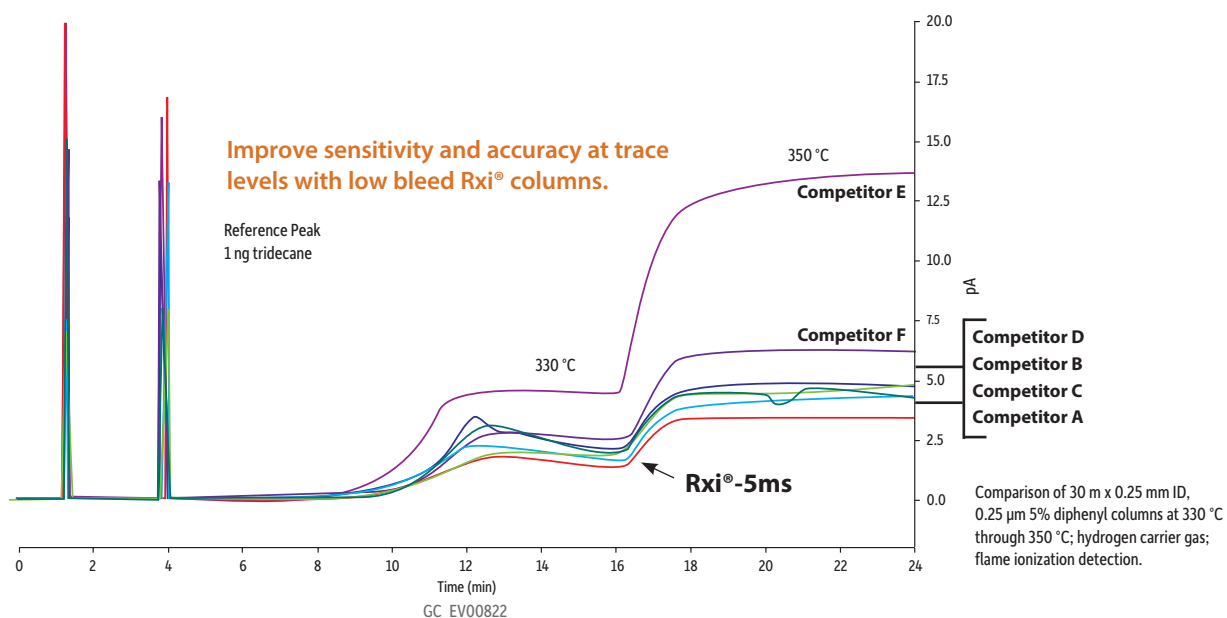
Contact [support@restek.com](mailto:support@restek.com) or your local Restek representative for helpful, knowledgeable technical support.

### Lowest Bleed

Rxi® columns are more stable at high temperatures than other manufacturers' columns, resulting in higher system sensitivity (Figure 5). This low-bleed characteristic is the result of superior stabilization achieved by optimizing polymer cross-linking and surface deactivation technologies. Benefits of using ultra-low bleed Rxi® columns include the following:

- Increased sensitivity, for lower detection limits and better matches to mass spectral libraries.
- Faster system stabilization.
- Reduced detector contamination results in less downtime for maintenance.

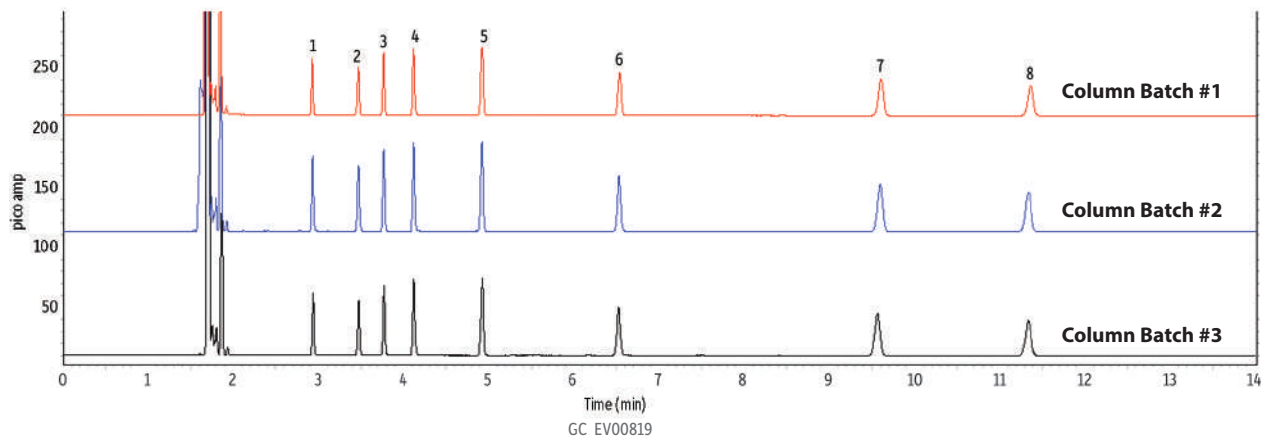
**Figure 5:** Rxi® columns have the lowest bleed among all major brands of columns.



## Exceptional Reproducibility

Chromatographers today need to know that every column they receive is going to perform the same way as the column it replaces. Unmatched manufacturing precision and stringent quality control mean Rxi® columns exceed industry standards, resulting in the best column-to-column reproducibility available as measured by efficiency, retention, bleed, and inertness (Figure 6).

**Figure 6:** Rxi® columns are engineered to assure column-to-column and lot-to-lot reproducibility.



1. 1,6-Hexanediol
2. 4-Chlorophenol
3. Methyl nonanoate
4. 1-Decylamine
5. Tridecane
6. 1-Undecanol
7. Acenaphthylene
8. Pentadecane

**Column** Rxi®-5ms, 30 m, 0.25 mm ID, 0.25 µm  
(cat.# 13423)

**Sample** Isothermal column test mix  
**Diluent:** Toluene  
**Conc.:** 500 µg/mL

**Injection**  
**Inj. Vol.:** 1.0 µL split (split ratio 100:1)  
**Liner:** Splitless taper (4 mm) w/wool  
(cat.# 22405)  
**Inj. Temp.:** 250 °C

**Oven**

**Oven Temp.:** 135 °C  
**Carrier Gas:** H<sub>2</sub>, constant linear velocity  
**Linear Velocity:** 38 cm/sec @ 135 °C  
**Detector:** FID @ 330 °C

Use **Rxi® Guard/Retention Gap Columns** to protect your analytical column and help focus analytes.



### Rxi® Guard/Retention Gap Columns (fused silica)

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360 °C.

Nominal ID	Nominal OD	5-Meter cat.#	5-Meter/6-pk. cat.#	10-Meter cat.#	10-Meter/6-pk. cat.#
0.25 mm	0.37 ± 0.04 mm	10029	10029-600	10059	10059-600
0.32 mm	0.45 ± 0.04 mm	10039	10039-600	10064	10064-600
0.53 mm	0.69 ± 0.05 mm	10054	10054-600	10073	10073-600



**Rxi®-1ms Columns** (fused silica)

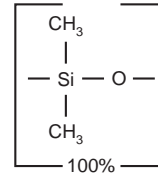
(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for arson accelerants, essential oils, hydrocarbons, pesticides, PCB congeners (e.g., Aroclor mixes), sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- Temperature range: -60 °C to 330/350 °C.
- Equivalent to USP G1, G2, and G38 phases.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	-60 to 330/350 °C	13320	13323	13326
	0.50 µm	-60 to 330/350 °C	13335	13338	13341
	1.00 µm	-60 to 330/350 °C	13350	13353	13356
0.32 mm	0.25 µm	-60 to 330/350 °C	13321	13324	13327
	0.50 µm	-60 to 330/350 °C	13336	13339	13342
	1.00 µm	-60 to 330/350 °C		13354	13357
	4.00 µm	-60 to 330/350 °C		13396	
0.53 mm	0.50 µm	-60 to 330/350 °C	13337	13340	
	1.00 µm	-60 to 330/350 °C	13352	13355	
	1.50 µm	-60 to 330/350 °C	13367	13370	13373

ID	df	temp. limits	10-Meter cat.#	12-Meter cat.#	20-Meter cat.#	25-Meter cat.#	50-Meter cat.#
0.15 mm	0.15 µm	-60 to 330/350 °C	43800		43801		
	2.0 µm	-60 to 330/350 °C			43802		
0.18 mm	0.18 µm	-60 to 330/350 °C			13302		
	0.36 µm	-60 to 330/350 °C			13311		
0.20 mm	0.33 µm	-60 to 330/350 °C		13397		13398	13399

**Rxi®-1ms Structure**

Similar to: (100%-methyl)-polysiloxane

**similar phases**

HP-1ms, HP-1msUI, DB-1ms, DB-1msUI, Ultra-1, VF-1ms, ZB-1, ZB-1ms

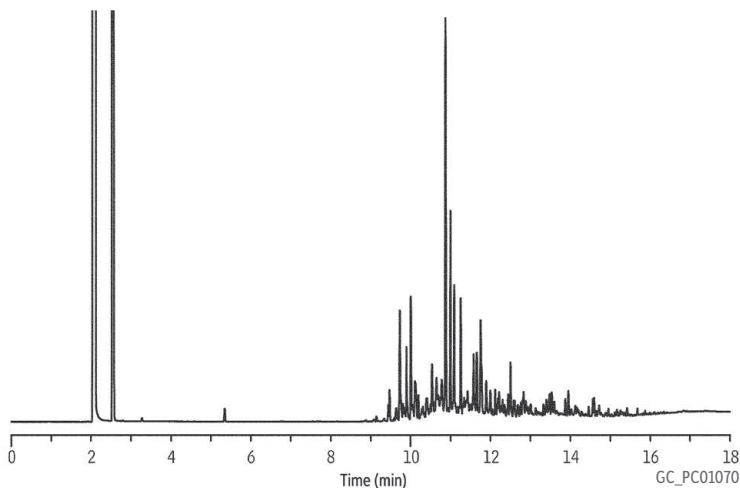
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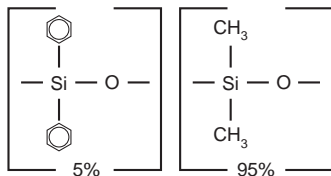
[www.restek.com](http://www.restek.com)

lit. cat.#  
CFTS1269

**99% Weathered Unleaded Gasoline on Rxi®-1ms**

**Column** Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)  
**Sample** Unleaded gasoline: 99% weathered (cat.# 30436)  
**Diluent:** Methanol  
**Conc.:** 5,000 µg/mL  
**Injection**  
**Inj. Vol.:** 1.0 µL split (split ratio 20:1)  
**Liner:** Splitless taper (4 mm) w/wool (cat.# 22405)  
**Inj. Temp.:** 250 °C  
**Oven**  
**Oven Temp.:** 50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)  
**Carrier Gas** He, constant flow  
**Linear Velocity:** 28 cm/sec  
**Detector** FID @ 300 °C

## Rxi®-5ms Structure



Similar to: (5%-phenyl)-methylpolysiloxane

## similar phases

HP-5ms SemiVolatiles, HP-5ms, HP-5msUI, DB-5, Ultra-2, CP-Sil 8 CB, ZB-5, ZB-5msi

## free literature

## Rxi® Columns

Lower Detection Limits with Ground-Breaking Column Technology

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GNFL1173A

## Rxi®-5ms Columns (fused silica)

(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

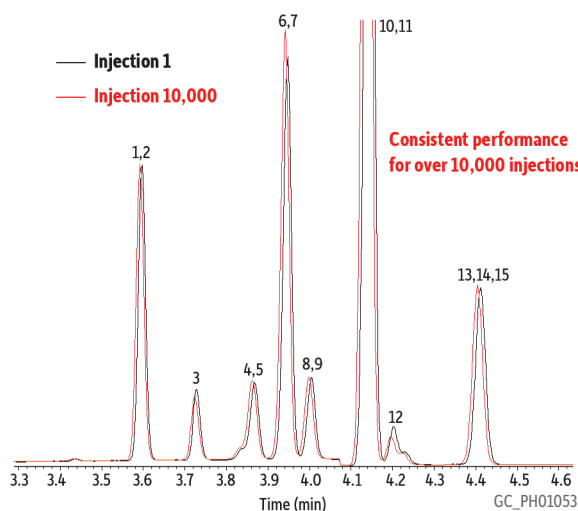
- General-purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners (e.g., Aroclor mixes), solvent impurities.
- Most inert column on the market.
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- Temperature range: -60 °C to 330/350 °C.
- Equivalent to USP G27 and G36 phases.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	-60 to 330/350 °C	13420	13423	13426
		-60 to 330/350 °C		13481	
	0.50 µm	-60 to 330/350 °C	13435	13438	13441
		-60 to 330/350 °C			
0.32 mm	1.00 µm	-60 to 330/350 °C	13450	13453	13456
	0.25 µm	-60 to 330/350 °C	13421	13424	13427
		-60 to 330/350 °C			
0.53 mm	0.50 µm	-60 to 330/350 °C	13436	13439	13442
		-60 to 330/350 °C			
	1.00 µm	-60 to 330/350 °C	13451	13454	13457
0.20 mm	0.25 µm	-60 to 330/350 °C	13422	13425	
		-60 to 330/350 °C			
	0.50 µm	-60 to 330/350 °C	13437	13440	
		-60 to 330/350 °C			
0.18 mm	0.18 µm	-60 to 330/350 °C		13402	
		-60 to 330/350 °C			
	0.36 µm	-60 to 330/350 °C		13411	
0.20 mm	0.33 µm	-60 to 330/350 °C	13497		13498
		-60 to 330/350 °C			13499



Stringent quality testing ensures consistent performance, column to column and injection to injection.

## Over 10,000 Injections of Lipidomics on Rxi®-5ms



Peaks	m/z
1. Coprostanol	370.40
2. d5-cholestanol (IS)	220.20
3. 7α-hydroxycholesterol	456.40
4. Cholestanol	306.30
5. d5-epichoestanol (IS)	220.20
6. 7-Dehydrocholesterol	325.25
7. Desmosterol	343.25
8. Lathosterol	458.35
9. d4-lathosterol (IS)	462.40
10. Campesterol	382.35
11. 4-Cholestenone	382.30
12. Stigmasterol	394.15
13. Lanosterol	393.35
14. β-Sitosterol	396.35
15. d7-β-sitosterol (IS)	403.45

**Column** Rxi®-5ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13423)  
**Sample** Lipid plasma extract as trimethylsilyl derivatives  
**Injection**  
 Inj. Vol.: 1 µL split (split ratio 10:1)  
 Liner: 4 mm split liner gooseneck with wool  
 Inj. Temp.: 310 °C  
**Oven**  
 Oven Temp.: 250 °C (hold 1 min) to 320 °C at 30 °C/min (hold 1.6 min)  
**Carrier Gas** He, constant flow  
**Flow Rate:** 1.0 mL/min  
**Detector** MS  
**Mode:** SIM  
**Transfer Line Temp.:** 330 °C  
**Ionization Mode:** EI

**Rxi®-XLB Columns** (fused silica)

(low-polarity proprietary phase)

- General-purpose columns exhibiting extremely low bleed. Ideal for many GC-MS applications, including pesticides, PCB congeners (e.g., Aroclor mixes), PAHs.
- Unique selectivity.
- Temperature range: 30 °C to 360 °C.

Improvements in polymer synthesis and tubing deactivation enable us to make inert, stable Rxi®-XLB columns especially well-suited for analyzing active, high molecular weight compounds with sensitive GC-MS systems, including ion trap detectors. Excellent efficiency, coupled with inertness, low bleed, and high thermal stability, make Rxi®-XLB columns ideal for analyzing semivolatiles compounds in drinking water.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	30 to 340/360 °C	13705	13708	
	0.25 µm	30 to 340/360 °C	13720	13723	13726
	0.50 µm	30 to 340/360 °C		13738	
	1.00 µm	30 to 340/360 °C		13753	
0.32 mm	0.25 µm	30 to 340/360 °C		13724	13727
	0.50 µm	30 to 340/360 °C		13739	
	1.00 µm	30 to 340/360 °C		13754	
0.53 mm	0.50 µm	30 to 320/360 °C		13740	

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	30 to 340/360 °C	43702

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

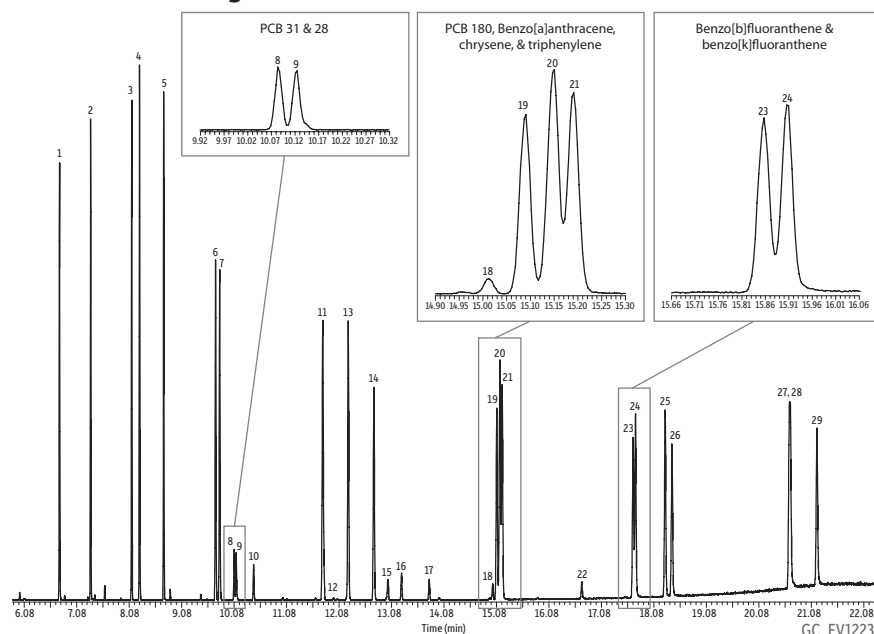
**similar phases**

DB-XLB, VF-Xms, MR1, ZB-XLB

**tech tip****Rxi®-XLB columns for Method 525**

In combination with an Rxi®-XLB column, simple adjustments to the injection conditions can greatly improve sensitivity for active and high molecular weight Method 525 target compounds.

By eliminating contact between the sample and the hot metal surfaces in the injection port, a drilled Uniliner® inlet liner prevents analytes from degrading in the injection port.

**PAHs and PCB Congeners on Rxi®-XLB**

Peaks	Conc. (µg/mL)
1. Naphthalene	5
2. 2-Methylnaphthalene	5
3. Acenaphthylene	5
4. Acenaphthene	5
5. Fluorene	5
6. Phenanthrene	5
7. Anthracene	5
8. PCB 31	1
9. PCB 28	1
10. PCB 52	1
11. Fluoranthene	5
12. PCB 101	1
13. Pyrene	5
14. 2-Methylfluoranthene	5
15. PCB 118	1
16. PCB 153	1
17. PCB 138	1
18. PCB 180	1
19. Benzo[a]anthracene	5
20. Chrysene	5
21. Triphenylene	5
22. PCB 194	1
23. Benzo[b]fluoranthene	5
24. Benzo[k]fluoranthene	5
25. Benzo[e]pyrene	5
26. Benzo[a]pyrene	5
27. Dibenzo[a,h]anthracene	5
28. Indeno[1,2,3-cd]pyrene	5
29. Benzo[g,h,i]perylene	5

**Column** Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)

**Sample** SV calibration mix #5 / 610 PAH mix (cat.# 31011)  
Benzo(e)pyrene (cat.# custom)  
Triphenylene (cat.# custom)  
2-Methylnaphthalene (cat.# 31285)  
2-Methylfluoranthene (cat.# custom)  
PCB congener standard #2 (cat.# 32294)  
PCB 31 (cat.# custom)  
Dichloromethane

**Diluent:**  
**Injection**  
**Inj. Vol.:** 0.5 µL splitless (hold 1.75 min)

**Liner:** 2.0 mm ID straight inlet liner w/wool (cat.# 21718)

**Inj. Temp.:** 300 °C  
**Purge Flow:** 50 mL/min  
**Oven**  
**Oven Temp.:** 40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)

**Carrier Gas**  
**Flow Rate:** 1 mL/min  
**Detector**  
**Mode:** MS  
**Scan**

**Transfer Line**

**Temp.:** 300 °C

**Analyzer Type:** Quadrupole

**Source Temp.:** 280 °C

**Electron Energy:** 70 eV

**Solvent Delay**

**Time:** 4 min

**Tune Type:** manual

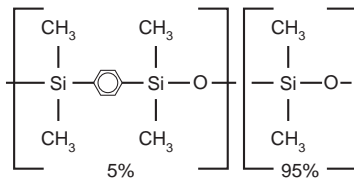
**Ionization Mode:** EI

**Scan Range:** 45-550 amu

**Scan Rate:** 5 scans/sec

**Instrument** PE Clarus 500 GC & Clarus 500 MS

## Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

## similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

## free literature

Rxi®-5Sil MS Columns  
Assured Performance  
for Forensic  
Applications



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CFBR1302A

Accurately Determine Mineral  
Oil Hydrocarbons in Food and  
Packaging



lit. cat.#  
FFTS1921-UNV

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## Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm 0.10 µm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm 0.25 µm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm 1.50 µm		-60 to 320/330 °C		13670	

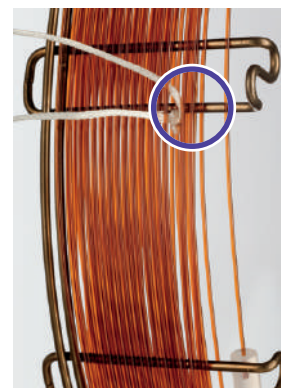
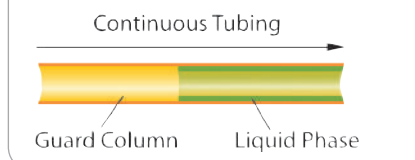
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm 0.15 µm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm 0.10 µm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

## Rxi®-5Sil MS with Integra-Guard®

- Extend column lifetime.
- Eliminate leaks with a built-in retention gap.
- Inertness verified by isothermal testing.

Description	qty.	cat.#
15 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13620-127
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13623-127
15 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13635-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13638-127
30 m, 0.32 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13639-125
30 m, 0.32 mm ID, 1.00 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13654-125

## Integra-Guard® Built-In Guard Column



String indicates where the



## Semivolatiles by EPA Method 8270 on Rxi®-5Si1 MS (30 m, 0.25 mm ID, 0.25 µm) w/Drilled Uniliner® Inlet Liner

**Column** Rxi®-5Si1 MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)

**Sample** 8270 MegaMix® (cat.# 31850)  
Benzoic acid (cat.# 31879)  
8270 Benzidines mix (cat.# 31852)  
Acid surrogate mix (4/89 SOW) (cat.# 31025)  
Revised B/N surrogate mix (cat.# 31887)  
1,4-Dioxane (cat.# 31853)  
SV internal standard mix (cat.# 31206)  
10 µg/mL (IS 40 µg/mL)

**Conc.:**

**Injection**

**Inj. Vol.:** 1.0 µL pulsed splitless (hold 0.15 min)

**Liner:** 4 mm drilled Uniliner® (hole near bottom) (cat.# 20756)

**Inj. Temp.:** 250 °C

**Pulse Pressure:** 25 psi (172.4 kPa)

**Pulse Time:** 0.2 min

**Purge Flow:** 60 mL/min

**Oven**

**Oven Temp.:** 40 °C (hold 1.0 min) to 280 °C at 25 °C/min to 320 °C at 5 °C/min (hold 1 min)

**Carrier Gas** He, constant flow

**Flow Rate:** 1.2 mL/min

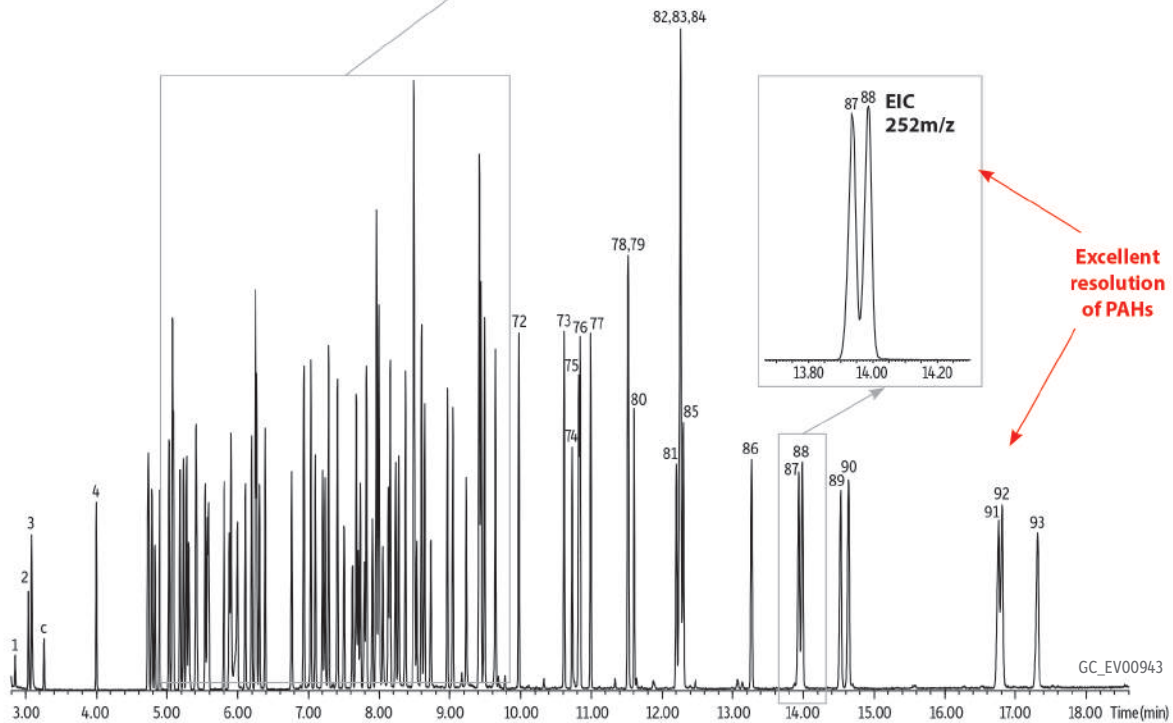
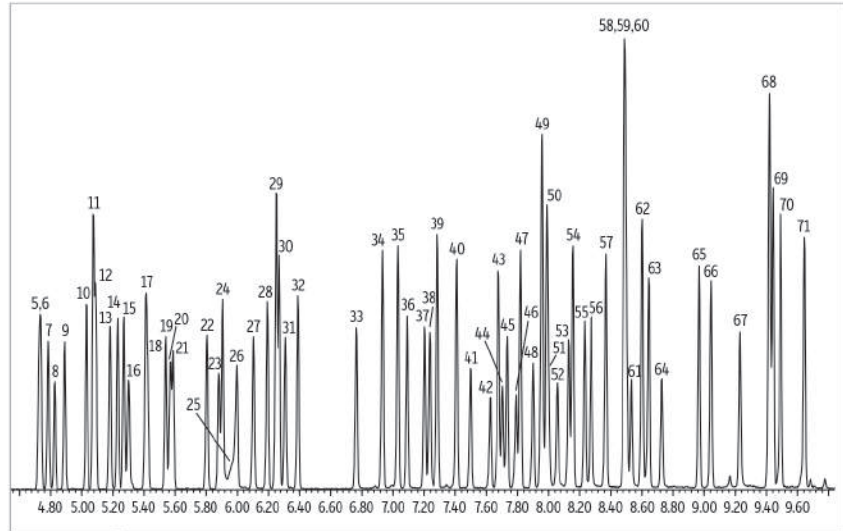
**Detector** MS

**Mode:** Scan

**Transfer Line Temp.:** 280 °C

**Ionization Mode:** EI

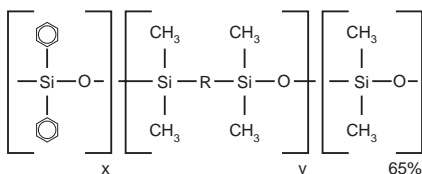
**Scan Range:** 35-550 amu



Peaks	17. 4-Methylphenol/3-methylphenol	34. 2-Methylnaphthalene	52. 4-Nitrophenol	66. Hexachlorobenzene	85. Chrysene
1. 1,4-Dioxane	18. N-Nitrosodi-N-propylamine	35. 1-Methylnaphthalene	53. 2,4-Dinitrotoluene	67. Pentachlorophenol	86. Di-n-octyl phthalate
2. N-Nitrosodimethylamine	19. Hexachloroethane	36. Hexachlorocyclopentadiene	54. Dibenzofuran	68. Phenanthrene-d10 (IS)	87. Benzo[b]fluoranthene
3. Pyridine	20. Nitrobenzene-d5 (SS)	37. 2,4,6-Trichlorophenol	55. 2,3,5,6-Tetrachlorophenol	69. Phenanthrene	88. Benzo[k]fluoranthene
4. 2-Fluorophenol (SS)	21. Nitrobenzene	38. 2,4,5-Trichlorophenol	56. 2,3,4,6-Tetrachlorophenol	70. Anthracene	89. Benzo[a]pyrene
5. Phenol-d6 (SS)	22. Isophorone	39. 2-Fluorobiphenyl (SS)	57. Diethyl phthalate	71. Carbazole	90. Perylene-d12 (IS)
6. Phenol	23. 2-Nitrophenol	40. 2-Chloronaphthalene	58. 4-Chlorophenyl phenyl ether	72. di-n-Butyl phthalate	91. Indeno[1,2,3-cd]pyrene
7. Aniline	24. 2,4-Dimethylphenol	41. 2-Nitroaniline	59. Fluorene	73. Fluoranthene	92. Dibenzo[a,h]anthracene
8. Bis(2-chloroethyl) ether	25. Benzoic acid	42. 1,4-Dinitrobenzene	60. 4-Nitroaniline	74. Benzidine	93. Benzo[ghi]perylene
9. 2-Chlorophenol	26. Bis(2-chloroethoxy)methane	43. Dimethyl phthalate	61. 4,6-Dinitro-2-methylphenol	75. Pyrene-d10 (SS)	
10. 1,3-Dichlorobenzene	27. 2,4-Dichlorophenol	44. 1,3-Dinitrobenzene	62. n-Nitroso-diphenylamine (diphenylamine)	76. Pyrene	
11. 1,4-Dichlorobenzene-d4 (IS)	28. 1,2,4-Trichlorobenzene	45. 2,6-Dinitrotoluene	63. 1,2-Diphenylhydrazine (as azobenzene)	77. p-Terphenyl-d14 (SS)	
12. 1,4-Dichlorobenzene	29. Naphthalene-d8 (IS)	46. 1,2-Dinitrobenzene	64. 2,4,6-Tribromophenol (SS)	78. 3,3'-Dimethylbenzidine	
13. Benzyl alcohol	30. Naphthalene	47. Acenaphthylene	65. 4-Bromophenyl phenyl ether	79. Butyl benzyl phthalate	
14. 1,2-Dichlorobenzene	31. 4-Chloroaniline	48. 3-Nitroaniline		80. Bis(2-ethylhexyl) adipate	
15. 2-Methylphenol	32. Hexachlorobutadiene	49. Acenaphthene-d10 (IS)		81. 3,3'-Dichlorobenzidine	
16. Bis(2-chloroisopropyl) ether	33. 4-Chloro-3-methylphenol	50. Acenaphthene		82. Benzo[a]anthracene	
		51. 2,4-Dinitrophenol		83. Bis(2-ethylhexyl)phthalate	
				84. Chrysene-d12 (IS)	

c = contaminant (toluene)

## Rxi®-35Sil MS Structure



## similar phases

DB-35ms, DB-35msUI, VF-35ms, MR2

## Rxi®-35Sil MS Columns (fused silica)

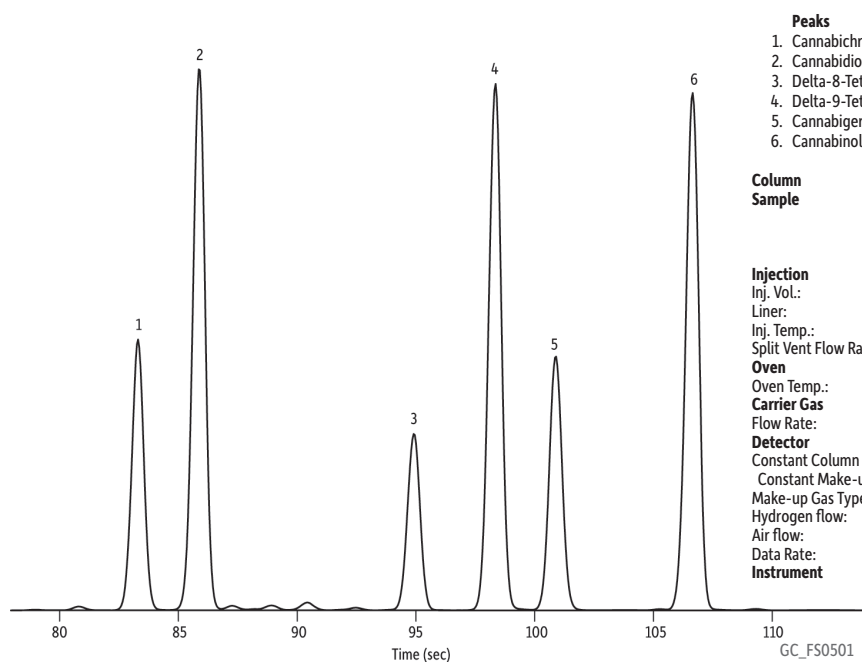
(midpolarity Crossbond® phase)

- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Provides superior separation for cannabinoids.
- Very low-bleed phase for GC-MS analysis.
- Extended temperature range: 50 °C to 340/360 °C.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	50 to 340/360 °C	13820	13823
	0.50 µm	50 to 340/360 °C	13835	13838
	1.00 µm	50 to 320/340 °C	13850	13853
0.32 mm	0.25 µm	50 to 340/360 °C	13821	13824
	0.50 µm	50 to 340/360 °C	13836	13839
	1.00 µm	50 to 320/340 °C	13851	13854
0.53 mm	0.50 µm	50 to 340/360 °C	13837	13840
	1.00 µm	50 to 325/340 °C	13852	13855
	1.50 µm	50 to 310/330 °C	13856	13857
	3.00 µm	50 to 280/300 °C	13858	13859

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## Cannabinoids on Rxi®-35Sil MS Using Hydrogen Carrier Gas by GC-FID



**Column** Rxi®-35Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13820)

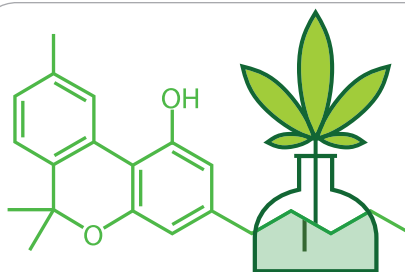
**Sample** Cannabinoids standard (cat.# 34014)  
Cannabichromene (cat.# 34092)  
delta-8-Tetrahydrocannabinol (THC) (cat.# 34090)  
Cannabigerol (cat.# 34091)

**Injection**  
Inj. Vol.: 1 µL split (split ratio 50:1)  
Liner: Sky® 4 mm Precision® liner w/wool (cat.# 23305.5)  
Inj. Temp.: 250 °C  
Split Vent Flow Rate: 125 mL/min

**Oven**  
Oven Temp.: 225 °C (hold 0.1 min) to 330 °C at 35 °C/min (hold 0.9 min)

**Carrier Gas**  
H<sub>2</sub>, constant flow  
Flow Rate: 2.5 mL/min

**Detector**  
Constant Column +  
Constant Make-up: 50 mL/min  
Make-up Gas Type: N<sub>2</sub>  
Hydrogen flow: 40 mL/min  
Air flow: 450 mL/min  
Data Rate: 20 Hz  
**Instrument** Agilent/HP6890 GC

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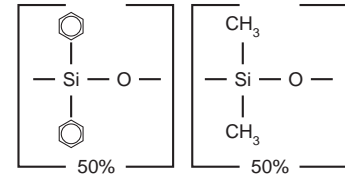
**Rxi®-17 Columns** (fused silica)

(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Temperature range: 40 °C to 320 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	40 to 280/320 °C	13520	13523
	0.50 µm	40 to 280/320 °C		13538
	1.00 µm	40 to 280/320 °C		13553
0.32 mm	0.25 µm	40 to 280/320 °C	13524	13524
	0.50 µm	40 to 280/320 °C		13539
	1.00 µm	40 to 280/320 °C		13554
0.53 mm	0.25 µm	40 to 280/320 °C	13525	13525
	0.50 µm	40 to 280/320 °C		13540
	0.83 µm	40 to 280/320 °C		13569
	1.00 µm	40 to 280/320 °C		13552
	1.50 µm	40 to 280/320 °C		13570

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	40 to 280/320 °C	13502

**Rxi®-17 Structure**

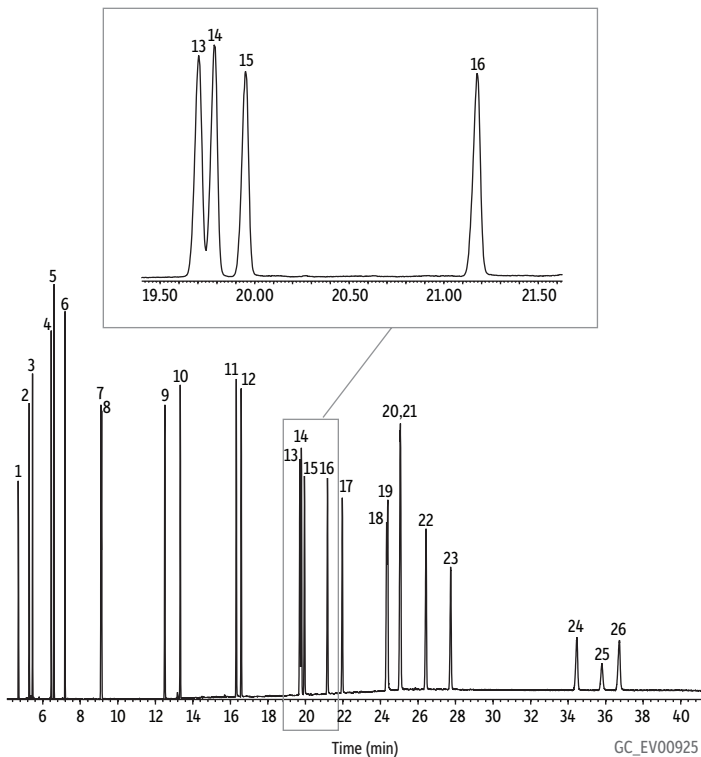
Similar to: (50%-phenyl)-methylpolysiloxane

**similar phases**

HP-17, DB-17, DB-17ht, DB-608, ZB-50

**Polycyclic Aromatic Hydrocarbons on Rxi®-17 column**

Completely resolve benzo(j)fluoranthene.



Peaks	tR (min)	9. Fluoranthene	12.50	18. Dibenz(a,h)acridine	24.33
1. Naphthalene	4.70	10. Pyrene	13.33	19. Dibenz[a,j]acridine	24.39
2. 1-Methylnaphthalene	5.28	11. Benz[a]anthracene	16.32	20. Indeno(1,2,3-cd)pyrene	25.04
3. 2-Methylnaphthalene	5.46	12. Chrysene	16.58	21. Dibenz[a,h]anthracene	25.07
4. Acenaphthylene	6.45	13. Benzo[b]fluoranthene	19.70	22. Benzo[ghi]perylene	26.43
5. Acenaphthene	6.60	14. Benzo[k]fluoranthene	19.78	23. 7H-Dibenzo(c,g)carbazole	27.75
6. Fluorene	7.18	15. Benzo(j)fluoranthene	19.95	24. Dibenzo(a,E)pyrene	34.46
7. Phenanthrene	9.10	16. Benzo[a]pyrene	21.17	25. Dibenzo(a,i)pyrene	35.80
8. Anthracene	9.14	17. 3-Methylcholanthrene	21.97	26. Dibenzo(a,h)pyrene	36.73

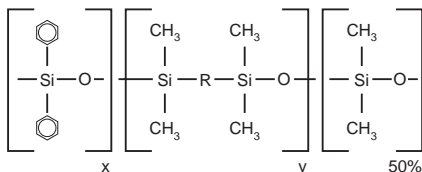
**Column** Rxi®-17, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13523)  
**Sample** SV Calibration Mix #5 / 610 PAH Mix (cat.# 31011)  
 PAH Supplement Mix for Method 8100 (cat.# 31857)  
 1-methylnaphthalene (cat.# 31283)  
 2-methylnaphthalene (cat.# 31285)  
 20 µg/mL each component

**Conc.:**  
**Injection** 1.0 µL pulsed splitless (hold 0.2 min)  
**Inj. Vol.:** 1.0 µL pulsed splitless (hold 0.2 min)  
**Liner:** Drilled Uniliner® (hole near top) (cat.# 21055)  
**Inj. Temp.:** 300 °C  
**Pulse Pressure:** 20 psi (137.9 kPa)  
**Pulse Time:** 0.3 min  
**Purge Flow:** 40 mL/min

**Oven**  
**Oven Temp.:** 90 °C (hold 1.0 min) to 215 °C at 25 °C/min (hold 0.5 min) to 235 °C at 4 °C/min (hold 0 min) to 280 °C at 15 °C/min (hold 0 min) to 320 °C at 4 °C/min (hold 20 min)

**Carrier Gas** He, constant flow  
**Flow Rate:** 1.2 mL/min  
**Detector** MS  
**Mode:** Scan  
**Analyzer Type:** Quadrupole  
**Solvent Delay Time:** 4.0 min  
**Tune Type:** DFTPP  
**Ionization Mode:** EI  
**Scan Range:** 50-550 amu  
**Instrument** HP6890 GC & 5973 MSD

### Rxi®-17Sil MS Structure



Similar to: (50%-phenyl)-methylpolysiloxane

### similar phases

DB-17ms, VF-17ms

### Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

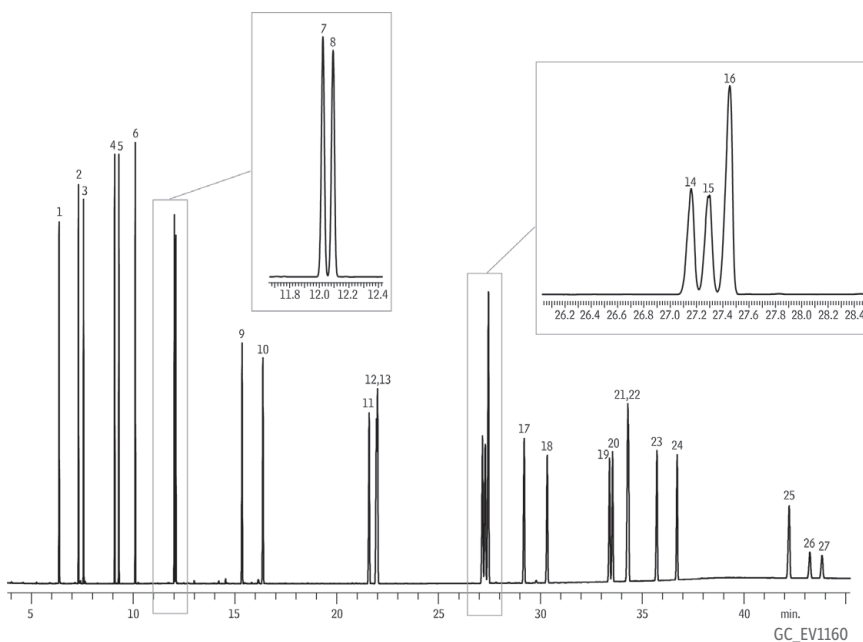
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Low bleed for use with sensitive detectors, such as MS.
- 340/360 °C upper temperature limits.
- Equivalent to USP phase G3.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 340/360 °C	14120	14123	14126
0.32 mm	0.25 µm	40 to 340/360 °C	14121	14124	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821
0.18 mm	0.18 µm	40 to 340/360 °C		14102
	0.36 µm	40 to 340/360 °C		14111

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS



Excellent resolution and peak shape for PAHs that cannot be resolved by MS.

#### Peaks

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenzo[a,h]acridine
20. Dibenzo[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenzo[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo[a,i]pyrene
27. Dibenzo[a,h]pyrene

**Column** Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)  
**Sample** PAH supplement mix for method 8100 (cat.# 31857)  
 EPA Method 8310 PAH mixture (cat.# 31841)  
 Triphenylene (custom)

**Diluent:** Dichloromethane  
**Conc.:** 10 ppm

**Injection**  
**Inj. Vol.:** 0.5 µL splitless (hold 1.75 min)  
**Liner:** Auto SYS XL PSS split/splitless w/wool (cat.# 21718)  
**Inj. Temp.:** 320 °C  
**Purge Flow:** 75 mL/min

**Oven**  
**Oven Temp.:** 65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)  
**Carrier Gas** He, constant flow  
**Flow Rate:** 2.0 mL/min

**Detector** FID @ 320 °C  
**Instrument** PE Clarus 600 GC

**Acknowledgement** Instrument provided by PerkinElmer



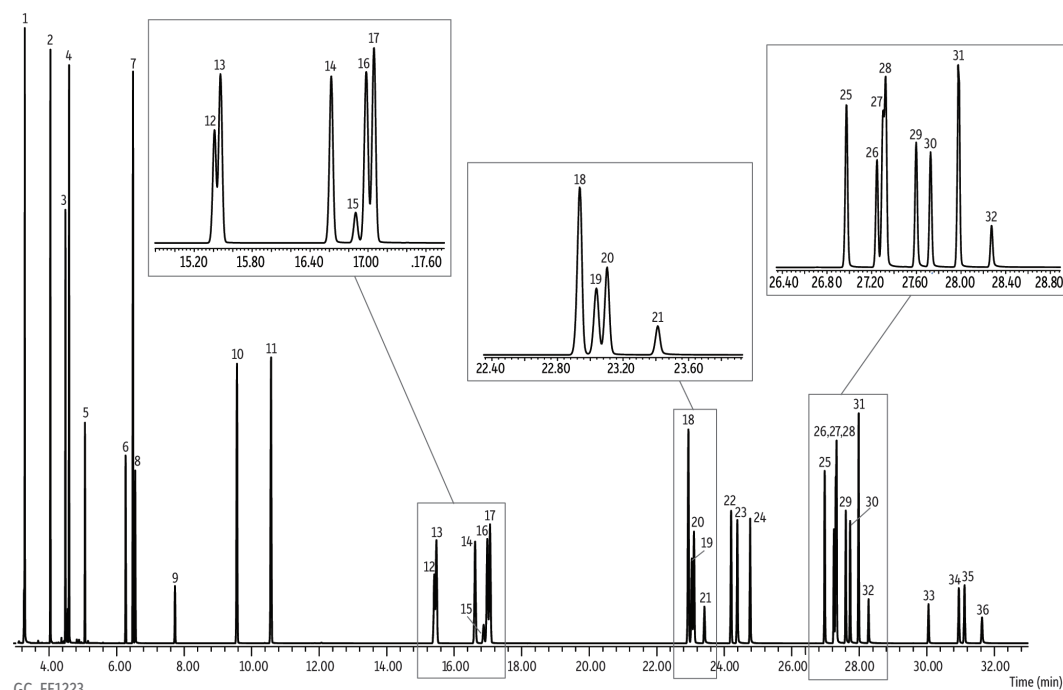
**Rxi®-PAH Columns** (fused silica)

(midpolarity proprietary phase)

- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [ j ], and [a] fluoranthenes.
- 360 °C thermal stability allows analysis of low-volatility dibenzo pyrenes.



ID	df	temp. limits	30-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.07 µm	to 360 °C		49316	
0.25 mm	0.10 µm	to 360 °C	49318		49317

**NIST SRM 2260a PAH Mix on Rxi®-PAH****Peaks**

1. Naphthalene
2. Biphenyl
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Dibenzothiophene
7. Phenanthrene
8. Anthracene
9. 4H-Cyclopenta[def]phenanthrene
10. Fluoranthene
11. Pyrene
12. Benzo[ghi]fluoranthene
13. Benzo[c]phenanthrene
14. Benz[a]anthracene
15. Cyclopenta[cd]pyrene
16. Triphenylene
17. Chrysene
18. Benzo[b]fluoranthene
19. Benzo[k]fluoranthene
20. Benzo[j]fluoranthene
21. Benzo[a]fluoranthene
22. Benzo[e]pyrene
23. Benzo[a]pyrene
24. Perylene
25. Dibenz[a,j]anthracene
26. Dibenz[a,c]anthracene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[b]chrysene
30. Picene
31. Benzo[ghi]perylene
32. Anthanthrene
33. Dibenzo[b,k]fluoranthene
34. Dibenzo[a,e]pyrene
35. Coronene
36. Dibenzo[a,h]pyrene

GC\_FF1223

Time (min)

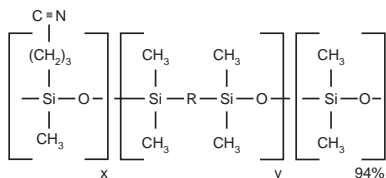
**Column** Rxi®-PAH, 40 m, 0.18 mm ID, 0.07 µm (cat.# 49316)  
**Sample** NIST SRM 2260a PAH mix  
**Diluent:** Toluene  
**Conc.:** 0.2 - 2 µg/mL (SRM 2260a PAH mix was diluted 5x in toluene)  
**Injection**  
 Inj. Vol.: 0.5 µL pulsed splitless (hold 0.58 min)  
 Liner: Sky® 2 mm single taper w/wool (cat.# 23316.1)  
 Inj. Temp.: 275 °C  
 Pulse Pressure: 80 psi (551.6 kPa)  
 Pulse Time: 0.6 min  
 Purge Flow: 40 mL/min  
**Oven**  
 Oven Temp.: 110 °C (hold 1 min) to 210 °C at 37 °C/min to 260 °C at 3 °C/min to 350 °C at 11 °C/min (hold 4.5 min)  
**Carrier Gas**  
 Flow Rate: He, constant flow 1.4 mL/min

**Detector** MS  
**Mode:** SIM  
**SIM Program:**

Group	Start Time (min)	Ion(s) (m/z)	Dwell (ms)
1	3.00	128, 152, 153, 154, 165	40
2	5.50	178, 184, 190, 202	50
3	13.00	226, 228	100
4	20.00	252	200
5	26.00	276, 278	100
6	29.00	300, 302	150

Transfer Line Temp.: 350 °C  
 Analyzer Type: Quadrupole  
 Source Temp.: 350 °C  
 Quad Temp.: 200 °C  
 Solvent Delay Time: 3.00 min  
 Tune Type: PFTBA  
 Ionization Mode: EI  
**Instrument** Agilent 7890A GC & 5975C MSD

### Rxi®-624Sil MS (G43) Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

### Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

### similar phases

DB-624, VF-624ms, CP-Select 624 CB

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875



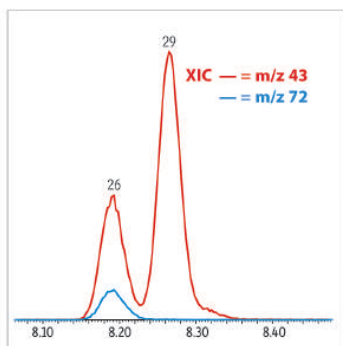
### free literature

Rxi®-624Sil MS Columns: Exceptionally Inert, Low-Bleed Columns for Volatiles Analysis

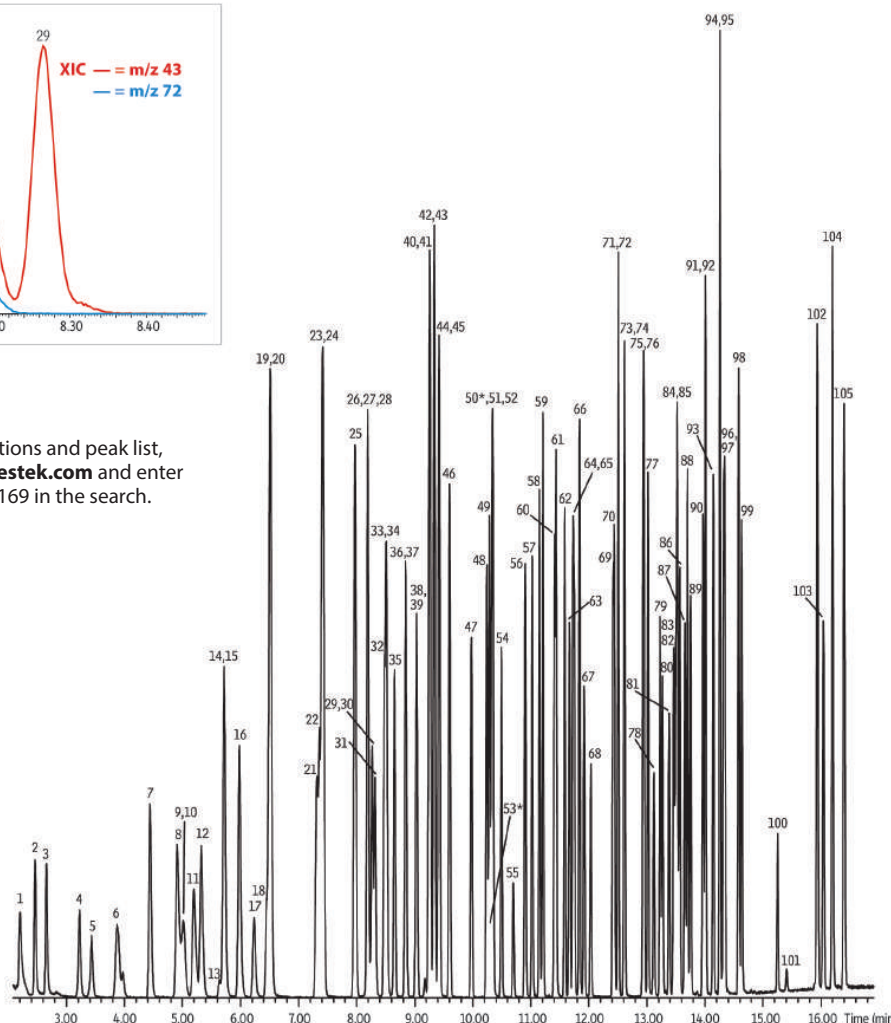
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lit. cat.# GNBR1334A-UNV

### Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



For conditions and peak list, visit [www.restek.com](http://www.restek.com) and enter GC\_EV1169 in the search.



GC\_EV1169

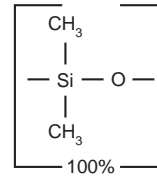
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Distributor

**Rxi®-1HT Columns** (fused silica)

(nonpolar phase; dimethyl polysiloxane)

- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as high molecular weight hydrocarbons.
- Temperature range: -60 to 400 °C.

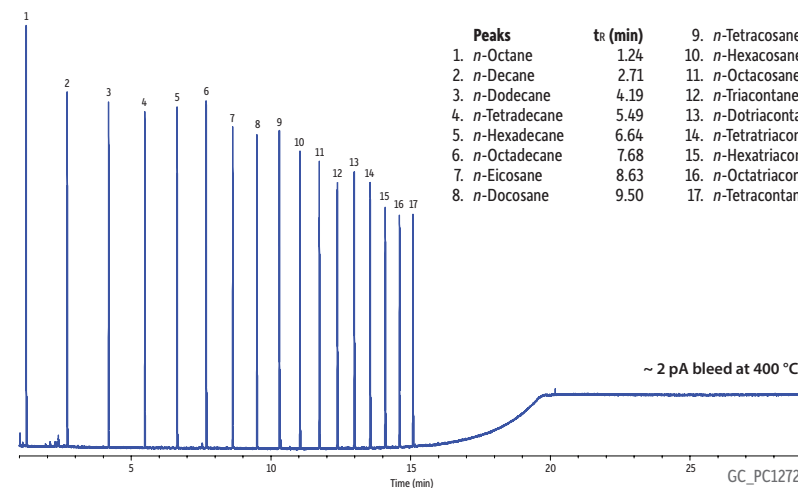
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	-60 to 400 °C	13950	13951
	0.25 µm	-60 to 400 °C		13952
0.32 mm	0.10 µm	-60 to 400 °C	13953	13954
	0.25 µm	-60 to 400 °C		13955

**Rxi®-1HT Structure**

Similar to: (100%-methyl)-polysiloxane

**similar phases**

DB-1ht, ZB-1HTinferno

**Florida TRPH Standard Mix on Rxi®-1HT**

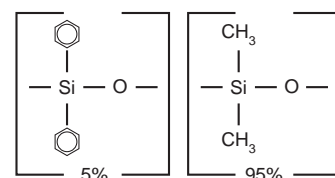
<b>Column</b>	Rxi®-1HT, 15 m, 0.25 mm ID, 0.10 µm (cat.# 13950)
<b>Sample</b>	Florida TRPH standard (cat.# 31266)
<b>Diluent:</b>	Hexane
<b>Conc.:</b>	50 ppm (1.25 ng on-column)
<b>Injection</b>	
<b>Inj. Vol.:</b>	1.0 µL split (split ratio 40:1)
<b>Liner:</b>	Sky® 4.0 mm ID Precision® inlet liner w/ wool (cat.# 23305.1)
<b>Inj. Temp.:</b>	275 °C
<b>Oven</b>	
<b>Oven Temp.:</b>	40 °C (hold 1.0 min) to 400 °C at 20 °C/min (hold 10 min)
<b>Carrier Gas</b>	He, constant flow
<b>Linear Velocity:</b>	55 cm/sec
<b>Detector</b>	FID @ 400 °C
<b>Make-up Gas</b>	
<b>Flow Rate:</b>	45 mL/min
<b>Make-up Gas</b>	
<b>Type:</b>	N <sub>2</sub>
<b>Hydrogen flow:</b>	40 mL/min
<b>Air flow:</b>	450 mL/min
<b>Data Rate:</b>	50 Hz
<b>Instrument</b>	Agilent/HP6890 GC

**Rxi®-5HT Columns** (fused silica)

(low-polarity phase; diphenyl dimethyl polysiloxane)

- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as mineral oil.
- Temperature range: -60 to 400 °C.

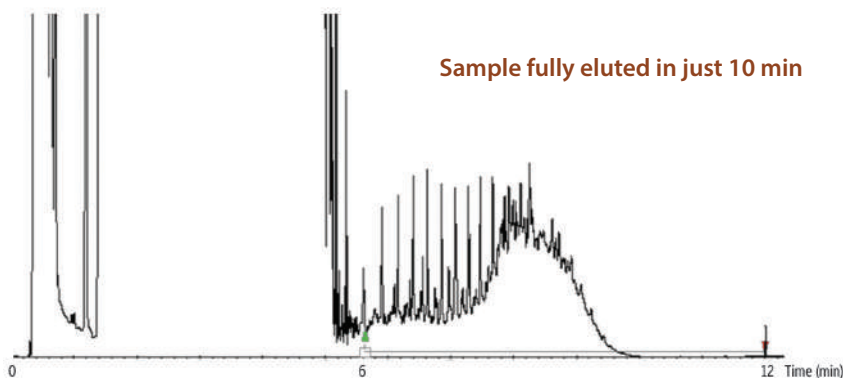
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	-60 to 400 °C	13905	13908
	0.25 µm	-60 to 400 °C		13923
0.32 mm	0.10 µm	-60 to 400 °C	13906	13909
	0.25 µm	-60 to 400 °C		13924
0.53 mm	0.15 µm	-60 to 380/400 °C		13910

**Rxi®-5HT Structure**

Similar to: (5%-phenyl)-methylpolysiloxane

**similar phases**

DB-5ht, VF-5ht, ZB-5HTinferno

**Mineral Oil on Rxi®-5HT by EN9377-2 (PTV large volume injection)**

<b>Column</b>	Rxi®-5HT, 15 m, 0.32 mm ID, 0.10 µm (cat.# 13906)
<b>Sample</b>	Mineral oil
<b>Diluent:</b>	Hexane
<b>Conc.:</b>	25 ppm
<b>Injection</b>	
<b>Inj. Vol.:</b>	100 µL ptv splitless
<b>Inlet Temp. Program:</b>	45 °C (hold 0.45 min) to 350 °C at 200 °C/min (hold 10 min)
<b>Oven</b>	
<b>Oven Temp.:</b>	35 °C (hold 4 min) to 150 °C at 60 °C/min to 250 °C at 50 °C/min to 350 °C at 30 °C/min
<b>Carrier Gas</b>	He, constant flow
<b>Flow Rate:</b>	2 mL/min
<b>Detector</b>	FID @ 360 °C
<b>Instrument</b>	Varian 450
<b>Acknowledgement</b>	Ambiente Analisi S.r.l., Italy

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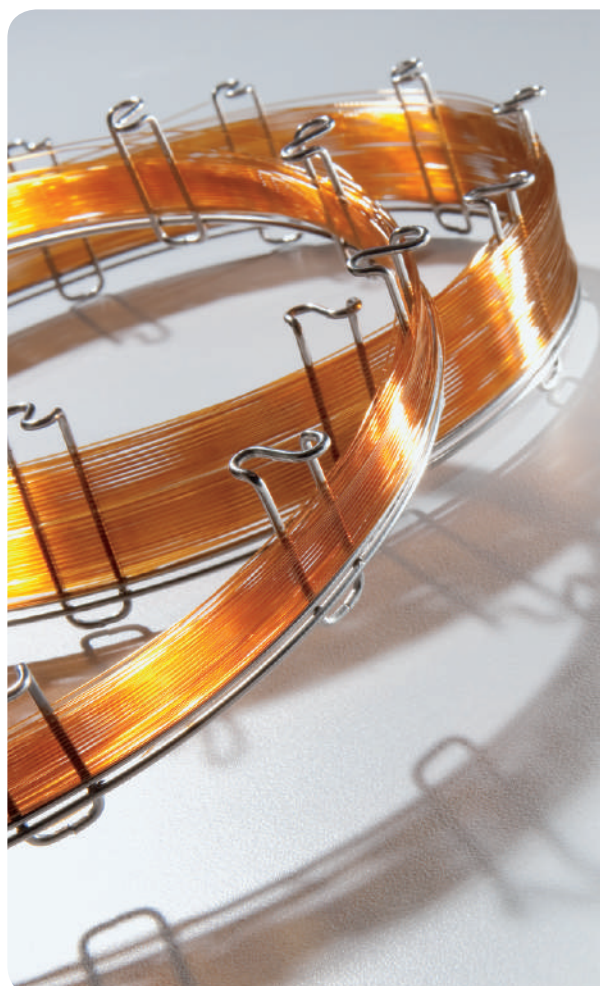
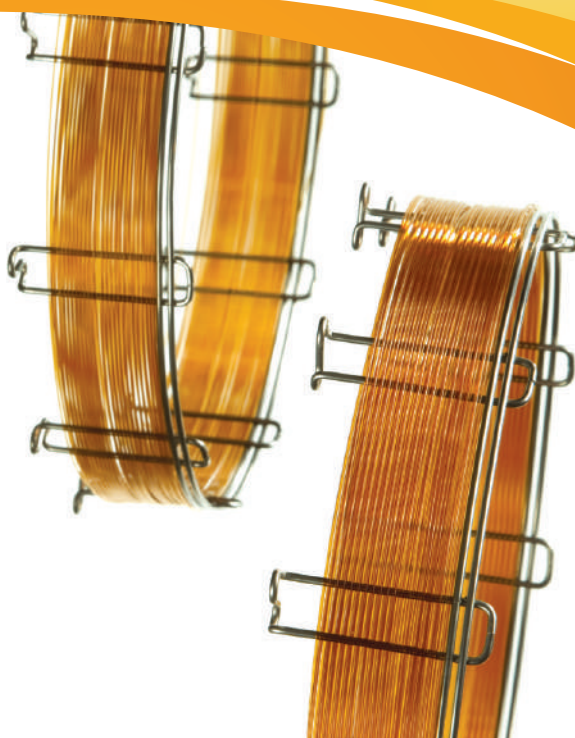
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# General-Purpose Columns

Rtx <sup>®</sup> -1.....	41
Rtx <sup>®</sup> -5, Rtx <sup>®</sup> -5MS.....	42-44
Rtx <sup>®</sup> -20, Rtx <sup>®</sup> -35.....	45-46
Rtx <sup>®</sup> -50, Rtx <sup>®</sup> -65.....	47
Rtx <sup>®</sup> -200, Rtx <sup>®</sup> -200MS.....	48-49
Rtx <sup>®</sup> -440.....	50
Rtx <sup>®</sup> -1301, Rtx <sup>®</sup> -624.....	51-52
Rtx <sup>®</sup> -1701, Rtx <sup>®</sup> -225.....	53-54
Rtx <sup>®</sup> -2330, Rtx <sup>®</sup> -2560.....	55-56
Rtx <sup>®</sup> -Wax.....	57
Stabilwax <sup>®</sup> .....	58
Stabilwax <sup>®</sup> -MS.....	59
GCxGC.....	60-62
Fast GC.....	63



## Chemically bonded capillary columns

- Reliable, rugged GC columns.
- Columns can be solvent rinsed.

## Extensive GC column selection

- Available in many dimensions, including variations in length, internal diameter, and film thickness.
- Internal diameters include 0.15 mm and 0.18 mm for faster analysis time and greater resolution.

## Broad range of stationary phases

- Columns based on polysiloxane backbone; functional groups added to the polymers to vary selectivity.



**Rtx<sup>®</sup>-1 Columns** (fused silica)(nonpolar phase; Crossbond<sup>®</sup> dimethyl polysiloxane)

- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), simulated distillation, arson accelerants, gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, oxygenates.
- Long lifetime and very low bleed at high operating temperatures.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G1, G2, G38 phases.

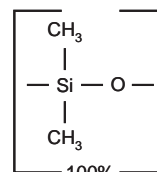
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 μm	-60 to 330/350 °C	10105	10108	10111	
	0.25 μm	-60 to 330/350 °C	10120	10123	10126	10129
	0.50 μm	-60 to 330/350 °C	10135	10138	10141	10144
	1.00 μm	-60 to 320/340 °C	10150	10153	10156	10159
0.32 mm	0.10 μm	-60 to 330/350 °C	10106	10109	10112	
	0.25 μm	-60 to 330/350 °C	10121	10124	10127	
	0.50 μm	-60 to 330/350 °C	10136	10139	10142	
	1.00 μm	-60 to 320/340 °C	10151	10154	10157	10160
	1.50 μm	-60 to 310/330 °C	10166	10169	10172	10175
	3.00 μm	-60 to 280/300 °C	10181	10184	10187	10190
	4.00 μm	-60 to 280/300 °C		10198		
	5.00 μm	-60 to 260/280 °C	10176	10178	10180	
0.53 mm	0.10 μm	-60 to 320/340 °C	10107	10110		
	0.25 μm	-60 to 320/340 °C	10122	10125	10128	
	0.50 μm	-60 to 310/330 °C	10137	10140	10143	
	1.00 μm	-60 to 310/330 °C	10152	10155	10158	
	1.50 μm	-60 to 310/330 °C	10167	10170	10173	
	3.00 μm	-60 to 270/290 °C	10182	10185	10188	10189
	5.00 μm	-60 to 270/290 °C	10177	10179	10183	10194
	7.00 μm	-60 to 240/260 °C	10191	10192	10193	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 μm	-60 to 330/350 °C	40101	40102	40103
	0.40 μm	-60 to 330/340 °C	40110	40111	40112

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

**Rtx<sup>®</sup>-1 with Integra-Guard<sup>®</sup> Column**

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 μm Rtx-1 w/5 m Integra-Guard Column	ea.	10123-124
30 m, 0.53 mm ID, 1.00 μm Rtx-1 w/5 m Integra-Guard Column	ea.	10155-126
30 m, 0.53 mm ID, 5.00 μm Rtx-1 w/5 m Integra-Guard Column	ea.	10179-126

**Rtx<sup>®</sup>-1 Structure**

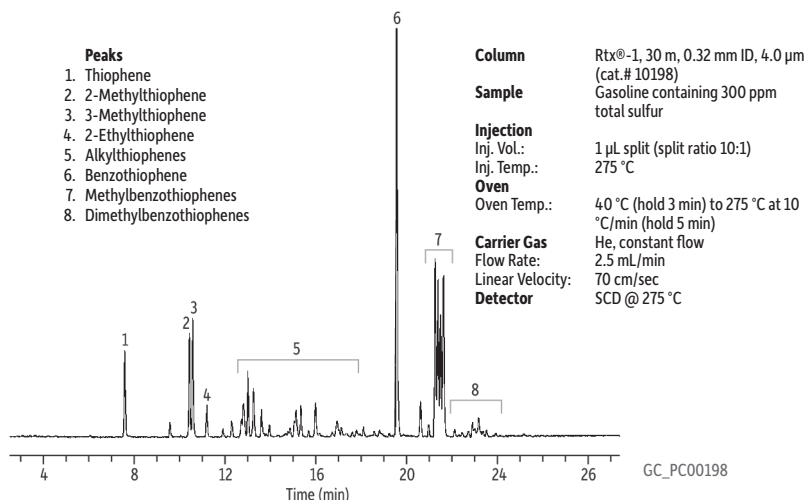
Similar to: (100%-methyl)-polysiloxane

**similar phases**

HP-1, DB-1, CP-Sil 5 CB, ZB-1

**also available****Metal MXT<sup>®</sup> Columns**Rugged, flexible, Siltek<sup>®</sup>-treated stainless steel tubing; inertness comparable to fused silica tubing.See **page 107**.**free literature**Analyze ppb Level Sulfur Compounds Using an Rt<sup>®</sup>-XLSulfur Micropacked GC Column or an Rtx<sup>®</sup>-1 Thick Film Capillary GC Column

Download your free copy from

[www.restek.com](http://www.restek.com)lit. cat.#  
PCAN1499-UNV**Sulfur in Gasoline on Rtx<sup>®</sup>-1****crossbond<sup>®</sup> technology**

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

**Fused Silica Capillary & PLOT Column Ferrule Guide**

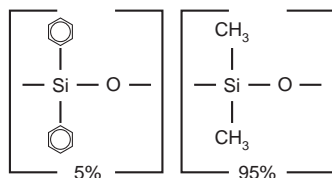
GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8

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**Rtx®-5 Structure**



Similar to: (5%-phenyl)-methylpolysiloxane

**similar phases**

HP-5, DB-5, CP-Sil 8 CB, ZB-5

**Rtx®-5 (G27) Columns** (fused silica)  
(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semivolatiles.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G27 and G36 phases.

The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight monomodal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	10205	10208	10211	
	0.25 µm	-60 to 330/350 °C	10220	10223	10226	10229
	0.50 µm	-60 to 330/350 °C	10235	10238	10241	10244
	1.00 µm	-60 to 325/340 °C	10250	10253	10256	10259
0.32 mm	0.10 µm	-60 to 330/350 °C	10206	10209		
	0.25 µm	-60 to 330/350 °C	10221	10224	10227	
	0.50 µm	-60 to 330/350 °C	10236	10239	10242	
	1.00 µm	-60 to 325/340 °C	10251	10254	10257	10260
	1.50 µm	-60 to 310/330 °C	10266	10269	10272	10275
	3.00 µm	-60 to 280/300 °C	10281	10284	10287	10290
0.53 mm	0.10 µm	-60 to 320/340 °C	10207	10210		
	0.25 µm	-60 to 320/340 °C	10222	10225	10228	
	0.50 µm	-60 to 320/330 °C	10237	10240	10243	
	1.00 µm	-60 to 320/330 °C	10252	10255	10258	
	1.50 µm	-60 to 310/330 °C	10267	10270	10273	
	3.00 µm	-60 to 270/290 °C	10282	10285	10288	
	5.00 µm	-60 to 270/290 °C	10277	10279	10283	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 325/340 °C	40201	40202	40203
	0.40 µm	-60 to 315/330 °C	40210	40211	40212

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

**also available**



**Metal MXT® Columns**

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-5 columns .....page 108

**also available**

Rtx®-5 Amine columns.....page 100

**Six columns for the price of five!**

Other phases and configurations available on request.

30-meter	6-pack cat.#
0.25 mm ID, 0.25 µm	10223-600
0.25 mm ID, 0.50 µm	10238-600
0.32 mm ID, 1.00 µm	10254-600
0.53 mm ID, 1.50 µm	10270-600

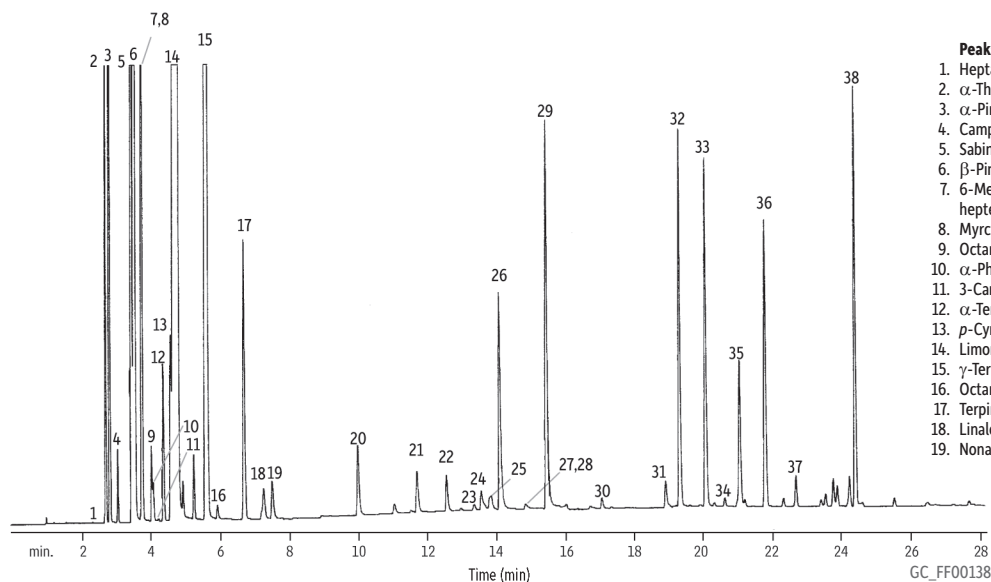
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## Lemon Oil on Rtx®-5



## Peaks

- |                            |  |
|----------------------------|--|
| 1. Heptanol                | 20. Citronellal                          |
| 2. $\alpha$ -Thujene       | 21. Terpinene-4-ol                       |
| 3. $\alpha$ -Pinene        | 22. $\alpha$ -Terpineol                  |
| 4. Camphene                | 23. Decanol                              |
| 5. Sabinene                | 24. Octyl acetate                        |
| 6. $\beta$ -Pinene         | 25. Nerol                                |
| 7. 6-Methyl-5-hepten-2-one | 26. Neral                                |
| 8. Myrcene                 | 27. Carvone                              |
| 9. Octanal                 | 28. Geranial                             |
| 10. $\alpha$ -Phellandrene | 29. Geranial                             |
| 11. 3-Carene               | 30. Nonyl acetate                        |
| 12. $\alpha$ -Terpinene    | 31. Citronellyl acetate                  |
| 13. <i>p</i> -Cymene       | 32. Neryl acetate                        |
| 14. Limonene               | 33. Geranyl acetate                      |
| 15. $\gamma$ -Terpinene    | 34. Dodecanal                            |
| 16. Octanol                | 35. $\beta$ -Caryophyllene               |
| 17. Terpinolene            | 36. <i>trans</i> - $\alpha$ -Bergamotene |
| 18. Linalool               | 37. $\alpha$ -Humulene                   |
| 19. Nonanal                | 38. $\beta$ -Bisabolene                  |

**Column** Rtx®-5, 30 m, 0.32 mm ID, 0.25  $\mu$ m (cat.# 10224)  
**Sample** Wet needle split injection of a neat lemon oil  
**Injection** Split (split ratio 100:1)  
**Inj. Temp.:** 250 °C  
**Oven**  
**Oven Temp.:** 75 °C (hold 8 min) to 250 °C at 4 °C/min

**Carrier Gas** H<sub>2</sub>, constant flow  
**Flow Rate:** 3.2 mL/min  
**Linear Velocity:** 40 cm/sec  
**Detector** FID @ 250 °C  
**Notes** FID sensitivity: 2 x 10<sup>-11</sup> AFS

## Rtx®-5 with Integra-Guard® Columns

- No leaks for a more robust method.
- No column connections for easier, faster maintenance.
- No peak distortions due to connector dead volume and thermal capacity.

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 $\mu$ m Rtx-5 w/5 m Integra-Guard Column	ea.	10223-124
30 m, 0.25 mm ID, 0.25 $\mu$ m Rtx-5 w/10 m Integra-Guard Column	ea.	10223-127
30 m, 0.25 mm ID, 1.00 $\mu$ m Rtx-5 w/5 m Integra-Guard Column	ea.	10253-124
30 m, 0.32 mm ID, 0.25 $\mu$ m Rtx-5 w/5 m Integra-Guard Column	ea.	10224-125
30 m, 0.32 mm ID, 1.00 $\mu$ m Rtx-5 w/5 m Integra-Guard Column	ea.	10254-125
30 m, 0.53 mm ID, 5.00 $\mu$ m Rtx-5/Rtx-G27 w/5 m Integra-Guard Column	ea.	10279-126
60 m, 0.32 mm ID, 0.25 $\mu$ m Rtx-5 w/5 m Integra-Guard Column	ea.	10227-125

## Integra-Guard® Built-In Guard Column

Continuous Tubing



Guard Column

Liquid Phase

Get the protection without the connection!

## Chromatogram Search Tool

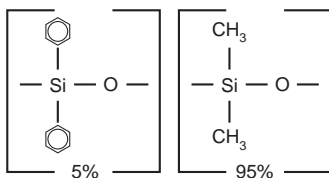
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Rtx<sup>®</sup>-5MS Structure

## similar phases

DB-5, HP-5, HP-5MS, Ultra-2, SPB-5,  
CP-Sil 8 CB, ZB-5

Rtx<sup>®</sup>-5MS—Low-Bleed GC-MS Columns (fused silica)

(low-polarity phase; Crossbond<sup>®</sup> diphenyl dimethyl polysiloxane)

- General purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semivolatiles.
- Column specifically tested for low-bleed performance.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G27 and G36 phases.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	12605	12608	12611
	0.25 µm	-60 to 330/350 °C	12620	12623	12626
	0.50 µm	-60 to 330/350 °C	12635	12638	12641
	1.00 µm	-60 to 325/350 °C	12650	12653	
0.32 mm	0.10 µm	-60 to 330/350 °C	12606	12609	
	0.25 µm	-60 to 330/350 °C	12621	12624	12627
	0.50 µm	-60 to 330/350 °C		12639	12642
	1.00 µm	-60 to 325/350 °C		12654	
0.53 mm	0.50 µm	-60 to 320/340 °C	12637	12640	
	1.00 µm	-60 to 320/340 °C	12652	12655	
	1.50 µm	-60 to 310/330 °C	12667	12670	

Note: The DB-5MS is a silarylene-based polymer equivalent to the Rxi-5Sil MS.

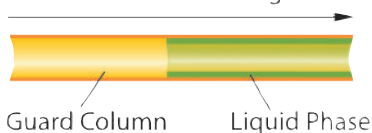
\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx<sup>®</sup>-5MS with Integra-Guard<sup>®</sup> Columns

Description	qty.	cat.#
15 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12620-124
15 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12635-127
30 m, 0.25 mm ID, 0.10 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12608-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12623-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12623-127
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12638-124
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12638-127
30 m, 0.32 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12624-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12654-125

Integra-Guard<sup>®</sup> Built-In Guard Column

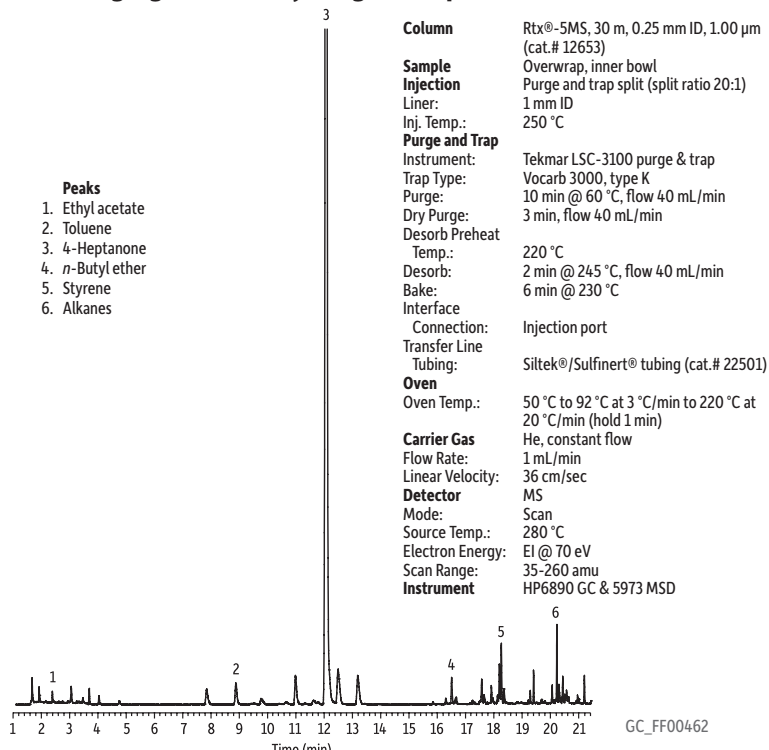
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Food Packaging Volatiles by Purge & Trap GC-MS on Rtx<sup>®</sup>-5MS

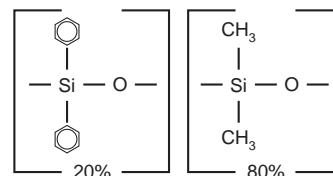


**Rtx<sup>®</sup>-20 Columns** (fused silica)(low- to midpolarity phase; Crossbond<sup>®</sup> diphenyl dimethyl polysiloxane)

- General-purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Temperature range: -20 °C to 320 °C.
- Equivalent to USP G28, G32 phases.

Rtx<sup>®</sup>-20 polymer is synthesized to exacting standards. All residual catalysts and low molecular weight fragments are removed from the polymer, providing a tight mono-modal distribution and extremely low bleed.

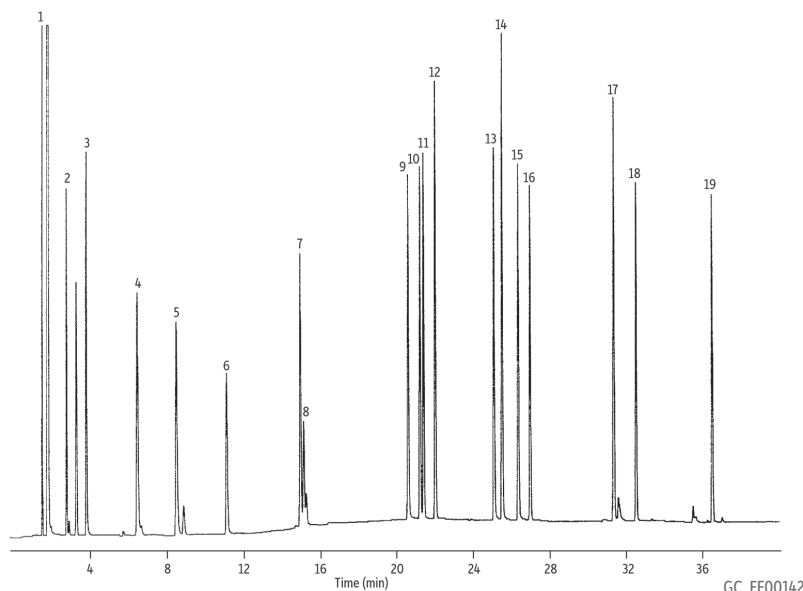
ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-20 to 300/320 °C	10323
	0.50 µm	-20 to 290/310 °C	10338
	1.00 µm	-20 to 280/300 °C	10353
0.32 mm	0.25 µm	-20 to 300/320 °C	10324
	0.50 µm	-20 to 290/310 °C	10339
	1.00 µm	-20 to 280/300 °C	10354
0.53 mm	1.00 µm	-20 to 260/280 °C	10355

**Rtx<sup>®</sup>-20 Structure**

Similar to: (20%-phenyl)-methylpolysiloxane

**similar phases**

SPB-20, EC-20, AT-20, 007-20

**Mushroom Aroma (Synthetic) on Rtx<sup>®</sup>-20**

Peaks	
1. Acetone	10. 3-Octanol
2. Ethyl Acetate	11. 3-Octanone
3. 1-Butanol	12. Benzaldehyde
4. 3-Methyl-1-butanol	13. Octyl alcohol
5. 1-Pentanol	14. Benzyl Alcohol
6. Hexanal	15. Phenylacetaldehyde
7. Furfural	16. Nonanal
8. Amyl acetate	17. α-terpineol
9. 1-Octen-3-ol	18. 2,4-Nonadienal
	19. 2,4-Decadienal

<b>Column</b>	Rtx <sup>®</sup> -20, 30 m, 0.32 mm ID, 1.00 µm (cat.# 10354)
<b>Sample</b>	synthetic mushroom aroma
<b>Conc.:</b>	10 ng per component
<b>Injection</b>	
<b>Inj. Vol.:</b>	1.0 µL split (split ratio 100:1)
<b>Inj. Temp.:</b>	260 °C
<b>Oven</b>	
<b>Oven Temp.:</b>	45 °C (hold 8 min) to 250 °C at 4 °C/min
<b>Carrier Gas</b>	H <sub>2</sub> , constant pressure
<b>Linear Velocity:</b>	40 cm/sec
<b>Detector</b>	FID @ 260 °C
<b>Notes</b>	FID sensitivity: 4 x 10 <sup>-11</sup> AFS

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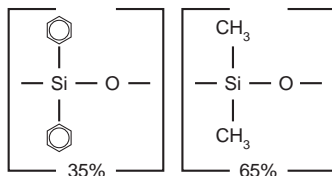
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## Rtx®-35 Structure



Similar to: (35%-phenyl)-methylpolysiloxane

## similar phases

HP-35, DB-35, ZB-35

## Rtx®-35 Columns (fused silica)

(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for organochlorine pesticides, PCB congeners (e.g., Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Temperature range: 40 °C to 320 °C.
- Equivalent to USP G42 phase.

An Rtx®-35 column is a popular confirmation column for pesticides and herbicides in conjunction with an Rtx®-5 or Rtx®-1701 column. The higher phenyl content causes useful elution order and retention time changes.

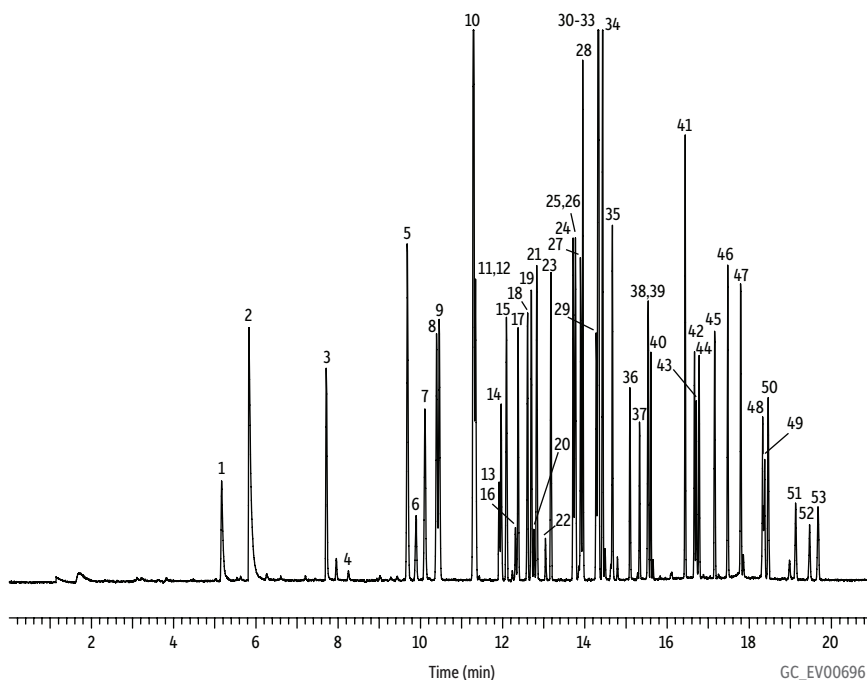
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	40 to 320 °C	10420	10423
	0.50 µm	40 to 310 °C	10435	10438
	1.00 µm	40 to 290 °C		10453
0.32 mm	0.25 µm	40 to 320 °C	10421	10424
	0.50 µm	40 to 310 °C		10439
	1.00 µm	40 to 290 °C		10454
0.53 mm	0.50 µm	40 to 300 °C	10437	10440
	1.00 µm	40 to 290 °C		10455
	1.50 µm	40 to 280 °C		10470
	3.00 µm	40 to 240/260 °C		10485

also available

Rtx®-35 Amine columns .....page 101

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.18 mm	0.20 µm	40 to 300/320 °C		40402
	0.40 µm	40 to 290/310 °C	40410	40411

## Organophosphorus Pesticides US EPA Method 8140/8141/8141A on Rtx®-35



Peaks	27. Methyl parathion
1. Dichlorvos	28. Aspon
2. Hexamethyl phosphoramide	29. Trichloronate
3. Mevinphos	30. Chlorpyrifos
4. Trichlorfon	31. Fenitrothion
5. Tributyl phosphate (SS)	32. Merphos
6. Demeton-o	33. Malathion
7. TEPP	34. Parathion-ethyl
8. Thionazin	35. Fenthion
9. Ethoprop	36. Chlorfenvinphos
10. Sulfotepp	37. Crotoxyphos
11. Naled	38. Merphos oxone
12. Phorate	39. Prothiofos
13. Dicrotophos	40. Stirofos
14. Demeton-S	41. Ethion
15. Terbufos	42. Sulprofos
16. Monocrotophos	43. Fensulfthion
17. Diazinon	44. Carbofenthion
18. Fonophos	45. Famphur
19. Disulfoton	46. Triphenyl phosphate (SS)
20. Dioxathion	47. Epn
21. Dimethoate	48. Phosmet
22. Phosphamidon isomer	49. Leptophos
23. Dichlorfenthion	50. Tri-o-cresyl phosphate
24. Chlorpyrifos methyl	51. Azinphos-methyl
25. Phosphamidon	52. Azinphos-ethyl
26. Ronnel	53. Coumaphos

**Column** Rtx®-35, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10424)  
**Sample** triphenylphosphate (cat.# 32281)  
 tributylphosphate (cat.# 32280)  
 8140/8141 OP Pesticide Calibration Mix A (cat.# 32277)  
 8141 OP Pesticide Calibration Mix B (cat.# 32278)  
 0.1µg/mL US EPA Method 8141A Custom Standard Mixes (100ng/mL)

**Conc.:**  
**Injection** 0.5 µL splitless (hold 5 min)  
**Inj. Vol.:** Drilled Uniliner (hole near top) (cat.# 21054-214.1)  
**Liner:**  
**Inj. Temp.:** 220 °C

**Oven**  
**Oven Temp.:** 100 °C to 180 °C at 10 °C/min (hold 2 min) to 300 °C at 18 °C/min (hold 10 min)  
**Carrier Gas** He, constant pressure  
**Linear Velocity:** 42 cm/sec @ 60 °C  
**Detector** FPD @ 280 °C

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**Rtx<sup>®</sup>-50 Columns** (fused silica)(midpolarity phase; Crossbond<sup>®</sup> phenyl methyl polysiloxane)

- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, sterols.
- Temperature range: 40 °C to 320 °C.
- Equivalent to USP G3 phase.

The high thermal stability of Rtx<sup>®</sup>-50 columns makes dual-column analysis possible with common phases such as Rtx<sup>®</sup>-1 or Rtx<sup>®</sup>-5MS.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 300/320 °C	10520	10523	10526
	0.50 µm	40 to 290/310 °C	10535	10538	10541
	1.00 µm	40 to 280/300 °C	10550	10553	
0.32 mm	0.25 µm	40 to 300/320 °C	10521	10524	10527
	0.50 µm	40 to 290/310 °C	10536	10539	10542
	1.00 µm	40 to 280/300 °C	10551	10554	10557
0.53 mm	0.25 µm	40 to 280/300 °C	10522		
	0.50 µm	40 to 270/290 °C	10537	10540	10543
	0.83 µm	40 to 270/290 °C		10569	
	1.00 µm	40 to 260/280 °C	10552	10555	10558
	1.50 µm	40 to 250/270 °C	10567	10570	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.18 mm	0.20 µm	40 to 310/330 °C	40501	40502
	0.40 µm	40 to 300/320 °C	40510	40511

**Rtx<sup>®</sup>-65 Columns** (fused silica)(mid- to high-polarity phase; Crossbond<sup>®</sup> diphenyl dimethyl polysiloxane)

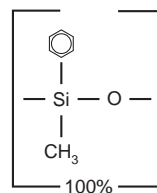
- General-purpose columns for phenols, fatty acids, triglycerides.
- Temperature range: 50 °C to 300 °C.

The Rtx<sup>®</sup>-65 phase contains the highest phenyl content of any bonded stationary phase available to improve separation of aromatic compounds through increased phase-analyte interaction. A unique polarity makes these columns ideal for a variety of analyses, from phenols to FAMES. As a confirmation column for EPA Method 604 phenols, an Rtx<sup>®</sup>-65 column produces a different elution order compared to the primary Rtx<sup>®</sup>-5 column. Rtx<sup>®</sup>-65 columns elute FAMES according to equivalent chain length, similar to bonded Carbowax<sup>®</sup> columns, but the Rtx<sup>®</sup>-65 phase does not suffer the thermal stability limitations of other polar stationary phases.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	50 to 300 °C	17023
	0.50 µm	50 to 280/300 °C	17038
	1.00 µm	50 to 260/280 °C	17053
0.32 mm	0.25 µm	50 to 300 °C	17024
	0.50 µm	50 to 280/300 °C	17039
	1.00 µm	50 to 260/280 °C	17054
0.53 mm	1.00 µm	50 to 250/270 °C	17055

**also available****Rtx<sup>®</sup>-65TG Columns**

Tested specifically for triglycerides.

See **page 89**.**Rtx<sup>®</sup>-50 Structure**

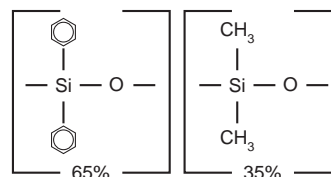
Similar to: (50%-phenyl)-methylpolysiloxane

**similar phases**

HP-50+, CP-Sil 24 CB, SPB-50, AT-50, 007-17

**also available****Metal MXT<sup>®</sup> Columns**

Rugged, flexible, Siltek<sup>®</sup>-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT<sup>®</sup>-50 columns .....page 109**Rtx<sup>®</sup>-65 Structure**

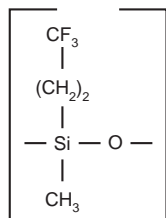
Similar to: (65%-phenyl)-methylpolysiloxane

**similar phases**

007-65HT

**crossbond<sup>®</sup> technology**

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

Rtx<sup>®</sup>-200 Structure

Similar to: (trifluoropropyl)-methylpolysiloxane

## similar phases

DB-200, DB-210, VF-200ms

Rtx<sup>®</sup>-200/Rtx<sup>®</sup>-200MS (fused silica)

- General-purpose columns for solvents, Freon<sup>®</sup> fluorocarbons, alcohols, ketones, silanes, glycols, and drugs of abuse. Excellent confirmation column with an Rtx<sup>®</sup>-5 column for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20 °C to 340 °C.
- Equivalent to USP G6 phase.

Rtx<sup>®</sup>-200 columns have accomplished many difficult separations not possible on any other bonded stationary phase. Many analysts consider these the best, most inert mid-polarity columns available. The trifluoropropylmethyl polysiloxane stationary phase has a unique selectivity that changes elution orders and resolves compounds that phenyl, cyano, or Carbowax<sup>®</sup> phases can not. The Rtx<sup>®</sup>-200 column offers exceptional thermal stability, low bleed, and superior inertness—even for active compounds such as phenols, and with sensitive detectors such as ECDs, NPDs, and MSDs.

Rtx<sup>®</sup>-200 Columns (fused silica)(midpolarity phase; Crossbond<sup>®</sup> trifluoropropylmethyl polysiloxane)

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.25 µm	-20 to 320/340 °C	15020	15023	15026	15029
	0.50 µm	-20 to 310/330 °C	15035	15038	15041	15044
	1.00 µm	-20 to 290/310 °C	15050	15053	15056	15059
0.32 mm	0.25 µm	-20 to 320/340 °C	15021	15024	15027	
	0.50 µm	-20 to 310/330 °C	15036	15039	15042	15045
	1.00 µm	-20 to 290/310 °C	15051	15054	15057	15060
0.53 mm	1.50 µm	-20 to 280/300 °C	15066	15069	15072	15075
	0.25 µm	-20 to 310/330 °C	15022	15025	15028	
	0.50 µm	-20 to 300/320 °C	15037	15040	15043	
0.18 mm	1.00 µm	-20 to 290/310 °C	15052	15055	15058	
	1.50 µm	-20 to 280/300 °C	15067	15070	15073	
	3.00 µm	-20 to 260/280 °C	15082	15085	15088	15091

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.15 mm	0.15 µm	-20 to 320/340 °C	43835	43836	
0.18 mm	0.20 µm	-20 to 310/330 °C	45001	45002	45003
	0.40 µm	-20 to 310/330 °C	45010	45011	45012

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## also available

Metal MXT<sup>®</sup> Columns

Rugged, flexible, Siltek<sup>®</sup>-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT<sup>®</sup>-200 columns..... page 110

## Speed Up and Simplify GC Method Development With Restek's EZGC<sup>®</sup> Online Suite

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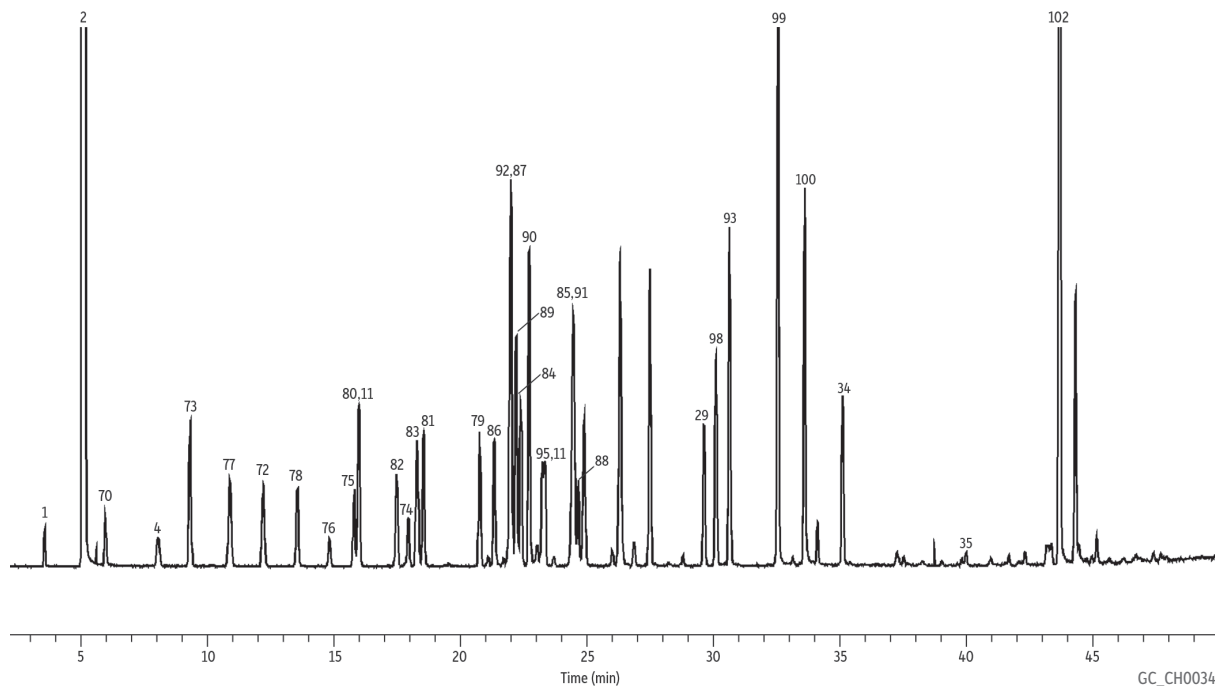
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The advertisement features a tablet and a laptop displaying the EZGC software interface. The tablet screen shows the 'EZGC Method Translator' and 'EZGC Flow Calculator' sections, with various input fields and tables. The laptop screen shows the 'EZGC Chromatogram Modeler' interface, including a chromatogram plot and a 'My EZGC Models' list. A cartoon scientist character with glasses and a white lab coat stands next to the laptop, pointing towards the software.

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Solvent Mixture #3 on Rtx<sup>®</sup>-200

**Column** Rtx<sup>®</sup>-200, 60 m, 0.53 mm ID,  
3.00 µm (cat.# 15088)

**Sample** Solvent mix #3

**Injection**  
Inj. Vol.: 1.0 µL split  
Inj. Temp.: 275 °C

**Split Vent**  
Flow Rate: 50 mL/min

**Oven**  
Oven Temp.: 40 °C (hold 5 min) to 285 °C  
at 5 °C/min

**Carrier Gas** He, constant flow  
Linear Velocity: 40 cm/sec

**Detector** MS  
Mode: Scan  
Source Temp.: 285 °C

**Peaks**

1. Pentane
2. Methylene chloride
3. Ethylene glycol
4. Heptane
5. Cyclopentanol
6. 3-Hexanol
7. Acetamide
8. 2-Methyl-1-pentanol
9. Furfuryl alcohol
10. Butyl ether
11. Nonane
12. Cumene
13. Ethyl amyl ketone
14. Heptanol
15. Butyl butanoate
16. Unknown
17. Benzyl alcohol
18. Dipropylene glycol
19. Benzene, diethyl-
20. Unknown
21. Unknown
22. Hexachloroethane
23. Undecane
24. 1-Nonanol
25. *p*-Methoxyphenol
26. Triethylene glycol

27. Dodecane
28. Undecanal
29. Tridecane
30. Unknown
31. Dodecanal
32. Dicyclohexylamine
33. bis(2,2-methoxy)ethyl ether
34. Pentadecane
35. Heptadecane
36. Octadecane
37. Nonadecane
38. Eicosane
39. Acetyl tributyl citrate
40. 2-Buten-1-ol
41. Formamide
42. 3-Pentanol
43. 1-Nitropropane
44. Dimethylformamide
45. 2-Methyl-3-pentanol
46. Toluene
47. Ethyl chloroacetate
48. Dimethylacetamide
49. *p*-Xylene
50. *sec*-tetrachloroethane
51. Benzaldehyde
52.  $\alpha$ -Chlorotoluene
53. 2,6-Dimethyl-4-heptanone

54. 2-Octanone
55. *o*-Cresol
56.  $\alpha$ -Methylbenzyl alcohol
57. 5-Nonanone
58. Nonanal
59. Decanal
60. Unknown
61. 1-Decanol
62. 1-Undecanol
63. 2-Dodecanone
64. 1-Dodecanol
65. Tetraethylene glycol
66. Dibenzyl
67. Diethyl Phthalate
68. Tributyl phosphate
69. Diphenyl sulfone
70. Allyl alcohol
71. Unknown
72. Isopropyl acetate
73. Benzene
74. 2-Nitropropane
75. Nitroethane
76. Pentanal
77. 2-Bromobutane
78. 1-Chloropentane
79. Cyclopentanone
80. 2-Hexanol

81. Butyl acetate
82. 2-Ethyl-1-butanol
83. 3-Ethyl-3-pentanol
84. 1,4-Dichlorobutane
85. 2-Methyl-2,4-pentanediol
86. Butoxyethanol
87. 1,2,3-Trichloropropane
88. 1,4-Butanediol
89. Methyl hexanoate
90. 1,2,4-Trimethylbenzene
91. 2-Ethyl-1-hexanol
92. Dipentene/Limonene
93. Tetrahydrofurfuryl acetate
94. Unknown
95. Decahydronaphthalene
96. Unknown
97. Unknown
98. 2-Decanol
99. 1,2-Bis(2-methoxyethoxy)ethane
100. 2-Phenoxyethanol
101. Unknown
102. Benzyl ether

**Rtx<sup>®</sup>-200MS—Low-Bleed GC-MS Columns (fused silica)**

(midpolarity phase; Crossbond<sup>®</sup> trifluoropropylmethyl polysiloxane)

Column specifically tested for low-bleed performance.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.10 µm	-20 to 320/340 °C	15608
	0.25 µm	-20 to 320/340 °C	15623
	0.50 µm	-20 to 310/330 °C	15638
	1.00 µm	-20 to 290/310 °C	15653
0.32 mm	0.10 µm	-20 to 320/340 °C	15609
	0.25 µm	-20 to 320/340 °C	15624
	0.50 µm	-20 to 310/330 °C	15639
	1.00 µm	-20 to 290/310 °C	15654

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**Rtx<sup>®</sup>-440 Columns** (fused silica)(midpolarity proprietary Crossbond<sup>®</sup> phase)

- General-purpose columns with unique selectivity for pesticides, PAHs, or other semivolatiles. Ideal for low/trace-level analyses.
- Low-bleed, high-resolution columns with unique selectivity.
- Wide temperature range: 20 °C to 340 °C.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	20 to 320/340 °C	12923
	0.50 µm	20 to 320/340 °C	12938
0.32 mm	0.25 µm	20 to 320/340 °C	12924
	0.50 µm	20 to 320/340 °C	12939
0.53 mm	0.50 µm	20 to 320/340 °C	12940

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	20 to 320 °C	42902

**Organochlorine Pesticides by EPA Method 8081A on Rtx<sup>®</sup>-440 (dual column w/ Rtx<sup>®</sup>-CLPesticides2)**

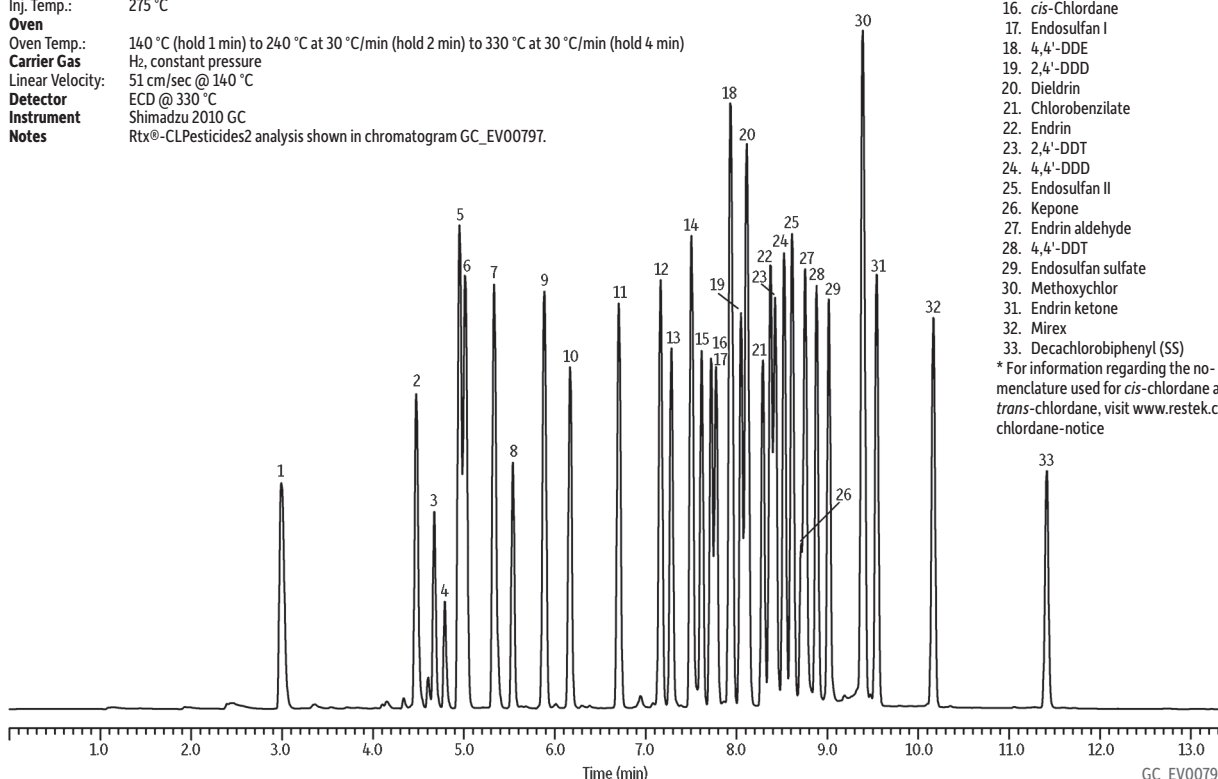
**Column** Rtx<sup>®</sup>-440, 30 m, 0.32 mm ID, 0.50 µm (cat.# 12939)  
**Sample** Organochlorine pesticide mix AB #2, 8-80 µg/mL in ethyl acetate (cat.# 32292)  
 Chlorobenzilate, 1,000 µg/mL in methanol (cat.# 32211)  
 Hexachlorobenzene, 1,000 µg/mL in acetone (cat.# 32231)  
 Hexachlorocyclopentadiene, 1,000 µg/mL in methanol (cat.# 32232)  
 2,4'-DDD, 1,000 µg/mL in methanol (cat.# 32098)  
 2,4'-DDE, 1,000 µg/mL in methanol (cat.# 32099)  
 2,4'-DDT, 1,000 µg/mL in methanol (cat.# 32200)  
 2,4,5,6-Tetrachloro-*m*-xylene, 200 µg/mL in acetone (cat.# 32027)  
 Decachlorobiphenyl (BZ #209), 200 µg/mL in acetone (cat.# 32029)  
 Diallyate (*cis* & *trans*), 1,000 µg/mL in hexane (cat.# custom)  
 Isodrin, 1,000 µg/mL in hexane (cat.# custom)  
 Kepone, 1,000 µg/mL in hexane (cat.# custom)  
 Mirex, 1,000 µg/mL in hexane (cat.# custom)

**Injection**  
 Inj. Vol.: 1.0 µL splitless (hold 0.75 min)  
 Liner: Siltek<sup>®</sup> single taper (cat.# 20961-214.1)  
 Inj. Temp.: 275 °C  
**Oven**  
 Oven Temp.: 140 °C (hold 1 min) to 240 °C at 30 °C/min (hold 2 min) to 330 °C at 30 °C/min (hold 4 min)  
**Carrier Gas**  
 Hz, constant pressure  
 Linear Velocity: 51 cm/sec @ 140 °C  
**Detector**  
 ECD @ 330 °C  
**Instrument**  
 Shimadzu 2010 GC  
**Notes**  
 Rtx<sup>®</sup>-CLPesticides2 analysis shown in chromatogram GC\_EV00796.

**Peaks**

1. Hexachlorocyclopentadiene
2. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
3. *cis*-Diallyate
4. *trans*-Diallyate
5. α-BHC
6. Hexachlorobenzene
7. γ-BHC
8. β-BHC
9. δ-BHC
10. Heptachlor
11. Aldrin
12. Isodrin
13. Heptachlor epoxide
14. 2,4'-DDE
15. *trans*-Chlordane
16. *cis*-Chlordane
17. Endosulfan I
18. 4,4'-DDE
19. 2,4'-DDD
20. Dieldrin
21. Chlorobenzilate
22. Endrin
23. 2,4'-DDT
24. 4,4'-DDD
25. Endosulfan II
26. Kepone
27. Endrin aldehyde
28. 4,4'-DDT
29. Endosulfan sulfate
30. Methoxychlor
31. Endrin ketone
32. Mirex
33. Decachlorobiphenyl (SS)

\* For information regarding the nomenclature used for *cis*-chlordane and *trans*-chlordane, visit [www.restek.com/chlordane-notice](http://www.restek.com/chlordane-notice)



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**Rtx®-1301 (G43) Columns** (fused silica)

(low- to midpolarity phase)

- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.

Many analysts feel the Rtx®-1301 column has the best cyanosiloxane bonded stationary phase available, with no other column manufacturer providing lower bleed, longer lifetime, or better inertness. Our polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed—even with sensitive detectors such as ECDs and MSDs.

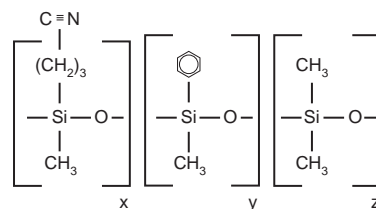
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.25 mm	0.25 µm	-20 to 280 °C	16020	16023	16026		
	0.50 µm	-20 to 270 °C		16038			
	1.00 µm	-20 to 260 °C		16053	16056		
	1.40 µm	-20 to 240 °C			16016		
0.32 mm	0.25 µm	-20 to 280 °C	16021	16024			
	0.50 µm	-20 to 270 °C		16039	16042		
	1.00 µm	-20 to 260 °C		16054	16057		
	1.50 µm	-20 to 250 °C	16066	16069	16072		
	1.80 µm	-20 to 240 °C		16092	16093		
0.53 mm	0.25 µm	-20 to 280 °C		16025			
	0.50 µm	-20 to 270 °C		16040	16043		
	1.00 µm	-20 to 260 °C	16052	16055	16058		
	1.50 µm	-20 to 250 °C		16070			
	3.00 µm	-20 to 240 °C		16085	16088	16076	16091

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

**Rtx®-1301 with Integra-Guard® Columns**

- No leaks for a more robust method.
- No column connections for easier, faster maintenance.
- No peak distortions due to connector dead volume and thermal capacity.

Description	qty.	cat.#
30 m, 0.53 mm ID, 3.00 µm Rtx-1301 w/5 m Integra-Guard Column	ea.	16085-126

**Rtx®-1301 Structure**

Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

**similar phases**

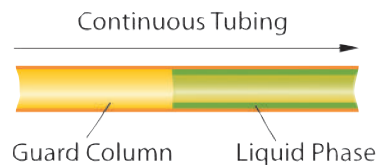
DB-1301, DB-624, DB-624UI, VF-1301ms, VF-624ms, CP-1301, ZB-624

also  
available

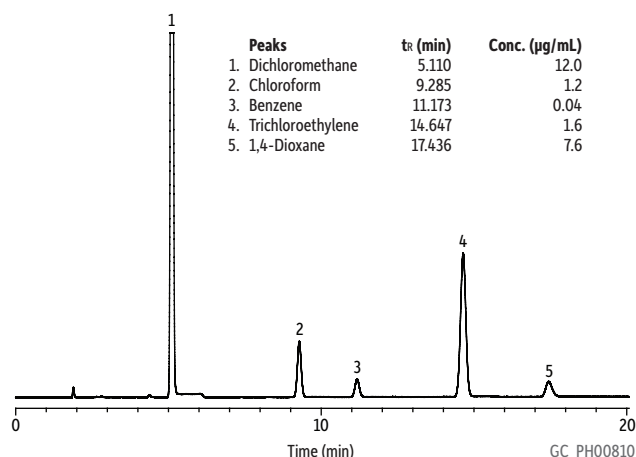
**Metal MXT® Columns**

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-1301 columns .....page 109

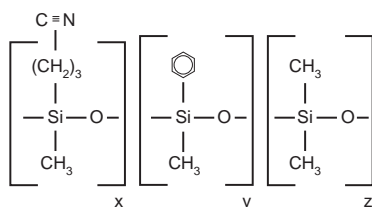
**Integra-Guard® Built-In Guard Column**

Get the protection without the connection!

**USP <467> Residual Solvents on Rtx®-1301 (G43) by Static Headspace**

<b>Column</b>	Rtx®-1301 w/5 m Integra-Guard®, 30 m, 0.53 mm ID, 3.00 µm (cat.# 16085-126)	Mixer time: 2.0 min
<b>Sample</b>	USP <467> Calibration Mixture #5 (cat.# 36007)	Mixing level: 5
<b>Diluent:</b>	DMSO	Mixer stabilize time: 0.5 min
<b>Conc.:</b>	To each 22 mL headspace vial 5mL water, ~1.0 g of sodium sulfate and 100 µL of stock standard were added.	Vial Pressure: 15 psi
<b>Injection</b>	headspace-loop split (split ratio 2:1)	Pressurize Time: 2.0 min
<b>Headspace-Loop</b>		Pressure
<b>Inj. Port Temp.:</b>	180 °C	Equilibration Time: 0.5 min
<b>Instrument:</b>	Teledyne Tekmar HT3	Loop Pressure: 5 psi
<b>Inj. Time:</b>	1.0 min	Loop Fill Time: 2.0 min
<b>Transfer Line Temp.:</b>	150 °C	Loop fill equil. time: 0.5 min
<b>Valve Oven Temp.:</b>	150 °C	<b>Oven</b>
<b>Standby flow rate:</b>	10 mL/min	Oven Temp.: 40 °C (hold 20 min) to 240 °C at 25 °C/min (hold 10 min)
<b>Sample Temp.:</b>	80 °C	<b>Carrier Gas</b>
<b>Platen temp</b>		He, constant flow
<b>equil. time:</b>	2.0 min	Flow Rate: 5 mL/min
<b>Sample Equil. Time:</b>	15.0 min	<b>Detector</b>
		Make-up Gas
		Flow Rate: 45 mL/min
		<b>Notes</b>
		<b>FID conditions:</b>
		hydrogen flow: 40 mL/min
		air flow: 450 mL/min

## Rtx®-624 Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

## similar phases

DB-1301, DB-624, DB-624UI, VF-1301ms, VF-624ms, CP-1301, ZB-624

## also available



## Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-624 columns.....page 111

## Rtx®-624 Columns (fused silica)

(low- to midpolarity phase)

- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Temperature range: -20 °C to 240 °C.
- Equivalent to USP G43 phase.

The unique polarity of the Rtx®-624 column makes it ideal for analyzing volatile organic pollutants. Although the Rtx®-502.2 column is recommended in many methods, the Rtx®-624 column offers better resolution of early eluting compounds. The Rtx®-624 phase produces greater than 90% resolution of the first six gases in EPA Methods 8260 and 524.2. This stationary phase is especially well-suited for EPA Method 524.2 since it resolves 2-nitropropane from 1,1-dichloropropanone, which share quantification ion m/z 43 and must be separated chromatographically.

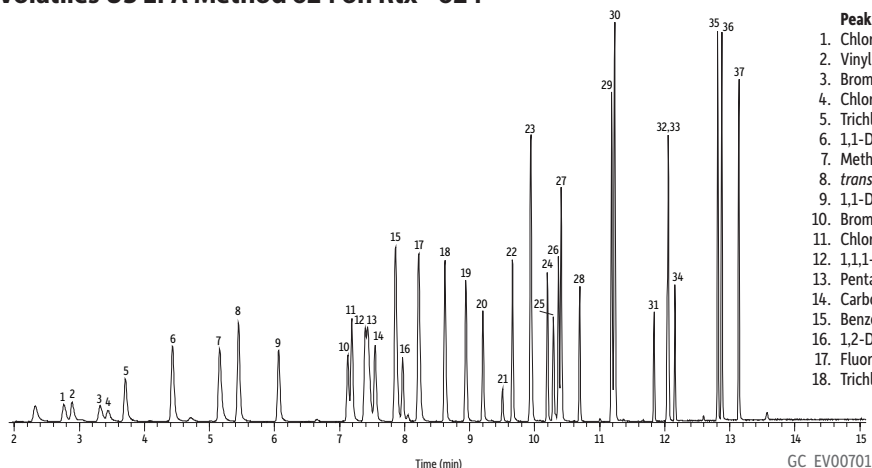
ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.25 mm	1.40 µm	-20 to 240 °C	10968	10969		
0.32 mm	1.80 µm	-20 to 240 °C	10970	10972		
0.53 mm	3.00 µm	-20 to 240 °C	10971	10973	10974	10975

ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-20 to 240 °C	40924	40925

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## Volatiles US EPA Method 624 on Rtx®-624



## Peaks

- |                                     |                                       |
|-------------------------------------|---------------------------------------|
| 1. Chloromethane                    | 19. 1,2-Dichloropropane               |
| 2. Vinyl chloride                   | 20. Bromodichloromethane              |
| 3. Bromomethane                     | 21. 2-Chloroethyl vinyl ether         |
| 4. Chloroethane                     | 22. <i>cis</i> -1,3-Dichloropropene   |
| 5. Trichlorofluoromethane           | 23. Toluene                           |
| 6. 1,1-Dichloroethene               | 24. 2-Bromo-1-chloropropane           |
| 7. Methylene Chloride               | 25. 1,1,2-Trichloroethane             |
| 8. <i>trans</i> -1,2-Dichloroethene | 26. Tetrachloroethene                 |
| 9. 1,1-Dichloroethane               | 27. Dibromochloromethane              |
| 10. Bromochloromethane              | 28. <i>trans</i> -1,3-Dichloropropene |
| 11. Chloroform                      | 29. Chlorobenzene                     |
| 12. 1,1,1-Trichloroethane           | 30. Ethylbenzene                      |
| 13. Pentafluorobenzene              | 31. Bromoform                         |
| 14. Carbon Tetrachloride            | 32. 1,4-Dichlorobutane                |
| 15. Benzene                         | 33. 4-Bromofluorobenzene              |
| 16. 1,2-Dichloroethane              | 34. 1,1,2,2-Tetrachloroethane         |
| 17. Fluorobenzene                   | 35. 1,3-Dichlorobenzene               |
| 18. Trichloroethene                 | 36. 1,4-Dichlorobenzene               |
|                                     | 37. 1,2-Dichlorobenzene               |

**Column** Rtx®-624, 40 m, 0.18 mm ID, 1.00 µm (cat.# 40925)  
**Sample** 624 Internal Standard Mix (cat.# 30023)  
 624 Surrogate Standard Mix (cat.# 30243)  
 Volatiles MegaMix™, EPA Method 624 (cat.# 30497)  
 compounds at 50 ppb (IS @ 40ppb) in 5mL of RO water  
 purge and trap split (split ratio 40:1)  
 250 °C

**Conc.:**  
**Injection**  
 Inj. Temp.: 250 °C  
**Purge and Trap**  
 Instrument: Tekmar LSC-3100 Purge and Trap  
 Trap Type: Vocarb 3000 (type K)  
 Purge: 11 min @ ambient, flow 40 mL/min  
 Dry Purge: 1 min, flow 40 mL/min  
 Desorb Preheat  
 Temp.: 245 °C  
 Desorb: 2 min @ 250 °C, flow 10 mL/min  
 Bake: 8 min @ 260 °C  
 Interface Connection: injection port  
 Transfer Line Tubing: Silcosteel® transfer line, 1mm ID sleeve

**Oven**  
 Oven Temp.: 50 °C (hold 4 min) to 100 °C at 12 °C/min to 230 °C  
 at 27 °C/min (hold 2 min)

**Carrier Gas**  
 Flow Rate: He, constant flow  
 1.1 mL/min  
**Dead Time:** 2.06 min @ 50 °C  
**Detector**  
 Transfer Line Temp.: 280 °C  
 Analyzer Type: Quadrupole  
 Tune Type: PFTBA/BFB  
 Ionization Mode: EI  
 Scan Range: 35-260 amu  
**Notes**  
 (MCS bypassed using Silcosteel® tubing)



**Rtx®-1701 Columns** (fused silica)

(midpolarity Crossbond® phase)

- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), pesticides, and fragrance compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G46 phase.

Rtx®-1701 is one of the more popular stationary phases used in capillary GC. The mix of cyano and phenyl functional groups increases the polarity and offers a different elution order relative to less polar Rtx®-1 or Rtx®-5 columns. An Rtx®-1701 column is ideal for confirmation analysis in combination with an Rtx®-35 or Rtx®-5 column. The polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed, even with sensitive detectors such as ECDs and MSDs.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-20 to 280 °C			12011
	0.25 µm	-20 to 280 °C	12020	12023	12026
	0.50 µm	-20 to 270/280 °C	12035	12038	12041
	1.00 µm	-20 to 260/280 °C	12050	12053	12056
0.32 mm	0.10 µm	-20 to 280 °C		12009	
	0.25 µm	-20 to 280 °C	12021	12024	12027
	0.50 µm	-20 to 270/280 °C	12036	12039	12042
	1.00 µm	-20 to 260/280 °C	12051	12054	12057
	1.50 µm	-20 to 240/260 °C	12066	12069	12072
0.53 mm	0.25 µm	-20 to 270/280 °C		12025	
	0.50 µm	-20 to 260/270 °C	12037	12040	
	1.00 µm	-20 to 250/270 °C	12052	12055	12058
	1.50 µm	-20 to 240/260 °C	12067	12070	12073
	3.00 µm	-20 to 230/250 °C	12082	12085	12088

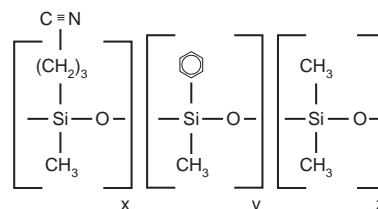
  

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-20 to 280 °C	42001	42002	42003
	0.40 µm	-20 to 280 °C		42011	42012

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

**Rtx®-1701 with Integra-Guard® Columns**

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm Rtx-1701 w/5 m Integra-Guard Column	ea.	12023-124

**Rtx®-1701 Structure**

Similar to: (14%-cyanoethylphenyl)-methylpolysiloxane

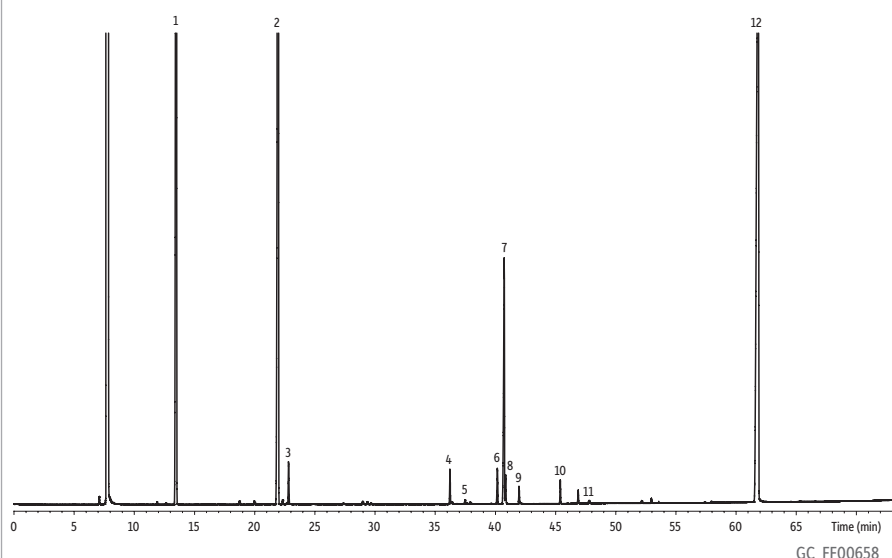
**similar phases**

DB-1701P, DB-1701, CP-Sil 19 CB, VF-1701ms, VF-1701 Pesticides, ZB-1701, ZB-1701P

**also available****Metal MXT® Columns**

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-1701 columns .....page 109

**5% Fragrance Materials Association Mix on Rtx®-1701**

Peaks	Conc. (wt.%)
1. Ethyl butyrate	35.7
2. Limonene	20.0
3. Eucalyptol	0.5
4. Geraniol	0.6
5. Benzoic acid	1.0
6. Cinnamic aldehyde	0.5
7. Hydroxycitronellal	5.0
8. Thymol	0.3
9. Cinnamyl alcohol	0.3
10. Cinnamyl acetate	0.3
11. Vanillin	0.1
12. Benzylsalicylate	35.7

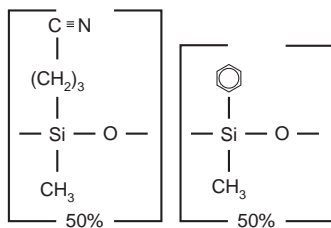
<b>Column</b>	Rtx®-1701, 60 m, 0.25 mm ID, 0.25 µm (cat.# 12026)
<b>Sample</b>	Fragrance materials test mix (cat.# 31807)
<b>Conc.:</b>	5% FMA mix in acetone
<b>Injection</b>	
<b>Inj. Vol.:</b>	1 µL split (split ratio 40:1)
<b>Liner:</b>	Splitless (4 mm ID) (cat.# 20814)
<b>Inj. Temp.:</b>	285 °C
<b>Oven</b>	
<b>Oven Temp.:</b>	50 °C to 270 °C at 3 °C/min
<b>Carrier Gas</b>	He, constant flow
<b>Flow Rate:</b>	0.6 mL/min
<b>Detector</b>	FID @ 300 °C

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**Rtx®-225 Structure**



Similar to: (50%-cyanopropylmethyl)-methylphenylpolysiloxane

**similar phases**

DB-225ms, CP-Sil 43 CB

**Rtx®-225 Columns** (fused silica)

(polar phase; Crossbond® cyanopropylmethyl phenylmethyl polysiloxane)

- General-purpose columns for FAMES, carbohydrates, sterols, flavor compounds.
- Temperature range: 40 °C to 240 °C.
- Equivalent to USP G7, G19 phases.

The cyanopropyl-containing Rtx®-225 phase is slightly less polar than bonded polyethylene glycol (PEG) phases, but it can be used for many of the same applications.

Improvements to the Rtx®-225 polymer have increased thermal stability, reduced bleed, and improved inertness. The Rtx®-225 column provides a 20 °C thermal stability advantage over other “225” columns because of our unique polymer synthesis technology and proprietary siloxane deactivation. In most similar columns, the Carbowax® deactivation layer is not fully compatible with the cyanopropyl siloxane polymer, which can cause adsorption, tailing of active compounds, and lower efficiency.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 220/240 °C	14020	14023	14026
	0.50 µm	40 to 220/240 °C		14038	
0.32 mm	0.25 µm	40 to 220/240 °C	14021	14024	
	0.50 µm	40 to 220/240 °C		14039	
	1.00 µm	40 to 200/220 °C	14051	14054	14057
0.53 mm	0.25 µm	40 to 200/220 °C	14022	14025	
	0.50 µm	40 to 200/220 °C		14040	
	1.00 µm	40 to 200/220 °C	14052	14055	

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.



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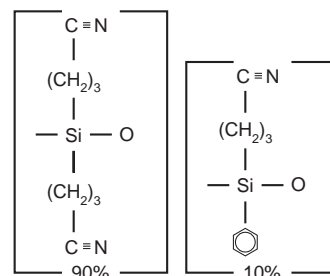
[www.restek.com/ezgc](http://www.restek.com/ezgc)

**Rtx<sup>®</sup>-2330 Columns** (fused silica)

(highly polar phase; biscyanopropyl cyanopropylphenyl polysiloxane)

- General-purpose columns for *cis/trans* FAMES, dioxin isomers.
- Temperature range: 0 °C to 275 °C.
- Equivalent to USP G8 and G48 phase.

Rtx<sup>®</sup>-2330 is one of the most polar capillary column stationary phases. Cyano groups on both sides of the polymer backbone give the phase a strong dipole moment and high selectivity for *cis/trans* compounds or compounds with conjugated double bonds. Highly polar columns typically exhibit poor column efficiencies, high bleed, and short column lifetimes when thermally cycled. To overcome some of these problems, we developed a surface treatment that is more compatible with the Rtx<sup>®</sup>-2330 phase. In addition, our improved polymer produces columns with better column efficiency and lower bleed.

**Rtx<sup>®</sup>-2330 Structure**

Similar to: (95%-cyanopropyl)-phenyl polysiloxane

**similar phases**

VF-23ms

**tech tip**

Do not solvent rinse Rtx<sup>®</sup>-2330 and Rt<sup>®</sup>-2560 columns. These columns are not fully bonded and solvent rinsing will remove the stationary phase.

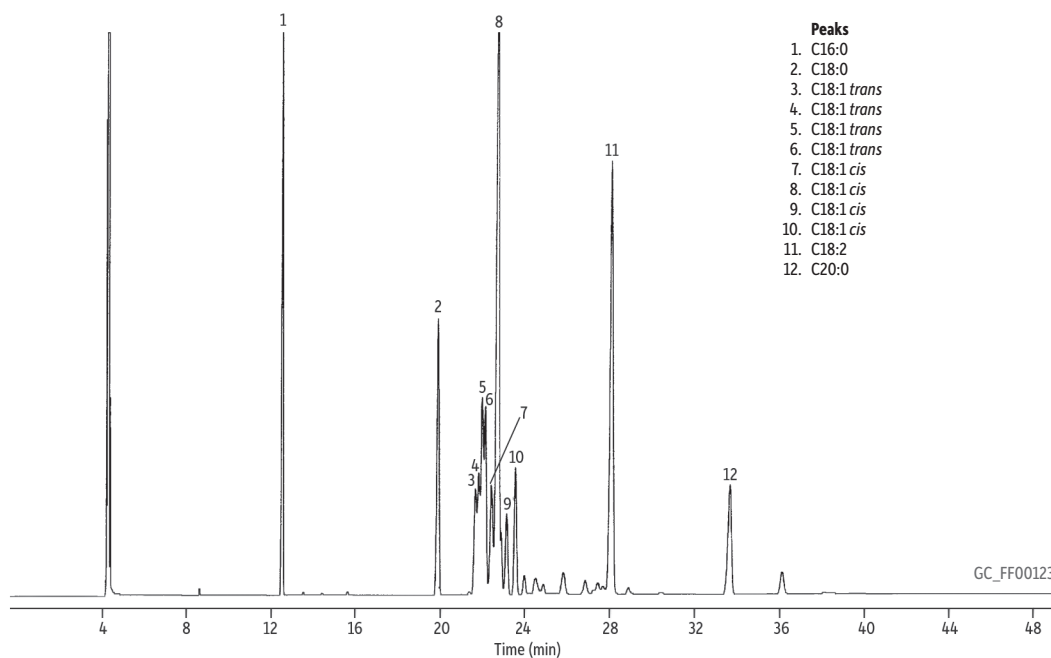
ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 μm	0 to 260/275 °C	10708	10711	10714
	0.20 μm	0 to 260/275 °C	10723	10726	10729
0.32 mm	0.20 μm	0 to 260/275 °C	10724	10727	10730
0.53 mm	0.20 μm	0 to 260/275 °C	10725	10728	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.10 μm	0 to 260 °C	40701	40702	40703

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

**FAMES (Commercial Margarine) on Rt<sup>®</sup>-2330**

(split injection)



**Column** Rt<sup>®</sup>-2330, 105 m, 0.25 mm ID, 0.20 μm (cat.# 10729)  
**Sample** Commercial margarine mixture  
 Conc.: Approximately 5 μg  
**Injection**  
 Inj. Vol.: 1.0 μL split (split ratio 50:1)  
 Inj. Temp.: 275 °C

**Oven**  
 Oven Temp.: 165 °C  
**Carrier Gas** Hz, constant pressure  
 Linear Velocity: 40 cm/sec  
**Detector** FID @ 275 °C  
**Notes** FID sensitivity: 4 x 10<sup>-11</sup> AFS

**Rt®-2560 Column** (fused silica)

(highly polar phase; biscyanopropyl polysiloxane—not bonded)

- Application-specific column for *cis/trans* FAMES.
- Stable to 250 °C.

Because the Rt®-2560 stationary phase is not bonded, it should not be solvent rinsed.

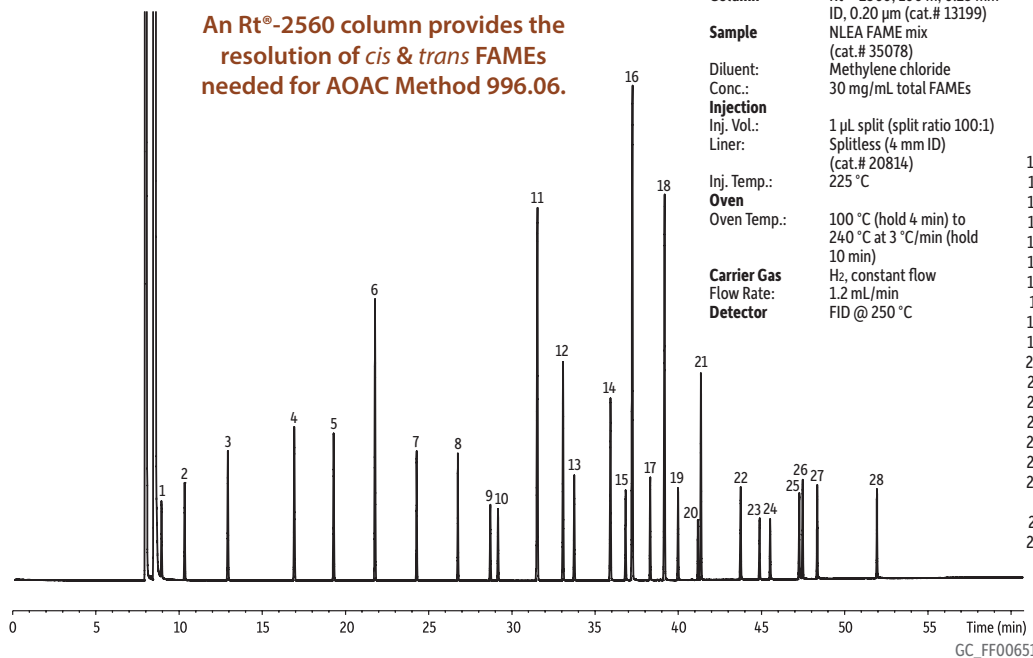
**similar phases**

HP-88, CP-Sil 88, SPB-2560

ID	df	temp. limits	100-Meter cat.#
0.25 mm	0.20 µm	20 to 250 °C	13199

**FAMES (NLEA Mix) on Rt®-2560**

An Rt®-2560 column provides the resolution of *cis* & *trans* FAMES needed for AOAC Method 996.06.



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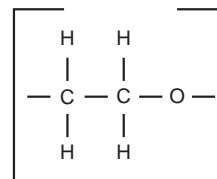


**Rtx®-Wax Columns** (fused silica)

(polar phase; Crossbond® polyethylene glycol)

- Best polyethylene glycol (PEG) phase for alkenols, glycols, and aldehydes.
- Temperature range: 20 °C to 250 °C.
- Equivalent to USP G14, G15, G16, G20, G39 phases.

Rtx®-Wax columns are the most inert and efficient PEG columns currently available. The extended operating temperature range allows analysis of compounds having a wide volatility range and ensures low bleed at temperatures as high as 250 °C. Selectivity is comparable to other Carbowax® columns for compounds of intermediate to high polarity.

**Rtx®-Wax Structure****similar phases**

DB-Wax, CP-Wax 52 CB, ZB-Wax

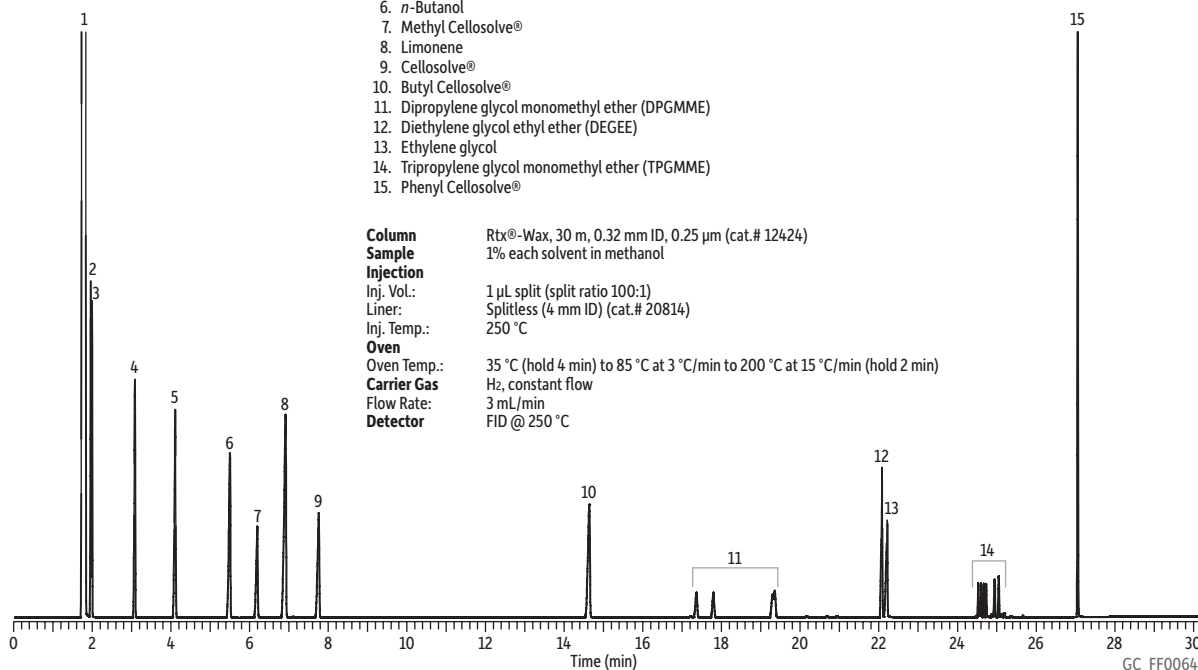
ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	20 to 250 °C	12420	12423	12426
	0.50 µm	20 to 250 °C	12435	12438	12441
0.32 mm	0.25 µm	20 to 250 °C		12424	12427
	0.50 µm	20 to 250 °C	12436	12439	12442
	1.00 µm	20 to 240/250 °C	12451	12454	12457
0.53 mm	0.25 µm	20 to 250 °C		12425	
	0.50 µm	20 to 250 °C		12440	12443
	1.00 µm	20 to 240/250 °C	12452	12455	12458

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

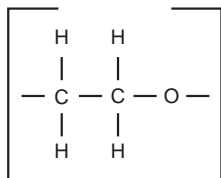
**Cleaning Solvents on Rtx®-Wax****Peaks**

1. Methanol
2. Isopropanol
3. Ethanol
4. *n*-Propanol
5. Isobutanol
6. *n*-Butanol
7. Methyl Cellosolve®
8. Limonene
9. Cellosolve®
10. Butyl Cellosolve®
11. Dipropylene glycol monomethyl ether (DPGME)
12. Diethylene glycol ethyl ether (DEGEE)
13. Ethylene glycol
14. Tripropylene glycol monomethyl ether (TPGME)
15. Phenyl Cellosolve®

**Column** Rtx®-Wax, 30 m, 0.32 mm ID, 0.25 µm (cat.# 12424)  
**Sample** 1% each solvent in methanol  
**Injection**  
 Inj. Vol.: 1 µL split (split ratio 100:1)  
 Liner: Splitless (4 mm ID) (cat.# 20814)  
 Inj. Temp.: 250 °C  
**Oven**  
 Oven Temp.: 35 °C (hold 4 min) to 85 °C at 3 °C/min to 200 °C at 15 °C/min (hold 2 min)  
**Carrier Gas**  
 Carrier Gas: H<sub>2</sub>, constant flow  
 Flow Rate: 3 mL/min  
**Detector** FID @ 250 °C



## Stabilwax® Structure



## similar phases

HP-INNOWax, CP-Wax 52 CB, VF-WAX MS, ZB-WAXplus

## Six columns for the price of five!

Call 800-356-1688, ext. 3, or your Restek representative for details!

## also available



## Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-WAX columns .....page 110

## Stabilwax® Columns (fused silica)

(polar phase; Crossbond® polyethylene glycol)

- Rugged enough to withstand repeated water injections.
- Low-bleed PEG column ensures long column lifetimes.
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

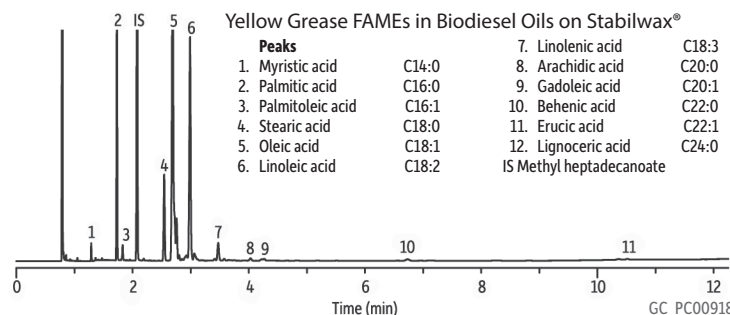
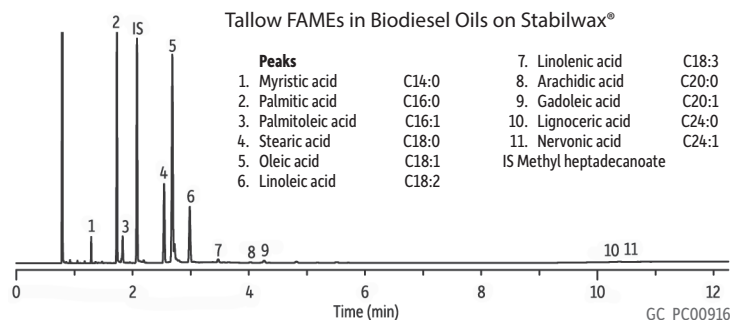
Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. The bonding mechanism of the column also produces polar compound retention times that do not shift, as is often observed on other wax-type columns. In addition, this bonding mechanism produces a column that can be rejuvenated by solvent washing. Stabilwax® columns are used for a wide range of compounds and matrices including: FAMES, flavor compounds, essential oils, solvents, aromatics (including xylene isomers), acrolein/acrylonitrile (EPA 603), and oxygenated compounds. Also used for purity testing of chemicals and analyzing impurities in water matrices and alcoholic beverages.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	40 to 250/260 °C	10605	10608	10611
	0.25 µm	40 to 250/260 °C	10620	10623	10626
	0.50 µm	40 to 250/260 °C	10635	10638	10641
0.32 mm	0.25 µm	40 to 250/260 °C	10621	10624	10627
	0.50 µm	40 to 250/260 °C	10636	10639	10642
	1.00 µm	40 to 240/250 °C	10651	10654	10657
0.53 mm	0.25 µm	40 to 250/260 °C	10622	10625	10628
	0.50 µm	40 to 250/260 °C	10637	10640	10643
	1.00 µm	40 to 240/250 °C	10652	10655	10658
	1.50 µm	40 to 230/240 °C	10666	10669	10672
2.00 µm	40 to 220/230 °C	10667	10670		

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831
0.18 mm	0.18 µm	40 to 250 °C		40602

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## FAMES in Biodiesel Oils on Stabilwax®



**Column Sample** Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)  
Tallow source of biodiesel (B100), prepared according to European Method EN 14103

**Injection**  
Inj. Vol.: 1.0 µL split (split ratio 100:1)  
Liner: Cycloplitter® (cat.# 20706)  
Inj. Temp.: 250 °C

**Oven**  
Oven Temp.: 210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)

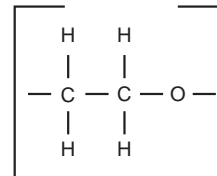
**Carrier Gas**  
Flow Rate: 3 mL/min  
Linear Velocity: 60 cm/sec

**Detector**  
FID @ 250 °C

Visit [www.restek.com](http://www.restek.com) for soy FAMES and rapeseed FAMES analyses.

**Stabilwax®-MS Columns** (fused silica)

- High-polarity, stable polyethylene glycol (PEG) stationary phase.
- Low bleed and rugged enough to withstand repeated temperature cycles without retention time shifting.
- Ideal for food, flavor, fragrance, and industrial chemical and solvent analysis.
- Temperature range: 40 °C to 250/260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

**Stabilwax®-MS Structure**

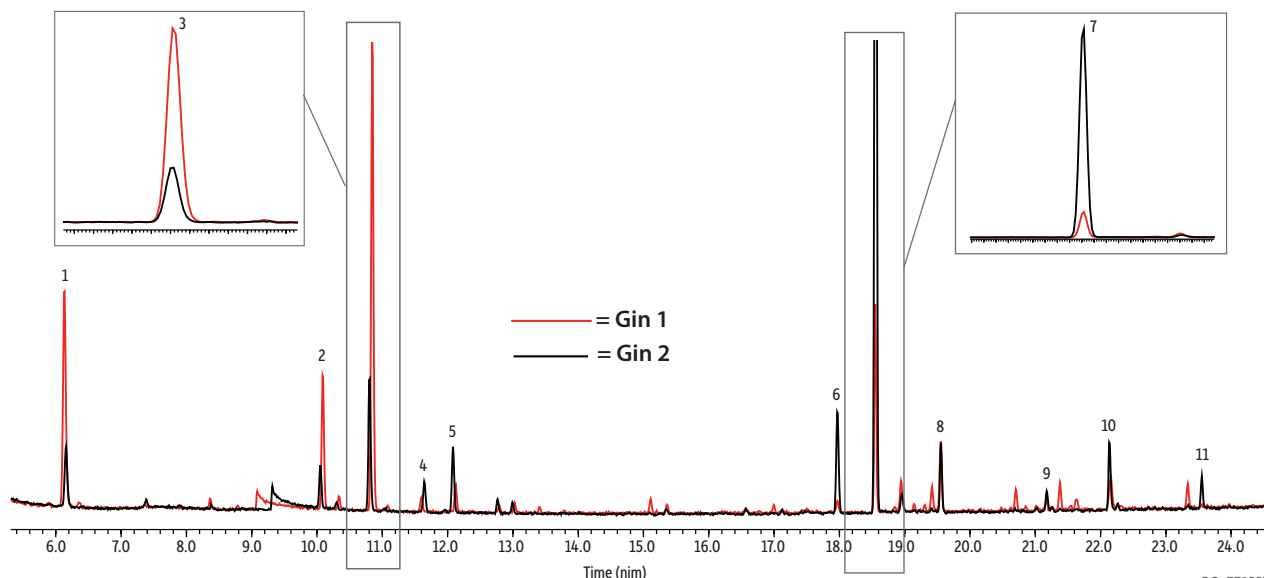
New Stabilwax®-MS columns ensure reproducible retention times from run to run, even with temperature cycling. When methods require trace analysis, this highly polar, low-bleed stationary phase produces excellent signal-to-noise levels! Ideal for food and flavor analysis (e.g., essential oils), fragrance and allergen analysis, as well as industrial solvent and chemical analysis.

ID	df	30-Meter cat.#
0.25 mm	0.25 µm	10673
0.32 mm	0.25 µm	10674

also available

Stabilwax®-DA and  
Stabilwax®-DB  
Columns

See pages 98 and 102.

**Two Brands of Gin on Stabilwax®-MS (Overlay)**

GC\_FF1237

**Column** Stabilwax®-MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10673)  
**Sample** Two different brands of gin  
**Conc.:** Neat  
**Injection**  
 Inj. Vol.: 1 µL split (split ratio 20:1)  
 Liner: Sky® 3.5 mm Precision® liner w/wool (cat.# 23320.1)  
 Inj. Temp.: 250 °C  
**Oven**  
 Oven Temp.: 35 °C (hold 5 min) to 250 °C at 7 °C/min (hold 5 min)  
**Carrier Gas** He, constant linear velocity  
 Linear Velocity: 36 cm/sec  
**Detector** MS  
 Mode: Scan  
 Scan Program:

Group	Start Time (min)	Scan Range (amu)	Scan Rate (scans/sec)
1	0.5	40-550	2

Transfer Line Temp.: 260 °C  
 Analyzer Type: Quadrupole  
 Source Temp.: 250 °C  
 Solvent Delay Time: 0.5 min  
 Ionization Mode: EI  
**Instrument** Shimadzu 2010 GC & QP2010+ MS

**Peaks**

Peak	tr (min)
1. α-Pinene	6.16
2. Beta-myrcene	10.05
3. D-Limonene	10.81
4. Isoamyl alcohol*	11.64
5. γ-Terpinene	12.08
6. Camphor*	17.97
7. Linalool	18.56
8. 4-Terpineol	19.56
9. α-Terpineol*	21.18
10. Nerol acetate*	22.14
11. Geraniol*	23.55

\* Not found in gin represented by red trace.

## Restek GCxGC Columns: Your One Source for 2D Gas Chromatography

### Why Use GCxGC?

GCxGC is a powerful multidimensional GC technique that combines two independent separations to accurately analyze highly complex samples. GCxGC involves two columns with differing stationary phase selectivity (orthogonal) that are press-fitted together in series and separated by a modulator. The first (primary) column performs an initial separation, and its effluent is continually focused and “injected” in defined cycles by the modulator onto the second (secondary) column, where another separation occurs. By choosing a secondary column that is orthogonal (has different selectivity) to the primary column, it is possible to separate and identify analytes that cannot be separated by the primary column. And, by keeping the secondary column very short, it is possible to maintain the separation produced by the primary column. Results generated through a series of high-speed chromatograms are plotted as a contour plot, sometimes known as a retention plane (Figure 1).

So, why use GCxGC? Because comprehensive two-dimensional gas chromatography allows you to perform separations that are simply not possible using standard one-dimensional chromatography!

### Why Use Restek GCxGC Columns?

- Wide range of stationary phases offers orthogonal separations.
- High thermal stability increases system ruggedness.
- Unrivaled column inertness for accurate analysis of active compounds.
- 0.15, 0.18, and 0.25 mm ID formats accommodate varying sample capacities, speeds, and detectors.
- Secondary columns come in convenient 2 m lengths for economical methods development.

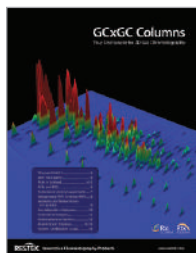
Restek has been performing comprehensive two-dimensional gas chromatography since its commercial inception. Our Innovations lab boasts multiple instruments dedicated to GCxGC applications, and we are continually exploring new application areas—including environmental, food safety, petroleum, forensics, fragrance, natural products, tobacco, metabolomics, and dietary supplements.

Restek's GCxGC secondary columns can be matched with any Restek® Rtx® or Rxi® primary column to create the perfect orthogonal separation for your application. See our combination guide below for help choosing your GCxGC columns. We also offer a range of complementary GC accessories—including Sky® inlet liners, the Restek® electronic leak detector, and Press-Tight® connectors—to boost your success with GCxGC.

### Restek GCxGC Column Combination Guide

To achieve ideal results in a GCxGC analysis, it is imperative that your primary and secondary columns feature orthogonal phases capable of producing differing separations. Use the chart below to find the perfect combination of Restek® columns to maximize the effectiveness of your GCxGC system.

Application Area	Primary Column		Secondary Column	
	Phase	Selectivity	Phase	Selectivity
Petrochemical	Rxi®-1ms	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
Petrochemical	Rxi®-5Sil MS	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
PAHs, environmental	Rxi®-17Sil MS	Midpolar, aromatic selective	Rxi®-1ms	Nonpolar
PAHs, environmental	Rxi®-17Sil MS	Midpolar, aromatic selective	Rxi®-5Sil MS	Nonpolar
PCBs, PBDEs, PAHs, environmental	Rxi®-XLB	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
Mono-ortho, coplanar PCBs	Rxi®-1ms	Nonpolar	Rxi®-XLB	Planar selective
Mono-ortho, coplanar PCBs	Rxi®-5Sil MS	Nonpolar	Rxi®-XLB	Planar selective
Pesticides, nitroaromatics, halogenated compounds	Rxi®-1ms	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Pesticides, nitroaromatics, halogenated compounds	Rxi®-5Sil MS	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Pesticides, nitroaromatics, halogenated compounds	Rxi®-XLB	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Flavors, fragrances	Rxi®-1ms	Nonpolar	Stabilwax®	Polar
Flavors, fragrances	Rxi®-5Sil MS	Nonpolar	Stabilwax®	Polar
Flavors, fragrances	Stabilwax®	Polar	Rxi®-1ms	Nonpolar
Flavors, fragrances	Stabilwax®	Polar	Rxi®-5Sil MS	Nonpolar



### free literature

**GCxGC Columns: Your One Source for 2D Gas Chromatography**

Download your free copy from [www.restek.com](http://www.restek.com)

lit. cat.# GNBR1585-UNV

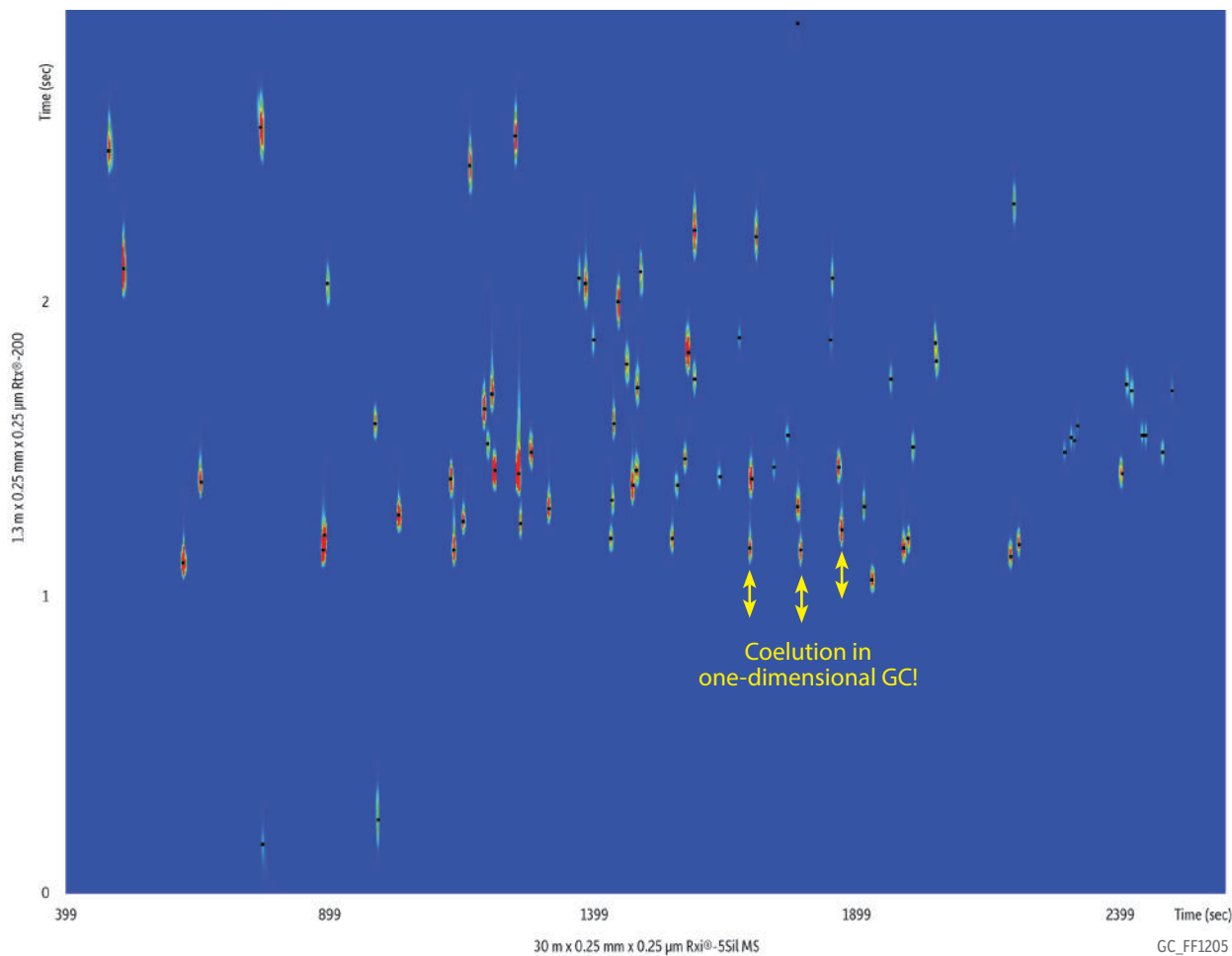


To order Restek GCxGC columns and accessories, see **page 62**.

To get additional assistance in choosing a column pair, visit [www.restek.com/gcxcg](http://www.restek.com/gcxcg)



**Figure 1:** In a contour plot like this one showing clear determination of over 80 pesticides in marijuana, the x-axis represents the primary column retention time and the y-axis represents the secondary column retention time. Peaks aligned along the y-axis would coelute in one-dimensional GC, which is especially problematic if they cannot then be separated by MS.



**Column:** Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); Rtx®-200 1.3 m, 0.25 mm ID, 0.25 µm (cat.# 15020); **Sample:** Diluent: Toluene; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); **Liner:** Sky™ 4 mm single taper w/wool (cat.# 23303.1); **Inj. Temp.:** 250 °C; **Purge Flow:** 40 mL/min; **Oven:** Oven Temp.: Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 5 °C/min; Rtx®-200: 85 °C (hold 1 min) to 315 °C at 5 °C/min; **Carrier Gas:** He, corrected constant flow (2 mL/min); **Modulation:** Modulator Temp. Offset: 20 °C; Second Dimension Separation Time: 3 sec; Hot Pulse Time: 0.9 sec; Cool Time between Stages: 0.6 sec; **Detector:** TOFMS; Transfer Line Temp.: 290 °C; **Analyzer Type:** TOF; **Source Temp.:** 225 °C; **Electron Energy:** 70 eV; **Mass Defect:** -20 mu/100 u; **Solvent Delay Time:** 5 min; **Tune Type:** PFTBA; **Ionization Mode:** EI; **Acquisition Range:** 45-550 amu; **Spectral Acquisition Rate:** 100 spectra/sec; **Instrument:** LECO Pegasus 4D GCxGC-TOFMS; **Notes:** Rtx®-200 (cat.# 15020) is a 15 m column. A 1.3 m section was used as the second dimension column.

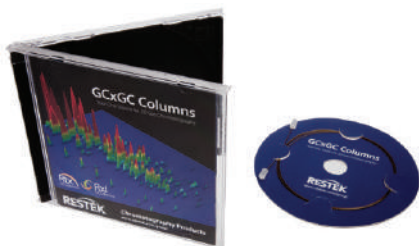
For a peak list, visit [www.restek.com](http://www.restek.com) and enter chromatogram GC\_FF1205 in the search function.

## ChromaBLOGraphy

Check out the Restek blog for the most current topics in GCxGC.

[blog.restek.com](http://blog.restek.com)

To choose the perfect primary/secondary column combination for your application, use our guide on page 60!



To choose the perfect primary/secondary column combination for your application, use our guide on page 60!

### Primary GCxGC Columns (In order of increasing polarity)

Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	30 m	0.25 mm	0.25 µm	-60 to 330/350 °C	13323
Rxi-5Sil MS	30 m	0.25 mm	0.25 µm	-60 to 320/350 °C	13623
Rxi-XLB	30 m	0.25 mm	0.25 µm	30 to 340/360 °C	13723
Rxi-17Sil MS	30 m	0.25 mm	0.25 µm	40 to 340/360 °C	14123
Rtx-200	30 m	0.25 mm	0.25 µm	-20 to 320/340 °C	15023
Stabilwax	30 m	0.25 mm	0.25 µm	40 to 250/260 °C	10623

### Secondary GCxGC Columns (In order of increasing polarity)

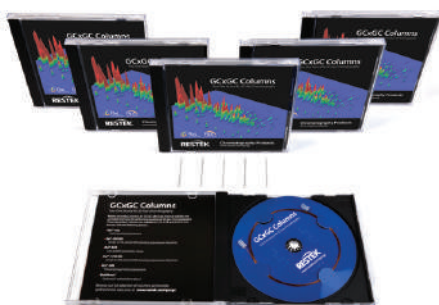
Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	2 m	0.15 mm	0.15 µm	-60 to 330/350 °C	15114
	2 m	0.18 mm	0.18 µm	-60 to 330/350 °C	15120
	2 m	0.25 mm	0.25 µm	-60 to 330/350 °C	15127
Rxi-5Sil MS	2 m	0.15 mm	0.15 µm	-60 to 330/350 °C	15113
	2 m	0.18 mm	0.18 µm	-60 to 330/350 °C	15119
	2 m	0.25 mm	0.25 µm	-60 to 330/350 °C	15126
Rxi-XLB	2 m	0.15 mm	0.15 µm	30 to 340/360 °C	15115
	2 m	0.18 mm	0.18 µm	30 to 340/360 °C	15121
	2 m	0.25 mm	0.25 µm	30 to 340/360 °C	15128
Rxi-17Sil MS	2 m	0.15 mm	0.15 µm	40 to 340/360 °C	15110
	2 m	0.18 mm	0.18 µm	40 to 340/360 °C	15116
	2 m	0.25 mm	0.25 µm	40 to 340/360 °C	15123
Rtx-200	2 m	0.15 mm	0.15 µm	-20 to 320/340 °C	15111
	2 m	0.18 mm	0.18 µm	-20 to 320/340 °C	15117
	2 m	0.25 mm	0.25 µm	-20 to 320/340 °C	15124
Stabilwax	2 m	0.15 mm	0.15 µm	40 to 250/260 °C	15112
	2 m	0.18 mm	0.18 µm	40 to 250/260 °C	15118
	2 m	0.25 mm	0.25 µm	40 to 250/260 °C	15125

### GCxGC Secondary Column Selectivity Kits

Description	qty.	cat.#
GCxGC (0.15 mm) Selectivity Kit	kit	15129
<b>Includes (each product also available separately)</b>		
Rxi-1ms	2 m x 0.15 mm x 0.15 µm	ea. 15114
Rxi-5Sil MS	2 m x 0.15 mm x 0.15 µm	ea. 15113
Rxi-XLB	2 m x 0.15 mm x 0.15 µm	ea. 15115
Rxi-17Sil MS	2 m x 0.15 mm x 0.15 µm	ea. 15110
Rtx-200	2 m x 0.15 mm x 0.15 µm	ea. 15111
Stabilwax	2 m x 0.15 mm x 0.15 µm	ea. 15112
Universal Press-Tight Connectors	Deactivated	5-pk. 20429

Description	qty.	cat.#
GCxGC (0.18 mm) Selectivity Kit	kit	15130
<b>Includes (each product also available separately)</b>		
Rxi-1ms	2 m x 0.18 mm x 0.18 µm	ea. 15120
Rxi-5Sil MS	2 m x 0.18 mm x 0.18 µm	ea. 15119
Rxi-XLB	2 m x 0.18 mm x 0.18 µm	ea. 15121
Rxi-17Sil MS	2 m x 0.18 mm x 0.18 µm	ea. 15116
Rtx-200	2 m x 0.18 mm x 0.18 µm	ea. 15117
Stabilwax	2 m x 0.18 mm x 0.18 µm	ea. 15118
Universal Press-Tight Connectors	Deactivated	5-pk. 20429

Description	qty.	cat.#
GCxGC (0.25 mm) Selectivity Kit	kit	15131
<b>Includes (each product also available separately)</b>		
Rxi-1ms	2 m x 0.25 mm x 0.25 µm	ea. 15127
Rxi-5Sil MS	2 m x 0.25 mm x 0.25 µm	ea. 15126
Rxi-XLB	2 m x 0.25 mm x 0.25 µm	ea. 15128
Rxi-17Sil MS	2 m x 0.25 mm x 0.25 µm	ea. 15123
Rtx-200	2 m x 0.25 mm x 0.25 µm	ea. 15124
Stabilwax	2 m x 0.25 mm x 0.25 µm	ea. 15125
Universal Press-Tight Connectors	Deactivated	5-pk. 20429



- Each kit includes one Rxi®-1ms, Rxi®-5Sil MS, Rxi®-17Sil MS, Rtx®-200, Rxi®-XLB, and Stabilwax® column.
- Comprehensive kit simplifies column selection for method developers and frequent GCxGC users alike.
- Included Press-Tight® connectors offer a reliable, hassle-free installation.

## Shorten Analysis Time and Boost Productivity With Restek Fast GC Columns

The math is simple: the less time it takes to perform each analysis, the more samples your laboratory can process. The easiest way to reduce analysis time while still maintaining resolution of critical compounds is to use hydrogen as your carrier gas. If hydrogen is not an option, or if you already use it and want to go even faster, turn to the higher resolving power of smaller-bore capillary columns from Restek.

As column ID decreases, column efficiency (i.e., plates/meter) increases, allowing you to achieve the same, or even better, resolution using a shorter length—and significantly less time. Whether you are currently using 0.25 or 0.53 mm ID columns, you can shorten analysis times as much as twofold by switching to Restek® 0.15 mm ID fast GC columns. These high-efficiency columns speed up separations on your existing GC or GC-MS instrumentation—while maintaining resolution and meeting method criteria—so you can make more runs per shift with the same exceptional accuracy you've come to expect from Restek.

### Fast GC 0.15 mm ID Columns

- Increase productivity up to 2x without sacrificing resolution.
- Compatible with your existing GC setup.
- Low bleed for maximum sensitivity and accurate GC-MS analyses.
- Thick films (up to 2 µm) eliminate loadability issues.
- OD similar to 0.25 mm columns for easy installation.
- Excellent as secondary columns for GCxGC.
- Available in a variety of stationary phases.

### Rxi®-1ms Columns for Fast GC (fused silica) (nonpolar phase; Crossbond® dimethyl polysiloxane)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	-60 to 330/350 °C	43800	43801

### Rxi®-5Sil MS Columns for Fast GC (fused silica) (low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816
	2.0 µm	-60 to 320/350 °C		

### Rxi®-17Sil MS Columns for Fast GC (fused silica) (midpolarity Crossbond® phase)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821

### Rtx®-200 Columns for Fast GC (fused silica) (midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	-20 to 320/340 °C	43835	43836

### Stabilwax® Columns for Fast GC (fused silica) (polar phase; Crossbond® polyethylene glycol)

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831

## tech tip

Use a 20 m fast GC column in place of a standard 30 m column; a 10 m in place of a 15 m; and a 40 m in place of a 60 m.

*Speed Up  
and Simplify GC  
Method Development*

**Restek's EZGC®  
Online Suite**

[www.restek.com/ezgc](http://www.restek.com/ezgc)



### How to Get the Same Chromatogram With a Fast GC Column

For over 20 years, 0.15 mm ID columns have been proven to work in virtually any application field. When switching to a smaller-ID and shorter-length column, there are several things you must do in order for your new, faster method to give you the same chromatogram (i.e., separations) as your old method:

- 1) Choose a column with the same phase ratio.
- 2) Adapt the temperature program so that the analyte elution temperatures are the same.
- 3) Adjust the linear velocity. (For a good starting point, see your column's certificate of analysis.)

Following these guidelines will help ensure that you achieve similar chromatography (i.e., identical elution order and resolution)—in a fraction of the time.

# Application-Specific Columns

Clinical, Forensic, & Toxicology.....	65
Environmental .....	66–81
Foods, Flavors, & Fragrances .....	82–89
Petroleum & Petrochemical .....	90–93
Pharmaceutical.....	94–97
Specially Deactivated.....	98–103



## Unique Column Chemistries for Application-Specific and Specially Deactivated Columns

Designed to help solve chromatographic challenges, these stationary phases are optimized for the best separations, accurate quantification, and shorter analysis times.

### Application-Specific Columns

- Clinical, Forensic, & Toxicology
- Environmental
- Foods, Flavors, & Fragrances
- Petroleum and Petrochemical
- Pharmaceutical

### Specially Deactivated Columns

Designed for specific classes of compounds.

- Acidic compound analysis
- Basic compound analysis
- Chiral analysis



## Blood Alcohol Analysis

### Rtx®-BAC Plus 1/Rtx®-BAC Plus 2 Columns

- Optimized column selectivities guarantee resolution of ethanol, internal standards, and frequently encountered interferences.
- Robust and reproducible column chemistry ensures longer column lifetime and consistent results.
- Stable to 260 °C.

These application-specific columns for blood alcohol analysis baseline separate all critical compounds—including ethanol, methanol, acetone, *tert*-butanol, acetaldehyde, isopropanol, and *n*-propanol—in less than 2 minutes. Every Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 column is qualified with a test mix containing these important BAC target compounds to ensure reproducibility.

These columns baseline separate all blood alcohol compounds in blood, breath, or urine, in less than 2 minutes, under isothermal conditions. Isothermal analysis increases productivity by eliminating the need for oven cycling. Confirmation is easily achieved with this tandem set because there are two elution order changes between the columns.

#### Rtx®-BAC Plus 1 Columns (fused silica)

ID	df	temp. limits	30-Meter cat.#
0.32 mm	1.80 µm	-20 to 240/260 °C	18004
0.53 mm	3.00 µm	-20 to 240/260 °C	18005

#### Rtx®-BAC Plus 2 Columns (fused silica)

ID	df	temp. limits	30-Meter cat.#
0.32 mm	0.6 µm	-20 to 240/260 °C	18006
0.53 mm	1.0 µm	-20 to 240/260 °C	18007

### similar phases

DB-ALC1, ZB-BAC1  
DB-ALC2, ZB-BAC2

### free literature

Rtx®-BAC Plus 1 and  
Rtx®-BAC Plus 2 Columns  
Advanced Technology for Fast,  
Reliable Measurement  
of Alcohol in Blood

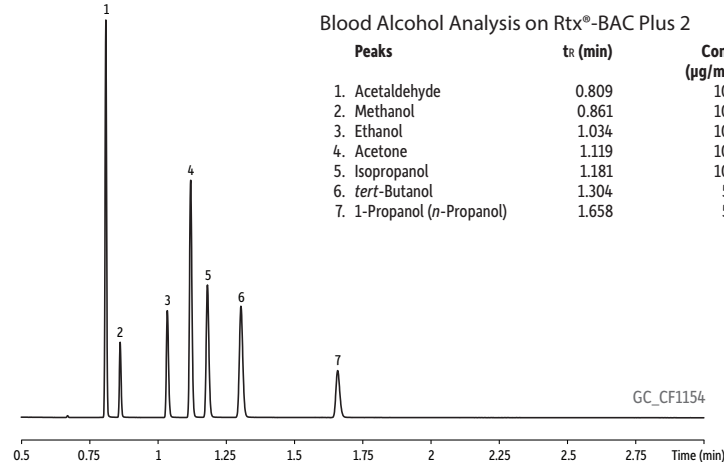
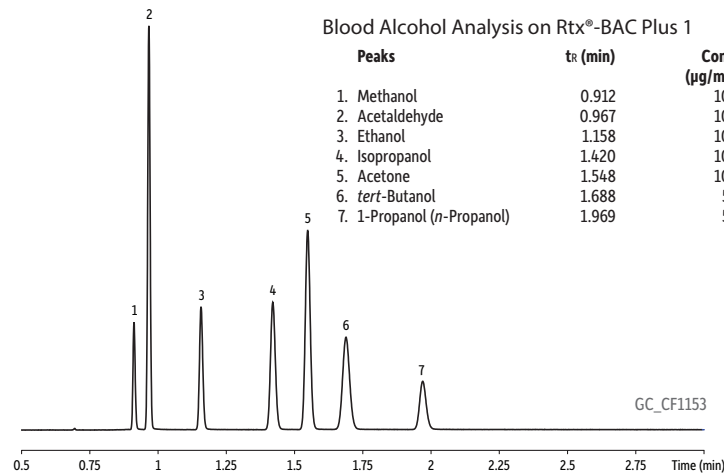
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lit. cat.#  
CFBR1538-UNV



### Blood Alcohol Analysis on Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2



**Column** Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004)  
**Sample** BAC resolution control standard n-P (cat.# 36010)  
BAC resolution control standard t-B (cat.# 36011)

**Diluent:** Water  
**Conc.:** 50 µL of each standard were diluted in 900 µL water in a 20 mL headspace vial.

**Injection**  
**Liner:** Headspace-loop split (split ratio 50:1)  
1 mm ID straight inlet liner (cat.# 20972)

**Headspace-Loop**  
**Inj. Port Temp.:** 200 °C  
**Instrument:** Tekmar HT3  
**Inj. Time:** 3 min  
**Transfer Line**  
**Temp.:** 125 °C  
**Valve Oven Temp.:** 125 °C

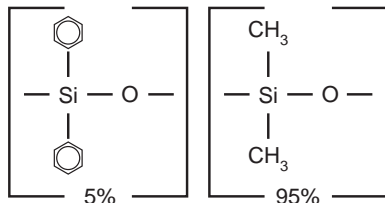
**Standby flow**  
**rate:** 50 mL/min  
**Sample Temp.:** 60 °C

**Sample Equil.**  
**Time:** 5 min  
**Vial Pressure:** 30 psi  
**Pressurize Time:** 1 min  
**Loop Pressure:** 20 psi  
**Loop Fill Time:** 1 min

**Oven**  
**Oven Temp.:** 40 °C (hold 3 min)  
**Carrier Gas** He, constant flow  
**Linear Velocity:** 80 cm/sec @ 40 °C

**Detector**  
**Make-up Gas** Flow Rate: 30 mL/min  
**Make-up Gas** Type: N<sub>2</sub>  
**Instrument** Agilent/HP6890 GC  
**Notes** Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

## Brominated Flame Retardants Analysis

Rtx<sup>®</sup>-1614 StructureRtx<sup>®</sup>-1614 Columns (fused silica)

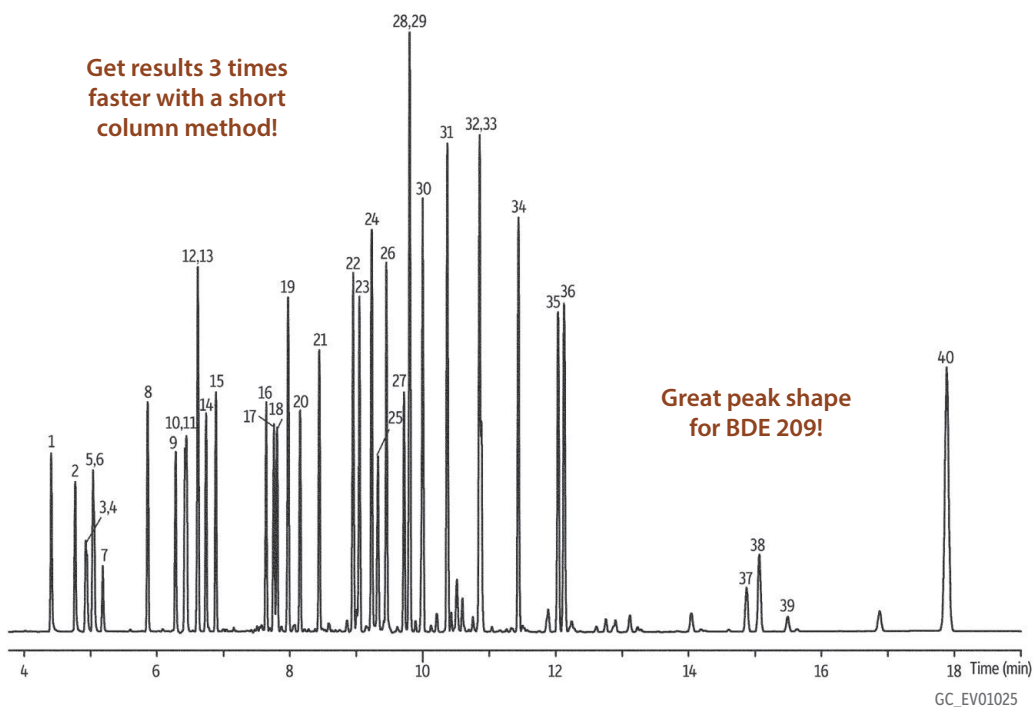
(5% diphenyl, 95% dimethyl polysiloxane)

- Optimized for PBDE analysis by EPA Method 1614.
- Short column option resolves BDE-209 3 times faster, with less thermal breakdown.
- Unique deactivation gives higher BDE-209 response than competitor columns, for greater analytical sensitivity.
- Exceeds EPA Method 1614 resolution criteria for BDE-49 and BDE-71.
- Stable to 360 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/360 °C	10296	10295

Brominated Flame Retardants on Rtx<sup>®</sup>-1614

Get results 3 times  
faster with a short  
column method!



## Peaks

1. BDE-10
2. BDE-7
3. BDE-8
4. BDE-11
5. BDE-12
6. BDE-13
7. BDE-15
8. BDE-30
9. BDE-32
10. BDE-17
11. BDE-25
12. BDE-28
13. BDE-33
14. BDE-35
15. BDE-37
16. BDE-75
17. BDE-49
18. BDE-71
19. BDE-47
20. BDE-66
21. BDE-77
22. BDE-100
23. BDE-119
24. BDE-99
25. BDE-116
26. BDE-118
27. BDE-85
28. BDE-155
29. BDE-126
30. BDE-154
31. BDE-153
32. BDE-138
33. BDE-166
34. BDE-183
35. BDE-181
36. BDE-190
37. BDE-208
38. BDE-207
39. BDE-206
40. BDE-209

**Column** Rtx<sup>®</sup>-1614, 15 m, 0.25 mm ID, 0.10 µm (cat.# 10296)  
**Sample** 100 - 300 ppb PBDE PAR solution (#EO-5113, Cambridge Isotope Laboratories Inc.)  
 500 ppb decabromodiphenyl ether (#BDE-209, Wellington Laboratories)

**Injection**  
 Inj. Vol.: 1 µL splitless (hold 1 min)  
 Liner: 4 mm cyclo double taper (cat.# 20896)  
 Inj. Temp.: 340 °C

**Oven**  
 Oven Temp.: 120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)

**Carrier Gas**  
 He, constant linear velocity

Linear Velocity: 60 cm/sec @ 120 °C

**Detector**  
 µ-ECD @ 345 °C

## Dioxin & Furan Analysis

### Rxi®-5Sil MS Columns (fused silica)

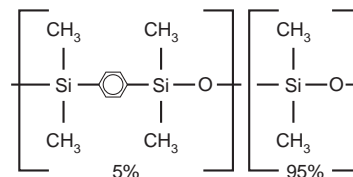
(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- Ideal for use in dual column confirmation of dioxin and furan.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#
0.18 mm	0.10 µm	-60 to 320/350 °C		43607
0.25 mm	0.25 µm	-60 to 320/350 °C	13623	

### Rxi®-5Sil MS Structure

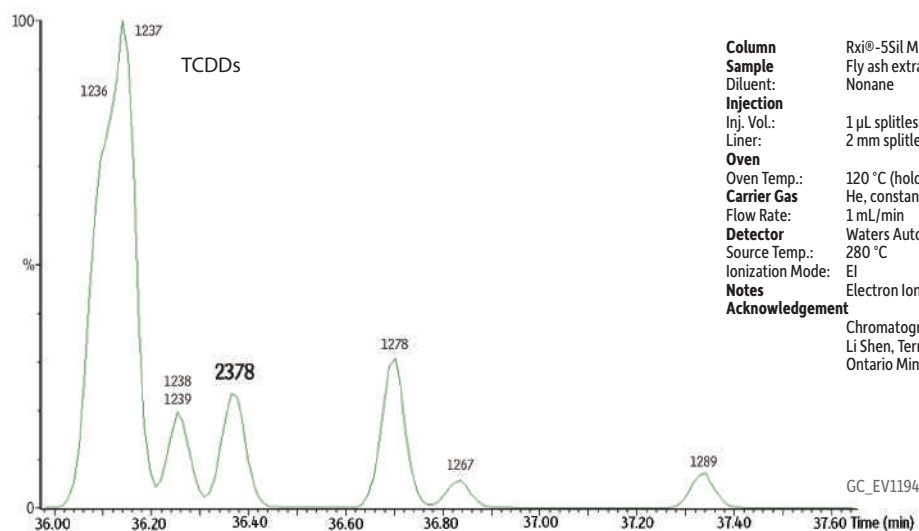


Similar to: (5%-phenyl)-methylpolysiloxane

### similar phases

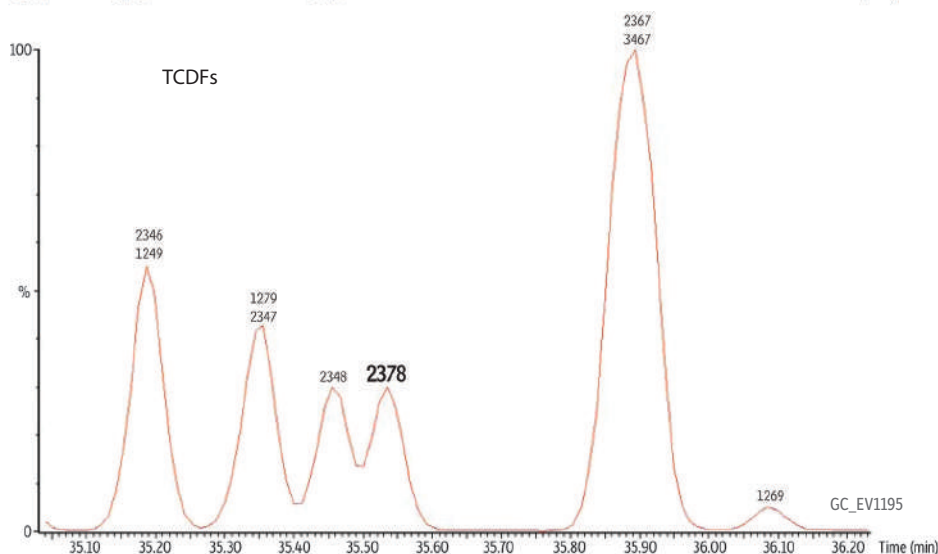
DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

### Dioxins (TCDDs) and Furans (TCDFs) in Fly Ash on an Rxi®-5Sil MS column



**Column** Rxi®-5Sil MS, 60 m, 0.18 mm ID, 0.10 µm (cat.#43607)  
**Sample** Fly ash extract  
**Diluent:** Nonane  
**Injection**  
 Inj. Vol.: 1 µL splitless  
 Liner: 2 mm splitless liner (cat.# 20712)  
**Oven**  
 Oven Temp.: 120 °C (hold 1 min) to 160 °C at 10 °C/min to 300 °C at 2.5 °C/min  
**Carrier Gas** He, constant flow  
**Flow Rate:** 1 mL/min  
**Detector** Waters AutoSpec Ultima Mass Spectrometer  
 Source Temp.: 280 °C  
 Ionization Mode: EI  
**Notes** Electron Ionization at 40eV  
**Acknowledgement**

Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment



## Restek innovation!

Excellent for dioxins or furans.

“Using the Rtx®-Dioxin2 column allowed us to combine EPA 1613 TCDD-only and TCDF confirmation analyses onto one column and one instrument. This resulted in multiple benefits—we shortened run times, reduced instrument downtime and column changes, and increased instrument capacity for our full list samples.”

Owen Cosby

Supervisor, HRMS Services

Maxxam Analytics

## Dioxin &amp; Furan Analysis

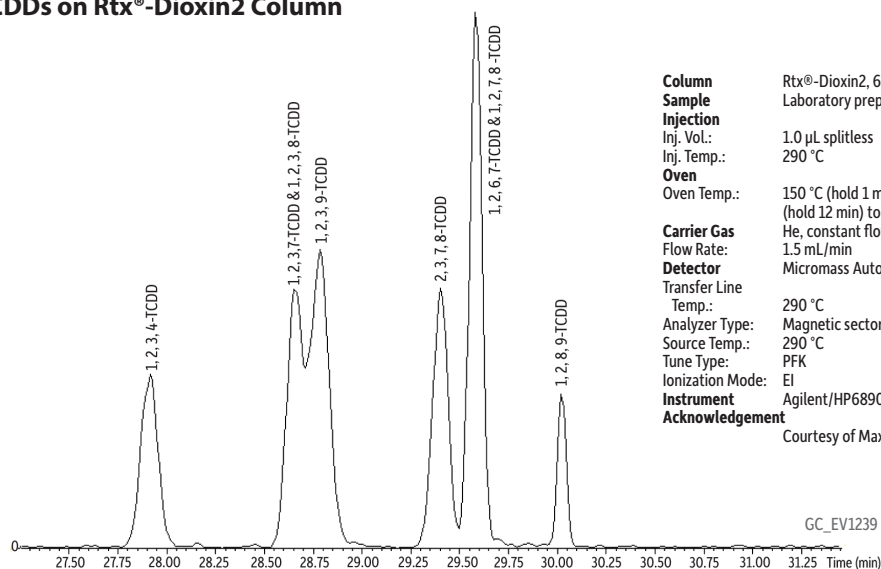
## Rtx®-Dioxin2 Columns (fused silica)

(proprietary Crossbond® phase)

- Isomer specificity for 2,3,7,8-TCDD and 2,3,7,8-TCDF achieved with one GC column.
- Thermally stable to 340 °C for longer lifetime.
- Unique selectivity for toxic dioxin and furan congeners allows use as a confirmation GC column.

ID	df	temp. limits	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	20 to 320/340 °C	10759	
0.25 mm	0.25 µm	20 to 320/340 °C		10758

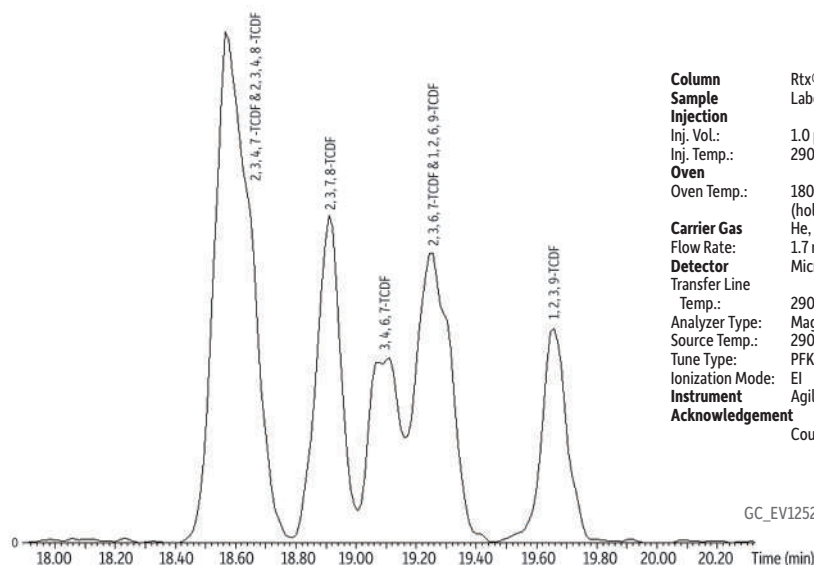
## TCDDs on Rtx®-Dioxin2 Column



**Column** Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)  
**Sample** Laboratory prepared test mix  
**Injection**  
 Inj. Vol.: 1.0 µL splitless  
 Inj. Temp.: 290 °C  
**Oven**  
 Oven Temp.: 150 °C (hold 1 min) to 210 °C at 30 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 12 min) to 330 °C at 70 °C/min (hold 6 min)  
**Carrier Gas**  
 Flow Rate: He, constant flow  
 1.5 mL/min  
**Detector** Micromass Autospec Ultima  
**Transfer Line**  
 Temp.: 290 °C  
**Analyzer Type:** Magnetic sector  
**Source Temp.:** 290 °C  
**Tune Type:** PFK  
**Ionization Mode:** EI  
**Instrument** Agilent/HP6890 GC  
**Acknowledgement** Courtesy of Maxxam Analytics (Ontario, Canada).

GC\_EV1239

## TCDFs on Rtx®-Dioxin2 Column



**Column** Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)  
**Sample** Laboratory prepared test mix  
**Injection**  
 Inj. Vol.: 1.0 µL splitless  
 Inj. Temp.: 290 °C  
**Oven**  
 Oven Temp.: 180 °C (hold 1 min) to 235 °C at 45 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 15 min) to 300 °C at 50 °C/min (hold 1 min)  
**Carrier Gas**  
 Flow Rate: He, constant flow  
 1.7 mL/min  
**Detector** Micromass Autospec Ultima  
**Transfer Line**  
 Temp.: 290 °C  
**Analyzer Type:** Magnetic sector  
**Source Temp.:** 290 °C  
**Tune Type:** PFK  
**Ionization Mode:** EI  
**Instrument** Agilent/HP6890 GC  
**Acknowledgement** Courtesy of Maxxam Analytics (Ontario, Canada).

GC\_EV1252

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## Mineral Oils/Extractable Petroleum Hydrocarbon Analysis

### Rtx®-Mineral Oil Columns (fused silica)

- Application specific columns meet DIN EN ISO 9377-2:2000 requirements.
- Optimized column dimensions for fast mineral oil screening.
- Surface linked phase guarantees long lifetime, robustness, and stability to 400 °C.

The Rtx®-Mineral Oil stationary phase and column dimensions were optimized for the fast screening of mineral oils in extracts from solids and water samples according to DIN EN ISO 9377-2:2000. The 0.10 µm column is the gold standard for the method, whereas the 0.15 µm column provides more complete separation of C10 from the solvent peak when large injection volumes are used. Compared with common industry solutions, the unique surface bonding of the Rtx®-Mineral Oil column ensures long column lifetime, even at higher temperatures. These unique columns can be used at temperatures ranging from 380 °C (isothermal) to 400 °C (programmable), and each column is tested individually for bleed to ensure exceptional performance at these extreme conditions.

ID	df	temp. limits	15-Meter cat.#
0.32 mm	0.10 µm	-60 to 380/400 °C	18079
	0.15 µm	-60 to 380/400 °C	18074
	0.30 µm	-60 to 380/400 °C	18075

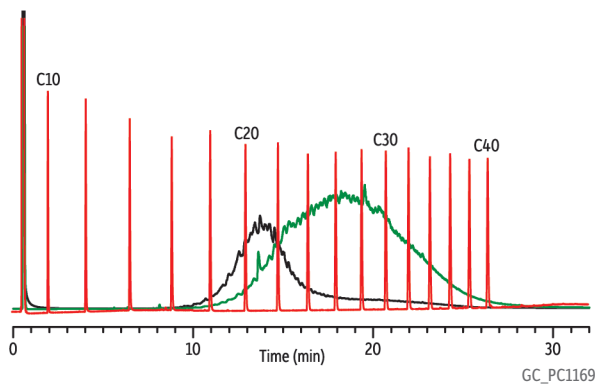
### similar phases

Select Mineral Oil

#### Fused Silica Capillary & PLOT Column Ferrule Guide

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8

### Mineral Oil and Motor Oil on Rtx®-Mineral Oil



**Column** Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.15 µm (cat.# 18074) using IP deactivated guard column 2 m, 0.53 mm ID (cat.# 10047)

**Sample** Custom mineral oil/motor oil mix

**Diluent:** Hexane

**Conc.:** 500 µg/mL

**Injection**

Inj. Vol.: 0.5 µL cold on-column

Temp. Program: 53 °C to 300 °C at 10 °C/min (hold 20 min)

**Oven**

Oven Temp.: 50 °C to 300 °C at 10 °C/min (hold 20 min)

**Carrier Gas** H<sub>2</sub>, constant flow

Linear Velocity: 40 cm/sec @ 50 °C

Dead Time: 0.625 min @ 50 °C

**Detector** FID @ 330 °C

**Make-up Gas**

Flow Rate: 30 mL/min

**Make-up Gas Type:** N<sub>2</sub>

Data Rate: 20 Hz

**Instrument** Agilent/HP6890 GC

**Notes** Black trace = mineral oil  
Green trace = motor oil  
Red trace = C10-C40 standard



Restek's state-of-the-art facility and rigorous product testing programs ensure you get the quality you need for accurate, reliable results.

## PCB Congeners Analysis

Restek innovation!

### Rtx®-PCB Columns (fused silica)

(proprietary Crossbond® phase)

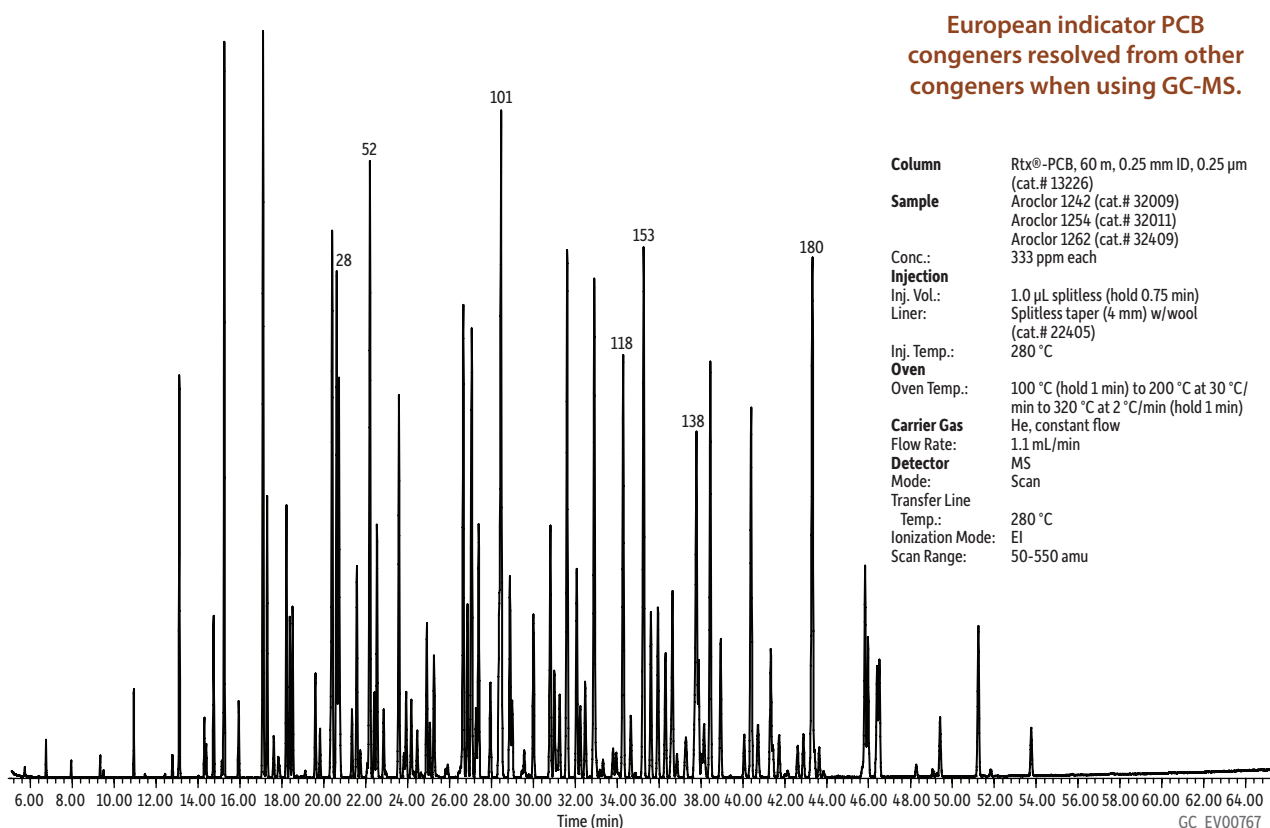
- Unique polymer for PCBs analysis by GC-ECD or GC-MS.
- Good results for other semivolatiles.
- Low polarity; inert to active compounds.
- Stable to 340 °C.



ID	df	temp. limits*	20-Meter cat.#	30-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	30 °C to 320 °C	41302		41303	41304
0.25 mm	0.25 µm	30 °C to 320/340 °C		13223		13226
0.32 mm	0.50 µm	30 °C to 320/340 °C		13239		

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### Aroclor PCBs on Rtx®-PCB



European indicator PCB congeners resolved from other congeners when using GC-MS.

**Column** Rtx®-PCB, 60 m, 0.25 mm ID, 0.25 µm (cat.# 13226)  
**Sample** Aroclor 1242 (cat.# 32009)  
 Aroclor 1254 (cat.# 32011)  
 Aroclor 1262 (cat.# 32409)  
 333 ppm each  
**Conc.:**  
**Injection**  
 Inj. Vol.: 1.0 µL splitless (hold 0.75 min)  
 Liner: Splitless taper (4 mm) w/wool (cat.# 22405)  
 Inj. Temp.: 280 °C  
**Oven**  
 Oven Temp.: 100 °C (hold 1 min) to 200 °C at 30 °C/min to 320 °C at 2 °C/min (hold 1 min)  
**Carrier Gas** He, constant flow  
 Flow Rate: 1.1 mL/min  
**Detector** MS  
 Mode: Scan  
 Transfer Line  
 Temp.: 280 °C  
 Ionization Mode: EI  
 Scan Range: 50-550 amu

GC\_EV00767

## PCB Congeners Analysis

### Rxi®-XLB Columns (fused silica)

(low-polarity proprietary phase)

- General-purpose columns exhibiting extremely low bleed. Ideal for many GC-MS applications, including pesticides, PCB congeners (e.g., Aroclor mixes), PAHs.
- Unique selectivity.
- Temperature range: 30 °C to 360 °C.

### similar phases

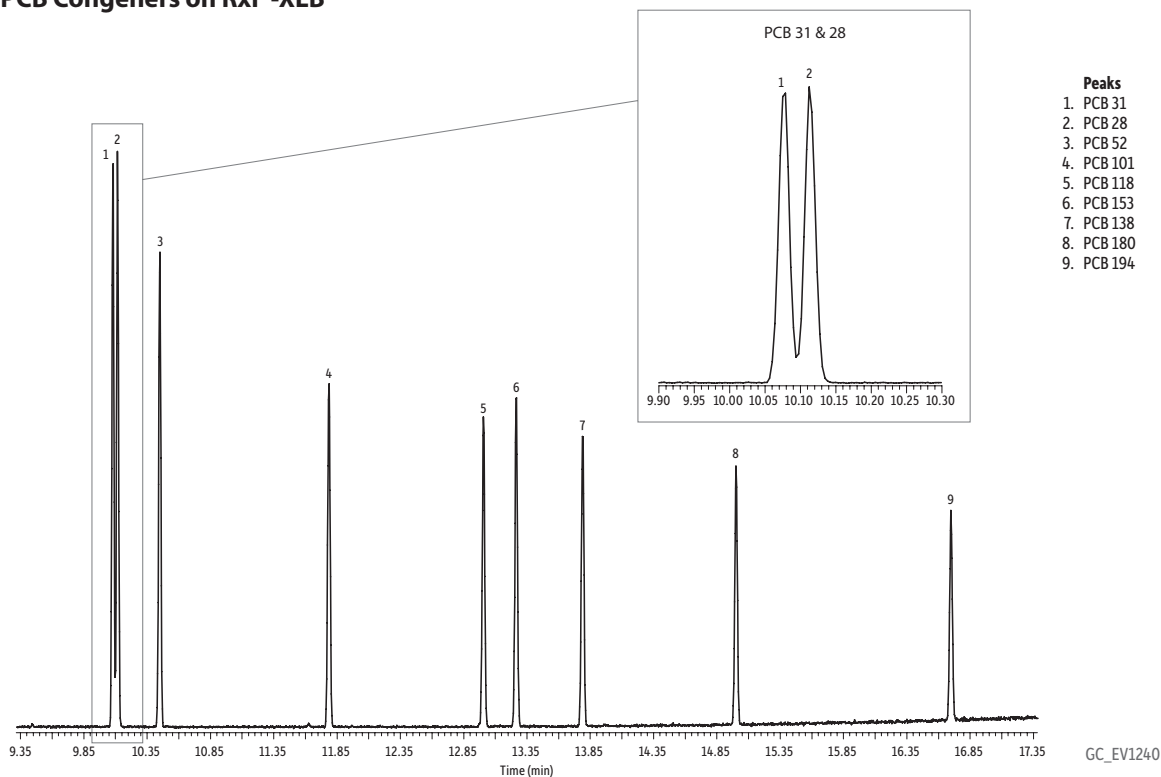
DB-XLB, VF-Xms, MR1, ZB-XLB

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	30 to 340/360 °C	13705	13708	
	0.25 µm	30 to 340/360 °C	13720	13723	13726
	0.50 µm	30 to 340/360 °C		13738	
0.32 mm	0.25 µm	30 to 340/360 °C		13724	13727
	0.50 µm	30 to 340/360 °C		13739	
	1.00 µm	30 to 340/360 °C		13754	
0.53 mm	0.50 µm	30 to 320/360 °C		13740	

ID	df	temp. limits	20-Meter cat.#
0.18 mm	0.18 µm	30 to 340/360 °C	43702

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### EU PCB Congeners on Rxi®-XLB



**Column** Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)  
**Sample** PCB congener standard #2 (cat.# 32294)  
 PCB 31 (cat.# custom)  
**Diluent:** Dichloromethane  
**Conc.:** 3.5 ppm  
**Injection**  
 Inj. Vol.: 0.5 µL splitless (hold 1.75 min)  
 Liner: 2.0 mm ID straight inlet liner w/wool (cat.# 21718)  
 Inj. Temp.: 300 °C  
 Purge Flow: 50 mL/min  
**Oven**  
 Oven Temp.: 40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)

**Carrier Gas** He, constant flow  
 Flow Rate: 1 mL/min  
**Detector** MS  
**Mode:** Scan  
 Transfer Line  
 Temp.: 300 °C  
 Analyzer Type: Quadrupole  
 Source Temp.: 280 °C  
 Electron Energy: 70 eV  
 Ionization Mode: EI  
 Scan Range: 45-550 amu  
 Scan Rate: 5 scans/sec  
**Instrument** PE Clarus 500 GC & Clarus 500 MS

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SPE Cartridges  
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**also available**  
Column connectors

See **pages 227–233**  
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PCBs and Chlorinated  
Herbicides

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lit. cat.#  
EVBR1013D-UNV



## Pesticides Analysis (Chlorinated)

**Rtx®-CLPesticides/Rtx®-CLPesticides2**

- Application-specific columns for organochlorine pesticides and herbicides.
- Low bleed—ideal for high sensitivity GC-ECD or GC-MS analyses.
- Baseline separations in less than 10 minutes.
- Stable to 340 °C.
- Analyze EPA Method 8081B, 8082A, 8151A, 504.1, 515, 508.1, and 552.2 compounds without time-consuming column changes.

**Rtx®-CLPesticides Columns** (fused silica)  
(proprietary Crossbond® phases)

ID	df	temp. limits	15-Meter cat.#	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.18 mm	0.18 µm	-60 to 320/340 °C		42102		
0.25 mm	0.25 µm	-60 to 320/340 °C	11120		11123	11126
0.32 mm	0.32 µm	-60 to 320/340 °C			11141	
	0.50 µm	-60 to 320/340 °C	11136		11139	
0.53 mm	0.50 µm	-60 to 300/320 °C			11140	

**Rtx®-CLPesticides2 Columns** (fused silica)  
(proprietary Crossbond® phases)

ID	df	temp. limits	10-Meter cat.#	15-Meter cat.#	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.18 mm	0.14 µm	-60 to 320/330 °C	42301		42302		
0.25 mm	0.20 µm	-60 to 320/340 °C				11323	11326
0.32 mm	0.25 µm	-60 to 320/340 °C		11321		11324	
	0.50 µm	-60 to 320/340 °C				11325	
0.53 mm	0.42 µm	-60 to 300/320 °C		11337		11340	

NOTE: Analyzing dirty or derivatized samples can contaminate your column. Restek does not recommend analyzing trace-level pesticide samples following derivatized samples (e.g., Methods 8151A and 552.2) without first performing inlet maintenance. Standard steps include trimming the guard column and changing the inlet liner, O-ring, seal, and septum.

**kit****Rtx®-CLPesticides Column Kit** (0.25 mm ID)  
(Note: Columns are not preconnected in this kit.)

Description	qty.	cat.#
Rtx-CLPesticides Kit (0.25 mm ID)	kit	11199
<b>Includes (each product also available separately)</b>		
30m, 0.25mm ID, 0.25µm Rtx-CLPesticides Column Column	ea.	11123
30m, 0.25mm ID, 0.20µm Rtx-CLPesticides2 Column Column	ea.	11323
Universal Angled "Y" Press-Tight Connector, Deactivated	ea.	20403-261
5 m, 0.25 mm ID Siltek Guard Column	ea.	10026

**kit****Rtx®-CLPesticides Column Kit** (0.32 mm ID)  
(Note: Columns are not preconnected in this kit.)

Description	qty.	cat.#
Rtx-CLPesticides Kit (0.32 mm ID)	kit	11196
<b>Includes (each product also available separately)</b>		
30m, 0.32mm ID, 0.32µm Rtx-CLPesticides Column Column	ea.	11141
30m, 0.32mm ID, 0.25µm Rtx-CLPesticides2 Column Column	ea.	11324
Universal Angled "Y" Press-Tight Connector, Deactivated	ea.	20403-261
5 m, 0.32 mm ID Siltek Guard Column	ea.	10027

**kit****Rtx®-CLPesticides Column Kit** (0.53 mm ID)  
(Note: Columns are not preconnected in this kit.)

Description	qty.	cat.#
Rtx-CLPesticides Kit (0.53 mm ID)	kit	11197
<b>Includes (each product also available separately)</b>		
30m, 0.53mm ID, 0.50µm Rtx-CLPesticides Column Column	ea.	11140
30m, 0.53mm ID, 0.42µm Rtx-CLPesticides2 Column Column	ea.	11340
Universal Angled "Y" Press-Tight Connector, Deactivated	ea.	20403-261
5m, 0.53mm ID ID Deactivated Guard Column	ea.	10025

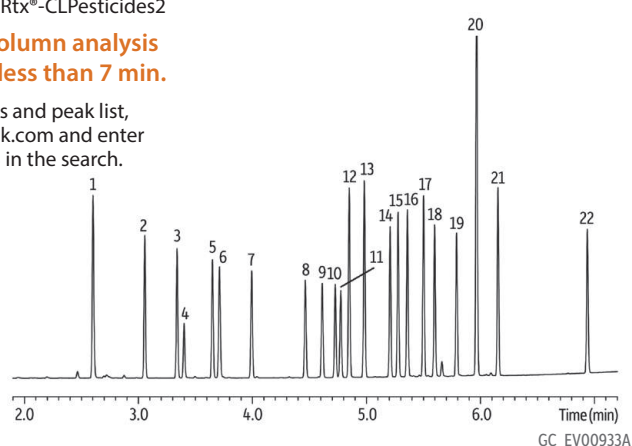
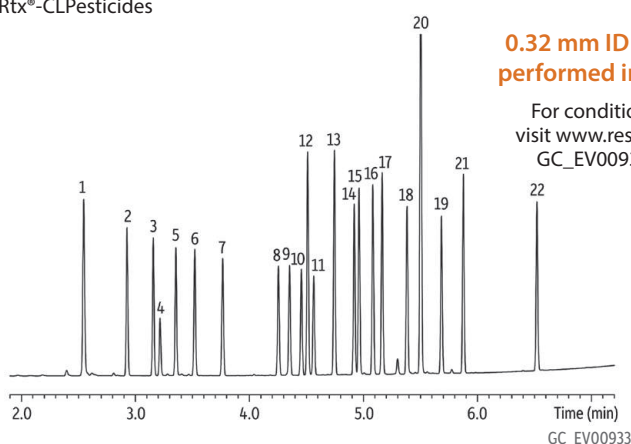
Save money with our  
kits. Each includes  
recommended guard  
and analytical column  
combinations.



## Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.32 mm ID column set)

Rtx®-CLPesticides

Rtx®-CLPesticides2

0.32 mm ID column analysis  
performed in less than 7 min.For conditions and peak list,  
visit [www.restek.com](http://www.restek.com) and enter  
GC\_EV00933 in the search.

Method Compound List	Column Pair	Analysis Time (min)	Coelutions	Restek Advantage
<b>8081B</b> (Organochlorine pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	7 / 7	0 / 0	• Increase sample throughput with 7 min analyses and baseline resolution.
	Competitor A set	7 / 8	0 / 1	
	Competitor B set	10 / 9	0 / 0	
<b>8081B (extended)</b> (Organochlorine pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	24 / 23	1 / 2	• Best balance of speed and selectivity. • All compounds are resolved on at least one column.
	Competitor A set	27 / 29	0 / 3	
	Competitor B set	NDP / 16	NDP / 3	
<b>8082A</b> (Polychlorinated biphenyls (PCBs), Aroclors)	Rtx-CLPesticides / Rtx-CLPesticides2	7 / 7	n/a	• Fast PCB analysis times.
	Competitor A set	6 / 7	n/a	
	Competitor B set	24 / 21	n/a	
<b>8151A</b> (Chlorinated herbicides)	Rtx-CLPesticides / Rtx-CLPesticides2	13 / 13	1 / 0	• More elution order changes improve confidence in confirmational results.
	Competitor A set	13 / 13	0 / 0	
	Competitor B set	16 / 15	1 / 1	
<b>504.1</b> (EDB, DBCP, TCP)	Rtx-CLPesticides / Rtx-CLPesticides2	6 / 6	0 / 0	• Reliably separate analytes from trihalomethane interferences.
	Competitor A set	6 / 6	0 / 0	
	Competitor B set	NDP	NDP	
<b>505</b> (Organohalide pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	18 / 18.5	1 / 1	• All compounds resolved on at least one column.
	Competitor A set	14 / 14	0 / 1	
	Competitor B set	35 / 36	1 / 2	
<b>508.1</b> (Chlorinated pesticides, herbicides, organohalides)	Rtx-CLPesticides / Rtx-CLPesticides2	23.5 / 24	2 / 2	• Good balance of speed and resolution.
	Competitor A set	21 / 23	0 / 3	
	Competitor B set	18 / 17	2 / 4	
<b>552.2</b> (Haloacetic acids, dalapon)	Rtx-CLPesticides / Rtx-CLPesticides2	12 / 12	0 / 0	• No coelutions—get accurate results for compounds that coelute on other columns.
	Competitor A set	8 / 9	1 / 1	
	Competitor B set	NDP/10	NDP/1	

**How much time do column changes cost you?**

Switch to Rtx®-CLPesticides columns and analyze pesticides, herbicides, PCBs and more on a single column set.

**did you know?**

Analyzing dirty or derivatized samples can contaminate your column. Restek does not recommend analyzing trace-level pesticide samples following derivatized samples (e.g., Methods 8151A and 552.2) without first performing inlet maintenance. Standard steps include trimming the guard column and changing the inlet liner, O-ring, seal, and septum.

For more information go to

[www.restek.com/CLP7](http://www.restek.com/CLP7)

Comparison based on published competitor data. All columns tested were 0.32 mm ID. NDP = no data published

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**FAST**efficient analysis  
of OPPs in EPA  
Method 8141**Restek innovation!**

- Better separations
- Faster analyses

**Pesticides Analysis (Organophosphorus)****Rtx®-OPPesticides/Rtx®-OPPesticides2**

- Application-specific columns for organophosphorus pesticides; best column combination for U.S. EPA Method 8141.
- Low bleed—ideal for GC-FPD, GC-NPD, or GC-MS analyses.
- Stable to 330 °C.

Using sophisticated computer modeling software, we created two stationary phases for separating the 53 organophosphorus pesticides (OPP) listed in EPA Method 8141. Separation is improved and analysis time is significantly reduced, compared to other columns. The extended upper temperature limit of these phases (330 °C) allows analysts to bake out high molecular weight contamination typically associated with pesticide samples. The low-bleed columns are a perfect match for sensitive detection systems.

**Rtx®-OPPesticides Columns (fused silica)**

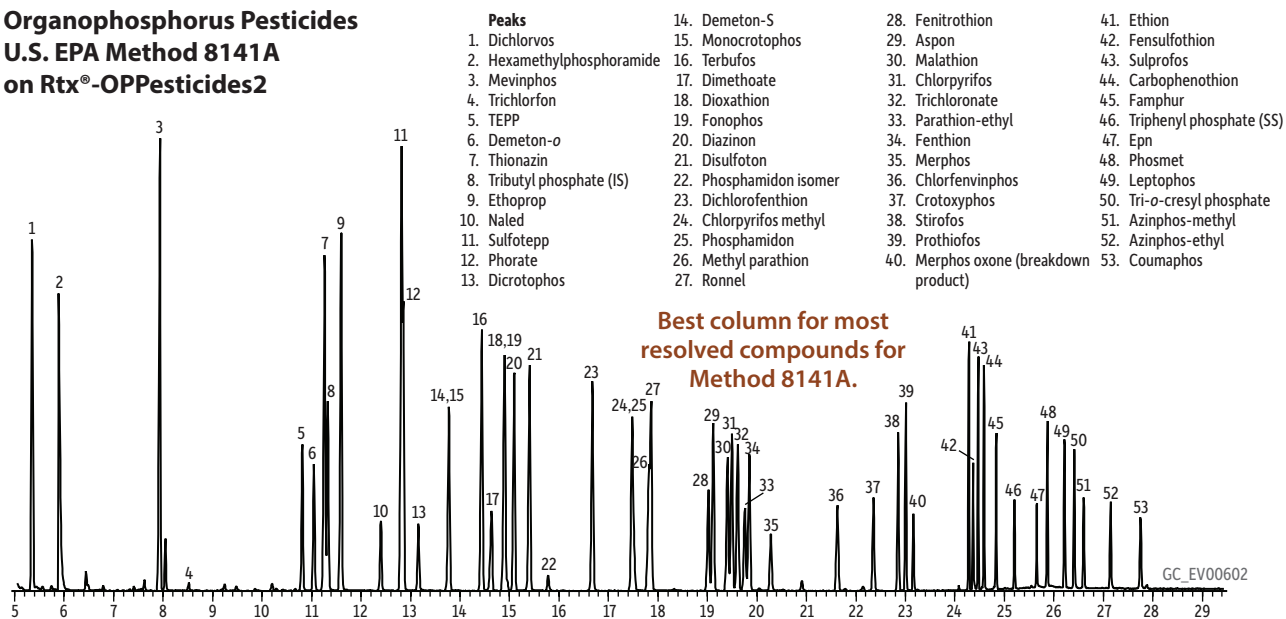
(proprietary Crossbond® phases)

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-20 to 310/330 °C	11223
0.32 mm	0.50 µm	-20 to 310/330 °C	11239
0.53 mm	0.83 µm	-20 to 310/330 °C	11240

**Rtx®-OPPesticides2 Columns (fused silica)**

(proprietary Crossbond® phases)

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#
0.18 mm	0.20 µm	-20 to 310/330 °C	11244	
0.25 mm	0.25 µm	-20 to 310/330 °C		11243
0.32 mm	0.32 µm	-20 to 310/330 °C		11241
0.53 mm	0.50 µm	-20 to 300/330 °C		11242

**Organophosphorus Pesticides  
U.S. EPA Method 8141A  
on Rtx®-OPPesticides2**


**Column** Rtx®-OPPesticides2, 30 m, 0.25 mm ID, 0.25 µm (cat.# 11243)

**Sample** Triphenylphosphate (cat.# 32281)  
Tributylphosphate (cat.# 32280)  
8140/8141 OP pesticide calibration mix A (cat.# 32277)  
8141 OP pesticide calibration mix B (cat.# 32278)

**Conc.:** 100 ppm (100 ng on-column)

**Injection** 1.0 µL splitless (hold 0.4 min)

**Inj. Vol.:** Double taper splitless (4 mm) (cat.# 20785)

**Inj. Temp.:** 250 °C

**Oven** 80 °C (hold 0.5 min) to 140 °C at 20 °C/min to 210 °C at 4 °C/min

(hold 1 min) to 280 °C at 30 °C/min (hold 5 min)

**Carrier Gas** He, constant flow

**Flow Rate:** 1.0 mL/min

**Detector** MS

**Mode:** Scan

**Transfer Line Temp.:** 280 °C

**Analyzer Type:** Quadrupole

**Ionization Mode:** EI

**Scan Range:** 35-400 amu

**Notes** U.S. EPA Method 8141A custom standard mix. Additional mixes not shown. Contact Restek for more information.

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74

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## Polycyclic Aromatic Hydrocarbons (PAHs) Analysis

### Rxi®-5Sil MS Columns (fused silica)

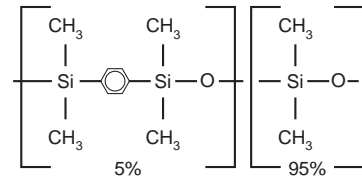
(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

### Rxi®-5Sil MS Structure

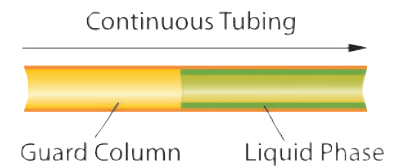


Similar to: (5%-phenyl)-methylpolysiloxane

### similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

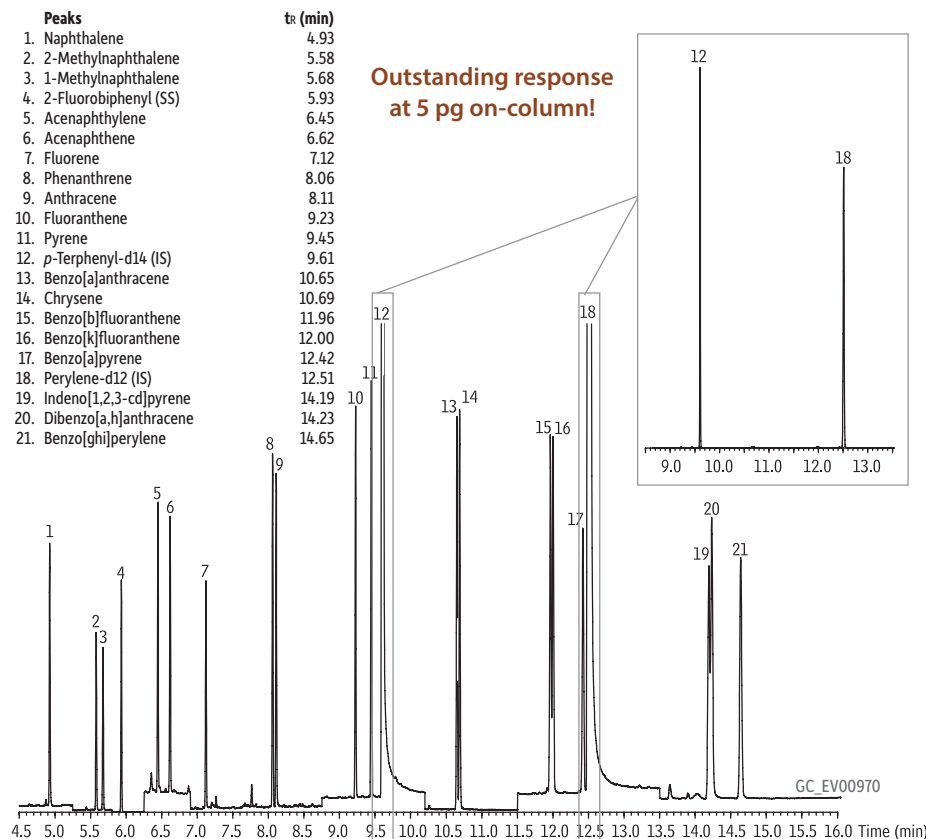
### Integra-Guard® Built-In Guard Column



**Get the protection without the connection!**

See **page 23** for Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns.

### Polycyclic Aromatic Hydrocarbons on Rxi®-5Sil MS



<b>Column</b>	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)	
<b>Sample</b>	PAH mix, 1 µL of 0.005 µg/mL (IS 2 µg/mL) SV Calibration mix #5 / 610 PAH Mix (cat.# 31011) 1-Methylnaphthalene (cat.# 31283) 2-Methylnaphthalene (cat.# 31285) 2-Fluorobiphenyl (cat.# 31091) 5 pg on-column	
<b>Conc.:</b>		
<b>Injection</b>		
Inj. Vol.:	1.0 µL pulsed splitless (hold 0.15 min)	
Liner:	Drilled Uniliner® (hole near top) w/wool (cat.# 21055-200.5)	
Inj. Temp.:	300 °C	
Pulse Pressure:	20 psi (137.9 kPa)	
Pulse Flow:	0.2 min	
Purge Flow:	60 mL/min	
<b>Oven</b>		
Oven Temp.:	50 °C (hold 0.5 min) to 290 °C at 25 °C/min to 320 °C at 5 °C/min	
<b>Carrier Gas</b>		
Flow Rate:	1.4 mL/min	
He, constant flow		
<b>Detector</b>		
Mode:	SIM	
SIM Program:		
<b>Start Time</b>		
<b>Group (min)</b>	<b>Ion(s)</b>	<b>Dwell (ms)</b>
1	128 m/z	100
2	142 m/z	100
3	172 m/z	100
4	152 m/z	100
5	166 m/z	100
6	178 m/z	100
7	202,244 m/z	100
8	228 m/z	100
9	252,264 m/z	100
10	276,278 m/z	100

Transfer Line  
Temp.: 290 °C  
Ionization Mode: EI

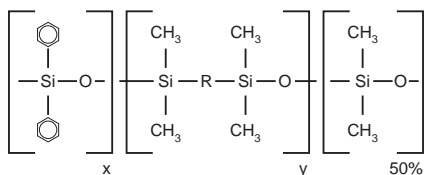
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## Polycyclic Aromatic Hydrocarbons (PAHs) Analysis

## Rxi®-17Sil MS Structure



Similar to: (50%-phenyl)-methylpolysiloxane

## similar phases

DB-17ms, VF-17ms

## Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- 340/360 °C upper temperature limits.
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Equivalent to USP phase G3.
- Low bleed for use with sensitive detectors, such as MS.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 340/360 °C	14120	14123	14126
0.32 mm	0.25 µm	40 to 340/360 °C	14121	14124	

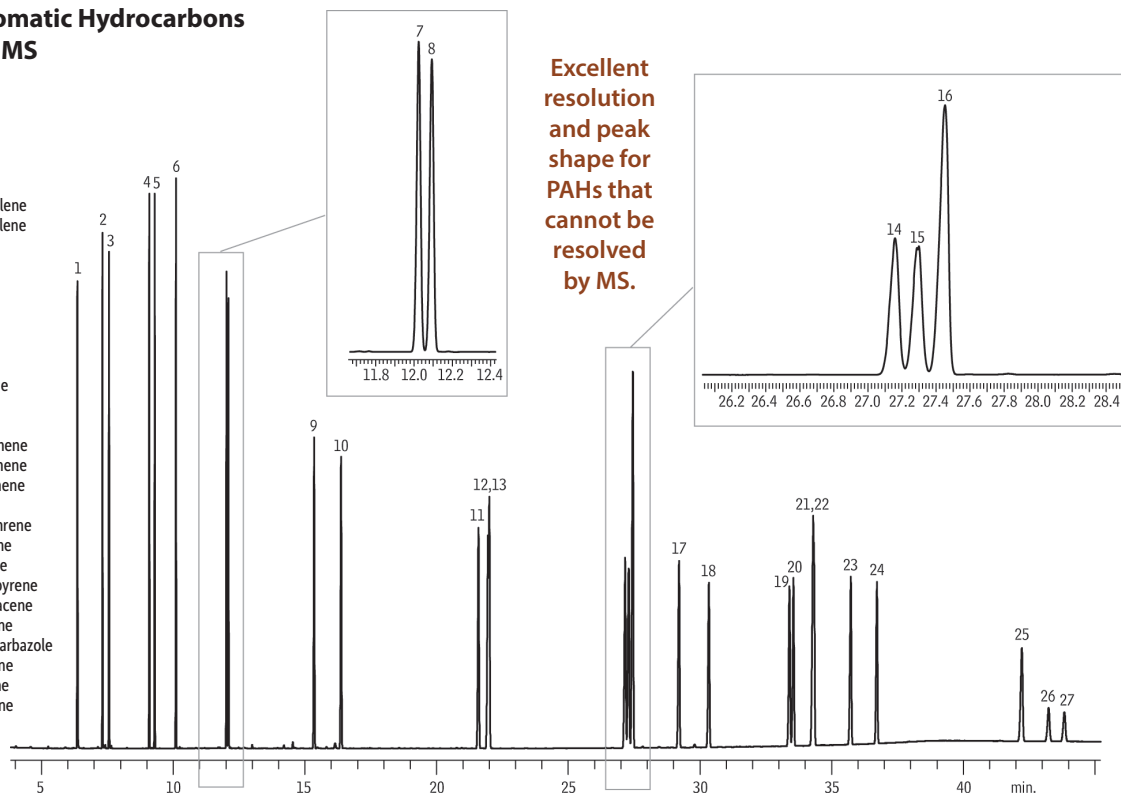
ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821
0.18 mm	0.18 µm	40 to 340/360 °C		14102
	0.36 µm	40 to 340/360 °C		14111

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS

## Peaks

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benz[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenz[a,h]acridine
20. Dibenz[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenz[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo[a,i]pyrene
27. Dibenzo[a,h]pyrene



Excellent resolution and peak shape for PAHs that cannot be resolved by MS.

## Column Sample

Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)  
PAH supplement mix for method 8100 (cat.# 31857)  
EPA Method 8310 PAH mixture (cat.# 31841)

## Diluent:

Triphenylene (custom)  
Dichloromethane

## Conc.:

10 ppm

## Injection

## Inj. Vol.:

0.5 µL splitless (hold 1.75 min)

## Liner:

Auto SYS XL PSS split/splitless w/wool (cat.# 21718)

## Inj. Temp.:

320 °C

## Purge Flow:

75 mL/min

## Oven

## Oven Temp.:

65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)

## Carrier Gas

He, constant flow

## Flow Rate:

2.0 mL/min

## Detector

FID @ 320 °C

## Instrument

PE Clarus 600 GC

## Acknowledgement

Instrument provided by PerkinElmer

GC\_EV1160



## Semivolatiles Analysis

### Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

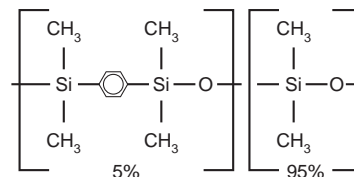
- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

### Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

### similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

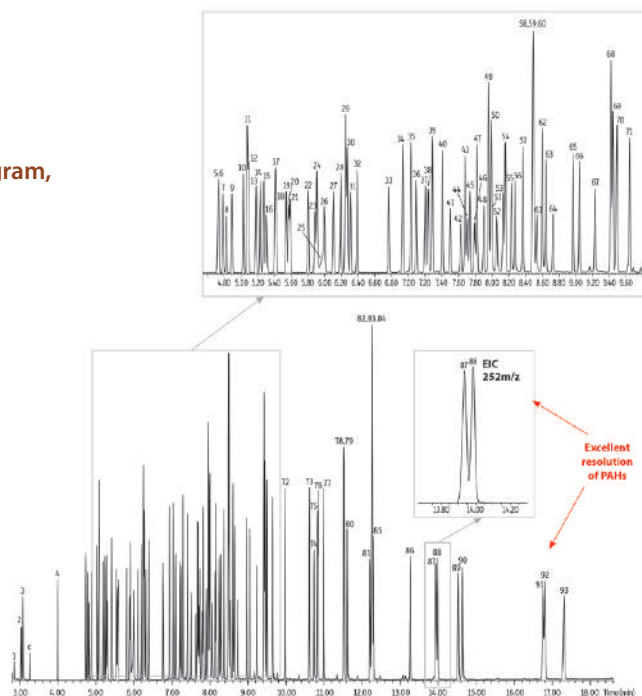
### ordering note

**Get the protection without the connection!**

For Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns, see **page 23**.

### Semivolatiles by EPA Method 8270 on Rxi®-5Sil MS (30 m, 0.25 mm ID, 0.25 µm) w/Drilled Uniliner® Inlet Liner

For complete chromatogram, see page 33.



GC\_EV00943

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## free literature

Whole Air Canister Sampling and Preconcentration GC-MS Analysis for pptv Levels of Trimethylsilanol in Semiconductor Cleanroom Air

lit. cat.#  
EVAN1788-UNV



Analysis of Trace Oxygenates in Petroleum-Contaminated Wastewater, Using Purge-and-Trap GC-MS (U.S. EPA Methods 5030B & 8260)

lit. cat.#  
EVAN1449-UNV



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## Volatile Organics Analysis

### Rtx®-VMS Columns (fused silica)

(proprietary Crossbond® phase)

- Application-specific columns for analyzing volatile organic pollutants by GC-MS including Methods TO-15, TMS, and EPA 8260.
- Complete separation of U.S. EPA Method 8260 compounds in less than 10 minutes.
- Stable to 260 °C.
- No known equivalent phases.

Rtx®-VMS columns offer lower bleed, better selectivity, and overall faster analysis for separating volatile organic compounds, such as those listed in U.S. EPA Method 8260B. The Rtx®-VMS stationary phase is a highly stable polymer that provides outstanding analysis of volatile compounds, in combination with sensitive ion traps and Agilent 5973 mass spectrometers. 0.18 and 0.25 mm ID columns allow sample splitting at the injection port, eliminating the added expense and maintenance of a jet separator. A 0.45 mm or 0.53 mm ID column can be directly connected to the purge-and-trap transfer line in a system equipped with a jet separator.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#
0.25 mm	1.40 µm	-40 to 240/260 °C	19915	19916	
0.32 mm	1.80 µm	-40 to 240/260 °C	19919	19920	
0.45 mm	2.55 µm	-40 to 240/260 °C	19908	19909	
0.53 mm	3.00 µm	-40 to 240/260 °C	19985	19988	19974

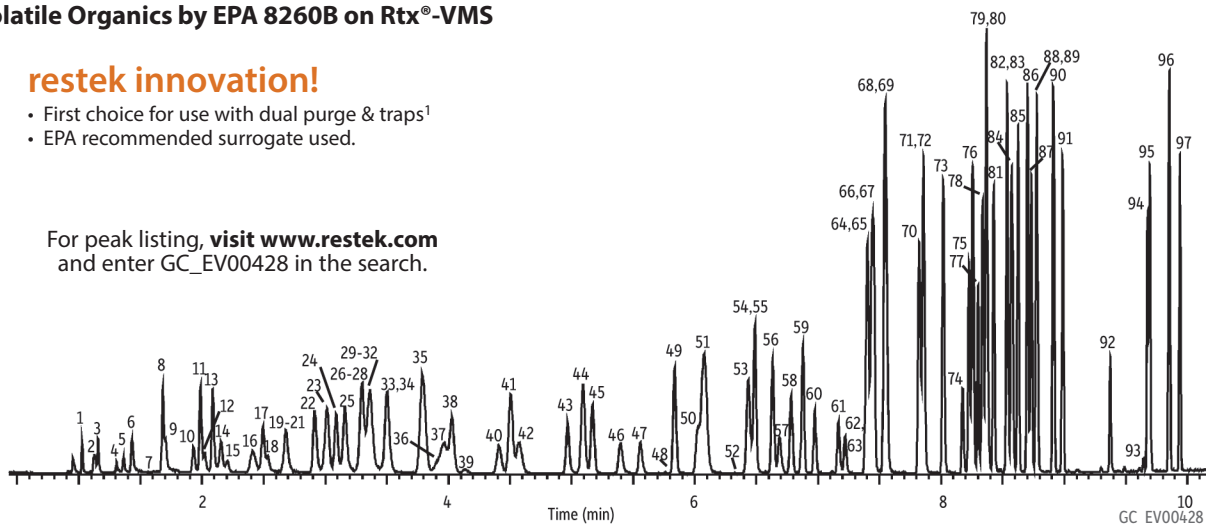
ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-40 to 240/260 °C	49914	49915

### Volatile Organics by EPA 8260B on Rtx®-VMS

#### restek innovation!

- First choice for use with dual purge & traps<sup>1</sup>
- EPA recommended surrogate used.

For peak listing, visit [www.restek.com](http://www.restek.com) and enter GC\_EV00428 in the search.



**Column** Rtx®-VMS, 20 m, 0.18 mm ID, 1.00 µm (cat.# 49914)  
**Sample**  
**Diluent:** Water  
**Conc.:** 10 ppb in 5 mL RO water (unless noted); ketones 2.5X  
**Injection** Purge and trap split (split ratio 40:1)  
**Liner:** 1 mm split (cat.# 20973)  
**Inj. Temp.:** 220 °C  
**Purge and Trap**  
**Instrument:** Tekmar LCS 3100  
**Trap Type:** Vocarb® 3000  
**Purge:** 11 min @ ambient, flow 40 mL/min  
**Dry Purge:** 1 min, flow 40 mL/min  
**Desorb Preheat**  
**Temp.:** 245 °C  
**Desorb:** 2 min @ 250 °C, flow 40 mL/min  
**Bake:** 8 min @ 260 °C  
**Interface**  
**Connection:** Injection port  
**Transfer Line**  
**Tubing:** Silcosteel® treated 0.53 mm ID tubing (cat.# 20595)  
**Transfer Line**  
**Temp.:** 120 °C

**Oven**  
**Oven Temp.:** 50 °C (hold 4 min) to 100 °C at 18 °C/min (hold 0 min) to 230 °C at 40 °C/min (hold 3 min)  
**Carrier Gas** He, constant flow  
**Flow Rate:** 1.0 mL/min  
**Detector** MS  
**Mode:** Scan  
**Transfer Line**  
**Temp.:** 280 °C  
**Analyzer Type:** Quadrupole  
**Tune Type:** BFB  
**Ionization Mode:** EI  
**Scan Range:** 35-300 amu  
**Instrument** HP6890 GC & 5973 MSD  
**Notes** For proper flows, adjust retention time of dichlorodifluoromethane to a retention time of 1.03 min @ 50 °C

<sup>1</sup>A.L. Hilling and G. Smith, Environmental Testing & Analysis, 10(3), 15-19, 2001.

## Volatile Organics Analysis

### Rtx®-VRX Columns (fused silica)

(proprietary Crossbond® phase)

- Application-specific columns for volatile organic pollutants.
- Excellent for U.S. EPA Method 8021 compounds.
- Stable to 260 °C.

The Rtx®-VRX stationary phase and optimized column dimensions provide low bleed, excellent resolution, and fast analysis times for volatile compounds.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#
0.25 mm	1.40 µm	-40 to 240/260 °C	19315	19316	
0.32 mm	1.80 µm	-40 to 240/260 °C	19319	19320	
0.45 mm	2.55 µm	-40 to 240/260 °C	19308		19309
0.53 mm	3.00 µm	-40 to 240/260 °C	19385	19388	

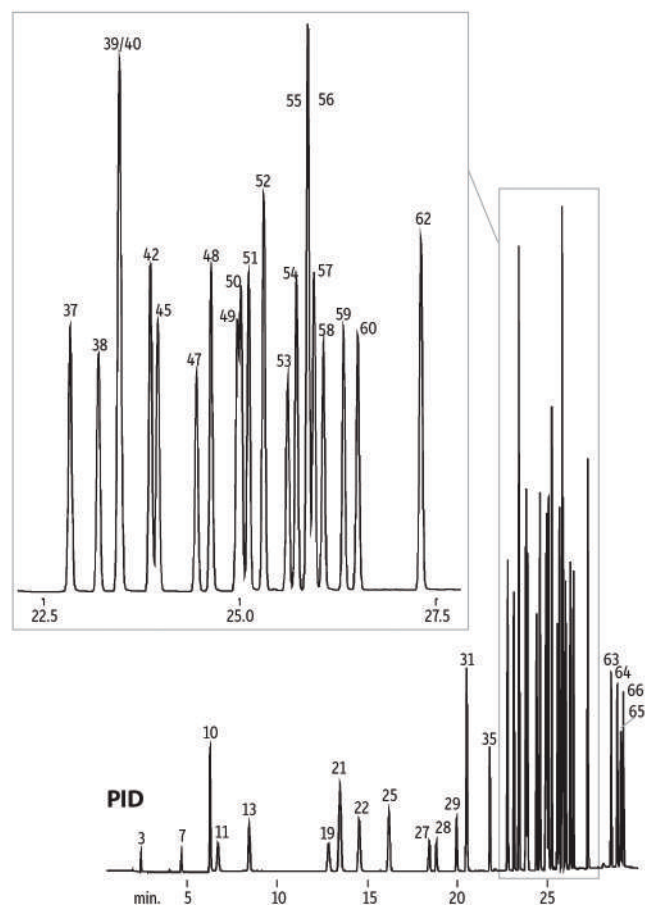
  

ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-40 to 240/260 °C	49314	49315

### similar phases

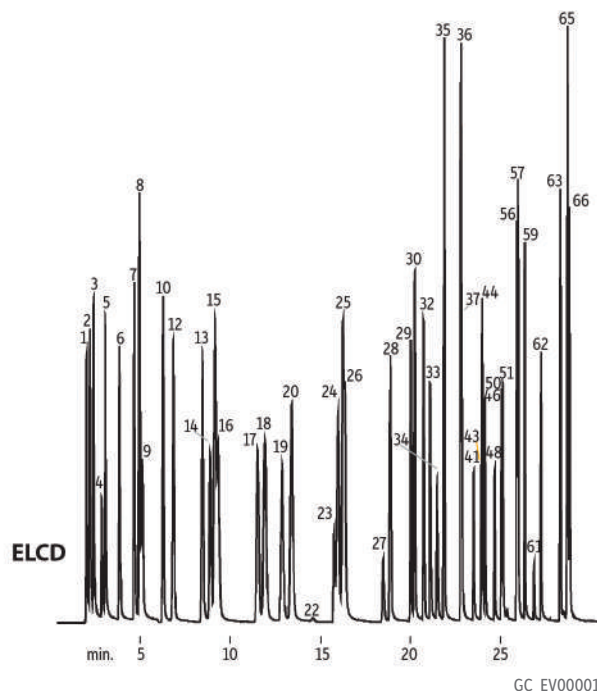
DB-VRX

### Volatile Organics by EPA 8021 on Rtx®-VRX



Good choice for wastewater analysis.

For peak list and conditions, visit [www.restek.com](http://www.restek.com) and enter GC\_EV00001 in the search.



GC\_EV00001

## similar phases

DB-502.2

## also available

## Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-502.2 columns .....page 111

MXT®-Volatiles .....page 111



## Volatile Organics Analysis

## Rtx®-502.2 Columns (fused silica)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants. The Rtx®-502.2 column is cited in U.S. EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks.
- Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Stable to 270 °C.

An Rtx®-502.2 column will enable you to quantify all compounds listed in U.S. EPA methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based Rtx®-502.2 stationary phase provides low bleed and thermal stability to 270 °C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling. Narrow bore columns can interface directly in GC/MS systems.

ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.25 mm	1.40 µm	-20 to 250/270 °C	10915	10916		
0.32 mm	1.80 µm	-20 to 250/270 °C	10919	10920		10921
0.45 mm	2.55 µm	-20 to 250/270 °C			10986	
0.53 mm	3.00 µm	-20 to 250/270 °C	10908	10909		10910

ID	df	temp. limits	20-Meter cat.#	40-Meter cat.#
0.18 mm	1.00 µm	-20 to 250/270 °C	40914	40915

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## Rtx®-Volatiles Columns (fused silica)


(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Stable to 280 °C.


Rtx®-Volatiles columns were the first columns designed specifically for analyses of the 34 volatile organic pollutants listed in U.S. EPA methods 601, 602, and 624. With these columns, you can quantify all compounds listed in these methods, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based Rtx®-Volatiles stationary phase provides low bleed and thermal stability to 280 °C. Narrow bore columns can interface directly in GC/MS systems.


ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	1.00 µm	-20 to 270/280 °C	10900	10903	
0.32 mm	1.50 µm	-20 to 270/280 °C	10901	10904	
0.53 mm	2.00 µm	-20 to 270/280 °C	10902	10905	10906

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.



## True Blue Performance





See pages 193–202 or visit [www.restek.com/sky](http://www.restek.com/sky)



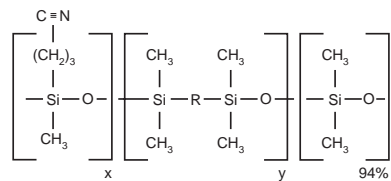
## Volatile Organics Analysis

### Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

### Rxi®-624Sil MS (G43) Structure



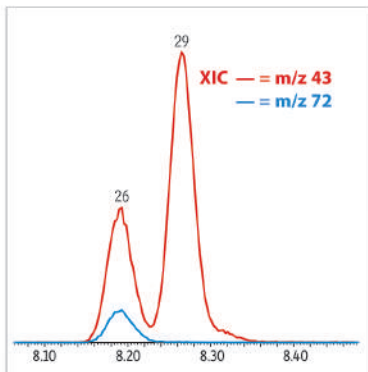
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

### similar phases

DB-624, VF-624ms, CP-Select 624 CB

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

### Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



Resolution of critical pairs, low bleed, and high inertness make this a great column for volatiles!

For peak list, visit [www.restek.com](http://www.restek.com) and enter GC\_EV1169 in the search.

#### Column Sample

Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)  
 8260A surrogate mix (cat.# 30240)  
 8260A internal standard mix (cat.# 30241)  
 8260B MegaMix® calibration mix (cat.# 30633)  
 VOA calibration mix #1 (ketones) (cat.# 30006)  
 8260B acetate mix (Revised) (cat.# 30489)  
 California oxygenates mix (cat.# 30465)  
 502.2 calibration mix #1 (gases) (cat.# 30042)

#### Conc.:

#### Injection

Inj. Temp.: 225 °C

#### Purge and Trap

Instrument: OI Analytical 4660

Trap Type: 10 Trap

Purge: 11 min @ 20 °C

Desorb Preheat Temp.: 180 °C

Desorb: 0.5 min @ 190 °C

Bake: 5 min @ 210 °C

Interface Connection: Injection port

#### Oven

Oven Temp.: 35 °C (hold 5 min) to 60 °C at 11 °C/min to 220 °C at 20 °C/min (hold 2 min)

#### Carrier Gas

Flow Rate: He, constant flow

1.0 mL/min

#### Detector

MS

Mode: Scan

Transfer Line Temp.: 230 °C

Analyzer Type: Quadrupole

Source Temp.: 230 °C

Quad Temp.: 150 °C

Electron Energy: 70 eV

Solvent Delay Time: 1.5 min

Tune Type: BFB

Ionization Mode: EI

Scan Range: 36-260 amu

Instrument: Agilent 7890A GC & 5975C MSD

#### Notes

Other Purge-and-Trap Conditions:

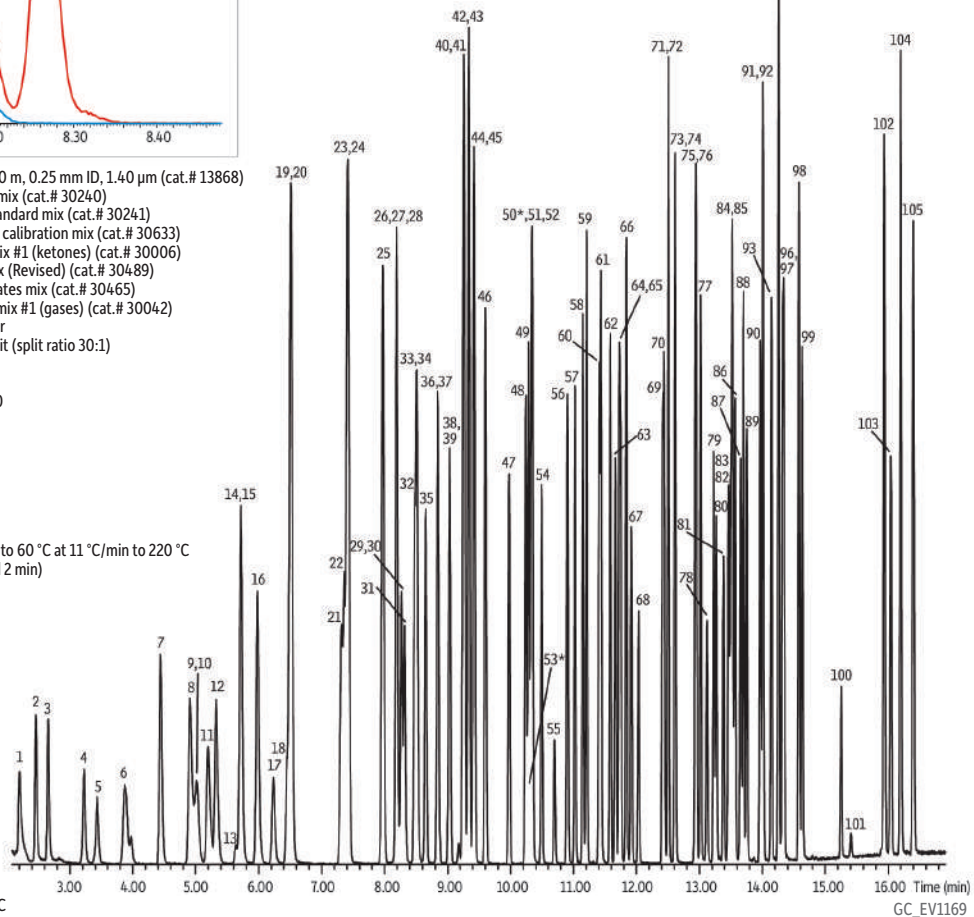
Sample Inlet: 40 °C

Sample: 40 °C

Water Management: Purge 110 °C, Desorb 0 °C, Bake, 240 °C

Eclipse 4660 purge-and-trap courtesy of O.I. Analytical, College Station, TX.

#### Acknowledgement



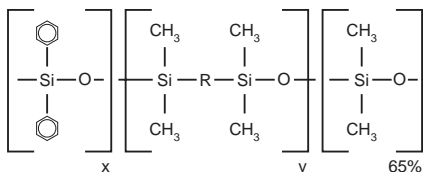
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## Cannabis Potency Analysis

## Rxi®-35Sil MS Structure



## similar phases

DB-35ms, DB-35msUI, VF-35ms, MR2

## Rxi®-35Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

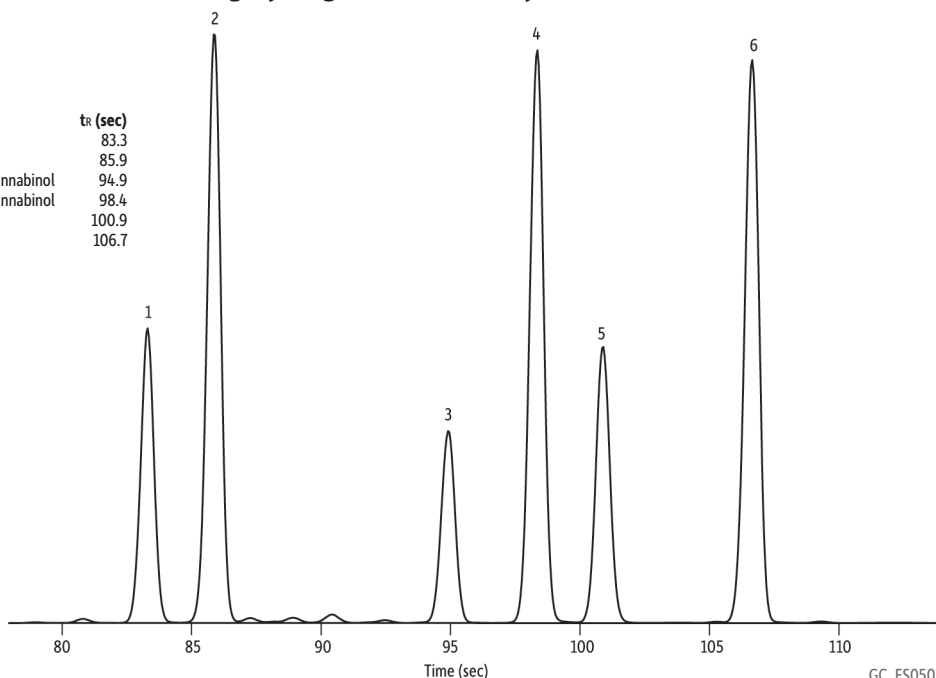
- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Provides superior separation for cannabinoids.
- Very low-bleed phase for GC-MS analysis.
- Extended temperature range: 50 °C to 340/360 °C.

The higher aromatic content of the Rxi®-35Sil MS column allows for superior separation of cannabinoids over traditional 5-type columns. Baseline separation can be achieved for a comprehensive list of cannabinoids by using a cost-effective 15 m column and readily available hydrogen carrier gas. The arylene content of the Rxi®-35Sil MS stationary phase ensures long column lifetime at the high elution temperatures required for cannabinoids analysis.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	50 to 340/360 °C	13820	13823

## Cannabinoids on Rxi®-35Sil MS Using Hydrogen Carrier Gas by GC-FID

Peaks	tr (sec)
1. Cannabichromene	83.3
2. Cannabidiol	85.9
3. Delta-8-Tetrahydrocannabinol	94.9
4. Delta-9-Tetrahydrocannabinol	98.4
5. Cannabigerol	100.9
6. Cannabinol	106.7



GC\_FS0501

**Column** Rxi®-35Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13820)  
**Sample** Cannabinoids standard (cat.# 34014)  
 Cannabichromene (cat.# 34092)  
 delta-8-Tetrahydrocannabinol (THC) (cat.# 34090)  
 Cannabigerol (cat.# 34091)

**Injection**  
 Inj. Vol.: 1 µL split (split ratio 50:1)  
 Liner: Sky® 4 mm Precision® liner w/wool (cat.# 23305.5)  
 Inj. Temp.: 250 °C  
 Split Vent Flow Rate: 125 mL/min  
**Oven**  
 Oven Temp.: 225 °C (hold 0.1 min) to 330 °C at 35 °C/min (hold 0.9 min)  
**Carrier Gas**  
 H<sub>2</sub>, constant flow  
 Flow Rate: 2.5 mL/min  
**Detector**  
 FID @ 350 °C  
 Constant Column +  
 Constant Make-up: 50 mL/min  
 Make-up Gas Type: N<sub>2</sub>  
 Hydrogen flow: 40 mL/min  
 Air flow: 450 mL/min  
 Data Rate: 20 Hz  
**Instrument** Agilent/HP6890 GC

## FAME Analysis (*cis/trans*)

### Rt<sup>®</sup>-2560 Column (fused silica)

(highly polar phase; biscyanopropyl polysiloxane—not bonded)

- Application-specific column for *cis/trans* FAMES.
- Stable to 250 °C.

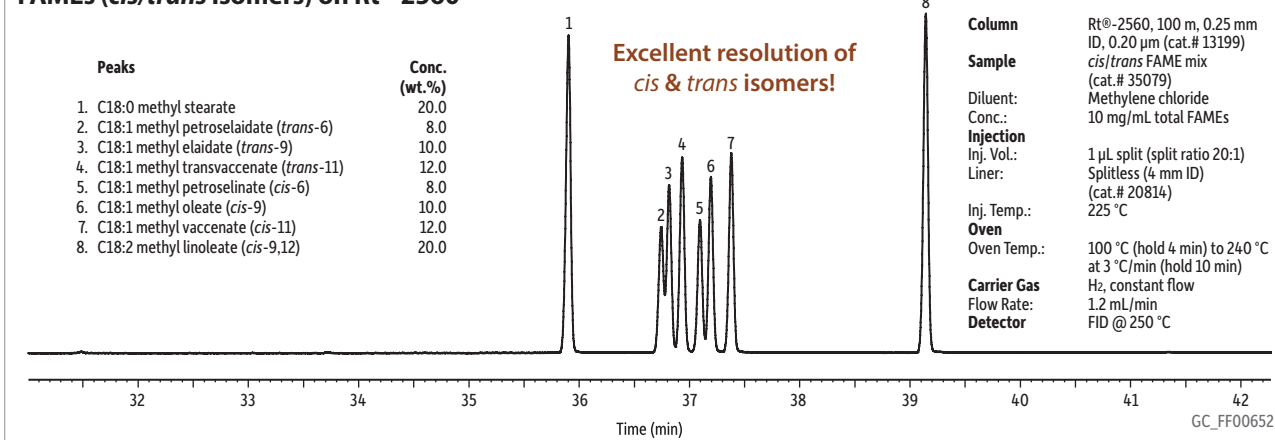
Because the Rt<sup>®</sup>-2560 stationary phase is not bonded, it should not be solvent rinsed.

### similar phases

HP-88, CP-Sil 88, SPB-2560

ID	df	temp. limits	100-Meter cat.#
0.25 mm	0.20 µm	20 to 250 °C	13199

### FAMES (*cis/trans* isomers) on Rt<sup>®</sup>-2560



## FAME Analysis (Polyunsaturated)

### FAMEWAX Columns (USP G16) (fused silica)

(polar phase; Crossbond<sup>®</sup> polyethylene glycol)

- Application-specific columns for FAMES, specially tested with a FAME mixture.
- Temperature range: 20 °C to 250 °C.

The elution order of polyunsaturated FAMES on FAMEWAX columns is comparable to that on other Carbowax<sup>®</sup> columns, but baseline resolution is achieved in significantly less time.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	20 to 240/250 °C	12497
0.32 mm	0.25 µm	20 to 240/250 °C	12498
0.53 mm	0.50 µm	20 to 250 °C	12499

### FAMES Analyses

High-Resolution GC Analyses of Fatty Acid Methyl Esters

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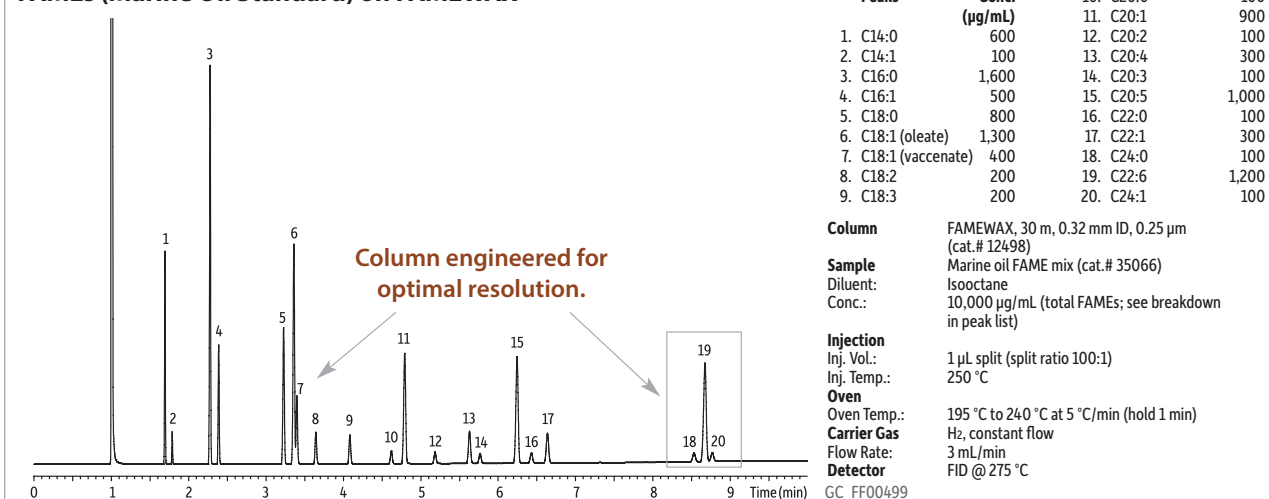
lit. cat.# 59584B



### similar phases

Select FAME, Omegawax

### FAMES (Marine Oil Standard) on FAMEWAX



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## PAHs in Food Analysis

“The Rxi®-PAH column enabled us to separate important PAH derivative isomers, which we were experiencing trouble with for months. This column is excellent for PAH, NPAH, and OPAH separation and I would recommend anyone working in this field to try it out. Thank you Restek!”

**Mohammed Salim Alam**  
Research Fellow  
University of Birmingham, UK

**Rxi®-PAH GC Column**  
Resolve Important Isobaric  
Polycyclic Aromatic Hydrocarbons  
for Food Safety and Environmental  
Methods

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lit. cat.#  
GNTS1718-UNV

**Rxi®-PAH Columns** (fused silica)

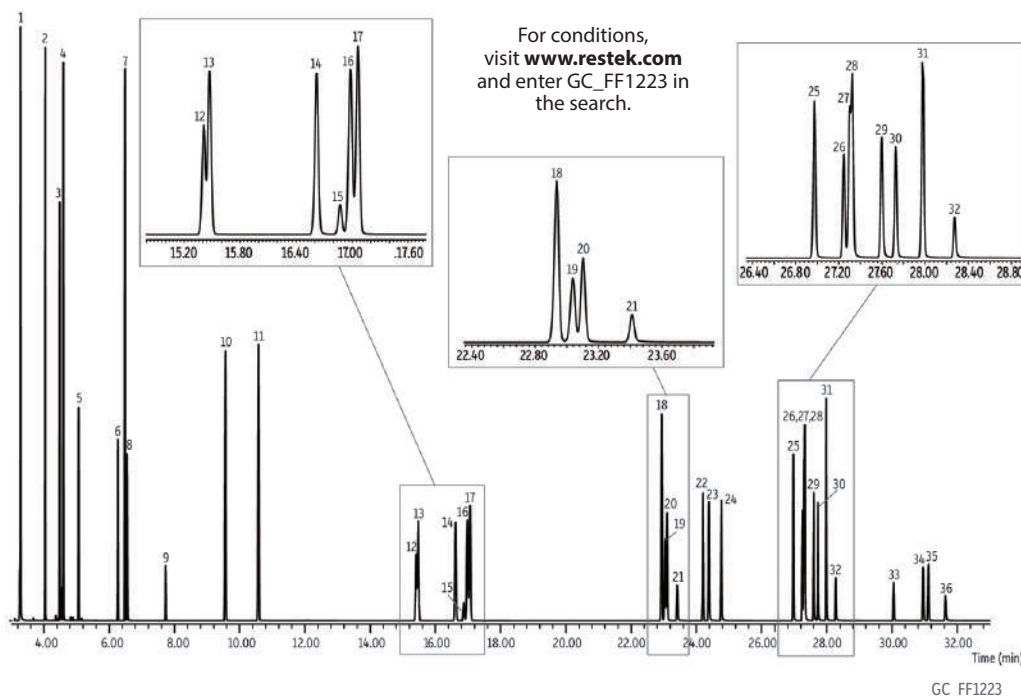
(midpolarity proprietary phase)

- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [ j ], and [a] fluoranthenes.
- 360 °C thermal stability allows analysis of low volatility dibenzo pyrenes.

The Rxi®-PAH GC columns were designed by Restek with a higher phenyl-content stationary phase that provides unique selectivity to separate important polycyclic aromatic hydrocarbons (PAH) for food safety that cannot be distinguished by mass spectrometry. Even difficult priority compounds, such as the European Food Safety Authority (EFSA) PAH4, are easily separated and accurately quantified—results that cannot be achieved on typical GC columns. Arylene modification and surface bonding of the stationary phase increase thermal stability and ruggedness so relatively nonvolatile, higher molecular weight PAHs can be analyzed routinely without interference from column bleed. Excellent column efficiency means that the column can be trimmed for maintenance purposes many times without losing critical PAH separations, including those that are part of environmental methods, as well as food safety testing. The selectivity and efficiency of the Rxi®-PAH column make it ideal for EFSA PAH4 analysis; chrysene/triphenylene separation and resolution of all benzofluoranthenes are easily achieved.

ID	df	temp. limits	30-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.18 mm	0.07 µm	to 360 °C		49316	
0.25 mm	0.10 µm	to 360 °C	49318		49317

## NIST SRM 2260a PAH Mix on Rxi®-PAH



For conditions,  
visit [www.restek.com](http://www.restek.com)  
and enter GC\_FF1223 in  
the search.

## Peaks

1. Naphthalene
2. Biphenyl
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Dibenzothiophene
7. Phenanthrene
8. Anthracene
9. 4H-Cyclopenta[def]phenanthrene
10. Fluoranthene
11. Pyrene
12. Benzo[ghi]fluoranthene
13. Benzo[c]phenanthrene
14. Benzo[a]anthracene
15. Cyclopenta[cd]pyrene
16. Triphenylene
17. Chrysene
18. Benzo[b]fluoranthene
19. Benzo[k]fluoranthene
20. Benzo[j]fluoranthene
21. Benzo[a]fluoranthene
22. Benzo[e]pyrene
23. Benzo[a]pyrene
24. Perylene
25. Dibenz[a,j]anthracene
26. Dibenz[a,c]anthracene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[b]chrysene
30. Picene
31. Benzo[ghi]perylene
32. Anthanthrene
33. Dibenzo[b,k]fluoranthene
34. Dibenzo[a,e]pyrene
35. Coronene
36. Dibenzo[a,h]pyrene

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## Pesticide Analysis in Cannabis

### Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

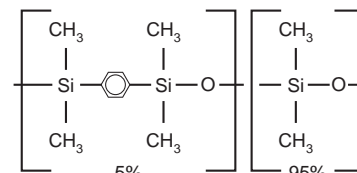
ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 µm	-60 to 320/350 °C	13623
	0.50 µm	-60 to 320/350 °C	13638

### Rxi®-5Sil MS with Integra-Guard®

- Extend column lifetime.
- Eliminate leaks with a built-in retention gap.
- Inertness verified by isothermal testing.

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124

### Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

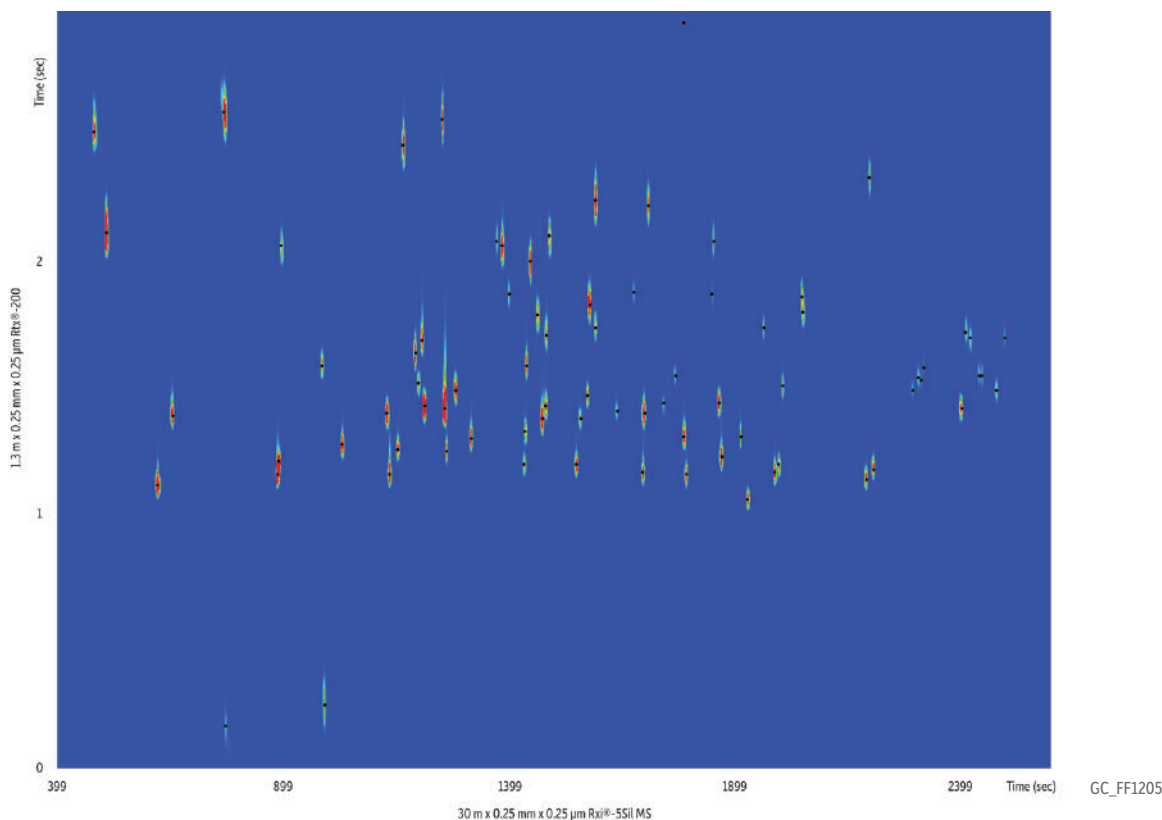
### similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

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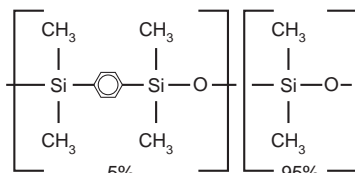
## Marijuana Pesticides by GCxGC on Rxi®-5Sil MS and Rtx®-200



**Column:** Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); Rtx®-200 1.3 m, 0.25 mm ID, 0.25 µm (cat.# 15020); **Sample:** Diluent: Toluene; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); **Liner:** Sky® 4 mm single taper w/wool (cat.# 23303.1); **Inj. Temp.:** 250 °C; **Purge Flow:** 40 mL/min; **Oven:** Oven Temp.: Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 5 °C/min; Rtx®-200: 85 °C (hold 1 min) to 315 °C at 5 °C/min; **Carrier Gas:** He, corrected constant flow (2 mL/min); **Modulation:** Modulator Temp. Offset: 20 °C; Second Dimension Separation Time: 3 sec; Hot Pulse Time: 0.9 sec; Cool Time between Stages: 0.6 sec; **Detector:** TOFMS; Transfer Line Temp.: 290 °C; **Analyzer Type:** TOF; **Source Temp.:** 225 °C; **Electron Energy:** 70 eV; **Mass Defect:** -20 mu/100 u; **Solvent Delay Time:** 5 min; **Tune Type:** PFTBA; **Ionization Mode:** EI; **Acquisition Range:** 45-550 amu; **Spectral Acquisition Rate:** 100 spectra/sec; **Instrument:** LECO Pegasus 4D GCxGC-TOFMS; **Notes:** Rtx®-200 (cat.# 15020) is a 15 m column. A 1.3 m section was used as the second dimension column.

For a peak list visit [www.restek.com](http://www.restek.com) and enter chromatogram GC\_FF1205 in the search function

### Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

### similar phases

DB-5ms, DB-5msUI, VF-5ms, ZB-5ms, ZB-SemiVolatiles, Rtx-5Sil MS

### also available

Comprehensive 203-compound GC multiresidue pesticide kit



See page 568.

## Pesticide Residues in Food Analysis

### Rxi®-5Sil MS Columns (fused silica)

(low-polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#	60-Meter cat.#
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

### Chlorinated Pesticide Residues in Olive Oil on Rxi®-5Sil MS

**Column** Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)  
**Sample** Olive oil spiked with organochlorine pesticide mix AB # 3 (cat.# 32415)  
**Conc.:** 10 µg/mL

**Injection**  
**Inj. Vol.:** 1 µL splitless (hold 0.5 min)  
**Liner:** Single taper w/wool (cat.# 22286-200.1)  
**Inj. Temp.:** 225 °C

**Oven**  
**Oven Temp.:** 130 °C (hold 0.5 min) to 330 °C at 5 °C/min

**Carrier Gas** He, constant flow

**Flow Rate:** 1 mL/min

**Detector** MS

**Mode:** SIM

**Transfer Line** 320 °C

**Temp.:** 320 °C

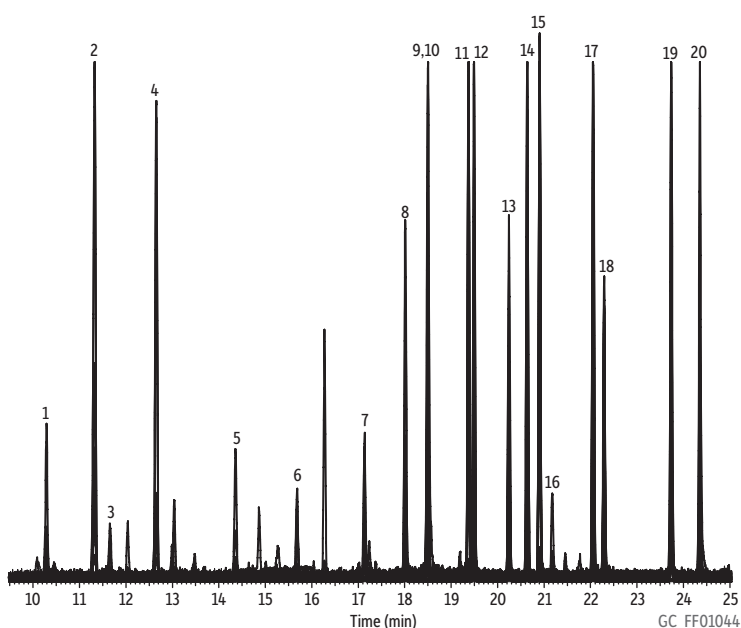
**Ionization Mode:** EI

**Notes**

#### Extraction and dSPE Cleanup for Pesticide Residues in Olive Oil

Test sample: A 1.5 mL sample of commercially obtained virgin olive oil was spiked with a standard organochlorine pesticide mix. The spiked sample was processed as follows.

1. Dilute with 1.5 mL hexane.
2. Add 6 mL of acetonitrile (ACN).
3. Mix for 30 minutes on a shaker.
4. Allow layers to separate (approximately 20 minutes), then collect the top (ACN) layer.
5. Repeat the liquid-liquid extraction (steps 2-4) and combine both ACN extract layers.
6. Place 1 mL of the combined ACN extract in a 1.5 mL tube containing 150 mg magnesium sulfate and 50 mg PSA.
7. Shake the tube for 2 minutes.
8. Centrifuge at 3,000 U/min for approximately 5 minutes.
9. Remove the top layer and inject directly into the gas chromatograph system.



For peak list, visit [www.restek.com](http://www.restek.com) and enter GC\_FF01044 in the search



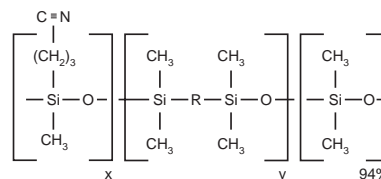
## Residual Solvent Analysis for Cannabis Concentrates

### Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

### Rxi®-624Sil MS (G43) Structure



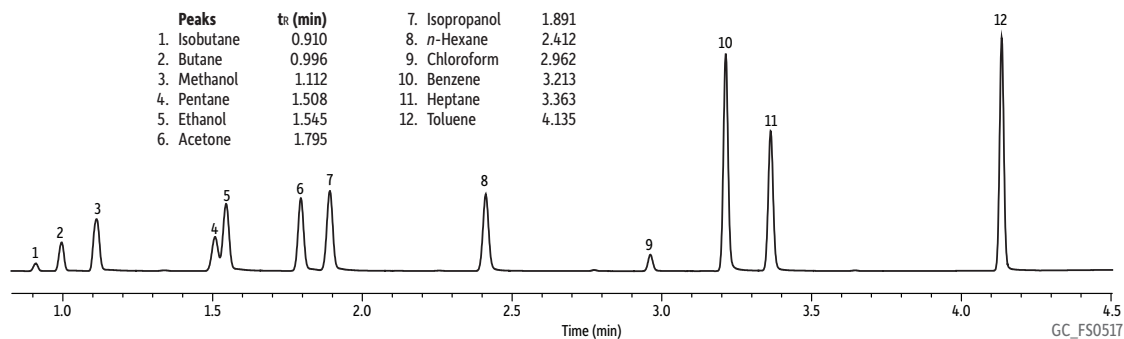
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

### similar phases

DB-624, VF-624ms, CP-Select 624 CB

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

### Residual Solvents in Cannabis Concentrates on Rxi®-624Sil MS by Headspace–Full Evaporation Technique (HS-FET)



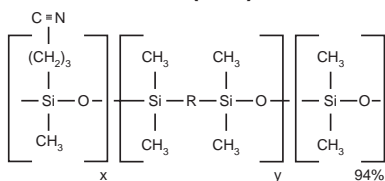
**Column** Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)  
**Sample** Residual solvent mix  
**Diluent:** Dimethyl sulfoxide (DMSO)  
**Conc.:** 500 ppm (For the HS-FET technique, 10 µL of a 1,000 µg/mL standard was placed into a 20 mL headspace vial to represent a 500 ppm sample concentration, assuming a 20 mg sample.)  
**Injection**  
**Liner:** headspace-loop split (split ratio 10:1)  
**Headspace-Loop** Sky® 1.0 mm ID straight inlet liner (cat.# 23333.1)  
**Instrument:** Tekmar HT3  
**Inj. Time:** 1.0 min  
**Transfer Line Temp.:** 160 °C  
**Valve Oven Temp.:** 160 °C  
**Needle Temp.:** 140 °C  
**Sample Temp.:** 140 °C  
**Platen temp**  
**equil. time:** 1.0 min  
**Sample Equil. Time:** 30.0 min  
**Vial Pressure:** 20 psi  
**Pressurize Time:** 5.0 min  
**Loop Pressure:** 15 psi  
**Loop Fill Time:** 2.0 min

**Oven**  
**Oven Temp.:** 35 °C (hold 1.5 min) to 300 °C at 30 °C/min (hold 2.0 min)  
**Carrier Gas** He, constant flow  
**Linear Velocity:** 80 cm/sec  
**Detector** FID @ 250 °C  
**Make-up Gas**  
**Flow Rate:** 45 mL/min  
**Make-up Gas Type:** N<sub>2</sub>  
**Hydrogen flow:** 40 mL/min  
**Air flow:** 450 mL/min  
**Data Rate:** 20 Hz  
**Instrument** Agilent/HP6890 GC  
**Notes** The butane used for standard preparation was a mixture of butane and isobutane in an unknown ratio. The concentrations of butane and isobutane should be considered approximate, but do not exceed 500 ppm for either component.

ChromaBLOGraphy  
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## Terpenes Analysis for Cannabis and Hops

## Rxi®-624Sil MS (G43) Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

## similar phases

DB-624, VF-624ms, CP-Select 624 CB

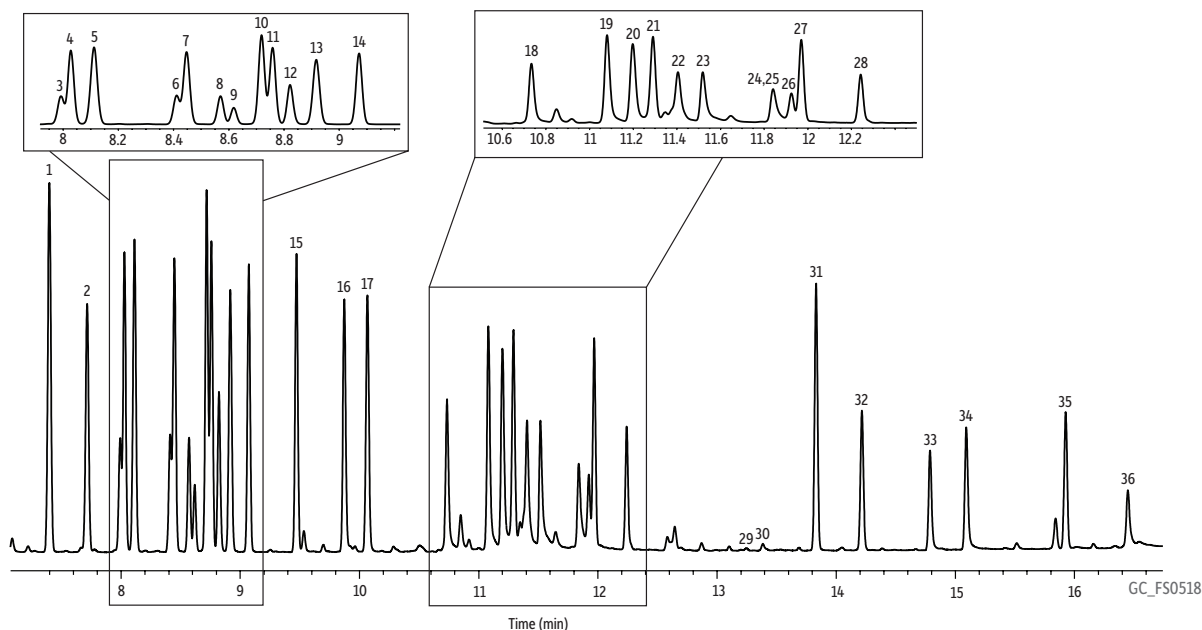
## Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

## Medical Cannabis Terpenes on Rxi®-624Sil MS by FET-HS-GC



Peaks	tr (min)	10. Limonene	8.71	20. Borneol	11.19	30. Citral 4	13.43
1. α-Pinene	7.39	11. p-Cymene	8.75	21. α-Terpineol	11.29	31. β-caryophyllene	13.83
2. Camphene	7.71	12. β-Ocimene	8.82	22. Dihydrocarveol	11.40	32. α-Humulene	14.21
3. β-Myrcene	7.98	13. Eucalyptol	8.91	23. Citronellol	11.51	33. Nerolidol 1	14.78
4. Sabinene	8.02	14. γ-Terpinene	9.06	24. Geraniol	11.82	34. Nerolidol 2	15.08
5. β-Pinene	8.11	15. Terpinolene	9.47	25. 2-Piperidinone	11.88	35. Caryophyllene oxide	15.92
6. α-Phellandrene	8.4	16. Linalool	9.87	26. Citral 1	11.92	36. α-Bisabolol	16.43
7. δ-3-Carene	8.44	17. Fenchone	10.06	27. Pulegone	11.97		
8. α-Terpinene	8.57	18. Isopulegol	10.73	28. Citral 2	12.24		
9. Ocimene	8.61	19. dl-Menthol	11.08	29. Citral 3	13.19		

**Column** Rxi® -624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)  
**Sample** Terpenes mix  
**Diluent:** Isopropyl alcohol  
**Conc.:** 200 ng/µL (0.02% wt/vol). The sample was prepared by placing 10 µL into the headspace vial.  
**Injection** headspace-loop split (split ratio 10:1)  
**Liner:** Sky® 1.0 mm ID straight inlet liner (cat.# 23333.1)  
**Headspace-Loop**  
**Inj. Port Temp.:** 250 °C  
**Instrument:** Tekmar HT-3  
**Inj. Time:** 1.0 min  
**Transfer Line Temp.:** 160 °C  
**Valve Oven Temp.:** 160 °C  
**Needle Temp.:** 140 °C  
**Sample Temp.:** 140 °C  
**Sample Equil. Time:** 30.0 min

**Vial Pressure:** 20 psi  
**Loop Pressure:** 15 psi  
**Oven**  
**Oven Temp.:** 60 °C (hold 0.10 min) to 300 °C at 12.50 °C/min (hold 3.0 min)  
**Carrier Gas** He, constant flow  
**Linear Velocity:** 33 cm/sec  
**Detector** FID @ 320 °C  
**Make-up Gas**  
**Flow Rate:** 45 mL/min  
**Make-up Gas Type:** N<sub>2</sub>  
**Hydrogen flow:** 40 mL/min  
**Air flow:** 450 mL/min  
**Data Rate:** 20 Hz  
**Instrument** Agilent/HP6890 GC





## Triglycerides in Foods Analysis

### Rtx®-65TG Columns (fused silica)

(high-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370 °C.

The Rtx®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370 °C thermal stability, an Rtx®-65TG column should not be used for the analyses of polar compounds.

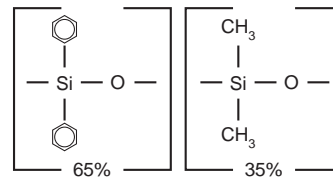
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	40 to 370 °C	17005	17008
0.32 mm	0.10 µm	40 to 370 °C	17006	17009
0.53 mm	0.10 µm	40 to 370 °C	17007	17010

### please note

Triglycerides are often injected via on-column injection. Use 0.53 mm retention gaps and appropriate connectors.

- Vu2 Union® connectors (see page 229.)
- MXT®-Union connector kits for fused silica (see page 231.)

### Rtx®-65TG Structure

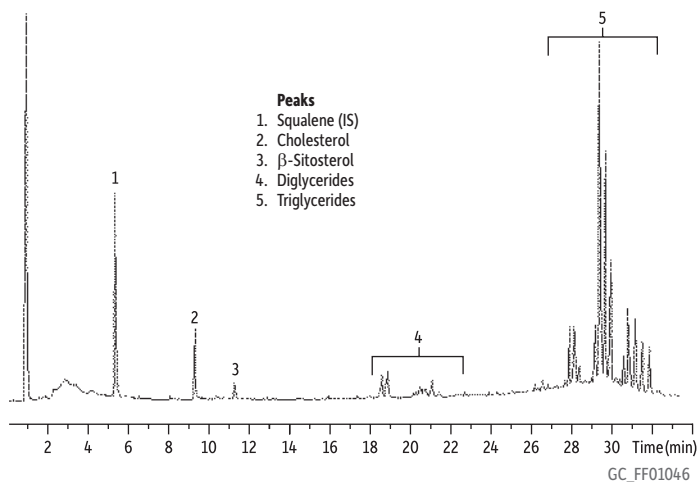


Similar to: (65%-phenyl)-methylpolysiloxane

### crossbond® technology

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

### Egg Pasta Sterols & Glycerides on Rtx®-65TG



**Column** Rtx®-65TG, 30 m, 0.25 mm ID, 0.10 µm (cat.# 17008)  
**Sample** Fat extract from egg pasta in diethyl ether solution with 3,000 ppm squalene (IS)  
**Conc.:** 50 µg/mL  
**Injection**  
 Inj. Vol.: 0.5 µL pvt split (split ratio 80:1)  
 Inlet Temp. Program: 70 °C (hold 12 min) to 370 °C at 99 °C/min (hold 5 min)  
**Oven**  
 Oven Temp.: 220 °C (hold 2 min) to 360 °C at 5 °C/min (hold 5 min)  
**Carrier Gas** H<sub>2</sub>, constant flow  
**Flow Rate:** 1.5 mL/min  
**Detector** FID @ 370 °C

**Acknowledgement**  
 Daniele Naviglio, Fabiana Pizzolongo; Dipartimento di Scienza degli Alimenti – Università degli Studi di Napoli “Federico II” – Via Università, 100 - 80055 Portici (NA) – Italia



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## Aromatics &amp; Oxygenates in Gasoline Analysis

**Rt®-TCEP Columns** (fused silica)

(highly polar phase; 1,2,3-tris[2-cyanoethoxy]propane—not bonded)

- General-purpose columns, ideal for aromatics and oxygenates in gasoline.
- Temperature range: 0 °C to 135 °C.

Most gasolines contain aliphatic hydrocarbons up to *n*-dodecane (C12). To improve identification of the aromatics and oxygenates, it is desirable to elute benzene after C11 and toluene after C12. The extremely polar Rt®-TCEP stationary phase provides a retention index for benzene greater than 1,100 and permits the separation of alcohols and aromatics from the aliphatic constituents in gasoline.

Rt®-TCEP columns have the same high polarity as TCEP packed columns (precolumns in ASTM Method D4815 for the analysis of petroleum oxygenates), with the efficiency of a capillary column. The result is a column that can separate a wide variety of compounds with an elution pattern unattainable using other high polarity siloxanes.

The Rt®-TCEP column incorporates a nonbonded stationary phase coated on a surface specialized for enhanced polymer stability and extended column lifetime. Solvent rinsing should be avoided. Conditioning is necessary only if the column is to be used at temperatures near the maximum operating temperature.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.40 µm	0 to 135 °C	10998	10999

## similar phases

SPB-TCEP, CP-TCEP

## free literature

Analyzing Oxygenates in Gasoline Using TCEP and RtX®-1/MXT®-1 Columns

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[www.restek.com](http://www.restek.com)

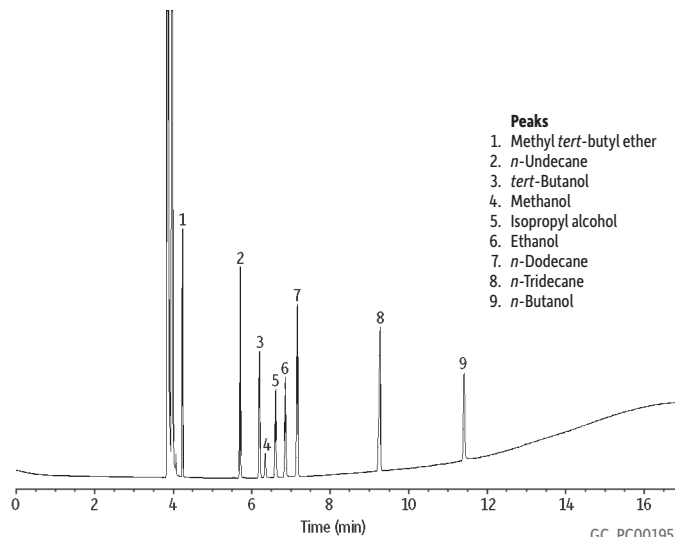
lit. cat.# 59587A



## Save money!

Get six columns for the price of five.  
Call 800-356-1688, ext. 3, or your Restek representative for details!

## Petroleum Oxygenates on Rt®-TCEP



GC\_PC00195

Column Rt®-TCEP, 60 m, 0.25 mm ID, 0.40 µm (cat.# 10999)  
 Sample Conc.: 500 ppm  
 Injection Inj. Vol.: 1.0 µL split  
 Inj. Temp.: 200 °C  
 Split Vent Flow Rate: 46 mL/min  
 Oven Oven Temp.: 60 °C (hold 5 min) to 100 °C at 5 °C/min (hold 10 min)  
 Carrier Gas He, constant pressure  
 Linear Velocity: 30 cm/sec @ 80 °C  
 Detector FID @ 200 °C  
 Notes FID sensitivity: 6.4 x 10<sup>-11</sup> AFS

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## Biodiesel Fuels Analysis

### Rtx®-Biodiesel TG Columns (fused silica)

- Linearity for all reference compounds exceeds method requirements.
- Columns with retention gaps feature Alumaseal® connectors to prevent leaks and extend column life.
- Low column bleed at high temperatures.
- For glycerin and glycerides analysis, according to ASTM D6584 and EN 14105 methods.
- Stable to 350 °C.

Description	temp. limits	cat.#
10 m, 0.32 mm ID, 0.10 µm	to 330/380 °C	10292
10 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm ID Retention Gap	to 330/380 °C	10291
15 m, 0.32 mm ID, 0.10 µm	to 330/380 °C	10294
15 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm ID Retention Gap	to 330/380 °C	10293

### free literature

Biodiesel Solutions  
Innovative Products for Simple,  
Reliable Biodiesel Analysis

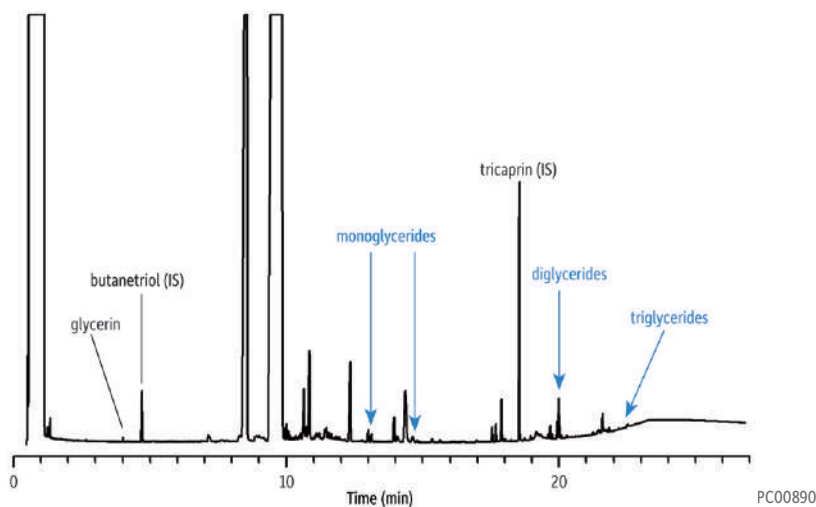
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lit. cat.#  
PCFL1409-UNV



### Glycerin in Biodiesel on Rtx®-Biodiesel TG



**Column** Rtx®-Biodiesel TG, 10 m, 0.32 mm ID, 0.10 µm using Hydroguard® tubing 2 m, 0.53 mm ID, with Alumaseal® connector (cat.# 10291)

**Sample Injection**  
Inj. Vol.: 1.0 µL cold on-column  
Temp. Program: oven track

**Oven**  
Oven Temp.: 50 °C (hold 1 min) to 180 °C at 15 °C/min (hold 7 min) to 230 °C at 30 °C/min to 380 °C at 30 °C/min (hold 5 min)

**Carrier Gas** H<sub>2</sub>, constant flow

**Flow Rate:** 4 mL/min

**Detector** FID @ 380 °C

## did you know?

Using hydrogen instead of helium can cut analysis time in half! Visit [www.restek.com](http://www.restek.com) to learn more.

## similar phases

HP-PONA, DB-Petro, CP-Sil PONA C8, Petrocol DH

## Method Recommended

Method	Column	cat. #	Dimensions
D6729	Rtx-DHA-100	10148	100 m x 0.25 mm, 0.50 µm
D6730	Rtx-DHA-100 & Rtx-5 DHA Tuning Column	10148 & 10165	100 m x 0.25 mm, 0.50 µm w/ precolumn
D6733	Rtx-DHA-50	10147	50 m x 0.20 mm, 0.50 µm
D5501	Rtx-DHA-150	10149	150 m x 0.25 mm, 1.0 µm

## free literature

Detailed Hydrocarbon Analysis  
Featuring Rtx®-DHA Columns

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lit. cat.#  
PCFL1007B-UNV



## Detailed Hydrocarbon Analysis (DHA)

### Rtx®-DHA Columns (fused silica)

(Crossbond® 100% dimethyl polysiloxane—optimized for hydrocarbon analysis)

- Columns meet or exceed all ASTM D6730-01 and CAN/CGSB 3.0 No. 14.3-99 method guidelines; test report for method D6730 supplied with each column.
- Excellent responses and peak symmetry for polar oxygenates.
- Stable to 340 °C.

Gasolines are complex mixtures of hundreds of compounds. Information about concentrations of the individual components is important for evaluating raw materials and for controlling refinery processes. ASTM D6730-01 outlines a high-resolution GC method for detailed hydrocarbon analysis (DHA) of gasolines. Rtx®-DHA columns are ideal for DHA methods and easily meet or exceed both ASTM D6730-01 and Canadian General Standards Board CAN/CGSB 3.0 No. 14.3-99 requirements. Every Rtx®-DHA column is tested for retention, efficiency, stationary phase selectivity, and bleed—guaranteeing reproducible column-to-column performance.

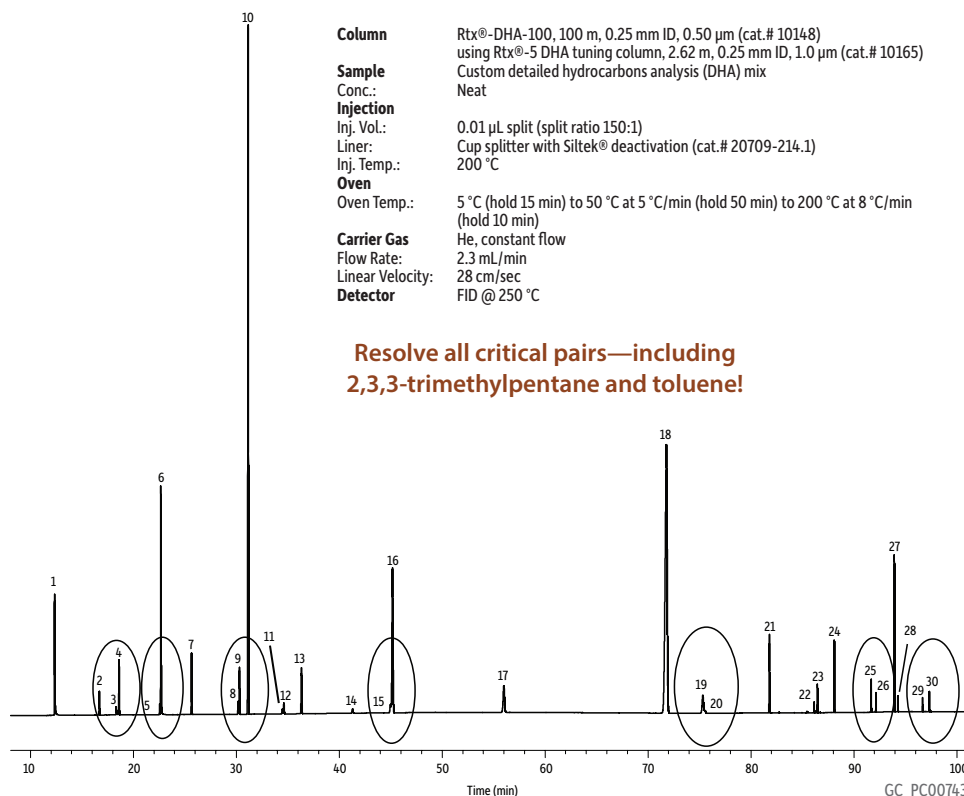
ID	df	temp. limits	50-Meter cat.#	100-Meter cat.#	150-Meter cat.#
0.20 mm	0.50 µm	-60 to 300/340 °C	10147		
0.25 mm	0.50 µm	-60 to 300/340 °C		10148	
	1.00 µm	-60 to 280/340 °C			10149

### Rtx®-5 DHA Tuning Column (fused silica)

(Crossbond® 5% diphenyl/95% dimethyl polysiloxane—optimized for hydrocarbon analysis)

ID	df	temp. limits	5-Meter cat.#
0.25 mm	1.00 µm	-60 to 325/350 °C	10165

## Detailed Hydrocarbons Analysis on Rtx®-DHA-100



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## Simulated Distillation Analysis (C5-C44)

### Rtx®-2887 Column (fused silica)

(nonpolar phase; Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

- Application-specific column for simulated distillation.
- Stable to 360 °C.

The Rtx®-2887 column's stationary phase, column dimensions, and film thickness have been optimized to exceed the resolution and skewing factor requirements specified in ASTM Method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times.

ID	df	temp. limits	10-Meter cat.#
0.53 mm	2.65 µm	-60 to 360 °C	10199

### similar phases

DB-2887, Petrocol 2887, Petrocol EX2887

### also available

MXT®-1HT SimDist  
and more simulated  
distillation products

See **pages 113–115.**



### free literature

#### Rtx®-2887/MXT®-2887

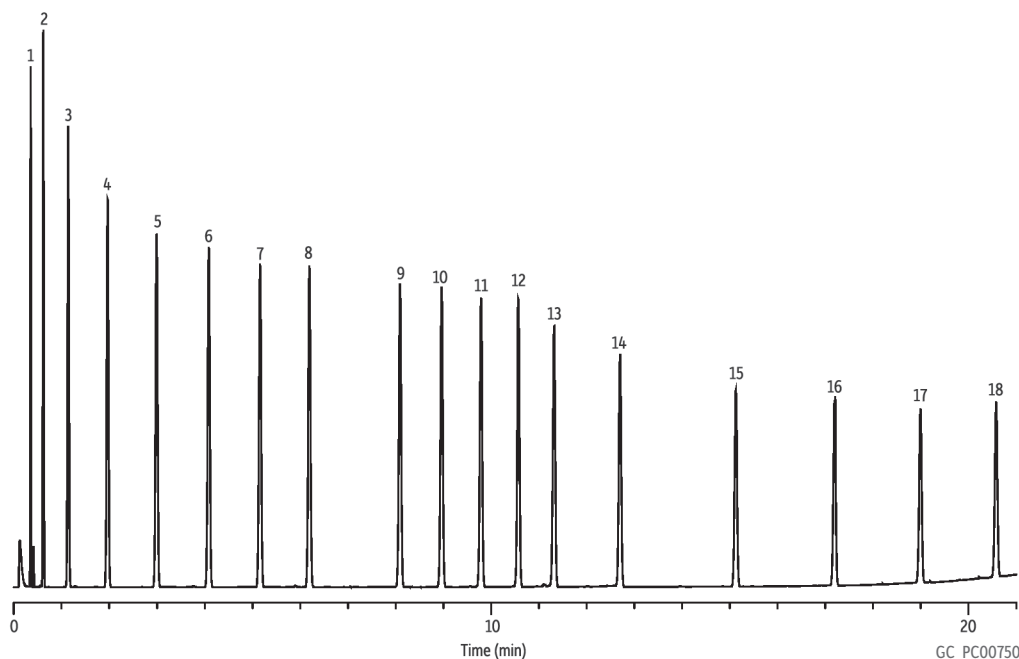
Restek's Capillary GC Columns for Simulated  
Distillation of Petroleum Fractions

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lit. cat.# 59567B



### Simulated Distillation (C5-C44) on Rtx®-2887

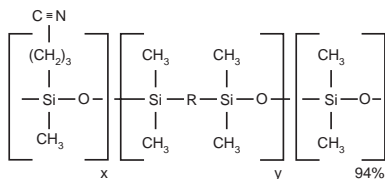


- Peaks**
1. C5
  2. C6
  3. C7
  4. C8
  5. C9
  6. C10
  7. C11
  8. C12
  9. C14
  10. C16
  11. C18
  12. C20
  13. C24
  14. C28
  15. C32
  16. C36
  17. C40
  18. C44

**Column** Rtx®-2887, 10 m, 0.53 mm ID, 2.65 µm (cat.# 10199)  
**Sample** C5 to C44 hydrocarbon standard  
**Diluent:** Carbon disulfide  
**Conc.:** 0.01-0.1 wt. %  
**Injection**  
**Inj. Vol.:** 1 µL direct  
**Inj. Temp.:** 360 °C  
**Oven**  
**Oven Temp.:** 35 °C to 360 °C at 15 °C/min (hold 5 min)  
**Carrier Gas** He, constant flow  
**Flow Rate:** 15 mL/min  
**Linear Velocity:** 112 cm/sec  
**Detector** FID @ 360 °C

## G43 phase

## Rxi®-624Sil MS Structure



## similar phases

DB-624, VF-624ms, CP-Select 624 CB

## Organic Volatile Impurities (OVI) Analysis

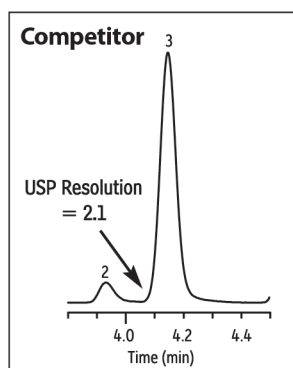
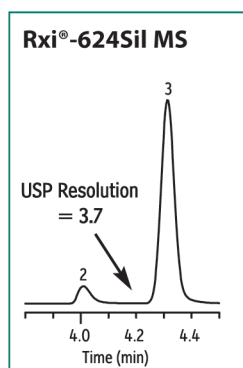
## Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

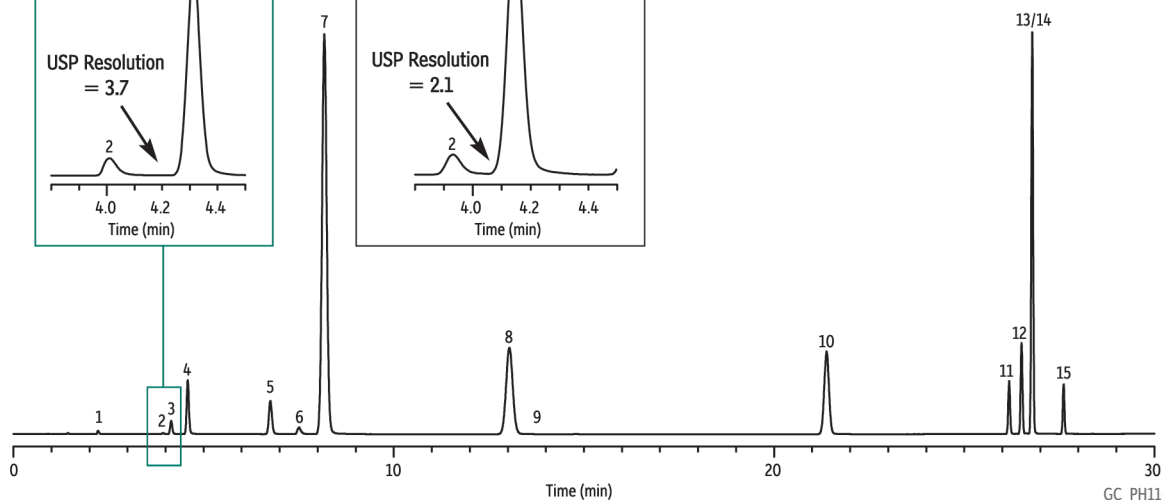
- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter cat.#	30-Meter cat.#	60-Meter cat.#	75-Meter cat.#	105-Meter cat.#
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

## Competitor Comparison: Class 2 - Mix A Residual Solvents for USP &lt;467&gt; Water-Soluble Articles



Improve system suitability pass rates with greater resolution on Rxi®-624Sil MS columns.



GC\_PH1161

**Column** Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)  
**Sample** Residual solvents class 2 - mix A (cat.# 36271)  
**Diluent:** Water  
**Injection** Headspace-loop split (split ratio 5:1)  
**Liner:** 1 mm split (cat.# 20972)  
**Headspace-Loop**  
**Inj. Port Temp.:** 140 °C  
**Instrument:** Tekmar HT3  
**Inj. Time:** 1 min  
**Transfer Line Temp.:** 110 °C  
**Valve Oven Temp.:** 110 °C  
**Sample Temp.:** 80 °C  
**Sample Equil. Time:** 60 min  
**Vial Pressure:** 10 psi  
**Pressurize Time:** 0.5 min  
**Pressure**  
**Equilibration Time:** 0.05 min  
**Loop Pressure:** 5 psi  
**Loop Fill Time:** 0.1 min  
**Oven**  
**Oven Temp.:** 40 °C (hold 20 min) to 240 °C at 10 °C/min (hold 20 min)  
**Carrier Gas** He, constant flow  
**Linear Velocity:** 35 cm/sec  
**Dead Time:** 1.45 min @ 40 °C  
**Detector** FID @ 250 °C  
**Data Rate:** 5 Hz  
**Instrument** Agilent/HP6890 GC  
**Acknowledgement** Teledyne Tekmar

Peaks	TR (min)	Conc. (µg/mL)
1. Methanol	2.281	25.00
2. Acetonitrile	4.009	3.42
3. Dichloromethane	4.313	5.00
4. <i>trans</i> -1,2-Dichloroethene	4.798	7.83
5. <i>cis</i> -1,2-Dichloroethene	7.028	7.83
6. Tetrahydrofuran	7.706	5.75
7. Cyclohexane	8.708	32.33
8. Methylcyclohexane	14.099	9.83
9. 1,4-Dioxane	15.054	3.17
10. Toluene	22.018	7.42
11. Chlorobenzene	26.570	3.00
12. Ethylbenzene	26.837	3.07
13. <i>m</i> -Xylene	27.147	10.85
14. <i>p</i> -Xylene	27.147	2.53
15. <i>o</i> -Xylene	27.927	1.63

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## Organic Volatile Impurities (OVI) Analysis

### Stabilwax® Columns (fused silica)

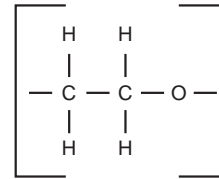
(polar phase; Crossbond® polyethylene glycol)

- Most stable polyethylene glycol (PEG) column available.
- Rugged enough to withstand repeated water injections.
- Lowest-bleed PEG column on the market; long column lifetimes.
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. The bonding mechanism of the column also produces polar compound retention times that do not shift, as is often observed on other wax-type columns. In addition, this bonding mechanism produces a column that can be rejuvenated by solvent washing.

### G16 phase

#### Stabilwax® Structure



### similar phases

HP-INNOWax, CP-Wax 52 CB, VF-WAX MS, ZB-WAXplus

### ordering note

**Get the protection without the connection!**  
For Stabilwax® columns with built-in Integra-Guard® guard columns, see **page 23**.

### free literature

#### Custom Residual Solvent Mixes

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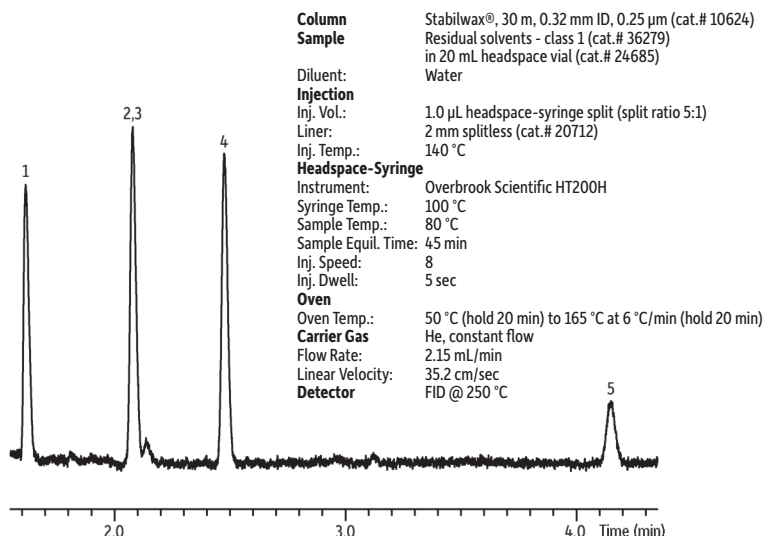
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PHTS1212



ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	40 to 250/260 °C	10605	10608	10611
	0.25 µm	40 to 250/260 °C	10620	10623	10626
	0.50 µm	40 to 250/260 °C	10635	10638	10641
0.32 mm	0.25 µm	40 to 250/260 °C	10621	10624	10627
	0.50 µm	40 to 250/260 °C	10636	10639	10642
	1.00 µm	40 to 240/250 °C	10651	10654	10657
0.53 mm	0.25 µm	40 to 250/260 °C	10622	10625	10628
	0.50 µm	40 to 250/260 °C	10637	10640	10643
	1.00 µm	40 to 240/250 °C	10652	10655	10658
	1.50 µm	40 to 230/240 °C	10666	10669	10672
	2.00 µm	40 to 220/230 °C	10667	10670	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831
0.18 mm	0.18 µm	40 to 250 °C		40602

### Residual Solvents (Class 1) on Stabilwax® (G16)



#### Peaks

- 1,1-Dichloroethene
- 1,1,1-Trichloroethane
- Carbon tetrachloride
- Benzene
- 1,2-Dichloroethane

System suitability  
criteria met

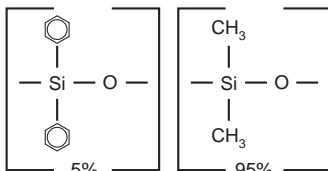
GC\_PH00951

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e-mail: sales @ chromtech.net.au

## G27 phase

Rtx<sup>®</sup>-5 Structure

Similar to: (5%-phenyl)-methylpolysiloxane

## similar phases

HP-5, DB-5, CP-Sil 8 CB, ZB-5

NOTE: DB-5MS is a silarylene-based polymer, similar to Rxi-5Sil MS.

USP

Pharmaceutical  
Standards

See pages 595–596.



## Organic Volatile Impurities (OVI) Analysis

Rtx<sup>®</sup>-5 (G27) Columns (fused silica)(low-polarity phase; Crossbond<sup>®</sup> diphenyl dimethyl polysiloxane)

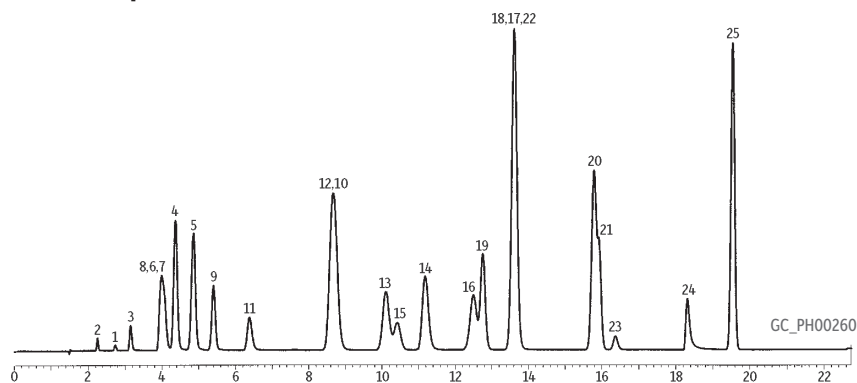
- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semivolatiles.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G27 and G36 phases.

The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx<sup>®</sup>-5 polymer, providing a tight mono-modal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/350 °C	10205	10208	10211	
	0.25 µm	-60 to 330/350 °C	10220	10223	10226	10229
	0.50 µm	-60 to 330/350 °C	10235	10238	10241	10244
	1.00 µm	-60 to 325/340 °C	10250	10253	10256	10259
0.32 mm	0.10 µm	-60 to 330/350 °C	10206	10209		
	0.25 µm	-60 to 330/350 °C	10221	10224	10227	
	0.50 µm	-60 to 330/350 °C	10236	10239	10242	
	1.00 µm	-60 to 325/340 °C	10251	10254	10257	10260
	1.50 µm	-60 to 310/330 °C	10266	10269	10272	10275
	3.00 µm	-60 to 280/300 °C	10281	10284	10287	10290
0.53 mm	0.10 µm	-60 to 320/340 °C	10207	10210		
	0.25 µm	-60 to 320/340 °C	10222	10225	10228	
	0.50 µm	-60 to 320/330 °C	10237	10240	10243	
	1.00 µm	-60 to 320/330 °C	10252	10255	10258	
	1.50 µm	-60 to 310/330 °C	10267	10270	10273	
	3.00 µm	-60 to 270/290 °C	10282	10285	10288	
	5.00 µm	-60 to 270/290 °C	10277	10279	10283	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 325/340 °C	40201	40202	40203
	0.40 µm	-60 to 315/330 °C	40210	40211	40212

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Organic Volatile Impurities on Rtx<sup>®</sup>-5 (Rtx<sup>®</sup>-G27)

## Peaks

1. Ethylene oxide
2. Methanol
3. Ethanol
4. Diethyl ether
5. 1,1-Dichloroethane
6. Acetone
7. Isopropanol
8. Acetonitrile
9. Methylene chloride
10. *n*-Hexane
11. *n*-Propanol
12. Methyl ethyl ketone
13. Ethyl acetate
14. Tetrahydrofuran
15. Chloroform
16. 1,1,1-Trichloroethane
17. Carbon tetrachloride
18. Benzene
19. 1,2-Dichloroethane
20. Heptane
21. Trichloroethylene
22. *n*-Butanol
23. 1,4-Dioxane
24. Pyridine
25. Toluene

**Column** Rtx<sup>®</sup>-5 w/5m Integra-Guard<sup>®</sup> Column (Rtx<sup>®</sup>-G27), 30 m, 0.53 mm ID, 5.00 µm (cat.# 10279-126)  
**Sample** Headspace injection of common solvents for pharmaceutical processing. Prepared to equal about 500 ppm in the bulk pharmaceutical. Samples shaken and heated at 90 °C for 15 minutes, 1 mL headspace injection.

**Injection**  
 Inj. Vol.: 1,000 µL headspace-syringe split (split ratio 2:1)  
 Inj. Temp.: 220 °C

**Oven**  
 Oven Temp.: 35 °C (hold 10 min) to 100 °C at 5 °C/min to 240 °C at 25 °C/min (hold 5 min)

**Carrier Gas**  
 He, constant pressure  
 Linear Velocity: 35 cm/sec @ 35 °C

**Detector**  
 FID @ 240 °C

**Notes**  
 FID sensitivity: 1.05 x 10<sup>-11</sup> AFS

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## Organic Volatile Impurities (OVI) Analysis

### Rtx®-G27 Column (fused silica with 5-meter Integra-Guard® guard column)

(Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns for residual solvents in pharmaceutical products.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G27 stable to 290 °C.

Some methods require the use of a guard column. Our Integra-Guard® integrated guard column system makes it easy to comply.

ID	df	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column cat.#
0.53 mm	5.00 µm	-60 to 270/290 °C	10279-126

### Rtx®-G43 Column (fused silica with 5-meter Integra-Guard® guard column)

(Crossbond® cyanopropylmethyl phenylmethyl polysiloxane)

- Application-specific columns for residual solvents in pharmaceutical products. Meet all requirements of USP <467>.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G43 stable to 240 °C.

Some USP <467> methods require the use of a guard column. Our Integra-Guard® integrated guard column system makes it easy to comply.

ID	df	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column cat.#
0.53 mm	3.00 µm	-20 to 240 °C	16085-126

### free literature

A Technical Guide for  
Static Headspace  
Analysis  
Using GC



lit. cat.#  
59895B

Custom Residual  
Solvents  
Mixes

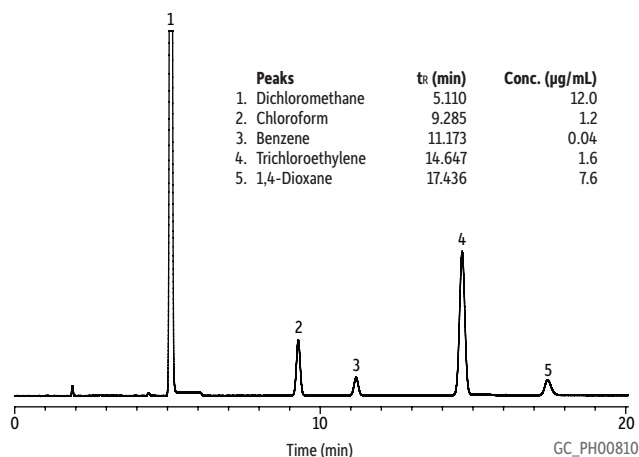


lit. cat.#  
PHTS1212

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### USP <467> Residual Solvents on Rtx®-1301 (G43) by Static Headspace



#### Column

Rtx®-1301 w/5 m Integra-Guard®, 30 m, 0.53 mm ID, 3.00 µm  
(cat.# 16085-126)

#### Sample

USP <467> calibration mixture #5 (cat.# 36007)

#### Diluent:

DMSO

#### Conc.:

To each 22 mL headspace vial 5mL water, ~ 1.0 g of sodium sulfate and 100 µL of stock standard were added. headspace-loop split (split ratio 2:1)

#### Injection

##### Headspace-Loop

Inj. Port Temp.: 180 °C  
Instrument: Teledyne Tekmar HT3  
Inj. Time: 1.0 min  
Transfer Line Temp.: 150 °C  
Valve Oven Temp.: 150 °C  
Standby flow rate: 10 mL/min  
Sample Temp.: 80 °C  
Platen temp equil. time: 2.0 min  
Sample Equil. Time: 15.0 min  
Mixer time: 2.0 min  
Mixing level: 5  
Mixer stabilize time: 0.5 min  
Vial Pressure: 15 psi  
Pressurize Time: 2.0 min  
Pressure Equilibration Time: 0.5 min  
Loop Pressure: 5 psi  
Loop Fill Time: 2.0 min  
Loop fill equil. time: 0.5 min

#### Oven

Oven Temp.: 40 °C (hold 20 min) to 240 °C at 25 °C/min (hold 10 min)

#### Carrier Gas

He, constant flow

#### Flow Rate:

5 mL/min

#### Detector

FID @ 250 °C

#### Make-up Gas Flow Rate:

45 mL/min

#### Notes

**FID conditions:**

hydrogen flow: 40 mL/min

air flow: 450 mL/min

## Acidic Compounds Analysis

**Stabilwax®-DA Columns** (fused silica)

(polar phase; Crossbond® acid-deactivated Carbowax® polyethylene glycol—for acidic compounds)

- Application-specific columns for free (underivatized) acids, some inorganic acids.
- Resistant to oxidative damage.
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G25, G35 phases.

Stabilwax®-DA bonded polyethylene glycol has an acidic functionality incorporated into the polymer structure. This permits analysis of acidic compounds without derivatization, significantly reduces adsorption of acids, and increases sample capacity for volatile free acids. Stabilwax®-DA columns last longer and give better peak shapes for high molecular weight acids.

Some inorganic acids also chromatograph well on a Stabilwax®-DA column; the limitation is the volatility of the acidic compound.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	40 to 250/260 °C	11005	11008	
	0.25 µm	40 to 250/260 °C	11020	11023	11026
	0.50 µm	40 to 250/260 °C	11035	11038	11041
0.32 mm	0.10 µm	40 to 250/260 °C		11009	
	0.25 µm	40 to 250/260 °C	11021	11024	11027
	0.50 µm	40 to 250/260 °C	11036	11039	11042
	1.00 µm	40 to 240/250 °C	11051	11054	11057
0.53 mm	0.10 µm	40 to 250/260 °C	11007		
	0.25 µm	40 to 250/260 °C	11022	11025	
	0.50 µm	40 to 250/260 °C	11037	11040	
	1.00 µm	40 to 240/250 °C	11052	11055	11058
	1.50 µm	40 to 230/240 °C	11062	11065	11068

## similar phases

HP-FFAP, DB-FFAP, CP-WAX 58 FFAP CB, NUKOL, ZB-FFAP

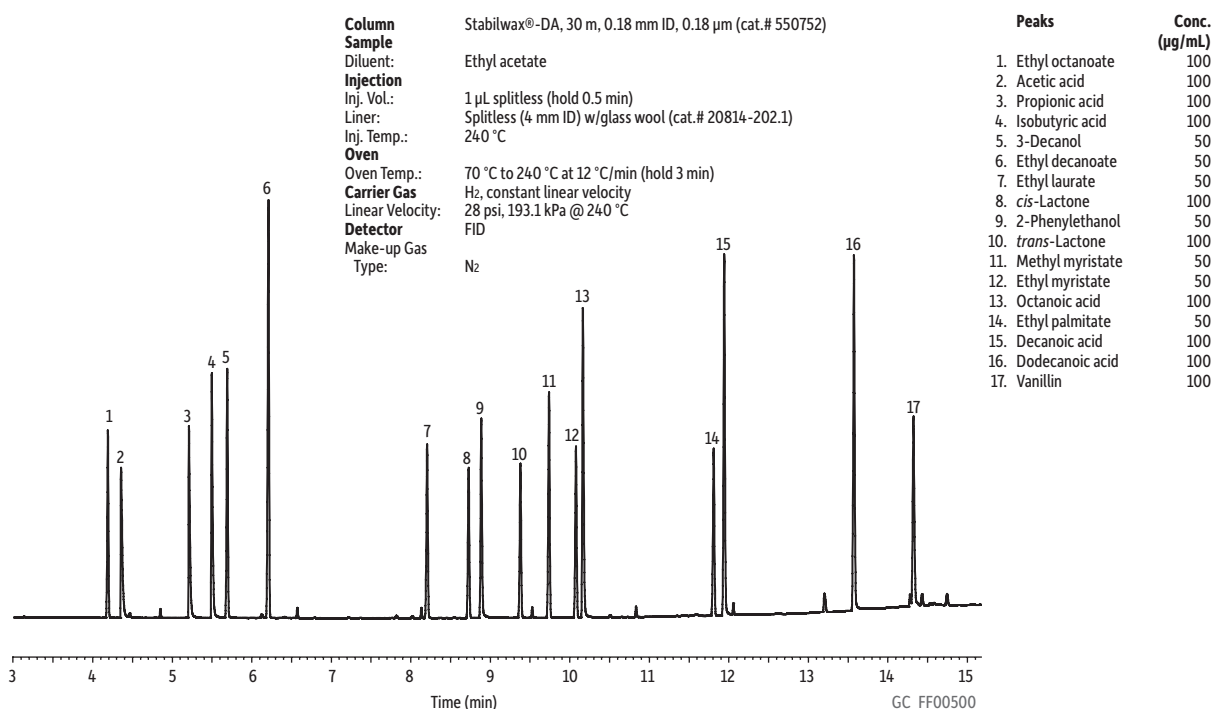
## crossbond® technology

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

## please note

Stabilwax®-DA columns should not be rinsed with water.

## Underivatized Alcoholic Beverage Acids and Methyl Esters on Stabilwax®-DA



## Basic Compounds Analysis

### Rtx®-Volatile Amine Columns (fused silica)

- Unique selectivity for baseline resolution of all volatile amines.
- Excellent inertness assures accuracy and sensitivity for volatile amines, including free ammonia.
- Highly robust phase withstands repeated water injections, resulting in longer column lifetime.
- High temperature stability (290 °C) ensures elution of amines up to C16 and allows contaminants to be removed by “baking out” the column.

The Rtx®-Volatile Amine column was designed specifically for analyzing volatile amines in difficult matrices, such as water. The unique base deactivation creates an exceptionally inert surface for these sensitive compounds, resulting in highly symmetrical peaks, which allow low detection limits. The stable bonded phase yields a column that is not only retentive and highly selective for these compounds but is also very robust and able to withstand repeated water injections. Comparisons made by customers performing routine volatile amine applications have shown the Rtx®-Volatile Amine column outperforms other amine-specific columns, especially for peak shape and lifetime. Each Rtx®-Volatile Amine column is held to stringent quality specifications and tested with a specially designed test mix that includes basic compounds to ensure exceptional inertness, reliability, and reproducibility. These qualities assure consistent performance and make the Rtx®-Volatile Amine column the best choice for volatile amines analysis.

### similar phases

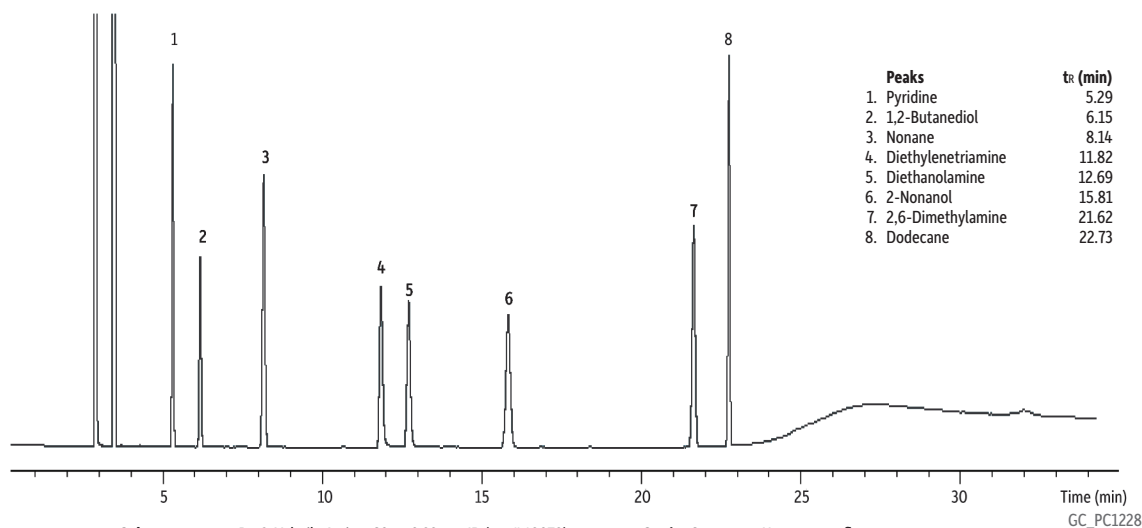
CP-Volamine

### please note

We recommend using base-deactivated fused silica guard columns (**page 22**) and base-deactivated liners (**page 203**) with Rtx®-Volatile Amine columns.

ID	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.32 mm	-60 to 270/290 °C	18076	18077	18078

### Volatile Amine Test Mix on Rtx®-Volatile Amine (60 m x 0.32 mm ID)



**Column** Rtx®-Volatile Amine, 60 m, 0.32 mm ID (cat.# 18078)  
**Sample** Volatile amine column test mix (cat.# 35008)  
**Diluent:** Methanol:dichloromethane (50:50)  
**Conc.:** 900-1,800 µg/mL snap and shoot  
**Injection**  
**Inj. Vol.:** 1 µL split (split ratio 17.8:1)  
**Liner:** Sky® 4 mm single taper w/wool (cat.# 23303.1)  
**Inj. Temp.:** 250 °C  
**Split Vent**  
**Flow Rate:** 60 mL/min  
**Oven**  
**Oven Temp.:** 160 °C (hold 21 min) to 290 °C at 40 °C/min (hold 10 min)

**Carrier Gas** He, constant flow  
**Flow Rate:** 3.4 mL/min  
**Detector** FID @ 300 °C  
**Make-up Gas**  
**Flow Rate:** 30 mL/min  
**Make-up**  
**Gas Type:** Nz  
**Data Rate:** 50 Hz  
**Instrument** Agilent/HP6890 GC

GC\_PC1228

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similar phases

Optima-5Amine

## Basic Compounds Analysis

### Rtx®-5 Amine Columns (fused silica)

(low-polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 315 °C.

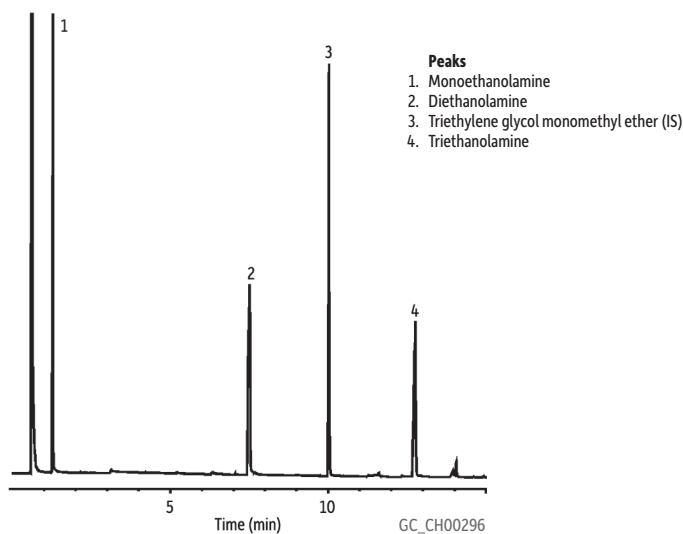
Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-5 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-5 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds, adsorptive compounds with oxygen groups susceptible to hydrogen bonding, or even weakly acidic compounds such as phenols. Every Rtx®-5 Amine column is tested to ensure that it exceeds the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.25 µm	-60 to 315 °C	12320	12323
	0.50 µm	-60 to 300/315 °C	12335	12338
	1.00 µm	-60 to 300/315 °C	12350	12353
0.32 mm	1.00 µm	-60 to 300/315 °C	12351	12354
	1.50 µm	-60 to 290/305 °C	12366	12369
0.53 mm	1.00 µm	-60 to 290/305 °C	12352	12355
	3.00 µm	-60 to 280/295 °C	12382	12385

### please note

We recommend using base-deactivated fused silica guard columns (page 22) and base-deactivated liners (page 203) with Rtx®-5 Amine columns.

### Ethanolamines on Rtx®-5 Amine



**Column** Rtx®-5 Amine, 15 m, 0.25 mm ID, 0.50 µm (cat.# 12335)  
**Sample** Ethanolamine mix  
**Diluent:** Methanol  
**Conc.:** 34 ng on column  
**Injection**  
**Inj. Vol.:** 1.0 µL split (split ratio 58:1)  
**Inj. Temp.:** 280 °C  
**Oven**  
**Oven Temp.:** 50 °C (hold 2 min) to 180 °C at 10 °C/min (hold 2 min)  
**Carrier Gas** H<sub>2</sub>, constant pressure  
**Linear Velocity:** 43 cm/sec @ 50 °C  
**Detector** FID @ 300 °C  
**Notes** FID sensitivity: 6.4 x 10<sup>-11</sup> AFS



## Basic Compounds Analysis

### Rtx®-35 Amine Columns (fused silica)

(midpolarity phase; Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 220 °C.

Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-35 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-35 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds and adsorptive compounds with oxygen groups susceptible to hydrogen bonding. Every Rtx®-35 Amine column is tested to ensure that it meets the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

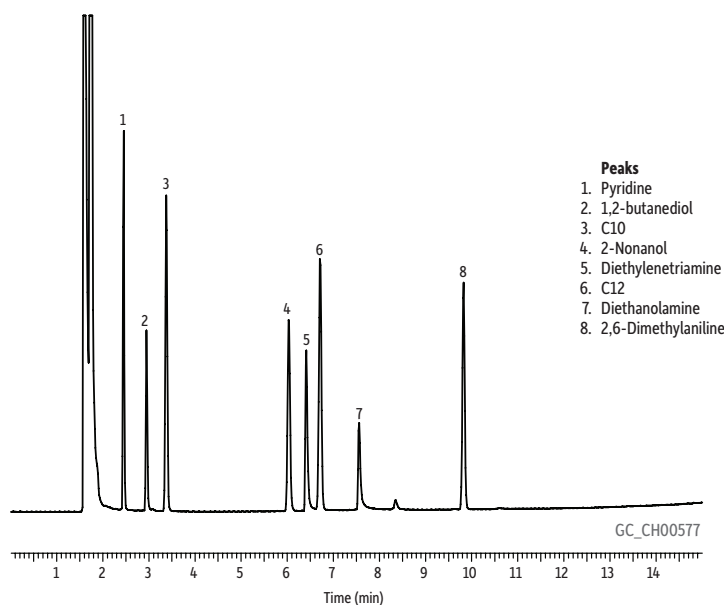
ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.50 µm	0 to 220 °C	11335	11338
	1.00 µm	0 to 220 °C	11350	11353
0.32 mm	1.00 µm	0 to 220 °C	11351	11354
	1.50 µm	0 to 220 °C	11366	11369
0.53 mm	1.00 µm	0 to 220 °C	11352	11355
	3.00 µm	0 to 220 °C		11385

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### please note

We recommend using base-deactivated fused silica guard columns (**page 22**) and base-deactivated liners (**page 203**) with Rtx®-35 Amine columns.

### Amine Test Mix Rtx®-35 Amine



**Column** Rtx®-35 Amine, 30 m, 0.53 mm ID, 1.00 µm (cat.# 11355)  
**Sample** Amine column test mix (cat.# 35002)  
**Diluent:** Methanol/methylene chloride  
**Conc.:** 450-900 ppm  
**Injection**  
**Inj. Vol.:** 1.0 µL split (split ratio 10:1)  
**Liner:** Splitless taper (4 mm), base deactivated (cat.# 20798-210.1)  
**Inj. Temp.:** 250 °C  
**Oven**  
**Oven Temp.:** 110 °C (hold 4 min) to 200 °C at 8 °C/min (hold 5 min)  
**Carrier Gas** He, constant pressure  
**Linear Velocity:** 30 cm/sec  
**Detector** FID @ 300 °C



Because Restek is employee owned and independent, we are dedicated to providing the right solutions for all types of instruments.

## similar phases

CAM, CP-WAX 51 for Amines, Carbowax® Amine



**NEW!**

Speed Up  
and Simplify GC  
Method Development

**Restek's EZGC®  
Online Suite**

[www.restek.com/ezgc](http://www.restek.com/ezgc)

## Basic Compounds Analysis

### Stabilwax®-DB Columns (fused silica)

(polar phase; Crossbond® base-deactivated Carbowax® polyethylene glycol—for amines and basic compounds)

- Application-specific columns for underivatized amines and other basic compounds, including alkylamines, diamines, triamines, nitrogen-containing heterocyclics. No need for column priming.
- Temperature range: 40 °C to 220 °C.

Stabilwax®-DB columns reduce adsorption and improve responses for many basic compounds, without analyte derivatization or column priming. For different selectivity of basic compounds, or higher oven temperatures, use an Rtx®-5 Amine column.

Stabilwax®-DB is a bonded stationary phase, but avoid rinsing these columns with water or alcohols.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 210/220 °C	10820	10823	
	0.50 µm	40 to 210/220 °C		10838	
0.32 mm	0.25 µm	40 to 210/220 °C	10821	10824	
	0.50 µm	40 to 210/220 °C		10839	
	1.00 µm	40 to 210/220 °C	10851	10854	10857
0.53 mm	0.50 µm	40 to 210/220 °C		10840	
	1.00 µm	40 to 210/220 °C	10852	10855	10858
	1.50 µm	40 to 210/220 °C		10869	

### Volatile Organic Compounds by U.S. EPA Method 1671 on Stabilwax®-DB

Peaks	tr (min)	Conc. (µg/mL)
1. Dimethylamine	1.71	200
2. Methylamine	1.76	200
3. Diethylamine	2.46	200
4. Triethylamine	2.64	200
5. Tetrahydrofuran (IS)	4.88	100
6. Methanol	7.12	40
7. Ethanol	8.01	40
8. Acetonitrile	9.82	200
9. n-Propanol	11.03	200
10. Methyl Cellosolve®	15.56	200
11. Formamide	18.68	500
12. Dimethyl sulfoxide	23.75	100
13. Ethylene glycol*		500

\*Included in sample, but does not elute due to base deactivation in the DB phase.

**Columns** Stabilwax®-DB 30 m, 0.32 mm ID, 1.00 µm (cat.# 10854) and Stabilwax® 30 m, 0.32 mm ID, 1.00 µm (cat.# 10654) using IP deactivated guard column 5 m, 0.53 mm ID (cat.# 10045) with SeCure® "Y" connector kit (cat.# 20278)

**Sample** 1671 Volatile organics mix

**Diluent:** Deionized water

**Injection**

**Inj. Vol.:** 1.0 µL split (split ratio 12:1)

**Liner:** Gooseneck splitless (4 mm) (cat.# 20798)

**Inj. Temp.:** 200 °C

**Oven**

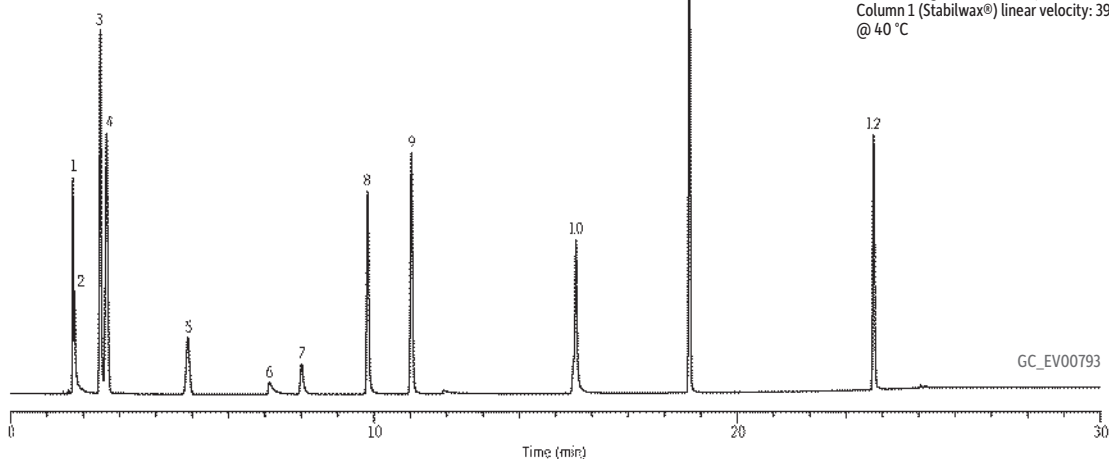
**Oven Temp.:** 40 °C (hold 5 min) to 180 °C at 7 °C/min (hold 5 min)

**Carrier Gas** He, constant pressure

**Linear Velocity:** 39.68 cm/sec @ 40 °C

**Detector** FID @ 250 °C

**Notes** "Y" Press-Tight® Connector (cat.# 20405) also used  
Column 1 (Stabilwax®) linear velocity: 39.25 cm/sec @ 40 °C





## Chiral Analysis

### Cyclodextrin Columns for Analyzing Many Chiral Compounds

By adding  $\beta$  or  $\gamma$  cyclodextrin to our bonded Rtx<sup>®</sup>-1701 stationary phase, we greatly enhance overall utility and column lifetime for our chiral columns, compared to columns that have pure cyclodextrin stationary phases. Separations of more than one hundred chiral compounds have been achieved using our unique DEX columns, and our columns continue to demonstrate stability after hundreds of temperature program cycles.

#### Rt<sup>®</sup>- $\gamma$ DEXsa Columns (fused silica)

(2,3-di-acetoxy-6-O-*tert*-butyl dimethylsilyl gamma cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Larger organic molecules. Also useful for flavor compounds in fruit juices.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13113
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13112

#### Rt<sup>®</sup>- $\beta$ DEXm Columns (fused silica)

(permethylated beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: General-purpose chiral phase with many published applications.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13100
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13101

#### Rt<sup>®</sup>- $\beta$ DEXsm Columns (fused silica)

(2,3-di-O-methyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Excellent column for most chiral compounds in essential oils.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13105
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13104

#### Rt<sup>®</sup>- $\beta$ DEXse Columns (fused silica)

(2,3-di-O-ethyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Similar in performance to Rt- $\beta$ DEXsm but provides better resolution for limonene, linalool, linalyl acetate, ethyl-2-methylbutyrate, 2,3-butane diol, and styrene oxides.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13107
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13106

#### Rt<sup>®</sup>- $\beta$ DEXsp Columns (fused silica)

(2,3-di-O-propyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Often useful in dual-column configurations, with the Rt- $\beta$ DEXsm column, for complex enantiomeric separations.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13111
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13110

#### Rt<sup>®</sup>- $\beta$ DEXsa Columns (fused silica)

(2,3-di-acetoxy-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Unique selectivity for esters, lactones, and other fruit flavor components.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13109
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13108

#### Rt<sup>®</sup>- $\beta$ DEXcst Columns (fused silica)

(Proprietary cyclodextrin material added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Proprietary stationary phase, developed specifically for the fragrance industry. Also used for pharmaceutical applications.

ID	df	temp. limits	30-Meter cat.#
0.25 mm	0.25 $\mu$ m	40 to 230 °C	13103
0.32 mm	0.25 $\mu$ m	40 to 230 °C	13102

### free literature

Grape Flavor Analysis,  
Using an Rt<sup>®</sup>- $\gamma$ DEXsa  
GC Column

lit. cat.#  
59553



GC Analysis of Chiral Flavor  
Compounds in Apple Juices,  
Using Rt<sup>®</sup>- $\beta$ DEXsm and  
Rt<sup>®</sup>- $\beta$ DEXse  
Columns

lit. cat.#  
59546



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### tech tip

**Lower elution temperatures significantly improve chiral selectivity.**

This can be achieved the following ways:

- Faster linear velocities (80 cm/sec) with hydrogen carrier gas.
- Slower temperature ramp rates (1–2 °C/min).
- Appropriate minimum operating temperature (40 or 60 °C).
- On-column concentrations of 50 ng or less.



# GC Columns

## Metal MXT<sup>®</sup> Capillary Columns

MXT <sup>®</sup> Columns Overview.....	105
Guard/Retention Gap Columns.....	106
General-Purpose Columns.....	107–110
MXT <sup>®</sup> -1.....	107
MXT <sup>®</sup> -5.....	108
MXT <sup>®</sup> -50.....	109
MXT <sup>®</sup> -1301.....	109
MXT <sup>®</sup> -1701.....	109
MXT <sup>®</sup> -200.....	110
MXT <sup>®</sup> -WAX.....	110
Application-Specific Columns.....	111–115
Environmental.....	111
MXT <sup>®</sup> -502.2, MXT <sup>®</sup> -Volatiles, MXT <sup>®</sup> -624	
Foods, Flavors, & Fragrances.....	112
MXT <sup>®</sup> -65TG	
Petroleum & Petrochemical.....	113–115
MXT <sup>®</sup> -Biodiesel TG, MXT <sup>®</sup> -2887,	
MXT <sup>®</sup> -1HT SimDist, MXT <sup>®</sup> -500 SimDist	





### What is an MXT® column?

MXT® columns are wall coated open tubular (WCOT) columns made from stainless steel tubing that has had the internal surface treated with an exclusive Siltek® treatment. This treatment makes the surface as inert as deactivated fused silica, and it allows us to treat the tubing with a wide variety of polymer phases. The unique Siltek® treatment also enables us to offer MXT® columns in a wide range of internal diameters, including 0.18 mm, 0.25 mm, 0.28 mm, 0.32 mm, and 0.53 mm. Because the Siltek® treatment permeates the stainless steel surface, rather than simply coating it, the layer is exceptionally flexible, so the tubing can be coiled to very small diameters. The standard coil diameter for most MXT® columns is 4.5", but they also are available in 3.5" and 6" coil diameters.

**Whether you're using them in a process GC or a benchtop GC, our MXT® columns will be a perfect fit. Just add the proper suffix number in the table to the column part number when you order!**

Coil Diameter	Suffix Number	Configuration
3.5"	-273	Bundled
4.5"	None	Standard Banded
6.0"	-276	Bundled

Additional sizes and configurations may be available; call for details.

Note that the minimum coil diameter for 0.53 mm ID columns is 2.5 inches, and the minimum coil diameter for 0.25 mm ID columns is 1.5 inches.

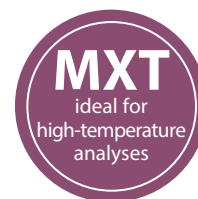
### MXT® columns are your best choice for high temperature analyses and situations in which the potential for column breakage is high. Here's why:

- Metal tubing allows MXT® columns to be used to higher temperatures (430 °C) than fused silica columns (standard rating is 360 °C). This is because the polyimide resin that encases the fused silica becomes brittle over time at high temperatures. MXT® columns do not become brittle or break.
- Inertness of MXT® columns and fused silica columns is similar, due to the unique properties of the Siltek® surface treatment.
- Metal columns can be coiled under 4.5 inches without breaking, making them ideal for small instruments.
- Coating efficiency (plates/meter) of MXT® columns is similar to that of fused silica.
- MXT® columns will not break under stress, making them perfect for process GCs and field instruments.

**MXT®-Biodiesel TG columns are undamaged by high thermal cycles compared to high-temperature (HT) fused silica columns, which break down under the same conditions.**

MXT®-Biodiesel TG columns are undamaged by high thermal cycles.  
100 temperature cycles to 430 °C totaling 500 minutes at maximum temperature.

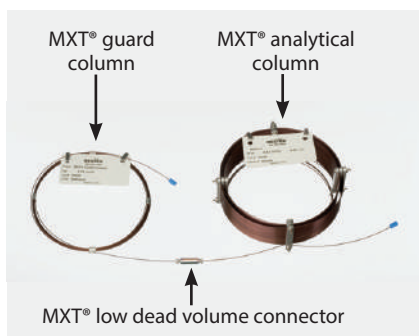
HT fused silica columns, labeled as stable to 430 °C, show pitting and breakdown.



### Custom MXT® columns are also available.

If you do not see the column you need listed in the following pages, contact Customer Service and we will be happy to help.

### Connect MXT® columns using an MXT® low dead volume connector!



## Connect transfer lines or guard columns directly to your MXT® columns without compromising your data.

Rugged MXT® low dead volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns! They can be used at temperatures up to 430 °C without degrading the deactivated layer, and their low thermal mass tracks rapid oven temperature programming. Kits are available for 0.28 mm, 0.32 mm, and 0.53 mm ID columns in a standard configuration for column-to-column connections and a “Y” configuration for connecting two columns to one inlet or one column to two detectors. In addition to the MXT® union, each kit also contains stainless steel 1/32-inch ferrules and nuts. (See page 232 for more details.)

### Intermediate-Polarity Deactivated MXT® Guard/Retention Gap Columns/Transfer Lines (passivated stainless steel)

- Useful for a wide range of applications.
- Compatible with most common solvents.
- Maximum temperature: 325 °C.

Nominal ID	Nominal OD	5-Meter cat.#	5-Meter (6-pk.) cat.#	10-Meter cat.#
0.28 mm	0.56 ± 0.025 mm	70044	70044-600	70046
0.53 mm	0.74 ± 0.025 mm	70045	70045-600	70047

### did you know?

Certificates of analysis for 5 m and 10 m Restek® guard columns are provided electronically. To view and download your 5 m or 10 m guard column certificate, simply visit [www.restek.com/documentation](http://www.restek.com/documentation) then enter your catalog # and serial #.

### Hydroguard®-Treated MXT® Guard/Retention Gap Columns/Transfer Lines (passivated stainless steel)

- Extend analytical column lifetime by preventing degradation from harsh “steam-cleaning” water injections.
- Maximum temperature: 325 °C.

When transfer lines from purge-and-trap systems, air monitoring equipment, or other instruments carry condensed water vapor, deactivated column tubing quickly becomes active because of the creation of free silanol groups. These silanol groups adsorb active oxygenated compounds, such as alcohols and diols.

Restek chemists have addressed this concern and found a solution—Hydroguard® deactivated tubing. A unique deactivation chemistry creates a high-density surface that is not readily attacked by aggressive hydrolysis. The high-density surface coverage of the Hydroguard® deactivation layer effectively prevents water vapor from reaching the surface beneath. Use Hydroguard® tubing for connecting GCs to:

- Headspace analyzers.
- Air analysis equipment and concentrator units.
- Purge-and-trap systems.

Nominal ID	Nominal OD	5-Meter cat.#	10-Meter cat.#	30-Meter* cat.#
0.28 mm	0.56 ± 0.025 mm	70080	70083	70086
0.53 mm	0.74 ± 0.025 mm	70081	70084	70087

\*30-meter lengths are banded in 5-meter sections.

Diameters greater than 0.10 mm are tested with the Grob test mix to ensure high inertness.

### also available

Column connector kits & ferrules

See page 232.



**MXT®-1 Columns** (Siltek®-treated stainless steel)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

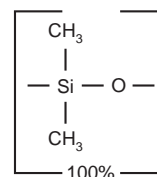
- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, and oxygenates.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G1, G2, G38 phases.
- 4.5" standard coil diameter.

MXT®-1 columns exhibit long lifetime and very low bleed at high operating temperatures. A proprietary synthesis process eliminates residual catalysts that could cause degradation and increase bleed.

ID	df	temp. limits*	6-Meter cat.#	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	0.10 µm	-60 to 360/430 °C		70105	70116	70117	70114
	0.25 µm	-60 to 360/430 °C		70120	70123	70126	70129
	0.50 µm	-60 to 330/400 °C		70135	70138		
	1.00 µm	-60 to 320/360 °C		70150	70153	70156	70159
0.28 mm	0.10 µm	-60 to 360/430 °C	70102	70106	70109		
	0.25 µm	-60 to 360/430 °C		70121	70124	70127	
	0.50 µm	-60 to 400 °C			70139	70142	
	1.00 µm	-60 to 320/360 °C		70151	70154	70157	
0.53 mm	0.15 µm	-60 to 360/430 °C	70101	70107			
	0.25 µm	-60 to 360/430 °C		70122	70125	70128	
	0.50 µm	-60 to 330/400 °C		70137	70140	70143	
	1.00 µm	-60 to 320/360 °C		70152	70155	70158	
0.53 mm	1.50 µm	-60 to 310/360 °C		70167	70170	70173	
	3.00 µm	-60 to 285/360 °C		70182	70185	70188	70189
	5.00 µm	-60 to 270/360 °C		70177	70179	70183	
	7.00 µm	-60 to 240/360 °C		70191	70192	70193	

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 330/430 °C	71811	71812	71813
	0.40 µm	-60 to 320/400 °C		71815	71816

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

**MXT®-1 Structure**

Similar to: (100%-methyl)-polysiloxane

**similar phases**

DB-PS1, UAC-1, UAC-1MS

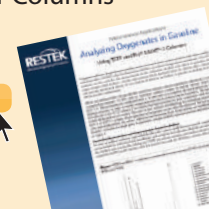
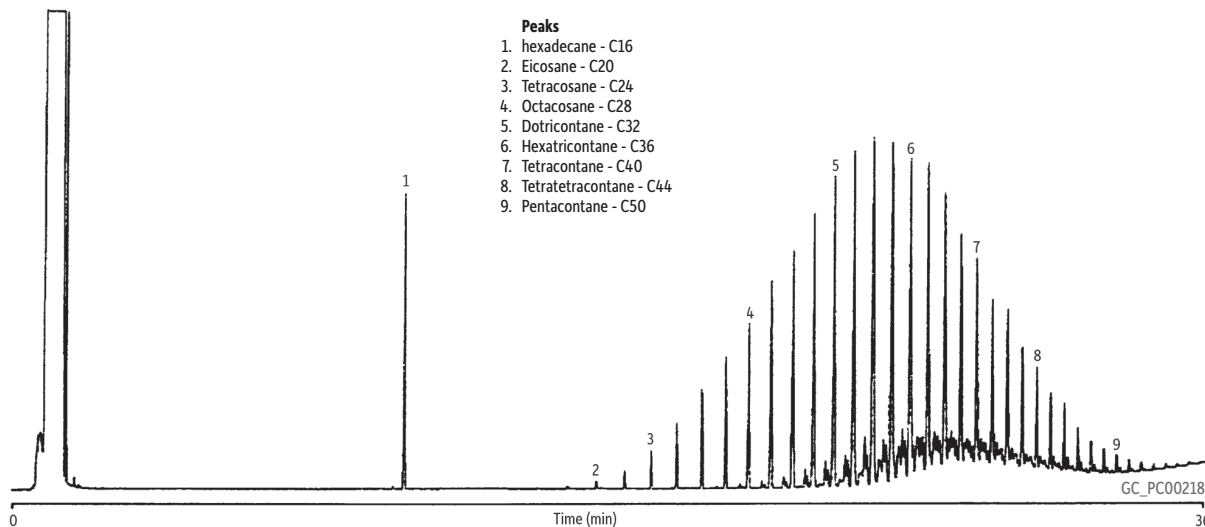
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lit. cat.# 59587A

**Petroleum Wax on MXT®-1**

**Column** MXT®-1, 30 m, 0.28 mm ID, 0.25 µm (cat.# 70124)  
**Sample** Petroleum wax  
**Diluent:** cyclohexane  
**Conc.:** 0.1% w/w  
**Injection**  
 Inj. Vol.: 1.0 µL cold on-column

**Oven**  
 Oven Temp.: 50 °C to 400 °C at 10 °C/min (hold 10 min)  
**Carrier Gas** Hz, constant flow  
**Linear Velocity:** 60 cm/sec @ 50 °C  
**Detector** FID @ 400 °C  
**Notes** FID sensitivity: 64 x 10<sup>-11</sup> AFS

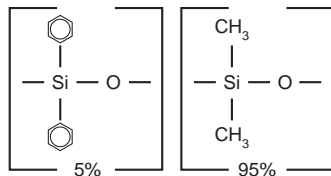
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## General-Purpose Columns

## MXT®-5 Structure



Similar to: (5%-phenyl)-methylpolysiloxane

## similar phases

DB-PS5, VF-5ht UltiMetal, UAC-5, UAC-5MS

also  
availableMetal MXT®  
PLOT Columns

See page 129.



## MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

## MXT®-5 Columns (Siletek®-treated stainless steel)

(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, and semivolatiles.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G27, G36 phases.
- 4.5" standard coil diameter.

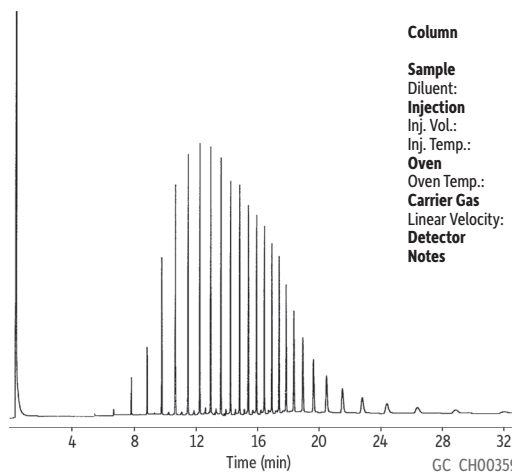
The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the MXT®-5 polymer, providing a tight monomodal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.10 µm	-60 to 330/430 °C	70205	70208	
	0.25 µm	-60 to 360/430 °C	70220	70223	70226
	0.50 µm	-60 to 330/360 °C	70235	70238	70241
	1.00 µm	-60 to 310/340 °C	70250	70253	
0.28 mm	0.25 µm	-60 to 340/430 °C	70221	70224	70227
	0.50 µm	-60 to 315/400 °C	70236	70239	
	1.00 µm	-60 to 310/360 °C	70251	70254	70257
	3.00 µm	-60 to 290/360 °C	70281	70284	
0.53 mm	0.25 µm	-60 to 340/430 °C	70222	70225	70228
	0.50 µm	-60 to 330/400 °C	70237	70240	
	1.00 µm	-60 to 310/360 °C	70252	70255	70258
	1.50 µm	-60 to 300/360 °C	70267	70270	
	3.00 µm	-60 to 290/360 °C	70282	70285	70288
	5.00 µm	-60 to 270/360 °C	70277	70279	70283

ID	df	temp. limits	10-Meter cat.#	20-Meter cat.#	40-Meter cat.#
0.18 mm	0.20 µm	-60 to 325/430 °C	71821	71822	71823
	0.40 µm	-60 to 315/400 °C	71824	71825	

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## Siloxane (Polysiloxane 20) on MXT®-5



**Column** MXT®-5, 15 m, 0.28 mm ID, 0.25 µm (cat.# 70221)  
**Sample** Polysiloxane 20  
**Diluent:** Pentane  
**Injection**  
 Inj. Vol.: 1.0 µL split (split ratio 100:1)  
 Inj. Temp.: 250 °C  
**Oven**  
 Oven Temp.: 75 °C to 340 °C at 15 °C/min  
**Carrier Gas** H<sub>2</sub>, constant flow  
 Linear Velocity: 40 cm/sec  
**Detector** FID @ 340 °C  
**Notes** FID sensitivity: 16 x 10<sup>-11</sup> AFS



### MXT®-50 Columns (Siltek®-treated stainless steel)

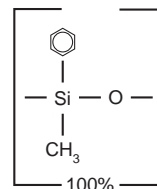
(midpolarity phase; Crossbond® phenyl methyl polysiloxane)

- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, and sterols.
- Temperature range: 0 °C to 300 °C.
- Equivalent to USP G3 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.53 mm	0.83 µm	0 to 280/300 °C		70569	
	1.00 µm	0 to 260/280 °C	70552	70555	70558
	1.50 µm	0 to 250/280 °C		70570	

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### MXT®-50 Structure



Similar to: (50%-phenyl)-methylpolysiloxane

### MXT®-1301 Columns (Siltek®-treated stainless steel)

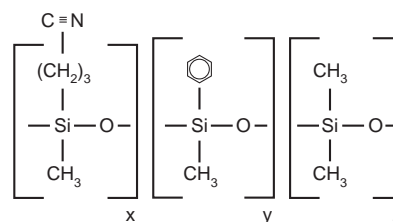
(low- to midpolarity phase)

- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.53 mm	1.00 µm	-20 to 260/280 °C		76055	
	3.00 µm	-20 to 240/280 °C	76082	76085	76088

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### MXT®-1301 Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

### MXT®-1701 Columns (Siltek®-treated stainless steel)

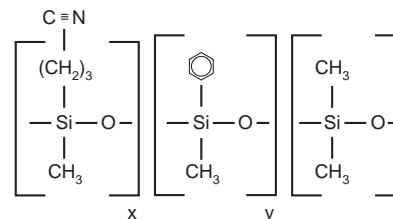
(midpolarity Crossbond® phase)

- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), and pesticides.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G46 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	-20 to 280 °C	72020	72023	
	1.00 µm	-20 to 260 °C		72053	
0.28 mm	1.00 µm	-20 to 260 °C	72051		
	1.50 µm	-20 to 250 °C	72066		
0.53 mm	0.50 µm	-20 to 270/280 °C		72040	
	1.00 µm	-20 to 260 °C	72052	72055	
	1.50 µm	-20 to 250 °C		72070	
	3.00 µm	-20 to 240 °C	72082	72085	72088

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### MXT®-1701 Structure



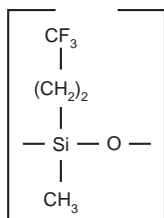
Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane

## similar phases

DB-PS1701

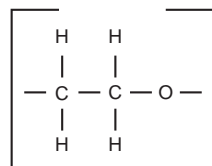
## General-Purpose Columns

## MXT®-200 Structure



Similar to: (trifluoropropyl)-methylpolysiloxane

## MXT®-WAX Structure



## similar phases

DB-PSWAX, UAC-CW

## MXT®-200 Columns (Siltek®-treated stainless steel)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

- General-purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, and glycols. Excellent confirmation column with an Rtx®-5 column, for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20 °C to 400 °C.
- Equivalent to USP G6 phase.
- 4.5" standard coil diameter.

ID	df	temp. limits*	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.50 µm	-20 to 400 °C		75038	
	1.00 µm	-20 to 310/360 °C		75053	
0.53 mm	1.00 µm	-20 to 290/360 °C	75052	75055	75058
	1.50 µm	-20 to 280/360 °C		75070	75073
	3.00 µm	-20 to 260/360 °C	75082	75085	75088

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

## MXT®-WAX Columns (Siltek®-treated stainless steel)

(polar phase; Crossbond® Carbowax® polyethylene glycol—provides oxidation resistance)

- General-purpose columns for FAMES, flavor compounds, essential oils, amines, solvents, xylene isomers, and U.S. EPA Method 603 (acrolein/acrylonitrile).
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.
- 4.5" standard coil diameter.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.25 mm	0.25 µm	40 to 250/260 °C	70620	70623	
	0.50 µm	40 to 260 °C		70638	
0.28 mm	0.25 µm	40 to 250/260 °C		70624	
	0.50 µm	40 to 250/260 °C		70639	70642
	1.00 µm	40 to 240/250 °C	70651	70654	70657
0.53 mm	0.25 µm	40 to 250/260 °C	70622	70625	
	0.50 µm	40 to 250/260 °C	70637	70640	
	1.00 µm	40 to 240/250 °C	70652	70655	70658
	1.50 µm	40 to 230/250 °C	70666	70669	70672
	2.00 µm	40 to 220/250 °C	70667	70670	

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

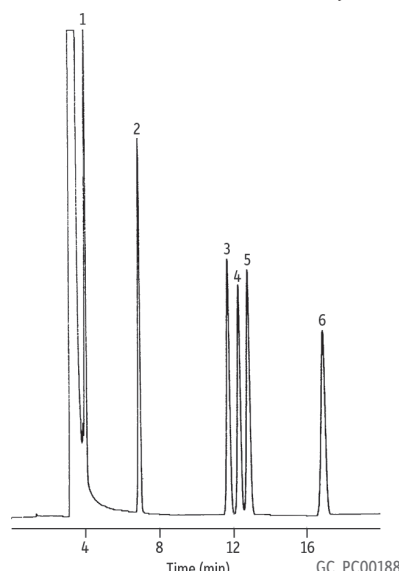
also available

Metal MXT®  
PLOT Columns

See page 129.



## Aromatics (Benzene/Toluene/Xylene) on MXT®-WAX



## Peaks

1. Benzene
2. Toluene
3. Ethylbenzene
4. *p*-Xylene
5. *m*-Xylene
6. *o*-Xylene

**Column** MXT®-WAX, 30 m, 0.28 mm ID, 1.00 µm (cat.# 70654)  
**Sample Injection** BTEX Standard (cat.# 30051)  
**Inj. Vol.:** 1.0 µL split (split ratio 100:1)  
**Inj. Temp.:** 260 °C  
**Oven**  
**Oven Temp.:** 60 °C  
**Carrier Gas** Hz, constant flow  
**Linear Velocity:** 38 cm/sec  
**Detector** FID @ 260 °C  
**Notes** FID sensitivity: 3.2 x 10<sup>-11</sup> AFS

## Volatile Organics Analysis

### MXT®-502.2 Columns (Siltek®-treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants, cited in U.S. EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks. Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Temperature range: -20 °C to 320 °C.
- 4.5" standard coil diameter.

An MXT®-502.2 column will enable you to quantify all compounds listed in U.S. EPA Methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based MXT®-502.2 stationary phase provides low bleed and thermal stability to 320 °C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling.

ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#	105-Meter cat.#
0.25 mm	1.40 µm	-20 to 270/320 °C		70916	
0.28 mm	1.60 µm	-20 to 250/320 °C	70919		
0.53 mm	3.00 µm	-20 to 250/320 °C	70908	70909	70910

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### MXT®-Volatiles Columns (Siltek®-treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Temperature range: -20 °C to 320 °C.
- 4.5" standard coil diameter.

MXT®-Volatiles columns were the first columns designed specifically for analyses of the 34 volatile organic pollutants listed in U.S. EPA Methods 601, 602, and 624. With these columns, you can quantify all compounds listed in these methods, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based MXT®-Volatiles stationary phase provides low bleed and thermal stability to 320 °C.

ID	df	temp. limits*	30-Meter cat.#	60-Meter cat.#
0.28 mm	1.25 µm	-20 to 280/320 °C	70924	70926
0.53 mm	2.00 µm	-20 to 280/320 °C	70925	70927
	3.00 µm	-20 to 250/320 °C	70922	

\*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

### MXT®-624 Columns (Siltek®-treated stainless steel)

(low- to midpolarity phase)

- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.
- 4.5" standard coil diameter.

The unique polarity of "624" columns makes them ideal for analyses of volatile organic pollutants. Although the MXT®-502.2 column is recommended in many methods, MXT®-624 columns offer the best separation of the early-eluting gases.

ID	df	temp. limits	30-Meter cat.#	60-Meter cat.#
0.25 mm	1.40 µm	-20 to 240/280 °C	70968	70969
0.53 mm	3.00 µm	-20 to 240/280 °C	70971	70973

## similar phases

DB-PS502.2

### MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

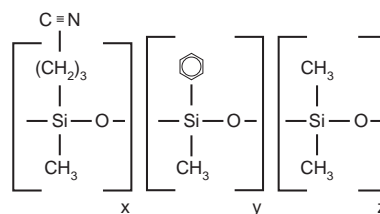
## also available

Column connector kits & ferrules

See **page 232**.



### MXT®-624 Structure



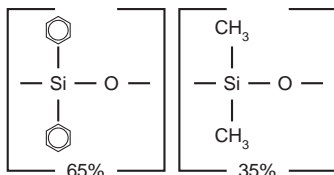
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

## similar phases

DB-PS624, UAC-624

## Triglycerides in Foods Analysis

### MXT®-65TG Structure



Similar to: (65%-phenyl)-methylpolysiloxane

### similar phases

UAC-65HT

### MXT®-65TG Columns (Siltek®-treated stainless steel)

(high-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370 °C.
- 4.5" standard coil diameter.

The MXT®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370 °C thermal stability, an MXT®-65TG column should not be used for analyses of compounds that contain active oxygenated groups.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	0.10 µm	20 to 370 °C	77005	77008
0.53 mm	0.10 µm	20 to 370 °C	77007	77010

### free literature

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lit. cat.# GNTS1368A



### MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

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## Biodiesel Fuels Analysis

### MXT®-Biodiesel TG Columns (Siltek®-treated stainless steel)

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430 °C for reliable, consistent performance.

Description	temp. limits	3.5" Coil	7" diameter
		cat.#	11-pin cage
14 m, 0.53 mm ID, 0.16 µm with 2 m Integra-Gap*	-60 to 380/430 °C	70289-273	70289
10 m, 0.32 mm ID, 0.10 µm	-60 to 380/430 °C	—	70292
10 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm Retention Gap**	-60 to 380/430 °C	—	70290
15 m, 0.32 mm ID, 0.10 µm	-60 to 380/430 °C	—	70293
15 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm Retention Gap**	-60 to 380/430 °C	—	70291
2 m x 0.53 mm MXT Biodiesel TG Retention Gap	-60 to 430 °C	—	70294

\*Total column length = 16 meters.

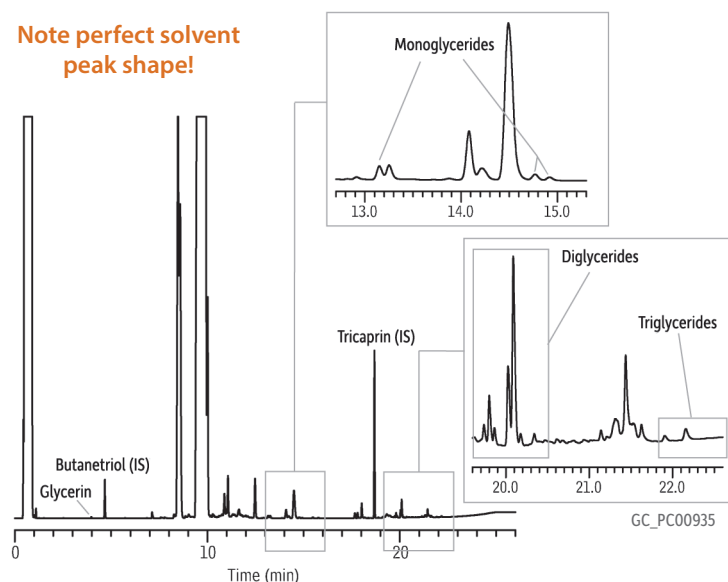
\*\*Connected with low dead volume MXT connector.

### similar phases

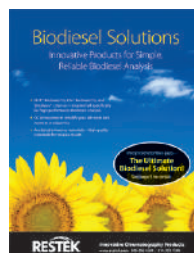
MET-Biodiesel

### ASTM D6584 Derivatized B100 and Internal Standards on MXT®-Biodiesel TG

Note perfect solvent peak shape!



<b>Column</b>	MXT®-Biodiesel TG w/2 m x 0.53 mm retention gap, 10 m, 0.32 mm ID, 0.10 µm (cat.# 70290)
<b>Sample</b>	B100 + IS butanetriol & tricaprln derivatized with MSTFA as per ASTM D6584
<b>Injection</b>	1.0 µL cold on-column
<b>Inj. Vol.:</b>	Oven track
<b>Temp. Program:</b>	Oven track
<b>Oven</b>	
<b>Oven Temp.:</b>	50 °C (hold 1 min) to 180 °C at 15 °C/min to 230 °C at 7 °C/min to 430 °C at 30 °C/min (hold 5 min)
<b>Carrier Gas</b>	H <sub>2</sub> , constant flow
<b>Flow Rate:</b>	4 mL/min
<b>Detector</b>	FID @ 430 °C



### free literature

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lit. cat.# PCFL1409-UNV

## Simulated Distillation Analysis (C5-C44)

### MXT®-2887 Column (Siltek®-treated stainless steel)

(nonpolar phase; Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

- Application-specific columns for simulated distillation.
- Stable to 400 °C.
- 4.5" standard coil diameter.

MXT®-2887 columns' stationary phase, column dimensions, and film thicknesses have been optimized to exceed the resolution and skewing factor requirements specified in ASTM Method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times. Manufactured from Siltek®-treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available.

### similar phases

DB-PS2887

### free literature

**Rtx®-2887/ MXT®-2887**  
Restek's Capillary GC Columns  
for Simulated Distillation of  
Petroleum Fractions

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lit. cat.# 59567B



ID	df	temp. limits	10-Meter
0.53 mm	2.65 µm	-60 to 380/430 °C	70190

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## Simulated Distillation Analysis (C5-C110)

**MXT®-1HT SimDist Column** (Siltek®-treated stainless steel)

(nonpolar phases)

- Stable up to 450 °C—lowest bleed for longest column lifetime.
- Reliably meets all ASTM D6352, D7169, and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.
- Individually tested for guaranteed performance.
- 7" coil diameter.



## similar phases

DB-HT SimDist ProSteel, CP-SimDist UltiMetal, ZB-1X SimDist

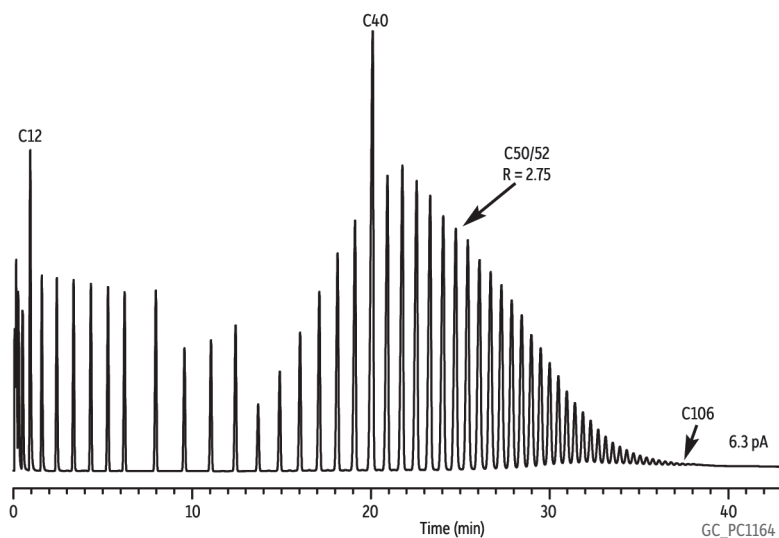
## Method Recommended Columns

ASTM Method	Hydrocarbon Range	cat. #	Configuration
D2887	C5-C44	70131	5 m x 0.53 mm, 0.88 µm
		70132	10 m x 0.53 mm, 2.65 µm
D7213 (D2887-ext)	C5-C60	70131	5 m x 0.53 mm, 0.88 µm
		70115	5 m x 0.53 mm, 0.20 µm
		70112	5 m x 0.53 mm, 0.10 µm
D5307	crude up to C42	70115	5 m x 0.53 mm, 0.20 µm
D6352	C10-C90	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm
D7096	gasoline up to C14	70132	10 m x 0.53 mm, 2.65 µm
		10177	15 m x 0.53 mm, 5 µm
D7500	C7-C110	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm
D7169	C5-C100	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm

Accurate boiling point determination for medium and heavy fractions using GC simulated distillation requires columns and phase polymers that are robust enough to withstand high temperatures without significant degradation.

ID	df	temp. limits	5-Meter cat.#	10-Meter cat.#
0.53 mm	0.10 µm	-60 to 430/450 °C	70112	
	0.20 µm	-60 to 400/430 °C	70115	
	0.21 µm	-60 to 400/430 °C		70118
	0.88 µm	-60 to 380/430 °C	70131	70134
	1.00 µm	-60 to 380/400 °C		70130
	1.20 µm	-60 to 380/380 °C		70119
	2.65 µm	-60 to 360/400 °C		70132
	5.00 µm	-60 to 360/400 °C		70133

## Hydrocarbons (C5-C106) on MXT®-1HT SimDist at 450 °C



Peaks	tr (min)	40. C70	30.002
1. C5	—	41. C72	30.489
2. C6	—	42. C74	30.906
3. C7	—	43. C76	31.414
4. C8	—	44. C78	31.862
5. C9	—	45. C80	32.294
6. C10	—	46. C82	32.719
7. C11	—	47. C84	33.132
8. C12	0.938	48. C86	33.529
9. C13	1.586	49. C88	33.927
10. C14	2.425	50. C90	34.310
11. C15	3.365	51. C92	34.689
12. C16	4.332	52. C94	35.059
13. C17	5.290	53. C96	35.423
14. C18	6.217	54. C98	35.773
15. C20	7.966	55. C100	36.120
16. C22	9.566	56. C102	36.463
17. C24	11.051	57. C104	36.793
18. C26	12.426	58. C106	37.118
19. C28	13.689		
20. C30	14.897		
21. C32	16.035		
22. C34	17.110		
23. C36	18.133		
24. C38	19.108		
25. C40	20.096		
26. C42	20.923		
27. C44	21.759		
28. C46	22.556		
29. C48	23.317		
30. C50	24.051		
31. C52	24.752		
32. C54	25.422		
33. C56	26.079		
34. C58	26.701		
35. C60	27.305		
36. C62	27.878		
37. C64	28.439		
38. C66	28.975		
39. C68	29.499		

**Column** MXT®-1HT SimDist, 5 m, 0.53 mm ID, 0.10 µm (cat.# 70112)  
**Sample** Custom C5-C106 hydrocarbon standard  
**Diluent:** Carbon disulfide  
**Conc.:** 1%  
**Injection**  
 Inj. Vol.: 0.5 µL cold on-column  
 Temp. Program: 53 °C to 450 °C at 10 °C/min (hold 5 min)  
**Oven**  
 Oven Temp.: 50 °C to 450 °C at 10 °C/min (hold 5 min)  
**Carrier Gas**  
 Carrier Gas He, constant flow  
 Flow Rate: 18 mL/min

**Detector** FID @ 450 °C  
**Make-up Gas**  
 Flow Rate: 24 mL/min  
**Constant Column**  
 + Constant  
 Make-up: 42 mL/min  
**Make-up**  
 Gas Type: N<sub>2</sub>  
 Data Rate: 20 Hz  
**Instrument** Shimadzu 2010 GC

**MXT®-500 SimDist Column** (Siltek®-treated stainless steel)

(nonpolar phase)

- Application-specific columns in unbreakable Siltek® treated stainless steel tubing meet all resolution criteria for high temperature simulated distillation.
- Stable to 430 °C.
- 4.5" standard coil diameter.

ID	df	temp. limits	6-Meter cat.#
0.53 mm	0.15 µm	-60 to 420/430 °C	70104

**Polywax® Calibration Materials**

Description	qty.	cat.#
Polywax 655 calibration material	1 g	36225
Polywax 1,000 calibration material	1 g	36227

**similar phases**

UAC-DX30

**free literature**

GC Analysis of Petroleum Products by Simulated Distillation, Using MXT® SimDist Columns

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lit. cat.# 59551A



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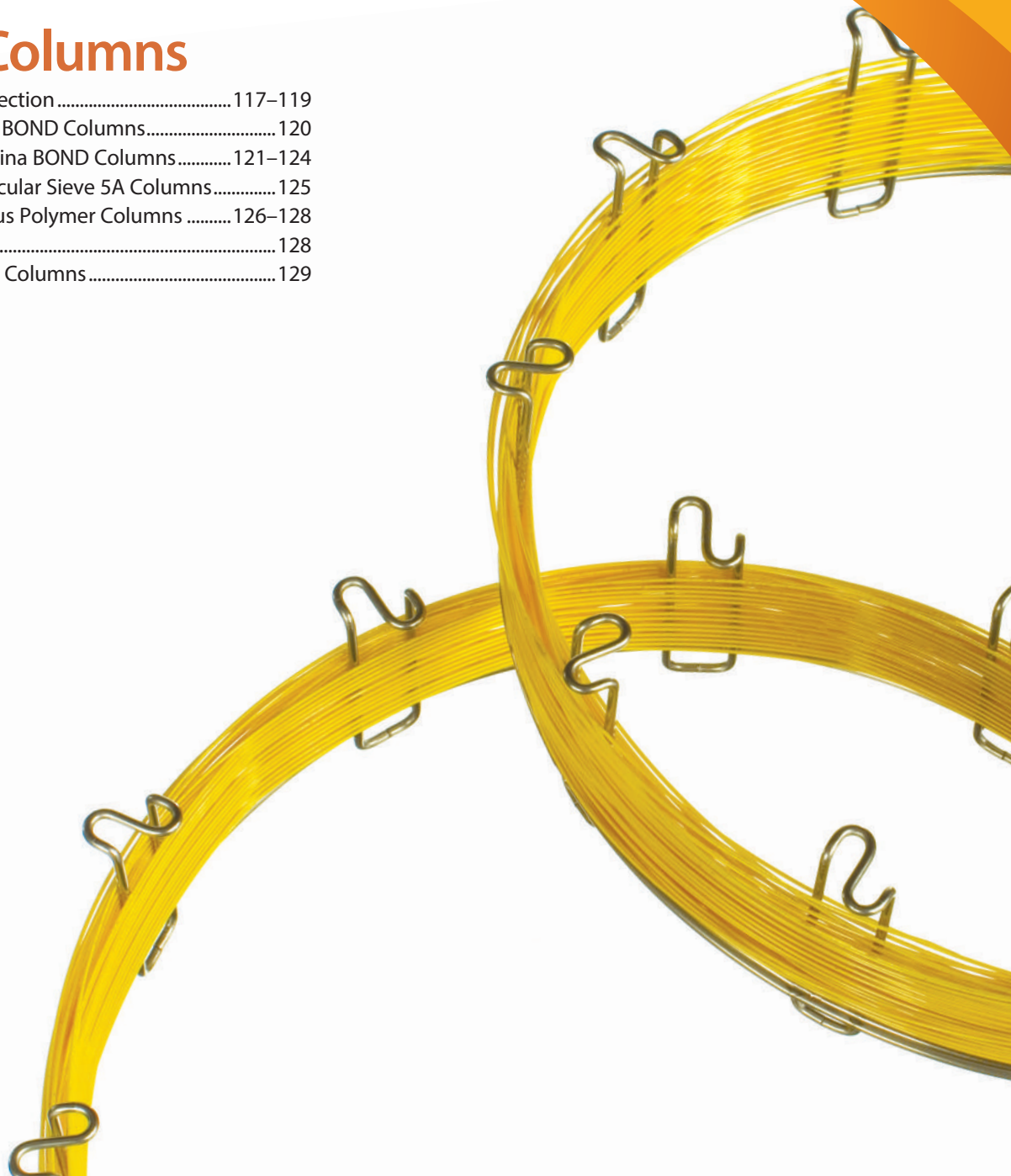
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# GC Columns

## PLOT Columns

PLOT Column Selection .....	117-119
Fused Silica Silica BOND Columns.....	120
Fused Silica Alumina BOND Columns.....	121-124
Fused Silica Molecular Sieve 5A Columns.....	125
Fused Silica Porous Polymer Columns .....	126-128
Particle Trap.....	128
Metal MXT® PLOT Columns.....	129



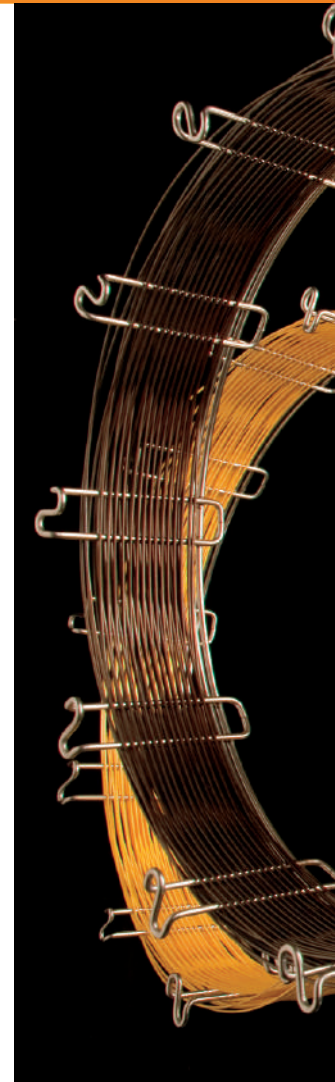


## Stable Bonded GC PLOT Columns

- Innovative bonding process minimizes particle release, reducing column blockage and protecting instrument parts.
- More consistent flow means stable retention times in Deans and related flow switching techniques.
- Outstanding peak symmetry improves impurity analysis for gases, solvents, and hydrocarbons.

### Quick Reference Chart

PLOT Column	Description / Application
Rt-Silica BOND (p. 120)	Bonded silica Light hydrocarbons, sulfur gases, carbon dioxide, and halocarbons
Rt-Alumina BOND/Na <sub>2</sub> SO <sub>4</sub> (p. 121) MXT-Alumina BOND/Na <sub>2</sub> SO <sub>4</sub> (p. 129)	C1-C5 hydrocarbons Purity analysis of ethylene, propylene, butenes, butadiene
Rt-Alumina BOND/KCl (p. 122)	C1-C10 hydrocarbons, C1-C5 isomers Purity analysis of ethylene, propylene, butene, butadiene.
Rt-Alumina BOND/CFC (p. 123)	Multi-halogenated alkanes, C1-C-5 range Chlorofluorocarbons (CFCs)
Rt-Alumina BOND/MAPD (p. 124) MXT-Alumina BOND MAPD (p. 129)	Trace analysis of methylacetylene, propadiene, acetylene
Rt-Msieve 5A (p. 125) MXT-Msieve 5A (p. 129)	Permanent gas analysis He, Ne, Ar, O <sub>2</sub> , N <sub>2</sub> , Xe, Rn, CH <sub>4</sub> , and CO
Rt-Q-BOND (p. 126) MXT-Q-BOND (p. 129)	Nonpolar porous polymer High retention for solvents, alcohols, polar volatiles, CO <sub>2</sub> , sulfur, and ppm water in solvents
Rt-QS-BOND (p. 127)	Intermediate polarity porous polymer (polarity between Q-BOND and S-BOND) Neutral solvents, ketones, esters, hydrocarbons, and baseline separation of ethane, ethene, acetylene
Rt-S-BOND (p. 127) MXT-S-BOND (p. 129)	Intermediate polarity porous polymer Light gases in ethylene and propylene, ketones, esters, hydrocarbons
Rt-U-BOND (p. 128)	Polar porous polymer More retention for polar compounds



### PLOT Column Phase Cross-Reference: Similar Selectivity

Restek® Rt® and MXT® Columns	Porous Layer	Supelco	Alltech	Agilent (J&W, Varian, Chrompack)	Quadrex
Silica BOND	Bonded silica	—	—	CP Silica PLOT, GS-GasPro	—
Alumina BOND/Na <sub>2</sub> SO <sub>4</sub>	Aluminum oxide	Alumina-Sulfate	AT-Alumina	GS-Alumina ,CP-Al <sub>2</sub> O <sub>3</sub> /NA <sub>2</sub> SO <sub>4</sub>	—
Alumina BOND/KCl	Aluminum oxide	Alumina-Chloride	—	GS-Alumina KCl, HP PLOT Al <sub>2</sub> O <sub>3</sub> , CP-Al <sub>2</sub> O <sub>3</sub> /KCl	—
Alumina BOND/CFC	Aluminum oxide	—	—	<b>unique product</b>	—
Alumina BOND/MAPD	Aluminum oxide	—	—	Select Al <sub>2</sub> O <sub>3</sub> MAPD	—
Msieve 5A	Molecular sieve 5A	Molsieve 5A	AT-Molesieve	HP PLOT Molesieve, CP-Molsieve 5A	PLT-5A
Q-BOND	100% Divinylbenzene	Supel-Q-PLOT	AT-Q	HP PLOT Q ,CP-PoraPLOT Q, CP-PoraBOND Q	—
QS-BOND	Intermediate polarity porous polymer	—	—	GS-Q	—
S-BOND	DVB vinylpyridine polymer	—	—	CP-PoraPLOT S	—
U-BOND	DVB ethylene glycol-dimethylacrylate polymer	—	—	HP PLOT U, CP-PoraPLOT U, CP-PoraBOND U	—

## Stable Bonded Porous Layer Open Tubular (PLOT) Columns

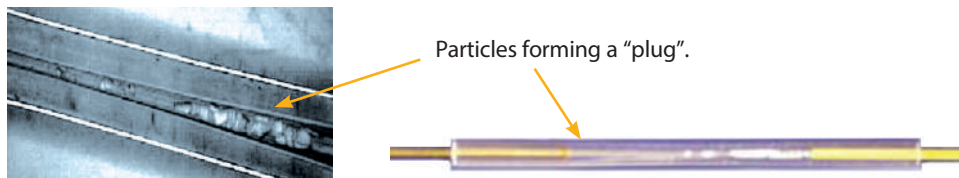
- Stabilized particle layers improve robustness and reproducibility of retention and flow.
- Fully compatible with valve switching and Deans switching systems.
- Highly efficient, reproducible analyses; ideal for permanent gases, solvents, and hydrocarbons.
- Innovative manufacturing procedure reduces particle generation and improves performance of porous polymer and molecular sieve PLOT columns.

Porous layer open tubular (PLOT) columns are very beneficial for solving application problems, especially for the analysis of volatile compounds. PLOT columns have a unique selectivity, allowing for the separation of gaseous compounds at room temperature. Due to the adsorption mechanism of the supports used in PLOT columns, permanent gases and light hydrocarbons can be resolved at room temperature; columns can then be programmed to higher temperatures to elute higher boiling compounds.

### Traditional PLOT Columns Offer Poor Stability

The traditional PLOT column is built with a 5–50  $\mu\text{m}$  layer of particles adhered to the tubing walls. Because this layer of particles generally lacks stability, PLOT columns must be used very carefully, as particle release is common and can cause unpredictable changes in retention time and flow behavior. Traditional PLOT columns also must generally be used in conjunction with particle traps to prevent the contamination of valves, injectors, and GC detectors. Detectors contaminated with particles typically generate electronic noise, which shows up chromatographically as a spike in the baseline. In extreme cases, detector flow can be obstructed by particle buildup. Particles can also affect valves by becoming lodged in the valve and causing leaks or restricting flow. Figure 1 shows an example of blockage caused by particle accumulation inside a press-fit connector.

**Figure 1:** Particles released from traditional PLOT columns can cause blockages.



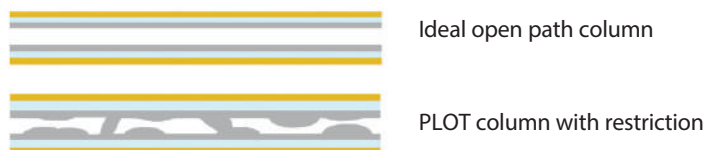
### Restek® PLOT Columns Offer Improved Stability to Minimize Particle Release

Restek has developed technology and procedures to manufacture PLOT columns with concentric stabilized adsorption layers. These next generation PLOT columns show a constant flow behavior (permeability) and have significantly improved mechanical stability, resulting in easier operation, better chromatography, and reduced particle release. Greater particle stability means more reproducible retention times, virtually no spiking, and longer column lifetimes. This innovative Restek® stabilization chemistry is currently applied to all fused silica and metal PLOT columns.

### Consistent Flow Restriction Factor (F) Guarantees Reproducible Flow

Thick layers of particles are difficult to deposit in a homogeneous layer, and in traditionally manufactured PLOT columns, this results in variable coating thicknesses. The positions where the layer is thicker act as restrictions and affect flow (Figure 2). Depending on the number and intensity of these restrictions, traditional PLOT columns often show greater variation in flow restriction than wall coated open tubular (WCOT) columns. In practice, conventional PLOT columns with the same dimensions can differ in flow by a factor of 4 to 6 when operated at the same nominal pressure. For applications where flow is important, such as with Deans switching, the nonreproducible flow behavior of most commercially available PLOT columns is a problem.

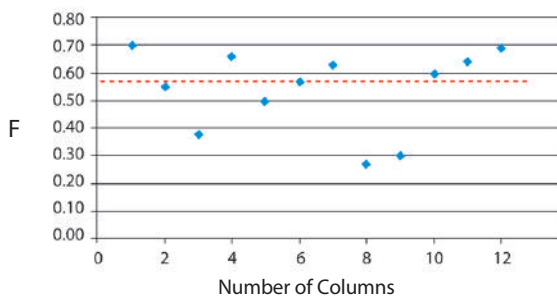
**Figure 2:** Inconsistent coating thicknesses result in restrictions that cause significant variation in flow.



In order to measure flow restriction reproducibility, Restek introduced a new factor: the flow restriction factor (F). This factor is based on the retention time of an unretained marker compound, as measured on both coated and uncoated tubing using the same backpressure setting (Equation 1). For quality control purposes, methane is used as the marker when evaluating porous polymer columns, and helium is used for testing molecular sieve 5A columns.

Flow restriction factor determination can be used to assess both the degree of column restriction and the reproducibility of the column coating process. Flow restriction can also be calculated (Equation 2). Figure 3 shows typical results for PLOT columns manufactured using a conventional process. Because of the difference in flow restriction, individual columns have very different flow characteristics. In contrast, Figure 4 shows results for columns made using our Rt®-QS-BOND (bonded porous polymer) PLOT column process. Clearly, Restek's manufacturing process results in greater consistency in both column coating thickness and flow restriction, which results in more stable retention times and better performance in Deans and related flow switching techniques. Flow restriction factors are specified on the certificate of analysis (CofA) included with every Restek® PLOT column, and the values are listed on the report.

**Figure 3:** Traditional PLOT columns show significant flow variability, indicating inconsistent column coating thicknesses.



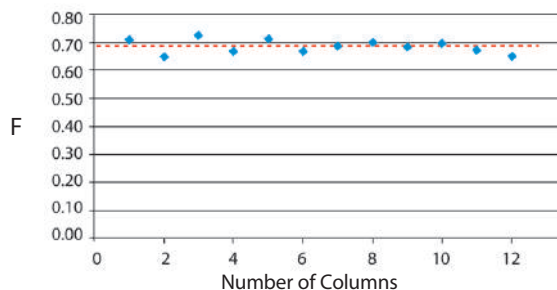
**Equation 1:** Flow restriction factor (F) is used to demonstrate coating consistency.

$$F = \frac{t_{R1} \text{ of unretained component (uncoated tubing)}}{t_{R2} \text{ of unretained component (coated column)}}$$

$t_R$  = retention time

Note: F values will always be <1 as the coated column always has more restriction than the uncoated column.

**Figure 4:** PLOT columns from Restek offer consistent flow restriction, giving more reproducible results column-to-column.



**Equation 2:** Percent flow restriction of coated column.

$$\% \text{ restriction} = (1 - F) \times 100$$

See what makes Restek's new **Rt®-Silica BOND** column the best on the market! .....**page 120**

Restek's PLOT columns are exceptionally robust, featuring concentric stabilized coating layers. They allow for more consistent gas flows and are recommended for applications sensitive to variation in retention time or flow. These PLOT columns are a significant advance in technology and are ideal for efficient, reproducible analyses of permanent gases, solvents, and hydrocarbons.

**Fused Silica Capillary & PLOT Column Ferrule Guide**

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8

**free literature**

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lit. cat.# PCBR1163D-UNV



## similar phases

GS-GasPro, CP-SilicaPLOT

NEW!

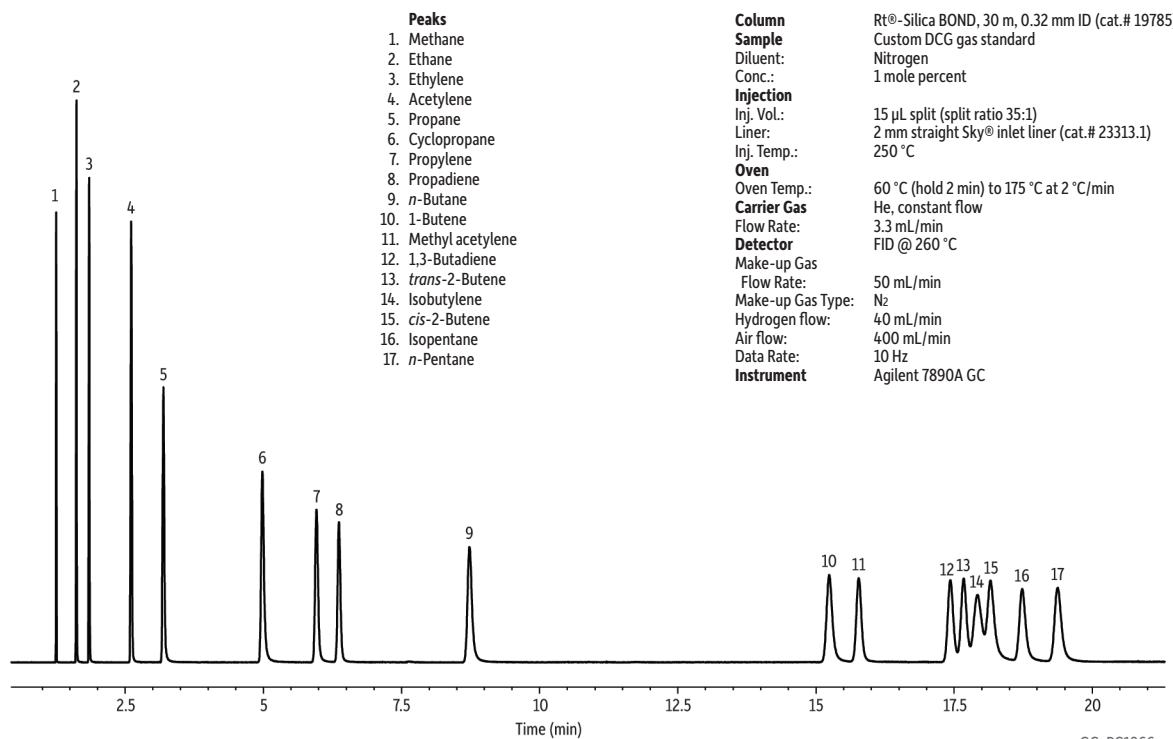
**Rt®-Silica BOND Columns** (fused silica PLOT)

- Versatile column ideal for analysis of light hydrocarbons, sulfur gases, halocarbons, and carbon dioxide.
- Individually QC tested with sensitive C4 probes to ensure consistent selectivity.
- Proprietary manufacturing process practically eliminates particle release, reducing downtime due to obstructed FID jets.
- Bonded silica stationary phase minimizes impact of water, resulting in reproducible retention times for water-containing samples.
- Stable to 260 °C.

Restek's Rt®-Silica BOND columns are robust, versatile, selective PLOT columns that offer excellent performance for the analysis of light hydrocarbons, sulfur gases, and halocarbons above ambient temperature. In addition, carbon dioxide and other gases can be retained at ambient temperature on this silica-based column. High loadability, inertness, and consistent selectivity, as well as unmatched robustness at a maximum temperature of 260 °C, make the Rt®-Silica BOND column ideal for the analysis of active unsaturated hydrocarbons.

Rigorous C4 selectivity testing and additional testing to confirm efficiency and inertness ensure good separations are achieved with optimal peak shape and response for active analytes. As with all Restek® PLOT columns, our proprietary manufacturing process minimizes particle generation, which reduces the problems commonly associated with released particles (signal spikes, valve damage, and obstructed FID jets).

ID	temp. limits	15-Meter cat.#	30-Meter cat.#	60-Meter cat.#
0.32 mm	-80 to 260 °C	19784	19785	19786

**Saturated and Unsaturated Hydrocarbons on Rt®-Silica BOND PLOT Column**



## Rt®-Alumina BOND Columns

Restek® Rt®-Alumina BOND columns are highly selective for C1–C5 hydrocarbons and separate all saturated and unsaturated hydrocarbon isomers above ambient temperatures. The reactivity of the aluminum oxide stationary phase is minimized to improve column response for polar unsaturates, such as dienes, and the column's sensitivity (or response) ensures linear and quantitative chromatographic analysis for these compounds. Strong bonding prevents particle generation and release, which allows valve switching without harming the injection or detection systems. And because they are stable up to at least 200 °C, Rt®-Alumina BOND columns can be regenerated to restore full efficiency and selectivity by conditioning at their maximum temperature if water is adsorbed. High capacity and loadability give you exceptionally symmetrical peaks, making these columns ideal for volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations. Restek® Rt®-Alumina BOND PLOT columns are manufactured on fused silica tubing; select phases are also available on metal MXT® tubing.

To ensure reproducible retention times and predictable flow behavior column-to-column, each Rt®-Alumina BOND column is extensively tested. A hydrocarbon test mix confirms proper phase retention and selectivity. To calculate *k* (retention or capacity factor), which is a measure of phase retention, 1,3-butadiene is used, while selectivity is measured using retention indices for propadiene and methyl acetylene. The resolution of *trans*-2-butene and 1-butene is also verified and, to measure efficiency, plates per meter are checked using 1,3-butadiene.

### Rt®-Alumina BOND/Na<sub>2</sub>SO<sub>4</sub> Columns (fused silica PLOT)

(Na<sub>2</sub>SO<sub>4</sub> deactivation)

- Acetylene and propadiene elute after butanes.
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.
- Stable to 200 °C.

ID	df	temp. limits	30-Meter cat.#	50-Meter cat.#
0.25 mm	4 µm	to 200 °C	19775	—
0.32 mm	5 µm	to 200 °C	19757	19758
0.53 mm	10 µm	to 200 °C	19755	19756

### similar phases

GS-Alumina, CP-Al<sub>2</sub>O<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub>, Alumina-Sulfate

### tech tip

#### Trace Water in the Carrier Gas

Traces of water in the carrier gas and samples will affect the retention and the selectivity of alumina. If exposed to water, the retention times will shorten. The column can be regenerated by conditioning for 15–30 minutes at 200 °C under normal carrier gas flow. Periodic conditioning ensures excellent run-to-run retention time reproducibility.

Unless noted, the maximum programmable temperature for an Rt®-Alumina BOND column is 200 °C. Temperatures higher than the stated maximum temperature can cause irreversible changes to the porous layer adsorption properties.

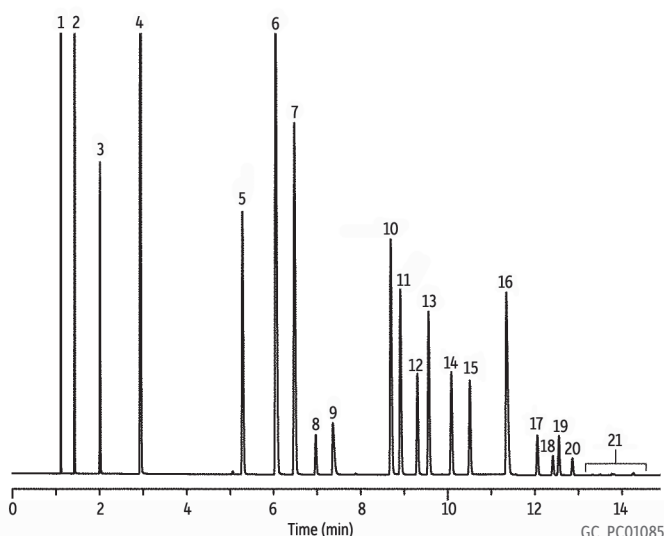
also available

Metal MXT®  
PLOT Columns



See page 129.

### Refinery Gas on Rt®-Alumina BOND (Na<sub>2</sub>SO<sub>4</sub>)



- | Peaks                      |                             |
|----------------------------|-----------------------------|
| 1. Methane                 | 11. 1-Butene                |
| 2. Ethane                  | 12. Isobutylene             |
| 3. Ethylene                | 13. <i>cis</i> -2-Butene    |
| 4. Propane                 | 14. <i>iso</i> -Pentane     |
| 5. Propylene               | 15. <i>n</i> -Pentane       |
| 6. Isobutane               | 16. 1,3-Butadiene           |
| 7. <i>n</i> -Butane        | 17. <i>trans</i> -2-Pentene |
| 8. Propadiene              | 18. 2-Methyl-2-butene       |
| 9. Acetylene               | 19. 1-Pentene               |
| 10. <i>trans</i> -2-Butene | 20. <i>cis</i> -2-Pentene   |
|                            | 21. Hexanes                 |

**Column** Rt®-Alumina BOND/Na<sub>2</sub>SO<sub>4</sub>, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)  
Refinery gas

**Sample Injection**  
Inj. Vol.: 10 µL split  
Liner: Taper (2 mm) (cat.# 20795)  
Inj. Temp.: 200 °C  
Split Vent  
Flow Rate: 80 mL/min

**Oven**  
Oven Temp.: 45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)

**Carrier Gas**  
Hz, constant pressure (8.0 psi, 55.2 kPa)  
Linear Velocity: 74 cm/sec @ 45 °C

**Detector** FID @ 200 °C

## similar phases

GC-Alumina KCl, HP-PLOT Al<sub>2</sub>O<sub>3</sub>/KCl,  
CP-Al<sub>2</sub>O<sub>3</sub>/KCl, Alumina-Chloride

### Rt®-Alumina BOND/KCl Columns (fused silica PLOT)

(KCl deactivation)

- Restek's lowest polarity alumina column.
- Low moisture sensitivity reduces the need for frequent regeneration.
- Acetylene elutes before *n*-butane.
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.
- Stable to 200 °C.

ID	df	temp. limits	30-Meter cat.#	50-Meter cat.#
0.25 mm	4 µm	to 200 °C	19776	—
0.32 mm	5 µm	to 200 °C	19761	19762
0.53 mm	10 µm	to 200 °C	19759	19760

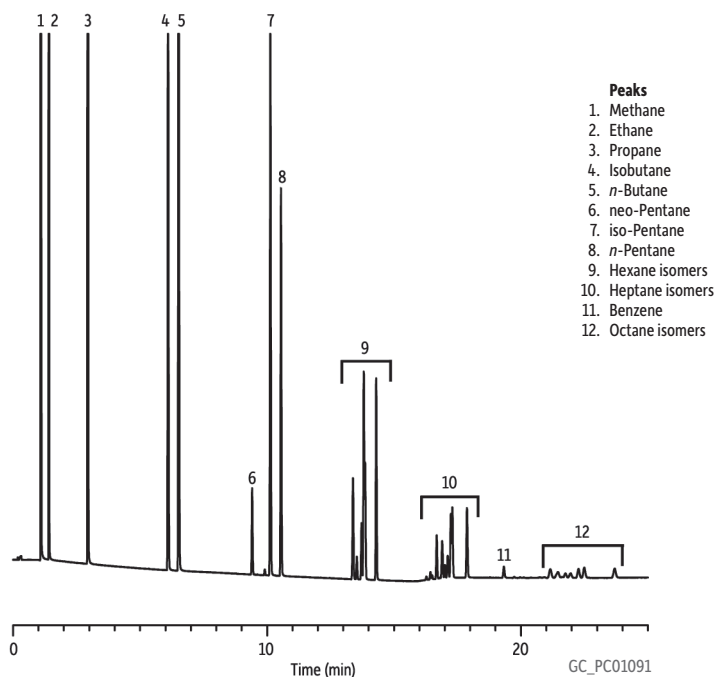
### Fused Silica Capillary & PLOT Column Ferrule Guide

GC Column ID	Ferrule ID
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.32 mm	0.5
0.53 mm	0.8



We pack Restek quality into each  
and every column we ship.

### Natural Gas on Rt®-Alumina BOND/KCl



**Column** Rt®-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (cat.# 19760)  
**Sample** Natural gas  
**Injection**  
 Inj. Vol.: 500 µL split  
 Liner: 2.0 mm ID single taper (cat.# 20795)  
 Inj. Temp.: 200 °C  
 Split Vent  
 Flow Rate: 50 mL/min  
**Oven**  
 Oven Temp.: 45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 8.5 min)  
**Carrier Gas** H<sub>2</sub>, constant pressure (8.0 psi, 55.2 kPa)  
 Linear Velocity: 45 cm/sec @ 45 °C  
**Detector** FID @ 200 °C  
 Make-up Gas  
 Type: N<sub>2</sub>  
 Data Rate: 20 Hz  
**Instrument** HP5890 GC

**Rt®-Alumina BOND/CFC Columns** (fused silica PLOT)

- Improved inertness for chlorofluorocarbon (CFC) compounds.
- Highly selective alumina-based column, separates most CFCs.
- High retention and capacity for CFCs.
- Stable to 200 °C.

The Alumina BOND/CFC adsorbent is ideal for retaining halogenated compounds, especially CFCs (chlorinated fluorocarbons) like Freon® products. It offers high selectivity, allowing a wide range of CFC isomers to be resolved at above ambient temperatures. The Rt®-Alumina BOND/CFC column is thoroughly deactivated to reduce the reactivity of alumina. Even though there is still some residual reactivity for some mono- or di-substituted CFCs, the majority of these compounds can be accurately quantified from main stream processes or in impurity analyses.

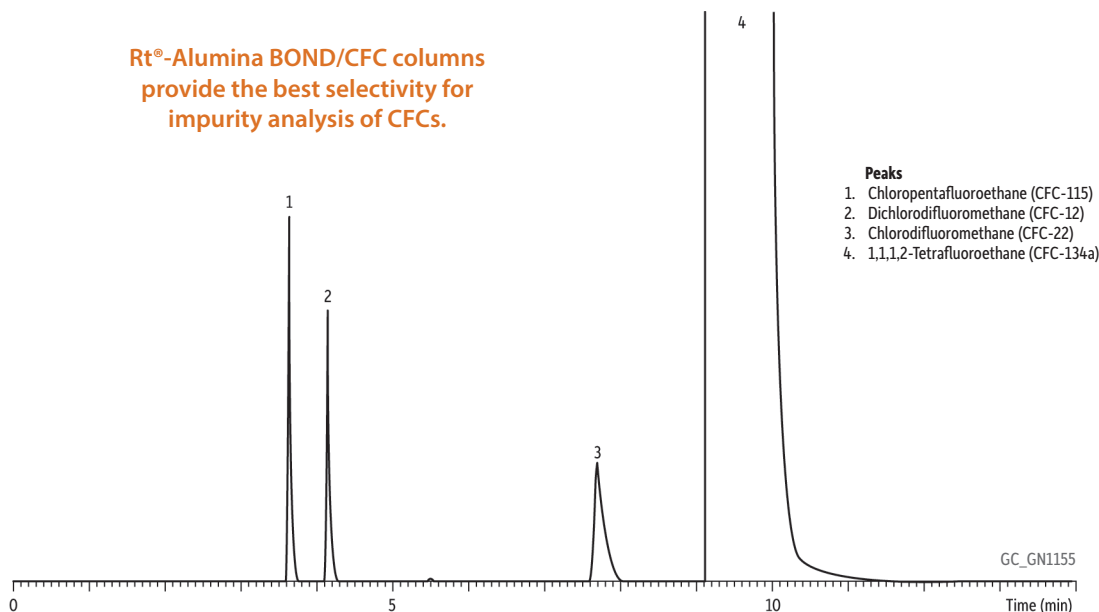
**did you know?**

All Restek PLOT columns come standard on a 7"-diameter, 11-pin cage.

ID	df	temp. limits	30-Meter cat.#
0.53 mm	10 µm	to 200 °C	19763

**Impurity Analysis of 1,1,1,2-Tetrafluoroethane (CFC-134a) on Rt®-Alumina BOND/CFC**

Rt®-Alumina BOND/CFC columns provide the best selectivity for impurity analysis of CFCs.



**Column** Rt®-Alumina BOND/CFC, 30 m, 0.53 mm ID (cat.# 19763)  
**Sample** 1,1,1,2-Tetrafluoroethane  
**Conc.:** Neat  
**Injection**  
 Inj. Vol.: 500 µL split  
**Oven**  
 Oven Temp.: 80 °C (hold 6 min) to 140 °C at 10 °C/min (hold 2 min)  
**Carrier Gas** He  
**Detector** FID  
**Notes** Gas sampling, purity analysis

Note that tailing peaks are common in CFC analyses due to overloading normally employed for this type of work.

## similar phases

Select Al<sub>2</sub>O<sub>3</sub> MAPD

## free literature

Analyze Trace Polar Hydrocarbons More Accurately and Reliably With New Alumina BOND/MAPD PLOT Columns

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lit. cat.#  
PCBR1412A-UNV

**Rt®-Alumina BOND/MAPD Columns** (fused silica PLOT)

- Optimized deactivation produces maximum response when analyzing trace levels of acetylene, methyl acetylene, and propadiene.
- Stable response factors make this column ideal for process-type applications where recalibration must be minimized.
- High loadability reduces peak tailing and improves separations.
- Extended temperature range up to 250 °C for fast elution of high molecular weight (HMW) hydrocarbons and accelerated column regeneration following exposure to water.
- Stable to 250 °C.

Restek's R&D chemists have optimized the deactivation technology applied to our Rt®-Alumina BOND/MAPD column for improved analysis of trace concentrations of polar hydrocarbons like acetylene, methyl acetylene, and propadiene in hydrocarbon streams containing higher levels of C1-C5 hydrocarbons. Our alumina PLOT deactivation produces an incredibly inert column that offers superior reproducibility and stable response factors to maximize the number of analyses before recalibration is required. Its high sample capacity reduces peak tailing, thereby improving the separation of target compounds. In addition, a 250 °C maximum operating temperature lets you more quickly elute hydrocarbons up to dodecane and reduces regeneration time when the column is exposed to water from samples or carrier gases.

ID	df	temp. limits	30-Meter cat.#	50-Meter cat.#
0.25 mm	4 µm	to 250 °C	19781	—
0.32 mm	5 µm	to 250 °C	19779	19780
0.53 mm	10 µm	to 250 °C	19777	19778

**1,3-Butadiene on Rt®-Alumina BOND/MAPD (Purity Analysis)**

- Peaks**
1. Isobutane
  2. *n*-Butane
  3. Propadiene
  4. *trans*-2-Butene
  5. 1-Butene
  6. Isobutene
  7. *cis*-2-Butene
  8. Isopentane
  9. *n*-Pentane
  10. 1,2-Butadiene
  11. 1,3-Butadiene
  12. Methyl acetylene

**Column** Rt®-Alumina BOND/MAPD, 50 m, 0.53 mm ID, 10.0 µm (cat.# 19778)

**Sample Injection** Crude 1,3-butadiene

Inj. Vol.: 10 µL split  
Liner: 2.0 mm ID straight inlet liner (cat.# 20712)

Inj. Temp.: 200 °C  
Split Vent

Flow Rate: 100 mL/min

**Oven**  
Oven Temp.: 70 °C (hold 5 min) to 200 °C at 10 °C/min (hold 0 min)

**Carrier Gas** He, constant pressure (20 psi, 137.9 kPa)

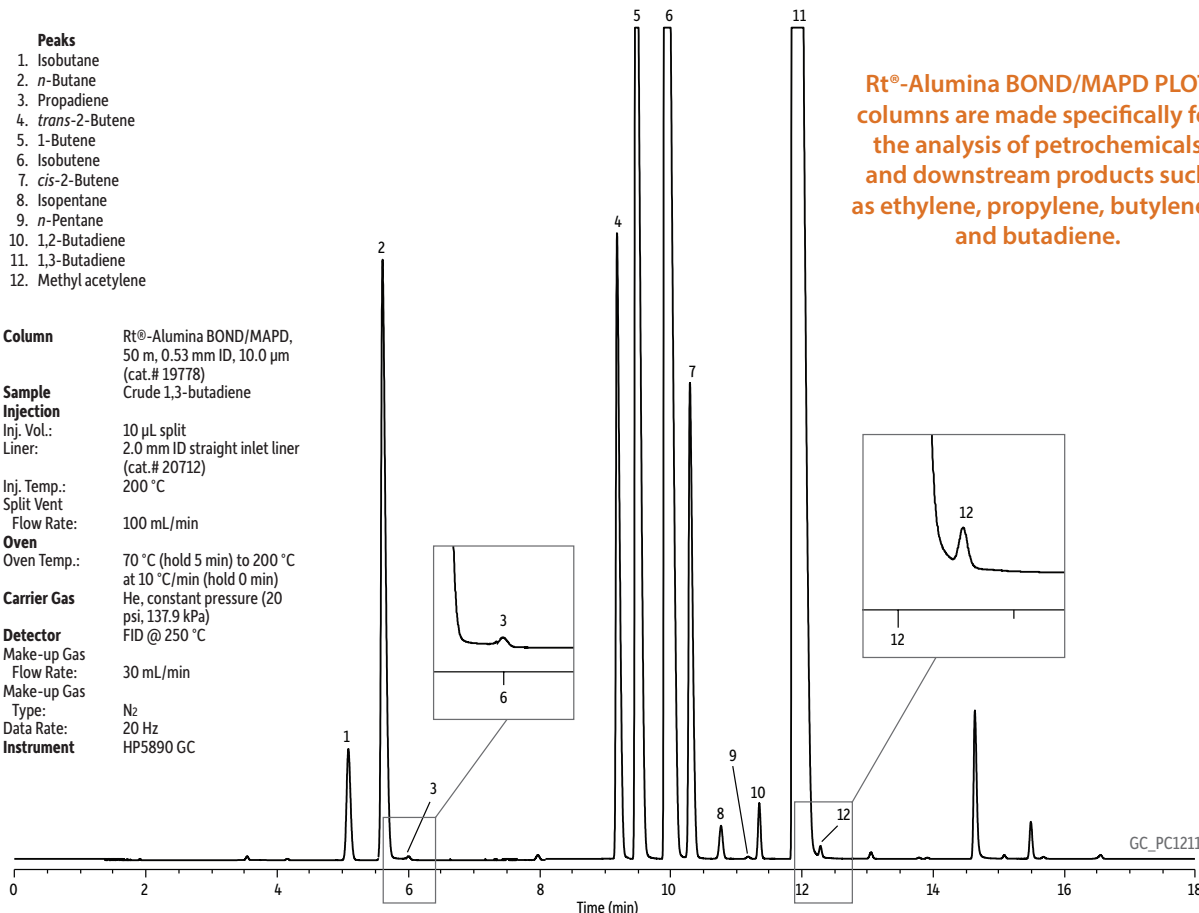
**Detector** FID @ 250 °C

Make-up Gas  
Flow Rate: 30 mL/min

Make-up Gas  
Type: N<sub>2</sub>

Data Rate: 20 Hz

**Instrument** HP5890 GC



Rt®-Alumina BOND/MAPD PLOT columns are made specifically for the analysis of petrochemicals and downstream products such as ethylene, propylene, butylenes, and butadiene.

**RESTEK** CHROMALYTICs® in AUSTRALIA: Contact +81 3 9762 2034  
Distributor



## Molecular Sieve 5A PLOT Columns

Restek's molecular sieve 5A PLOT columns are designed for efficient separation of argon/oxygen and other permanent gases, including carbon monoxide. Special coating and deactivation procedures ensure chromatographic efficiency and the integrity of the porous layer coating. Molecular sieves have very high retention, allowing separations of permanent gases at temperatures above ambient. Our deactivation technology also allows carbon monoxide to elute as a sharp peak. Additionally, our unique immobilization process guarantees that the uniform particles remain adhered to the tubing—even after continuous valve-cycling.

### Rt<sup>®</sup>-Msieve 5A Columns (fused silica PLOT)

- Improve accuracy with sharp, symmetrical peaks for argon, oxygen, and carbon monoxide.
- Easily separate permanent gases at temperatures above ambient.
- Restek<sup>®</sup> PLOT technology reduces particle release, improving flow reproducibility and reducing downtime for maintenance.
- Stable to 300 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	20 µm	to 300 °C	19773	—
0.32 mm	30 µm	to 300 °C	19720	19722
0.53 mm	50 µm	to 300 °C	19721	19723

### did you know?

Rt<sup>®</sup>-Msieve 5A PLOT columns are designed for efficient separation of Ar/O<sub>2</sub> and other permanent gases, including CO.

### similar phases

HP PLOT Molsieve, CP-Molsieve 5A, Molsieve 5A, AT-Molsieve, PLT-5A

### tech tip

#### Molecular sieve materials are very hydrophilic

Because molecular sieve materials are very hydrophilic, they will adsorb water from the sample or carrier gas. Water contamination can have a detrimental effect on peak symmetry and can reduce the resolution of all compounds. If water contamination occurs, reactivate your Rt<sup>®</sup>-Msieve 5A PLOT column by conditioning at 300 °C with dry carrier gas flow for 3 hours.

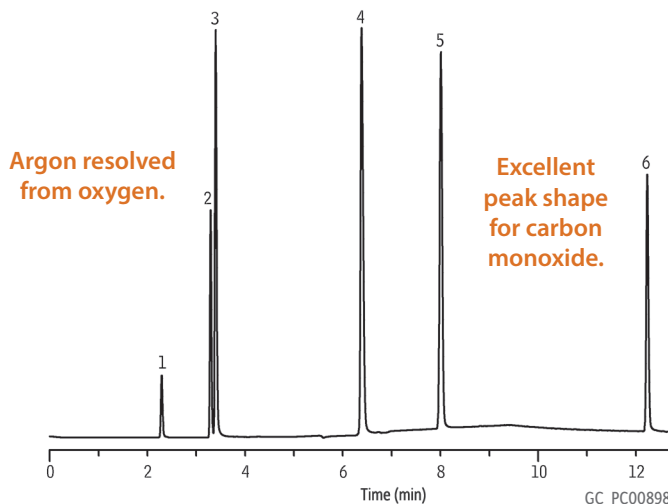
### also available

Metal MXT<sup>®</sup>  
PLOT Columns

See page 129.



### Separation of Argon/Oxygen and Other Permanent Gases on Rt<sup>®</sup>-Msieve 5A



Peaks	Conc. (µg/mL)	Column	Rt <sup>®</sup> -Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 19723)
1. Hydrogen	40	Sample	Permanent gases
2. Argon	30	Injection	Sample valve
3. Oxygen	50	Sample Loop Vol.:	5 µL
4. Nitrogen	50	Valve Name:	6-port Valco <sup>®</sup> valve
5. Methane	40	Inj. Temp.:	200 °C
6. Carbon monoxide	50	Valve Temp.:	Ambient
		Oven	
		Oven Temp.:	27 °C (hold 5 min) to 100 °C at 10 °C/min (hold 5 min)
		Carrier Gas	He, constant flow
		Flow Rate:	5.0 mL/min
		Detector	Valco <sup>®</sup> helium ionization detector @ 150 °C

## Porous Polymer Columns

Porous polymers are unique, highly retentive stationary phases with a wide application range that are able to elute both polar and nonpolar compounds. They are very hydrophobic, so water has no impact on retention times and even elutes as a good chromatographic peak. The Q-BOND is our most nonpolar and widely used porous polymer column; functional groups can be added to increase polarity (i.e., QS-, S-, and U-BOND). The process used to manufacture porous polymer PLOT columns causes the particles to adhere strongly to the walls of the tubing, so there is virtually no particle generation. You get reproducible performance from column to column, including selectivity and flow.

### similar phases

HP PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q, Supel-Q-PLOT, AT-Q

Our porous polymer PLOT columns are not moisture sensitive, making them ideal for applications where moisture is of major concern.

### Rt®-Q-BOND Columns (fused silica PLOT)

100% divinylbenzene

- Nonpolar PLOT column incorporating 100% divinylbenzene.
- Excellent for analysis of C1 to C3 isomers and alkanes up to C12.
- High retention for CO<sub>2</sub> simplifies gas analysis; CO<sub>2</sub> and methane separated from O<sub>2</sub>/N<sub>2</sub>/CO. (Note: O<sub>2</sub>/N<sub>2</sub>/CO not separated at room temperature.)
- Use for analysis of oxygenated compounds and solvents.
- Maximum temperature of 300 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 280/300 °C	19764	19765
0.32 mm	10 µm	to 280/300 °C	19743	19744
0.53 mm	20 µm	to 280/300 °C	19741	19742

Restek porous polymer PLOT columns cover a wide range of polarities

least polar



Q-BOND

QS-BOND

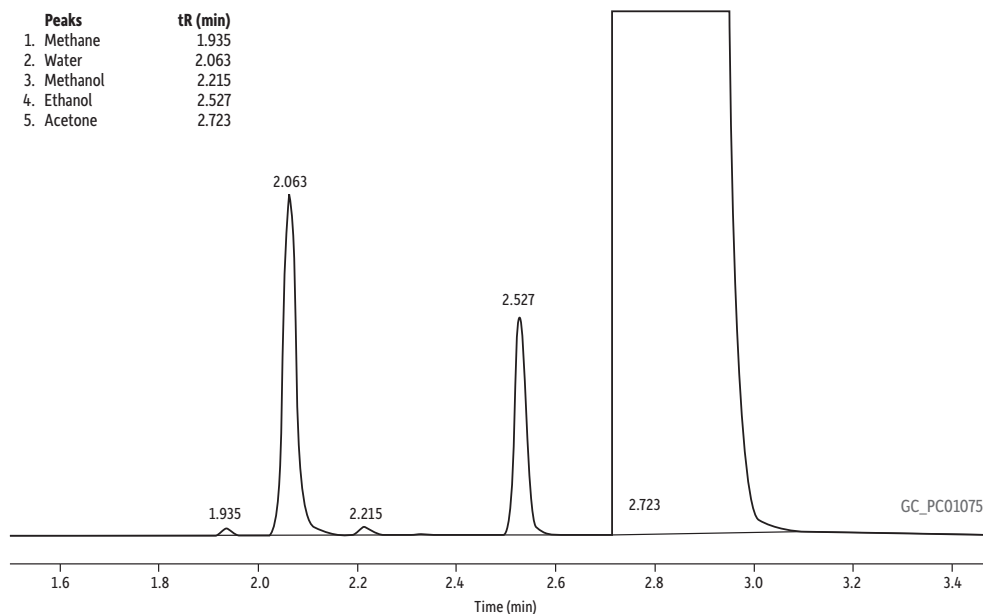
S-BOND

U-BOND

most polar

### Water and Ethanol in Acetone on Rt®-Q-BOND

Peaks	tR (min)
1. Methane	1.935
2. Water	2.063
3. Methanol	2.215
4. Ethanol	2.527
5. Acetone	2.723



**Column** Rt®-Q-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19742)  
**Sample** Acetone  
**Diluent:** 0.5% Water and ethanol  
**Conc.:**  
**Injection**  
**Inj. Vol.:** 3 µL split (split ratio 11:1)  
**Liner:** Splitless taper (4 mm) w/wool (cat.# 22405)  
**Inj. Temp.:** 250 °C  
**Oven**  
**Oven Temp.:** 200 °C (hold 4 min)  
**Carrier Gas** He, constant linear velocity  
**Linear Velocity:** 28.7 cm/sec @ 200 °C  
**Detector** TCD @ 260 °C

**Rt®-QS-BOND Columns** (fused silica PLOT)

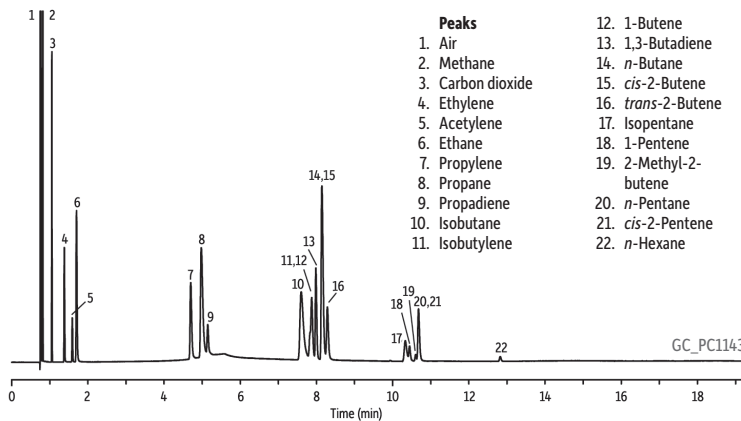
porous divinylbenzene homopolymer

- Intermediate polarity PLOT column incorporating low 4-vinylpyridine.
- Separates ethane, ethylene, and acetylene to baseline.
- Designed for the best possible separation between all C2 isomers.
- Stable to 250 °C.

**similar phases**

GS-Q

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 250 °C	19767	19768
0.32 mm	10 µm	to 250 °C	19739	19740
0.53 mm	20 µm	to 250 °C	19737	19738

**Refinery Gas Mixture on Rt®-QS-BOND****Peaks**

- Air
- Methane
- Carbon dioxide
- Ethylene
- Acetylene
- Ethane
- Propylene
- Propane
- Propadiene
- Isobutane
- Isobutylene
- 1-Butene
- 1,3-Butadiene
- n*-Butane
- cis*-2-Butene
- trans*-2-Butene
- Isopentane
- 1-Pentene
- 2-Methyl-2-butene
- n*-Pentane
- cis*-2-Pentene
- n*-Hexane

**Column Sample Injection**

Inj. Vol.: 20 µL split  
Liner: 2 mm (cat.# 20712)  
Inj. Temp.: 200 °C

**Split Vent**

Flow Rate: 35 mL/min

**Oven**

Oven Temp.: 40 °C (hold 2 min) to 225 °C at 15 °C/min (hold 5 min)

**Carrier Gas**

He, constant pressure (11.5 psi, 79.3 kPa)

**Linear Velocity:**

68 cm/sec @ 40 °C

**Detector**

TCD @ 225 °C

**Make-up Gas**

Type: He

**Data Rate:**

20 Hz

**Sensitivity Mode:**

He/Hz

**Instrument**

HP5890 GC

Column Rt®-QS-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19738)  
Sample Refinery gas standard

**Rt®-S-BOND Columns** (fused silica PLOT)

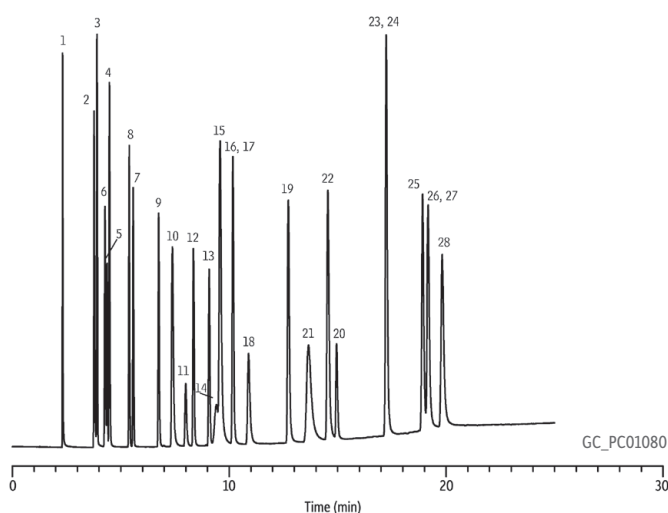
porous divinylbenzene homopolymer

- Midpolarity PLOT column, incorporating high 4-vinylpyridine.
- Use for the analysis of nonpolar and polar compounds.
- Stable to 250 °C.

**similar phases**

CP-PoraPLOT S

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 250 °C	19769	19770
0.32 mm	10 µm	to 250 °C	19747	19748
0.53 mm	20 µm	to 250 °C	19745	19746

**Solvent Mixture on Rt®-S-BOND****Peaks**

- Methanol
- Ethanol
- Acetonitrile
- Acetone
- Dichloromethane
- 1,1-Dichloroethane
- Nitromethane
- trans*-1,2-Dichloroethylene
- cis*-1,2-Dichloroethylene
- Tetrahydrofuran
- Chloroform
- Ethyl acetate
- 1,2-Dichloroethane
- 1,1,1-Trichloroethane
- Benzene
- 1,2-Dimethoxyethane
- Trichloroethylene
- 1,4-Dioxane
- Pyridine
- Dimethylformamide
- Methylcyclohexane
- Toluene
- 2-Hexanone
- Chlorobenzene
- Ethylbenzene
- m*-Xylene
- p*-Xylene
- o*-Xylene

**Column**

Rt®-S-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19746)

**Sample**

Solvent mixture

**Injection**

Inj. Vol.: 1.0 µL split

**Liner:**

Taper (4 mm) (cat.# 20798)

**Inj. Temp.:**

200 °C

**Split Vent**

Flow Rate: 100 mL/min

**Oven**

Oven Temp.: 120 °C to 220 °C at 5 °C/min (hold 5.0 min)

**Carrier Gas**

H<sub>2</sub>, constant pressure (4.2 psi, 29.0 kPa)

**Linear Velocity:**

40 cm/sec @ 120 °C

**Detector**

FID @ 220 °C

## similar phases

HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U

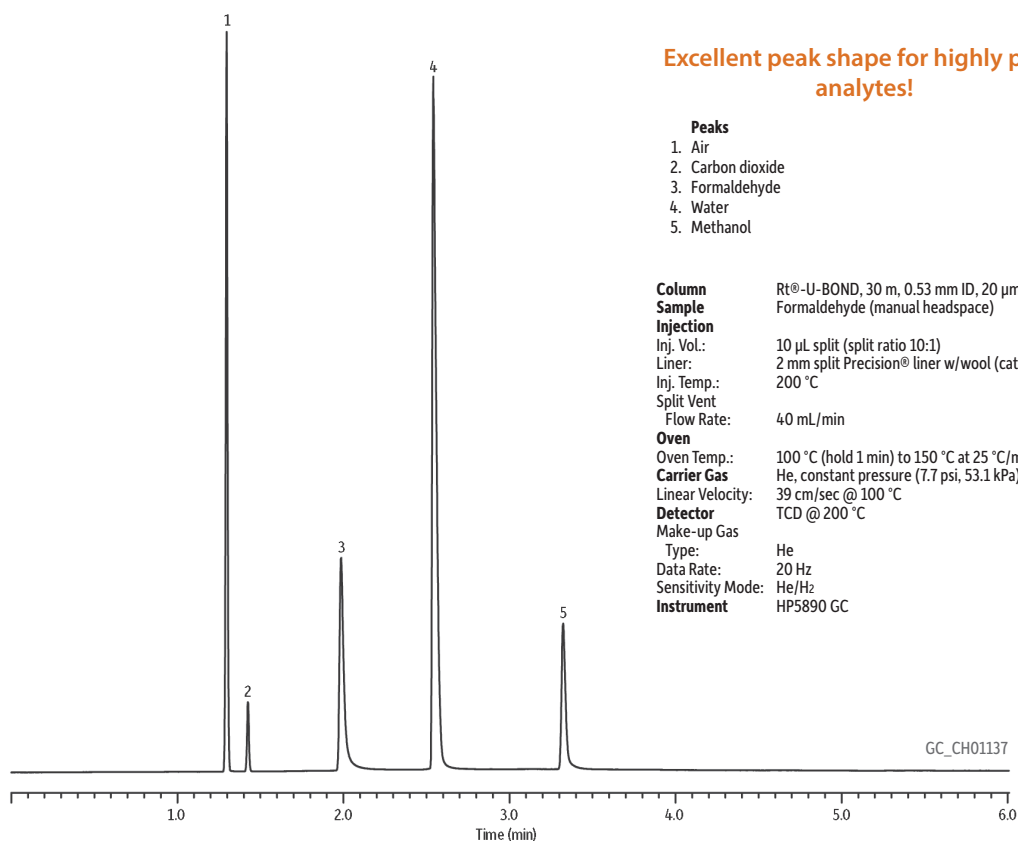
**Rt®-U-BOND Columns** (fused silica PLOT)

divinylbenzene ethylene glycol/dimethylacrylate

- Restek's highest polarity porous polymer column.
- Polar PLOT column, incorporating divinylbenzene ethylene glycol/dimethylacrylate.
- Highly inert for the analysis of polar and nonpolar compounds.
- Stable to 190 °C.

ID	df	temp. limits	15-Meter cat.#	30-Meter cat.#
0.25 mm	8 µm	to 190 °C	19771	19772
0.25 mm	12 µm	to 190 °C	19782	—
0.32 mm	10 µm	to 190 °C	19751	19752
0.53 mm	20 µm	to 190 °C	19749	19750

## Formaldehyde on Rt®-U-BOND

**PLOT Column Particle Trap**

- Includes two Press-Tight® connectors and a 2.5 m column.
- Protects detector and valves; connects between column and detector or valve.
- Eliminates detector spikes and scratches in valve rotors.

The technology used to adhere particles in PLOT columns is excellent; however, it is still possible for particles to dislodge when extreme pressure shocks and gas flow changes occur. This sometimes happens when valve switching or backflushing is used. In those cases, using particle traps is recommended.



19754

Description	qty.	cat.#
PLOT Column Particle Trap, 2.5 m, 0.32 mm ID with 2 Press-Tight Connectors	ea.	19753
PLOT Column Particle Trap, 2.5 m, 0.53 mm ID with 2 Press-Tight Connectors	ea.	19754



### Metal MXT® PLOT Columns

Advantages of metal MXT® PLOT columns include:

- Can be made in small coil diameters—perfect for tight spaces.
- Rugged material withstands rough handling and shock.
- Designed for robust performance in process GCs and field instruments.
- Available in 3.5"-coil diameter or 7"-diameter, 11-pin cage.

Restek® chemists have developed technology that allows many of our popular PLOT columns to be made on Siltek®-treated stainless steel. These columns have the same characteristics and performance as fused silica PLOT columns, but offer additional benefits for process GCs and field applications as they are virtually unbreakable and can be coiled into very small diameters.

ID	df	temp. limits	3.5" coil 15-Meter cat.#	7" diameter 11-pin cage 15-Meter cat.#	3.5" coil 30-Meter cat.#	7" diameter 11-pin cage 30-Meter cat.#
<b>MXT-MSieve 5A</b>						
0.25 mm	20 µm	to 300 °C	79717-273	79717	—	—
0.53 mm	50 µm	to 300 °C	—	—	79723-273	79723
<b>MXT-Alumina BOND/Na<sub>2</sub>SO<sub>4</sub></b>						
0.53 mm	10 µm	to 200 °C	—	—	79714-273	79714
<b>MXT-Alumina BOND/MAPD</b>						
0.53 mm	10 µm	to 250 °C	—	—	79728-273	79728
<b>MXT-Q-BOND</b>						
0.25 mm	8 µm	to 300 °C	79718-273	79718	—	—
0.53 mm	20 µm	to 280/300 °C	—	—	79716-273	79716
<b>MXT-S-BOND</b>						
0.53 mm	20 µm	to 250 °C	—	—	79712-273	79712



### MXT® GC Column Ferrule Guide

GC Column ID	GC Column OD	Ferrule ID
0.18 mm	0.36 ± 0.001	0.4
0.25 mm	0.41 ± 0.001	0.5
0.28 mm	0.56 ± 0.001	0.6
0.32 mm	0.44 ± 0.0015	0.5
0.53 mm	0.74 ± 0.001	0.8

## Speed Up and Simplify GC Method Development with Restek's EZGC® Online Suite



Download these FREE web apps at [www.restek.com/ezgc](http://www.restek.com/ezgc)

### free literature

Restek's PLOT Column Family  
The New Benchmark For  
Performance!

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free copy from

[www.restek.com](http://www.restek.com)

lit. cat.#  
PCBR1163D-UNV



# GC Columns

## Packed/Micropacked Columns

Overview .....	131
Bonded Stationary Phases.....	132–133
Packed Column Tubing .....	134
Stock Packed Columns.....	135–136
Stock Micropacked Columns.....	137
Application-Specific	
Packed/Micropacked Columns.....	138–141
Packed/Micropacked Column Installation Kits ....	142
Packed Column Packing Materials.....	143–145
Liquid Phases for Custom Columns.....	146
USP Liquid Phase & Solid Support	
Cross-Reference.....	147
Custom Coated Packing Materials .....	148
Custom Packed/Micropacked Columns.....	149
Packed/Micropacked Column	
Custom Order Form.....	150
Column Configurations .....	151



## Put the power of Restek® packed columns to work for you.

- SilcoSmooth® tubing provides the inertness of glass and the durability of stainless steel, so you get accurate results for a wide range of active compounds.
- Stable bonded stationary phases mean short conditioning times, low bleed, and long column lifetimes.
- Excellent retention time reproducibility delivers reliable, consistent results.

Packed columns offer large sample capacity and often can retain and separate compounds that cannot be analyzed by other techniques. While these advantages have resulted in their use in a wide range of GC applications, traditional packed columns are limited by unstable phases that break down easily, producing high column bleed and short column lifetimes. In addition, the tubing used for packed columns can present challenges; columns packed in glass tubing are inflexible and break easily, whereas columns made with metal tubing typically are not inert, meaning active compounds cannot be analyzed accurately as they react with metal tubing.

Restek® packed columns overcome these problems and are preferred over conventional packed columns, because they are exceptionally rugged and inert. You can generate accurate data quickly and reliably with less downtime for column changes with Restek® packed columns since they combine high-quality SilcoSmooth® tubing with stable bonded phase technology. SilcoSmooth® tubing is rugged, ultra-smooth seamless 304 stainless steel tubing that is deactivated with an innovative Siltek® treatment. This process results in packed columns that have both the inertness of glass and the strength and flexibility of stainless steel. In addition, our bonded phase technology features a coated support that is extremely stable and results in longer column lifetimes, lower bleed, and excellent reproducibility.

Put the power of Restek® packed columns to work in your lab today. We offer a broad range of common phases, as well as application-specific products developed for light hydrocarbon analysis, sulfurs, permanent gases, and ASTM Method D3606.

- Know which Restek® packed column you need? Find it on the following pages and order by web, phone, or fax today.
- Looking for an application-specific column? See what we recommend for your work on the following page.
- Need a custom column? Complete our custom product form on page 150 and we will send you a quote within two business days!

## Who says packed columns are old technology? Not Restek!

By combining flexible SilcoSmooth® tubing with low-bleed bonded phases, we have made the most significant improvements in packed column technology in more than 25 years!

Columns available in  
0.53, 0.75, 1.0, 2.0, 2.1,  
3.2, & 5.3 mm ID.

Bonded phase packings  
decrease conditioning times  
and bleed, and increase  
column lifetime.

Columns can be configured  
for all GC models.

Silcosmooth® tubing has a Siltek®-treated  
surface, which is more inert than glass.

The most complete  
line of packing  
materials available.

## Bonded Stationary Phases

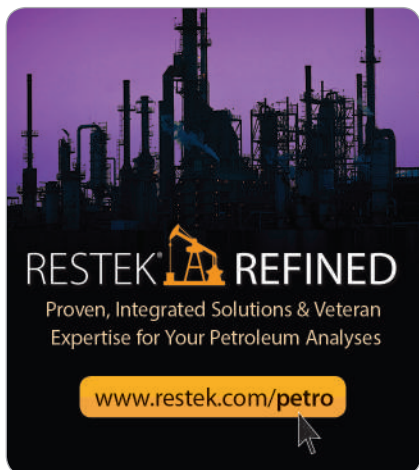
We combined our stationary phase synthesis experience with our unique Silcoport® packing deactivation process to create bonded phase packings that provide longer life-times, lower bleed, and shorter conditioning times.

Bonded methyl silicone phases (Rtx®-1 and Rtx®-5 columns) and bonded Carbowax® phase (Stabilwax® columns) are completely cross-linked on Silcoport® packing. We have evaluated Rtx®-1 and Rtx®-5 bonded packed column phases side-by-side with non-bonded phases of comparable polarity; the bonded phases last longer than the equivalent nonbonded packing materials. Table I shows that retention times on an Rtx®-1 bonded packed column are highly repeatable after only 30 minutes of conditioning.

**Table I:** Retention data shows the perfect reproducibility of the bonded phase packed columns with respect to retention times.

Hydrocarbon	Retention Time			
	Min.	Max.	Mean	Stand. Dev.
C5	0.241	0.243	0.242	0.001
C6	0.493	0.497	0.495	0.002
C10	5.746	5.765	5.752	0.005
C20	18.482	18.491	18.486	0.004
C28	25.093	25.103	25.098	0.004
C40	32.160	32.171	32.166	0.004
C44	34.316	34.328	34.326	0.007

n = 9 columns



## Quick Reference Chart

For specific applications, Restek recommends using these optimized columns for better method performance.

Application	Column	Feature	Benefit
ASTM Method D3606	D3606 Application Column Set, p. 138 (Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, Rtx-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material)	Excellent separation of ethanol and benzene.	Reliably meets method requirements.
Refinery gases	2abc Refinery Gas Column Set, p. 139  Backflush Column	Optimized three-column set. (Backflush column sold separately.)	Elutes C5 hydrocarbons before C1-C4 hydrocarbons for optimized resolution.
Unsaturated light hydrocarbons	n-Octane on Res-Sil C Column, p. 139	Unique selectivity for unsaturated hydrocarbons.	Excellent resolution of unsaturated light hydrocarbons gives increased data accuracy.
cis-2-Butene and 1,3-butadiene	OPN on Res-Sil C Column, p. 139	Optimized selectivity for cis-2-butene and 1,3-butadiene resolution.	Increases data accuracy.
Permanent gases	Shincarbon ST Columns, p. 140 Packed or micropacked	Optimized selectivity for permanent gas resolution without cryogenic cooling. Preconditioned.	Increases productivity.
Low-level sulfurs	Rt-XLSulfur Columns, p. 141 Packed or micropacked	Highly inert for ppbv levels of sulfur. Eliminates need for PTFE tubing.	Increases data accuracy for low-level sulfur analysis. Eliminates need for a special GC setup.



## Bonded Packed Column Stationary Phases

- Short conditioning times.
- Reproducible bonded phase selectivity.
- Low bleed levels.
- Longer column lifetimes.
- Unsurpassed inertness for active compounds.

Bonded phases are used in capillary columns because they provide a dramatic increase in column quality. To truly bridge the gap between traditional packed columns and capillary columns, it was necessary to develop bonded liquid phases for packed columns. Packed column chromatographers can expect shorter conditioning times, lower bleed, and longer column lifetimes by using Restek bonded phase packed columns.

Bonded phases also last much longer than nonbonded phases. Bonded phases are more resistant to oxidation than nonbonded phases because of the stronger intermolecular forces produced by cross-linking. Because the material is thoroughly cross-linked, the phase will not migrate or puddle, as often happens with nonbonded phases. Figure 1 shows a comparison of a bonded and a nonbonded methyl silicone column after 170 temperature cycles. The results show the impressive durability of bonded phases.

### Equivalent Liquid Phases

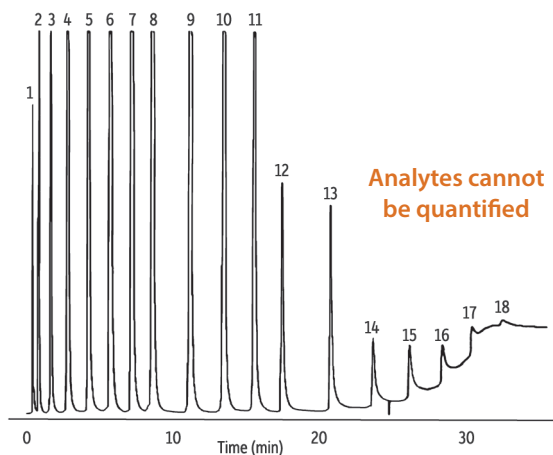
	BP-1, CC-1, CP-Sil 5CB, DB-1, DC-200, GE-SF-96, HP-1, HP-101, OV-1, OV-101,
<b>Rtx-1</b>	RSK-150, RH-1, SE-30, SP-2100, SPB-1, UCC W-98, G2, G1
<b>Rtx-5</b>	BP-5, CB-5, CC-5, CP-Sil 8CB, DB-5, HP-5, OV-73, SE-52, SE-54, SPB-5, Ultra-5, G27, G36
<b>Stabilwax</b>	BP-20, CP-Wax, CW-20, DB-Wax, HP-Innowax, PE-Wax, Supelcowax-10, G16

## Restek's packed columns deliver the 1-2-3 PUNCH!

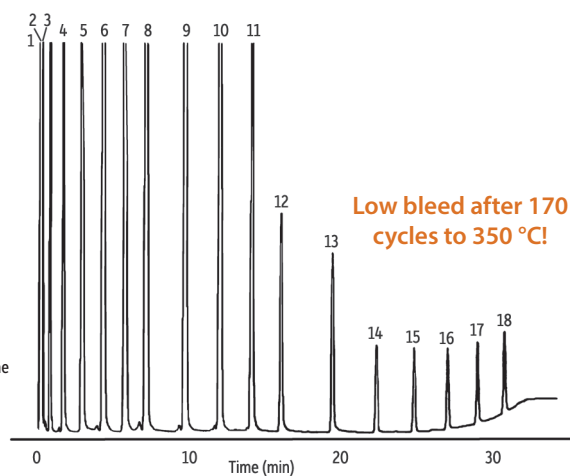
1. Bonded stationary phases mean short conditioning times, low bleed, and unsurpassed column lifetimes.
2. SilcoSmooth® tubing provides the inertness of glass and the durability of stainless steel.
3. Excellent retention time reproducibility for reliable, consistent results!

**Figure 1: Bonded packed columns exhibit longer lifetime than nonbonded packed columns.**

Nonbonded Methyl Silicone



Bonded Rtx®-1



- Peaks**
1. Pentane
  2. Hexane
  3. Heptane
  4. Octane
  5. Nonane
  6. Decane
  7. Undecane
  8. Dodecane
  9. Tetradecane
  10. Hexadecane
  11. Octadecane
  12. Eicosane
  13. Tetracosane
  14. Octacosane
  15. Dotriacontane
  16. Hexatriacontane
  17. Tetracontane
  18. Tetraetracontane

GC\_PC00369

<b>Column Sample</b>	Rtx®-1 Sim Dist 2887, SilcoSmooth® Tubing, 25 inches, 1/8 in. OD, 2 mm ID (cat.# 80000-800) 1-12% (w/w) each component ASTM D2887-01 calibration mix (1% each listed analyte in CS2) (cat.# 31674) ASTM D2887-01 calibration mix (5% each, neat) (cat.# 31675)
<b>Injection</b>	
Inj. Vol.:	1.0 µL packed not on-column
Inj. Temp.:	350 °C
<b>Oven</b>	
Oven Temp.:	35 °C to 350 °C at 10 °C/min (hold 5 min)
<b>Carrier Gas</b>	
Flow Rate:	He, constant flow 25 mL/min
<b>Detector</b>	
Notes	FID @ 350 °C FID sensitivity: 256 x 10 <sup>-11</sup> AFS

## did you know?

Restek's advanced packed column technology provides columns with unmatched inertness and efficiency.

### Packed Column Reduction Fittings

We will weld tubing reducers or VCR fittings to your column. Call Customer Service (ext. 3) or your Restek representative for pricing and availability.



Welded Tubing Reducers



Welded VCR Fittings

### Packed Column Tubing

Restek offers a wide range of tubing choices for our packed columns, including SilcoSmooth® (Siltek®-treated stainless steel), stainless steel, PTFE, nickel, copper, and Hastelloy® tubing. SilcoSmooth® and stainless steel tubing are our two most popular column materials. SilcoSmooth® tubing is an excellent replacement for fragile glass columns. Stainless steel tubing works well with most applications for nonreactive compounds.

#### SilcoSmooth® Tubing

If your analysis involves reactive compounds, you can use SilcoSmooth® tubing, which combines the inertness of glass with the strength and flexibility of stainless steel. Made from ultra-smooth, seamless 304 stainless steel and treated with the innovative Siltek® process, SilcoSmooth® tubing can replace glass columns for virtually any application.

#### Stainless Steel Tubing

If you are analyzing hydrocarbons or nonreactive compounds, you can use our rugged, flexible, and economical stainless steel columns. Restek® stainless steel columns are made from high-quality welded and drawn tubing.

#### Hastelloy® Tubing

Hastelloy® tubing is a nickel-chromium alloy with excellent inertness. It is normally used only for highly corrosive or oxidizing compounds or gases.

#### Nickel Tubing

Nickel tubing is often used for analyses of caustic or oxidizing compounds or gases.

#### Copper Tubing

Copper is a general-purpose tubing that is only recommended for inactive compounds.

#### PTFE Tubing

PTFE tubing is often used for reactive compounds or other special applications. Note that this tubing is permeable to gases.

**Table I:** Packed and Micropacked Column Tubing Dimensions

Material	Packed				Micropacked		
	1/4-inch OD x 5.3 mm ID	3/16-inch OD x 3.2 mm ID <sup>1</sup>	1/8-inch OD x 2.0 mm ID <sup>2</sup>	1/8-inch OD x 2.1 mm ID	1/16-inch OD x 1.0 mm ID <sup>3</sup>	0.95 mm OD x 0.75 mm ID <sup>4</sup>	0.74 mm OD x 0.53 mm ID
SilcoSmooth	✓	✓	✓		✓	✓	✓
Stainless Steel	✓	✓		✓	✓	✓	
Hastelloy				✓			
Nickel				✓			
Copper	✓			✓			
PTFE				✓			

<sup>1</sup> 3/16-inch OD x 3.2 mm ID replaces 1/4-inch OD x 4 mm ID glass columns.

<sup>2</sup> 1/8-inch OD x 2.0 mm ID replaces 1/4-inch OD x 2 mm ID glass columns.

<sup>3</sup> 1/16-inch OD x 1.0 mm ID micropacked columns are designed for packed column injection systems.

<sup>4</sup> 0.95 mm OD x 0.75 mm ID micropacked columns are designed for capillary injection systems.

## also available

For more information on micropacked columns, see [page 137](#).

### please note

We do not offer glass packed columns. SilcoSmooth® columns offer the inertness of glass, without the breakage problems.

## Chromosorb® Diatomaceous Earth Packed Columns

### Bonded Stationary Phase Packed Columns

- Low bleed levels.
- Longer column lifetimes.
- Short conditioning times.

Bonded Phase on 100/120 Silcoport W***	Stainless Steel Tubing				SilcoSmooth Tubing**			
	L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
3% Rtx-1	6	1/8	2.1	80441-	2	1/8	2.0	80401-
10% Rtx-1	6	1/8	2.1	80442-	2	1/8	2.0	80405-
20% Rtx-1	6	1/8	2.1	80443-	2	1/8	2.0	80409-
3% Rtx-5	6	1/8	2.1	80444-	2	1/8	2.0	80477-
10% Rtx-5	6	1/8	2.1	80445-	2	1/8	2.0	80478-
20% Rtx-5	6	1/8	2.1	80446-	2	1/8	2.0	80479-
5% Rtx-Stabilwax	6	1/8	2.1	80447-	2	1/8	2.0	80415-
10% Rtx-Stabilwax	6	1/8	2.1	80448-	2	1/8	2.0	80416-
20% Rtx-Stabilwax	6	1/8	2.1	80449-	2	1/8	2.0	80417-
Rtx-1 SimDist 2887****	25"	1/8	2.1	80450-	25"	1/8	2.0	80000-

### please note

Stock packed columns are designed with a 2" void on the inlet end for on-column injections. For column configurations containing no void, add suffix -901 to the part number.

### Non-Bonded Stationary Phase Packed Columns

On 100/120 Silcoport W***	Stainless Steel Tubing				SilcoSmooth Tubing**			
	L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
3% Rt-101	6	1/8	2.1	80461-	2	1/8	2.0	80400-
5% Rt-1200/1.75% Bentone 34	6	1/8	2.1	80463-	2	1/8	2.0	80125-
5% Rt-1200/5% Bentone 34	6	1/8	2.1	80464-	2	1/8	2.0	80129-

On Chromosorb PAW	Mesh	Stainless Steel Tubing				SilcoSmooth Tubing**			
		L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
10% TCEP	100/120	8	1/8	2.1	80465-	2.5	1/8	2.0	80126-
23% Rt-1700	80/100	30	1/8	2.1	80466-	9.2	1/8	2.0	80128-

### please note

Temperature limits for stationary phases are listed on **page 146**.

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.

\*\*Siltek-treated stainless steel.

\*\*\*Modified version of Chromosorb W; highest inertness, most consistent performance.

\*\*\*\*Application-specific column.

## Porous Polymer Packed Columns

Restek offers a full range of porous polymers, including HayeSep® and Porapak polymer packings for analyses of volatile compounds and light solvents.

Porous Polymers 80/100 Mesh	Stainless Steel Tubing				SilcoSmooth Tubing**			
	L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
HayeSep Q	6	1/8	2.1	80467-	2	1/8	2.0	80433-
Porapak Q	6	1/8	2.1	80468-	2	1/8	2.0	80427-
Porapak QS	6	1/8	2.1	80469-	2	1/8	2.0	80426-
Porapak R	6	1/8	2.1	80470-	2	1/8	2.0	80425-

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.

\*\*Siltek-treated stainless steel.

## Customized Solutions

Restek builds  
to your exact  
specifications.



Request columns at

[www.restek.com/packed](http://www.restek.com/packed)



### also available

Porapak, HayeSep®, and Tenax® packing materials.

See **page 145**.

## also available

CarboBlack packing materials. See page 143.

## Column Instrument Configurations



General Configuration  
Suffix -800



Agilent 5880, 5890, 5987,  
6890, 7890:  
Suffix -810\*



Bruker 430, 3700, Vista Series, FID:  
Suffix -820



8 3/4" PE 900-3920, Sigma 1,2,3:  
Suffix -830



6 1/2" PE Auto System 8300, 8400, 8700  
Suffix -840

See page 151 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.

\*-810 suffix also includes 1 1/2" void on detector side.

Note: Standard micropacked columns fit all instruments. No special instrument configuration suffix is required.

## CarboBlack Packed Columns

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to Carbowax™ and Carbowax graph supports.

On CarboBlack B	Mesh	Stainless Steel Tubing				SilcoSmooth Tubing**			
		L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
5% Carbowax 20M	80/120	—	—	—	—	2	1/8	2.0	80105-
5% Carbowax 20M	60/80	6	1/8	2.1	88012-	1.8	1/8	2.0	80106-
6.6% Carbowax 20M	80/120	6	1/8	2.1	80451-	2	1/8	2.0	80107-
4% Carbowax 20M/ 0.8% KOH	60/80	—	—	—	—	2	1/8	2.0	80116-
1% Rt-1000	60/80	8	1/8	2.1	88013-	2.4	1/8	2.0	80206-
1% Rt-1000	60/80	6	1/8	2.1	80452-	2	1/8	2.0	80207-
3% Rt-1500	80/120	10	1/8	2.1	80453-	3.05	1/8	2.0	80211-
1% Rt-1510	60/80	10	1/8	2.1	80454-	3.05	1/8	2.0	80216-
1.5% XE-60/1% H <sub>3</sub> PO <sub>4</sub>	60/80	6	1/8	2.1	80455-	1.8	1/8	2.0	80305-

On CarboBlack B	Mesh	Nickel 200 Tubing			
		L (m)	OD (in)	ID (mm)	cat.#*
5% Krytox (Ni 200 tubing)	60/80	3.05	1/8	2.1	80127-

On CarboBlack C	Mesh	Stainless Steel Tubing				SilcoSmooth Tubing**			
		L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
0.2% Carbowax 1500	60/80	6	1/8	2.1	80456-	2	1/8	2.0	80121-
0.2% Carbowax 1500	80/100	6	1/8	2.1	80457-	2	1/8	2.0	80122-
0.1% Rt-1000	80/100	6	1/8	2.1	80458-	1.8	1/8	2.0	80205-
0.19% picric acid	80/100	6	1/8	2.1	80459-	2	1/8	2.0	80311-

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

\*\*Siltek-treated stainless steel.

## Molecular Sieve Packed Columns

Molecular sieve packed columns easily separate permanent gases at above-ambient temperatures. Restek's R&D chemists have developed a process for preparing molecular sieve packings, which results in excellent batch-to-batch reproducibility. In addition, our molecular sieves are preactivated and ready to use. Each column comes with metal end-fittings to prevent water or carbon dioxide from adsorbing into the packing during shipment.

Molecular Sieve	Mesh	Stainless Steel Tubing				SilcoSmooth Tubing**			
		L (ft)	OD (in)	ID (mm)	cat.#*	L (m)	OD (in)	ID (mm)	cat.#*
Molesieve 5A	60/80	6	1/8	2.1	80473-	2	1/8	2.0	80428-
Molesieve 5A	80/100	3	1/8	2.1	88015-	1	1/8	2.0	80440-
Molesieve 5A	80/100	6	1/8	2.1	80474-	2	1/8	2.0	80429-
Molesieve 5A	80/100	10	1/8	2.1	88014-	3.05	1/8	2.0	80430-
Molesieve 13X	60/80	6	1/8	2.1	80475-	2	1/8	2.0	80480-
Molesieve 13X	80/100	6	1/8	2.1	80476-	2	1/8	2.0	80439-

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

\*\*Siltek-treated stainless steel.



**Micropacked GC Columns**

- Increased efficiency over traditional packed columns.
- Higher capacity than PLOT columns.
- Made from inert, flexible SilcoSmooth® tubing.
- Wide range of packings available.
- Standard coils fit all instruments. No special instrument configurations required.

**Efficient, Inert, and Flexible**

Micropacked columns are highly efficient and provide good sample capacity, resulting in a powerful tool for solving many difficult application problems. The unsurpassed inertness of SilcoSmooth® tubing is based on Siltek® deactivation, which allows the column to be flexed and coiled without any fear of chipping or cracking the inert surface.

**Easy to Install—Multiple Internal Diameters**

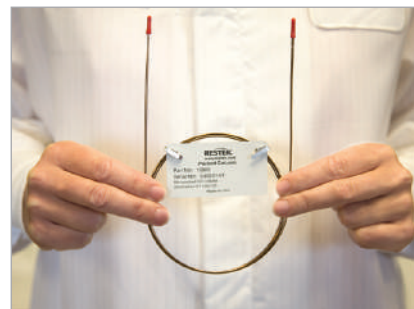
Our micropacked columns are designed to fit packed and capillary injection systems. Standard wall (1/16-inch OD) micropacked columns offer improved efficiency in packed column instruments without the expense of converting to capillary injection systems. Smaller OD (0.95 mm OD) micropacked columns install easily into a capillary injector, using slightly larger ferrules. Micropacked columns operate at flows exceeding 10 cc/min for trouble-free operation.

**Braided Wire End Plugs\***

Restek's packed column experts insert braided wire into the column and secure it by making a small crimp near the column outlet. End plugs are Siltek® treated—the sample contacts only inert surfaces.



All micropacked columns are made with inert SilcoSmooth® tubing, which is Siltek® treated for maximum inertness. See **page 134**.

**Micropacked GC Columns (0.53 mm ID)\***

	Mesh	ID	OD	Temp. Range	1-Meter cat.#	2-Meter cat.#
HayeSep Q	80/100	0.53 mm	0.74 mm	up to 275 °C		19042
Molesieve 5A	80/100	0.53 mm	0.74 mm	up to 300 °C		19041
Rt-XLSulfur	100/120	0.53 mm	0.74 mm	up to 300 °C		19044
ShinCarbon ST	80/100	0.53 mm	0.74 mm	up to 300 °C	19045	19043

**Micropacked GC Columns (0.75 mm ID)**

	ID	OD	Temp. Range	0.56-Meter cat.#
20% TCEP on 80/100 Chromosorb PAW	0.75 mm	1/16"	0–175 °C	19040

	Mesh	ID	OD	Temp. Range	1-Meter cat.#	2-Meter cat.#
HayeSep R	100/120	0.75 mm	0.95 mm	up to 250 °C	19014	19015
HayeSep Q	100/120	0.75 mm	0.95 mm	up to 275 °C	19018	19019
HayeSep N	100/120	0.75 mm	0.95 mm	up to 165 °C	19022	19023
HayeSep S	100/120	0.75 mm	0.95 mm	up to 250 °C	19010	19011
Molesieve 5A	80/100	0.75 mm	0.95 mm	up to 300 °C	19002	19003
Molesieve 13X	80/100	0.75 mm	0.95 mm	up to 350 °C	19006	19007

**Micropacked GC Columns (1.00 mm ID)**

	Mesh	ID	OD	Temp. Range	1-Meter cat.#	2-Meter cat.#
HayeSep R	100/120	1.00 mm	1/16"	up to 250 °C	19012	19013
HayeSep Q	100/120	1.00 mm	1/16"	up to 275 °C	19016	19017
HayeSep N	100/120	1.00 mm	1/16"	up to 165 °C	19020	19021
HayeSep S	100/120	1.00 mm	1/16"	up to 250 °C	19008	19009
Molesieve 5A	80/100	1.00 mm	1/16"	up to 300 °C	19000	19001
Molesieve 13X	80/100	1.00 mm	1/16"	up to 350 °C	19004	19005

\*Due to the small internal diameter of 0.53 mm ID columns, braided wire end plugs cannot be used; wool is inserted into the ends instead.

**Customized Solutions**

Restek builds to your exact specifications.



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## Aromatics Analysis

### D3606 Application Column Set (2 column set)

- Complete resolution of benzene from ethanol—no compromising coelutions.
- Accurate quantification of benzene and toluene.
- Fully conditioned two column set—ready to use out of the box.
- Listed in the appendix of ASTM Method D3606 as an acceptable alternative to TCEP columns—get better separation of benzene and ethanol while still following ASTM method requirements.

Conforms to the specifications established in the current ASTM method D3606 for the quantitation of benzene and toluene in spark ignition fuel containing ethanol.

Description	cat.#*
D3606 Application Column (2 column set)**	
Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx-1	83606-
Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material	

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 141.

\*\*The column set is designed to accommodate both valve injection and/or syringe injection. Column 1 is configured with a 2" inlet void to facilitate on-column injection. The inlet is identified on both column 1 and column 2. Note: The inlet of column 2 is identified for proper orientation for connection to the valve.

### free literature

Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

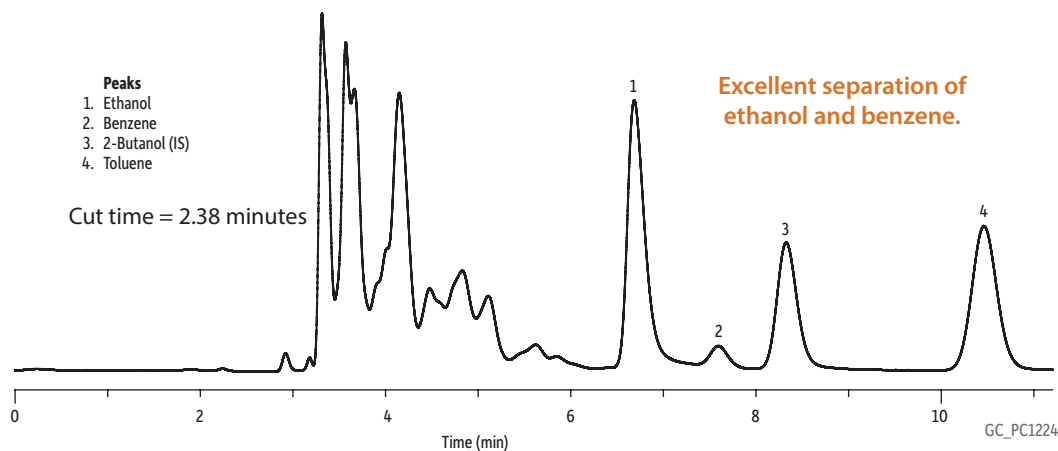
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### Gasoline Containing Ethanol on D3606 Application Column Set by ASTM D3606-10 (Modified)



<b>Column</b>	D3606 application column (2 column set). Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx®-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material (cat.# 83606-800)
<b>Sample</b>	Ethanol-containing gasoline with internal standard (IS)
<b>Diluent:</b>	
<b>Injection</b>	Sample valve
<b>Sample Loop Vol.:</b>	1.5 µL
<b>Valve Temp.:</b>	150 °C
<b>Oven</b>	
<b>Oven Temp.:</b>	135 °C (hold 12 min)
<b>Carrier Gas</b>	He, constant flow
<b>Flow Rate:</b>	20.0 mL/min
<b>Detector</b>	TCD @ 200 °C
<b>Notes</b>	2.38 minute backflush (must be determined for each GC system).

## Light Hydrocarbon Analysis

### Special Columns for Unsaturated Light Hydrocarbons

- Faster separations of C1 to C4 hydrocarbons.
- Res-Sil® packing replaces Porasil materials.

#### *n*-Octane on Res-Sil® C Packed Column

This packed column has unique selectivity for resolving unsaturated light hydrocarbons (Figure 1).

#### OPN on Res-Sil® C Packed Column

This column separates the light hydrocarbons, and baseline resolves *cis*-2-butene from 1,3-butadiene (Figure 2).

#### 2abc Refinery Gas Column Set

This three-column set is finely tuned to resolve light hydrocarbons. When used in the proper valving system, it will elute C5+ hydrocarbons ahead of C1 through C4 hydrocarbons (Figure 3).

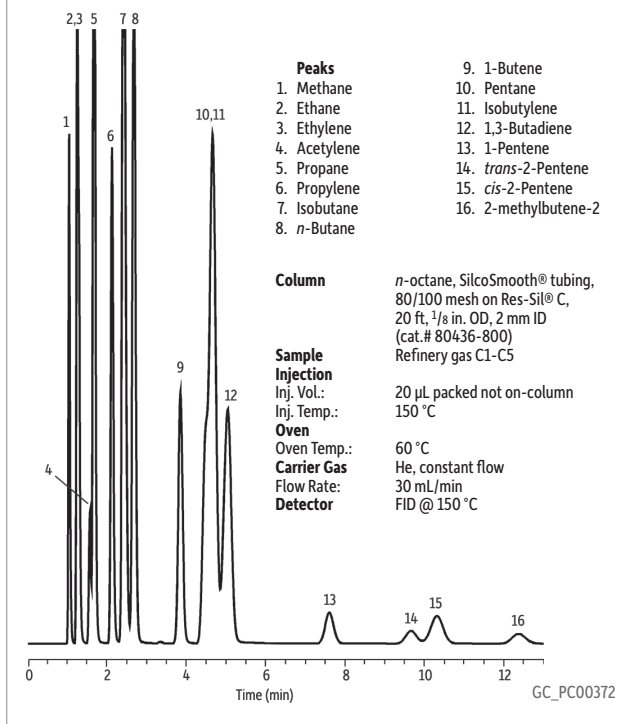
Description	cat.#*
<i>n</i> -Octane on Res-Sil C, 80/100 (20', 2.0 mm ID, 1/8" Silcosmooth OD)	80436-
OPN on Res-Sil C, 80/100 (12', 2.0 mm ID, 1/8" Silcosmooth OD)	80437-
2abc Refinery Gas Column Set (3 column set)**	88000-
2.1% Carbowax 1540 Porasil C (backflush column)***	88004-875

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on page 141.

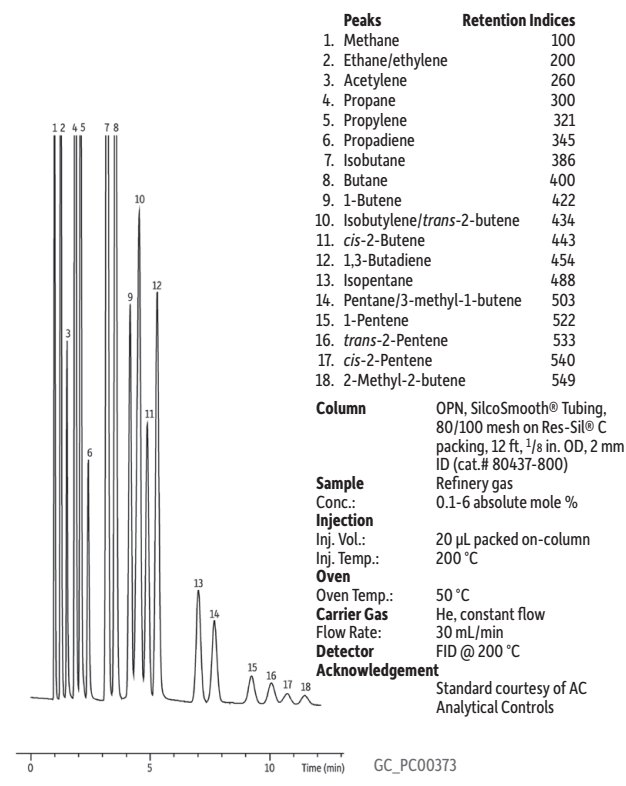
\*\*This column set is for a valving system; therefore, packing material is filled to ends of columns.

\*\*\*To be used with 2abc refinery gas column set (cat.# 88000-) to backflush and prevent C6+ hydrocarbons from entering column set.

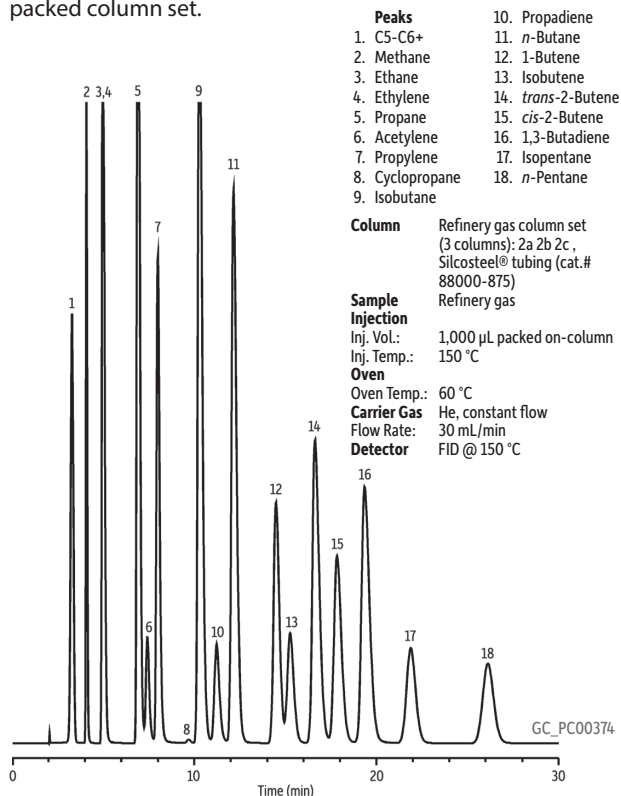
**Figure 1:** *n*-Octane on Res-Sil® C packing demonstrates unique selectivity for unsaturated light hydrocarbons.



**Figure 2:** OPN on Res-Sil® C packing demonstrates unique selectivity for *cis*-2-butene and 1,3-butadiene.



**Figure 3:** Refinery gas calibration standard on refinery gas packed column set.



for more info

See page 144 for more information on Res-Sil® packing materials.

RESTEK CHROMALYTICs® in AUSTRALIA: Contact +81 3 9762 2034  
 Distributor

SHOPPE 39  
 www.chromalytic.net.au  
 e-mail: sales@chromtech.net.au

## it's a fact

ShinCarbon ST is an ideal packing material for permanent gases, low molecular weight hydrocarbons, sulfur dioxide, and Freon® gases.

## also available

Adapter kits for installing packed/micropacked columns.

See **page 142**.



19808

## free literature

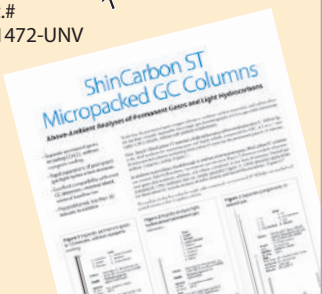
ShinCarbon ST  
Micropacked GC Columns  
Above-Ambient Analyses of  
Permanent Gases and  
Light Hydrocarbons

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## Permanent Gases & Hydrocarbon Analysis

**ShinCarbon ST Columns** (packed & micropacked)  
(SilcoSmooth® Stainless Steel)

- Separate permanent gases, including carbon monoxide and carbon dioxide, without cryogenic cooling.
- Rapid separations of permanent gas/light hydrocarbon mixtures.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Preconditioned, less than 30 minutes to stabilize.
- Maximum temperature of 280 °C/300 °C.

Analyze oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide with one column at room temperature. ShinCarbon ST material, a high surface area carbon molecular sieve (~1,500 m<sup>2</sup>/g), is the ideal medium for separating gases and highly volatile compounds by gas solid chromatography (GSC). The rapid, above-ambient analyses these columns provide is a great convenience. Excellent thermal stability of the high surface area carbon, combined with careful conditioning during column manufacturing, ensures low-bleed operation and rapid stabilization when installing a new column. Custom-made ShinCarbon ST columns are available on request.

ShinCarbon ST is a highly stable material. Its 300 °C upper programmed temperature limit minimizes bleed and baseline rise during temperature programming, making the material compatible with most detection systems used for gas analysis, including TCD or HID. All ShinCarbon ST columns are fully conditioned in an oxygen/moisture-free environment for your convenience. This minimizes stabilization time (less than 30 minutes) when installing a new column which, in turn, reduces downtime.

**ShinCarbon ST Columns** (packed)\*

OD	ID	Mesh	2-Meter cat.#*
1/8" Silcosmooth	2.0 mm	80/100	80486-

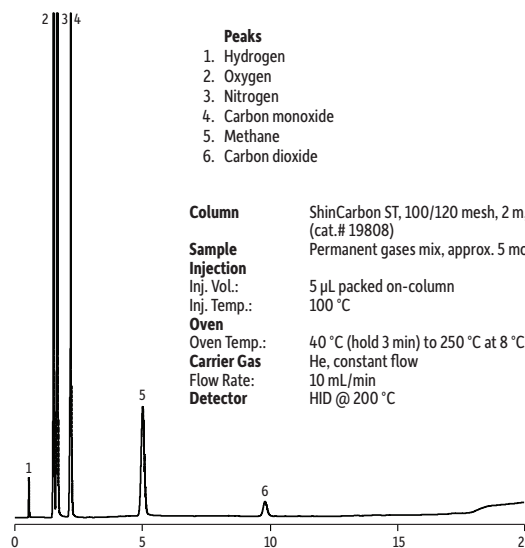
**ShinCarbon ST Columns** (micropacked)

OD	ID	Mesh	1-Meter cat.#	2-Meter cat.#
1/16"	1.0 mm	100/120	19809	19808
0.95 mm	0.75 mm	100/120	19810	—
0.74 mm	0.53 mm	80/100	19045	19043

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.

Note: Columns do not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 142.

### Permanent Gases on ShinCarbon ST



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Distributor



## Sulfur Analysis

### Rt®-XLSulfur Columns (packed & micropacked)

- Optimized columns for low ppbv sulfur analyses.
- Eliminate the need for PTFE tubing.
- Column and end fittings are Sulfinert® treated for maximum inertness.
- Maximum temperature of 290 °C.

Sulfur analyses are traditionally performed using PTFE tubing to improve column inertness. Unfortunately, PTFE tubing is gas permeable, difficult to pack with high efficiency, prone to shrinkage, and has poor thermal stability. The Rt®-XLSulfur packed or micropacked column eliminates these problems. The packing material for Rt®-XLSulfur columns is extensively deactivated for analysis of low ppbv levels of hydrogen sulfide and methyl mercaptan. It is then treated to achieve effective separation of hydrocarbons from sulfur compounds. The interior wall and the end fittings of the Rt®-XLSulfur column are Sulfinert® treated, making the column as inert as PTFE. The extra care taken to manufacture this column ensures more accurate analyses of sulfur compounds.

### Rt®-XLSulfur Columns (packed)\*

OD	ID	Mesh	1-Meter cat.#*	2-Meter cat.#*
1/8"	2.0 mm	100/120	80484-	80485-
3/16"	3.2 mm	100/120	80482-	80483-

### Rt®-XLSulfur Columns (micropacked)

OD	ID	Mesh	1-Meter cat.#	2-Meter cat.#
1/16"	1.0 mm	100/120	19804	19805
0.95 mm	0.75 mm	100/120	19806	19807
0.74 mm	0.53 mm	100/120		19044

\*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

NOTE: Columns do not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 142.

## did you know?

Rt®-XLSulfur columns are optimized for low ppb-level sulfur analysis!

## also available

Adapter kits for installing packed/micropacked columns.

See **page 142**.

## free literature

Rt®-XLSulfur Packed Column  
Specialized packed and micropacked columns for eXtra-Low Sulfur analysis

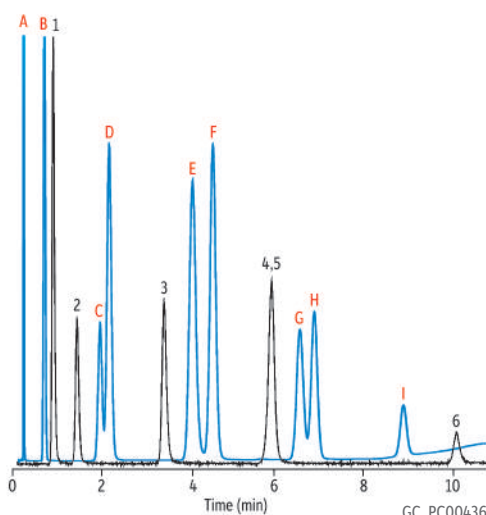
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lit. cat.#  
PCTS1500A-UNV



## Sulfur Compounds and Hydrocarbons on Rt®-XLSulfur



### Sulfurs

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Dimethyl disulfide

### Hydrocarbons

- A. Methane
- B. Ethane
- C. Propylene
- D. Propane
- E. Isobutane
- F. Butane
- G. Isopentane
- H. Pentane
- I. Hexane

**Column** Rt®-XLSulfur, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)  
**Sample**  
**Conc.:** 50 ppb each  
**Injection** packed not on-column  
**Oven**  
**Oven Temp.:** 60 °C to 230 °C at 15 °C/min  
**Carrier Gas** He, constant flow  
**Flow Rate:** 9 mL/min  
**Detector** SCD/FID  
**Acknowledgement** Sulfur standards courtesy of DCG Partnership 1 Ltd., Pearland, TX.

## Column Instrument Configurations



General Configuration  
Suffix -800



Agilent 5880, 5890, 5987,  
6890, 7890:  
Suffix -810\*



Bruker 430, 3700, Vista Series, FID:  
Suffix -820



8 3/4" PE 900-3920, Sigma 1,2,3:  
Suffix -830



6 1/2" PE Auto System 8300, 8400, 8700  
Suffix -840

See page 151 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.

\*-810 suffix also includes 1 1/2" void on detector side.  
Note: Standard micropacked columns fit all instruments.  
No special instrument configuration suffix is required.

# Packed/Micropacked Column Installation Kits



Adaptor kit centers the packed column in the injection port, so the syringe will not scrape the sides of the column.

## Packed Column Inlet Adaptor Kits

- Use 1/8" and 3/16" OD columns in 1/4" on-column injection ports.
- Centers column perfectly in injection port to eliminate bent syringe needles.
- Slotted design prevents carrier gas occlusion.
- Vespel®/graphite reducing ferrules make installation easy.
- Includes all nuts and ferrules used to attach tubing to the injector or detector.

Description	For 1/8" Columns		For 3/16" Columns	
	qty.	cat.#	qty.	cat.#
Packed Column Inlet Adaptor Kit for 1/4" Injection Ports	kit	21651	kit	21650

## Installation Kits for Micropacked Columns



21065

Description	qty.	cat.#
<b>Micropacked Column Installation Kit for 1 mm ID columns; for valve applications.</b> Kit contains: 1/16" Valco nut (1), 1/16" stainless steel nut (1), 1/16" Vespel/graphite ferrule (1), 1/16" graphite ferrule (1), stainless steel ferrule (1), 1/16" stainless steel front ferrule (1), 1/16" stainless steel back ferrule (1).	kit	21065
<b>Micropacked Column Installation Kit for 1 mm ID columns; for direct injections.</b> Kit contains: 1/16" stainless steel nuts (2), 1/16" Vespel/graphite ferrules (2), 1/16" graphite ferrules (2), 1/16" stainless steel front ferrules (2), 1/16" stainless steel back ferrules (2).	kit	21066



21067

## Installation Kit for Packed Columns

Description	qty.	cat.#
<b>Packed Column Installation Kit for 2 mm ID columns; for valve applications.</b> Kit contains: 1/8" stainless steel nut (1), stainless steel Valco nut (1), 1/8" Vespel/graphite ferrule (1), stainless steel Valco ferrule (1), 1/8" stainless steel front ferrule (1), 1/8" stainless steel back ferrule (1).	kit	21067

## Micropacked Inlet Conversion Kits

- Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.
- For use with Agilent 5890, 6890, and 7890 GCs.
- Sample pathways deactivated for ultimate inertness.



22429

Large-Bore Dual Vespel® Ring Inlet Seals



1/4" SS Nut  
23152

Large-Bore  
FID Adaptor



1/4" Vespel®/Graphite  
Ferrule  
20221



1/16" SS Nuts  
23150



Large-Bore  
Reducing Nut



1/16" Vespel®/  
Graphite Ferrules  
20218



22430



20772

Description	qty.	cat.#
<b>Micropacked Column Adaptor Kit for Split/Splitless Injection*</b> <i>Complete kit with FID and injection port adaptors</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4 mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424
<b>Micropacked Column Adaptor Kit for On-Column Injection*</b> <i>Complete kit with FID and injection port adaptors</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425
<b>Micropacked Column Adaptor Kit for Split/Splitless Injection</b> <i>Injection Port Adaptor Kit</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4 mm splitless liner, intermediate polarity deactivated	kit	22426
<b>Micropacked Column Adaptor Kit for On-Column Injection</b> <i>Injection Port Adaptor Kit</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427
<b>Micropacked Column Adaptor Kit for FID*</b> <i>FID Adaptor Kit</i> Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428
<b>Replacement Inlet Seals for Micropacked Column Adaptor</b> Dual Vespel ring inlet seals, large bore (2)	2-pk.	22429
<b>Replacement Metal Liner Installation Guide for On-Column Injection, Siltek Treated</b>	ea.	22430
<b>Replacement 4 mm Splitless Liner</b>	ea.	20772

\*For use with packed column FIDs only.

### CarboBlack Packing Materials

- CarboBlack B supports up to 10% loading of a nonsilicone liquid phase.
- CarboBlack C supports up to 1% loading of a nonsilicone liquid phase.

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to CarboBlack™ and Carbograph supports.

Description	Temp. Limit	Mesh	Min. Qty.	cat.#
CarboBlack B	500 °C	60/80	10 g	25500
	500 °C	80/120	10 g	25501
CarboBlack C	500 °C	60/80	10 g	25502
	500 °C	80/100	10 g	25503
CarboBlack BHT-100	150 °C	40/60	10 g	25504
CarboBlack III (F)	175 °C	80/100	10 g	25506
5% Carbowax 20m on CarboBlack B	225 °C	80/120	10 g	25507
6.6% Carbowax 20m on CarboBlack B	225 °C	80/120	10 g	25508
4% Carbowax 20m / 0.8% KOH on CarboBlack B	220 °C	60/80	10 g	25509
0.19% picric acid on CarboBlack C	120 °C	80/100	10 g	25510
4% Carbowax 20m on CarboBlack B-DA	200 °C	80/120	10 g	25511

Minimum order of 10 grams. Price is per gram.

### did you know?

#### CarboBlack supports replace

- CarboBlack™
- Carbograph



## Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you with everything from setup to method development.

### Contact us:

For quick answers to commonly asked questions any time of the day, visit [www.restek.com/answers](http://www.restek.com/answers) or contact us directly:

**In the U.S.:** Phone: 1-800-356-1688, ext. 4 • e-mail: [support@restek.com](mailto:support@restek.com)

#### Hours of operation (Eastern Time):

Monday - Thursday, 8:00 a.m. to 6:00 p.m.

Friday, 8:00 a.m. to 5:00 p.m.

**Outside the U.S.:** Contact International Technical Service at [intltechsupp@restek.com](mailto:intltechsupp@restek.com) or find a local distributor at [www.restek.com/distributor](http://www.restek.com/distributor)



**also available**

Custom packing materials are also available.

See **page 148**.



Put our decades of experience to work for you.

**did you know?****Res-Sil® replaces**

- Porasil B
- Porasil C
- Durapak

**Res-Sil® Packing Materials**

- Unique separation of saturated and unsaturated hydrocarbons.
- Innovative bonding chemistry for batch-to-batch reproducibility, excellent thermal stability, and long life.
- Wide range of bonded phases available.
- Equivalent to Durapak and Porasil packings.

Bonded silica packings with *n*-octane or cyanopropyl (OPN) functional groups yield faster separations of C1 to C4 hydrocarbons, higher thermal stability, shorter conditioning times, and longer lifetimes than conventional packings. However, bonded silica packings have had inconsistent reproducibility and limited availability. Restek's research team has solved these age-old problems by developing Res-Sil® C packings for consistent performance.

**Unique Selectivity for Process GC and High-Speed Analysis of Petrochemicals**

Res-Sil® C bonded packings are ideal for fast resolution of difficult-to-separate saturated and unsaturated C4 hydrocarbons (see page 139). This unique selectivity, when combined with other columns in series, provides petroleum and petrochemical method developers with a powerful tool for fast determination of C1 to C5 hydrocarbons.<sup>1</sup>

**Innovative Research and Stringent QC Provide Batch-to-Batch Consistency**

Restek's synthesis procedure eliminates batch-to-batch variations. The amount of bonded liquid phase is precisely controlled in every batch for reproducible retention times and separations. Each production batch of Res-Sil® C packing is tested with a complex hydrocarbon mixture to meet demanding retention time and retention index specifications and to ensure there are no retention shifts. Column bleed is also evaluated to ensure that baselines remain low.

**OPN on Res-Sil® C Packing—the Latest in a Line of Bonded GC Phases**

Restek offers a wide range of bonded packings for packed column GC, including Rtx®-1, Stabilwax®, and Carbowax® phases. We have extended this technology to make *n*-octane on Res-Sil® C packing, and OPN on Res-Sil® C packing. Each of these packings has low bleed, conditioning times of less than 30 minutes, long lifetime, and consistent batch-to-batch reproducibility.

Description	temp. limits	Mesh	Min. Qty.	cat.#
Res-Sil C	300 °C	60/80	10 g	25400
	300 °C	80/100	10 g	25028
Res-Sil B	300 °C	60/80	10 g	25401
	300 °C	80/100	10 g	25080
1% TCEP on Res-Sil B	175 °C	80/100	10 g	25081
OPN on Res-Sil C	150 °C	80/100	10 g	25042
<i>n</i> -Octane on Res-Sil C	150 °C	80/100	10 g	25030
2% Carbowax 1540 on Res-Sil C	150 °C	80/100	10 g	25044

Minimum order of 10 grams. Price is per gram.

<sup>1</sup>N.C. Saha, S.K. Jain, and R.K. Dua. J. Chromat. Sci 1978, 323-328.

**Customized Solutions**

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### Porapak Packing Materials

Description	temp. limits	g/btl.	Mesh 50/80	Mesh 80/100	Mesh 100/120
			cat.#	cat.#	cat.#
Porapak P	250 °C	20 g	25576	25577	25578
Porapak PS	250 °C	20 g	25579	25580	25581
Porapak Q	250 °C	26 g	25582	25583	25584
Porapak QS	250 °C	26 g	25585	25586	25587
Porapak R	250 °C	24 g	25588	25589	25590
Porapak S	250 °C	26 g	25591	25592	25593
Porapak N	190 °C	29 g	25594	25595	25596
Porapak T	190 °C	31 g	25597	25598	25599

### also available

Custom packing materials are also available.

See page 148.

### HayeSep® Packing Materials

Description	temp. limits	g/btl.	Mesh 60/80	Mesh 80/100	Mesh 100/120
			cat.#	cat.#	cat.#
HayeSep A	165 °C	24 g	22560	25032	25033
HayeSep B	190 °C	24 g	25561	25034	25035
HayeSep C	250 °C	24 g	25562	25036	25037
HayeSep D	290 °C	24 g	25563	25038	25039
HayeSep DIP	290 °C	24 g	25564	25565	25566
HayeSep DB	290 °C	24 g	25567	25568	25569
HayeSep DOX			(Use HayeSep DB)		
HayeSep N	165 °C	24 g	25570	25045	25046
HayeSep P	250 °C	24 g	25571	25047	25048
HayeSep Q	275 °C	24 g	25572	25049	25050
HayeSep R	250 °C	24 g	25573	25051	25052
HayeSep S	250 °C	24 g	25574	25053	25054
HayeSep T	165 °C	24 g	25575	25055	25056



### Tenax® Packing Materials

Description	temp. limits	Min. Qty.	Mesh 60/80	Mesh 80/100
			cat.#	cat.#
Tenax-TA	350 °C	10 g	25550	25551
Tenax-GR	350 °C	10 g	25552	25553

## Restek's Learning Network

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We can prepare packed and micropacked columns from the extensive list of liquid phases shown here. We have many more liquid phases. If you don't see the phase you need, call Technical Service or contact your Restek representative for availability.

Phase	min./max. temp. (°C)	Phase	min./max. temp. (°C)
Apiezon L	50/300	OV-22, phenyl methyl diphenyl, 65% phenyl	0/350
<i>p,p'</i> -Azoxydiphenetole	132/140	OV-25, phenyl methyl diphenyl, 75% phenyl	0/350
BC-120	0/125	OV-61, diphenyl, 33% phenyl	0/350
Bentone-34	0/180	OV-73, 5.5% diphenyl	0/325
bis (2-ethoxyethyl) adipate	0/150	OV-101, dimethyl (fluid)	0/350
bis (2-ethylhexyl) phthalate	150 max.	OV-105, cyanopropyl methyl	0/275
bis (2-methoxyethyl) adipate	20/100	OV-202, trifluoropropyl (fluid)	0/275
<i>n,n'</i> -Bis( <i>p</i> -methoxybenzylidene)- $\alpha,\alpha'$ -bi- <i>p</i> -toluidine (BMBT)	189/225	OV-210, trifluoropropyl (fluid)	0/275
Carbowax 1000	40/150	OV-215, trifluoropropyl (gum)	0/275
Carbowax 20M	60/225	OV-225, cyanopropyl methylphenyl methyl	0/265
Carbowax 20M-terephthalic acid	60/225	OV-275, dicyanoallyl	25/250
Carbowax 400	10/100	OV-330, silicone - Carbowax	0/250
Carbowax 600	30/125	OV-351	50/270
Cyclohexanedimethanol succinate	100/250	OV-1701, vinyl	0/250
DC-11	0/300	Phenyldiethanolamine succinate	0/230
DC-200	0/200	Polyethylene glycol adipate (EGA)	100/225
DC-550	20/250	Polyphenyl ether (5 rings) OS-124	0/200
DEGS-PS	20/200	Polypropylene glycol	0/150
Di(2-ethylhexyl)sebacate	0/125	Rtx-1 (Rt-101)	0/350
Diethylene glycol succinate (DEGS)	20/200	Rt-1000	50/250
Diethylene glycol adipate (DEGA)	0/200	Rt-1200	25/200
Diisodecyl phthalate	0/175	Rt-1220	50/200
2,4-Dimethylsulfolane	0/50	Rt-1500, Rt-1510	50/230
Di- <i>n</i> -decyl phthalate	10/175	Rt-2100	0/350
Dinonyl phthalate	20/150	Rt-2300	20/275
Ethylene glycol adipate	100/225	Rt-2330, Rt-2340	25/275
Ethylene glycol phthalate	100/200	Rt-608Pkd	0/275
Ethylene glycol succinate	100/200	Rt-Sebaconitrile	25/110
FFAP	50/250	Rt-XLSulfur	250 max.
Fluorad FC-431, 50% solution in ethyl acetate	40/200	SE-30, SE-52, SE-54	50/300
Hallcomid M-18-OL	8/150	Silar 5 CP, Silar 10 CP	0/250
Halocarbon 10-25	20/100	Sorbitol	150 max.
Halocarbon K-352	0/250	Squalane	20/100
Halocarbon wax	50/150	Squalene	0/100
Igepal® CO-880 (Nonoxynol)	100/200	Stabilwax	40/240
Igepal CO-890	100/200	Tetracyanoethylated pentaerythritol	30/175
Krytox	-30/260	THEED (Tetrahydroxyethlenediamine)	0/125
Neopentyl glycol adipate	50/225	$\beta,\beta$ -Thiodipropionitrile (TDPN)	100
Neopentyl glycol sebacate	50/225	Tricresyl phosphate	20/125
Neopentyl glycol succinate	50/225	1,2,3-Tris (2-cyanoethoxy) propane (TCEP)	0/175
Nonoxynol (Igepal CO-880)	100/200	Triton X-100, Triton X-305	0/200
$\beta,\beta$ -Oxydipropionitrile	0/75	UC W982	0/300
OV-1, dimethyl (gum)	100/350	UCON 50-HB-2000	0/200
OV-1, vinyl	100/350	UCON 50-HB-280-X	0/200
OV-3, phenyl methyl	0/350	UCON 50-HB-5100	0/200
OV-7, phenyl methyl dimethyl, 20% phenyl	0/350	UCON HB-1800-X	200 max.
OV-11, phenyl methyl dimethyl, 35% phenyl	0/350	UCON LB-550-X	0/200
OV-17, phenyl methyl, 50% phenyl	0/375	Versamid 900	190/275

## Advantages of Using Restek® Packed Columns

- Reasonably priced.
- Low-bleed, long-lifetime bonded phases.
- Wide variety of supports and packings.
- Produced by experienced packed column chromatographers.



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14

**SHOPPE**

[www.chromalytic.net.au](http://www.chromalytic.net.au)

e-mail : [sales@chromtech.net.au](mailto:sales@chromtech.net.au)

Restek can meet all of your packed column needs for U.S. Pharmacopeia methods. Commonly used USP liquid phases and supports are listed below. Call Restek or your representative for a quote on your next packed column for pharmaceuticals.

USP	Phase Description	Restek-Supplied Equivalent
G1	Dimethylpolysiloxane oil	Rt-2100, OV-101, Rtx-1
G2	Dimethylpolysiloxane gum	OV-1, Rtx-1
G3	50% Phenyl-50% methylpolysiloxane	Rt-2250, OV-17
G4	Diethylene glycol succinate polyester	DEGS
G5	3-Cyanopropylpolysiloxane	Rt-2340
G6	Trifluoropropylmethylpolysiloxane	Rt-2401, OV-210
G7	50% 3-Cyanopropyl-50% phenylmethylsilicone	Rt-2300
G8	80% Bis (3-cyanopropyl)-20% phenylpolysiloxane	Rt-2330
G9	Methylvinylpolysiloxane	UCW 98
G11	Bis(2 ethylhexyl) sebecate polyester	Bis(2 ethylhexyl) sebecate polyester
G12	Phenyldiethanolamine succinate polyester	Phenyldiethanolamine succinate polyester
G13	Sorbitol	Sorbitol
G14	Polyethylene glycol (average mol. wt. 950-1050)	Carbowax 1000
G15	Polyethylene glycol (average mol. wt. 3000-3700)	Carbowax 4000
G16	Polyethylene glycol compound (average mol. wt. 15,000), a high molecular weight compound of polyethylene glycol and a diepoxide linker	Carbowax 20M
G17	75% Phenyl-25% methylpolysiloxane	OV-25
G18	Polyalkylene glycol	UCON LB 550X
G19	25% Phenyl-25% cyanopropyl-50% methylsilicone	OV 225
G20	Polyethylene glycol (average mol. wt. 380-420)	Carbowax 400
G21	Neopentyl glycol succinate	Neopentyl glycol succinate
G22	Bis(2 ethylhexyl) phthalate	Bis(2 ethylhexyl) phthalate
G23	Polyethylene glycol adipate, ethylene glycol adipate	EGA
G24	Diisodecyl phthalate	Diisodecyl phthalate
G25	Polyethylene glycol compound TPA, a high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with terephthalic acid	Carbowax 20M TPA
G26	25% 2-Cyanoethyl-75% methylpolysiloxane	XE 60
G27	5% Phenyl-95% methylpolysiloxane	SE-52, Rtx-5
G28	25% Phenyl-75% methylpolysiloxane	DC 550
G29	3,3'-Thiodipropionitrile	TDPN
G30	Tetraethylene glycol dimethyl ether	Tetraethylene glycol dimethyl ether
G31	Nonylphenoxy poly(ethyleneoxy)ethanol (average ethyleneoxy chain length is 30): nonoxynol 30	Igepal CO 880
G32	20% Phenylmethyl-80% dimethylpolysiloxane	OV-7
G33	20% Carborane®-80% methylsilicone	Dexsil 300
G34	Diethylene glycol succinate polyester stabilized with phosphoric acid	DEGS PS
G35	A high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with nitroterephthalic acid	Rt-1000
G36	1% Vinyl-5% phenylmethylpolysiloxane	SE 54, Rtx-5
G38	Phase G1 containing a small amount of tailing inhibitor	Rt-2100/0.1% Carbowax 1500
G39	Polyethylene glycol (average mol. wt. 1500)	Carbowax 1500
G40	Ethylene glycol adipate	EGA

USP	Support Description	Restek-Supplied Equivalent
S1A	Siliceous earth, see method for details on treatment	Silcoport W
S1AB	Siliceous earth, treated as S1A and both acid- and base-washed	Silcoport WBW
S1C	Crushed firebrick, calcined or burned with a clay binder >900 °C, acid-washed, may be silanized	Chromosorb PAW or PAW DMDCS
S1D	Crushed firebrick, calcined or burned with a clay binder >900 °C, not acid-washed, may be silanized	Chromosorb PNAW
S1NS	Untreated siliceous earth	Chromosorb W- Non Acid Washed
S2	Styrene-divinylbenzene copolymer with nominal surface area of less than 50 m <sup>2</sup> /g and an average pore diameter of 0.3 to 0.4 µm	Chromosorb 101
S3	Ethylvinylbenzene-divinylbenzene copolymer with nominal surface area of 500 to 600 m <sup>2</sup> /g and an average pore diameter of 0.0075 µm	HayeSep Q
S4	Styrene-divinylbenzene copolymer with aromatic -O and -N groups having a nominal surface area of 400 to 600 m <sup>2</sup> /g and an average pore diameter of 0.0076 µm	HayeSep R
S5	High molecular weight tetrafluorethylene polymer, 40- to 60-mesh	Chromosorb T
S6	Styrene-divinylbenzene copolymer having a nominal surface area of 250 to 350 m <sup>2</sup> /g and an average pore diameter of 0.0091 µm	Chromosorb 102
S7	Graphitized carbon having a nominal surface area of 12 m <sup>2</sup> /g	HayeSep P
S8	Copolymer of 4-vinyl-pyridine and styrene-divinylbenzene	CarboBlack C
S9	Porous polymer based on 2,6-diphenyl-p-phenylene oxide	HayeSep S
S10	Highly cross-linked copolymer of acrylonitrile and divinylbenzene	Tenax TA
S11	Graphitized carbon having a nominal surface area of 100 m <sup>2</sup> /g, modified with small amounts of petrolatum and polyethylene glycol compound	HayeSep C
S12	Graphitized carbon having a nominal surface area of 100 m <sup>2</sup> /g	CarboBlack B 80/120 3% Rt 1500
		CarboBlack B



### Custom Coated Packing Materials

Custom coated packing materials can be made with any of the supports listed below. The liquid stationary phases available are listed on page 146 and the coating ranges are listed in the chart. Coated packings are available in minimum orders of 20 grams.

To order, please call your Restek representative for pricing and specify the following:

- 1) Stationary phase and stationary phase concentration.
- 2) Support and support mesh size.
- 3) Amount of packing needed.

Ordering Example: (1%) (XE-60) (CarboBlack B (80/120) (20 g)

Support	Max. Coating %	Mesh Sizes
CarboBlack B	1–10%*	60/80, 80/120
CarboBlack B HT	1–10%	40/60
CarboBlack C	0.1–1%*	60/80, 80/100
HayeSep	15%	60/80, 80/100, 100/120
Porapak	15%	50/80, 80/100, 100/120

### ordering note

#### Mesh Size

When ordering a packed column solid support, please specify mesh size. Refer to this chart to convert microns to mesh size.

Example:

150–180 micron particles = 80/100 mesh

( $\mu\text{m}$ )	Mesh Size
850	20
710	25
600	30
500	35
425	40
355	45
300	50
250	60
212	70
180	80
150	100
125	120
106	140
90	170
75	200
63	230
53	270

### ordering note

#### Special phases that require a surcharge:

OV<sup>®</sup>-275, OV<sup>®</sup>-330, OV<sup>®</sup>-225, BMBT, 2,4-dimethylsulfolane, OV<sup>®</sup>-1701, and XE-60. Call your Restek representative for pricing.

## Customized Solutions

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[www.restek.com/packed](http://www.restek.com/packed)





### Custom Packed Columns

#### To order, specify the following:

- 1) Column dimensions (length, ID) and tubing material.
- 2) Packing description (percent coating and phase, support mesh size, and treatment).
- 3) Column configuration (instrument manufacturer, model number, on-column injection or not) and with or without nuts and ferrules.

*Ordering Example:* (6' x 1/8") (stainless steel) (1%) (XE-60) (CarboBlack B 80/120) (Agilent 6890) (on-column injection) (fittings kit)

Please use the custom order form on page 150 or visit [www.restek.com/packed](http://www.restek.com/packed)



### did you know?

Packing material in packed and micropacked columns is secured using wire braids or frits. This prevents packing material from exiting the column.

### Custom Micropacked Columns

#### To order, contact your Restek representative and specify the following:

- 1) Physical dimensions (length, OD, ID, and tubing material).
- 2) Packing description (percent coating and phase, support mesh size).
- 3) Installation kit (see page 142), frit type.

*Ordering Example:* (2 m x 1/16" OD x 1.00 mm ID) (Siltek®-treated tubing) (5%) (Carbowax® 20M) (CarboBlack B) (80/120) (installation kit for valve applications, cat. #21065) (Siltek® frits)

Please use the custom order form on page 150 or visit [www.restek.com/packed](http://www.restek.com/packed)

### ordering note

For international pricing on custom packed or micropacked columns, please contact your Restek representative.

## Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you with everything from setup to method development.

### Contact us:

For quick answers to commonly asked questions any time of the day, visit [www.restek.com/answers](http://www.restek.com/answers) or contact us directly:

**In the U.S.:** Phone: 1-800-356-1688, ext. 4 • e-mail: [support@restek.com](mailto:support@restek.com)

#### Hours of operation (Eastern Time):

*Monday - Thursday, 8:00 a.m. to 6:00 p.m.*

*Friday, 8:00 a.m. to 5:00 p.m.*

**Outside the U.S.:** Contact International Technical Service at [intltechsupp@restek.com](mailto:intltechsupp@restek.com) or find a local distributor at [www.restek.com/distributor](http://www.restek.com/distributor)

# Packed/Micropacked Column Custom Order Form

Order: \_\_\_\_\_ Quote: \_\_\_\_\_ Reference # from previous order (if available): \_\_\_\_\_

Date: \_\_\_\_\_

Restek Account #: \_\_\_\_\_

Contact: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

**Restek Use Only:**

Custom No.: \_\_\_\_\_

Stock No.: \_\_\_\_\_

Price: \_\_\_\_\_

Fitting Costs: \_\_\_\_\_

Authorization: \_\_\_\_\_

**Number of Columns:** \_\_\_\_\_

1) Column Dimensions:

Length \_\_\_\_\_ OD x ID: \_\_\_\_\_

2) Tubing (choose one):  SilcoSmooth®  Stainless Steel  Hastelloy®  Nickel  Copper  PTFE

3) Packing Description:

Liquid Phase A (% + description): \_\_\_\_\_

Liquid Phase B (% + description): \_\_\_\_\_

Liquid Phase C (% + description): \_\_\_\_\_

Solid Support: \_\_\_\_\_ Mesh: \_\_\_\_\_

4) Column Configuration:

Instrument (mfr. + model): \_\_\_\_\_

Inlet: Packed Full?  Yes  No, leave \_\_\_\_\_" void (for on-column injection)

Outlet: Packed Full?  Yes  No, leave \_\_\_\_\_" void

Do you want this column preconditioned?  Yes (additional charge)  No

Standard configuration suffix number (next page):

Frits  Hastelloy®  Siltek®

Special configuration (next page): Figure: \_\_\_\_\_ Dimensions: \_\_\_\_\_

Welded Tubing Reducers  (additional charge)

Special Instructions: \_\_\_\_\_

**Fittings** (check appropriate circle)

**KIT 1S**

1/4" brass nuts  
1/4" to 1/8" V/G reducing ferrules  
No additional charge

**KIT 2S**

1/4" brass nuts  
1/4" to 3/16" V/G reducing ferrules  
No additional charge

**KIT A**

1/8" brass nuts  
1/8" V/G ferrules  
No additional charge

**KIT B**

1/8" brass nuts  
1/8" brass front & back ferrules  
No additional charge  
V/G - Vocnel®/granhite

**KIT C**

1/8" stainless steel nuts  
1/8" stainless steel front & back ferrules  
Additional charge

**KIT D**

1/8" stainless steel nuts  
1/8" V/G ferrules  
Additional charge

**KIT E**

1/4" stainless steel nuts  
1/4" to 1/8" V/G reducing ferrules  
Additional charge

**KIT F**

1/4" stainless steel nuts  
1/4" to 3/16" V/G reducing ferrules  
Additional charge

**KIT V**

1/8" VCR fitting  
check appropriate circle:  
 Stainless Steel (additional charge)  
 Nickel (additional charge)

**for a quote:**

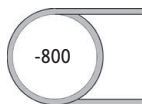
Complete this form and fax to Restek at 814-353-1309, or to your Restek representative.

This form is also available online at:

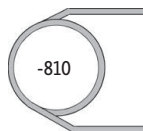
[www.restek.com/packed](http://www.restek.com/packed)

**Standard Configurations** (choose one)

General Configuration



Agilent 5880, 5890, 5987, 6890, 7890



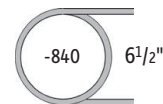
Bruker 430, 450 (Varian 3700, Vista Series, FID)



PE 900-3920, Sigma 1,2,3



PE Auto System 8300, 8400, 8700

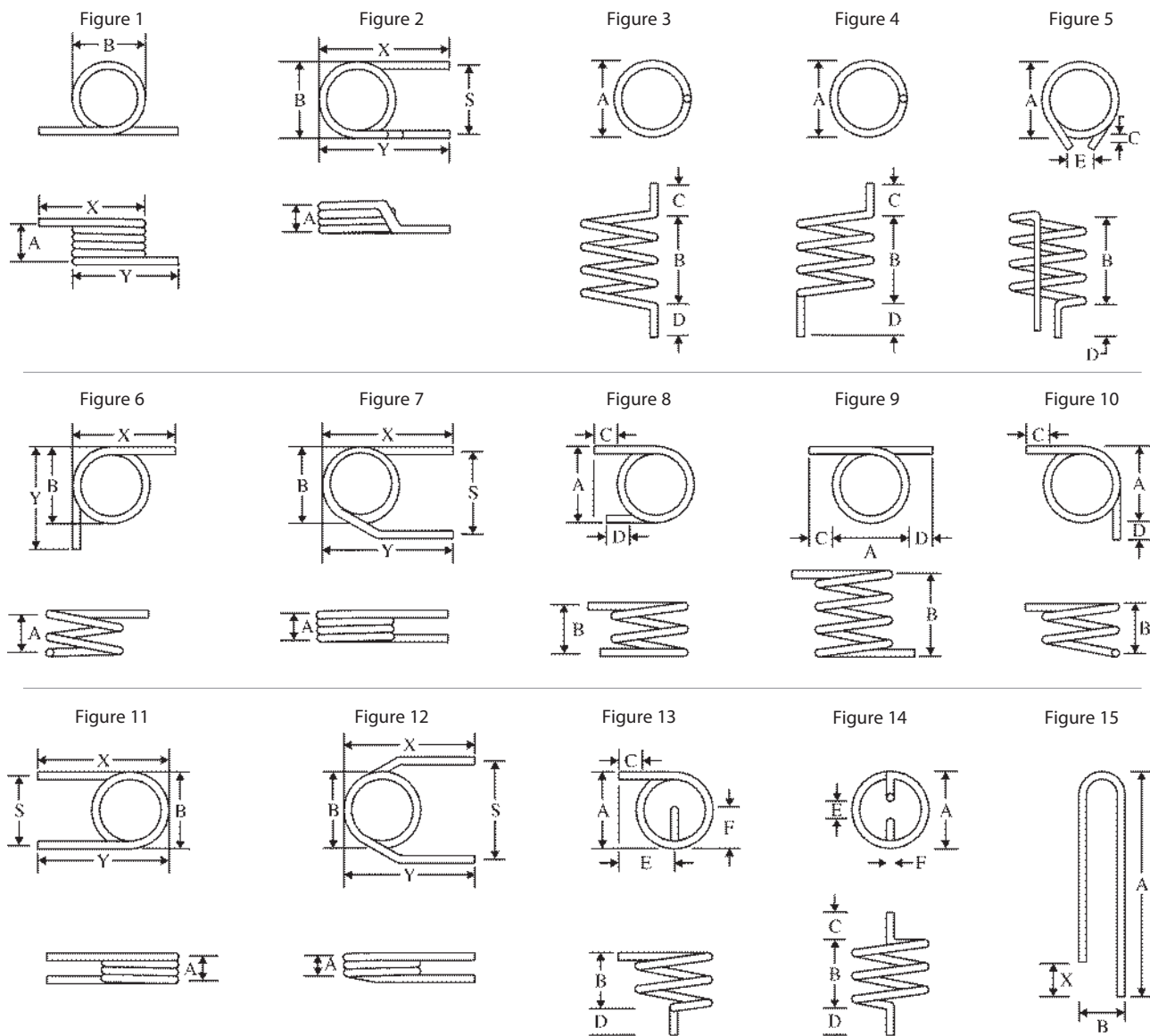


- 810 Agilent 5880, 5890, 5987, 6890, 7890
- 811 Agilent 6850
- 820 Scion (Bruker 430, 450) (Varian 3700, Vista Series, FID)
- 821 Scion (Bruker 430, 450) (Varian 3800)
- 830 PerkinElmer 900-3920, Sigma 1,2,3
- 840 PerkinElmer Auto System 8300, 8400, 8700, Clarus 500 (C500)
- 841 PerkinElmer Auto Sys XL
- 845 ABB 3100, AAI (4" coil)
- 850 Shimadzu 14A, 2014

- 851 Shimadzu 8A
- 852 Shimadzu 9A
- 853 Shimadzu 17A, 2010
- 854 Shimadzu Mini 2
- 860 Thermo Scientific - TRACE 2000
- 865 Carlo Erba
- 870 Tometrics/Tracor
- 874 HNU 310 & 311 (4.5" coil)
- 875 Analytical Controls Configuration
- 880 Carle 40030
- 881 Hitachi 263

- 885 Pye Unicam 4500
- 890 Gow Mac 590
- 891 Gow Mac 550
- 892 Gow Mac 750
- 893 Gow Mac 816 (3" coil, 3" spread on the arms, and a total height of 5")
- 894 Gow Mac 580
- 895 SRI 8610C
- 895R SRI 8610C Dual GC Right Side
- 895L SRI 8610C Dual GC Left Side
- 896 SRI 9300

**Custom Configurations** (Please provide dimensions on order form, page 150, or at [www.restek.com/packed](http://www.restek.com/packed))



# LC Columns

U.S. Pharmacopeia Cross-Reference.....	153
Tables and Reference.....	154
Raptor™ SPP Columns .....	155–159
USLC® Columns.....	160–162
Columns for UHPLC.....	163–168
Columns for HPLC.....	169–174
Columns for Bioseparations.....	175–177
Application-Specific Columns.....	178–183
Prep Columns.....	184–187
Bulk Packing Materials.....	187
UHPLC Filters.....	188
HPLC Guard Cartridge Systems.....	189–191
LC Column & Detector Test Mixes.....	475





## U.S. Pharmacopeia Cross-Reference

<b>L1</b>	Octadecyl silane chemically bonded to porous silica or ceramic microparticles; 1.7 to 10 $\mu\text{m}$ in diameter or a monolithic rod. <i>Raptor™ ARC-18 (p. 158), Raptor™ C18 (p. 158), Pinnacle® DB Aqueous C18 (p. 163), Pinnacle® DB C18 (p. 166), Ultra Aqueous C18 (p. 169), Ultra C18 (p. 171), Viva C18 (p. 175)</i>
<b>L3</b>	Porous silica particles; 5 to 10 $\mu\text{m}$ in diameter. <i>Pinnacle® DB Silica (p. 168), Ultra Silica (p. 174), Viva Silica (p. 177)</i>
<b>L7</b>	Octylsilane chemically bonded to totally porous silica particles; 1.7 to 10 $\mu\text{m}$ in diameter. <i>Pinnacle® DB C8 (p. 167), Ultra C8 (p. 172), Viva C8 (p. 175)</i>
<b>L8</b>	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support; 3 to 10 $\mu\text{m}$ in diameter. <i>Ultra Amino (p. 174)</i>
<b>L10</b>	Nitrile groups chemically bonded to porous silica particles; 3 to 10 $\mu\text{m}$ in diameter. <i>Pinnacle® DB Cyano (p. 167), Ultra Cyano (p. 174)</i>
<b>L11</b>	Phenyl groups chemically bonded to porous silica particles; 1.7 to 10 $\mu\text{m}$ in diameter. <i>Raptor™ Biphenyl (p. 157), Pinnacle® DB Biphenyl (p. 165), Ultra Biphenyl (p. 170), Ultra Aromax (p. 173), Viva Biphenyl (p. 176)</i>
<b>L13</b>	Trimethylsilane chemically bonded to porous silica particles; 3 to 10 $\mu\text{m}$ in diameter. <i>Ultra C1 (p. 173)</i>
<b>L26</b>	Butyl silane chemically bonded to totally porous silica particles; 3 to 10 $\mu\text{m}$ in diameter. <i>Ultra C4 (p.172), Viva C4 (p.176)</i>
<b>L43</b>	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer; 5 to 10 $\mu\text{m}$ in diameter. <i>Pinnacle® DB PFP Propyl (p. 166), Ultra PFP Propyl (p. 171), Viva PFP Propyl (p. 176)</i>
<b>L68</b>	Spherical, porous silica; 100 $\mu\text{m}$ or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not end-capped. <i>Pinnacle® DB IBD (p. 164), Ultra IBD (p. 169)</i>

EXP<sup>®</sup> fittings

## Reusable fittings for easy, yet reliable HPLC & UHPLC connections

- Hand-tight fitting style achieves effortless HPLC seals—no tools needed for a 8,700+ psi seal.
- Both hand-tight and hex-head styles wrench-tighten for reliable UHPLC use up to 20,000+ psi!
- Patented ferrule can be installed repeatedly without compromising high-pressure seal.
- Hybrid design combines the durability of titanium with the sealing ability of PEEK.
- Cutting-edge system provides ZDV (zero dead volume) connection to any 10-32 female port.
- Compatible with 1/16" PEEK and stainless steel tubing.

See **page 335**.
[www.restek.com/exp](http://www.restek.com/exp)


Optimal Linear Velocities

Column ID (mm)	Optimal flow rate (mL/min)*				
	1.9 µm dp	3 µm dp	5 µm dp	2.7 µm Raptor™	5 µm Raptor™
4.6	—	1.5	1.0	1.6	1.0
3.2	—	0.7	0.5	0.8	0.5
3.0	1.1	0.6	0.4	0.7	0.4
2.1	0.5	0.3	0.2	0.3	0.2
1.0	—	0.07	0.05	0.08	0.05

\* Optimal flow rates are mobile phase dependent; table above is provided as a guide.

Common Classifications for LC Columns by Internal Diameter

Classification	Internal Diameter
Capillary	<1.0 mm ID
Micro bore	1.0 mm ID
Narrow bore	2.1–3.0 mm ID
Standard bore	3.2–4.6 mm ID
Semi-prep	10–21.2 mm ID
Prep	30–50 mm ID

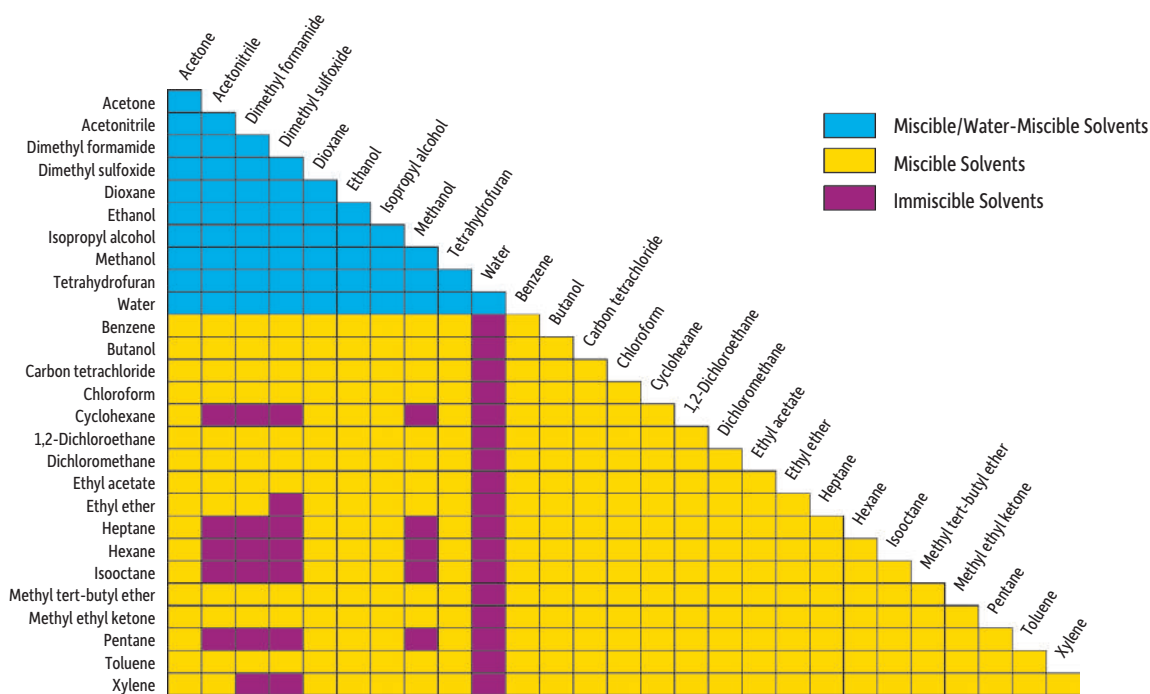
HPLC Pump Pressure Conversion Table

Pressure	psi	atm	kg/cm <sup>2</sup>	torr	kPa	bar	inches Hg
1 psi =	1	0.068	0.0703	51.713	6.8948	0.06895	2.0359
1 atm =	14.696	1	1.0332	760	101.32	1.0133	29.921
1 kg/cm <sup>2</sup> =	14.223	0.967	1	735.5	98.06	0.9806	28.958
1 torr =	0.0193	0.00132	0.00136	1	0.1330	0.00133	0.0394
1 kPa =	0.1450	0.00987	0.0102	7.52	1	0.0100	0.2962
1 bar =	14.5038	0.9869	1.0197	751.88	100	1	29.5300
1 in Hg =	0.49612	0.0334	0.0345	25.400	3.376	0.03376	1

To convert a pressure, multiply the units in the left-most column by the conversion factors listed in the columns to the right.

For example: 10 psi x 0.068 = 0.68 atm  
 10 bar x 29.5300 = 295.300 inches Hg

Solvent Miscibility and Solubility





SPP speed.  
USLC® resolution.

## A new species of column.

Restek is excited to announce the evolution of superficially porous particles with the introduction of Raptor™ LC columns and guards.

Superficially porous particles (commonly referred to as SPP or “core-shell” particles) changed the world of LC by dramatically boosting column efficiency and reducing analysis times, but they were only the beginning. With Raptor™ LC columns, Restek chemists have combined the speed of SPP with the resolution of highly selective USLC® technology. This new species of chromatographic column allows you to more easily achieve peak separation and faster analysis times without expensive UHPLC instrumentation.

- Higher efficiency for drastically faster analysis times.
- Better selectivity for substantially improved resolution.
- Increased sample throughput with existing HPLC instrumentation.
- Long-lasting ruggedness for dependable reproducibility.

*Selectivity  
Accelerated*

Put Raptor™ LC columns and guards to the test on your most challenging workflows!

### Dissecting the Raptor™ LC Column

#### Larger 2 µm Frit

Prevents clogging better than commonly used 0.5 µm frits; boosts column lifetime and helps maintain optimal pressures.

#### Rugged Label

Clearly identifies both flow direction and column; resists solvents and tearing to last as long as your column does.



#### Proprietary Column-Packing Technique

Provides greater pressure stability (600 bar for 2.7 µm; 400 bar for 5 µm); achieves higher linear velocities without sacrificing efficiency or lifetime.



#### Raptor™ SPP Particles

Robust 2.7 and 5 µm Particles

Let you run high-speed analyses without UHPLC.

**Narrow Silica Distribution**

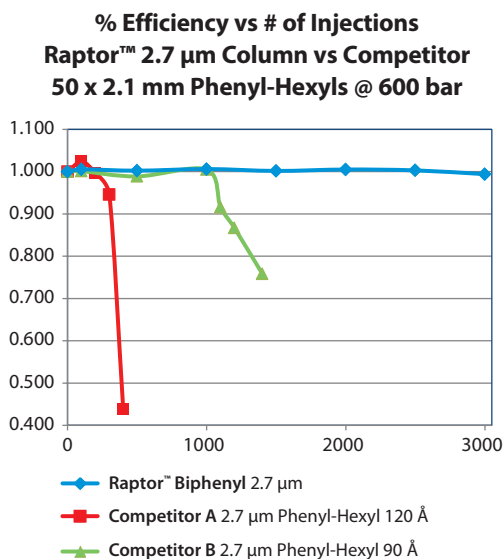
Ensures high efficiency and consistent flows.

**Updated Bonding and QC**

Guarantee retention time stability, run to run and column to column.

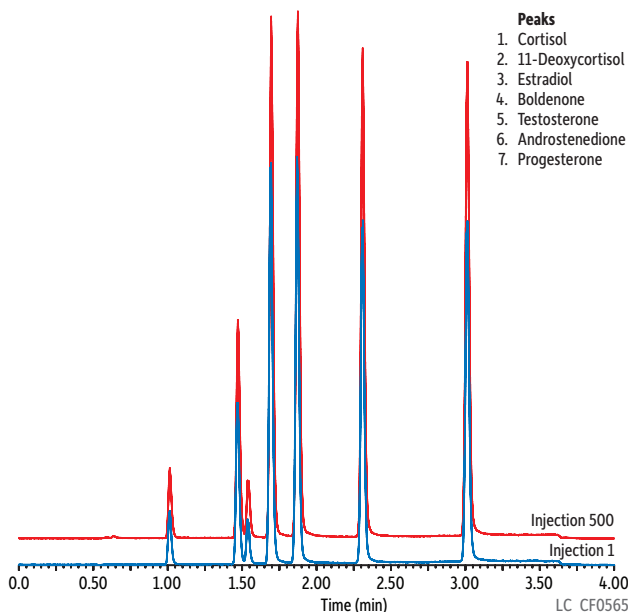
**Pressure Stability**

At high pressures, competitor phenyl-hexyl columns experience a quick and sharp drop-off in efficiency, but Raptor™ columns are unaffected to at least 3,000 injections.



**Reproducibility**

Even after hundreds of injections, a Raptor™ column will provide consistent, reliable data.



**Column:** Raptor™ Biphenyl (cat.# 9309A1E); **Dimensions:** 100 mm x 3.0 mm ID; **Particle Size:** 2.7 μm; **Pore Size:** 90 Å; **Temp.:** 30 °C; **Sample:** Diluent: initial mobile phase; **Conc.:** 50 ng/mL; **Inj. Vol.:** 5 μL **Mobile Phase:** A: 0.1% formic acid in water, B: 0.1% formic acid in acetonitrile; **Gradient (%B):** 0.00 min (40%), 3.00 min (80%), 3.01 min (40%), 5.00 min (40%); **Flow:** 0.700 mL/min; **Detector:** Waters Xevo TQ-S; **Ion Mode:** ESI+; **Instrument:** Waters.

**Raptor™ EXP® Guard Column**

To help protect your investment and further extend the life of our already-rugged Raptor™ LC columns, we have mated our new superficially porous particles with patent-pending guard column hardware developed by Optimize Technologies. A Raptor™ LC guard column cartridge in an EXP® direct connect holder is the ultimate in column protection.

**Patented Titanium Hybrid Ferrules**

Can be installed repeatedly without compromising high-pressure seal.

**Free-Turn® Architecture**

Allows you to change cartridges without breaking inlet/outlet fluid connections—and without tools.

**Auto-Adjusting Connection**

Provides ZDV (zero dead volume) connection to any 10-32 female port.



**Flexible Design**

Replace nut with longer or even tool-free options to best suit your needs.



**Unidirectional Raptor™ Cartridge**

**In-Tandem Development**  
 Made to pair perfectly with Raptor™ LC columns.

**Superior Packing Technique**

Withstands 600 bar (2.7 μm) / 400 bar (5 μm) operating pressures.

**Restek® Quality**

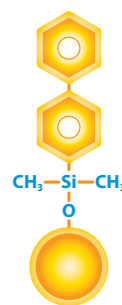
Backed by the manufacturing and QC systems you trust.



## Raptor™ Biphenyl LC Columns (USP L11)

### Chromatographic Properties

The innovative Biphenyl is Restek's most popular LC stationary phase because it is particularly adept at separating compounds that are hard to resolve or that elute early on C18 and other phenyl chemistries. As a result, the rugged Raptor™ Biphenyl column is extremely useful for fast separations in bioanalytical testing applications like drug and metabolite analyses, especially those that require a mass spectrometer (MS). Increasing retention of early-eluting compounds can limit ionization suppression, and the heightened selectivity helps eliminate the need for complex mobile phases that are not well-suited for MS detection.



**Column Characteristics:**

**Stationary Phase Category:** Phenyl (L11)

**Ligand Type:** Biphenyl

**Particle:** 2.7 μm or 5 μm superficially porous silica (SPP or "core-shell")

**Pore Size:** 90 Å

**Surface Area:** 150 m<sup>2</sup>/g (2.7 μm) or 100 m<sup>2</sup>/g (5 μm)

**Recommended Usage:**

pH range: 1.5–8.0

Maximum Temperature: 80 °C

Maximum Pressure: 600 bar / 8,700 psi (2.7 μm) or 400 bar / 5,800 psi (5 μm)

Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
<b>2.7 μm Columns</b>			
30 mm	9309A32	9309A3E	9309A3S
50 mm	9309A52	9309A5E	9309A5S
100 mm	9309A12	9309A1E	9309A1S
150 mm	9309A62	9309A6E	9309A6S
<b>5 μm Columns</b>			
30 mm	—	930953E	—
50 mm	9309552	930955E	930955S
100 mm	9309512	930951E	930951S
150 mm	9309562	930956E	930956S
250 mm	—	—	930957S

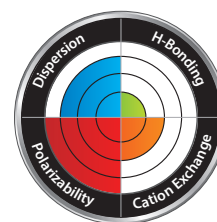
### Properties:

- Increased retention for dipolar, unsaturated, or conjugated solutes.
- Enhanced selectivity when used with methanolic mobile phase.
- Ideal for increasing sensitivity and selectivity in LC-MS analyses.

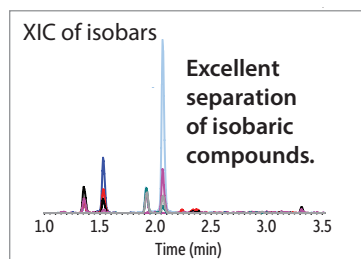
### Switch to a Biphenyl when:

- Limited selectivity is observed on a C18.
- You need to increase retention of hydrophilic aromatics.

**USLC® Column Interaction Profile**  
(See page 161 for more information.)

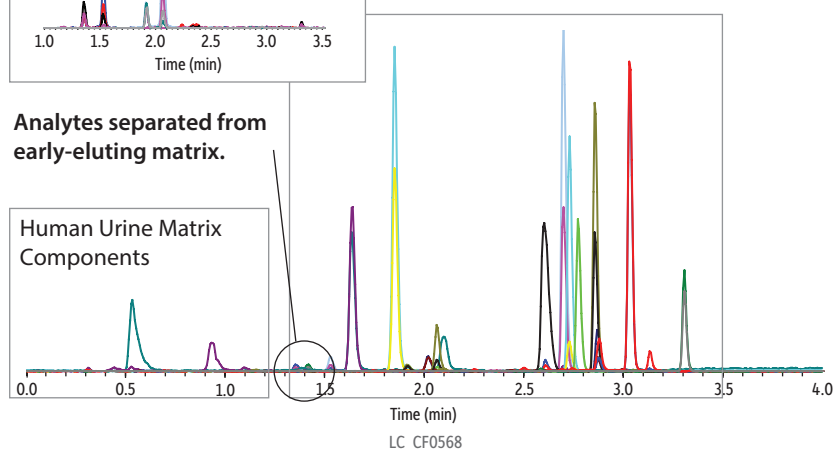


## Pain Panel in Urine on Raptor™ Biphenyl (50 x 3.0 mm) by LC-MS/MS



Analytes separated from early-eluting matrix.

Human Urine Matrix Components



▶ For compound listing including isobars, visit [www.restek.com](http://www.restek.com) and search for LC\_CF0568.

**Column** Raptor™ Biphenyl (cat.# 9309A5E)

**Dimensions:** 50 mm x 3.0 mm ID

**Particle Size:** 2.7 μm

**Temp.:** 30 °C

**Sample**

**Diluent:** Urine:mobile phase A:mobile phase B (17:76:7)

**Conc.:** 10–100 ng/mL

**Inj. Vol.:** 10 μL

**Mobile Phase**

**A:** Water + 0.1% formic acid

**B:** Methanol + 0.1% formic acid

Time (min)	Flow (mL/min)	%A	%B
0.00	0.6	90	10
1.50	0.6	55	45
2.50	0.6	0	100
3.70	0.6	0	100
3.71	0.6	90	10
5.00	0.6	90	10

**Detector** AB SCIEX API 4000™ MS/MS

**Ion Source:** TurbolonSpray®

**Ion Mode:** ESI+

**Instrument** API LC-MS/MS

**Notes** Lorazepam was prepared at 100 ng/mL; all other analytes are 10 ng/mL.

**Column Characteristics:**

**Stationary Phase Category:** C18, octadecylsilane (L1)  
**Ligand Type:** Sterically protected C18  
**Particle:** 2.7 µm or 5 µm superficially porous silica (SPP or “core-shell”)  
**Pore Size:** 90 Å  
**Surface Area:** 150 m<sup>2</sup>/g (2.7 µm) or 100 m<sup>2</sup>/g (5 µm)  
**Recommended Usage:**  
 pH range: 1.0–8.0  
 Maximum Temperature: 80 °C  
 Maximum Pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)



**Properties:**

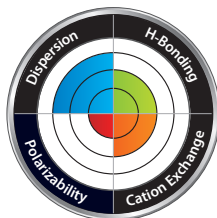
- Well-balanced retention profile.
- Sterically protected and acid-resistant to resist harsh, low-pH mobile phases.
- Ideal for use with sensitive detectors like mass spec.

**Switch to an ARC-18 when:**

- You are analyzing large, multiclass lists by LC-MS/MS.
- Strongly acidic (pH 1–3) mobile phases are required.

**USLC® Column Interaction Profile**

(See page 161 for more information.)



**Raptor™ ARC-18 LC Columns (USP L1)**

**Chromatographic Properties**

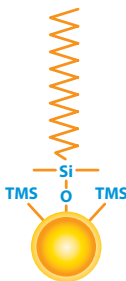
Designed and intended specifically for use on LC-MS/MS systems, the Raptor™ ARC-18 column offers a well-balanced retention profile without the drawbacks of using an ordinary C18 in the harsh, acidic mobile phases needed for mass spectrometry (MS). Even after extended use in these low-pH (≤ 2.0) conditions, the sterically protected ARC-18 offers consistent retention, peak shape, and response for charged bases, neutral acids, small polar compounds, and more. For the rapid analysis of large, multiclass assays by LC-MS/MS, the acid-resistant Raptor™ ARC-18 truly is *ahead of the curve*.



Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
<b>2.7 µm Columns</b>			
30 mm	9314A32	9314A3E	9314A35
50 mm	9314A52	9314A5E	9314A55
100 mm	9314A12	9314A1E	9314A15
150 mm	9314A62	9314A6E	9314A65
<b>5 µm Columns</b>			
30 mm	—	931453E	—
50 mm	9314552	931455E	9314555
100 mm	9314512	931451E	9314515
150 mm	9314562	931456E	9314565
250 mm	—	—	9314575

**Column Characteristics:**

**Stationary Phase Category:** C18, octadecylsilane (L1)  
**Ligand Type:** End-capped C18  
**Particle:** 2.7 µm or 5 µm superficially porous silica (SPP or “core-shell”)  
**Pore Size:** 90 Å  
**Surface Area:** 150 m<sup>2</sup>/g (2.7 µm) or 100 m<sup>2</sup>/g (5 µm)  
**Recommended Usage:**  
 pH range: 2.0–8.0  
 Maximum Temperature: 80 °C  
 Maximum Pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)



**Properties:**

- Compatible with moderately acidic to neutral mobile phases (pH 2–8).
- Excellent data quality in food, environmental, bioanalytical, and other applications.

**Switch to a C18 when:**

- You need a general-purpose column for reversed-phase chromatography.
- You need to increase retention of hydrophobic compounds.

**USLC® Column Interaction Profile**

(See page 161 for more information.)



**Raptor™ C18 LC Columns (USP L1)**

**Chromatographic Properties**

When you need a general-purpose LC column, don't just grab any C18. Choose the speed, efficiency, and long-lasting ruggedness of the Raptor™ C18. This traditional end-capped C18 offers the highest hydrophobic retention of any Raptor™ phase, and it is compatible with a wide range of mobile phases from moderately acidic to neutral (pH 2–8). Whether for food safety or environmental or bioanalytical analyses, this phase offers consistently excellent data quality in less time across myriad reversed-phase applications, matrices, and compound classes. To lower costs and improve profitability, you need columns to last longer, data to be reproducible, and existing HPLC instrumentation to run faster. Get there with the only general-purpose C18 that gives you *Selectivity Accelerated*.



Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
<b>2.7 µm Columns</b>			
30 mm	9304A32	9304A3E	9304A35
50 mm	9304A52	9304A5E	9304A55
100 mm	9304A12	9304A1E	9304A15
150 mm	9304A62	9304A6E	9304A65
<b>5 µm Columns</b>			
30 mm	—	930453E	—
50 mm	9304552	930455E	9304555
100 mm	9304512	930451E	9304515
150 mm	9304562	930456E	9304565
250 mm	—	—	9304575

### Raptor™ EXP® Guard Column Cartridges

- Free-Turn® architecture lets you change cartridges by hand without breaking inlet/outlet fluid connections—no tools needed.
- Patented titanium hybrid ferrules can be installed repeatedly without compromising high-pressure seal.
- Auto-adjusting design provides ZDV (zero dead volume) connection to any 10-32 female port.
- Guard column cartridges require EXP® direct connect holder (cat.# 25808).
- Pair with EXP® hand-tight fitting (cat.# 25937–25939) for tool-free installation.

To help protect your investment and further extend the life of our already-rugged LC columns, Restek offers the patent-pending guard column hardware developed by Optimize Technologies. A Restek® LC guard cartridge in an EXP® direct connect holder is the ultimate in column protection.

Description	Particle Size	qty.	5 x 2.1 mm cat.#	5 x 3.0 mm cat.#	5 x 4.6 mm cat.#
Raptor ARC-18 EXP Guard Column Cartridge	2.7 µm	3-pk.	9314A0252	9314A0253	9314A0250
Raptor ARC-18 EXP Guard Column Cartridge	5 µm	3-pk.	931450252	931450253	931450250
Raptor Biphenyl EXP Guard Column Cartridge	2.7 µm	3-pk.	9309A0252	9309A0253	9309A0250
Raptor Biphenyl EXP Guard Column Cartridge	5 µm	3-pk.	930950252	930950253	930950250
Raptor C18 EXP Guard Column Cartridge	2.7 µm	3-pk.	9304A0252	9304A0253	9304A0250
Raptor C18 EXP Guard Column Cartridge	5 µm	3-pk.	930450252	930450253	930450250

Maximum cartridge pressure: 600 bar / 8,700 psi (2.7 µm) or 400 bar / 5,800 psi (5 µm)

### EXP® Direct Connect Holder

Description	qty.	cat.#
EXP Direct Connect Holder for EXP Guard Cartridges (includes hex-head fitting & 2 ferrules)	ea.	25808

Maximum holder pressure: 20,000 psi (1,400 bar)



Raptor™ EXP® Guard Column Cartridge

Learn more about the Raptor™ EXP® guard column on page 156!



25808  
EXP® Direct Connect Holder

### also available



**Hand-Tight Nut** (cat.# 25937–25939)  
Upgrade the supplied nut to install your Raptor™ EXP® guard column by hand—no tools needed.



**Long Hex-Head Nut** (cat.# 25934)  
Extend the nut on your Raptor™ EXP® guard column for easier access in tight spaces—no more bumped knuckles.



**EXP® Hand-Tight Coupler** (cat.# 25940)  
Achieve tool-free 8,700+ psi (600 bar) seals anywhere in your LC system with EXP® hand-tight couplers and connectors.

See **page 335** for more EXP® hex-head fittings, couplers, replacement parts, and more.

## Ultra Selective Liquid Chromatography™ Technology

*Choose Columns Fast. Develop Methods Faster.*

What is Ultra Selective Liquid Chromatography™ (USLC®) technology? This technique is the directed application of orthogonal selectivity—the most influential factor affecting peak separation, or resolution—to provide the practicing chromatographer with the best tools for choosing columns fast and developing methods faster. Through our extensive study of reversed-phase chromatography, Restek created the widest range of selectivity in the industry using just four unique stationary phases: the USLC® column set. We also defined a simple approach to choosing a column with the appropriate selectivity for any application.

### Selectivity Drives Separations

*Quickly and effectively resolve analytes by understanding and controlling selectivity through USLC® technology.*

One of the most significant, yet least understood, steps of method development is finding the proper stationary phase for a particular separation. As sample complexity increases, achieving adequate resolution between matrix components and target analytes becomes more difficult. Despite recent advancements in column format, such as sub-2-micron packings and pellicular particles, resolution can still be difficult to obtain because, while these formats can increase chromatographic efficiency and analysis speed, they do not significantly influence resolution. Selectivity, as shown in Equation 1, is the single most powerful factor affecting resolution, and it is largely dependent upon stationary phase composition.

**Equation 1:** Selectivity has the greatest mathematical effect on resolution.

$$R = \frac{1}{4} \sqrt{N} \times (k/(k+1)) \times (\alpha-1)$$


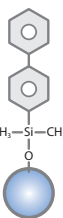
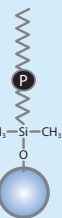
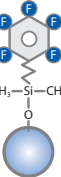
*Efficiency   Retention Factor   Selectivity*

### Real Diversity in Phase Chemistry

*A small set of defined orthogonal columns means faster separations and more robust methods.*

While numerous bonded phases are available for reversed-phase chromatography, many (e.g., C8 and C18) are similar and offer only moderate changes in retention rather than significant differences in selectivity. Method development is less laborious and time-consuming when you use a full range of column selectivities, including orthogonal phase chemistries like polar-embedded, phenyl, and fluorophenyl columns. Restek has led the development of the unique USLC® column set across these phase classes to provide analysts with a more effective range of column selectivities and innovative column chemistries for method development. The USLC® column set (Figure 1) provides the widest range of reversed-phase selectivity available with just four columns and can be used to guide proper stationary phase selection—the least understood yet most significant part of method development.

**Figure 1:** Restek® columns offer the widest range of unique and effective phase chemistries to aid the chromatographer in choosing columns fast and developing methods faster.

Restek® USLC® Phase (column class)	Aqueous C18 (alkyl)	Biphenyl (phenyl)	IBD (polar embedded)	PFP Propyl (fluorophenyl)
				
<b>Ligand Type</b>	Proprietary polar modified and functionally bonded C18	Unique Biphenyl	Proprietary polar functional embedded alkyl	Fluorophenyl
<b>Properties</b>	<ul style="list-style-type: none"> <li>• General-purpose with a well-balanced retention profile.</li> <li>• Compatible with 100% aqueous mobile phases.</li> <li>• Ideal for multi-component LC-MS analyses.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased retention for dipolar, unsaturated, or conjugated solutes.</li> <li>• Enhanced selectivity when used with protic (methanol) mobile phase.</li> <li>• Ideal for increasing sensitivity and selectivity in LC-MS analyses.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased retention for acids and water-soluble compounds.</li> <li>• Compatible with 100% aqueous mobile phases.</li> <li>• Capable of both reversed-phase and HILIC separations.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased retention for both charged bases and electronegative compounds.</li> <li>• Capable of both reversed-phase and HILIC separations.</li> <li>• Ideal for increasing sensitivity and selectivity in LC-MS analyses.</li> </ul>



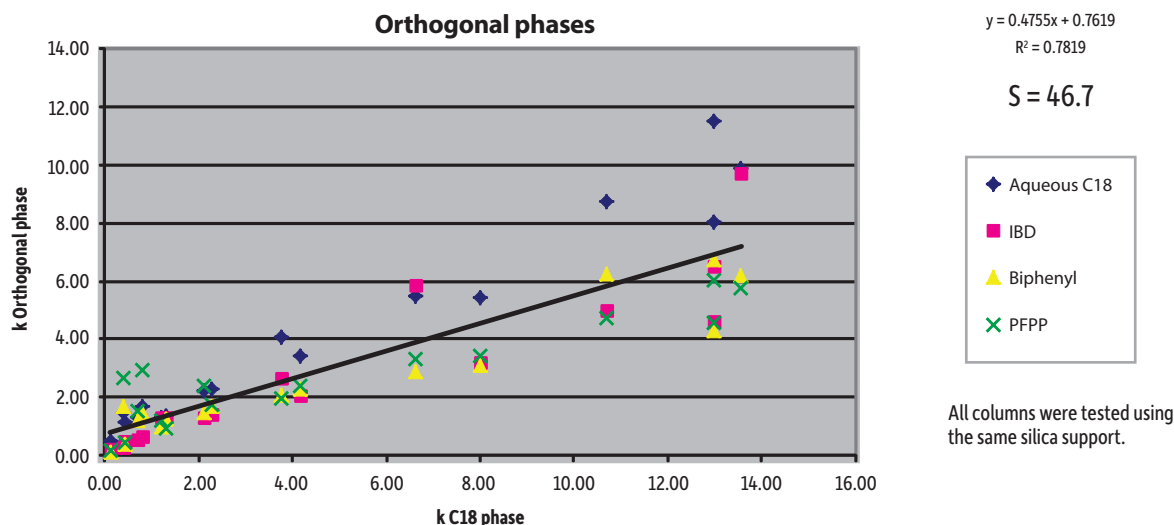
## Evaluating and Extending Selectivity

The Restek® USLC® column set offers the highest range of alternate selectivity available.

The diverse selectivity provided by USLC® columns can be demonstrated empirically using the hydrophobic-subtraction model [1]. This model is a novel procedure for characterizing selectivity that uses test probes to define the solute and stationary phase interactions in reversed-phase separations. Restek is leading the commercial application of this model by implementing it in the development of USLC® bonded phases. To evaluate phase selectivity using the hydrophobic-subtraction model, the retention characteristics of the solute probes are compared across different phases relative to a C18 benchmark with all columns using the same silica base.

The resulting scatter plot is an excellent way to visualize selectivity. Stationary phases with similar selectivity show high linearity when graphed. However, stationary phases with alternate selectivity—even orthogonality—produce significant scatter around the regression line. The high degree of scatter shown in Figure 2 shows just how diverse the phases in the USLC® column set are. When we quantify column selectivity based on this correlation by calculating the selectivity (S) statistic [2], the resulting value of 46.7 shows that the USLC® column set truly has the highest range of selectivity available.

**Figure 2:** Restek has extended the selectivity range for commercially available columns and defined a column set—the four USLC® phases—that is ideal for fast column choice and faster method development.



### References

- [1] L.R. Snyder, J.W. Dolan, P.W. Carr, *The Hydrophobic-Subtraction Model of Reversed-Phase Column Selectivity*, J. Chromatogr. A 1060 (2004) 77.  
[2] U.D. Neue, J.E. O'Gara, A. Mendez, *Selectivity in Reversed-Phase Separations Influence of the Stationary Phase*, J. Chromatogr. A 1127 (2006) 161.

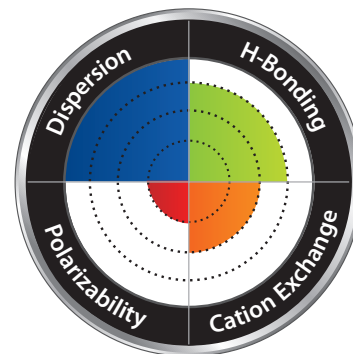
## ▶ USLC® Column Interaction Profile

Put simply, selectivity is the retention of one compound relative to another. Therefore, because solutes will be retained to different degrees by different molecular interactions, we can fundamentally define a column's selectivity based on the molecular interactions it delivers.

Each USLC® column is optimized for a different chemical interaction. The pie chart provided for each USLC® stationary phase in this catalog (Figure 3) identifies the same four molecular interactions (color coded to correspond to the retention of a different solute type). The more rings shown for a given interaction, the more significant a role it plays in defining solute retention.

If you know what type of column interaction you need for your analysis, use these charts to select your USLC® column.

**Figure 3:** A look at a sample USLC® column interaction profile.





**USLC® Columns**  
Choose Columns Fast.  
Develop Methods Faster.

[www.restek.com/uslc](http://www.restek.com/uslc)

### USLC® Method Development Toolbox

- Ultra Selective Liquid Chromatography™ (USLC®) method development toolbox contains all four USLC® stationary phases in one convenient package.
- Available for UHPLC (1.9 µm) and HPLC (3 or 5 µm) in 50, 100, or 150 mm lengths.
- Included selection guide makes it even easier to pick the right column the first time.

Description	Size	Includes	qty.	cat.#
Pinnacle DB USLC Method Development Toolbox	1.9 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9409252), Aqueous C18 (9418252), IBD (9425252), PFP Propyl (9419252)	kit	25800
Pinnacle DB USLC Method Development Toolbox	1.9 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9409212), Aqueous C18 (9418212), IBD (9425212), PFP Propyl (9419212)	kit	25807
Ultra USLC Method Development Toolbox	3 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9109352), Aqueous C18 (9178352), IBD (9175352), PFP Propyl (9179352)	kit	25801
Ultra USLC Method Development Toolbox	3 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9109312), Aqueous C18 (9178312), IBD (9175312), PFP Propyl (9179312)	kit	25802
Ultra USLC Method Development Toolbox	3 µm, 3.0 mm x 100 mm	(1) each: Biphenyl (910931E), Aqueous C18 (917831E), IBD (917531E), PFP Propyl (917931E)	kit	25803
Ultra USLC Method Development Toolbox	5 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9109552), Aqueous C18 (9178552), IBD (9175552), PFP Propyl (9179552)	kit	25804
Ultra USLC Method Development Toolbox	5 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9109512), Aqueous C18 (9178512), IBD (9175512), PFP Propyl (9179512)	kit	25805
Ultra USLC Method Development Toolbox	5 µm, 4.6 mm x 150 mm	(1) each: Biphenyl (9109565), Aqueous C18 (9178565), IBD (9175565), PFP Propyl (9179565)	kit	25806

## Mobile Phase Management 101

Neatly Keep Mobile Phase Lines Where They Belong

Hub-Cap Bottle Tops and Adaptors  
See **page 340**.



Hub-Cap (assembly of the bottle cap and plug)

Transfer and Filter Mobile Phase in a Single Step

Hub-Cap Filters  
See **page 341**.



Extend Column Life

Bluestem Glass Solvent Filter  
See **page 343**.



Prepare and Maintain Mobile Phases Without Dissolved Gas or Unnecessary Costs

Mobile Phase Sparge Filter  
See **page 342**.



Avoid Messy Spills Around Mobile Phase Waste Containers

Waste Overflow Indicator  
See **page 341**.



## Pinnacle® DB Columns: 1.9, 3, or 5 µm particles; 140 Å pore size

Restek® Pinnacle® DB columns are built for optimal UHPLC performance.

Pinnacle® DB columns are 100% manufactured by Restek in our Bellefonte, Pennsylvania, facility. Because performance begins with the support, our Pinnacle® DB UHPLC columns start with base-deactivated spherical silica that is optimized for UHPLC stability. From there, we bond them with a wide variety of phases to give chromatographers a stable and selective column. Get the most out of your UHPLC system. Combine selectivity and efficiency by using Restek® Pinnacle® DB UHPLC columns.

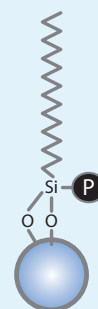


### Pinnacle® DB Aqueous C18 Columns (USP L1)

#### Chromatographic Properties

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9418232	—	—
50 mm	9418252	—	—
100 mm	9418212	—	—
<b>3 µm Columns</b>			
30 mm	9418332	941833E	941833S
50 mm	9418352	941835E	941835S
100 mm	9418312	941831E	941831S
150 mm	9418362	941836E	941836S
<b>5 µm Columns</b>			
30 mm	9418532	941853E	941853S
50 mm	9418552	941855E	941855S
100 mm	9418512	941851E	941851S
150 mm	9418562	941856E	941856S
200 mm	9418522	941852E	941852S
250 mm	9418572	941857E	941857S



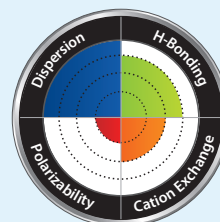
#### Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

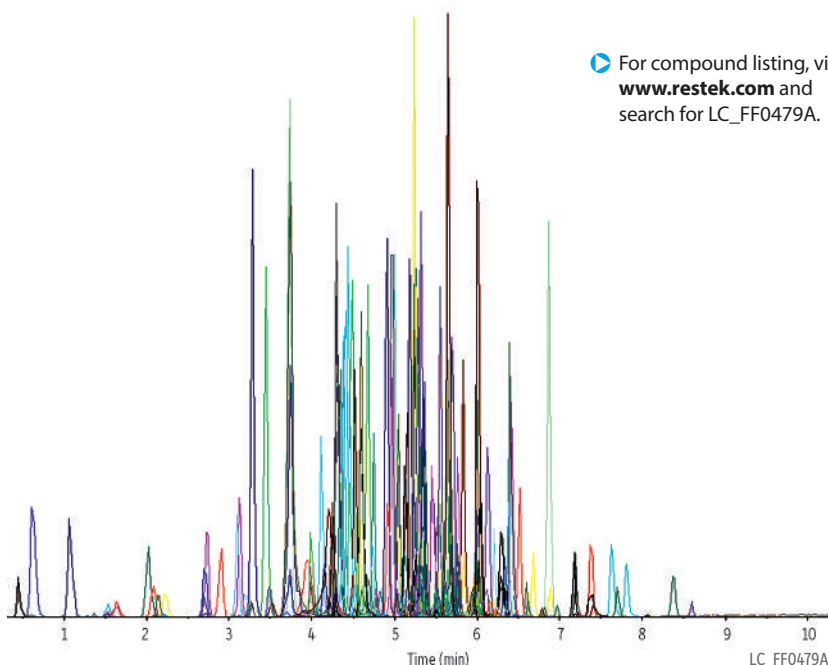
#### Aqueous C18

#### USLC® Column Interaction Profile

(See page 161 for more information.)



### Pesticides on Pinnacle® DB Aqueous C18 (LC-MS/MS, ESI+)



▶ For compound listing, visit [www.restek.com](http://www.restek.com) and search for LC\_FF0479A.

**Column** Pinnacle® DB Aqueous C18 (cat.# 9418252)  
**Dimensions:** 50 mm x 2.1 mm ID  
**Particle Size:** 1.9 µm  
**Pore Size:** 140 Å  
**Temp.:** 35 °C  
**Sample** multicomponent pesticide standard  
**Diluent:** water  
**Conc.:** 33.3 ppb each pesticide  
**Inj. Vol.:** 5 µL  
**Mobile Phase**  
**A:** 10 mM NH<sub>4</sub>OAc in water  
**B:** 10 mM NH<sub>4</sub>OAc in methanol

Time (min)	%B
0	10
1	10
8	90
10	90
11	10

**Flow:** 0.60 mL/min  
**Max Pressure:** ~517 bar  
**Detector** Applied Biosystems/MDS Sciex LC-MS/MS  
**Model #:** 4000 QTRAP® LC-MS/MS system  
**Ion Source:** TurbolonSpray®  
**Ion Spray Voltage:** 5 kV  
**Gas 1:** 40 psi (275.8 kPa)  
**Gas 2:** 60 psi (413.7 kPa)  
**Source Temp.:** 500 °C  
**Instrument** Shimadzu UFLCXR



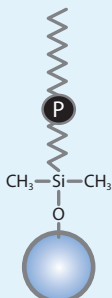
**Pinnacle® DB IBD UHPLC Columns (USP L68)**

**Chromatographic Properties**

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

**Column Characteristics:**

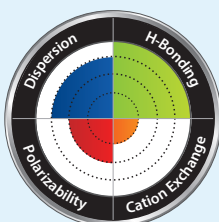
particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl



IBD

Length	2.1 mm ID cat.#
<b>1.9 µm Columns</b>	
30 mm	9425232
50 mm	9425252
100 mm	9425212

**USLC® Column Interaction Profile**  
(See page 161 for more information.)



## Protect your column and your UHPLC performance with UltraShield and UltraLine UHPLC filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system.



See page 188.

[www.restek.com/LCguard](http://www.restek.com/LCguard)



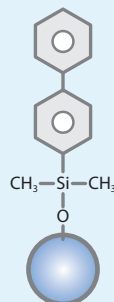


## Pinnacle® DB Biphenyl Columns (USP L11)

### Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9409232	—	—
50 mm	9409252	—	—
100 mm	9409212	—	—
<b>3 µm Columns</b>			
30 mm	9409332	940933E	9409335
50 mm	9409352	940935E	9409355
100 mm	9409312	940931E	9409315
150 mm	9409362	940936E	9409365
<b>5 µm Columns</b>			
30 mm	9409532	940953E	9409535
50 mm	9409552	940955E	9409555
100 mm	9409512	940951E	9409515
150 mm	9409562	940956E	9409565
200 mm	9409522	940952E	9409525
250 mm	9409572	940957E	9409575

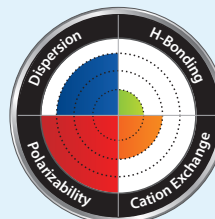


### Column Characteristics:

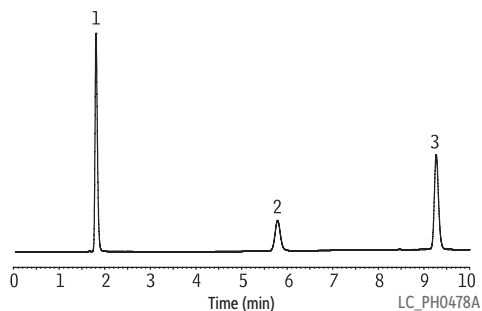
particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl

### Biphenyl

USLC® Column Interaction Profile  
(See page 161 for more information.)



## NSAIDs on Pinnacle® DB Biphenyl



### Peaks

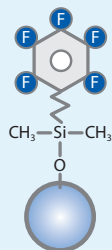
1. Uracil (void marker)
2. Tenoxicam
3. Sulfinpyrazone

<b>Column</b>	Pinnacle® DB Biphenyl (cat.# 9409565)
<b>Dimensions:</b>	150 mm x 4.6 mm ID
<b>Particle Size:</b>	5 µm
<b>Pore Size:</b>	140 Å
<b>Temp.:</b>	30 °C
<b>Sample</b>	
<b>Diluent:</b>	0.1% formic acid in water:methanol (40:60)
<b>Conc.:</b>	100 µg/mL each component (see peak list)
<b>Inj. Vol.:</b>	10 µL
<b>Mobile Phase</b>	
<b>A:</b>	0.1% formic acid in water
<b>B:</b>	methanol
<b>Time (min)</b>	<b>%B</b>
0.00	60
2.0	60
8.0	90
20.0	90
20.1	60
<b>Flow:</b>	1.0 mL/min
<b>Detector</b>	UV/Vis @ 254 nm
<b>Instrument</b>	Shimadzu Prominence



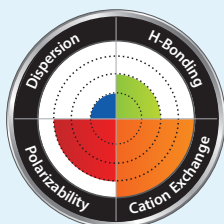
**Column Characteristics:**

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl



PFP Propyl

**USLC® Column Interaction Profile**  
(See page 161 for more information.)



**Pinnacle® DB PFP Propyl Columns (USP L43)**

**Chromatographic Properties**

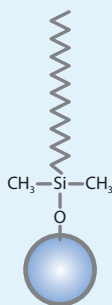
The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9419232	—	—
50 mm	9419252	—	—
100 mm	9419212	—	—
<b>3 µm Columns</b>			
30 mm	9419332	941933E	9419335
50 mm	9419352	941935E	9419355
100 mm	9419312	941931E	9419315
150 mm	9419362	941936E	9419365
<b>5 µm Columns</b>			
30 mm	9419532	941953E	9419535
50 mm	9419552	941955E	9419555
100 mm	9419512	941951E	9419515
150 mm	9419562	941956E	9419565
200 mm	9419522	941952E	9419525
250 mm	9419572	941957E	9419575



**Column Characteristics:**

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18



C18

**Pinnacle® DB C18 Columns (USP L1)**

**Chromatographic Properties**

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9414232	—	—
50 mm	9414252	—	—
100 mm	9414212	—	—
<b>3 µm Columns</b>			
30 mm	9414332	941433E	9414335
50 mm	9414352	941435E	9414355
100 mm	9414312	941431E	9414315
<b>5 µm Columns</b>			
30 mm	9414532	941453E	9414535
50 mm	9414552	941455E	9414555
100 mm	9414512	941451E	9414515
150 mm	9414562	941456E	9414565
200 mm	9414522	941452E	9414525
250 mm	9414572	941457E	9414575

**also available**

**Trident Direct Guard Column System**

See page 189.



**Looking for an equivalent column?**

Restek has extensively studied column selectivity and can provide you with an accurate recommendation. Please contact Restek® Technical Support or your local Restek® representative.

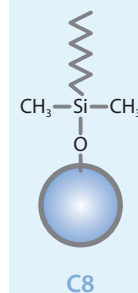
## Pinnacle® DB C8 Columns (USP L7)



### Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9413232	—	—
50 mm	9413252	—	—
100 mm	9413212	—	—
<b>3 µm Columns</b>			
30 mm	9413332	941333E	9413335
50 mm	9413352	941335E	9413355
100 mm	9413312	941331E	9413315
<b>5 µm Columns</b>			
30 mm	9413532	941353E	9413535
50 mm	9413552	941355E	9413555
100 mm	9413512	941351E	9413515
150 mm	9413562	941356E	9413565
200 mm	9413522	941352E	9413525
250 mm	9413572	941357E	9413575



### Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8

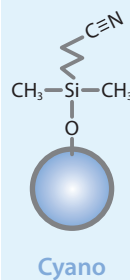
## Pinnacle® DB Cyano Columns (USP L10)



### Chromatographic Properties

The Restek® Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9416232	—	—
50 mm	9416252	—	—
100 mm	9416212	—	—
<b>5 µm Columns</b>			
30 mm	9416532	941653E	9416535
50 mm	9416552	941655E	9416555
100 mm	9416512	941651E	9416515
150 mm	9416562	941656E	9416565
200 mm	9416522	941652E	9416525
250 mm	9416572	941657E	9416575



### Column Characteristics:

particle size:	1.9 µm or 5 µm, spherical
pore size:	140 Å
carbon load:	4%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane



Whether it's on our new Raptor™ SPP or the proven Pinnacle® DB and Ultra supports, Restek's LC Manufacturing group bonds our silica with stationary phases that offer maximum selectivity and reliability.



**Column Characteristics:**

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none



Silica

**Pinnacle® DB Silica Columns (USP L3)**

**Chromatographic Properties**

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>1.9 µm Columns</b>			
30 mm	9410232	—	—
50 mm	9410252	—	—
100 mm	9410212	—	—
<b>3 µm Columns</b>			
30 mm	9410332	941033E	9410335
50 mm	9410352	941035E	9410355
100 mm	9410312	941031E	9410315
150 mm	9410362	941036E	9410365
<b>5 µm Columns</b>			
30 mm	9410532	941053E	9410535
50 mm	9410552	941055E	9410555
100 mm	9410512	941051E	9410515
150 mm	9410562	941056E	9410565
200 mm	9410522	941052E	9410525
250 mm	9410572	941057E	9410575



**Pinnacle® DB PAH UHPLC Columns**

**Chromatographic Properties**

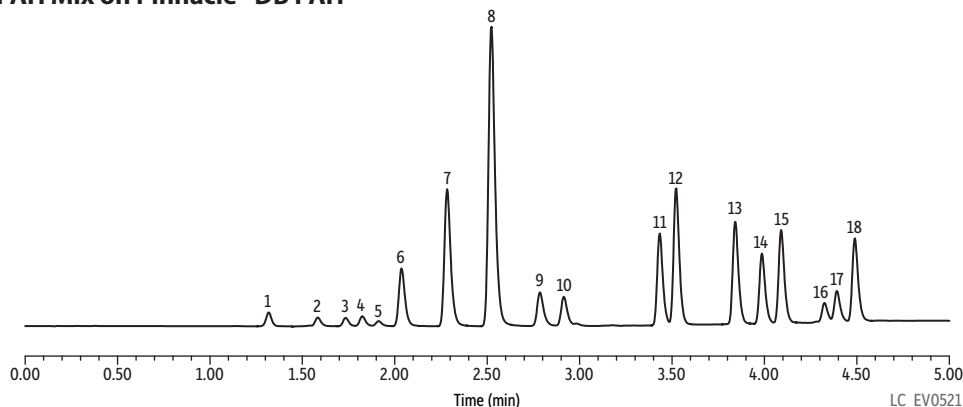
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons (PAHs). Get complete resolution of all 16 EPA 610 PAHs, plus two other routinely analyzed PAH compounds, in less than five minutes to greatly reduce run times and increase sample throughput.

**Column Characteristics:**

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

Length	2.1 mm ID cat.#
<b>1.9 µm Columns</b>	
30 mm	9470232
50 mm	9470252
100 mm	9470212

**PAH Mix on Pinnacle® DB PAH**



**Peaks**

1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

**Column** Pinnacle® DB PAH (cat.# 9470252)  
**Dimensions:** 50 mm x 2.1 mm ID  
**Particle Size:** 1.9 µm  
**Pore Size:** 140 Å  
**Temp.:** 30 °C  
**Sample** EPA Method 8310 PAH Mixture (cat.# 31841)  
**Diluent:** acetonitrile  
**Conc.:** 10 µg/mL  
**Inj. Vol.:** 1 µL

**Mobile Phase**

A:	water		
B:	acetonitrile		
<b>Time (min)</b>	<b>Flow (mL/min)</b>	<b>%A</b>	<b>%B</b>
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

**Max Pressure:** 724 bar  
**Detector** Photo diode array @ 254, 4.8 nm  
**Instrument** Waters



## Ultra HPLC Columns: 3 or 5 µm particles; 100 Å pore size

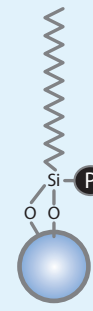
The Ultra line represents Restek's broadest selection of stationary phases on a single silica support. Made of high-purity, type-B silica that minimizes activity and creates high-density bonding, these columns are designed for selective and reliable HPLC applications.

### Ultra Aqueous C18 Columns (USP L1)

#### Chromatographic Properties

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9178332	917833E	917833S
50 mm	9178352	917835E	917835S
100 mm	9178312	917831E	917831S
150 mm	9178362	917836E	917836S
<b>5 µm Columns</b>			
30 mm	9178532	917853E	917853S
50 mm	9178552	917855E	917855S
100 mm	9178512	917851E	917851S
150 mm	9178562	917856E	917856S
200 mm	9178522	917852E	917852S
250 mm	9178572	917857E	917857S

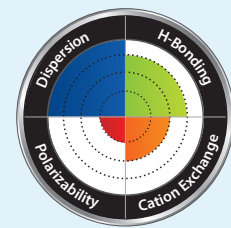


**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

**Aqueous C18**

**USLC® Column Interaction Profile**  
(See page 161 for more information.)

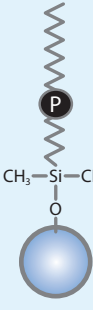


### Ultra IBD Columns (USP L68)

#### Chromatographic Properties

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9175332	917533E	917533S
50 mm	9175352	917535E	917535S
100 mm	9175312	917531E	917531S
150 mm	9175362	917536E	917536S
<b>5 µm Columns</b>			
30 mm	9175532	917553E	917553S
50 mm	9175552	917555E	917555S
100 mm	9175512	917551E	917551S
150 mm	9175562	917556E	917556S
200 mm	9175522	917552E	917552S
250 mm	9175572	917557E	917557S

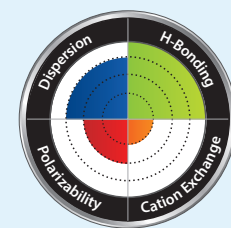


**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl

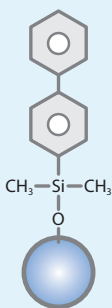
**IBD**

**USLC® Column Interaction Profile**  
(See page 161 for more information.)



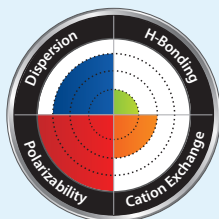
**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl



Biphenyl

**USLC® Column Interaction Profile**  
(See page 161 for more information.)



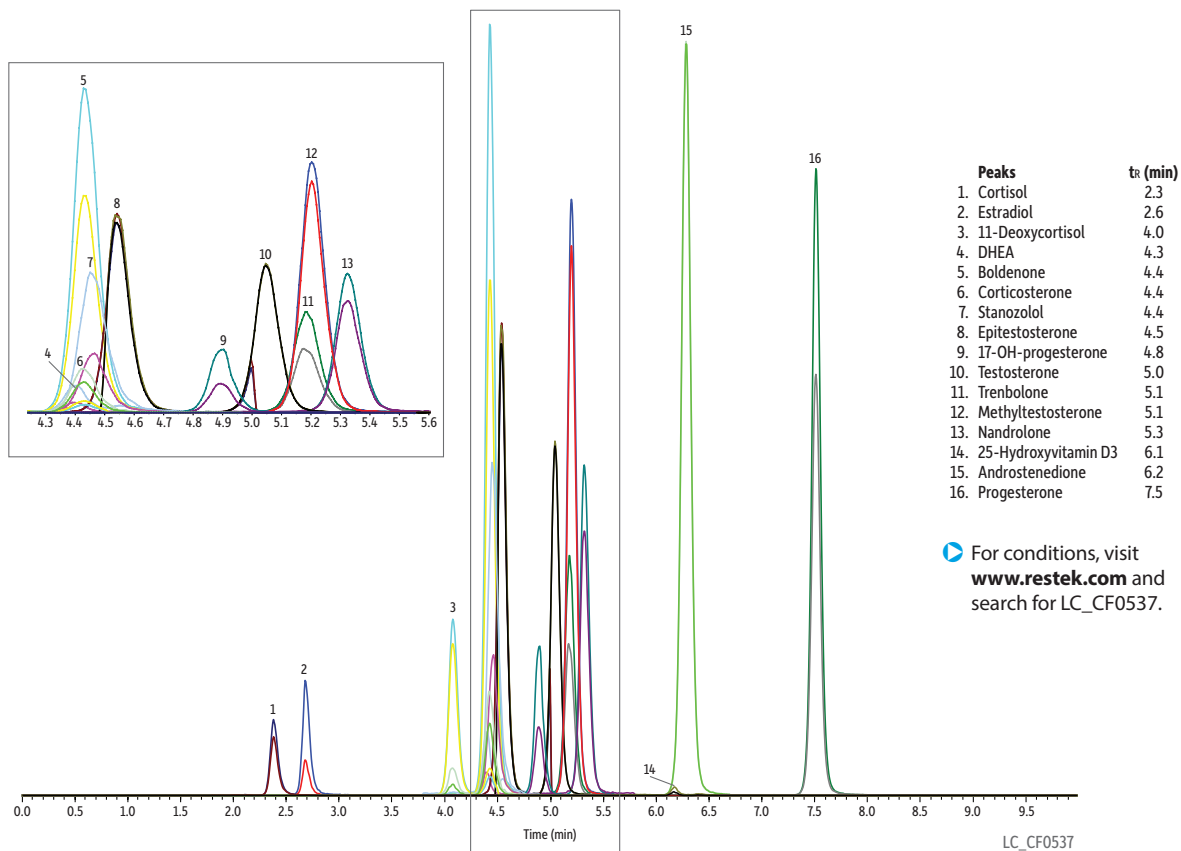
**Ultra Biphenyl Columns (USP L11)**

**Chromatographic Properties**

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9109332	910933E	9109335
50 mm	9109352	910935E	9109355
100 mm	9109312	910931E	9109315
150 mm	9109362	910936E	9109365
<b>5 µm Columns</b>			
30 mm	9109532	910953E	9109535
50 mm	9109552	910955E	9109555
100 mm	9109512	910951E	9109515
150 mm	9109562	910956E	9109565
200 mm	9109522	910952E	9109525
250 mm	9109572	910957E	9109575

**Steroid Panel Analysis on the Ultra Biphenyl**



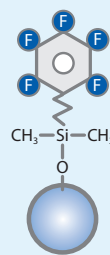
For conditions, visit [www.restek.com](http://www.restek.com) and search for LC\_CF0537.

## Ultra PFP Propyl Columns (USP L43)

### Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9179332	917933E	9179335
50 mm	9179352	917935E	9179355
100 mm	9179312	917931E	9179315
150 mm	9179362	917936E	9179365
<b>5 µm Columns</b>			
30 mm	9179532	917953E	9179535
50 mm	9179552	917955E	9179555
100 mm	9179512	917951E	9179515
150 mm	9179562	917956E	9179565
200 mm	9179522	917952E	9179525
250 mm	9179572	917957E	9179575

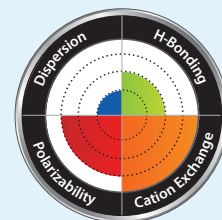


### Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl

### PFP Propyl

### USLC® Column Interaction Profile (See page 161 for more information.)

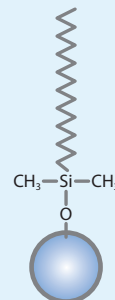


## Ultra C18 Columns (USP L1)

### Chromatographic Properties

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>				
30 mm	9174332	917433E	—	9174335
50 mm	9174352	917435E	—	9174355
100 mm	9174312	917431E	—	9174315
150 mm	9174362	917436E	—	9174365
<b>5 µm Columns</b>				
30 mm	9174532	917453E	—	9174535
50 mm	9174552	917455E	—	9174555
100 mm	9174512	917451E	9174514	9174515
150 mm	9174562	917456E	9174564	9174565
200 mm	9174522	917452E	—	9174525
250 mm	9174572	917457E	—	9174575



### Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	20%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

### C18

also available

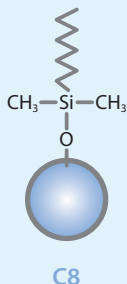
200+ compound multiresidue  
pesticides standard kits for  
LC-MS/MS and GC-MS/MS!



See pages 568–571.

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8



**Ultra C8 Columns (USP L7)**

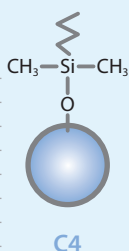
**Chromatographic Properties**

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>				
30 mm	9103332	910333E	—	9103335
50 mm	9103352	910335E	—	9103355
100 mm	9103312	910331E	—	9103315
150 mm	9103362	910336E	—	9103365
<b>5 µm Columns</b>				
30 mm	9103532	910353E	—	9103535
50 mm	9103552	910355E	—	9103555
100 mm	9103512	910351E	9103514	9103515
150 mm	9103562	910356E	9103564	9103565
200 mm	9103522	910352E	—	9103525
250 mm	9103572	910357E	—	9103575

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	9%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L26
phase category:	C4, butylsilane
ligand type:	monomeric C4



**Ultra C4 Columns (USP L26)**

**Chromatographic Properties**

Exceptionally stable C4 packing with high bonding coverage and base deactivation. Less retention than C18 or C8 phases.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9102332	910233E	9102335
50 mm	9102352	910235E	9102355
100 mm	9102312	910231E	9102315
150 mm	9102362	910236E	9102365
<b>5 µm Columns</b>			
30 mm	9102532	910253E	9102535
50 mm	9102552	910255E	9102555
100 mm	9102512	910251E	9102515
150 mm	9102562	910256E	9102565
200 mm	9102522	910252E	9102525
250 mm	9102572	910257E	9102575



Our LC Manufacturing experts follow tightly controlled processes to ensure that you receive robust and reliable columns every time you order from Restek.

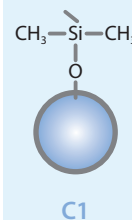


### Ultra C1 Columns (USP L13)

#### Chromatographic Properties

This exceptionally stable C1 phase features our least-retentive reversed-phase hydrocarbon packing.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9101332	910133E	910133S
50 mm	9101352	910135E	910135S
100 mm	9101312	910131E	910131S
150 mm	9101362	910136E	910136S
<b>5 µm Columns</b>			
30 mm	9101532	910153E	910153S
50 mm	9101552	910155E	910155S
100 mm	9101512	910151E	910151S
150 mm	9101562	910156E	910156S
200 mm	9101522	910152E	910152S
250 mm	9101572	910157E	910157S



#### Column Characteristics:

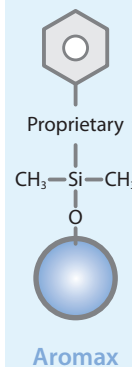
particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	5%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L13
phase category:	trimethylsilane
ligand type:	monomeric C1

### Ultra Aromax Columns (USP L11)

#### Chromatographic Properties

Ultra Aromax is a unique reversed-phase material that exhibits extreme retention and selectivity for aromatic and/or unsaturated compounds. This column is a great alternative to our Biphenyl phase when increased retention is required, and it's an excellent choice for gradient LC-MS analyses when conventional columns are not giving adequate retention or selectivity.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9127332	912733E	912733S
50 mm	9127352	912735E	912735S
100 mm	9127312	912731E	912731S
150 mm	9127362	912736E	912736S
<b>5 µm Columns</b>			
30 mm	9127532	912753E	912753S
50 mm	9127552	912755E	912755S
100 mm	9127512	912751E	912751S
150 mm	9127562	912756E	912756S
200 mm	9127522	912752E	912752S
250 mm	9127572	912757E	912757S



#### Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	17%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L11
phase category:	phenyl
ligand type:	proprietary phenyl ligand



## All the Right Tools— All in One Toolbox

Get all four USLC® stationary phases  
in one convenient package.

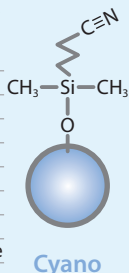
- Available for UHPLC (1.9 µm) and HPLC (3 or 5 µm) in 50, 100, or 150 mm lengths.
- Included selection guide makes it even easier to pick the right column the first time.

See page 162.

[www.restek.com/uslc](http://www.restek.com/uslc)

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane



**Ultra Cyano Columns (USP L10)**

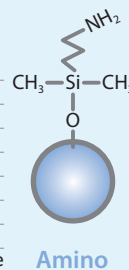
**Chromatographic Properties**

The Restek® Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9106332	910633E	910633S
50 mm	9106352	910635E	910635S
100 mm	9106312	910631E	910631S
150 mm	9106362	910636E	910636S
<b>5 µm Columns</b>			
30 mm	9106532	910653E	910653S
50 mm	9106552	910655E	910655S
100 mm	9106512	910651E	910651S
150 mm	9106562	910656E	910656S
200 mm	9106522	910652E	910652S
250 mm	9106572	910657E	910657S

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	2%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L8
phase category:	amino
ligand type:	aminopropylsilane



**Ultra Amino Columns (USP L8)**

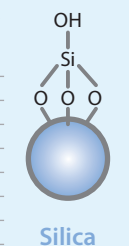
**Chromatographic Properties**

The general-purpose Restek® Amino is an aminopropylsilane that offers reproducible retention and efficiency. It is a great choice for the normal-phase or HILIC analysis of simple sugars.

Length	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>		
30 mm	910733E	910733S
50 mm	910735E	910735S
100 mm	910731E	910731S
150 mm	910736E	910736S
<b>5 µm Columns</b>		
30 mm	910753E	910753S
50 mm	910755E	910755S
100 mm	910751E	910751S
150 mm	910756E	910756S
200 mm	910752E	910752S
250 mm	910757E	910757S

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none



**Ultra Silica Columns (USP L3)**

**Chromatographic Properties**

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>			
30 mm	9100332	910033E	910033S
50 mm	9100352	910035E	910035S
100 mm	9100312	910031E	910031S
150 mm	9100362	910036E	910036S
<b>5 µm Columns</b>			
30 mm	9100532	910053E	910053S
50 mm	9100552	910055E	910055S
100 mm	9100512	910051E	910051S
150 mm	9100562	910056E	910056S
200 mm	9100522	910052E	910052S
250 mm	9100572	910057E	910057S

## Viva HPLC Columns: 3 or 5 µm particles; 300 Å pore size

- Excellent for separating peptides or proteins.
- Rugged, spherical particles with 300 Å pore size.
- High proportion of pore/surface area available to large molecules.

Viva columns are based on a wide pore material we designed for optimal large-molecule separations. In developing Viva silica, we found that although many commercial wide-pore silicas meet the standard 300 Å mean pore size, most have very broad distributions about this mean, with a significant portion of their pore volume falling below 150 Å. This means a large portion of the surface area is unavailable to larger molecules. Viva columns have a narrow distribution around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.



## Viva C18 Columns (USP L1)

### Chromatographic Properties

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>				
30 mm	9514331	9514332	951433E	9514335
50 mm	9514351	9514352	951435E	9514355
100 mm	9514311	9514312	951431E	9514315
150 mm	9514361	9514362	951436E	9514365
<b>5 µm Columns</b>				
30 mm	9514531	9514532	951453E	9514535
50 mm	9514551	9514552	951455E	9514555
100 mm	9514511	9514512	951451E	9514515
150 mm	9514561	9514562	951456E	9514565
200 mm	9514521	9514522	951452E	9514525
250 mm	9514571	9514572	951457E	9514575



C18

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	300 Å
carbon load:	9%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

## Viva C8 Columns (USP L7)

### Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Columns</b>				
30 mm	9513531	9513532	951353E	9513535
50 mm	9513551	9513552	951355E	9513555
100 mm	9513511	9513512	951351E	9513515
150 mm	9513561	9513562	951356E	9513565
200 mm	9513521	9513522	951352E	9513525
250 mm	9513571	9513572	951357E	9513575



C8

**Column Characteristics:**

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8



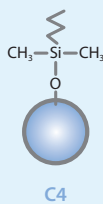
### Viva C4 Columns (USP L26)

#### Chromatographic Properties

Base-deactivated, wide-pore packing exhibits excellent peak shape for a wide range of compounds. Less retention in reversed-phase assays than Viva C18 or Viva C8.

#### Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	3.5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L26
phase category:	C4, butylsilane
ligand type:	monomeric C4



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Columns</b>				
30 mm	9512531	9512532	951253E	951253S
50 mm	9512551	9512552	951255E	951255S
100 mm	9512511	9512512	951251E	951251S
150 mm	9512561	9512562	951256E	951256S
200 mm	9512521	9512522	951252E	951252S
250 mm	9512571	9512572	951257E	951257S



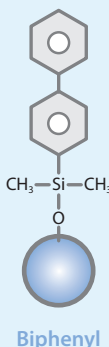
### Viva Biphenyl Columns (USP L11)

#### Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

#### Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	7%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Columns</b>				
30 mm	9516531	9516532	951653E	951653S
50 mm	9516551	9516552	951655E	951655S
100 mm	9516511	9516512	951651E	951651S
150 mm	9516561	9516562	951656E	951656S
200 mm	9516521	9516522	951652E	951652S
250 mm	9516571	9516572	951657E	951657S



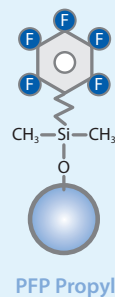
### Viva PFP Propyl Columns (USP L43)

#### Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

#### Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Columns</b>				
30 mm	9519531	9519532	951953E	951953S
50 mm	9519551	9519552	951955E	951955S
100 mm	9519511	9519512	951951E	951951S
150 mm	9519561	9519562	951956E	951956S
200 mm	9519521	9519522	951952E	951952S
250 mm	9519571	9519572	951957E	951957S





**Viva Silica Columns** (USP L3)

**Chromatographic Properties**

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Columns</b>				
30 mm	9510531	9510532	951053E	951053S
50 mm	9510551	9510552	951055E	951055S
100 mm	9510511	9510512	951051E	951051S
150 mm	9510561	9510562	951056E	951056S
200 mm	9510521	9510522	951052E	951052S
250 mm	9510571	9510572	951057E	951057S

Silica

**Column Characteristics:**

particle size:	5 µm, spherical
pore size:	300 Å
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

# Choose Cost-Effective Restek® LC Kits For Your Preventative Maintenance

- Significant savings over instrument manufacturer prices.
- High-quality components in every kit.
- Wide range of options for LC systems and pumps.

See **page 321** for Agilent-system kits or **page 329** for Waters-system kits.



[www.restek.com/LC-Maintenance](http://www.restek.com/LC-Maintenance)

## Application-Specific LC Phases



## Column Characteristics:

particle size:	4 µm, spherical
pore size:	110 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

## Pinnacle® II PAH HPLC Columns

## Chromatographic Properties

Developed specifically for challenging analyses of polycyclic aromatic hydrocarbons (PAHs). The Pinnacle® II PAH stationary phase incorporates a proprietary C18 bonding that enables unique shape selectivity to baseline-resolve all 16 PAHs listed in U.S. EPA Method 610 plus two other routinely analyzed PAH compounds. Every lot of Pinnacle® II PAH bonded phase material is tested to ensure baseline resolution of the Method 610 PAHs using a simple water/acetonitrile mobile phase gradient. Further, because we make Pinnacle® II PAH columns using our own silica, we have greater control over quality and reproducibility. If you are analyzing PAHs using HPLC, Pinnacle® II PAH columns are a reliable, cost-effective choice.

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>4 µm Columns</b>			
50 mm	9219452	921945E	9219455
100 mm	9219412	921941E	9219415
150 mm	9219462	921946E	9219465
200 mm	9219422	921942E	9219425
250 mm	9219472	921947E	9219475

## Pinnacle® II PAH Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Pinnacle II PAH Guard Cartridge	921950212	921950210

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& LOCAL CONNECTIONS**UNITED STATES:**  
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E-mail: [support@restek.com](mailto:support@restek.com)

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## Pinnacle® DB PAH UHPLC Columns



### Chromatographic Properties

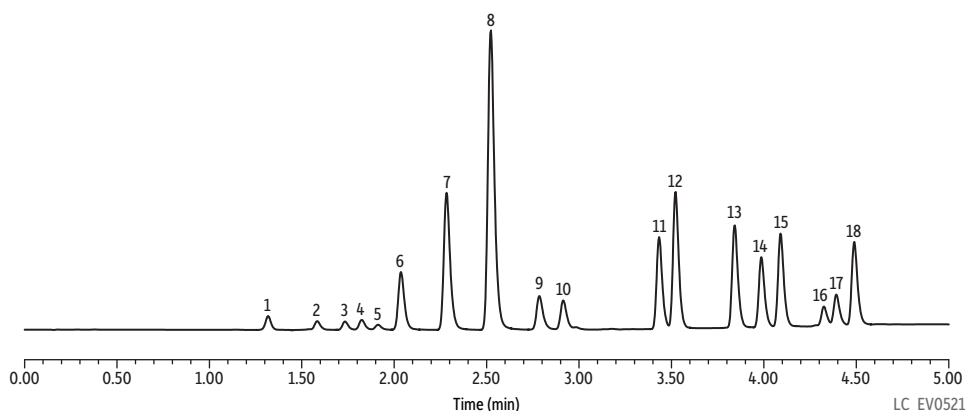
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons (PAHs). Get complete resolution of all 16 EPA 610 PAHs, plus two other routinely analyzed PAH compounds, in less than five minutes to greatly reduce run times and increase sample throughput.

Length	2.1 mm ID cat.#
<b>1.9 µm Columns</b>	
30 mm	9470232
50 mm	9470252
100 mm	9470212

### Column Characteristics:

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

### PAH Mix on Pinnacle® DB PAH



**Column** Pinnacle® DB PAH (cat.# 9470252)  
**Dimensions:** 50 mm x 2.1 mm ID  
**Particle Size:** 1.9 µm  
**Pore Size:** 140 Å  
**Temp.:** 30 °C  
**Sample** EPA Method 8310 PAH Mixture (cat.# 31841)  
**Diluent:** acetonitrile  
**Conc.:** 10 µg/mL  
**Inj. Vol.:** 1 µL

**Mobile Phase**  
**A:** water  
**B:** acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

**Max Pressure:** 724 bar  
**Detector** Photo diode array @ 254, 4.8 nm  
**Instrument** Waters

### Peaks

1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

**Column Characteristics:**

particle size:	5 µm, spherical
pore size:	60 Å
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C

**Allure® AK Columns**

**Chromatographic Properties**

This highly retentive, highly selective phase—unique to Restek—was developed specifically for the analysis of aldehydes and ketones as DNPH derivatives. Allure® AK is a reversed-phase HPLC material that has the unique ability to separate all 13 carbonyl compounds specified in California Air Resources Board (CARB) Method #1004 using a simple acetonitrile/water gradient. Other columns require long analysis times or the use of tetrahydrofuran.

Length	3.2 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Columns with Trident Integral Inlet Fittings</b>		
200 mm	9159523-700	9159525-700

**Allure® AK Guard Cartridge**

Guard Cartridges	3-pk. (10 x 4.0 mm)
Allure AK Guard Cartridge	915950210



**Restek Offers a Full Line of Certified Reference Materials**

Learn more on pages 464–465.

[www.restek.com/iso](http://www.restek.com/iso)



## Allure® Organic Acids Columns

### Chromatographic Properties

Allure® Organic Acids columns provide enhanced retention and selectivity for polar organic acids, allowing the separation to be performed on a single 30 cm column. An Allure® Organic Acids column effectively resolves key organic acids such as tartaric and quinic acids using the chromatographic conditions specified in AOAC method 986.13. Retention is stable and reproducible, even with the 100% aqueous mobile phase specified in the AOAC method.

Length	3.0 mm ID cat.#	4.6 mm ID cat.#
<b>5 µm Column</b>		
150 mm	916556E	916556S
250 mm	—	916557S
300 mm	—	916558S

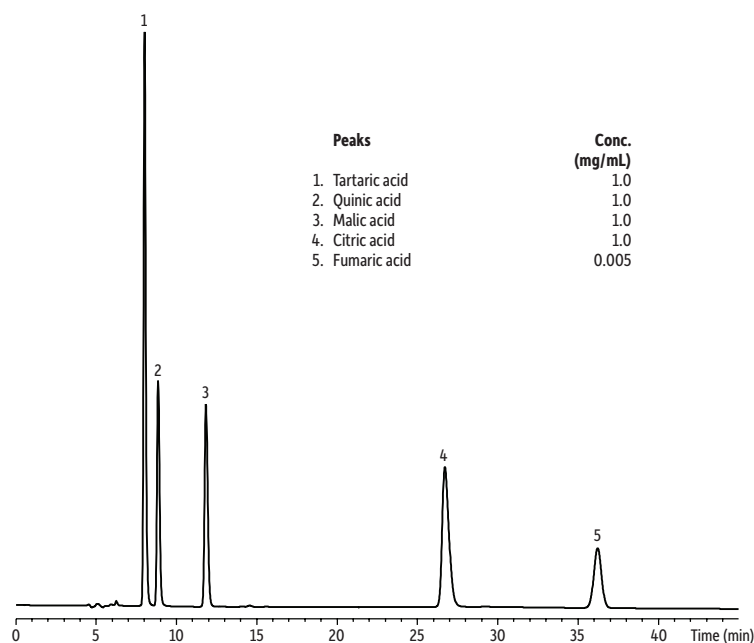
### Column Characteristics:

particle size:	5 µm, spherical
pore size:	60 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

## Allure® Organic Acids Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Allure Organic Acids Guard Cartridge	916550212	916550210

### Organic Acids Standard on Allure® Organic Acids



LC\_0238

**Column** Allure® Organic Acids (cat.# 916558S)  
**Dimensions:** 300 mm x 4.6 mm ID  
**Particle Size:** 5 µm  
**Pore Size:** 60 Å  
**Temp.:** ambient  
**Sample** standard solution  
**Diluent:** water  
**Inj. Vol.:** 10.0 µL  
**Mobile Phase** 100 mM phosphate buffer, pH 2.5  
**Flow:** 0.5 mL/min  
**Detector** UV/Vis @ 226 nm

**Column Characteristics:**

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
pH range:	2.5 to 8
temperature limit:	80 °C

**Ultra Carbamate Columns**

**Chromatographic Properties**

Restek chemists developed the Ultra Carbamate column specifically for carbamates analysis. The unique packing separates 10 target carbamates in just over 10 minutes. The column is compatible with fluorescence or LC-MS detection.\* An Ultra Carbamate column can process as many as three samples per hour, versus less than two samples per hour on a general-purpose C18 column. In addition to increased sample throughput, this much faster analysis will significantly reduce solvent usage—and the costs of disposing of solvent waste.

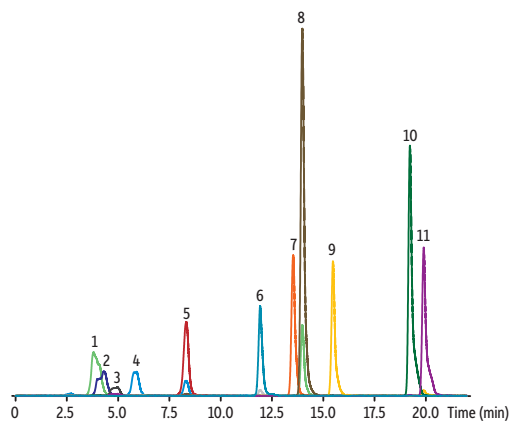
Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Columns</b>				
50 mm	9177352	917735E	9177354	9177355
100 mm	9177312	917731E	—	9177315
<b>5 µm Columns</b>				
250 mm	—	—	—	9177575

\*For post-column derivatization/fluorescence detection applications using a 4.6 mm ID column, the total system dead volume, including the post-column reactor, must be less than 650 µL. For standard post-column reactor systems, we recommend a 250 mm x 4.6 mm, 5 µm column. Contact Restek® Technical Service or your local Restek® representative for more information.

**Ultra Carbamate Guard Cartridges**

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Ultra Carbamate Guard Cartridge	917750212	917750210

**Carbamates on Ultra Carbamate**



LC\_FF0473

- Peaks**
1. Aldicarb sulfone
  2. Aldicarb sulfoxide
  3. Oxamyl
  4. Methomyl
  5. 3-Hydroxycarbofuran
  6. Aldicarb
  7. Propoxur
  8. Carbofuran
  9. Carbaryl
  10. Methiocarb
  11. BDMC (IS)

**Column** Ultra Carbamate (cat.# 9177352)  
**Dimensions:** 50 mm x 2.1 mm ID  
**Particle Size:** 3 µm  
**Pore Size:** 100 Å  
**Temp.:** ambient  
**Sample** 531.1 Carbamate Pesticide Calibration Mixture (cat.# 32273)  
 4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC) (cat.# 32274)  
**Diluent:** methanol  
**Conc.:** 50 µg/mL  
**Inj. Vol.:** 1 µL  
**Mobile Phase**  
 A: 2 mM ammonium acetate:methanol (v/v, 90/10)  
 B: 2 mM ammonium acetate:methanol (v/v, 10/90)

Time (min)	%A	%B
0.00	80	20
20	0	100
25	0	100

**Flow:** 0.2 mL/min  
**Detector** LECO Unique® TOFMS  
**Run Length:** 25 min  
**Ionization Source Type:** high flow ESI  
**Ion Mode:** positive  
**Desolvation Temp.:** 130 °C  
**Nebulizing Pressure:** 100 kPa  
**Desolvation Gas (N<sub>2</sub>):** 4 L/min  
**Interface Temp.:** 120 °C  
**Nozzle Voltage:** 62 V  
**Capillary Voltage:** 2.75 kV  
**Instrument** Agilent 1100  
**Acknowledgement** LECO Corporation

## Ultra Quat Columns

### Chromatographic Properties

A retentive, high-purity, base-deactivated, reversed-phase packing. Ideal for the analysis of paraquat and diquat or other quaternary amines.

Length	2.1 mm ID cat.#	4.6 mm ID cat.#
<b>3 µm Column</b>		
50 mm	9181352	—
<b>5 µm Column</b>		
150 mm	—	9181565

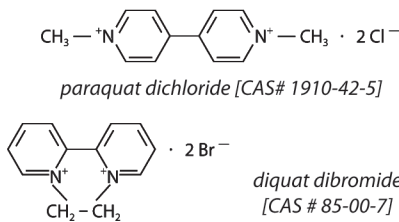
### Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
pH range:	2.5 to 8
temperature limit:	80 °C

## Ultra Quat Guard Cartridges

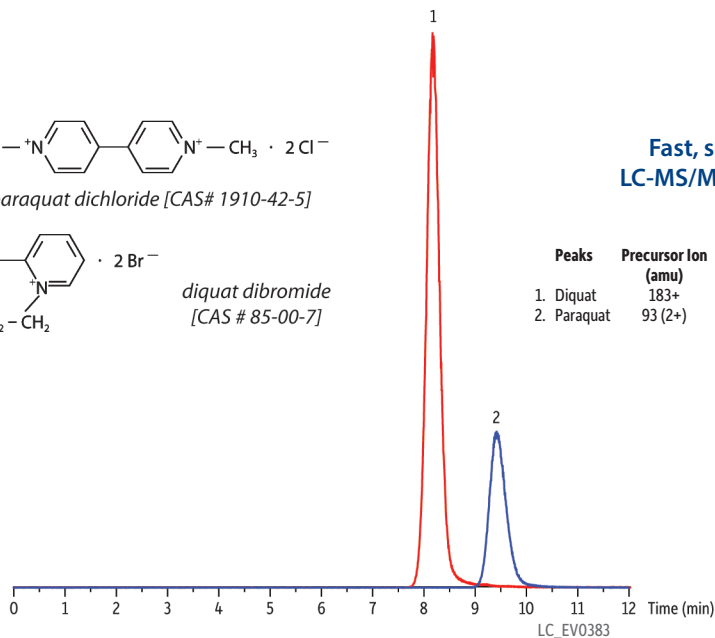
Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Ultra Quat Guard Cartridge	918150212	918150210

## Paraquat and Diquat on Ultra Quat



Fast, sensitive  
LC-MS/MS analysis!

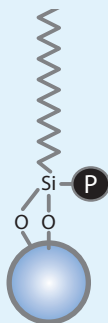
Peaks	Precursor Ion (amu)	Fragment Ion (amu)	DP (V)	Collision Energy (eV)
1. Diquat	183+	157+	30	30
2. Paraquat	93 (2+)	171+	20	20



<b>Column</b>	Ultra Quat (cat.# 9181352)
<b>Dimensions:</b>	50 mm x 2.1 mm ID
<b>Particle Size:</b>	3 µm
<b>Pore Size:</b>	100 Å
<b>Temp.:</b>	ambient
<b>Sample</b>	
<b>Diluent:</b>	DI Water
<b>Conc.:</b>	5 µg/mL each component
<b>Inj. Vol.:</b>	10 µL
<b>Mobile Phase</b>	10 mM heptafluorobutyric acid:acetonitrile (95:5)
<b>Flow:</b>	0.3 mL/min
<b>Detector</b>	Applied Biosystems/MDS Sciex LC-MS/MS
<b>Model #:</b>	API 3200™ MS/MS system
<b>Ion Source:</b>	Electrospray
<b>Ion Mode:</b>	ESI+
<b>Ion Spray Voltage:</b>	5.5 kV
<b>Curtain Gas:</b>	15 psi (103.4 kPa)
<b>Gas 1:</b>	70 psi (482.6 kPa)
<b>Gas 2:</b>	60 psi (413.7 kPa)
<b>Source Temp.:</b>	600 °C
<b>Mode:</b>	MRM
<b>Dwell Time:</b>	200 ms
<b>Instrument</b>	Applied Biosystems/MDS Sciex LC-MS/MS System
<b>Notes</b>	Collision exit potential: 3V Q1/Q3: unit resolution
<b>Acknowledgement</b>	Data courtesy of Houssain El Aribi, Ph.D., LC/MS Product and Application Specialist, MDS SCIEX, 71 Four Valley Drive, Concord, Ontario, Canada, L4K 4V8

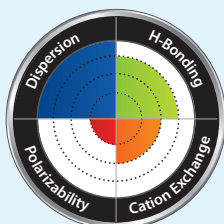
**Column Characteristics:**

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	15%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18



**Aqueous C18**

**USLC® Column Interaction Profile**  
(See page 161 for more information.)



**Ultra Preparative Columns**

Using Restek® Ultra columns for preparative applications can save you time, solvents, and money. By utilizing the right phase for your prep analysis, you can make sure your peaks are resolved and your compounds are pure. The Ultra line has high loading and features high-purity silica.

**USLC® Phases for Preparative HPLC**

**Ultra Aqueous C18 HPLC Prep Columns**

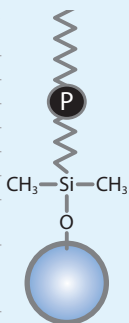
**Chromatographic Properties**

The Restek® Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multicomponent LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9178557	9178558	9178559
100 mm	9178517	9178518	9178519
150 mm	9178567	9178568	9178569
250 mm	9178577	9178578	9178579

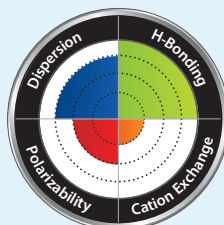
**Column Characteristics:**

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar embedded alkyl
ligand type:	proprietary polar functional embedded alkyl



**IBD**

**USLC® Column Interaction Profile**  
(See page 161 for more information.)



**Ultra IBD HPLC Prep Columns**

**Chromatographic Properties**

The Restek® IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9175557	9175558	9175559
100 mm	9175517	9175518	9175519
150 mm	9175567	9175568	9175569
250 mm	9175577	9175578	9175579

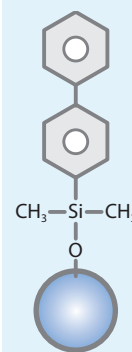


## Ultra Biphenyl Prep Columns

### Chromatographic Properties

Since 2005, the Restek® Biphenyl has offered a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9109557	9109558	9109559
100 mm	9109517	9109518	9109519
150 mm	9109567	9109568	9109569
250 mm	9109577	9109578	9109579

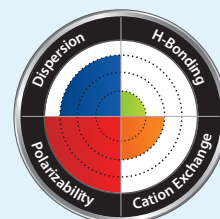


### Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl

### Biphenyl

USLC® Column Interaction Profile  
(See page 161 for more information.)

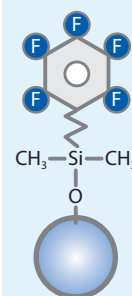


## Ultra PFP Propyl Prep Columns

### Chromatographic Properties

The Restek® PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, the Restek® PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9179557	9179558	9179559
100 mm	9179517	9179518	9179519
150 mm	9179567	9179568	9179569
250 mm	9179577	9179578	9179579

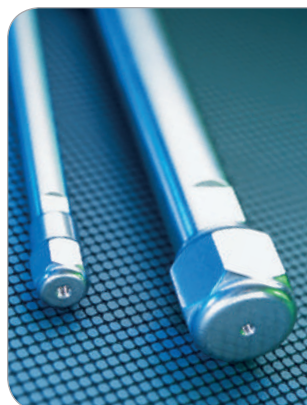
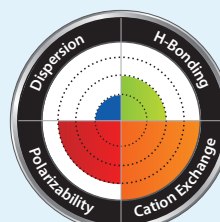


### Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluoro- phenyl propyl

### PFP Propyl

USLC® Column Interaction Profile  
(See page 161 for more information.)



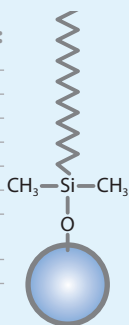
## Before You Buy a Prep Column...

**PLEASE NOTE:** We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot reuse a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns.

## Traditional Phases for Preparative HPLC

### Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	20%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18



C18

### Ultra C18 HPLC Prep Columns

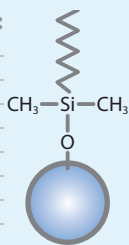
#### Chromatographic Properties

The general-purpose Restek® C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9174557	9174558	9174559
100 mm	9174517	9174518	9174519
150 mm	9174567	9174568	9174569
250 mm	9174577	9174578	9174579

### Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8



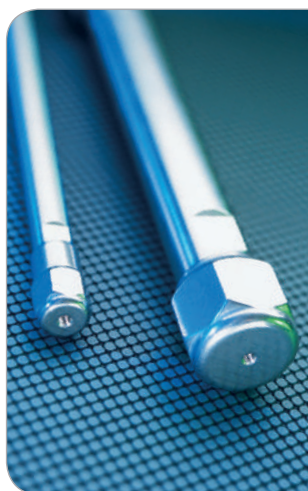
C8

### Ultra C8 HPLC Prep Columns

#### Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek® C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9103557	9103558	9103559
100 mm	9103517	9103518	9103519
150 mm	9103567	9103568	9103569
250 mm	9103577	9103578	9103579



## Before You Buy a Prep Column...

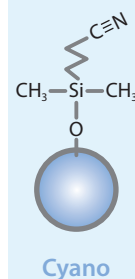
**PLEASE NOTE:** We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot reuse a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns.

## Ultra Cyano HPLC Prep Columns

### Chromatographic Properties

The Restek® Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9106557	9106558	9106559
100 mm	9106517	9106518	9106519
150 mm	9106567	9106568	9106569
250 mm	9106577	9106578	9106579



### Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropyl silane

## Ultra Silica HPLC Prep Columns

### Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
<b>5 µm Columns</b>			
50 mm	9100557	9100558	9100559
100 mm	9100517	9100518	9100519
150 mm	9100567	9100568	9100569
250 mm	9100577	9100578	9100579



### Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

## Ultra Bulk Packing Materials (5 µm)

Use our bulk packing materials to pack your own columns!

- Prepare your own columns in conventional or custom dimensions.
- Consistent, high-quality materials.

Our extensive QC program ensures the high quality and reproducibility of these silicas. You can be confident that you are getting consistent, high-quality product when you source your silica from Restek.

Use these materials for easy scale-up to preparative chromatography or for packing your own columns.

Description	qty.	cat.#
<b>5 µm Ultra Bulk Packing Materials</b>		
Ultra C1 Bulk Packing	10 g/btl.	91015
Ultra C4 Bulk Packing	10 g/btl.	91025
Ultra C8 Bulk Packing	10 g/btl.	91035
Ultra C18 Bulk Packing	10 g/btl.	91745
Ultra Amino Bulk Packing	10 g/btl.	91075
Ultra Cyano Bulk Packing	10 g/btl.	91065
Ultra Silica Bulk Packing	10 g/btl.	91005



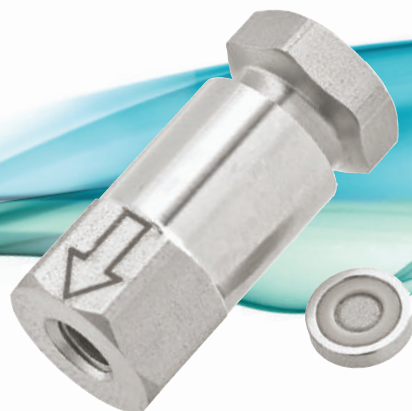
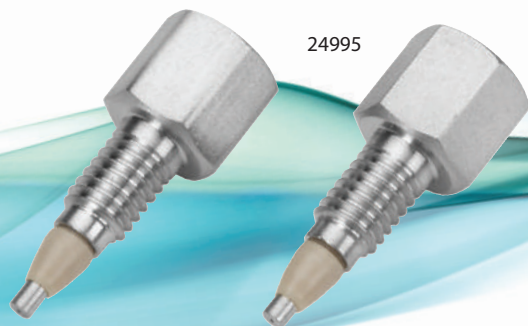
### also available

Other stationary phases and particle sizes are also available in bulk; call Customer Service or your local Restek® representative for details.

# Protect Your Column and Your UHPLC Performance With UltraShield and UltraLine UHPLC Filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system

Use with any UHPLC system



## UltraShield UHPLC PreColumn Filter

- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Universal fit—connects easily to any brand column.
- Leak-tight to 15,000 psi (1,034 bar).
- 0.5 µm or 0.2 µm titanium frit in a stainless steel body with PEEK ferrule.

### Specifications:

Inlet/Outlet:	Female/Male 10-32
Port Geometry:	Parker (1/16 CPI)
Material:	Titanium, stainless steel, PEEK ferrule
Filter:	0.5 µm or 0.2 µm stainless steel
Pressure Rating:	15,000 psig (1,034 bar)
Wrench Flat:	5/16"

Description	Filter Porosity	Filter	
		qty.	cat.#
UltraShield UHPLC PreColumn Filter	0.5 µm frit	ea.	24995
		5-pk.	24996
		10-pk.	24997
UltraShield UHPLC PreColumn Filter	0.2 µm frit	ea.	25809
		5-pk.	25810
		10-pk.	25811

## UltraLine UHPLC In-Line Filter

- In-line design installs easily with standard fittings.
- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Leak-tight to 15,000 psi (1,034 bar).
- Replaceable 0.5 µm stainless steel frit in stainless steel body.

### Specifications:

Inlet/Outlet:	Female/Female 10-32
Port Geometry:	Parker (1/16 CPI)
Material:	Stainless steel housing
Filter:	0.5 µm stainless steel, 0.125" W x 0.062" T, 5 µL volume
Pressure Rating:	15,000 psig (1,034 bar)
Wrench Flat:	3/8"

Description	qty.	cat.#
UltraLine UHPLC In-Line Filter (In-Line Assembly with Filter)	ea.	24993
UltraLine Replacement Filters	5-pk.	24994



**Trident Direct Guard Cartridge System** Easy to Use, Low Dead Volume—  
The Ultimate Combination of Convenience and Column Protection

Unlike “one size fits all” guard systems, the Trident direct system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection, with a variety of bonded phases to match your analytical column. The economical, leak-free cartridge design provides an unprecedented combination of convenience, economy, and reliability. The foundation of the Trident direct system is a reusable direct connect holder that easily attaches to any HPLC column using CPI- or Waters-style end fittings.\* The system is available in configurations to match different protection levels: filter only, guard cartridge holder without filter, and guard cartridge holder with filter. The guard cartridges (see page 191) are available in 2.1 and 4.0 mm ID and are interchangeable within the holder.



25082

**Filter:**

Protection against particulate matter.



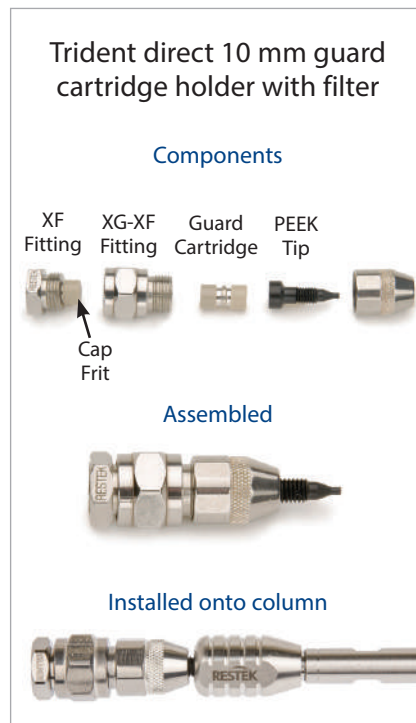
25084

**Guard Cartridge and Filter:**

Protection against particulate matter *and* moderate protection against irreversibly adsorbed compounds.

Description	qty.	cat.#
High-pressure filter	ea.	25082
10 mm guard cartridge holder without filter	ea.	25083
10 mm guard cartridge holder with filter	ea.	25084
PEEK tip for Waters-style end fittings	ea.	25088
PEEK tip for standard fittings	ea.	25087

\*The standard PEEK tip in Trident direct systems is compatible with Parker, Upchurch Scientific, Valco, and other CPI-style fittings. To use Trident direct systems with Waters-style end fittings, replace the tip with cat.# 25088.



See page 191 for a full selection of Trident HPLC guard cartridges.

**Double the Protection With Cap Frits!**

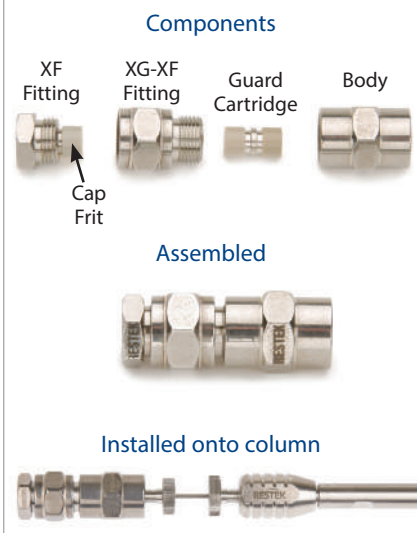
**Replacement Cap Frits** for Trident Guard Cartridges

Replacement guard cartridges can cost as much as an analytical column, so why not protect them, too? The removable cap frit in a Trident direct helps prevent clogged cartridges to extend the life of your column, your cartridge, and your budget.

Description	ID	Porosity	qty.	cat.#
Replacement Cap Frits	4 mm	2.0 µm	5-pk.	25022
Replacement Cap Frits	4 mm	0.5 µm	5-pk.	25023
Replacement Cap Frits	2 mm	2.0 µm	5-pk.	25057
Replacement Cap Frits	2 mm	0.5 µm	5-pk.	25990



Trident in-line 10 mm guard cartridge holder with filter



Trident HPLC In-Line Guard Cartridge Holders

A Trident in-line guard cartridge holder can be used with almost any HPLC column by connecting it with a short piece of 1/16" tubing, appropriate nuts and ferrules, or finger-tight fittings. The system can be used with Restek® columns, or with columns from other manufacturers. Holders are available for 10 mm guard cartridges (see page 191). Purchase with or without a prefilter, which provides added protection against the particles that can shorten the lifetime of the guard cartridge.



25021



25040

Description	qty.	cat.#
Holder for 10 mm guard cartridge	ea.	25021
Holder with filter for 10 mm guard cartridge	ea.	25040
Frit-Type In-Line Filter, 2.0 µm	ea.	25041

For HPLC tubing, visit [www.restek.com/LCacc](http://www.restek.com/LCacc)

EXP® Reusable Fittings for HPLC & UHPLC for 10-32 fittings and 1/16" tubing  
EXP® Hand-Tight Coupler



25940

Description	qty.	cat.#
EXP Hand-Tight Coupler (2 Nuts, 2 Ferrules, 1/16" x 0.005" ID Tubing)	ea.	25940

Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Opti- prefix is a registered trademark of Optimize Technologies, Inc.

also available

Our entire EXP® fitting selection.

See page 335.



Double the Protection With Cap Frits!

Replacement Cap Frits for Trident Guard Cartridges

Replacement guard cartridges can cost as much as an analytical column, so why not protect them, too? The removable cap frit in a Trident direct helps prevent clogged cartridges to extend the life of your column, your cartridge, and your budget.



25057

Description	ID	Porosity	qty.	cat.#
Replacement Cap Frits	4 mm	2.0 µm	5-pk.	25022
Replacement Cap Frits	4 mm	0.5 µm	5-pk.	25023
Replacement Cap Frits	2 mm	2.0 µm	5-pk.	25057
Replacement Cap Frits	2 mm	0.5 µm	5-pk.	25990

Trident HPLC Guard Cartridges

Description	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
<b>Pinnacle DB Guard Cartridges</b>		
Pinnacle DB C18 Guard Cartridge	941450212	941450210
Pinnacle DB C8 Guard Cartridge	941350212	941350210
Pinnacle DB Aqueous C18 Guard Cartridge	941850212	941850210
Pinnacle DB Biphenyl Guard Cartridge	940950212	940950210
Pinnacle DB PFP Propyl Guard Cartridge	941950212	941950210
Pinnacle DB Cyano Guard Cartridge	941650212	941650210
Pinnacle DB Silica Guard Cartridge	941050212	941050210
<b>Ultra Guard Cartridges</b>		
Ultra C18 Guard Cartridge	917450212	917450210
Ultra C8 Guard Cartridge	910350212	910350210
Ultra C4 Guard Cartridge	910250212	910250210
Ultra C1 Guard Cartridge	910150212	910150210
Ultra Aromax Guard Cartridge	912750212	912750210
Ultra Aqueous C18 Guard Cartridge	917850212	917850210
Ultra Biphenyl Guard Cartridge	910950212	910950210
Ultra IBD Guard Cartridge	917550212	917550210
Ultra PFP Propyl Guard Cartridge	917950212	917950210
Ultra Cyano Guard Cartridge	910650212	910650210
Ultra Amino Guard Cartridge	—	910750210
Ultra Silica Guard Cartridge	910050212	910050210
<b>Viva Guard Cartridges</b>		
Viva C18 Guard Cartridge	951450212	951450210
Viva C8 Guard Cartridge	951350212	951350210
Viva C4 Guard Cartridge	951250212	951250210
Viva Biphenyl Guard Cartridge	951650212	951650210
Viva PFP Propyl Guard Cartridge	951950212	951950210
Viva Silica Guard Cartridge	951050212	951050210



Trident HPLC Guard Cartridge

# Raptor™

LC Columns

Experience *Selectivity Accelerated*

See pages 155–159 or visit [www.restek.com/raptor](http://www.restek.com/raptor)

Raptor™ EXP® Guard Columns also available.

# GC Accessories

## Inlet Liners

### Sky® Inlet Liners ..... 193–202

Overview ..... 193–196

For Agilent GCs..... 197–198

For Bruker/Varian GCs ..... 199

For PerkinElmer GCs.....200

For Shimadzu GCs .....201

For Thermo Scientific GCs.....202

### Other Deactivations..... 203–215

For Agilent GCs.....204–206

For APEX GCs.....207

For ATAS Injectors .....207

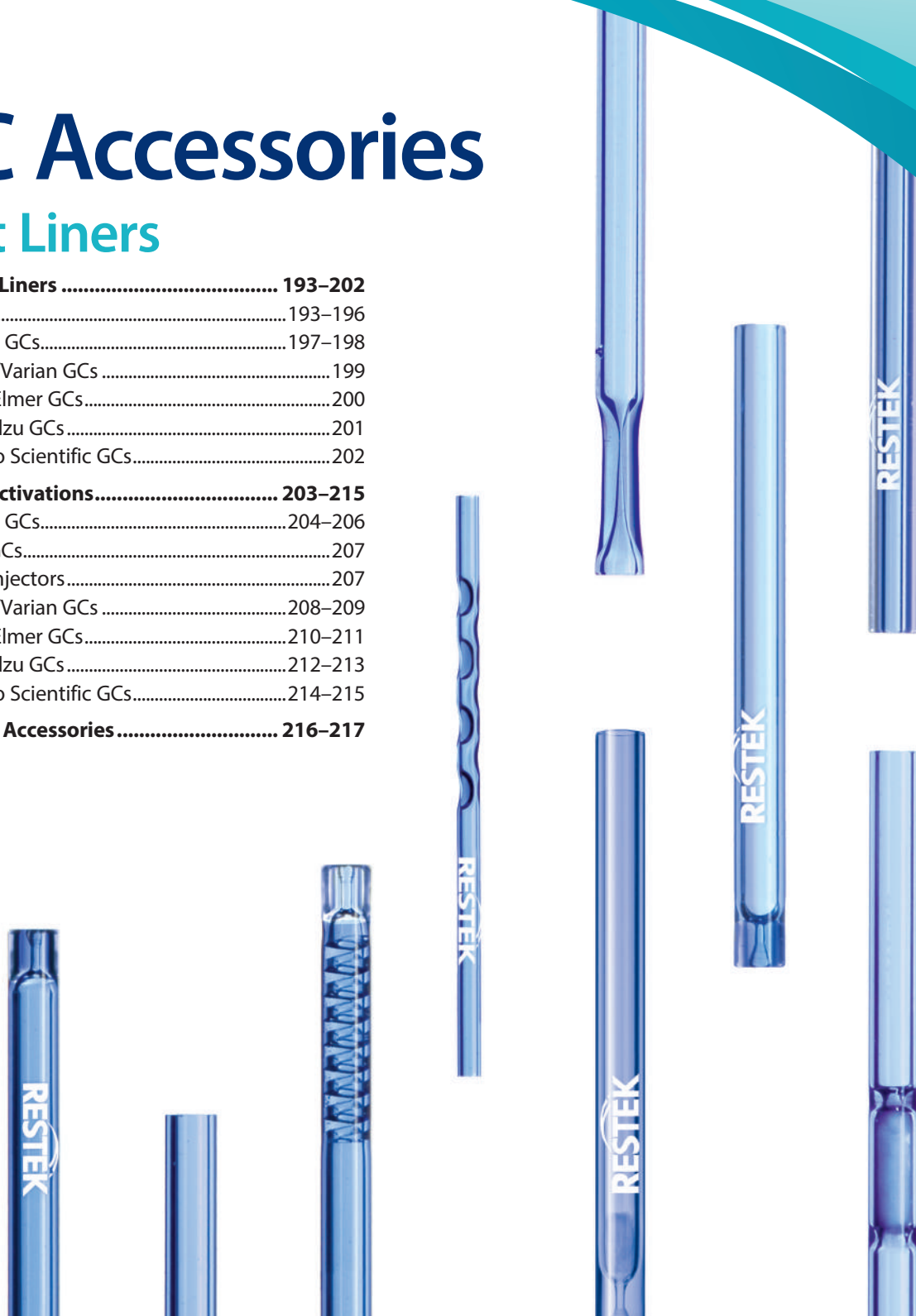
For Bruker/Varian GCs .....208–209

For PerkinElmer GCs.....210–211

For Shimadzu GCs .....212–213

For Thermo Scientific GCs.....214–215

### Inlet Liner Accessories ..... 216–217



**RESTEK** *CHROMALYTICs*® in AUSTRALIA : Contact +81 3 9762 2034  
Distributor

**SHOPPE**

[www.chromalytic.net.au](http://www.chromalytic.net.au)

e-mail : sales @ chromtech.net.au



# Sky<sup>®</sup> Inlet Liners



## True Blue Performance

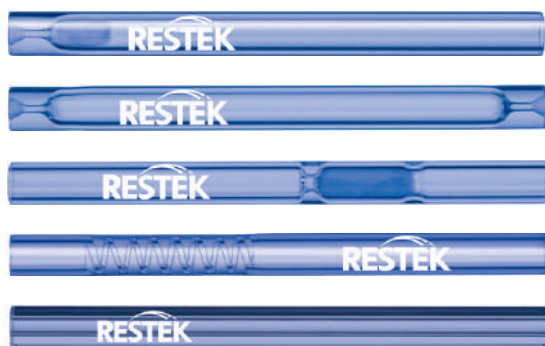
- **Increase accuracy and precision** by preventing loss of sensitive analytes—even when using wool.
- **Achieve lower detection limits** for a wide range of active compounds.
- **Ensure liner-to-liner reproducibility** through consistent manufacturing and extensive testing.
- **100% customer satisfaction**—if a liner doesn't perform to expectations, we will replace it or credit your account.\*

When faced with complex choices, simple solutions stand out. Sky<sup>®</sup> inlet liners from Restek use a comprehensive, state-of-the-art deactivation and are the only blue liners on the market—making them an easy-to-recognize solution to common inlet problems.

The innovative deactivation used for Sky<sup>®</sup> liners results in exceptional inertness for a wide range of analyte chemistries. By reducing active sites and enhancing analyte transfer to the column, these liners increase accuracy and precision, allowing lower detection limits for many active compounds. **In addition to improved data quality, you'll benefit from fewer liner changes and less downtime for maintenance.**

Selecting the right liner for your application can be a challenging task. Sky<sup>®</sup> inlet liners make the choice simple; the comprehensive deactivation, distinctive color, and availability in popular configurations mean Sky<sup>®</sup> liners are the best choice for optimizing chromatographic performance. Regardless of your application, Sky<sup>®</sup> liners provide reliable inertness and assured performance, day-after-day and analysis-after-analysis.

\* For details on our 100% satisfaction guarantee, see page 196.



Sky<sup>®</sup> liners give you the inertness you need for more accurate trace-level results.

## Simple Solutions:

### Inert Sky® Inlet Liners Improve Accuracy and Precision for a Wide Range of Analytes

Many chromatographic problems, such as poor response and missing or tailing peaks are caused by activity in the inlet liner. These effects complicate quantification and can be particularly problematic for sensitive analytes. Sky® inlet liners from Restek offer exceptional inertness, ensuring enhanced transfer of analytes to the column, good response, and highly symmetric peaks. The inertness of these liners is due to a state-of-the-art deactivation process that completely passivates the liner—and the wool—so that they are inert to a wide variety of reactive analytes.

Some deactivations, such as base deactivation, are effective only for particular target compound chemistries. In contrast, the balanced deactivation of Sky® liners prevents interactions with many chemical classes. With Sky® inlet liners, you will see improved sensitivity, accuracy, robustness, and reproducibility from liner to liner, which allows you to quantify challenging compounds at trace levels with confidence.

### Prevent the Loss of Sensitive Analytes—Even When Using Wool

Sensitive analytes like carbaryl and methiocarb readily react with active sites in your inlet, especially when using a liner with wool. That reactivity makes these compounds difficult to analyze, but excellent for demonstrating inertness (i.e., the reduction of unwanted reactions between a liner and active compounds). Sky® liners with quartz wool offer superb results for these and other inertness probes even at low concentrations, whereas other leading deactivations using borosilicate wool show reduced response—or no response at all. When you are concerned about losing sensitive analytes, feel confident in choosing Sky® liners with wool.

**Table I:** Relative Response Factors for Sensitive Analytes Using Trace-Level (100 pg on column) Splitless Injection

	Carbaryl	Methiocarb	Captan	Folpet
Sky® Liner w/Wool	0.718	0.720	0.380	0.403
Siltek® Liner w/Wool	ND	ND	0.087	0.150
Non-Sky® Liner w/Wool	ND	ND	0.237	0.290

See Figures 1 and 2 for more details.

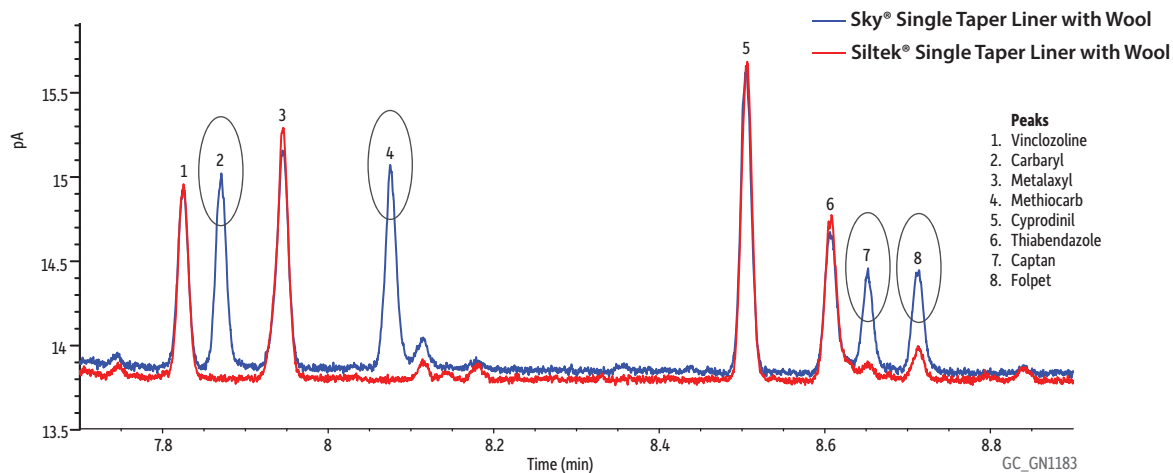
## The Story Behind Sky® Liners

For over 25 years, Restek has been a leader in the development and manufacturing of GC and LC products. With Sky® liners, we created a novel, state-of-the-art deactivation process that provides better performance, lower detection limits, and unbeatable accuracy and precision—even when using wool. We also took full control of our production stream to ensure unparalleled reliability and reproducibility. And to prove that every Sky® liner offers True Blue Performance, each one is backed by a 100% satisfaction guarantee.\*

**But, why are they blue?** Restek has always been associated with the color blue because it signifies strength, innovation, and excellence. We made Sky® liners blue because it represents the technological advancements and unmatched quality that define Restek® products and service. Choose blue—the best choice for dependable results.

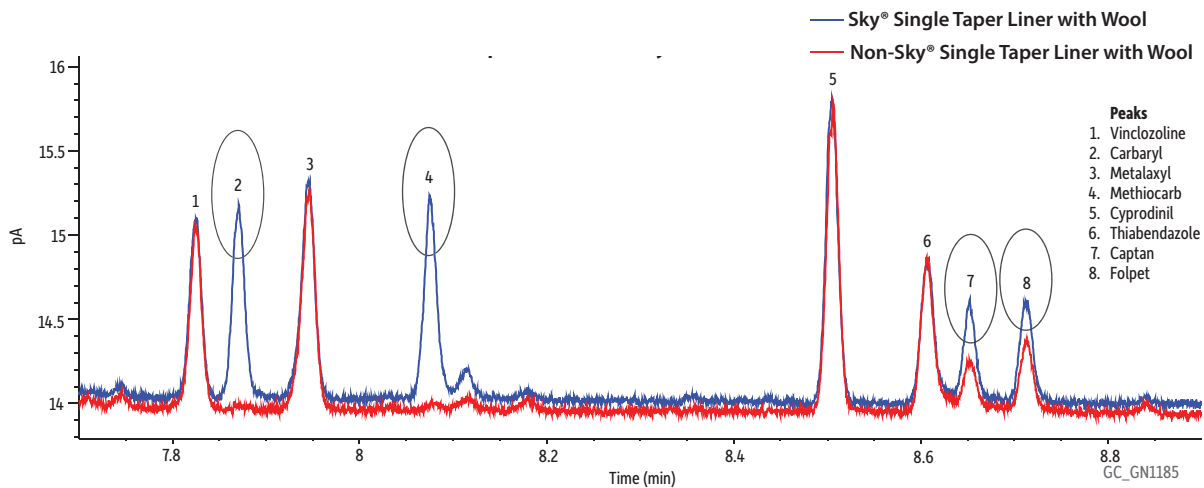
\* For details on our 100% satisfaction guarantee, see page 196.

**Figure 1:** Especially for active compounds like pesticides, Sky® liners with quartz wool offer superior trace-level response over Siltek®-deactivated liners with borosilicate wool.



For a full list of conditions, search for chromatogram# GC\_GN1183 at [www.restek.com](http://www.restek.com)

**Figure 2:** Sky® liners with quartz wool also offer markedly better trace-level response for sensitive analytes compared to non-Sky® liners with borosilicate wool, as shown here with pesticides.

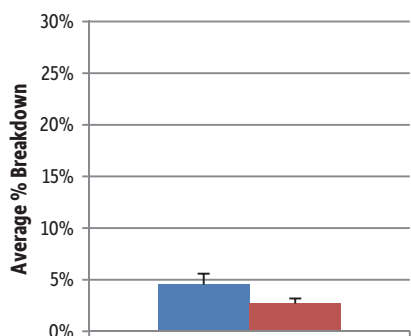


For a full list of conditions, search for chromatogram# GC\_GN1185 at [www.restek.com](http://www.restek.com)

### Ensure Consistent Data From Liner to Liner and Injection to Injection

It's not good enough to have one quality liner. You have to be confident that *every liner you use* will give you the same high level of performance *every time you use it*. We test Sky® liners extensively to ensure they are exceptionally inert and will provide optimal results with every lot, liner, and injection.

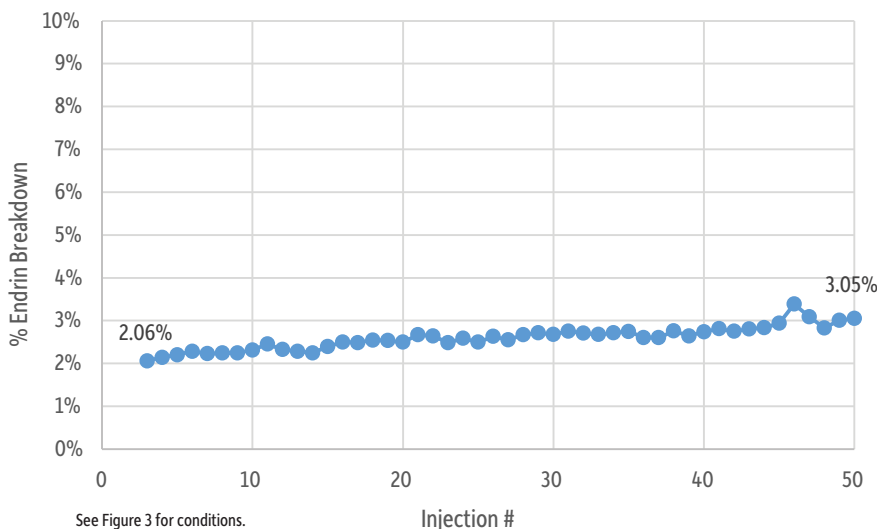
**Figure 3:** Sky® inlet liners offer outstanding lot-to-lot inertness and reproducibility—exhibited here through consistently low endrin and DDT breakdown test results.



Error bars represent 1 standard deviation. The data represent triplicate analyses of multiple liners (n = 70) taken from 10 different lots.

<b>Column</b>	Rxi®-5Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13620)
<b>Sample</b>	50 ng/mL (ppb) 100 ng/mL DDT in hexane
<b>Injection</b>	
Inj. Vol.:	1 µL splitless (hold 45 sec)
Liner:	Sky® 4 mm single taper w/wool (cat. # 23303.5)
Inj. Temp.:	250 °C
Purge Flow:	20 mL/min
<b>Oven</b>	
Oven Temp.:	75 °C (hold 0.75 min) to 310 °C at 20 °C/min (hold 1 min)
<b>Carrier Gas</b>	constant flow
Flow Rate:	1.5 mL/min
<b>Detector</b>	Micro-ECD @ 330 °C
Make-Up Gas Flow Rate:	60 mL/min
Make-Up Gas Type:	N <sub>2</sub>

**Figure 4:** Even after 50 injections, highly robust Sky® liners show minimal increase in compound degradation.



See Figure 3 for conditions.

## Choose Blue, the Best Choice for Dependable Results









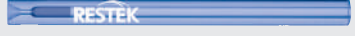









Sky® liners provide exceptional inertness across a wide range of active analytes. The consistent, comprehensive deactivation process results in the accuracy and precision you need for reliable trace-level analyses. Simplify your liner selection—and improve your results—with Sky® liners from Restek. [www.restek.com/sky](http://www.restek.com/sky)



\* 100% SATISFACTION GUARANTEE: If your Sky® inlet liner does not perform to your expectations for any reason, simply contact Restek® Technical Service or your local Restek® representative and provide a sample chromatogram showing the problem. If our GC experts are not able to quickly and completely resolve the issue to your satisfaction, you will be given an account credit or replacement product (same cat.#) along with instructions for returning any unopened product. (Do not return product prior to receiving authorization.) For additional details about Restek's return policy, visit [www.restek.com/warranty](http://www.restek.com/warranty)













Sky® Inlet Liners for Agilent GCs

Split Liners for Agilent GCs	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 1 mm Split	1.0 mm 6.3 mm x 78.5 mm	18740-80200 (ea.)	23333.1	23333.5	23333.25
 4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540, 5190-2294 (ea.) 5183-4691, 5190-3164 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25
 2 mm Precision Liner w/Wool	2.0 mm 6.3 mm x 78.5 mm		23468.1	23468.5	<b>NEW!</b>
 4 mm Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm	210-4004-5 (5-pk.)	23305.1	23305.5	23305.25
 4 mm Cyclo	4.0 mm 6.3 mm x 78.5 mm		23312.1	23312.5	23312.25
Splitless Liners for Agilent GCs	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 2 mm Splitless	2.0 mm 6.5 mm x 78.5 mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	23313.1	23313.5	23313.25
 2 mm Splitless w/Wool	2.0 mm 6.5 mm x 78.5 mm		23314.1	23314.5	23314.25
 2 mm Single Taper	2.0 mm 6.5 mm x 78.5 mm		23315.1	23315.5	23315.25
 2 mm Single Taper w/Wool	2.0 mm 6.5 mm x 78.5 mm		23316.1	23316.5	23316.25
 4 mm Straight	4.0 mm 6.3 mm x 78.5 mm	210-3003 (ea.) 210-3003-05 (5-pk.)	23301.1	23301.5	23301.25
 4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540, 5190-2294 (ea.) 5183-4691, 5190-3164 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25
 4 mm Single Taper	4.0 mm 6.5 mm x 78.5 mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	23302.1	23302.5	23302.25
 4 mm Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	5062-3587, 5190-2293 (ea.) 5183-4693, 5190-3163 (5-pk.) 5183-4694 (25-pk.)	23303.1	23303.5	23303.25
 4 mm Double Taper	4.0 mm 6.5 mm x 78.5 mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	23308.1	23308.5	23308.25
 4 mm Cyclo Double Taper	4.0 mm 6.5 mm x 78.5 mm		23310.1	23310.5	23310.25
Split/Splitless Liners for Agilent GCs	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540, 5190-2294 (ea.) 5183-4691, 5190-3164 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25
 Low Pressure Drop Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm		23309.1	23309.5	
 Low Pressure Drop Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm	5183-4647, 5183-4711 (ea.) 5183-4701, 5183-4712 (5-pk.) 5183-4713 (25-pk.)	23467.1	23467.5	23467.25 <b>NEW!</b>

COLUMN INSTALLS THIS END

Patent pending

## Sky® Inlet Liners for Agilent GCs

CIS4 and PTV Liners for Agilent GCs	ID OD x L	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	10-pk. cat.#
 On Column PTV	1.7 mm 3.0 mm x 71 mm		23430.1	23430.5	
 Single Baffle PTV	2.0 mm 3.0 mm x 71 mm	5183-2036 (10-pk.)			23431.10
 Single Baffle PTV w/Wool	2.0 mm 3.0 mm x 71 mm	5183-2038 (10-pk.)			23432.10
 Baffled PTV	1.5 mm 3.0 mm x 71 mm	5183-2037 (10-pk.)			23433.10
Analytical Controls TPI Inlet Liners for Agilent GCs	ID OD x L				10-pk. cat.#
 TPI for 0.53 mm ID columns	2.4 mm 4.0 mm x 71 mm				23429.10
 TPI for 0.25/0.32 mm ID columns	2.4 mm 4.0 mm x 71 mm				23428.10
SPME Liners for Agilent GCs	ID OD x Length		ea. cat.#	5-pk. cat.#	
 SPME Liner	0.75 mm 6.35 mm x 78.5 mm		23434.1	23434.5	
Direct Injection Liners for Agilent GCs (for 0.25/0.32/0.53mm ID Columns)	ID OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Drilled Uniliner (hole near bottom)	4.0 mm 6.3 mm x 78.5 mm	G1544-80730 (ea.)	23306.1	23306.5	23306.25
 Drilled Uniliner (hole near bottom) w/Wool	4.0 mm 6.3 mm x 78.5 mm		23307.1	23307.5	
 Drilled Uniliner (hole near top)	4.0 mm 6.3 mm x 78.5 mm		23311.1	23311.5	23311.25

Patent pending

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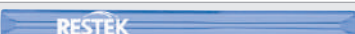
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## Sky® Inlet Liners for Bruker/Varian Injection Ports

Liners for Bruker/Varian 1177 S/SL Injection Ports	ID OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#
 RESTEK 4 mm Split Liner w/Glass Frit	4.0 mm 6.3 mm x 78.5 mm		23330.1	23330.5
 RESTEK 4 mm Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm		23328.1	23328.5
 RESTEK 4 mm Single Taper	4.0 mm 6.5 mm x 78.5 mm	392611927	23331.1	23331.5
 RESTEK 4 mm Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	392611936	23332.1	23332.5

SPI Liners for Bruker/Varian S/SL Injection Ports	ID OD x L	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 RESTEK SPI Liner	0.53 mm 4.6 mm x 54 mm	190010906	23460.1	23460.5	
 RESTEK SPI Liner	0.8 mm 4.6 mm x 54 mm	190010907	23461.1	23461.5	23461.25

Liners for Bruker/Varian 1078/1079 Injection Ports	ID OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 RESTEK 3.4 mm Split-No Frit	3.4 mm 5.0 mm x 54 mm	392611945	23329.1	23329.5	23329.25
 RESTEK Split w/Glass Frit	3.4 mm 5.0 mm X 54 mm	392611946	23462.1	23462.5	
 RESTEK Splitless	2.0 mm 5.0 mm X 54 mm	392611947	23463.1	23463.5	
 RESTEK SPME Liner	0.75 mm 5.0 mm X 54 mm	392611948	23465.1	23465.5	
 RESTEK Split Precision Liner w/Wool	3.4 mm 5.0 mm X 54 mm		23466.1	23466.5	

Patent pending

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tech tip

Correct installation of Sky® inlet liner is **quick and easy**. Simply orient the liner so the column installs toward the "R" on the Restek logo.





## Sky® Inlet Liners for PerkinElmer GCs

Split Liners for PerkinElmer GCs	ID OD x L	Similar to PE Part #	ea. cat.#	5-pk. cat.#	
 RESTEK Splitter w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6502009	23449.1	23449.5	
 RESTEK Split Precision Liner w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6121020	23450.1	23450.5	
Splitless Liners for PerkinElmer GCs	ID OD x L	Similar to PE Part #	ea. cat.#	5-pk. cat.#	
 RESTEK Splitless w/Wool	2.0 mm 6.2 mm x 92.1 mm	N6121021	23451.1	23451.5	
PSS Liners for PerkinElmer GCs	ID OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 RESTEK Auto SYS XL PSS Split/ Splitless w/Wool	2.0 mm 4.0 mm x 86.2 mm	N6121004	23317.1	23317.5	23317.25
DI Liners for PerkinElmer GCs	ID OD x L	Similar to PE Part #	ea. cat.#	5-pk. cat.#	
 RESTEK Open-Top Uniliner w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6502016	23452.1	23452.5	
 RESTEK Drilled Uniliner (hole near top)	4.0 mm 6.2 mm x 92.1 mm	N6121022	23453.1	23453.5	
 RESTEK Drilled Uniliner (hole near bottom)	4.0 mm 6.2 mm x 92.1 mm	N6502013	23454.1	23454.5	

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Patent pending

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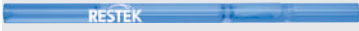

[www.chromalytic.net.au](http://www.chromalytic.net.au)




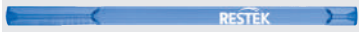
e-mail : sales @ chromtech.net.au



Sky® Inlet Liners for Shimadzu GCs


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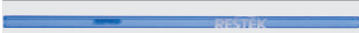
Split Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 3.5 mm Split	3.5 mm 5.0 mm x 95 mm	221-41444-01	23318.1	23318.5	23318.25
 3.5 mm Split w/Wool	3.5 mm 5.0 mm x 95 mm		23319.1	23319.5	23319.25
 3.5 mm Precision Liner w/Wool	3.5 mm 5.0 mm x 95 mm		23320.1	23320.5	
 Single Taper Precision Liner w/Wool	3.5 mm 5.0 mm x 95 mm		23455.1	23455.5	
 Cyclo	3.5 mm 5.0 mm x 95 mm		23456.1	23456.5	

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 3.5 mm Single Taper	3.5 mm 5.0 mm x 95 mm	221-48335-01	23321.1	23321.5	23321.25
 3.5 mm Single Taper w/Wool	3.5 mm 5.0 mm x 95 mm		23336.1	23336.5	<b>NEW!</b>
 3.5 mm Single Taper w/Wool	3.5 mm 5.0 mm x 95 mm		23322.1	23322.5	
 Double Taper	3.5 mm 5.0 mm x 95 mm		23457.1	23457.5	

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x L	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Split/Splitless w/Wool	3.5 mm 5.0 mm x 95 mm	221-41444-00	23458.1	23458.5	23458.25

















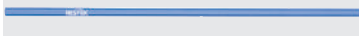

Liners for Shimadzu 17A PTV GCs	ID OD x L	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 PTV w/Wool	1.6 mm 4.0 mm x 95 mm	225-09212-01	23435.1	23435.5	23435.25

DI Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x L	ea. cat.#	5-pk. cat.#
 Uniliner w/Wool	3.5 mm 5.0 mm x 95 mm	23459.1	23459.5

Liners for Shimadzu 2010 PTV GCs	ID OD x L	ea. cat.#	10-pk. cat.#
 PTV 2010	1.5 mm 3.5 mm x 95 mm	23471.1	23471.10
 PTV 2010 w/Wool	1.5 mm 3.5 mm x 95 mm	23472.1	23472.10

Patent pending.

## Sky® Inlet Liners for Thermo Scientific GCs

Split Liners for Thermo TRACE GC Ultra and Focus SSL	ID OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Split Straight	3.0 mm 8.0 mm x 105 mm	453 20031	23439.1	23439.5	23439.25
 Split Straight w/Wool	3.0 mm 8.0 mm x 105 mm		23440.1	23440.5	23440.25
 5 mm Straight	5.0 mm 8.0 mm x 105 mm	453 20030	23323.1	23323.5	23323.25
 5 mm Straight w/Wool	5.0 mm 8.0 mm x 105 mm		23324.1	23324.5	23324.25
 5 mm Precision Liner w/Wool	5.0 mm 8.0 mm x 105 mm		23327.1	23327.5	
Splitless Liners for Thermo TRACE GC Ultra and Focus SSL	ID OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Splitless	3.0 mm 8.0 mm x 105 mm	453 20032	23441.1	23441.5	23441.25
 Splitless w/Wool	3.0 mm 8.0 mm x 105 mm		23442.1	23442.5	23442.25
 Splitless Precision Liner w/Wool	5.0 mm 8.0 mm x 105 mm		23443.1	23443.5	
 5 mm Splitless	5.0 mm 8.0 mm x 105 mm	453 20033	23325.1	23325.5	23325.25
 5 mm Splitless w/Wool	5.0 mm 8.0 mm x 105 mm		23326.1	23326.5	23326.25
Split Liners for Thermo TRACE 1300 Series GCs	ID OD x L		ea. cat.#	5-pk. cat.#	
 Split	1.0 mm 6.3 mm x 78.5 mm		23448.1	23448.5	
Splitless Liners for Thermo TRACE 1300 Series GCs	ID OD x L		ea. cat.#	5-pk. cat.#	
 Splitless Straight	4.0 mm 6.3 mm x 78.5 mm		23445.1	23445.5	
 Splitless Single Taper	4.0 mm 6.5 mm x 78.5 mm		23446.1	23446.5	
 Splitless Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm		23447.1	23447.5	
Split/Splitless Liners for Thermo TRACE 1300 Series GCs	ID OD x L		ea. cat.#	5-pk. cat.#	
 Split/Splitless Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm		23444.1	23444.5	
Split Liners for Thermo Scientific TRACE PTV	ID OD x L	Similar to TS Part #	ea. cat.#	5-pk. cat.#	
 Split PTV	1.0 mm 2.75 mm x 120 mm	453 22054	23436.1	23436.5	
 Split PTV	2.0 mm 2.75 mm x 120 mm	453 22045	23437.1	23437.5	
 Baffled PTV	2.0 mm 2.75 mm x 120 mm		23438.1	23438.5	

COLUMN INSTALLS THIS END

## Other Deactivations

### Intermediate Polarity (IP) Deactivation

- Phenylmethyl-deactivated surface for better recovery of polar and nonpolar compounds.
- Compatible with most common solvents.
- Our standard deactivation—every clear Restek® liner is IP deactivated unless otherwise requested.

### Siltek®-Deactivation\*

For Siltek®-deactivated inlet liners, add the corresponding suffix number to the liner catalog number. (Cannot be used with Sky® liners.)

qty.	Siltek Liner	Siltek Liner w/Wool	Siltek Liner w/CarboFrit
5-pk.	-214.5	-213.5	-216.5
25-pk.	-214.25	-213.25	-216.25

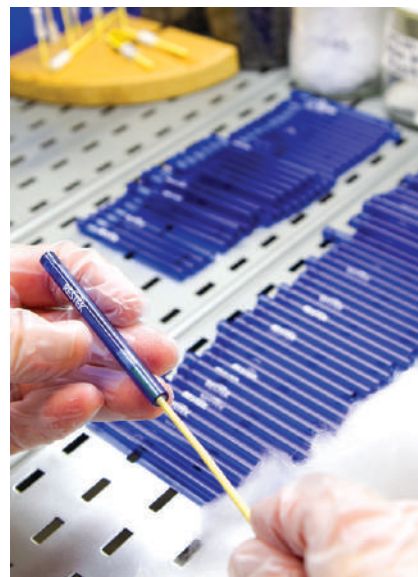
\*There is an additional cost for these deactivations. Contact your Restek representative for pricing.

### Base-Deactivation\*

For base-deactivated inlet liners, add the corresponding suffix number to the liner catalog number. (Cannot be used with Sky® liners.)

qty.	Base-Deactivated Liner	Base-Deactivated Liner w/ Base-Deactivated Wool	Base-Deactivated Liner w/CarboFrit
5-pk.	-210.5	-211.5	-229.5
25-pk.	-210.25	-211.25	-229.25

\*There is an additional cost for these deactivations. Contact your Restek representative for pricing.



Sky® inlet liners feature Restek's premier deactivation.

## Don't Forget Routine Maintenance

Inlet liners are the key to good injection port maintenance; changing them regularly helps prevent the following problems:

- Sample degradation resulting in poor response.
- Sample adsorption resulting in poor peak shape (tailing).
- Sample discrimination.
- Irreproducibility.
- Extraneous peaks from contamination or cored septum particles.

Finally, be sure to condition your liners at 20 °C higher than the operating inlet temperature for a minimum of 10 minutes to prepare them for use. By following these basic tips, you can avoid inlet problems and improve chromatographic performance.

**Sky®**  
Inlet Liners





















## Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

Liners for Agilent GCs

Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 2 mm Splitless	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	20712	20713	20714
 4 mm Splitless	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	210-3003 (ea.) 210-3003-5 (5-pk.)	20772	20773	20774
 4 mm Splitless w/Deactivated Wool	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	22400	22401	22402
 5 mm Splitless	accommodates more polar solvents and lower MW solvents	5.0 mm 6.5 mm x 78.5 mm		22975	22976	
 2 mm Splitless (Quartz)	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	18740-80220 (ea.) 5183-4707 (5-pk.)	20914	20915	
 4 mm Splitless (Quartz)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20912	20913	
 4 mm Splitless w/Deactivated Wool (Quartz)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		22403	22404	
 Single Taper Splitless (2 mm)	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20795	20796	20797
 Single Taper Splitless (4 mm)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	20798	20799	20800
 Single Taper Splitless (4 mm) w/Deactivated Wool	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5062-3587 (ea.) 5183-4693 (5-pk.) 5183-4694 (25-pk.)	22405	22406	22407
 Single Taper Splitless (5 mm)	accommodates more polar solvents and lower MW solvents	5.0 mm 6.5 mm x 78.5 mm		22973	22974	
 Double Taper Splitless (4 mm)	trace, active samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	20784	20785	20786
 Cyclo Double Taper (2 mm)	trace, active, dirty samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20907	20908	
 Cyclo Double Taper (4 mm)	trace, active, dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20895	20896	20997
 Recessed Single Taper (2 mm)**	base easily packs with wool for dirty samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20980	20981	20982
 Recessed Single Taper (4 mm)**	base easily packs with wool for dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20983	20984	20985
 Recessed Single Taper (4 mm) w/Deactivated Wool**	base easily packs with wool for dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		22408	22409	22410
 Recessed Double Taper (4 mm)**	trace, active samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20986	20987	

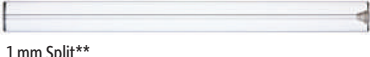
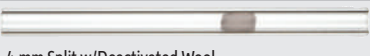





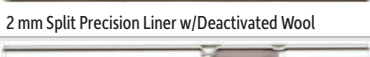




COLUMN INSTALLS THIS END

\*Nominal ID at syringe needle expulsion point.  
\*\*Use with two-hole ferrule for dual-column analysis.



Liners for Agilent GCs, cont.

COLUMN INSTALLS THIS END

Split Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part#	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 1 mm Split**	for purge & trap inlet splitting or sample <1 µL	1.0 mm 6.3 mm x 78.5 mm	18740-80200 (ea.) 5183-4709 (5-pk.)	20972	20973	
 4 mm Split w/Deactivated Wool	universal, use with Agilent 7673 autosampler	4.0 mm 6.3 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	20781	20782	20783
 Laminar Cup Splitter	high MW compounds	4.0 mm 6.3 mm x 78.5 mm		20801	20802	
 mini-Lam Split	high MW compounds	4.0 mm 6.3 mm x 78.5 mm		20990	20991	
 Cup Splitter	high & low MW compounds	4.0 mm 6.3 mm x 78.5 mm	18740-80190 (ea.) 5183-4699 (5-pk.)	20709	20710	
 Cyclo	dirty samples, many injections before cleaning required	4.0 mm 6.3 mm x 78.5 mm		20706	20707	20708
 2 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	2.0 mm 6.3 mm x 78.5 mm		20823	20824	
 4 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm	210-4004-5 (5-pk.)	21022	21023	20979
 4 mm Single Taper Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm	210-4022-5, 5183-4712 (5-pk.)	22983	22984	22985
<b>Split/Splitless Liners for Agilent GCs</b>						
 Low Pressure Drop Precision Liner w/Deactivated Wool	universal	4.0 mm 6.3 mm x 78.5 mm		21032	21033	
 Low Pressure Drop Liner w/Deactivated Wool	universal	4.0 mm 6.3 mm x 78.5 mm	5183-4647, 5183-4711 (ea.) 5183-4701, 5183-4712 (5-pk.) 5183-4713 (25-pk.)	20994	20995	20996
<b>SPME Liners for Agilent GCs</b>						
 SPME Liner	ideal for low-volume SPME applications	0.75 mm 6.35 mm x 78.5 mm			21110	21111

\*Nominal ID at syringe needle expulsion point.  
\*\*Use this liner for increased sensitivity.








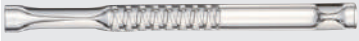



## Genuine Restek Replacement Parts for Agilent GCs




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## Liners for Agilent GCs, cont.

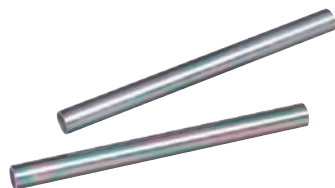
DI Liners for Agilent GCs** (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to Agilent Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		21054	21055	20998
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	G1544-80730	20756	20771	
 Double Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		20508	20509	
 Double Taper Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	G1544-80700	20954	20989	
 Drilled Cyclo-Uniliner (hole near top)	trace, dirty, high MW, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22979	22980	
 1 mm Uniliner	trace, active samples, samples <1 µL	1.0 mm 6.3 mm x 78.5 mm		21052	21053	
 Uniliner	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22268	22269	
 Cyclo-Uniliner	trace, dirty, high MW active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22270	22271	
 Open-top Uniliner w/Deactivated Wool	trace, dirty, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22272	22273	

CIS4 and PTV Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent Part#	10-pk. cat.#
 Straight Glass	general use	2.0 mm 3.0 mm x 71 mm	5183-2036	21157
 Baffled Glass	active compounds, drugs, pesticides	1.5 mm 3.0 mm x 71 mm	5183-2037	21704
 Glass w/Deactivated Wool	large volume injections	2.0 mm 3.0 mm x 71 mm	5183-2038	21156

\*Nominal ID at syringe needle expulsion point.

\*\*Hole in Drilled Uniliner liner makes direct injection possible with EPC-equipped Agilent 6890 &amp; 7890 GCs!


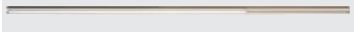



### Siltek® Metal Inlet Liners for Agilent GCs

Won't crack, chip, or break like glass liners.

Liner Type (5.2 mm ID x 6.3 mm OD x 78.5 mm)	5-pk. cat.#	25-pk. cat.#
Cyclo Single Taper	20974	20975
Single Taper	21702	21703
Cyclo	20726	
Split/Splitless w/Deactivated Wool	21700	21701


**Liners for APEX ProSep 800 & ProSep 800 Plus GCs**

APEX Liners for ProSep 800 & ProSep 800 Plus GCs	Benefits/Uses:	ID* OD x Length	Similar to APEX Part #	ea. cat.#
 Mega IV (4.0 mm ID)	injections ≤125 µL	4.0 mm 6.0 mm x 243 mm	L-00410	21075
 Micro I (1.0 mm ID)	injections ≤5 µL	1.0 mm 6.0 mm x 243 mm	L-00110	21073
 MIDI II (2.0 mm ID)	injections ≤25 µL	2.0 mm 6.0 mm x 243 mm	L-00210	21074

\*Nominal ID at syringe needle expulsion point.

**Liners for ATAS Injectors**

Liners for ATAS Injectors	Benefits/Uses:	ID* OD x Length	Similar to ATAS Part #	ea. cat.#	5-pk. cat.#
 ATAS Fritted Single Taper	dirty samples	3.0 mm 5.0 mm x 80 mm	A100126	22419	22420

Liners for ATAS LINEX DMI System OPTIC 2 and 3 inlets	ID* OD x Length	5-pk. cat.#
 ATAS LINEX DMI Liner	3.3 mm 5.0 mm x 81 mm	22353

\*Nominal ID at syringe needle expulsion point.

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## Liners for Bruker/Varian 1075/1077 S/SL Injection Ports




Split Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#
 1 mm Split	purge & trap inlet splitting or samples <1 µL	1.0 mm 6.3 mm x 72 mm		20970	20971
 Splitter w/Deactivated Wool	universal, use with rapid autosamplers	4.0 mm 6.3 mm x 72 mm	190010901	20792	20793
 Cup Splitter	high & low MW compounds	4.0 mm 6.3 mm x 72 mm		20724	20725
 Cyclo	dirty samples, many injections before cleaning required	4.0 mm 6.3 mm x 72 mm		20727	20728
 Frit Splitter	dirty samples, non-active compounds	4.0 mm 6.3 mm x 72 mm	190010903	20715	20716
 Split Precision Liner w/Deactivated Wool	dirty samples, active samples	4.0 mm 6.3 mm x 72 mm		21030	21031

Splitless Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 2 mm Splitless	trace samples <2 µL	2.0 mm 6.3 mm x 74 mm	190010905	20721	20722	20723
 4 mm Splitless	trace samples >2 µL	4.0 mm 6.3 mm x 74 mm		20904	20905	20906

DI Liners for Bruker/Varian 1075/1077 S/SL Injection Ports (0.25/0.32/0.53 mm ID)	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Uniliner	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 72 mm	20345	20346

SPME Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#
 SPME Liner	ideal for low-volume SPME applications	0.75 mm 6.3 mm x 74 mm	21112	21113

## Liners for Bruker/Varian S/SL Injection Ports









SPI Liners for Bruker/Varian S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 0.5 mm SPI	high linearity for 0.25 & 0.32 mm ID columns	0.53 mm 4.6 mm x 54 mm	190010906	20775	20776	20777
 0.8 mm SPI	high linearity for 0.53 mm ID columns	0.80 mm 4.6 mm x 54 mm	190010907	20778	20779	20780
 SPI with Buffer	dirty samples >1 µL, fits 0.25, 0.32 & 0.53 mm ID columns	2.4 mm 4.6 mm x 54 mm	190010908	20850	20851	20852



\*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END









**Liners for Bruker/Varian 1177 S/SL Injection Ports**


Liners for Bruker/Varian 1177 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#
 4 mm Split w/Glass Frit	universal	4.0 mm 6.3 mm x 78.5 mm		21045	21046
 4 mm Split w/Deactivated Wool	universal, use with Agilent 7673 autosampler	4.0 mm 6.3 mm x 78.5 mm	392611934		21079
 4 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm		20759	20762
 Low Pressure Drop Precision Liner w/Deactivated Wool	trace samples <2 µL, dirty samples	2.0 mm 6.3 mm x 78.5 mm		22421	22422
 2 mm Splitless w/Deactivated Wool	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	392599903		21077
 Single Taper Splitless (4 mm)	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611927	21896	21897
 Single Taper Splitless (4 mm) w/Deactivated Wool	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611928	21896-200.1	21897-200.5
 Double Taper Splitless (4 mm)	trace, active samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611929	21891	21892

DI Liners for Bruker/Varian 1177 S/SL Injection Ports (For 0.25/0.32/0.53 mm ID Columns)	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	21470	21471
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	21468	21469

\*Nominal ID at syringe needle expulsion point.

**Liners for Bruker/Varian 1078/1079 Injection Ports**











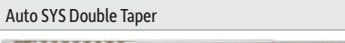

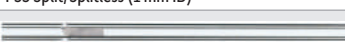

Liners for Bruker/Varian 1078/1079 Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 1078/1079 Split w/Glass Frit	dirty samples, non-active compounds	3.4 mm 5.0 mm x 54 mm	392611946	21708	21709	
 1078/1079 Splitless	trace samples <2 µL	2.0 mm 5.0 mm x 54 mm	392611947	21711	21712	
 Open 0.5 mm ID	trace samples <1 µL	0.5 mm 5.0 mm x 54 mm	392611949	20992	20993	
 1078/1079 Split-No Frit	active samples	3.4 mm 5.0 mm x 54 mm	392611945	20859	20901	20909
 Open 0.75 mm ID	trace, low volume samples	0.75 mm 5.0 mm x 54 mm	392611948	21714	21715	21716
 1078/1079 Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	3.4 mm 5.0 mm x 54 mm		21024	21025	

DI Liners for Bruker/Varian 1078/1079 Injection Ports (For 0.25/0.32/0.53 mm ID Columns)	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 54 mm	24974	24975

\*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END

## Liners for PerkinElmer GCs








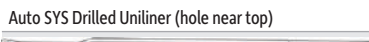
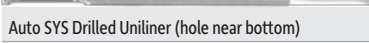
Split Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Straight	universal, for most common analyses	3.5 mm 5.0 mm x 100 mm	N6502008	20736	20737	
 Auto SYS Splitter w/Deactivated Wool	universal for most common analyses	4.0 mm 6.2 mm x 92.1 mm	N6502009	20832	20833	20834
 Auto SYS Cup Splitter	high & low MW compounds	4.0 mm 6.2 mm x 92.1 mm	N6502011	20835	20836	
 Auto SYS Cyclo	dirty samples, many injections before cleaning required	4.0 mm 6.2 mm x 92.1 mm	N6502012	20910	20911	
 Auto SYS Laminar Cup Splitter	high MW compounds	4.0 mm 6.2 mm x 92.1 mm		20827	20828	
 Auto SYS Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	4.0 mm 6.2 mm x 92.1 mm	N6121020	21026	21027	
<b>Splitless Liners for PerkinElmer GCs</b>						
 Splitless (2 mm ID)	trace samples	2.0 mm 5.0 mm x 100 mm	N6502007	20730	20731	
 Auto SYS Splitless	headspace, purge & trap	1.0 mm 6.2 mm x 92.1 mm	N6502006	21272	21273	21274
 Auto SYS Splitless (2 mm ID) w/Deactivated Wool	trace samples	2.0 mm 6.2 mm x 92.1 mm	N6121021	20829	20830	
 Auto SYS Double Taper	trace, active samples up to 4 µL	4.0 mm 6.2 mm x 92.1 mm	N6502003	20853	20854	
 Auto SYS Cyclo Double Taper	trace, dirty, active samples, up to 4 µL	4.0 mm 6.2 mm x 92.1 mm	N6502005	20899	20900	
<b>PSS Liners for PerkinElmer GCs</b>						
 PSS Split/Splitless (1 mm ID)	trace samples	1.0 mm 4.0 mm x 86.2 mm	N6121006	20738	20741	
 Auto SYS XL PSS Split/Splitless w/Deactivated Wool	most common analyses	2.0 mm 4.0 mm x 86.2 mm	N6121004	21717	21718	
 PSS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	2.0 mm 4.0 mm x 86.2 mm		22986	22987	

\*Nominal ID at syringe needle expulsion point.

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Liners for PerkinElmer GCs, *cont.*

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Zero Dilution Liners for PerkinElmer Auto SYS and Clarus GCs		Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
	Zero Dilution Inner Liner	headspace analysis	1.0 mm 2.0 mm x 73 mm	N1011446	22990	22991
	Zero Dilution Outer Liner	headspace analysis	2.5 mm 6.2 mm x 90 mm	N1011445	22992	22993
Zero Dilution Liners for PerkinElmer GCs with PSS Inlets		Benefits/Uses:	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
	Zero Dilution Inner Liner	headspace analysis	1.0 mm 2.0 mm x 73 mm	N1011446	22990	22991
	Zero Dilution Outer Liner	headspace analysis	2.5 mm 4.2 mm x 83 mm	N1011447		24979
DI Liners for PerkinElmer GCs (For 0.25/0.32/0.53mm ID Columns)		Benefits/Uses	ID* OD x Length	Similar to PE Part #	ea. cat.#	5-pk. cat.#
	Auto SYS Open-Top Uniliner w/Deactivated Wool	trace, dirty, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502016	20837	20838
	Auto SYS Cyclo-Uniliner	trace, dirty, high MW active samples, high linearity	4.0 mm 6.2 mm x 92.1 mm	N6502017	20839	20840
	Auto SYS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6121022	20819	20822
	Auto SYS Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502013	21293	21294
	Auto SYS Single Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502014	21295	21296

\*Nominal ID at syringe needle expulsion point.



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## Liners for Shimadzu 14A GCs




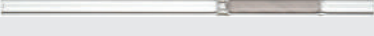

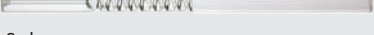
Split Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Split	universal, for most common analyses	3.5 mm 5.0 mm x 99 mm	221-32544-01	20860	20861	20862
 Cyclo	dirty samples, many injections before cleaning required	3.5 mm 5.0 mm x 99 mm		20870	20871	
 Laminar Cup Splitter	high MW compounds	3.5 mm 5.0 mm x 99 mm		20868	20869	

## Splitless Liners for Shimadzu 14A GCs




Splitless Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 3.5 mm Splitless	trace samples	3.5 mm 5.0 mm x 99 mm	221-32544-00	20863	20864	

\*Nominal ID at syringe needle expulsion point.


## Liners for Shimadzu 17A, 2010, and 2014 GCs

Split Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 1 mm Split	purge & trap, fast GC	1.0 mm 5.0 mm x 95 mm		20976	20977	20978
 3.5 mm Split	universal, for most common analyses	3.5 mm 5.0 mm x 95 mm	221-41444-01	22283	22284	22285
 2 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	2.0 mm 5.0 mm x 95 mm		22171	22172	
 3.5 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	3.5 mm 5.0 mm x 95 mm		21020	21021	
 3.5 mm Single Taper Precision Liner w/Deactivated Wool	dirty samples, trace samples	3.5 mm 5.0 mm x 95 mm		22173	22174	
 Cyclo	dirty samples, many injections before cleaning required	3.5 mm 5.0 mm x 95 mm		22072	22073	

## Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 2 mm Single Taper Splitless	universal, trace samples	2.0 mm 5.0 mm x 95 mm		22276	22277	
 3.5 mm Single Taper Splitless	universal, trace samples	3.5 mm 5.0 mm x 95 mm	221-48335-01	22286	22287	
 Double Taper Splitless	reduces backflash and catalytic decomposition	3.5 mm 5.0 mm x 95 mm		22274	22275	

## Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Split/Splitless w/Deactivated Wool	universal, for most common analyses	3.5 mm 5.0 mm x 95 mm	221-41444-00	20955	20956	20957







\*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END




Liners for Shimadzu 17A, 2010, and 2014 GCs, *cont.*

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SPME Liner for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
 SPME Liner	ideal for low volume SPME applications	0.75 mm 5.0 mm x 95 mm	22278	22279
DI Liners for Shimadzu 17A, 2010, and 2014 GCs (0.25/0.32/0.53 mm ID)	Benefits/Uses	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Uniliner w/Deactivated Wool	trace, dirty, high MW active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21713	21719
 Open-Top Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21285	21286
 Open-Top Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21287	21288
 Single Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21289	21290
 Single Taper Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21291	21292

\*Nominal ID at syringe needle expulsion point.

Liners for Shimadzu 17A PTV GCs

Liners for Shimadzu 17A PTV GCs	Benefits/Uses	ID* OD x Length	Similar to Shimadzu Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 17A PTV Liner w/Deactivated Wool	trace, dirty, high & low MW active samples	1.6 mm 4.0 mm x 95 mm	225-09212-01	21705	21706	21707

\*Nominal ID at syringe needle expulsion point.

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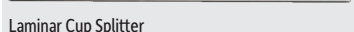







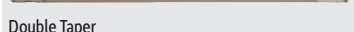
## Inlet Liners for Thermo Scientific GCs


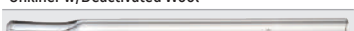
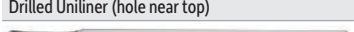
## Liners for Thermo Scientific 1300 Series GCs

Splitless Liners for Thermo Scientific 1300 Series GCs	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#	
 2 mm Splitless	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	23250	23251	<b>NEW!</b>
 4 mm Splitless	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	23252	23253	<b>NEW!</b>
 4 mm Splitless, Base Deactivated	trace samples < 2 µL	4.0 mm 6.5 mm x 78.5 mm	23254	23255	<b>NEW!</b>
 4 mm Splitless w/Base Deactivated Wool	trace samples < 2 µL	4.0 mm 6.5 mm x 78.5 mm	23256	23257	<b>NEW!</b>

## Liners for Thermo Scientific TRACE GC Ultra &amp; Focus SSL

Split Liners for Thermo Scientific TRACE GC Ultra & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 1 mm Split	purge & trap, fast GC	1.0 mm 8.0 mm x 105 mm	453 20075	20916	20917	
 3 mm Split	universal	3.0 mm 8.0 mm x 105 mm	453 20031	20936	20937	20938
 5 mm Split	universal	5.0 mm 8.0 mm x 105 mm	453 20030	20939	20940	20941
 Laminar Cup Splitter	high MW compounds	4.0 mm 8.0 mm x 105 mm		20948	20949	
 Cup Splitter	high & low MW compounds	4.0 mm 8.0 mm x 105 mm		20950	20951	
 5 mm Split Precision Liner w/Deactivated Wool	dirty samples, trace samples	5.0 mm 8.0 mm x 105 mm		22288	22289	

Splitless Liners for Thermo Scientific TRACE GC Ultra & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#	25-pk. cat.#
 Splitless Liner	trace samples	2.0 mm 8.0 mm x 105 mm		22266	22267	<b>NEW!</b>
 Splitless (3 mm ID)	trace samples	3.0 mm 8.0 mm x 105 mm	453 20032	20942	20943	20944
 Splitless (5 mm ID)	trace samples	5.0 mm 8.0 mm x 105 mm	453 20033	20945	20946	20947
 Double Taper	trace, active samples up to 4 µL	4.0 mm 8.0 mm x 105 mm		20952	20953	
 5 mm Splitless Precision Liner w/Deactivated Wool	dirty samples, trace samples	5.0 mm 8.0 mm x 105 mm		21028	21029	

DI Liners for Thermo Scientific TRACE GC Ultra & Focus SSL (0.32 & 0.53mm ID columns)	Benefits/Uses:	ID* OD x Length	ea. cat.#	5-pk. cat.#
 Uniliner w/Deactivated Wool	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	21005	21006
 Drilled Uniliner (hole near top)	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	22411	22412
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	22413	22414

\*Nominal ID, not outside needle connection point

COLUMN INSTALLS THIS END

## Liners for Thermo Scientific TRACE PTV

COLUMN INSTALLS  
THIS END

Split Liners for Thermo Scientific TRACE PTV	Benefits/Uses:	ID* OD x Length	Similar to TS Part #	ea. cat.#	5-pk. cat.#
1 mm ID Glass Liner	trace samples, high recovery & linearity	1.0 mm 2.75 mm x 120 mm	453 22054	21114	21115
2 mm ID Glass Liner	universal	2.0 mm 2.75 mm x 120 mm	453 22045	21116	21117
Baffle Liner	trace samples	2.0 mm 2.75 mm x 120 mm		22074	22075

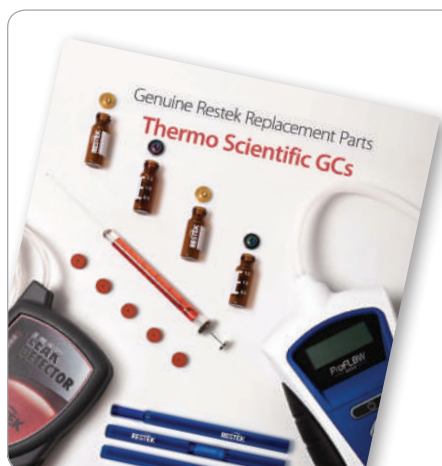
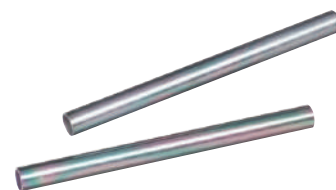
\*Nominal ID at syringe needle expulsion point.

## Siltek®-Treated Metal Inlet Liners for Thermo Scientific GCs

Won't crack, chip, or break like glass liners.

Liner Type (5.0 mm ID x 8.0 mm OD x 105 mm)	ea. cat.#	5-pk. cat.#
5 mm ID Split/Splitless w/ Deactivated Wool	—	21004
Liner Type (2.75 mm OD x 120 mm)	ea. cat.#	5-pk. cat.#
1 mm ID Split/Splitless*	21080	21081
2 mm ID Split/Splitless*	21082	21083

\*Works with PTV injectors.



## Genuine Restek Replacement Parts for Thermo Scientific GCs

Download *Genuine Restek Replacement Parts Catalog for Thermo Scientific GCs* today!
[www.restek.com/GRRP](http://www.restek.com/GRRP)



24324

### Deactivated Glass Wool

- More inert than our traditional glass wool.
- Use to vaporize a sample in a liner prior to introduction into a capillary column.

Description	qty.	cat.#
Deactivated Glass Wool	10 grams	24324



20999

### Base-Deactivated Glass Wool

Ideal for amines and other basic compounds.

Description	qty.	cat.#
Base-Deactivated Glass Wool	10 grams	20999

## tech tip

### Use of Packings With an Autosampler

We recommend using an injection port liner with wool or CarboFrit® packing when making injections with an autosampler. If there is no packing material in the liner, the solvent droplets act like water on a hot iron: they bounce around until vaporized (Leidenfrost phenomenon). Because autosamplers make rapid injections, samples can be incompletely vaporized, leading to nonreproducible peak response and tailing. You can prevent this by using wool or CarboFrit® packing material in the splitless liner to provide a surface for the solvent droplets to "sit" on until the heat from the injector vaporizes them.

### Prepacked Inlet Liners

Let Restek do the work! Just add the appropriate suffix to the liner catalog number.

qty.	Wool	CarboFrit	
ea.	-200.1	-209.1	addl. cost
5-pk.	-200.5	-209.5	addl. cost
25-pk.	-200.25	-209.25	addl. cost

†CarboFrit® inserts require a neck greater than 2 mm.

### CarboFrit® Inlet Liner Packing Material

- Highly inert.
- Extends analytical column lifetime.
- Enhances reproducibility of split and splitless injections.
- Uniform pore size and consistent packing density guarantee consistent flow through the liner.
- Easy to install in any liner with an ID > 3.5 mm when using puller-inserter tool listed below.\*



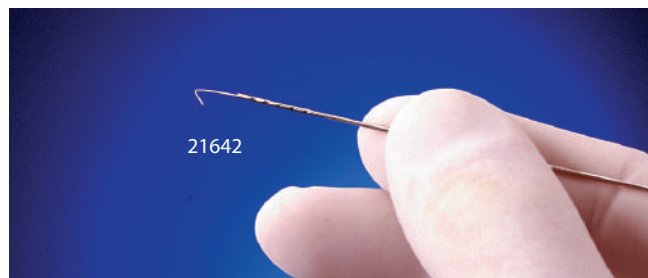
Add the corresponding suffix number to the liner catalog number.

qty.	suffix	
ea.	-209.1	addl. cost
5-pk.	-209.5	addl. cost
25-pk.	-209.25	addl. cost

\*Liners with IDs less than 3.5 mm are difficult to pack. We will pack them on a custom basis (minimum neck ID of 2 mm required).

### Replacement CarboFrit® Inserts

Description	qty.	cat.#
Frits for liner ID ≤ 4 mm	10-pk.	20295
Frits for liner ID > 4 mm	10-pk.	20294



### CarboFrit® Puller/Inserter Tool

- Hook end for removing CarboFrit® inserts.
- Bent end (90°) for inserting CarboFrit® inserts.

Description	qty.	cat.#
CarboFrit Puller/Inserter Tool	ea.	21642



### Mini Wool Puller/Inserter

Insert and remove wool plugs easily. Order a spare pack so you'll always have one available.



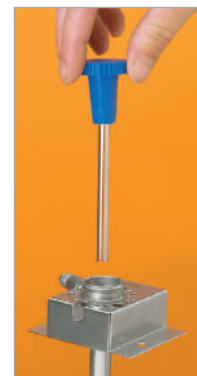
Description	qty.	cat.#
Mini Wool Puller/Inserter	2-pk.	20114



**No more burned fingers!**

### Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.



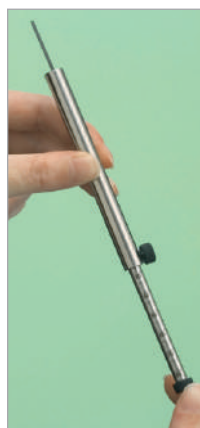
Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181



**Eliminates user variation!**

### Inlet Liner Packing Tool

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturers' liners.



Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.



Place a plug of loosely bound wool at the top of the inlet liner.



Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Recommended for inlet liners with an ID  $\geq 2$  mm.



### The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.



Description	qty.	cat.#
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 4/8 Snap Seal Vial	100-pk.	24658



### Injector Maintenance

Approximately ninety percent of "bad" chromatography is traceable to problems in the injection port. These problems include contaminated carrier gas, incorrect injector flows, active or dirty sites on inlet seals and liners, improper use of wool, leaks, backflash, discrimination, incorrect injector temperature, poor column installation, and use of the wrong injection technique. To minimize injection port problems, set up a routine maintenance schedule and be sure to investigate the injector first when troubleshooting.

# GC Accessories

## Instrument Supplies

Dynamic Duo .....	219
Leak Detector.....	220
Flowmeter .....	221–222
Supplies.....	222
Septa.....	223
Ferrules .....	224–226
Connectors.....	227–233
<b>Supplies for Agilent GCs.....</b>	<b>234–258</b>
Inlet.....	234–241
Injection Port .....	242–244
Replacement Parts.....	245–246
Tools .....	247–248
Packed Column.....	248–249
Dual-Column.....	250
GC-MS.....	251–253
Detector.....	254–257
Cables & Autosampler .....	258
Supplies For APEX Injectors .....	259
Supplies for ATAS Injectors .....	259
<b>Supplies For Bruker/Varian GCs .....</b>	<b>260–262</b>
<b>Supplies For PerkinElmer GCs .....</b>	<b>263–264</b>
<b>Supplies For Shimadzu GCs .....</b>	<b>265–266</b>
<b>Supplies For Thermo Scientific GCs ....</b>	<b>267–271</b>
Packed Column Inlet Conversion .....	272–274
Dual Column Analysis.....	274–275
Purge & Trap Supplies .....	276
PID Lamps.....	276
Tools.....	277–283

## Dynamic Duo (Restek® Leak Detector and ProFLOW 6000 Flowmeter)

Protect your instrument and improve data quality with this powerful pair from Restek. Checking for leaks and verifying flows before you start helps you avoid costly problems later.

### Restek's New Leak Detector

Redesigned and better than ever, our new leak detector is an essential tool for troubleshooting and routine maintenance of your gas chromatograph. Don't risk damaging your system or losing sensitivity; check for leaks often and protect your GC column and instrument with a Restek® leak detector!



#### Leak Detector Specifications

Detectable Gases:	Helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable lithium ion internal battery pack (12 hours normal operation)
Operating Temperature Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	One year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

#### Limits of Detection

These gases can be detected with the Restek® electronic leak detector at the following leak rates:

##### Minimum Detectable Gas Limits and Indicating LED Color:

Helium, $1.0 \times 10^{-5}$ , red LED
Hydrogen*, $1.0 \times 10^{-5}$ , red LED
Nitrogen, $1.4 \times 10^{-3}$ , yellow LED
Argon, $1.0 \times 10^{-4}$ , yellow LED
Carbon dioxide, $1.0 \times 10^{-4}$ , yellow LED
Gas detection limits measured in atm cc/sec.

\*Caution: The Restek® electronic leak detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek® electronic leak detector may only be used for determining trace amounts in a GC environment.

### ProFLOW 6000 Flowmeter

With its wide range of capabilities, the ProFLOW 6000 flowmeter simplifies gas flow measurement in the lab. Real-time measurements can be made for various types of flow paths, including continually changing gas types.

#### Flowmeter Specifications:

Type of Flowmeter:	Volumetric
Battery:	2-AA
Operating Temp. Range:	32–120 °F (0–48 °C)
Warranty:	One year
Certifications:	CE, Ex
Compliance:	WEEE, RoHS
Patented	



22658



22657

Description	qty.	cat.#
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
<b>Related Products and Accessories</b>		
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Restek ProFLOW 6000 Electronic Flowmeter With Hard-Sided Carrying Case	ea.	22656
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657



## Leak Detector



NEW LOOK!

22655

**Restek® Electronic Leak Detector**

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek® leak detector.

Features & benefits include:

- Audible tone indicates the severity of a leak.
- Redesigned circuitry offers 12 hours of operation between charges.
- Detects a broad range of gases; Ex rated for use with hydrogen and other explosive gases.\*
- Ergonomic, handheld design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Long-lasting battery; up to 12 hours of continuous use.
- Automatic shutoff.
- A convenient carrying and storage case.
- Easy-to-clean probe assembly.
- A universal charger set (U.S., European, UK, and Australian plugs included).

Backed by a one-year warranty, the Restek® leak detector is the industry standard for performance and affordability in handheld leak detectors.



Restek's electronic leak detector makes finding leaks a quick and easy task.

**Leak Detector Specifications**

Detectable Gases:	Helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable lithium ion internal battery pack (12 hours normal operation)
Operating Temperature Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	One year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

**Limits of Detection**

**These gases can be detected with the Restek® electronic leak detector at the following leak rates:**

**Minimum Detectable Gas Limits and Indicating LED Color:**

Helium, $1.0 \times 10^{-5}$ , red LED
Hydrogen*, $1.0 \times 10^{-5}$ , red LED
Nitrogen, $1.4 \times 10^{-3}$ , yellow LED
Argon, $1.0 \times 10^{-4}$ , yellow LED
Carbon dioxide, $1.0 \times 10^{-4}$ , yellow LED

Gas detection limits measured in atm cc/sec.

**Description**

Description	qty.	cat.#
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657
Car Charger/Adaptor	ea.	22652
Universal AC Power Adaptor	ea.	22653

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system and/or into the leak detector.

\*Caution: The Restek® electronic leak detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek® electronic leak detector may only be used for determining trace amounts in a GC environment.



22658



22657

**Restek recommends**

If you think that your Restek® electronic leak detector needs service or repair, please contact Restek® Customer Service before sending your unit in (cat.# 22655-R). Leak detector service/repair will include inspection and testing of the unit.



22652

NEW!



22653

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**Restek ProFLOW 6000 Electronic Flowmeter**

State-of-the-art features include:

- Measures volumetric flow for gases across a range of 0.5–500 mL/min.
- NIST traceable calibration.
- Ex rating (electrical apparatus for explosive gas atmospheres) for hydrogen and related gas types.
- Accuracy of  $\pm 2\%$  of flow reading or  $\pm 0.2$  mL/min, whichever is greater.
- Over-range warning indicator.
- Auto shutoff feature.
- Use as a benchtop or handheld unit.
- Ergonomic design and side grips for comfort.
- Measures most gas types.\*
- Convenient carrying/storage case included.
- Uses 2-AA batteries (included).
- Data output via USB port.
- 1-year warranty.
- Recalibration service available.

Flowmeters that can measure flammable gases are becoming mandatory due to the increased use of hydrogen in chromatography. With its Ex rating, the Restek® ProFLOW 6000 meter is designed specifically with explosive and flammable gases in mind.

The Restek® ProFLOW 6000 is the only flowmeter you need for any type of chromatography gas measurement because of its wide range of capabilities. The ProFLOW 6000 is an electronic meter capable of measuring volumetric flow for most gases. Real-time measurements can be made for various types of flow paths, including continually changing gas types. This portable unit is designed for easy handheld use, and the stand adds benchtop convenience.

**Flowmeter Specifications:**

Type of Flowmeter:	Volumetric
Battery:	2-AA
Operating Temp. Range:	32–120 °F (0–48 °C)
Warranty:	One year
Certifications:	CE, Ex
Compliance:	WEEE, RoHS

Description	qty.	cat.#
Restek ProFLOW 6000 Electronic Flowmeter With Hard-Sided Carrying Case	ea.	22656
ProFLOW 6000 Recalibration Service	ea.	22656-R
Soft-Side Storage Case	ea.	22657

\*The flowmeter is designed to measure clean, dry, non-corrosive gases. Patented



22656

**Restek recommends**

Recalibrate your ProFLOW 6000 flowmeter once every year. Prolonged failure to recalibrate your unit may result in increased error. To always get the most accurate flow measurements, contact Customer Service to send in your flowmeter for recalibration (cat.# 22656-R).



22657

Optional soft-side storage case is ideal for storing your leak detector or flowmeter in smaller spaces, such as your toolbox.

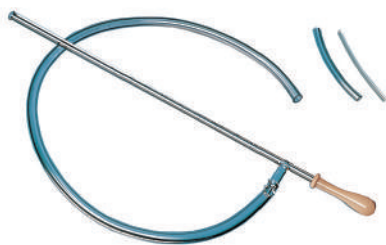
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e-mail : sales @ chromtech.net.au

## Flowmeter, Supplies



20135

**Soap Film Bubble Flowmeter**

- 1 mL flowmeter for flows between 0.1 and 10 cc/min.
- 50 mL flowmeter for flows between 10 and 300 cc/min.
- Includes a reservoir bulb, twenty-four inches (60 cm) of 1/4-inch ID tubing, adaptor tubes for 1/8-inch tubing and 0.53 mm ID capillary columns, and Velcro® fasteners.

Description	Volume	qty.	cat.#
Bubble Flowmeter	1 mL	ea.	20135
Bubble Flowmeter	50 mL	ea.	20136

**Methane Cylinder Kit**

For optimizing linear velocity

Setting the column flow rate by injecting methane and optimizing linear velocity is a preferred method for establishing reproducible retention times (ASTM Method E1510-93). The kit includes a Scotty® 14 cylinder containing 1% methane in helium, a MINICYL regulator, a syringe adaptor, and a package of twenty-five septa for the adaptor.



20197

Description	qty.	cat.#
Methane Cylinder Kit	kit	20197
Replacement Septa for Syringe Adaptor	25-pk.	20198
Replacement Methane Cylinder	ea.	20199



20612

**Capillary Column Rinsing Reservoir Kit**

Restore the performance of bonded-phase capillary columns by dissolving and removing soluble, nonvolatile residue, using this reservoir kit. The 50 mL rinsing reservoir is equipped with 1/4-inch inlet and outlet connections and includes a built-in fritted disk to prevent particulate matter from contaminating the column. The kit includes reservoir, pressure regulator, fittings, ferrules, and tubing. Reservoir also available separately.

Description	qty.	cat.#
Rinsing Reservoir Complete Kit	kit	20612
Rinsing Reservoir only	ea.	20613

Column not included.



21000

**FID Flow Measuring Adaptor**

for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to		
	Agilent part #	qty.	cat.#
FID Flow Measuring Adaptor	19301-60660	ea.	21000

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**Restek® Thermolite® Septa**

- Usable to 340 °C inlet temperature\*.
- Precision molding assures consistent, accurate fit.
- Excellent puncturability.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs\*\*.
- A Restek exclusive!



Septum Diameter	50-pk. cat.#	100-pk. cat.#
5 mm (3/16")	27121	27122
6 mm (1/4")	27124	27125
7 mm	27127	27128
8 mm	27130	27131
9 mm	27133	27134
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
11.5 mm	27145	27146
12.7 mm (1/2")	27148	27149
17 mm	27151	27152
Shimadzu Plug	27154	27155

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo TRACE and Focus GCs.

\*For 17 mm inlets, the maximum temperature is 330 °C.

\*\*12.7 mm and 17 mm septa packaged in precleaned glass jars.

**Premium Non-Stick BTO® Septa**

- Usable to 400 °C inlet temperature\*.
- New plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs\*\*.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC-MS applications.



Septum Diameter	50-pk. cat.#	100-pk. cat.#
5 mm CenterGuide	27082	27083
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091
11.5 mm CenterGuide	27092	27093
12.7 mm (1/2") CenterGuide	27094	27095
17 mm CenterGuide	27096	27097
Shimadzu Plug	27098	27099

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo TRACE and Focus GCs.

\*For 17 mm inlets, the maximum temperature is 330 °C. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.

\*\*12.7 mm and 17 mm septa packaged in precleaned glass jars.

Measure  
your old  
septum here  
(size in mm)

5

7

9

9.5

10

11

11.5

12.7

17

**RESTEK** CHROMALYTICs® in AUSTRALIA : Contact +81 3 9762 2034  
Distributor

www.chromalytic.net.au

e-mail : sales @ chromtech.net.au

**HANDY septum size chart**

Instrument	Septum Diameter (mm)
<b>Agilent (HP)</b>	
5880A, 5890, 6850, 6890, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5
<b>Bruker/Varian</b>	
Injector type:	
Packed column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11
<b>Finnigan (TMQ)</b>	
GC 9001	9.5
GCQ	9.5
QCQ	9.5
TRACE 2000	9.5
<b>PerkinElmer</b>	
Sigma series	11
900,990	11
8000 series	11
Auto SYS	11
Auto SYS XL	11
<b>Shimadzu</b>	
All models	Plug
<b>SRI</b>	
GCs with heated inlet	9.5
All other models	Plug
<b>Thermo Scientific</b>	
TRACE GC	17
GCQ w/TRACE, PTV	17
8000 series	17
1300 and 1310 GC	11
<b>Tracor</b>	
540	11.5
550,560	9.5

**tech tip****Tips for Handling Septa**

All septa, regardless of composition, puncturability, or resistance to thermal degradation will fail if they are mishandled. Overtightening a septum nut invariably will reduce septum lifetime by increasing coring/splitting. All septa contain volatile materials (e.g., phthalates) that are released when the septum is heated (septum bleed). Because most GCs are equipped with a septum purge, septum bleed generally will disappear within 30 minutes after installing a new septum and exposing it to normal injector temperatures. All Restek septa are preconditioned and are ready to use without delay.



 **tech tip**
**Choosing the Right Ferrule**

Graphite ferrules are soft, easy to seal, stable to 450 °C, and contain no binders that might off-gas. Vespel®/graphite ferrules work better for vacuum and high-pressure applications (e.g., GC-MS) because they will not fragment or allow oxygen to permeate into the system, whereas graphite ferrules will. Because Vespel®/graphite ferrules are made from a harder material, they might require retightening after several temperature cycles.



Graphite Ferrules



Vespel®/Graphite Ferrules



Encapsulated Graphite Ferrules

**Vespel® Ferrules**

- 100% high-temperature polyimide.
- Stable to 350 °C.
- Durable, leak-tight.



Vespel® Ferrules

**Graphite Ferrules**

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450 °C.

**Vespel®/Graphite Ferrules**

- VG2, 60% Vespel®/40% graphite blend offers the best combination of sealing and ease of workability.
- VG1, 85% Vespel®/15% graphite blend offers equivalent composition to Agilent Vespel®/graphite ferrules.
- Seal with minimal torque, reusable, and preferred for vacuum and high-pressure uses.
- Stable to 400 °C.
- Recommended for mass spec transfer lines.

**Capillary Ferrules** for 1/16-Inch Compression-Type Fittings

Available in Vespel®, graphite, or Vespel®/graphite material.

Ferrule ID	Fits Column ID	qty.	NEW!			
			Vespel	Graphite	VG1 (85/15)	VG2 (60/40)
0.3 mm		10-pk.	22213	20233	27061	20275
0.4 mm	0.10/0.15/0.18/ 0.25/0.28 mm	10-pk.	22214	20200	27062	20211
0.4 mm	0.10/0.15/0.18/ 0.25/0.28 mm	50-pk.	—	20227	27063	20229
0.5 mm	0.32 mm	10-pk.	22215	20201	27064	20212
0.5 mm	0.32 mm	50-pk.	—	20228	27065	20231
0.6 mm	0.28 mm**	10-pk.	—	—	27066	20232
0.8 mm	0.45/0.53 mm	10-pk.	22216	20202	27067	20213
0.8 mm	0.45/0.53 mm	50-pk.	—	20224	27068	20230
1.0 mm	0.75 mm*	10-pk.	22217	21058	27069	24912
1.2 mm	0.75 mm*	10-pk.	22218	—	—	—
1.6 mm	1.00 mm*	10-pk.	—	21060	—	—

\*For micropacked columns.

\*\*For 0.28 mm MXT columns.

**Encapsulated Ferrules** for 1/16-Inch Compression Fittings

- Reusable—will not deform and stick in fittings.
- Less torque needed to seal ferrule.
- Restek's unique blend of graphite minimizes fragmentation and out-gassing.

Ferrule ID	Fits Column ID	qty.	cat.#
0.4 mm	0.25 mm	10-pk.	21036
0.5 mm	0.32 mm	10-pk.	21037
0.8 mm	0.53 mm	10-pk.	21038



**Compact Ferrules** for Agilent 5890/6890/6850/7890 GCs

Available in graphite or Vespel®/graphite material.

**NEW!**

Ferrule ID	Fits Column ID	qty.	Graphite	VG1 (85/15)	VG2 (60/40)
0.4 mm	0.25/0.28 mm	10-pk.	20250	27070	20238
0.4 mm	0.25/0.28 mm	50-pk.	20251	27071	20239
0.5 mm	0.32 mm	10-pk.	21007	27072	20248
0.5 mm	0.32 mm	50-pk.	21008	27073	20249
0.8 mm	0.45/0.53 mm	10-pk.	20252	27074	20263
0.8 mm	0.45/0.53 mm	50-pk.	20253	27075	20264
1.0 mm	0.75 mm*	10-pk.	21059	—	—
1.6 mm	1.00 mm*	10-pk.	21061	—	—

\*For micropacked columns.

**Standard Ferrules** for 1/16-, 1/8-, and 1/4-Inch Fittings

Available in Vespel®, graphite, or Vespel®/graphite material.

**NEW!**

Fitting Size	Ferrule ID	qty.	Vespel	Graphite	VG1 (85/15)	VG2 (60/40)
1/4"	3/16"	5-pk.	—	—	—	20258
1/16"	1/16"	10-pk.	22210	20207	27076	20218
1/8"	1/8"	10-pk.	22211	20208	27077	20219
1/8"	reduce to 1/16"	10-pk.	—	20209	—	20220
1/4"	1/4"	10-pk.	22212	20210	27078	20221
1/4"	reduce to 1/8"	10-pk.	22219	20225	—	20222
1/4"	reduce to 1/16"	10-pk.	—	20226	—	20223

**Two-Hole Ferrules** for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	VG2 (60/40)
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

**Reducing Ferrules**

Available in graphite or Vespel®/graphite material.

**NEW!**

Fitting Size	Ferrule ID	Fits Column ID	qty.	Graphite	VG1 (85/15)	VG2 (60/40)
1/8"	0.4 mm	0.25 mm	5-pk.	20205	27079	20254
1/8"	0.5 mm	0.32 mm	5-pk.	20205	27080	20255
1/8"	0.8 mm	0.53 mm	5-pk.	20206	27081	20215
1/4"	0.4 mm	0.25 mm	5-pk.	20203	—	—
1/4"	0.5 mm	0.32 mm	5-pk.	20203	—	20257
1/4"	0.8 mm	0.45/0.53 mm	5-pk.	20204	—	20217

**Blank Ferrules** for 1/16-Inch Fittings

Fitting Size	Ferrule ID	qty.	VG2 (60/40)
1/16"	no hole	10-pk.	20240



## Ferrules

**PTFE Ferrules**

- Upper temperature limit 250 °C.
- 100% PTFE; completely inert.
- One-piece design requires no back ferrule.

Fitting Size	Ferrule ID	qty.	cat.#
1/16"	1/16"	10-pk.	21122
1/16"	0.4 mm	10-pk.	21123
1/16"	0.5 mm	10-pk.	21124
1/16"	0.8 mm	10-pk.	21125
1/8"	1/8"	10-pk.	21126
3/16"	3/16"	10-pk.	21127
1/4"	1/4"	10-pk.	21128

**Graphite Ferrules**

(M4 Fittings) for Thermo Scientific TRACE, 8000, 8000 TOP &amp; Focus GCs

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450 °C.



Ferrule ID	Fits Column ID	Similar to TS Part #	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	—	22221	22222
0.4 mm	0.18–0.28 mm	29013488 (2-pk.) 29053488 (10-pk.)	20280	20281
0.5 mm	0.32 mm	29013487 (2-pk.) 29053487 (10-pk.)	20282	20283
0.8 mm	0.45–0.53 mm	29013486 (2-pk.) 29053486 (10-pk.)	20284	20285

**5 mm Ferrules** for Shimadzu 17A GCs

- For use with packed columns.
- Graphite construction.

Description	qty.	cat.#
5 mm Ferrules for Shimadzu 17A GCs	10-pk.	21121

**Graphite Ferrules** for Shimadzu 17A, 2010, and 2014 GCs

- Graphite two-piece construction.
- Available in 0.4, 0.5, and 0.8 mm sizes.
- Packaged on mandrel for easy handling.



Ferrule ID	Fits Column ID	Similar to Shimadzu Part #	qty.	cat.#
0.4 mm	0.25 mm and less	220-90765-00	10-pk.	24827
0.5 mm	0.32 mm	221-32126-05	10-pk.	24828
0.8 mm	0.53 mm	221-32126-08	10-pk.	24829

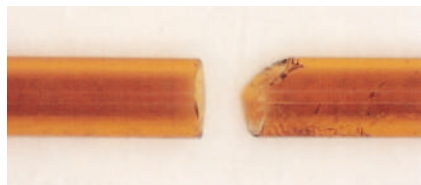
**GRAPHPACK® 2M Ferrules** for Gerstel CIS 3 and CIS 4 PTV Inlets

Fits Column ID	Similar to Gerstel Part #	qty.	cat.#
0.25 mm	001805-040-00	10-pk.	22223
0.32 mm	001805-045-00	10-pk.	22224
0.53 mm	001805-007-00	10-pk.	22225

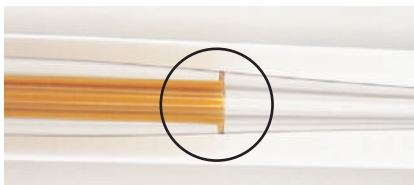
## Restek Press-Tight® Connectors

Press-Tight® connectors are lightweight, quickly installed, and easy to use. They connect fused silica tubing having outside diameters ranging from 0.33 to 0.74 mm (Restek® 0.1 to 0.53 mm ID). Press-Tight® connectors do not cause solvent tailing, or adsorb active compounds.

Press-Tight® connectors most often are used to connect a guard column to an analytical column. They also are used to connect columns differing in polarity, for unique separations, or to repair a broken column.



Make a clean, square cut for optimum connector performance. The cut on the right will produce a poor seal.



A brown ring indicates a proper seal.

### Obtaining a leak-tight seal:

To achieve optimum performance from these connectors, begin with a properly cut fused silica column or retention gap end. Even if you use polyimide resin (cat.# 20445, page 228) for extra insurance, a poorly cut capillary column will make an inadequate seal.

Press the cut ends into the connector, then establish a flow, and leak-check the seal with a Restek® electronic leak detector (cat.# 22655, page 220) before heating the system.

### What is the maximum temperature for a Press-Tight® connector?

Press-Tight® connectors are effective at oven temperatures up to 325 °C, the temperature at which the polyimide coating on the column decomposes and the connection will begin to leak. We strongly recommend using a Vu2 Union® (page 229) or SeCure® “Y” (page 230) connector if oven temperatures will exceed 325 °C for prolonged periods of time.

### Can Press-Tight® connectors be used with MXT® columns?

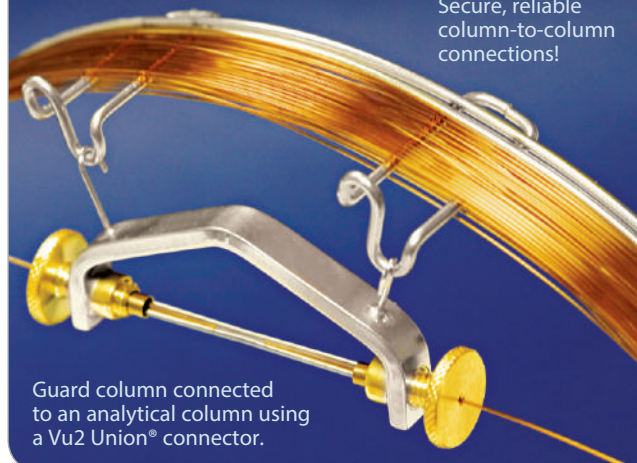
No. To achieve a leak-tight fused silica to stainless steel connection, we recommend an MXT® connector (see page 231).



Our attention to detail is why Restek® products are known for quality and reliability.

## Let Restek Make the Connection!

Secure, reliable column-to-column connections!



Guard column connected to an analytical column using a Vu2 Union® connector.

Restek will connect a guard column/transfer line to any analytical column, using a Vu2 Union® connector. We will leak-check the connection and confirm analytical integrity by analyzing a test mixture. To order a preconnected guard column/transfer line, add the three-digit suffix from the chart below to any analytical column catalog number. Example: A 5 m, 0.32 mm ID guard column connected to a 30 m, 0.32 mm ID, 1.0 µm Rtx®-5 column is cat.# 10254-163.

5m Guard Column ID	cat.# suffix	Additional Cost*
0.15 mm	-160	
0.18 mm	-161	
0.25 mm	-162	
0.32 mm	-163	
0.53 mm	-164	
10m Guard Column ID	cat.# suffix	Additional Cost*
0.25 mm	-165	
0.32 mm	-166	
0.53 mm	-167	

\*Additional cost will be added to the price of the column.

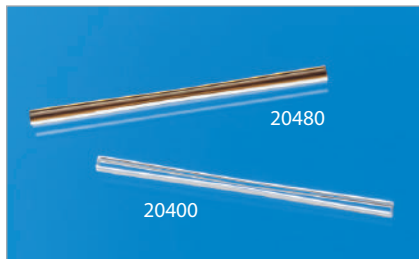
Guard columns listed are intermediate polarity (IP) deactivated.

For more information about guard columns, see pages 18–19.



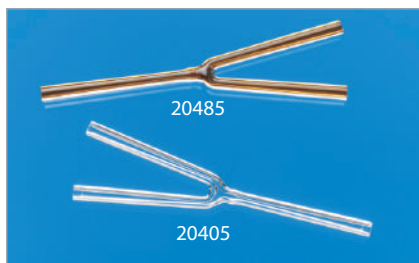
**Press-Tight® Connectors**

- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek® 0.1–0.53 mm ID).

**Universal Press-Tight® Connectors**

- Connect a guard column to an analytical column.
- Repair a broken column.
- Connect a column outlet to a transfer line.

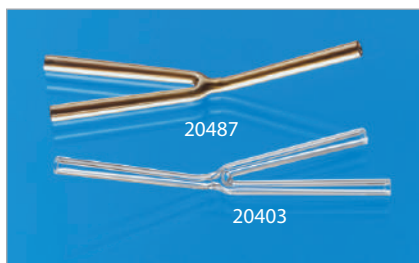
Description	5-pk.	25-pk.	100-pk.
Universal Press-Tight Connectors	20400	20401	20402
Universal Press-Tight Connectors, Deactivated	20429	20430	—
Universal Press-Tight Connectors, Siltek Deactivated	20480	20449	—

**Universal “Y” Press-Tight® Connectors**

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.

Description	ea.	3-pk.
Universal “Y” Press-Tight Connector	20405	20406
Universal “Y” Press-Tight Connector, Deactivated	20405-261	20406-261
Universal “Y” Press-Tight Connector, Siltek Deactivated	20485	20486

**Universal Angled “Y” Press-Tight® Connectors**

- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

Description	ea.	3-pk.
Universal Angled “Y” Press-Tight Connector	20403	20404
Universal Angled “Y” Press-Tight Connector, Deactivated	20403-261	20404-261
Universal Angled “Y” Press-Tight Connector, Siltek Deactivated	20487	20469

**Polyimide Resin**

Securely connects a Press-Tight® connector to a fused silica column.

Description	Max. Temp.	qty.	cat.#
Polyimide Resin	350 °C	5 grams	20445



## Vu2 Union® Connectors

- Connect a guard column to an analytical column.
- Connect a column to a transfer line.
- Connect two columns in series.
- Repair a broken column.
- Fit both Restek® cage designs.

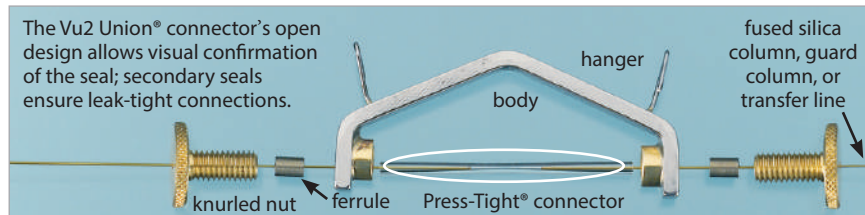
Restek's Vu2 Union® connector combines the simplicity of a Press-Tight® union with the strength of a metal union.

How does a Vu2 Union® connector work?

A Press-Tight® union in the Vu2 Union® connector joins the fused silica tubing ends together; the ferrule and knurled nut at each end of the connector hold the tubing in place via a secondary seal between the ferrule and the Press-Tight® union. Each knurled nut applies independent pressure to each ferrule to make leak-tight seals with the column ends. These ultra-strong connections will not unexpectedly disconnect under temperature changes, vibrations, or other stresses normally encountered in GC analyses. The open design allows visual confirmation of the seal between the column and the Press-Tight® union to ensure confidence in the connection. Hang the connector from the column cage to minimize stress on the connections.

Who will benefit from using Vu2 Union® connectors?

Any analyst using guard columns, transfer lines, or restrictor tubing; performing a dual-column analysis with columns connected in series; or seeking to repair a broken column will find Vu2 Union® connectors the simple, reliable, easy-to-use solution to their connection needs.



Kits include: Vu2 Union® body, two knurled nuts, two Press-Tight® unions, and four ferrules

Description	Ferrules Fit Column ID	qty.	cat.#
Vu2 Union Connector Kit	0.10–0.15 mm	kit	22220
Vu2 Union Connector Kit	0.18–0.28 mm	kit	21105
Vu2 Union Connector Kit	0.32 mm	kit	21106
Vu2 Union Connector Kit	0.45–0.53 mm	kit	21107
Knurled Nut		2-pk.	21108

## Universal Press-Tight® Connectors

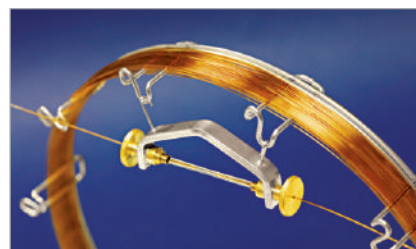
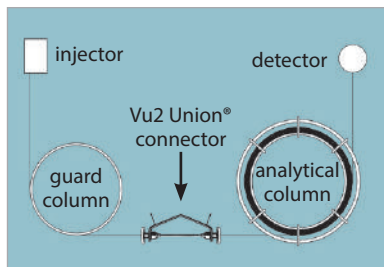
Description	5-pk.	25-pk.	100-pk.
Universal Press-Tight Connectors	20400	20401	20402
Universal Press-Tight Connectors, Deactivated	20429	20430	—
Universal Press-Tight Connectors, Siltek Deactivated	20480	20449	—

## Graphite Ferrules for Vu2 Union® Connectors

- High-purity, high-density graphite.
- Stable to 450 °C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.

Ferrule ID	Fits Column ID	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	22221	22222
0.4 mm	0.18–0.28 mm	20280	20281
0.5 mm	0.32 mm	20282	20283
0.8 mm	0.45–0.53 mm	20284	20285

A guard column connected to an analytical column by a Vu2 Union® connector.

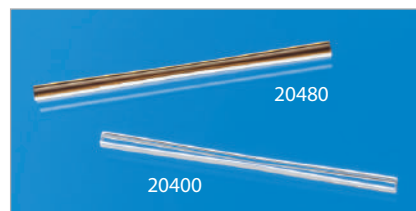


Fit both Restek® cage designs.



Secure, reliable  
column-to-column  
connections!

NOTE: This product is not recommended for GC column-to-MS connections.





Fit both Restek® cage designs.



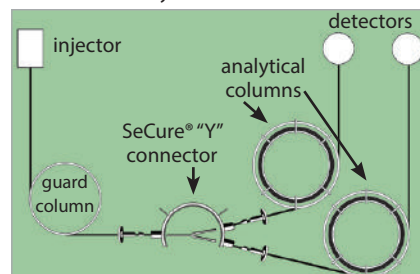
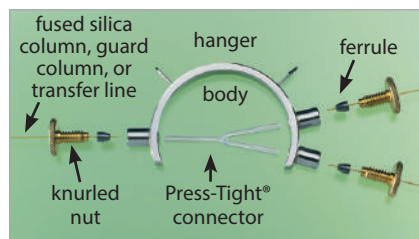
### SeCure® “Y” Connector Kits

- Connect two analytical columns to a transfer line or guard column.
- Use standard “Y” Press-Tight® connectors and 1/16" graphite ferrules.
- Reliable seal integrity—will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- Fit both Restek® cage designs.

Combine the simplicity of a “Y” Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400 °C.

The SeCure® “Y” connector’s open design allows visual confirmation of the seal.

Dual-column confirmational analysis with a single injection—one of the SeCure® “Y” connector’s many uses.



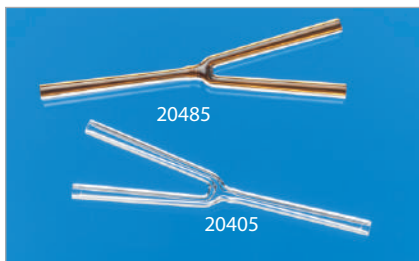
Kits include: SeCure® “Y” connector body, three knurled nuts, universal “Y” Press-Tight® union, three ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#
SeCure “Y” Connector Kit	0.18/0.25/0.28 mm	kit	20276
SeCure “Y” Connector Kit	0.32 mm	kit	20277
SeCure “Y” Connector Kit	0.45/0.53 mm	kit	20278
Knurled Nut		3-pk.	20279

### Universal “Y” Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek® 0.1–0.53 mm ID).



Description	ea.	3-pk.
Universal “Y” Press-Tight Connector	20405	20406
Universal “Y” Press-Tight Connector, Deactivated	20405-261	20406-261
Universal “Y” Press-Tight Connector, Siltek Deactivated	20485	20486

### Graphite Ferrules for SeCure® “Y” Connectors

- Preconditioned to minimize out-gassing.
- High-purity, high-density graphite.
- Stable to 450 °C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.



Ferrule ID	Fits Column ID	Graphite 10-pk.	Graphite 50-pk.
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	20200	20227
0.5 mm	0.32 mm	20201	20228

## MXT®-Union Connector Kits for Connecting Metal and/or Fused Silica GC Columns

- Low dead volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 350 °C.
- Available in union and “Y” configurations.
- Can also be used for connecting fused silica to metal.

These MXT® connectors can be used with fused silica tubing because of a Valcon polyimide, 1/32-inch, one-piece fused silica adaptor. This unique graphite-reinforced composite allows a capillary column to slide into the adaptor and be locked in place simply by loosening and tightening the fitting.



### MXT®-Union Connector Kits

for Connecting Metal and/or Fused Silica GC Columns

Each kit contains the MXT® union; two 1/32-inch nuts; and two, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Fused Silica Columns	kit	21386
For 0.32 mm ID Fused Silica Columns	kit	21385
For 0.53 mm ID Fused Silica Columns	kit	21384



### MXT® “Y”-Union Connector Kits

for Connecting Metal and/or Fused Silica GC Columns

Each kit contains the MXT® union; three 1/32-inch nuts; and three, one-piece, fused silica adaptors.

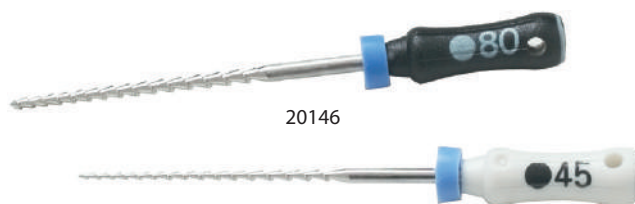
Description	qty.	cat.#
For 0.25 mm ID Columns	kit	21389
For 0.32 mm ID Columns	kit	21388
For 0.53 mm ID Columns	kit	21387



### 1/32-Inch Valco® Adaptor Ferrules (Valcon Polyimide)

Fused silica adaptor ferrules are made from Valcon polyimide, a unique, graphite-reinforced composite specially prepared to maximize mechanical stability at temperatures up to 350 °C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

Tubing OD	Tubing ID	Valco #	qty.	cat.#
0.25–0.40 mm	0.25 mm	FS.4-5	5-pk.	20137
0.40–0.50 mm	0.32 mm	FS.5-5	5-pk.	20140
0.50–0.80 mm	0.53 mm	ZF.5V-5	5-pk.	20141
1/32" Replacement Nut			5-pk.	20389



### Ferrule Removal Kit

The tapered tools in this kit have teeth designed to grip and remove fused silica adaptor ferrules that have become stuck in the fitting detail. Each kit has two tools: one for removing 1/32-inch adaptor ferrules and one for removing 1/16-inch adaptor ferrules.

Description	Valco #	qty.	cat.#
Ferrule Removal Kit	FRK1	kit	20146

### tech tip

#### Coupling GC Columns

An MXT® connector is a good alternative to a glass connector when coupling GC columns. This connector is constructed from stainless steel and will not break; it uses ferrules for sealing. The design ensures low dead volume, and Siltek® treatment ensures the MXT® connector is inert; both features help minimize peak tailing. MXT® connectors can be used to connect metal-to-metal, metal-to-fused silica, or fused silica-to-fused silica tubing. When connecting metal tubing, use 1/32-inch stainless steel ferrules (see page 232); for fused silica tubing, use Valcon polyimide adaptor ferrules (see above).



## Connectors

### MXT® Low Dead Volume Connector Kits For Metal Columns

These low dead volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns. They can be used at temperatures up to 430 °C without degrading the deactivated layer. Purchase the appropriate ferrules for connecting 0.28, 0.32, or 0.53 mm ID tubing.



### MXT® Low Dead Volume Connector Kits

for Metal Columns

- Connect a guard column/transfer line to an MXT® stainless steel column.
- Low thermal mass tracks rapid oven temperature programming.
- Stainless steel ferrules and nuts.
- Available in “Y” and union configurations.
- Siltek® treatment ensures ultimate inertness.

Each kit contains the MXT® union, two 1/32-inch ferrules and nuts.

Description	qty.	cat.#
For 0.28 mm ID MXT Columns	kit	20397
For 0.32 mm ID MXT Columns	kit	20536
For 0.53 mm ID MXT Columns	kit	20394



### MXT® Low Dead Volume “Y” Connector Kits

for Metal Columns

Connect two MXT® columns to one inlet or one MXT® column to two detectors.

Each kit contains the MXT® union, three 1/32-inch ferrules and nuts.

Description	qty.	cat.#
For 0.28 mm ID MXT Columns	kit	20396
For 0.32 mm ID MXT Columns	kit	20537
For 0.53 mm ID MXT Columns	kit	20395

### Replacement Ferrules

(1/32-Inch Stainless Steel) for MXT® Connectors



Ferrule ID	Fits Column ID	qty.	cat.#
0.59 mm	0.28 mm	10-pk.	20398
0.53 mm	0.32 mm	10-pk.	20535
0.79 mm	0.53 mm	10-pk.	20399



### 1/4-Inch–3/16-Inch Open-End Wrenches

High-quality miniature wrenches to use with MXT® low-dead-volume connectors.

Description	qty.	cat.#
1/4"-3/16" Open-End Wrenches	2-piece set	20388



## MXT® Capillary Columns

### Ideal for High Temperature GC Analysis

- Metal tubing won't become brittle at high temperatures (430 °C).
- Exclusive Siltek® layer makes the internal surface as inert as deactivated fused silica.
- Can be tightly coiled well under 4.5" without breaking, even under stress.
- Column efficiency (Trennzahl valve) is similar to that of fused silica.

See pages 104–115.

[www.restek.com/mxt](http://www.restek.com/mxt)





20147

### Zero Dead Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. Made of 300-series stainless steel. For use with 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#
Internal Union	0.15 mm	ZU1XC	ea.	20147
Internal Union	0.25 mm	ZU1C	ea.	20148
Internal Union	0.75 mm	ZU1	ea.	20149
Internal Union	1/16"	ZU1T	ea.	20150



20159



20158

### Male Pipe to Valco® Internal Adapter (Stainless Steel)

Makes a minimum volume connection from a female pipe fitting on a pressure gauge or regulator to a Valco® zero-dead-volume fitting. Made of 300 series stainless steel; stainless steel ferrules included.

Description	Fitting Size	Bore	Valco #	qty.	cat.#
Male Pipe to Valco Internal Adapter	1/8" NPT Male to 1/16" ZDV	1.0 mm	PZA21	ea.	20158
Male Pipe to Valco Internal Adapter	1/4" NPT Male to 1/16" ZDV	1.0 mm	PZA41	ea.	20159



20286

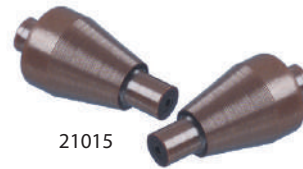


20287

### Nuts & Ferrules

(1/16-Inch Stainless Steel) for Valco® Connectors

Description	Valco #	qty.	cat.#
Ferrules, 1/16" Stainless Steel	ZF1-10	10-pk.	20286
Nuts, 1/16" Stainless Steel	ZN1-10	10-pk.	20287



21015

### 1/16-Inch Valco® Adaptor Ferrules

Fused silica adaptor ferrules are made from Valcon polyimide, a unique, graphite-reinforced composite specially prepared to maximize mechanical stability at temperatures up to 350 °C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

Tubing OD	Valcon Polyimide			Virgin Polyimide		
	Valco #	qty.	cat.#	Valco #	qty.	cat.#
0.30±0.40 mm	FS1.4-5	5-pk.	20142	FS1.4V1-5	2-pk.	21015
0.40±0.50 mm	FS1.5-5	5-pk.	20143	FS1.5V1-5	2-pk.	21016
0.50±0.80 mm	FS1.8-5	5-pk.	20144	—	—	—
0.80±0.90 mm	FS1.9-5	5-pk.	20145	—	—	—



## WORLD-CLASS SERVICE & LOCAL CONNECTIONS

### UNITED STATES:

[www.restek.com](http://www.restek.com)

#### Customer Service

Phone: 1-800-356-1688 or 1-814-353-1300, ext. 3

E-mail: [csreps@restek.com](mailto:csreps@restek.com)

#### Technical Service

Phone: 1-800-356-1688 or 1-814-353-1300, ext. 4

E-mail: [support@restek.com](mailto:support@restek.com)

#### Sales

Phone: 1-800-356-1688 or 1-814-353-1300, ext. 3

E-mail: [salesreps@restek.com](mailto:salesreps@restek.com)

Or visit [www.restek.com/USsales](http://www.restek.com/USsales) to find the sales representative for your region.

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Web: [www.restekchina.com](http://www.restekchina.com)

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#### International Technical Service

E-mail: [intltechsupp@restek.com](mailto:intltechsupp@restek.com)

**FIND A LOCAL DISTRIBUTOR** [www.restek.com/distributor](http://www.restek.com/distributor)



22241

**Viton® O-Rings** for Agilent GCs

Fit split (6.3 mm OD) or splitless (6.5 mm OD) liners.

Description	Max Temp	Similar to Agilent Part #	10-pk. cat.#	50-pk. cat.#
Viton O-Rings for Agilent GCs	300 °C	5188-5365	22241	22242



22684

**Liner Seals** for CIS4 and PTV

Description	Max Temp	Similar to Agilent Part #	Similar to Gerstel Part #	qty.	cat.#
Liner Seals for CIS4 and PTV	450 °C	5182-9749	007541-005-00	5-pk.	22684



20296

**Graphite O-Rings** for Agilent and Bruker/Varian 1177 Injectors

Excellent thermal stability at injection port temperatures up to 450 °C!

Description	Max Temp	Similar to Agilent Part #	10-pk. cat.#	50-pk. cat.#
6.35 mm ID Graphite O-Rings for split liners	450 °C	5180-4168	20296	20297
6.5 mm ID Graphite O-Rings for splitless liners	450 °C	5180-4173	20298	20299



22352

22349

21409

Inlet Adaptor

**PTV Inlet Adaptor Kit** for Gerstel CIS 3 and CIS 4 PTV Inlets

- Meets original manufacturer's performance.
- Includes inlet adaptor, silver PTV seal, and slotted capillary nut.

Description	Similar to Gerstel Part #	qty.	cat.#
PTV Inlet Adaptor Kit for 0.25 and 0.32 mm ID Columns	007259-045-00	kit	22350
Silver PTV Seals	002841-005-00	5-pk.	21409
PTV Slotted Capillary Column Nut	001268-005-00	2-pk.	22349
Liner Seal Pre-Seal Tool	007542-000-00	ea.	22352



22336

**Replacement Viton® O-Rings** for use with the Agilent Flip Top Inlet Sealing System

Description	Similar to Agilent Part #	qty.	cat.#
Viton Replacement O-Rings for use with the Agilent Flip Top Inlet Sealing System	5188-5366	10-pk.	22336



22223

**GRAPHPACK® 2M Ferrules** for Gerstel CIS 3 and CIS 4 PTV Inlets

Fits Column ID	Similar to Gerstel Part #	qty.	cat.#
0.25 mm	001805-040-00	10-pk.	22223
0.32 mm	001805-045-00	10-pk.	22224
0.53 mm	001805-007-00	10-pk.	22225



21409

**Silver PTV Seals** for Agilent 6890 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409

### Merlin Microseal Septa for Agilent GCs

- Allow operation from 3 to 100 psi (general-purpose Microseal septa) or 1 to 45 psi (low-pressure Microseal septa).
- 400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring; longer life; and consistent, low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. No adapter is required for the Agilent inlet. Installation is simple, requiring no modification of the injection port.

Description	Merlin #	Similar to Agilent Part #	qty.	cat.#
<b>General Purpose Kit for Agilent GCs (3 to 100 psi)</b>				
Nut & 2 General Purpose (#410) Microseals	404	5181-8833	kit	22810
Nut & 1 General Purpose (#410) Microseal	405	5182-3442	kit	22811
<b>Low Pressure Kit for Agilent GCs (1 to 45 psi)</b>				
Nut & 2 Low Pressure (#310) Microseals	304		kit	22813
Nut & 1 Low Pressure (#310) Microseal	305	5181-8816	kit	22814
<b>Replacement Microseals</b>				
General-Purpose Microseal (most applications, 3 to 100 psi)	410	5182-3444	ea.	22812
Low-Pressure Microseal (1 to 45 psi)	310	5181-8815	ea.	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W		ea.	22782
Replacement Microseal Nut	403	5182-3445	ea.	22809

Note: Merlin Microseal septa require a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Compatible syringes and replacement needles are available at [www.restek.com](http://www.restek.com).



### Merlin MicroShot™ Injector

- NIST traceability assures accurate injections.
- Fixed volume reduces sampling error.
- Saves time—no need to transfer to autosampler vials.
- Prevents bent syringe plungers.
- Five injection volumes available.\*

Increase the accuracy and reproducibility of manual injections with the Merlin MicroShot™ injector. This new injector is calibrated to NIST reference standards to assure accurate and traceable displacement. Precise repeated injections of the preset volume can be made using a standard autosampler syringe with less variation than when injecting by hand. The trigger mechanism provides rapid sample delivery, which reduces needle residence time in the injection port and minimizes potential sample discrimination.

The Merlin MicroShot™ injector allows convenient sampling from a wide variety of containers, so you can save time by eliminating the need to transfer aliquots into autosampler vials. The design of this unit also includes a plunger support, which protects the syringe plunger and prevents it from bending.

Fits Agilent-style (ball-end plunger) autosampler syringes with either fixed or removable, 23- or 26-gauge needles.

Description	Merlin cat.#	qty.	cat.#
0.1 µL injection volume	701-01	ea.	22226
0.2 µL injection volume	701-02	ea.	22227
0.5 µL injection volume	701-05	ea.	22228
1.0 µL injection volume	701-10	ea.	22229
2.0 µL injection volume	701-20	ea.	22230

\*Syringe not included. Requires Agilent style (ball-end plunger) autosampler syringes.



22226





Thermolite® Septa



Premium Non-Stick BTO® Septa



21309

**Septa for Agilent GCs**

- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs.

Septum Diameter	50-pk. cat.#	100-pk. cat.#
<b>Thermolite Septa (usable to 340 °C inlet temp.)</b>		
5 mm (3/16")	27121	27122
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143

<b>Premium Non-Stick BTO Septa (usable to 400 °C inlet temp.*)</b>		
5 mm CenterGuide	27082	27083
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091

\*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

**HANDY septum size chart**

Agilent Instrument	Septum Diameter (mm)
5880A, 5890, 6890, 6850, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5

**Septum Nuts** for use with Agilent 5890/6890/6850/7890 Split/Splitless Injectors

- Needle guide allows easy penetration and prevents septum coring.
- Manual injection septum nut allows use of 26-gauge needles for on-column injections.
- Made of high-quality stainless steel.

Description	Similar to Agilent Part #	qty.	cat.#
Septum Nut, Autosampler & PTV (for 23-gauge needles)	18740-60835	ea.	20631
Septum Nut, Manual Injection (for 26-gauge needles)	18740-60835	ea.	21309

**Septum Nut Removal Tool** for Agilent 5890/6850/6890/7890 GCs

- Easily remove the septum nut without touching the heated nut—no more burned fingers!
- Unique, ergonomic handle—easy to grip.
- Nut remains in tool for quick reattachment.



24918

**Septum Puller**

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory for other uses, too.



Dislodge a stuck ferrule quickly and easily—without scoring the fitting.



Remove a septum without damaging an expensive weldment.



20117



Slip tool over septum nut...



loosen nut...



and remove, avoiding hot metal surfaces.

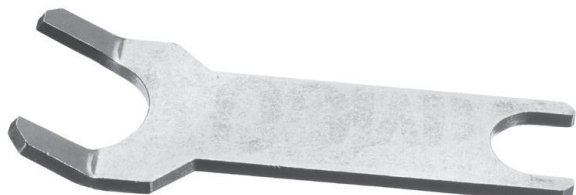


Septum nut remains in tool until reinstalled.

Description	qty.	cat.#
Septum Puller	ea.	20117

Description	qty.	cat.#
Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs	ea.	24918





22065

**Inlet Wrench** for Agilent 5890/6850/6890 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

Description	Similar to Agilent Part #	qty.	cat.#
Inlet Wrench for Agilent 5890/6850/6890 GCs	19251-00100	ea.	22065

**Rethreading Tool** for Agilent Split/Splitless Injection Ports

Worn and damaged threads can allow oxygen into the system—compromising analytical results and destroying columns. The built-in guide helps prevent cross-threading.



23018



**Repair damaged injection port threads!**

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool	ea.	23018



21393

**Injection Port Repair Tool** for Agilent Split/Splitless Injection Ports

- Remove contaminants, achieve a better seal.
- Cleans critical inlet seal areas.

Description	qty.	cat.#
Injection Port Repair Tool for Agilent Split/Splitless Injection Ports (includes: a handle and brush adaptor, 5 medium sanding disks, 5 fine sanding disks, a 6.5 mm bore brush, & a 7 mm bore brush)	ea.	21393
Replacement Sanding Disks (5 fine & 5 medium)	10-pk.	22689
Replacement Bore Brushes (one 6.5 mm & one 7 mm)	2-pk.	21353



22181

**Inlet Maintenance Kit** for Agilent GCs

- Includes the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

**Inlet kit includes:**

- 0.4, 0.5, and 0.8 mm ID graphite ferrules
- Viton® O-rings
- Capillary nuts
- Inlet seals
- Reducing nut
- Scoring wafer
- 11 mm Thermolite® septa
- 4.0 mm single taper liner
- 4.0 mm split liner with wool
- Capillary column caps
- 1/4" x 5/16" wrench
- Septum puller
- Installation gauge
- Wire cleaning brush
- Jet reamers/ferrule removers
- Inlet liner removal tool
- Septa nut removal tool

Description	qty.	cat.#
Inlet Maintenance Kit	kit	22181



Stainless Steel



Brass



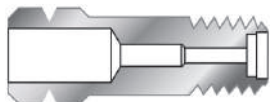
Capillary Column Nut

Reducing Nut



### Capillary Column Nuts for Agilent 5890/6850/6890/7890 GCs

Available in brass or stainless steel.



Choose for use with "compact" Agilent-style ferrules...



or for use with standard ferrules.

Description	Similar to Agilent Part #	qty.	cat.#
<b>For use with "compact" Agilent-style ferrules.</b>			
Stainless Steel Capillary Column Nut	5181-8830	2-pk.	21884
Brass Capillary Column Nut	5181-8830	2-pk.	21878
<b>For use with standard 1/16"-type ferrules.*</b>			
Stainless Steel Capillary Column Nut	05921-21170	2-pk.	20883
Brass Capillary Column Nut	05921-21170	2-pk.	21879

\*Designed to fit a wider variety of 1/16" ferrules

### Extended Capillary Column Nuts

for Agilent 5890/6850/6890/7890 GCs

- Visible below inlet insulating cup for easy, breakage-free column installation without removing cup.
- Finger-tight design to allow wrench-free use.
- Available for standard (1/16") and compact (Agilent-style) ferrules.
- Made from high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.

Description	qty.	cat.#
Extended Capillary Column Nut Kit for standard 1/16" ferrules Includes: extended reducing nut and extended capillary column nut for standard 1/16" ferrules	kit	22633
Extended Capillary Column Nut Kit for compact ferrules Includes: extended reducing nut and extended capillary column nut for compact ferrules	kit	22634
Extended Reducing Nut	ea.	22635
Extended Capillary Column Nut for standard 1/16" ferrules	ea.	22636
Extended Capillary Column Nut for compact ferrules	ea.	22637

### free literature

GC Column Installation Made Easier with Extended Reducing Nuts for the Agilent® Split/Splitless Inlet

Download your free copy from

[www.restek.com](http://www.restek.com)

lit. cat.# GNAR2056-UNV



Sky®  
Inlet Liners

## True Blue Performance

Exceptionally inert Sky® inlet liners with state-of-the-art deactivation improve trace-level analysis—and now come with a 100% satisfaction guarantee!\*

See pages 193-202 or visit [www.restek.com/sky](http://www.restek.com/sky)

\* For details on our 100% satisfaction guarantee, visit [www.restek.com/sky](http://www.restek.com/sky)

### Hot Swap Capillary Column Nuts

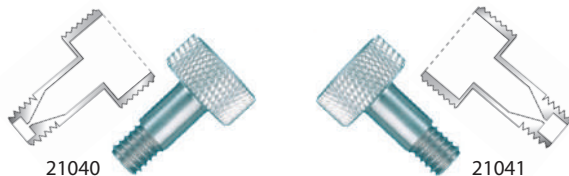
- No more burned fingers!
- No more downtime waiting for injector parts to cool down.

Never worry again about burned fingers or having to wait for the injector to cool down. The Hot Swap capillary column nut allows you to change your capillary column while the injector temp is still hot.



Description	qty.	cat.#
<b>For use with "compact" Agilent-style ferrules.</b>		
Hot Swap Capillary Column Nut	ea.	22348
<b>For use with standard 1/16"-type ferrules.</b>		
Hot Swap Capillary Column Nut	ea.	22347

NOTE: For proper operation, oven fan must be kept operational during change out or risk of burn may occur.



### Finger-Tight Capillary Column Nuts

- Allow wrench-free column installations.
- Available for standard (1/16") and compact (Agilent-style) ferrules.
- Made from high-quality stainless steel.

Description	Similar to Agilent Part #	qty.	cat.#
<b>For use with "compact" Agilent-style ferrules.</b>			
Finger-Tight Capillary Column Nuts	5020-8293, 5020-8292	2-pk.	21040
<b>For use with standard 1/16"-type ferrules.</b>			
Finger-Tight Capillary Column Nuts		2-pk.	21041

### Injector/Detector Plug Nuts

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.



Description	Similar to Agilent Part#	qty.	cat.#
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883



**Easily seat ferrules for consistent installations!**

### Capillary Installation Gauge for Agilent GCs

- Seats graphite\* ferrules onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399

\*For use with graphite ferrules only.

**RESTEK**<sup>®</sup>  
Pure Chromatography



Restek  
Recommends!



Patented



22083

22085

**Dual Vespel® Ring Inlet Seals** Washerless, Leak-Tight Seals for Agilent GCs

- Does not require a separate washer.
- Requires less torque to seal.
- Does not require retightening of reducing nut after several oven cycles.
- Extends column lifetime by preventing oxygen from reaching the column.
- Same price as the regular inlet seals with washers.
- Siltek® treatment provides enhanced inertness versus stainless steel.



Vespel® ring seal on top and bottom surfaces!

Extend column lifetime!



21238

21240

21248

0.8 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#	50-pk. cat.#
Gold-Plated	21240	21241	23418
Siltek-Treated	21242	21243	23419
Stainless Steel	21238	21239	23420

1.2 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	21246	21247
Siltek-Treated	21248	21249
Stainless Steel	21244	21245

**Dual Vespel® Ring Cross-Disk Inlet Seals** for Agilent GCs

- Ideal for high-flow split applications >500 mL/min.
- Washerless, leak-tight seals.

0.8 mm ID Dual Vespel Ring Cross-Disk Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	22083	22084
Siltek-Treated	22085	22086

Restek innovation!



Patented



1/16" Adaptor Fitting

**Flip Seal® Dual Vespel® Ring Inlet Seals**

- Reversible, two-sided design allows significantly more analyses than other seals, at the same price—simply use, flip, then use again!
- Vespel® ring embedded in top and bottom surface eliminates need for a washer.
- Highly inert gold or Siltek®-deactivated seals reduce breakdown and adsorption of active compounds, maximizing component transfer to GC column.
- Very little torque required to make seal—reduces operator variability.

Flip Seal Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	23411	23413
Siltek-Deactivated	23412	23414

Flip Seal Dual Vespel Ring Inlet Seal Kit	qty.	cat.#
Includes: gold-plated inlet seal, reducing nut adaptor, 1/16" SS nut	kit	23406

Note: The Flip Seal® inlet seal requires a special reducing nut adaptor fitting, which is included in the kit. The Flip Seal® Adaptor can be used with standard 1/16" ferrules.



## Replacement Inlet Seals With Washers

- Siltek® treatment provides enhanced inertness versus stainless steel.
- All seals include washers.

### Replacement Inlet Seals for Agilent GCs

The inlet seal at the base of the Agilent 5890/6890/7890 GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

To reduce breakdown and adsorption of active compounds, use Siltek® or gold-plated seals.

Single-Column 0.8 mm ID (Opening)	Similar to Agilent Part #	2-pk. cat.#	10-pk. cat.#	50-pk. cat.#
Gold-Plated	5188-5367	21317	21318	23415
Siltek-Treated		21319	21320	23416
Stainless Steel	18740-20880	21315	21316	23417

0.25/0.32 mm ID Dual-Column 1.2 mm ID (Opening)	2-pk. cat.#	10-pk. cat.#
Gold-Plated	21305	21306
Siltek-Treated	21307	21308
Stainless Steel	20390	20391

0.53 mm ID Dual-Column 1/16-inch ID (Opening)	2-pk. cat.#	10-pk. cat.#
Stainless Steel	20392	20393



Note: The 1.2 mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.

All seals include washers.

## Replacement Inlet Seal Washers

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Inlet Seal Washers	5061-5869	15-pk.	21710

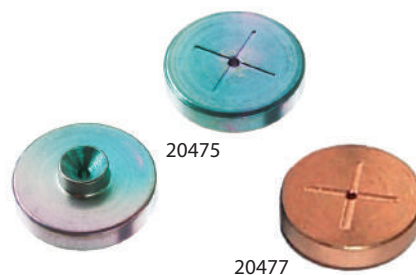
### Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications >500 mL/min on Agilent 5890 GCs.
- Siltek® treatment provides enhanced inertness versus stainless steel.
- All seals include washers.

0.8 mm ID Cross-Disk Inlet Seal	Similar to Agilent Part #	2-pk. cat.#	10-pk. cat.#
Gold-Plated	5182-9652	20477	20476
Siltek-Treated	—	20475	20474

1.2 mm ID Cross-Disk Inlet Seal	Similar to Agilent Part #	2-pk. cat.#	10-pk. cat.#
Gold-Plated	—	21009	21010
Siltek-Treated	—	21011	21012



### Silver PTV Seals for Agilent 6890 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409



## Restek innovation!



Simply slip the weldment removal tool over the weldment, then twist and remove the weldment. For speed and efficiency, the weldment stays secured in the weldment removal tool until you reattach it.

## EZ Twist Top® Split/Splitless Injection Ports for Agilent GCs

- Change inlet liners faster and more easily.
- Gas lines are attached to shell weldment bottom to help eliminate broken gas lines.
- Gas lines don't interfere with routine maintenance.
- Weldment removal tool allows for quick removal of the hot weldment without fingers ever touching hot surfaces.
- Weldment stays secure in the tool for reattachment.

The importance of injection port maintenance has been well documented by instrument and column companies industry wide. Restek has made it easy to carry out this maintenance with the innovation of our EZ Twist Top® injection port.

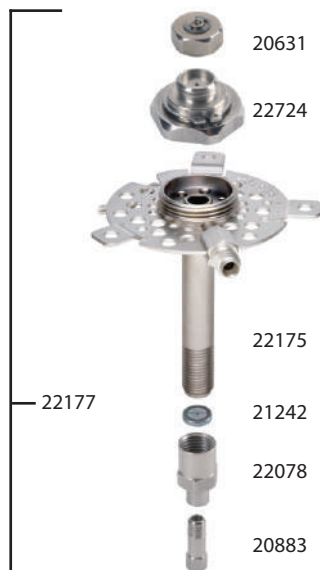
Get the EZ Twist Top Advantage	Restek EZ Twist Top	Agilent Flip Top
Eliminate damaged gas lines	x	
Siltek deactivation for enhanced inertness & durability	x	
Avoid touching hot metal surfaces—weldment tool included	x	



## EZ Twist Top® Split/Splitless Injection Port for Agilent 7890 GCs

Description	qty.	cat.#
<b>Injection Port Assembly Kit</b> Includes: weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22177
<b>Injection Port Assembly Kit, Siltek Treated</b> Includes: Siltek weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22178
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22175
Shell Weldment, Siltek Treated	ea.	22176
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk.	21242
	10-pk.	21243
Weldment Removal Tool	ea.	22728

Visit [www.restek.com/slideshows](http://www.restek.com/slideshows) for an educational video on our EZ Twist Top® injection port system.



## tech tip

## Which EZ Twist Top® injection port should you buy?

The type of split vent trap you have connected to the EPC module/block on your 6890/6850 Agilent GC determines which EZ Twist Top® Injection Port you need to buy.

Simply remove the top and rear panel on the GC and see if you have the small (pencil type) split vent filter (cat.# 22820) or the large canister type filter (cat.# 23031) attached to the split vent gas line. If you have the small (pencil type) split vent filter, you need the EZ Twist Top® injection port for Agilent 6890/6850 GCs (cat.# 22721 or 22722). If you have the large canister filter, you'll need the EZ Twist Top® with optional split vent for Agilent 6890/6850 GCs, for use with large canister type filters (cat.# 22725 or 22726).

## EZ Twist Top® Split/Splitless Injection Port

for Agilent 6850/6890 GCs With Large Canister-Type Filter

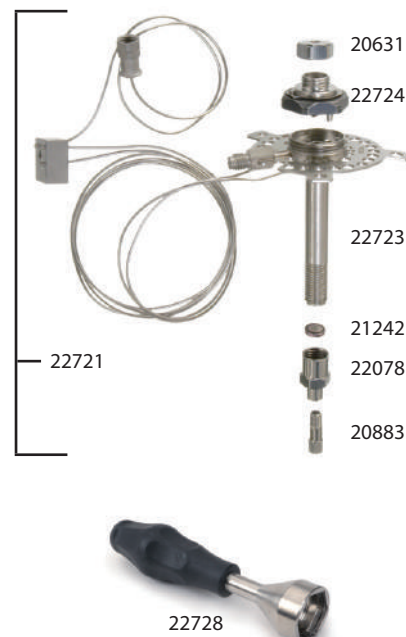
Description	qty.	cat.#
<b>Injection Port Assembly Kit</b>		
Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22735
<b>Injection Port Assembly Kit, Siltek Treated</b>		
Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22736
Optional Split/Splitless Shell Weldment	ea.	22733
Optional Split/Splitless Shell Weldment, Siltek Treated	ea.	22734



## EZ Twist Top® Split/Splitless Injection Port

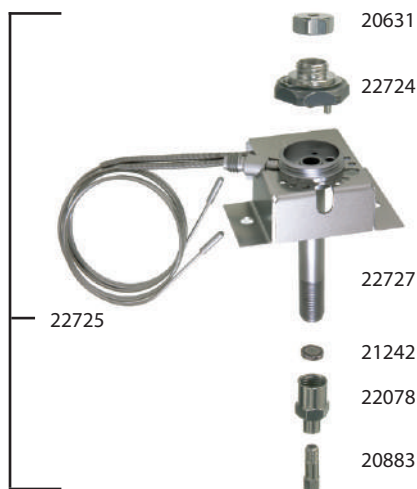
for Agilent 6850/6890 GCs with Pencil Traps

Description	qty.	cat.#
<b>Injection Port Assembly Kit</b>		
Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22721
<b>Injection Port Assembly Kit, Siltek Treated</b>		
Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22722
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22723
Shell Weldment, Siltek Treated	ea.	22730
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk.	21242
	10-pk.	21243
Weldment Removal Tool	ea.	22728



## EZ Twist Top® Split/Splitless Injection Port for Agilent 5890 GCs

Description	qty.	cat.#
<b>Injection Port Assembly Kit</b>		
Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22725
<b>Injection Port Assembly Kit, Siltek Treated</b>		
Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22726
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22727
Shell Weldment, Siltek Treated	ea.	22731
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk.	21242
	10-pk.	21243
Weldment Removal Tool	ea.	22728





**Split/Splitless Injection Ports for Agilent GCs**

Would you like better performance from your injector? Our Siltek®-treated split/splitless injector is a direct replacement for Agilent 5890 and 6890/6850 GCs, but Siltek® treatment passivates the metal surface to ensure an inert pathway for the sample, delivering increased performance. The injector is manufactured from high-quality stainless steel and meets or exceeds Agilent original equipment performance.



20265



20266

**Split/Splitless Injection Port**

(Direct Replacement or Siltek® Treated) for Agilent 5890 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Weldment*	19251-60575	ea.	20265
Replacement Weldment*, Siltek Treated	19251-60575	ea.	20267
Replacement Shell Weldment	19251-80570	ea.	20266
Replacement Shell Weldment, Siltek Treated	19251-80570	ea.	20268

\*Cat.# 20265 and 20267 are for use with manual flow or EPC on Agilent 5890 GCs. For use with manual flow only on Agilent 6890/6850 GCs.



22674



22686



20265



22673

**Split/Splitless Injection Port**

(Direct Replacement or Siltek® Treated) for Agilent 6890/6850 GCs

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Weldment with EPC	G1544-60575	ea.	22674
Replacement Weldment with EPC, Siltek Treated	G1544-60575	ea.	22672
Replacement Weldment*	19251-60575	ea.	20265
Replacement Weldment*, Siltek Treated	19251-60575	ea.	20267
Replacement Shell Weldment	G1544-80570	ea.	22673
Replacement Shell Weldment, Siltek Treated	G1544-80570	ea.	22671
Split/Splitless Weldment (for use with large canister-type filter)	G1544-60585	ea.	22686
Split/Splitless Weldment (for use with large canister-type filter), Siltek Treated	G1544-60585	ea.	22670

\*Cat.# 20265 and 20267 are for use with manual flow or EPC on Agilent 5890 GCs. For use with manual flow only on Agilent 6890/6850 GCs

**Injection Port Weldments for Agilent GCs for Use With Purge and Trap Systems**

Easily attach your purge-and-trap with pre-installed low dead volume fittings.



22664

**Injection Port Weldments**

for Agilent GCs with Tekmar Purge and Trap Systems

Description	qty.	cat.#
Weldment for Agilent 6890 GCs	ea.	22664
Weldment for Agilent 6890 GCs with large canister-type filter	ea.	22668
Weldment for Agilent 5890 GCs	ea.	22666



22665

**Injection Port Weldments**

for Agilent GCs with OI Purge and Trap Systems

Description	qty.	cat.#
Weldment for Agilent 6890 GCs	ea.	22665
Weldment for Agilent 6890 GCs with large canister-type filter	ea.	22669
Weldment for Agilent 5890 GCs	ea.	22667





27184

**1/16-Inch Capillary Inlet Adaptor Fitting Kit**

Split/Splitless Fitting for Capillary Columns

- 1/16-inch split/splitless fitting that accepts standard capillary ferrules.
- Easier to install capillary columns because the nut protrudes farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, capillary nut, gold-plated 0.8 mm ID dual Vespel® ring inlet seal, and one 0.4 mm ID ferrule.

Description	qty.	cat.#
1/16-Inch Capillary Inlet Adaptor Fitting Kit	kit	27184
0.8 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21240
	10-pk.	21241

**Direct Replacement Reducing Nut**

for Agilent 5890/6850/6890/7890 GCs

- Made from high-quality stainless steel.
- Meets original manufacturer's equipment performance.



22078

Description	Similar to		
	Agilent Part #	qty.	cat.#
Reducing Nut	18740-20800	ea.	22078



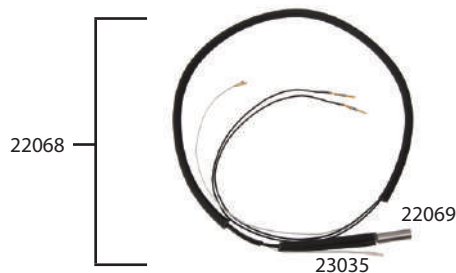
24323

**EPC Test Kit for Agilent 6890 GCs**

Kit includes three O-rings, two plugs, one mounting screw, and one test block.

Description	Similar to		
	Agilent Part #	qty.	cat.#
EPC Test Kit for Agilent 6890 GCs	G1530-60960*	kit	24323

\*Similar to Agilent part # G1530-60960, but not exact equivalent. Kits differ in parts.

**Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs**

- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to		
	Agilent Part #	qty.	cat.#
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	kit	22068
Injector/FID Heater	19231-60620	ea.	22069
Injector/FID PRT Sensor	19231-60660	ea.	23035

**Heat Sink**

for Agilent 5890 GC Split/Splitless Injector

Meets or exceeds original manufacturer's performance.



20409

Description	Similar to		
	Agilent Part #	qty.	cat.#
Heat Sink	18740-20940	ea.	20409

**Heater Block**

for Agilent 6850/6890/7890 GC Split/Splitless Injector

Meets or exceeds original manufacturer's performance.



27199

Description	Similar to		
	Agilent Part #	qty.	cat.#
Heater Block	G3452-20500, G1544-20570	ea.	27199



**Heater/Sensor Assembly** for Agilent 6850/6890/7890 GCs

- Use with FID, TCD, NPD, and split/splitless inlets.
- Meets or exceeds original manufacturer’s performance.

Description	Similar to Agilent Part #	qty.	cat.#
Heater/Sensor Assembly	G1530-61950	ea.	27200

**Heater Block Retaining Nuts** for Agilent GC Split/Splitless Injectors

- Aluminum construction.
- Meet or exceed manufacturer’s performance.



Description	Similar to Agilent Part #	qty.	cat.#
Heater Block Retaining Nut for Agilent 5890 GCs	19251-20620	ea.	22080
Heater Block Retaining Nut for Agilent 6850/6890 GCs	G1544-20590	ea.	23042



**Oven Temperature Sensor Assembly** for Agilent GCs

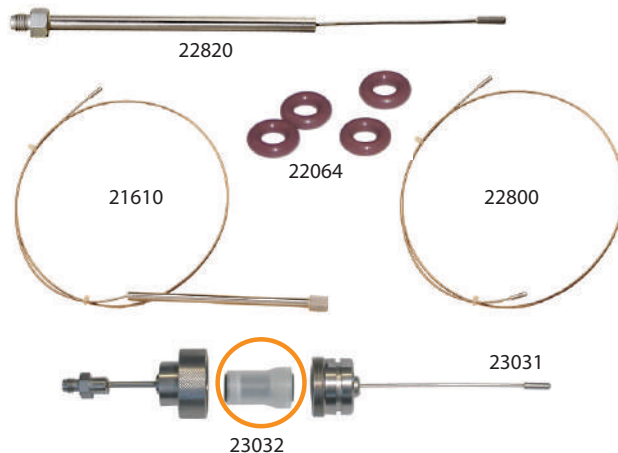
Description	Similar to Agilent Part #	qty.	cat.#
Oven Temperature Sensor for Agilent 5890 GCs	05890-61030	ea.	23040
Oven Temperature Sensor for Agilent 6890 GCs	G1530-61030	ea.	23039



**60 psig Backpressure Regulator Kit** for Agilent GCs

Increase the versatility of your Agilent 5890 GC by replacing the existing 30 psig (207 kPa) backpressure regulator and gauge with our 60 psig (414 kPa) regulator. Enables you to use longer 60 m and 105 m columns as well as shorter 10 m columns. Includes complete instructions.

Description	Similar to Agilent Part #	qty.	cat.#
Backpressure Regulator Kit	19246-60630	kit	20634



**Replacement Chemical Traps and Parts** for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer’s equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Split Vent Trap for Agilent 6850/6890 GCs	G1544-80550	ea.	22820
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610
Split Vent Line (32-inch) for Agilent GCs Includes: all installation hardware		2-pk.	22800
O-Rings for Agilent Trap Fittings	5180-4181	25-pk.	22064
Optional Split Vent Trap Assembly for Agilent 6850/6890 GCs	G1544-60610, G1544-80530	kit	23031
Replacement Traps (2) and O-Rings (4)	G1544-80530, 5188-6495	kit	23032



**Air Diverter** for Agilent GCs

- Divert GC exhaust heat up and away from the lab bench.
- Meets or exceeds original manufacturer’s performance.
- Easy to install—no tools required.
- Compatible with 4" flexible metal dryer hose.

Description	Similar to Agilent Part #	qty.	cat.#
Air Diverter for Agilent 5890/6890/7890 GCs	19247-60510, G1530-80650	ea.	22076

### Inlet Wrench for Agilent 5890/6850/6890 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.



22065

Description	Similar to Agilent Part #	qty.	cat.#
Inlet Wrench for Agilent 5890/6850/6890 GCs	19251-00100	ea.	22065

### Rethreading Tool

for Agilent Split/Splitless Injection Ports

Worn and damaged threads can allow oxygen into the system—compromising analytical results and destroying columns. The built-in guide helps prevent cross-threading.



23018

#### Repair damaged injection port threads!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.



Description	qty.	cat.#
Rethreading Tool	ea.	23018

### Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.




20181

#### No more burned fingers!



Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181






26262

#### The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.



Description	qty.	cat.#
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658



Everything you need in one complete kit!



22186

**Make Life Easier (MLE) Capillary Tool Kit for Agilent GCs**

Includes:

- Capillary installation gauge for Agilent GCs
- Injector wrench for Agilent GCs
- Septum nut removal tool
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/insert tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit for Agilent GCs	kit	22186

**Column Hanger**

for Agilent 7890, 6890, 5890, and 5880A GCs

Description	qty.	cat. #
Column Hanger for Agilent 7890, 6890, 5890, and 5880A GCs	ea.	22128



22128

**Direct Injection (DI) Inserts and Liner Adaptor for 1/4-Inch Packed Column Injection Ports (for 0.25, 0.32, & 0.53 mm ID columns)**



**DI Glass Inserts** for Agilent 5890 Packed Column GC

- Tolerances closely controlled.
- Can be removed from the septum nut weldment.

Description	Similar to Agilent Part #	qty.	cat.#
DI Glass Inserts for Agilent 5890 Packed Column GC (1.7 mm ID x 3.0 mm OD x 93 mm)	5181-3382, 5080-8732	5-pk.	20967



**DI Uniliner® Liners** for Agilent 5890 Packed Column GC

- Press-Tight® taper forms dead volume free connection to column.
- Minimizes solvent and peak tailing.
- Use with 0.25, 0.32, and 0.53 mm ID capillary columns.
- Can be removed from the septum nut weldment.

Description	Fits Same Liner Adaptor as Agilent Part #	qty.	cat.#
DI Uniliner Liner for Agilent 5890 Packed Column GC (1.7 mm ID x 3.0 mm OD x 93 mm)	5181-3382, 5080-8732	ea.	20964
		5-pk.	20965
		25-pk.	20966

**DI Liner Adaptor**

for Agilent 5890 Packed Column GC

- Uses standard 1/16-inch capillary nut and ferrules.
- Convenient wrench pad at base.
- Includes 1/4-inch graphite ferrule and stainless steel nut.
- Use with Agilent or Restek® DI glass inserts or Restek® DI Uniliner® liners for an Agilent 5890 packed column GC.



Description	Similar to Agilent Part #	qty.	cat.#
DI Liner Adaptor for Agilent 5890 Packed Column GC	19244-80540	ea.	21303

**Siltek® Septum Packed Purge Port Weldment for Agilent 5890 GCs**



Siltek® treatment makes weldment inert and eliminates adsorption of sensitive compounds (e.g., DDT and endrin). Order Viton® O-rings (cat.# 21685, below) and appropriate septa (page 236) separately.

Description	Similar to Agilent part #	qty.	cat.#
Siltek Septum Packed Purge Port Weldment for Agilent 5890 GCs	19243-80570	ea.	21691
Viton Replacement O-rings	5080-8898	10-pk.	21685



**Micropacked Inlet Conversion Kits**

- Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.
- For use with Agilent 5890, 6890, and 7890 GCs.
- Sample pathways deactivated for ultimate inertness.

Description	qty.	cat.#
<b>Micropacked Column Adaptor Kit for Split/Splitless Injection*</b> <i>Complete kit with FID and injection port adaptors</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4 mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424
<b>Micropacked Column Adaptor Kit for On-Column Injection*</b> <i>Complete kit with FID and injection port adaptors</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425
<b>Micropacked Column Adaptor Kit for Split/Splitless Injection</b> <i>Injection Port Adaptor Kit</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4 mm splitless liner, intermediate polarity deactivated	kit	22426
<b>Micropacked Column Adaptor Kit for On-Column Injection</b> <i>Injection Port Adaptor Kit</i> Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427
<b>Micropacked Column Adaptor Kit for FID*</b> <i>FID Adaptor Kit</i> Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428
<b>Replacement Inlet Seals for Micropacked Column Adaptor</b> Dual Vespel Ring Inlet Seals, large bore (2)	2-pk.	22429
<b>Replacement Metal Liner Installation Guide for On-Column Injection, Siltek Treated</b>	ea.	22430
<b>Replacement 4 mm Splitless Liner</b>	ea.	20772

\*For use with packed column FIDs only.



Large-Bore Dual Vespel® Ring Inlet Seals



1/4" SS Nut



Large-Bore FID Adaptor



1/4" Vespel®/Graphite Ferrule



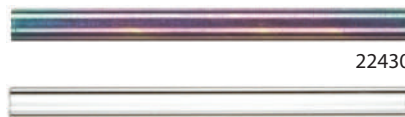
1/16" SS Nuts



Large-Bore Reducing Nut



1/16" Vespel®/Graphite Ferrules



22430



20772

## Solid Phase Extraction Cartridges from Restek

Proven Quality • Superior Cleanliness • Method-Specific Performance

See pages 396–399 or visit

[www.restek.com/resprep](http://www.restek.com/resprep)


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e-mail: sales @ chromtech.net.au



### Inlet Adaptor Kit for Dual Column Installation

for Agilent Capillary Injectors (Split/Splitless Fitting for Capillary Columns)

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2 mm ID dual Vespel® ring inlet seal, one 0.4 mm ID two-hole ferrule, and one 0.5 mm ID two-hole ferrule.

Description	qty.	cat.#
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185
1.2 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246
	10-pk.	21247



For use with 0.53 mm ID columns.

### 1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/Splitless Fitting for 0.53 mm ID Capillary Columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8 mm ID two-hole ferrule.
- Use recessed taper liners with this adaptor.

Description	qty.	cat.#
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645
0.53 mm ID Dual-Column	2-pk.	20392
1/16-inch ID (Opening) Replacement Inlet Seal	10-pk.	20393



### Two-Hole Ferrules

for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	VG2 (60/40)
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246



**Sky**  
Inlet Liners

### Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

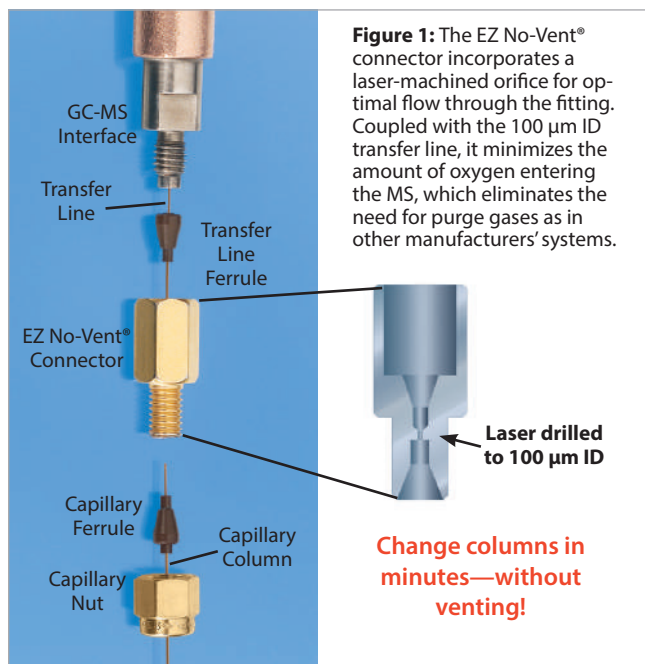
See pages 193–202 for details.

### EZ No-Vent® GC Column-Mass Spectrometer Connector

for Agilent GCs with 5971/5972, 5973, or 5975 GC-MS

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and eliminates the need to vent.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other “no-vent” fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers’ vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of down-time with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

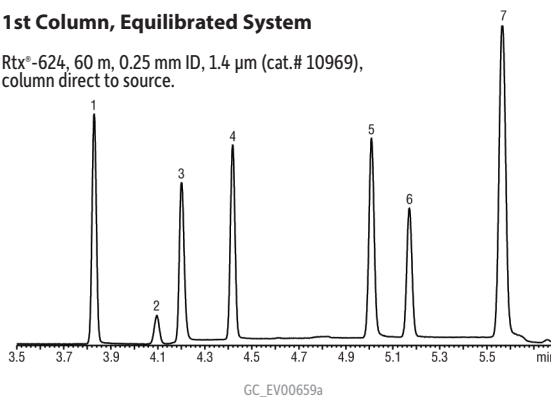


**Figure 1:** The EZ No-Vent® connector incorporates a laser-machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases as in other manufacturers’ systems.

**Figure 2:** Sharp, symmetric peaks for gases show the EZ No-Vent® connector does not add dead volume and allows rapid column changes.

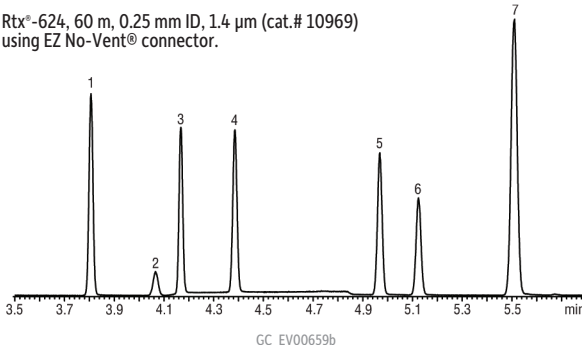
#### 1st Column, Equilibrated System

Rtx®-624, 60 m, 0.25 mm ID, 1.4 µm (cat.# 10969), column direct to source.



#### Acquired 76 Minutes After Installing 2nd Column

Rtx®-624, 60 m, 0.25 mm ID, 1.4 µm (cat.# 10969) using EZ No-Vent® connector.



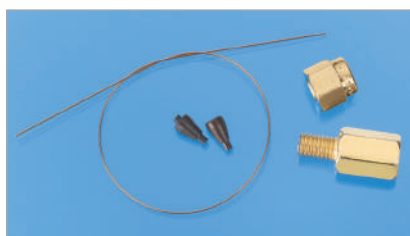
#### Peaks

1. Dichlorodifluoromethane
2. 1,2-dichlorotetrafluoroethene (Freon® 114)
3. Chloromethane
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Trichlorofluoromethane

<b>Column</b>	Rtx®-624, 60 m, 0.25 mm ID, 1.40 µm (cat.# 10969)	<b>Detector</b>	Agilent 5973 GC-MS
<b>Sample</b>	502.2 Calibration mix #1 (gases) (cat.# 30042)	<b>Transfer Line Temp.:</b>	280 °C
<b>Injection</b>	purge and trap split	<b>Analyzer Type:</b>	Quadrupole
<b>Inj. Temp.:</b>	300 °C	<b>Tune Type:</b>	BFB
<b>Oven</b>		<b>Ionization Mode:</b>	EI
<b>Oven Temp.:</b>	60 °C	<b>Scan Range:</b>	35-550 amu
<b>Carrier Gas</b>	He, constant flow	<b>Instrument</b>	Agilent/HP6890 GC
<b>Flow Rate:</b>	1.0 mL/min		

### Restek innovation!

Kit installs easily, without special tools or plumbing.

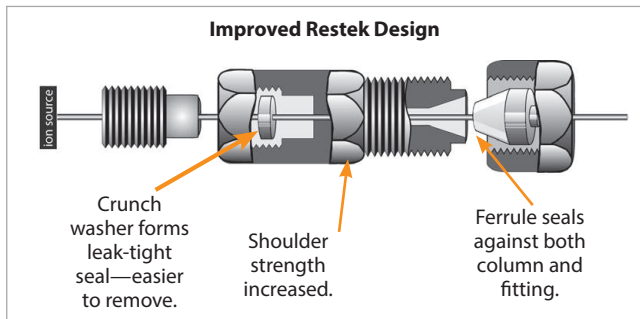
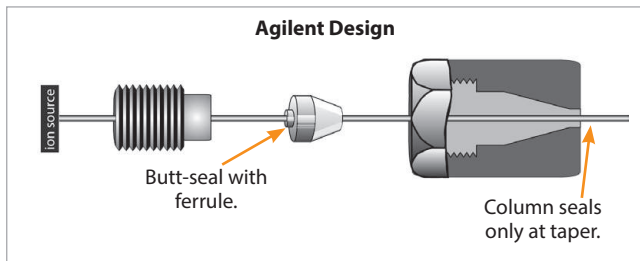


Description	qty.	cat.#
EZ No-Vent Connector Kit Includes: EZ No-Vent Connector, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft.), column plug, column nut	kit	21323
Replacement ferrules for connecting capillary column to EZ No-Vent Connector:		
0.30:0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40:0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110



### MSD Conversion Fitting

- A flat, soft aluminum sealing ring deforms and butt-seals against the MSD interface.
- A standard Vespe<sup>l</sup>® ferrule seals the column and 1/16-inch stainless steel nut.
- Fitting is constructed of nickel-plated brass for longevity and softness.
- Use any standard Vespe<sup>l</sup>® or Vespe<sup>l</sup>®/graphite 1/16-inch ferrule.
- Includes a 1/16-inch stainless steel nut and two replacement sealing rings. Order ferrules separately.
- Improved design reduces chance of leaks.



Description	qty.	cat.#
MSD Conversion Fitting	ea.	21314
Replacement Ring Seal for MSD Conversion Fitting	2-pk.	21313

### MSD Source Nut

- 1.2 mm nut bore permits easy removal of ferrules with a standard tapered-needle file (cat.# 20106).
- Made of brass to prevent thread-stripping on the transfer line.
- Design enhances ease of threading onto the transfer line and improves overall lifetime.



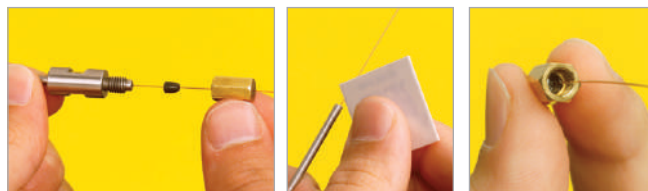
Description	Similar to		
	Agilent Part #	qty.	cat.#
(Detector) MSD Source Nut	05988-20066	2-pk.	20643

### Restek innovation!



### Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.



Install the nut and ferrule onto the column, then insert the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).

Score and remove the exposed end of the column.

Loosen the nut.

Description	Similar to		
	Agilent Part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894

### Gold Tip Transfer Line

- For use with Agilent 5971/5972 MS systems.
- Gold-plated for inertness.
- Meets or exceeds original manufacturer's performance.



Description	Similar to		
	Agilent Part #	qty.	cat.#
Gold Tip Transfer Line	05971-20305	ea.	24699

### Ion Source Cleaning Powder

Use this aluminum oxide powder to clean surfaces that contact the sample or ion beam when you encounter poor sensitivity and inadequate abundances at high masses.



Description	Similar to		
	Agilent Part #	qty.	cat.#
Ion Source Cleaning Powder	8660-0791	1 kg	22685



### Inland 45 Pump Oil

Recommended for most mass spectrometers.

- Ease at cold start.
- Low vapor pressure  $10^{-7}$  torr.
- Nontoxic and noncorrosive.
- Compatible with buna-N, neoprene, and Viton® seals.
- Optimum vacuum pump performance.
- Lowest mass spectrometer background.
- Recommended for optimum mass spec performance.



24819

Description	Similar to Agilent Part #	qty.	cat.#
Inland 45 Pump Oil	6040-0834, 6040-0798	1 liter	24819

### Rough Pump Oil #19 for MSD Pumps, Oil Vacuum Pump

- Formulated from crude oil stocks known for their durability and line-lubricating qualities.
- Use in Agilent 5973/5972/5971 and GCD mass spec systems, or in other manufacturers' MSD systems that require rough pump oil.
- Under average use, the oil in the foreline rough pump should be replaced every six months.



22687

Description	qty.	cat.#
Rough Pump Oil for MSD Pumps	1 liter	22687



27194

### GC-MS Cleaning Kit

Poor sensitivity, loss of sensitivity at high masses, or high multiplier gain during an auto tune are all indicators that your mass spectrometer source may need to be cleaned. Restek has assembled all of the necessary components for cleaning and polishing your ion source.

The Restek GC-MS Cleaning Kit (cat.#s 27194, 27195) Includes:

- Lint-free nylon gloves (small, 2 pair)
- Lint-free nylon gloves (large, 2 pair)
- Lint-free cotton cloth, 9 x 9 (10-pk.)
- Micro mesh 4 x 6 sheet (4-pk.)
- Aluminum oxide (1-kg jar)
- Cotton tip applicators
- Tweezers, large
- Tweezers, small
- Septum puller
- Dremel® tool, battery-operated (optional, 27194)
- Tool kit bag

Reorder Kit (cat.# 27196) Includes:

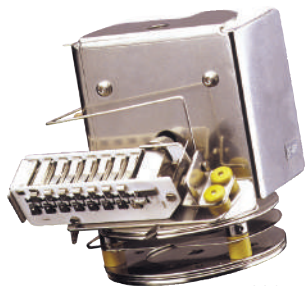
- Lint-free nylon gloves (small, 2 pair)
- Lint-free nylon gloves (large, 2 pair)
- Lint-free cotton cloth, 9 x 9 (10-pk.)
- Micro mesh 4 x 6 sheet (4-pk.)

Description	qty.	cat.#
Mass Spec Cleaning Kit with Dremel Tool	kit	27194
Mass Spec Cleaning Kit without Dremel Tool	kit	27195
Mass Spec Cleaning Kit Replacement Parts Kit Includes: cloths, micro mesh sheets, small and large gloves	kit	27196

### ETP Electron Multipliers

for Mass Spectrometry

- Proprietary specialized surface material resulting in very high secondary electron emission.
- Air stable.
- 2-year shelf life guarantee.
- Discrete dynode design results in extended operating life.



23074

The electron multipliers manufactured by ETP use a proprietary dynode material. This material has a number of properties that make it very suitable for use in an electron multiplier. It has very high secondary electron emission, which allows exceptional gain to be achieved from each dynode. This material is also very stable in air. In fact, an ETP multiplier can be stored for years before being used. As a direct result of the high stability of the active materials used in ETP multipliers, they come with a 2-year shelf life warranty (stored in original sealed package). Many testing laboratories take advantage of this long shelf life by keeping a replacement ETP multiplier on hand, ready for immediate installation. This keeps instrument downtime to a minimum.

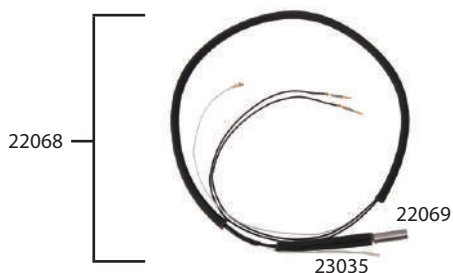
### did you know?

For a typical ETP electron multiplier for GC-MS, the total active dynode surface area is ~1,000 mm<sup>2</sup>. This can be compared to a standard continuous dynode multiplier that has a total channel surface area of only around 160 mm<sup>2</sup> (for a channel with 1 mm diameter and 50 mm length). This increased surface area spreads out the workload of the electron multiplication process over a larger area, effectively slowing the aging process and improving operating life and gain stability.

Description	qty.	cat.#
<b>Electron Multipliers for Agilent GC-MS and LC-MS</b>		
For Agilent 5970 GC-MS	ea.	23072
For Agilent 5971, 5972, GC GC-MS	ea.	23073
For Agilent 5973 & 5975 GC-MS (includes mount for initial installation)*†	ea.	23074
For Agilent 5973 & 5975 GC-MS and LC-MSD (Replacement Multiplier)*†	ea.	23075

\*Note: The electron multipliers have been specifically developed to retrofit the original manufacturer's equipment. The detector incorporates a modular design to facilitate ease of replacement and additional innovations intended to enhance performance. First-time installation requires a mount that includes the mechanical housing. After initial installation, only the replacement electron multiplier is required.

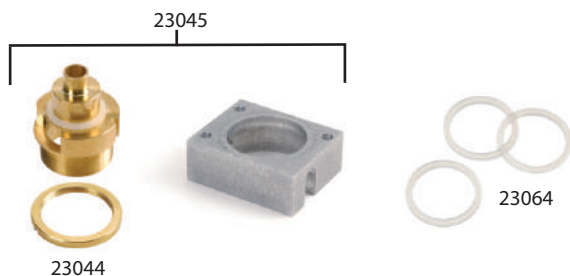
†This unit is designed for use in the 5975, 5973 GC, and the LC-MSD (not for 5975C Triple Axis Detector).



### Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs

- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	kit	22068
Injector/FID Heater	19231-60620	ea.	22069
Injector/FID PRT Sensor	19231-60660	ea.	23035



### FID Collector Housing Kits for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Housing Kit for Agilent 5890 GCs (includes collector body, spanner nut, and silicone washer—order mount separately)	19231-20920	kit	23037
FID Collector Housing Kit for Agilent 6890/7890 GCs (includes collector body, silicone washer, nut, and mount)	G1531-20550	kit	23045
FID Collector Housing for Agilent 6890/7890 GCs	G1531-20740	ea.	23044
Replacement Silicone Washers for FID Collector Housing for Agilent 5890/6890/7890 GCs	5180-4165	12-pk.	23064



### FID Collector Mount for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Mount for Agilent 5890 GCs	19231-20930	ea.	23036
FID Collector Mount for Agilent 6890/7890 GCs	G1531-20550	ea.	23043



### FID Base Weldment for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Includes brass nut.
- Available for Agilent 5890, 6850, or 6890 GCs.

Description	Similar to Agilent Part #	qty.	cat.#
FID Base Weldment for Agilent 5890 GCs	19231-80580	ea.	23041
FID Base Weldment, Pack Column FID for Agilent 6850/6890 GCs	G1531-80580	ea.	23052
FID Base Weldment, Capillary Column FID for Agilent 6850/6890 GCs	G1531-80630	ea.	23053

Note: 6890 GC connections to EPC modules are not compatible with the 7890 EPC modules.

### Spanner Wrench

for Agilent 6890/6850/6890/7890 FID Collector Assemblies

- Easily remove the nut from the FID collector without damaging the nut.
- Unique, ergonomic handle—easy to grip.
- Fits all instrument models.



Remove FID ignitor castle.



Easily loosen the nut by aligning the two pins on the bottom of the wrench with the two open slots on the nut...

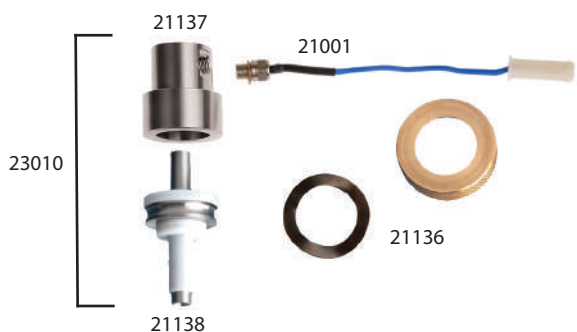


then turn counterclockwise...



and remove.

Description	Similar to Agilent Part #	qty.	cat.#
Spanner Wrench for Agilent 5890/6890/6850/7890	19231-00130	ea.	22329

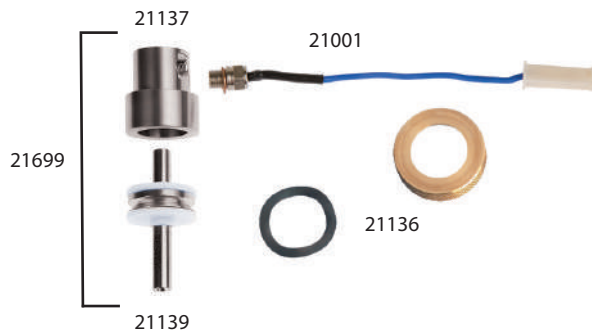


### FID Collector Assembly Kit for Agilent 5890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Assembly Kit (includes insulators)	19231-60690	kit	23010
FID Collector Assembly Kit w/Siltek Ignitor Castle		kit	21131
FID Collector (includes insulators)	19231-20970, 19231-20960, 19231-20950	ea.	21138
FID Collector Nut and Washer	19231-20940, 5181-3311	set	21136
FID Ignitor*	19231-60680	ea.	21001
FID Ignitor Castle	19231-20910	ea.	21137
Siltek FID Ignitor Castle		ea.	21135

\*Also fits OI Analytical 4410 detector (similar to OI part # 191833).



### FID Collector Assembly Kit for Agilent 6850/6890/7890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent Part #	qty.	cat.#
FID Collector Assembly Kit (includes insulator)	G1531-60690	kit	21699
FID Collector Assembly Kit w/Siltek Ignitor Castle		kit	21132
FID Collector (includes insulators)	G1531-20690, G1531-20700	ea.	21139
FID Collector Nut and Washer	19231-20940, 5181-3311	set	21136
FID Ignitor*	19231-60680	ea.	21001
FID Ignitor Castle	19231-20910	ea.	21137

\*Also fits OI Analytical 4410 detector (similar to OI part # 191833).



### FID Flow Measuring Adaptor

for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
FID Flow Measuring Adaptor	19301-60660	ea.	21000

### FID Gauge Pack for Agilent 5890 GCs

- Pressure regulators and gauges for air and hydrogen.
- 1/8-inch bulkhead allows easy hookup to instrument.
- Rated for inlet pressures to 250 psi (1,724 kPa).
- Rated for outlet pressures of 0 to 60 psi (0-414 kPa).



Description	qty.	cat.#
FID Gauge Pack for Agilent 5890 GCs	ea.	22071

### FID Maintenance Kits for Agilent GCs

- Include the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

#### FID kits include:

- 1/4" and 0.4, 0.5, and 0.8 mm ID graphite ferrules
- FID/NPD capillary adaptor
- Capillary nuts
- Jet reamers/ferrule removers
- 1/4" nut
- Scoring wafer
- Capillary column caps
- Ignitor for either Agilent 5890 or 6890/6850/7890 GCs
- FID flow-measuring adaptor
- 1/4" x 5/16" wrench
- Installation gauge
- Wire cleaning brush
- High-performance Siltek® treated FID jet for either Agilent 5890 (adaptable jet) or 6890/6850/7890 (dedicated jet) GCs
- Spanner wrench
- FID jet removal tool

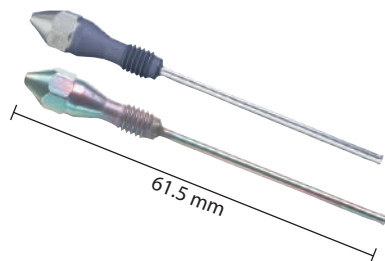


Description	qty.	cat.#
FID Maintenance Kit for Agilent 5890 GCs	kit	22180
FID Maintenance Kit for Agilent 6850/6890/7890 GCs	kit	22179

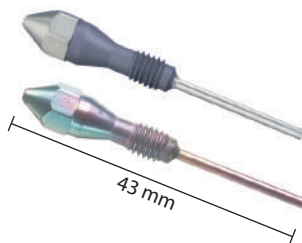


**Which FID Jet Should I Use?**

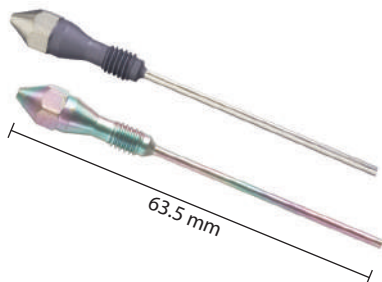
There are two FID jet configurations for Agilent GCs. The longer "adaptable" jet fits both 5890 and 6890 GCs, and can be used with capillary or packed columns. The shorter "dedicated" jet is for the FID in the 6890/7890 GC that is designed only for use with capillary columns.



61.5 mm



43 mm



63.5 mm



22328

**FID Replacement Jets****Standard Version**

- Threads specially coated for easy installation and removal.
- Special processing ensures the highest degree of cleanliness.
- Meets or exceeds original manufacturer's performance.

**High-Performance Version—Siltek® Treated**

- Similar to the standard version, but Siltek® treated.
- Extremely inert, for use with active compounds.

**Capillary Adaptable FID Replacement Jet for Agilent 5890/6890/6850 GCs**

Engineered with a fluted tip to guide the capillary column into the jet.

Description	Similar to				
	Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.011-Inch ID Tip	19244-80560	ea.	20670	3-pk.	20671
High-Performance Siltek Treated, 0.011-Inch ID Tip	19244-80560	ea.	20672	3-pk.	20673

**Capillary Dedicated FID Replacement Jet for Agilent 5890/6890/6850/7890 GCs**

Description	Similar to				
	Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.011-Inch ID Tip	G1531-80560	ea.	21621	3-pk.	21682
High-Temperature, 0.018-Inch ID Tip	G1531-80620	ea.	23078	3-pk.	23079
High-Performance Siltek Treated, 0.011-Inch ID Tip	G1531-80560	ea.	21620	3-pk.	21683

**Packed Column FID Replacement Jets for Agilent 5890/6890/6850 GCs**

- 0.018-inch ID jets: Used for most general-purpose packed column applications.
- 0.030-inch ID jets: For packings that exhibit high bleed and that frequently clog the tip of smaller 0.018-inch jets.

Description	Similar to				
	Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.018-Inch ID Tip	18710-20119	ea.	21694	3-pk.	21695
High-Performance Siltek Treated, 0.018-Inch ID Tip	18710-20119	ea.	21696	3-pk.	21697

Description	Similar to				
	Agilent Part #	qty.	cat.#	qty.	cat.#
Standard, 0.030-Inch ID Tip	18789-80070	ea.	21688	3-pk.	21689
High-Performance Siltek Treated, 0.030-Inch ID Tip	18789-80070	ea.	21686	3-pk.	21687

**FID Jet Removal Tool for Agilent 5890/6850/6890/7890 FIDs**

- Securely grips jet in socket for easy removal or installation.
- Unique, ergonomic handle—easy to hold.



Slip tool over FID jet...

loosen jet...

and remove.

Description	qty.	cat.#
FID Jet Removal Tool for Agilent 5890/6890/6850/7890 FIDs	ea.	22328





23034

### Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.



20884

### FID/NPD Adaptor Fitting

- Easy-to-use, sturdy, compact stainless steel fitting.
- 1/16-inch nut uses standard graphite or Vespel®/graphite ferrules.
- Wrench pad won't turn when installing a capillary column.
- Includes 1/4- and 1/16-inch stainless steel nuts, and 1/4-inch Vespel® and 0.4 mm ID graphite ferrules.

Description	qty.	cat.#
FID/NPD Adaptor Fitting	kit	20884



20120



### FID/Injector Cleaning Kit

The FID/injector cleaning kit includes:

- Nylon tube brushes (1/8", 3/16", 1/4").
- Pipe cleaner.
- Stainless steel tube brushes (3/8", 3/16", 1/4").
- Stainless steel surface brush.
- Stainless steel jet reamers.
- Emery cloth.

Description	qty.	cat.#
FID/Injector Cleaning Kit	kit	20120

### Injector/Detector Plug Nuts

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.



21883

Description	Similar to Agilent Part#	qty.	cat.#
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883



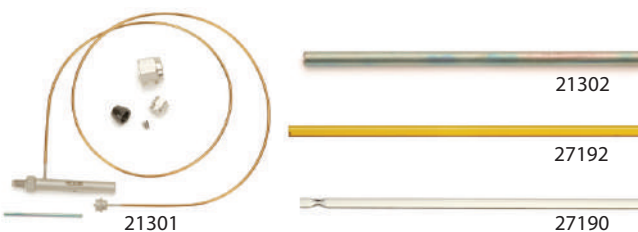
22077

### FID/NPD Capillary Adaptor Fitting

for Agilent 5890/6890/6850 GCs

- High-quality stainless steel construction.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent Part #	qty.	cat.#
FID/NPD Capillary Adaptor Fitting	19244-80610	ea.	22077



21301

21302

27192

27190

### ECD/FID Dual-Purpose Make-Up Gas Kit

for Agilent 5890 GCs

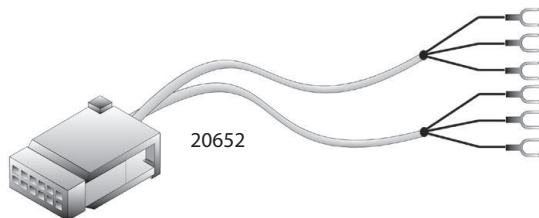
Kit includes: replacement fitting, 1/4" nut, Vespel®/graphite ferrule, 1/16" nut, 0.4 mm ID graphite ferrule, Siltek®-treated guide.

Description	Similar to Agilent Part #	qty.	cat.#
ECD/FID Replacement Fitting Kit with Flow Manifold Connection		kit	21301
Replacement ECD Siltek Metal Guide		2-pk.	21302
Replacement ECD Fused Silica Liner	19233-20625	ea.	27192
		5-pk.	27193
Replacement Micro ECD Liner	G2397-20540	ea.	27190
		5-pk.	27191

**Replacement Cables**

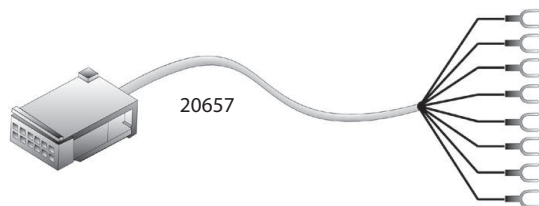
for Agilent GCs, Integrators, & Autosamplers

- Considerable savings over original manufacturer's equipment.
- Instructions and wiring diagrams included.
- Manufactured with only the highest-quality components.



Connect an Agilent 5890 GC to a non-Agilent integrator or standard strip chart recorder.

Description	Similar to Agilent Part #	length	qty.	cat.#
Replacement Cable	05890-60800	6 ft	ea.	20652



Connect an Agilent 5890 GC to remote-start another piece of equipment or to start the Agilent 5890 GC from that piece of equipment.

Description	Similar to Agilent Part #	length	qty.	cat.#
Replacement Cable	05890-61080	6 ft	ea.	20657



**Injector Mounting Posts and Parking Post**

for Agilent 7673 & 7683 Autosamplers

Performance equivalent to original manufacturer's parts.

Description	Similar to Agilent Part #	qty.	cat.#
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 6890 GCs	07673-21140	ea.	21237
Injector Mounting Post for Agilent 7683 Series Autosamplers for use with 6850/6890 GCs	G2613-20500	ea.	21172
Parking Post for Agilent 7673/7683 Series Autosamplers for use with 6890/6890/7890 GCs	05890-61525	ea.	22343

**Turret Tray Assembly**

for Agilent 7673 Autosamplers

Holds sample, waste, and solvent vials.



22855

Description	Similar to Agilent Part #	qty.	cat.#
Turret Tray Assembly for Agilent 7673 Autosamplers	07673-60605	ea.	22855

**Autosampler Plunger Carrier Belt**

for Agilent 7673A & 7673B Autosamplers

All parts meet or exceed original manufacturer's performance.



22695

Description	For Agilent Model #	qty.	cat.#
Autosampler Plunger Carrier Belt	7673A, 7673B	ea.	22695

**Carriage Motor Belt**

for Agilent 7673A, 7673B, and 7673C Autosamplers

Meets original manufacturer's performance.



22692

Description	Similar to Agilent Part #	qty.	cat.#
Carriage Motor Belt for Agilent 7673A, 7673B, and 7673C	1500-0676	ea.	22692

**Z-Belt for Agilent 7673B & 7683 Autosamplers**

Meets original manufacturer's performance.

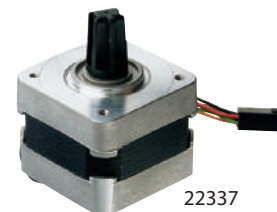


22363

Description	Similar to Agilent Part #	qty.	cat.#
Z-Belt for Agilent 7673B & 7683 Autosamplers	1500-0803	ea.	22363

**Injector Turret Motor for Agilent 7673A & 7673B Injectors**

Meets original manufacturer's performance.



22337

Description	Similar to Agilent Part #	qty.	cat.#
Injector Turret Motor for Agilent 7673A & 7673B Injectors	07673-60810	ea.	22337



22067



22354



22355

**Viton® O-Rings** for Apex Liners

Description	Max. temp.	qty.	cat. #
Viton O-Rings for APEX liners	250 °C	25-pk.	22067

**Accessories** for ATAS LINEX DMI System

Description	qty.	cat. #
Needle Guide for ATAS LINEX DMI Liner	5-pk.	22354
Microvial/Insert for ATAS LINEX DMI Liner	100-pk.	22355



**Sky®**  
Inlet Liners

**True Blue Performance**

Exceptionally inert Sky® inlet liners with state-of-the-art deactivation improve trace-level analysis—and now come with a 100% satisfaction guarantee!\*



See pages 193-202 or visit [www.restek.com/sky](http://www.restek.com/sky)

\* For details on our 100% satisfaction guarantee, visit [www.restek.com/sky](http://www.restek.com/sky)

**Inlet Liner Seals**

for Bruker/Varian 1177 Injectors

Meets or exceeds original manufacturer's performance.



Description	Max. Temp.	Similar to Bruker/Varian Part #	10-pk. cat.#	50-pk. cat.#
6.35 mm ID Graphite O-Rings for split liners	450 °C	—	20296	20297
6.5 mm ID Graphite O-Rings for splitless liners	450 °C	39-26119-40	20298	20299

**Liner Seals**

for Bruker/Varian 1078/1079 GCs



Description	Max. Temp.	Similar to Bruker/Varian Part #	qty.	cat.#
5 mm Graphite Liner Seals for Bruker/Varian 1078/1079 GCs	450 °C	392611919, 392534201	10-pk.	22683



Premium Non-Stick BTO® Septa



Thermolite® Septa

**Septa for Bruker/Varian GCs**

Septum Diameter	50-pk. cat.#	100-pk. cat.#
<b>Thermolite Septa (usable to 340 °C inlet temp.)</b>		
9 mm	27133	27134
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143

**Premium Non-stick BTO Septa (usable to 400 °C inlet temp.\*)**

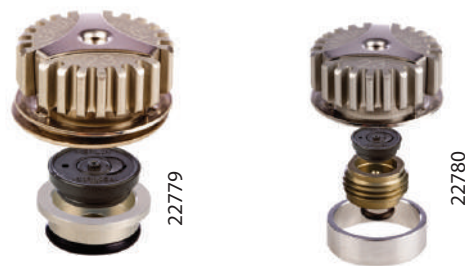
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091

\*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

**HANDY septum size chart**

Injector Type	Septum Diameter (mm)
Packed Column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11

**Merlin Microseal Septa for Bruker/Varian GCs**

400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistently low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. Installation is simple, requiring no modification of the injection port.

Description	Merlin#	cat.#
General Purpose Kit for Bruker/Varian 1078/1079 GCs Includes: Nut, Adapter, O-Ring, & 1 General-Purpose (#410) Microseal	21-11W	22779
General Purpose Kit for Bruker/Varian 1177 GCs Includes Nut, Adapter, O-Ring, & 1 General-Purpose (#410) Microseal	22-11W	22780
<b>Replacement Microseals</b>		
General-Purpose Microseal (most applications, 3 to 100 psi)	410	22812
Low-Pressure Microseal (1 to 45 psi)	310	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W	22782





20881

### Capillary Nuts for Bruker/Varian GCs

Choose brass or stainless steel construction.

Description	Similar to		
	Bruker/Varian Part #	qty.	cat.#
Brass Capillary Nuts	03-949551-00	2-pk.	20881
Stainless Steel Capillary Nuts	03-949551-00	2-pk.	20882

### Siltek® Treated Inlet Support Springs for Bruker/Varian 1075/1077 Split Injectors

Siltek® treated to eliminate sample adsorption.



21690

Siltek® treated to eliminate sample adsorption.

Description	Similar to		
	Bruker/Varian Part #	qty.	cat.#
Siltek Treated Inlet Support Springs for Bruker/Varian 1075/1077 Split Injectors	03-949786-00	3-pk.	21690



22335

### Capillary Installation Gauge for Bruker/Varian GCs

for use with 1/16" ferrules

- Seats ferrule\* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Bruker/Varian GCs for use with 1/16" ferrules	ea.	22335

\*For use with graphite ferrules only.



22184

Everything you need in one complete kit!

### Make Life Easier (MLE) Capillary Tool Kit for Bruker/Varian GCs

for Bruker/Varian GCs

#### Includes:

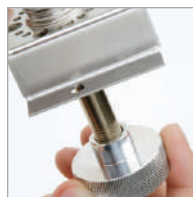
- Capillary installation gauge for Bruker/Varian GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/insertor tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22184

### Rethreading Tool for Bruker/Varian Injection Ports

for Bruker/Varian Injection Ports

- Repair worn or damaged threads.
- Multiple uses (injection ports, fittings, etc.).
- Built-in guide to prevent cross-threading.



#### Make your injection port threads like new!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, then repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool for 7/16" compression fitting (Bruker/Varian injection ports)	ea.	23019
Rethreading Tool for 1/4" Bruker/Varian-style capillary column fittings	ea.	21893

## Restek innovation!

Kit installs easily,  
without special tools  
or plumbing.



22423

### EZ No-Vent® GC Column-Mass Spectrometer Connector

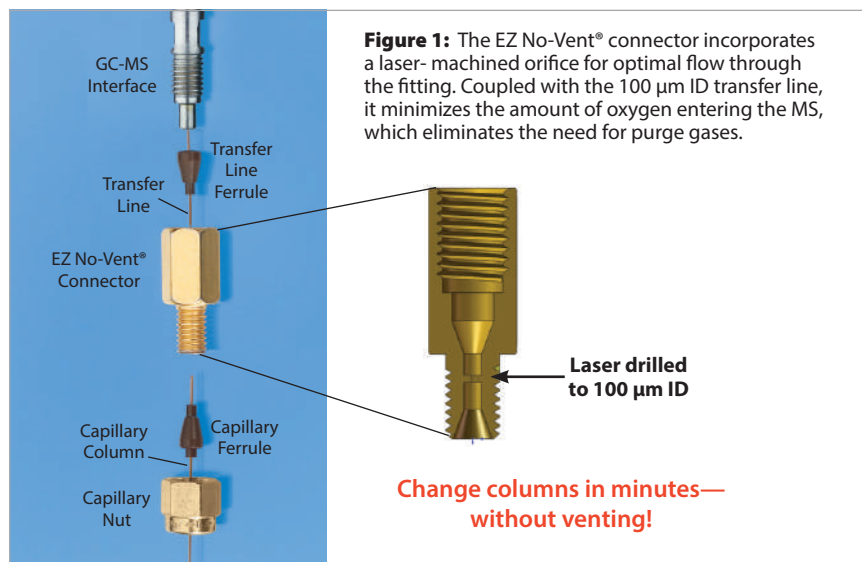
for Bruker/Varian Saturn 2000 Series Mass Spectrometers

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other “no-vent” fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.



As an employee-owned company, we take pride in producing the best chromatography products on the market.



**Figure 1:** The EZ No-Vent® connector incorporates a laser-machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.

Description	qty.	cat.#
<b>EZ No-Vent Connector Kit for Bruker/Varian Saturn 2000 Series MSs</b>		
Includes: EZ No-Vent connector, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft), column plug, column nut	kit	22423
Replacement ferrules for connecting capillary column to EZ No-Vent connector:		
0.30≤0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40≤0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector:		
0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110

**Graphite O-Rings** for PerkinElmer Auto SYS XL or Clarus GCs With PSS Injector



Fits 4 mm OD liners.

Description	Max. Temp.	Similar to PE Part #	qty.	cat.#
Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs	450 °C	N610-1751	10-pk.	21475
w/PSS Injector	450 °C	N610-1751	25-pk.	21476

**Viton® O-Rings** for PerkinElmer PSS Injector



Fits 4 mm OD liners.

Description	Max. Temp.	Similar to PE Part #	qty.	cat.#
Viton O-Rings for PerkinElmer PSS Injector	250 °C	N6101747	10-pk.	20366

**Silicone O-Rings** for PerkinElmer Auto SYS XL or Clarus With CAP Injector



Fits 6.2 mm OD liners.

Description	Max. Temp.	Similar to PE Part #	qty.	cat.#
Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus w/CAP Injector	250 °C	N6101374	10-pk.	20262



Thermolite® Septa



Premium Non-Stick BTO® Septa

**Septa** (11 mm) for PerkinElmer GCs

Thermolite Septa		Premium Non-Stick BTO Septa	
Usable to 340 °C Inlet Temp.		Usable to 400 °C Inlet Temp.	
qty.	cat.#	qty.	cat.#
50-pk.	27142	50-pk.	27090
100-pk.	27143	100-pk.	27091

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo TRACE and Focus GCs.

**Merlin Microseal Septa**

for PerkinElmer GCs

400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistent low needle insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.



22781

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. Installation is simple, requiring no modification of the injection port.

Description	Merlin#	Similar to PE#	cat.#
General Purpose Kit for PerkinElmer GCs (3 to 100 psi) Includes: Nut, Adapter, O-ring & 2 General Purpose (#410) Microseals	51-12W	N9303344	22781
<b>Replacement Microseals</b>			
General-Purpose Microseal (most applications, 3 to 100 psi)	410	N9303345	22812
Low-Pressure Microseal (1 to 45 psi)	310		22815
Microseal for SPME Applications (3 to 100 psi)	21-01W		22782

Check out the Restek blog for the latest developments and new applications!

[blog.restek.com](http://blog.restek.com)





### Injector Adaptors for PerkinElmer CAP Injector

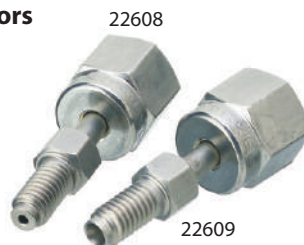
- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.
- Siltek®-treated version available for increased inertness.

Description	Similar to PE Part #	qty.	cat.#
<b>For use with PE-style capillary nuts</b>			
Injector Adaptor for PerkinElmer CAP Injector	N6100157	ea.	22318
Siltek-Treated Injector Adaptor for PerkinElmer CAP Injector	—	ea.	22320
<b>For use with 1/16" compression-style nuts</b>			
Injector Adaptor for PerkinElmer CAP Injector	—	ea.	22319

### FID Capillary Column Adaptors

for PerkinElmer Auto SYS XL

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.



Description	Similar to PE Part #	qty.	cat.#
<b>For use with PE-style capillary nuts</b>			
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL	N6120020	ea.	22608
<b>For use with 1/16" compression-style nuts</b>			
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL	—	ea.	22609



### FID Replacement Parts

for PerkinElmer Auto SYS XL and Clarus 500

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

Description	Similar to PE Part #	qty.	cat.#
FID Jet for PerkinElmer Auto SYS XL and Clarus 500	N6100361	ea.	23038
Auto-Ignite FID Replacement Part Kit for PerkinElmer Auto SYS XL and Clarus 500	N6103167, N6103175, N6101085, N6001204, 09912223	kit	23061
Nozzle Insulator for PerkinElmer Auto SYS XL and Clarus 500	N6101085	ea.	23062
FID Body for PerkinElmer Auto SYS XL and Clarus 500	N6100364	ea.	23063



22185

Everything you need in one complete kit!

### Make Life Easier (MLE) Capillary Tool Kit for PerkinElmer GCs

#### Includes:

- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 1/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/insertor tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22185

**100%**  
Satisfaction  
Guaranteed

# Sky

Inlet Liners

## Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.



### Viton® O-Rings

for Shimadzu 17A, 2010, and 2014 GCs



Description	Max. Temp.	Similar to Shimadzu Part #	qty.	cat. #
Viton O-Rings for Shimadzu 17A, 2010, and 2014 GCs	250 °C	036-11203-84	10-pk.	24899

### Graphite O-Rings

for Shimadzu 2010 and 2014 GCs



Description	Max. Temp.	Similar to Shimadzu Part #	qty.	cat. #
Graphite O-Rings for Split Liners	450 °C	221-48393-91	5-pk.	20243
Graphite O-Rings for Splitless Liners	450 °C	221-47222-91	5-pk.	20244



### Septa (Plug) for Shimadzu GCs

Thermolite Septa		Premium Non-stick BTO Septa	
Usable to 340 °C Inlet Temp.		Usable to 400 °C Inlet Temp.*	
qty.	cat.#	qty.	cat.#
50-pk.	27154	50-pk.	27098
100-pk.	27155	100-pk.	27099

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo TRACE and Focus GCs.

\*For 17 mm inlets, the maximum temperature is 330 °C. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.

### Septum Nut

for Shimadzu 17A, 2010, and 2014 GCs

- One-piece design for ease of installation and removal.
- Made of clear anodized aluminum and high-quality stainless steel.



22079

Description	Similar to Shimadzu Part #	qty.	cat. #
Septum Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41286-00, 221-44584-00	ea.	22079



21895

### Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs

Includes 17A injector nut, 0.4 mm graphite ferrule, and 1/16-inch stainless steel capillary nut.

Description	qty.	cat. #
Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	21895
Siltek Treated Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	22331

### Merlin Microseal Septa for Shimadzu GCs

- Compatible with Shimadzu models GC-2010 and GC-2025 only.
- 450 °C maximum injection port temperature.
- For use with 23-gauge (0.63 mm, 0.025") needle or probe with blunt, truncated conical tip.



22972

A Merlin Microseal septum provides several distinct advantages: elimination of septum coring, long lifetime, and consistently low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms; these sliding seals prevent septum coring and the associated accumulation of septum crumbs in the injection port liner. Installation is simple, requiring no modification of the injection port.

Description	Merlin #	cat. #
General Purpose Kit for Shimadzu GCs (3 to 100 psi) Includes: Nut, Adapter, O-Ring, & 2 General-Purpose (#410) Microseals	61-12	22972
<b>Replacement Microseals</b>		
General-Purpose Microseal (most applications, 3 to 100 psi)	410	22812
Low-Pressure Microseal (1 to 45 psi)	310	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W	22782



← slot

22688

### Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs

Meets original manufacturer's performance.

Description	Similar to Shimadzu Part #	qty.	cat. #
Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	22688



← no slot

20375

### Restek Enhanced Capillary Nut

for Shimadzu 17A, 2010, and 2014 GCs

- Restek's design eliminates the slot, increasing lifetime and durability.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Shimadzu Part #	qty.	cat. #
Restek Enhanced Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	20375

**5 mm Ferrules** for Shimadzu 17A GCs

- For use with packed columns.
- Graphite construction.



Description	qty.	cat.#
5 mm Ferrules for Shimadzu 17A GCs	10-pk.	21121

**Graphite Ferrules**

for Shimadzu 17A, 2010, and 2014 GCs

- Graphite two-piece construction.
- Available in 0.4, 0.5, and 0.8 mm sizes.
- Packaged on mandrel for easy handling.



Ferrule ID	Fits Column ID	Similar to Shimadzu Part #	qty.	cat.#
0.4 mm	0.25 mm and less	220-90765-00	10-pk.	24827
0.5 mm	0.32 mm	221-32126-05	10-pk.	24828
0.8 mm	0.53 mm	221-32126-08	10-pk.	24829



**Inlet Wrench** for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu Part #	qty.	cat.#
Inlet Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159



**Capillary Installation Gauge**

for Shimadzu 17A, 2010, and 2014 GCs

- Seats ferrule\* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333

\*For use with graphite ferrules only.

100% Satisfaction Guaranteed

Sky Inlet Liners

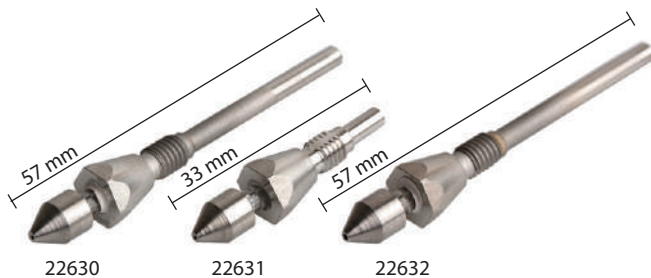
RESTEK

See pages 193-202.



**Open-End Wrench Set** for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#
1/4" x 5/16" and 10 mm x 11 mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334



**FID Jets** for Shimadzu 2010 GCs

Description	Similar to Shimadzu Part #	qty.	cat.#
Capillary FID Jet for Shimadzu 2010 GCs	221-48258-91	ea.	22630
Packed Column FID Jet for Shimadzu 2010 GCs	221-48885-91	ea.	22631
Wide Bore FID Jet for Shimadzu 2010 GCs	221-49373-91	ea.	22632

Everything you need in one complete kit!



**Make Life Easier (MLE) Capillary Tool Kit**

for Shimadzu GCs

- Includes:**
- Capillary installation gauge for Shimadzu GCs
  - Injector wrench for Shimadzu GCs
  - 1/8", 3/16", and 1/4" nylon brushes
  - 1/4", 3/8", and 3/16" stainless steel wire tube brushes
  - Stainless steel surface brush
  - 6 stainless steel jet reamers (0.25–0.65 mm OD)
  - 1/4" x 5/16" open end wrench
  - 3/8" x 1/16" open end wrench
  - 6 mm x 7 mm open end wrench
  - 8 mm x 10 mm open end wrench
  - 16 mm x 17 mm open end wrench
  - Rubber-tipped slide-lock tweezers
  - Scoring wafers
  - Inlet liner removal tool
  - Septum puller
  - Mini wool puller/insertor tool
  - 4-inch tapered needle file
  - Swivel head flashlight
  - Mini hand drill set
  - 15 cm compact steel ruler
  - Pocket magnifier
  - High-temperature string (1 meter)
  - Pipe cleaner (12 inch)
  - Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182

**Dual Vespel® Ring Inlet Seals**

Washerless, Leak-Tight Seals for Thermo 1300/1310 GCs

- Does not require a separate washer.
- Requires less torque to seal.
- Does not require retightening of reducing nut after several oven cycles.
- Extends column lifetime by preventing oxygen from reaching the column.
- Same price as the regular inlet seals with washers.
- Siltek® treatment provides enhanced inertness versus stainless steel.



Patented

Feature	Benefit
Vespel® ring embedded in bottom surface.	Eliminates need for a washer.
Vespel® ring embedded in top surface.	Very little torque required to make seal—reduces operator variability.
Lower leak rate compared to OEM metal inlet seals.	Less detector noise.
Prevents oxygen from permeating the carrier gas.	Increases column lifetime.

Our patented dual Vespel® ring inlet seal greatly improves injection port performance—it stays sealed, even after repeated temperature cycles, without retightening the reducing nut! This seal features two soft Vespel® rings, one embedded in its top surface and the other embedded in its bottom surface. These rings eliminate the need for a washer and ensure very little torque is needed to make a leak-tight seal. The rings will not harm the critical seal in the injector body, or any other surface, and are outside the sample flow path.

To reduce breakdown and adsorption of active compounds, use a gold-plated or Siltek®-treated seal.

0.8 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	22243	22244
Siltek-Treated	22247	22248

1.2 mm ID Dual Vespel Ring Inlet Seal	2-pk. cat.#	10-pk. cat.#
Gold-Plated	22245	22246
Siltek-Treated	22249	22250

**Replacement Inlet Seals With Washers**

- Siltek® treatment provides inertness similar to fused silica.
- All seals include washers.

**Replacement Inlet Seals** for Thermo Scientific 1300/1310 GCs

The inlet seal at the base of the GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

**Single-Column Installation**

0.8 mm ID (Opening)	Similar to Thermo Part #	qty.	cat.#
Gold-Plated	290GA082	2-pk.	22231
Gold-Plated	290GA081	10-pk.	22232
Siltek-Treated	290GA092	2-pk.	22237
Siltek-Treated	290GA091	10-pk.	22238

**0.25/0.32 mm ID Dual-Column Installation**

1.2 mm ID (Opening)	Similar to Thermo Part #	qty.	cat.#
Gold-Plated	290GA122	2-pk.	22233
Gold-Plated	290GA121	10-pk.	22234

**Cross-Disk Inlet Seals** for Thermo Scientific 1300/1310 GCs

All seals include washers.

0.8 mm ID Cross-Disk Inlet Seal	Similar to Thermo Part #	qty.	cat.#
Gold-Plated	290GA083	2-pk.	22235
Gold-Plated	290GA084	10-pk.	22236
Siltek-Treated	290GA093	2-pk.	22239
Siltek-Treated	290GA094	10-pk.	22240



Note: The 1.2 mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.





**Inlet Liner Seals**

for Thermo Scientific TRACE PTV



Description	Max. Temp.	Similar to TS Part #	qty.	cat.#
Inlet Liner Seals for Thermo Scientific TRACE PTV	450 °C	29013417	2-pk.	21392

**Graphite Sealing Ring** for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL Instruments

Description	Max. Temp.	Similar to TS Part #	qty.	cat.#
Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	450 °C	290-334-06	ea.	21898
	450 °C	290-334-06	2-pk.	21899

**Premium Non-Stick BTO® Septa****Septa** (9 mm, 9.5 mm, 11 mm, 17 mm) for Thermo Scientific GCs Premium Non-Stick BTO® Septa

- Usable to 400 °C inlet temperature\*.
- New plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs\*\*.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC-MS applications.

Septum Diameter	50-pk. cat.#	100-pk. cat.#
<b>Premium Non-Stick BTO Septa (usable to 400 °C inlet temp.*)</b>		
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
11 mm (7/16") CenterGuide	27090	27091
17 mm CenterGuide	27096	27097

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo TRACE and Focus GCs.

\*For 17 mm inlets, the maximum temperature is 330 °C. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.

\*\*12.7 mm and 17 mm septa packaged in precleaned glass jars.

**HANDY septum size chart**

Instrument	Septum Diameter (mm)
<b>Thermo Scientific</b> TRACE GC, 8000, 8000 TOP, GCQ w/TRACE, PTV, 8000 series17	17
TRACE 1300, 1310	11
<b>Finnigan (TMQ)</b> GC 9001, GCQ, QCQ, TRACE 2000	9.5

**Septum Cap** for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

24971

Description	Similar to TS Part #	qty.	cat.#
Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	35001050	ea.	24971



21299

24972

**Septa Holder Kits**

for Thermo Scientific TRACE, 8000, 8000 TOP &amp; Focus SSL

- Includes septum support and holder.
- Made from high-quality stainless steel.
- Silcosteel® -AC-treated version helps with septum removal.

Description	Similar to TS Part #	qty.	cat.#
Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	23303015, 350054335	kit	21299
Silcosteel-AC-Treated Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	23303015, 35005433	kit	24972

**Gold-Plated Liner Cap**

for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP &amp; Focus SSL



22089

Description	Similar to TS Part #	qty.	cat.#
Gold-Plated Liner Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	29004290	ea.	22089

**Silver Seals** for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

23057

Description	Similar to TS Part #	qty.	cat.#
Silver Seal for Split/Splitless Injector	29033629	10-pk.	23057
	29033629	20-pk.	23058



**Adapters for Capillary Columns**

on Thermo Scientific TRACE &amp; Focus SSL

- Use same installation distance as manufacturer's adaptors.
- Made of high-quality stainless steel.
- Siltek®-treated version available for additional inertness.

Description	Similar to TS Part #	qty.	cat.#
<b>For use with standard 1/16" ferrules.</b>			
Adaptor for Capillary Column on Detector Base		ea.	24916
Adaptor for Capillary Column on Split/Splitless Injector		ea.	24917
Siltek Treated Adaptor for Capillary Column on Split/Splitless Injector		ea.	20543
<b>For use with M4 ferrules.</b>			
Adaptor for Capillary Column on Detector Base	347 25 436	2-pk.	24969
Adaptor for Capillary Column on Split/Splitless Injector	347 05 451	ea.	24970
Siltek Treated Adaptor for Capillary Column on Split/Splitless Injector		ea.	20544

**Nut for Terminal Fitting**

for Thermo Scientific TRACE GCs



Description	Similar to TS Part #	qty.	cat.#
Nut for Terminal Fitting for Thermo Scientific TRACE GCs	350 221 25	2-pk.	24896

**Fixing Nut for Capillary**

Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP &amp; Focus SSL

Made of high-quality stainless steel.



Description	Similar to TS Part #	qty.	cat.#
Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	350 32 423	5-pk.	24973

**Graphite Ferrules (M4 Fittings)**

for Thermo Scientific TRACE, 8000, 8000 TOP &amp; Focus GCs



Ferrule ID	Fits Column ID	Similar to TS Part #	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10-0.15 mm	—	22221	22222
0.4 mm	0.18-0.28 mm	29013488 (2-pk.) 29053488 (10-pk.)	20280	20281
0.5 mm	0.32 mm	29013487 (2-pk.) 29053487 (10-pk.)	20282	20283
0.8 mm	0.45-0.53 mm	29013486 (2-pk.) 29053486 (10-pk.)	20284	20285

**FID Jet** for Thermo Scientific TRACE & Focus GCs

Meets or exceeds original manufacturer's performance.



Description	Similar to TS Part #	qty.	cat.#
FID Jet for Thermo Scientific TRACE & Focus GCs	404 043 01	ea.	23080

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### Liner Cap Removing Tool

for Thermo Scientific GCs:  
Focus GC, TRACE GC Ultra &  
TRACE GC x GC

- Easily loosens the liner cap from the injector.
- Unique, ergonomic handle—easy to grip.



Remove septum cap, septum holder, septum, and septum support.



Place tool on liner cap. Align two pins on bottom of tool with two open slots on liner cap.



Turn counter-clockwise to loosen liner cap.



Use tweezers (cat.# 20101) to remove liner cap.

Description	Similar to TS Part #	qty.	cat.#
Liner Cap Removing Tool for Thermo Scientific GCs	205 070 10	ea.	24937



### Metric Wrench Set

High-quality 6 x 7 mm, 8 x 10 mm, and 16 x 17 mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#
Metric Wrench Set	set	22997



### Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
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### Capillary Installation Gauge

for Thermo Scientific TRACE & Focus SSL (M4 Ferrules)

- Seats ferrule\* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.



Install nut and ferrule onto column. Cut column end squarely. Slide column into installation gauge to recommended insertion distance. Fingertighten column nut.

Tighten assembly to ensure a properly seated ferrule. Loosen assembly and remove column and column nut.

The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330

\*For use with graphite ferrules only.



Everything you need in one complete kit!

22183



### Make Life Easier (MLE) Capillary Tool Kit

for Thermo Scientific GCs

#### Includes:

- Capillary installation gauge for Thermo Scientific GCs
- Liner cap removing tool for Thermo Scientific GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/insertor tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
-------------	------	-------



### EZ No-Vent® GC Column-Mass Spectrometer Connector

for Thermo Scientific Focus DSQ GC Mass Spectrometers

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other “no-vent” fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers’ vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.



22454



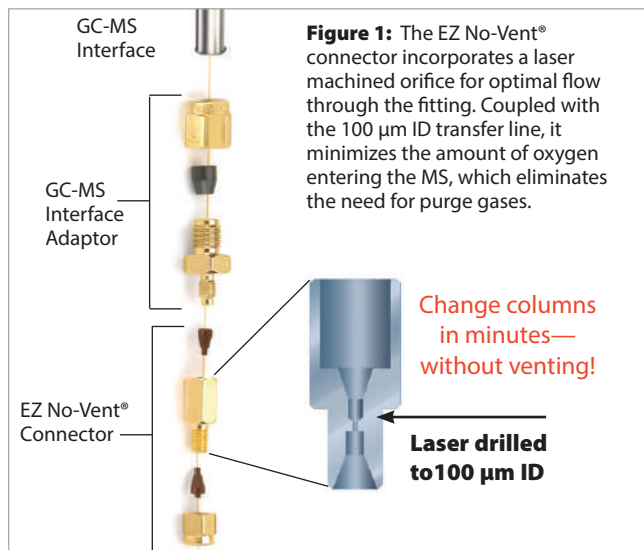
22082

### Transfer Line Reducing Kit

for Thermo Scientific TRACE & Focus DSQ Mass Spectrometers

Meets or exceeds original manufacturer’s performance.

Description	Similar to TS part #	qty.	cat.#
Transfer Line Reducing Kit for Thermo Scientific TRACE & Focus DSQ Mass Spectrometers	76458-2014s, 76458-2009s, A0101-03151	kit	22082



**Figure 1:** The EZ No-Vent® connector incorporates a laser machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.

Description	qty.	cat.#
EZ No-Vent Connector Kit for Thermo Scientific Focus DSQ GC Mass Spectrometers Includes: EZ No-Vent Connector, interface adaptor, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft), column plug, column nut	kit	22454
Replacement Ferrules for connecting capillary column to EZ No-Vent Connector:		
0.30±0.40 mm Tubing OD (Virgin Polyimide)	2-pk.	21015
0.40±0.50 mm Tubing OD (Virgin Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110
Open-End Wrenches 3/16" x 7/16"	2-pk.	22455

**100%**  
Satisfaction  
Guaranteed

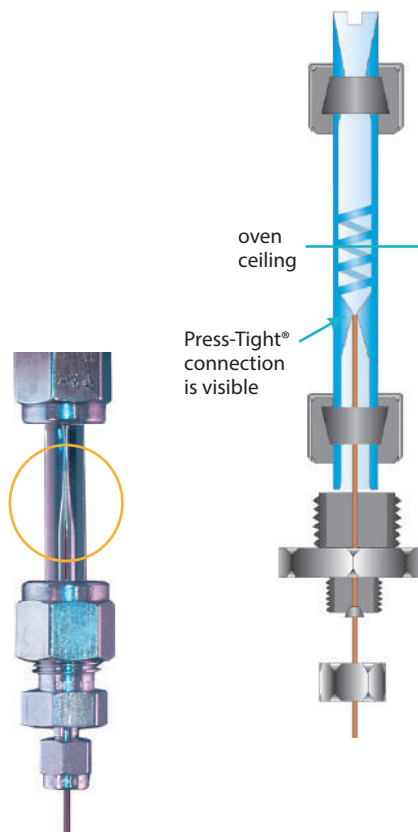
## Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.

## it's a fact

The 1/4-inch Vu-Tight liner fits directly into a 1/4-inch injection port. The connection between the liner and the column is in the GC oven, allowing visual confirmation of the seal. Problems, such as a crushed column end in the Press-Tight® taper, can be detected easily, making proper installation worry-free. The Cyclo Vu-Tight liner prevents nonvolatile residue from contaminating the column.



## Converting Packed Inlets to Capillary Column Use

Two types of inlet conversion kits are available for a 1/4-inch packed column injection port to fit either 0.32 or 0.53 mm ID capillary columns: the Vu-Tight liner and the Uniliner® liner with adaptor (next page). The Vu-Tight liner fits directly into the 1/4-inch injection port and allows visual confirmation of the connection between the column and the liner. The Uniliner® liner and adaptor work together to allow either direct or on-column injection when using 0.53 mm ID columns. Both systems incorporate a Press-Tight® connection between the liner and column inlet, minimize dead volume, and reduce solvent peak tailing.

### Features of Both Conversion Kits:

- Fit Agilent, Bruker/Varian, and other common GCs with 1/4-inch packed column injection ports (with maximum insertion depth of 4 inches).
- Install easily within 15 minutes.
- Accommodate either 0.32 or 0.53 mm ID fused silica columns (tubing OD ≥ 0.5 mm).
- Liners are deactivated and extremely inert.
- Liners designed to accept dirty samples are available for either system.
- Press-Tight® connections between the liner and column inlet minimize dead volume, reduce solvent peak tailing, and sharpen early-eluting components.

### Vu-Tight DI Liners for 1/4-Inch Packed Injection Port Conversion

- Visually observe the Press-Tight® connection between the column end and liner.
- Fit 0.32 and 0.53 mm ID capillary columns (column ODs from 0.5 mm to 0.8 mm).
- Slotted top prevents obstruction of carrier gas flow.
- Two designs available.
- Operate in the direct injection mode.

### Vu-Tight DI Liners for 1/4-Inch Packed Injection Port Conversion

Can easily be packed with wool for dirty samples.

Description	qty.	cat.#
Vu-Tight DI Liner	ea.	20342
Vu-Tight DI Liner	5-pk.	20343
Vu-Tight DI Liner	25-pk.	20344

### Cyclo Vu-Tight DI Liners (1/4-inch OD)

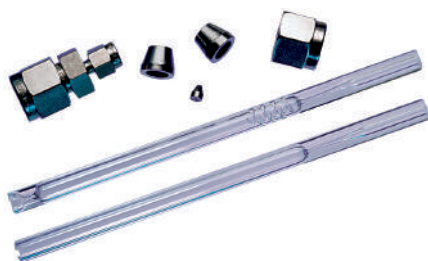
Ideal for dirty samples. Spiral bore prevents nonvolatile residue from contaminating the column.

Description	qty.	cat.#
Cyclo Vu-Tight DI Liner	ea.	20787
Cyclo Vu-Tight DI Liner	5-pk.	20788

### Vu-Tight Installation Fittings Kit

Includes a 1/4-inch stainless steel nut and graphite ferrule for attaching the liner to the GC inlet and a 1/4 to 1/16-inch stainless steel reducer, plus a 1/4-inch and 0.5 mm ID graphite ferrule for attaching the column to the liner.

Description	qty.	cat.#
Vu-Tight Installation Fittings Kit	kit	20504








### Uniliner® Liner for 1/4-Inch Packed Injection Port Conversion

- Reduces solvent tailing.
- Versatile—0.53 mm ID version can be used in the direct (DI) or on-column (OC) injection mode.
- Incorporates a gentle taper that seals the column and reduces dead volume in direct injection mode.
- Available in various designs.

On-column injections can be performed only with 0.53 mm ID columns because 26-gauge needles do not fit into the bore of 0.32 mm ID columns, or into the Uniliner® liner taper.

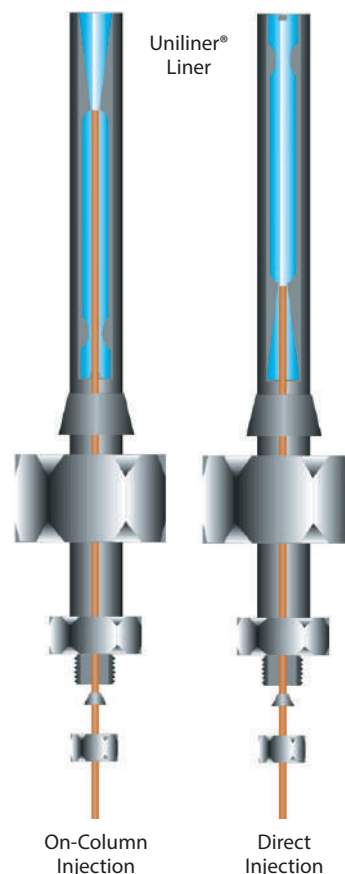
### it's a fact

5 mm Uniliner® liners fit into the 1/4-inch Uniliner® liner adaptor, which fits into a 1/4-inch injection port. The Uniliner® liner can be inserted in one direction for direct injections or inverted for on-column injections. Because the 1/4-inch injection port ferrule seals against the metal liner adaptor surface, it is virtually impossible to crack the glass Uniliner® liner during installation.

Description	Column ID Injection Mode*	ea. cat.#	5-pk. cat.#
Uniliner Liner (small buffer volume chamber 60 mm long, for injections ≤2 µL) 	0.53 mm DI or OC	20902	20903
Uniliner Liner (large buffer volume chamber 85 mm long, for injections ≤4 µL) 	0.32 & 0.53 mm DI only	20308	20309
	0.53 mm DI or OC	20301	20305
Cyclo-Uniliner Liner (for active, dirty samples) 	0.32 & 0.53 mm DI only	20319	20320
Open-Top Uniliner Liner (packed with wool) 	0.32 & 0.53 mm DI only	20315	20316
Low Volume/Purge & Trap Uniliner Liner (1 mm ID x 5 mm OD: use in 1/4" injection ports to troubleshoot purge & trap units) 	0.32 & 0.53 mm DI only		20314
Includes 1/4-inch nut & graphite ferrule, 1/16-inch nut, and 0.8 mm ID graphite ferrule.			
Uniliner Liner Adaptor (required for installing Uniliner liners in 1/4" injection ports) 		<b>Stainless Steel cat.#</b>	<b>Siltek-Treated cat.#</b>
	For injection ports <8 cm	20310	22282
	For injection ports 8-15 cm	20311	
	<b>qty.</b>	<b>cat.#</b>	
1/4" Ferrules for Uniliner Liner Adaptor	5-pk.	20234	

\*DI = direct injection, OC = on-column injection

Note: a Uniliner liner must be used with a Uniliner liner adaptor (cat.# 20310 or 20311) for 1/4-inch injection ports. Remember to include a liner adaptor when ordering a Uniliner liner, unless you are purchasing replacement Uniliner liners.



## Injection Port Conversion Chart

Instrument	Uniliner Liner Set-Up		Vu-Tight Fitting	
	Uniliner Liner: cat.# 20301, 20305, 20308, 20309, 20315, 20316, 20319, 20320, 20902, & 20903	Liner Adaptor: cat.# 20310	Vu-Tight Fitting Kit: cat.# 20504 Liner: cat.# 20342, 20343, 20344, 20787, & 20788	Vu-Tight Fitting Kit: cat.# 20504
Agilent GCs (1/4-inch injection ports) Models: 5700, 5710, 5711, 5712, 5830, 5840, 5880, 5890, 6850, 6890	✓	✓	✓	✓
Varian GCs (1/4-inch injection ports) Models: 1200, 1400, 2100, 2400, 3300-3700, 4400, 4600, 6000	✓	✓	✓	✓
Tracor GCs (1/4-inch injection ports) Models: 540, 550, 560, 565, 570	✓	✓	✓	✓
Packard Becker GCs (1/4-inch injection ports) Models: 427, 428, 429, 430, 433, 436, 437, 438	✓	✓	✓	✓
Gow-Mac GCs (1/4-inch injection ports) Models: 69-750, 69-550	✓	✓	✓	✓
HNU GCs (1/4-inch injection ports) Models: 301, 401, 421	✓	✓	✓	✓
PerkinElmer GCs (1/4-inch injection ports) Models: Sigma, 1B-4B, 300, 2001, 2100	✓	✓	✓	✓
PerkinElmer Auto SYS*	✓			

\*Does not require Uniliner liner adaptor.

Inlet Adaptor Kit for  
Dual Column Installationfor Agilent Capillary Injectors  
(Split/Splitless Fitting for  
Capillary Columns)

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2 mm ID dual Vespe<sup>l</sup>® ring inlet seal, one 0.4 mm ID two-hole ferrule, and one 0.5 mm ID two-hole ferrule.



27185

Description	qty.	cat.#
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185
1.2 mm ID Dual Vespe Ring Inlet Seal, Gold-Plated	2-pk.	21246
	10-pk.	21247



20645

## 1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/Splitless Fitting for 0.53 mm ID Capillary Columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8 mm ID two-hole ferrule.
- Use recessed taper liners with this adaptor.

Description	qty.	cat.#
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645
0.53 mm ID Dual-Column	2-pk.	20392
1/16-inch ID (Opening) Replacement Inlet Seal	10-pk.	20393

## Graphite Replacement Ferrules

ID	fitting size	qty.	cat.#
0.5 mm	1/16"	10-pk.	20201
	1/16"	50-pk.	20228
0.8 mm	1/16"	10-pk.	20202
	1/16"	50-pk.	20224
1/4-inch	1/4"	10-pk.	20210

Two-Hole Ferrules for 1/8-Inch and 1/16-Inch  
Compression-Type Fittings

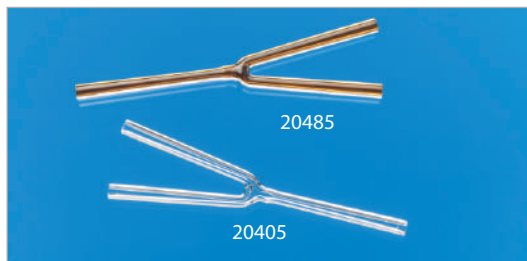
- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).



Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespe/Graphite
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

## Press-Tight® Connectors

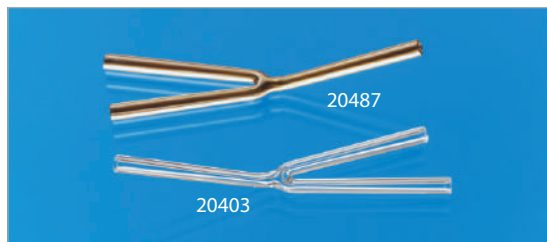
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek® 0.1–0.53 mm ID).



### Universal “Y” Press-Tight® Connectors

- An alternative method of performing dual-column confirmational analyses!
- Split sample flow onto two columns—perform confirmation analysis with a single injection.
  - Split a single column flow to two detectors.

Description	ea.	3-pk.
Universal “Y” Press-Tight Connector	20405	20406
Universal “Y” Press-Tight Connector, Deactivated	20405-261	20406-261
Universal “Y” Press-Tight Connector, Siltek Deactivated	20485	20486



### Universal Angled “Y” Press-Tight® Connectors

- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

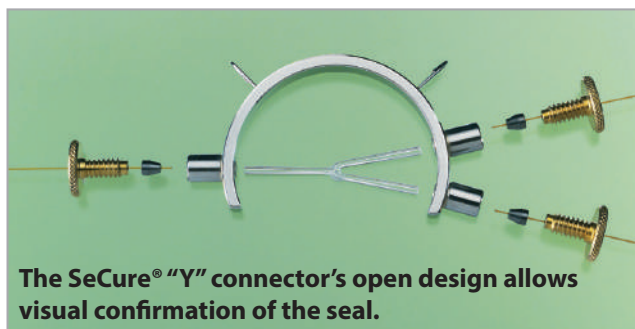
Description	ea.	3-pk.
Universal Angled “Y” Press-Tight Connector	20403	20404
Universal Angled “Y” Press-Tight Connector, Deactivated	20403-261	20404-261
Universal Angled “Y” Press-Tight Connector, Siltek Deactivated	20487	20469

## Polyimide Resin

Securely connects a Press-Tight® connector to a fused silica column.



Description	Max. Temp.	qty.	cat.#
Polyimide Resin	350 °C	5 grams	20445



The SeCure® “Y” connector’s open design allows visual confirmation of the seal.

## SeCure® “Y” Connector Kits

- Connect two analytical columns to a transfer line or guard column.
- Use standard “Y” Press-Tight® connectors and 1/16” graphite ferrules.
- Reliable seal integrity—will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- Fit both Restek® cage designs.

Combine the simplicity of a “Y” Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400 °C.

Kits include: SeCure® “Y” connector body, three knurled nuts, universal “Y” Press-Tight® union, and three ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#
SeCure “Y” Connector Kit	0.18/0.25/0.28 mm	kit	20276
SeCure “Y” Connector Kit	0.32 mm	kit	20277
SeCure “Y” Connector Kit	0.45/0.53 mm	kit	20278
Knurled Nut		3-pk.	20279

## MXT® “Y”-Union Connector Kits

For Connecting Metal and/or Fused Silica GC Columns

- Low dead volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 350 °C.
- Available in union and “Y” configurations.
- Can also be used for connecting fused silica to metal.



Each kit contains the MXT® union; three 1/32-inch nuts; and three, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Columns	kit	21389
For 0.32 mm ID Columns	kit	21388
For 0.53 mm ID Columns	kit	21387

## Purge &amp; Trap, PID

## Purge-and-Trap Spargers

- Available with uniform frits to ensure maximum purging efficiency.
- Use nonfritted spargers for wastewater samples.
- Manufactured to tight tolerances to ensure a leak-tight seal.



20676



20675



23020

Description	Volume	qty.	cat.#
<b>Fritted Spargers</b>			
Fritted, 1/2-inch mount	5 mL	ea.	21150
Fritted, 1/2-inch mount	10 mL	ea.	26138
Fritted, 1/2-inch mount	25 mL	ea.	21151
<b>Non-Fritted Spargers</b>			
Non-Fritted, 1/2-inch mount	5 mL	ea.	26139
Non-Fritted, 1/2-inch mount	10 mL	ea.	26140
Non-Fritted, 1/2-inch mount	25 mL	ea.	26141



21035

## Moisture Control By-Pass Lines for Tekmar Instruments

- Increase response for ketones, alcohols, and acetates.
- Silcosteel®-deactivated tubing for increased inertness.
- Suitable for U.S. EPA Methods 8260, 524.2, and OLM4.1.
- Easily attaches in minutes.

Description	qty.	cat.#
Moisture Control By-Pass Line for Tekmar 3000	ea.	21035
Moisture Control By-Pass Line for Tekmar 3100	ea.	21109

## Photoionization (PID) Lamps

Model 108-10.0/10.6 offers both 10.0 and 10.6 eV potential, has a 0.781" base diameter, and is used in Tracor, OI, and Base-line instruments. Model 103 has a 1.375" base and is used in HNU and SRI detectors. Model 108-BTEX lamp's higher output makes it ideal for detection of BTEX compounds.

## Features

Longer life.

Model 108-BTEX has 33% more output than older models.

Lamps individually tested.

Variety of models.

## Benefits

More for your money with each lamp.

Operate continuously at 1 ma and 250 °C for 6 months and still have better than 50% of the initial output.

Your lamp will work to specifications.

Among the best lamps available for most instrumentation.

Description	eV Rating	Base	qty.	cat. #
PID Lamp, Model 103 C	10.2	1.375"	ea.	20676
PID Lamp, Model 108	10.0/10.6	0.781"	ea.	20675
PID Lamp, Model 108-BTEX	10.0/10.6	0.781"	ea.	23020
PID Lamp Polishing Kit (contains iron oxide cleaning compound, swabs, and instructions)			kit	20674



## Antifoam Agent for Purge-and-Trap Samples

- Efficiently controls foam; effective over a wide pH range.
- No hazardous materials, no components that are target analytes.
- Effective at less than 0.1% of sample volume.

See page 546.



## Make Life Easier (MLE) Capillary Tool Kits

Everything you need in one complete kit!

### All kits include these components:

- $\frac{1}{8}$ "  $\frac{3}{16}$ ",  $\frac{1}{4}$ " nylon brushes
- $\frac{1}{4}$ "  $\frac{3}{8}$ ",  $\frac{3}{16}$ " stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- $\frac{1}{4}$ " x  $\frac{9}{16}$ " open end wrench
- $\frac{3}{8}$ " x  $\frac{7}{16}$ " open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/insertor tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)



22186

### MLE Capillary Tool Kit for Agilent GCs (cat.# 22186) also includes:

- Capillary installation gauge for Agilent GCs
- Injector wrench for Agilent GCs
- Septum nut removal tool
- $\frac{7}{16}$ " x  $\frac{1}{2}$ " open end wrench
- $\frac{1}{2}$ " x  $\frac{9}{16}$ " open end wrench

### MLE Capillary Tool Kit for Bruker/Varian GCs (cat.# 22184) also includes:

- Capillary installation gauge for Varian GCs
- $\frac{7}{16}$ " x  $\frac{1}{2}$ " open end wrench
- $\frac{1}{2}$ " x  $\frac{9}{16}$ " open end wrench

### MLE Capillary Tool Kit for PerkinElmer GCs (cat.# 22185) also includes:

- $\frac{7}{16}$ " x  $\frac{1}{2}$ " open end wrench
- $\frac{1}{2}$ " x  $\frac{9}{16}$ " open end wrench

### MLE Capillary Tool Kit for Shimadzu GCs (cat.# 22182) also includes:

- Capillary installation gauge for Shimadzu GCs
- Injector wrench for Shimadzu GCs
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench



22184

### MLE Capillary Tool Kit for Thermo Scientific GCs (cat.# 22183) also includes:

- Capillary installation gauge for Thermo Scientific GCs
- Liner cap removing tool for Thermo Scientific GCs
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench



22185

MLE tool kits conveniently provide the tools that make it easier to install and maintain capillary columns at a discounted price compared to buying the tools individually!



22182



22183

Description	qty.	cat.#
MLE Capillary Tool Kit for Agilent GCs	kit	22186
MLE Capillary Tool Kit for Bruker/Varian GCs	kit	22184
MLE Capillary Tool Kit for PerkinElmer GCs	kit	22185
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182
MLE Capillary Tool Kit for Thermo Scientific GCs	kit	22183

Easily seat ferrules for consistent installations!



21034



21399



22330



22335



22333

### Capillary Installation Gauge

- Seats ferrules onto column for consistent installations.\*
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Using the Capillary Installation Gauge for Agilent-Style Fittings



Install the column nut and ferrule onto the column. Slide the column into the installation gauge to the recommended insertion distance. Finger-tighten the nut.



Tighten the assembly to ensure a properly seated ferrule. Loosen the assembly and remove the column and column nut.



The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399
Capillary Installation Gauge for Bruker/Varian GCs for use with 1/16" ferrules	ea.	22335
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330

\*For use with graphite ferrules only.

### Restek innovation!



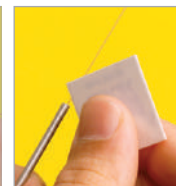
21894

### Capillary Installation Gauge for Agilent 5973/5975 MS

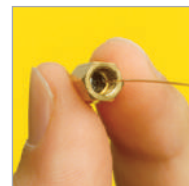
- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.



Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).



Score and remove the exposed end of the column.



Loosen the nut.

Description	Similar to Agilent Part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894



22858



21044

### Capillary Column Caps

- Attach to the column in seconds to form an airtight seal.
- Increase column lifetime—prevent moisture and air from entering the column during storage.
- Two styles to choose from: glass or silicone material.
- Glass caps are color-coded for identifying detector and injector ends.
- Not recommended for reuse.

Description	Material	qty.	cat.#
Capillary Column Caps	Glass	10-pk.	21044
Capillary Column Caps	Silicone	10-pk.	22858



23015

### Scoring Wafer With Handle

- Ceramic wafer is straight-edged for cutting fused silica tubing cleanly.
- Unique, ergonomic handle is made of soft, comfortable rubber.

Description	qty.	cat.#
Scoring Wafer with Handle	2-pk.	23015



23027

### Shortix® Capillary GC Column Cutter

- Consistently make precise, clean, square cuts with a diamond blade.
- Built-in magnifier to verify square cut.
- Use with 0.25 mm ID to 0.53 mm ID tubing (0.78 mm OD maximum).



23026

Description	qty.	cat.#
Shortix Capillary GC Column Cutter	ea.	23026
Maintenance Kit for Shortix Capillary GC Column Cutter (Includes: diamond cutting wheel, O-rings, and a tool to open the column cutter)	kit	23027

### Ceramic Scoring Wafer

Four straight scoring edges for cutting fused silica tubing and four serrated edges for cutting MXT® metal capillary columns.



20116

Description	qty.	cat.#
Ceramic Scoring Wafers	5-pk.	20116

### Sapphire Scribe

- Cuts fused silica tubing.
- Produces a clean, square cut.



20182



One quick stroke...



and just a tap leaves a clean, square end.

Description	qty.	cat.#
Sapphire Scribe	ea.	20182

## Reference Standards Documentation Search

Locate SDSs, certificates, and data packs by cat. # or lot #

[www.restek.com/documentation](http://www.restek.com/documentation)





Tools

**Inlet Liner Removal Tool**

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.



20181

**No more burned fingers!**



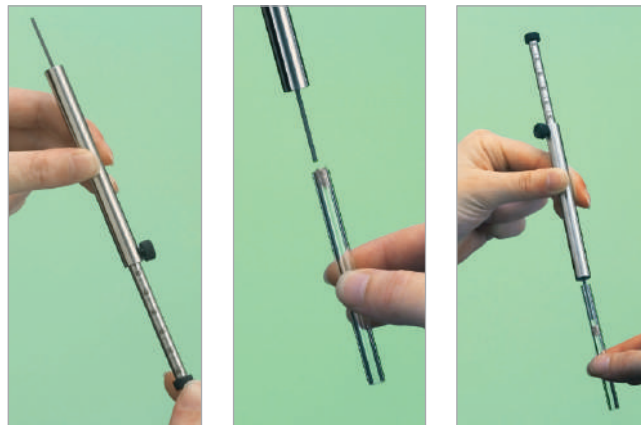
Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181



**Eliminates user variation!**

**Inlet Liner Packing Tool**

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturers' liners.



Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.

Place a plug of loosely bound wool at the top of the inlet liner.

Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Recommended for inlet liners with an ID ≥ 2 mm.

**The Claw and The Claw Holder Kit**

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.



26262

Description	qty.	cat.#
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

**Inlet Wrench** for Agilent 5890/6850/6890 GCs

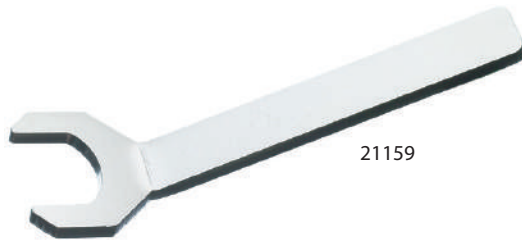
- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.



22065

Description	Similar to Agilent Part #	qty.	cat.#
Inlet Wrench for Agilent 5890/6850/6890 GCs	19251-00100	ea.	22065





21159

**Inlet Wrench** for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu Part #	qty.	cat.#
Inlet Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159



22997

**Metric Wrench Set**

High-quality 6 x 7 mm, 8 x 10 mm, and 16 x 17 mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#
Metric Wrench Set	set	22997



22334

**Open-End Wrench Set** for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#
1/4" x 5/16" and 10 mm x 11 mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334



22999

**Metric 9-Piece, Ball-Point Hex Key Set**

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999



20387

**Open-End Wrench Set**

High-quality 1/4" x 5/16", 3/8" x 7/16", 7/16" x 1/2", and 1/2" x 9/16" wrenches for tightening a wide variety of chromatography fittings.

Description	qty.	cat.#
Open-End Wrench Set	set	20387

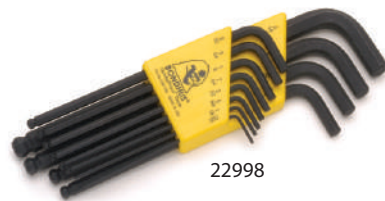


20110

**Open-End Wrenches**

High-quality wrenches for tightening capillary fittings.

Description	Size	qty.	cat.#
Open-End Wrenches	1/4" x 5/16"	2-pk.	20110
Open-End Wrenches	3/8" x 7/16"	2-pk.	22455



22998

**12-Piece, Ball-Point Hex Key Set**

Includes twelve hex keys (Allen wrenches): 0.050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#
12-Piece, Ball-Point Hex Key Set	set	22998



23034

**Torx® Screwdriver Set**

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034



20109

### High-Temperature String

Use to restring capillary columns, attach column connectors to column cages, or hold the column in the GC oven. Capable of withstanding temperatures to 400 °C.

Description	qty.	cat.#
High-Temperature String	10 m	20109
High-Temperature String	450 m	20618



20101

### Slide-Lock Tweezers and 15 cm Compact Steel Ruler

- “Lock” capillary columns to the correct insertion distance recommended by the instrument manufacturer during installation.
- Useful for many laboratory tasks.

This duo provides an alternative way to install capillary columns to the correct insertion distance recommended by the instrument manufacturer.

Description	qty.	cat.#
Slide-Lock Tweezers and 15 cm Compact Steel Ruler	set	20101



20112

### Stainless Steel Tube Brushes/Surface Brush

Unlike brass brushes that can leave a metal residue, these stainless steel tube brushes ( $\frac{3}{8}$ -,  $\frac{3}{16}$ -, and  $\frac{1}{4}$ -inch) work well for cleaning dirty collectors, injector ports, and detector ports. The surface brush can be used to remove residue that builds up on metal detector jets and electronic contacts.

Description	qty.	cat.#
Stainless Steel Tube Brushes/Surface Brush	4-piece set	20112



20108

### Nylon Tube Brushes and Pipe Cleaner

Use to remove small septum fragments and residue from dirty glass inlet liners. Brushes are  $\frac{1}{8}$ -,  $\frac{3}{16}$ -, and  $\frac{1}{4}$ -inch in diameter; pipe cleaner is one foot (30 cm) long.

Description	qty.	cat.#
Nylon Tube Brushes and Pipe Cleaner	4-piece set	20108



20106

### 4" Tapered Needle Files

These files can be used for many purposes. They are especially useful for removing ferrules that are lodged in injector or detector ports.

Description	qty.	cat.#
4" Tapered Needle Files	2-pk.	20106

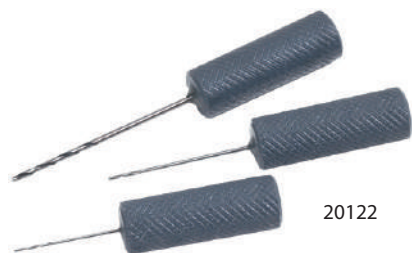


21601

### MXT® Needle Files

Multi-purpose files especially useful for cutting Siltek® treated stainless steel columns.

Description	qty.	cat.#
MXT Needle Files	2-pk.	21601



20122

### Mini Hand Drill Set

Drill ferrules to the proper ID in seconds! Includes three drills, for use with 0.25, 0.32, and 0.53 mm ID (0.4, 0.5, and 0.8 mm OD) capillary columns.

Description	qty.	cat.#
Mini Hand Drill Set	3-piece set	20122



20113

### Stainless Steel Jet Reamers / Ferrule Removers

A great tool for cleaning detector jets or removing stuck ferrules from other small orifices. Serrated design is optimal for removing silica deposits and other contaminants.

Description	qty.	cat.#
Stainless Steel Jet Reamers / Ferrule Removers	6-piece set	20113



20124

### Pocket Magnifier

- Small and easy to handle.
- 10x magnification makes it easy to see the column end to verify a square cut.

Description	qty.	cat.#
Pocket Magnifier	ea.	20124

### GC Oven Thermometer

- Verify GC oven temperature.
- Quick measurements via sensor in the measuring tip.
- Swivel head can turn 180°.
- Wide measuring range: -50 °C to +350 °C.

Description	qty.	cat.#
GC Oven Thermometer	ea.	22066



22066



22187

### Flashlight with Swivel Head

- Ideal for tight spaces—like inside a GC oven.
- Uses two AA batteries (included).

Description	qty.	cat.#
Flashlight with Swivel Head	ea.	22187

### Septum Puller

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory for other uses, too.



Dislodge a stuck ferrule quickly and easily—without scoring the fitting.



Remove a septum without damaging an expensive weldment.

Description	qty.	cat.#
Septum Puller	ea.	20117



20117



# GC Accessories

## Gas Management

Gas Purification Essentials .....	285
Gas Management System .....	286
Leak Detector .....	286
Super Clean® Gas Filters.....	287–291
Gas Traps.....	292–293
Gas Management Supplies .....	294
Gas Generators .....	295–300
Gas Regulators.....	301–303
Gas Regulator Accessories.....	304
Gas Pressure System Accessories.....	305–306
Fittings .....	307–311
Tubing.....	312–315
Gas Valves.....	316
VCO Fittings.....	316
Installation Tools.....	317
Tubing Tools.....	318–319
Fitting Tools.....	319





**Restek provides the following total gas system solution:**

- Restek® gas purifiers provide cost-effective gas purity assurance.
- Restek stainless steel and copper tubing is pre-cleaned and ready to use.
- Swagelok® and Parker A-Lok® tube fittings consistently deliver high-quality performance.
- Extensive line of hand tools, including Restek's electronic leak detector, to make your work easier and faster.
- Gas generators offer an uninterrupted supply of gas.
- Gas regulators ensure optimum line pressure control of all your chromatography gases.

Restek Technical Service (1-800-356-1688, ext. 4; 1-814-353-1300, ext. 4; or support@restek.com) or your Restek representative can answer your questions and provide system-design advice. From the gas source to your point of use, we offer the products and services that ensure the purity of your gas.



**Why do I need to use traps and where should I install them?**

Carrier gas must contain less than 1 ppm of oxygen, water vapor, or any other trace contaminant to prevent column degradation, shortened column lifetime, and increased stationary phase bleed. Contaminants cause ghost peaks to appear during temperature programming and degrade the validity of analytical data. The expense of using high-purity gases in combination with carrier gas purifiers will be offset by longer column lifetime and less instrument maintenance.

**Moisture Removal**

Moisture in carrier gas lines will prematurely degrade oxygen and hydrocarbon traps and increase detector noise (particularly with ECDs). As a precaution, we highly recommend installing a moisture trap before the hydrocarbon and oxygen traps on all carrier gas lines. Our favorite trap is the Super Clean® ultra-high capacity moisture filter (cat.# 22028, p. 287).

**Hydrocarbon Removal**

Use a hydrocarbon trap if your gas has a potential source of hydrocarbon contaminants (e.g., an oil pump in an air compressor) or if you suspect you are observing carrier gas ghost peaks. Install the hydrocarbon trap after the moisture trap to prevent moisture from degrading the hydrocarbon-trapping ability of the activated carbon in the hydrocarbon trap. We recommend the Super Clean® ultra-high capacity hydrocarbon filter (cat.# 22030, p. 287).

**Oxygen Removal**

Oxygen is a column killer and can enter the system at any connection that is leaking. It is present even in ultra-high purity gases, as minute leaks at fittings allow oxygen to influx against the concentration gradient. There are many choices for oxygen removal—the Super Clean® ultra-high capacity oxygen Filter (cat.# 22029, p. 287) is popular with Restek chemists. Because oxygen can enter a gas line at any fitting, the oxygen trap should be the last connection before the gas line enters the chromatograph.

**Leak Checking**

To prevent column degradation, increase column lifetime, and decrease stationary phase bleed, carrier gas should always contain <1 ppm oxygen. This can be monitored by continually leak checking all gas system connections using the Restek® electronic leak detector (cat.# 22655, p. 286).

**for more info**

Questions about which carrier gas purifier to use?

Call Restek

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Distributor

**SHOPPE** B5

[www.chromalytic.net.au](http://www.chromalytic.net.au)

e-mail : sales @ chromtech.net.au

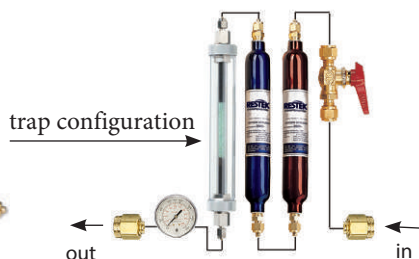


Dimensions:  
12" x 14" x 3"  
(30.5 x 35.6 x 7.6 cm)

### Restek® Gas Management System

- Removes moisture, hydrocarbons, and oxygen from carrier gas, extending column lifetime.
- Produces high-purity carrier gas for most applications.
- Includes one each: moisture, hydrocarbon, and indicating oxygen trap.
- Replacing traps is safe and easy.
- Maximum flow: 150 cc/min for optimal performance.

Restek has put together a convenient unit providing gas purification all in one step. Complete with an indicating trap, your gas purification issues are handled in one central location.



### did you know?

The Restek® gas management system removes water vapor (to 10 ppb), hydrocarbons (to 0.1 ppm), and oxygen (to less than 0.1 ppm) with three traps housed in one unit.

Description	Fittings	qty.	cat.#
Restek Gas Management System	includes fittings for 1/8" and 1/4" gas line	kit	21999
Replacement Traps		qty.	cat.#
High-Capacity Moisture Trap	1/8" Nickel-Plated Brass	ea.	21997
Capillary-Grade Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	21991
Indicating Oxygen Trap	1/8" Brass	ea.	22010



22655



**NEW  
LOOK!**

### Restek® Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek® leak detector.

Backed by a one-year warranty, the Restek® leak detector is the industry standard for performance and affordability in handheld leak detectors.

#### Leak Detector Specifications

Detectable Gases:	Helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable lithium ion internal battery pack (12 hours normal operation)
Operating Temperature Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	One year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

Description	qty.	cat.#
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22655
Small Probe Adaptor for Leak Detector	ea.	22658
Dynamic Duo Combo Pack (Restek Leak Detector and ProFLOW 6000 Flowmeter)	kit	22654
Soft-Sided Storage Case for Leak Detector or ProFLOW 6000 Flowmeter	ea.	22657
Car Charger/Adaptor	ea.	22652
Universal AC Power Adaptor	ea.	22653

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system and/or into the leak detector.

\*Caution: The Restek® electronic leak detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek® electronic leak detector may only be used for determining trace amounts in a GC environment.



22658

Verify hard-to-reach leaks using the small probe adaptor (sold separately).



### Restek recommends

If you think that your Restek® electronic leak detector needs service or repair, please contact Restek® Customer Service before sending your unit in (cat.# 22655-R). Leak detector service/repair will include inspection and testing of the unit.

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### Restek® Super Clean® Gas Filter Kits and Replacements

- High-purity output ensures 99.9999% pure gas (at max. flow of 2 L/min).
- Designed for easy, hassle-free cartridge changes.
- Glass inside to prevent diffusion; polycarbonate housing outside for safety.
- All traps measure 10<sup>5</sup>/<sub>8</sub>" x 1<sup>3</sup>/<sub>4</sub>" (27 x 4.4 cm).
- Each base plate unit measures 4" x 4" x 1<sup>7</sup>/<sub>8</sub>" (10.2 x 10.2 x 4.8 cm).



22022

**Table I:** Each Super Clean® gas filter provides high-purity outlet gas.

Type of Filter	Outlet Gas Quality (%)	Maximum Pressure/ Maximum Flow Rates	Use for:	Indicator Color Change	Capacity			Estimated Lifetime (Years)
					H <sub>2</sub> O (g)	O <sub>2</sub> (mL)	Hydrocarbons (g) (n-Butane)	
Moisture cat.# 22028	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	Yellow/orange to clear	7.2	—	—	>2
Oxygen cat.# 22029	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas	Green to grey	—	1,000	—	>2
Hydrocarbons cat.# 22030	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	No indicator	—	—	12	>2
Fuel Gas <sup>1</sup> cat.# 22022	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	Yellow/orange to clear	3.5	—	6	>1.5
Triple <sup>2</sup> cat.# 22020	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas	Yellow/orange to clear Green to grey	1.8	500	4	>1
Helium Specific <sup>2</sup> cat.# 21982	>99.9999	11 bar 159 psi/ 7 L/min	Helium	Yellow/orange to clear Green to grey	1.8	500	4	>1

<sup>1</sup>Removes hydrocarbons and moisture.

<sup>2</sup>Removes hydrocarbons, moisture, and oxygen.

### did you know?

All Super Clean® gas filter cartridges (except the hydrocarbon filter cat.# 22030) feature easy-to-read indicators. The indicator code is shown on every trap, so there is no confusion about when to replace it.



22020



22022



base plate

#### Description

Description	qty.	cat.#
Carrier Gas Cleaning Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and oxygen/moisture/hydrocarbon triple gas filter	kit	22019
Fuel Gas Purification Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and hydrocarbon/moisture fuel gas filter	kit	22021
Ultra-High Capacity Hydrocarbon Filter	ea.	22030
Ultra-High Capacity Moisture Filter	ea.	22028
Ultra-High Capacity Oxygen Filter	ea.	22029
Replacement Triple Gas Filter (removes oxygen, moisture, and hydrocarbons)	ea.	22020
Replacement Fuel Gas Filter (removes moisture and hydrocarbons)	ea.	22022
Helium-Specific Carrier Gas Cleaning Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and oxygen/moisture/hydrocarbon helium-specific filter	kit	21983
Replacement Helium-Specific Gas Filter (removes oxygen, moisture, and hydrocarbons)	ea.	21982
Gas Filter Bundle Kit Includes: one triple gas filter (cat.# 22020) and two fuel gas filters (cat.# 22022)	kit	22031



### tech tip

#### Oxygen and Moisture Traps

Restek highly recommends oxygen and moisture traps for make-up gas when operating sensitive detectors such as electron capture detectors (ECD). The hydrogen reaction gas for sensitive electrolytic conductivity detectors (ELCD) also requires a hydrocarbon trap to remove trace impurities.



# Super Clean® Gas Filters



22026



22025



22027

## Restek® Filter Base Plates

- End fittings available in brass or stainless steel.
- Base plates fit all stand alone Super Clean® gas filters offered.

### Each single-position base plate unit measures:

4" x 4" x 1 7/8" (10.2 x 10.2 x 4.8 cm)

### Each 2-position base plate unit measures:

8" x 4" x 1 7/8" (20.3 x 10.2 x 4.8 cm)

### Each 3-position base plate unit measures:

12" x 4" x 1 7/8" (30.5 x 10.2 x 4.8 cm)

Standard base plate inlet/outlet fittings accept 1/8" tubing. To adapt to 1/4" tubing, order 1/8" to 1/4" tube end reducers.

Description	Brass		Stainless Steel	
	qty.	cat.#	qty.	cat.#
Filter Base Plate, Single-Position	ea.	22025	ea.	22344
Filter Base Plate, 2-Position	ea.	22026	ea.	22345
Filter Base Plate, 3-Position	ea.	22027	ea.	22346

## Wall Mounting Bracket

Base plates can be mounted by using screws and the mounting holes on the base plate, or by using this optional wall mounting bracket.



21984

Description	qty.	cat.#
Wall Mounting Bracket for Super Clean Base Plates	ea.	21984

## Replacement O-Rings for Cartridge Base Plates

Pack includes 10 large O-rings and 10 small O-rings.



22023

Description	qty.	cat.#
Replacement O-Rings for Cartridge Base Plates	20-pk.	22023

## 1/8-Inch to 1/4-Inch Tube End Reducer

To adapt 1/8" Super Clean® base plate fittings to 1/4" tubing, use 1/8" to 1/4" tube end reducers.



21833

Description	Brass		Stainless Steel	
	qty.	cat.#	qty.	cat.#
Tube End Reducer 1/8" to 1/4"	5-pk.	21833	5-pk.	21833

## Restek® Super Clean® Gas Trapping System for LC-MS

A Super Clean® quick-change cartridge system efficiently removes hydrocarbons from nitrogen!

- Designed for easy, hassle-free cartridge changes.
- Up to 20 L of hydrocarbon-free nitrogen per minute.
- Filters connected in parallel to handle high flows for LC-MS.

### Super Clean® gas filters provide high-purity outlet gas

Type of filter:	Hydrocarbon (charcoal)
Max. Flow:	20 L/min
Outlet Gas Quality %:	99.9999%
Maximum Pressure:	11 bar/159 psi
Estimated Lifetime:	3 to 6 months

### All traps measure:

10 5/8" x 1 3/4" (27 x 4.4 cm)

### Each 2-position base plate unit measures:

8" x 4" x 1 7/8" (20.3 x 10.2 x 4.8 cm)

Standard base plate inlet/outlet fittings accept 1/4" tubing. To adapt to 1/8" tubing, order 1/4" to 1/8" tube end reducers.



20 L of purified nitrogen per minute!

The Super Clean® gas trapping system purifies nitrogen and is ideal for use in LC-MS systems. The two-position base plate (installed in the gas line; standard base plate inlet/outlet fittings accept 1/4" tubing) allows cartridges to be exchanged without introducing impurities into the system. Spring-loaded check valves seal when a cartridge is removed and open only when a new cartridge has been locked in place. There is no need for loosening and tightening fittings every time you change cartridges, and your system cannot become contaminated during the changing process.

To meet the high flow needs of the LC-MS system, the activated charcoal-filled cartridges are positioned and connected in parallel. The incoming gas stream is split equally between the cartridges, and the two streams are rejoined after purification but before the gas exits the base plate. This approach allows longer contact between the nitrogen and the adsorbent, ensuring higher gas purity and eliminating a potential source of contaminants to your analyses.

A handy date wheel, included with the system, indicates the cartridge installation date and the recommended replacement date.

Description	qty.	cat.#
Super Clean Gas-Trapping System (2-position base plate, 2 charcoal filters)	ea.	22062
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061
Particle Drop-In Filter, 0.5 µm	2-pk.	22367

## also available

### Looking for a nitrogen generator for your LC-MS?

Restek offers a full line of Parker LC-MS generators.

See page 299.



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## Restek® Click-On Inline Super Clean® Purification Gas Traps

- High-purity output ensures 99.9999% pure gas.
- Click-On fittings for easy, leak-tight cartridge changes; brass or stainless steel, 1/4" or 1/8".
- Helium-specific triple gas trap is ideal for GC-MS—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Triple gas trap is ideal for purifying carrier gas—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Fuel gas trap is ideal for purifying flame ionization detector (FID) fuel gases, removing both moisture and hydrocarbons.

Click-On adaptor connectors allow cartridges to be exchanged without introducing oxygen, moisture, and hydrocarbons. Spring-loaded check valves seal when a filter is removed and open only when a new filter has been locked in place.

Filter Type	Gas Quality at Outlet	Maximum Pressure	Maximum Flow (L/min)	Use For	H <sub>2</sub> O (g)	Capacity O <sub>2</sub> (mL)	Hydrocarbons (g) ( <i>n</i> -Butane)	Estimated Lifetime (Years)
Moisture cat.# 22467	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H <sub>2</sub>	15	NA	NA	>3
Oxygen cat.# 22468	>99.9999	11 bar 160 psi	25	Inert carrier gas	NA	2,000	NA	>3
Hydrocarbon cat.# 22466	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H <sub>2</sub>	NA	NA	24	>3
Fuel Gas <sup>1</sup> cat.# 22465	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H <sub>2</sub>	7	NA	12	>2
Triple <sup>2</sup> cat.# 22464	>99.9999	11 bar 160 psi	25	Inert carrier gas	4	1,000	8	>2
Helium-Specific Triple <sup>2</sup> cat.# 22473	>99.9999	11 bar 160 psi	25	Helium	4	1,000	8	>2

<sup>1</sup>Removes hydrocarbons, moisture.

<sup>2</sup>Removes hydrocarbons, moisture, oxygen.

NOTE: Super Clean® gas filters are recommended for purifying noncorrosive gases with low concentrations of contaminants. The maximum concentration of oxygen in the incoming gas stream for oxygen purifiers is 0.5%.

See next page for more Click-On in-line Super Clean® products.

Click-On traps measure:  
8 1/2" x 1 1/4" (21.6 x 3.2 cm)



## did you know?

Trap replacement depends on the quality of the incoming gas. Use the double connector and install an indicating cartridge after a trap to indicate when the trap should be replaced.

## Restek Click-On In-Line Super Clean® Gas Traps and Connector Kits

Description	qty.	cat.#
<b>Carrier Gas Purification Kit</b>		
Includes: (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22456
Includes: (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22457
Includes: (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22458
Includes: (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22459
<b>Fuel Gas Purification Kit</b>		
Includes: (4) 1/8" SS connectors and (2) hydrocarbon/moisture traps	kit	22460
Includes: (4) 1/8" brass connectors and (2) hydrocarbon/moisture traps	kit	22461
Includes: (4) 1/4" SS connectors and (2) hydrocarbon/moisture traps	kit	22462
Includes: (4) 1/4" brass connectors and (2) hydrocarbon/moisture traps	kit	22463



To prevent settling of dessicant, mount vertically, not horizontally.



Click-On traps measure:  
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

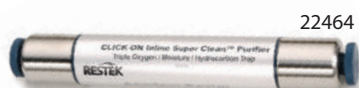
**Click-On In-Line Super Clean® Indicator**

- Oxygen: green to grey
- Moisture: beige to clear

Install an indicator after the Click-On in-line gas filter so there is no confusion about when to replace the traps.

Description	qty.	cat.#
Click-On In-line Super Clean Indicator (oxygen, moisture)	ea.	22474

Note: Fittings sold separately.

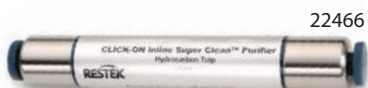


Click-On traps measure:  
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

**Click-On In-Line Super Clean® Replacement Gas Traps**

Description	qty.	cat.#
Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22464
Fuel Gas Trap (removes moisture and hydrocarbons)	ea.	22465

Note: Replacement trap only—fittings sold separately.



Click-On traps measure:  
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

**Click-On In-Line Super Clean® Ultra-High Capacity Gas Traps**

Description	qty.	cat.#
Ultra-High Capacity Hydrocarbon Trap	ea.	22466
Ultra-High Capacity Moisture Trap	ea.	22467
Ultra-High Capacity Oxygen Trap	ea.	22468

**Helium-Specific Click-On In-Line Super Clean® Gas Trap and Connector Kits**

Helium-specific Click-On in-line Super Clean® gas trap and kits are designed specifically for purification of helium in GC-MS systems.

Description	qty.	cat.#
<b>Helium-Specific Carrier Gas Cleaning Kits</b>		
Includes: (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22469
Includes: (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22470
Includes: (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22471
Includes: (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22472
<b>Replacement Trap</b>		
Helium-Specific Replacement Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22473

**Click-On In-Line Super Clean® Connectors**

Click-On connectors allow you to change traps quickly, without introducing oxygen into your system.



**Attach Click-On connectors to the gas lines once—avoid damaging the lines.**

Each connector is 2 3/8" (6 cm) in length.

Description	Fittings	qty.	cat.#
Click-On In-line Super Clean Connectors	1/8" Brass	2-pk.	22475
Click-On In-line Super Clean Connectors	1/8" Stainless Steel	2-pk.	22476
Click-On In-line Super Clean Connectors	1/4" Brass	2-pk.	22477
Click-On In-line Super Clean Connectors	1/4" Stainless Steel	2-pk.	22478

**Click-On In-Line Super Clean® Double Connector**

Connects any Click-On trap to a Click-On indicator.



Each double connector is 3" (8 cm) in length.

Description	qty.	cat.#
Click-On In-line Super Clean Double Connector, Stainless Steel	ea.	22479



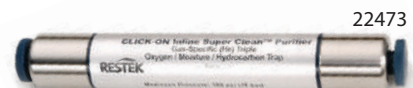
22480



22481

**Accessories for In-Line Super Clean® Gas Traps and Connectors**

Description	qty.	cat.#
Wall-Mounting Clamps for Click-On In-line Super Clean Gas Traps	4-pk.	22480
Replacement O-Rings for Click-On In-line Super Clean Connectors (includes 10 large and 10 small)	20-pk.	22481



Click-On traps measure:  
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

### Click-On In-Line Super Clean® Big Trap Filter Kits

- Largest-capacity traps available—run longer without replacing.
- “Quick connect” fittings with spring-loaded check valves allow filter replacement in seconds without tools or contamination.
- Stainless steel construction withstands pressures up to 1,000 psig.
- High-purity output ensures 99.9999% pure gas (maximum flow of 8 L/min).
- Triple gas trap is ideal for purifying carrier gas.
- Helium-specific triple gas trap is made for GC-MS—ready to use within 15 minutes of installation.
- Hydrocarbon trap removes hydrocarbon contamination from carrier gas to help eliminate ghost peaks.



**Click-On In-Line Super Clean® Big Traps measure:**  
 22" x 2 1/2" (55.9 x 6.4 cm)

**Capacity:**  
 Triple Gas Traps: 2.0 L oxygen; 30 g total hydrocarbons; 70 g water  
 Hydrocarbon Trap: 90 g total hydrocarbons



27201

Description	qty.	cat.#
<b>Triple Helium Kit, 1/4"</b> Includes: (2) 1/4" SS connectors, (1) oxygen/moisture/hydrocarbon helium-specific trap, and (2) wall-mounting clamps	kit	27201
<b>Triple Helium Kit, 1/8"</b> Includes: (2) 1/8" SS connectors, (1) oxygen/moisture/hydrocarbon helium-specific trap, and (2) wall-mounting clamps	kit	27202
<b>Hydrocarbon Kit, 1/4"</b> Includes: (2) 1/4" SS connectors, (1) oxygen/moisture/hydrocarbon trap, and (2) wall-mounting clamps	kit	27203

### Click-On In-Line Super Clean® Big Trap Replacement Filters

**Capacity:**  
 Triple Gas Traps: 2.0 L oxygen; 30 g total hydrocarbons; 70 g water  
 Hydrocarbon Trap: 90 g total hydrocarbons



Description	qty.	cat.#
Triple Helium Trap	ea.	27204
Triple Standard Trap	ea.	27205
Hydrocarbon Trap	ea.	27206



27205

Note: Replacement filter only—fittings sold separately. See Click-On in-line Super Clean® Big Trap filter kits for more information.

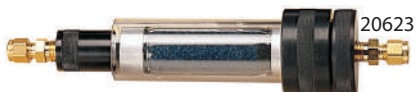
### Click-On In-Line Super Clean® Big Trap Wall-Mounting Clamp Set

Description	qty.	cat.#
Click-On In-Line Super Clean Big Trap Wall-Mounting Clamp Set	2-pk.	27207



27207

## Gas Traps



Dimensions: 9 1/4" x 2" (23.5 x 5.1 cm)



22081

**High-Capacity Indicating Oxygen Trap**

- Indicator changes from dark blue to black as oxygen and water are trapped.
- Lasts longer than three smaller traps.
- Use with all carrier gases.
- Ambient operating temperature, 100 psi (689 kPa) operating pressure.
- Built-in frit traps microparticles.
- Outlet gas purity:
  - $O_2 < 0.1$  ppm when inlet does not exceed 15 ppm.
  - $H_2O < 0.5$  ppm when inlet does not exceed 10 ppm.
- Maximum operating pressure: 150 psi (1,034 kPa).
- Maximum flow: 16.5 L/min.

Description	Fittings	qty.	cat.#
High-Capacity Indicating Oxygen Trap	1/8" Compression Tube Brass	ea.	20624
High-Capacity Indicating Oxygen Trap	1/4" Compression Tube Brass	ea.	20623
Replacement Cartridge (fits 1/4" or 1/8" housing)		ea.	20625
Replacement O-Rings (5 small O-rings and 5 large O-rings)		kit	22081



Dimensions: 10" x 1 1/4" (25.4 x 3.2 cm)

**Indicating Oxygen Trap**

- Indicator changes from light green to grey as oxygen is trapped.
- Heavy-walled glass body, protected by polycarbonate sleeve, prevents oxygen and water infusion.
- Prepurged for fast stabilization.
- 100 psi (689 kPa) maximum operating pressure.
- Reduces oxygen to 0.1 ppm.
- 10  $\mu$ m frits at inlet and outlet.
- Optimal flow rate: < 150 mL/min.

Description	Fittings	qty.	cat.#
Indicating Oxygen Trap	1/8" Brass	ea.	22010
Indicating Oxygen Trap	1/4" Brass	ea.	22011



Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)

**High-Capacity Oxygen Trap**

- Removes up to 600 mg of oxygen or 2 g of water.
- Long life—typically purifies more than five 200 ft<sup>3</sup> cylinders.
- Reduces oxygen to 15 ppb.
- Maximum operating pressure: 250 psi (1,724 kPa).
- Flow: 3 L/min @ 32 psi (221 kPa).

Description	Fittings	qty.	cat.#
High-Capacity Oxygen Trap	1/8" Nickel-Plated Brass	ea.	20601

High-

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29

Distributor

**Molecular Sieve S-Trap**

- Traps water vapor; increases column and oxygen trap lifetime.
- Reduces baseline noise from sensitive detectors such as ECDs and mass spectrometers.
- Activated and ready to use.
- Reduces water to less than 1 ppm.
- Maximum flow: 1 L/min.



Dimensions: 6 3/4" x 5 5/8" (17.1 x 14.3 cm)

Description	Fittings	qty.	cat.#
Molecular Sieve S-Trap	1/8" Brass	ea.	20686

This trap can be regenerated by heating to 300 °C for three hours using a 50-70 mL flow of dry nitrogen.



Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)  
Moisture capacity: 16 g of water

**High-Capacity Moisture Trap**

- Purged with ultra-high-purity helium; ready to use with any carrier gas including hydrogen.
- Reduces water to less than 15 ppb.
- Maximum operating pressure: 250 psi (1,724 kPa).
- Maximum flow: 1.25 L/min.

Description	Fittings	qty.	cat.#
High-Capacity Moisture Trap	1/8" Nickel-Plated Brass	ea.	21997
High-Capacity Moisture Trap	1/4" Nickel-Plated Brass	ea.	20638



Dimensions: 13" x 2" (33 x 5.1 cm)  
Moisture capacity: 6 g of water  
Maximum flow: 1 L/min

**Indicating Moisture Trap**

- Reduces water to less than 10 ppb; indicator changes from yellowish-green to blue at 5% relative humidity.
- Prepurged for fast stabilization.
- Reduces noise from high-sensitivity detectors.
- Heavy-walled glass body prevents oxygen and water infusion.
- 10  $\mu$ m frit prevents microparticulate damage to needle valves and flow controllers.
- Maximum operating pressure: 100 psi (689 kPa).

Description	Fittings	qty.	cat.#
Indicating Moisture Trap	1/8" Brass	ea.	22014
Indicating Moisture Trap	1/4" Brass	ea.	22015





Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)

### Capillary-Grade Hydrocarbon Trap

- Packed with an extremely high surface area, baked coconut shell-based activated carbon.
- Purged with ultra-high-purity helium; ready to use with any carrier gas including hydrogen.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- Maximum operating pressure: 250 psi (1,724 kPa).

Description	Fittings	qty.	cat.#
Capillary-Grade Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	21991
Capillary-Grade Hydrocarbon Trap	1/4" Nickel-Plated Brass	ea.	21992



Dimensions: 9 1/4" x 2 1/4" (23.5 x 5.7 cm)

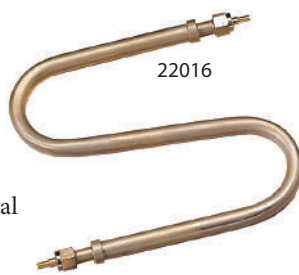
### Refillable Hydrocarbon Trap

- Removes trace impurities from carrier gas.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- 60 µm frit prevents gas contamination by purifier particles.
- Good for purge-and-trap systems.
- Refillable and rechargeable.
- Maximum operating pressure: 125 psig (862 kPa).
- Maximum flow: 5 L/min.

Description	Fittings	qty.	cat.#
Refillable Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	22012
Refillable Hydrocarbon Trap	1/4" Nickel-Plated Brass	ea.	22013
Carbon Refill (two recharges)		pint	20626

### Hydrocarbon S-Trap

- Removes hydrocarbons and other contaminants.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- Each individually activated to ensure maximum efficiency.
- Fits in GC oven for easy thermal recharging.
- Maximum operating pressure: 60 psi (414 kPa).



Dimensions: 6 3/4" x 5 5/8" (17.1 x 14.3 cm)

Description	Fittings	qty.	cat.#
Hydrocarbon S-Trap	1/8" Brass	ea.	22016



Dimensions: 6" x 1 3/4" (15.2 x 4.4 cm)

### Indicating Hydrocarbon Trap for Air Compressors

- Pass compressed air from an oil-filled air compressor through this trap to remove oil vapors and mist.
- Indicator changes from pale pink to deep pink.

Description	Fittings	qty.	cat.#
Indicating Hydrocarbon Trap for Air Compressors	1/8" Brass	ea.	20637
Indicating Hydrocarbon Trap for Air Compressors	1/4" Brass	ea.	20636



Dimensions: 6" x 1" (15.2 x 2.5 cm)

### High-Capacity Split Vent Trap

- Reduces the release of hazardous materials from the capillary split vent into the lab.
- Includes connecting lines and mounting kit.

Description	Fittings	qty.	cat.#
High-Capacity Split Vent Trap	1/8"	ea.	20698
High-Capacity Split Vent Trap	1/8"	5-pk.	20699



Dimensions: 6" x 1" (15.2 x 2.5 cm)

### ECD Vent Trap

- Reduces the release of hazardous materials from the ECD vent into the lab.
- Includes connecting lines and mounting kit.

Description	Fittings	qty.	cat.#
ECD Vent Trap	1/8"	ea.	22017

### tech tip

#### Carrier Gas Purity

Carrier gas should contain less than 1 ppm of oxygen, moisture, or other trace contaminants to prevent column degradation, increase column lifetime, and decrease stationary phase bleed.

The expense of using high-purity gases in combination with carrier gas line purifiers will be offset by longer column lifetime and less GC maintenance.



Dimensions:  
21" x 1 1/2"  
(53.3 x 3.8 cm)

### VICI® Mat/Sen® Gas-Specific Purifier Modules

- Replace separate oxygen, moisture, and hydrocarbon traps with one multiple-bed purifier, specific for purifying helium, hydrogen, nitrogen, or air.
- Reduce gas impurities from ppm to low ppb levels.
- Decrease baseline noise and increase GC-MS sensitivity.
- Prepurged with the specified gas to shorten downtime.

Performance for these purifiers is optimized by incorporating a multiple-bed format that progressively lowers concentrations of contaminants at each successive bed. VICI® Mat/Sen® purifiers are guaranteed to produce gases that are purer than 99.9999%, when supplied with gas of 99.995% purity, and are prepurged with the specified gas to speed conditioning. Purifier capacity is approximately four tanks of gas at 99.995% (50 ppm) purity, and correspondingly longer for purer gases.

Please Note: We recommend using an indicating oxygen trap (e.g., cat.# 22029, pg. 287) downstream from a VICI® Mat/Sen® purifier to continually ensure gas purity and indicate absolute change-out time.

#### Specifications:

Length:	21" (53.3 cm)
Diameter:	1.5" (3.8 cm)
Maximum Inlet Pressure:	1,000 psi (6895 kPa)
Maximum Recommended Flow:	500 mL/min
Pressure Drop from 120 psi (827 kPa) inlet at a flow of 0-500 mL/min:	<0.20 psi (1.4 kPa)
Compression End Fittings:	1/8" or 1/4", stainless steel
Shipping Weight:	3.04 lb (1,300 g)

#### Compression Tube Fittings

Gas-Specific Purifier Module	1/4-inch		1/8-inch	
	qty.	cat.#	qty.	cat.#
Helium Purifier Module	ea.	22600	ea.	22601
Hydrogen Purifier Module	ea.	22602	ea.	22603
Nitrogen Purifier Module*	ea.	22604	ea.	22605
Air Purifier Module	ea.	22606	ea.	22607

\*Warning: Do not use with nitrogen containing more than 500 ppm of oxygen. If the oxygen level in the stream exceeds 500 ppm, use an air purifier.

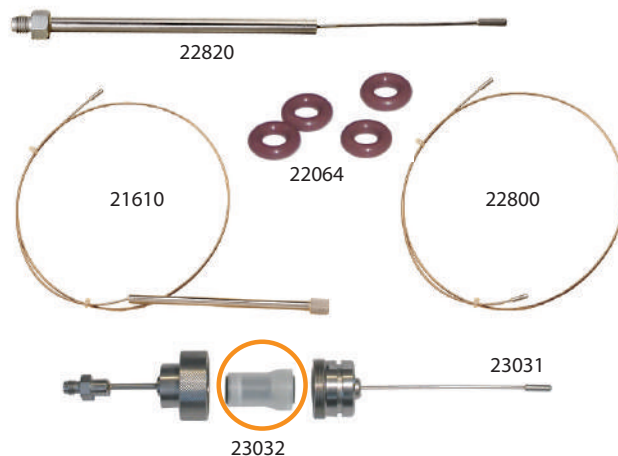
### Gas Pressure Gauge Kit

- Use an in-line pressure gauge to indicate when a thermal gas purifier getter tube should be replaced.
- Includes 1/8" tee and 0-100 psi (0-689 kPa) gauge.



21657

Description	qty.	cat.#
In-line Gas Pressure Gauge Kit for Thermal Gas Purifiers	kit	21657



### Replacement Chemical Traps and Parts for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent Part #	qty.	cat.#
Replacement Split Vent Trap for Agilent 6850/6890 GCs	G1544-80550	ea.	22820
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610
Split Vent Line (32-inch) for Agilent GCs Includes: all installation hardware		2-pk.	22800
O-Rings for Agilent Trap Fittings	5180-4181	25-pk.	22064
Optional Split Vent Trap Assembly for Agilent 6850/6890 GCs	G1544-60610, G1544-80530	kit	23031
Replacement Traps (2) and O-Rings (4)	G1544-80530, 5188-6495	kit	23032

### Parker Balston® H2PEMPD Hydrogen Generators

- Proton exchange membrane (PEM) cell eliminates the need for liquid electrolytes.
- Maintenance-free palladium purifier removes oxygen to <0.01 ppm and moisture to <1.0 ppm.
- Produces continuous supply of 99.99999+% pure hydrogen gas.
- Does not require downstream gas filters.
- Maximum outlet pressures of 100 or 175 psig (690 or 1,200 kPa).
- Automatic safety feature shuts the generator down if a hydrogen leak is detected.
- Compact unit, requires only one square foot of bench space.



**Specifications:**

Purity:	99.99999+% pure hydrogen
Outlet Port:	1/4" compression
Electrical Requirements:	100 to 230 VAC, 50/60Hz
Physical Dimensions:	17.1" h x 13.5" w x 21" d
Shipping Weight:	60 lb

Description	Model #	Capacity	Delivery Pressure	qty.	cat.#
Hydrogen Generator	H2PEMPD-510	510 cc/min	100 psig	ea.	22144
Hydrogen Generator	H2PEMPD-510	510 cc/min	175 psig	ea.	22145
Hydrogen Generator	H2PEMPD-650	650 cc/min	100 psig	ea.	22146
Hydrogen Generator	H2PEMPD-650	650 cc/min	175 psig	ea.	22147
Hydrogen Generator	H2PEMPD-850	850 cc/min	100 psig	ea.	22148
Hydrogen Generator	H2PEMPD-850	850 cc/min	175 psig	ea.	22149
Hydrogen Generator	H2PEMPD-1100	1,100 cc/min	100 psig	ea.	22150
Hydrogen Generator	H2PEMPD-1100	1,100 cc/min	175 psig	ea.	22151
Hydrogen Generator	H2PEMPD-1300	1,300 cc/min	100 psig	ea.	22152
Hydrogen Generator	H2PEMPD-1300	1,300 cc/min	175 psig	ea.	22153

**Maintenance Kits**

6-Month Maintenance Kit for H2PEMPD Units Includes: Deionizer cartridge, 100 µm water filter, environmental filters (2), and filter replacement tool	kit	22154
24-Month Maintenance Kit for H2PEMPD Units Includes: deionizer cartridge, 100 µm water filter, environmental filters (2), filter replacement tool, tube clamp, water pump, and fan guard (2)	kit	22155



Your satisfaction is our top priority.





- Dimensions: 17.12" x 13.46" x 17.95"
- 59 lb dry weight

**Safer alternative to high-pressure gas cylinders!**

### Parker Balston® PEM Hydrogen Generators

- Proton exchange membrane (PEM) cell eliminates the need for liquid electrolytes.
- Reliably generate 99.9995% pure hydrogen—for better chromatography.
- Eliminates high-pressure cylinders—greater convenience and improved lab safety.
- Compact unit, requiring only one square foot of bench space.
- Quick and easy to service and maintain; unique display lighting changes color for easy status checks and water level indication.
- Comes with a set of universal power adapters for U.S., European, and Asian plug types.
- Automatic safety feature shuts the generator down if a hydrogen leak is detected.

#### Specifications

Purity:	99.9995% pure hydrogen
Delivery Pressure:	5-100 psig ± 0.5 psig (69-689 kPa ± 7kPa)
Outlet Port:	1/8" compression
Electrical Requirements:	100-230 VAC/50-60 Hz
Physical Dimensions:	17.12" h x 13.46" w x 17.95" d (43.48 x 34.19 x 45.6 cm)
Shipping Weight:	59 lb (27 kg) dry

Description	Model #	Capacity	qty.	cat.#
Hydrogen Generator	H2PEM-100	100 cc/min	ea.	23065
Hydrogen Generator	H2PEM-165	165 cc/min	ea.	23066
Hydrogen Generator	H2PEM-260	260 cc/min	ea.	23067
Hydrogen Generator	H2PEM-510	510 cc/min	ea.	23068

#### Replacement and Maintenance Components for Hydrogen Generators (for all models listed above)

Replacement Desiccant Cartridge for H2PEM Generators	ea.	23069
6-Month Maintenance Kit for H2PEM Generators	kit	23070
Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters		
24-Month Maintenance Kit for H2PEM Generators	kit	23071
Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters, 1 water level sensor, 1 water pump, and 1 desiccant cartridge		

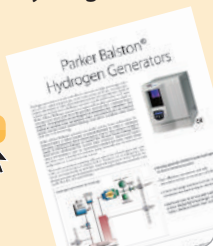
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Parker Balston® Hydrogen Generators

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## Restek Electronic Leak Detector

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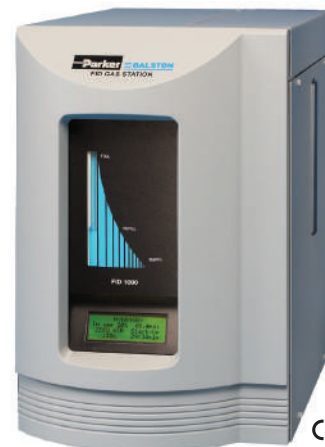


### Parker Balston® Model FID-1000 and FID-2500 Gas Stations

- Single unit produces UHP zero air from house compressed air and 99.9995% pure hydrogen from deionized water.
- Ideal for supplying up to 5-6 FIDs.
- Eliminates inconvenient and dangerous gas cylinders.
- Silent operation, minimal operator attention required.

Parker Balston® gas stations provide both UHP grade hydrogen gas and zero grade air for flame ionization detectors. The system is specifically designed to supply gas to FIDs and to support flame thermionic and flame photometric detectors. The units produce zero air by purifying compressed air to a total hydrocarbon concentration of 0.1 ppm or less (measured as methane).

The hydrogen generators produce hydrogen gas from deionized water, using the principle of electrolytic dissociation of water and hydrogen proton conduction through a proton exchange membrane cell.



Produce zero air and pure hydrogen from one unit!

#### Specifications - FID Gas Stations:

Hydrogen Purity:	99.9995%
Zero Air Purity:	< 0.1 ppm total hydrocarbons as methane
Max. Hydrogen Flow Rate:	FID-1000: 90 cc/min FID-2500: 250 cc/min
Max. Zero Air Flow Rate:	FID-1000: 1000 cc/min FID-2500: 2500 cc/min
Power:	120 VAC/amp, 60 Hz, 480 watts
Hydrogen Outlet Pressure:	60 psig (414 kPa)
Zero Air Outlet Pressure:	40-125 psig* (276-862 kPa)
Inlet Connection:	1/4" NPT (female)
Outlet:	1/8" compression
Dimensions:	16.5" h x 10.5" w x 17" d (42 cm x 27 cm x 43 cm)
Weight:	53 lb (24 kg)

Description	Model #	qty.	cat. #
Gas Station	Model FID-1000 (ideal for 1-2 FIDs)	ea.	20177
Gas Station	Model FID-2500 (ideal for 5-6 FIDs)	ea.	24913

#### Replacement Components for FID Gas Stations

Resin Bed Cartridge for Hydrogen Generators in FID-1000 and FID-2500 Gas Stations	ea.	24914
Replacement Desiccant Cartridge	ea.	21671
FID Gas Station Annual Maintenance Kit	ea.	24915
Includes: 1 desiccant cartridge, 1 resin cartridge, 1 inline filter**, and 1 tube filter**		

\*Zero air inlet requires minimum of 40 psig (276 kPa) compressed air pressure.

\*\* Filters should be changed every year; resin and desiccant cartridges can be replaced every 2 years.

### ordering note

For **international orders**, please contact Customer Service or your Restek representative.

### free literature

FID Gas Stations

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lit. cat.#  
GNTS1437-UNV





20697

### Parker Balston® Nitrogen Gas Generators

- Produces ultra-pure nitrogen (up to 99.9999%).
- Require only a compressed air source and 110 volt AC power.
- Typical applications include GC carrier gas, make-up gas, and low flow sample concentrators.
- Maintenance kits include replacement filters.

#### Specifications Model HPN2-1100 or UHPN2-1100

Maximum Nitrogen Flow Rate:	See Flow Table
Nitrogen Purity:	99.9999%
Minimum/Maximum Inlet Pressure:	60 psig/125 psig (414/862 kPa)
Electrical Requirements:	120 VAC/60 Hz
Dimensions:	35" h x 12" w x 16" d (89 cm x 30 cm x 41 cm)
Shipping Weight:	115 lb (52 kg)

#### Flow Table for Models HPN2-1100 and UHPN2-1100

Inlet Air Pressure	Maximum Outlet Flow (cc/min)	Maximum Outlet Pressure	<b>Note:</b> Model HPN2-1100 does not remove hydrocarbons. *Power consumption is: Model HPN2-1100 = 25 Watts Model UHPN2-1100 = 700 Watts
125 psig (862 kPa)	1100	85 psig (586 kPa)	
110 psig (758 kPa)	1000	75 psig (517 kPa)	
100 psig (689 kPa)	900	65 psig (448 kPa)	
90 psig (621 kPa)	800	60 psig (414 kPa)	
80 psig (552 kPa)	700	50 psig (345 kPa)	
70 psig (483 kPa)	600	45 psig (310 kPa)	
60 psig (414 kPa)	500	35 psig (241 kPa)	

Nitrogen Generators	Model #	qty.	cat. #
Nitrogen Generator	HPN2-1100 (ultra-high purity)	ea.	21653
Nitrogen Generator	UHPN2-1100 (ultra-high purity zero grade)	ea.	20697
Maintenance Kits	Model #	qty.	cat. #
Annual Maintenance Kit Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter	for HPN2-1100, 76-92	kit	21649
Annual Maintenance Kit Includes: 1st, 2nd, and 3rd stage prefilters (1 each) and 1 final filter	for UHPN2-1100, 76-94, 76-96	kit	21655

### ordering note

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lit. cat.# GNB1758-UNV

### Parker Balston® Nitrogen Gas Generators for LC-MS

- Turn compressed air into ultra-pure nitrogen (up to 99.5%).
- Flows from 1 to 44 L/min.
- Models N2-04, N2-14, N2-22, and N2-35 require no electricity.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.



Specifications	NitroFlow Lab*	N2-04	N2-14	N2-22 or N2-22A	N2-35 or N2-35A
Maximum Nitrogen Flow Rate:	32 L/min	8 L/min N2-22A: 29 L/min	36 L/min max. flow	N2-22: 44 L/min	44 L/min
Nitrogen Purity:	99.50%	99%	95.0%–99.5%	99%	99%
Min/Max Inlet Pressure:	N/A	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig
Electrical Requirements:	120 VAC/60 Hz	None	None	N2-22: None N2-22A: 120 VAC/60 Hz	N2-35: None N2-35A: 120 VAC/60 Hz
Dimensions:	27.6" h x 35.4" w x 12.2" d (70 cm x 90 cm x 31 cm)	11" h x 13" w x 16" d (27 cm x 34 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)
Shipping Weight:	205 lb (93 kg)	43 lb (20 kg)	75 lb (34 kg)	N2-22: 101 lb (46 kg) N2-22A: 106 lb (48 kg)	N2-35: 115 lb (52 kg) N2-35A: 119 lb (54 kg)

\* Has built-in air compressor.

Nitrogen Generators for LC-MS	Model #	qty.	cat.#
Nitrogen Generator for LC-MS	NitroFlow Lab Model, 32 L/min max. flow	ea.	22129
Nitrogen Generator for LC-MS	N2-04 Model for ELSD, 8 L/min max. flow	ea.	22130
Nitrogen Generator for LC-MS	N2-14 (general purpose) 36 L/min max. flow	ea.	20677
Nitrogen Generator for LC-MS	N2-22 Model, 44 L/min max. flow	ea.	22131
Nitrogen Generator for LC-MS	N2-22A Model, 29 L/min max. flow	ea.	22132
Nitrogen Generator for LC-MS	N2-35 Model, 44 L/min max. flow	ea.	22133
Nitrogen Generator for LC-MS	N2-35A Model, 44 L/min max. flow	ea.	22134
Includes: Oxygen analyzer and audible alarm (monitors oxygen in nitrogen stream and signals high or low concentrations)			
Maintenance Kits	Model #	qty.	cat.#
Maintenance Kit	for NitroFlow Lab	kit	22156
Includes: carbon filter			
6-Month Maintenance Kit*			
Includes: 1st stage prefilter, 2nd stage prefilter, and final filter (2 each)	for N2-14, N2-14A, 75-72, 75-720NA	kit	21648
6-Month Maintenance Kit With Carbon Filter*			
Includes: 1st stage prefilter, 2nd stage prefilter, hydrocarbon scrubber, and final filter (1 each)	for N2-14, N2-14A, 75-72, 75-720NA	kit	22135
Generator Maintenance Kit	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000, and 75-80 (Zero Air); N2-04 (Nitrogen); and TOC-1250 (TOC)	kit	21647
Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter			

\*The manufacturer recommends maintenance for this unit every 6 months.



### ordering note

For **international orders**, please contact Customer Service or your Restek representative.



### Parker Balston® Zero Air Generators

- Turn in-house compressed air into ultra-pure air (<0.1 ppm total hydrocarbons).
- Remove hydrocarbons to less than 0.1 ppm by catalytic oxidation.
- Operate at 40–125 psi (276–862 kPa).
- Typical payback is less than one year, based on cylinder costs.
- Install easily and take up little bench space\*.
- Maintenance kits include a one-year supply of prefilters and final filter.



Model	Number of FIDs*
75-83NA	Up to 2
HPZA-3500	Up to 8
HPZA-7000	Up to 16
HPZA-18000	Up to 40
HPZA-30000	Up to 66

\*Based on a 450 cc/min fuel air rate

#### Specifications


Maximum Zero Air Flow Rate:	75-83NA	1 L/min
	HPZA-3500	3.5 L/min
	HPZA-7000	7 L/min
	HPZA-18000	18 L/min
	HPZA-30000	30 L/min
Outlet Hydrocarbon Concentration (as Methane):	75-83NA	< 0.1 ppm
	HPZA-30000	< 0.1 ppm
	Other Models	< .05 ppm
Minimum/Maximum Inlet Air Pressure:	40 psig/125 psig (276/862 kPa)	
Maximum Inlet Hydrocarbon Concentration (as Methane):	100 ppm	
Pressure Drop at Maximum Flow Rate:	4 psi (28 kPa) differential	
Maximum Inlet Air Temperature:	78°F (25°C)	
Inlet/Outlet Ports:	1/4" NPT (female)	
Start-up Time to Specified Hydrocarbon Concentration:	45 minutes	
Electrical Requirements:	75-83NA	120 VAC/60 Hz, 0.5 amps
	HPZA-3500, HPZA-7000	120 VAC/60 Hz, 2.0 amps
	HPZA-18000, HPZA-30000	120 VAC/60 Hz, 4.0 amps
Dimensions:	75-83NA	10" h x 12" w x 3" d (25 cm x 30 cm x 8 cm)
	Other Models	16" h x 11" w x 13" d (42 cm x 27 cm x 34 cm)
Shipping Weight:	75-83NA	7 lb (3 kg)
	Other Models	41 lb (19 kg)

Zero Air Generator	Model #	Capacity	qty.	cat. #	
Zero Air Generator	75-83NA	1,000 cc/min	ea.	20684	
Zero Air Generator	HPZA-3500	3,500 cc/min	ea.	20680	
Zero Air Generator	HPZA-7000	7,000 cc/min	ea.	20681	
Zero Air Generator	HPZA-18000	18,000 cc/min	ea.	20682	
Zero Air Generator	HPZA-30000	30,000 cc/min	ea.	20683	
<b>Annual Maintenance Kits</b>				<b>qty.</b>	<b>cat. #</b>
Annual Maintenance Kit					
Includes: 1 prefilter and 1 sintered metal filter	for 75-83NA		kit	21646	
Generator Maintenance Kit	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000, and 75-80 (Zero Air); N2-04 (Nitrogen); and TOC-1250 (TOC)		kit	21647	
Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter					
<b>Replacement Catalyst Towers</b>		<b>Model #</b>	<b>Capacity</b>	<b>qty.</b>	<b>cat. #</b>
Replacement Catalyst Tower	for 75-83NA		1,000 cc/min	ea.	22005
Replacement Catalyst Tower	for HPZA-3500		3,500 cc/min	ea.	22004
Replacement Catalyst Tower	for HPZA-7000		7,000 cc/min	ea.	22006
Replacement Catalyst Tower	for HPZA-18000		18,000 cc/min	ea.	22007
Replacement Catalyst Tower	for HPZA-30000		30,000 cc/min	ea.	22008

\*Parker Model 75-83NA (Restek cat.# 20684) is a wall-mount model, and its dimensions are 12" w x 10" h x 3" d.

### ordering note

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Zero Air Generators

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lit. cat.# GNTS1439-UNV



## Silcosteel® Regulators and Switchover Systems

Applications:

- CEM continuous emission monitoring.
- Environmental stack and gas emission standards.
- Low-level sulfur and mercury analysis.
- Reactive or corrosive gases.
- Off-shore platform systems.
- Corrosive and salt water exposure.

Single- and dual-stage regulators and switchover systems are available with Silcosteel® surface treatment. This proprietary passivation process provides excellent inertness for sulfur and mercury calibration standards and improved corrosion resistance over bare 316L stainless steel or other more expensive alloys.

Silcosteel®-treated sampling and transfer systems allow oil and gas exploration companies, chemical and petrochemical plants, and refineries to obtain accurate sulfur and mercury data the first time, every time, with no delay, sample errors, or false readings, down to part-per-billion (ppb) levels. Analysts charged with monitoring sulfur and mercury levels in process streams can save thousands of dollars in improved yields, better test cycle times, and improved system reliability.

### Silcosteel® Regulators (Dual Stage & Single Stage)

Description	qty.	cat.#
<b>Single-Stage Regulator</b>		
CGA 330 (H <sub>2</sub> S and other reduced sulfurs)	ea.	21361-5
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	ea.	21361-6
CGA 660 (NO, NO <sub>2</sub> , SO <sub>2</sub> )	ea.	21361-11
<b>Dual-Stage Regulator</b>		
CGA 330 (H <sub>2</sub> S and other reduced sulfurs)	ea.	21360-2
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	ea.	21360-7

For other CGA fittings, please contact your local Restek representative.



Outlet pressure: 0 to 150 psig  
 Outlet gauge: 30"-0 to 200 psig  
 Inlet gauge: 0 to 4,000 psig  
 Outlet assembly: diaphragm valve, 1/4" tube fitting

### Automatic Switchover System for Corrosive Gases (Silcosteel®-Treated)

Description	qty.	cat.#
CGA 320 (CO <sub>2</sub> , CH <sub>3</sub> F)	ea.	22364320
CGA 330 (H <sub>2</sub> S and other reduced sulfurs)	ea.	22364330
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	ea.	22364350



Outlet pressure: 0 to 150 psig  
 Outlet gauge: 30"-0 to 200 psig  
 Inlet gauge: 0 to 4,000 psig  
 Outlet assembly: diaphragm valve, 1/4" tube fitting

### Overview of Restek Ultra-High Purity (UHP) Gas Regulators

- Regulators feature metal-to-metal seals throughout for long-term leak-tightness.
- Metal diaphragm outlet valve ensures gas purity.
- Each regulator is helium leak-test-certifiable to  $1 \times 10^{-8}$  scc/sec.
- Temperature range:  $-40$  °C to  $60$  °C.

### Ultra-High Purity (UHP) Brass Body Gas Regulators

UHP brass regulators are the best choice when using ultra-high purity carrier gas for sensitive GC applications using MS, PID, or ECD detection methods. They feature reduced internal dead volume relative to stainless steel bodies. The metal valve diaphragm ensures leak-free shutoff. Oxidation-resistant chrome plating maintains a like-new appearance.

### Dual-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Most stable outlet pressure control.
- Secondary pressure regulation not needed.
- Most widely used regulator.
- Less internal volume than stainless steel gas regulators.



All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.

Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)  
Outlet assembly: diaphragm valve,  $\frac{1}{4}$ " tube fitting

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	21667
CGA 350 (H <sub>2</sub> , P <sub>2</sub> )	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	21668
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	21669
DIN 477 #1 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22369
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22368
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22370
DIN 477 #10 (N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22371
BS 341 #3 (He, Ar, Air, N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22136
BS 341 #4 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22137

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

### Single-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.



All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.

Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)  
Outlet assembly: diaphragm valve,  $\frac{1}{4}$ " tube fitting

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20646
CGA 350 (H <sub>2</sub> , P <sub>2</sub> )	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20647
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20648
DIN 477 #1 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22373
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22372
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22374
DIN 477 #10 (N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22375
BS 341 #3 (He, Ar, Air, N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22138
BS 341 #4 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22139

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

### Ultra-High Purity Chrome-Plated Brass Line Gas Regulator

- Oxidation-resistant, chrome-plated.
- Use where you need to reduce the line pressure by 20 psig (138 kPa) or more.
- Same purity protection as high-pressure cylinder regulators.



Inlet connections:  $\frac{1}{4}$ " FPT  
Outlet assembly:  $\frac{1}{4}$ " FPT port

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
$\frac{1}{4}$ " female NPT ports*	0–50 psig (0–345 kPa)	30", 0 to 100 psig (0–689 kPa)	ea.	21666
$\frac{1}{4}$ " female NPT ports*	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	22452

## Ultra-High Purity (UHP) Stainless Steel Body Gas Regulators

UHP stainless steel regulators are the standard for ultra-high-purity and corrosion-resistant pressure regulation. They are more easily purged of atmospheric components, compared to brass gas regulators, making them ideal for the most demanding applications. Stainless steel is especially useful in atmospheres of dry corrosive gases such as hydrogen.

### Dual-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Most stable outlet pressure control.
- Secondary pressure regulation not needed.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20662
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20663
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20664
DIN 477 #1 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22377
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22376
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22378
DIN 477 #10 (N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22379
BS 341 #3 (He, Ar, Air, N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22140
BS 341 #4 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22141

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

### Single-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20665
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20666
CGA 590 (Air)	0 to 150 psig (0–1,034 kPa)	30", 0 to 200 psig (0–1,379 kPa)	ea.	20667
DIN 477 #1 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22380
DIN 477 #6 (He, Ar)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22445
DIN 477 #9 (Air)	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22446
DIN 477 #10 (N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22447
BS 341 #3 (He, Ar, Air, N <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22142
BS 341 #4 (H <sub>2</sub> )	0 to 10 bar (0–150 psig)	30", 0 to 14 bar (0–200 psig)	ea.	22143

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.



All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.  
Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)  
Outlet assembly: diaphragm valve, 1/4" tube fitting



All regulators are rated to 3,000 psig (20,684 kPa) maximum inlet pressure.  
Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)  
Outlet assembly: diaphragm valve, 1/4" tube fitting

## ordering note

### International Fittings

All gas regulators are available with the following BS (British Standard) and DIN (German Industrial Standards Organization) connections. Please contact your local Restek representative for more information.

BS 341 #01	BS 341 #08	BS 341 #15	DIN 477 #06	DIN 477 #10	DIN 477 #14
BS 341 #02	BS 341 #10	DIN 477 #01	DIN 477 #07	DIN 477 #11	DIN 477 #15
BS 341 #03	BS 341 #13	DIN 477 #03	DIN 477 #08	DIN 477 #12	
BS 341 #04	BS 341 #14	DIN 477 #05	DIN 477 #09	DIN 477 #13	



BS 341 #3 Fitting



DIN 477 #3 Fitting



21339

### Flexible Stainless Steel Hoses

Description	Length	Fittings	qty.	cat. #
Flexible Stainless Steel Hose	36"	1/4" Female NPT	ea.	21339
Flexible Stainless Steel Hose	18"	1/4" Female NPT	ea.	21340



21334

### Hydrogen Flashback Arrestor

- Valve cuts off gas supply in the event of a flashback.
- Can be reset and reused after flashback has occurred.
- Meets safety requirements of BS6158, EN730, ISO 5175, AS 4603 and are UL Listed 23Y5.

#### Specifications:

Body and Internals:	Brass with brass internals
Temperature Sensor:	Polyethylene
Valve spring:	316 stainless steel
Connections:	1/4" female NPT
Maximum pressure:	Hydrogen, 50 psig (3.5 bar)

Description	Fittings	qty.	cat.#
Hydrogen Flashback Arrestor, Brass Body	1/4" Female NPT	ea.	21334



21336

### CGA Fittings

CGA-specified nuts and nipples with internal frit, 1/4-inch NPT nickel-plated brass.

Description	qty.	cat.#
CGA 580 Fitting (N <sub>2</sub> , He, Ar)	ea.	21336
CGA 350 Fitting (H <sub>2</sub> , P <sub>2</sub> )	ea.	21337
CGA 590 Fitting (Air)	ea.	21338



23134



23179

### Swagelok® Male Connector, Pipe-to-Tube Fittings

Fitting Type	Size (inches)	Similar to Swagelok	Brass		Stainless Steel	
			qty.	cat.#	qty.	cat.#
Male Connector	1/4" to 1/4" NPT	400-1-4	10-pk.	23134	2-pk.	23184
Male Connector	1/8" to 1/4" NPT	200-1-4	10-pk.	23136	2-pk.	23186
Tube End Reducer	1/4" to 1/8"	200-R-4	5-pk.	23129	2-pk.	23179



**Automatic Switchover System for Noncorrosive Gases** (Critical Purity)

High-purity automatic switchover systems provide a continuous supply of high-purity gas to the laboratory, process, or instrument to allow you to replace a depleted gas source without interruption in the gas supply. Continuous gas supply is achieved by setting the two regulators at slightly different pressures and discharging one side of the system at a time. These models include flexible, all-stainless-steel pigtailed with armor casing. The CGA connection on each pigtail has a check valve in the gland to prevent contamination and minimize purging requirements.

Switching pressure: 200 psig/170 psig (1,379/1,172 kPa)  
 Inlet connections: flexible SS pigtailed (3/6")  
 Line regulator: 0 to 150 psig (0-1,034 kPa)



Brass Automatic Switchover System with Line Regulator	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	ea.	20668580
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	ea.	20668350
CGA 590 (Air)	ea.	20668590
Stainless Steel Automatic Switchover System with Line Regulator	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	ea.	21593580

**Protocol Station**

The protocol station is designed for convenient wall mounting of high-purity gas regulators. Wall mounting provides ease of use, prevents gas regulator damage, and improves safety. Either chrome-plated brass or 316 stainless steel option is complete with a 3-foot, flexible, all-stainless-steel pigtail with armor casing. The CGA connection on the pigtail has an integral check valve in the gland to prevent contamination during cylinder changeout.



Chrome-Plated Brass Protocol Station*	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	ea.	21347
CGA 350 (H <sub>2</sub> , P <sub>5</sub> )	ea.	21348
CGA 590 (Air)	ea.	21349
Stainless Steel Protocol Station*	qty.	cat.#
CGA 580 (N <sub>2</sub> , He, Ar)	ea.	21327

\*Pressure regulator not included. Order separately.

**Technical Service**

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you from set-up to method development.

**Contact us:**

For quick answers to commonly asked questions any time of the day, visit [www.restek.com/answers](http://www.restek.com/answers) or contact us directly:

**In the U.S.:** Phone: 1-800-356-1688, ext. 4 • e-mail: [support@restek.com](mailto:support@restek.com)

**Outside the U.S.:** Contact International Technical Service at [intltechsupp@restek.com](mailto:intltechsupp@restek.com) or find a local distributor at [www.restek.com/distributor](http://www.restek.com/distributor)



21321

### Cylinder Valve Wrench

This specially designed wrench enables easy opening of cylinder valves that are fitted with a hand wheel. It is also suitable for removing difficult cylinder caps.

Description	qty.	cat.#
Cylinder Valve Wrench	ea.	21321



21322

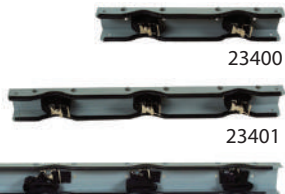
### Universal Cylinder Wrench

Use this versatile wrench for tightening gauges and gas regulator CGA fittings to cylinder outlets and pipe thread connections.

Description	qty.	cat.#
Universal Cylinder Wrench	ea.	21322



21333



23400

23401

23402

### Cylinder Holders, Wall Mounted

Prevent serious injuries! These holders are designed to prevent free-standing gas cylinders from tipping over and injuring personnel. The cast aluminum holder can be secured to a wall or the side of a work bench. Each mount will secure a cylinder 4-15 inches in diameter.

Description	Size	qty.	cat.#
Cylinder Holder, Wall Mounted	Single	ea.	21333
Cylinder Holder, Wall Mounted	Double	ea.	23400
Cylinder Holder, Wall Mounted	Triple	ea.	23401
Cylinder Holder, Wall Mounted	Four	ea.	23402



20635

### Backpressure Gas Regulator

Capillary GC inlet systems have backpressure regulators to maintain a constant upstream pressure and rapidly respond to catastrophic leaks. The 0-60 psig (0-414 kPa) operating range is sufficient to operate a 105 m, 0.25 mm ID column at its optimum flow rate.

Description	qty.	cat.#
Backpressure Gas Regulator	ea.	20635



20610

### MINICYL Regulator

This compact general purpose regulator has many laboratory applications including air-drying glassware, sparging or evaporating solutions, and controlling pneumatic valves. It is constructed of lightweight aluminum with an elastomer diaphragm. Includes a 0-60 psig (0-414 kPa) gauge and either 1/8- or 1/4-inch tube fittings.

Description	Fittings	Max Inlet Pressure	qty.	cat.#
MINICYL Regulator	1/8" Fittings	300 psi	ea.	20610
MINICYL Regulator	1/4" Fittings	300 psi	ea.	20611

## Swagelok® Fitting Kits

Save more than 40% by purchasing a Swagelok® fittings kit compared to paying full price for the individual parts!

- Includes the most common assortment of 1/8" and 1/4" brass or stainless steel fittings.
- Parts list makes reordering easy.
- Parts come in sturdy toolbox for easy and convenient storage.



40%  
savings



### Swagelok® Fitting Kit (Brass)

#### Swagelok # Description (qty included in kit)

B-202-1	1/8" brass nut (20)
B-402-1	1/4" brass nut (20)
B-203-1	1/8" brass front ferrule (20)
B-403-1	1/4" brass front ferrule (20)
B-204-1	1/8" brass back ferrule (20)
B-404-1	1/4" brass back ferrule (20)
B-200-C	1/8" brass cap (6)
B-400-C	1/4" brass cap (6)
B-200-P	1/8" brass plug (6)
B-400-P	1/4" brass plug (6)
B-200-6	1/8" brass union (2)
B-400-6	1/4" brass union (2)
B-400-6-2	1/4" to 1/8" brass reducing union (2)
B-200-3	1/8" brass tee (2)
B-400-3	1/4" brass tee (2)
B-400-R-2	1/8" to 1/4" brass tube end reducer (2)
B-200-R-4	1/4" to 1/8" brass tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#
Swagelok Fitting Kit, Brass	kit	23141

### Swagelok® Fitting Kit (Stainless Steel)

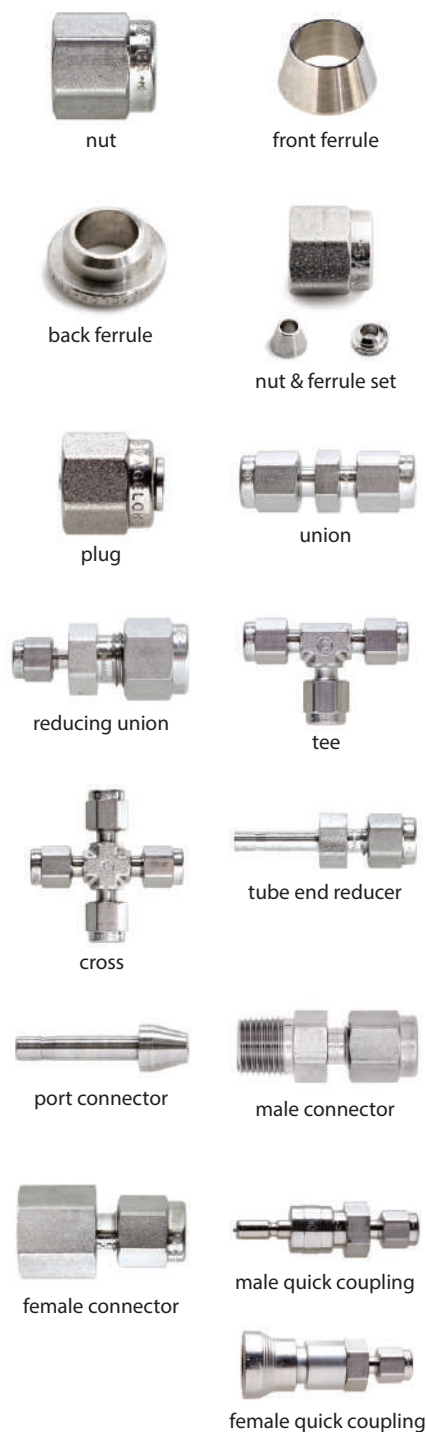
#### Swagelok # Description (qty included in kit)

SS-202-1	1/8" SS nut (20)
SS-402-1	1/4" SS nut (20)
SS-203-1	1/8" SS front ferrule (20)
SS-403-1	1/4" SS front ferrule (20)
SS-204-1	1/8" SS back ferrule (20)
SS-404-1	1/4" SS back ferrule (20)
SS-200-C	1/8" SS cap (6)
SS-400-C	1/4" SS cap (6)
SS-200-P	1/8" SS plug (6)
SS-400-P	1/4" SS plug (6)
SS-200-6	1/8" SS union (2)
SS-400-6	1/4" SS union (2)
SS-400-6-2	1/4" to 1/8" SS reducing union (2)
SS-200-3	1/8" SS tee (2)
SS-400-3	1/4" SS tee (2)
SS-400-R-2	1/8" to 1/4" SS tube end reducer (2)
SS-200-R-4	1/4" to 1/8" SS tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#
Swagelok Fitting Kit, Stainless Steel	kit	23197

**Swagelok® Fittings** (Brass & Stainless Steel)

Restek is pleased to offer one of the premier lines of fittings available for chromatographers in the market today. We can supply the entire line of Swagelok® fittings. If you do not see the exact product you're looking for, please call us or contact your Restek representative for a quote.



Fitting Type	Size	Swagelok #	Brass		316 Grade Stainless Steel	
			qty.	cat.#	qty.	cat.#
Nut	1/16"	102-1	20-pk.	23100	5-pk.	23150
	1/8"	202-1	40-pk.	23101	10-pk.	23151
	1/4"	402-1	40-pk.	23102	10-pk.	23152
Front Ferrule	1/16"	103-1	20-pk.	23103	10-pk.	23153
	1/8"	203-1	40-pk.	23104	20-pk.	23154
	1/4"	403-1	40-pk.	23105	20-pk.	23155
Back Ferrule	1/16"	104-1	20-pk.	23106	10-pk.	23156
	1/8"	204-1	40-pk.	23107	20-pk.	23157
	1/4"	404-1	40-pk.	23108	20-pk.	23158
Nut & Ferrule Set	1/16"	—	10-pk.	23109	2-pk.	23159
	1/8"	—	20-pk.	23110	5-pk.	23160
	1/4"	—	20-pk.	23111	5-pk.	23161
Plug	1/16"	100-P	5-pk.	23112	2-pk.	23162
	1/8"	200-P	10-pk.	23113	4-pk.	23163
	1/4"	400-P	10-pk.	23114	4-pk.	23164
Union	1/16"	100-6	3-pk.	23115	ea.	23165
	1/8"	200-6	5-pk.	23116	2-pk.	23166
	1/4"	400-6	5-pk.	23117	2-pk.	23167
Reducing Union	1/8" to 1/16"	200-6-1	5-pk.	23118	ea.	23168
	1/4" to 1/16"	400-6-1	5-pk.	23119	2-pk.	23169
	1/4" to 1/8"	400-6-2	5-pk.	23120	2-pk.	23170
Tee	1/16"	100-3	2-pk.	23121	ea.	23171
	1/8"	200-3	2-pk.	23122	ea.	23172
	1/4"	400-3	2-pk.	23123	ea.	23173
Cross	1/8"	200-4	2-pk.	23124	ea.	23174
	1/4"	400-4	2-pk.	23125	ea.	23175
Tube End Reducer	1/8" to 1/16"	100-R-2	5-pk.	23126	2-pk.	23176
	1/4" to 1/16"	100-R-4	5-pk.	23127	2-pk.	23177
	1/8" to 1/4"	400-R-2	5-pk.	23128	2-pk.	23178
	1/4" to 1/8"	200-R-4	5-pk.	23129	2-pk.	23179
Port Connector	1/8"	201-PC	5-pk.	23130	2-pk.	23180
	1/4"	401-PC	10-pk.	23131	2-pk.	23181
	1/8" to 1/4"	401-PC-2	5-pk.	23132	2-pk.	23182
Male Connector	1/8" to 1/8" NPT	200-1-2	10-pk.	23133	2-pk.	23183
	1/4" to 1/4" NPT	400-1-4	10-pk.	23134	2-pk.	23184
	1/16" to 1/8" NPT	100-1-2	5-pk.	23135	2-pk.	23185
	1/8" to 1/4" NPT	200-1-4	10-pk.	23136	2-pk.	23186
	1/4" to 1/8" NPT	400-1-2	10-pk.	23137	2-pk.	23187
Female Connector	1/8" to 1/8" NPT	200-7-2	5-pk.	23138	2-pk.	23188
	1/4" to 1/4" NPT	400-7-4	5-pk.	23139	2-pk.	23189
	1/4" to 1/8" NPT	400-7-2	5-pk.	23140	2-pk.	23190
Male & Female Quick Couplings	1/8" male*	QC4D-200	—	—	ea.	23191
	1/8" male	QC4S-200	—	—	ea.	23192
	1/8" female*	QC4B-200	—	—	ea.	23193
	1/4" male*	QC4D-400	—	—	ea.	23194
	1/4" male	QC4S-400	—	—	ea.	23195
	1/4" female*	QC4B-400	—	—	ea.	23196

\*Includes self-sealing shut-off valve.



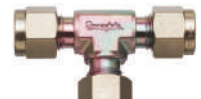
**Swagelok® Fittings** (Siltek®/Sulfinert® & Silcosteel®-CR Treated)

- Full line of treated 1/16", 1/8", and 1/4" fittings.
- Silcosteel®-CR treatment enhances corrosion resistance by 10x or more.
- For custom treatment on any Swagelok® fitting or other system parts not listed here, call us or contact your Restek representative.

Fitting Type	Size	Swagelok #	Siltek/Sulfinert Treated		Silcosteel-CR Treated	
			qty.	cat.#	qty.	cat.#
Union	1/16"	SS-100-6	ea.	22540	ea.	22575
	1/8"	SS-200-6	ea.	22541	ea.	22576
	1/4"	SS-400-6	ea.	22542	ea.	22577
	3/8"	SS-600-6	ea.	22909	ea.	22904
Tee	1/16"	SS-100-3	ea.	22543	ea.	22578
	1/8"	SS-200-3	ea.	22544	ea.	22579
	1/4"	SS-400-3	ea.	22545	ea.	22580
	3/8"	SS-600-3	ea.	22910	ea.	22905
Reducing Union	1/8" to 1/16"	SS-200-6-1	ea.	22546	ea.	22581
	1/4" to 1/16"	SS-400-6-1	ea.	22547	ea.	22582
	1/4" to 1/8"	SS-400-6-2	ea.	22548	ea.	22583
	3/8" to 1/4"	SS-600-6-4	ea.	22911	ea.	22906
Elbow	1/8"	SS-200-9	ea.	22549	ea.	22584
	1/4"	SS-400-9	ea.	22550	ea.	22585
Plug	1/8"	SS-200-P	ea.	22573	ea.	22620
	1/4"	SS-400-P	ea.	22574	ea.	22597
Cross	1/8"	SS-200-4	ea.	22551	ea.	22586
	1/4"	SS-400-4	ea.	22552	ea.	22587
Tube End Reducer	1/8" to 1/16"	SS-100-R-2	ea.	22553	ea.	22588
	1/4" to 1/16"	SS-100-R-4	ea.	22554	ea.	22589
	1/8" to 1/4"	SS-400-R-2	ea.	22555	ea.	22590
	1/4" to 1/8"	SS-200-R-4	ea.	22556	ea.	22591
Port Connector	1/8"	SS-201-PC	ea.	22557	ea.	22592
	1/4"	SS-401-PC	ea.	22558	ea.	22593
	1/8" to 1/4"	SS-401-PC-2	ea.	22559	ea.	22594
Male Connector	1/8" to 1/8" NPT	SS-200-1-2	ea.	22561	ea.	22595
	1/4" to 1/4" NPT	SS-400-1-4	ea.	22562	ea.	22596
	1/16" to 1/8" NPT	SS-100-1-2	ea.	22563	ea.	22610
	1/8" to 1/4" NPT	SS-200-1-4	ea.	22564	ea.	22611
	1/4" to 1/8" NPT	SS-400-1-2	ea.	22565	ea.	22612
	3/8" to 3/8" NPT	SS-600-1-6	ea.	22912	ea.	22907
Female Connector	1/8" to 1/8" NPT	SS-200-7-2	ea.	22566	ea.	22613
	1/4" to 1/4" NPT	SS-400-7-4	ea.	22567	ea.	22614
	1/4" to 1/8" NPT	SS-400-7-2	ea.	22568	ea.	22615
	1/8" to 1/4" NPT	SS-200-7-4	ea.	22569	ea.	22616
Bulkhead Union	1/8"	SS-200-61	ea.	22570	ea.	22617
	1/4"	SS-400-61	ea.	22571	ea.	22618



union



tee



reducing union



elbow



plug



cross



tube end reducer



port connector



male connector



female connector



bulkhead union

**Custom Coatings**

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.

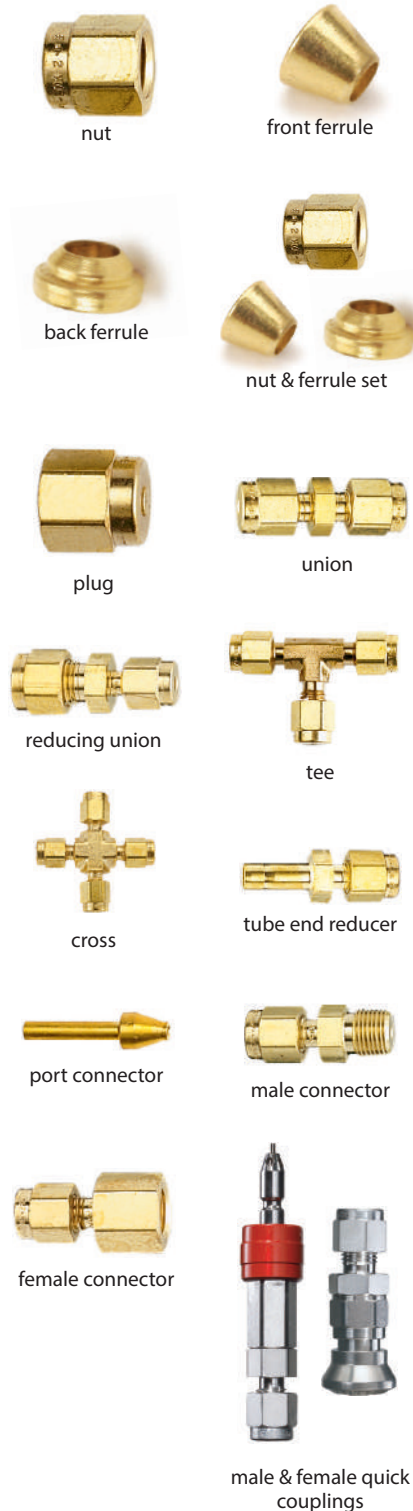
For more information on our custom coatings, see page 312.



# Fittings

## Parker® Fittings (Brass & Stainless Steel)

Parker's (A-Lok®) two-piece ferrules and NPT fittings are ideal for installing new equipment, modifying existing instrumentation, or replacing worn connections. Restek offers both brass and stainless steel fittings. If there is a particular Parker® fitting that you are looking for and it is not listed here, please contact us to inquire about availability.



Fitting Type	Size	Parker #	Brass		316 Grade Stainless Steel	
			qty.	cat.#	qty.	cat.#
Nut	1/16"	1 Nu 1	20-pk.	21800	5-pk.	21900
	1/8"	2 Nu 2	40-pk.	21801	10-pk.	21901
	1/4"	4 Nu 4	40-pk.	21802	10-pk.	21902
Front Ferrule	1/16"	1 FF 1	20-pk.	21803	10-pk.	21903
	1/8"	2 FF 2	40-pk.	21804	20-pk.	21904
	1/4"	4 FF 4	40-pk.	21805	20-pk.	21905
Back Ferrule	1/16"	1 BF 1	20-pk.	21806	10-pk.	21906
	1/8"	2 BF 2	40-pk.	21807	20-pk.	21907
	1/4"	4 BF 4	40-pk.	21808	20-pk.	21908
Nut & Ferrule Set	1/16"	—	10-pk.	21809	2-pk.	21909
	1/8"	—	20-pk.	21810	5-pk.	21910
	1/4"	—	20-pk.	21811	5-pk.	21911
Plug	1/16"	1 BLP 1	5-pk.	21815	2-pk.	21915
	1/8"	2 BLP 2	10-pk.	21816	4-pk.	21916
	1/4"	4 BLP 4	10-pk.	21817	4-pk.	21917
Union	1/16"	1 SC 1	3-pk.	21818	ea.	21918
	1/8"	2 SC 2	5-pk.	21819	2-pk.	21919
	1/4"	4 SC 4	5-pk.	21820	2-pk.	21920
Reducing Union	1/8" to 1/16"	2 RU 1	5-pk.	21823	ea.	21923
	1/4" to 1/16"	4 RU 1	5-pk.	21824	2-pk.	21924
	1/4" to 1/8"	4 RU 2	5-pk.	21825	2-pk.	21925
Tee	1/16"	1 ET 1	2-pk.	21826	ea.	21926
	1/8"	2 ET 2	2-pk.	21827	ea.	21927
	1/4"	4 ET 4	2-pk.	21828	ea.	21928
Cross	1/8"	2 ECR 2	2-pk.	21829	ea.	21929
	1/4"	4 ECR 4	2-pk.	21830	ea.	21930
Tube End Reducer	1/8" to 1/16"	2 TUR 1	5-pk.	21831	2-pk.	21931
	1/4" to 1/16"	4 TUR 1	5-pk.	21832	2-pk.	21932
	1/8" to 1/4"	2 TUR 4	5-pk.	21833	2-pk.	21933
	1/4" to 1/8"	4 TUR 2	5-pk.	21834	2-pk.	21934
Port Connector	1/8"	2 PC 2	5-pk.	21835	2-pk.	21935
	1/4"	4 PC 4	10-pk.	21836	2-pk.	21936
	1/8" to 1/4"	2 PC 4	5-pk.	21837	2-pk.	21937
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	10-pk.	21841	2-pk.	21941
	1/4" to 1/4" NPT	4 MSC 4N	10-pk.	21842	2-pk.	21942
	1/16" to 1/8" NPT	1 MSC 2N	5-pk.	21843	2-pk.	21943
	1/8" to 1/4" NPT	2 MSC 4N	10-pk.	21844	2-pk.	21944
Female Connector	1/4" to 1/8" NPT	4 MSC 2N	10-pk.	21845	2-pk.	21945
	1/8" to 1/8" NPT	2 FSC 2N	5-pk.	21846	2-pk.	21946
	1/4" to 1/4" NPT	4 FSC 4N	5-pk.	21847	2-pk.	21947
	1/4" to 1/8" NPT	4 FSC 2N	5-pk.	21848	2-pk.	21948
Male & Female Quick Couplings	1/8" male*	2A-Q4VN	—	—	ea.	21957
	1/8" male	2A-Q4P	—	—	ea.	21958
	1/8" female*	2A-Q4CN	—	—	ea.	21959
	1/4" male*	4A-Q4VN	—	—	ea.	21960
	1/4" male	4A-Q4P	—	—	ea.	21961
	1/4" female*	4A-Q4CN	—	—	ea.	21962

\*Includes self-sealing shut-off valve.

**Parker® Fittings** (Siltek®/Sulfinert® Treated & Silcosteel®-CR Treated)

A broad line of 1/16", 1/8" and 1/4" fittings are available with Siltek®/Sulfinert® or Silcosteel®-CR treatment. Because of expanding applications for these coatings, we have received many requests for a broader product offering. If you do not see everything you need, contact us for information on custom coating services.

Fitting Type	Size	Parker #	Siltek/Sulfinert Treated		Silcosteel-CR Treated	
			qty.	cat.#	qty.	cat.#
Union	1/16"	1 SC 1	ea.	22520	ea.	22863
	1/8"	2 SC 2	ea.	22521	ea.	22864
	1/4"	4 SC 4	ea.	22522	ea.	22865
Tee	1/16"	1 ET 1	ea.	22526	ea.	22866
	1/8"	2 ET 2	ea.	22527	ea.	22867
	1/4"	4 ET 4	ea.	22528	ea.	22868
Reducing Union	1/8" to 1/16"	2 RU 1	ea.	22523	ea.	22869
	1/4" to 1/16"	4 RU 1	ea.	22524	ea.	22870
	1/4" to 1/8"	4 RU 2	ea.	22525	ea.	22871
Elbow	1/8"	2 EE 2	ea.	22530	ea.	22875
	1/4"	4 EE 4	ea.	22531	ea.	22876
Plug	1/8"	2 BLP 2	ea.	21540	ea.	22878
	1/4"	4 BLP 4	ea.	21541	ea.	22879
Cross	1/8"	2 ECR 2	ea.	21542	ea.	22872
	1/4"	4 ECR 4	ea.	21543	ea.	22873
Tube End Reducer	1/8" to 1/16"	2 TUR 1	ea.	21544	ea.	22880
	1/4" to 1/16"	4 TUR 1	ea.	21545	ea.	22881
	1/8" to 1/4"	2 TUR 4	ea.	21546	ea.	22882
	1/4" to 1/8"	4 TUR 2	ea.	21547	ea.	22883
Port Connector	1/8"	2 PC 2	ea.	21548	ea.	22884
	1/4"	4 PC 4	ea.	21549	ea.	22885
	1/8" to 1/4"	2 PC 4	ea.	21550	ea.	22886
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	ea.	21551	ea.	22887
	1/4" to 1/4" NPT	4 MSC 4N	ea.	21552	—	—
	1/16" to 1/8" NPT	1 MSC 2N	ea.	21553	ea.	22889
	1/8" to 1/4" NPT	2 MSC 4N	ea.	21554	ea.	22890
	1/4" to 1/8" NPT	4 MSC 2N	ea.	21555	ea.	22891
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	ea.	21556	ea.	22892
	1/4" to 1/4" NPT	4 FSC 4N	ea.	21557	ea.	22893
	1/4" to 1/8" NPT	4 FSC 2N	ea.	21558	ea.	22894
	1/8" to 1/4" NPT	2 FSC 4N	ea.	21559	—	—
Plug Valve, 2-Way	1/8"	2A PR4 VT SS	ea.	21586	—	—
	1/4"	4A PR4 VT SS	ea.	21587	—	—
Ball Valve, 2-Way	1/8"	2A B2LJ2 SSP	ea.	21588	—	—
	1/4"	4A B2LJ2 SSP	ea.	21589	—	—

Please note: Nuts and ferrules are not treated unless requested (custom parts). Nuts and ferrules normally are not in contact with sample pathway, and thus do not require coating.

Ball and plug valves are also available in brass and stainless steel. See **page 316**.



union



tee



reducing union



elbow



plug



cross



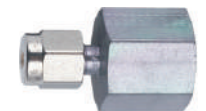
tube end reducer



port connector



male connector



female connector



plug valve, 2-way



ball valve, 2-way

**Valco® Fittings** (Siltek®/Sulfinert® Treated)

Fitting Type	Size	Siltek/Sulfinert Treated	
		qty.	cat.#
Zero Dead Volume Tee	1/16"	ea.	22534
	1/8"	ea.	22535
Zero Dead Volume Union	1/16"	ea.	22532
	1/8"	ea.	22533



zero dead volume tee



zero dead volume union



## Tubing and Available Coatings

Restek sets the standard in tubing for analytical and process applications. Complete your system with precleaned or treated tubing and treated fittings and valves for an inert, corrosion-resistant pathway.

Available tubing coatings include:

- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.

## Frequently Asked Questions

### 1. Can treated tubing be bent?

Treated tubing can be bent into curves with a bend radius greater than 1 inch for 1/16-inch OD tubing, 2 inches for 1/8-inch OD tubing, or 4 inches for 1/4-inch OD tubing. The treatment layer will remain intact as long as the tubing isn't stretched dramatically. If tight bends are necessary, use a treated elbow union or bend untreated tubing and send it to Restek for custom treatment.

### 2. Can compression fittings be used without crushing the treatment layer?

Yes. The layer is thin and permeates the surface. It compresses with minimal damage.

### 3. Is welding possible after treatment?

Yes. The coating does not interfere with the welding of two coated components. The coating is lost at the weld and in the heat affected zones approximately 2 to 5 mm on either side of the weld.

### 4. Is any additional chemical deactivation necessary?

A Sulfinert® or Silcosteel® layer leaves few exposed active sites, so there usually is no need for additional treatment. Chemical deactivation is useful in chromatographic applications in which water will be vaporized on the Silcosteel®-treated surface, but is not necessary for Sulfinert®-treated surfaces. Parts used in high-temperature applications (>400 °C) cannot be chemically deactivated.

### 5. What are the temperature constraints of these surface treatments?

On stainless steel, a Silcosteel® layer is stable to 600 °C. Parts treated with a secondary polymeric layer are limited to temperatures of 400 °C in inert atmospheres and 250 °C when oxygen is present, the temperature maximums for the polymer. Temperatures above 600 °C can be used under certain conditions—please contact us for information.

### 6. Why use Sulfinert® or Silcosteel® treatment instead of PTFE coating?

Three reasons: 1) Sulfinert® and Silcosteel® layers are nonpolymeric, so they do not exhibit the problems associated with gas permeability. 2) PTFE coating often flakes off the surface, while the Sulfinert® or Silcosteel® layer is tightly integrated into the substrate lattice. 3) PTFE coating is limited to 280 °C, while Silcosteel®-treated stainless steel tubing and fittings can be used to 600 °C.

### 7. Why use Sulfinert®-treated tubing for transfer lines?

Sulfinert®-treated stainless steel tubing offers all of the advantages of glass or fused silica tubing for the transfer of active compounds (e.g., sulfurs), but is far more durable and flexible.

### 8. Is treated tubing similar to glass-lined tubing (GLT)?

No. Sulfinert® or Silcosteel®-treated tubing is flexible and can be bent without heating. Also, the Sulfinert® or Silcosteel® layer is highly inert, unlike impure glass.

### 9. How can I clean the surface of a treated part after use?

Most often, a mild organic solvent (methylene chloride, methanol, hexane) or water is sufficient. Mild sonication may assist and accelerate the process. Do not use caustic, abrasive, or high pH (pH>8) cleaners, as they will damage or dissolve the layer. Steam cleaning in the presence of oxygen or air could create surface activity, and also should be avoided.

### 10. What materials should I avoid using with Silcosteel®-treated parts?

The Silcosteel® coating is silicon-based and is prone to attack by hydrofluoric acid or by basic compounds. The surface should not be exposed to media with pH>8.

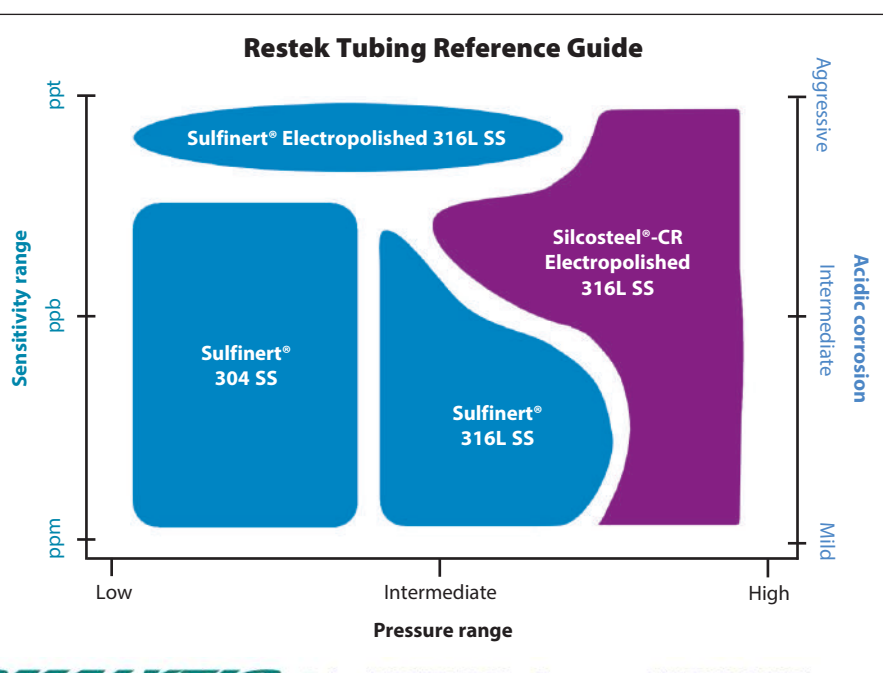
### 11. Siltek® and Sulfinert®: What's the Difference?

Siltek® is the name for the patented deposition process. When the Siltek® process was developed, the application that showed the greatest benefit was the storage and transfer of low ppb level active sulfur compounds, such as hydrogen sulfide and mercaptans. Because there was (and continues to be) demand for a reliable surface treatment for this application, the name Sulfinert® is used to describe Siltek®-treated products created specifically for this purpose.

## frequently asked question

Which treated tubing should I use?

This chart will help you determine the tubing best suited to your application with respect to pressure, sensitivity of your analysis, and acidic environment exposure.





## Rinsed and Cleaned 304 Stainless Steel Tubing

Use for providing carrier, fuel, make-up, or auxiliary gases to laboratory instruments.

ID (in.)	OD (in.)	6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	Length				
					20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#*
0.01"	1/16"	29000	29001	29002	29003	21500	29004	29005	21502
0.02"	1/16"	29006	29007	29008	29009	21503	29010	29011	21505
0.03"	1/16"	29012	29013	29014	29015	21506	29017	29018	21508
0.04"	1/16"	29019	29020	29021	29022	21509	29023	29024	21511
0.085"	1/8"	29025	29026	29027	29028	21512	29029	29030	21514
0.21"	1/4"	29031	29032	29033	29034	21515	29035	29036	21517

\*The availability of long lengths is subject to inventory constraints. Lead times may vary depending on the continuous length needed. Please inquire before ordering. Maximum continuous lengths are: 2,000 ft (cat.# 21502, 21505, 21508, 21511), 1,500 ft (cat.# 21514), and 750 ft (cat.#21517). Pricing for lengths of 101 ft or more is on a per foot basis.



An extra charge is applied for cutting and/or straightening stainless steel and/or copper tubing, calculated from the total number of pieces produced for each line item.

## Copper Tubing

- Use for plumbing GC systems.
- Cleaned to remove residual organics.

ID	OD	Wall	Max Operating Pressure	qty.	cat.#
0.065"	1/8"	0.030"	2,800 psig	50 ft	22628
0.190"	1/4"	0.030"	1,000 psig	50 ft	22629

### Minimum Bend Radius for Coated Tubing

OD	Min. Bend Radius
1/16"	1" (2.5 cm)
1/8"	2" (5.1 cm)
1/4"	4" (10.2 cm)
3/8"	6" (15.2 cm)

## ordering note

Required length in meters x 3.2808  
= length in feet.

## did you know?

A smoother internal surface is less adsorptive.



Top: electropolished finish, surface roughness average number: 10-15.

Bottom: conventional finish, surface roughness average number: approx. 23-27.

## Treated Seamless Electropolished 316L Grade Stainless Steel Tubing

Our highest performing tubing. Recommended for:

- Demanding/corrosive environments.
- High temperatures.
- Ultimate inertness.

ID	OD	Wall Thickness	Length							
			6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#*	>100 Feet cat.#*
<b>Silcosteel®-CR Treated (Coiled)</b>										
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29037	29038	29039	29040	29041	29042	—	29043
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29044	29045	29046	29047	29048	29049	29050	29051
<b>Sulfinert Treated (Coiled)</b>										
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29052	29053	29054	29055	29056	29057	—	29058
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29059	29060	29061	29062	29063	29064	29065	29066

\*1/8" OD: 95 ft in one continuous coil; 1/4" OD: 300 ft in one continuous coil. Longer lengths will be more than one coil. Pricing for lengths of 101 ft or more is on a per foot basis.

Note: req

An extra charge is applied for cutting Sulfinert® or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item

## Treated Welded/Drawn 304 Grade Stainless Steel Tubing

Our most popular grade of tubing. Recommended for:

- Chromatography applications.
- Gas delivery systems.
- Lower pressures.
- Inert applications.

Maximum temperature of 450 °C in an inert atmosphere.

ID	OD	Wall Thickness	Length							
			6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#*
<b>Sulfinert® Treated (Coiled)</b>										
0.011" (0.28 mm)	0.022" (0.56 mm)		29194	29195	29196	29197	29198	29199	29200	29201
0.021" (0.53 mm)	0.029" (0.74 mm)		29202	29203	29204	29205	29206	29207	29208	29209
0.010" (0.25 mm)	1/16" (1.59 mm)		29210	29211	29212	29213	29214	29215	29216	29217
0.020" (0.51 mm)	1/16" (1.59 mm)		29218	29219	29220	29221	29222	29223	29224	29225
0.030" (0.76 mm)	1/16" (1.59 mm)		29226	29227	29228	29229	29230	29231	29232	29233
0.040" (1.02 mm)	1/16" (1.59 mm)		29234	29235	29236	29237	29238	29239	29240	29241
0.085" (2.16 mm)	1/8" (3.18 mm)	0.020"	29242	29243	29244	29245	29246	29247	29248	29249
0.210" (5.33 mm)	1/4" (6.35 mm)	0.020"	29250	29251	29252	29253	29254	29255	29256	29257

\*The availability of long lengths is subject to inventory constraints. Lead times may vary depending on the continuous length needed. Please inquire before ordering. Maximum continuous lengths are: 200\*\* ft (cat.# 29201, 29209), 2,000 ft (cat.# 29217, 29225, 29233, 29241), 1,150 ft (cat.# 29249), and 750 ft (cat.# 29257). Pricing for lengths of 101 ft or more is on a per foot basis.

\*\*Contact us if longer length is needed for cat.# 29201 or 29209.

## Treated Seamless 316L Grade Stainless Steel Tubing

High durability tubing. Recommended for:

- Inert applications.
- High temperatures.
- High pressures.
- Corrosive environments.
- Zero bleed.

ID	OD	Wall Thickness	Length							
			6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#*
<b>Silcosteel®-CR Treated (Coiled)</b>										
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	29091	29092	29093	29094	29095	29096	29097	29098
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29099	29100	29101	29102	29103	29104	29105	29106
0.277" (7.04 mm)	3/8" (9.52 mm)	0.049"	29107	29108	29109	29110	29111	29112	29113	29114
<b>Sulfinert® Treated (Coiled)</b>										
0.055" (1.40 mm)	1/8" (3.18 mm)	0.035"	29067	29068	29069	29070	29071	29072	29073	29074
0.180" (4.57 mm)	1/4" (6.35 mm)	0.035"	29075	29076	29077	29078	29079	29080	29081	29082
0.277" (7.04 mm)	3/8" (9.52 mm)	0.049"	29083	29084	29085	29086	29087	29088	29089	29090

\*The availability of long lengths is subject to inventory constraints. Lead times may vary depending on the continuous length needed. Please inquire before ordering. 1/8" OD: 1,500 ft in one continuous coil; 1/4" OD: 750 ft in one continuous coil; 3/8" OD: 250 ft in one continuous coil. Longer lengths will be more than one coil. Pricing for lengths of 101 ft or more is on a per foot basis.

## ordering note

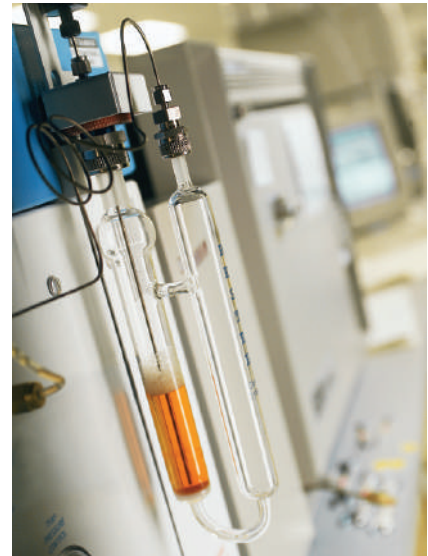
Required length in meters x 3.2808 = length in feet.

## Treated Straight, 6-Foot Length Stainless Steel Tubing

Individual 6-foot ( $\pm 1/2"$ ) straight pieces.

In response to customer requests, we offer 6-foot straight lengths of  $1/8$ -,  $1/4$ -, and  $3/8$ -inch treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

ID	OD	Wall Thickness	qty.	cat.#
<b>Silcosteel®-CR Treated, 316L Grade</b>				
0.055" (1.40 mm)	$1/8$ " (3.18 mm)	0.035"	ea.	22898
0.180" (4.57 mm)	$1/4$ " (6.35 mm)	0.035"	ea.	22899
0.277" (7.04 mm)	$3/8$ " (9.52 mm)	0.049"	ea.	22900
<b>Sulfinert® Treated, 316L Grade</b>				
0.055" (1.40 mm)	$1/8$ " (3.18 mm)	0.035"	ea.	22901
0.180" (4.57 mm)	$1/4$ " (6.35 mm)	0.035"	ea.	22902
0.277" (7.04 mm)	$3/8$ " (9.52 mm)	0.049"	ea.	22903



**Sulfinert® treated tubing is recommended for purge & trap and headspace systems.**

## Treated Hydroguard® Deactivated Stainless Steel Tubing

Hydroguard® deactivation creates a high-density surface that is not readily attacked by aggressive hydrolysis.

ID	OD	Wall Thickness	Length (per-foot pricing on 101 feet or more)							
			6 Feet cat.#	10 Feet cat.#	15 Feet cat.#	20 Feet cat.#	25 Feet cat.#	50 Feet cat.#	100 Feet cat.#	>100 Feet cat.#
<b>Silcosteel® Treated, 304 Grade</b>										
0.010" (0.25 mm)	$1/16$ " (1.59 mm)		29186	29187	29188	29189	29190	29191	29192	29193
0.020" (0.51 mm)	$1/16$ " (1.59 mm)		29178	29179	29180	29181	29182	29183	29184	29185
0.030" (0.76 mm)	$1/16$ " (1.59 mm)		29170	29171	29172	29173	29174	29175	29176	29177
0.040" (1.02 mm)	$1/16$ " (1.59 mm)		29162	29163	29164	29165	29166	29167	29168	29169
0.085" (2.16 mm)	$1/8$ " (3.18 mm)	0.020"	29154	29155	29156	29157	29158	29159	29160	29161
0.210" (5.33 mm)	$1/4$ " (6.35 mm)	0.020"	29146	29147	29148	29149	29150	29151	29152	29153
<b>Silcosteel® Treated, Seamless 316L Grade</b>										
0.055" (1.40 mm)	$1/8$ " (3.18 mm)	0.035"	29138	29139	29140	29141	29142	29143	29144	29145
0.180" (4.57 mm)	$1/4$ " (6.35 mm)	0.035"	29130	29131	29132	29133	29134	29135	29136	29137
<b>Silcosteel® Treated, Electropolished 316L Grade</b>										
0.085" (2.16 mm)	$1/8$ " (3.18 mm)	0.020"	29123	29124	29125	29126	29127	29128	—	29129
0.180" (4.57 mm)	$1/4$ " (6.35 mm)	0.035"	29115	29116	29117	29118	29119	29120	29121	29122

An extra charge is applied for cutting Sulfinert®, Silcosteel®, or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item.



Toggle valve



Ball valve



Plug valve



23207



23209



23214



23211



23215

### Shut-Off Gas Valves Swagelok®

Valve Type	1/8" Brass cat.#	1/4" Brass cat.#	1/8" Stainless Steel cat.#	1/4" Stainless Steel cat.#
Toggle	23142	23143	23198	23199
Ball	23144	23145	23200	23201
Plug	23146	23147	23202	23203

### Metering Gas Valves Swagelok®



23206

Description	qty.	cat.#
1/8" Chrome-Plated Brass Metering Valve, straight	ea.	23148
1/4" Chrome-Plated Brass Metering Valve, straight	ea.	23149
1/8" Stainless Steel Metering Valve, straight	ea.	23204
1/4" Stainless Steel Metering Valve, straight	ea.	23205
Vernier Knob for Metering Valve	ea.	23206



23204

### VCO® O-Ring Face Seal Fittings

(Stainless Steel & Treated) Swagelok®

- Unique design allows easy installation where space is limited.
- Assemblies can be used from high pressure to critical vacuum across a wide range of temperatures.
- Smooth finish on gland face ensures positive seal.
- Sealing is accomplished with a captive O-ring in the body component.

Swagelok® VCO® O-ring face seal fittings are designed for rapid assembly in pipe, tube, and welded systems.



#### Specifications:

Pressure Ratings	Up to 15,400 psig (1,061 bar)
Temperature Ratings	Up to 400 °F (204 °C)



Toggle valve



Ball valve



Plug valve

### Shut-Off Gas Valves Parker Balston®

Valve Type	1/8" Brass cat.#	1/4" Brass cat.#	1/8" Stainless Steel cat.#	1/4" Stainless Steel cat.#
Toggle	22188	22189	22190	22191
Ball	22192	22193	22194	22195
Plug	22196	22197	22198	22199

### Metering Gas Valves Parker Balston®



22209

Description	qty.	cat.#
1/8" Nickel-Plated Brass Metering, straight	ea.	22200
1/4" Nickel-Plated Brass Metering, straight	ea.	22201
1/8" Stainless Steel Metering, straight	ea.	22204
1/4" Stainless Steel Metering, straight	ea.	22205
Vernier Knob for Metering Valve	ea.	22209



22200



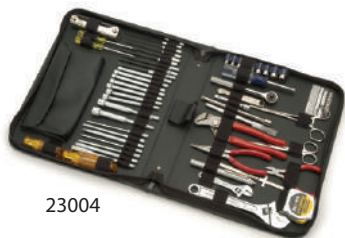


21325

### GC Installation Kit

This kit contains the tubing and fittings needed to add an additional GC to your lab bench. Kit includes: tubing cutter, one 1/8-inch x 1/4-inch reamer, one 1/4-inch x 1/8-inch brass tube end reducer, one 7/16-inch wrench, one 1/2-inch wrench, four 1/8-inch brass tees, ten 1/8-inch brass nuts, ten brass front and back ferrules, and 50 feet (15.2 meters) of our instrument-grade cleaned 1/8-inch copper tubing.

Description	qty.	cat.#
GC Installation Kit	kit	21325



23004

### 54-Piece Tool Kit

Set comes with screwdrivers, pliers, wrenches, sockets, scissors, clamps, and more. Durable, zippered, notebook-style carrying case for easy transport.

Description	qty.	cat.#
Tool Kit	kit	23004

### Plier Set

Includes 6-inch nose/side cutter, 6-inch wire cutter, and 6-inch adjusting pliers.

Description	qty.	cat.#
Plier Set	set	23033



22999

### Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999



22998

### 12-Piece, Ball-Point Hex Key Set

Includes twelve hex keys (Allen wrenches): 0.050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#
12-Piece, Ball-Point Hex Key Set	set	22998



23034

### Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.



23002

### 5-in-1 Magnetic Screwdriver

Magnetic power tip holds bits and screws securely.

Description	qty.	cat.#
5-in-1 Magnetic Screwdriver	set	23002



23001

### Wrench Set

Includes 4-inch, 6-inch, and 8-inch adjustable wrenches.

Description	qty.	cat.#
Wrench Set	set	23001

# Tubing Tools



20192

### 1/16-Inch Tubing Cutter

- Produces square, smooth cuts in 1/16-inch tubing.
- Eliminates tubing distortion.
- Cuts hard or soft copper, aluminum, brass, stainless steel, Monel® alloy, or titanium.
- Replaceable cutting wheel.

Description	qty.	cat.#
1/16" Tubing Cutter	ea.	20192
Replacement Cutting Wheels	3-pk.	20185



20193

### 1/16-Inch Tubing Cutting Pliers

- Ideal for cutting 1/16-inch tubing.
- Cuts quickly, reducing distortion.
- Cuts clean, eliminating need for deburring.

Description	qty.	cat.#
1/16" Tubing Cutting Pliers	ea.	20193

### Ridgid® Tubing Cutter

- Excellent for cutting 1/8- or 1/4-inch metal tubing.\*
- Compact size is ideal for tight spaces.
- Replaceable cutting wheel.



23011

Description	qty.	cat.#
Ridgid Tubing Cutter for 1/8" or 1/4" metal tubing	ea.	23011
Replacement Cutting Wheels	2-pk.	23012

\*Not for use with stainless steel tubing.

### Hi-Duty Tubing Cutter

- Specifically designed to cut 1/8" to 1-1/8" (4 mm to 28 mm) OD tubing.
- Easily cuts stainless steel, Monel® alloy, and other hard-temper materials.
- Unique design makes clean, right-angle cuts and eliminates spiraling.
- Integral reamer folds away for safety and convenience.
- Replacement cutter wheels also available.



22356

Description	qty.	cat.#
Hi-Duty Tubing Cutter	ea.	22356
Replacement Cutting Wheels	2-pk.	22357



23029



### SSI TC-20 Tube Cutting Machine

- Cuts 1/16", 1/8", or 1/4" tubing with inside diameter as small as 0.008".
- Electrically operated bench-top model.
- Handy dressing tool on the swing arm removes burrs and reams tubing.
- Voltage selectable 110–120/220–240 volts, 50–60 Hz.\*

Dimensions: 8" x 6 1/4" x 4 1/4" (20.3 x 15.9 x 10.8 cm)

Weight: 11 lb (5.0 kg)

Description	qty.	cat.#
SSI Tubing Cutter Machine	ea.	23029
SSI Replacement Cutting Wheels	3-pk.	23030

\*Unit shipped set for 110–120 operating voltage. Switch to 220–240 volts by using alternate fuse and power cord (included).



20188

### Tubing Burring & Reaming Tool

Removes burrs and reams tubing.

Description	Size	qty.	cat.#
Tubing Dressing Tool	1/16"	ea.	20188
Replacement Insert	for 1/16" Tubing Dressing Tool	ea.	20189
Tubing Dressing Tool	1/8"	ea.	20190
Replacement Insert	for 1/8" Tubing Dressing Tool	ea.	20191



20134

### Tubing Reamer

- Removes burrs from stainless steel tubing.
- For 1/4- or 1/8-inch tubing.
- Nonslip safety design.

Description	qty.	cat.#
Tubing Reamer	ea.	20134



23009

### Tubing Bender

- Bends 1/8-inch, 3/16-inch, or 1/4-inch tubing.
- Assists in making accurate left-hand, right-hand, or offset bends.

Description	qty.	cat.#
Tubing Bender	ea.	23009

### ResTape PTFE Tape

- For threaded connections in a wide range of plumbing materials.
- Each roll is 1/2" x 260".
- Maximum temperature: 260 °C.



Description	Color	Uses	qty.	cat.#
ResTape	Green PTFE	oxygen service*	ea.	22485
ResTape	Yellow PTFE	general gas service**	ea.	22486
ResTape	Grey PTFE	stainless steel fittings***	ea.	22487

\*Compatible with gaseous or liquid oxygen, and with many other gases and liquids.

\*\*Compatible with a broad range of gases and liquids.

\*\*\*Anti-galling. Also compatible with many other metals and polymers.

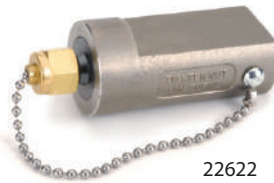


22627

### Flexible Inspection Light

- Inspect inside surfaces of sample cylinders or other chambers.
- 14" reach.
- 100,000-hour LED life.

Description	qty.	cat.#
Flexible Inspection Light	ea.	22627

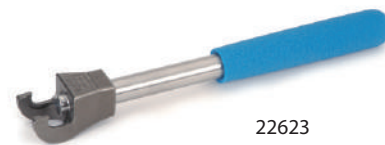


22622

### Swaging Tool

- Preswage compression fittings for easy installation.
- Ideal for installations in tight areas.
- For use with 1/4" Swagelok® fittings only.

Description	qty.	cat.#
Swaging Tool	ea.	22622



22623

### Tee Wrench

- Hold 1/4" or 6 mm tee or cross fittings secure in multiple orientations during installation.
- Fits easily in tool box, pouch, or belt.
- Cushioned vinyl grip with generous gripping area.
- For Swagelok® fittings only.

Description	qty.	cat.#
Tee Wrench	ea.	22623



22624

### Gap Inspection Gauge

- Confirm that fittings are sufficiently tightened.
- For use with 1/4", 3/8", 1/2" Swagelok® fittings.
- For Swagelok® fittings in new installations only.

Description	qty.	cat.#
Gap Inspection Gauge	ea.	22624



# LC Accessories

## Instrument Replacement Parts

For Agilent HPLC Systems.....	321–324
For PerkinElmer HPLC Systems.....	325
For Shimadzu HPLC Systems.....	326–327
For Thermo HPLC Systems.....	328
For Waters HPLC & ACQUITY UPLC® Systems.....	329–334
Fittings.....	335
Connectors.....	336
Tubing.....	337
Flow Splitters & Lab Organizers.....	338
Tools & Maintenance.....	339
Mobile Phase Accessories	
Bottle Tops.....	340
Filters.....	341–343
Dampeners.....	342
Mixers.....	343
Degassers.....	344
Column Heaters.....	344
LC-MS Generators & Traps.....	345
Valves & Backpressure Regulators.....	346
Column Hardware.....	347
Syringes.....	348
Well Plates.....	349







25259



25270



25271



**NEW!**

25915

**Preventive Maintenance (PM) Kits for Agilent HPLC Systems**

Description	Model #	Similar to Agilent Part #	qty.	cat.#
<b>Autosampler PM Kit</b> Includes: rotor seal, needle seat, needle assembly, seat cap	1050	01078-68721	kit	25259
<b>Autosampler PM Kit</b> Includes: rotor seal, piston seals (2), needle assembly, needle seat, finger caps (3)	1100, 1200	G1313-68709	kit	25271
<b>Pump PM Kit</b> Includes: PTFE frits (2), outlet cap, gold disk seal, active inlet cartridge, piston seals (4), glass solvent filters (2)	1050, 1100, 1200	G1311-68710	kit	25270
<b>Pump Maintenance Kit</b> Includes: sapphire plunger (2), piston seals (2), outlet ball check valve, active inlet cartridge, PTFE frits (5)	1100, 1200	5065-4499	kit	25915



25258



25916, 25278



25272



25275

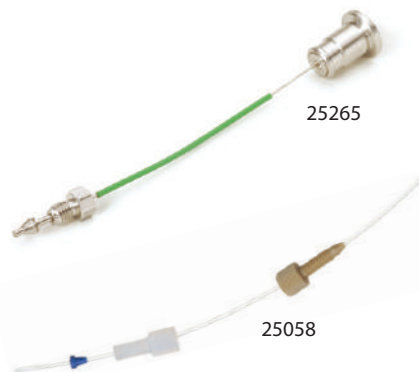


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26424

For even more options, visit [www.restek.com/LCacc](http://www.restek.com/LCacc)



25265

25058

**Injector & Autosampler Supplies for Agilent HPLC Systems**

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Needle Seat	1050, 1090	79846-67101	ea.	25258
Needle Seat Assembly	1100, 1200, 1220	G1329-87017	ea.	25265
Needle Assembly	1100, 1200	G1313-87201	ea.	25278
Needle Assembly, 900 µL	1050, 1100, 1200	G1313-87202	ea.	25916
Rotor Seal, 2-Groove (not for use with 7125 injection valve)	1050	0101-0626	ea.	25272
Rotor Seal, 2-Groove	1100, 1200	0100-1853	ea.	25275
Rotor Seal (Rheodyne-Style), 3-Groove	1090	1535-4048	ea.	25349
Stator Face Assembly	1100, 1200	0100-1851	ea.	26424
Connecting Tube	1050, 1100	G1311-67304	ea.	25058
Injector Lubricant, PTFE, 10 g	1050, 1100	79841-65501	ea.	26520
Solvent Inlet Filter, SS	1050, 1090, 1100, 1200	01018-60025	ea.	26423
Isolation Seal for Injection Valve	1100, 1200	0100-1852	ea.	25917



26520



26423



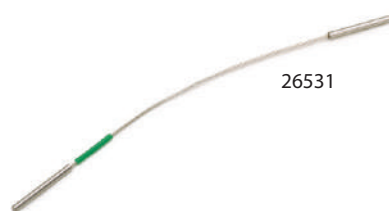
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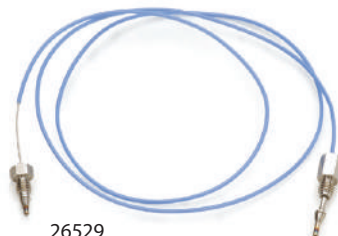
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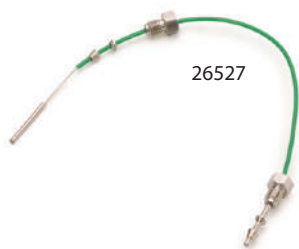
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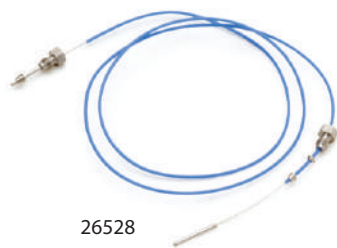
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26533



26537



26528

**Capillary Stainless Steel Tubing Assemblies** for Agilent HPLC Systems

- Precut, micropolished tubing and presealed fittings for quick, easy maintenance of your Agilent HPLC systems.
- Meet or exceed manufacturer's performance.

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Capillary SS Tubing With Fittings, 130 mm x 0.17 mm ID	1090	01090-87305	ea.	26525
Capillary SS Tubing With Fittings, 800 mm x 0.17 mm ID	1050	01078-87305	ea.	26526
Capillary SS Tubing With Fittings, 180 mm x 0.17 mm ID	1100	G1313-87305	ea.	26527
Capillary SS Tubing With Fittings, 700 mm x 0.25 mm ID	1050	01018-67305	ea.	26528
Capillary SS Tubing With Fittings, 700 mm x 0.25 mm ID	1050	01078-87306	ea.	26529
Seat Capillary, SS Tubing, 0.17 mm ID	1050	01078-87303	ea.	26530
Capillary SS Tubing, 105 mm x 0.17 mm ID	—	5021-1816	ea.	26531
Mixing Capillary Assembly	1100	G1312-67302	ea.	26532
Capillary SS Tubing, Valve to Metering Head	1100	G1313-87301	ea.	26533
Capillary SS Tubing, 150 mm x 0.17 mm ID	—	5021-1817	ea.	26534
Capillary SS Tubing, 280 mm x 0.17 mm ID	—	5021-1818	ea.	26535
Capillary SS Tubing, 400 mm x 0.17 mm ID	—	5021-1819	ea.	26536
1/16" Fitting, Front and Back Ferrules, Stainless Steel	—	5062-2418	10-pk.	26537



**Pump Supplies for Agilent HPLC Systems**

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Piston Seals, PTFE w/Graphite, Black*	1050, 1100, 1200	5063-6589	2-pk.	22482
Piston Seals, PTFE w/Graphite, Black*	1050, 1100, 1200	5063-6589	10-pk.	22483
Piston Seals, Black, ASI	1050, 1100	5062-8516	10-pk.	25176
Piston Seals, Black	1090	5062-2494	4-pk.	25347
Pump Block Piston Seal	1050, 1100, 1200	0905-1420	2-pk.	25918
Seal Wash Kit, Binary Pump (4 seals, 4 gaskets)	1050, 1100, 1200	—	kit	25268
Seal Wash Kit (2 seals, 2 gaskets)	1050, 1100, 1200	—	kit	25269
Wash Seal	1050, 1100, 1200	0905-1175	ea.	25277
Active Inlet Cartridge	1050, 1100, 1200	5062-8562	ea.	26393
Seal, Gold Disk (outlet)	1050, 1100, 1200	5067-4728	ea.	25889
Outlet Cap	1050, 1100, 1200	5062-2485	4-pk.	25139
Outlet Cap & Gold Seal Assembly	1050, 1100, 1200	—	2-pk.	25890
Outlet Ball Valve, Binary Pump	1100, 1200	G1312-60012	ea.	25267
Outlet Ball Valve	1050, 1100, 1200	G1311-60012	ea.	25276
Sieves for Outlet Valve	1100, 1200	5063-6505	10-pk.	25266
Check Valve Cartridge Assembly	1090	79835-67101	ea.	25344
Frits, PTFE	1050, 1100, 1200	01018-22707	5-pk.	25466
Plunger Assembly	1050, 1100, 1200	5063-6586	ea.	25273
Sapphire Piston	1090	3980-0672	ea.	25345

\*Graphite-filled PTFE; best for organic solvents.

For even more options, visit [www.restek.com/LCacc](http://www.restek.com/LCacc)





25261



25262



25399



25263



25888

**Lamps for Agilent HPLC Systems**

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Detector Lamp, 1090 DA, 1050 VW/DA/MWD	1090, 1050	79883-60002	ea.	25260
Lamp, DAD G1315A, G1365A*	1100, 1200	2140-0590	ea.	25261
Lamp, VWD G1314A	1100, 1200	G1314-60100	ea.	25262
Lamp, DAD Long-Life Deuterium (2,000 hours)	1100, 1200 DAD	5181-1530	ea.	25399
8453 Deuterium Lamp	—	2140-0605	ea.	25263
Deuterium Lamp (2,000 hours)*	1100 DAD/MWD/1200	2140-0813	ea.	25888

\*Compatible with 1260.

**Other Supplies for Agilent HPLC Systems**

Description	Model #	Similar to Agilent Part #	qty.	cat.#
Bottle Head Assembly	—	G1311-60003	ea.	25059



**Injector & Autosampler Supplies** for PerkinElmer HPLC Systems

Description	Model #	Similar to PE Part #	qty.	cat.#
Needle	PE Series 200 Pumps	N2930023	ea.	25432



25432



25434



26425



25438



25435



25437

**Pump Supplies** for PerkinElmer HPLC Systems

Description	Model #	Similar to PE Part #	qty.	cat.#
Low-Pressure Seal, Gold*	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	09907339	ea.	25435
Standard High-Pressure Seal, Gold*	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	09907324	ea.	25434
Standard Pump Seal Kit	200 Series	N2910383	kit	26425
High-Pressure Seal Kit Includes: pump seals (4), backup rings (4), O-rings (4)	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	0254-0275	kit	25433
Inlet Check Valve	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620, Series 200 Micropump	02540177	ea.	25438
Outlet Check Valve	PE 200, 4, 250, 400, 410, 620	02540197	ea.	25437



25433

\*Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.



25436



25431

**Deuterium Lamps** for PerkinElmer HPLC Systems

Description	Model #	Similar to PE Part #	qty.	cat.#
Deuterium Lamp	Lambda-2, 5, 7, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 25, 40, 800, 900	B016-0917	ea.	25436
Deuterium Lamp	200 Series, 785A	N2920149	ea.	25431



25471



25468



25919



25920



24986



25469



25470

For even more options, visit  
[www.restek.com/LCacc](http://www.restek.com/LCacc)

**Injector & Autosampler Supplies** for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu Part #	qty.	cat.#
Needle Seal, Vespel	LC-2010, SIL-10ADvp, 10AXL	228-33355-04	ea.	25468
Needle Seal, PEEK	SIL-10ADvp, 10AXL, HT	228-33355-01	ea.	25919
Needle Seal, PEEK	SIL-2010A/C HT, 20A/AC	228-42325-01	ea.	25920
Rotor Seal	SIL-10ADvp	228-21217-97	ea.	24986
Rotor Seal Assembly	SIL-10A, 10AXL, 10Ai	228-21217-91	ea.	25469
Stator Assembly	SIL-10A, 10AXL, 10Ai	228-21220-91	ea.	25470
Syringe, 500 µL	SIL-10A, 10AXL, 10Ai	228-25237-04	ea.	25471



25284

**Deuterium Lamps** for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu Part #	qty.	cat.#
Deuterium Lamp	SPD-10, 10A, 10AVvp, SPD-20A, SPD-20AV	228-34016-02	ea.	25284

# Protect your column and your UHPLC performance with UltraShield and UltraLine UHPLC filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system.



See **page 188**.

[www.restek.com/LCguard](http://www.restek.com/LCguard)

# Instrument Replacement Parts for Shimadzu HPLC Systems



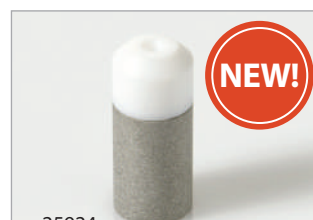
## Pump Supplies for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu Part #	qty.	cat.#
Plunger Seal, Polyethylene, Gold**	LC-10Ai, 10AS, 10AT, 10ATvp, LC-7A	228-21975-00	ea.	25290
Plunger Seal, Black*	LC-10AD, 10ADvp, LC-20AD/AB, LC-600, LC-2010 A/C HT, LC-9A	228-35146-00	ea.	24980
Plunger Seal, Gold**	LC-10ADvp, LC-20AD/AB	228-32628-00	ea.	24981
Plunger Seal, Black*	LC-10ATvp, LC-20AT, LC-HT, SIL-10ADvp, SIL-2010 A/C HT, SIL-20A/AC, SIL-HT	228-35145-00	ea.	24985
Plunger Rinse Seal	LC-10Ai, LC-10AS, LC-10AT, LC-10ATvp	228-28499-00	ea.	25292
Inlet Check Valve	LC-6A, LC-10AS	228-12353-91	ea.	25287
Inlet Check Valve	LC-600, LC-9A, LC-10AD	228-18522-91, 228-33492-91	ea.	25295
Inlet Check Valve	LC-10ADvp	228-39093-92	ea.	24984
Inlet Check Valve	LC-10AT, LC-10ATvp	228-32166-91	ea.	26521
Inlet Check Valve	LC-20AD/AB XR	228-48249-91, 228-45704-91	ea.	26426
Outlet Check Valve	LC-6, LC-10AS, LC-8A	228-09054-93	ea.	25288
Outlet Check Valve Rebuild Kit Includes: ruby ball (2), seat (2), thin washer (2), thick washer (2), retainer washer (2)	LC-6A, LC-10AS	228-11200-91	kit	25289
Outlet Check Valve	LC-600, LC-9A, LC-10AD, LC-10AT	228-18522-92, 228-32531-92	ea.	25282
Outlet Check Valve	LC-10ADvp, LC-10ATvp	228-34976-91	ea.	24983
Outlet Check Valve	LC-20AD/AB XR	228-45705-91, 228-45563-91	ea.	26427
Sapphire Plunger	LC-10AS, LC-7A	228-17019-93	ea.	25291
Sapphire Plunger	LC-600, LC-9A, LC-10AD	228-18523-91	ea.	25294
Sapphire Plunger	LC-20AT	228-35009-93	ea.	25921
Sapphire Plunger	LC-20AD/AB, LC-2010	228-35601-93	ea.	25922
Sapphire Plunger	LC-2010A/C HT, LC-HTSIL-10ADvp, SIL-20A/AC	228-35010-91	ea.	25923
Plunger Assembly, Ceramic	LC-10ADvp	228-35601-91	ea.	25472
Plunger Assembly, Ceramic	LC-10ATvp	228-35009-92	ea.	25473
Plunger Assembly, Sapphire	LC-10ADvp	228-35601-92	ea.	24982
Suction Filter, SS	LC-10ADvp, 10ATvp, 20AD/AB, 2010A/C HT	228-45707-91	ea.	25924

\*Graphite-filled PTFE; best for organic solvents.

\*\*Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

For even more options, visit [www.restek.com/LCacc](http://www.restek.com/LCacc)







**Injector & Autosampler Supplies** for Thermo HPLC Systems

Description	Model #	Similar to Thermo Part #	qty.	cat.#
Rotor Seal Assembly, Rheodyne 7010	TSP AS100, 300, 1000, 3000, 3500, 8875, and 8880 Autosamplers	1535-4048, 7010-039, 2508-0360	ea.	25481
Syringe Assembly, 250 µL	1000, CM3000, CM3500, AS100	A3588-020	ea.	25482
Syringe, 500 µL	8800 Series	3301-0100	ea.	25483



**Lamps** for Thermo HPLC Systems

Description	Model #	Similar to Thermo Part #	qty.	cat.#
Lamp, UV	Spectrachrom 200, UV100, UV1000, UV150, UV200, UV2000, UV3000	9551-0023	ea.	25484



**Pump Supplies** for Thermo HPLC Systems

Description	Model #	Similar to Thermo Part #	qty.	cat.#
Inlet Check Valve Assembly	8800, 8810, ISOCHROM, P1000, P2000, P4000	A3495-010	ea.	25474
Outlet Check Valve Assembly	8700, 8800, 881, ISOCHROM	A3490-010	ea.	25475
Transducer Check Valve Assembly	P1000, P2000, P4000	A3990-010	ea.	25479
Check Valve Cartridge	3000, 3200, 3500, 4000, 4100, Constametric I, II, and III	900946	ea.	25485
Piston	8800, 8810, ISOCHROM, P1000, P2000, P4000	A3102-010	ea.	25476
Sapphire Plunger	CM3000, CM3200, CM3500, CM4000	801306	ea.	25486
Back-Up Seal	8800, 8810, ISOCHROM, P1000, P2000, P4000	A2963-010	ea.	25477
Plunger Seal, Gold Superseal**	8800, 8810, ISOCHROM, P1000, P2000, P4000	A2962-010	ea.	25478
Plunger Seal Kit, Gold** Includes: SS plunger seal spacer, Rulon plunger seal spacer (2), O-ring, gold plunger seal	LDC Constametric Pumps	801892001	kit	25487
Plunger Seal, Black*	CM3000, CM3200, CM3500, CM4000	206129001	ea.	25488
Plunger Seal, Gold**	CM3000, CM3200, CM3500, CM4000	206156001	ea.	25489
Kel-F Washer	P1000, P2000, P4000	A4848-010	ea.	25480



\*Graphite-filled PTFE; best for organic solvents.

\*\*Ultra-high molecular weight polyethylene (UHMWPE): increased resistance to abrasion; best for buffers





25143



25145



26519



25144



25146



**Preventive Maintenance (PM) Kits for Waters HPLC Systems**

Description	Model #	Similar to Waters Part #	qty.	cat.#
<b>2690/2695 Pump &amp; Autosampler PM Kit</b> Includes: sapphire plungers (2), seal wash plunger seals (4), head plunger seals (4), wash tube seals (4), battery, sparge diffuser, filter insert, face seals (4), solvent reservoir 10 µm filters (4), 250 µL syringe, check valve cartridges (2), wash tube seal, seal wash tube, PTFE washer, filter retainer, lower wash seal frit, needle wash frit, TFE washer, needle assembly, gold injector seals (2), stainless steel ferrule, compression screw	Alliance 2690, 2695	WAT270944	kit	25143
<b>717 Autosampler PM Kit</b> Includes: seal pack assembly, tube assembly (0.020" ID), needle, needle compression screw, 0.062 stainless steel ferrule, pre-column filter assembly, filter insert, 250 µL WISP syringe	717 Autosampler	WAT052669	kit	25145
<b>600 Pump PM Kit</b> Includes: PerformancePLUS cartridges (4), sparge diffusers (4), Super Seals (2), solvent reservoir 10 µm filters (4), sapphire plungers (2), reference valve button, valve disk spacer, valve disk, TFE ball plug, TFE seat, ruby ball, inlet tube body assembly manifold insert, insert seal, Belleville washers (2), flat washer	600 Pump	WAT052675	kit	25144
<b>616 Pump PM Kit</b> Includes: sapphire plungers (2), sparge diffusers (4), solvent reservoir 10 µm filters (4), plunger seals (2), plunger wash seals (2), O-rings (2), backup rings (2), check valve cartridges (4)	616 Pump	WAT052672	kit	25146
<b>515 Pump PM Kit</b> Includes: PerformancePLUS check valves (4), sparge diffuser, solvent reservoir 10 µm filter, sapphire plungers (2), plunger seals (2), pivot inserts (2), pivot guides (2), washer (2), plunger springs (2), retaining rings (2)	515 Pump	WAT052587	kit	26519
<b>1525 Pump PM Kit</b> Includes: sapphire plungers (4), check valve cartridges (8), plunger seals (4), solvent reservoir 10 µm filters (2), reference valve button, valve disk spacer, valve disk	1525 Pump	201000114	kit	26430

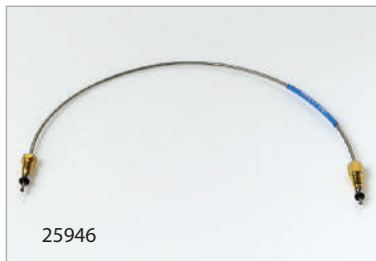
**Simplify Routine LC Maintenance Preventive Maintenance Kits**

- Significant savings over instrument manufacturer prices.
- High-quality components in every kit.
- Wide range of options for HPLC systems and pumps.

[www.restek.com/LC-Maintenance](http://www.restek.com/LC-Maintenance)



26430



**Injector & Autosampler Supplies** for Waters HPLC & ACQUITY UPLC® Systems

Description	Model #	Similar to Waters Part #	qty.	cat.#
Needle Assembly, 0.010 mm ID	ACQUITY	700002644	ea.	25942
Sample Loop, 10 µL	ACQUITY, nanoACQUITY	430001326	ea.	25943
Wash Station O-Ring	ACQUITY, nanoACQUITY	700002572	ea.	25944
Metering Syringe, 100 µL	ACQUITY, nanoACQUITY	700002570	ea.	25945
Tube Assembly, Inject Outlet	ACQUITY	430001084	ea.	25946
Tube Assembly, System Outlet	ACQUITY	430001486	ea.	25947
Seal Pack Rebuild Kit, Without Seal Wash Tube Assembly Includes: wash tube seal, seal wash tube, PTFE washer, filter retainer, lower wash seal frit, needle wash frit, TFE washer, needle, injector seal (2), compression screw, ferrule	2690, 2695	WAT271019	kit	25495
Seal Pack With Needle Includes: seal pack assembly, pre-column filter assembly, needle, 0.020" ID tube assembly, compression screw, ferrule	717, LC Module 1	WAT045559	ea.	25496
Vespel Rotor Seal	1090, 7000, 7010, 7040, 7067	7010-039	ea.	25279
Vespel Rotor Seal	7125, 7126, 7725, 7725i, 9725	7125-047	ea.	25280
Isolation Seal	7010	7010-015	ea.	25281

# Instrument Replacement Parts for Waters HPLC & ACQUITY UPLC® Systems



## Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (Also see pages 332–333.)

Description	Model #	Similar to Waters Part #	qty.	cat.#
Head Plunger Seal Kit Includes: head plunger seals (2), back-up washers (2)	ACQUITY, nanoACQUITY	700002599	kit	26428
Wash Seal	ACQUITY, nanoACQUITY	700002598	2-pk.	26429
Pump O-Ring	ACQUITY, nanoACQUITY	WAT076152	ea.	25951
In-Line Filter Assembly, Stainless Steel Frit	ACQUITY, nanoACQUITY	289003547	ea.	25952
Filter Frit Cartridge, Stainless Steel	ACQUITY	700002913	ea.	25953
Solvent Bottle Filters	ACQUITY	700003616	7-pk.	25954
Tube Assembly, SSV to In-line Filter	nanoACQUITY	430001470	ea.	25948
Tube Assembly, Transducer to Check Valve, BSM	ACQUITY, nanoACQUITY	430001121	ea.	25949
Tube Assembly, Transducer to Check Valve, QSM	ACQUITY	430002357	ea.	25950
Tube Assembly, SSV to I2V	ACQUITY	430001443	ea.	25941
Super Seal for Analytical Heads	M6KA, 1515, 1525, 510, 515, 590, 600, 610, LC Module 1	WAT022946	ea.	25374
Plunger Seal, Gold**	1515, 1525, 510, 515, 600, 610, LC Module 1	—	ea.	25375
Plunger Seal, Black*	1515, 1525, 510, 515, 600, 610, LC Module 1	WAT026613	ea.	25378
Plunger Seal, Gold for EF Heads**	510, 515, 590, 600, 610, LC Module 1	700002282	ea.	25380
Pump Seal Kit Includes: plungers seals (2), wash seals (2), O-rings (2), back-up rings (2)	616, 1525 Micro	WAT034515	kit	25497
Seal Wash Plunger Seals	2690, 2695, 2790, 2795	WAT270160, WAT271018	2-pk.	25386
Head Plunger Seals, Gold	2690, 2695, 2790, 2795	WAT270789, WAT270938	2-pk.	25387
Head Plunger Seals, Black	2690, 2695, 2790, 2795	WAT271066	2-pk.	25388
Seal Wash Face Seal	2690, 2695, 2790, 2795	WAT271017	ea.	25428
Wash Tube Seal Kit	2690, 2695, 2790, 2795	WAT270940	4-pk.	25429
Face Seals Replacement Kit	2690, 2695, 2790, 2795	WAT270163, WAT270939	4-pk.	26547



\*Graphite-filled PTFE; best for organic solvents.

\*\*Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.





**Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (cont.)**

Description	Model #	Similar to Waters Part #	qty.	cat.#
Primary Check Valve	ACQUITY, nanoACQUITY	700002596	2-pk.	25955
Accumulator Check Valve (Double Ball & Seat)	ACQUITY, nanoACQUITY	700002968	2-pk.	25956
I2 Check Valve Cartridge	ACQUITY	700005165	ea.	25957
Inlet Check Valve Assembly	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT033679, WAT025214	ea.	25360
Inlet Check Valve Housing	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT025203	ea.	25361
Inlet Check Valve Rebuild Kit Includes: blue washer (2), retainer gasket (2), Kel-F insert (2), ruby ball (2), TFE seat (2), TFE washer (2)	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT060495	kit	25362
Outlet Check Valve Assembly (Actuator Style)	M6KA, 510, 590	WAT025028	ea.	25363
Outlet Check Valve Housing (Actuator Style)	M6KA, 510, 590	WAT025212	ea.	25364
Outlet Check Valve Rebuild Kit (Actuator Style) Includes: 2 µm cup filter (2), compression spring (2), actuator (2), TFE washer actuator seat (2), TFE washer (2)	M6KA, 510, 590	WAT026016	kit	25365
Outlet Check Valve Assembly (Ball & Seat Style)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT025216	ea.	25366
Outlet Check Valve Housing (Ball & Seat Style)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT025207	ea.	25367
Outlet Check Valve Rebuild Kit (Ball & Seat Style) Includes: 2 µm cup filter (2), ruby ball (2), ball seat (2), Kel-F insert (2), blue washer (2), washer (2)	1525EF, 510, 515, 600, 610, LC Module 1	WAT026014	kit	25368
Inlet Check Valve Assembly, 225 µL (Extended Flow)	1525EF, 510, 515, 600, 610, LC Module 1	WAT060307	ea.	25369
Check Valve Rebuild Kit (Extended Flow) Includes: 3/16" EF ruby ball (2), EF ball seat (2), EF guide seal (2), EF ball guide (2), EF housing seal (2)	510, 590, 600, LC Module 1	WAT088223	kit	25371
PerformancePLUS Check Valve Housing	1515, 1525, 510, 515, 525, 600, 610	—	ea.	25372
PerformancePLUS Check Valve Cartridge	1515, 1525, 2690, 2695, 2795, 510, 515, 600, 610	700000254	2-pk.	25370
Check Valve Cartridges	2690, 2695, 2790, 2795	WAT270941	2-pk.	25373
Check Valve Cartridge, Stainless Steel	616	WAT024960	ea.	25498



Instrument Replacement Parts for Waters HPLC & ACQUITY UPLC® Systems



**Pump Supplies** for Waters HPLC & ACQUITY UPLC® Systems (cont.)

Description	Model #	Similar to Waters Part #	qty.	cat.#
Sapphire Plungers	ACQUITY, nanoACQUITY	700002600	2-pk.	25958
Sapphire Plunger	M6KA, 510, 590, 600, 610, LC Module 1	WAT025656, WAT069511	ea.	25381
Sapphire Plunger (Extended Flow)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT060304	ea.	25382
Sapphire Plunger Assembly Kit Includes: sapphire plunger, pivot insert, pivot guide, washer, spring, retaining ring	515, 1515, 1525	WAS207069	kit	25384
Sapphire Plunger	616, 625, 626, 1525 Micro	WAT031788	ea.	25420
Sapphire Plunger	2690, 2695, 2790, 2795, 2796	WAT270488, WAT271067, WAT270959	ea.	25385
Indicator Manifold Kit Includes: TFE ball plug, TFE seat, ruby ball, manifold insert, TFE insert seal, Belleville washer (2), flat washer, inlet tube body assembly	M45, 501, 510, 515, 590, 600, 610	WAT060448	kit	25412
Reference Valve Rebuild Kit Includes: ref valve button, valve disk spacer, valve disk	600 Pump	WAT025746	kit	25492
Ferrule, Stainless Steel	—	WAT022330	ea.	25417
Compression Screw, Stainless Steel	—	WAT025313	ea.	25493
Battery	2690, 2695, 717, 486, 484	WAT080443	ea.	25494



25404



25410



25408



25409

**Detector Supplies** for Waters HPLC & ACQUITY UPLC® Systems



25405

Description	Model #	Similar to Waters Part #	qty.	cat.#
Xenon Lamp (without holder or mirror)	470	—	ea.	25404
Xenon Lamp	474	—	ea.	25405
Deuterium Lamp, Long Life (2,000 hours)*	486	WAT080678	ea.	25410
Deuterium Lamp	996, 2996	WAT052586	ea.	25408
Deuterium Lamp	2487, 2488	WAS081142	ea.	25409

\*Standard lamps have nominal 1,000-hour life.

# Thomson SINGLE StEP® Filter Vials

**Sample filtration that's economical, eco-friendly, and fast!**



- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12x32 mm autosamplers, including UHPLC instruments.

See **page 410**.

[www.restek.com/singlestep](http://www.restek.com/singlestep)

**EXP® Reusable Fittings for HPLC & UHPLC** for 10-32 fittings and 1/16" tubing

- Hand-tight fitting style achieves effortless HPLC seals—no tools needed for a 8,700+ psi seal.
- Both hand-tight and hex-head styles wrench-tighten for reliable UHPLC use up to 20,000+ psi!
- Patented ferrule can be installed repeatedly without compromising high-pressure seal.
- Hybrid design combines the durability of titanium with the sealing ability of PEEK.
- Cutting-edge system provides ZDV (zero dead volume) connection to any 10-32 female port.
- Compatible with 1/16" PEEK and stainless steel tubing.

Restek is pleased to offer the reusable EXP® fitting system from Optimize Technologies for the ultimate in easy, reliable LC connections!

The patented hybrid EXP® ferrule combines the durability of titanium with the sealing ability of PEEK for a swage that can be reused over and over again. And, when you choose the hand-tight fitting style, the special EXP® nut offers an effortless seal up to 8,700+ psi (600+ bar)—no tools needed! For a reliable 20,000+ psi (1,400+ bar) UHPLC connection with either fitting style, simply wrench-tighten an extra 1/4 to 1/2 turn.

EXP® ferrules should only be used with genuine EXP® nuts. When used with an EXP® nut, the EXP® ferrule provides repeated ZDV (zero dead volume) connections to any 10-32 female threaded port, including Restek® LC columns, 6-port injection valves, and more. To accommodate varying port depths, simply hold the tubing fully bottomed in the port and tighten as instructed.

**WARNING:** Do not use EXP® ferrules with standard nuts. Failure to use EXP® fittings according to the included instructions may result in unsafe UHPLC connections and/or non-ZDV connections.

**EXP® Hand-Tight Fittings**

Description	qty.	cat.#
EXP Hand-Tight Fitting (Nut w/Ferrule)	ea.	25937
EXP Hand-Tight Fitting (Nut w/Ferrule)	10-pk.	25938
EXP Hand-Tight Nut (w/o Ferrule)	ea.	25939

**EXP® Hex-Head Fittings**

Description	qty.	cat.#
EXP Std. Hex-Head Fitting (Nut w/Ferrule)	ea.	25926
EXP Std. Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25927
EXP Short Hex-Head Fitting (Nut w/Ferrule)	ea.	25928
EXP Short Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25929
EXP Long Hex-Head Fitting (Nut w/Ferrule)	ea.	25930
EXP Long Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25931
EXP Std. Hex-Head Nut (w/o Ferrule)	ea.	25932
EXP Short Hex-Head Nut (w/o Ferrule)	ea.	25933
EXP Long Hex-Head Nut (w/o Ferrule)	ea.	25934


**EXP® Hand-Tight Coupler**

Description	qty.	cat.#
EXP Hand-Tight Coupler (2 Nuts, 2 Ferrules, 1/16" x 0.005" ID Tubing)	ea.	25940

**EXP® Titanium Hybrid Replacement Ferrules**

Description	qty.	cat.#
EXP Titanium Hybrid Ferrule	ea.	25935
EXP Titanium Hybrid Ferrule	10-pk.	25936

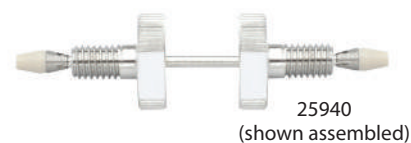
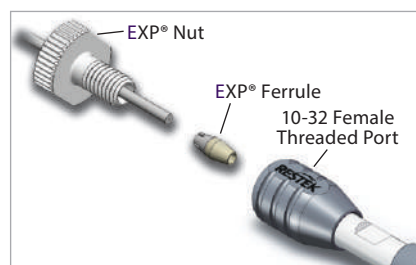
Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Optimize prefix is a registered trademark of Optimize Technologies, Inc.

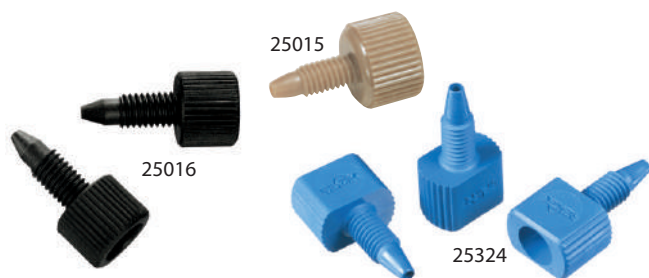


A Raptor™ LC guard column cartridge in an EXP® holder is the **Ultimate in Column Protection.**

See **pages 155–159.**

**Raptor™**  
LC Columns  
*Selectivity Accelerated*





### Universal 10-32 PEEK Column Connectors and Plugs

Universal PEEK connectors allow easy installation of all 1/16" tubing, including stainless steel, up to 5,000 psi.

Description	qty.	cat.#
PEEK Column Connector (beige, round body)	10-pk.	25015
PEEK Column Plug (black)	10-pk.	25016
PEEK Finger-Tight Fittings (blue, flat-sided)	10-pk.	25324



### Zero Dead Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. Made of 300-series stainless steel. For use with 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#
Internal Union	0.15 mm	ZU1XC	ea.	20147
Internal Union	0.25 mm	ZU1C	ea.	20148
Internal Union	0.75 mm	ZU1	ea.	20149
Internal Union	1/16"	ZUIT	ea.	20150



### Rheodyne® Style Nut and Ferrule

Replacement long nut for connecting stainless steel tubing to a Rheodyne® 6-port valve or other Rheodyne® part.

Description	qty.	cat.#
1/16" Rheodyne Style Nut	10-pk.	25095
1/16" Rheodyne Style Ferrule	10-pk.	25096



### PEEK Union Connector

Quickly and reliably connect two pieces of 1/16" tubing. 0.3 mm union bore. End fittings included.

Description	qty.	cat.#
PEEK Union Connector 1/16"	2-pk.	25323



## LC-MS Gas Generators From Restek

### Affordable

Generators are cost-effective and quickly pay for themselves.

### Reliable

Dependably produce a continuous supply of high-purity carrier and fuel gas.

### Safe

Eliminate hazardous cylinders and free up valuable lab space.

See **page 345**.

[www.restek.com/gas](http://www.restek.com/gas)



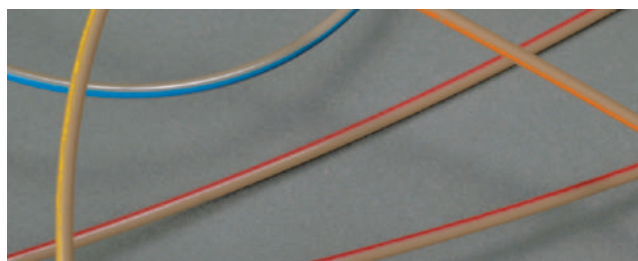


### LC Stainless Steel Capillary Tubing

- 316-grade stainless steel.
- Precise precut lengths.
- Smooth surface finish.
- Ultra clean.

Whether you need to replace system tubing as part of your troubleshooting or want to reduce the dwell volume of your system as you move to narrower columns, Restek has the quality tubing in the lengths and IDs you need. Each ID is color coded, so it is easy to identify and replace correctly.

Length	qty.	0.005" ID	0.007" ID	0.010" ID	0.020" ID
		(red) max. 21,600 psi	(gray) max. 20,900 psi	(blue) max. 19,700 psi	(yellow) max. 15,800 psi
		cat.#	cat.#	cat.#	cat.#
<b>1/16" OD Tubing</b>					
5 cm	3-pk.	25240	25244	25248	25252
10 cm	3-pk.	25241	25245	25249	25253
20 cm	3-pk.	25242	25246	25250	25254
30 cm	3-pk.	25243	25247	25251	25255



### Inert PEEK Tubing

- Replaces stainless steel, titanium, PTFE, or Tefzel® tubing.
- Less oxygen permeable and more temperature resistant (to 100 °C) than PTFE or Tefzel® tubing.
- Use with PEEK finger-tight or flangeless fittings.
- Use tubing ≤ 0.007" to 7,000 psi; tubing ≥ 0.010" ID to 5,000 psi.

Description	OD	ID	Length	Color Code	qty.	cat.#
PEEK Tubing	1/16"	0.0025"	1 m	pink dash stripe	3-pk.	25320
PEEK Tubing	1/16"	0.005"	3 m	red stripe	ea.	25065
PEEK Tubing	1/16"	0.007"	3 m	yellow stripe	ea.	25066
PEEK Tubing	1/16"	0.010"	3 m	blue stripe	ea.	25067
PEEK Tubing	1/16"	0.020"	3 m	orange stripe	ea.	25068

### Tubing Dressing Tool



20188

Opens stainless steel tubing bore and removes burrs. For 1/16" OD tubing or 1/8" OD tubing.

Description	Size	qty.	cat.#
Tubing Dressing Tool	1/16"	ea.	20188
Replacement Insert	for 1/16" Tubing Dressing Tool	ea.	20189
Tubing Dressing Tool	1/8"	ea.	20190
Replacement Insert	for 1/8" Tubing Dressing Tool	ea.	20191

### Clean-Cut Tubing Cutter

- Burr-free, perpendicular cuts that will not distort the tubing OD or close the ID.
- Use on PEEK, PTFE, Tefzel®, and other polymeric tubing.

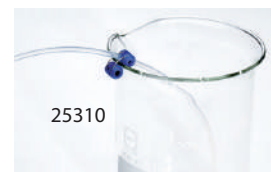


25069

Description	qty.	cat.#
Clean-Cut Tubing Cutter	ea.	25069
Replacement Blade for Clean-Cut Cutter	ea.	25070

### Tubing Clip

Securely holds 1/16" or 1/8" tubing in beaker, flask, or bottle up to 4 mm thick.



25310

Description	qty.	cat.#
Tubing Clip	5-pk.	25310

### PTFE Tubing

- Ideal for mobile phase inlet lines.
- Chemically inert.
- Use to 500 psi (3,447 kPa) and 80 °C.



25306

Description	OD	ID	Length	qty.	cat.#
PTFE Tubing	1/8"	0.063" (1.6 mm)	3 m	3 m	25306
PTFE Tubing	1/8"	0.094" (2.4 mm)	3 m	3 m	25307

### PEEK Tubing Elbows

Tubing elbows (90° and 180°) are ideal for routing 1/16" PEEK tubing through your system. Simply snap the tubing into the elbow. Prevent pinching of PEEK tubing, which can cause high pressure.



25308



25309

Description	qty.	cat.#
PEEK Tubing Elbow, 90°	5-pk.	25308
PEEK Tubing Elbow, 180°	5-pk.	25309



**QuickSplit Post-Column Flow Splitters**

Fluid resistor technology eliminates adjustments to capillary tubing for optimizing split ratio. Wide range of interchangeable resistors available.

**Fixed Flow Splitters for HPLC & LC-MS**

- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 10,000 psi (68,948 kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0 mL/min.

**Adjustable Flow Splitter**

- Adjustable metering valve gives convenient control of split ratio.
- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 5,000 psi (34,474 kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0 mL/min.

Description	Split Ratio	qty.	cat.#
Binary Fixed, Post Column	100:1	ea.	25326
	50:1	ea.	25327
	20:1	ea.	25328
	10:1	ea.	25329
	5:1	ea.	25330
Replacement Fixed Resistor Set, Post Column	100:1	ea.	25331
	50:1	ea.	25332
	20:1	ea.	25333
	10:1	ea.	25334
	5:1	ea.	25335
Adjustable, Post Column	5:1 to 100:1	ea.	25336
	1:1 to 20:1	ea.	25337
	50:1 to 1000:1	ea.	26416
Replacement Adjustable Resistor Set, Post Column*	5:1 to 100:1	ea.	25338
	1:1 to 20:1	ea.	25339

\*QuickSplit post-column flow splitter serial number required for replacement resistor set to ensure compatibility. Every resistor is manufactured per serial number. The serial number is located on top of the splitter.



LCLocker LC Organizer



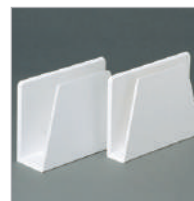
Deluxe BenchBooster Organizer



Mini pHPerch Storage Unit



LC 30-Column Storage Cabinet



Book Holders



Open Supply Bins, 13-bin unit



TopLoader Balance-Bank Storage Unit



Glove Box Dispensers

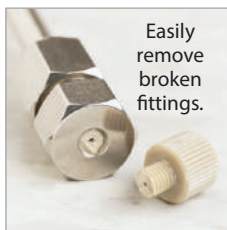
**LC Organizers**

Description	Dimensions	qty.	cat.#
LCLocker	24 x 12 x 6"	ea.	25149
BenchBooster	24 x 7 x 12"	ea.	25150
Mini pHPerch	13 x 12 x 6"	ea.	25147
TopLoader	12 x 12 x 7"	ea.	25148
30 Column Cabinet	17 x 15 x 3"	ea.	25159
Book Holder, 0.75" ID (Small)	4 1/2 x 6 x 1 1/4"	ea.	25151
Book Holder, 1.5" ID (Large)	4 1/2 x 6 x 1 3/4"	ea.	25152
Open Supply Bin	24 x 12 x 10" (4-Bin Unit)	ea.	25153
Open Supply Bin	12 x 16 x 10.5" (5-Bin Unit)	ea.	25154
Open Supply Bin	12 x 12 x 7.5" (13-Bin Unit)	ea.	25155
Glove Box Dispenser	5 1/8 x 11 x 4 1/8" (Single)	ea.	25156
Glove Box Dispenser	10 1/8 x 11 x 4 1/4" (Double)	ea.	25157
Glove Box Dispenser	15 1/8 x 11 x 4 1/4" (Triple)	ea.	25158

\*Please note: Accessories and supplies in photographs are not included.



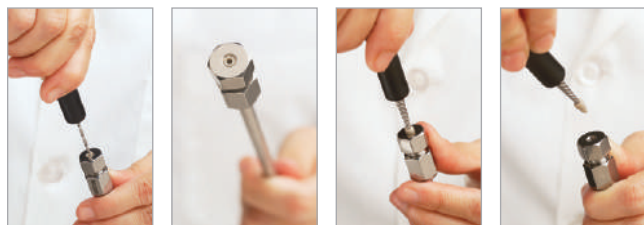
25325



Easily  
remove  
broken  
fittings.

### PEEK Fitting Extractor

Drill into the broken fitting, then screw the extractor into the fitting and remove it easily. Eliminates the need for heat or other techniques that could damage your column.



Description	qty.	cat.#
PEEK Fitting Extractor	ea.	25325



25321

### ValvTool Wrench

The ValvTool is a time-saving device that provides easy access to many hard-to-reach Rheodyne® or Valco® valves. For 1/4" nuts.

Description	qty.	cat.#
ValvTool Wrench	ea.	25321

Use the flat side of the piston seal insertion tool to seat a Waters face seal.



### LC Piston Seal Insertion Tool

Simplify pump maintenance: use one end to remove your old seal, then simply slip your new seal on the other end and push it flush into position. The tool cannot mar the surrounding metal surface of the pump housing.



21356

Remove a seal



Seat a seal



Description	qty.	cat.#
LC Piston Seal Insertion Tool	ea.	21356

# Raptor™

LC Columns



Experience  
Selectivity Accelerated

See pages 155–159 or visit [www.restek.com/raptor](http://www.restek.com/raptor)

Raptor™ EXP® Guard Columns also available.

RESTEK *CHROMALYTICs*™ in AUSTRALIA : Contact +81 3 9762 2034  
Distributor

[www.chromalytic.net.au](http://www.chromalytic.net.au)

e-mail : sales @ chromtech.net.au





**Opti-Cap® GL-45 Bottle Tops**

The most economical way to helium-sparge and deliver LC mobile phases. Opti-Cap® tops fit all standard GL-45 bottles and have two 1/8" holes and one 1/16" hole for tubing. All three openings are designed for threaded PEEK plugs.



Description	qty.	cat.#
Opti-Cap (Cap and PEEK Plug)	ea.	25300
Opti-Cap Kit	kit	25301
Opti-Cap Kit with 1 L Bottle	kit	25302
Opti-Cap Kit with 2 L Bottle	kit	25303

**Hub-Cap 4-Liter Bottle Tops**

Hub-Cap bottle tops are a great way to neatly keep your mobile phase lines where they belong. Use them instead of plastic paraffin film, aluminum foil, or tape on your mobile phase reservoirs.



Description	qty.	cat.#
Hub-Cap (assembly of the bottle cap and plug)	kit	26541
Hub-Cap Multi-Pack	3-pk.	26542

**Hub-Cap Adaptors**

Allow the use of the Opti-Cap® Top with 4-liter solvent bottles.

Description	qty.	cat.#
Hub-Cap Adaptor (allows use of the Opti-Cap w/4 L solvent bottles)	ea.	26538
Hub-Cap Adaptor Multi-Pack	3-pk.	26539
Hub-Cap Adaptor and Opti-Cap (for use w/GL-45 solvent bottles)	kit	26540

**Related Items and Replacement Parts for Hub-Cap 4-Liter Bottle Tops**

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
PTFE Tubing, 1/8" OD x 0.094" (2.4 mm) ID x 3 m	3 m	25307
PTFE Tubing, 1/8" OD x 0.063" (1.6 mm) ID x 3 m	3 m	25306
PEEK Plug, 1/4"-28 threads	3-pk.	25319

**Opti-Cap® Adaptors**

Allow the use of the Hub-Cap Top with GL-45 solvent bottles.



Description	qty.	cat.#
Opti-Cap Adaptor (allows use of Hub-Cap w/GL-45 solvent bottles)	ea.	27197
Opti-Cap Adaptor Multi-Pack	3-pk.	27198
Opti-Cap Adaptor w/Hub-Cap	kit	26551




**Related Items and Replacement Parts for Opti-Cap® GL-45 Bottle Tops**

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
PTFE Tubing, 1/8" OD x 0.094" (2.4 mm) ID x 3 m	3 m	25307
PTFE Tubing, 1/8" OD x 0.063" (1.6 mm) ID x 3 m	3 m	25306
PEEK Plug, 1/4"-28 threads	3-pk.	25319
1 L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25304
2 L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25305

**Which Bottle Top Do I Need?**




**I have a 4-Liter bottle...**

- Option 1: Hub-Cap Top (cat.# 26541) or
  - Option 2\*: Opti-Cap® Top (cat.# 25300) plus Hub-Cap Adaptor (cat.# 26538)
- \*Also available as a kit (cat.# 26540)

<p><b>Option 1</b></p>  <p>26541</p>	<p><b>Option 2*</b></p>  <p>25300      26538</p>	 <p>*Also available as a kit (cat.# 26540)</p>
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**I have a GL-45 bottle...**

- Option 1: Opti-Cap® Top (cat.# 25300) or
  - Option 2\*: Hub-Cap Top (cat.# 26541) plus Opti-Cap® Adaptor (cat.# 27197)
- \*Also available as a kit (cat.# 26551)

<p><b>Option 1</b></p>  <p>25300</p>	<p><b>Option 2*</b></p>  <p>26541      27197</p>	 <p>*Also available as a kit (cat.# 26551)</p>
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Bottle not included.

### Waste Overflow Indicator for LC Systems

- Avoid messy pooling around mobile phase waste containers.
- Audible alarm instantly alerts user, preventing overflow.
- Compact, battery-operated unit.
- Available for 4-liter and GL-45 solvent bottles.

The Restek® waste overflow indicator will help keep your mobile phase waste where it belongs—in the waste container! Compact, battery-operated unit fits securely on solvent bottles and accommodates two waste streams. An audible alarm is given as the solvent waste container approaches capacity, giving you time to empty or change the container. Another innovative design from Restek!

Description	qty.	cat.#
Waste Overflow Indicator for LC Systems, 4 Liter	ea.	26543
Waste Overflow Indicator for LC Systems, GL-45	ea.	26550
Replacement AA Battery for the Waste Overflow Indicator	ea.	26544
Replacement AA Batteries for the Waste Overflow Indicator	3-pk.	26545

Extend the life of columns and pump seals with Restek's Bluestem glass solvent filter

See **page 343**.



### tech tip

#### Mobile Phase Additives with LC-MS

Mobile phase additives such as triethylamine, trifluoroacetic acid, and ion-pairing reagents can compete with sample ions, decreasing sensitivity and, in some cases, reducing sample ion intake into the MS. To obtain symmetric peaks and/or sufficient retention, use base deactivated silica, like Pinnacle® DB or high purity silicas like Ultra or Raptor™, that minimize the need for additives.



26395



Polypropylene Membrane Filters



25925

### Hub-Cap Filter Kit

Kit includes: bottle adaptor, bottle adaptor nut, filter inlet cap, grid support, vacuum hose barb, tube compression fitting, 47 mm grid, 47 mm 0.22 µm filter membrane, 47 mm 0.45 µm filter membrane, 1/4" OD x 1/8" ID ultra chemical resistant, FEP-lined Tygon® tubing (3'), 6" x 6" box with shrink-wrap insert.

Includes universal threads designed for 4 L or Wheaton bottles. Use with GL-45 bottles requires Opti-Cap® adaptor (sold separately).



Bottle not included.

### Assembles quickly and easily!



Unscrew and lift off top.



Place membrane filter on top of grid.



Reattach top.



Connect vacuum line to side port.

Description	qty.	cat.#
Hub-Cap Filter Kit for 4 L or Wheaton bottles	kit	26395
Replacement Parts		
	qty.	cat.#
Polypropylene Membrane Filters, 47 mm, 0.45 µm	100-pk.	26396
Polypropylene Membrane Filters, 47 mm, 0.22 µm	100-pk.	26397
Nylon Membrane Filters, 47 mm, 0.45 µm	100-pk.	26398
Nylon Membrane Filters, 47 mm, 0.22 µm	100-pk.	26399
Hub-Cap Filter Hose Barb	ea.	25925

**Last Drop Filter**

The flat filter element sits parallel to the bottom of the mobile phase reservoir, allowing the filter to draw 98% of the mobile phase without drawing air into the system. Conventional cylindrical mobile phase filters begin to draw air into the system when approximately 10% of the solvent remains in the reservoir. The Last Drop filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. 22.1 mm OD.



25314

Description	qty.	cat.#
Last Drop Filter, 2 µm	ea.	25314
Last Drop Filter, 10 µm	ea.	25315



25008

**Low-Pressure Slip-On Inlet Filter for Mobile Phase Reservoir**

A 316 stainless steel tip with a Tefzel® collar seals to a corrosion-resistant 316 stainless steel filter element. The slip-on filter easily attaches to the pump inlet line, without the use of wrenches. The universal 1/8" OD tip accommodates standard PTFE tubing inner diameters. The cylindrical filter is standard 10 µm porosity. Fits Altex, ISCO, LDC, Varian, Waters, PerkinElmer, and other pumps.

Description	qty.	cat.#
Slip-On Inlet Filter	ea.	25008

**Mobile Phase Sparge Filters**

The sparge filter is an inexpensive way to prepare and maintain mobile phases free of dissolved gas. Filters are made from 316 stainless steel and PEEK, and they are compatible with most solvents. Connects to standard 1/8" OD (3.2 mm) PTFE tubing.



25311

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
Mobile Phase Sparge Filter, 20 µm	ea.	25313

**UHP Pulse Dampener**

UHPLC compatible

The UHP pulse dampener provides minimal flow pulsation at system pressures up to 18,000 psi. Its low dead volume (220 µL at atmospheric pressure) reduces overall system volume for UHP applications. The UHP pulse dampener has a stainless steel fluid path.



26549

Specifications:	
Operating Pressure:	0–18,000 psi
Pulsation Dampening:	3:1 reduction in pulsation (dependent on pump characteristics and system volume and pressure)
Fluid Path Volume:	220 µL (atmospheric pressure) +44 µL (per 1,000 psi system pressure)
Wetted Materials:	316 SS; PTFE
Dimensions:	2.5" diameter x 2.0" high

Description	qty.	cat.#
UHP Pulse Dampener	ea.	26549

**MiniPulse Pulse Dampener**

- Compact unit (2.5" x 1.5") can be placed almost anywhere.
- Small, 160 µL dead volume at atmospheric pressure.
- PEEK unit can withstand pressures to 5,000 psi (34,474 kPa).
- 316 stainless steel unit can withstand pressures to 6,000 psi (41,369 kPa).



25238

Improve system baseline stability while increasing the total system volume by only 160 µL. The MiniPulse pulse dampener is ideal for applications where minimizing the total system volume is critical. Stainless steel and PEEK options for a wide range of applications.

Description	qty.	cat.#
MiniPulse Pulse Dampener, Stainless Steel	ea.	25238
MiniPulse Pulse Dampener, PEEK	ea.	25239

**Solvent Debubbler**

Bubbles in an LC system can cause check valve malfunctions and pump cavitation, seriously affecting pump performance. The debubbler removes bubbles from the fluid stream before it enters the pump.



25014

Special geometry at the base of the housing allows bubbles entrained in the inlet fluid stream to rise and be trapped in the reservoir. The gas/liquid interface is easily visible through the translucent wall of the device. Loosening the airtight cap releases the trapped gas. The debubbler features a polypropylene body and bracket; universal inlet and outlet connecting tips are made of 316 stainless steel and accept 0.063", 0.085", and 0.125" ID tubing.

Description	qty.	cat.#
Solvent Debubbler With Bracket	ea.	25014



**NEW!**



26431

26392

### Bluestem Glass Solvent Filter

- Restek® Bluestem glass solvent filter provides clean mobile phase to extend the life of columns and pump seals.
- 15 µm borosilicate glass frit sits lower than conventional glass filters to draw more mobile phase from each bottle.
- Blue filter stem allows instant visual confirmation of upright filter orientation.
- Connects to standard 1/8" OD (3.2 mm) PTFE tubing using your existing frit adaptor (also sold separately as cat.# 26392).

Prevent the particulates and microbial growth in your LC solvents from entering your instrument with the new Restek® Bluestem glass solvent filter.

Description	Similar to Agilent Part #	qty.	cat.#
Glass Solvent Filter, 15 µm frit	5041-2168	ea.	26431
Frit Adaptor, PTFE	5062-8517	4-pk.	26392

### Mixers

- Reduced baseline noise.
- Increased sensitivity.
- Improved gradient accuracy for more reproducible results.
- Increased reaction efficiency in post-column derivatization.

An efficient cross-flow shearing mechanism and interchangeable cartridges produce vortex shear mixing over a wide range of flows.

### HyperShear Static In-Line Mixers

Stainless steel or PEEK.



25342

Volume	Stainless Steel		PEEK	
	qty.	cat.#	qty.	cat.#
1 µL	ea.	26409	ea.	26410
25 µL	ea.	26411	ea.	26412
50 µL	ea.	25341	ea.	26413
150 µL	ea.	25342	ea.	26414
250 µL	ea.	25343	ea.	26415



25138

### Ternary Tee Mixer

Stainless steel.

Description	Volume	qty.	cat.#
Ternary Tee Mixer	25 µL	ea.	25138



Polypropylene Membrane Filters



KT953825-0000

### Membrane Microfiltration Glassware

This 47 mm filtration apparatus with fritted glass support is recommended for routine filtration of corrosive liquids and removal of particles from LC solvents. The ground joint connection eliminates phthalate contamination that can occur when using silicone or neoprene stoppers. The support base has a coarse-porosity glass frit and an integral vacuum connection, located above the drip tip to prevent contamination of the vacuum line with filtrate droplets. Each apparatus includes a funnel, an anodized aluminum clamp, a 47 mm fritted glass support base, and a filtration flask.

All-Glass Microfiltration Apparatus	qty.	cat.#
300 mL Funnel, 1,000 mL Flask	ea.	KT953825-0000
500 mL Funnel, 2,000 mL Flask	ea.	KT953835-0000
1000 mL Funnel, 4,000 mL Flask	ea.	KT953845-0000
Replacement Parts for Microfiltration Apparatus	qty.	cat.#
40/35 PTFE Joint Sleeve	6-pk.	KT676001-4035
Flask Cap, 40/35 Outer Joint	ea.	KT953830-0000
Fritted Glass Support, 47 mm, 40/35 Joint	ea.	KT953826-0000
Glass Funnel, 47 mm, 100 mL	ea.	KT953761-0000
Glass Funnel, 47 mm, 300 mL	ea.	KT953751-0000
Glass Funnel, 47 mm, 500 mL	ea.	KT953771-0000
Glass Funnel, 47 mm, 1,000 mL	ea.	KT953781-0000
Flask, 1,000 mL, 40/35 Joint	ea.	KT953827-0000
Flask, 2,000 mL, 40/35 Joint	ea.	KT953828-0000
Flask, 4,000 mL, 40/35 Joint	ea.	KT953829-0000
Aluminum Clamp, 47 mm	ea.	KT953753-0000
Membrane Filters	qty.	cat.#
Polypropylene Membrane Filters, 47 mm, 0.45 µm	100-pk.	26396
Polypropylene Membrane Filters, 47 mm, 0.22 µm	100-pk.	26397
Nylon Membrane Filters, 47 mm, 0.45 µm	100-pk.	26398
Nylon Membrane Filters, 47 mm, 0.22 µm	100-pk.	26399



**Mobile Phase Degasser**

Dissolved oxygen can cause flow rate instability and increased baseline noise. Also, it has a quenching effect on fluorescence detection and increases the background of UV detectors. Dissolved gases can out-gas in the LC system, forming bubbles in check valves, at connections, or in detector flow cells.

In-line vacuum degassing is more effective at removing dissolved gas from mobile phases than sonication or helium sparging. In-line degassers work by withdrawing gas across a gas-permeable membrane encased in a sealed chamber. Traditionally, the membrane has been made of PTFE tubing, but the Degasys Ultimate Degasser uses tubing composed of an amorphous fluoropolymer (AF) that is 200 to 300 times more gas permeable than PTFE. This translates into the ability to use shorter tubing for removing dissolved gas. This new material also has better tubular burst strength than PTFE. To prevent cross contamination, each channel on this Degasys unit is individually encased within its own vacuum chamber.



<b>Specifications:</b>		Wetted Parts	AF, PTFE, ETFE, PPS
Residual Oxygen <sup>1</sup>	0.9 ppm	Max Flow Rate	7 mL/min/channel
Pressure Loss <sup>1</sup>	0.24 psi (1.65 kPa)	<sup>1</sup> At a flow rate of 1 mL/min	
Internal Volume	500 µL		

Description	Voltage	qty.	cat.#
Mobile Phase Degasser (4 Channel, 7 mL/min/channel)	110V	ea.	25189
Mobile Phase Degasser (4 Channel, 7 mL/min/channel)	220V	ea.	25194

To prevent system damage, do not use the Degasys system with solutions containing TFA at concentrations greater than 5%.



**Sidewinder LC Column Heater**

- Easy to set up!
- Operation range: 5 °C above ambient to 85 °C, ±1 °C.
- Lightweight, compact design fits in small spaces.
- Column holder can be placed in any orientation.

This unique design completely encloses any LC analytical column up to 25 cm in length. Two lengths of heater jackets are available: the short column holder accommodates columns up to 10 cm in length, while the long column holder holds columns up to 25 cm in length. The control module provides optimum heating performance, accuracy to within 1 °C, and stability to within 0.1 °C. The new Sidewinder controller has fast 10 Hz sampling for improved responsiveness. The RS232 control allows external programming.

Description	Length	qty.	cat.#
Temperature Control Module and Column Holder	Long (25 cm)	ea.	26516
Temperature Control Module and Column Holder	Short (10 cm)	ea.	26517



**Sidewinder LC Heater/Cooler Temperature Control Module and Column Holder**

- Operation range: 5–55 °C, ±0.2 °C.
- Ability to program multiple temperature points.
- Accommodates columns up to 30 cm in length and 7.8 mm ID.
- Compact design.

The Sidewinder heater/cooler unit has a doubly insulated cover to maintain the programmed temperature to within 0.2 °C. The 24 V control unit provides maximum stability and rapid equilibration times. RS232 control allows external programming.

Description	qty.	cat.#
Sidewinder Heater/Cooler Temperature Control Module and Column Holder	ea.	26518

All Sidewinder temperature control products carry the globally recognized CE mark. Each unit meets the demanding electromagnetic emission standards of the new European Union Directives, United States standards, and Canadian standards.

**Power requirements:** All Sidewinder heater and heater/cooler units utilize a 24 VDC input to energize the system. This voltage is generated from a universal power supply included with each Sidewinder unit. Also included with each Sidewinder unit is a power cable (also known as a mains cable) for use in the U.S. The power cable supplies current from a wall or bench receptacle to the provided universal 24 VDC universal power supply.

**FOR USE OUTSIDE THE U.S.** If the Sidewinder unit is intended for use outside the U.S., an appropriate power cable must be purchased separately (not available from Restek).



### Parker Balston® Nitrogen Gas Generators for LC-MS

- Turn compressed air into ultra-pure nitrogen (up to 99.5%).
- Flows from 1 to 44 L/min.
- Models N2-04, N2-14, N2-22, and N2-35 require no electricity.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.



Specifications	NitroFlow Lab	N2-04	N2-14	N2-22 or N2-22A	N2-35 or N2-35A
Maximum Nitrogen Flow Rate:	32 L/min	8 L/min	36 L/min	N2-22: 44 L/min N2-22A: 29 L/min	44 L/min
Nitrogen Purity:	99.50%	99%	95.0%–99.5%	99%	99%
Min/Max Inlet Pressure:	N/A	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig
Electrical Requirements:	120 VAC/60 Hz	None	None	N2-22: None N2-22A: 120 VAC/60 Hz	N2-35: None N2-35A: 120 VAC/60 Hz
Dimensions:	27.6" h x 35.4" w x 12.2" d (70 cm x 90 cm x 31 cm)	11" h x 13" w x 16" d (27 cm x 34 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)
Shipping Weight:	205 lb (93 kg)	43 lb (20 kg)	75 lb (34 kg)	N2-22: 101 lb (46 kg) N2-22A: 106 lb (48 kg)	N2-35: 115 lb (52 kg) N2-35A: 119 lb (54 kg)

Nitrogen Generators for LC-MS	Model #	qty.	cat.#
Nitrogen Generator for LC-MS	NitroFlow Lab Model, 32 L/min max. flow	ea.	22129
Nitrogen Generator for LC-MS	N2-04 Model for ELSD, 8 L/min max. flow	ea.	22130
Nitrogen Generator for LC-MS	N2-14 (general purpose) 36 L/min max. flow	ea.	20677
Nitrogen Generator for LC-MS	N2-22 Model, 44 L/min max. flow	ea.	22131
Nitrogen Generator for LC-MS	N2-22A Model, 29 L/min max. flow	ea.	22132
Nitrogen Generator for LC-MS	N2-35 Model, 44 L/min max. flow	ea.	22133
Nitrogen Generator for LC-MS	N2-35A Model, 44 L/min max. flow	ea.	22134
Includes: Oxygen analyzer and audible alarm (monitors oxygen in nitrogen stream and signals high or low concentrations)			
Maintenance Kits	Model #	qty.	cat.#
Maintenance Kit	for NitroFlow Lab	kit	22156
Includes: carbon filter			
6-Month Maintenance Kit*			
Includes: 1st stage prefilter, 2nd stage prefilter, and final filter (1 each)	for N2-14, N2-14A, 75-T2, 75-T20NA	kit	21648
6-Month Maintenance Kit With Carbon Filter*			
Includes: 1st stage prefilter, 2nd stage prefilter, hydrocarbon scrubber, and final filter (1 each)	for N2-14, N2-14A, 75-T2, 75-T20NA	kit	22135
Generator Maintenance Kit	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000, and 75-80 (Zero Air); N2-04 (Nitrogen); and TOC-1250 (TOC)	kit	21647
Includes: 1st and 2nd stage prefilters (1 each) and 1 final filter			



\*The manufacturer recommends maintenance for this unit every 6 months.  
International power cords are available. Contact Customer Service or your Restek® representative to order.

## Need to clean up your nitrogen stream for LC-MS?

Check out our Restek® Super Clean® gas trapping system.

See **page 288**.

[www.restek.com/gas](http://www.restek.com/gas)

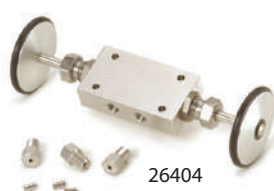




26400

26401

26402



26404



26403



26406



26407



25017

25018

25020

**Backpressure Regulators**

Backpressure regulators can improve detector performance by preventing bubble formation in the detector flow cell. They also are useful in post-column reaction lines and between detectors and fraction collectors in preparatory work. Regulators are superior to more specific alternative solutions, like small-bore tubing, in which pressure varies with flow rate.

Our end-of-line and flow-through backpressure regulators are adjustable to ensure constant backpressure over a wide range of mobile phase viscosities and flow rates. The end-of-line model is available with 1/4-28 plastic flange-type fittings or high-pressure 1/16" compression fittings; this design adjusts from 15 to 60 psi (103 to 414 kPa). The flow-through design has 1/16" compression fittings and is adjustable from 7 to 75 psi (48 to 517 kPa).

**Valves for HPLC**

Our valves have low internal volumes and are rated to 15,000 psi (103,421 kPa). They feature a two-piece stem assembly in which the rotating upper shank is coupled through a ball joint to a static lower stem. Only finger-tight torque is required to make the seal.

Description	qty.	cat.#
Through Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26400
Angle Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26401
Bottom Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26402
Side Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26403
Dual-Stem Three-Way Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26404
Prime/Purge Valve for HPLC, 1/4-28 Flanged Seat, Stainless Steel, with Tubing and Fittings	ea.	26406
Prime/Purge Valve Repair Kit for Prime/Purge Valve (includes: soft seal (2), PTFE O-ring (2), 7/32 hex key)	kit	26407

Description	qty.	cat.#
Backpressure Regulator: end-of-line, 1/16" OD tubing, flanged	ea.	25017
Backpressure Regulator: end-of-line, high-pressure seat	ea.	25018
Backpressure Regulator: flow-through, 5 µL internal volume	ea.	25020

**also available**

Dampeners.  
See page 342.



### Restek® Pack in a Box Kit

Restek's Pack in a Box kit is a complete column-packing system. Everything you need to pack your own analytical HPLC columns is included: pump, 20 mL reservoir, column hardware (150 x 4.6 mm, 316 stainless steel tubing with end-fittings, frits, nuts, and ferrules for two complete, empty columns), and system control software (computer not included). Detailed packing instructions and a DVD are also included. The packing pump is electric, so no pressurized air is required. AC input requirement: 85–265 VAC. 10,000 psi maximum pressure.



Description	qty.	cat.#
Pack in a Box Kit	kit	26408

### Bio-Safe Column System (PEEK)

- Completely biocompatible.
- 100% metal free.
- Stable to 8,000 psi.

Bio-Safe columns are biocompatible and precision-machined from virgin PEEK (polyetheretherketone), a strong, inert polymer material.

#### Product Specs

- 4.6 mm ID x 30 mm length column with end fittings.
- 2.0 µm frits.

Description	qty.	cat.#
Bio-Safe Column System, PEEK, 4.6 mm x 30 mm, 2.0 µm	ea.	26546



### HPLC Column Tubing

Restek® tubing is manufactured from fine, chromatographic-grade 316 stainless steel. It is corrosion resistant, ultrasonically cleaned, and passivated. We polish the tubing and promise a burr-free cut. You can use this tubing immediately—there is no need for additional treatment.



Length	2.1 mm ID cat.#	3.2 mm ID cat.#	4.6 mm ID cat.#
<b>1/4" OD Tubing</b>			
30 mm	25100	25106	25112
50 mm	25101	25107	25113
100 mm	25102	25108	25114
150 mm	25103	25109	25115
200 mm	25104	25110	25116
250 mm	25105	25111	25117

### Empty Chromatography Columns

- 316 stainless steel tubing complete with end-fittings, frits, nuts, and ferrules.
- Preassembled prior to shipment, unless otherwise requested.
- Internal 1/16" seats are compatible with Valco® and Parker fittings.



Length	2.1 mm ID cat.#	3.2 mm ID cat.#	4.6 mm ID cat.#
<b>1/4" OD Tubing</b>			
30 mm	25118	25124	25130
50 mm	25119	25125	25131
100 mm	25120	25126	25132
150 mm	25121	25127	25133
200 mm	25122	25128	25134
250 mm	25123	25129	25135

### Column End-Fittings

- Fittings with distribution cone are intended for use on 3.0–4.6 mm ID HPLC columns.
- Fittings with flat bottom are intended for use on 1.0–3.0 mm ID HPLC columns.

These 1/4" compression end-fittings are compatible with 1/16" connecting tubing using Valco® and Parker fittings.



Description	qty.	cat.#
Column End-Fitting with Distribution Cone	ea.	25077
Column End-Fitting with Flat Bottom	ea.	25078

### 1/4" HPLC Frits

We manufacture our frits from fine, chromatographic-grade 316 stainless steel, and we offer sizes to fit most column and pore sizes. To choose the correct frit, check its pore size compatibility with the particle size of the packing in the column. If the packing has a smaller particle size than the pore size of the frit, the packing can clog the frit.



Packing	Use this particle size: pore size:
3–4 µm:	0.5 µm
5–20 µm:	2.0 µm

ID	Pore Size	qty.	cat.#
4.6 mm	2.0 µm	10-pk.	25071
4.6 mm	0.5 µm	10-pk.	25072
3.2 mm	2.0 µm	10-pk.	25073
3.2 mm	0.5 µm	10-pk.	25074
2.1 mm	2.0 µm	10-pk.	25075
2.1 mm	0.5 µm	10-pk.	25076



22292

**Syringe** for Hitachi LC Autosamplers

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
500 µL, M10 X1 Thread	500C-HITACH1	007660	ea.	22292



22297

**Syringes** for PerkinElmer LC Autosamplers

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-CX-GT	006995	ea.	22297
500 µL, 1/4-28 UNF Thread	500D-CX-GT	007995	ea.	22298

**Syringe** for Waters WISP LC Autosamplers

PTFE-tipped plungers

Hamilton

Volume	Hamilton Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	1725	80024	ea.	24529



22294

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-WISP	006690	ea.	22294

**Syringes** for CTC LC Autosamplers

Hamilton



22746

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	22s	2"/51 mm	3	701N	203073	ea.	22743
25 µL	N	22s	2"/51 mm	3	1702N	203075	ea.	22744
100 µL	N	22s	2"/51 mm	3	1710N Slim Line*	203077	ea.	22745
100 µL	N	22	2"/51 mm	3	1710N	203235	ea.	22746
250 µL	N	22	2"/51 mm	3	1725N	203079	ea.	22747
500 µL	N	22	2"/51 mm	3	1750N	203349	ea.	22748

\*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.



22737

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	22s	2"/51 mm	LC	10F-CTC-LC	002710	ea.	22737
100 µL*	R	22s	2"/51 mm	LC	100R-C/T-GT-LC	005330	ea.	22741
500 µL*	F	22s	2"/51 mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742

\*Gas-tight syringe.

Guide to Needle Termination Codes

**Hamilton:**

(N) Cemented Needle

**SGE:**

(F) Fixed Needle

(R) Removable Needle

also available

More syringes!

See page 394.





### Well Plates

- Polypropylene plates with round-bottom wells reduce liquid retention; conical bottom provides optimal recovery of reagents.
- Nunc® shared wall technology allows increased well volume for optimum storage capacity and improved mixing.
- Round well shape is ideal for applications that require vortexing.
- Ideal for sample collection, storage, sampling, and combinatorial chemistry and library applications.
- Fits most autosampler compartments.
- All microplates manufactured by Nunc® meet the recommendation of American National Standards Institute (ANSI) (ANSI/SBS 1-2004).

Description	Well Shape	Well Bottom	qty.	cat.#
0.45 mL 96-Well Plates	round	conical	20-pk.	26497
0.45 mL 96-Well Plates	round	conical	case of 120	26496
1.3 mL 96-Well Plates	round	round	5-pk.	26495
1.3 mL 96-Well Plates	round	round	case of 50	26494
2.0 mL 96-Well Plates	round	round	5-pk.	26493
2.0 mL 96-Well Plates	round	round	case of 60	26492



### Universal Sealing Mats

- Protect contents and prevent carryover with pre-slit cap mats.
- Chemically resistant, silicone mats are excellent for compound storage to -80 °C.
- Pre-slit mats pierceable by autosampler needle, pipette tip, or probe.
- Universal mat for sealing 0.45, 1.3, and 2.0 mL plates.

Description	qty.	cat.#
Universal Sealing Mat	10-pk.	26499
Universal Sealing Mat	case of 50	26498



## Thomson SINGLE StEP® Filter Vials

Sample filtration that's economical, eco-friendly, and fast!



- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12x32 mm autosamplers, including UHPLC instruments.

See **page 410**.

[www.restek.com/singlestep](http://www.restek.com/singlestep)

# Vials

Septum Selection Guide.....	350
Instrument Reference Chart.....	351
Vial Size Quick Reference Chart.....	352–353
Microsampling Vials & Inserts .....	354–356
Crimp-Top Vials.....	357–358
Screw-Thread Vials.....	359–362
Certified Vials .....	363
WISP Vials.....	364–365
Headspace Vials .....	366–367
Versa Vials.....	368
VOA Sampling Vials .....	369
Filter Vials, Sampling Valves for Vials .....	370
Crimpers & Decappers.....	371



## Septum Selection Guide

Materials	Compatibility	Incompatibility	Resealability	Max. Temp.
Red Rubber (synthetic)	acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	90 °C
PTFE/ Natural Rubber	PTFE: resistance until punctured Rubber: acetone, ACN, alcohols, diethylamine, DMF, DMSO, phenol	aromatics, carbon disulfide, chlorinated solvents, hydrocarbon solvents	very good	90 °C
PTFE/Silicone PTFE/Silicone/PTFE	PTFE: resistance until punctured Silicone: acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	205 °C
Polyethylene	Good resistance to solvents and weak acids or bases. Unreactive with most chemicals, but some solvents cause softening or swelling.	hydrocarbon solvents	one-time use	175 °C
Gray Chlorobutyl	acids or bases, water solutions, buffer solutions, oxygenated solvents, vegetable oils	aliphatic or aromatic hydrocarbons, halogenated solvents, mineral oils, strong acids	very good	100 °C

Abbreviations: ACN = acetonitrile, DMF = dimethylformamide, DMSO = dimethylsulfoxide, THF = tetrahydrofuran

NOTE: This chemical resistance chart is intended only as a guideline. It does not cover all compounds or all solvents. Tests were done at room temperature on pure, single solvents, and there is no data on solvent combinations. Always confirm the compatibility of your vial, closure, and chemical combination prior to sample preparations.



Manufacturer	Instrument/Model #	11 mm Crimp-Top	9 mm Short Cap Screw-Thread	Headspace	8 mm Screw-Thread	10 mm Screw-Thread	4 mL WISP 48 Style	1 mL WISP 96 Style
A.I.M.	CPS-100, 200	x			x			
A.I.	42 Vial Tray	x						
A.I.	Headspace (HS: 10, 20 mL)			x				
Agilent	1042, 1050, 1080, 1082, 1084, 1090, 1100, 5890, 6850, 6890, 7670A, 7671A, 7672, 7673A/B, 7683, 7890, 8042	x	x					
Agilent	Headspace (HS: 6, 10, 20 mL, Flat)			x				
Alcott	738	x			x	x		
Alltech	570	x			x	x		
Alltech	580 (standard tray)	x						
Altex		x				x		
AMS	42	x						
Antek	736 Unisampler, 738	x						
ASC		x			x	x		
Beckman	501, 502, 507				x	x		
Bruker	LC 51						x	
Bruker/Varian	8100/8200	x	x		x	x		
Bruker/Varian	Marathon	x	x					
Bruker/Varian	8035, 8000 Series, 8055, 8085, 3800 GC				x			
Bruker/Varian	9100/9090/9095	x			x			
Bruker/Varian	Genesis (HS: 10, 20 mL Rounded)			x				
Bruker/Varian/Rainin	Dynamax AI-IA, AI-200, Dynamax AI-3	x						
Bruker/Varian/Rainin	Dynamax AI-3AI-IA, AI-2W				x			
Carlo Erba/Fisons	42 vial tray AS 800	x						
Carlo Erba/Fisons	AS 800		x					
Carlo Erba/Fisons	AS 800, 8000				x			
Carlo Erba	HS 500, HS 800 (HS: 6, 10, 20 mL, Flat)			x				
Carnegie	CMA-250/200	x						
Chrompack	CP 9000 GC Series	x						
Cueni	Headspace (HS: 10, 20 mL)			x				
CTC	CTC A1055	x						
CTC	Headspace (HS: 20 mL, Flat)			x				
Dani	ALS 39.80, 86.80	x	x		x			
Dani	HSS 39.50, HSS 86.50 (HS: 10, 20 mL)			x				
Dani	SPT 37.50 (HS: 20 mL)			x				
Delsi		x						
Dynatech	42 vial tray	x	x		x			
Dynatech	LC2000		x					
Fisons	42 vial tray, AS800	x						
GBC		x						
Gerstel		x						
Gilson	231 XL, 232 XL, 233 XL, Aspec XL	x	x		x			
Gilson	Asted XL	x			x			
Gynkotech	Gina, others	x			x			
Hitachi	AS-2000, AS-6000	x	x					
Hitachi	S6551				x			
Hitachi	L-7200				x		x	x
Hitachi	L-7250				x		x	
IBM		x			x			
ICI	other than LC 1600	x			x			
Infochroma		x			x			

Manufacturer	Instrument/Model #	11 mm Crimp-Top	9 mm Short Cap Screw-Thread	Headspace	8 mm Screw-Thread	10 mm Screw-Thread	4 mL WISP 48 Style	1 mL WISP 96 Style
Jasco	851-AS, AS-950	x			x			
Jasco	LC800 & 900 series				x			
Kipp		x			x			
Kontron	360	x			x			
Kontron	460				x			
LDC	Marathon, Promis	x	x		x			
LDC	other than 713	x			x			
L.E.A.P. Technologies	CTC A1055	x						
L.E.A.P. Technologies	CTC A2005	x	x		x	x		
L.E.A.P. Technologies	HS 500 (HS: 10, 20 mL Rounded)			x				
Magnus Scientific		x			x			
PerkinElmer	AI-1	x	x					
PerkinElmer	Autosystem GC (HS: 10, 20 mL, Rounded)	x		x	x			
PerkinElmer	F40, F45, HS 6, HS 40 (HS: 10, 20 mL, Rounded)			x				
PerkinElmer	Integral 4000 (HS: 10, 20 mL, Rounded)	x		x				
PerkinElmer	ISS 100, LC 600 42 vial tray	x	x					
PerkinElmer	ISS 200 (HS: 6 mL)	x	x	x				
PerkinElmer	420/B, 4900	x			x			
Pharmacia LKB	2157-010	x			x			
Phillips	4247, 4710	x			x			
Phillips	LC-XP	x			x		x	
Polymer-Labs	GPC 110/210	x						
Precision Sampling	GC111, GC 311, LC 241-60	x			x			
Pye	LCXP	x						
S.G.E.	M280D	x			x			
Sedere		x			x			
Shimadzu	AOC 20i	x				x		
Shimadzu	AOC-14/1400, AOC-17				x		x	
Shimadzu	AOC-8B/9, SIL-6A, SIL-6B, -9A, -8A				x			
Shimadzu	HSS-2B (HS: 27 mL)			x				
Shimadzu	SIL-2AS						x	
Shimadzu	SIL-10A, 10Ai, 10AxL	x	x		x	x		
Siemens	AS 32, AS 200	x						
Spark Holland	SPH 125	x	x					
Spark Holland	Marathon, Promis	x	x		x			
Spark Holland	Triathlon, Midas	x			x			
Spectra-Physics	8875, 8880	x	x		x			
Talbot		x			x			
Tekmar	7000, 7000/7050 (HS: 10, 20 mL, Rounded)			x				
Thermo Scientific	TRACE GC 2000, AS2000	x	x					
TOA	ICA5450				x			
Tosca 1		x						
TosoHaas	TSK-6080, AS-8010, AS-8020	x			x		x	
Tracor	770, 771, 772	x						
TSP	8875, 8880, AS 100/1000, AS 300/3000	x			x			
Unicam	4710	x						
Unicam	4700LC				x			
Unicam	4247	x			x			
Unicam	LC-XP	x			x		x	
United Technologies		x			x			
Waters	Alliance 2690	x	x		x	x		
Waters	710, 717+						x	x
Waters	48-pos. M700						x	
Waters	GC-999 M700							x

# Vial Size Quick Reference Chart

All vials pictured are actual size with description, Restek catalog number, and page number for quick reference.

## WISP Vials

4.0 mL Screw-Thread Step Vial



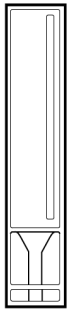
24654, 24655  
24656, 24657  
Page 364

4.0 mL Clear Crimp-Top



24658, 24659  
Page 364

700 µL Limited Volume



24680,  
24681  
Page 365

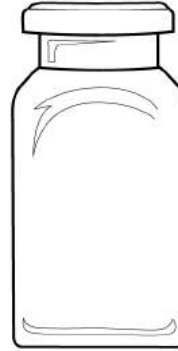
96 Style



24662, 24663,  
24664, 24665,  
24678, 24679  
Page 365

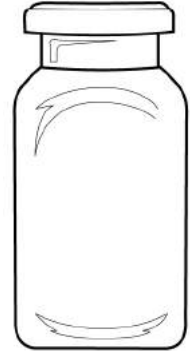
## Headspace Vials

10 mL Clear Flat Bottom



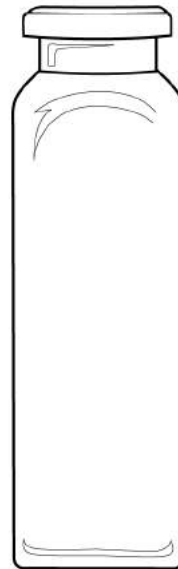
24683,  
24684  
Page 367

10 mL Clear Rounded Bottom



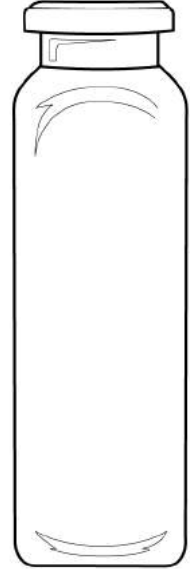
21164,  
21165  
Page 367

20 mL Clear Flat Bottom



24685,  
24686  
Page 367

20 mL Clear Rounded Bottom



21162,  
21163  
Page 367



All vials pictured are actual size with description, Restek catalog number, and page number for quick reference.

### Limited Volume Inserts

250 µL Big Mouth Insert



24516,  
21779  
Page 355

250 µL Glass Flat Bottom



24510  
Page 355

350 µL Glass Flat Bottom Inserts



21780,  
24517  
Page 355

w/ID Ring



24692,  
24693  
Page 355

500 µL Glass WISP Flat Bottom



21787, 21788  
Page 356

100 µL Glass or Polypropylene w/ Polypropylene Bottom Spring



24508, 21775  
24512  
Page 355

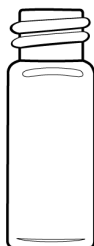
250 µL Glass or Polypropylene w/ Bottom Spring



21776, 21777,  
24518  
Page 355

### 8 mm Screw-Thread Vials

2.0 mL Clear or Amber w/ White Graduated Marking Spot



24619, 24620,  
24621, 24622  
Page 360

### 9 mm Short-Cap Vials

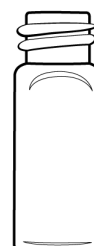
2.0 mL Clear or Amber w/White Graduated Marking Spot



21154\*, 21155\*  
\*w/o white graduated marking spot  
21140, 21141  
21142, 21143  
Page 359

### 10 mm Screw-Thread Vials

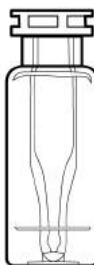
2.0 mL Big Mouth Step Clear or Amber



24626, 24627,  
24628, 24629  
Page 362

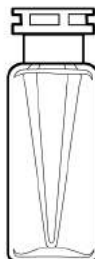
### 11 mm Crimp-Top Vials

Limited Volume 100 µL Glass Insert, Clear Plastic Vial



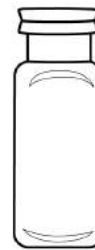
24653  
Page 357

Limited Volume 100 µL Polypropylene



24651, 24652  
Page 357

2.0 mL Snap Seal Style Clear or Amber Glass



21152, 21153, 24383, 24384, 24385, 24386  
Page 357



We put quality and a personal commitment to you in all our products.

### Microsampling Vials and Inserts

Microsampling vials and inserts are ideal for applications where sample volume is limited because they provide maximum sample extraction and minimal sample waste. One-piece interlock vials offer less handling of vial components and reduce the chance of sample loss due to spillage. Limited-volume inserts are designed to work in 2 mL vials.



### Interlock Vials

Interlock limited volume vials offer the performance and convenience of a one-piece microvial for a fraction of the cost. A 300 µL insert is fused into a 12 x 32 mm clear or amber glass vial. This one-piece design reduces the potential for contamination.

Description	Type	Volume	Color	Material	100-pk.	500-pk.
Interlock Vial	9 mm Thread	300 µL	Clear	Glass	22433	22434
Interlock Vial	9 mm Thread	300 µL	Amber	Glass	22435	22436
Interlock Vial	11 mm Crimp or Snap Ring	300 µL	Clear	Glass	22437	22438
Interlock Vial	11 mm Crimp or Snap Ring	300 µL	Amber	Glass	22439	22440



### also available

Mininert® sampling valves

See **page 370**.



### Micro-Vials with Screw Threads

- Two sizes available.
- Tapered for high recovery of contents.
- Work with Mininert® sampling valves.

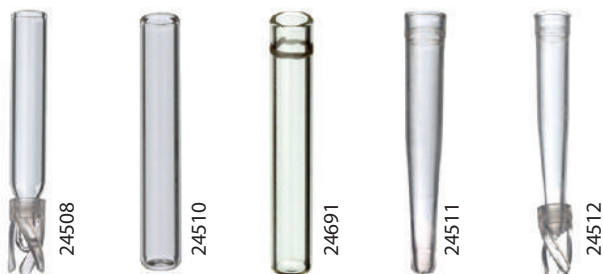
Description	Volume	Screw Thread		qty.	cat.#
		Size			
Micro-Vial, Open Top Cap (attached), Borosilicate Glass, w/Graduated Marking Spot	1.0 mL	13 mm/425		12-pk.	21050
Micro-Vial, Open Top Cap (attached), Borosilicate Glass, w/Graduated Marking Spot	3.0 mL	20 mm/400		12-pk.	21051



**Inserts** for 2.0 mL, 11 mm Crimp-Top & 2.0 mL, 9 mm Short-Cap, Screw-Thread Vials  
(Vials shown on pages 357–359.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	50 µL	Glass	24513	21782
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777
Big Mouth Insert w/Glass Flange (Step Design)*	250 µL	Glass	24516	21779
Insert, Flat Bottom	350 µL	Glass	21780	24517
Insert, Flat Bottom w/ID Ring	350 µL	Glass	24692	24693
Big Mouth Insert w/Bottom Spring	250 µL	Polypropylene	24518	—
Big Mouth Insert w/Bottom Spring & Graduated Markings	250 µL	Polypropylene	24518A	—
Big Mouth Insert, Top Flange	250 µL	Polypropylene	24519	—
Big Mouth Insert, No Spring	250 µL	Polypropylene	24520	—

\*Big Mouth insert w/glass flange (step design) not to be used with 9 mm screw-thread vials.



**Inserts** for 2.0 mL, 8 mm Screw-Thread Vials  
(Vials shown on page 360.)

Description	Volume	Material	100-pk.	1,000-pk.
Insert w/Polypropylene Bottom Spring	100 µL	Glass	24508	21775
Insert, Flat Bottom	250 µL	Glass	—	24510
Insert, Flat Bottom w/ID Ring	250 µL	Glass	—	24691
Insert, No Spring	100 µL	Polypropylene	24511	—
Insert w/Bottom Spring	100 µL	Polypropylene	24512	—



**Inserts** for 2.0 mL, 10 mm Big Mouth Step Design Screw-Thread Vials  
(Vials shown on page 362.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777
Insert, Flat Bottom	350 µL	Glass	21780	24517
Insert, Flat Bottom w/ID Ring	350 µL	Glass	24692	24693
Big Mouth Insert w/Glass Flange (Step Design)*	250 µL	Glass	24516	21779

Polypropylene inserts available on request (1,000-packs only).

\*Big Mouth

**also available**  
Crimpers & Decappers  
See **page 371**.



**Sky**  
Inlet Liners

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Looking for the Best Solution?

Sky® inlet liners, featuring a state-of-the-art deactivation, give you the inertness you need for accurate, reproducible trace-level results.

See pages 193–202 for details.



**Inserts** for 4.0 mL WISP 48 Screw-Thread Step Vials  
(Vials shown on page 364.)

Description	Volume	Material	100-pk.	1,000-pk.
Insert for WISP 48 Vials, Flat Bottom**	500 µL	Glass	21787	21788

Polypropylene inserts available on request (1,000-packs only).

\*\*Also fit 4.0 mL Snap Seal vials. See page 364.



**Limited Volume Inserts** for Shell Vials, 1.0 mL WISP 96 Style, 8 x 40 mm  
(Vials shown on page 365.)


Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777

**free literature**

How to Choose the Right Vial for Chromatography Applications

Download your free copy from [www.restek.com](http://www.restek.com)

lit. cat.# GNR2018-UNV




**Inserts** for Versa Vials™  
(Vials shown on page 368.)

Description	Volume	Material	100-pk.	1,000-pk.
Versa Vial Insert w/Glass Flange	250 µL	Glass	22707	—
Versa Vial Insert w/Flange	250 µL	Polypropylene	22709	22710
Versa Vial Insert, Flat Bottom	250 µL	Glass	22711	22712



## 2.0 mL Crimp-Top Vials, 12 x 32 mm, 11 mm

Choose with or without graduated marking spots.



## 2.0 mL Crimp-Top Vials, 12 x 32 mm, 11 mm

Description	Color	Material	100-pk.	1,000-pk.
Vial w/White Graduated Marking Spot	Clear	Glass	24383	24384
Vial w/Blue Graduated Marking Spot	Clear	Glass	—	24384B
Vial w/Green Graduated Marking Spot	Clear	Glass	—	24384G
Vial w/Rust Graduated Marking Spot	Clear	Glass	—	24384R
Vial w/Yellow Graduated Marking Spot	Clear	Glass	—	24384Y
Vial w/White Graduated Marking Spot	Amber	Glass	24385	24386
Vial without Graduated Marking Spot	Clear	Glass	21152	21153



## 2.0 mL Crimp-Top Vial With 100 µL Insert

- Plastic vial.
- Choice of glass or polypropylene fused insert.

Description	100-pk.	1,000-pk.
Clear Plastic Vial w/100 µL Polypropylene Insert	24651	24652
Clear Plastic Vial w/100 µL Glass Insert	24653	—



## 2.0 mL, 11 mm Aluminum Crimp Seals With Septa

Seal Color	Septa Material	100-pk.	500-pk.	1,000-pk.
Silver	PTFE/Natural Rubber	21174	—	21175
Blue	PTFE/Red Rubber	24351	—	24352
Green	PTFE/Red Rubber	24353	—	24354
Red	PTFE/Red Rubber	24355	—	24356
Yellow	PTFE/Red Rubber	24357	—	24358
Mixed	PTFE/Rubber	—	21724	—
Silver	PTFE/Silicone	24359	—	24360
Blue	PTFE/Silicone	24361	—	24362
Green	PTFE/Silicone	24363	—	24364
Red	PTFE/Silicone	24365	—	24366
Yellow	PTFE/Silicone	24367	—	24368
Mixed	PTFE/Silicone	—	21725	—
Silver	PTFE/Silicone/PTFE	24369	—	24370
Silver	PTFE/Silicone/PTFE	26562	—	26563



Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater

also available  
Crimpers & Decappers  
See page 371.



# Crimp-Top Vials



**also available**  
 Limited Volume Inserts  
 for 2.0 mL, 11 mm Crimp-Top Vials  
 See **page 355**.



## 2.0 mL, 11 mm Poly Crimp Seal Caps: Snap-On or Crimp

The Poly Crimp seal is versatile, working as either a snap-on or crimp-top cap. Simply use a standard crimping tool to secure the Poly Crimp seal onto any crimp-top vial. It's that easy!

Seal Color	Septa Material	100-pk.	400-pk.	1,000-pk.
Clear	PTFE/Butyl Rubber	24433	—	24434
Clear	PTFE/Silicone	24443	—	24444
Blue	PTFE/Silicone	24445	—	24446
Clear	PTFE/Silicone/PTFE	24453	—	24454
Blue	PTFE/Silicone/PTFE	24455	—	24456
Mixed	PTFE/Silicone/PTFE	—	21728	—
Clear	PTFE/Silicone w/Slit	26564	—	26565
Clear	PTFE/Silicone/PTFE w/Starburst	26566	—	26567
Clear	PTFE/Silicone w/Starburst	26568	—	26569
Blue	PTFE/Silicone w/Starburst	26570	—	26571

**NEW!**

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.



## 2.0 mL, 11 mm GC Snap Ring Cap With Septum

- Snaps on any crimp-style vial.
- Save money! Use this snap cap when you don't need to crimp.

Description	Septa Material	100-pk.	1,000-pk.
Polypropylene Snap Ring Cap w/Liner	PTFE, 10 mil	21729	21730
Polypropylene Snap Ring Cap w/Septum	PTFE/Butyl Rubber	21731	21732
Polypropylene Snap Ring Cap w/Septum	PTFE/Silicone	21733	21734

**Restek Recommends!**



24673

## 2.0 mL Crimp Vial Convenience Kits (Vials, Caps, & Septa)

Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Deactivated, Silver Seal, PTFE/Natural Rubber Septa	24671	24672
Amber 2.0 mL Vial, Deactivated, Silver Seal, PTFE/Natural Rubber Septa	24673	24674
Clear 2.0 mL Vial, Untreated, Silver Seal, PTFE/Natural Rubber Septa	21196	21197
Amber 2.0 mL Vial, Untreated, Silver Seal, PTFE/Natural Rubber Septa	21198	21199
Clear 2.0 mL Vial, Untreated, Silver Seal, PTFE/Silicone Septa	24646	24647
Amber 2.0 mL Vial, Untreated, Silver Seal, PTFE/Silicone Septa	24648	24649

## 2.0 mL Sample Vial Racks

- Racks feature alphanumeric indexing for easier vial identification.
- Racks can be stacked for efficient storage.
- Fits most 2.0 mL, 12 x 32 mm vials (vials sold separately).



22856

Description	Capacity	qty.	cat.#	qty.	cat.#
Polypropylene Storage Rack	50 vials 5 x 10	ea	22856	5-nk	22857

**RESTEK** *CHROMALYTICs* Distributor in AUSTRALIA : Contact +81 3 9762 2034

## 2.0 mL, 9 mm Short-Cap, Screw-Thread Vials, 12 x 32 mm

Fit all 2.0 mL, 12 x 32 mm, crimp-top vial-based autosamplers.



Ideal for Agilent 7673, 7683,  
and 7693 autosamplers.

also available

Limited Volume Inserts  
for 2.0 mL, 9 mm Short-Cap  
Screw-Thread Vials

See page 355.



### 2.0 mL, 9 mm Short-Cap, Screw-Thread Vials (vial only)

Description	Color	100-pk.	1,000-pk.
Short-Cap Vial w/White Graduated Marking Spot	Clear	21140	21141
Short-Cap Vial w/White Graduated Marking Spot	Amber	21142	21143
Short-Cap Vial without Graduated Marking Spot	Clear	21154	21155



24668

### 2.0 mL, 9 mm Short-Cap, Screw-Vial Closures (Polypropylene, preassembled)

Cap Color	Septa Material	100-pk.	500-pk.	1,000-pk.
Blue	PTFE/Butyl Rubber	24473	—	24474
Mixed	PTFE/Butyl Rubber	—	24668	—
Blue	PTFE/Silicone	24485	—	24486
Green	PTFE/Silicone	24487	—	24488
Yellow	PTFE/Silicone	24493	—	24494
Mixed	PTFE/Silicone	—	24669	—
Blue	PTFE/Silicone/PTFE	24497	—	24498
Black	PTFE/Silicone/PTFE	24495	—	24496
Natural	PTFE/Silicone/PTFE	24501	—	24502
Red	PTFE/Silicone/PTFE	24503	—	24504
Green	PTFE/Silicone/PTFE	24499	—	24500
Yellow	PTFE/Silicone/PTFE	24505	—	24506
Mixed	PTFE/Silicone/PTFE	—	24670	—
Black	PTFE/Silicone w/Slit	26572	—	26573
Green	PTFE/Silicone w/Slit	26574	—	26575
Red	PTFE/Silicone w/Slit	26576	—	26577
Blue	PTFE/Silicone w/Slit	26578	—	26579
Yellow	PTFE/Silicone w/Slit	26580	—	26581



Choose prelit caps to reduce the risk of  
needle bending, release vacuum from  
high-volume injections, and improve  
injection reproducibility when greater  
than 20% of vial volume is withdrawn.

NEW!

### 2.0 mL Screw-Thread Vial Convenience Kits (Vials, Caps, & Septa)

Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk. cat.#	1,000-pk. cat.#
Clear Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Butyl Rubber Liner	26590	26591
Clear Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Silicone Liner	26592	26593
Amber Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Butyl Rubber Liner	26594	26595
Amber Vial w/Graduated Marking Spot, 9 mm, Blue Cap PTFE/Silicone Liner	26596	26597



26592



**also available**

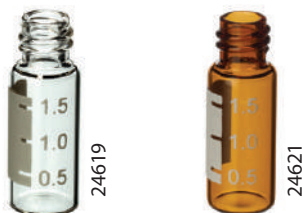
Mininert® sampling valves

See page 370.



**2.0 mL Screw-Thread Vials, 12 x 32 mm, 8 mm/425 Thread**

- Fit all 2.0 mL, 12 x 32 mm, screw-thread 8 mm/425 vial-based autosamplers.



**2.0 mL, 8 mm Screw-Thread Vials (vial only)**

These vials provide the most secure environment for your sample because evaporation is minimized.

Description	Volume	Color	100-pk.	1,000-pk.
Vial w/White Graduated Marking Spot	2.0 mL	Clear	24619	24620
Vial w/White Graduated Marking Spot	2.0 mL	Amber	24621	24622

All vials undeactivated unless otherwise noted.



**2.0 mL, 8 mm Screw-Thread Vials with 100 µL Insert**

- Plastic vials.
- Choice of glass or fused polypropylene insert.

Description	Color	100-pk.	1,000-pk.
Plastic Vial w/100 µL Polypropylene Insert	Clear	24623	24624
Plastic Vial w/100 µL Glass Insert	Clear*	24625	—

\*Amber plastic vial with clear glass insert available on request. (1,000-packs only)

**also available**

Limited Volume Inserts for 2.0 mL, 8 mm Screw-Thread Vials

See page 355.



**2.0 mL, 8 mm Caps and Septa (preassembled)**

Cap Color	Septa Material	100-pk.	1,000-pk.
Black	Red PTFE/Silicone, 0.065"	21149	21720
Black Top Hat	PTFE/Silicone	21721	21722
Black	Red PTFE/Silicone, 0.060" w/Slit	26582	26583
Black Flangeless	Red PTFE/Silicone, 0.060" w/Slit	26584	26585

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

**NEW!**



**Caps and Septa for 2.0 mL, 8 mm Screw-Thread Vials**

Description	Septa Material	100-pk.	1,000-pk.
Black Polypropylene, Open-Hole Caps		21176	21177
Septa, 8 mm x 0.060"	Red PTFE/Silicone	21178	21179
Septa, 8 mm x 0.065"	Red PTFE/White Silicone	21795	21147



## 2.0 mL Autosampler Vial Convenience Kits

- Vials packaged in a clear-lid tray. Preassembled caps with septa packaged separately in a plastic bag.
- Black polypropylene open-hole caps and 8 mm red PTFE/silicone septa, 0.065".

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Silcote Deactivated, Black Cap, Red PTFE/Silicone Septa, 0.065"	24638	24639
Amber 2.0 mL Vial, Silcote Deactivated, Black Cap, Red PTFE/Silicone Septa, 0.065"	24640	24641
Clear 2.0 mL Vial, Untreated, Black Cap, Red PTFE/Silicone Septa, 0.065"	21192	21193
Amber 2.0 mL Vial, Untreated, Black Cap, Red PTFE/Silicone Septa, 0.065"	21194	21195



24638

## 2.0 mL Preassembled Vial Kits

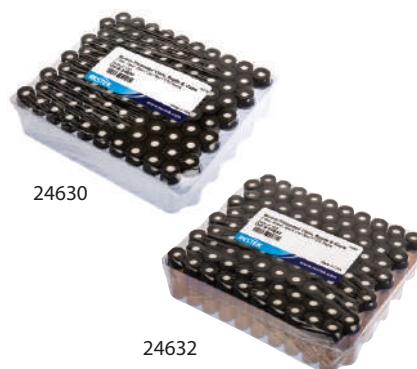
8 mm/425 Screw-Thread, Unmarked Vials, Septa, and Caps

Caps attached to vials.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"	24630	24631
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"	24632	24633
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24634	24635
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24636	24637

\*Best fit for Shimadzu.

\*\*Best fit for Varian.



24630

24632



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**also available**

Limited Volume Inserts  
for 2.0 mL, 10 mm Big Mouth Step  
Design Screw-Thread Vials

See **page 355**.



**2.0 mL Big Mouth Step Design Screw-Thread Vials,  
12 x 32 mm, 10 mm/425 Thread**

- 40% larger opening than other vials.
- Step profile automatically centers glass flange limited volume inserts.
- Preassembled caps with septa, with or without vials.
- Designed for Waters Alliance® autosamplers.

The Big Mouth Step vial system has a larger ID than conventional vials and incorporates a neck finish that is uniquely designed to allow the insert to be precisely aligned in the center of the vial. This precise alignment provides maximum sample withdrawal and eliminates any chance of missed injections.



**2.0 mL Big Mouth Step Screw-Thread Vials (vial only)**

Description	Volume	Color	100-pk.	1,000-pk.
Big Mouth Step Vial w/White Graduated Marking Spot	2.0 mL	Clear	24626	24627
Big Mouth Step Vial w/White Graduated Marking Spot	2.0 mL	Amber	24628	24629

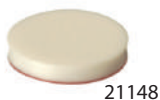


**Caps and Septa for 2.0 mL Big Mouth Step Vials (preassembled)**

Description	Septa Material	100-pk.	1,000-pk.
Caps and Septa, Preassembled	PTFE/Silicone/PTFE, 0.040"	—	21723
Caps and Septa, Preassembled	Red PTFE/White Silicone, 0.060"	—	24677
Vial Caps & Septa	Red PTFE/Silicone, 0.060" w/Slit	26586	26587

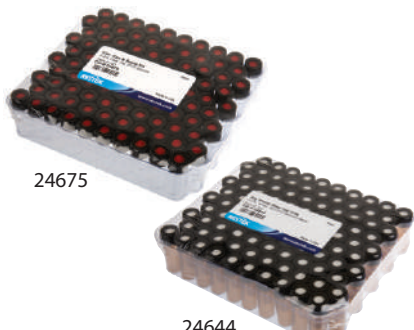
Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.

**NEW!**



**Septa for 2.0 mL Big Mouth Step Vials**

Description	Septa Material	qty.	cat.#
Septa Only	Red PTFE/White Silicone, 0.060"	1,000-pk.	21148



**2.0 mL Big Mouth Step Vial Kits w/Black Caps (preassembled)**

Caps attached to vials.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Black Cap, PTFE/Silicone/Red PTFE Septa, 0.040"	24675	24676
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24642	24643
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24644	24645

### Certified Autosampler Vial Kits

Certified 2.0 mL Screw-Thread Vials

- Certificates enclosed with each kit.
- Vials of clear or amber borosilicate glass with ID marking spots.
- Closures with pre-inserted septa.
- Each kit sealed for integrity.

#### Certification Parameters Include:

Vial Dimensions: Height, diameter, bottom thickness, neck length, thread profile, and annealing

Cap/Septum: Diameter, height, thread integrity, center flash, septa insertion, sealing/resealing test, residue by headspace GC, and extractables

Chemical Test: LC Test: nonvolatile residue

GC Test: volatile residue



22788



22792

#### Description

Description	100-pk.
Assembled Clear 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22789
Assembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22788
Unassembled Clear 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Septa	22792
Unassembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Septa	22790
Unassembled Clear 2.0 mL High-Recovery Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22793
Unassembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22791

## Raptor™ LC Columns



Experience *Selectivity Accelerated*

See pages 155–159 or visit [www.restek.com/raptor](http://www.restek.com/raptor)

Raptor™ EXP® Guard Columns also available.



**also available**  
Limited Volume Inserts  
for 4.0 mL WISP 48 Screw-Thread  
Step Vials  
See **page 356**.



### 4.0 mL WISP 48 Crimp-Top 13 mm Vials, 15 x 45 mm, Snap Seal



#### 4.0 mL WISP 48 Snap Seal Crimp-Top Vial (vial only)

Description	Volume	Color	100-pk.	1,000-pk.
WISP 48 Snap Seal Vial w/White Graduated Marking Spot	4.0 mL	Clear	24658	24659



#### Aluminum Seals w/Septa for 4.0 mL WISP Crimp-Top Vials

Seal Color	Septa Material	100-pk.	1,000-pk.
Silver	PTFE/Butyl Rubber	21753	21754
Silver	PTFE/Silicone	21755	

### 4.0 mL WISP 48 Screw-Thread Step Vials, 15 x 45 mm, 13/425



#### 4.0 mL WISP 48 Screw-Thread Step Vials (vials only)

Description	Volume	Material	100-pk.	1,000-pk.
WISP 48 Step Vial w/White Graduated Marking Spot	4.0 mL	Clear	24654	24655
WISP 48 Step Vial w/White Graduated Marking Spot	4.0 mL	Amber	24656	24657



26588



21749

#### 4.0 mL WISP 48 Caps and Septa

Description	Septa Material	100-pk.	1,000-pk.
WISP 48 Caps and Septa, Top Hat	PTFE/Silicone	21745	21746
WISP 48 Caps and Septa, Preassembled	Red PTFE/Silicone, 0.065"	21743	21744
Vial Caps & Septa, Black Polypropylene, Open-Hole	Red PTFE/Silicone, 0.060" w/Slit	26588	26589
WISP 48 Caps, Black Polypropylene, Open-Hole		21741	21742
Septa	Red PTFE/Silicone/PTFE, 0.040"	21751	21752
Septa	Red PTFE/Silicone, 0.060"	21749	21750

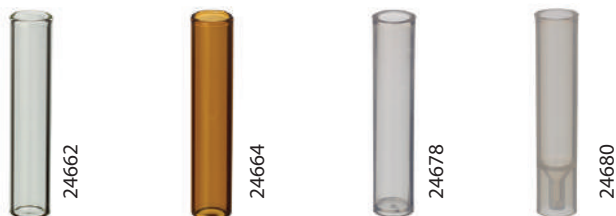
**NEW!**

Choose preslit caps to reduce the risk of needle bending, release vacuum from high-volume injections, and improve injection reproducibility when greater than 20% of vial volume is withdrawn.



## 1.0 mL WISP 96 Style Shell Vials, 8 x 40 mm

Available in three styles.



**also available**

Limited Volume Inserts  
for 1.0 mL WISP 96 Style Shell Vials

See **page 356**.



## 1.0 mL WISP 96 Style, 8 x 40 mm Shell Vials

Description	Volume	Color	Material	200-pk.	1,000-pk.
WISP 96 Style Vial	1.0 mL	Clear	Glass	24662	24663
WISP 96 Style Vial	1.0 mL	Amber	Glass	24664	24665
WISP 96 Style Vial	1.0 mL	Clear	Polypropylene	24678	24679
WISP 96 Style Vial	700 µL Limited Volume	Clear	Polypropylene	24680	24681

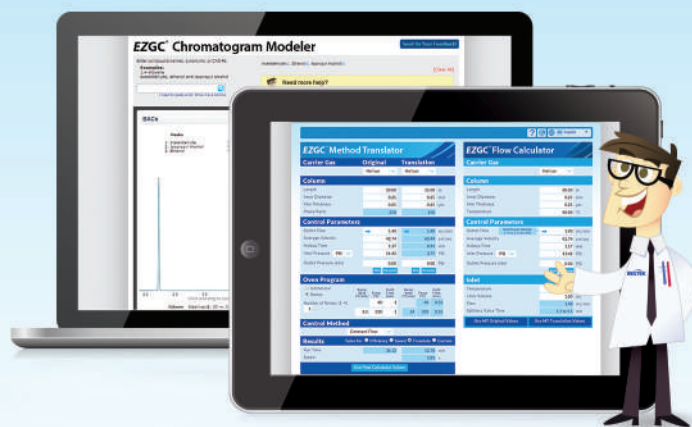
8mm Starburst Plugs sold separately.



## 8 mm Starburst Plugs for Shell Vials, 1.0 mL WISP 96 Style, 8 x 40 mm

Description	Color	Material	200-pk.	1,000-pk.
Starburst Snap Plugs for Shell Vials	Clear	Polyethylene	21769	21770
Starburst Snap Plugs for Shell Vials, Conical	Clear	Polyethylene	21771	21772
Starburst Snap Plugs for Shell Vials, Silicone-Lined	Clear	Polyethylene	21773	21774

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**Headspace Screw-Thread Vials (18 mm)**

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial	10 mL	Clear	22 x 45 mm	23084	23085
Headspace Vial	10 mL	Amber	22 x 45 mm	23088	23089
Headspace Vial	20 mL	Clear	22 x 75 mm	23082	23083
Headspace Vial	20 mL	Amber	22 x 75 mm	23086	23087

Caps not included (sold separately).



**Magnetic Screw-Thread Caps (18 mm)**

Description	Septa Material	100-pk.	1,000-pk.
Magnetic Caps and Septa for SPME	Blue PTFE/Silicone, 1.5 mm thick	23090	23091
Magnetic Caps and Septa	Red PTFE/Silicone, 1.9 mm thick	23092	23093
Magnetic Caps and Septa	PTFE/Red Chlorobutyl	23094	23095

**Rxi**  
 GCColumns

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 Highest Inertness • Lowest Bleed • Exceptional Reproducibility

See pages 24–39.

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### Headspace Crimp Vials (20 mm)

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial	6 mL	Clear	22 x 38 mm	21166	21167
Headspace Vial, Flat Bottom	10 mL	Clear	23 x 46 mm	24683	24684
Headspace Vial, Rounded Bottom	10 mL	Clear	23 x 46 mm	21164	21165
Headspace Vial, Flat Bottom	20 mL	Clear	23 x 75 mm	24685	24686
Headspace Vial, Rounded Bottom	20 mL	Clear	23 x 75 mm	21162	21163
Headspace Vial	27 mL	Clear	30 x 60 mm	21160	21161

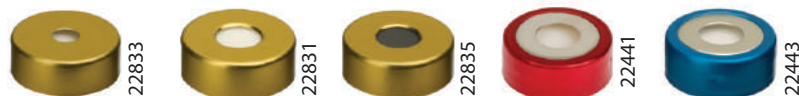
Vial-to-instrument compatibility is designated in instrument reference chart. See page 351.



### Aluminum Seals w/Septa (20 mm, preassembled)

Description	Cap Color	Septa Material	100-pk.	1,000-pk.
Seals w/Septa	Silver	PTFE/Gray Butyl Rubber	21761	21762
Seals w/Septa	Silver	PTFE/Silicone	21763	21764
Pressure Release Seals w/Septa*	Silver	PTFE/Gray Butyl Rubber	21765	21766
Pressure Release Seals w/Septa*	Silver	PTFE/Silicone	21767	21768

\*Pressure release point: 3.0 bar ± 0.5 bar



### Magnetic Seals w/Septa (20 mm, preassembled)

Description	Cap Color	Septa Material	100-pk.	1,000-pk.
Magnetic Seals w/Septa, with 5 mm Hole	Gold	PTFE/Silicone	22833	22834
Magnetic Seals w/Septa, with 8 mm Hole	Gold	PTFE/Silicone	22831	22832
Magnetic Seals w/Septa, with 8 mm Hole	Gold	PTFE/Butyl	22835	22836
BiMetal Magnetic Seals w/Septa, with 8 mm Hole	Red/Silver	PTFE/Silicone	22441	22442
BiMetal Magnetic Seals w/Septa, with 8 mm Hole	Blue/Silver	PTFE/Silicone	22443	22444

5 mm hole is compatible with the following systems: Carlo Erba HS500/HS800, CTC 500, Fisons HS500/HS800, and Bruker/Varian/Chrompack 9020/25. 8 mm hole is compatible with the Combi Pal. BiMetal magnetic seals are easier to crimp and decap than standard 20 mm magnetic seals.



### 2.0 mL Versa Vials™, Glass, 12 x 32 mm

- Elongated neck allows for consistent, reliable autosampler pick up.
- 9 mm opening is ideal for sampling and pipette use.

**also available**  
Versa Vial™ Inserts  
See **page 356**.



Description	Volume	Color	Material	100-pk.	1,000-pk.
Versa Vial	2.0 mL	Clear	Glass	22701	22702
Versa Vial	2.0 mL	Amber	Glass	22697	—
Versa Vial w/Marking Spot	2.0 mL	Clear	Glass	22703	22704
Versa Vial w/Marking Spot	2.0 mL	Amber	Glass	22699	22700



### 1.5 mL Versa Vials™, Polypropylene, 12 x 32 mm

Description	Volume	Color	Material	100-pk.	1,000-pk.
Versa Vial	1.5 mL	Clear	Polypropylene	22705	22706



### Versa Vial™ Plugs (12 mm)

Description	Color	Plug Material	100-pk.	1,000-pk.
Versa Vial Plug	Green	Polyethylene	22713	22714
Versa Vial Plug	Grey	Chlorobutyl/Siliconized	22715	22716
Versa Vial Plug	White	PTFE/Silicone	22717	22718
Versa Vial Plug	White	PTFE/Silicone Plug w/Slit*	22719	22720

\*Eliminates needle damage to plug.



**Precleaned Volatile Organic Analyte (VOA) Sampling Vials**

- Container, liner, and closure cleaned, assembled, and lot traceable.
- Open-top caps.
- PTFE faced 0.125" silicone septa.
- Cleaned to U.S. EPA Protocol B specifications.



24694

Description	Volume	Color	Material	Screw-Thread Size	qty.	cat. #
Precleaned VOA Vials	20 mL	Clear	Glass	24 mm/400	72-pk.	21798
Precleaned VOA Vials	20 mL	Amber	Glass	24 mm/400	72-pk.	21799
Precleaned VOA Vials	40 mL	Clear	Glass	24 mm/400	72-pk.	21796
Precleaned VOA Vials	40 mL	Amber	Glass	24 mm/400	72-pk.	21797
Collection Vials for ASE 200	60 mL	Clear	Glass	24 mm/400	72-pk.	26121
Collection Vials for ASE 200	60 mL	Amber	Glass	24 mm/400	72-pk.	26122
Replacement Septa, 24 mm x 0.125"			PTFE-lined silicone		100-pk.	24694



21798

26122

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See **pages 464-465**.

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# Filter Vials, Sampling Valves for Vials



Simply squeeze particulates and contaminants out of your sample!

## Thomson SINGLE StEP® Filter Vials

- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12 x 32 mm autosamplers, including UHPLC instruments.



Porosity	Color	qty.	cat.#
<b>Nylon</b>			
0.2 µm	black cap	100-pk.	25891
0.45 µm	pink cap	100-pk.	25892
<b>PES (polyethersulfone)</b>			
0.2 µm	grey cap	100-pk.	25897
0.45 µm	orange cap	100-pk.	25898
<b>PTFE (polytetrafluoroethylene)</b>			
0.2 µm	green cap	100-pk.	25893
0.45 µm	blue cap	100-pk.	25894
<b>PVDF (polyvinylidene difluoride)</b>			
0.2 µm	red cap	100-pk.	25895
0.45 µm	yellow cap	100-pk.	25896

Patent No. 7,790,117

See **pages 410–411** for a compatibility chart.



## Mininert® Precision Sampling Valves for Vials

Mininert® valves are very convenient for repetitive sampling and limit content exposure to the silicon septum. Models are available for screw-cap and crimp-top vials. The crimp-top valve for 20 mm ID glassware slides into the neck of the vial. Turn the threaded flange to secure a tight fit.

Description	Type	Thread Size	qty.	cat.#
Mininert Precision Sampling Valves	Screw-Thread	13 mm/425	12-pk.	24900
Mininert Precision Sampling Valves	Screw-Thread	15 mm/425	12-pk.	24901
Mininert Precision Sampling Valves	Screw-Thread	18 mm/400	12-pk.	24902
Mininert Precision Sampling Valves	Screw-Thread	20 mm/400	12-pk.	24903
Mininert Precision Sampling Valves	Screw-Thread	24 mm/400	12-pk.	24904
Mininert Precision Sampling Valves	Crimp-Top	—	12-pk.	24905
Replacement Septa			50-pk.	24906
Septum Insertion Tool			ea.	24907

### Electronic Rechargeable Crimpers and Decappers

- Easy to use; comfortable grip.
- Hundreds of operations from one charge.
- Adjustable crimping force.
- Large battery allows for faster charge cycle.
- All kits include a universal plug set for the battery charger.
- For 11 mm and 20 mm caps.
- One-year warranty.

These electronic crimpers and decappers have a rechargeable 6.4-volt battery installed. The large battery allows for quick, powerful operation and a faster charge cycle, minimizing downtime. Charging the battery takes thirty minutes to two hours. The universal plug set includes U.S., European, UK, and Australian plug clips.

Description	Size	qty.	cat.#
Electronic Crimper	11 mm	kit	22358
Electronic Crimper	20 mm	kit	22359
Electronic Decapper	11 mm	kit	22360
Electronic Decapper	20 mm	kit	22361
Replacement Battery for Electronic Crimpers and Decappers		ea.	22362



Universal plug set for battery charger included in all kits.

### Easy Grip Manual Crimpers and Decappers

Our Easy Grip crimpers and decappers feature tough, light, plastic bodies with curved handles that improve hand comfort during use. The bottom-pull handle allows for a steadier hold than top-push handles. An easily viewed adjustment knob is located at the head of the product. The clearly shown + and - symbols, along with directional arrows, simplify adjusting the intensity of the crimp/decap as needed. The knob is also designed to indicate when the crimp setting has been reached, when it fully contacts the body of the product.

Description	Size	qty.	cat.#
Crimper	11 mm	ea.	23396
Crimper	20 mm	ea.	23398
Decapper	11 mm	ea.	23397
Decapper	20 mm	ea.	23399



Safer than removing caps with pliers, knives, or screwdriver blades!

## Restek Electronic Leak Detector

Protect your instrument and your analytical column

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# Syringes

Syringe Overview .....	372–373
Plastic Syringes .....	373
Autosampler Syringes .....	374–385
For Agilent .....	374–377
For Bruker/Varian .....	378
For CTC .....	379–380
For PerkinElmer .....	381
For Shimadzu .....	382
For Thermo Scientific .....	383–385
Manual Syringes .....	386–387
Micro-Volume Syringes .....	388
Gas-Tight Syringes .....	389–393
Jumbo Syringes .....	393
LC Syringes .....	394–395



## Syringe Basics

### Needle Gauge Chart

Gauge	Nominal OD		Nominal ID	
	in	mm	in	mm
26s	0.019	0.47	0.0050	0.13
26	0.018	0.46	0.0102	0.26
25	0.021	0.51	0.0102	0.26
23s	0.025	0.64	0.0060	0.15
23	0.025	0.64	0.0132	0.34
22s	0.028	0.72	0.0060	0.15
22	0.028	0.72	0.0162	0.41

s (after gauge) = smaller ID with thicker walls

## did you know?

Syringes and needles manufactured by Hamilton Company and SGE are intended for scientific research and laboratory use only and are not intended for human *in vivo* use.

### Guide to Needle Termination Codes

#### Hamilton:

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

#### SGE:

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip

### Needle Point Style

Restek offers several different point styles on syringe and needle products. Choose one based on your application.



**Point Style 2, BV:** beveled needle tip. Recommended for optimum septum penetration and reduction of septum coring.



**Point Style 3, LC:** square/blunt needle tip. For use with HPLC injection valves and for sample pipetting.



**Point Style 5, S/Hole, Bevel:** conical needle with side hole. Liquid samples are filled and dispensed through the side hole.



**Point Style H, Dome:** domed needle tip with side hole. Liquid samples are filled and dispensed through the side hole. The solid tip minimizes septum damage.



**Point Style Agilent, Cone, AS:** special conical style needle point used exclusively on syringes for autosamplers.



### Syringe Termination Types

From cemented to removable needles, and from PTFE luer lock to special syringe fittings, syringe barrel terminations create the interface between a syringe and its mating connection. For your reference, we describe the most common Hamilton/SGE terminations below.



**N, Cemented Needle / F, Fixed:**  
Needle cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Not autoclavable.



**KH, Knurled Hub / R, Removable:**  
Used on 7000 series Hamilton syringes, exclusively. Knurled hub enables 6,000 psig maximum injection pressures and the attachment of a spacer for repeatable-depth injections. Autoclavable when disassembled.



**RN, Removable Needle / R, Removable:**  
Needle seats precisely to the zero graduation mark of the syringe. Allows the use of different specification needles on the same syringe barrel. Autoclavable when disassembled.



**TLL, PTFE Luer Lock / LL, Luer Lock / LT, Luer Tip:**  
Male luer taper with nickel-plated brass hub accepts and locks into place luer hub needles and connectors. Autoclavable when disassembled.

### NORM-JECT® Plastic Syringes

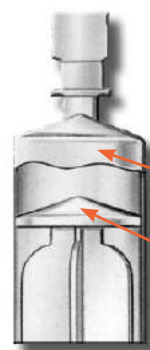
NORM-JECT® syringes are latex-free, contain no rubber, no silicone oil, styrene or DEHP, and are DNA-free. These syringes are the choice for any situation needing an inert, nonreactive syringe. Because of their composition, they are ideal for chromatography and many other laboratory procedures. They are more chemically resistant than rubber-tipped syringes and are manufactured from only laboratory grade polypropylene and polyethylene. These unique plastic syringes have a positive safety stop to prevent accidental spills. NORM-JECT® syringes are individually sterile strip packed.



Not recommended for human use.

Description	qty.	cat.#
1 mL Luer Slip Tuberculin <sup>1</sup>	100-pk.	22766
3 mL Luer Slip Centric Tip	100-pk.	22767
5 mL Luer Slip Centric Tip <sup>2</sup>	100-pk.	22768
10 mL Luer Slip Eccentric Tip <sup>2</sup>	100-pk.	22769
20 mL Luer Slip Eccentric Tip <sup>2</sup>	100-pk.	22770
30 mL Luer Slip Eccentric Tip	50-pk.	22771
50 mL Luer Slip Eccentric Tip <sup>2</sup>	30-pk.	22772
3 mL Luer Lock Tip	100-pk.	22773
5 mL Luer Lock Tip <sup>2</sup>	100-pk.	22774
10 mL Luer Lock Tip <sup>2</sup>	100-pk.	22775
20 mL Luer Lock Tip <sup>2</sup>	100-pk.	22776
30 mL Luer Lock Tip	50-pk.	22777
50 mL Luer Lock Tip <sup>2</sup>	30-pk.	22778

<sup>1</sup>Dose saver design with low dead space plug on the piston to minimize waste.  
<sup>2</sup>The 5 mL has graduations to 6 mL, 10 mL has graduations to 12 mL, 20 mL has graduations to 24 mL, and 50 mL has graduations to 60 mL.



Great for use with Restek syringe filters!  
See page 408.

Barrel - Polypropylene  
Plunger - Polyethylene  
CE

## Standard Microliter Syringes

for Agilent 7673, 7683, 7693A, and 6850 Autosamplers

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.



20167



24785

### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
0.5 µL	ASRN	23s	1.71"	Agilent	7000.5	86276	ea.	24895
0.5 µL	ASRN	26s	1.71"	Agilent	7000.5	86274	ea.	21221
5 µL	ASRN	23s	1.71"	Agilent	75	87957	ea.	20172
5 µL	ASN	23s	1.71"	Agilent	75	87987	ea.	20168
5 µL	ASN	23s	1.71"	Agilent	75	87990	6-pk.	20170
5 µL	ASN	26s	1.71"	Agilent	75	87988	ea.	24592
5 µL	ASN	26s	1.71"	Agilent	75	87989	6-pk.	21230
5 µL	ASRN	23s-26s	1.71"	Agilent	75	87959	ea.	21223
5 µL	ASN	23s-26s	1.71"	Agilent	75	87993	ea.	24593
5 µL	ASN	23s-26s	1.71"	Agilent	75	87994	6-pk.	24594
10 µL	ASRN	23s	1.71"	Agilent	701	80357	ea.	20171
10 µL	ASN	23s	1.71"	Agilent	701	80387	ea.	20167
10 µL	ASN	23s	1.71"	Agilent	701	80390	6-pk.	20169
10 µL	ASRN	26s	1.71"	Agilent	701	80358	ea.	24597
10 µL	ASN	26s	1.71"	Agilent	701	80388	ea.	24595
10 µL	ASN	26s	1.71"	Agilent	701	80389	6-pk.	24599
10 µL	ASRN	23s-26s	1.71"	Agilent	701	80359	ea.	24598
10 µL	ASN	23s-26s	1.71"	Agilent	701	80393	ea.	24596
10 µL	ASN	23s-26s	1.71"	Agilent	701	80391	6-pk.	24600

### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	42 mm	Cone	0.5BR-HP-0.63	000410	ea.	24791
0.5 µL	R	26	42 mm	Cone	0.5BR-HP-0.47	000400	ea.	24790
5 µL	F	23	42 mm	Cone	5F-HP-0.63	001810	ea.	24781
5 µL	F	23	42 mm	Cone	SK-5F-HP-0.63	001814	6-pk.	24783
5 µL	F	26	42 mm	Cone	5F-HP-0.47	001800	ea.	24780
5 µL	F	26	42 mm	Cone	SK-5F-HP-0.47	001804	6-pk.	24782
5 µL	F	23-26s	42 mm	Cone	5F-HP-0.63/0.47	001821	ea.	21210
5 µL	F	23-26s	42 mm	Cone	SK-5F-HP-0.63/0.47	001822	6-pk.	21214
10 µL	R	23	42 mm	Cone	10R-HP-0.63	002815	ea.	24795
10 µL	F	23	42 mm	Cone	10F-HP-0.63	002810	ea.	24785
10 µL	F	23	42 mm	Cone	SK-10F-HP-0.63	002814	6-pk.	24787
10 µL	R	26	42 mm	Cone	10R-HP-0.47	002805	ea.	24794
10 µL	F	26	42 mm	Cone	10F-HP-0.47	002800	ea.	24784
10 µL	F	26	42 mm	Cone	SK-10F-HP-0.47	002804	6-pk.	24786
10 µL	F	23-26	42 mm	Cone	10F-HP-0.63/0.47	002821	ea.	21212
10 µL	F	23-26	42 mm	Cone	SK-10F-HP-0.63/0.47	002822	6-pk.	21215
<b>Large Volume</b>								
50 µL	R	23	42 mm	Cone	50R-HP-0.63	004665	ea.	24799

## Gas-Tight PTFE-Tipped Syringes

for Agilent 7673, 7683, 7693A, and 6850 Autosamplers

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	ASN	23s	1.71"	Agilent	1701	80080	ea.	24894
10 µL	ASRN	23s	1.71"	Agilent	1701	80087	ea.	21224
10 µL	ASRN	26s	1.71"	Agilent	1701	80088	ea.	21228
10 µL	ASRN	23s-26s	1.71"	Agilent	1701	80089	ea.	21229

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	23	42 mm	Cone	10F-HP-GT-0.63	002812	ea.	24789
10 µL	F	23-26	42 mm	Cone	10F-AG-GT-0.63/0.47C	002826	ea.	22256
10 µL	R	23-26	42 mm	Cone	10R-HP-GT-0.63/0.47	002829	ea.	21220

NEW!



24894



24789

## Replacement Needles

for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5-10 µL	23s	1.71"	Agilent	7786-01	6-pk.	20164
5-10 µL	26s	1.71"	Agilent	7786-02	6-pk.	20165
5-10 µL	23s-26s	1.71"	Agilent	7785-01	6-pk.	20166

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	42 mm	Cone	033715	ea.	24821
0.5 µL	26	42 mm	Cone	033708	ea.	24820
5 µL	23	42 mm	Cone	036720	2-pk.	24823
10 µL	23	42 mm	Cone	037717	2-pk.	24825
10 µL	26	42 mm	Cone	037715	2-pk.	24824
25-250 µL	23	42 mm	Cone	038717	2-pk.	24826

Do not reuse PTFE washers.

### Guide to Needle Termination Codes

#### Hamilton:

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

#### SGE:

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip

### Replacement Plunger Assembly, PTFE-Tipped

for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes



21218

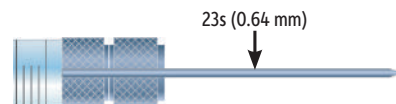
SGE

Syringe Volume	Needle Term.	SGE cat.#	qty.	Restek cat.#
10 µL	F	031808	2-pk.	21218
10 µL	R	031809	2-pk.	21284

### Needle Gauge for Agilent 7673, 7683, 7693A, and 6850 Syringes

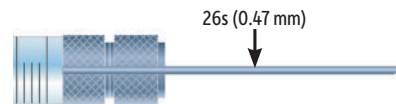
#### Single Gauge Needle (23s)

- The most popular gauge for Agilent 7673.
- Best for Merlin Microseptum and standard septum-equipped GCs.
- Packed column injection ports.
- Split/splitless injection ports.



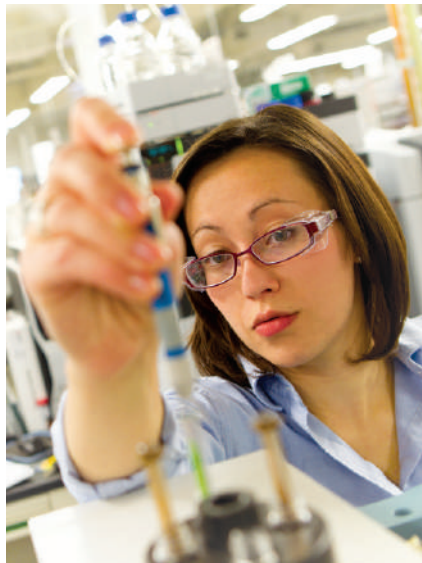
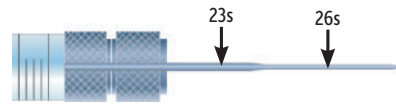
#### Single Gauge Needle (26s)

- On-column injection ports.
- Split/splitless injection ports.



#### 23s-26s—Dual Gauge (tapered)

- Durability of a 23s gauge needle.
- Ability of a 26s gauge needle to perform split/splitless and on-column injections.



Precision in all we do ensures quality for you.

### Cross-Reference for Agilent Syringes

Similar to Agilent Part #	Restek Part #	Description	Page
5181-1267	21212, 24596	10 µL Standard Syringe, Fixed Needle, 23-26 Gauge	374
5181-1273	21210, 24593	5 µL Standard Syringe, Fixed Needle, 23-26 Gauge	374
5181-3319	20166	Needle for 10 µL Standard Syringe, 23-26 Gauge	375
5181-3321	24598	10 µL Standard Syringe, Removable Needle, 23-26 Gauge	374
5181-3358	24919	PTFE-Tipped Plunger for 10 µL Standard Syringe, Removable Needle	390
5181-3360	21215, 24600	10 µL Standard Syringe, Fixed Needle, 23-26 Gauge (6-pk.)	374
5181-3365	21218	PTFE-Tipped Plunger for 10 µL Standard Syringe, Fixed Needle	376
5181-8809	24894, 24789	10 µL Gas-tight Syringe, Fixed Needle, 23 Gauge	375
5181-8811	20164, 24825	Needle for 10 µL Gas-tight Syringe, 23 Gauge	375
5181-8813	21224	10 µL Gas-tight Syringe, Removable Needle, 23 Gauge	375
5182-0830	24821	Needle for 0.5 µL Standard Syringe, 23 Gauge	375
5182-0832	20166	Needle for 5-10 µL Autosampler Syringe, 23-26 Gauge	375
5182-0834	20172	5 µL Standard Syringe, Removable Needle, 23 Gauge	374
5182-0835	21223	5 µL Standard Syringe, Removable Needle, 23-26 Gauge	374
5182-0875	20170, 24783	5 µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	374
9301-0713	20167, 24785	10 µL Standard Syringe, Fixed Needle, 23 Gauge	374
9301-0714	24595, 24784	10 µL Standard Syringe, Fixed Needle, 26 Gauge	374
9301-0725	20169, 24787	10 µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	374
9301-0891	24592, 24780	5 µL Standard Syringe, Fixed Needle, 26 Gauge	374
9301-0892	20168, 24781	5 µL Standard Syringe, Fixed Needle, 23 Gauge	374



### Merlin MicroShot Injector

- NIST traceability assures accurate injections.
- Fixed volume reduces sampling error.
- Saves time—no need to transfer to autosampler vials.
- Prevents bent syringe plungers.
- Five injection volumes available.\*

Increase the accuracy and reproducibility of manual injections with the Merlin MicroShot injector. This new injector is calibrated to NIST reference standards to assure accurate and traceable displacement. Precise repeated injections of the preset volume can be made using a standard autosampler syringe with less variation than when injecting by hand. The trigger mechanism provides rapid sample delivery, which reduces needle residence time in the injection port and minimizes potential sample discrimination.

The Merlin MicroShot injector allows convenient sampling from a wide variety of containers, so you can save time by eliminating the need to transfer aliquots into autosampler vials. The design of this unit also includes a plunger support, which protects the syringe plunger and prevents it from bending.

Fits Agilent-style (ball-end plunger) autosampler syringes with either fixed or removable, 23- or 26-gauge needles.



22226

Description	Merlin cat.#	qty.	Restek cat.#
0.1 µL injection volume	701-01	ea.	22226
0.2 µL injection volume	701-02	ea.	22227
0.5 µL injection volume	701-05	ea.	22228
1.0 µL injection volume	701-10	ea.	22229
2.0 µL injection volume	701-20	ea.	22230

\*Syringe not included. Requires Agilent-style (ball-end plunger) autosampler syringe.



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Inlet Liners

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See page 193–202.

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24956

### Autosampler Syringes for Bruker/Varian 8000 Series GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

#### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
<b>Bruker/Varian 8100/8200 Syringes</b>								
10 µL	RN	26s	1.99"	5	701 Varian	202880	ea.	24956

#### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
<b>Bruker/Varian 8035, 8100, &amp; 8200 Syringes</b>								
10 µL*	R	25	53 mm	S/Hole	10R-VA8X-II	002924	ea.	24852

#### Bruker/Varian CP 8400, CP8410 Syringes

10 µL	F	23	50 mm	Cone	10F-VA8400-5/0.63C	002951	ea.	24923
10 µL	F	26	50 mm	Bevel	10F-VA8400-5/0.47	002950	ea.	21202
10 µL	R	26	50 mm	Cone	10R-VA8400-5/0-0.47C	002952	ea.	24930

\*Gas-tight syringe.



24857

### Replacement Needles for Bruker/Varian 8000 Series Autosampler Syringes

#### SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	23	53 mm	S/Hole	037779	2-pk.	24857
10 µL*	25	53 mm	S/Hole	037780	ea.	24858
10 µL**	25	53 mm	S/Hole	037777	ea.	24854
10 µL	25	53 mm	2	037776	2-pk.	24855

\*Straight needle shaft, 0.20 mm ID needle, for use with viscous samples.

\*\*Tapered needle shaft, 0.12 mm ID needle.

## High Dynamic (HD) Headspace Syringes

for CTC CombiPAL Autosamplers

- High Dynamic (HD) plunger optimized for higher throughput in the headspace technique.
- Excellent performance over a large range of temperatures and temperature gradients.
- Increased lifetime, as compared to traditional headspace syringes.
- Increased accuracy and reproducibility of headspace GC analysis.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		qty.	Restek cat.#
					Model	cat.#		
1.0 mL	N	23	2"/51 mm	5	1001	203082	ea.	26552
2.5 mL	N	23	2"/51 mm	5	1002	203084	ea.	26553
5.0 mL	N	23	2"/51 mm	5	1005	203086	ea.	26554
1.0 mL	N	26	2"/51 mm	5	1001	203141	ea.	26555
2.5 mL	N	26	2"/51 mm	5	1002	203181	ea.	26556
5.0 mL	N	26	2"/51 mm	5	1005	203182	ea.	26557



26554

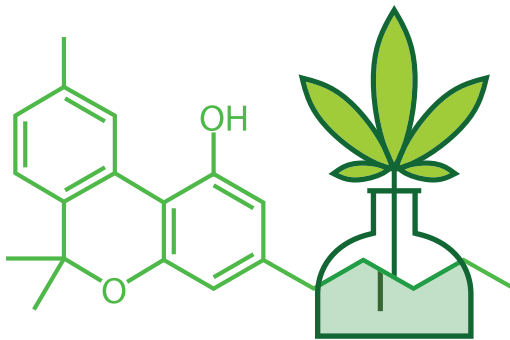
## Replacement Plungers for HD-Type CTC CombiPAL AS Syringes

Hamilton

Volume	Hamilton		qty.	Restek cat.#
	Model	cat.#		
1.0 mL	1001	207114	ea.	26558
5.0 mL	1005	207116	ea.	26560



26560



## Growing Analytical Solutions for Medical Cannabis Labs

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### Guide to Needle Termination Codes

**Hamilton:**

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

**SGE:**

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip



22757



24922

### Autosampler Syringes for CTC GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

#### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
1.2 µL	N	26	2"/51 mm	AS	7701.2N	203185	ea.	22755
5 µL	N	26s	2"/51 mm	AS	75N	203189	ea.	22756
10 µL	N	23s	2"/51 mm	AS	701N	203361	ea.	22757
10 µL	N	23s-26s	2"/51 mm	AS	701N	203362	ea.	22758
10 µL	N	23s	2"/51 mm	2	701N	203363	ea.	22759
10 µL	N	26s	2"/51 mm	AS	701N	203205	ea.	22761
10 µL	N	26s	2"/51 mm	2	701N	203269	6-pk.	22762
25 µL*	N	26s	2"/51 mm	AS	1702N	203043	ea.	22763
25 µL*	N	26s	2"/51 mm	AS	1702N Slim Line**	203074	ea.	22764
100 µL*	N	26s	2"/51 mm	AS	1710N Slim Line**	203076	ea.	22765

Due to collar design, Hamilton syringes may not work with older generation LEAP autosamplers.

\*Gas-tight syringe.

\*\*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

#### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	50 mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928
0.5 µL	R	26	50 mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926
5 µL	F	23	50 mm	Cone	5F-C/F-5/0.63	001981	ea.	24921
5 µL	F	26	50 mm	Cone	5F-BT-5/0.47	0019821	ea.	24920
10 µL*	F	23	50 mm	Cone	10F-BT-GT-5/0.63C	0029871	ea.	22749
10 µL	R	23	50 mm	Cone	10R-BT-0.63	0029841	ea.	24932
10 µL*	F	23	50 mm	Cone	10F-C/T-GT-5/0.63C	002987	ea.	22254
10 µL	F	23	50 mm	Cone	10F-C/T-5/0.63C	002981	ea.	22255
10 µL	F	26	50 mm	Cone	10F-BT-5/0.47C	0029801	ea.	24922
10 µL	F	26	50 mm	Cone	SK-10F-BT-5/0.47C	0029861	6-pk.	24925
10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002980	ea.	22252
10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002986	6-pk.	22253
25 µL*	F	23	50 mm	Cone	25F-C/T-GT-5/0.63C	003987	ea.	23897
25 µL*	F	23	50 mm	Cone	25F-BT-GT-5/0.63C	0039871	ea.	22751
25 µL*	R	26	50 mm	S	25R-C/T-GT-5/0.47H	003988	ea.	23899
100 µL*	F	23	50 mm	Cone	100F-C/T-GT-5/0.63C	005335	ea.	22753
100 µL*	R	26	50 mm	Cone	100R-C/T-GT-5/0.47C	005333	ea.	22754

\*Gas-tight syringe.

### Replacement Needles for CTC Autosampler Syringes

#### SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	50 mm	Cone	033772	kit	24929
10 µL	23	50 mm	Cone	037787	2-pk.	24933

### Replacement Plungers for CTC Autosampler Syringes

#### SGE

Syringe Volume	Needle Term.	Model	SGE cat.#	qty.	Restek cat.#
25 µL	F	P25F-C/T-GT	031817	ea.	23907
25 µL	F	P25F-BT-GT	0318171	ea.	23908



NEW!

23900



**Autosampler Syringes** for PerkinElmer Autosystem and Clarus 500 GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		qty.	Restek cat.#
					Model	cat.#		
5 µL	ASN	23	2.756"	3	75ASN/PE	88035	ea.	24953
5 µL	ASN	26	2.756"	3	75ASN/PE	88040	ea.	24952

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		qty.	Restek cat.#
					Model	cat.#		
0.5 µL	R	23	70 mm	Cone	0.5BR-PE-0.63	000478	ea.	24811
0.5 µL	R	26	70 mm	Cone	0.5BR-PE-0.47	000475	ea.	24810
5 µL	F	23	70 mm	Cone	5F-PE-0.63	001954	ea.	24813
5 µL*	F	23	70 mm	Cone	5F-PE-GT-0.63	001957	ea.	24815
5 µL	F	26	70 mm	Cone	5F-PE-0.47	001953	ea.	24812
5 µL*	F	26	70 mm	Cone	5F-PE-GT-0.47	001955	ea.	24814
50 µL	F	23	70 mm	Cone	50F-PE-0.63	004670	ea.	24816

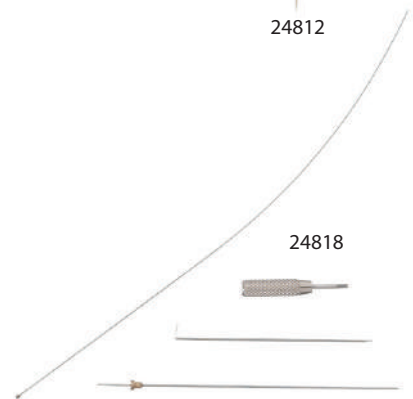
\*Gas-tight.



**Replacement Needle and Plunger Kit** for PerkinElmer Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	70 mm	Cone	033765	kit	24818



**Guide to Needle Termination Codes**

**Hamilton:**

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

**SGE:**

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip



24530



24843

### Autosampler Syringes for Shimadzu GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton  
for Shimadzu AOC 9 GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
5 µL	RN	26s	2"/51 mm	2	75RN	87930	ea.	24617
5 µL	N	26s	2"/51 mm	2	75N	87900	ea.	24938
10 µL	RN	26s	2"/51 mm	2	701RN	80330	ea.	24530

SGE  
for Shimadzu AOC 14, 17, 20, and 20i GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	42 mm	Cone	0.5BR-S-0.63	000445	ea.	24841
0.5 µL	R	26	42 mm	Cone	0.5BR-S-0.47	000440	ea.	24840
5 µL	F	23	42 mm	Cone	5F-S-0.63	001988	ea.	24843
10 µL	R	23	42 mm	Cone	10R-S-0.63	002898	ea.	24845
10 µL*	R	23	42 mm	Cone	10R-S-GT-0.63	002902	ea.	24846
10 µL	R	26	42 mm	Cone	10R-S-0.47	002897	ea.	24844

\*Gas-tight syringe.



24749

### Replacement Needles for Shimadzu Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	42 mm	Cone	033745	ea.	24747
10 µL	23	42 mm	Cone	037747	2-pk.	24749
10 µL	26	42 mm	Cone	037745	2-pk.	24748

#### Guide to Needle Termination Codes

##### Hamilton:

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

##### SGE:

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip

**Syringes** for Thermo Scientific RSH Autosampler

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE			Restek cat.#
					Model	cat.#	qty.	
5 µL	F	23	57 mm	Cone	5F-RTC/RSH-5.7/0.63C	001861	ea.	23908
5 µL	F	23	85 mm	Cone	5F-RTC/RSH-8.5/0.63C	001863	ea.	23909
5 µL	F	26	57 mm	Cone	5F-RTC/RSH-5.7/0.47C	001865	ea.	23910
5 µL	F	26	85 mm	Cone	5F-RTC/RSH-8.5/0.47C	001867	ea.	23911
5 µL	R	23	57 mm	Cone	5R-RTC/RSH-5.7/0.63C	001871	ea.	23912
5 µL	R	23	85 mm	Cone	5R-RTC/RSH-8.5/0.63C	001873	ea.	23913
5 µL	R	26	57 mm	Cone	5R-RTC/RSH-5.7/0.47C	001875	ea.	23914
5 µL	R	26	85 mm	Cone	5R-RTC/RSH-8.5/0.47C	001877	ea.	23915
10 µL	F	23	57 mm	Cone	10F-RTC/RSH-5.7/0.63C	002861	ea.	23916
10 µL*	F	23	57 mm	Cone	10F-RTC/RSH-GT-5.7/0.63C	002862	ea.	23917
10 µL	F	23	85 mm	Cone	10F-RTC/RSH-8.5/0.63C	002863	ea.	23918
10 µL*	F	23	85 mm	Cone	10F-RTC/RSH-GT-8.5/0.63C	002864	ea.	23919
10 µL	F	26	57 mm	Cone	10F-RTC/RSH-5.7/0.47C	002865	ea.	23920
10 µL*	F	26	57 mm	Cone	10F-RTC/RSH-GT-5.7/0.47C	002866	ea.	23921
10 µL	F	26	85 mm	Cone	10F-RTC/RSH-8.5/0.47C	002867	ea.	23922
10 µL*	F	26	85 mm	Cone	10F-RTC/RSH-GT-8.5/0.47C	002868	ea.	23923
10 µL	R	23	57 mm	Cone	10R-RTC/RSH-5.7/0.63C	002871	ea.	23924
10 µL*	R	23	57 mm	Cone	10R-RTC/RSH-GT-5.7/0.63C	002872	ea.	23925
10 µL	R	23	85 mm	Cone	10R-RTC/RSH-8.5/0.63C	002873	ea.	23926
10 µL*	R	23	85 mm	Cone	10R-RTC/RSH-GT-8.5/0.63C	002874	ea.	23927
10 µL	R	26	57 mm	Cone	10R-RTC/RSH-5.7/0.47C	002875	ea.	23928
10 µL*	R	26	57 mm	Cone	10R-RTC/RSH-GT-5.7/0.47C	002876	ea.	23929
10 µL	R	26	85 mm	Cone	10R-RTC/RSH-8.5/0.47C	002877	ea.	23930
10 µL*	R	26	85 mm	Cone	10R-RTC/RSH-GT-8.5/0.47C	002878	ea.	23931
25 µL*	F	26	57 mm	Cone	25F-RTC/RSH-GT-5.7/0.47C 2	003866	ea.	23932
50 µL*	F	26	57 mm	Cone	50F-RTC/RSH-GT-5.7/0.47C	004866	ea.	23933
100 µL*	F	26	57 mm	Cone	100F-RTC/RSH-GT-5.7/0.47(0.11)C	005866	ea.	23934
250 µL*	F	26	57 mm	Cone	250F-RTC/RSH-GT-5.7/0.47C	006866	ea.	23935

\*Gas-tight syringe.



23909



23928

**Replacement Needles** for Thermo Scientific RSH Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE			Restek cat.#
				Model	cat.#	qty.	
5 µL	23	57 mm	Cone	N5-RSH-5.7/0.63C 2-pk	036871	2-pk.	23942
5 µL	23	85 mm	Cone	N5-RSH-8.5/0.63C 2-pk	036873	2-pk.	23943
5 µL	26	57 mm	Cone	N5-RSH-5.7/0.47C 2-pk	036875	2-pk.	23944
5 µL	26	85 mm	Cone	N5-RSH-8.5/0.47C 2-pk	036877	2-pk.	23945
10 µL	23	57 mm	Cone	N10-RSH-5.7/0.63C 2-pk	037871	2-pk.	23946
10 µL	23	85 mm	Cone	N10-RSH-8.5/0.63C 2-pk	037873	2-pk.	23947
10 µL	26	57 mm	Cone	N10-RSH-5.7/0.47C 2-pk	037875	2-pk.	23948
10 µL	26	85 mm	Cone	N10-RSH-8.5/0.47C 2-pk	037877	2-pk.	23949



23945

**Replacement Plungers** for Thermo Scientific RSH Autosampler Syringes

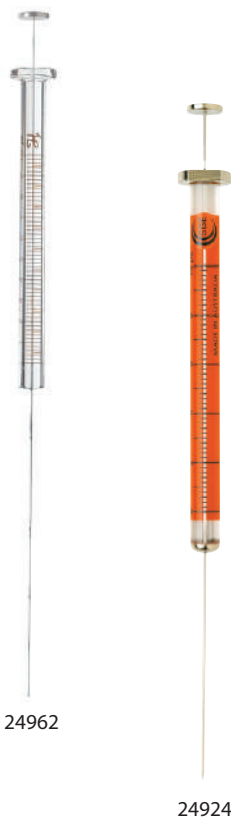
SGE

Syringe Volume	Needle Term.	SGE			Restek cat.#
		Model	cat.#	qty.	
10 µL	F	P10F-RSH-GT	032810	ea.	23936
25 µL	F	P25F-RSH-GT	032815	ea.	23938
50 µL	F	P50F-RSH-GT	032821	ea.	23939
100 µL	F	P100F-RSH-GT	032825	ea.	23940
250 µL	F	P250F-RSH-GT	032831	ea.	23941



23936

Note: Compatible with Thermo Scientific gas-tight syringes only.



### Autosampler Syringes for Thermo Scientific GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

#### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	25s	2"	2	701SN	80320	ea.	24961
10 µL	N	26s	3.15"	AS	701SN	80318	ea.	24962

#### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	50 mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928
0.5 µL	R	26	50 mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926
<b>NEW!</b> 5 µL	F	26	50 mm	Cone	5F-C/T-5/0.47C	001982	ea.	22251
<b>NEW!</b> 10 µL	F	23	50 mm	Cone	10F-C/T-5/0.63C	002981	ea.	22255
<b>NEW!</b> 10 µL	R	23	50 mm	Cone	10R-BT-0.63	0029841	ea.	24932
<b>NEW!</b> 10 µL	R	23	50 mm	Cone	10R-C/T-0.63C	002984	ea.	23903
<b>NEW!</b> 10 µL*	F	23	50 mm	Cone	10F-C/T-GT-5/0.63C	002987	ea.	22254
<b>NEW!</b> 10 µL	F	25	50 mm	Cone	10F-C/T-5/0.5C	002967	ea.	23902
<b>NEW!</b> 10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002980	ea.	22252
10 µL	F	26	50 mm	Cone	10F-BT-5/0.47C	0029801	ea.	24922
<b>NEW!</b> 10 µL	F	26	50 mm	Cone	10F-C/T-5/0.47C	002986	6-pk.	22253
10 µL	F	26	50 mm	Cone	SK-10F-BT-5/0.47C	0029861	6-pk.	24925
10 µL	F	26	80 mm	Cone	10F-BT-8/0.47C	0029921	ea.	24924
<b>NEW!</b> 10 µL	F	26	80 mm	Cone	10F-C/T-8/0.47C	002992	ea.	23904
10 µL	R	26	80 mm	Cone	10R-BT-8/0-0.47C	0029931	ea.	24934
<b>NEW!</b> 10 µL	R	26	80 mm	Cone	10R-C/T-8/0.47C	002993	ea.	23901

\*Gas-tight syringe.

### Replacement Needle and Plunger Kit for Thermo Scientific Autosampler Syringes

#### SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	26	50 mm	Cone	033770	kit	24927
0.5 µL	23	50 mm	Cone	033772	kit	24929

#### Guide to Needle Termination Codes

##### Hamilton:

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

##### SGE:

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip





**Replacement Needles** for Thermo Scientific Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	26	50 mm	Cone	033770	kit	24927
0.5 µL	23	50 mm	Cone	033772	kit	24929
10 µL	26	80 mm	Cone	031535	3-pk.	24935
10 µL	23	50 mm	Cone	037787	2-pk.	24933

**Replacement Plungers** for Thermo Scientific Autosampler Syringes

SGE



Syringe Volume	Needle Term.	Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	P10F-C/T-GT	0318120	2-pk.	23905

**instrument reference**

**Autosampler Syringes** for Thermo Scientific GCs

Autosampler syringes for TriPlus, AS3000, AS2000, AS200/800 GCs. The following autosamplers are compatible with the respective SGE and Hamilton syringes. For further information or questions, contact your Restek sales representative or technical service.

**SGE Syringes**

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24928	380, 384
•	•			24926	380, 384
•				23901	384
•				23902	384
•				23903	384
•				23904	384
•				22251	384
•				22252	384
•				22253	384
•				22254	384
•				22255	384
•				24921	380
	•	•	•	24922	380, 384
	•	•	•	24925	380, 384
	•	•	•	24932	380, 384
	•			24920	380
		•		22749	380
		•		24924	384
		•		24934	384

**Replacement Needles for SGE Syringes for Thermo Scientific GCs**

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24929	380, 384, 385
•	•			24927	384, 385
•	•	•	•	24933	380, 385
•		•	•	24935	385

**Replacement Plungers for SGE Syringes for Thermo Scientific GCs**

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•				23905	385

**Hamilton Syringes**

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
		•	•	24962	384



24532



24703

### Manual Microliter Syringes

- Economical.
- Available with cemented needles (N/F) or removable needles (RN/R).
- Each syringe plunger and barrel assembly is manufactured as one working unit; components are not interchangeable or individually replaceable.

#### Hamilton 700 Series

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		qty.	Restek cat.#
					Model	cat.#		
5 µL	N	26s	2"/51 mm	2	75N	87900	ea.	24938
5 µL	RN	26s	2"/51 mm	2	75RN	87930	ea.	24617
10 µL	N	26s	2"/51 mm	2	701N	80300	ea.	20174
10 µL	N	26s	2"/51 mm	2	701N	80366	6-pk.	20175
10 µL	RN	26s	2"/51 mm	2	701RN	80330	ea.	24530
25 µL	N	22s	2"/51 mm	2	702N	80400	ea.	24531
10 µL	N	26s	2"/51 mm	5	701NPT5	80339	ea.	24967
25 µL*	RN	22s	2"/51 mm	2	702RN	80430	ea.	24532
50 µL	N	22s	2"/51 mm	2	705N	80500	ea.	24533
50 µL*	RN	22s	2"/51 mm	2	705RN	80530	ea.	24534
100 µL	N	22s	2"/51 mm	2	710N	80600	ea.	24535
100 µL*	RN	22s	2"/51 mm	2	710RN	80630	ea.	24536
250 µL	N	22s	2"/51 mm	2	725N	80700	ea.	24537
250 µL*	RN	22s	2"/51 mm	2	725RN	80730	ea.	24538
500 µL	N	22	2"/51 mm	2	750N	80800	ea.	24539
500 µL*	RN	22	2"/51 mm	2	750RN	80830	ea.	24540

\*Replacement RN/R needles available. See page 390.

#### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		qty.	Restek cat.#
					Model	cat.#		
5 µL	F	26	50 mm	2	5F**	001000	ea.	24700
5 µL*	R	26	50 mm	2	5R**	001050	ea.	24701
10 µL	F	26	50 mm	2	10F**	002000	ea.	24702
10 µL	F	26	50 mm	2	SK-10F**	002030	6-pk.	24715
10 µL*	R	26	50 mm	2	10R**	002050	ea.	24703
10 µL*	R	26	50 mm	2	SK-10R**	002080	6-pk.	24716
25 µL	F	25	50 mm	2	25F	003000	ea.	24704
25 µL*	R	25	50 mm	2	25R	003050	ea.	24705
50 µL	F	25	50 mm	2	50F	004000	ea.	24706
50 µL*	R	25	50 mm	2	50R	004050	ea.	24707
100 µL	F	25	50 mm	2	100F	005000	ea.	24708
100 µL*	R	25	50 mm	2	100R	005050	ea.	24709
250 µL	F	25	50 mm	2	250F	006000	ea.	24710
250 µL*	R	25	50 mm	2	250R	006050	ea.	24711
500 µL	F	25	50 mm	2	500F	007000	ea.	24712
500 µL*	R	25	50 mm	2	500R	007050	ea.	24713

\*Replacement RN/R needles available. See page 390.

\*\*With plunger protection.

#### Guide to Needle Termination Codes

##### Hamilton:

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

##### SGE:

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip

## SuperfleX Flexible Plunger Microliter Syringes

- The SuperfleX syringe features a super-elastic plunger that returns to its original shape if twisted or bent.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		Restek cat.#
					Model	cat.#	
5 µL	F	26	50 mm	2	5FX	001100	ea. 24720
10 µL	F	26	50 mm	2	10FX	002100	ea. 24722
10 µL	F	26	50 mm	2	SK-10FX	002130	6-pk. 24718
10 µL	R	26	50 mm	2	SK-10RX	002180	6-pk. 24719

## Reinforced Plunger Microliter Syringes

- Reinforcing extends the life of fragile, small diameter plungers.
- Economical because of longer life—even in rugged applications.
- Hand-lapped plunger ensures a perfect seal with the barrel.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		Restek cat.#
					Model	cat.#	
5 µL	N	26s	2"/51 mm	2	95	87920	ea. 24541
5 µL*	RN	26s	2"/51 mm	2	95	87925	ea. 24542
10 µL	N	26s	2"/51 mm	2	901	80360	ea. 24543
10 µL*	RN	26s	2"/51 mm	2	901	80370	ea. 24544

\*Replacement RN/R needles available. See page 390.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		Restek cat.#
					Model	cat.#	
5 µL	F	26	50 mm	2	5F-GP	001400	ea. 24769
5 µL*	R	26	50 mm	2	5R-GP	001450	ea. 24766
10 µL	F	26	50 mm	2	10F-GP	002400	ea. 24767
10 µL*	R	26	50 mm	2	10R-GP	002450	ea. 24768

\*Replacement RN/R needles available. See page 390.





### Micro-Volume, Positive Displacement Syringes

- Sample is contained in the needle with full plunger displacement, ensuring no dead volume.
- High precision and accuracy down to 0.1 µL.
- Seal between the plunger and the needle can be tightened for high-pressure injection.
- Replaceable needle/plunger kits and barrels (available on request).

#### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		Restek cat.#
					Model	cat.#	
0.5 µL	KH	25	2.75"/70 mm	2	7000.5	86259	ea. 24545
0.5 µL	KH	25	2.75"/70 mm	3	7000.5	86250	ea. 24546
1.0 µL	KH	22s	2.75"/70 mm	2	7101	86211	ea. 24549
1.0 µL	KH	25s	2.75"/70 mm	2	7001	80135	ea. 24547
1.0 µL	KH	25s	2.75"/70 mm	3	7001	80100	ea. 24548
2.0 µL	KH	25	2.75"/70 mm	2	7002	88411	ea. 24551
5.0 µL	KH	24	2.75"/70 mm	2	7105	88011	ea. 24555
5.0 µL	KH	24	2.75"/70 mm	3	7105	88000	ea. 24556

#### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		Restek cat.#
					Model	cat.#	
0.5 µL	R	23	70 mm	2	0.5BR-7BV	000311	ea. 24771
0.5 µL	R	23	70 mm	Cone	0.5BR-7	000310	ea. 24772
0.5 µL	R	26	70 mm	Cone	0.5BR-OC-7/0.47*	000376	ea. 24770
1.0 µL	R	23	70 mm	2	1BR-7BV	000506	ea. 24775
1.0 µL	R	23	70 mm	Cone	1BR-7	000505	ea. 24774
1.0 µL	R	23	50 mm	Cone	1BR-5	000500	ea. 24773
1.0 µL	R	26	70 mm	Cone	1BR-7/0.47*	000570	ea. 24776
5.0 µL	R	23	70 mm	2	5BR-7BV	000803	ea. 24779
5.0 µL	R	23	70 mm	Cone	5BR-7	000802	ea. 24778
5.0 µL	R	23	50 mm	Cone	5BR-5	000800	ea. 24777

\*70 mm needle length, 0.47 mm OD, on-column syringe.

#### Guide to Needle Termination Codes

##### Hamilton:

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

##### SGE:

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip

#### Replacement Plunger-in-Needle Kits

- Kits are supplied with both a plunger and a needle.
- Plunger and needle must be replaced together.

#### SGE

Volume	Needle Gauge	Needle Length	Point Style	SGE		For Syringe cat.#	Restek cat.#
				Model	cat.#		
0.5 µL	23	70 mm	2	NP0.5B-7BV	033060	24771	kit 24831
0.5 µL	23	70 mm	Cone	NP0.5B-7C	033057	24772	kit 24830
1.0 µL	23	70 mm	2	NP1B-7BV	034060	24775	kit 24835
1.0 µL	23	70 mm	Cone	NP1B-7C	034057	24774	kit 24834
1.0 µL	23	50 mm	Cone	NP1B-5C	034055	24773	kit 24833
5.0 µL	23	70 mm	2	NP5B-7BV	035058	24779	kit 24839
5.0 µL	23	70 mm	Cone	NP5B-7C	035057	24778	kit 24838



## PTFE Tip, Gas-Tight Syringes

- Suitable for gases or liquids.
- High accuracy of dispensed volumes.
- Interchangeable barrels, plungers, and tips extend performance and increase cost-effectiveness.

### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		qty.	Restek cat.#
					Model	cat.#		
10 µL	N	26s	2"/51 mm	2	1701	80000	ea.	24557
10 µL	RN	26s	2"/51 mm	2	1701	80030	ea.	24558
25 µL	N	22s	2"/51 mm	2	1702	80200	ea.	24559
25 µL	RN	22s	2"/51 mm	2	1702	80230	ea.	24560
50 µL	N	22s	2"/51 mm	2	1705	80900	ea.	24561
50 µL	RN	22s	2"/51 mm	2	1705	80930	ea.	24562
100 µL	N	22s	2"/51 mm	2	1710	81000	ea.	24563
100 µL	RN	22s	2"/51 mm	2	1710	81030	ea.	24564
250 µL	N	22s	2"/51 mm	2	1725	81100	ea.	24567
250 µL	RN	22s	2"/51 mm	2	1725	81130	ea.	24568
500 µL	LTN	22	2"/51 mm	2	1750	81217	ea.	24571
500 µL	RN	22	2"/51 mm	2	1750	81230	ea.	24572
1 mL	LTN	22	2"/51 mm	2	1001	81317	ea.	24575
1 mL	RN	22	2"/51 mm	2	1001	81330	ea.	24576
1 mL	TLL	*		w/o slots	1001	81320	ea.	24578
2.5 mL	TLL	*		w/o slots	1002	81420	ea.	24584
2.5 mL	RN	22	2"/51 mm	2	1002	81430	ea.	24582
2.5 mL	N	22	2"/51 mm	2	1002	81417	ea.	24581
5 mL	TLL	*		w/o slots	1005	81520	ea.	20178
10 mL	TLL	*		w/o slots	1010	81620	ea.	20179
25 mL	TLL	*		w/o slots	1025	82520	ea.	24591
50 mL	TLL	*		w/o slots	1050	85020	ea.	24717
100 mL	TLL	*		w/o slots	1100	86020	ea.	24724

\*Needles sold separately. See page 390.

### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		qty.	Restek cat.#
					Model	cat.#		
10 µL	F	26	50 mm	2	10F-GT	002200	ea.	24725
10 µL	R	26	50 mm	2	10R-GT	002250	ea.	24726
25 µL	F	25	50 mm	2	25F-GT	003200	ea.	24727
25 µL	R	25	50 mm	2	25R-GT	003250	ea.	24728
50 µL	F	25	50 mm	2	50F-GT	004200	ea.	24729
50 µL	R	25	50 mm	2	50R-GT	004250	ea.	24730
100 µL	F	25	50 mm	2	100F-GT	005200	ea.	24734
100 µL	R	25	50 mm	2	100R-GT	005250	ea.	24735
100 µL	LL	*			100F-LL-GT	005230	ea.	24737
250 µL	F	25	50 mm	2	250F-GT	006200	ea.	24738
250 µL	R	25	50 mm	2	250R-GT	006250	ea.	24739
250 µL	LL	*			250F-LL-GT	006230	ea.	24741
500 µL	F	25	50 mm	2	500F-GT	007200	ea.	24742
500 µL	R	25	50 mm	2	500R-GT	007250	ea.	24743
1 mL	R	23	50 mm	2	1MR-GT	008100	ea.	24750
1 mL	LL	*			1MDF-LL-GT	008025	ea.	24752
2.5 mL	LL	*			2.5MDF-LL-GT	008425	ea.	24755
5 mL	LL	*			5MDR-LL-GT	008760	ea.	24757
10 mL	LL	*			10MDR-LL-GT	008960	ea.	24759
25 mL	LL	*			25MDR-LL-GT	009462	ea.	24760
50 mL	LL	*			50MR-LL-GT	009660	ea.	24761
100 mL	LL	*			100MR-LL-GT	009760	ea.	24762

\*Needles sold separately. See page 390.



24558



24727



24761

### PTFE Tip, Gas-Tight Syringe Replacement Needles

for Removable Needle Syringes

Materials: stainless steel needle, nickel-plated brass hub.

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5-100 µL	26s	2"	2	7758-02	6-pk.	24939
5-100 µL	22s	2"	2	7758-03	6-pk.	24940
250 µL-10 mL	22	2"	2	7779-01	6-pk.	24942
250 µL-10 mL	26s	2"	2	7779-02	6-pk.	24943
250 µL-10 mL	22s	2"	2	7779-03	6-pk.	24944

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
5 µL	26	50 mm	2	036110	5-pk.	24802
10 µL	23	50 mm	2	037111	5-pk.	24804
10 µL	26	50 mm	2	037110	5-pk.	24803
25-500 µL	23	50 mm	2	038111	5-pk.	24806
25-500 µL	25	50 mm	2	038110	5-pk.	24805
1-2.5 mL	23	50 mm	2	039110	5-pk.	24807



### also available

Gas-Tight PTFE-Tipped Syringes for Agilent 7673, 7683, 7693A, and 6850 Autosamplers.

See **page 375**.

### Replacement Plunger Assembly, PTFE-Tipped

for Agilent 7670, 7671, and 7672 ALS Autosampler Syringes

Hamilton

Syringe Volume	Needle Term.	Hamilton cat.#	qty.	Restek cat.#
10 µL	N, RN, LT/LTN	13205	ea.	24919



### Gas-Tight Syringe Replacement Needles for Luer Lock Syringes

Hamilton

Hub Material	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
metal	26s	2"/51 mm	2	90053	6-pk.	20133
metal	25s	1.97"	3	90049*	6-pk.	24605
metal	22s	2"/51 mm	2	90051	6-pk.	24606
Kel-F (PTFE tip)	26s	2"/51 mm	2	90153	6-pk.	24607
Kel-F (PTFE tip)	25s	1.97"	3	90149*	6-pk.	24608
Kel-F (PTFE tip)	22s	2"/51 mm	2	90151	6-pk.	24609

\*For Waters U6K injection valve.

SGE

Hub Material	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
metal	23	50 mm	2	039802	5-pk.	24763
metal	18	50 mm	2	039842	5-pk.	24764
metal	22	2"/51 mm	3	039895**	2-pk.	24765

\*\*For Waters U6K injection valve.

## SGE Gas-Tight Syringes with Shut-off Valves

- Ideal for sample storage and transportation.
- Push-pull shut-off valve.

SGE

Syringe Fitted with Removable Needle and Valve

Volume	Model	SGE cat.#	qty.	Restek cat.#
50 µL	50R-V-GT	004279	ea.	24880
100 µL	100R-V-GT	005279	ea.	24881
250 µL	250R-V-GT	006279	ea.	24882
500 µL	500R-V-GT	007279	ea.	24883
1 mL	1MDR-V-GT	008110	ea.	24884
2.5 mL	2.5MDR-V-GT	008510	ea.	24885

SGE

Syringe Fitted with Luer Lock Valve\*

Volume	Model	SGE cat.#	qty.	Restek cat.#
1 mL	1MR-VLL-GT	008160	ea.	24886
2.5 mL	2.5MDR-VLL-GT	008560	ea.	24887
5 mL	5MDR-VLLMA-GT	008770	ea.	24888
10 mL	10MDR-VLLMA-GT	008970	ea.	24889
25 mL	25MDR-VLLMA-GT	009472	ea.	24890
50 mL	50MR-VLLMA-GT	009670	ea.	24891
100 mL	100MR-VLLMA-GT	009770	ea.	24892

\*Order needles separately.

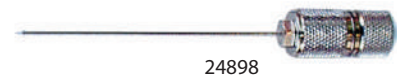


## Replacement Needles for Gas-Tight Syringes with Shut-off Valves

SGE

Model V Syringe Valve: fits any SGE removable needle syringe, 25 µL–2.5 mL

Syringe Volume	Needle Gauge	Needle Length	Point Style	Model	SGE cat.#	qty.	Restek cat.#
25 µL–2.5 mL	23	50 mm	Cone	V	031905	ea.	24898



SGE

Luer Lock Needles

Syringe Volume	Needle Gauge	Needle Length	Point Style	Model	SGE cat.#	qty.	Restek cat.#
1 mL–100 mL	23	50 mm	2	NLL-5/23	039802	5-pk.	24763
1 mL–100 mL	18	50 mm	2	NLL-5/18	039842	5-pk.	24764
1 mL–100 mL	22	2"/51 mm	3	NLL-LC**	039895	2-pk.	24765



\*\*Fits Rheodyne & Valco injection valves.

## Economical Hamilton Syringe Guide\*

- Prevents syringe plunger from bending.
- Adjustable stop prevents plunger damage.
- Easily installed.
- Used with syringe series 700/1700/1000.

Syringe Volume	Hamilton cat.#	qty.	Restek cat.#
25–500 µL	14906	ea.	24615
5–10 µL	14806	ea.	24616



\*Syringe not included

# Gas-Tight Syringes

For complete loop-fill, the syringe capacity should be >2X the loop volume.



21260



24868

## Gas-Tight Syringes for Rheodyne® & Valco® Valves

- PTFE-tipped plungers.
- Removable needles.
- Replaceable syringe barrels, plungers, and plunger tips.

### Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton		Restek cat.#
					Model	cat.#	
10 µL	RN	26s	2"/51 mm	3	1701	80065	ea. 21260
25 µL	RN	22s	2"/51 mm	3	1702	80265	ea. 21261
50 µL	RN	22s	2"/51 mm	3	1705	80965	ea. 21262
100 µL	RN	22s	2"/51 mm	3	1710	81065	ea. 21263
250 µL	RN	22s	2"/51 mm	3	1725	81165	ea. 21264

### SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE		Restek cat.#
					Model	cat.#	
10 µL	R	22	2"	3	10R-GT-LC	002313	ea. 24866
25 µL	R	22	2"	3	25R-GT-LC	003312	ea. 24867
50 µL	R	22	2"	3	50R-GT-LC	004312	ea. 24868
100 µL	R	22	2"	3	100R-GT-LC	005312	ea. 24869
250 µL	R	22	2"	3	250R-GT-LC	006312	ea. 24870
500 µL	R	22	2"	3	500R-GT-LC	007312	ea. 24871

## Replacement Needles for Gas-Tight Syringes for Rheodyne® & Valco® Valves

### Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5-100 µL	22s	2"	3	7770-01	6-pk.	24941
250 µL-10 mL	22	2"	3	7780-04	6-pk.	24945

### SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	22	2"	3	037250	5-pk.	24808
25-500 µL	22	2"	3	038250	5-pk.	24809

### Guide to Needle Termination Codes

**Hamilton:**

- (N) Cemented Needle
- (RN) Removable Needle
- (ASN) Autosampler Cemented Needle
- (ASRN) Autosampler Removable Needle
- (TLL) PTFE Luer Lock
- (KH) Knurled Hub
- (LT) Luer Tip
- (LTN) Luer Tip Cemented Needle

**SGE:**

- (F) Fixed Needle
- (R) Removable Needle
- (LL) Luer Lock
- (LT) Luer Tip



**A-2 Luer Gas-Tight Syringes\***

- For use with VOA-CYL 4 standards.
- Push-style on-off button valve.

Use to withdraw a gas sample from a high-pressure cylinder through a high-purity VOC single-stage regulator after attaching the appropriate adaptor (cat.# 21118) to the regulator. Use with luer syringe needles.

Description	qty.	cat.#
100 µL Luer Syringe	ea.	20162
500 µL Luer Syringe	ea.	20163

\*Restek's A-2 syringes have a luer tip.



20162

High-purity VOC single-stage regulator is described on page 453 of the Air Sampling Products section.

**Replacement Needles for A-2 Luer Gas-Tight Syringes**

Description	Needle Gauge	Size	qty.	cat.#
Luer Syringe Needles for 100 µL A2 Gas-Tight Syringes	22	0.028" OD x 0.006" ID x 2"	3-pk.	22783
Luer Syringe Needles for 500 µL A2 Gas-Tight Syringes	22	0.028" OD x 0.012" ID x 2"	3-pk.	22784

**Heavy Duty Purge & Trap Syringe** Dynatech Precision Sampling

- Heavy-duty glass barrel with metal front and rear flanges.
- PTFE luer lock tip.
- Can fill and empty sparge tubes.
- Sample-Lok valve accepts standard luer lock needles.
- Suitable for purge & trap applications.

Syringe	5 mL cat.#	10 mL cat.#
without Sample-Lok	21206	21209
with Sample-Lok	21208	21207



21208

**Luer Lock Valve Adaptors**

Use a luer lock valve adaptor to connect a luer lock fitting to a Rheodyne® or Valco® valve.

Description	SGE cat.#	qty.	Restek cat.#
Luer Lock Valve Adaptors	200010	2-pk.	21283



21283

**Jumbo Syringe**

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.

Volume	Model	SGE cat.#	qty.	Restek cat.#
500 ml	500MAR-LL-GT	009910	ea.	21275
1000 ml	1000MAR-LL-GT	009920	ea.	21276
2000 ml	2000MAR-LL-GT	009930	ea.	21277



21276

**Syringe O-Rings**

Syringe Volume	SGE cat.#	qty.	Restek cat.#
500 mL	032527	ea.	21278
1,000 mL	032532	ea.	21279



21279

21278

Septa also available (cat.# 27127, page 223)



### Economical Microliter Liquid-Type Syringes

for Rheodyne® & Valco® Valves

- Cemented/fixed needles.
- Plungers and barrels are not interchangeable or replaceable.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	N	22s	2"	3	701	80365	ea.	21250
25 µL	N	22s	2"	3	702	80465	ea.	21251
50 µL	N	22s	2"	3	705	80565	ea.	21252
100 µL	N	22s	2"	3	710	80665	ea.	21253
250 µL	N	22s	2"	3	725	80765	ea.	21254

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	22	2"	3	10F-LC	002301	ea.	24860
25 µL	F	22	2"	3	25F-LC	003300	ea.	24861
50 µL	F	22	2"	3	50F-LC	004300	ea.	24862
100 µL	F	22	2"	3	100F-LC	005300	ea.	24863
250 µL	F	22	2"	3	250F-LC	006300	ea.	24864
500 µL	F	22	2"	3	500F-LC	007300	ea.	24865

### Priming Syringes for Waters 6000, 6000A, 501, 510, 590, 610, and 610E HPLC Pumps

- Designed for maximum safety with metal flange and luer lock (LL) hub.
- PTFE-tipped plunger.

Hamilton

Volume	Needle Term.	Hamilton Model	Hamilton cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	TLL	1010W	81610	700 psig	ea.	21265

SGE

Volume	Needle Term.	SGE Model	SGE cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	LL	10MDR-LL-GT	008960	100 psig	ea.	24759

\*Needles sold separately.



21265



24759

### Syringes for Waters U6K Valves

- Reinforced plungers.
- Removable needles.
- Replaceable plunger/barrel assemblies.
- Barrel stop prevents plunger blowout.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	RN	25s	1.97"	3	801	84815	ea.	21255
25 µL	RN	25s	1.97"	3	802	84816	ea.	21256
50 µL	RN	25s	1.97"	3	805	84817	ea.	21257
100 µL	RN	25s	1.97"	3	810	84818	ea.	21258
250 µL	RN	25s	1.97"	3	825	84819	ea.	21259

### Replacement Needles for Syringes for Waters U6K Valves

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	Restek cat.#
10-100 µL	25s	1.97"	3	8647-01	6-pk. 21270
250 µL	25s	1.97"	3	8648-01	6-pk. 21271



21257



21270

### Syringes for LC Autosamplers

SGE  
for Hitachi LC Autosamplers

Volume	SGE Model	cat.#	qty.	Restek cat.#
500 µL, M10 X1 Thread	500C-HITACH1	007660	ea.	22292



SGE  
for PerkinElmer LC Autosamplers

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-CX-GT	006995	ea.	22297
500 µL, 1/4-28 UNF Thread	500D-CX-GT	007995	ea.	22298



### Syringes for Waters WISP LC Autosamplers

PTFE-tipped plungers

HAMILTON

Volume	HAMILTON Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	1725	80024	ea.	24529

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
250 µL, 1/4-28 UNF Thread	250D-WISP	006690	ea.	22294



### Syringes for CTC LC Autosamplers

HAMILTON

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	HAMILTON Model	cat.#	qty.	Restek cat.#
10 µL	N	22s	2"/51 mm	3	701N	203073	ea.	22743
25 µL	N	22s	2"/51 mm	3	1702N	203075	ea.	22744
100 µL	N	22s	2"/51 mm	3	1710N Slim Line*	203077	ea.	22745
100 µL	N	22	2"/51 mm	3	1710N	203235	ea.	22746
250 µL	N	22	2"/51 mm	3	1725N	203079	ea.	22747
500 µL	N	22	2"/51 mm	3	1750N	203349	ea.	22748



\*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	22s	2"/51 mm	LC	10F-CTC-LC	002710	ea.	22737
100 µL*	R	22s	2"/51 mm	LC	100R-C/T-GT-LC	005330	ea.	22741
500 µL*	F	22s	2"/51 mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742



\*Gas-tight syringe.

# Sample Preparation

SPE Cartridges.....	397–399
Manifolds & Replacement Parts .....	400–401
Disks & Holders.....	402
Bulk Adsorbents.....	403
QuEChERS Products .....	404–407
Sample Filtration .....	408–411
Accelerated Solvent Extraction (ASE).....	412–416



## Solid Phase Extraction Cartridges from Restek

### Proven Quality, Superior Cleanliness, and Method-Specific Performance

Resprep® solid phase extraction (SPE) cartridges are manufactured with specially cleaned sorbents and high-purity materials to minimize background and to help eliminate troublesome interference. In order to ensure reproducibility, raw materials and finished products go through rigorous QC testing, targeted to specific applications whenever possible, and an extensive certificate of analysis details the results.

#### Available with the following sorbents:

- **Silica:** Multipurpose
- **EPH Silica:** Petroleum
- **Florisil® Adsorbent:** Pesticides
- **CarboPrep® Adsorbent:** Dirty Samples
- **Reversed Phase:** Hydrophobic Compounds

[www.restek.com/resprep](http://www.restek.com/resprep)



**RESTEK** *CHROMALYTICs*® in AUSTRALIA : Contact +81 3 9762 2034  
Distributor

39

**SHOPPE**

[www.chromalytic.net.au](http://www.chromalytic.net.au)

e-mail : sales @ chromtech.net.au



### Resprep® SPE Cartridges (Normal Phase)

Hydrophilic (polar) adsorbents used to extract hydrophilic analytes from nonpolar matrices, such as organic solvents (e.g., polar contaminants from sample extracts).

	3 mL/500 mg (50-pk.)	6 mL/500 mg (30-pk.)	6 mL/1,000 mg (30-pk.)	15 mL/2 g (15-pk.)
Florisisil (EPA SW 846 methods and CLP protocols)	24031		24034	26228
	24032*	26086**	26085**	
Silica (EPA SW 846 methods)	24035		24038	
	24036*			

\*PTFE frits

\*\*Glass tubes with PTFE frits



24031

All cartridges are manufactured using high-density polypropylene and have polyethylene frits unless otherwise noted.

Cartridges may be processed by any one or all of these techniques: positive pressure, sidearm flask, centrifuge, or vacuum manifold.

### Resprep® SPE Cartridges (Bonded Reversed Phases)

Hydrophobic (nonpolar) silica-based adsorbents; used to extract hydrophobic analytes from polar matrices, such as water (e.g., pesticides from water).

	1 mL/100 mg (100-pk)	3 mL/200 mg (50-pk.)	3 mL/500 mg (50-pk.)	6 mL/500 mg (30-pk.)	6 mL/1,000 mg (30-pk.)	60 mL/10 g (16-pk.)
C18 (high load, endcapped)	26030	26031	24050	24052	24051	26035



26030

### Closed End SPE Cartridge: Activated Sodium Sulfate

- High quality anhydrous sodium sulfate.
- Approximately 2 grams prepackaged in a convenient capped cartridge with both male and female luer ends for easy connection to a variety of devices or equipment.
- The adsorbent is fully activated and ready to use for removal of excess water from organic solvent solutions, prior to many types of analysis.
- Capped cartridges will remain active for long periods of storage in the lab.

SPE Cartridge	Bed Weight	qty.	cat#
Activated Sodium Sulfate	2 g	50-pk.	26207



26207

### CarboPrep® Reversing SPE Cartridges

- High adsorbent capacity (surface area ~200 m<sup>2</sup>/g) for large volume sampling.
- Chromatographic grade graphitized carbon provides consistent and quantitative recoveries of a wide variety of semivolatiles, pesticides, and herbicides.
- 500 mg bed weight.

Reversing cartridge design allows convenient inverted elution of strongly retained analytes using minimum solvent volumes. Ideal design for extraction of pesticides in water.<sup>1</sup>

SPE Cartridge	Bed Weight	qty.	cat#
CarboPrep 200 Reversing Cartridge	500 mg	30-pk.	26206



26206

<sup>1</sup>Crescenzi, C.; DiCorcia, A.; Guerriero, E.; and Saperi, R. "Development of a Multiresidue Method for Analyzing Pesticide Traces in Water Based on Solid-Phase Extraction and Electro spray Liquid Chromatography Mass Spectrometry", Environmental Science & Technology vol.31, no. 2 (1997) 479-488. (Reference not available from Restek.)

# SPE Cartridges



**Excellent for Pesticide Residue Cleanup!**

## Resprep® CarboPrep® SPE Cartridges

- Improved recovery of sulfonylurea herbicides, phenols, carbamates, and triazine herbicides, compared to C18 and C8 cartridges.
- Wide range of selectivity for both analytes and their metabolites or degradation products.
- Rapid sampling flow rates; uncompromised recoveries.
- Maximum capacity for contaminant cleanup.
- Controlled manufacturing improves cleanliness and ensures reproducible performance.
- Excellent performance removing pigments from samples.

CarboPrep® cartridges are manufactured from chromatographic-grade, nonporous, graphitized carbon. Our manufacturing process minimizes variability and improves recovery and cleanup procedures. We offer two types of carbons: CarboPrep® 90 has a surface area of approximately 90 m<sup>2</sup>/g, and CarboPrep® 200 has a surface area of 200 m<sup>2</sup>/g. Both have higher capacity than silica-based packings for a variety of compounds.

CarboPrep® cartridges can be used for sample extraction of organic compounds and extract cleanup to remove matrix interferences, including highly pigmented materials.

SPE Cartridge	Tube Volume, Bed Weight	qty.	cat.#
CarboPrep 90	3 mL, 250 mg	50-pk.	26091
CarboPrep 90	6 mL, 500 mg	30-pk.	26092
CarboPrep 200	3 mL, 250 mg	50-pk.	26088
CarboPrep 200	6 mL, 500 mg	30-pk.	26087

## Pesticide Residue Cleanup SPE Cartridges

- Convenient, multiple adsorbent beds in a single cartridge.
- For use in multiresidue pesticide analysis to remove matrix interferences.
- Excellent for cleanup of dietary supplement extracts.



SPE Cartridge	qty.	cat.#
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg Aminopropyl, Polyethylene Frits	30-pk.	26193
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg PSA, Polyethylene Frits	30-pk.	26194
6 mL SPE Cartridge Packed with 500 mg PSA, Polyethylene Frits	30-pk.	26195
6 mL Combo SPE Cartridge Packed with 200 mg CarboPrep 200 and 400 mg PSA, PTFE Frits	30-pk.	26127
6 mL Combo SPE Cartridge Packed with 250 mg CarboPrep 200 and 500 mg PSA, PTFE Frits	30-pk.	26128
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 200 and 500 mg PSA, PTFE Frits	30-pk.	26129

PSA—primary and secondary amine

## Method Specific SPE Cartridges

These cartridges have been specifically designed to provide consistent and reproducible results for the method or application stated.

Description	Applications	Tube Volume, Bed Weight	qty.	cat.#
EPH Fractionation	Separation of aliphatic and aromatic hydrocarbons into distinct extract fractions. Specially treated to reduce contaminants and increase capacity. Silica packing.	20 mL, 5 g	15-pk.	26065
EPA Methods 521 & 522	For use in EPA Method 521: Nitrosamines in Drinking Water and EPA Method 522 for 1,4-Dioxane in Drinking Water. Activated charcoal packing.	6 mL, 2 g	30-pk.	26032
EPA Method 548.1	Extraction of endothall from aqueous samples. Weak anion exchange resin (BioRex 5) packing.	6 mL	30-pk.	26063
Ultra Quat SPE	For use in HPLC analysis of paraquat/diquat, as an alternative to EPA 549.2. For an HPLC column developed specifically for this application, see page 183.	6 mL, 500 mg	30-pk.	25499
Organo Tin	High-capacity cleanup of butyl and phenyl tin compounds from soil, water, and biota. Mixed bed.	60 mL	16-pk.	24049
RDX	Extraction of explosive compounds (similar to EPA Method 8095 and 8330 list) from water samples.	6 mL, 500 mg	30-pk.	26093

**Resprep® SPE Tube Parts & Accessories**

Empty Tubes (polypropylene)	Volume	qty.	cat.#
	1 mL	50-pk.	26010
	3 mL	50-pk.	26011
	6 mL	50-pk.	26012
	15 mL	50-pk.	26013
	sample reservoir, 25 mL	12-pk.	26014
	sample reservoir, 60 mL	12-pk.	26015
Frits (polyethylene), 20 µm	Fits Tube Volume, Diameter	qty.	cat.#
	1 mL, 6 mm	100-pk.	26016
	3 mL, 9 mm	100-pk.	26017
	6 mL, 1.2 cm	100-pk.	26018
	15 mL, 1.6 cm	100-pk.	26019
	25 mL, 2.0 cm*	100-pk.	26020
	60 mL, 2.6 cm	100-pk.	26021
Tube Caps (polyethylene)	Fits Tube Volume	qty.	cat.#
	1 mL	12-pk.	26001
	3 mL	12-pk.	26002
	6 mL	12-pk.	26003
	15 mL	12-pk.	26004
	25 mL*	12-pk.	26005
Female Luer End Caps (polypropylene)	Fits Tube Volume	qty.	cat.#
	universal	12-pk.	26000
Connectors (polypropylene)	Fits Tube Volume	qty.	cat.#
	1, 3, 6 mL	12-pk.	26007
	15, 25 mL*	12-pk.	26008
	60 mL	12-pk.	26009

Resprep® tubes, frits, caps, and connectors for your method development needs.



\*For 20 mL packed tubes.



**Solid Phase Extraction Cartridges** from Restek  
Proven Quality • Superior Cleanliness • Method-Specific Performance

[www.restek.com/resprep](http://www.restek.com/resprep)



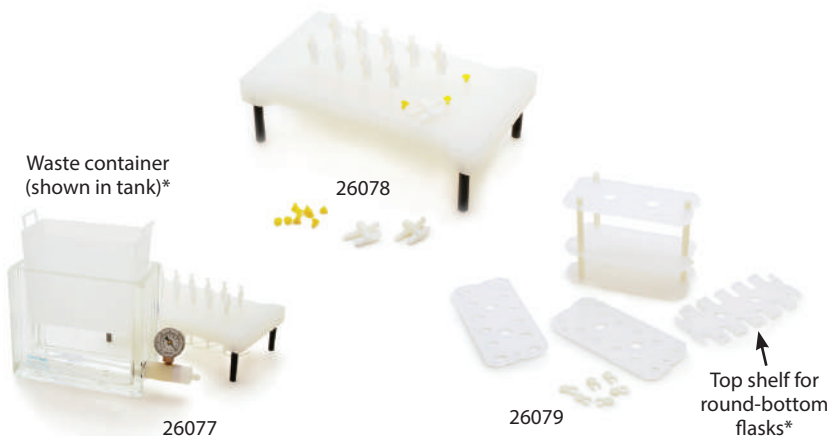
# Manifolds & Replacement Parts



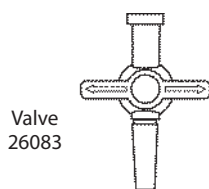
26077

## Resprep® 12- or 24-Port SPE Manifolds

- Use with any standard male luer end SPE cartridges.
- Inert, PTFE sample guides reduce cross-contamination and carryover.
- Flexible sample collection rack will accommodate a variety of receiving vessels.
- Quick vacuum-release valve for better system control.
- Individual valves allow vacuum control for each cartridge, improving reproducibility.



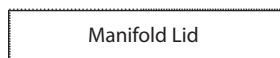
### Resprep® Manifold Replacement Parts



Valve  
26083



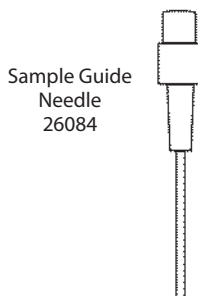
Valve  
Attachment  
26130



Manifold Lid



Needle  
Attachment  
26131



Sample Guide  
Needle  
26084

Description	qty.	cat.#
Complete Resprep SPE Manifold, 12-Port (Includes: glass basin with built-in vacuum regulator, polypropylene lid with 12 individual control valves, 12-position collection rack, 12 PTFE sample guides, and waste container.)	kit	26077
Complete Resprep SPE Manifold, 24-Port (Includes: glass basin with built-in vacuum regulator, polypropylene lid with 24 individual control valves, 24-position collection rack, and 24 PTFE sample guides.)	kit	26080
Resprep® Manifold Replacement Parts		
<b>Description</b>		
Replacement Waste Container, 12-Port	ea.	24014
Replacement Vacuum Valve and Gauge Assembly	ea.	24008
Glass Vacuum Chamber w/gauge & valve for Resprep manifolds, 6 or 12-Port	ea.	25991
<b>Collection Rack</b>		
Collection Rack, 12-Port	ea.	26079
Collection Rack, 24-Port	ea.	26082
<b>Manifold Lid</b>		
Replacement Manifold Lid (sample guides not included), 12-Port	ea.	26078
Replacement Manifold Lid (sample guides not included), 24-Port	ea.	26081
<b>Manifold Lid Replacement Parts</b>		
Valves, 12 or 24-Port	2-pk.	26083
Valve Attachment	48-pk.	26130
Needle Attachment	48-pk.	26131
Sample Guide Needles, 12 or 24-Port	12-pk.	26084

\*Waste container (shown in tank) and top shelf for round-bottom flasks are not included in 24-port manifold kit (cat.# 26080).



CE

24002

## Oil-Free Vacuum/Pressure Station for 12-Port Resprep® SPE Systems

Allows switching from pressure to vacuum in a matter of seconds. Quiet, oil-free unit will not contaminate the extraction system or your samples. Provides 20" Hg (68 kPa) vacuum or 18 psi (124 kPa) pressure.

Description	qty.	cat.#
Oil-Free Vacuum/Pressure Station, 115VAC, 60Hz, US	ea.	24002
Oil-Free Vacuum/Pressure Station, 230VAC, 50Hz, Europe (CE certified)	ea.	24003
Vacuum Tubing (10 ft./3 m, 1/4" ID)	ea.	24016

Not recommended for use with 24-port manifold.

Warranty period is one year from date of purchase. Evaluation fee is charged for repairs out of warranty.

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Distributor

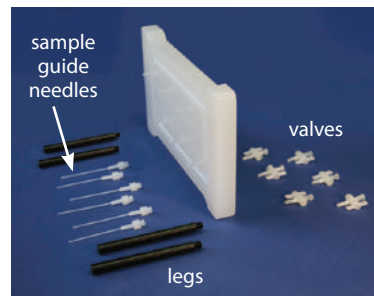
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e-mail : sales @ chromtech.net.au



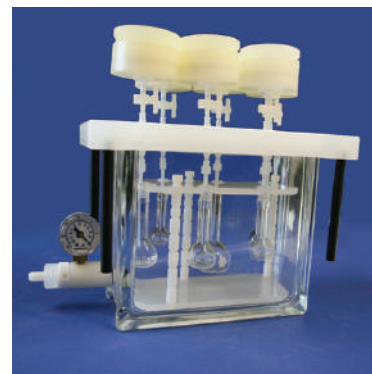
### Resprep® 6-Port Disk Manifolds Lid

- Low-cost option for disk extraction; fits standard 3 3/4" x 7 1/2" glass vacuum chambers.
- Doubles sample capacity—holds six disks, compared to standard 12-port manifolds, which only hold three.
- Individual vacuum control for each port improves reproducibility.
- Collection plate design secures variety of receiving vessels.
- Inert PTFE sample guides reduce cross-contamination and carryover.
- Compatible with any standard male luer end disk holder.



Description	qty.	cat.#
Resprep 6-Port Disk Manifolds Lid*		
Includes: polypropylene lid with 6 ports, 6 nylon valves, 6 PTFE needle guides, 4 black lid legs, collection baseplate, collection plate for volumetric flasks, collection plate for concentrator tubes, 3 white collection plate posts, 12 collection plate retaining clips	kit	25992
<b>Accessories</b>		
Glass Vacuum Chamber w/gauge & valve for Resprep manifolds, 6 or 12-Port	ea.	25991
<b>Manifold Lid Replacement Parts</b>		
Valves, 12 or 24-Port	2-pk.	26083
Valve Attachment	48-pk.	26130
Needle Attachment	48-pk.	26131
Sample Guide Needles, 12 or 24-Port	12-pk.	26084
Gasket, 12-port	2-pk.	24011

\*Vacuum chamber (cat.# 25991) not included.



Fully assembled unit shown with glass vacuum chamber (cat.# 25991) and disk holders (cat.# 24020).

### Resprep® Sample Delivery System

- Compatible with Resprep® 1, 3, 6, and 15 mL SPE cartridges and Diskcover-47 extraction disk holder (cat.# 24020).
- Six PTFE transfer lines (1/8" OD x 1/16" ID x 36" long); each is banded with a different color for easy sample identification.
- Specified in EPA drinking water methods.
- Tested to pH of 1 to ensure no contaminants leach from system.

Use the Resprep® sample delivery system to transfer large volumes of low viscosity samples directly from a bottle to a solid phase extraction cartridge, or to a disk on a vacuum manifold system for extraction or cleanup. Each unit consists of six transfer lines with a stainless steel weight on one end and a color-coded screw fitting and polyethylene terephthalate (PET) adapter on the opposite end.

Description	qty.	cat.#
Resprep Sample Delivery System	6-pk.	26250





Resprep® disks & flow filters extract analytes of interest at high flow rates and significantly reduce clogging.

### Resprep®-C18 and Resprep®-C8 SPE Disks

- Glass fiber disks embedded with C18 or C8 bonded silica.
- Extract semivolatile organic compounds.
- Deep-pore design reduces clogging and allows faster flow rates.
- Meet requirements for EPA Methods 525.1, 506, 550.1, and 549.1.
- Lower cost than PTFE disks.

Description	Diameter	qty.	cat.#
Resprep-C8	47 mm	24-pk.	24048
Resprep-C18	47 mm	20-pk.	24004
Resprep-C18	90 mm	12-pk.	25988

### Resprep® Oil & Grease SPE Disks

- 47 mm glass fiber disks embedded with specialty bonded silica.
- Meet requirements for EPA Method 1664.\*
- Reduce emulsion formation and amount of solvent required by previous EPA methods.
- No chlorofluorocarbons needed.

Description	qty.	cat.#
Resprep Oil & Grease SPE Disks	20-pk.	26022

\*A sodium sulfate drying tube (cat.# 26207, page 397) and a 0.45 µm PTFE syringe filter (cat.# 26145, page 408) also may be used.

### Resprep® SPE Flow Filters

- Designed specifically to improve flow when filtering oil and grease samples.
- Use with Resprep® Diskcover-47 reservoir, or any 47 mm glass sample reservoir.

Description	qty.	cat.#
Resprep SPE Flow Filters	20-pk.	26024



26024



26023

### Resprep® Resin SPE Disks

- 47 mm glass fiber disks embedded with styrene/DVB resin.
- For chlorinated, benzidine-containing, or nitrogen-containing pesticides.
- Meet requirements of EPA Methods 515.2 and 553.

Description	qty.	cat.#
Resprep Resin SPE Disks	20-pk.	26023



24020

## Parts for Diskcover-47 Extraction System

### Diskcover-47 Extraction Disk Holder

- Compatible with most vacuum manifold systems that accept 1/8-inch male luer fittings.
- Sample can be automatically introduced via 1/8-inch PTFE tubing or from the optional Diskcover-47 reservoir.

Description	qty.	cat.#
Diskcover-47 Extraction Disk Holder	ea.	24020
Diskcover-47 Extraction Disk Holder	6-pk.	24021
PTFE Tube Luer Adaptors (1/8" OD)	6-pk.	24017
PTFE Sample Tubing (2 ft./0.6 m, 1/8" OD)	6-pk.	24025



24029

### Diskcover-47 Reservoir\*

The Diskcover-47 open-top reservoir allows you to pour up to 125 mL of sample directly onto the filter disk holder. It easily installs on top of the Diskcover-47 extraction disk holder.

Description	qty.	cat.#
Diskcover-47 Reservoir	ea.	24029
Diskcover-47 Reservoir	6-pk.	24030

\*Must be used with the Diskcover-47 extraction disk holder.

**Sodium Sulfate** (Bulk Adsorbent)

- Ideal for removing water from sample extracts.
- Activate by heating to 400 °C for four hours before use.
- Packaged in recloseable 5 kg buckets.

Anhydrous sodium sulfate is the most common drying agent used to remove moisture from sample extracts. We package our 60 mesh material in recloseable buckets.

Description	qty.	cat.#
Sodium Sulfate	5 kg	26204



**Florisil® PR** (Bulk Adsorbent)

- Pesticide residue grade.
- Packaged in glass containers.

Florisil® PR is commonly used to remove polar interferences from pesticide residues. This bulk material is ideal for labs packing their own extraction cartridges for pesticide residue extractions.

Description	qty.	cat.#
Florisil PR, 60/100 mesh	500 g	26135



**Granulated Activated Copper** (Bulk Adsorbent)

- Convenient form for removing sulfur from environmental extracts.
- Acidified and activated—ready for use.

Activated copper effectively removes elemental sulfur from environmental extracts. Our acid-washed and activated material can be used right out of the package. The 30 mesh granular material eliminates the potential for fine copper particles in filtered extracts.

Description	qty.	cat.#
Granulated Activated Copper, 30 mesh	1 kg	26136



**Ottawa Sand** (Bulk Adsorbent)

- Sample medium for matrix spikes and laboratory control blanks.
- Packaged in convenient 5 kg buckets.

Ottawa sand is listed in several U.S. EPA methods as the specified medium for matrix spike and laboratory control blanks.

Description	qty.	cat.#
Ottawa Sand	5 kg	26137



**Diatomaceous Earth** (Bulk Adsorbent)

- Improves extraction efficiency.
- Adsorbs moisture from samples.

Diatomaceous earth is used as a filter aid to improve extraction efficiency of densely packed soils, such as clays. By mixing the sample with diatomaceous earth, recoveries can be improved and excess moisture can be absorbed. Packaged in a convenient 1 kg quantity.

Description	Similar to Dionex Part #	qty.	cat.#
Diatomaceous Earth, 30/40 mesh	062819	1 kg	26033







QuEChERS Products

Ideal for multiresidue pesticide analysis from food and other matrices.

Restek Q-sep® QuEChERS Products






Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

- Ready-to-use tubes, no glassware required.
- Preweighed, ultra-pure sorbents.
- Support original unbuffered, AOAC (2007.01), European (EN 15662), and mini-multiresidue QuEChERS methods.

QuEChERS methods are fast, easy, and cost-effective, and Restek Q-sep® products make QuEChERS procedures even simpler. All extraction salts, sorbents, and sample tubes are included—no specialized equipment or glassware is required. Prepare samples more efficiently with a complete line of QuEChERS supplies from Restek.

	Mini-Luke or Modified Luke Method	QuEChERS	Savings with QuEChERS
Estimated time to process 6 samples (min)	120	30	4x faster
Solvent used (mL)	60-90	10	6-9x less solvent
Chlorinated waste (mL)	20-30	0	Safer, cheaper, greener
Glassware/specialized equipment	capacity for 200 mL, quartz wool, funnel, water bath or evaporator	none	Ready-to-use

Selection Guide for Q-sep® QuEChERS dSPE Tubes

Commodity types and examples	AOAC 2007.01	EN 15662	Mini-multiresidue	Additional products
 <p><b>Low fat &amp; low pigment fruits &amp; vegetables</b></p> <ul style="list-style-type: none"> <li>• Celery</li> <li>• Cucumber</li> <li>• Head lettuce</li> <li>• Melon</li> </ul>	<p><b>2 mL, 100-pk.</b> (cat.# 26124)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26220)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26215)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26223)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26215)</p>	
 <p><b>Fatty or waxy fruits &amp; vegetables</b></p> <ul style="list-style-type: none"> <li>• Cereals</li> <li>• Avocado</li> <li>• Nuts &amp; seeds</li> <li>• Dairy</li> </ul>	<p><b>2 mL, 100-pk.</b> (cat.# 26125)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26221)</p>		<p><b>2 mL, 100-pk.</b> (cat.# 26216)</p>	<p><b>15 mL, 50-pk.</b> (cat.# 26226)</p> <p><b>2 mL, 100-pk.</b> (cat.# 26242)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26244)</p>
 <p><b>Pigmented fruits &amp; vegetables</b></p> <ul style="list-style-type: none"> <li>• Strawberries</li> <li>• Sweet potatoes</li> <li>• Tomatoes</li> </ul>	<p><b>15 mL, 50-pk.</b> (cat.# 26222)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26217)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26224)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26217)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26123)</p>
 <p><b>Highly pigmented fruits &amp; vegetables</b></p> <ul style="list-style-type: none"> <li>• Red peppers</li> <li>• Spinach</li> <li>• Blueberries</li> </ul>	<p><b>2 mL, 100-pk.</b> (cat.# 26219)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26218)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26225)</p>	<p><b>2 mL, 100-pk.</b> (cat.# 26218)</p>	<p><b>15 mL, 50-pk.</b> (cat.# 26126)</p>
 <p><b>Universal use</b> Wide range of commodities, including fatty &amp; pigmented fruits &amp; vegetables.</p>				<p><b>2 mL, 100-pk.</b> (cat.# 26243)</p> <p><b>15 mL, 50-pk.</b> (cat.# 26245)</p>
<p>Download free instructions at <a href="http://www.restek.com/quachers">www.restek.com/quachers</a></p>	<p>Instruction sheet# 805-01-002</p>	<p>Instruction sheet# 805-01-001</p>	<p>Instruction sheet# 805-01-001</p>	<p>Generic dSPE 805-01-003</p>



### Q-sep® QuEChERS Extraction Salts

- Salt packets eliminate the need for a second empty tube to transfer salts.
- Go green by using packets with reusable tubes.
- Convenient and easy to use.

Description	Material	Methods	qty.	cat.#
Q-sep QuEChERS Extraction Kit (Original)	4 g MgSO <sub>4</sub> , 1 g NaCl with 50 mL Centrifuge Tube	original unbuffered	50 packets & 50 tubes	23991
Q-sep QuEChERS Extraction Salt Packets Only (Original)	4 g MgSO <sub>4</sub> , 1 g NaCl	original unbuffered	50 packets	23992
Q-sep QuEChERS Extraction Kit (EN)	4 g MgSO <sub>4</sub> , 1 g NaCl, 1 g TSCD, 0.5 g DHS with 50 mL Centrifuge Tube	European EN 15662	50 packets & 50 tubes	26235
Q-sep QuEChERS Extraction Salt Packets Only (EN)	4 g MgSO <sub>4</sub> , 1 g NaCl, 1 g TSCD, 0.5 g DHS	European EN 15662	50 packets	26236
Q-sep QuEChERS Extraction Kit (AOAC)	6 g MgSO <sub>4</sub> , 1.5 g NaOAc with 50 mL Centrifuge Tube	AOAC 2007.01	50 packets & 50 tubes	26237
Q-sep QuEChERS Extraction Salt Packets Only (AOAC)	6 g MgSO <sub>4</sub> , 1.5 g NaOAc	AOAC 2007.01	50 packets	26238
Empty 50 mL Centrifuge Tube, Polypropylene			50-pk.	26239
Empty 50 mL Centrifuge Tube, FEP			2-pk.	23997

TSCD—trisodium citrate dihydrate  
 DHS—disodium hydrogen citrate sesquihydrate  
 NaOAc—sodium acetate



### Q-sep® QuEChERS dSPE Tubes for Extract Cleanup

Packaged in foil subpacks of 10 for enhanced protection and storage stability.

Description	Methods	qty.	cat.#
<b>2 mL Micro-Centrifuge Tubes Prefilled with dSPE Materials for Cleanup (1 mL Extract)</b>			
150 mg MgSO <sub>4</sub> , 25 mg PSA	original unbuffered, mini-multi-residue, European EN 15662	100-pk.	26215
150 mg MgSO <sub>4</sub> , 25 mg PSA, 25 mg C18	mini-multi-residue	100-pk.	26216
150 mg MgSO <sub>4</sub> , 25 mg PSA, 2.5 mg GCB	mini-multi-residue, European EN 15662	100-pk.	26217
150 mg MgSO <sub>4</sub> , 25 mg PSA, 7.5 mg GCB	mini-multi-residue, European EN 15662	100-pk.	26218
150 mg MgSO <sub>4</sub> , 50 mg PSA	AOAC 2007.01	100-pk.	26124
150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg C18	AOAC 2007.01	100-pk.	26125
150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg GCB	AOAC 2007.01	100-pk.	26123
150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg C18, 50 mg GCB	AOAC 2007.01	100-pk.	26219
150 mg MgSO <sub>4</sub> , 50 mg C18	NA	100-pk.	26242
150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg C18, 7.5 mg GCB	universal	100-pk.	26243
<b>15 mL Centrifuge Tubes Prefilled with dSPE Materials for Cleanup (6 mL and 8 mL Extract)</b>			
1,200 mg MgSO <sub>4</sub> , 400 mg PSA	AOAC 2007.01	50-pk.	26220
1,200 mg MgSO <sub>4</sub> , 400 mg PSA, 400 mg C18	AOAC 2007.01	50-pk.	26221
1,200 mg MgSO <sub>4</sub> , 400 mg PSA, 400 mg C18, 400 mg GCB	AOAC 2007.01	50-pk.	26222
1,200 mg MgSO <sub>4</sub> , 400 mg C18	similar to AOAC 2007.01	50-pk.	26244
900 mg MgSO <sub>4</sub> , 150 mg PSA	original unbuffered, European EN 15662	50-pk.	26223
900 mg MgSO <sub>4</sub> , 150 mg PSA, 15 mg GCB	European EN 15662	50-pk.	26224
900 mg MgSO <sub>4</sub> , 150 mg PSA, 45 mg GCB	European EN 15662	50-pk.	26225
900 mg MgSO <sub>4</sub> , 150 mg PSA, 150 mg C18	similar to European EN 15662	50-pk.	26226
900 mg MgSO <sub>4</sub> , 300 mg PSA, 300 mg C18, 45 mg GCB	similar to European EN 15662	50-pk.	26245
900 mg MgSO <sub>4</sub> , 300 mg PSA, 150 mg GCB	NA	50-pk.	26126

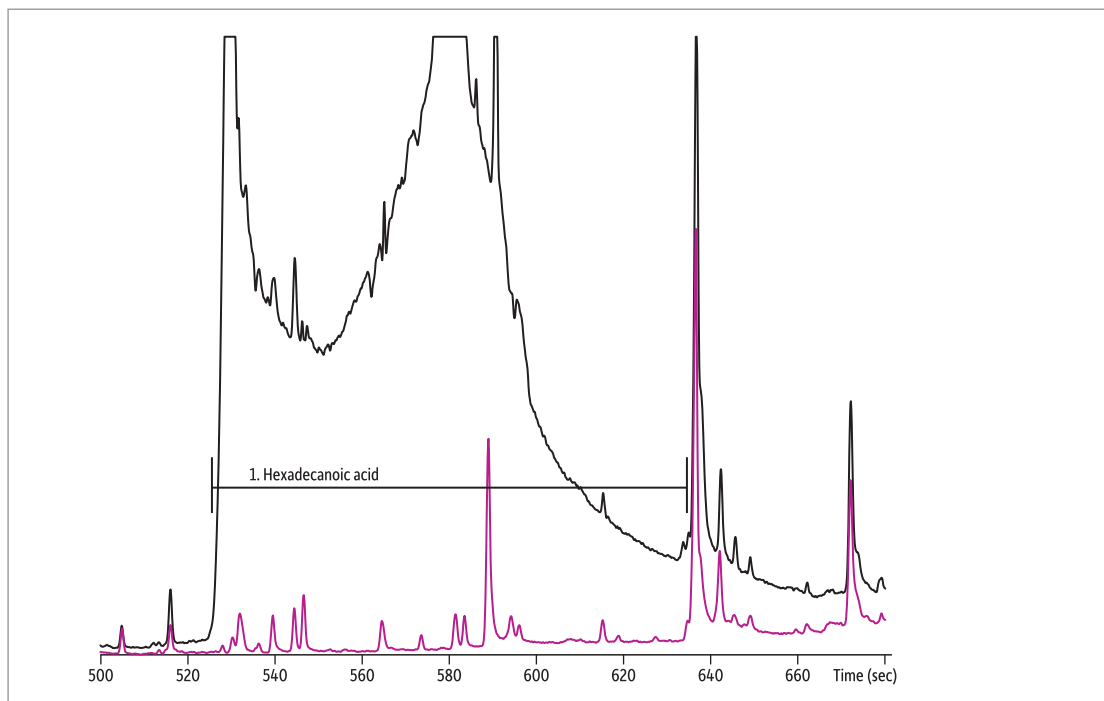
PSA—primary and secondary amine  
 GCB—graphitized carbon black



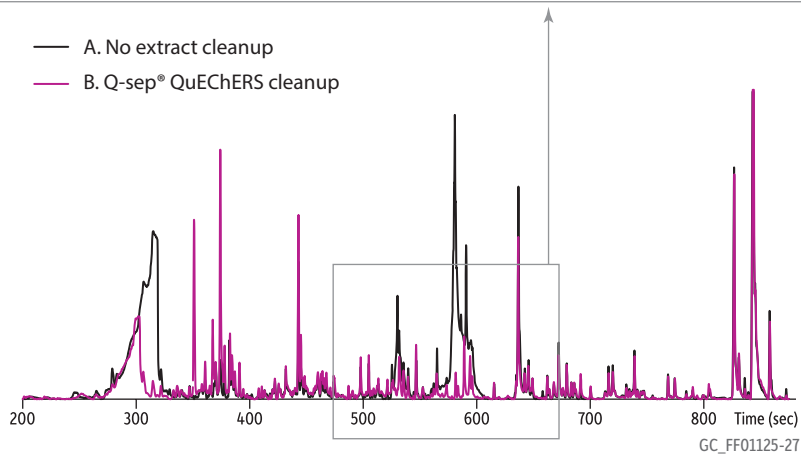
#### Multiple sorbents are used to extract different types of interferences.

MgSO <sub>4</sub>	removes excess water
PSA	removes sugars, fatty acids, organic acids, and anthocyanine pigments
C18	removes nonpolar interferences
GCB	removes pigments, sterols, and nonpolar interferences

**Use Q-sep® QuEChERS tubes to easily remove matrix interferences.**



— A. No extract cleanup  
 — B. Q-sep® QuEChERS cleanup



GC\_FF01125-27

**Column** Rxi®-5Sil MS, 20 m, 0.18 mm ID, 0.18 µm (cat.# 43602)  
**Sample** Sweet potato spiked with pesticide mix and extracted with acetonitrile and Q-sep® QuEChERS EN Method 15662 extraction salts  
**Injection**  
 Inj. Vol.: 1.0 µL splitless (hold 1 min)  
 Liner: Single taper (4 mm) w/deact. wool (cat.# 22405)  
 Inj. Temp.: 250 °C  
**Oven**  
 Oven Temp.: 72.5 °C (hold 1 min) to 350 °C at 20 °C/min  
**Carrier Gas** He, constant flow  
**Flow Rate:** 1.2 mL/min  
**Detector** MS  
**Mode:**  
 Transfer Line  
 Temp.: 300 °C  
 Analyzer Type: TOF  
 Ionization Mode: EI  
 Acquisition Range: 45-550 amu  
**Instrument** Agilent/HP6890 GC  
**Notes**  
 A. Extract (without cleanup step) acidified with formic acid to pH 5  
 B. Extract with cleanup using Q-sep® QuEChERS dSPE cleanup tube (cat.# 26124) acidified with formic acid to pH 5.

Scan range: m/z 60, 73, 87, 129, 256 plotted

### Q-sep® 3000 Centrifuge for QuEChERS

- Meets or exceeds requirements of original unbuffered, AOAC, and European QuEChERS methodology.
- Supports 50 mL, 15 mL, and 2 mL centrifuge tubes.
- Small footprint requires less bench space.
- Safe and reliable—UL, CSA, and CE approved; 1-year warranty.

Priced to fit your laboratory's budget, the Q-sep® 3000 centrifuge is the first centrifuge specifically designed for QuEChERS methodology. This compact, quiet, yet powerful unit spins at the 3,000 g force required by the European method.

Centrifuge includes 50 mL tube carriers (six), 50 mL conical tube inserts (six), 4-place 15 mL tube carriers (six), and 2 mL tube adaptors (24).

#### Specifications:

Motor Speed and Force Rating: 4,130 rpm, 3,000 xg  
 Maximum Capacity with 6-Place Horizontal Rotor:  
 6 x 50 mL tubes, 18 x 15 mL tubes, 24 x 2 mL tubes  
 Motor: 1/2 H.P. brushless DC  
 Nominal Acceleration Time: 45 seconds  
 Nominal Braking Time: 60 seconds  
 Timer (electronic): 1 to 30 minutes +/-1%  
 Requirement: 2.0 or 1.0 amps  
 Current Voltage Requirement: 115 or 230 (+/-10%) volts  
 Frequency: 50 / 60 Hz  
 Centrifuge Protection Breaker: 4 amp resettable  
 Overall Dimensions:  
 9" h x 14.5" w x 17" d (22.9 cm x 36.8 cm x 43.2 cm)  
 Weight: 39 lb (17.7 kg)

Description	qty.	cat.#
Q-sep 3000 Centrifuge, 110V	ea.	26230
Q-sep 3000 Centrifuge, 220V	ea.	26231
<b>Replacement Accessories</b>		
50 mL Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26232
50 mL Conical Tube Insert for Q-sep 3000 Centrifuge	6-pk.	26249
15 mL 4-Place Tube Carrier for Q-sep 3000 Centrifuge (fits four 15 mL tubes)	2-pk.	26233
2 mL Tube Adaptors for Q-sep 3000 Centrifuge	4-pk.	26234



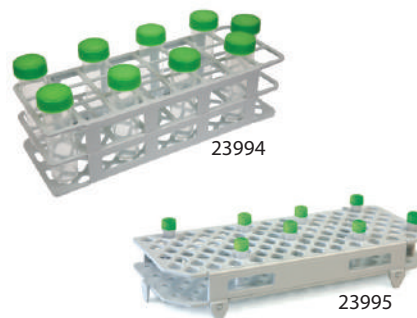
Dimensions: 9" h x 14.5" w x 17" d  
 (22.9 cm x 36.8 cm x 43.2 cm)



### Q-sep® Tube Racks

- Available for 2 mL, 15 mL, and 50 mL tubes.
- Alphanumerical grid reference on top tier for easy identification of samples.
- Easy to assemble; simply fold and snap together securely.

Description	Size	Material	qty.	cat.#
Q-sep Tube Rack for 2 mL Centrifuge Tube	Holds 100	Polypropylene, White	ea.	23995
Q-sep Tube Rack for 15 mL Centrifuge Tube	Holds 60	Polypropylene, White	ea.	23993
Q-sep Tube Rack for 50 mL Centrifuge Tube	Holds 24	Polypropylene, White	ea.	23994



### Q-sep® Bottle Top Solvent Dispenser

- Adjustment knob offers 56 output volume settings from 2.5 mL to 30 mL per stroke (0.5 mL increments)—ideal for QuEChERS methods!
- Base features 30 mm threads and includes four adaptors (25 mm, 28 mm, 38 mm, and 45 mm).
- Individually calibrated in accordance with ISO 8655 standards (certificate included) and can also be recalibrated by the user.
- PTFE, glass, and polypropylene construction for excellent chemical compatibility and 100% autoclavability.
- Integral safety discharge reduces risk of accidental dispensing, and nozzle cap prevents dripping.
- Easy to disassemble for cleaning and servicing.

Accurately and precisely dispense liquids for QuEChERS extractions with this versatile pump. A quick, simple adjustment lets you set the output volume anywhere from 2.5 mL to 30 mL per stroke, and the included adaptors will accommodate most reagent bottles.



23990  
 Bottle not included.

Description	qty.	cat.#
Q-sep Bottl		

# Sample Filtration



Cut costs, not quality!

## Syringe Filters with Luer Lock Inlet

- Luer lock inlet offers leak-tight syringe connection.
- Variety of filter types, porosities, and diameters.
- Color coded for easy identification.
- Rugged polypropylene housing.
- Autoclavable to 121 °C for 15 minutes.
- Quantity break pricing for greater savings.



Size	Porosity	Color	qty.	cat.#
<b>Cellulose Acetate</b>				
4 mm	0.22 µm	green	100-pk.	23972
4 mm	0.45 µm	blue	100-pk.	23973
13 mm	0.22 µm	red	100-pk.	26156
13 mm	0.45 µm	red	100-pk.	26155
25 mm	0.22 µm	red	100-pk.	26158
25 mm	0.45 µm	red	100-pk.	26157
30 mm	0.22 µm	red	100-pk.	23982
30 mm	0.45 µm	red	100-pk.	23983
<b>Nylon</b>				
4 mm	0.22 µm	yellow	100-pk.	23970
4 mm	0.45 µm	pink	100-pk.	23971
13 mm	0.22 µm	pink	100-pk.	26146
13 mm	0.45 µm	pink	100-pk.	26147
25 mm	0.22 µm	pink	100-pk.	26148
25 mm	0.45 µm	pink	100-pk.	26149
30 mm	0.22 µm	pink	100-pk.	23980
30 mm	0.45 µm	pink	100-pk.	23981
<b>PES (polyethersulfone)</b>				
4 mm	0.22 µm	white	100-pk.	23978
4 mm	0.45 µm	blue	100-pk.	23979
13 mm	0.22 µm	green	100-pk.	23966
13 mm	0.45 µm	green	100-pk.	23967
25 mm	0.22 µm	green	100-pk.	23968
25 mm	0.45 µm	green	100-pk.	23969
30 mm	0.22 µm	green	100-pk.	23988
30 mm	0.45 µm	green	100-pk.	23989
<b>PTFE (polytetrafluoroethylene)</b>				
4 mm	0.22 µm	purple	100-pk.	23974
4 mm	0.45 µm	orange	100-pk.	23975
13 mm	0.22 µm	white	100-pk.	26142
13 mm	0.45 µm	white	100-pk.	26143
25 mm	0.22 µm	white	100-pk.	26144
25 mm	0.45 µm	white	100-pk.	26145
30 mm	0.22 µm	white	100-pk.	23984
30 mm	0.45 µm	white	100-pk.	23985
<b>PVDF (polyvinylidene fluoride)</b>				
4 mm	0.22 µm	brown	100-pk.	23976
4 mm	0.45 µm	red	100-pk.	23977
13 mm	0.22 µm	blue	100-pk.	26150
13 mm	0.45 µm	blue	100-pk.	26151
25 mm	0.22 µm	blue	100-pk.	26152
25 mm	0.45 µm	blue	100-pk.	26153
30 mm	0.22 µm	blue	100-pk.	23986
30 mm	0.45 µm	blue	100-pk.	23987

Syringe filters are for laboratory use only.

### Membrane selection guide

Membrane	Properties	Applications	Incompatible with
Cellulose Acetate	hydrophilic	aqueous solutions	organic solvents
Nylon	hydrophilic, low protein binding	bases, HPLC solvents, alcohols, aromatic hydrocarbons	acids, aggressive halogenated hydrocarbons, proteins
PES	hydrophilic, low protein binding, fast flow rates	filtration of buffers & culture media	—
PTFE	hydrophobic	organic solvents, acids, alcohols, bases, aromatics	aqueous samples without pre-wetting (to avoid high backpressure)
PVDF	hydrophilic, low protein binding	alcohols, biomolecules	bases, esters, ethers, ketones
Cellulose Acetate, Nylon, PES, PVDF—hydrophilic applications			
PTFE—hydrophobic applications			



## Syringe Filters Compatibility Chart

Group of Substance & Chemical Reagents	Cellulose Acetate	Nylon	PES	PTFE	PVDF
<b>ACIDS</b>					
Acetic, 5%	L	R	R	R	R
Acetic, 10%	L	R	R	R	R
Acetic, 25%	N	L	R	R	R
Acetic, Glacial	N	N	R	R	R
Boric	-	L	-	R	-
Formic 25%	L	N	-	R	-
Hydrochloric 15%	L	L	R	R	L
Hydrochloric 25%	N	N	R	R	-
Hydrochloric concentrated	N	N	L	R	N
Hydrofluoric 10%	N	N	-	-	-
Hydrofluoric 35%	N	N	-	R	-
Nitric 25%	N	N	R	R	-
Nitric 6N, 38%	N	N	L	R	R
Nitric concentrated	N	N	N	R	N
Phosphoric 25%	L	N	R	R	-
Sulfuric 25%	N	N	N	R	-
Sulfuric 6N, 29%	N	N	N	R	-
Sulfuric concentrated	N	N	N	R	N
Trichloroacetic 10%	N	N	-	R	R
<b>ALKALINES</b>					
Ammonium Hydroxide 25%	N	R	R	R	L
Formalin 30%	L	L	R	-	-
Sodium Hydroxide 3N, 12%	N	R	R	R	R
<b>ALCOHOLS</b>					
Amyl Alcohol	L	R	N	R	R
Benzyl Alcohol	L	L	L	L	L
Butyl Alcohol	L	R	L	R	R
Butyl Cellosolve	N	L	-	L	-
Ethanol 70%	L	R	L	R	R
Ethanol 98%	N	R	N	R	R
Ethylene glycol	L	R	R	R	R
Glycerol	L	R	R	R	R
Isobutyl Alcohol	L	L	L	L	L
Isopropanol, <i>n</i> -Propanol	L	R	R	R	R
Methanol 98%	N	R	L	R	R
Methyl Cellosolve	L	L	-	L	-
Propylene glycol	L	-	R	R	R
Phenol, Aqueous 10%	-	R	-	R	R

R = Recommended. No significant change observed in flow rate or bubble point of the membrane, nor visible indication of chemical attack.

L = Limited Recommended Use. Moderate changes in physical properties. The filter may be suitable for short term, non-critical use.

N = Not Recommended. The membrane may be unstable.

- = Insufficient Data. Information is not available. Trial testing is rec

Group of Substance & Chemical Reagents	Cellulose Acetate	Nylon	PES	PTFE	PVDF
<b>HYDROCARBONS</b>					
Hexane	L	R	L	R	R
Xylene	L	R	N	R	R
Kerosene, Gasoline	L	R	R	R	R
Tetrakin, Decalin	N	R	-	R	R
Toluene, benzene	L	R	N	R	R
<b>HALOGENATED HYDROCARBONS</b>					
Carbon Tetrachloride	N	N	N	N	N
Chloroform	N	N	N	R	R
Methylene Chloride	N	L	N	R	N
Monochlorobenzene	N	N	-	R	-
Trichloethylene	N	N	N	R	R
<b>KETONES</b>					
Acetone	N	R	N	R	N
Cyclohexanone	N	L	N	R	N
Isopropylacetone	-	R	-	R	N
Methyl Ethyl Ketone	N	R	N	R	N
Methyl Isobutyl Ketone	N	R	-	R	N
<b>ESTERS</b>					
Amyl Acetate	N	R	L	R	-
Amyl Propyl & Butyl Acetate	L	-	-	R	-
Benzyl Benzoate	-	-	-	R	-
Butyl Acetate	N	-	N	-	-
Ethyl Acetate & Methyl Acetate	N	R	N	R	R/L
Isopropyl Myristate	-	-	-	R	-
Methyl Cellosolve Acetate	N	-	-	R	-
Propylene Glycol Acetate	-	-	-	R	-
Tricresyl Phosphate	-	-	-	R	-
Isopropyl Acetate	L	R	-	-	R
<b>OXIDES - ETHERS</b>					
Dimethylsulfoxide (DMSO)	N	R	N	R	N
Dioxane & Tetrahydrofuran	N	R	L	R	L
Ethyl Ether	L	R	R	R	R
Isopropyl Ether	-	-	-	R	R
<b>SOLVENTS WITH NITROGEN</b>					
Acetonitrile	N	R	N	R	N
Aniline	N	-	-	R	-
Diethylacetamide	N	L	N	R	N
Dimethyl Formamide	N	R	N	R	N
Pyridine	N	R	N	R	-
Triethanolamine	-	R	-	R	N
<b>MISCELLANEOUS</b>					
Formaldehyde Solution 30%	L	R	R	R	R
Hydrogen Peroxide 30%	N	L	N	R	R
Pyridine	N	R	N	R	R
Silicone Oil & Mineral Oil	R	R	R	R	R

# Sample Filtration



Simply squeeze particulates and contaminants out of your sample!

## Thomson SINGLE StEP® Filter Vials

- Easy-to-use vials offer fast sample filtration and require only a squeeze of your fingers.
- Color-coded caps allow easy identification of 0.2 µm or 0.45 µm membranes in PVDF, PTFE, PES, or nylon.
- Pre-slit PTFE/silicone caps help eliminate broken autosampler needles and cored septa.
- Low dead volume units feature rugged polypropylene vial and insert with 450 µL loading capacity.
- Fit most standard 12 x 32 mm autosamplers, including UHPLC instruments.



Now available in convenient 100-pks.



Porosity	Color	qty.	cat.#
<b>Nylon</b>			
0.2 µm	black cap	100-pk.	25891
0.45 µm	pink cap	100-pk.	25892
<b>PES (polyethersulfone)</b>			
0.2 µm	grey cap	100-pk.	25897
0.45 µm	orange cap	100-pk.	25898
<b>PTFE (polytetrafluoroethylene)</b>			
0.2 µm	green cap	100-pk.	25893
0.45 µm	blue cap	100-pk.	25894
<b>PVDF (polyvinylidene fluoride)</b>			
0.2 µm	red cap	100-pk.	25895
0.45 µm	yellow cap	100-pk.	25896

Patent No. 7,790,117

## Filter Vials Compatibility Chart

Most solvents and mobile phases used in liquid chromatography are also compatible with SINGLE StEP® filter vials.

Solvent / Mobile Phase	HOUSINGS		FILTERS		
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyethersulfone)	NYL (nylon)
Acetic Acid (glacial) <i>acid, organic</i>	L	R	R	R	N
Acetone <i>ketone</i>	R	R	N	N	R
Acetonitrile (ACN) <i>nitrile</i>	R	R	L	N	R
Alconox, 1% <i>surfactant/detergent</i>	L	L	L	L	L
Ammonium Hydroxide <i>caustic</i>	L	R	R	N	L
Ammonium Sulfate (saturated) <i>salt, aqueous solution</i>	R	R	N	L	R
Amyl Acetate <i>ester</i>	L	R	R	R	L
Amyl Alcohol <i>alcohol</i>	R	R	R	R	L
Benzene <i>HC, aromatic</i>	N	R	R	N	R
Benzyl Alcohol <i>HC aromatic/alcohol</i>	N	R	R	L	L
Boric Acid (aqueous solution) <i>acid, inorganic</i>	R	R	L	R	R
Butyl Acetate <i>ester</i>	L	R	L	N	R

Solvent / Mobile Phase	HOUSINGS		FILTERS		
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyethersulfone)	NYL (nylon)
Butyl Alcohol <i>alcohol</i>	R	R	R	R	R
Carbon Tetrachloride <i>HC, halogenated</i>	N	R	R	N	L
Cellosolve (ethyl) <i>glycol ether</i>	R	R	L	R	R
CHAPS (aqueous solution) <i>surfactant/detergent</i>	L	L	L	L	L
Chloroform <i>HC, halogenated</i>	N	R	R	N	N
Cyclohexanone <i>ketone</i>	N	R	N	N	R
Diethyl Pyrocarbonate, 0.2% <i>carboxylic anhydride</i>	L	L	L	L	L
Dimethyl Sulfoxide (DMSO) <i>sulfoxide</i>	R	R	N	N	R
Dimethylacetamide <i>amide</i>	R	R	N	N	N
Dimethylformamide <i>amide</i>	R	R	N	L	R
Dioxane <i>ether</i>	R	R	R	L	R
Ethers <i>ether</i>	N	R	R	L	R

Continued on next page

## Filter Vials Compatibility Chart

Continued from previous page

Solvent / Mobile Phase	HOUSINGS		FILTERS		
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyether sulfone)	NYL (nylon)
Ethyl Acetate ester	L	R	R	N	R
Ethyl Alcohol alcohol	R	R	R	R	L
Ethylene Glycol glycol	R	R	R	R	R
Formaldehyde aldehyde	R	R	R	L	R
Formic Acid, 50% acid, organic	R	R	R	L	N
Freon® (TF or PCA) HC, halogenated	R	R	R	L	R
Gasoline HC	N	R	R	R	R
Glycerine (Glycerol) glycol	R	R	R	R	R
Guanidine Hydrochloride, 6M salt, aqueous solution	L	R	L	L	L
Guanidine Thiocyanate, 5M salt, aqueous solution	L	R	L	L	L
Helium gas	R	R	L	L	R
Hexane HC, aliphatic	N	R	R	R	R
Hydrochloric Acid, 1N (HCL) acid, inorganic	R	R	R	R	R
Hydrochloric Acid, 6N (HCL) acid, inorganic	L	R	L	R	L
Hydrochloric Acid, conc. (HCL) acid, inorganic	N	R	N	L	N
Hydrofluoric Acid acid, inorganic	N	R	N	N	N
Hydrogen gas	R	R	R	L	R
Hydrogen Peroxide, 3% peroxide	R	R	R	L	R
Hydrogen Peroxide, 30% peroxide	L	R	R	L	L
Hydrogen Peroxide, 90% peroxide	R	R	R	L	N
HYPO (aqueous solution) salt, aqueous solution	R	R	R	L	R
Isobutyl Alcohol alcohol	R	R	R	R	L
Isopropyl Acetate ester	L	R	R	N	R
Isopropyl Alcohol alcohol	R	R	R	R	L
Kerosene HC	L	L	R	R	R
Lactic Acid, 50% acid, organic/alcohol	R	R	L	L	L
Lubrol PX (aqueous solution) surfactant/detergent	L	L	L	L	L
Methyl Ethyl Ketone (MEK) ketone	R	R	N	N	R
Mercaptoethanol, 0.1M alcohol/mercaptan	L	L	L	L	L
Methyl Acetate ester	L	R	N	N	R
Methyl Alcohol alcohol	R	R	R	R	L
Methylene Chloride HC, halogenated	N	R	N	N	L

Solvent / Mobile Phase	HOUSINGS		FILTERS		
	PP (polypropylene)	PTFE (polytetrafluoroethylene)	PVDF (polyvinylidene fluoride)	PES (polyether sulfone)	NYL (nylon)
Methyl Isobutyl Ketone (MIBK) ketone	N	R	N	N	R
Mineral Spirits HC	N	R	R	R	R
Nitric Acid, 6N acid, inorganic	L	R	R	R	N
Nitric Acid (concentrated) acid, inorganic	N	L	N	L	N
Nitrobenzene HC, aromatic	N	R	R	L	R
Nitrogen gas	L	R	R	L	R
Nonidet-P40 (aqueous solution) surfactant/detergent	L	L	L	L	L
Ozone gas	N	R	R	L	N
Paraldehyde aldehyde	L	R	L	L	R
Pentane HC, aliphatic	N	R	R	R	R
Petroleum Ether ether	L	R	R	L	R
Phenol (aqueous solution) phenol	N	R	R	L	N
Potassium Hydroxide, 3N caustic	R	R	R	L	R
Pyridine amine	R	R	N	N	L
Silicone Oils silicone	R	R	R	L	R
Sodium Carbonate (aqueous solution) salt, aqueous solution	R	R	R	L	L
Sodium Chloride (aqueous solution) salt, aqueous solution	R	R	R	L	R
Sodium Dodecyl Sulfate surfactant/detergent	L	L	L	L	L
Sodium Hydroxide, 3N caustic	R	R	R	R	R
Sodium Hydroxide (concentrated) caustic	R	R	R	R	N
Sulfuric Acid (concentrated) acid, inorganic	N	R	L	N	N
TCA (aqueous solution) acid, organic	R	R	R	L	L
Tetrahydrofuran (THF) ether	N	R	N	L	R
Toluene HC, aromatic	N	R	R	R	R
Trichloroethane HC, halogenated	N	R	L	N	L
Trichloroethylene HC, halogenated	N	R	R	N	L
Tween 20 (aqueous solution) surfactant/detergent	L	R	L	L	L
Urea, 8M salt, aqueous solution	R	R	R	L	R
Water (Brine) salt, aqueous solution	R	R	R	L	R
Xylene HC, aromatic	N	R	R	L	R

R = Recommended. No significant change observed in flow rate or bubble point of the membrane, nor visible indication of chemical attack.

L = Limited Recommended Use. Moderate changes in physical properties. The filter may be suitable for short term, non-critical use.

N = Not Recommended. The membrane may be unstable.

- = Insufficient Data. Information is not available. Trial testing is recommended.

## Accelerated Solvent Extraction (ASE)

Accelerated solvent extraction is a common technique for fast and reliable extraction of organic materials from solid matrices using EPA SW-846 Method 3545, Pressurized Fluid Extraction (PFE). Restek offers a wide range of replacement parts to keep your extraction system running smoothly. All parts are economically priced to save you money and are designed to meet or exceed the performance of the original manufacturer's parts.

### Replacement Parts for ASE® 150/350 Systems, Manufacturer's Design

#### Extraction Cell Bodies for ASE® 150/350 Systems

- Cell bodies are serialized for easy sample identification.
- Smooth inner surfaces for easier cleaning.



Extraction Cell Body	Similar to Dionex Part #	Stainless Steel qty.	Stainless Steel cat.#
1 mL for ASE 150/350	068261	ea.	25993
5 mL for ASE 150/350	068262	ea.	25994
10 mL for ASE 150/350	068263	ea.	25995
22 mL for ASE 150/350	068264	ea.	25996
34 mL for ASE 100/300 and 150/350	056646	ea.	26176
66 mL for ASE 100/300 and 150/350	056696	ea.	26178
100 mL for ASE 100/300 and 150/350	056693	ea.	26132

#### Extraction Cell Caps for ASE® 150/350 Systems

- Smooth inner surfaces for easier cleaning.
- Caps include frit, PEEK washer, PTFE O-ring, threaded insert, and snap ring.

Description	Stainless Steel qty.	Stainless Steel cat.#
Replacement Extraction Cell End Caps for ASE 150/350	2-pk.	25997

# Q-sep® QuEChERS Products

*Quick, Easy, Cheap, Effective, Rugged and Safe!*

## Standards Available!

### Standards for AOAC QuEChERS Method 2007.01

See **page 575** for:

- AOAC IS Solution .....cat.# 31963
- AOAC TPP Solution .....cat.# 31964
- AOAC QC Spike Mix.....cat.# 31999

[www.restek.com/quechers](http://www.restek.com/quechers)



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 Distributor



## Replacement Parts for ASE® 200 Systems, Manufacturer's Design

### Extraction Cell Bodies for ASE® 200 Systems

- Cell bodies are serialized for easy sample identification.
- Smooth inner surfaces for easier cleaning.

Extraction Cell Body	Similar to Dionex Part #	Stainless Steel qty.	cat.#
1 mL for ASE 200	054973	ea.	26110
5 mL for ASE 200	054974	ea.	26112
11 mL for ASE 200	048820	ea.	26114
22 mL for ASE 200	048821	ea.	26098
33 mL for ASE 200	048822	ea.	26116



Cell bodies are serialized for easy sample identification.

### Extraction Cell Caps & Replacement Parts for ASE® 200 Systems

- Smooth inner surfaces for easier cleaning.
- Caps include frit, PEEK washer, PTFE O-ring, threaded insert, and snap ring.

Description	Similar to Dionex Part #	Stainless Steel qty.	cat.#
Replacement Extraction Cell End Caps for ASE 200	049450	2-pk.	26096
Threaded Cap Inserts for ASE 200	—	2-pk.	26166
Replacement Frits for ASE 200	049453	10-pk.	26100
Replacement Frits for ASE 200	049453	100-pk.	25959

Description	Similar to Dionex Part #	qty.	cat.#
Snap Rings for Caps for ASE 200	049456	10-pk.	26184
Funnel for ASE 200	056958	ea.	26180
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188



26166



26180

### PEEK Washers for ASE® 200 Systems

- Meet original equipment manufacturer's performance.
- Available in four quantities.

Description	Similar to Dionex Part #	qty.	cat.#
PEEK Washers for ASE 200	049454	12-pk.	25256
		48-pk.	25257
		250-pk.	26120
		1,000-pk.	26229



25256

### 20 mm Filters for ASE® 200 Extraction Cells

- Cellulose or glass fiber construction.
- Fit 11 mL, 22 mL, and 33 mL cells.
- Cellulose filters available in economical 1,000-packs.

Description	Similar to Dionex Part #	qty.	cat.#
Cellulose Filters for ASE 200	049458	100-pk.	26118
Cellulose Filters for ASE 200	049458	1,000-pk.	26190
Glass Fiber Filters for ASE 200	047017	100-pk.	26119



26119

### 60 mL Sample Collection Vials for ASE® 200 Systems

- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and PTFE-lined septa included.

Description	Color	Similar to Dionex Part #	qty.	cat.#
60 mL Collection Vials for ASE 200	Clear	048784	72-pk.	26121
60 mL Collection Vials for ASE 200	Amber	048781	72-pk.	26122
Replacement Caps 24 mm x 0.125" PTFE-lined silicone	—	—	100-pk.	26100



26121

26122

# Accelerated Solvent Extraction (ASE)

## Replacement Parts for ASE® 100/300 Systems, Manufacturer's Design



26167



26169



26187



26174



26188



25393



26168



26191



26260

### Extraction Cell Bodies for ASE® 100/300 Systems

- Cell bodies are serialized for easy sample identification.
- Smooth inner surfaces for easier cleaning.

Extraction Cell Body	Similar to Dionex Part #	Stainless Steel qty.	cat.#
34 mL for ASE 100/300 and 150/350	056646	ea.	26176
66 mL for ASE 100/300 and 150/350	056696	ea.	26178
100 mL for ASE 100/300 and 150/350	056693	ea.	26132

### Extraction Cell Caps & Replacement Parts for ASE® 100/300 Systems

- Smooth inner surfaces for easier cleaning.
- Caps include frit, PEEK washer, PTFE O-ring, threaded insert, and snap ring.

Description	Similar to Dionex Part #	Stainless Steel qty.	cat.#
Replacement Extraction Cell End Caps for ASE 300	056921	2-pk.	26170
Threaded Cap Inserts for ASE 300	—	2-pk.	26167
Replacement Frits for ASE 100/300	—	6-pk.	26174

Description	Similar to Dionex Part #	qty.	cat.#
Snap Rings for Caps for ASE 100/300	056778	12-pk.	26134
Funnel for ASE 100/300	056699	ea.	26169
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188

### PEEK Washers for ASE® 100/300 Systems

- Meet original equipment manufacturer's performance.
- Available in two quantities.

Description	Similar to Dionex Part #	qty.	cat.#
PEEK Washers for ASE 100/300	061687	12-pk.	25393
		48-pk.	25394

### 30 mm Filters for ASE® 100/300 Extraction Cells

- Cellulose or glass fiber construction.

Description	Similar to Dionex Part #	qty.	cat.#
Cellulose Filters for ASE 100/300	056780	100-pk.	26168
Glass Fiber Filters for ASE 100/300	056781	100-pk.	26189

### 250 mL Sample Collection Bottles for ASE® 100/300 Systems

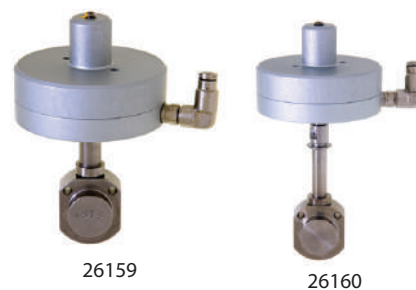
- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and PTFE-lined septa included.

Description	Color	Similar to Dionex Part #	qty.	cat.#
250 mL Collection Bottles for ASE 100/300	Clear	056284	12-pk.	26191
250 mL Collection Bottles for ASE 100/300	Amber	—	12-pk.	26260
Replacement Septa, 24 mm x 0.125", PTFE-lined silicone	—	—	100-pk.	24694

### Valves for ASE® 100/200/300 Systems

- Fits ASE® 100, 200, 300 systems.
- Meets original equipment manufacturer's performance.

Description	Similar to Dionex Part #	qty.	cat.#
Pressure Relief Valve for ASE 100/200/300	048889	ea.	26159
Static Valve for ASE 100/200/300	048778	ea.	26160



### Autoseal Tip Assembly for ASE® 200/300 Systems

- Meets original equipment manufacturer's performance.
- Choose original equipment-equivalent stainless steel or Siltek® deactivation for improved inertness and extended lifetime.

Description	Similar to Dionex Part #	Stainless Steel		Siltek Treated	
		qty.	cat.#	qty.	cat.#
Autoseal Tip Assembly for ASE 200	048811	ea.	26162	ea.	26161
Autoseal Tip Assembly for ASE 300	056641	ea.	26246	ea.	26247



### Tubing Assembly for ASE® 200/300 Systems

- Great value and improved design.
- Eliminates the need for the adaptor fitting on the static and purge valves.

Description	Similar to Dionex Part #	qty.	cat.#
Tubing Assembly for ASE 200	049311	ea.	26251
Tubing Assembly for ASE 300	057059	ea.	26248



### Cell Organizer for ASE® Parts

- Convenient storage of extraction cell parts and consumables.
- Thirteen open bins provide easy visibility and organization for small and large pieces.
- Small footprint conserves valuable lab bench and drawer space.

Description	qty.	cat.#
Cell Organizer for ASE Parts, blue 13-bin unit, 12" l x 12" h x 7.5" d	ea.	23998



### Carrier Basket for ASE® Cells

- Sturdy stainless steel construction to carry full or empty ASE® cells and caps.
- Can hold twelve complete 33 mL cell assemblies and more of smaller sizes.

Description	qty.	cat.#
Carrier Basket for ASE Cells	ea.	23996



# Accelerated Solvent Extraction (ASE)



### Resprep® Tools for ASE® Systems

- Use to insert filter in extraction cell or O-ring in cell cap.
- Fits all extraction cells, except 1 mL size.

#### Inserting a Filter Using Filter Insertion Attachment on Resprep® Tool Handle (ASE® 100/200/300 systems)



Screw the appropriate size attachment onto the end of the Resprep™ tool handle.



Place a filter at the top of the extraction cell.



Push the filter to the bottom of the extraction cell.

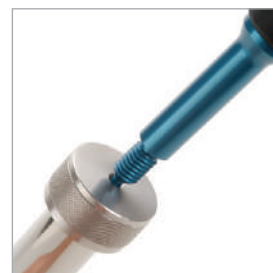
#### Inserting an O-Ring Using Resprep® Tool Handle (ASE® 100/200/300 systems)



Place the O-ring over the tip of the tool.



Insert the tool into the center hole of the extraction cell cap.



Press the tool firmly inside the cap until the O-ring snaps into place.

Description	qty.	cat.#
2-in-1 Filter/O-Ring Insertion Tool Kit for ASE 100/200/300 (includes Resprep Tool Handle and Filter Insertion Attachments)	kit	26181
Resprep Tool Handle for ASE 100/200/300	ea.	26182
Filter Insertion Attachments (1 mL, 5 mL, 11 mL, 33 mL) for ASE 100/200/300	4-piece set	26183



### Retaining Ring Pliers for ASE® 100/200/300 Systems

- Can be used for internal or external retaining rings.
- Works to remove retaining ring in all ASE® cell caps.

Description	qty.	cat.#
Retaining Ring Pliers for ASE 100/200/300	ea.	26185

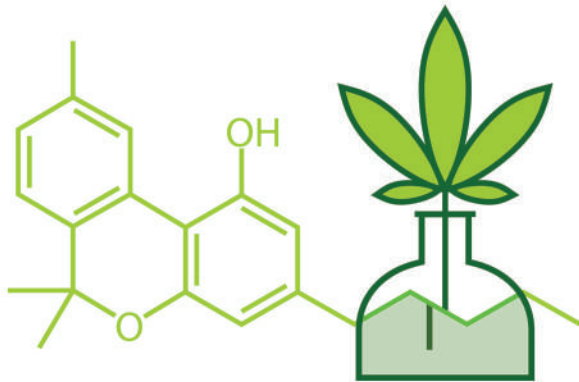


### Cell Cleaning Brushes for ASE® 100/200/300 Cells

- Firm nylon bristle brushes for easy cell cleaning and removal of solid samples.
- Range of sizes to fit all extraction cells for ASE® 100, 200, and 300.

Description	qty.	cat.#
Cell Cleaning Brushes	3-pk.	23999





## Growing Analytical Solutions for Medical Cannabis Labs

PRODUCTS AND EXPERTISE FOR **ACCURATE, RELIABLE RESULTS** EVERY TIME

Whether you are an experienced potency testing chemist or a manager starting up a new lab, Restek has the products and expertise you need for successful medical cannabis analyses. We are proud to have helped medical cannabis labs establish sound analytical practices from the beginning, and we will continue to be there for you every step of the way as the testing landscape changes.

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- Terpene Profiling
- Pesticide Residues

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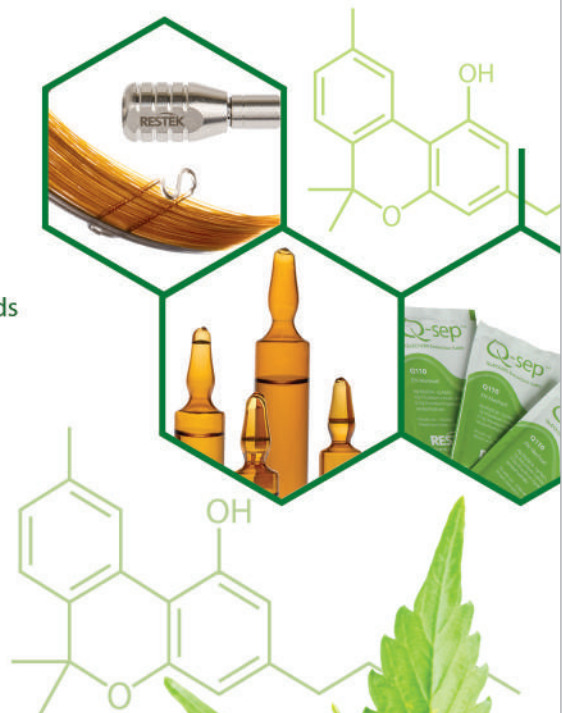
Comprehensive suite of top-quality reference standards helps you report more accurate results.

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For fast, easy removal of matrix components that contaminate inlets and columns and interfere with analysis.

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# Air Sampling

## Canisters & Accessories

- Canisters .....418–422
- Canister Valves & Gauges .....423–424
- Passive Air Sampling Kits .....425–428
- Flow Calibrators .....429
- Canister Accessories .....430–432
- Canister Maintenance/Reconditioning .....433
- Miniature Air Sampling Canisters .....434–435
- Gas Sampling Bags .....436–437
- Thermal Desorption Unit Tubes .....438–440
- PUFs, Resins, Glass Impingers .....441–442
- Gas Calibration Standards .....443–452
- Regulators .....453



# Air Canisters for VOC Sampling

## SilcoCan® & TO-Can® Air Sampling Canisters

- Get high-performance canisters from the innovators of silicon coating technology.
- Variety of options available, including SUMMA can equivalent.
- Standard fittings compatible with all instrumentation and accessories.
- Exclusive manufacturer of 1 L spherical canister.
- Repair service available to extend canister life.

### Canister Options

Sizes	1, 3, 6, 15 L
Valves	RAVE™ diaphragm, Parker® diaphragm, Swagelok® bellows
Interior Coating	Electropolished, Siltek®-treated
Gauges	3 vacuum/pressure ranges

### Applications

Ambient Air	U.S. EPA TO-14A, TO-15, IP-1A, ASTM D5466, OSHA PV 2120, NJ DEP Low Level TO-15
Indoor Air	IP-1A, NJ DEP Low Level TO-15
Vapor Intrusion	
Emergency Response	

### Dimensions/Weights of Air Canisters

Can Volume	Dimensions (height x sphere diameter)		Weight	
	1 liter	8.5 x 5.25"	21.6 x 13.3 cm	2.25 lb
3 liter	11.5 x 7.25"	29.2 x 18.4 cm	3.5 lb	1.59 kg
6 liter	12.5 x 9.25"	31.8 x 23.5 cm	5.75 lb	2.61 kg
15 liter	17 x 12.25"	43.2 x 31.1 cm	11.75 lb	5.33 kg



▶ See pages 421–422 for canister product listings or go to [www.restek.com/air](http://www.restek.com/air) for more air sampling products and solutions.

## Anatomy of a SilcoCan® Canister

### Optional gauge



- Quickly confirm vacuum or pressure inside canister.
- Monitor pressure changes.
- Fully protected by canister frame.
- Can be heated to 110 °C during cleaning.

### Newest surface technology

To ensure sample stability, SilcoCan® canisters are deactivated with innovative Siltek® surface treatment, which chemically bonds a silicon layer to the metal inner surface of the canister. This layer offers unsurpassed inertness for active compounds, including polar and sulfur-containing molecules. It will not crack, chip, or flake off, despite harsh handling in the field or during transport.



### Enhanced valve and canister bracket

Canister holder and valve bracket protect canister, tube stub, and valve.

### 1/4" tube stub

Allows user to interchange valves.

### Serial-controlled label

For quick, sure identification.

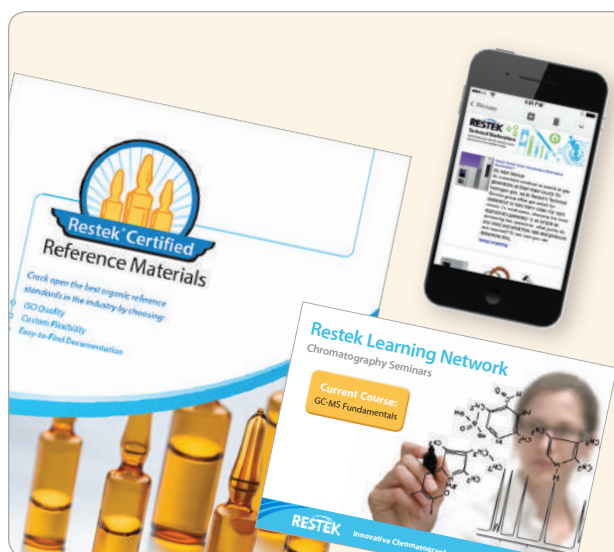
### Rugged stainless steel

Canisters and valves are made of 304 and 316 stainless steel to withstand the rigors of field work.



### Custom Coatings Available from Restek

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high-nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion-resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.



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# Introduce Your Sampling Canisters to Restek® Air Valve Excellence (RAVE™)



RAVE™ valves feature proven long life, leak-free performance, and effortless operation. Now standard on our full line of SilcoCan®, TO-Can®, and miniature air sampling canisters, these newly redesigned valves are also great for upgrading existing canisters.

## RAVE™ Diaphragm Air Valves

### Available options:

- Rugged stainless steel construction with or without Siltek® treatment for added inertness.
- Choose 2 or 3 ports to accommodate optional gauge.
- Diaphragm rebuild kits available to extend the life of your valves.

- **Proven long life**—durable design is engineered to exceed 15,000 cycles.
- **Leak-free performance**—every valve is helium leak-tested to  $1 \times 10^{-6}$  mL/sec.
- **Effortless operation**—easily finger-turn to achieve full valve closure (only 10 in-lb).
- **Enhanced damage-resistance**—W-type valve seats are work-hardened and wetted surfaces contain no moving parts.

Turn to your trusted partner for air sampling and chromatography. Order Restek® Air Valve Excellence for your air sampling canisters today.

▶ See pages 421–423.

[www.restek.com/air](http://www.restek.com/air)





## SilcoCan® Air Sampling Canisters with RAVE™ Valve

Ideal for low-level reactive sulfur (5–20 ppb), TO-14A, or TO-15 compounds

- Siltek®-treated canister with optional Siltek®-treated valve offers unsurpassed inertness, even for sulfur-containing or brominated compounds.
- High-quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms prevent sample adsorption for more-accurate results.
- Canisters and valves made of 304 and 316 stainless steel to withstand the rigors of field work.
- Both 2-port and 3-port valves available; 3-port valve includes -30" Hg/60 psi vacuum/pressure gauge (other gauges available).
- Now featuring the proven long life, leak-free performance, and effortless operation of the new RAVE™ valve. (See page 420 for more information.)

For ultimate inertness, SilcoCan® air sampling canisters feature our unique Siltek® treatment technology. Even highly active components, at low parts-per-billion concentrations, can be readily sampled and stored without loss. The RAVE™ valve is a high-quality, metal-to-metal seal, 2/3-turn valve with metal diaphragms to prevent sample adsorption for more-accurate results. Both stainless steel and Siltek®-treated RAVE™ valves are available, in both the 2-port and 3-port configurations. Each canister is slightly pressurized with contaminant-free nitrogen prior to shipment.

Whether you are sampling for TO-14A, TO-15, or reactive sulfur compounds, SilcoCan® canisters are your best choice for inertness. In Tedlar® bags, the stability of low-level (100 ppbv) sulfur volatile organic compounds (VOCs) is poor, even within 24 hours of sampling. Sulfur compounds react with the metal surface in electro-polished canisters, so they are unsuitable for collecting and storing low-level sulfur VOCs. SilcoCan® air sampling canisters, which feature a Siltek®-treated surface, offer excellent storage stability for sulfur VOCs at very low levels (5–20 ppbv), under dry or humid conditions. The versatility of the SilcoCan® canister makes it an excellent choice for collecting and storing TO-14A or TO-15 compounds.



Canisters are the gold standard for ambient VOC sampling.

## Volume discounts?

Call Restek® Customer Service or your local Restek® representative!

Get the ultimate insurance plan—order your SilcoCan® canister with a Siltek®-treated valve.

Description	1 L Volume cat.#	3 L Volume cat.#	6 L Volume cat.#	15 L Volume cat.#
2-Port RAVE Valve	27400	27404	27408	27412
2-Port Siltek-Treated RAVE Valve	27401	27405	27409	27413
3-Port RAVE Valve with Gauge*	27402	27406	27410	27414
3-Port Siltek-Treated RAVE Valve with Gauge*	27403	27407	27411	27415
without Valve	22090	22091	22092	22093

\*Range of standard gauge is -30" Hg to 60 psi.

Do not exceed canister maximum pressure of 40 psig (2.75 bar).

Note: If attaching any of Restek's passive sampling kits to a 3 L canister, use a Siltek®-treated (cat.# 563646) or stainless steel (cat.# 563647) connector between the two components. Please contact Restek® Customer Service or your local Restek® representative to order.



## Stable Storage of 66 VOCs for 30 Days With SilcoCan® Air Sampling Canisters

Download the free application note by searching for "EVAN2066-UNV" at

[www.restek.com](http://www.restek.com)



### TO-Can® Air Sampling Canisters with RAVE™ Valve

Optimized for Methods TO-14A, TO-15, IP-1A, ASTM D5466, OSHA PV 2120, and NJ DEP Low Level TO-15

- Proprietary electropolished surface maintains compound stability.
- High-quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms prevent sample adsorption for more-accurate results.
- Both 2-port and 3-port valves available; 3-port valve includes -30" Hg/60 psi vacuum/pressure gauge (other gauges available).
- SUMMA canister equivalent.
- Now featuring the proven long life, leak-free performance, and effortless operation of the new RAVE™ valve. (See page 420 for more information.)

U.S. EPA Methods TO-14A and TO-15 regulate the collection, storage, and analysis of volatile organic compounds (VOCs) using treated air sampling canisters. Restek offers a complete line of TO-Can® canisters (SUMMA can equivalent), electropolished using a proprietary process and extensively cleaned using an ultrasonic method. This ensures a high-quality, passivated surface that maintains the stability of TO-14A/TO-15 compounds during storage. A frame surrounds the electropolished canister, eliminating the need for weld marks on the sphere, thereby preventing active sites on the canister. The RAVE™ valve supports the excellent performance of the canister.

A unique holder attaches the handle and base to the canister without welds and protects the canister, tube stub, and valve. The 2/3-turn diaphragm valve has a metal-to-metal seat and a temperature limit of 250 °C. Each canister is slightly pressurized with contaminant-free nitrogen prior to shipment.

Quickly confirm vacuum or pressure by ordering your SilcoCan® or TO-Can® canisters with high-quality premounted gauges.

Description	1 L Volume cat.#	3 L Volume cat.#	6 L Volume cat.#	15 L Volume cat.#
2-Port RAVE Valve	27416	27418	27420	27422
3-Port RAVE Valve with Gauge*	27417	27419	27421	27423
without Valve	22094	22095	22096	22097

\*Range of standard gauge is -30" Hg to 60 psi.

Do not exceed canister maximum pressure of 40 psig (2.75 bar).

also available

Miniature Air Sampling Canisters

See page 435.



### Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is -30" Hg to 60 psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.\*

Gauge	Suffix
-30" Hg/15 psi	-651
-30" Hg/30 psi	-652

\*No price difference for these substituted gauges.

### free literature

A Guide to Whole Air Canister Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

*In this guide, we focus on collecting whole air samples in canisters, a flexible technique with many applications.*

Download your free copy from [www.restek.com](http://www.restek.com) by searching for "EVTG1073A"



## Valves and Gauges for Air Sampling Applications

### Replacement RAVE™ Diaphragm Valves

- Proven long life—durable design is engineered to exceed 15,000 cycles.
- Leak-free performance—every valve is helium leak-tested to  $1 \times 10^{-6}$  mL/sec.
- Effortless operation—easily finger-turn to achieve full valve closure (only 10 in-lb).
- Enhanced damage-resistance—W-type valve seats are work-hardened and wetted surfaces contain no moving parts.
- Now standard on our full line of SilcoCan®, TO-Can®, and miniature air sampling canisters.



Description	qty.	Siltek-treated cat.	Stainless Steel cat.
1/4" Replacement Diaphragm Valve, RAVE (2-port)	ea.	26386	26385
1/4" Replacement Diaphragm Valve, RAVE (3-port)	ea.	26388	26387
RAVE Diaphragm Rebuild Kit (includes: 3 diaphragms)	kit	26390	26389



### Replacement Swagelok® SS4H Bellows Valve

- All metal flow path prevents sample adsorption, giving more accurate results.
- Unique serial number on each valve for complete traceability.
- Withstands temperatures of up to 300 °C.
- Rugged performance in the field.
- Fast delivery from Restek!

Description	qty.	cat.
Replacement 1/4" Swagelok SS4H Bellows-Sealed Valve (2-port)	ea.	24148

Replacement 1/4" Swagelok SS4H bellows-sealed valves are available on SilcoCan canisters as a custom product. Contact Technical Service for more information.



24148

### Replacement Combination Vacuum/Pressure Gauges

2-inch vacuum/pressure gauges, 316 stainless steel with 1/8" NPT fitting and center back mount. Recommended for use with canisters.

Description	qty.	cat.#
-30" Hg/15 psi Vacuum/Pressure Gauge	ea.	24100
-30" Hg/30 psi Vacuum/Pressure Gauge	ea.	24104
-30" Hg/60 psi Vacuum/Pressure Gauge	ea.	24108



24108

### Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is -30" Hg to 60 psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.\*

Gauge	Suffix
-30" Hg/15 psi	-651
-30" Hg/30 psi	-652

\*No price difference for these substituted gauges.

### Vacuum Gauges

High-quality vacuum gauges with 316 stainless steel wetted surfaces. -30" Hg to 0" Hg. Recommended for use with passive sampling kits. All are rear mount.

Description	Fittings	qty.	cat.#
2" Vacuum Gauge	1/8" NPT	ea.	24269
2" Vacuum Gauge	1/4" NPT	ea.	24270
1 1/2" Vacuum Gauge	1/8" NPT	ea.	24120



24120





24285



24268

### Ashcroft® Test Gauges

- Accurate measurement of vacuum to -30" Hg and pressure to 60 psi.
- Available in both analog and digital formats.
- Accuracy to +/- 0.25%.
- Gauge connector to canister valve available.

High-accuracy test gauges are recommended for verifying the vacuum/pressure in canisters before and after sampling. The 6-inch face on the analog gauge allows for easy reading. The digital gauge operates on two AAA batteries and offers an unambiguous readout. Both gauges have an accuracy of +/- 0.25% and all-metal wetted parts.

Description	qty.	cat.#
Analog Test Gauge, 6" diameter, 1/4" NPT	ea.	24285
Digital Test Gauge, 3" diameter, 1/4" NPT	ea.	24268
Ashcroft Gauge Connector to Canister Valve, stainless steel, connects 1/4" male NPT to 1/4" male compression fitting	ea.	22121

## Choose the Appropriate Device for Your Sampling Needs



	Canister	Gas Sampling Bag	Thermal Desorption Unit (TDU) Tube
<b>Media Type</b>	whole air	whole air	adsorption
<b>Sensitivity</b>	ppb	ppm	ppm
<b>Technique</b>	passive (no pump)	active	active
<b>Sample Type</b>	grab or integrated	grab	integrated
<b>Analyte</b>	wide range of VOCs	wide range of VOCs & permanent gases	sorbent-specific
<b>Applications</b>	ambient, IAQ, emergency response, IH	ambient, IAQ emission	IAQ, IH
<b>Durability</b>	reusable	one-time use	one-time use
<b>Inertness</b>	excellent	fair	fair
<b>Stability</b>	30 day	48 hours	varies by analyte
<b>Sample Volume</b>	0.4–6 L	0.5–100 L	varies by analyte
<b>Sampling Time</b>	minutes to days	minutes to hours	minutes to hours

See pages 421–422 for canisters. See page 436 for gas sampling bags.  
See page 438 for canister and thermal desorption tube comparison.

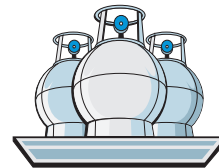


**Passive Air Sampling Kits—Integrated** (Stainless Steel & Siltek®-Treated)  
Superior Performance—an Excellent Restek® Value

- Provide accurate integrated sampling without a sampling pump.
- Siltek®-treated components ensure accurate sampling of active components.
- Excellent for sampling times from 0.5 hour to 125 hours.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples and is easy to assemble for field sampling.\* The improved filter design greatly reduces the number of potential leak sites.

The passive air sampling kit is available in seven sampling flow ranges and in stainless steel or Siltek®-treated finish. The stainless steel kit is ideal to partner with the Restek® TO-Can® air sampling canister for TO-14A and TO-15 methods. Use the Siltek®-treated version with the Restek® SilcoCan® air sampling canister when collecting low-level volatile sulfur compounds or other active compounds.



also available

▶ See **page 434** for miniature air sampling kits.

▶ See **page 433** for canister and flow controller repair service.

Canister Volume/Sampling Time					Flow	Orifice Size	Siltek-Treated cat.#	Stainless Steel cat.#
400 cc	1 Liter	3 Liter	6 Liter	15 Liter				
8 hour	24 hour	48 hour	125 hour	—	0.5–2 mL/min	0.0008"	24217	24216
2 hour	4 hour	12 hour	24 hour	60 hour	2–4 mL/min	0.0012"	24160	24165
1 hour	2 hour	6 hour	12 hour	30 hour	4–8 mL/min	0.0016"	24161	24166
—	1 hour	4 hour	8 hour	20 hour	8–15 mL/min	0.0020"	24162	24167
—	—	2 hour	3 hour	8 hour	15–30 mL/min	0.0030"	24163	24168
—	—	1 hour	1.5 hour	4 hour	30–80 mL/min	0.0060"	24164	24169
—	—	—	0.5 hour	1 hour	80–340 mL/min	0.0090"	22101	22100

\*Vacuum/pressure gauge included in kit; air sampling canisters sold separately.

**1. Veriflo® SC423XL flow controller**

This flow controller is the heart of the sampling train. It is a high-quality device designed to maintain a constant mass flow as the pressure changes from –30" Hg to 7" Hg (we recommend you stop sampling at or before 7" Hg of vacuum). All wetted parts of the flow controller can be Siltek® treated.

**2. Stainless steel vacuum gauge, 1/8-inch NPT**

Fitted to the flow controller, the gauge monitors canister vacuum change during sampling.

**3. 1/4-inch Siltek® sample inlet**

The 0.3 m x 1/4" tubing includes a stainless steel nut on the inlet end to prevent water droplets from accumulating at the edge of the tubing, where they could be pulled into the sampling train.

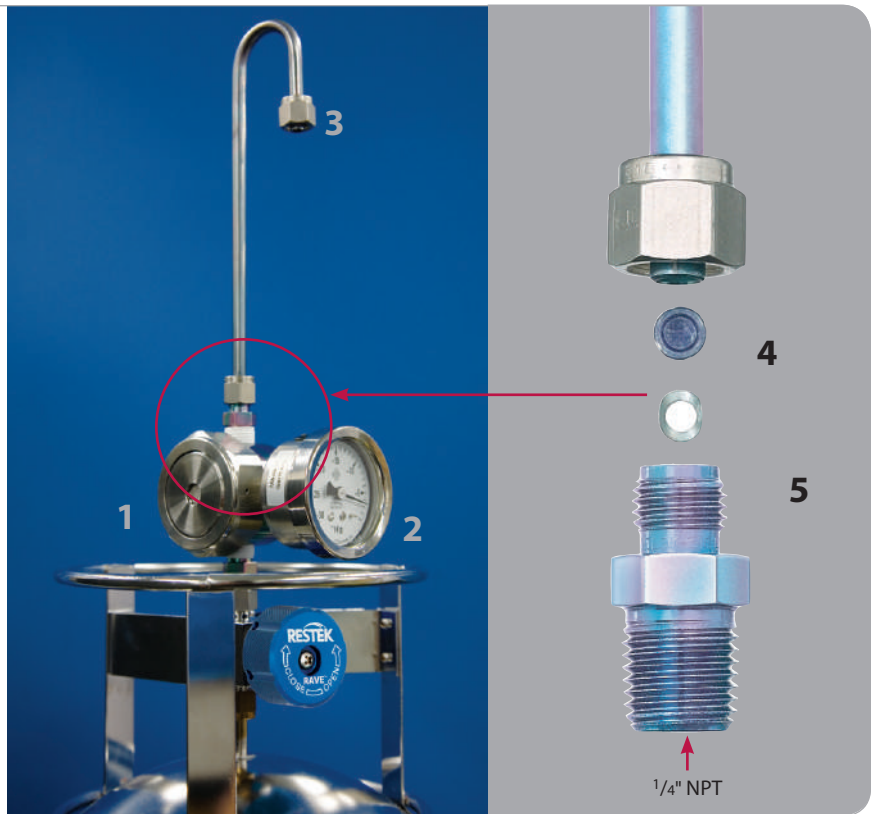
**4. 2-micron frit filter and washer**

Located prior to the critical orifice to prevent airborne particles from clogging the critical orifice. Replaceable. Available in stainless steel or Siltek® treated for optimum inertness.

**5. Interchangeable critical orifice**

An interchangeable ruby critical orifice allows you to control the flow with very high precision.

Note: All fitting connections are 1/4" tube, except where noted.



## Stock up or buy only the parts you need now!

### Replacement Orifices

Use these orifices with a Veriflo® 423XL flow controller to change the flow range for alternative sampling times.



24249

Description	Flow	Orifice Size	Siltek Treated cat.#	Stainless Steel cat.#
Replacement Orifice	0.5–2 mL/min	0.0008"	24219	24218
Replacement Orifice	2–4 mL/min	0.0012"	24233	24245
Replacement Orifice	4–8 mL/min	0.0016"	24234	24246
Replacement Orifice	8–15 mL/min	0.0020"	24235	24247
Replacement Orifice	15–30 mL/min	0.0030"	24236	24248
Replacement Orifice	30–80 mL/min	0.0060"	24237	24249
Replacement Orifice	80–340 mL/min	0.0090"	22099	22098



24171

24170

### 2 µm Frit Filters

For use in critical orifice fitting. Includes washers.

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
Replacement Frit Filter	3-pk.	24171	24170

### Veriflo® Flow Controllers

Veriflo® 423XL flow controllers are offered in a Siltek®-treated and stainless steel version. The flow device is available with or without a critical orifice. (Vacuum gauge sold separately.)

The critical orifice in a Veriflo® flow controller is interchangeable. Order orifices for alternate sampling times, or replacement orifices, separately.



24262

Description	Flow	Orifice Size	Siltek Treated cat.#	Stainless Steel cat.#
Veriflo Flow Controller	0.5–2 mL/min	0.0008"	24232	24229
Veriflo Flow Controller	2–4 mL/min	0.0012"	24255	24260
Veriflo Flow Controller	4–8 mL/min	0.0016"	24256	24261
Veriflo Flow Controller	8–15 mL/min	0.0020"	24257	24262
Veriflo Flow Controller	15–30 mL/min	0.0030"	24258	24263
Veriflo Flow Controller	30–80 mL/min	0.0060"	24259	24264
Veriflo Flow Controller	80–340 mL/min	0.0090"	22103	22102
Veriflo Flow Controller	—	without orifice	24238	24239



24266

### 7 µm In-Line Filter

This 316 stainless steel filter is designed to collect particles larger than 7 microns. We offer Siltek®-treated and stainless steel versions (1/4" compression fitting on both ends).

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
7 µm In-Line Filter	ea.	24265	24266

Note: frit is not replaceable.

### Sample Inlets

- Inlets have 1/4" stainless steel compression fitting on each end.
- One end connects to flow controller or canister; nut on other end serves as rain guard.
- Includes nuts and ferrules.
- Two different lengths for use with large canisters and miniature canisters.

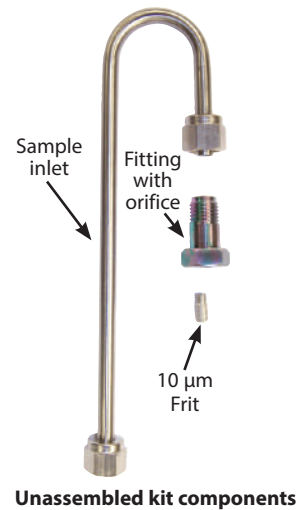


26211

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
Sample Inlet, 6" Length	ea.	26210	26209
Sample Inlet, 1.5" Length	ea.	26212	26211

### Passive Air Sampling Kits—Grab (Stainless Steel & Siltek®-Treated)

- Use with 1, 3, or 6 L canisters for grab air sampling.
- Variety of orifice sizes for fast sampling from 5 to 60 minutes.
- Connect 1/4" compression fitting directly to canister valve inlet.
- Replaceable frit protects orifice and valve from particulates.
- Sample inlet design minimizes water entry into sampling train.
- Individual replacement components available.



Unassembled kit components

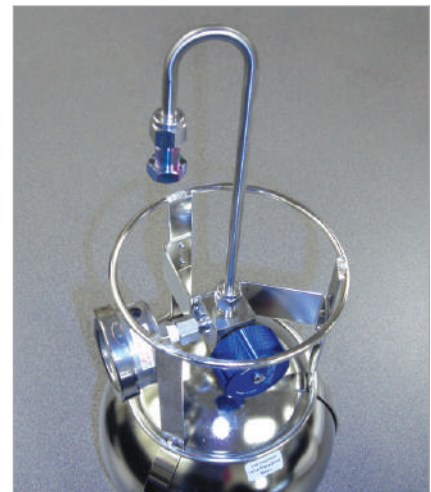
Canister Volume/Sampling Time (min)			Flow	Orifice Size	Siltek-Treated	Stainless Steel
1 Liter	3 Liter	6 Liter			cat.#	cat.#
60	—	300	15 mL/min	0.0018"	26280	26263
45	—	240	20 mL/min	0.0020"	26281	26264
15	60	120	45 mL/min	0.0030"	26282	26265
10	30	60	80 mL/min	0.0040"	26283	26266
5	15	30	150 mL/min	0.0055"	26284	26267
—	—	15	300 mL/min	0.0080"	26285	26268
—	5	10	390 mL/min	0.0090"	26286	26269
—	3	5	>1,000 mL/min	0.0130"	26287	26270

Air sampling canisters sold separately.

### Replacement Fittings for Grab Sampling Kits

Includes fitting and orifice.

Description	Orifice Size	Siltek-Treated cat.#	Stainless Steel cat.#
Replacement Fitting for Grab Sampling Kit	0.0018"	26288	26271
Replacement Fitting for Grab Sampling Kit	0.0020"	26289	26272
Replacement Fitting for Grab Sampling Kit	0.0030"	26290	26273
Replacement Fitting for Grab Sampling Kit	0.0040"	26291	26274
Replacement Fitting for Grab Sampling Kit	0.0055"	26292	26275
Replacement Fitting for Grab Sampling Kit	0.0080"	26293	26276
Replacement Fitting for Grab Sampling Kit	0.0090"	26294	26277
Replacement Fitting for Grab Sampling Kit	0.0130"	26295	26278



Assembled kit on canister

Air sampling canisters sold separately.

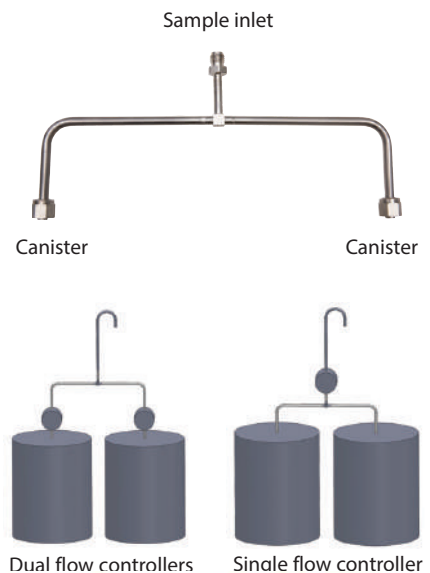
### Replacement 10 µm Frits for Grab Sampling Kits

Description	qty.	Siltek-Treated cat.#	Stainless Steel cat.#
10 µm Frit for Grab Sampling Kit	3-pk.	26296	26279

### Dual Canister Sampling Manifold (Stainless Steel & Siltek®-Treated)

- Duplicate sampling with all canister sizes using one or two flow controllers.
- Precise dimensions (9.5" wide x 3.5" high) provide accurate splitting of sample between two canisters.
- One-piece design means fewer leaks.
- Thick-walled stainless steel tubing is rugged enough for field use.
- Uses 1/4" compression connections.

Field duplicates of canister samples frequently result in analyte concentrations with high relative standard deviations. In addition, field duplicates do not differentiate laboratory performance from sampling variability. Restek's dual canister sampling manifold (DCSM) minimizes sampling variability through a single sample inlet and flow controller by which the sample is evenly collected between two canisters. Use of a single flow controller eliminates flow rate variability, as well as environmental variables common with collocated samples. The DCSM may also be used with two flow controllers to monitor individual canister vacuum.



Description	qty.	Siltek-Treated cat.#	Stainless Steel cat.#
Dual Canister Sampling Manifold	ea.	24999	24998

Note: Do not use the DCSM on handle tanks or resistors.





**Assembled kit on canister**  
 Air sampling canisters sold separately.

**Passive Air Sampling Kits—Soil Gas** (Stainless Steel & Siltek®-Treated)

This unique grab sampler is specifically designed for soil gas sampling by allowing the connection of tubing coming from the soil gas sample port. The innovative design minimizes connections and leaks and houses a critical orifice in the tee fitting. It also incorporates a vacuum gauge and 2 µm frit filter.

Assembled sampler includes:

- Stainless steel tee with orifice.
- Variety of orifice sizes for sampling from 4 minutes to 10 hours.
- 1 1/2" vacuum gauge (-30" Hg to 0" Hg).
- 2 µm frit filter for insertion into 1/4" compression sample inlet.

The 1/4" compression inlet and outlet allows easy connection to the canister valve and also to the tubing from the sample port. Several orifice sizes provide sampling times from 4 minutes to 10 hours on a 6 L canister. Individual replacement parts are available, providing a cost-effective alternative to replacing the entire sampler.

Canister Volume/Sampling Time		Flow	Orifice Size	Siltek-Treated	Stainless Steel
1 Liter	6 Liter			cat.#	cat.#
4 min	20 min	210 mL/min	0.0065"	22935	22930
6 min	30 min	150 mL/min	0.0055"	22936	22931
10 min	1 hr	80 mL/min	0.0040"	22937	22932
30 min	3 hr	30 mL/min	0.0025"	26337	26336
45 min	4 hr	19 mL/min	0.0020"	22938	22933
2 hr	10 hr	6 mL/min	0.0014"	22939	22934

Air sampling canisters sold separately.



**Replacement Tees w/Orifice for Soil Gas Sampler Kits**

Description	Orifice Size	Siltek-Treated cat.#	Stainless Steel cat.#
Soil Gas Sampler Replacement Tee w/Orifice	0.0065"	22945	22940
Soil Gas Sampler Replacement Tee w/Orifice	0.0055"	22946	22941
Soil Gas Sampler Replacement Tee w/Orifice	0.0040"	22947	22942
Soil Gas Sampler Replacement Tee w/Orifice	0.0025"	26339	26338
Soil Gas Sampler Replacement Tee w/Orifice	0.0020"	22948	22943
Soil Gas Sampler Replacement Tee w/Orifice	0.0014"	22949	22944

**Replacement Parts for Soil Gas Sampler Kits**

Description	qty.	cat.#
Vacuum Gauge, 1 1/2"	ea.	24120
Replacement Frit Filter, Stainless Steel	3-pk.	24170
Replacement Frit Filter, Siltek-Treated	3-pk.	24171
Port Connector, 1/4", Siltek/Sulfinert-Treated	ea.	21549
Port Connector, 1/4", Stainless Steel	2-pk.	21936
Nut & Ferrule Set, 1/4", Stainless Steel	5-pk.	21911
Nut, 1/4", Stainless Steel	10-pk.	21902



(Frits do not control flow.)

**also available**

**VCO® Fittings**

- Use VCO® fittings for rapid assembly to cleaning system.
- Protect canister valves, flow controllers, and cleaning system fittings.

See **page 316**.





### Alicat M-Series Flow Calibrators

- Accurate—NIST-traceable and rated at 0.8% of the reading + 0.2% full-scale repeatability; calibration documents provided with each unit.
- Fast—5 ms response speed with no warm-up required.
- Convenient—no computer connection or software required and all data is visible on one screen.
- Tough—stainless steel construction; unaffected by bumps, humidity, or changes in orientation and supported by an Alicat lifetime warranty.\*
- Downloadable—data can be recorded on a computer via RS-232 connection (unit has no on-board data logging).
- Long-lasting—portable models with lithium-ion battery offer 5 hours (color) or 18 hours (monochrome) of use between charges; rated for 500 cycles before decline to 85%.\*\*

Quickly and precisely verify flow rates generated by vacuum or pressure before going into the field. These compact, convenient units are ideal for real-time calibration of air flow controllers, passive sampling kits, air canisters, sampling pumps, and more. They measure absolute pressure, mass flow, volumetric flow, and temperature of 30 different gases across a wide range of flows. Choose a lab-based or convenient battery-powered portable model.



26437



26438

Monochrome display shown; also available in color.

#### Specifications:

Accuracy at Calibration Conditions After Tare:	± 0.8% of reading + 0.2% of full scale
High Accuracy at Calibration Conditions After Tare:	± 0.4% of reading + 0.2% of full scale
Accuracy for Bidirectional Meters at Calibration Conditions After Tare:	± 0.8% of reading + 0.2% of total span from positive full scale to negative full scale
Repeatability:	± 0.2% full scale
Zero Shift and Span Shift:	0.02% full scale / °C / atm
Operating Range / Turndown Ratio:	0.5% to 100% full scale / 200:1 turndown
Maximum Measurable Flow Rate:	128% full scale
Typical Response Time:	10 ms (adjustable)
Warm-Up Time:	<1 second
Operating Temperature:	-10 to +50 °C
Humidity Range (non-condensing):	0 to 100%
Maximum Internal Pressure (static):	145 psig
Wetted Materials:	303 & 302 stainless steel, Viton®, silicone RTV (rubber), glass-reinforced nylon, aluminum
Programmed Gases:	Acetylene, air, argon, butane, carbon dioxide, carbon monoxide, ethane, ethylene (ethene), helium, hydrogen, iso-butane, krypton, methane, neon, nitrogen, nitrous oxide, oxygen, propane, sulfur hexafluoride, xenon, A-25, A-75, A1025, C-2, C-8, C-10, C-25, C-75, P-5, Star29
Dimensions:	cat.#s 26434 & 26438: 3.9" H x 2.4" W x 1.1" D; 0.8 lb cat.#s 26435 & 26439: 4.1" H x 2.4" W x 1.1" D; 1.0 lb cat.#s 26432 & 26436: 6.4" H x 2.4" W x 1.1" D; 1.0 lb cat.#s 26433 & 26437: 6.7" H x 2.4" W x 1.1" D; 1.2 lb

Description	Flow capacity	qty.	Color Display	Monochrome Display
			cat.#	cat.#
Portable Mass Flow Calibrator	0-50 sccm	ea.	26432	26436
Portable Mass Flow Calibrator	0-500 sccm	ea.	26433	26437
Lab-Based Mass Flow Calibrator	0-50 sccm	ea.	26434	26438
Lab-Based Mass Flow Calibrator	0-500 sccm	ea.	26435	26439

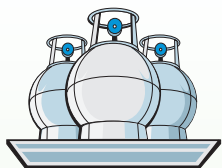
Monochrome display shown; also available in color.

\*Restek Recommends: Recalibrate your Alicat flow calibrator once every year to maintain lifetime warranty. Prolonged failure to recalibrate your unit may result in increased error. To always get the most accurate measurements, contact Restek® Customer Service to send in your flow calibrator for service, recertification, and recalibration (cat.# 26462).

\*\* NOTE: Handling, removing, or replacing the battery will void the Alicat warranty.

coming soon  
Mesa Labs Flow Calibrators

[www.restek.com](http://www.restek.com)



Feature	Benefit
Large capacity—holds twelve 6 L cans or twenty-four 1 L cans.	Twice the capacity of other ovens for faster turnaround.
Embedded touch screen controller.	No separate computer needed.
Adjustable oven control up to 110 °C.	Cleans canisters AND valves faster and more completely than heating bands.
Ten user defined methods.	Each cleaning cycle parameter can be configured separately to minimize overall cycle time.
Oil-free Edwards vacuum pump.	Cheaper to run and maintain than 2-pump alternatives; lowers risk of contamination.
Humidifier	Provides humidified nitrogen to improve cleaning process.
Dimensions: 44" H x 48" W x 27" D.	Small footprint saves valuable lab space.
Oven cart available as option.	Saves bench space and provides convenient mobility.

	Restek	Competitor A
Capacity	Twelve 6 L cans	Six 6 L cans
Software	Included	Separate

[www.restek.com/air](http://www.restek.com/air)

## for more info

Search for **EVTS1186A-UNV** at [www.restek.com](http://www.restek.com)

### Specifications:

#### TO-Clean Oven

Dimensions: 44" H x 48" W x 27" D  
Weight: 525 lb

#### Cart

Dimensions: 29" H x 48" W x 30" D  
Weight: 340 lb

Note: Ovens are built on demand; therefore, a ten-week lead time is required on all orders. A limited cancellation and return policy applies to TO-Clean ovens; contact Restek® Customer Service for details.

**TO-Clean Canister Cleaning System** High capacity, fully automated, easy-to-use canister cleaning oven dramatically increases lab efficiency.

- Oil-free pump lowers risk of contamination.
- EPA Method TO-14A/15 compliant.
- Powerful 6i pump can achieve 50 mTorr in <25 minutes for twelve 6 L canisters; higher power 10i option also available.
- Custom-built trays for different canister sizes.
- Humidifier provides humidified nitrogen to improve cleaning process.
- One-year limited warranty.
- Fully assembled and ready to use.

### Cut Cleaning Time in Half

Get finished cleaning faster—the high capacity interior holds twice as many canisters as similar models, which lets you finish cleaning in half the time. EPA Method TO-14A/15 compliant unit holds up to twelve 6-liter or twenty-four 1-liter canisters.



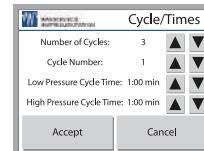
### Oven Control at Your Fingertips

Isothermal oven cleans both canisters and valves faster and more completely than a heating band system. Temperature is adjustable up to 110 °C.

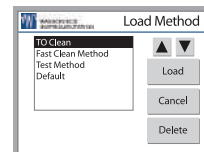
### Easily Create Custom Cleaning Programs

Create up to 10 different methods using the on-board touch screen controller. Define the number of cycles, pressure, and soak times; then save the method for later use. Ensures consistent procedures are followed and makes operation as simple as pressing "start".

Easily create custom methods.

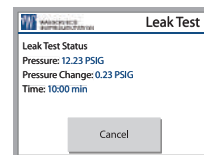


Choose a saved method for a fast start and consistent process.



### Ensure Performance with Easy, On-Board Diagnostics

With embedded diagnostic software, you can check for leaks and test valve operation at the touch of a button. Quick and easy system verification ensures effective cleaning. No separate computer needed.



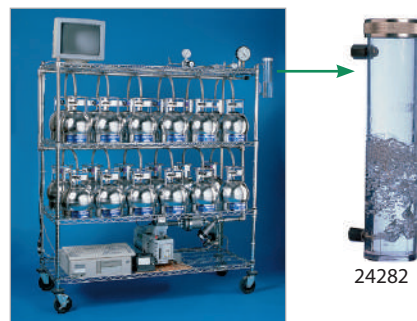
Description	Type	Voltage	qty.	cat.#	
TO-Clean Oven w/Oil Free Pump	Edwards nXDS6i Dry Scroll Pump	120 V, 60 hz	ea.	26379	
TO-Clean Oven w/Oil Free Pump	Edwards nXDS6i Dry Scroll Pump	220/230 V, 50/60 hz	ea.	26380	
TO-Clean Oven w/Oil Free Pump	Edwards nXDS10i Dry Scroll Pump	120 V, 60 hz	ea.	26381	
TO-Clean Oven w/Oil Free Pump	Edwards nXDS10i Dry Scroll Pump	220/230 V, 50/60 hz	ea.	26382	
<b>Optional Accessories (not included with TO-Clean Oven)</b>				<b>qty.</b>	<b>cat.#</b>
Oil-free Pump Silencer			ea.	26383	
Oil-free Pump Exhaust Tubing for customer exhaust (10' PVC tubing, clamps, adapters, O-rings)			ea.	26384	
Oven Cart, 29" H x 48" W x 30" D, 12 gauge steel, push handle and casters			ea.	22919	
1 L Option: includes tubing, fittings, and inserts for twenty-four 1 L canisters			ea.	22920	
3 L Option: includes tubing, fittings, and inserts for twelve 3 L canisters			ea.	22126	
Mini-Can Option: includes tubing, fittings, and inserts for either forty-eight 400 cc or forty-eight 1,000 cc mini-canisters			ea.	22127	

Shipping: FedEx Ground, unless otherwise requested. Costs vary depending on ship-to location.

### Humidification Chamber

When cleaning SilcoCan® or TO-Can® canisters, it is important to use humidified air or nitrogen to help remove volatile organic contaminants. Restek's humidification chamber is made of acrylic and withstands pressure up to 90 psi. The 1/4-inch inlet and outlet compression fittings allow easy connection to pressure lines on your cleaning system. Our humidification chamber also has an easy-to-open lid for filling with water.

Description	qty.	cat.#
Humidification Chamber	ea.	24282



Restek's canister cleaning system with humidification chamber.

### Canister Air Sampling Timer

- Program up to 12 timed events!
- Capable of both manual and automated operation.
- Perfect for either grab or time-integrated sampling.
- Long battery life; recharges conveniently using the USB port on any PC.
- All stainless steel sample flow path ensures inertness, improving accuracy.



These timers are designed to simplify both automated and manual air sampling. The easy-to-use keypad and graphic display facilitate the programming of up to 12 timed events. They offer the convenience of remote start/stop sampling and permit intermittent sampling throughout a test period. The LCD remains in sleep mode when not in use, greatly extending battery life. Timers are compatible with any canister and flow controller.

Features include solenoid valve for sampling control, 1/4" inlet and outlet fittings, highly inert stainless steel flow path, and waterproof exterior for outdoor use.

Description	qty.	cat.#
Canister Air Sampling Timer	ea.	24267



Canister and passive air sampling kit must be purchased separately.



Restek's Innovations and Technical Service Groups feature several chemists with hands-on EPA and environmental lab experience, particularly with air sampling and testing—and they are ready to help.





Air canister tripod conveniently holds two air canisters.

### Air Canister Tripod

- Lightweight (12 lb) and compact for easy storage and transport.
- Extends from 6' to 9' high.
- Large base provides enhanced stability without additional supports.
- Sturdy, rugged metal design for outdoor sampling and transport.

Restek's air canister tripod holds two canisters simultaneously for collocated ambient air sampling. The custom-designed bracket holds most 1, 3, and 6 L canisters\* securely without any tools.



Description	qty.	cat.#
Air Canister Tripod	ea.	24151

\*Air sampling canisters sold separately.



Restek canisters are shipped in boxes with handles for easy transportation.

### Canister Carrying Supplies

#### Canister Carrying Box Kit

6-liter carrying boxes with plastic handles simplify canister transport. Four carrying boxes and one shipping box per kit.

Description	qty.	cat.#
Canister Carrying Box Kit	kit	24215

#### Canister Carrying Case

- Heavy-duty, all-aluminum design fits two 6 L SilcoCan<sup>®</sup> or TO-Can<sup>®</sup> canisters tightly without foam.
- Weight: 9 lb.
- Inside dimensions: length 18", width 9 1/8", height 12 1/2" (46 x 23 x 32 cm).
- No organic contaminants from foam or plastics.



Description	qty.	cat.#
Deluxe Canister Carrying Case	ea.	24226



## How to Extend Canister Life

What reduces canister performance and longevity? Leakage is the most common reason for canister retirement, but contamination and damage to the silicon lining can also send canisters to the scrapyards prematurely. Here are some tips to protect your investment:

### 1. Prevent leaks

Use proper handling to avoid these three leading causes of leaks.

#### a. Particles in the valve

You can prevent particles from entering the valve by always using a 2 or 7  $\mu\text{m}$  particulate filter during sampling and on your canister-cleaning equipment. Also, protect the valve inlet by replacing the brass dust cap when not in use. The EPA-recommended metal-to-metal sealing valves provide the greatest inertness, but tend to be more sensitive to particulate damage than other valve types.

#### b. Galled thread fittings

Avoid galled thread fittings by using a gap gauge to prevent overtightening of compression fittings. Turning only  $\frac{1}{4}$  turn past finger-tight is another rule of thumb to prevent overtightening. Use brass compression fittings on stainless steel during nonsampling activities, such as cleaning or calibration, to minimize thread damage. Galled threads may also cause a poor connection to vacuum/pressure gauges, resulting in inaccurate measurement and the misleading conclusion that canister leakage exists.

#### c. Overtightened valve

Canister valves are designed to close securely with hand tightening only. Overtightening a valve closure with a wrench may damage the valve seat where the seal is made.

### 2. Reduce contamination

a. Segregate high concentration (ppm) cans and trace concentration (ppb) cans. Use dedicated canisters, or gas sampling bags, for ppm-level sampling, since it is extremely difficult to remove impurities from ppm sampling to a level suitable for trace sampling.

b. Clean the entire sampling train as you would the can to minimize introduction of contaminants into a clean can. Maximum temperature is 110 °C on the gauge and 130 °C on Restek's Veriflo® flow controller.

c. High-temperature (>100 °C) humidified air (steam cleaning) provides the most effective way to remove contamination from electropolished cans (TO-Can® or SUMMA canisters), but can damage silicon-lined cans (SilcoCan® canisters).

### 3. Avoid damage to silicon-lined cans

Be sure to follow method recommendations when cleaning your canisters to avoid oxygen damaging the silicon lining. Cleaning studies of SilcoCan® canisters using humidified air and heat at 80 °C and 125 °C have shown reduced recoveries of sulfur compounds when compared to using nitrogen under the same conditions. This irreversible damage is due to oxidation of the surface, creating active sites that may affect the recovery of reactive or polar compounds. Strong acids and bases may also result in damage to the internal can surface.

## Canister and Flow Controller Repair Service

Save money and increase performance with Restek's canister and flow controller repair service.

Normal wear and tear on canisters and components can result in damage and leakage. Restek's repair service allows you to extend the life of your equipment for much less than the cost to replace with new products. Contact Restek® Customer Service or your local Restek® representative to take advantage of this service. You will be given instructions and an RMA # to return the parts and completed health & safety declaration to us.

#### Sampling Kit/Flow Controller Repair

Includes all new rubber seals in flow controller and orifice and frit replacement  
cat.# 550131

#### Canister Repair

Includes valve replacement, leak test & cleaning  
for RAVE™ valve: cat.# 569604  
for Parker: cat.# 560838  
for Swaelok: cat.# 563801

<b>Replacement Parts.....</b>	<b>Page #</b>
Flow Controller .....	426
Gauge .....	423
Orifices .....	426
Sample Inlet .....	426



26252

## Expand Air Sampling with Mini-Cans & Accessories

- Grab and integrated sampling without a sampling pump.
- Possible to perform 8-hour integrated sample with 400 cc mini-can.
- Siltek® coating delivers high level of inertness for H<sub>2</sub>S and other reactive compounds.
- Versatile enough for many applications:
  - Indoor air
  - Industrial hygiene
  - Soil gas
  - Emergency response

### Miniature Air Sampling Kits (Stainless Steel & Siltek®-Treated)

- Provide accurate integrated sampling without a sampling pump.
- Convenient smaller size connects easily to miniature canisters.
- Available in stainless steel or with Siltek® treatment for greater inertness.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples and is easy to assemble for field sampling.\* Kit includes flow controller, critical orifice, 2 µm frit filter, vacuum gauge, and sample inlet. The gauge (cat.# 24120) and sample inlet (cat.#s 26211, 26212) are downsized for use with smaller canisters.

Canister Volume/Sampling Time		Flow	Orifice Size	Siltek-Treated cat.#	Stainless Steel cat.#
400 cc	1 Liter				
8 hour	24 hour	0.5-2 mL/min	0.0008"	26253	26252
2 hour	4 hour	2-4 mL/min	0.0012"	26255	26254
1 hour	2 hour	4-8 mL/min	0.0016"	26257	26256
—	1 hour	8-15 mL/min	0.0020"	26259	26258

\*Air sampling canisters sold separately.

### Mini-Can Accessories

#### Sampling Belt:

- Adjustable up to 50".
- Two reclosable hook-and-loop straps securely hold mini-can or other sampling device.
- Straps slide anywhere on belt.
- Versatile design, perfect for personal wear or hang for area sampling.



Sampling belt & personal sample inlet

#### Personal Sample Inlet:

- 3' long x 1/16" OD all PTFE tubing.
- Convenient clip can be moved along length of tubing for proper attachment in breathing zone.
- PTFE reducing ferrule allows direct connection from 1/16" tubing to 1/4" flow controller without another fitting.

#### Mini-Can Stand:

- Collapsible for easy storage and transport.
- Two out of three legs move to accommodate uneven surfaces.
- Holds 2 3/4" diameter cans securely.
- Small footprint—12" diameter x 6.5" height.



22124  
Mini-Can Stand

Mini-Can and Sampling Kit not included.

These accessories enhance mini-can usage and provide flexibility in their application, from personal, to area, to vapor intrusion sampling.

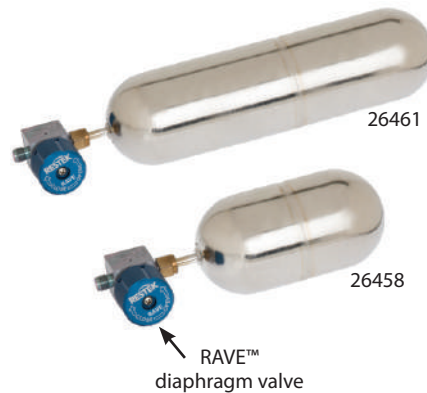
Description	qty.	cat.#
Sampling Belt	ea.	22122
Personal Sample Inlet (includes: 3' x 1/16" OD PTFE tubing, Clip, PTFE Reducing Ferrule, 1/4" SS nut)	ea.	22123
Mini-Can Stand	ea	22124

**Miniature Air Sampling Canisters**

- Ideal for indoor air, personal, emergency response, or soil gas sampling.
- Choose 400 cc or 1,000 cc.
- Available with quick-connect fitting that is compatible with sampling and analysis instruments.
- New option: the proven long life, leak-free performance, and effortless operation of the RAVE™ valve.

These small canisters are designed for controlled sampling, such as personal air sampling, as an alternative to tube and pump samplers. The 1,000 cc canister is suitable for sampling volatile organic compounds in air according to methods TO-14A, TO-15, IP-1A, ASTM 5466, OSHA PV 2120, and NJ DEP Low Level TO-15.

Restek offers these products in stainless steel or with Siltek® treatment, for greatest inertness. We continue to offer passive coating technologies that are unmatched in the air sampling industry—try a Siltek®-treated canister to achieve the ultimate in analyte stability.



**Dimensions:**

400 cc = 2.75" diameter, 5.35" long (7 x 13.6 cm),  
1.25 lb (0.567 kg)  
1,000 cc = 2.75" diameter, 11.92" long (7 x 30 cm),  
2.00 lb (0.91 kg)

Description	qty.	400 cc cat.#	1,000 cc cat.#
<b>Miniature Canister with Quick-Connect Stem Fitting</b>			
Electropolished Stainless Steel Canister with Quick-Connect Stem Fitting	ea.	24188	24194
Siltek-Treated Canister with Quick-Connect Stem Fitting	ea.	24189	24195
Siltek-Treated Canister with Siltek-Treated Quick-Connect Stem Fitting	ea.	24190	24196
<b>Miniature Canister with RAVE Valve</b>			
Electropolished Stainless Steel Canister with RAVE Valve	ea.	26456	26459
Siltek-Treated Canister with RAVE Valve	ea.	26457	26460
Siltek Treated Canister with Siltek-Treated RAVE Valve	ea.	26458	26461
<b>Miniature Canister without Valve</b>			
Electropolished Stainless Steel	ea.	24205	24206
Siltek-Treated	ea.	24207	24208

**NEW!**

Do not exceed canister maximum pressure of 40 psig.

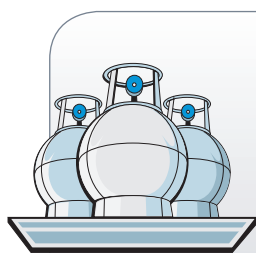
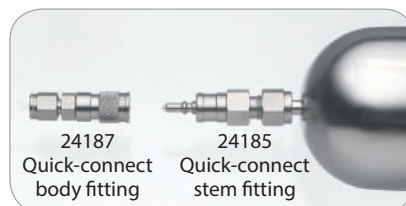
**Swagelok® Quick-Connect Fittings** for Miniature Air Sampling Canisters

Attach quick-connect body fitting to stem fitting to open canister. Attach quick-connect stem protector to stem fitting when not sampling to prevent canister from accidentally opening.

Connection: 1/4" tube fitting.

Description	qty.	cat.#
Quick-Connect Stem Fitting	ea.	24185
Quick-Connect Stem Fitting, Siltek-Treated	ea.	24186
Quick-Connect Stem Protector, Stainless Steel	ea.	24121
Quick-Connect Body Fitting	ea.	24187

Note: Quick-connect body fitting (cat.# 24187) must be ordered separately to sample with quick-connect stem fitting.



**Get Mini!**  
**Mini-Can Options**

Sizes	400 cc or 1,000 cc
Valves	RAVE™ diaphragm, quick connect
Interior Coating	Electropolished, Siltek®-treated
Sample Inlets	Area, personal
Flow ranges	0.5–15 mL/min

**i tech tip**

Use a gap inspection gauge to confirm fittings are sufficiently tightened. See page 319.



### Gas Sampling Bags

Sampling bags are a low-cost, whole-air sampling device for high-level VOCs and permanent gases. Several EPA, NIOSH, and OSHA methods exist for bag sampling for a variety of applications: stationary sources emissions, workplace atmospheres, ambient, indoor air quality, and breath analysis. Choose the film type appropriate for your application. All our bags feature a polypropylene combo valve with hose connection to fit 3/16" ID tubing and syringe port with replaceable septum. A single eyelet provides handling convenience.

#### Tedlar® Sampling Bags

- Find the bags you need—we offer sizes from 0.5 L to 100 L.
- Unique all-in-one septum and valve fitting make these lightweight and easy to use.
- Polypropylene or stainless steel valve.
- Both valves conveniently connect to 3/16" ID PTFE tubing.
- Continuous sampling temperature up to 225 °F (107 °C); short term (1–2 hours) temperature up to 350 °F (176 °C).



Description	Size	qty.	Polypropylene Valve cat.#	Stainless Steel Valve cat.#
0.5 L Tedlar Sampling Bag	6" x 6"	10-pk.	22049	22038
1 L Tedlar Sampling Bag	7" x 7"	10-pk.	22050	22039
3 L Tedlar Sampling Bag	9.5" x 10"	10-pk.	22051	22040
5 L Tedlar Sampling Bag	12" x 12.5"	10-pk.	22052	22041
10 L Tedlar Sampling Bag	11.75" x 22"	10-pk.	22053	22042
12 L Tedlar Sampling Bag	13" x 24"	10-pk.	22054	22043
25 L Tedlar Sampling Bag	17.5" x 24"	5-pk.	22055	22044
40 L Tedlar Sampling Bag	24" x 24.25"	5-pk.	22056	22045
80 L Tedlar Sampling Bag	28.25" x 30.5"	5-pk.	22057	22046
100 L Tedlar Sampling Bag	28" x 36"	3-pk.	22058	22047
Description		qty.	cat.#	
PTFE Faced Silicone Replacement Septum, 4 mm diameter		10-pk.	22104	

#### Multi-Layer Foil Gas Sampling Bags

- Good stability for low molecular weight compounds, such as methane, CO, CO<sub>2</sub>, and permanent gases.
- Chemically inert with light and moisture protection.
- Not recommended for low ppm VOCs due to background levels.
- Protective 5-layer barrier minimizes gas permeability.
  - 60 gauge nylon (outer layer)
  - Metalized aluminum
  - Polyethylene
  - 0.0003" aluminum foil
  - 0.002" polyethylene (inner layer)
- Continuous sampling temperature up to 190 °F (88 °C) indefinitely; do not exceed 190 °F for any period of time.



Volume	Size	qty.	cat.#
1 L	7" x 7"	5-pk.	22950
3 L	10" x 10"	5-pk.	22951
5 L	12" x 12"	5-pk.	22952
10 L	12" x 22"	5-pk.	22953
12 L	13" x 24"	5-pk.	22966
25 L	18" x 24"	5-pk.	22967
40 L	24" x 24.5"	5-pk.	22968
PTFE Faced Silicone Replacement Septum, 4 mm diameter		10-pk.	22104

also available

ALTEF gas sampling bags

[www.restek.com/air](http://www.restek.com/air)



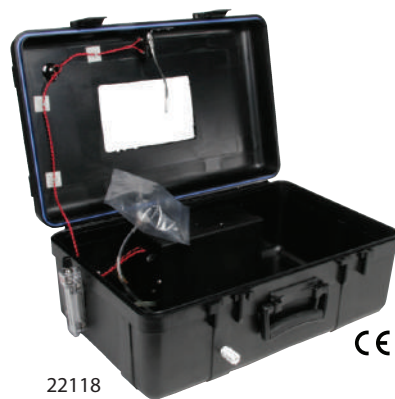
### Vacuum Bag Sampler

- Fast bag sampling without sample passing through pump.
- Bag capacity up to 10 L.

The model 1062 vacuum bag sampler provides fast sampling with zero cross-contamination. A vacuum created in the box draws air into the sampling bag without drawing it through the vacuum pump first, as is the case with standard air sampling pumps, thereby preventing contamination of the sample. This bag sampler can fill a 10 L bag in two minutes with an automatic shut-off switch, which stops the sample bag from overfilling. The filling rate is adjusted with a vent rotometer valve. An external battery-recharging port enables continuous operation with battery charger. In addition, the quick exhaust valve allows for fast removal of the sampling bag. The sampler comes with a universal power adaptor/charger, battery, instruction manual, and 1-year limited warranty.

**Specifications:**

Sampling Bag:	1 bag up to 10 L size
Running Time:	8 hours
Flow Rate (Fill Rate):	1-5 L/min
Power Requirements:	12 V battery, 4.5 amp
Charge Time:	9 hours
Dimensions:	9" x 14.6" x 21.7"
Weight:	17 lb



22118

**Features:**

- Observation window on case lid.
- Sample inlet accepts 1/4" OD tubing.
- Case designed for rugged outdoor use.
- CE certified.

Description	qty.	cat.#
Vacuum Bag Sampler Model 1062 (includes: power adaptor, battery, manual)	ea.	22118
Replacement Battery for Vacuum Bag Sampler Model 1062	ea.	22119
Universal Battery Charger for Vacuum Bag Sampler Model 1062 (115/230 VAC)	ea.	22120

### Physical Specifications of Gas Sampling Bags

	Tedlar® bags	ALTEF Bags	Multi-Layer Foil Bags
<b>Composition</b>	polyvinyl fluoride (PVF) polymer resin	Proprietary PVDF film	5-layer
<b>Thickness</b>	0.002"	0.003"	0.005"
<b>Tensile Strength</b>	8,000 psi	6,100 psi	24 lb/inch (CD)
<b>Max. Operating Temp.</b>	204 °C	150 °C	87 °C
<b>Specific Gravity</b>	1.7 g/mL	1.78 g/mL	1.09 g/mL
<b>Oxygen Permeability</b>	50 cc/m <sup>2</sup> x day	58 cc/m <sup>2</sup> x day	0.0006 cc/m <sup>2</sup> /day
<b>Water Vapor Permeability</b>	9-57 g/m <sup>2</sup> x day	12-15 g/m <sup>2</sup> x day	0.0006 g/100 in <sup>2</sup> x day
<b>Carbon Dioxide Permeability</b>	172 cc/m <sup>2</sup> x day	172 cc/m <sup>2</sup> x day	0.0005 cc/100 in <sup>2</sup> x day

### General Guidelines for Bag Sampling

Follow these basic considerations for trouble-free air sampling using gas sampling bags.

*Before Sampling*

- Store unused bags in a clean environment, sealed in an outer bag to prevent adsorption of contaminants.
- Preclean bags before use by flushing with high-purity nitrogen.
- For validation, compounds must be stable at >80% for 72 hours.
- Leak rate must not exceed 0.1" Hg/min.

*During Sampling*

- Be sure the PTFE tubing used for bag connection is clean.
- Use a vacuum box sampler for direct bag filling in order to avoid contamination from a sampling pump.
- Typical flow rate is 3 L/min.
- Do not fill bags more than 80%.

*After Sampling*

- Bags are intended for a single use due to potential sample adsorption onto the bag film.
- Hold times are typically 48 hours unless validation study demonstrates longer stability.
- Protect samples from direct sunlight and store above 0 °C to prevent condensation.
- Transport in rigid, opaque container to prevent bag puncture; do not ship by air unless samples will be kept in a pressurized area.

## free literature

A Guide to Whole Air Canister Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

Download your free copy from

[www.restek.com](http://www.restek.com)

by searching for "EVTG1073A"



## tech guides

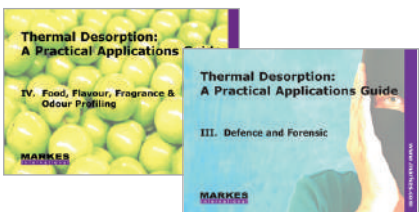
Thermal desorption application guides are available for a broad range of markets. Download your FREE copy today at [www.restek.com](http://www.restek.com)

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## Thermal Desorption Unit (TDU) Tubes vs. Canister Sampling Which VOC Sampling Technique is Right for You?

Thermal desorption unit (TDU) tubes provide a complementary option to canisters for sampling VOCs. Both techniques have advantages and disadvantages, and their features must be evaluated for suitability relative to the sampling environment and analytical capabilities. Table I outlines the similarities and differences between these techniques; use this handy comparison to determine which equipment is best for you.

**Table I:** Comparison of thermal desorption tube and canister sampling for VOCs.

### Similarities Between Thermal Desorption Tubes and Canisters

- Reusable sampling device.
- Long product lifetime.
- Long-term sample stability.
- Blank certification required prior to sampling.
- Sample concentration required before GC-MS analysis.
- Dry purge helpful to remove moisture before GC injection.
- ppt sensitivity.
- Method acceptance.
- Collection of wide range of VOCs with single device.
- Useful for screening of unknowns.
- Leak tightness critical to maintaining sample integrity and preventing contamination of a clean device.

### Differences Between Thermal Desorption Tubes and Canisters

	Thermal Desorption Tubes	Canisters
<b>Methods</b>	U.S. EPA TO-17 ASTM D6196 ISO 16017 ISO 16000-6 NIOSH 2549	U.S. EPA TO-14A, TO-15 ASTM D5466 OSHA PV2120 NIOSH Protocol Draft
	World-wide acceptance	Gold standard for U.S. ambient air market
<b>Applications</b>	Ambient air, indoor air, industrial hygiene Material emissions Food & flavor Chemical weapons	Ambient air, indoor air, vapor intrusion, emergency response
	C3 to C30	<C3 to ~C10
<b>Handling</b>	Lightweight for personal sampling and general ease of use	Larger and heavier; more costly to ship
<b>Sampling</b>	Active sampling with sampling pump or diffusive sampling without pump is possible with determined diffusion coefficients for each compound.	Passive sampling, no sampling pump required. Long-term sampling possible without battery to recharge.
	Integrated sampling only	Grab & integrated sampling
	Concentrated sample	Whole air
	Proper sorbent selection recommended in methodology.	N/A
	Must sample below sorbent breakthrough volumes to avoid sample loss and irreversible adsorption on sorbent	N/A
	Large sample volumes >100L	Sample volume is function of canister size, 15 L max
<b>Analysis</b>	Tube dimensions are instrument specific	Compatible with all manufacturer sample concentrators
	One injection, more injections possible for some instrumentation	Multiple sample injections
	Concentration range ppt to ppm	ppt to ppm
	Some sorbents prone to artifact formation.	Low blanks when properly cleaned.
<b>Storage</b>	Sample storage at 4 °C recommended for multibed tubes to prevent potential migration of compounds to more retentive sorbent, which may be difficult to recover.	Room temperature
<b>Cleaning</b>	Analytical process automatically cleans tube for reuse. Cleans as it analyzes. Conditioning/cleaning and analysis incorporated in one thermal desorption unit.	Canister cleaning requires separate equipment as additional step prior to background certification and sampling.
<b>Cost</b>	\$50-130 each	\$200-700 each

## Thermal Desorption Unit (TDU) Tubes

- Variety of sorbents to collect a wide range of VOCs.
- Use corrosion-resistant glass tubes for excellent inertness; allow monitoring of sorbent bed condition.
- Choose stainless steel tubes for greater durability in the field. No sampling pump necessary for passive sampling with diffusion caps.
- Individually etched with unique serial number for convenient sample identification.
- Robust barcode—the most reliable “code 128” format—on tube for recording and tracking.
- Each tube has an arrow indicating flow direction to reduce errors during use.
- Available unconditioned or preconditioned and ready to sample. Tubes are reusable after thermal desorption for most applications.



High-quality thermal desorption tubes are suitable for ppt to ppm concentrations of volatile organic compounds (VOCs) in ambient, indoor, personal, and industrial hygiene environments. Fit Markes (ULTRA and UNITY™), PerkinElmer, and Shimadzu thermal desorbers. Packed tubes come with a report detailing the total mass of sorbent in the tube; conditioned tubes also include a blank chromatogram.

Thermal Desorption Tube Sorbent	Vapor Phase Organics Applications
Tenax TA	C6/7 to C26
Graphitized Carbon	C5/6 to C14
Tenax GR/Carbopack B	n-C5/6 to n-C20 (EPA Methods TO-14A/TO-15/TO-17)
Carbopack B/Carbosieve SIII	n-C2/3 to n-C12/14 (EPA Methods TO-14A/TO-15/TO-17)
Tenax TA/Graphitized Carbon/Carboxen 1000	C2/3 to C20
Carbopack C/Carbopack B/Carbosieve SIII	n-C2/3 to n-C16/20 (EPA Methods TO-14A/TO-15/TO-17)

Tenax is a trademark of Buchem BV. Carbopack, Carbosieve, and Carboxen are trademarks of Sigma-Aldrich.

## method applications

Method	Application
U.S. EPA	TO-17
ASTM	D6196
NIOSH	2549
DIN EN ISO	16017

### Specifications

Dimensions: 1/4" OD x 3 1/2" long  
Low sampling rates: 0.01–0.20 L/min (<10 L total volume)  
Long-term storage caps are supplied with conditioned tubes

## Thermal Desorption Unit Tubes (Unconditioned and Conditioned & Capped)

Sorbent Description	qty.	Unconditioned		Conditioned & Capped	
		Stainless Steel cat.#	Glass cat.#	Stainless Steel cat.#	Glass cat.#
Tenax TA (35/60 mesh)	10-pk.	24056	24062	24080	24086
Graphitized Carbon (20/40 mesh)	10-pk.	24057	24063	24081	24087
Tenax GR (35/60 mesh)/ Carbopack B (60/80 mesh)	10-pk.	24058	24064	24082	24088
Carbopack B (60/80 mesh)/ Carbosieve SIII (60/80 mesh)	10-pk.	24059	24065	24083	24089
Tenax TA (35/60 mesh)/ Graphitized Carbon (40/60 mesh)/ Carboxen 1000 (60/80 mesh)	10-pk.	24060	24066	24084	24090
Carbopack C (60/80 mesh)/ Carbopack B (60/80 mesh)/ Carbosieve SIII (60/80 mesh)	10-pk.	24061	24067	24085	24091



## Thermal Desorption Unit Tubes (Empty)

- Empty tubes for direct desorption of VOCs from liquids, solids, or pastes.
- Stainless steel: front sorbent-retaining gauze, rear gauze, and gauze retaining spring supplied; or glass: glass frit positioned 15 mm from sampling end.
- Can be packed with any sorbent to suit any application.

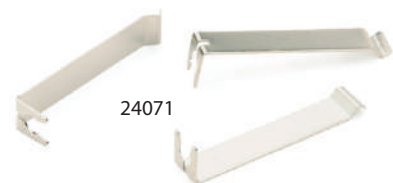
Description	qty.	Stainless Steel cat.#	Glass cat.#
TDU Tubes, Empty	10-pk.	24054	24055

## Thermal Desorption Unit Tubes (Calibration)

Description	qty.	Stainless Steel cat.#	Glass cat.#
TDU Tubes, Calibration, Tenax TA 1 cm Bed (35/60 mesh)	10-pk.	24075	24076
Description	qty.	cat.	
Calibration Solution Loading Rig	ea.	24077	
Calibration Solution Loading Rig Replacement Septa, 9.5 mm	10-pk.	24078	
Certified Reference Standard, 100 ng BTX on Tenax TA	10-pk.	24079	



# Thermal Desorption Unit Tubes



## Thermal Desorption Unit Tubes (Accessories)

Description	Benefits/Uses	qty.	cat.
1/4" Brass Cap and PTFE Ferrules	Long-term storage of blank/sampled tubes.	20-pk.	24068
1/4" PTFE Ferrules	Long-term storage caps.	20-pk.	24069
CapLok Tool	Use for tightening long-term storage caps.	ea.	24070
Pen Clip		10-pk.	24071
TubeMate Tool	Assists with tube packing.	ea.	24072
1/4" Stainless Steel Union and PTFE Ferrules	Use for connecting tubes in series.	10-pk.	24073
Diffusion Caps	Required for diffusive sampling with stainless steel tubes.	10-pk.	24074



## WORLD-CLASS SERVICE & LOCAL CONNECTIONS

**UNITED STATES:** [www.restek.com](http://www.restek.com)

### Customer Service

**Phone:** 1-800-356-1688 or 1-814-353-1300, ext. 3

**E-mail:** [csreps@restek.com](mailto:csreps@restek.com)

### Technical Service

**Phone:** 1-800-356-1688 or 1-814-353-1300, ext. 4

**E-mail:** [support@restek.com](mailto:support@restek.com)

### Sales

**Phone:** 1-800-356-1688 or 1-814-353-1300, ext. 3

**E-mail:** [salesreps@restek.com](mailto:salesreps@restek.com)

Or visit [www.restek.com/USsales](http://www.restek.com/USsales)

## INTERNATIONAL:

### Customer Service

**Phone:** 1-814-353-1300, ext. 9

**Fax:** 1-814-353-1309

**E-mail:** [ics@restek.com](mailto:ics@restek.com)

### Technical Service

**E-mail:** [intltechsupp@restek.com](mailto:intltechsupp@restek.com)

### FIND A LOCAL DISTRIBUTOR

[www.restek.com/distributor](http://www.restek.com/distributor)





## Polyurethane Foam (PUF) Cartridges

- Use for collection of semivolatiles (pesticides, PCBs, PAHs).
- Both large high-volume (220–280 L/min) and small low-volume (1–5 L/min) PUFs available.
- Suitable for ambient, indoor, and industrial hygiene applications.
- PUF/XAD-2 “sandwiches” capture a wider range of semivolatiles.



## method applications

Method	Applications	cat.#
EPA TO-10A	Organochlorine and organophosphorus pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
EPA IP-7	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA IP-8	Organochlorine and organophosphorus pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
ASTM D4861	Organochlorine and organophosphorus pesticides, PCB	22116
ASTM D4947	Chlordane and heptachlor residues	22116
Research	Pesticides	22117
EPA TO-4A	Organochlorine pesticides, PCBs	22114
EPA TO-9A	Polychlorinated dibenzo- <i>p</i> -dioxins (PCDDs)	22114
EPA TO-13A	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA 600/8-80-038	Organochlorine pesticides, PCBs, PAHs	22115
ASTM D6209	Polycyclic aromatic hydrocarbons (PAHs)	22114



22114



22115



22116



22117

## Cleaned Polyurethane Foam (PUF) Cartridges

Pre-cleaned and ready to use.

Description	qty.	cat.#
Cleaned PUF Plug (7.6 cm length, 6 cm diameter)	ea.	24295
Large PUF Cartridge, 65 mm OD x 125 mm length, 75 mm PUF	ea.	22114
Large PUF/XAD Cartridge, 65 mm OD x 125 mm length, 25 mm PUF/10 g XAD-2/50 mm PUF	ea.	22115
Small PUF Cartridge, 22 mm OD x 100 mm length, 76 mm PUF	ea.	22116
Small PUF/XAD Cartridge, 22 mm OD x 100 mm length, 30 mm PUF/1.5 g XAD-2/30 mm PUF	ea.	22117



22954



22955

## Raw Polyurethane Foam (PUF) Plugs

- Unwashed PUF plugs for both low-volume and high-volume sampling.
- Flame retardant free—making them easier to clean for trace analysis.
- Compliant with EPA and ASTM methods—0.022 g/cm<sup>3</sup> density.
- Glass holders sold separately.

Description	Size	qty.	cat.#
Large PUF Plug, Unwashed	6 cm OD x 7.6 cm length	10-pk.	22954
Large PUF Plug, Unwashed	6 cm OD x 5.1 cm length	10-pk.	22955
Large PUF Plug, Unwashed	6 cm OD x 2.5 cm length	10-pk.	22956
Small PUF Plug, Unwashed	22 mm OD x 7.6 cm length	10-pk.	22957



22957



22956

## PUF Glass Holders

Durable and reusable, PUF glass holders reduce waste and are a cost-effective alternative to pre-cleaned packed cartridges.

- Fit either 6 cm or 22 mm OD PUF plug or can be used with bulk SDVB resin.
- Large glass holder fitted with double stainless steel screens for support.
- Small glass holder has stem designed for secure 1/4" ID tubing connection to sampling pump.

Description	Size	qty.	cat.#
Large PUF Glass Holder	fits 6 cm OD PUF Plug (4.9" L x 2.5" OD)	ea.	22964
Small PUF Glass Holder	fits 22 mm OD PUF Plug (4.4" L x 0.9" OD)	ea.	22965



22964



22965



Restek's Ultra-Clean resin typically eliminates the hassle of cleaning and testing resin for air sampling.

**Ultra-Clean Resin** Equivalent to XAD-2 Resin—Exclusively from Restek!

- For adsorbing semivolatiles in air.
- Cleaned and GC tested.
- Available in 100 gram quantities.

**Frequently Asked Questions**

- **Is Restek's Ultra-Clean resin really the same as XAD®-2 resin?**  
Yes. Restek's resin has been manufactured to match the original XAD®-2 specifications of composition, pore size, and surface area. You will experience identical sampling performance for all semivolatile compounds.
- **Does Restek's Ultra-Clean resin need to be baked-out prior to use?**  
No. Restek's resin is precleaned and prebaked. Unlike other resins, Restek's resin is rigorously cleaned and baked prior to being bottled. When we say our Ultra-Clean resin is precleaned, you can count on it!

**method applications**

Method	Applications
EPA TO-13A	PAHs in Ambient Air
ASTM D6209	PAHs in Ambient Air
EPA Method 23	Dioxins in Stationary Source Emissions
EPA Method 0010	Semivolatiles in Stationary Source Emissions

Although resin is an excellent adsorbent for trapping PAHs, it requires extensive clean-up because many of its impurities are PAH compounds. To enable you to eliminate time-consuming clean-up, we do the cleaning for you! We test each batch by capillary GC-flame ionization detector (FID) to ensure cleanliness. However, depending on your application, additional cleaning may be required.

Description	cat.#
Ultra-Clean Resin, 100 grams	24230



24053

**SDVB Resin**

- Styrene/divinylbenzene, equivalent to XAD®-2 resin.
- Untreated, packaged in 1 kg plastic containers.
- Spherical, 20 to 60 mesh particles.

Description	qty.	cat.#
SDVB Resin	1 kg	24053



23388

23389

**Midget Glass Impingers**

Use with a sampling pump to trap air contaminants into liquid collection media, as specified in OSHA and NIOSH industrial hygiene methods. Both dispersion and fritted nozzles are available as bubblers.

Description	Volume	Taper Size	qty.	cat.#
Midget Glass Impinger w/Fritted Tube	30 mL	24/40	kit	23388
Midget Glass Impinger w/Dispersion Tube	30 mL	24/40	kit	23389

## Environmental Air Sampling Gas Standards

Our high-quality air sampling gas calibration standards are provided by Spectra/Linde and Scott/Air Liquide—meeting lab requirements for two separate sources of calibration standards. Each comes with a certificate of analysis and unique serial number. All cylinders are disposable and do not require rental or demurrage fees. Recertification of cylinders is available directly with our suppliers. All cylinders are drop-shipped from our suppliers to provide fast delivery and the “freshest” standard possible. Minimum 12-month stability on all cylinders.

### TO-14A Internal Standard Mix (3 components)

Bromochloromethane	1,4-Difluorobenzene
Chlorobenzene-d5	
1 ppm in nitrogen, 104 liters @ 1,800 psi	
cat.# 34412 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 26352 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 34412-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi	
cat.# 34427 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 26353 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 34427-PI (ea.)	

No data pack available.

### TO-14A Internal Standard/Tuning Mix (4 components)

Bromochloromethane	Chlorobenzene-d5
1-Bromo-4-fluorobenzene (4-Bromofluorobenzene)	1,4-Difluorobenzene
1 ppm in nitrogen, 104 liters @ 1,800 psi	
cat.# 34408 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 26354 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 34408-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi	
cat.# 34425 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 26355 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 34425-PI (ea.)	

No data pack available.

### TO-14A GC-MS Tuning Mix

4-Bromofluorobenzene
1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34406 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 26346 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±10%; Analytical accuracy: ±5%
cat.# 34406-PI (ea.)
100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34424 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 26347 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
Blend tolerance: ±20%; Analytical accuracy: ±10%
cat.# 34424-PI (ea.)

No data p.

### TO-14A Aromatics Mix (14 components)

Benzene	Toluene
Chlorobenzene	1,2,4-Trichlorobenzene
<i>m</i> -Dichlorobenzene	1,2,4-Trimethylbenzene
<i>o</i> -Dichlorobenzene	1,3,5-Trimethylbenzene
<i>p</i> -Dichlorobenzene	<i>m</i> -Xylene
Ethyl benzene	<i>o</i> -Xylene
Styrene	<i>p</i> -Xylene
1 ppm in nitrogen, 104 liters @ 1,800 psi	
cat.# 34404 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 26348 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 34404-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi	
cat.# 34423 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 26349 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 34423-PI (ea.)	

No data pack available.

### TO-14A Chlorinated Hydrocarbon Mix (19 components)

Carbon tetrachloride	Hexachloro-1,3-butadiene
Chloroform	Methyl chloride
1,1-Dichloroethane	Methylene chloride
1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
1,1-Dichloroethene	Tetrachloroethylene
<i>cis</i> -1,2-Dichloroethylene	1,1,1-Trichloroethane
1,2-Dichloropropane	1,1,2-Trichloroethane
<i>cis</i> -1,3-Dichloropropene	Trichloroethene
<i>trans</i> -1,3-Dichloropropene	Vinyl chloride
Ethyl chloride	
1 ppm in nitrogen, 104 liters @ 1,800 psi	
cat.# 34402 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 26350 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	
cat.# 34402-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi	
cat.# 34422 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 26351 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	
cat.# 34422-PI (ea.)	

No data pack available.

▶ See pages 452–453 for cylinder and regulator information.

## please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

**TO-14A CFC/HCFC Mix (4 components)**

Trichlorofluoromethane (Freon 11)	
Dichlorodifluoromethane (Freon 12)	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	
1,2-Dichlorotetrafluoroethane (Freon 114)	
1 ppm in nitrogen, 104 liters @ 1,800 psig	cat.# 34410 (ea.)
100 ppb in nitrogen, 104 liters @ 1,800 psig	cat.# 34426 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	cat.# 34410-PI (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	cat.# 26356 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	cat.# 34426-PI (ea.)
No data pack available.	

**TO-14A Calibration Mix (39 components)**

Benzene	Ethyl chloride
Bromomethane	Hexachloro-1,3-butadiene
Carbon tetrachloride	Methylene chloride
Chlorobenzene	Styrene
Chloroform	1,1,2,2-Tetrachloroethane
Chloromethane	Tetrachloroethylene
1,2-Dibromoethane	Toluene
<i>m</i> -Dichlorobenzene	1,2,4-Trichlorobenzene
<i>o</i> -Dichlorobenzene	1,1,1-Trichloroethane
<i>p</i> -Dichlorobenzene	1,1,2-Trichloroethane
Dichlorodifluoromethane	Trichloroethene
1,1-Dichloroethane	Trichlorofluoromethane
1,2-Dichloroethane	1,1,2-Trichlorotrifluoroethane
1,1-Dichloroethene	1,2,4-Trimethylbenzene
<i>cis</i> -1,2-Dichloroethene	1,3,5-Trimethylbenzene
1,2-Dichloropropane	Vinyl chloride
<i>cis</i> -1,3-Dichloropropene	<i>m</i> -Xylene
<i>trans</i> -1,3-Dichloropropene	<i>o</i> -Xylene
Dichlorotetrafluoroethane	<i>p</i> -Xylene
Ethyl benzene	
1 ppm in nitrogen, 104 liters @ 1,800 psi	cat.# 34400 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±10%; Analytical accuracy: ±5%	cat.# 26340 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	cat.# 34400-PI (ea.)
100 ppb in nitrogen, 104 liters @ 1,800 psi	
	cat.# 34421 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	cat.# 26341 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	cat.# 34421-PI (ea.)
No data pack available.	

**TO-14A 41 Component Mix (41 components)**

Acrylonitrile	Ethyl benzene
Benzene	Ethyl chloride
Bromomethane	Hexachloro-1,3-butadiene
1,3-Butadiene	Methylene chloride
Carbon tetrachloride	Styrene
Chlorobenzene	1,1,2,2-Tetrachloroethane
Chloroform	Tetrachloroethylene
Chloromethane	Toluene
1,2-Dibromoethane	1,2,4-Trichlorobenzene
<i>m</i> -Dichlorobenzene	1,1,1-Trichloroethane
<i>o</i> -Dichlorobenzene	1,1,2-Trichloroethane
<i>p</i> -Dichlorobenzene	Trichloroethene
Dichlorodifluoromethane	Trichlorofluoromethane
1,1-Dichloroethane	1,1,2-Trichlorotrifluoroethane
1,2-Dichloroethane	1,2,4-Trimethylbenzene
1,1-Dichloroethene	1,3,5-Trimethylbenzene
<i>cis</i> -1,2-Dichloroethene	Vinyl chloride
1,2-Dichloropropane	<i>m</i> -Xylene
<i>cis</i> -1,3-Dichloropropene	<i>o</i> -Xylene
<i>trans</i> -1,3-Dichloropropene	<i>p</i> -Xylene
Dichlorotetrafluoroethane	
1 ppm in nitrogen, 104 liters @ 1,800 psi	cat.# 34430 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±10%; Analytical accuracy: ±5%	cat.# 26342 (ea.)
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±10%; Analytical accuracy: ±5%	cat.# 34430-PI (ea.)
100 ppb in nitrogen, 104 liters @ 1,800 psi	
	cat.# 34431 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi	
Blend tolerance: ±20%; Analytical accuracy: ±10%	cat.# 26343 (ea.)
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)	
Blend tolerance: ±20%; Analytical accuracy: ±10%	cat.# 34431-PI (ea.)
No data pack available.	





## 2nd Source TO-14A/TO-15 Gas Calibration Standards

- Standards from TWO manufacturers provide second source on one order.
- 12-month stability in transportable cylinders.
- Drop-shipped for fast delivery and maximum shelf life.

**A. Spectra (Linde) 104 L Cylinders**  
**B. Scotty (Air Liquide) 110 L Cylinders**  
**C. Scotty (Air Liquide) 110 L Cylinders (Pi-marked Cylinders for EU Regulations)**

▶ See pages 452–453 for cylinder and regulator information.

[www.restek.com/air](http://www.restek.com/air)

**please note**

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.



**TO-14A 43 Component Mix (43 components)**

Acrylonitrile	Ethyl benzene
Benzene	Ethyl chloride
Bromomethane	4-Ethyltoluene
1,3-Butadiene	Hexachloro-1,3-butadiene
Carbon tetrachloride	Methylene chloride
Chlorobenzene	Styrene
Chloroform	1,1,2,2-Tetrachloroethane
Chloromethane	Tetrachloroethylene
3-Chloropropene	Toluene
1,2-Dibromoethane	1,2,4-Trichlorobenzene
<i>m</i> -Dichlorobenzene	1,1,1-Trichloroethane
<i>o</i> -Dichlorobenzene	1,1,2-Trichloroethane
<i>p</i> -Dichlorobenzene	Trichloroethene
Dichlorodifluoromethane	Trichlorofluoromethane
1,1-Dichloroethane	1,1,2-Trichlorotrifluoroethane
1,2-Dichloroethane	1,2,4-Trimethylbenzene
1,1-Dichloroethene	1,3,5-Trimethylbenzene
<i>cis</i> -1,2-Dichloroethene	Vinyl chloride
1,2-Dichloropropane	<i>m</i> -Xylene
<i>cis</i> -1,3-Dichloropropene	<i>o</i> -Xylene
<i>trans</i> -1,3-Dichloropropene	<i>p</i> -Xylene
Dichlorotetrafluoroethane	

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34432 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26344 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34432-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi

cat.# 34433 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26345 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34433-PI (ea.)

No data pack available.

**TO-15 Subset 25 Component Mix (25 components)**

Acetone	4-Ethyltoluene
Allyl chloride	Heptane
Benzyl chloride*	Hexane
Bromodichloromethane	2-Hexanone (MBK)
Bromoform	4-Methyl-2-pentanone
1,3-Butadiene	Methyl <i>tert</i> -butyl ether (MTBE)
2-Butanone (MEK)	2-Propanol
Carbon disulfide*	Propylene
Cyclohexane	Tetrahydrofuran
Dibromochloromethane	2,2,4-Trimethylpentane
<i>trans</i> -1,2-Dichloroethene	Vinyl acetate
1,4-Dioxane	Vinyl bromide
Ethyl acetate	

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34434 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26357 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34434-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi

cat.# 34435 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26358 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34435-PI (ea.)

\*Stability of this compound cannot be guaranteed.

No data pack available.

**TO-15 65 Component Mix (65 components)**

Acetone	4-Ethyltoluene
Acrolein	Trichlorofluoromethane (Freon 11)
Benzene	Dichlorodifluoromethane (Freon 12)
Benzyl chloride*	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
Bromodichloromethane	1,2-Dichlorotetrafluoroethane (Freon 114)
Bromoform	Heptane
Bromomethane	Hexachloro-1,3-butadiene
1,3-Butadiene	Hexane
2-Butanone (MEK)	2-Hexanone (MBK)
Carbon disulfide*	4-Methyl-2-pentanone (MIBK)
Carbon tetrachloride	Methylene chloride
Chlorobenzene	Methyl <i>tert</i> -butyl ether (MTBE)
Chloroethane	Methyl methacrylate
Chloroform	Naphthalene
Chloromethane	2-Propanol
Cyclohexane	Propylene
Dibromochloromethane	Styrene
1,2-Dichlorobenzene	1,1,2,2-Tetrachloroethane
1,3-Dichlorobenzene	Tetrachloroethene
1,4-Dichlorobenzene	Tetrahydrofuran
1,1-Dichloroethane	Toluene
1,1-Dichloroethene	1,2,4-Trichlorobenzene
<i>cis</i> -1,2-Dichloroethene	1,1,1-Trichloroethane
<i>trans</i> -1,2-Dichloroethene	1,1,2-Trichloroethane
1,2-Dichloropropane	Trichloroethene
<i>cis</i> -1,3-Dichloropropene	1,2-Dichloropropane
<i>trans</i> -1,3-Dichloropropene	<i>cis</i> -1,3-Dichloropropene
1,4-Dioxane	<i>trans</i> -1,3-Dichloropropene
Ethanol*	1,4-Dioxane
Ethyl acetate	Ethanol*
Ethyl benzene	Ethyl acetate
Ethylene dibromide (1,2-dibromoethane)	Ethyl benzene
	Ethylene dibromide (1,2-dibromoethane)

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34436 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26359 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34436-PI (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26360 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34437-PI (ea.)

\*Stability of this compound cannot be guaranteed.

No data pack available.

**75 Comp TO15 + NJ Mix**

(75 components)

Acetone	4-Ethyltoluene
Acrolein	Trichlorofluoromethane (Freon 11)
Benzene	Dichlorodifluoromethane (Freon 12)
Benzyl chloride*	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
Bromodichloromethane	1,2-Dichlorotetrafluoroethane (Freon 114)
Bromofom	Heptane
Bromomethane	Hexachloro-1,3-butadiene
1,3-Butadiene	Hexane
<i>n</i> -Butane	2-Hexanone (MBK)
2-Butanone (MEK)	4-Methyl-2-pentanone (MIBK)
<i>tert</i> -Butyl alcohol	Methylene chloride
Carbon disulfide*	Methyl <i>tert</i> -butyl ether (MTBE)
Carbon tetrachloride	Methyl methacrylate
Chlorobenzene	Naphthalene
Chloroethane	<i>n</i> -Nonane
Chloroform	<i>n</i> -Pentane
Chloromethane	2-Propanol
3-Chloroprene	<i>n</i> -Propylbenzene
2-Chlorotoluene	Propylene
Cumene	Styrene
Cyclohexane	1,1,2,2-Tetrachloroethane
Dibromochloromethane	Tetrachloroethene
1,2-Dichlorobenzene	Tetrahydrofuran
1,3-Dichlorobenzene	Toluene
1,4-Dichlorobenzene	1,2,4-Trichlorobenzene
1,1-Dichloroethane	1,1,1-Trichloroethane
1,2-Dichloroethane	1,1,2-Trichloroethane
1,1-Dichloroethene	Trichloroethene
<i>cis</i> -1,2-Dichloroethene	1,2,4-Trimethylbenzene
<i>trans</i> -1,2-Dichloroethene	1,3,5-Trimethylbenzene
1,2-Dichloropropane	2,2,4-Trimethylpentane
<i>cis</i> -1,3-Dichloropropene	Vinyl acetate
<i>trans</i> -1,3-Dichloropropene	Vinyl bromide
1,4-Dioxane	Vinyl chloride
Ethanol*	<i>m</i> -Xylene
Ethyl acetate	<i>o</i> -Xylene
Ethyl benzene	<i>p</i> -Xylene
Ethylene dibromide (1,2-dibromoethane)	

1 ppm in nitrogen, 104 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34396 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34392 (ea.)

100 ppb in nitrogen, 110 liters @ 1800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34393 (ea.)

\*Stability of this compound cannot be guaranteed.  
No data pack available.

**10 Comp NJ Subset Test Mix (10 components)**

<i>n</i> -Butane	<i>n</i> -Nonane
<i>tert</i> -Butyl alcohol	<i>n</i> -Pentane
3-Chloroprene	<i>n</i> -Propylbenzene
2-Chlorotoluene	2,2,4-Trimethylpentane
Cumene	Vinyl bromide

1 ppm in nitrogen, 104 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34398 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34394 (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34399 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34395 (ea.)

No data pack available.



**74 Comp TO15 + NJ Mix, (no Acrolein)**

(74 components)

Acetone	Trichlorofluoromethane (Freon 11)
Benzene	Dichlorodifluoromethane (Freon 12)
Benzyl chloride*	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
Bromodichloromethane	1,2-Dichlorotetrafluoroethane (Freon 114)
Bromofom	Heptane
Bromomethane	Hexachloro-1,3-butadiene
1,3-Butadiene	Hexane
<i>n</i> -Butane	2-Hexanone (MEK)
2-Butanone (MEK)	4-Methyl-2-pentanone (MIBK)
<i>tert</i> -Butyl alcohol	Carbon disulfide*
Carbon disulfide*	Carbon tetrachloride
Carbon tetrachloride	Chlorobenzene
Chlorobenzene	Chloroethane
Chloroethane	Chloroform
Chloroform	Chloromethane
Chloromethane	3-Chloroprene
3-Chloroprene	2-Chlorotoluene
2-Chlorotoluene	Cumene
Cumene	Cyclohexane
Cyclohexane	Dibromochloromethane
Dibromochloromethane	1,2-Dichlorobenzene
1,2-Dichlorobenzene	1,3-Dichlorobenzene
1,3-Dichlorobenzene	1,4-Dichlorobenzene
1,4-Dichlorobenzene	1,1-Dichloroethane
1,1-Dichloroethane	1,2-Dichloroethane
1,2-Dichloroethane	1,1-Dichloroethene
1,1-Dichloroethene	<i>cis</i> -1,2-Dichloroethene
<i>cis</i> -1,2-Dichloroethene	<i>trans</i> -1,2-Dichloroethene
<i>trans</i> -1,2-Dichloroethene	1,2-Dichloropropane
1,2-Dichloropropane	<i>cis</i> -1,3-Dichloropropene
<i>cis</i> -1,3-Dichloropropene	<i>trans</i> -1,3-Dichloropropene
<i>trans</i> -1,3-Dichloropropene	1,4-Dioxane
1,4-Dioxane	Ethanol*
Ethanol*	Ethyl acetate
Ethyl acetate	Ethyl benzene
Ethyl benzene	Ethylene dibromide (1,2-dibromoethane)
Ethylene dibromide (1,2-dibromoethane)	4-Ethyltoluene

100 ppb in nitrogen, 104 liters @ 1,800 psig  
Blend tolerance: ±10%; Analytical accuracy: ±5%  
cat.# 34397 (ea.)

\*Stability of this compound cannot be guaranteed.  
No data pack available.



**2nd Source TO-14A/TO-15 Gas Calibration Standards**



- Standards from TWO manufacturers provide second source on one order.
- 12-month stability in transportable cylinders.
- Drop-shipped for fast delivery and maximum shelf life.

**A. Spectra (Linde) 104 L Cylinders**  
**B. Scotty (Air Liquide) 110 L Cylinders**  
**C. Scotty (Air Liquide) 110 L Cylinders (Pi-marked Cylinders for EU Regulations)**

▶ See pages 452–453 for cylinder and regulator information.

[www.restek.com/air](http://www.restek.com/air)

### Massachusetts APH Mix (26 components)

Benzene	<i>p</i> -Isopropyltoluene
1,3-Butadiene	Methyl <i>tert</i> -butyl ether
Butylcyclohexane	1-Methyl-3-ethylbenzene
Cyclohexane	Naphthalene
<i>n</i> -Decane	<i>n</i> -Nonane
2,3-Dimethylheptane	<i>n</i> -Octane
2,3-Dimethylpentane	Toluene
<i>n</i> -Dodecane	1,2,3-Trimethylbenzene
Ethylbenzene	1,3,5-Trimethylbenzene
<i>n</i> -Heptane	<i>n</i> -Undecane
<i>n</i> -Hexane	<i>o</i> -Xylene
Isopentane	<i>m/p</i> -Xylene (combined)
Isopropylbenzene	

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34540 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26366 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psig (Pi-marked cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34540-PI (ea.)

No data pack available.

▶ See pages 452–453 for cylinder and regulator information.

### Ozone Precursor Mixture/PAMS (57 components)

Acetylene	Isopropylbenzene
Benzene	Methylcyclohexane
<i>n</i> -Butane	Methylcyclopentane
1-Butene	2-Methylheptane
<i>cis</i> -2-Butene	3-Methylheptane
<i>trans</i> -2-Butene	2-Methylhexane
Cyclohexane	3-Methylhexane
Cyclopentane	2-Methylpentane
<i>n</i> -Decane	3-Methylpentane
<i>m</i> -Diethylbenzene	<i>n</i> -Nonane
<i>p</i> -Diethylbenzene	<i>n</i> -Octane
2,2-Dimethylbutane	<i>n</i> -Pentane
2,3-Dimethylbutane	1-Pentene
2,3-Dimethylpentane	<i>cis</i> -2-Pentene
2,4-Dimethylpentane	<i>trans</i> -2-Pentene
<i>n</i> -Dodecane	Propane
Ethane	<i>n</i> -Propylbenzene
Ethylbenzene	Propylene
Ethylene	Styrene
<i>m</i> -Ethyltoluene	Toluene
<i>o</i> -Ethyltoluene	1,2,3-Trimethylbenzene
<i>p</i> -Ethyltoluene	1,2,4-Trimethylbenzene
<i>n</i> -Heptane	1,3,5-Trimethylbenzene
<i>n</i> -Hexane	2,2,4-Trimethylpentane
1-Hexene	2,3,4-Trimethylpentane
Isobutane	<i>n</i> -Undecane
Isopentane	<i>o</i> -Xylene
Isoprene	<i>m/p</i> -Xylene (combined)

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34420 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26368 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34420-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi

cat.# 34429 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26369 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34429-PI (ea.)

No data pack available.

### Japan Calibration Mix (9 components)

Acrylonitrile	Dichloromethane
Benzene	Tetrachloroethylene
1,3-Butadiene	Trichloroethylene
Chloroform	Vinyl chloride
1,2-Dichloroethane	

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34418-PI (ea.)

No data pack available.

## Custom Gas Calibration Standards Quote

[www.restek.com/customgas](http://www.restek.com/customgas)



### Ozone Precursor/PAMS Mix

(57 components at EPA concentrations: ppbC)

Acetylene	40	Isopropylbenzene	40
Benzene	30	Methylcyclohexane	30
<i>n</i> -Butane	40	Methylcyclopentane	25
1-Butene	30	2-Methylheptane	25
<i>cis</i> -2-Butene	35	3-Methylheptane	25
<i>trans</i> -2-Butene	25	2-Methylhexane	25
Cyclohexane	40	3-Methylhexane	25
Cyclopentane	20	2-Methylpentane	20
<i>n</i> -Decane	30	3-Methylpentane	40
<i>m</i> -Diethylbenzene	40	<i>n</i> -Nonane	25
<i>p</i> -Diethylbenzene	25	<i>n</i> -Octane	30
2,2-Dimethylbutane	40	<i>n</i> -Pentane	25
2,3-Dimethylbutane	50	1-Pentene	25
2,3-Dimethylpentane	50	<i>cis</i> -2-Pentene	35
2,4-Dimethylpentane	40	<i>trans</i> -2-Pentene	25
<i>n</i> -Dodecane	40	Propane	40
Ethane	25	<i>n</i> -Propylbenzene	30
Ethylbenzene	25	Propylene	25
Ethylene	20	Styrene	40
<i>m</i> -Ethyltoluene	25	Toluene	40
<i>o</i> -Ethyltoluene	30	1,2,3-Trimethylbenzene	25
<i>p</i> -Ethyltoluene	40	1,2,4-Trimethylbenzene	40
<i>n</i> -Heptane	25	1,3,5-Trimethylbenzene	25
<i>n</i> -Hexane	30	2,2,4-Trimethylpentane	30
1-Hexene	60	2,3,4-Trimethylpentane	25
Isobutane	25	<i>n</i> -Undecane	30
Isopentane	40	<i>o</i> -Xylene	25
Isoprene	40	<i>m/p</i> -Xylene (combined)	40

20–60 ppbC (parts per billion expressed as carbon) in nitrogen, 104 liters @ 1,800 psi

cat.# 34445 (ea.)

20–60 ppbC (parts per billion expressed as carbon) in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26370 (ea.)

20–60 ppbC (parts per billion expressed as carbon) in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34445-PI (ea.)

No data pack available.

## please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

# Gas Calibration Standards

## Sulfur 5-Component Mix (5 components)

Stability is 12 months from date of manufacture.

+/- 10% accuracy.

Carbonyl sulfide	Hydrogen sulfide
Dimethyl sulfide	Methyl mercaptan
Ethyl mercaptan	

1 ppm in nitrogen, 110 liters @ 1,800 psi

cat.# 34561 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34561-PI (ea.)

## BTEX Gas Mix (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi

cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34428-PI (ea.)

No data pack available.

## BTEX and MTBE Gas Mix (7 components)

Benzene	<i>m</i> -Xylene
Ethylbenzene	<i>o</i> -Xylene
Methyl <i>tert</i> -butyl ether (MTBE)	<i>p</i> -Xylene
Toluene	

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34541 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 26363 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 34541-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi

cat.# 34542 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi

Blend tolerance: ±20%; Analytical accuracy: ±10%

cat.# 26364 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)

Blend tolerance: ±10%; Analytical accuracy: ±5%

cat.# 34542-PI (ea.)

No data pack available.

# Reference Standards Search

Search by compound name, synonym, or CAS #.

[www.restek.com/reference](http://www.restek.com/reference)





### 2nd Source TO-14A/TO-15 Gas Calibration Standards

- Standards from TWO manufacturers provide second source on one order.
- 12-month stability in transportable cylinders.
- Drop-shipped for fast delivery and maximum shelf life.

**A.** Spectra (Linde) 104 L Cylinders  
**B.** Scotty (Air Liquide) 110 L Cylinders  
**C.** Scotty (Air Liquide) 110 L Cylinders (Pi-marked Cylinders for EU Regulations)

▶ See pages 452–453 for cylinder and regulator information.

[www.restek.com/air](http://www.restek.com/air)



## Natural Gas and Refinery Gas Standards

- Each available in three varying concentrations.
- Mini-regulator designed specially for these standards.

### Natural Gas Standards

Available in three mixes, from lean to rich. Each has an extended list of C6+ components.

	Natural Gas Standard #1 cat.# 34438, ea. % each compound*	Natural Gas Standard #2 cat.# 34439, ea. % each compound*	Natural Gas Standard #3 cat.# 34440, ea. % each compound*
nitrogen	1.000	2.500	5.000
carbon dioxide	0.500	1.000	1.500
methane UHP	94.750	85.250	70.000
ethane UHP	2.000	5.000	9.000
propane	0.750	3.000	6.000
isobutane	0.300	1.000	3.000
<i>n</i> -butane	0.300	1.000	3.000
isopentane	0.150	0.500	1.000
<i>n</i> -pentane	0.150	0.500	1.000
hexanes plus	0.100	0.250	0.500
<b>Concentration</b>	mole	mole	mole
<b>Volume</b>	13.16 L @ 200 psig (1,379 kPa)	13.16 L @ 200 psig (1,379 kPa)	5.5 L @ 75 psig (517 kPa)
<b>Ideal Heating Value (Dry BTU/SCF)</b>	1,048 gross	1,142 gross	1,317 gross

Ideal Heating Value: Dry BTU/SCF @ 14.696 psia & 60 °F.

\*Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

### Refinery Gas Standards

Available in three mixes with varying C5 unsaturates or extended C6+ components.

	Refinery Gas Standard #1 cat.# 34441, ea. % each compound*	Refinery Gas Standard #2 cat.# 34442, ea. % each compound*	Refinery Gas Standard #5 cat.# 34443, ea. % each compound*
hydrogen	40.750	12.500	12.500
argon	0.500	1.000	1.000
nitrogen	4.000	37.200	37.200
carbon monoxide	1.000	1.000	1.000
carbon dioxide	3.000	3.000	3.000
methane	8.500	5.000	5.000
ethane	6.000	4.000	4.000
ethylene	2.000	2.000	2.000
acetylene	—	1.000	1.000
propane	7.000	6.000	6.000
propylene	3.000	3.000	3.000
propadiene	0.850	1.000	1.000
cyclopropane	—	0.040	—
isobutane	6.000	5.000	5.000
<i>n</i> -butane	4.000	4.000	4.000
isobutylene	2.000	1.000	1.000
1,3 butadiene	3.000	3.000	3.000
<i>cis</i> -2-butene	2.000	2.000	2.000
<i>trans</i> -2-butene	2.000	3.000	3.000
1-butene	2.000	2.000	2.000
2-methyl-2-butene	—	0.200	0.200
isopentane	1.000	1.000	1.000
<i>n</i> -pentane	1.000	1.000	1.000
<i>cis</i> -2-pentene	—	0.400	0.400
<i>trans</i> -2-pentene	—	0.160	0.200
pentene-1	—	0.400	0.400
<i>n</i> -hexane	0.500	0.100	—
hexanes plus	—	—	0.100
<b>Concentration</b>	mole	mole	mole
<b>Volume</b>	5.2 L @ 70 psig (483 kPa)	4.9 L @ 60 psig (414 kPa)	4.6 L @ 60 psig (414 kPa)

\*Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

## please note

Gas standards on this page are not available in Pi-marked cylinders for EU countries.



## cylinder design

DCG Partnership Cylinders:

**Size:** 7.6 x 24 cm  
**Connection:** CGA-170/110  
**U.S. DOT Specs:** DOT-4B-240ET

**Please note:** This cylinder is not approved for use in Canada.

also available

See page 453 for regulators.





### Scotty/Air Liquide Transportable Pure Gases and Mixtures

in 14 L, 48 L, and 110 L Sizes

We offer a wide range of Scotty/Air Liquide transportable gases, from pure gases for purging or calibrating to multicomponent mixes, which are ideal for peak identification work.

The 14 L container has a CGA 160 connection for more precise integration with analytical systems. The 48 L cylinder has a CGA 165 connection and can deliver large volumes of sample. The 110 L cylinder has a CGA 180 connection.

See **pages 452–453** for cylinder and regulator information.

NOTE: Scotty 14 and Scotty 48 cylinders are not approved for use in Canada.

Description	Product Grade	Shelf Life	Scotty 14 (14 L) cat.#	Scotty 48 (48 L) cat.#	Scotty 110 (110 L) cat.#
<b>Pure Gases</b>					
Air, zero	THC < 1 ppm	—	34448	34449	34449-PI
Argon	99.995%	—	34457	—	34457-PI
Carbon dioxide	99.80%	—	34451	34452	34452-PI
Hydrogen	99.99%	—	34453	—	34453-PI
Methane	99.00%	—	34454	—	34454-PI
Oxygen	99.60%	—	34455	—	—
<b>Two-Component Mixtures</b>					
Benzene in air (1 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34458	34458-PI
Benzene in air (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	—	34459	34459-PI
1,3-Butadiene in nitrogen (10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34460	34461	34461-PI
Carbon dioxide in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34462	—	34462-PI
Carbon dioxide in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34463	34464	34464-PI
Carbon dioxide in nitrogen (1,000 ppm)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34465	34466	34466-PI
Ethylene in air (8–10 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34467	34468	34468-PI
Ethylene in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34489	—	34489-PI
Hydrogen in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34469	—	34469-PI
Hydrogen in nitrogen (1%)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34471	34472	34472-PI
Hydrogen in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34473	34474	34474-PI
Methane in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34476	34477	34477-PI
Methane in nitrogen (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34478	—	34478-PI
Methane in nitrogen (1%)	Blend tolerance: ±5%; Analytical accuracy: ±2%	3 yr	34482	34483	34483-PI
Nitrogen in helium (100 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34479	—	34479-PI
Nitrous oxide in nitrogen (1 ppm)	Blend tolerance: ±10%; Analytical accuracy: ±5%	3 yr	34484	34485	34485-PI

Description	Product Grade	Shelf Life	Scotty 14 (14 L) cat.#	Scotty 48 (48 L) cat.#	Scotty 110 (110 L) cat.#
<b>Two-Component Mixtures</b>					
Oxygen in helium (100 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34480	—	34480-PI
Oxygen in nitrogen (2%)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34487	34488	34488-PI
Oxygen in nitrogen (6%)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34491	34492	34492-PI
1,1,1-Trichloroethane in nitrogen (10 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	—	34493	34493-PI
Trichloroethylene in nitrogen (10 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34494	34495	34495-PI
Vinyl chloride in nitrogen (1 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34496	34497	34497-PI
Vinyl chloride in nitrogen (10 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34498	34499	34499-PI
Vinyl chloride in nitrogen (50 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34500	—	34500-PI
Vinyl chloride in nitrogen (100 ppm)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34501	—	34501-PI
Vinyl chloride in nitrogen (1,000 ppm)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34502	—	34502-PI
<b>Multi-Component Mixtures</b>					
Carbon monoxide, carbon dioxide, hydrogen, and oxygen in nitrogen (0.5% each)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34504	34505	34505-PI
Carbon monoxide, carbon dioxide, hydrogen, and oxygen in nitrogen (1% each)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34507	34508	34508-PI
Carbon monoxide, carbon dioxide, methane, ethane, ethylene, and acetylene in nitrogen (1% each)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	—	34511	34511-PI
Carbon monoxide, carbon dioxide, nitrogen, and oxygen (5% each), and methane and hydrogen (4% each) in helium	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34512	—	34512-PI*
Carbon monoxide (7%), carbon dioxide (15%), and oxygen (5%) in nitrogen	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34514	—	34514-PI
Carbon monoxide (7%), oxygen (4%), carbon dioxide (15%), and methane (4.5%) in nitrogen	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34515	34516	34516-PI
C1–C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (15 ppm each)	Blend tolerance: $\pm 20\%$ ; Analytical accuracy: $\pm 10\%$	3 yr	34518	34519	34519-PI
C1–C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (100 ppm each)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34521	34522	34522-PI
C1–C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (1,000 ppm each)	Blend tolerance: $\pm 5\%$ ; Analytical accuracy: $\pm 2\%$	3 yr	34524	34525	34525-PI
C1–C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (100 ppm each)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34527	34528	34528-PI
C2–C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in helium (100 ppm each)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34529	34530	34530-PI
C2–C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in nitrogen (100 ppm each)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	34531	34532	34532-PI
Branched Paraffins: 2,2-dimethylbutane, 2,2-dimethylpropane, isobutane, 2-methylbutane, 2-methylpentane, 3-methylpentane in nitrogen (15 ppm each)	Blend tolerance: $\pm 20\%$ ; Analytical accuracy: $\pm 10\%$	3 yr	34534	—	34534-PI
Methane, ethane, ethylene, acetylene, propane, propylene, <i>n</i> -butane, propyne in nitrogen (15 ppm each)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	—	34537	34537-PI
<i>n</i> -butane, isobutane, <i>cis</i> -2-butene, <i>trans</i> -2-butene, 1-butene, iso-butylene, 1,3-butadiene, ethyl acetylene in nitrogen (15 ppm each)	Blend tolerance: $\pm 10\%$ ; Analytical accuracy: $\pm 5\%$	3 yr	—	34539	34539-PI

\*Cat.# 34512-PI is 30 L at 500 psig (34.5 bar).

Our PI-marked gas standards from Scott/Air Liquide meet the requirements of the Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.





**DCG Partnership Cylinders:**  
Size: 7.6 x 24 cm  
Connection: CGA-170/110  
U.S. DOT Specs: DOT-4B-240ET  
**Please note:** This cylinder is not approved for use in Canada.  
**Recommended regulator:**  
cat.# 22032



**Scotty® (Air Liquide) 110 L (Pi-marked Cylinders for EU Regulations):**  
Aluminum construction  
Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas @ 1,800 psi  
Outlet Fitting: CGA-180  
Weight: 2.2 lb/1 kg  
DOT Specifications: 3AL2216  
**Recommended regulators:**  
cat.# 26371, 26372, 21572, or 21572-R100



**Spectra (Linde) 104 L:**  
Aluminum construction  
Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas @ 1,800 psi  
Outlet Fitting: CGA-180  
Weight: 1.5 lb/0.7 kg  
**Recommended regulators:**  
cat.# 21572, 21572-R100, 26371, or 26372



**Scotty® (Air Liquide) 110 L**  
Aluminum construction  
Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas @ 1,800 psi  
Outlet Fitting: CGA-180  
Weight: 2.2 lb/1 kg  
DOT Specifications: 3AL2216  
**Recommended regulators:**  
cat.# 26371, 26372, 21572, or 21572-R100



**Scotty® (Air Liquide) 14 L**  
Contents: 14 liters  
Pressure: 240 psig (17 bar)  
Outlet Fitting: CGA-160  
Weight: 1.5 lb/0.7 kg  
Dimensions: 3" diameter x 11" height (7.6 x 28 cm)  
DOT Specifications: 4B240  
**Please note:** This cylinder is not approved for use in Canada.  
**Recommended regulators:**  
cat.# 22690



**Scotty® (Air Liquide) 48 L**  
Contents: 48 liters  
Pressure: 300 psig (21 bar)  
Outlet Fitting: CGA-165  
Weight: 1.75 lb/0.8 kg  
Dimensions: 4" diameter x 16 1/4" height (10.2 x 41 cm)  
DOT Specifications: 39 NRC  
**Please note:** This cylinder is not approved for use in Canada.  
**Recommended regulators:**  
cat.# 22691

**Small Cylinder Stand**

- Supports and stabilizes disposable gas cylinders.
- Fits cylinders up to 3 3/8" (8 cm) in diameter.
- Adjustable screw secures cylinder in place.



This cylinder stand is designed to support small-diameter cylinders, such as 104 L and 110 L disposable cylinders. It is a simple, safe, and economical way to stabilize the position of small cylinders, while keeping them within close proximity. The stand is constructed of heavyweight painted steel and includes an adjustable screw for safely securing cylinders.

Description	qty.	cat.#
Small Cylinder Stand	ea.	24129

24129



**Mini-Regulator** for natural gas and refinery gas standards

- 0–300 psig inlet pressure range.
- 0–15 psig outlet pressure range.
- Supplied with 0–15 psig outlet pressure gauge, brass CGA 170 nut and nipple, and 1/8-inch compression outlet.

Description	qty.	cat.#
Mini-Regulator	ea.	22032



22032

**High-Purity VOC Regulators**

- Single-stage, stainless steel.
- Two pressure gauges and CGA-180 fitting.
- Stainless steel diaphragm and Kel-F® seat.
- Accurate pressure control even at low flow rates.
- Individually tested for leaks and impurities.

**Spectra Gas 7621 High-Purity VOC Regulators**

**Specifications:**  
Maximum Inlet Pressure: 3,000 psig  
Outlet Connection: 1/8" tube compression  
Internal Volume: 3.03 cc

Description	qty.	cat.#
0–30 psig outlet pressure gauge	ea.	21572
0–100 psig outlet pressure gauge	ea.	21572-R100



21572

**Air Liquide High-Purity VOC Regulators**

**Specifications:**  
Maximum Inlet Pressure: 3,000 psig  
Outlet Connection: 1/4" NPT female  
Internal Volume: 3.03 cc

Description	qty.	cat.#
CGA-180 (0–30 psig)	ea.	26371
CGA-180 (0–100 psig)	ea.	26372



26371

**Regulators** for use with 14 L and 48 L Scott/Air Liquide transportable gases

Use the CGA-160 inlet connection with 14 L Scott/Air Liquide transportable gases.  
Use the CGA-165 inlet connection with 48 L Scott/Air Liquide transportable gases.

**Specifications:**  
Maximum Inlet Pressure: 300 psig  
Outlet Pressure Range: 2–10 psig  
Maximum Delivery Pressure: 25 psig  
Operating Temperature Range: 35 °F to 150 °F (2 °C to 65 °C)  
Outlet Connection: 1/4" female NPT

**Materials of Construction:**  
Body: Brass  
Diaphragm: Viton®  
Seat: Acetal  
Seal: Viton®

Description	qty.	cat.#
Regulator, CGA-160 Inlet Connection	ea.	22690
Regulator, CGA-165 Inlet Connection	ea.	22691



22690

**also available**

Single-Stage and Dual-Stage  
Ultra-High Purity Gas Regulators  
See **pages 301–303**.



**Syringe Adaptor Kit** for Single-Stage VOC Regulator

Use to withdraw sample from a high-pressure cylinder after pressure reduction through the high-purity VOC single-stage regulator.

Kit contains one nickel-plated brass 1/4" NPT to female luer fitting, which can be used with an A-2 Luer syringe (cat.# 20162 or 20163), and one stainless steel 1/4" NPT x 1/8" compression fitting with septum (can be used with any syringe needle).

Description	qty.	cat.#
Syringe Adaptor Kit	1 ea.	21110



21110

# Gas Sampling

Sample Cylinders.....	454
Sample Cylinder Valves.....	455
Sample Cylinder Accessories.....	456
Gas Sampling Valves & Loops.....	457



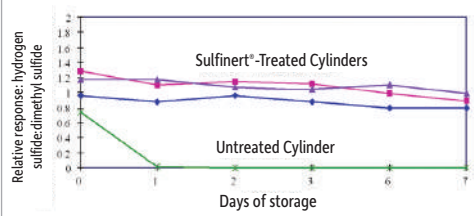
## Sample Cylinders

- All cylinders have 1/4" female NPT threads on both ends.
- TPED compliant cylinders available for EU community.

Swagelok® sample cylinders are made of 304L and 316L stainless steel to resist corrosion and DOT rated to 1,800 and 5,000 psig (TPED cylinders rated to 1,450 and 4,350 psig), which allows sampling at gas wellheads as well as on-site refineries. Each cylinder is hydrostatically tested to at least 5/3 the working pressure.

Sulfur compounds are stable in Sulfinert®-treated stainless steel systems.

17 ppbv hydrogen sulfide in 500 mL cylinders



### Applications:

- ASTM D1265
- Hydrocarbon sampling in refineries & petrochemical plants

### Analyzing sulfur or mercury?

- Sulfinert® coating provides stable storage of sulfur and mercury at ppb levels.
- Inert coating doesn't flake; more durable than PTFE.

## Sample Cylinders, High Pressure (Stainless Steel & Sulfinert®-Treated)

- 304L stainless steel; DOT rating to 1,800 psig (TPED cylinders to 1,450 psig).
- Range of cylinder sizes, 75 cc to 2,250 cc.

Size	1,800 psig (12,411 kPa), 304L SS		TPED, 1,450 psig (9,997 kPa), 304L SS	
	Stainless Steel cat.#	Sulfinert-Treated cat.#	Stainless Steel cat.#	Sulfinert-Treated cat.#
75 cc	22921	24130	22921-PI	24130-PI
150 cc	22922	24131	22922-PI	24131-PI
300 cc	22923	24132	22923-PI	24132-PI
500 cc	22924	24133	22924-PI	24133-PI
1,000 cc	22925	24134	22925-PI	24134-PI
2,250 cc	22926	21394	22926-PI	21394-PI

## Sample Cylinders, Ultra-High Pressure (Stainless Steel & Sulfinert®-Treated)

- 316L stainless steel; DOT rating to 5,000 psig (TPED cylinders to 4,350 psig).
- Range of cylinder sizes, 150 cc to 500 cc.

Size	5,000 psig (34,474 kPa), 316L SS		TPED, 4,350 psig (29,992 kPa), 316L SS	
	Stainless Steel cat.#	Sulfinert-Treated cat.#	Stainless Steel cat.#	Sulfinert-Treated cat.#
150 cc	22927	22111	22927-PI	22111-PI
300 cc	22928	22112	22928-PI	22112-PI
500 cc	22929	22113	22929-PI	22113-PI

## also available

Certificates are available upon request.

### Sample Cylinder Valves (Stainless Steel & Sulfinert®-Treated)

- Multiple valve configurations, including dip tube and rupture discs.
- Large, durable, Kel-F® seat ensures leak-free operation.
- Temperature range: -40 °C to 120 °C
- 303 stainless steel.

Alta-Robbins' unique valve design incorporates a fully contained soft seat that provides durability and longer lifetime. Tight shut-off is easily achieved with very low torque, yet the valve is rugged enough to withstand overtightening.

Multiple valve configurations are available for both high-pressure and ultra-high-pressure sample cylinders. An outage tube or dip tube provides a headspace above liquefied gases so that, should expansion occur with an increase in temperature, the pressure is not dramatically increased. Outage is expressed as a percent of the total cylinder volume, based on the ratio of the length of headspace to the total length of the cylinder, with a maximum available outage of 50%. The dip tube is welded directly to the male inlet of the valve and cut to a length of up to 5.25 inches. Rupture discs function to protect sample cylinders from over-pressurization by venting to the atmosphere. The pressure rating on the rupture disc should always be lower than the cylinder.

Description	Stainless Steel cat.#	Sulfinert-Treated cat.#
<b>3,500 psig (24,132 kPa) DOT Pressure Rating</b>		
1/4" Male NPT x 1/4" Male NPT	26297	21400
1/4" Male NPT x 1/4" Female NPT	26298	26299
1/4" Male NPT x 1/4" Male Compression	26300	21401
1/4" Male NPT x 1/4" Male NPT w/5.25" Dip Tube*	26301	21402*
1/4" Male NPT x 1/4" Male NPT w/1,800 psi (12,411 kPa) Rupture Disc	26302	26303
1/4" Male NPT x 1/4" Female NPT w/1,800 psi (12,411 kPa) Rupture Disc	26304	26305
Replacement Rupture Disc, 1,800 psig (12,411 kPa)	26320	—
<b>5,000 psig (34,474 kPa) DOT Pressure Rating</b>		
1/4" Male NPT x 1/4" Male NPT	26306	26307
1/4" Male NPT x 1/4" Female NPT	26308	26309
1/4" Male NPT x 1/4" Male Compression	26310	26311
1/4" Male NPT x 1/4" Male NPT w/5.25" Dip Tube*	26312	26313
1/4" Male NPT x 1/4" Male NPT w/2,850 psi (19,650 kPa) Rupture Disc	26314	26315
1/4" Male NPT x 1/4" Female NPT w/2,850 psi (19,650 kPa) Rupture Disc	26316	26317
Replacement Rupture Disc, 2,850 psig (19,650 kPa)	26324	—

\*To order a sample cylinder valve with dip tube, please call Restek® Customer Service at 800-356-1688, ext. 3, or contact your Restek® representative. Specify dip tube length or % outage when ordering (maximum length = 5.25" / 13.3 cm).  
Note: End of part will not be treated after cutting tube to length.

### Rupture Disc Tee (Stainless Steel & Sulfinert®-Treated)

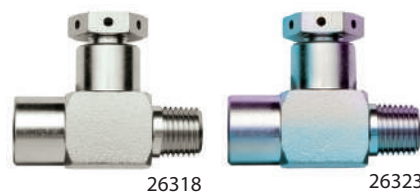
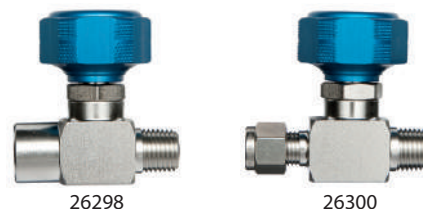
Unlike other designs, Alta-Robbins rupture disc tee is NOT permanently soldered to the disc, making the discs replaceable. Discs are easily changed without removing the valve or tee from the cylinder. These tees are designed to be installed into existing systems to provide reliable over-pressure protection.

Description	Stainless Steel cat.#	Sulfinert-Treated cat.#
<b>1,800 psig DOT Pressure Rating</b>		
Rupture Disc Tee, 1/4" Male NPT x 1/4" Female NPT	26318	26319
Replacement Rupture Disc	26320	—
<b>2,850 psig DOT Pressure Rating</b>		
Rupture Disc Tee, 1/4" Male NPT x 1/4" Female NPT	26322	26323
Replacement Rupture Disc	26324	—

### Metering Control Valves (Stainless Steel & Sulfinert®-Treated)

- Reduces pressure between sample cylinder and GC injector.
- Maintains fine metering control.
- Contains Kel-F® seat.

Description	Stainless Steel cat.#	Sulfinert-Treated cat.#
<b>3,500 psig (24,132 kPa) DOT Pressure Rating</b>		
Metering Control Valve, 1/4" Male NPT x 1/4" Male NPT	26326	26327





### Sample Cylinder Accessories

Description	Fittings	qty.	cat.#
Sample Cylinder Carrying Handle, 304 SS for 1.9" & 2" OD Cylinders (Includes handle and two attachment rings)	—	ea.	26373
Sample Cylinder Carrying Handle, 304 SS for 3.5" & 4" OD Cylinders (Includes handle and two attachment rings)	—	ea.	26374
Sample Cylinder 316 SS End Pipe Plug, Stainless Steel	1/4" Male NPT	ea.	26375
Sample Cylinder 316 SS End Pipe Plug, Sulfinert-Treated	1/4" Male NPT	ea.	26376
Sample Cylinder 316 SS Hollow Hex Plug	1/4" Male NPT	ea.	26377
Sample Cylinder SS Pipe Cap w/Lanyard	1/4" Female NPT & 20" Lanyard	ea.	26378
Sample Cylinder SS Pipe Cap, Stainless Steel	1/4" Female NPT	ea.	22969
Sample Cylinder SS Pipe Cap, Sulfinert-Treated	1/4" Female NPT	ea.	22970

SS=stainless steel

### Protecting Your Sulfinert®-Treated Products

#### Cleaning Tips

When cleaning a treated part, rinse with a solvent that will dissolve probable surface contaminants (i.e., use a nonpolar solvent to remove hydrocarbon contaminants, or a more polar solvent to remove more active contaminants).

Avoid using cleaners containing abrasives as they can scratch the layer. Mild sonication may assist in contaminant removal, but do not oversonicate—this could damage the layer. Solids can be removed with a soft nylon bristle brush using light pressure.

**Caution!** Do not use basic solutions or soaps with pH>8. Do not steam clean Sulfinert®-treated components or lines as this could damage the layer.

#### Preventing Galling

As with any threaded fitting, galling may occur when assembling two treated parts. To prevent thread damage, use a PTFE tape.

A scouring pad can be used to remove coating from the threads to reduce galling.

Ferrules used in compression fittings should not be coated—leaks may occur.

#### Troubleshooting

Under normal use, your treated items should deliver outstanding performance for years to come. However, effective lifetime is dependent on the severity of the environment. Factors that can reduce performance are:

- *Contamination*—Failure to properly clean the surface can allow increased surface activity. If performance changes, thoroughly clean the surface and inspect the layer for damage.
- *Erosion*—Contact with abrasives can accelerate surface wear.
- *Bases*—Contact with a base (pH 8 or higher) can accelerate deterioration of the layer.

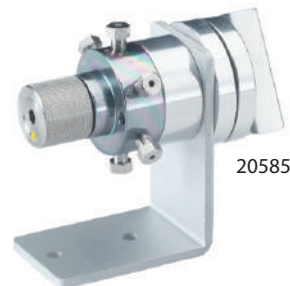
Surface finish and color should stay consistent throughout the life of the product. Changes in the finish or color may indicate a partial loss of the layer. To prevent further loss, ensure no exposure to bases or abrasives.



## Gas Sampling Valves and Sample Loops (Sulfinert®-Treated)

- Ideal for samples containing low concentrations of sulfur or other active compounds.
- Sample loop sizes from 5 µL to 5 mL.

Sulfinert® treatment eliminates active sites in the valve or loop for better recovery of active compounds.



20585

## Gas Sampling Valves & Replacement Rotors (Sulfinert®-Treated)

(1/16" Fittings, 0.40 mm Port Diameter; "W Type" Valve)

Description	qty.	cat.#
Sulfinert Gas Sampling Valve; 4-Port	ea.	20584
Sulfinert Gas Sampling Valve; 6-Port	ea.	20585
Sulfinert Gas Sampling Valve; 10-Port	ea.	20586

Replacement Rotors (Not Coated)

Description	qty.	cat.#
Replacement Rotor (not coated) for 4-Port Sulfinert Gas Sampling Valve	ea.	20587
Replacement Rotor (not coated) for 6-Port Sulfinert Gas Sampling Valve	ea.	20588
Replacement Rotor (not coated) for 10-Port Sulfinert Gas Sampling Valve	ea.	20589



20588

## Gas Sample Loops (Sulfinert®-Treated)

(1/16" fittings, 1 mm ID, for "W Type" valves)

Description	Size	qty.	cat.#
Sample Loops, Sulfinert-Treated	5 µL	ea.	22840
Sample Loops, Sulfinert-Treated	10 µL	ea.	22841
Sample Loops, Sulfinert-Treated	20 µL	ea.	22842
Sample Loops, Sulfinert-Treated	25 µL	ea.	22843
Sample Loops, Sulfinert-Treated	50 µL	ea.	22844
Sample Loops, Sulfinert-Treated	100 µL	ea.	22845
Sample Loops, Sulfinert-Treated	250 µL	ea.	22846
Sample Loops, Sulfinert-Treated	500 µL	ea.	22847
Sample Loops, Sulfinert-Treated	1 mL	ea.	22848
Sample Loops, Sulfinert-Treated	2 mL	ea.	22849
Sample Loops, Sulfinert-Treated	5 mL	ea.	22850



22848

## Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.



21276

Volume	Model	SGE cat.#	Restek cat.#	qty.
500 mL	500MAR-LL-GT	009910	21275	ea.
1000 mL	1000MAR-LL-GT	009920	21276	ea.
2000 mL	2000MAR-LL-GT	009930	21277	ea.

## Syringe O-Rings

Syringe Volume	SGE cat.#	Restek cat.#	qty.
500 mL	032527	21278	ea.
1,000 mL	032532	21279	ea.



21279

21278

# Reference Standards

10 Critical Steps to World-Class CRMs.....	464–465
Compound Index for Reference Standards .....	586–592
Single-Component Solutions.....	466–471
Column & Detector Test Mixes & Reagents.....	472–475
Deactivating Agent .....	472
Derivatization Reagents .....	472–473
Detector Tuning Mixes .....	473
GC Column & Detector Test Mixes.....	473–474
GPC Calibration Mixes.....	474
LC Column & Detector Test Mixes.....	475

## Index of Reference Standards by Industry

### Clinical, Forensic & Toxicology 476–481

Blood Alcohol.....	477
Exempted Drugs of Abuse.....	478
Explosives .....	479
Fire Debris Analysis.....	479
Personal Care Products .....	480
Ethylene Oxide.....	480
Polyethylene Glycol (PEG).....	480
Weathered Petrochemical.....	480–481

### Environmental 482–561

Acetates.....	483
Alcohols.....	483
Aldehydes.....	483
Base, Neutral & Acid Extractable (BNA) .....	532–544
Benzidines .....	483
BTEX.....	484
Diesel Fuel.....	484–485
Disinfection By-Products .....	485
Drinking Water Odor.....	485
Ethylene Oxide .....	485
Explosives .....	486–487
Gases .....	488
Gasoline.....	489
Glycols.....	490
Haloacetic Acids.....	490
Herbicides.....	491–494
Chloroacetanilide Herbicide Degradates.....	491
Chlorinated Acid.....	491–494
Glyphosate.....	494
Paraquat/Diquat.....	494
Triazines.....	494

Hormones.....	495
Hydrocarbons.....	495–517
Aromatic Hydrocarbons .....	495
Halogenated Hydrocarbons.....	495–496
Leaking Underground Storage Tank (LUST).....	497–510
Polycyclic Aromatic Hydrocarbons (PAHs).....	511–513
Petroleum Hydrocarbons.....	513–517
<i>Fuels &amp; Products</i> .....	513–515
Aviation Gas .....	513
BTEX.....	484
Creosote Oil.....	513
Diesel.....	484–485
Fuel Oil .....	513–514
Gasoline.....	489
Hydraulic Oil.....	514
Jet Fuel .....	514
Kerosene .....	514
Leaking Underground Storage Tank (LUST).....	497–510
Mineral Spirits .....	515
Motor Oil.....	515
Stoddard Solvent.....	515
Retention Time Markers.....	516
Total Petroleum Hydrocarbons (TPH).....	517
Weathered Petrochemical.....	480–481
Isocyanates.....	518
Jet Fuel.....	514
Kerosene .....	514
Ketones.....	518
Leaking Underground Storage Tank (LUST).....	497–510
Nitriles .....	518
Nitroaromatics & Nitramines.....	486–487
Nitrosamines .....	519
Oil & Grease.....	519
Organometallics/Organotin .....	520
Oxygenates/Ethers.....	520
Pesticides .....	521–529
Carbamate .....	521
Chlordane & Toxaphene.....	521
Chlorinated Disinfection By-Products, Pesticides & Herbicides.....	521
Chlorinated/Organochlorine/Organohalide.....	522–526
Nitrogen & Phosphorus .....	527
Organophosphorus.....	527–528
Pesticides & Flame Retardants.....	528
Phenylurea.....	528
State-Specific .....	529
Phenols.....	529
Phthalates (Phthalate Esters) .....	530
Polybrominated Diphenyl Ethers (PBDEs).....	528
Polychlorinated Biphenyls (PCBs).....	530–531
PCB Aroclors.....	530–531
PCB Congeners.....	531
Polycyclic Aromatic Hydrocarbons (PAHs).....	511–513
Semivolatile Organics .....	532–544
Toxicity Characteristic Leaching Procedure (TCLP).....	544
Trihalomethanes.....	545
Volatile Organics.....	546–559

**Environmental Reference Standards – International-Specific**

Canada.....	559
Europe.....	560
Japan .....	560
ISO/DIS.....	561

** Foods, Flavors & Fragrances 562–575**

Derivatization Reagents.....	472–473
Fatty Acid Methyl Esters (FAMES).....	563–564
Fatty Acids.....	565
Food Analysis Performance Assessment Scheme (FAPAS®).....	565
Fragrance Allergens.....	566
Fragrances.....	566
Medical Cannabis .....	566
Melamine .....	567
MN Dept of Agriculture Pesticides.....	567
Multiresidue Pesticides.....	568–571
GC Pesticides Kit.....	568
LC Pesticides Kit.....	570
Packaging .....	572
Phthalate Esters.....	530
Plastic Container Testing.....	572
Polycyclic Aromatic Hydrocarbons (PAHs).....	572
QuEChERS.....	573–575

** Petroleum & Petrochemical 576–581**

Biodiesel.....	577
Finished Motor Oil & Aviation Gasoline.....	578
Leaking Underground Storage Tank (LUST).....	497–510
PCBs in Transformer Oil.....	578
Simulated Distillation.....	579
Spark Ignition Engine Fuels.....	580–581

** Pharmaceutical 582–585**

Diethylene & Ethylene Glycol .....	583
Fatty Acids.....	583
Pharmaceutical Compounds in Drinking Water.....	583
Plastic Container Testing.....	583
Residual Solvents.....	584–585

**Index of Reference Standards by Method Source**

**American Oil Chemists Society (AOCS) Methods**

AOCS Method CE 1-62 Fatty Acid Methyl Esters FAMES.....	564
---	-----

**Association of Analytical Communities (AOAC) International Methods**

2007.01 QuEChERS.....	575
-----------------------	-----

**American Society for Testing & Materials (ASTM) Methods**

D2887 Simulated Distillation Petroleum Fractions.....	579
D3606 Benzene & Toluene in Finished Motor & Aviation Gasoline.....	578
D3710 Simulated Distillation .....	579
D4059 PCBs in Insulating Liquids.....	578
D5197 Formaldehyde and Other Carbonyl Compounds in Air.....	483
D5836 2,4-Toluene Diisocyanate (2,4-TDI) and 2,6-Toluene Diisocyanate (2,6-TDI) in Workplace Atmospheres.....	518
D6042 Phenolic Antioxidants & Erucamide Slip Additives in Polypropylene Homopolymer Formulations (Plastic Container Testing).....	572, 583
D6352 High-Temperature Simulated Distillation .....	579



D6584 Total Monoglyceride, Total Diglyceride, Total Triglyceride & Free & Total Glycerin in B100 Biodiesel Methyl Esters Biodiesel..... 577

D6730 Individual Components in Spark Ignition Engine Fuels..... 580–581

E1387 Ignitable Liquid Residues in Extracts From Fire Debris Samples Using GC..... 479

E1618 Ignitable Liquid Residues in Extracts From Fire Debris Samples Using GC-MS..... 479

**Canadian Council of Ministers of the Environment (CCME) Methods**

CCME Petroleum Hydrocarbons..... 559

Canadian Drinking Water..... 559

Atlantic RBCA..... 559

**European Norm (EN) Methods**

EN14105 Biodiesel..... 577

**European Pharmacopeia (EP)**

EP 2.4.22 Fatty Acids by GC..... 565, 583

EP/ICH Residual Solvents..... 585

**Fragrance Materials Association (FMA)**

Essential Oils Test Mix..... 566

**ISO/DIS**

9377 Water Quality Testing..... 485

**Minnesota Department of Agriculture**

MN Dept. of Agriculture Pesticides..... 567

**OSHA/NIOSH Industrial Hygiene (IH) Methods**

ASTM Method D5836-03/OSHA 42, OSHA 47, NIOSH 5522 (Analysis of Isocyanates in Indoor Air by LC)..... 518

**Standard Methods for the Analysis of Water and Wastewater**

5560 Organic and Volatile Acids..... 583

**U.S. EPA Methods**

**500 SERIES METHODS – U.S. EPA SAFE DRINKING WATER ACT (SDWA)**

Method 501, 501.2, 501.3 – Trihalomethanes..... 545

Method 502.1, 502.2 – Volatile Halogenated Organics..... 546–547

Method 504.1 – Ethylene Dibromide & Dibromochloropropane..... 548

Method 505 – Organohalide Pesticides & PCBs..... 523

Method 506 – Phthalate & Adipate Esters..... 530

Method 507 – Nitrogen & Phosphorus Pesticides..... 527

Method 508 – Chlorinated Pesticides..... 522–523

Method 515, 515.4 – Chlorinated Acid Herbicides..... 491–492

Method 521 – Nitrosamines..... 519

Method 522 – 1,4-Dioxane..... 519

Method 524.1, 524.2, 524.3 – Volatile Organics..... 548–550

Method 525, 525.1, 525.2 – Semivolatile Organics..... 531–533

Method 527 – Pesticides & Flame Retardants (GC-MS)..... 528

Method 528 – Phenols..... 529

Method 531.1, 531.2 – Carbamates..... 521

Method 532 – Phenylurea Pesticides..... 528

Method 535 – Chloroacetanilide Herbicide Degradates..... 491

Method 539 – Hormones in Drinking Water..... 495

Method 547 – Glyphosate..... 494

Method 549.2 – Paraquat/Diquat..... 494

Method 551.1 – Chlorinated Pesticides & Herbicides..... 521

Method 552, 552.1, 552.2, 552.3 – Haloacetic Acids & Dalapon..... 490

Method 555 – Chlorinated Acids..... 492

**600 SERIES METHODS – U.S. EPA CLEAN WATER ACT (CWA)**

Method 601 – Purgeable Hydrocarbons ..... 551  
 Method 603 – Acrolein & Acrylonitrile ..... 518, 551  
 Method 604 – Phenols ..... 529  
 Method 605 – Benzidine & 3,3'-Dichlorobenzidine ..... 483  
 Method 606 – Phthalate Esters ..... 530  
 Method 607 – Nitrosamines ..... 519  
 Method 608 – Organochlorine Pesticides & PCBs ..... 523  
 Method 609 – Nitroaromatics & Isophorone ..... 486, 495  
 Method 610 – Polycyclic Aromatic Hydrocarbons (PAHs) ..... 511  
 Method 612 – Chlorinated Hydrocarbons ..... 495  
 Method 615 – Chlorinated Acid Herbicides ..... 492  
 Method 624 – Purgeable Halocarbons ..... 496, 551–552  
 Method 625 – Semivolatiles ..... 534  
 Tuning Mixes ..... 473  
 Aroclors ..... 530–531  
 Chlordane & Toxaphene ..... 521, 526  
 Method 418.1 – Total Recoverable Petroleum Hydrocarbons ..... 517  
 Method 1311 – Toxicity Characteristic Leaching Procedure (TCLP) ..... 494, 544  
 Method 1614 – Polybrominated Diphenyl Ethers (PBDEs) ..... 528  
 Method 1664 – Oil & Grease ..... 519  
 Method 3500 – Organic Extraction Surrogates ..... 535–538

**8000 SERIES METHODS – RESOURCE CONSERVATION & RECOVERY ACT (RCRA)**

**SOLID WASTE MANUAL (SW-846)**

Method 8010 – Halogenated Volatile Organics ..... 496, 552  
 Method 8011 – 1,2-Dibromoethane & 1,2-Dibromo-3-Chloropropane ..... 496, 553  
 Method 8020 – Aromatic Volatile Organics ..... 495, 553  
 Method 8021 – Volatile Organics ..... 553  
 Method 8040 – Phenols ..... 529  
 Method 8061A – Phthalate Esters ..... 530  
 Method 8080, 8081 – Chlorinated Pesticides ..... 524  
 Method 8082, 8082A – Polychlorinated Biphenyls (PCBs) ..... 531  
 Method 8095 – Explosives by GC ..... 486  
 Method 8100 – Polycyclic Aromatic Hydrocarbons (PAHs) ..... 511  
 Method 8140, 8141 – Organophosphorus Pesticides ..... 527  
 Method 8150, 8151, 8151A – Chlorinated Acid Herbicides ..... 493  
 Method 8240 – Volatile Organic Compounds (VOCs) ..... 488, 553–554  
 Method 8260, 8260A, 8260B – Volatile Organic Compounds (VOCs) ..... 554–556  
 Method 8270C, 8270D – Semivolatile Organic Compounds (SVOCs) ..... 535–538  
 Method 8310 – Polycyclic Aromatic Hydrocarbons (PAHs) by LC ..... 511  
 Method 8315 – Aldehydes & Ketones DNPH by LC ..... 483  
 Method 8321 – Chlorinated Acids by LC ..... 494  
 Method 8330 – Nitroaromatics and Nitramines by LC ..... 487

**CLP METHODS – CERCLA/SUPERFUND PROGRAM**

Method SOM01.1, 04.2, 04.1, 10/92 SOW – Volatiles (QA) ..... 557  
 Method 04.2, 04.1, 3/90 SOW, OLC 03.2 – Volatiles (Calibration) ..... 558–559  
 Method SOM01.1, 04.2, 04.1, 4/89 & 3/90 SOW, Low Concentration – Semivolatiles (QA) ..... 539–540  
 Method SOM01.1, 04.2, 04.1, 4/89 & 3/90 SOW, 03.2 Low Concentration – Semivolatiles (Calibration) .. 541–543  
 Method SOM01.1, 04.2, 04.1, 03.2, 3/90, 4/89 & 2/88 SOW – Pesticides (QA) ..... 524–525  
 Method SOM01.1, 04.2, 04.1, 03.2, 3/90, 4/89 & 2/88 SOW – Pesticides (Calibration) ..... 526  
 Aroclors ..... 530–531  
 Chlordane & Toxaphene ..... 521, 526  
 GPC Calibration Mixes ..... 544  
 PCB Congeners ..... 531

**STATIONARY SOURCE & AMBIENT AIR METHODS**

ASTM D5197 .....	483
CARB 1004 .....	483
TO-11A Aldehydes & Ketones.....	483, 518
TO-14 VOCs.....	443–444
TO-15 .....	445–446
Ozone Precursors/PAMS .....	447

**LEAKING UNDERGROUND STORAGE TANK (LUST) RECOVERY ACT PROGRAM METHODS**

General .....	497–501
Diesel/Biodiesel Standard.....	501
Diesel Surrogates & Internal Standards.....	501
Fuel Composite Standards.....	497
Fuel Oil Degradation Test.....	499
Gasoline Surrogate & Internal Standards .....	501
Retention Time Standards.....	497
Military Fuels (Jet Propellant) .....	499
Mineral Spirits.....	499
Motor Oil Composite Standards .....	497
Petroleum Volatile Organic Compounds (PVOCs), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX) .....	500–501
Single-Source Fuels.....	498
Weathered Fuels .....	480–481
State-Specific Methods.....	502–510
Alaska .....	502–503
Arizona.....	504
California .....	504
Connecticut.....	504
Florida .....	505
Massachusetts.....	505–506
Michigan.....	507
Mississippi.....	507
New Jersey.....	507–508
Northwest U.S. (Oregon & Washington) .....	508
Pennsylvania.....	508
Tennessee & Mississippi .....	508
Texas.....	509
Washington.....	510
Wisconsin.....	510

**U.S. Pharmacopeia (USP)**

USP <467> Residual Solvents.....	584–585
----------------------------------	---------

**Compound Index  
for Reference Standards**

See pages 586–592.





### What are Certified Reference Materials (CRMs)?

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\* National Institute of Standards and Technology





# Reference Materials (CRMs)

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# Reference Standards

## Single-Component Solutions



Compound	CAS #	Solvent	Conc.	cat.#
Acenaphthene	83-32-9	M	1,000	31267
Acenaphthylene	208-96-8	M	1,000	31268
Acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074
Acetone	67-64-1	Neat		30012
Acetone	67-64-1	PTM	5,000	30245
Acetonitrile	75-05-8	DMSO	2.05 mg/mL	36281
Acetonitrile	75-05-8	PTM	1,000	30495
Acetophenone	98-86-2	PTM	5,000	30621
Acifluorfen	50594-66-6	M	1,000	32255
Acifluorfen methyl ester	50594-67-7	M	1,000	32256
Acrolein	107-02-8	PTM	5,000	30645
Acrolein	107-02-8	W	5,000	30646
Acrylamide	79-06-1	M	1,000	30494
Acrylonitrile	107-13-1	PTM	2,000	30246
Alachlor	15972-60-8	M	1,000	32204
Aldrin	309-00-2	M	1,000	32205
Allyl chloride	107-05-1	PTM	2,000	30248
Alprazolam	28981-97-7	PTM	1,000	34042
4-Amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
Aminomethyl phosphonic acid (AMPA)	1066-51-9	W	100	32428
Ammelide	645-93-2	DEA:W (20:80)	1,000	33249
Ammeline	645-92-1	DEA:W (20:80)	1,000	33250
Amobarbital	64-43-7	PTM	1,000	34028
d-Amphetamine	51-63-8	PTM	1,000	34020
tert-Amyl alcohol	75-85-4	PTM	10,000	30631
tert-Amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-Amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
5- $\alpha$ -Androstane	438-22-2	D	2,000	31065
Aniline	62-53-3	M	1,000	31470
Anthracene	120-12-7	A	1,000	31269
Anthracene-d10	1719-06-08	D	2,000	31037
Anthracene (5 mL)	120-12-7	ACN	100	33264
Antifoam agent for purge-and-trap	N/A	Neat	1 mL	31822
Aprobarbital	77-02-1	PTM	1,000	34029
Aramite	140-57-8	H	2,000	31624

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	H	1,000	32006
Aroclor 1016	12674-11-2	I	200	32064
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1221	11104-28-2	H	1,000	32007
Aroclor 1221	11104-28-2	I	200	32065
Aroclor 1232	11141-16-5	H	1,000	32008
Aroclor 1232	11141-16-5	I	200	32066
Aroclor 1242	53469-21-9	H	1,000	32009
Aroclor 1242	53469-21-9	I	200	32067
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1248	12672-29-6	H	1,000	32010
Aroclor 1248	12672-29-6	I	200	32068
Aroclor 1254	11097-69-1	H	1,000	32011
Aroclor 1254	11097-69-1	I	200	32069
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1260	11096-82-5	H	1,000	32012
Aroclor 1260	11096-82-5	I	200	32070
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1262	37324-23-5	H	1,000	32409
Aroclor 1268	11100-14-4	H	1,000	32410
Atrazine	1912-24-9	A	1,000	32208
Atrazine-d5	163165-75-1	ACN	100	31984
Aviation gas (5 mL)	8006-69-1	PTM	50,000	30208
Aviation gas	8006-69-1	PTM	50,000	30207
Azobenzene	103-33-3	D	1,000	31496
Barbital	57-44-3	PTM	1,000	34030
Bentazon	25057-89-0	M	1,000	32257
Benzaldehyde	100-52-7	D	2,000	33017
Benzene	71-43-2	DMSO	10 mg/mL	36282
Benzene	71-43-2	D	250	35262
Benzene	71-43-2	PTM	2,000	30249
Benzene-d6	1076-43-3	PTM	2,000	30025

Volume is 1 mL/ampul unless otherwise noted. Concentration is  $\mu\text{g/mL}$  unless otherwise noted.

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Compound	CAS #	Solvent	Conc.	cat.#
Benzidine	92-87-5	M	1,000	31441
Benz(a)anthracene	56-55-3	M	1,000	31270
Benzo(a)pyrene	50-32-8	A	1,000	31271
Benzo(b)fluoranthene	205-99-2	A	1,000	31272
Benzo(ghi)perylene	191-24-2	D	1,000	31273
Benzo(k)fluoranthene	207-08-9	A	1,000	31274
Benzoguanamine	91-76-9	pyridine	1,000	33251
Benzoic acid	65-85-0	D	2,000	31879
Benzoic acid	65-85-0	M	1,000	31845
Benzoylcegonine	519-09-5	PTM	1,000	34016
Benzphetamine	5411-22-3	PTM	1,000	34022
Benzyl benzoate	120-51-4	H	5,000	31847
α-BHC	319-84-6	M	1,000	32206
β-BHC	319-85-7	A	1,000	32209
δ-BHC	319-86-8	M	1,000	32217
γ-BHC (lindane)	58-89-9	M	1,000	32226
Bis(2-ethylhexyl)adipate	103-23-1	M	1,000	31449
Bis(2-ethylhexyl)phthalate	117-81-7	D	1,000	31420
Bromazepam	1812-30-2	PTM	1,000	34043
Bromobenzene	108-86-1	PTM	2,000	30250
2-Bromobutanoic acid	80-58-0	MTBE	2,000	31881
2-Bromobutyrate	3196-15-4	MTBE	2,000	31882
2-Bromochlorobenzene	694-80-4	PTM	2,000	30228
4-Bromochlorobenzene	106-39-8	PTM	2,000	30230
1-Bromo-2-chloroethane	107-04-0	PTM	2,000	30469
Bromochloromethane	74-97-5	PTM	2,000	30225
2-Bromo-1-chloropropane	3017-95-6	PTM	2,000	30226
Bromodichloromethane	75-27-4	PTM	2,000	30251
4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC)	672-99-1	M	100	32274
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,500	30067
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	5,000	30003
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	10,000	30082
Bromoform	75-25-2	PTM	2,000	30252
Bromomethane	74-83-9	PTM	2,000	30253
1-Bromo-2-nitrobenzene	577-19-5	A	1,000	32279
2-Bromopropionic acid	598-72-1	MTBE	1,000	31653
Butabarbital	125-40-6	PTM	1,000	34031
Butachlor ESA sodium salt		M	100	33202
1,3-Butadiene	106-99-0	PTM	2,000	30622
Butalbital	77-26-9	PTM	1,000	34032
1,4-Butanediol	110-63-4	M	1,000	34078
(s)-(-)-1,2,4-Butanetriol	42890-76-6	pyridine	1,000	33024
(s)-(-)-1,2,4-Butanetriol (5 mL)	42890-76-6	pyridine	1,000	33032
1-Butanol	71-36-3	PTM	50,000	30474
tert-Butanol (TBA)	75-65-0	PTM	50,000	30470
tert-Butanol-d9	25725-11-5	PTM	20,000	30618
2-Butanone (MEK)	78-93-3	PTM	5,000	30254
γ-Butyrolactone (GBL)	96-48-0	ACN	1,000	34077
Caffeine	58-08-2	W	5	31804
Caffeine	58-08-2	W	25	31803
Caffeine	58-08-2	W	125	31802
Caffeine	58-08-2	W	250	31801
Caffeine	58-08-2	W	500	31800
Caffeine	58-08-2	M	1,000	34084
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol (CBG)	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
ε-Caprolactam	105-60-2	D	2,000	31833
Carbaryl-d7	362049-56-7	ACN	100	31985
Carbazole	86-74-8	D	1,000	31836
Carbazole	86-74-8	M	1,000	31430
Carbendazim	10605-21-7	M	100	31981
Carbon disulfide	75-15-0	PTM	2,000	30258
Carbon tetrachloride	56-23-5	DMSO	20 mg/mL	36283
Carbon tetrachloride	56-23-5	PTM	2,000	30259
Chloral hydrate	302-17-0	ACN	1,000	30609

Compound	CAS #	Solvent	Conc.	cat.#
Chlordane	57-74-9	H	1,000	32021
Chlordane	57-74-9	I	5,000	32072
Chlordane	57-74-9	M	2,000	32016
cis-Chlordane	5103-71-9	M	1,000	32207
trans-Chlordane	5103-74-2	M	1,000	32227
Chloridiazepoxide	438-41-5	PTM	1,000	34044
4-Chloroaniline	106-47-8	D	2,000	31211
Chlorobenzene	108-90-7	DMSO	1.8 mg/mL	36284
Chlorobenzene	108-90-7	PTM	2,000	30261
Chlorobenzene-d5	3114-55-4	PTM	2,000	30223
Chlorobenzilate	510-15-6	M	1,000	32211
Chloroethane	75-00-3	PTM	2,000	30263
2-Chloroethanol	107-07-3	PTM	2,000	30264
2-Chloroethyl vinyl ether	110-75-8	PTM	2,000	30265
1-Chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040
1-Chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066
Chloroform	67-66-3	DMSO	0.3 mg/mL	36285
Chloroform	67-66-3	PTM	2,000	30266
Chloromethane	74-87-3	PTM	2,000	30267
2-Chloronaphthalene	91-58-7	M	1,000	31284
4-Chloro-3-nitrobenzotrifluoride	121-17-5	A	1,000	32282
1-Chlorooctadecane	3386-33-2	D	10,000	31098
1-Chlorooctane	111-85-3	PTM	10,000	30084
Chloroprene	126-99-8	PTM	5,000	30238
Chlorpyrifos	2921-88-2	M	1,000	32212
Chrysene	218-01-9	A	1,000	31275
Clobazam	22316-47-8	PTM	1,000	34045
Clonazepam	1622-61-3	PTM	1,000	34046
Cocaethylene	529-38-4	ACN	1,000	34066
Cocaine	53-21-4	PTM	1,000	34015
Codeine	76-57-3	PTM	1,000	34000
Cotinine	486-56-6	M	1,000	34086
Creosote oil	8001-58-9	D	50,000	31838
Cyanazine	21725-46-2	A	1,000	32215
Cyanuric acid	108-80-5	DEA:W (20:80)	1,000	33248
Cyclohexane	110-82-7	DMSO	19.4 mg/mL	36286
2,4-D (2,4-Dichlorophenoxyacetic acid)	94-75-7	M	1,000	32239
2,4-D methyl ester	1928-38-7	M	1,000	32240
DCPA methyl ester (Chlorthal-dimethyl)	1861-32-1	M	1,000	32216
Dalapon	75-99-0	ACN	1,000	32432
Dalapon	75-99-0	M	1,000	32253
Dalapon	75-99-0	M	2,000	32056
Dalapon methyl ester	17640-02-7	H	2,000	32057
2,4-DB	94-82-6	M	1,000	32241
DCPA diacid	2136-79-0	M	200	32261
2,4'-DDD	53-19-0	M	1,000	32098
4,4'-DDD	72-54-8	M	1,000	32201
2,4'-DDE	3424-82-6	M	1,000	32099
4,4'-DDE	72-55-9	M	1,000	32202
2,4'-DDT	789-02-6	M	1,000	32200
4,4'-DDT	50-29-3	M	1,000	32203

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

**Solvent codes:**

- A = acetone
- ACN = acetonitrile
- C = carbon disulfide
- Cy = cyclohexane
- D = methylene chloride
- DMS = diethylamine
- DMSO = dimethyl sulfoxide
- EA = ethyl acetate
- H = hexane
- I = isoctane
- Ip = isopropanol
- M = methanol
- MTBE = methyl *tert*-butyl ether
- PTM = purge-and-trap grade methanol
- T = toluene
- TO = transformer oil
- W = water (DI)



# Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
Decachlorobiphenyl (BZ #209) (5 mL)	2051-24-3	A	200	32030
Decachlorobiphenyl (BZ #209)	2051-24-3	A	200	32029
Decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289
Decafluorobiphenyl	434-90-2	A	1,000	31855
Decafluorobiphenyl	434-90-2	D	2,000	31041
Decafluorobiphenyl	434-90-2	ACN	1,000	31842
Decafluorotriphenylphosphine (DFTPP)	5074-71-5	D	2,500	31001
n-Decane	124-18-5	Neat	1 mL	31858
Dextromethorphan HBr monohydrate	6700-34-1	M	1,000	34081
Dextro-propoxyphene	1639-60-7	PTM	1,000	34008
Diazepam	439-14-5	PTM	1,000	34047
Diazinon-d10 (diethyl-d10)	100155-47-3	ACN	100	31986
Dibenz(a,h)anthracene	53-70-3	D	1,000	31276
4,4'-Dibromobiphenyl	92-86-4	EA	500	32092
Dibromochloromethane (chlorodibromochloromethane)	124-48-1	PTM	2,000	30271
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	PTM	2,000	30270
1,2-Dibromoethane	106-93-4	PTM	2,000	30272
Dibromomethane	74-95-3	PTM	2,000	30430
4,4'-Dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040
4,4'-Dibromooctafluorobiphenyl	10386-84-2	H	250	32053
4,4'-Dibromooctafluorobiphenyl	10386-84-2	MTBE	2,000	31856
2,3-Dibromopropionic acid	600-05-5	MTBE	1,000	31655
2,5-Dibromotoluene	615-59-8	PTM	1,000	30435
2,5-Dibromotoluene	615-59-8	PTM	10,000	30453
Dibutylchloride	1770-80-5	A	200	32025
Dicamba	1918-00-9	M	1,000	32247
Dicamba methyl ester	6597-78-0	M	1,000	32248
1,2-Dichlorobenzene	95-50-1	M	1,000	31442
1,3-Dichlorobenzene	54-1-73-1	M	1,000	31443
1,4-Dichlorobenzene	106-46-7	ACN	1,000	30498
1,4-Dichlorobenzene	106-46-7	M	1,000	31444
1,2-Dichlorobenzene-d4	2199-69-1	PTM	2,000	30049
3,3'-Dichlorobenzidine	91-94-1	D	2,000	31835
3,3'-Dichlorobenzidine	91-94-1	M	2,000	31026
1,4-Dichlorobutane	110-56-5	PTM	2,000	30227
trans-1,4-Dichloro-2-butene	110-57-6	PTM	2,000	30274
Dichlorodifluoromethane (CFC-12)	75-71-8	PTM	2,000	30275
1,1-Dichloroethane	75-34-3	PTM	2,000	30276
1,2-Dichloroethane	107-06-2	DMSO	25 mg/mL	36288
1,2-Dichloroethane	107-06-2	PTM	2,000	30277
1,2-Dichloroethane-d4	17060-07-0	PTM	2,000	30027
1,1-Dichloroethene	75-35-4	DMSO	40 mg/mL	36287
1,1-Dichloroethene	75-35-4	PTM	2,000	30278
cis-1,2-Dichloroethene	156-59-2	PTM	2,000	30279
trans-1,2-Dichloroethene	156-60-5	PTM	2,000	30280
cis-1,2-Dichloroethylene	156-59-2	DMSO	4.67 mg/mL	36289
trans-1,2-Dichloroethylene	156-60-5	DMSO	4.67 mg/mL	36290
2,6-Dichlorophenol	87-65-0	M	1,000	31409
2,4-Dichlorophenylacetic acid	19719-28-9	M	200	32049
2,4-Dichlorophenylacetic acid	19719-28-9	A	1,000	32439
2,4-Dichlorophenyl acetic acid methyl ester	55954-23-9	H	200	32050
1,2-Dichloropropane	78-87-5	PTM	2,000	30281
2,2-Dichloropropane	594-20-7	PTM	2,000	30283
cis-1,3-Dichloropropene	10061-01-5	PTM	2,000	30284
trans-1,3-Dichloropropene	10061-02-6	PTM	2,000	30285
2,3-Dichloropropionic acid	565-64-0	MTBE	1,000	31650
1,2-Dichlorotetrafluoroethane (CFC-114)	76-14-2	PTM	2,000	30476
Dichlorprop	120-36-5	M	1,000	32249
Dichlorprop methyl ester	57153-17-0	M	1,000	32250
Dichlorvos-d6	203645-53-8	A	100	31987
Dieldrin	60-57-1	M	1,000	32218

Compound	CAS #	Solvent	Conc.	cat.#
Diesel fuel #2 composite (5 mL)	68334-30-5	D	50,000	31259
Diesel fuel #2 composite	68334-30-5	D	5,000	31093
Diesel fuel #2 composite	68334-30-5	D	50,000	31258
Diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234
Diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235
Diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236
Diesel fuel #2: unweathered	68334-30-5	D	5,000	31233
Diesel:biodiesel (80:20)	67784-80-9	D	5,000	31880
Diethyl ether (ethyl ether)	60-29-7	PTM	2,000	30286
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
Dimethachlor ESA sodium salt		M	100	33203
Dimethoate-d6	1219794-81-6	ACN	100	31988
1,2-Dimethoxyethane	110-71-4	DMSO	0.5 mg/mL	36291
N,N-Dimethylacetamide	127-19-5	DMSO	5.45 mg/mL	36292
Dimethyldichlorosilane (DMDCS) (25 mL)	75-78-5	Neat	25 mL	31861
N,N-Dimethylformamide	68-12-2	DMSO	4.4 mg/mL	36293
3,5-Dinitroaniline	618-87-1	ACN	1,000	31661
1,2-Dinitrobenzene	528-29-0	M	1,000	31453
1,3-Dinitrobenzene	99-65-0	ACN	1,000	31662
1,4-Dinitrobenzene	100-25-4	ACN	2,000	33205
4,6-Dinitro-2-methylphenol (Dinitro-o-cresol)	534-52-1	M	1,000	31292
2,4-Dinitrophenol	51-28-5	M	1,000	31291
2,4-Dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-Dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-Dinitrotoluene	610-39-9	M	1,000	31452
Di-n-octyl phthalate	117-84-0	M	1,000	31426
Dinoseb	88-85-7	M	1,000	32251
Dinoseb methyl ether	6099-79-2	M	1,000	32252
Diolen (1,3-di[ <i>cis</i> -octadecenyl] glycerol)	2465-32-9	pyridine	5,000	33022
1,4-Dioxane	123-91-1	DMSO	1.9 mg/mL	36294
1,4-Dioxane	123-91-1	D	2,000	31853
1,4-Dioxane	123-91-1	PTM	2,000	30287
1,4-Dioxane-d8	17647-74-4	PTM	2,000	30614
1,2-Diphenylhydrazine	122-66-7	M	1,000	31497
Diuron	330-54-1	ACN	200	32450
Diuron-d6	1007536-67-5	ACN	100	31989
Ecgonine	5796-31-6	PTM	1,000	34017
Ecgonine methyl ester	38969-40-3	PTM	1,000	34018
EDDP perchlorate	66729-78-0	M	1,000	34069
EGDN*	628-96-6	M	1,000	31601
Endosulfan I	959-98-8	A	1,000	32465
Endosulfan II	33213-65-9	A	1,000	32466
Endosulfan sulfate	1031-07-8	A	1,000	32467
Endrin	72-20-8	A	1,000	32463
Endrin ketone	53494-70-5	A	1,000	32464
Ethanol	64-17-5	PTM	2,000	30288
Ethanol	64-17-5	W	10,000	30466
2-Ethoxyethanol	110-80-5	DMSO	0.8 mg/mL	36295
Ethylbenzene	100-41-4	DMSO	1.84 mg/mL	36296
Ethylbenzene	100-41-4	PTM	2,000	30290
Ethylbenzene-d10	25837-05-2	PTM	2,000	30029
Ethylbenzene-d5	20302-26-5	PTM	2,000	30028
Ethyl-tert-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
Ethylendiamine	107-15-3	M	540	35222
Ethylene glycol	3775-85-7	DMSO	3.1 mg/mL	36297
Ethylene oxide	75-21-8	D	50 mg/mL	30620
Ethylene oxide	75-21-8	DMSO	500	36005
Ethylene oxide (5 mL)	75-21-8	PEG-200	0.005% w/w	30548
Ethyl methacrylate	97-63-2	PTM	2,000	30289
Fentanyl	437-38-7	M	1,000	34082
nor-Fentanyl oxalate	1609-66-1	M	1,000	34083

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

\*Ships under Restek's USDOT explosives approval.



Compound	CAS #	Solvent	Conc.	cat.#
Fluazepam	79622-59-6	ACN	100	31982
Flunitrazepam	1622-62-4	PTM	1,000	34049
Fluoranthene	206-44-0	M	1,000	31277
Fluorene	86-73-7	M	1,000	31278
Fluorobenzene	462-06-6	PTM	2,000	30030
2-Fluorobiphenyl	321-60-8	D	2,000	31091
2-Fluorobiphenyl	321-60-8	D	10,000	31096
2-Fluorophenol	367-12-4	D	2,000	31047
Flurazepam	1172-18-5	PTM	1,000	34050
Formaldehyde-DNPH	1081-15-8	ACN	500	31837
Formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082
Formamide	75-12-7	DMSO	1.1 mg/mL	36298
Fuel oil # 4	68476-31-3	D	5,000	31216
Fuel oil # 4	68476-31-3	D	50,000	31244
Fuel oil # 6	68553-00-4	D	5,000	31218
Fuel oil # 6	68553-00-4	D	50,000	31248
DL-Glutethimide	18389-24-7	PTM	1,000	34058
Glycerin	56-81-5	pyridine	500	33020
Glycolaldehyde-2,4-DNPH		ACN	100	33091
Glyphosate (5 mL)	1071-83-6	W	1,000	32427
Glyphosate	1071-83-6	W	1,000	32426
1,6-HDIP	72375-27-0	DMSO	1,000	33002
Heptachlor	76-44-8	M	1,000	32228
Heptachlor epoxide (isomer B)	1024-57-3	M	1,000	32230
Hexachlorobenzene	118-74-1	A	1,000	32231
Hexachloro-1,3-butadiene	87-68-3	M	1,000	31435
Hexachlorocyclopentadiene	77-47-4	M	1,000	32232
Hexachloroethane	67-72-1	M	1,000	31436
Hexachlorophene	70-30-4	D	2,000	31811
Hexane	8031-34-3	DMSO	1.45 mg/mL	36299
Hexobarbital	56-29-1	PTM	1,000	34033
HMX*	2691-41-0	ACN	1,000	31665
Hydramethylnon	67485-29-4	ACN	100	31979
Hydraulic oil	64741-89-5	D	50,000	31839
Hydrocodone	34195-34-1	PTM	1,000	34002
Hydromorphone	71-68-1	PTM	1,000	34063
Indeno(1,2,3-cd)pyrene	193-39-5	D	1,000	31279
Iodomethane	74-88-4	PTM	2,000	30292
Isobutyl alcohol	78-83-1	PTM	2,000	30293
Isobutylbenzene	538-93-2	PTM	1,000	30613
Isopropylbenzene	98-82-8	PTM	2,000	30294
Jet fuel A (5 mL)	64742-47-8	D	50,000	31243
Jet fuel A	64742-47-8	D	5,000	31215
Jet fuel A	64742-47-8	D	50,000	31242
JP-5 military fuel	8008-20-6	D	50,000	31252
JP-8 military fuel	94114-58-6	D	5,000	31262
JP-8 military fuel	94114-58-6	D	50,000	31254
Kerosene composite (5 mL)	84742-81-0	D	50,000	31257
Kerosene composite	84742-81-0	D	5,000	31094
Kerosene composite	84742-81-0	D	50,000	31256
Kerosene: 25% weathered	84742-81-0	D	5,000	31230
Kerosene: 50% weathered	84742-81-0	D	5,000	31231
Kerosene: 75% weathered	84742-81-0	D	5,000	31232
Kerosene: unweathered	84742-81-0	D	5,000	31229

Compound	CAS #	Solvent	Conc.	cat.#
Levorphanol	5985-38-6	PTM	1,000	34003
Linuron-d6	330-55-2	ACN	100	31990
Lorazepam	846-49-1	PTM	1,000	34051
3,4-MDA HCl	4764-17-4	M	1,000	34070
3,4-MDEA HCl	82801-81-8	M	1,000	34072
4,4'-MDIP	72375-24-7	DMSO	1,000	33003
3,4-MDMA HCl	64057-70-1	M	1,000	34071
Melamine	108-78-1	DEA:W (20:80)	1,000	33247
Meperidine	50-13-5	PTM	1,000	34004
Mephobarbital	115-38-8	PTM	1,000	34034
Meprobamate	57-53-4	PTM	1,000	34059
Methacrylonitrile	126-98-7	PTM	2,000	30297
Methadone	1095-90-5	PTM	1,000	34005
(+)Methamphetamine	51-57-0	PTM	1,000	34021
Methanol	67-56-1	DMSO	15 mg/mL	36401
Methanol	67-56-1	W	10,000	30467
Methapyrilene hydrochloride	135-23-9	D	2,000	32460
Methaqualone	340-56-7	PTM	1,000	34064
Methohexital	151-83-7	PTM	1,000	34035
Methoxychlor	72-43-5	M	1,000	32233
2-Methoxyethanol	109-86-4	DMSO	0.25 mg/mL	36402
Methyl arachidate	1120-28-1	Neat		35056
Methyl behenate	929-77-1	Neat		35062
Methyl tert-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402
Methylbutylketone	591-78-6	DMSO	0.25 mg/mL	36400
Methyl caprate	110-42-9	Neat		35041
Methyl caproate	106-70-7	Neat		35037
Methyl caprylate	111-11-5	Neat		35039
3-Methylcholanthrene	56-49-5	D	2,000	31996
Methylcyclohexane	108-87-2	DMSO	5.9 mg/mL	36403
Methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656
Methyl eicosatrienoate	55682-88-7	Neat		35059
Methyl eicosenoate	2390-09-2	Neat		35057
Methyl erucate	1120-34-9	Neat		35063
Methyl heneicosanoate	6064-90-0	Neat		35061
Methyl heptadecanoate	1731-92-6	Neat		35050

Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

\*Ships under Restek's USDOT explosives approval.

#### Solvent codes:

A = acetone	I = isooctane
ACN = acetonitrile	Ip = isopropanol
C = carbon disulfide	M = methanol
Cy = cyclohexane	MTBE = methyl tert-butyl ether
D = methylene chloride	PTM = purge-and-trap grade methanol
DEA = diethylamine	T = toluene
DMSO = dimethyl sulfoxide	TO = transformer oil
EA = ethyl acetate	W = water (DI)
H = hexane	

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# Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
Methyl laurate	111-82-0	Neat		35043
Methyl lignocerate	2442-49-1	Neat		35064
Methyl linoleate	112-63-0	Neat		35053
Methyl linolenate	301-00-8	Neat		35054
Methyl methacrylate	80-62-6	PTM	2,000	30299
Methyl myristate	124-10-7	Neat		35045
1-Methylnaphthalene	90-12-0	M	1,000	31283
2-Methylnaphthalene	91-57-6	D	1,000	31285
Methyl nonadecanoate	1731-94-8	Neat		35055
Methyl oleate	112-62-9	Neat		35052
Methyl palmitate	112-39-0	Neat		35048
Methyl palmitoleate	1120-25-8	Neat		35049
4-Methyl-2-pentanone (MIBK)	108-10-1	PTM	5,000	30400
3-Methylphenol	108-39-4	M	1,000	31403
N-Methylpyrrolidone	872-50-4	DMSO	2.65 mg/mL	36405
Methyl stearate	112-61-8	Neat		35051
Methyl tridecanoate	1731-88-0	Neat		35044
Methyl undecanoate	1731-86-8	Neat		35042
$\alpha$ -Methylene- $\gamma$ -butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079
Methylene chloride (dichloromethane)	75-09-2	DMSO	3 mg/mL	36404
Methylene chloride (dichloromethane)	75-09-2	PTM	2,000	30401
Methypylon	125-64-4	PTM	1,000	34060
Metribuzin	21087-64-9	A	1,000	32436
Mineral spirits: unweathered	8030-30-6	D	5,000	31225
Mineral spirits: unweathered	8030-30-6	D	50,000	31260
Monolein (1-mono[ <i>cis</i> -9-octadecenoyl]-rac-glycerol)	111-03-5	pyridine	5,000	33021
Monopalmitin	524-44-9	pyridine	5,000	33026
Morphine	6211-15-0	PTM	1,000	34006
Motor oil composite	64742-47-8	D	50,000	31464
Naphthalene	91-20-3	M	1,000	31280
Naphthalene-d8	1146-65-2	D	2,000	31043
Nicarbazin (bis-nitrophenol urea) (5 mL)	330-95-0	ACN	10	33261
Nicotine	54-11-5	M	1,000	34085
Nitrazepam	146-22-5	PTM	1,000	34053
Nitrobenzene	98-95-3	ACN	1,000	31657
Nitroglycerin*	55-63-0	M	1,000	31498
Nitroguanidine*†	556-88-7	M	1,000	31602
Nitromethane	75-52-5	DMSO	0.25 mg/mL	36406
4-Nitrophenol	100-02-7	M	1,000	31296
2-Nitropropane	79-46-9	PTM	2,000	30403
N-Nitrosodimethylamine	62-75-9	M	1,000	31427
N-Nitrosodimethylamine-d6	17829-05-9	D	1,000	33910
N-Nitrosodiphenylamine	86-30-6	M	1,000	31429
N-Nitroso-di-n-propylamine	621-64-7	M	1,000	31428
N-Nitrosodi-n-propylamine-d14	93951-96-3	D	1,000	33911
2-Nitrotoluene	88-72-2	ACN	1,000	31659
3-Nitrotoluene	99-08-1	ACN	1,000	31660
4-Nitrotoluene	99-99-0	ACN	1,000	31658
n-Nonatriacontane (C39) (10 mL)	7194-86-7	C	3,000	31877
n-Nonatriacontane (C39)	7194-86-7	C	3,000	31456
n-Octacosane (C28)	630-02-4	D	10,000	31672
Oxazepam	604-75-1	PTM	1,000	34054
Oxycodone	124-90-3	PTM	1,000	34007
Oxymorphone	76-41-5	PTM	1,000	34065
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263

Compound	CAS #	Solvent	Conc.	cat.#
Pentachloroanisole	1825-21-4	M	1,000	32268
Pentachloroethane	76-01-7	PTM	2,000	30404
Pentachloronitrobenzene	82-68-8	EA	100	32091
Pentachlorophenol	87-86-5	M	1,000	31297
n-Pentacontane (C50)	6596-40-3	T	10	31685
Pentacosane (C25)	629-99-2	D	10,000	31487
Pentafluorobenzene	363-72-4	PTM	2,000	30031
Pentafluorophenol	771-61-9	D	2,000	31048
Pentazocine	64024-15-3	PTM	1,000	34062
Pentobarbital	76-74-4	PTM	1,000	34036
Perfluorotributylamine (PFTBA)	311-89-7	Neat	1 mL	30482
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
Phenanthrene	85-01-8	M	1,000	31281
Phenanthrene-d10	1517-22-2	D	2,000	31045
Phencyclidine	956-90-1	PTM	1,000	34027
Phendimetrazine	50-58-8	PTM	1,000	34025
Phenmetrazine	1707-14-8	PTM	1,000	34026
Phenobarbital	50-06-6	PTM	1,000	34037
Phenol	108-95-2	M	1,000	31298
Phenol-d6	13127-88-3	D	2,000	31049
Phentermine	1197-21-3	PTM	1,000	34024
Picloram	1918-02-1	M	1,000	32265
Picloram methyl ester	14143-55-6	M	1,000	32266
Picric acid*	88-89-1	M	1,000	31499
Poly (ethylene glycol) 200 (10 mL)	25322-68-3	Neat		30549
Poly (ethylene glycol) 400 (10 mL)	25322-68-3	Neat		30559
Polywax 500	9002-88-4	Neat	1 g	36224
Polywax 655	9002-88-4	Neat	1 g	36225
Polywax 850	9002-88-4	Neat	1 g	36226
Polywax 1,000	9002-88-4	Neat	1 g	36227
Prazepam	2955-38-6	PTM	1,000	34055
Propachlor	1918-16-7	M	1,000	32235
2-Propanol	67-63-0	W	50,000	30473
Propionitrile	107-12-0	PTM	2,000	30407
Pyrene	129-00-0	M	1,000	31282
Pyridine	110-86-1	DMSO	1 mg/mL	36407
Pyridine	110-86-1	PTM	2,000	30409

Volume is 1 mL/ampul unless otherwise noted. Concentration is  $\mu$ g/mL unless otherwise noted.

\*Ships under Restek's USDOT explosives approval.

† Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.



## Restek® Safe Cracker

Included with every reference standard shipment for added convenience.



Compound	CAS #	Solvent	Conc.	cat.#
RDX*	121-82-4	ACN	1,000	31666
Secobarbital	29071-21-4	PTM	1,000	34038
Simazine	122-34-9	A	1,000	32236
Stearyl stearate (10 mL)	2778-96-3	Cy	2,000	31636
Stearyl stearate (10 mL)	2778-96-3	H	2,000	31681
Stearyl stearate	2778-96-3	Neat	100 mg	31860
Stoddard solvent	8052-41-3	PTM	10,000	30487
Styrene	100-42-5	PTM	2,000	30410
Sulfolane	126-33-0	DMSO	0.8 mg/mL	36413
2,4,5-T methyl ester	1928-37-6	M	1,000	32244
Talbutal	115-44-6	PTM	1,000	34039
2,4-TDIP	72375-21-4	DMSO	1,000	33001
2,6-TDIP	195625-39-9	DMSO	1,000	33000
Temazepam	846-50-4	PTM	1,000	34056
<i>o</i> -Terphenyl	84-15-1	A	2,000	31066
<i>o</i> -Terphenyl	84-15-1	D	10,000	31097
<i>p</i> -Terphenyl	92-94-4	D	10,000	31095
<i>p</i> -Terphenyl-d14	1718-51-0	D	1,000	31828
$\alpha$ -Terpineol	98-55-5	D	2,000	33912
1,1,1,2-Tetrachloroethane	630-20-6	PTM	2,000	30411
1,1,2,2-Tetrachloroethane	79-34-5	PTM	2,000	30412
Tetrachloroethene	127-18-4	PTM	2,000	30413
2,3,4,6-Tetrachlorophenol	58-90-2	M	1,000	31402
2,4,5,6-Tetrachloro- <i>m</i> -xylene (5 mL)	877-09-8	A	200	32028
2,4,5,6-Tetrachloro- <i>m</i> -xylene	877-09-8	A	200	32027
<i>n</i> -Tetracontane (C40)	4181-95-7	Neat	100 mg	31859
$\Delta^8$ -Tetrahydrocannabinol (THC)	5957-75-5	PTM	1,000	34090
Tetrahydrofuran (THF)	109-99-9	DMSO	3.6 mg/mL	36408
Tetrahydrofuran (THF)	109-99-9	PTM	2,000	30414
Tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
Tetralin	119-64-2	DMSO	0.5 mg/mL	36409
Tetra- <i>n</i> -propyltin	2176-98-9	D	2,000	31474
Tetryl*	479-45-8	ACN	1,000	31667
$\Delta^9$ -Tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
( $\pm$ )11-nor-9-carboxy- $\Delta^9$ -THC	104874-50-2	M	100	34068
$\Delta^9$ -Tetrahydrocannabinolic acid A (THCA-A)	23978-85-0	PTM	1,000	34093
Thebaine	115-37-7	PTM	1,000	34009
Tinuvin P	2440-22-4	lp	52	31629
Toluene	108-88-3	DMSO	4.45 mg/mL	36410
Toluene	108-88-3	PTM	2,000	30415
Toluene-d8	2037-26-5	PTM	2,000	30224
Toxaphene	8001-35-2	H	1,000	32005
Toxaphene	8001-35-2	I	5,000	32071
Toxaphene	8001-35-2	M	2,000	32015
2,4,5-TP (Silvex)	93-72-1	M	1,000	32245
2,4,5-TP (Silvex) methyl ester	4841-20-7	M	1,000	32246
Transformer oil (PCB-free)	64742-53-6	Neat	50 mL	32425
Transformer oil (PCB-free)	64742-53-6	Neat	5 mL	32424
<i>n</i> -Triacontane-d62 (C30)	638-68-6	D	500	31816
Triazolam	28911-01-5	PTM	1,000	34057
2,4,6-Tribromophenol	118-79-6	M	1,000	31401
Tributylphosphate	126-73-8	A	1,000	32280
Tributyltin chloride	1461-22-9	D	2,000	31478
Tricaprin (1,2,3-tricaprinoylglycerol) (5 mL)	621-71-6	pyridine	8,000	33025
Tricaprin (1,2,3-tricaprinoylglycerol) (5 mL)	621-71-6	pyridine	8,000	33033
1,2,3-Trichlorobenzene	87-61-6	PTM	2,000	30416
1,2,4-Trichlorobenzene	120-82-1	M	1,000	31439
1,3,5-Trichlorobenzene	108-70-3	PTM	1,000	31081
1,1,1-Trichloroethane	71-55-6	DMSO	50 mg/mL	36411
1,1,1-Trichloroethane	71-55-6	PTM	2,000	30418
1,1,2-Trichloroethane	79-00-5	PTM	2,000	30419
Trichloroethene	79-01-6	DMSO	0.4 mg/mL	36412
Trichloroethene	79-01-6	PTM	2,000	30420

Compound	CAS #	Solvent	Conc.	cat.#
Trichlorofluoromethane (CFC-11)	75-69-4	PTM	2,000	30421
2,4,5-Trichlorophenol	95-95-4	A	1,000	32017
2,4,5-Trichlorophenol	95-95-4	M	1,000	31299
2,4,6-Trichlorophenol	88-06-2	M	1,000	31400
1,2,3-Trichloropropane	96-18-4	MTBE	1,000	31648
1,2,3-Trichloropropane	96-18-4	PTM	2,000	30429
1,1,2-Trichlorotrifluoroethane (CFC-113)	76-13-1	PTM	2,000	30462
$\alpha,\alpha,\alpha$ -Trifluorotoluene	98-08-8	PTM	2,000	30048
$\alpha,\alpha,\alpha$ -Trifluorotoluene	98-08-8	PTM	2,500	30068
$\alpha,\alpha,\alpha$ -Trifluorotoluene	98-08-8	PTM	10,000	30083
Trifluralin	1582-09-8	M	1,000	32238
1,2,4-Trimethylbenzene	95-63-6	PTM	2,000	30422
1,3,5-Trimethylbenzene	108-67-8	PTM	2,000	30423
2,2,4-Trimethylpentane (isooctane)	540-84-1	nonane	5% vol/vol	30671
1,3,5-Trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-Trinitrobenzene*	118-96-7	ACN	1,000	31669
Triolein (1,2,3-tri[ <i>cis</i> -octadecenoyl] glycerol)	122-32-7	pyridine	5,000	33023
Triptylytin chloride	3342-67-4	D	2,000	31477
Triphenylmethane (5 mL)	519-73-3	ACN	10	33260
Triphenylphosphate (5 mL)	115-86-6	ACN:acetic acid (99:1)	2	31964
Triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
Tri- <i>n</i> -propyltin chloride	995-25-5	D	2,000	31476
Triphenylphosphate	115-86-6	A	1,000	32281
Tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259
Unleaded gasoline composite (5 mL)	8006-61-9	PTM	50,000	30206
Unleaded gasoline composite	8006-61-9	PTM	2,500	30081
Unleaded gasoline composite	8006-61-9	PTM	50,000	30205
Unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097
Unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098
Unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099
Unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436
Unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096
Used motor oil composite	64742-65-0	D	50,000	31465
$\gamma$ -Valerolactone	108-29-2	ACN	1,000	34080
Vinyl acetate	108-05-4	PTM	2,000	30216
Vinyl chloride	75-01-4	PTM	2,000	30089
Vinyl chloride	75-01-4	PTM	2,500	30093
<i>m</i> -Xylene	108-38-3	DMSO	6.51 mg/mL	36414
<i>m</i> -Xylene	108-38-3	PTM	2,000	30424
<i>o</i> -Xylene	95-47-6	DMSO	0.97 mg/mL	36415
<i>o</i> -Xylene	95-47-6	PTM	2,000	30425
<i>p</i> -Xylene	106-42-3	DMSO	1.52 mg/mL	36416
<i>p</i> -Xylene	106-42-3	PTM	2,000	30426

Volume is 1 mL/ampul unless otherwise noted. Concentration is  $\mu$ g/mL unless otherwise noted.

\*Ships under Restek's USDOT explosives approval.

#### Solvent codes:

A = acetone	I = isooctane
ACN = acetonitrile	lp = isopropanol
C = carbon disulfide	M = methanol
Cy = cyclohexane	MTBE = methyl <i>tert</i> -butyl ether
D = methylene chloride	PTM = purge-and-trap grade methanol
DEA = diethylamine	T = toluene
DMSO = dimethyl sulfoxide	TO = transformer oil
EA = ethyl acetate	W = water (DI)
H = hexane	



# Reference Standards

## Column & Detector Test Mixes & Reagents



Deactivating Agent.....	472
Derivatization Reagents.....	472–473
Detector Tuning Mixtures.....	473
GC Column & Detector Test Mixes..	473–474
GPC Calibration Mixes.....	474
LC Column & Detector Test Mixes.....	475

### Deactivating Agent

#### Dimethyldichlorosilane (DMDCS) Deactivating Agent

- Easy deactivation of liners and other glass surfaces.
- Convenient—25 mL bottle deactivates 60 inlet liners.
- Tested to ensure consistent quality and effectiveness.

Restek offers dimethyldichlorosilane (DMDCS) for deactivating liners and other glassware. DMDCS reacts with active hydroxyl groups on the glass surface to produce a deactivated surface. A simple, step-by-step procedure is included with the product.

Dimethyldichlorosilane (DMDCS) (75-78-5)

Neat, 25 mL/bottle

cat.# 31861 (ea.)

Ground transportation shipments only.

No data pack available.

### Quantity Discounts Available

— Buy 3 Standards, Get 10% Off

— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

### Derivatization Reagents

#### Acylation Derivatization Reagents

- Most commonly used for electron capture detection.
- React with alcohols, amines, and phenols.
- Frequently used for drugs of abuse confirmation.

Acylation reagents offer the same advantage available from silylation reagents: creating less polar, more volatile derivatives. In comparison to silylating reagents, the acylating reagents can more readily target highly polar multifunctional compounds, such as carbohydrates and amino acids. In addition, acylating reagents offer the distinct advantage of introducing electron-capturing groups, thus enhancing detectability during analysis.

Compound	CAS #	cat.#
<b>MBTFA (N-methyl-bis-trifluoroacetamide)</b>		
10-pk. (10x1 g)	685-27-8	35616
25 g vial	685-27-8	35617
<b>TFAA (trifluoroacetic acid anhydride)</b>		
10-pk. (10x1 g)	407-25-0	35618
25 g vial	407-25-0	35619
<b>PFAA (pentafluoropropionic acid anhydride)</b>		
10-pk. (10x1 g)	356-42-3	35620
25 g vial	356-42-3	35621
<b>HFAA (heptafluorobutyric acid anhydride)</b>		
10-pk. (10x1 g)	336-59-4	35622
25 g vial	336-59-4	35623
<b>PFPOH (pentafluoropropanol)</b>		
10-pk. (10x1 g)	422-05-9	35624
25 g vial	422-05-9	35625





## GC Column & Detector Test Mixes, *cont.*

### Grob Test Mix (12 components)

For use with temperature-programmed conditions.

<i>n</i> C10-FAME (110-42-9)	0.42 mg/mL	Dicyclohexylamine (101-83-7)	0.31
<i>n</i> C11-FAME (1731-86-8)	0.42	2,6-Dimethylaniline (87-62-7)	0.32
<i>n</i> C12-FAME (111-82-0)	0.41	2,6-Dimethylphenol (576-26-1)	0.32
Decane (C10) (124-18-5)	0.28	2-Ethylhexanoic acid (149-57-5)	0.38
Undecane (C11) (1120-21-4)	0.29	Nonanal (124-19-6)	0.40
2,3-Butanediol (6982-25-8)	0.53	1-Octanol (111-87-5)	0.36

In methylene chloride, 1 mL/ampul

cat.# 35000 (ea.)

No data pack available.

### Inter-Polar Column Test Mix (11 components)

<i>n</i> -Heptane (C7) (142-82-5)	1.25 mg/mL	1,2-Dichloropropane (78-87-5)	2.00
<i>n</i> -Octane (C8) (111-65-9)	1.40	Methanol (67-56-1)	1.25
<i>n</i> -Nonane (C9) (111-84-2)	2.00	1-Propanol (71-23-8)	1.25
Acetone (67-64-1)	1.25	Pyridine (110-86-1)	1.40
2-Butanone (MEK) (78-93-3)	1.25	Tetrachloroethylene (127-18-4)	3.25
Chlorobenzene (108-90-7)	2.00		

In methylene chloride, 1 mL/ampul

cat.# 35076 (ea.)

### ISO-C14-C20 Column Test Mix (5 components)

<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Octadecane (C18) (593-45-3)
<i>n</i> -Pentadecane (C15) (629-62-9)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Hexadecane (C16) (544-76-3)	

400 µg/mL each in cyclohexane, 1 mL/ampul

cat.# 35006 (ea.)

### OQ/PV Headspace Standard (3 components)

<i>tert</i> -Butyl disulfide (110-06-5)	Nitrobenzene (98-95-3)
1,2-Dichlorobenzene (95-50-1)	

2,000 µg/mL each in ethanol, 1 mL/ampul

cat.# 33909 (ea.)

### OQ Response Linearity Test Standard (6 components)

<i>n</i> -Heptadecane (C17) (629-78-7)	1.5 µg/mL	<i>n</i> -Eicosane (C20) (112-95-8)	100
<i>n</i> -Octadecane (C18) (593-45-3)	10	<i>n</i> -Docosane (C22) (629-97-0)	1,000
<i>n</i> -Nonadecane (C19) (629-92-5)	2	<i>n</i> -Tetracosane (C24) (646-31-1)	10,000

In isooctane, 1 mL/ampul

cat.# 33906 (ea.)

### Polar ISO Column Test Mix (8 components)

<i>n</i> -Heptadecane (C17) (629-78-7)	2-Dodecanol (10203-28-8)
<i>n</i> -Nonadecane (C19) (629-92-5)	Methyl dodecanoate
Aniline (62-53-3)	2-Nonanone (821-55-6)
2-Chlorophenol (95-57-8)	1-Octanol (111-87-5)

250 µg/mL each in 1,2-dichloroethane, 1 mL/ampul

cat.# 35103 (ea.)

### Q-BOND and U-BOND Column Test Mix (7 components)

<i>n</i> -Pentane (C5) (109-66-0)	Ethanol (64-17-5)
<i>n</i> -Hexane (C6) (110-54-3)	Ethyl acetate (141-78-6)
Acetone (67-64-1)	Methanol (67-56-1)
Diethyl ether (ethyl ether) (60-29-7)	

0.1% vol/vol each in heptane, 1 mL/ampul

cat.# 35202 (ea.)

### Volatile Amine Column Test Mix (8 components)

<i>n</i> -Nonane (C9) (111-84-2)	900 µg/mL	Diethylenetriamine (111-40-0)	1,800
<i>n</i> -Dodecane (C12) (112-40-3)	900	2,6-Dimethylaniline (87-62-7)	900
1,2-Butanediol (26171-83-5)	900	2-Nonanol (628-99-9)	900
Diethanolamine (DEA) (111-42-2)	1,800	Pyridine (110-86-1)	900

In methanol:dichloromethane (50:50), 1 mL/ampul

cat.# 35008 (ea.)

### XIL-350 Column Test Mix (8 components)

<i>n</i> -Tridecane (C13) (629-50-5)	2-Ethylhexanoic acid (149-57-5)
<i>n</i> -Tetradecane (C14) (629-59-4)	1,6-Hexanediol (629-11-8)
4-Chlorophenol (106-48-9)	1-Methylnaphthalene (90-12-0)
Dicyclohexylamine (101-83-7)	1-Undecanol (112-42-5)

350 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 35226 (ea.)

## GPC Calibration Mixes

### CLP GPC Calibration Mix (5 components)

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

Bis(2-ethylhexyl) phthalate (117-81-7)	10 mg/mL	Methoxychlor (72-43-5)	2.0
Corn oil (8001-30-7)	250	Perylene (198-55-0)	0.2
		Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul

cat.# 32019 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32023 (ea.)

No data pack available.

### Revised GPC Calibration Mix (5 components)

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

Bis(2-ethylhexyl) phthalate (117-81-7)	5 mg/mL	Methoxychlor (72-43-5)	1.0
Corn oil (8001-30-7)	250	Perylene (198-55-0)	0.2
		Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul

cat.# 32041 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32042 (ea.)

No data pack available.

## LC Column & Detector Test Mixes

### LC Normal Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

Benzene (71-43-2)	1.00 mg/mL	Benzyl alcohol (100-51-6)	3.00
Benzaldehyde (100-52-7)	0.04	4-Methoxybenzyl alcohol (105-13-5)	2.00

In hexane, 1 mL/ampul

cat.# 35004 (ea.)

### LC Reversed Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

Benzene (71-43-2)	3.00 mg/mL	Naphthalene (91-20-3)	0.50
Biphenyl (92-52-4)	0.06	Uracil (66-22-8)	0.02

In methanol:water (75:25), 1 mL/ampul

cat.# 35005 (ea.)

### LC Performance Test Mix (5 components)

- Highly effective for characterizing LC column parameters.
- Simple, easy, reliable approach to quality control (QC) evaluations or column classification.
- Monitor column performance over time.

The National Institute of Standards and Technology (NIST) has formulated a mixture that is highly effective for characterizing LC columns for efficiency, void volume, methylene selectivity, retentiveness, and activity toward chelators and organic bases. Results can be used for column classification, for column selection, for monitoring column performance over time, or for quality control. We test our material against the NIST 870 standard.

Amitriptyline hydrochloride (549-18-8)	2,800 µg/mL	Quinizarin (81-64-1)	94
Ethylbenzene (100-41-4)	1,700	Toluene (108-88-3)	1,400
		Uracil (66-22-8)	28

In methanol, 1 mL/ampul

cat.# 31699 (ea.)

For Restek's complete line of column test mixes, visit

[www.restek.com/testmixes](http://www.restek.com/testmixes)



### Carbohydrate LC Performance Check Mix (5 components)

Performance qualification (PQ) determines the precision of the LC system. Our performance check mix for LC-RI consists of five simple sugars in varied concentrations. We prepare the reference material in water, dehydrate it, and package it dry for enhanced stability.

Glucose (50-99-7)	2.1 mg	Maltose (6363-53-7)	4.5
Fructose (57-48-7)	2.0	Sucrose (57-50-1)	4.0
Lactose (5989-81-1)	4.4		

Dry components in 4 mL screw-cap vial. Reconstitute in 1 mL acetonitrile:water (75:25) to 2.1, 2.0, 4.4, 4.5, 4.0 mg/mL, respectively.

cat.# 31809 (ea.)

No data pack available.

### LC OQ Wavelength Accuracy Standard

Erbium perchlorate (14017-55-1)

10 mg/mL in water, 5 mL/ampul

cat.# 31053 (ea.)

No data pack available.

### LC OQ Gradient Standard (Acetone)

Acetone (67-64-1)

Neat, 1 mL/ampul

cat.# 30012 (ea.)

No data pack available.

### LC OQ Linearity Test Mix Kit

Linear detector responses to concentration variations are an important part of operation qualification (OQ) for LC instruments. Our kit of five aqueous solutions of caffeine can be used to generate simple plots of UV response versus concentration. Certificate of analysis includes caffeine concentration, calculated variance in preparing each mixture, a linearity plot, and coefficient of determination ( $r^2$ ) for the linear plot.

Contains 1 mL each of these mixtures.

- 31804: Caffeine (caffeine at 5 µg/mL in water)
- 31803: Caffeine (caffeine at 25 µg/mL in water)
- 31802: Caffeine (caffeine at 125 µg/mL in water)
- 31801: Caffeine (caffeine at 250 µg/mL in water)
- 31800: Caffeine (caffeine at 500 µg/mL in water)

1 mL each of these mixtures.

cat.# 31805 (kit)

kit

No data pack available.

### LC OQ Standards Kit

Contains the following:

- 30012: LC OQ Gradient Standard, 1 mL
- 31053: LC OQ Wavelength Accuracy Standard, 5 mL
- 31068: LC OQ Linearity Kit, 6 - 1 mL/ampuls

cat.# 31069 (kit)

kit

No data pack available.

# Reference Standards

## Clinical, Forensic & Toxicology



Blood Alcohol.....	477
Exempted Drugs of Abuse.....	478
Explosives .....	479
Fire Debris Analysis.....	479
Personal Care Products.....	480
Weathered Petrochemical.....	480-481





## Blood Alcohol

### Blood Alcohol Standards (Control)

Use to verify the retention time for each compound normally included in a blood alcohol test and to verify that the compounds are resolved from and do not interfere with one another.

### Blood Alcohol Mix Resolution Control Standard

(8 components)

Acetaldehyde (75-07-0)	Ethyl acetate (141-78-6)
Acetone (67-64-1)	2-Propanol (Isopropanol) (67-63-0)
Acetonitrile (75-05-8)	Methanol (67-56-1)
Ethanol (64-17-5)	Methyl ethyl ketone (78-93-3)

0.100 g/dL each in water, 1 mL/ampul

cat.# 36256 (ea.)

### BAC Resolution Control Standard n-P (6 components)

- Includes 1-propanol internal standard.
- Intended for qualitative use only.

Acetaldehyde (75-07-0)	Methanol (67-56-1)
Acetone (67-64-1)	1-Propanol ( <i>n</i> -Propanol) (71-23-8)
Ethanol (BAC) (64-17-5)	2-Propanol (Isopropanol) (67-63-0)

100 mg/dL each in water, 1 mL/ampul

cat.# 36010 (ea.)

No data pack available.

### BAC Resolution Control Standard t-B (6 components)

- Includes *tert*-butanol internal standard.
- Intended for qualitative use only.

Acetaldehyde (75-07-0)	Ethanol (BAC) (64-17-5)
Acetone (67-64-1)	Methanol (67-56-1)
<i>tert</i> -Butanol (TBA) (75-65-0)	2-Propanol (Isopropanol) (67-63-0)

100 mg/dL each in water, 1 mL/ampul

cat.# 36011 (ea.)

No data pack available.



## Get Fast, Definitive Data for Blood Alcohol Testing

### Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 Columns & Standards

- Optimized column selectivities.
- Robust and reproducible column chemistry.
- 2-minute analysis time.
- Product line also features resolution control standards.

See **page 65** for columns.

[www.restek.com/BACPlus](http://www.restek.com/BACPlus)



Formulated and produced by our team of veteran chemists, 50,000+ batches of highly stable and accurate reference standards have left our facility over the last 20+ years.

# Exempted Drug of Abuse

## Exempted Drug of Abuse

### Exempted Drug of Abuse Reference Standards

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
<b>Benzodiazepines</b>				
Alprazolam	28981-97-7	PTM	1,000	34042
Bromazepam	1812-30-2	PTM	1,000	34043
Chlordiazepoxide	438-41-5	PTM	1,000	34044
Clobazam	22316-47-8	PTM	1,000	34045
Clonazepam	1622-61-3	PTM	1,000	34046
Diazepam	439-14-5	PTM	1,000	34047
Flunitrazepam	1622-62-4	PTM	1,000	34049
Flurazepam	1172-18-5	PTM	1,000	34050
Lorazepam	846-49-1	PTM	1,000	34051
Nitrazepam	146-22-5	PTM	1,000	34053
Oxazepam	604-75-1	PTM	1,000	34054
Prazepam	2955-38-6	PTM	1,000	34055
Temazepam	846-50-4	PTM	1,000	34056
Triazolam	28911-01-5	PTM	1,000	34057
<b>Cocaine &amp; Metabolites</b>				
Cocaethylene	529-38-4	ACN	1,000	34066
Cocaine	53-21-4	PTM	1,000	34015
Benzoylcegonine	519-09-5	PTM	1,000	34016
Ecgonine	5796-31-6	PTM	1,000	34017
Ecgonine methyl ester	38969-40-3	PTM	1,000	34018
<b>Methadone &amp; Metabolites</b>				
EDDP perchlorate	66729-78-0	M	1,000	34069
Methadone	1095-90-5	PTM	1,000	34005
<b>Amphetamines &amp; Metabolites</b>				
d-Amphetamine	51-63-8	PTM	1,000	34020
(+)Methamphetamine	51-57-0	PTM	1,000	34021
3,4-MDA HCl	4764-17-4	M	1,000	34070
3,4-MDEA HCl	82801-81-8	M	1,000	34072
3,4-MDMA HCl	64057-70-1	M	1,000	34071
<b>Opiates &amp; Metabolites</b>				
Codeine	76-57-3	PTM	1,000	34000
Dextromethorphan HBr monohydrate	6700-34-1	M	1,000	34081
Hydrocodone	34195-34-1	PTM	1,000	34002
Hydromorphone	71-68-1	PTM	1,000	34063
Morphine	6211-15-0	PTM	1,000	34006
Oxycodone	124-90-3	PTM	1,000	34007
Oxymorphone	76-41-5	PTM	1,000	34065
<b>Cannabinoid &amp; Metabolites</b>				
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol (CBG)	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
Δ <sup>9</sup> -Tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
(±)11-nor-9-carboxy-Δ <sup>9</sup> -THC	104874-50-2	M	100	34068
<b>Barbiturates</b>				
Amobarbital	64-43-7	PTM	1,000	34028
Aprobarbital	77-02-1	PTM	1,000	34029
Barbital	57-44-3	PTM	1,000	34030
Butabarbital	125-40-6	PTM	1,000	34031
Butalbital	77-26-9	PTM	1,000	34032
DL-Glutethimide	18389-24-7	PTM	1,000	34058
Hexobarbital	56-29-1	PTM	1,000	34033
Mephobarbital	115-38-8	PTM	1,000	34034
Methohexital	151-83-7	PTM	1,000	34035
Pentobarbital	76-74-4	PTM	1,000	34036
Phenobarbital	50-06-6	PTM	1,000	34037
Secobarbital	29071-21-4	PTM	1,000	34038
Talbutal	115-44-6	PTM	1,000	34039

Compound	CAS #	Solvent	Conc.	cat.#
<b>GHB</b>				
1,4-Butanediol	110-63-4	M	1,000	34078
γ-Butyrolactone (GBL)	96-48-0	ACN	1,000	34077
α-Methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079
γ-Valerolactone	108-29-2	ACN	1,000	34080
<b>Other</b>				
Benzphetamine	5411-22-3	PTM	1,000	34022
Caffeine	58-08-2	M	1,000	34084
Cotinine	486-56-6	M	1,000	34086
Fentanyl	437-38-7	M	1,000	34082
nor-Fentanyl oxalate	1609-66-1	M	1,000	34083
Levorphanol	5985-38-6	PTM	1,000	34003
Meperidine	50-13-5	PTM	1,000	34004
Meprobamate	57-53-4	PTM	1,000	34059
Methaqualone	340-56-7	PTM	1,000	34064
Methyprylon	125-64-4	PTM	1,000	34060
Nicotine	54-11-5	M	1,000	34085
Pentazocine	64024-15-3	PTM	1,000	34062
Phencyclidine	956-90-1	PTM	1,000	34027
Phendimetrazine	50-58-8	PTM	1,000	34025
Phenmetrazine	1707-14-8	PTM	1,000	34026
Phentermine	1197-21-3	PTM	1,000	34024
Dextro-propoxyphene	1639-60-7	PTM	1,000	34008
Thebaine	115-37-7	PTM	1,000	34009

ACN = acetonitrile; M = methanol; PTM = purge-and-trap grade methanol

### Forensic Drug Screen Test Mixture (8 components)

Amiodarone (19774-82-4)	10 µg/mL	Diazepam (439-14-5)	10
Amphetamine (51-63-8)	10	Doxepine (1229-29-4)	10
Caffeine (58-08-2)	10	Haloperidol (52-86-8)	1
Codeine (76-57-3)	10	Morphine (6211-15-0)	10

In P&T methanol, 1 mL/ampul

cat.# 36340 (ea.)

### Forensic Drug Screen Internal Standard Solution 1 rev A (2 components)

Diazepam-d5  
D5-doxepine

10 µg/mL each in P&T methanol, 10 mL/ampul

cat.# 36341 (ea.)

Restek Offers a Full Line of Certified Reference Materials



See pages 464-465.

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## Explosives

### Single-Component Explosives Solutions

- Supports U.S. Department of Defense base closures and remediation.
- Mixtures and singles supporting LC U.S. EPA Method 8330.
- Mixtures and singles supporting GC-ECD U.S. EPA Method 8095.
- Internal standards and surrogates to support both methods.

These materials support nitroaromatic, nitramine, and nitro-ester analyses by GC-ECD (Method 8095).<sup>1,2</sup> Compounds listed are explosives, manufacturing intermediates, or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-Amino-2,6-dinitrotoluene	194-06-51-0	ACN	1,000	31671
3,5-Dinitroaniline	618-87-1	ACN	1,000	31661
1,2-Dinitrobenzene	528-29-0	M	1,000	31453
1,3-Dinitrobenzene	99-65-0	ACN	1,000	31662
2,4-Dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-Dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-Dinitrotoluene	610-39-9	M	1,000	31452
EGDN*	628-96-6	M	1,000	31601
HMX*	2691-41-0	ACN	1,000	31665
Nitrobenzene	98-95-3	ACN	1,000	31657
Nitroglycerin*	55-63-0	M	1,000	31498
Nitroguanidine*†	556-88-7	M	1,000	31602
2-Nitrotoluene	88-72-2	ACN	1,000	31659
3-Nitrotoluene	99-08-1	ACN	1,000	31660
4-Nitrotoluene	99-99-0	ACN	1,000	31658
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
Picric acid*	88-89-1	M	1,000	31499
RDX*	121-82-4	ACN	1,000	31666
Tetryl*	479-45-8	ACN	1,000	31667
1,3,5-Trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-Trinitrotoluene*	118-96-7	ACN	1,000	31669

ACN = acetonitrile; M = methanol

\* Ships under Restek's USDOT explosives approval.

† Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.

### References (Not available from Restek)

<sup>1</sup>U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.

<sup>2</sup>M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406-416, August 1998.

## Fire Debris Analysis (ASTM E1387 and E1618)

These materials also can be used for underground storage tank monitoring.

### E1387 Column Resolution Check Mix (13 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Octane (C8) (111-65-9)	2-Ethyltoluene (611-14-3)
<i>n</i> -Decane (C10) (124-18-5)	3-Ethyltoluene (620-14-4)
<i>n</i> -Dodecane (C12) (112-40-3)	Toluene (108-88-3)
<i>n</i> -Tetradecane (C14) (629-59-4)	1,2,4-Trimethylbenzene (95-63-6)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>p</i> -Xylene (106-42-3)
<i>n</i> -Octadecane (C18) (593-45-3)	

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31224 (ea.)

### E1618 Test Mix (13 components)

Components in this mix (0.5 µL/mL or 0.05% volume/volume each) are at 10x the concentration of the final test solution specified in ASTM 1618 and ASTM 1387.

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Octane (C8) (111-65-9)	2-Ethyltoluene (611-14-3)
<i>n</i> -Decane (C10) (124-18-5)	3-Ethyltoluene (620-14-4)
<i>n</i> -Dodecane (C12) (112-40-3)	Toluene (108-88-3)
<i>n</i> -Tetradecane (C14) (629-59-4)	1,2,4-Trimethylbenzene (95-63-6)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>p</i> -Xylene (106-42-3)
<i>n</i> -Octadecane (C18) (593-45-3)	

0.05% volume/volume each in methylene chloride, 1 mL/ampul  
cat.# 31613 (ea.)

No data pack available.

## please note

We can custom prepare weathered accelerants for fire debris analysis.

Please complete the custom reference material request form at [www.restek.com/solutions](http://www.restek.com/solutions)

We'll be glad to work with you!

## Compound Index for Reference Standards

See pages 586-592.



## Personal Care Products

### Ethylene Oxide Standards

- The industry's only suite of off-the-shelf reference standards for detecting ethylene oxide and 1,4-dioxane in PEG-based products.
- Formulated with concentrations needed by labs analyzing cosmetics and personal care products for possible carcinogens.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.

#### Ethylene Oxide/1,4-Dioxane Standard

(2 components)

1,4-Dioxane (123-91-1)  
Ethylene oxide (75-21-8)

0.001% w/w each in PEG-400, 5 mL/ampul

cat.# 30546 (ea.)



#### Ethylene Oxide/Acetaldehyde Standard

(2 components)

Acetaldehyde (75-07-0)  
Ethylene oxide (75-21-8)

0.001% w/w each in PEG-400, 5 mL/ampul

cat.# 30547 (ea.)



#### Ethylene Oxide Standard

Ethylene oxide (75-21-8)

0.005% w/w in PEG-200, 5 mL/ampul

cat.# 30548 (ea.)



#### PEG-200 Standard

Poly (ethylene glycol) 200 (25322-68-3)

Neat, 10 mL/ampul

cat.# 30549 (ea.)



#### PEG-400 Standard

Poly (ethylene glycol) 400 (25322-68-3)

Neat, 10 mL/ampul

cat.# 30559 (ea.)



## Weathered Petrochemical

### Weathered Petrochemical Standards

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

#### Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

Stoddard solvent (8052-41-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30487 (ea.)

We prepare our mineral spirit solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096
Unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097
Unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098
Unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099
Unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436
Kerosene	CAS #	Solvent	Conc.	cat.#
Kerosene: unweathered	84742-81-0	D	5,000	31229
Kerosene: 25% weathered	84742-81-0	D	5,000	31230
Kerosene: 50% weathered	84742-81-0	D	5,000	31231
Kerosene: 75% weathered	84742-81-0	D	5,000	31232
Diesel Fuel #2	CAS #	Solvent	Conc.	cat.#
Diesel fuel #2: unweathered	68334-30-5	D	5,000	31233
Diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234
Diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235
Diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236
Mineral Spirits	CAS #	Solvent	Conc.	cat.#
Mineral spirits: unweathered	8030-30-6	D	5,000	31225
Mineral spirits: unweathered	8030-30-6	D	50,000	31260

D = methylene chloride

PTM = purge-and-trap grade methanol





**Weathered Petrochemical, cont.****Weathered Gasoline Kit**

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

Contains 1 mL each of these mixtures.

30096: Unleaded Gasoline Standard

30097: Unleaded Gasoline Standard: 25% Weathered

30098: Unleaded Gasoline Standard: 50% Weathered

30099: Unleaded Gasoline Standard: 75% Weathered

cat.# 30100 (kit)

kit

**Weathered Gasoline Kit #2**

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

Contains 1 mL each of these mixtures.

30096: Unleaded Gasoline Standard

30097: Unleaded Gasoline Standard: 25% Weathered

30098: Unleaded Gasoline Standard: 50% Weathered

30099: Unleaded Gasoline Standard: 75% Weathered

30436: Unleaded Gasoline Standard: 99% Weathered

cat.# 30437 (kit)

kit

**Weathered Kerosene Kit**

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material.

Contains 1 mL each of these mixtures.

31229: Kerosene Standard

31230: Kerosene Standard: 25% Weathered

31231: Kerosene Standard: 50% Weathered

31232: Kerosene Standard: 75% Weathered

cat.# 31238 (kit)

kit

**Weathered Diesel Fuel #2 Kit**

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material.

Contains 1 mL each of these mixtures.

31233: Diesel Fuel #2 Standard

31234: Diesel Fuel #2 Standard: 25% Weathered

31235: Diesel Fuel #2 Standard: 50% Weathered

31236: Diesel Fuel #2 Standard: 75% Weathered

cat.# 31239 (kit)

kit



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Introducing New Alumina MAPD PLOT  
Columns in Both Fused Silica & Metal

See page 116.

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# Reference Standards

## Environmental

Acetates.....	483
Alcohols.....	483
Aldehydes.....	483
Base, Neutral & Acid Extractable (BNA) .....	532-544
Benzidines .....	483
BTEX .....	484
Diesel Fuel .....	484-485
Disinfection By-Products .....	485
Drinking Water Odor.....	485
Ethylene Oxide .....	485
Explosives .....	486-487
Gases.....	488
Gasoline.....	489
Glycols.....	490
Haloacetic Acids.....	490
Herbicides.....	491-494
Hormones.....	495
Hydrocarbons .....	495-517
International-Specific.....	559-561
Isocyanates.....	518
Jet Fuel.....	514
Kerosene .....	514
Ketones.....	518
Leaking Underground Storage Tank (LUST).....	497-510
Nitriles .....	518
Nitroaromatics & Nitramines .....	486-487
Nitrosamines .....	519
Oil & Grease .....	519
Organometallics/Organotin.....	520
Oxygenates/Ethers.....	520
Pesticides .....	521-529
Phenols .....	529
Phthalates (Phthalate Esters).....	530
Polybrominated Diphenyl Ethers (PBDEs).....	528
Polychlorinated Biphenyls (PCBs).....	530-531
Polycyclic Aromatic Hydrocarbons (PAHs) .....	511-513
Semivolatile Organics .....	532-544
Toxicity Characteristic Leaching Procedure (TCLP).....	544
Trihalomethanes.....	545
Volatile Organics.....	546-559



## Acetates

### 8260B Acetate Mix (5 components)

*n*-Butyl acetate (123-86-4)      *n*-Propyl acetate (109-60-4)  
Ethyl acetate (141-78-6)      Vinyl acetate (108-05-4)  
Isopropyl acetate (108-21-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30477 (ea.)

### 8260B Acetate Mix (Revised) (7 components)

- Includes methyl acetate and *n*-amyl acetate.
- Contains 7 acetates.

*n*-Amyl acetate (628-63-7)      Methyl acetate (79-20-9)  
Butyl acetate (123-86-4)      Propyl acetate (109-60-4)  
Ethyl acetate (141-78-6)      Vinyl acetate (108-05-4)  
Isopropyl acetate (108-21-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30489 (ea.)

### Vinyl Acetate

Vinyl acetate (108-05-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30216 (ea.)

## Alcohols

### 8240 Alcohols Mix (5 components)

Allyl alcohol (2-propen-1-ol) (107-18-6)      Isobutyl alcohol (78-83-1)  
2-Chloroethanol (107-07-3)      Propargyl alcohol (107-19-7)  
Ethanol (64-17-5)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30214 (ea.)

## Aldehydes

### Method 8315 (Aldehydes & Ketones DNPH by LC)

#### Aldehyde-Ketone-DNPH TO-11A Calibration Mix (15 components)

Acetaldehyde-DNPH (1019-57-4)      Formaldehyde-DNPH (1081-15-8)  
Acetone-DNPH (1567-89-1)      Hexaldehyde-DNPH (1527-97-5)  
Acrolein-DNPH (888-54-0)      Isovaleraldehyde-DNPH (2256-01-1)  
Benzaldehyde-DNPH (1157-84-2)      Propionaldehyde-DNPH (725-00-8)  
*n*-Butyraldehyde-DNPH (1527-98-6)      *m*-Tolualdehyde-DNPH (2880-05-9)  
Crotonaldehyde-DNPH (1527-96-4)      *o*-Tolualdehyde-DNPH (1773-44-0)  
2,5-Dimethylbenzaldehyde-DNPH      *p*-Tolualdehyde-DNPH (2571-00-8)  
(152477-96-8)      Valeraldehyde-DNPH (2057-84-3)

15 µg/mL each in acetonitrile, 1 mL/ampul\*

cat.# 31808 (ea.)

\*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

#### Formaldehyde-DNPH Mix

500 µg/mL in acetonitrile, 1 mL/ampul\*

cat.# 31837 (ea.)

\*The reported concentrations reflect the amount of formaldehyde in the mixture. The concentration of derivatized formaldehyde is not reported.

## Aldehydes, cont.

### CARB 1004 Aldehyde/Ketone-DNPH Calibration

#### Standard (13 components)

Acetaldehyde-2,4-DNPH (1019-57-4)      Hexaldehyde-2,4-DNPH (1527-97-5)  
Acetone-2,4-DNPH (1567-89-1)      Methacrolein-2,4-DNPH (5077-73-6)  
Acrolein-2,4-DNPH (888-54-0)      Methyl ethyl ketone-2,4-DNPH  
Benzaldehyde-2,4-DNPH (1157-84-2)      (958-60-1)  
*n*-Butyraldehyde-2,4-DNPH (1527-98-6)      Propionaldehyde-2,4-DNPH (725-00-8)  
Crotonaldehyde-2,4-DNPH (1527-96-4)      *m*-Tolualdehyde-2,4-DNPH (2880-05-9)  
Formaldehyde-2,4-DNPH (1081-15-8)      Valeraldehyde-2,4-DNPH (2057-84-3)

3 µg/mL each in acetonitrile, 1 mL/ampul\*

cat.# 33093 (ea.)

\*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

#### DNPH Reference Materials

Volume is 1 mL/ampul. Concentration is µg/mL.\*

Compound	CAS #	Solvent	Conc.	cat.#
acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074
formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082
glycolaldehyde-2,4-DNPH		ACN	100	33091

\*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

ACN = acetonitrile

### ASTM Method 5197 (Formaldehyde and Other Carbonyl Compounds in Air)

See cat. #s 33093, 33074, 33082, and 33091 above.

## Base, Neutral & Acid Extractable (BNA)/ Semivolatile Organics

See pages 532–544.

## Benzidines

### 605 Benzidines Calibration Mix (2 components)

Benzidine (92-87-5)  
3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31030 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31834 (ea.)

### 8270 Benzidines Mix (3 components)

Benzidine (92-87-5)      3,3'-Dimethylbenzidine (*o*-tolidine)  
3,3'-Dichlorobenzidine (91-94-1)      (119-93-7)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31688 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31852 (ea.)

### 3,3'-Dichlorobenzidine

3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 31026 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31835 (ea.)

## BTEX

### BTEX Standard (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)
200 µg/mL each in P&T methanol, 1 mL/ampul cat.# 30051 (ea.)	
2,000 µg/mL each in P&T methanol, 1 mL/ampul cat.# 30213 (ea.)	
2,000 µg/mL each in P&T methanol ( <i>m</i> - & <i>p</i> -xylene at 1,000 µg/mL), 1 mL/ampul cat.# 30488 (ea.)	

### BTEX Gas Mix (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

#### cylinder design

Cylinder Construction: aluminum  
Cylinder Fitting: CGA-180 outlet

#### Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas  
@ 1,800 psi  
Weight: 1.5 lb/0.7 kg



#### Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas  
@ 1,800 psi  
Weight: 2.2 lb/1 kg  
U.S. DOT Specs: 3AL2216



1 ppm in nitrogen, 104 liters @ 1,800 psi  
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi  
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi  
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi  
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

#### also available

High-Purity VOC Regulators

See page 453.



## Diesel Fuel

### Diesel Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Chlorooctadecane	3386-33-2	D	10,000	31098
2-Fluorobiphenyl	321-60-8	D	10,000	31096
<i>o</i> -Terphenyl	84-15-1	D	10,000	31097
<i>p</i> -Terphenyl	92-94-4	D	10,000	31095

### Recommended Internal Standards

Compound	CAS #	Solvent	Conc.	cat.#
5- $\alpha$ -Androstane	438-22-2	D	2,000	31065
<i>o</i> -Terphenyl	84-15-1	A	2,000	31066

A = acetone; D = methylene chloride

### Diesel Fuel #2 Composite Standard

Diesel fuel #2 composite (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31259 (ea.)

### Diesel Fuel #2 Standard

Prepared from a single-source (one-refinery) product.

Diesel fuel #2: unweathered (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31233 (ea.)

### Certified PAHs in Diesel (7 components)

- Confirms diesel #2 TPH and priority PAHs in a single analysis.
- Certificate of analysis includes concentration of TPH and certified concentrations of individual PAHs.
- Complete data packs available.

<b>Certified for:</b>	1-Methylnaphthalene*
Acenaphthene*	2-Methylnaphthalene*
Acenaphthylene*	Naphthalene*
Fluorene*	Phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul  
cat.# 31673 (ea.)

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

### Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31880 (ea.)



**Diesel Fuel, cont.****ISO/DIS 9377 Water Quality Testing (German H-53)**

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography–flame ionization detection (GC-FID) method.

**Diesel #2/Motor Oil** (2 components)

Diesel fuel #2 composite (68334-30-5)  
Motor oil (64742-65-0)

5,000 µg/mL each in hexane, 1 mL/ampul  
cat.# 31682 (ea.)

**Diesel #2/Mineral Oil** (2 components)

Diesel fuel #2 composite (68334-30-5)  
Mineral oil (8042-47-5)

5,000 µg/mL each in hexane, 1 mL/ampul  
cat.# 31676 (ea.)

**Standard Mixture Stock Solution** (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

Diesel #2 (additive-free) (68334-30-5)  
Mineral oil (additive-free [i.e., USP grade] bp 325–460 or C18–C32 retention time range) (8042-47-5)

5,000 µg/mL each in cyclohexane, 1 mL/ampul (prepares 8 mL of 1.25 µg/µL calibration curve high point). Total hydrocarbon concentration is 10,000 µg/mL.  
cat.# 31630 (ea.)

**Quality Control Standard Mixture, Revised**

(2 components)

- Updated reference materials for GC analysis of TPH in water.
- Determination of hydrocarbon oil index—applicable to drinking, surface, waste, and treated water.

Diesel #2 (additive-free) (68334-30-5)  
Motor oil (additive-free bp 325–460 or C18–C32 retention time range) (64742-65-0)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one 900 mL quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.  
cat.# 31641 (ea.)

**Quality Control Standard Mixture** (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Environmentally safer than previous methods.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

Diesel #2 (additive-free) (68334-30-5)  
Mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range) (8042-47-5)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.  
cat.# 31631 (ea.)

**Disinfection By-Products****Chloral Hydrate**

Chloral hydrate (302-17-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul  
cat.# 30609 (ea.)

**Disinfection By-Product Mix** (7 components)

Bromochloroacetonitrile (83463-62-1)	1,1-Dichloro-2-propanone (513-88-2)
Chloropicrin (76-06-2)	Trichloroacetonitrile (545-06-2)
Dibromoacetonitrile (3252-43-5)	1,1,1-Trichloro-2-propanone (918-00-3)
Dichloroacetonitrile (3018-12-0)	

2,000 µg/mL each in acetone, 1 mL/ampul  
cat.# 30616 (ea.)

**Drinking Water Odor****Drinking Water Odor Standard** (2 components)

- Reference mix of the two most common odor-causing compounds.
- Convenient concentration for purge-and-trap analysis: 100 µg/mL in methanol.

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10 ppt), and purge-and-trap analyses usually are used to quantify them.

(+/-)-Geosmin (16423-19-1)  
2-Methylisoborneol (MIB) (2371-42-8)

100 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30608 (ea.)

**Ethylene Oxide****Ethylene Oxide**

Ethylene oxide (75-21-8)

500 µg/mL in dimethyl sulfoxide, 1 mL/ampul  
cat.# 36005 (ea.)

50 mg/mL in methylene chloride, 1 mL/ampul  
cat.# 30620 (ea.)

Ethylene oxide is available in other solvents and concentrations. Request your custom formulation at [www.restek.com/solutions](http://www.restek.com/solutions)

Restek Offers a Full Line of Certified Reference Materials

See **pages 464–465**.



[www.restek.com/iso](http://www.restek.com/iso)

## Explosives

### Method 609 (Nitroaromatics & Isophorone)

#### 609 Nitroaromatics & Isophorone Calibration Mix

(4 components)

2,4-Dinitrotoluene (121-14-2)                      2,6-Dinitrotoluene (606-20-2)  
Isophorone (78-59-1)                                      Nitrobenzene (98-95-3)

2,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31033 (ea.)

### Method 8095 (Explosives by GC)

#### 8095 Matrix Spike Mix B (7 components)

3,5-Dinitroaniline (618-87-1)\*                      3-Nitrotoluene (99-08-1)  
Nitrobenzene (98-95-3)                              4-Nitrotoluene (99-99-0)  
Nitroglycerin (55-63-0)                              PETN (78-11-5)  
2-Nitrotoluene (88-72-2)

1,000 µg/mL each in acetonitrile (\*3,5-dinitroaniline at 200 µg/mL), 1 mL/ampul  
cat.# 31610 (ea.)

Ships under Restek's USDOT explosives approval.

#### 8095 Calibration Mix A (10 components)

2-Amino-4,6-dinitrotoluene (35572-78-2)                      HMX (2691-41-0)  
4-Amino-2,6-dinitrotoluene (19406-51-0)                      RDX (121-82-4)  
1,3-Dinitrobenzene (99-65-0)                                      Tetryl (479-45-8)  
2,4-Dinitrotoluene (121-14-2)                                      1,3,5-Trinitrobenzene (99-35-4)  
2,6-Dinitrotoluene (606-20-2)                                      2,4,6-Trinitrotoluene (118-96-7)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31607 (ea.)

Ships under Restek's USDOT explosives approval.

#### 8095 Calibration Mix B (7 components)

3,5-Dinitroaniline (618-87-1)\*                      3-Nitrotoluene (99-08-1)  
Nitrobenzene (98-95-3)                                      4-Nitrotoluene (99-99-0)  
Nitroglycerine (55-63-0)                                      PETN (78-11-5)  
2-Nitrotoluene (88-72-2)

5,000 µg/mL each in acetonitrile (\*3,5-dinitroaniline at 1,000 µg/mL), 1 mL/ampul  
cat.# 31608 (ea.)

Ships under Restek's USDOT explosives approval.

### Method 8095 (Explosives by GC), *cont.*

#### Single-Component Explosives Solutions

- Supports U.S. Department of Defense base closures and remediation.
- Mixtures and singles supporting LC U.S. EPA Method 8330.
- Mixtures and singles supporting GC-ECD U.S. EPA Method 8095.
- Internal standards and surrogates to support both methods.

These materials support nitroaromatic, nitramine, and nitro-ester analyses by GC-ECD (Method 8095).<sup>1,2</sup> Compounds listed are explosives, manufacturing intermediates, or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-Amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
3,5-Dinitroaniline	618-87-1	ACN	1,000	31661
1,2-Dinitrobenzene	528-29-0	M	1,000	31453
1,3-Dinitrobenzene	99-65-0	ACN	1,000	31662
2,4-Dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-Dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-Dinitrotoluene	610-39-9	M	1,000	31452
EGDN*	628-96-6	M	1,000	31601
HMX*	2691-41-0	ACN	1,000	31665
Nitrobenzene	98-95-3	ACN	1,000	31657
Nitroglycerin*	55-63-0	M	1,000	31498
Nitroguanidine*†	556-88-7	M	1,000	31602
2-Nitrotoluene	88-72-2	ACN	1,000	31659
3-Nitrotoluene	99-08-1	ACN	1,000	31660
4-Nitrotoluene	99-99-0	ACN	1,000	31658
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
Picric acid*	88-89-1	M	1,000	31499
RDX*	121-82-4	ACN	1,000	31666
Tetryl*	479-45-8	ACN	1,000	31667
1,3,5-Trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-Trinitrotoluene*	118-96-7	ACN	1,000	31669

ACN = acetonitrile; M = methanol

\* Ships under Restek's USDOT explosives approval.

† Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.

#### References (Not available from Restek)

<sup>1</sup>U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.

<sup>2</sup>M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406-416, August 1998.

## Compound Index for Reference Standards

See pages 586-592.



## Explosives, cont.

### Method 8330 (Nitroaromatics and Nitramines by LC)

#### 8330 Internal Standard

3,4-Dinitrotoluene (610-39-9)  
1,000 µg/mL in methanol, 1 mL/ampul  
cat.# 31452 (ea.)

#### 8330 Internal Standard

1,4-Dinitrobenzene (100-25-4)  
2,000 µg/mL in acetonitrile, 1 mL/ampul  
cat.# 33205 (ea.)

#### 8330 Surrogate

1,2-Dinitrobenzene (528-29-0)  
1,000 µg/mL in methanol, 1 mL/ampul  
cat.# 31453 (ea.)

#### 8330B Nitroaromatics and Nitramine Mix

(17 components)\*

2-Amino-4,6-dinitrotoluene (35572-78-2)	2-Nitrotoluene (88-72-2)
4-Amino-2,6-dinitrotoluene (19406-51-0)	3-Nitrotoluene (99-08-1)
3,5-Dinitroaniline (618-87-1)	4-Nitrotoluene (99-99-0)
1,3-Dinitrobenzene (99-65-0)	PETN (78-11-5)
2,4-Dinitrotoluene (121-14-2)	RDX (121-82-4)
2,6-Dinitrotoluene (606-20-2)	Tetryl (479-45-8)
HMX (2691-41-0)	1,3,5-Trinitrobenzene (99-35-4)
Nitrobenzene (98-95-3)	2,4,6-Trinitrotoluene (118-96-7)
Nitroglycerin (55-63-0)	

1,000 µg/mL each in acetonitrile, 1 mL/ampul  
cat.# 33204 (ea.)

#### Nitroaromatics and Nitramine Explosives by LC

(14 components)\*

1,3-Dinitrobenzene (99-65-0)	2-Nitrotoluene (88-72-2)
2-Amino-4,6-dinitrotoluene (35572-78-2)	3-Nitrotoluene (99-08-1)
4-Amino-2,6-dinitrotoluene (19406-51-0)	4-Nitrotoluene (99-99-0)
2,4-Dinitrotoluene (121-14-2)	RDX (121-82-4)
2,6-Dinitrotoluene (606-20-2)	Tetryl (479-45-8)
HMX (2691-41-0)	1,3,5-Trinitrobenzene (99-35-4)
Nitrobenzene (98-95-3)	2,4,6-Trinitrotoluene (118-96-7)

1,000 µg/mL each in acetonitrile, 1 mL/ampul  
cat.# 33905 (ea.)

\*Ships under Restek's USDOT explosives approval.

#### 8330 Calibration Mix #1 (7 components)\*

1,3-Dinitrobenzene (99-65-0)	RDX (121-82-4)
2,4-Dinitrotoluene (121-14-2)	1,3,5-Trinitrobenzene (99-35-4)
HMX (2691-41-0)	2,4,6-Trinitrotoluene (118-96-7)
Nitrobenzene (98-95-3)	

1,000 µg/mL each in acetonitrile, 1 mL/ampul  
cat.# 31450 (ea.)

#### 8330 Calibration Mix #2 (7 components)\*

2-Amino-4,6-dinitrotoluene (35572-78-2)	3-Nitrotoluene (99-08-1)
4-Amino-2,6-dinitrotoluene (19406-51-0)	4-Nitrotoluene (99-99-0)
2,6-Dinitrotoluene (606-20-2)	Tetryl (479-45-8)
2-Nitrotoluene (88-72-2)	

1,000 µg/mL each in acetonitrile, 1 mL/ampul  
cat.# 31451 (ea.)

\*Ships under Restek's USDOT explosives approval.

## did you know?

Obtaining pure, neat compounds for Method 8330 reference standards can be very difficult.

To ensure the highest quality standards, Restek's Quality Control (QC) lab confirms the chemical identity and purity of mixture components and solvents using one or more of the following techniques: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.



More than 1/3 of the ampuls that leave our facility are custom-ordered reference standards, and almost all of them are certified reference materials (CRMs).

**Restek® Safe Cracker**

Included with every reference standard shipment for added convenience.



## Gases

### 624 Calibration Mix #1 (gases) (5 components)

Bromomethane (methyl bromide) (74-83-9)  
 Chloroethane (ethyl chloride) (75-00-3)  
 Chloromethane (methyl chloride) (74-87-3)  
 Trichlorofluoromethane (CFC-11) (75-69-4)  
 Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
 cat.# 30020 (ea.)

### Method 8240 (Volatile Organic Compounds [VOCs])

### 502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)  
 Chloroethane (ethyl chloride) (75-00-3)  
 Chloromethane (methyl chloride) (74-87-3)  
 Dichlorodifluoromethane (CFC-12) (75-71-8)  
 Trichlorofluoromethane (CFC-11) (75-69-4)  
 Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul  
 cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
 cat.# 30042 (ea.)

## **i** tech tip

### Achieving the Best Results From Gas Standards

In order to achieve the best results from gas standards, proper handling and storage of gas solutions is of vital importance. Use the following tips to help ensure trouble-free performance:

- Before opening the sealed ampul, gently invert the ampul several times. This will redissolve any gases that may have migrated into the headspace of the ampul.
- When diluting a gas standard, always add it to a solvent. Adding the gas standard to an empty vessel prior to adding solvent will result in the loss of gas compounds.
- Keep the gas standard cold throughout its use. Make sure it is cold before opening the ampul, work quickly to minimize heat transfer from hands or room, and only dilute the standard into a very cold solvent.
- When diluting a gas standard in solvent, make sure the pipette or needle tip is directly above, or immersed below, the solvent surface.
- We recommend that any unused portion of gas standard be disposed of after it has been removed from the sealed ampul. If it is necessary to store the unused portion, place it into a tightly capped vial with little to no headspace and store it in the freezer.
- We recommend that any gas solutions that have been stored outside of a sealed ampul be disposed of after 7 days.

### BTEX Gas Mix (6 components)

Benzene (71-43-2) *m*-Xylene (108-38-3)  
 Ethylbenzene (100-41-4) *o*-Xylene (95-47-6)  
 Toluene (108-88-3) *p*-Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi  
 cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi  
 cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
 cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi  
 cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi  
 cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
 cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

### cylinder design

Cylinder Construction: aluminum  
 Cylinder Fitting: CGA-180 outlet

#### Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm  
 Volume/Pressure:  
 104 liters of gas  
 @ 1,800 psi  
 Weight: 1.5 lb/0.7 kg



#### Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm  
 Volume/Pressure:  
 110 liters of gas  
 @ 1,800 psi  
 Weight: 2.2 lb/1 kg  
 U.S. DOT Specs: 3AL2216



### Japan Calibration Mix (9 components)

Acrylonitrile  
 Benzene  
 1,3-Butadiene  
 Chloroform  
 1,2-Dichloroethane  
 Dichloromethane  
 Tetrachloroethylene  
 Trichloroethylene  
 Vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi  
 cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi  
 cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
 cat.# 34418-PI (ea.)

No data pack available.



For more gas  
 calibration  
 standards,

see pages 443–451.

### also available

High-Purity VOC Regulators

See page 453.





## Gasoline

### Gasoline Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,500	30067
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	10,000	30082
1-Chlorooctane	111-85-3	PTM	10,000	30084
α,α,α-Trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-Trifluorotoluene	98-08-8	PTM	10,000	30083

Recommended Internal Standard (PID) for EPA GRO Method

Compound	CAS #	Solvent	Conc.	cat.#
1-Chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066

PTM = Purge-and-trap grade methanol

### Unleaded Gasoline Standard

Prepared from a single-source (one-refinery) product.

Unleaded gasoline: unweathered (8006-61-9)

5,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30096 (ea.)

### Unleaded Gasoline Composite Standard

Unleaded gasoline composite (8006-61-9)

2,500 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul

cat.# 30206 (ea.)

## Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

### PVOC Mix (California) (7 components)

Benzene (71-43-2)	Toluene (108-88-3)
Ethylbenzene (100-41-4)	<i>m</i> -Xylene (108-38-3)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	<i>o</i> -Xylene (95-47-6)
	<i>p</i> -Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30231 (ea.)

### PVOC/GRO Mix (Wisconsin) (10 components)

Benzene (71-43-2)	1,2,4-Trimethylbenzene (95-63-6)
Ethylbenzene (100-41-4)	1,3,5-Trimethylbenzene (108-67-8)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	<i>m</i> -Xylene (108-38-3)
	<i>o</i> -Xylene (95-47-6)
Naphthalene (91-20-3)	<i>p</i> -Xylene (106-42-3)
Toluene (108-88-3)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30095 (ea.)

### GRO Mix (9 components)

Benzene (71-43-2)	1,2,4-Trimethylbenzene (95-63-6)
Ethylbenzene (100-41-4)	2,2,4-Trimethylpentane (isooctane) (540-84-1)
3-Methylpentane (96-14-0)	<i>m</i> -Xylene (108-38-3)
Naphthalene (91-20-3)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30060 (ea.)

## Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX), *cont.*

### GRO Mix (EPA) (9 components)

Benzene (71-43-2)	500 µg/mL	1,2,4-Trimethylbenzene (95-63-6)	1,000
Ethylbenzene (100-41-4)	500	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Heptane (142-82-5)	500	<i>m</i> -Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	<i>o</i> -Xylene (95-47-6)	1,000
Toluene (108-88-3)	1,500		

In P&T methanol, 1 mL/ampul

cat.# 30065 (ea.)

### BTEX Standard (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul

cat.# 30488 (ea.)

### Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	<i>m</i> -Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	<i>o</i> -Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	<i>p</i> -Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul

cat.# 30486 (ea.)

### Certified BTEX in Unleaded Gas Composite Standard

(9 components)

<b>Certified for:</b>	Naphthalene*
Benzene*	Toluene*
Ethylbenzene*	<i>m</i> -Xylene*
Isopropyl benzene*	<i>o</i> -Xylene*
Methyl <i>tert</i> -butyl ether (MTBE)*	<i>p</i> -Xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul

cat.# 30237 (ea.)

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

### Certified Aromatics in Gasoline (16 components)

<b>Certified for:</b>	<i>n</i> -Propylbenzene*
Benzene*	Toluene*
Ethylbenzene*	1,2,3-Trimethylbenzene*
<i>m</i> -Ethyltoluene*	1,2,4-Trimethylbenzene*
<i>o</i> -Ethyltoluene*	1,3,5-Trimethylbenzene*
<i>p</i> -Ethyltoluene*	<i>m</i> -Xylene*
Isopropylbenzene*	<i>o</i> -Xylene*
Methyl <i>tert</i> -butyl ether (MTBE)*	<i>p</i> -Xylene*
Naphthalene*	

5,500 ppm gasoline in P&T methanol, 1 mL/ampul

cat.# 30485 (ea.)

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

# Glycols, Haloacetic Acids

## Glycols

### Glycols Standard (2 components)

Ethylene glycol (107-21-1)  
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul

cat.# 30471 (ea.)

## Haloacetic Acids

### Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon)

#### Internal Standards and Surrogates for Method 552

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
<b>Internal Standard</b>				
1,2,3-trichloropropane	96-18-4	MTBE	1,000	31648
<b>Surrogates for Method 552, 552.1</b>				
2,3-dichloropropionic acid	565-64-0	MTBE	1,000	31650
<b>Surrogates for Method 552.2</b>				
2-bromopropionic acid	598-72-1	MTBE	1,000	31653
2,3-dibromopropionic acid	600-05-5	MTBE	1,000	31655
methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656
<b>Surrogates for Method 552.3</b>				
2-bromobutanoic acid	80-58-0	MTBE	2,000	31881
2-bromobutyrate	3196-15-4	MTBE	2,000	31882

MTBE = methyl *tert*-butyl ether

### Haloacetic Acid Mix (9 components)

Bromochloroacetic acid (5589-96-8)	Monobromoacetic acid (79-08-3)
Bromodichloroacetic acid (71133-14-7)	Monochloroacetic acid (79-11-8)
Chlorodibromoacetic acid (5278-95-5)	Tribromoacetic acid (75-96-7)
Dibromoacetic acid (631-64-1)	Trichloroacetic acid (76-03-9)
Dichloroacetic acid (79-43-6)	

1,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul  
cat.# 31896 (ea.)

### Haloacetic Acid Mix #1 (6 components)

Bromochloroacetic acid (5589-96-8)	Monobromoacetic acid (79-08-3)
Dibromoacetic acid (631-64-1)	Monochloroacetic acid (79-11-8)
Dichloroacetic acid (79-43-6)	Trichloroacetic acid (76-03-9)

2,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul  
cat.# 31644 (ea.)

## Haloacetic Acids, *cont.*

### Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon), *cont.*

#### Haloacetic Acid Methyl Ester Mix #1 (6 components)

Methyl bromochloroacetate (20428-74-4)	Methyl monobromoacetate (96-32-2)
Methyl dibromoacetate (6482-26-4)	Methyl monochloroacetate (96-34-4)
Methyl dichloroacetate (116-54-1)	Methyl trichloroacetate (598-99-2)

1,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul  
cat.# 31645 (ea.)

#### Haloacetic Acid Mix #2 (9 components)

Bromochloroacetic acid (5589-96-8)	400 µg/mL	Dibromoacetic acid (631-64-1)	200
Bromodichloroacetic acid (71133-14-7)	400	Dichloroacetic acid (79-43-6)	600
Chlorodibromoacetic acid (5278-95-5)	1,000	Monobromoacetic acid (79-08-3)	400
		Monochloroacetic acid (79-11-8)	600
		Tribromoacetic acid (75-96-7)	2,000
		Trichloroacetic acid (76-03-9)	200

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 31646 (ea.)

### Dalapon (2,2-dichloropropionic acid)

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32056 (ea.)

### Dalapon Methyl Ester

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul

cat.# 32057 (ea.)



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## Herbicides, Chloroacetanilide Herbicide Degradates

### Method 535 (Chloroacetanilide Herbicide Degradates)

#### Method 535 Internal Standard

Butachlor ESA sodium salt

100 µg/mL in methanol, 1 mL/ampul

cat.# 33202 (ea.)

#### Method 535 Surrogate Standard

Dimethachlor ESA sodium salt

100 µg/mL in methanol, 1 mL/ampul

cat.# 33203 (ea.)

## Herbicides, Chlorinated Acids

### Method 515, 515.4 (Chlorinated Acid Herbicides)

#### Herbicide Internal Standard

4,4'-Dibromooctafluorobiphenyl (10386-84-2)

250 µg/mL in hexane, 1 mL/ampul

cat.# 32053 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31040 (ea.)

2,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul

cat.# 31856 (ea.)

#### Herbicide Surrogate

##### Free Acid Form

2,4-Dichlorophenylacetic acid (2,4-DCAA) (19719-28-9)

200 µg/mL in methanol, 1 mL/ampul

cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32439 (ea.)

##### Derivatized Form

2,4-Dichlorophenyl acetic acid methyl ester (DCAA methyl ester) (55954-23-9)

200 µg/mL in hexane, 1 mL/ampul

cat.# 32050 (ea.)

#### Herbicide Lab Performance Check Mix (5 components)

Dinoseb methyl ether (6099-79-2)	4 µg/mL	3,5-Dichlorobenzoic acid methyl ester (2905-67-1)	600
DCAA methyl ester (55954-23-9)	500	4-Nitroanisole (100-17-4)	1,600
4,4'-Dibromooctafluorobiphenyl (10386-84-2)	250		

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 32063 (ea.)

### Method 515, 515.4 (Chlorinated Acid Herbicides), *cont.*

#### Herbicide Mix #1 (7 components)

##### Free Acid Form

2,4-D (94-75-7)

2,4-DB (94-82-6)

2,4,5-T (93-76-5)

2,4,5-TP (Silvex) (93-72-1)

Dicamba (1918-00-9)

Dichlorprop (120-36-5)

Dinoseb (88-85-7)

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32054 (ea.)

##### Derivatized Form

2,4-D methyl ester (1928-38-7)

2,4-DB methyl ester (18625-12-2)

2,4,5-T methyl ester (1928-37-6)

2,4,5-TP methyl ester (Silvex) (4841-20-7)

Dicamba methyl ester (6597-78-0)

Dichlorprop methyl ester (57153-17-0)

Dinoseb methyl ether (6099-79-2)

200 µg/mL each in hexane, 1 mL/ampul

cat.# 32055 (ea.)

#### Herbicide Mix #2

##### Free Acid Form

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32056 (ea.)

##### Derivatized Form

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul

cat.# 32057 (ea.)

#### Herbicide Mix #4 (8 components)

##### Free Acid Form

Acifluorfen (50594-66-6)

Bentazon (25057-89-0)

Chloramben (133-90-4)

DCPA diacid (tetrachloroterephthalic acid)  
(2136-79-0)

3,5-Dichlorobenzoic acid (51-36-5)

4-Nitrophenol (100-02-7)

Pentachlorophenol (87-86-5)

Picloram (1918-02-1)

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32061 (ea.)

##### Derivatized Form

Acifluorfen methyl ester (50594-67-7)

Bentazon methyl ester (61592-45-8)

Chloramben methyl ester (7286-84-2)

DCPA methyl ester (Chlorthal-dimethyl)  
(1861-32-1)

3,5-Dichlorobenzoic acid methyl ester  
(2905-67-1)

4-Nitroanisole (100-17-4)

Pentachloroanisole (1825-21-4)

Picloram methyl ester (14143-55-6)

200 µg/mL each in hexane, 1 mL/ampul

cat.# 32062 (ea.)



Herbicides, Chlorinated Acids, *cont.*

Method 515, 515.4

(Chlorinated Acid Herbicides), *cont.*

515.4 Calibration Mix (16 components)

Acifluorfen (50594-66-6)	50 µg/mL	3,5-Dichlorobenzoic acid (51-36-5)	50
Bentazon (25057-89-0)	100	Dichlorprop (120-36-5)	100
Chloramben (133-90-4)	50	Dinoseb (88-85-7)	100
2,4-D (94-75-7)	100	Pentachlorophenol (87-86-5)	10
Dalapon (75-99-0)	100	Picloram (1918-02-1)	50
2,4-DB (94-82-6)	100	Quinclorac (84087-01-4)	50
DCPA diacid (tetrachloroterephthalic acid) (2136-79-0)	50	2,4,5-T (93-76-5)	25
Dicamba (1918-00-9)	50	2,4,5-TP (Silvex) (93-72-1)	25

In acetone, 1 mL/ampul

---

cat.# 32443 (ea.)

515.4 Methylated Chlorinated Acids Mix

(16 components)

Acifluorfen methyl ester (50594-67-7)	50 µg/mL	3,5-Dichlorobenzoic acid methyl ester (2905-67-1)	50
Bentazon methyl ester (61592-45-8)	100	Dichlorprop methyl ester (57153-17-0)	100
Chloramben methyl ester (7286-84-2)	50	Dinoseb methyl ether (6099-79-2)	100
Dalapon methyl ester (17640-02-7)	100	Pentachloroanisole (1825-21-4)	10
2,4-D methyl ester (1928-38-7)	100	Picloram methyl ester (14143-55-6)	50
2,4-DB methyl ester (18625-12-2)	100	Quinclorac methyl ester	50
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)	100	2,4,5-T methyl ester (1928-37-6)	25
Dicamba methyl ester (6597-78-0)	50	2,4,5-TP (Silvex) methyl ester (4841-20-7)	25

In methyl *tert*-butyl ether, 1 mL/ampul

---

cat.# 32444 (ea.)

Method 555 (Chlorinated Acids) LC Mixes

Chlorinated Acids by LC, Mix A (8 components)

Acifluorfen (50594-66-6)	Dicamba (1918-00-9)
Bentazon (25057-89-0)	Dichlorprop (120-36-5)
Chloramben (133-90-4)	Picloram (1918-02-1)
2,4-D (94-75-7)	2,4,5-TP (Silvex) (93-72-1)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

---

cat.# 32431 (ea.)

Chlorinated Acids by LC, Mix B (8 components)

2,4-DB (94-82-6)	MCPP (Mecoprop) (93-65-2)
3,5-Dichlorobenzoic acid (51-36-5)	4-Nitrophenol (100-02-7)
Dinoseb (88-85-7)	Pentachlorophenol (87-86-5)
MCPA (94-74-6)	2,4,5-T (93-76-5)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

---

cat.# 32430 (ea.)

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Method 615 (Chlorinated Acid Herbicides)

Herbicide Surrogate

Free Acid Form

2,4-Dichlorophenylacetic acid (2,4-DCAA) (19719-28-9)
200 µg/mL in methanol, 1 mL/ampul
cat.# 32049 (ea.)
1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32439 (ea.)

Derivatized Form

2,4-Dichlorophenyl acetic acid methyl ester (DCAA methyl ester) (55954-23-9)
200 µg/mL in hexane, 1 mL/ampul
cat.# 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D (94-75-7)	Dicamba (1918-00-9)
2,4-DB (94-82-6)	Dichlorprop (120-36-5)
2,4,5-T (93-76-5)	Dinoseb (88-85-7)
2,4,5-TP (Silvex) (93-72-1)	
200 µg/mL each in methanol, 1 mL/ampul	
cat.# 32054 (ea.)	

Derivatized Form

2,4-D methyl ester (1928-38-7)	Dicamba methyl ester (6597-78-0)
2,4-DB methyl ester (18625-12-2)	Dichlorprop methyl ester (57153-17-0)
2,4,5-T methyl ester (1928-37-6)	Dinoseb methyl ether (6099-79-2)
2,4,5-TP methyl ester (Silvex) (4841-20-7)	
200 µg/mL each in hexane, 1 mL/ampul	
cat.# 32055 (ea.)	

Herbicide Mix #2

Free Acid Form

Dalapon (75-99-0)
1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)
1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)
2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Derivatized Form

Dalapon methyl ester (17640-02-7)
2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

Herbicide Mix #3 (2 components)

Free Acid Form

MCPA (94-74-6)
MCPP (Mecoprop) (93-65-2)
20,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32058 (ea.)

Derivatized Form

MCPA methyl ester (2436-73-9)
MCPP (Mecoprop) methyl ester (2786-19-8)
20,000 µg/mL each in hexane, 1 mL/ampul
cat.# 32059 (ea.)





## Herbicides, Chlorinated Acids, *cont.*

### Method 8150, 8151, 8151A (Chlorinated Acid Herbicides)

#### Herbicide Internal Standard

4,4'-Dibromooctafluorobiphenyl (10386-84-2)

250 µg/mL in hexane, 1 mL/ampul

cat.# 32053 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31040 (ea.)

2,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul

cat.# 31856 (ea.)

#### Herbicide Surrogate

##### Free Acid Form

2,4-Dichlorophenylacetic acid (2,4-DCAA) (19719-28-9)

200 µg/mL in methanol, 1 mL/ampul

cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32439 (ea.)

##### Derivatized Form

2,4-Dichlorophenyl acetic acid methyl ester (DCAA methyl ester) (55954-23-9)

200 µg/mL in hexane, 1 mL/ampul

cat.# 32050 (ea.)

#### Herbicide Mix #1 (7 components)

##### Free Acid Form

2,4-D (94-75-7)

Dicamba (1918-00-9)

2,4-DB (94-82-6)

Dichlorprop (120-36-5)

2,4,5-T (93-76-5)

Dinoseb (88-85-7)

2,4,5-TP (Silvex) (93-72-1)

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32054 (ea.)

##### Derivatized Form

2,4-D methyl ester (1928-38-7)

Dicamba methyl ester (6597-78-0)

2,4-DB methyl ester (18625-12-2)

Dichlorprop methyl ester (57153-17-0)

2,4,5-T methyl ester (1928-37-6)

Dinoseb methyl ether (6099-79-2)

2,4,5-TP methyl ester (Silvex) (4841-20-7)

200 µg/mL each in hexane, 1 mL/ampul

cat.# 32055 (ea.)

#### Herbicide Mix #2

##### Free Acid Form

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32056 (ea.)

##### Derivatized Form

Dalapon methyl ester (17640-02-7)

2,000 µg/mL in hexane, 1 mL/ampul

cat.# 32057 (ea.)

#### Herbicide Mix #3 (2 components)

##### Free Acid Form

MCPA (94-74-6)

MCPP (Mecoprop) (93-65-2)

20,000 µg/mL each in methanol, 1 mL/ampul

cat.# 32058 (ea.)

##### Derivatized Form

MCPA methyl ester (2436-73-9)

MCPP (Mecoprop) methyl ester (2786-19-8)

20,000 µg/mL each in hexane, 1 mL/ampul

cat.# 32059 (ea.)

#### Herbicide Mix #4 (8 components)

##### Free Acid Form

Acifluorfen (50594-66-6)

Bentazon (25057-89-0)

Chloramben (133-90-4)

DCPA diacid (tetrachloroterephthalic acid) (2136-79-0)

3,5-Dichlorobenzoic acid (51-36-5)

4-Nitrophenol (100-02-7)

Pentachlorophenol (87-86-5)

Picloram (1918-02-1)

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32061 (ea.)

##### Derivatized Form

Acifluorfen methyl ester (50594-67-7)

Bentazon methyl ester (61592-45-8)

Chloramben methyl ester (7286-84-2)

DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)

200 µg/mL each in hexane, 1 mL/ampul

cat.# 32062 (ea.)

#### Picloram

Picloram (1918-02-1)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32265 (ea.)

## Reference Standards Documentation Search

Locate SDSs, certificates,  
& data packs by cat. #  
or lot #

[www.restek.com/documentation](http://www.restek.com/documentation)



**Herbicides, Chlorinated Acids, *cont.***

**Method 8321 (Chlorinated Acids by LC)**

**Chlorinated Acids by LC, Mix A (8 components)**

Acifluorfen (50594-66-6)	Dicamba (1918-00-9)
Bentazon (25057-89-0)	Dichlorprop (120-36-5)
Chloramben (133-90-4)	Picloram (1918-02-1)
2,4-D (94-75-7)	2,4,5-TP (Silvex) (93-72-1)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32431 (ea.)

**Chlorinated Acids by LC, Mix B (8 components)**

2,4-DB (94-82-6)	MCPP (Mecoprop) (93-65-2)
3,5-Dichlorobenzoic acid (51-36-5)	4-Nitrophenol (100-02-7)
Dinoseb (88-85-7)	Pentachlorophenol (87-86-5)
MCPA (94-74-6)	2,4,5-T (93-76-5)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32430 (ea.)

**Dalapon (2,2-dichloropropionic acid)**

Dalapon (75-99-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32056 (ea.)

**Method 1311 (Toxicity Characteristic Leaching Procedure [TCLP])**

**TCLP Herbicide Mix (2 components)**

2,4-D (free acid) (94-75-7)  
2,4,5-TP (Silvex) (free acid) (93-72-1)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 32014 (ea.)

**Herbicides, Glyphosate**

**Method 547 (Glyphosate)**

**Glyphosate Standard**

Glyphosate (N-(phosphonomethyl)glycine) (1071-83-6)

1,000 µg/mL in DI water, 1 mL/ampul

cat.# 32426 (ea.)

1,000 µg/mL in DI water, 5 mL/ampul

cat.# 32427 (ea.)

**AMPA (glyphosate metabolite)**

Aminomethyl phosphonic acid (AMPA) (1066-51-9)

100 µg/mL in DI water, 1 mL/ampul

cat.# 32428 (ea.)

**Herbicides, Paraquat/Diquat**

**Method 549.2 (Paraquat/Diquat)**

**Paraquat & Diquat Calibration Mix (2 components)**

Diquat dibromide (6385-62-2)  
Paraquat dichloride (1910-42-5)

1,000 µg/mL each in water, 1 mL/ampul

cat.# 32437 (ea.)

**Herbicides, Triazines**

**Canadian Drinking Water Triazine Herbicides Mix**

(7 components)

Alachlor (15972-60-8)  
Atrazine (122-34-9)  
Cyanazine (Bladex) (21725-46-2)  
Metolachlor (51218-45-2)

Metribuzin (21087-64-9)  
Prometryne (7287-19-6)  
Simazine (122-34-9)

500 µg/mL each in acetone, 1 mL/ampul

cat.# 31864 (ea.)

Compound Index for Reference Standards



See pages 586–592.

## Hormones

### Method 539 (Hormones in Drinking Water)

#### EPA 539 Calibration Stock Standard (7 components)

- Contains the seven hormones listed in EPA Method 539 at the appropriate concentrations.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also available: UCMR3 Method 539 calibration standard with concentrations of 10–400 µg/mL to more conveniently match UCMR3 requirements (cat.# 32461, see below).

4-Androstene-3,17-dione (63-05-8)	100 µg/mL
Equilin (474-86-2)	200
17-beta-Estradiol (50-28-2)	250
Estriol (50-27-1)	200
Estrone (53-16-7)	200
17-alpha-Ethynylestradiol (57-63-6)	350
Testosterone (58-22-0)	100

In acetonitrile, 1 mL/ampul

cat.# 31998 (ea.)

#### UCMR3 Method 539 Calibration Standard

(7 components)

- Contains the seven hormones listed in EPA Method 539 at concentrations suited for Unregulated Contaminant Monitoring Rule 3 (UCMR3) screening.
- Ideal for the analysis of finished drinking water as outlined in UCMR3, which requires monitoring of all public drinking water systems with 10,000 or more customers.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also available: EPA 539 calibration stock standard with concentrations of 100–350 µg/mL to more conveniently match EPA requirements (cat.# 31998, see above).

4-Androstene-3,17-dione (63-05-8)	30 µg/mL
Equilin (474-86-2)	400
17-beta-Estradiol (50-28-2)	40
Estriol (50-27-1)	80
Estrone (53-16-7)	200
17-alpha-Ethynylestradiol (57-63-6)	90
Testosterone (58-22-0)	10

In acetonitrile, 1 mL/ampul

cat.# 32461 (ea.)

## Hydrocarbons, Aromatic

### Method 8020 (Aromatic Volatile Organics)

#### Internal and Surrogate Standards for Method 8020

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Fluorobenzene	462-06-6	PTM	2,000	30030
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

#### 8020A Calibration Mix (10 components)

Benzene (71-43-2)	Ethylbenzene (100-41-4)
Chlorobenzene (108-90-7)	Toluene (108-88-3)
1,2-Dichlorobenzene (95-50-1)	<i>m</i> -Xylene (108-38-3)
1,3-Dichlorobenzene (541-73-1)	<i>o</i> -Xylene (95-47-6)
1,4-Dichlorobenzene (106-46-7)	<i>p</i> -Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30222 (ea.)

### Method 609 (Nitroaromatics & Isophorone)

#### 609 Nitroaromatics & Isophorone Calibration Mix

(4 components)

2,4-Dinitrotoluene (121-14-2)	2,6-Dinitrotoluene (606-20-2)
Isophorone (78-59-1)	Nitrobenzene (98-95-3)

2,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31033 (ea.)

## Hydrocarbons, Halogenated

### Method 612 (Chlorinated Hydrocarbons)

#### 612 Chlorinated Hydrocarbons Calibration Mix

(9 components)

2-Chloronaphthalene (91-58-7)	Hexachlorobutadiene (87-68-3)
1,2-Dichlorobenzene (95-50-1)	Hexachlorocyclopentadiene (77-47-4)
1,3-Dichlorobenzene (541-73-1)	Hexachloroethane (67-72-1)
1,4-Dichlorobenzene (106-46-7)	1,2,4-Trichlorobenzene (120-82-1)
Hexachlorobenzene (118-74-1)	

2,000 µg/mL each in iso-octane, 1 mL/ampul

cat.# 31035 (ea.)

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## Hydrocarbons, Halogenated, *cont.*

### Method 624 (Purgeable Halocarbons)

#### Volatiles MegaMix® Standard, EPA Method 624 (26 components)

MEGAMIX®

Benzene (71-43-2)  
Bromodichloromethane (75-27-4)  
Bromoform (75-25-2)  
Carbon tetrachloride (56-23-5)  
Chlorobenzene (108-90-7)  
2-Chloroethyl vinyl ether (110-75-8)  
Chloroform (67-66-3)  
Dibromochloromethane (124-48-1)  
1,2-Dichlorobenzene (95-50-1)  
1,3-Dichlorobenzene (541-73-1)  
1,4-Dichlorobenzene (106-46-7)  
1,1-Dichloroethane (75-34-3)  
1,2-Dichloroethane (107-06-2)  
1,1-Dichloroethene (75-35-4)

*trans*-1,2-Dichloroethene (156-60-5)  
1,2-Dichloropropane (78-87-5)  
*cis*-1,3-Dichloropropene (10061-01-5)  
*trans*-1,3-Dichloropropene (10061-02-6)  
Ethylbenzene (100-41-4)  
Methylene chloride (dichloromethane) (75-09-2)  
1,1,2,2-Tetrachloroethane (79-34-5)  
Tetrachloroethene (127-18-4)  
Toluene (108-88-3)  
1,1,1-Trichloroethane (71-55-6)  
1,1,2-Trichloroethane (79-00-5)  
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30497 (ea.)

#### 624 Internal Standard Mix (3 components)

Bromochloromethane (74-97-5)  
2-Bromo-1-chloropropane (3017-95-6)  
1,4-Dichlorobutane (110-56-5)

1,500 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30023 (ea.)

#### 624 Surrogate Standard Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
Fluorobenzene (462-06-6)  
Pentafluorobenzene (363-72-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30243 (ea.)

#### Surrogate Standard (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
 $\alpha,\alpha,\alpha$ -Trifluorotoluene (98-08-8)

2,500 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30484 (ea.)

#### 624 Calibration Mix #1 (gases) (5 components)

Bromomethane (methyl bromide) (74-83-9)  
Chloroethane (ethyl chloride) (75-00-3)  
Chloromethane (methyl chloride) (74-87-3)  
Trichlorofluoromethane (CFC-11) (75-69-4)  
Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30020 (ea.)

### Method 624 (Purgeable Halocarbons), *cont.*

#### 624 Calibration Mix #2 (12 components)

Benzene (71-43-2)  
Carbon tetrachloride (56-23-5)  
Chlorobenzene (108-90-7)  
2-Chloroethyl vinyl ether (110-75-8)  
Dibromochloromethane (124-48-1)  
1,1-Dichloroethane (75-34-3)  
1,1-Dichloroethene (75-35-4)

1,2-Dichloropropane (78-87-5)  
Methylene chloride (dichloromethane) (75-09-2)  
Tetrachloroethene (127-18-4)  
1,1,2-Trichloroethane (79-00-5)  
Trichloroethene (79-01-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30021 (ea.)

#### 624 Calibration Mix #3 (14 components)

Bromodichloromethane (75-27-4)  
Bromoform (75-25-2)  
Chloroform (67-66-3)  
1,2-Dichlorobenzene (95-50-1)  
1,3-Dichlorobenzene (541-73-1)  
1,4-Dichlorobenzene (106-46-7)  
1,2-Dichloroethane (107-06-2)

*trans*-1,2-Dichloroethene (156-60-5)  
*cis*-1,3-Dichloropropene (10061-01-5)  
*trans*-1,3-Dichloropropene (10061-02-6)  
Ethylbenzene (100-41-4)  
1,1,2,2-Tetrachloroethane (79-34-5)  
Toluene (108-88-3)  
1,1,1-Trichloroethane (71-55-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30022 (ea.)

### Method 8010 (Halogenated Volatile Organics)

#### 502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)  
Chloroethane (ethyl chloride) (75-00-3)  
Chloromethane (methyl chloride) (74-87-3)  
Dichlorodifluoromethane (CFC-12) (75-71-8)  
Trichlorofluoromethane (CFC-11) (75-69-4)  
Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30042 (ea.)

#### BTEX Standard (6 components)

Benzene (71-43-2)  
Ethylbenzene (100-41-4)  
Toluene (108-88-3)

*m*-Xylene (108-38-3)  
*o*-Xylene (95-47-6)  
*p*-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul  
cat.# 30488 (ea.)

### Method 8011 (1,2-Dibromoethane & 1,2-Dibromo-3-chloropropane)

#### 8011 Calibration Mix—EDB/DBCP (2 components)

1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)  
1,2-Dibromoethane (EDB) (106-93-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30062 (ea.)



## Hydrocarbons, Leaking Underground Storage Tank (LUST): General

### Retention Time Standards

Used during initial sample screening to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

### Leaking Underground Storage Tank Retention Time Standard (7 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Triacontane (C30) (638-68-6)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Tetracontane (C40) (4181-95-7)
<i>n</i> -Tetracosane (C24) (646-31-1)	

25 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31200 (ea.)

### Retention Time Marker (3 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Dodecane (C12) (112-40-3)
<i>n</i> -Decane (C10) (124-18-5)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30483 (ea.)

### TNRCC 1005 Retention Time Markers Mix

(4 components)

- Easily determine the retention time window for each boiling point range.
- Prepared in *n*-pentane according to EPA requirements.

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Pentatriacontane (C35) (630-07-9)

200 µg/mL each in pentane, 1 mL/ampul  
cat.# 31698 (ea.)

### Retention Time Marker - Alaska (4 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Pentacosane (C25) (629-99-2)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Hexatriacontane (C36) (630-06-8)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31819 (ea.)

### Fuel Composite Standards

#### Unleaded Gasoline Composite Standard

Unleaded gasoline composite (8006-61-9)

2,500 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul  
cat.# 30206 (ea.)

#### Diesel Fuel #2 Composite Standard

Diesel fuel #2 composite (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31259 (ea.)

#### Kerosene Composite Standard

Kerosene composite (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31257 (ea.)

### Motor Oil Composite Standards

#### Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31464 (ea.)

#### Used Motor Oil Composite Standard

Prepared from an equal-volume blend from five gasoline-powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Used motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31465 (ea.)

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See pages 464-465.



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### also available

Other fuels, oils, and lubricant oils available on request as custom products.

## Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

### Single-Source Fuels

#### Unleaded Gasoline Standard

Prepared from a single-source (one-refinery) product.

Unleaded gasoline: unweathered (8006-61-9)

5,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30096 (ea.)

#### Kerosene Standard

Prepared from a single-source (one-refinery) product.

Kerosene: unweathered (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31229 (ea.)

#### Diesel Fuel #2 Standard

Prepared from a single-source (one-refinery) product.

Diesel fuel #2: unweathered (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31233 (ea.)

#### Fuel Oil #4 Standard

Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. The fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38 °C (100 °F), measured using ASTM D-445.

Fuel oil #4 (68476-31-3)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31216 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31244 (ea.)

#### Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

Fuel oil #6 (68553-00-4)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31248 (ea.)

#### Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31880 (ea.)

#### Aviation Gas Standard

100-octane, low-lead fuel used in piston-type aircraft.

Aviation gas (8006-69-1)

50,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30207 (ea.)

#### Jet Fuel A Standard

Jet fuel A (64742-47-8)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31215 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31242 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31243 (ea.)

#### Creosote Oil Standard

Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene).

Creosote oil (8001-58-9)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31838 (ea.)

#### Hydraulic Oil Standard

Hydraulic oil (64741-89-5)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31839 (ea.)



**Restek® Safe Cracker**

Included with every reference standard shipment for added convenience.



## Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

### Military Fuels (Jet Propellant)

#### JP-5 Military Fuel Standard

JP-5 Military fuel (8008-20-6)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31252 (ea.)

#### JP-8 Military Fuel Standard

JP-8 Military fuel (94114-58-6)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31262 (ea.)  
50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31254 (ea.)

### Fuel Oil Degradation Test

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.<sup>1</sup> To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

#### Fuel Oil Degradation Mix (4 components)

Heptadecane (C17) (629-78-7)  
Octadecane (C18) (593-45-3)  
Pristane (2,6,10,14-tetramethylpentadecane) (1921-70-6)  
Phytane (2,6,10,14-tetramethylhexadecane) (638-36-8)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31240 (ea.)

<sup>1</sup>Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

### Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

We prepare our solutions from an equal-volume blend of Type I, II, and III mineral spirits.

#### Mineral Spirits Standards (Unweathered)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31225 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31260 (ea.)

#### Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Tex-solve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

Stoddard solvent (8052-41-3)

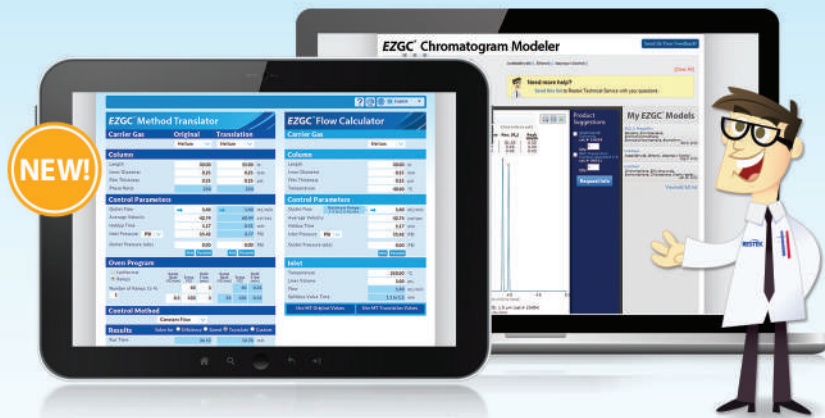
10,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30487 (ea.)

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## Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

### Petroleum Volatile Organic Compounds (PVOCs), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

#### PVOC Mix (California) (7 components)

Benzene (71-43-2)	Toluene (108-88-3)
Ethylbenzene (100-41-4)	<i>m</i> -Xylene (108-38-3)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	<i>o</i> -Xylene (95-47-6)
	<i>p</i> -Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30231 (ea.)

#### PVOC/GRO Mix (Wisconsin) (10 components)

Benzene (71-43-2)	1,2,4-Trimethylbenzene (95-63-6)
Ethylbenzene (100-41-4)	1,3,5-Trimethylbenzene (108-67-8)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	<i>m</i> -Xylene (108-38-3)
Naphthalene (91-20-3)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30095 (ea.)

#### GRO Mix (9 components)

Benzene (71-43-2)	1,2,4-Trimethylbenzene (95-63-6)
Ethylbenzene (100-41-4)	2,2,4-Trimethylpentane (isooctane) (540-84-1)
3-Methylpentane (96-14-0)	<i>m</i> -Xylene (108-38-3)
Naphthalene (91-20-3)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30069 (ea.)

#### GRO Mix (EPA) (9 components)

Benzene (71-43-2)	500 µg/mL	1,2,4-Trimethylbenzene (95-63-6)	1,000
Ethylbenzene (100-41-4)	500	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Heptane (142-82-5)	500	<i>m</i> -Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	<i>o</i> -Xylene (95-47-6)	1,000
Toluene (108-88-3)	1,500	<i>p</i> -Xylene (106-42-3)	1,000

In P&T methanol, 1 mL/ampul  
cat.# 30065 (ea.)

#### Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	<i>m</i> -Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	<i>o</i> -Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	<i>p</i> -Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul  
cat.# 30486 (ea.)

#### BTEX Standard (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30051 (ea.)

---

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30213 (ea.)

---

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul  
cat.# 30488 (ea.)

#### BTEX Gas Mix (6 components)

Benzene (71-43-2)	
Ethylbenzene (100-41-4)	
Toluene (108-88-3)	
<i>m</i> -Xylene (108-38-3)	
<i>o</i> -Xylene (95-47-6)	
<i>p</i> -Xylene (106-42-3)	

1 ppm in nitrogen, 104 liters @ 1,800 psi  
cat.# 34414 (ea.)

---

1 ppm in nitrogen, 110 liters @ 1,800 psi  
cat.# 26361 (ea.)

---

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
cat.# 34414-PI (ea.)

---

100 ppb in nitrogen, 104 liters @ 1,800 psi  
cat.# 34428 (ea.)

---

100 ppb in nitrogen, 110 liters @ 1,800 psi  
cat.# 26362 (ea.)

---

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
cat.# 34428-PI (ea.)

#### cylinder design



**Spectra (Linde)**  
**104 L Cylinders:**  
Aluminum construction  
Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas @ 1,800 psi  
CGA-180 outlet fitting.  
Weight: 1.5 lb/0.7 kg



**Scotty (Air Liquide)**  
**110 L Cylinders:**  
Aluminum construction  
Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas @ 1,800 psi  
CGA-180 outlet fitting.  
Weight: 2.2 lb/1 kg  
U.S. DOT Specs: 3AL2216

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available

High-Purity VOC Regulators

See page 453.





## Hydrocarbons, Leaking Underground Storage Tank (LUST): General, *cont.*

### Petroleum Volatile Organic Compounds (PVOCs), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX), *cont.*

#### Certified BTEX in Unleaded Gas Composite Standard

(9 components)

<b>Certified for:</b>	Naphthalene*
Benzene*	Toluene*
Ethylbenzene*	<i>m</i> -Xylene*
Isopropyl benzene*	<i>o</i> -Xylene*
Methyl <i>tert</i> -butyl ether (MTBE)*	<i>p</i> -Xylene*
5,500 ppm gasoline in P&T methanol, 1 mL/ampul	
cat.# 30237 (ea.)	

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

#### Certified Aromatics in Gasoline (16 components)

<b>Certified for:</b>	<i>n</i> -Propylbenzene*
Benzene*	Toluene*
Ethylbenzene*	1,2,3-Trimethylbenzene*
<i>m</i> -Ethyltoluene*	1,2,4-Trimethylbenzene*
<i>o</i> -Ethyltoluene*	1,3,5-Trimethylbenzene*
<i>p</i> -Ethyltoluene*	<i>m</i> -Xylene*
Isopropylbenzene*	<i>o</i> -Xylene*
Methyl <i>tert</i> -butyl ether (MTBE)*	<i>p</i> -Xylene*
Naphthalene*	
5,500 ppm gasoline in P&T methanol, 1 mL/ampul	
cat.# 30485 (ea.)	

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

#### Certified PAHs in Diesel (7 components)

<b>Certified for:</b>	1-Methylnaphthalene*
Acenaphthene*	2-Methylnaphthalene*
Acenaphthylene*	Naphthalene*
Fluorene*	Phenanthrene*
50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul	
cat.# 31673 (ea.)	

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

### Gasoline Surrogate & Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,500	30067
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	10,000	30082
1-Chlorooctane	111-85-3	PTM	10,000	30084
$\alpha,\alpha,\alpha$ -Trifluorotoluene	98-08-8	PTM	2,500	30068
$\alpha,\alpha,\alpha$ -Trifluorotoluene	98-08-8	PTM	10,000	30083
1-Chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066

PTM = Purge-and-trap grade methanol

### Diesel Surrogate & Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Chlorooctadecane	3386-33-2	D	10,000	31098
2-Fluorobiphenyl	321-60-8	D	10,000	31096
<i>o</i> -Terphenyl	84-15-1	D	10,000	31097
<i>p</i> -Terphenyl	92-94-4	D	10,000	31095
5- $\alpha$ -Androstane	438-22-2	D	2,000	31065
<i>o</i> -Terphenyl	84-15-1	A	2,000	31066

A = acetone; D = methylene chloride

### Diesel/Biodiesel Standard

#### Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31880 (ea.)

### also available

ASTM Method D6584-10 and  
EN14105 Biodiesel Standards

See **page 577**.



## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Alaska

Alaska Department of Environmental Conservation (ADEC) regulations indicate which products and indicator compounds are to be tested for each petroleum range. The analyst must use the following Alaska Series Methods or appropriate SW-846 Method for the indicator compounds. The Alaska UST procedural manual indicates which products are to be tested for each petroleum range.

#### AK101

Method for determination of aromatic and aliphatic hydrocarbons in gasoline range organics.

#### Retention Time Marker - Alaska (4 components)

*n*-Hexane (C6) (110-54-3)                      *n*-Pentacosane (C25) (629-99-2)  
*n*-Decane (C10) (124-18-5)                      *n*-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31819 (ea.)

#### 1-Chloro-4-fluorobenzene Mix

1-Chloro-4-fluorobenzene (352-33-0)  
2,500 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30066 (ea.)

#### Alaska UST Method AK101AA (14 components)

Benzene (71-43-2)                      Toluene (108-88-3)  
Ethylbenzene (100-41-4)                      1,2,3-Trimethylbenzene (526-73-8)  
1-Ethyl-2-methylbenzene (611-14-3)                      1,2,4-Trimethylbenzene (95-63-6)  
1-Ethyl-3-methylbenzene (620-14-4)                      1,3,5-Trimethylbenzene (108-67-8)  
1-Ethyl-4-methylbenzene (622-96-8)                      *m*-Xylene (108-38-3)  
Isopropylbenzene (cumene) (98-82-8)                      *o*-Xylene (95-47-6)  
*n*-Propylbenzene (103-65-1)                      *p*-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30461 (ea.)

#### 1-Bromo-4-fluorobenzene (BFB)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30026 (ea.)  
2,500 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30067 (ea.)  
10,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30082 (ea.)

#### Unleaded Gasoline Composite Standard

Unleaded gasoline composite (8006-61-9)  
2,500 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30081 (ea.)  
50,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30205 (ea.)  
50,000 µg/mL in P&T methanol, 5 mL/ampul  
cat.# 30206 (ea.)

#### $\alpha,\alpha,\alpha$ -Trifluorotoluene

$\alpha,\alpha,\alpha$ -Trifluorotoluene (98-08-8)  
2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30048 (ea.)  
2,500 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30068 (ea.)  
10,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30083 (ea.)



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## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Alaska, *cont.*

#### AK102

Method for determination of aromatic and aliphatic hydrocarbons in diesel range organics.

##### DRO Mix (Tennessee/Mississippi) (16 components)

<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Octadecane (C18) (593-45-3)
<i>n</i> -Undecane (C11) (1120-21-4)	<i>n</i> -Nonadecane (C19) (629-92-5)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Tridecane (C13) (629-50-5)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Docosane (C22) (629-97-0)
<i>n</i> -Pentadecane (C15) (629-62-9)	<i>n</i> -Tricosane (C23) (638-67-5)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Heptadecane (C17) (629-78-7)	<i>n</i> -Pentacosane (C25) (629-99-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31214 (ea.)

##### Kerosene Composite Standard

Kerosene composite (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31257 (ea.)

##### Diesel Fuel #2 Composite Standard

Diesel fuel #2 composite (68334-30-5)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31259 (ea.)

##### *o*-Terphenyl

*o*-Terphenyl (84-15-1)

2,000 µg/mL in acetone, 1 mL/ampul  
cat.# 31066 (ea.)

10,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31097 (ea.)

##### 5- $\alpha$ -Androstane

5- $\alpha$ -Androstane (438-22-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31065 (ea.)

#### AK103

Method for determination of aromatic and aliphatic hydrocarbons in residual range organics.

##### Residual Range Calibration Standard (RCS)

(2 components)

SAE30 motor oil:SAE40 motor oil (1:1) (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31817 (ea.)

##### Residual Range Calibration Verification Standard (CVS) (2 components)

SAE30 motor oil:SAE40 motor oil (1:1) (64742-65-0)

25,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31818 (ea.)

##### Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31464 (ea.)

##### Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

Fuel oil #6 (68553-00-4)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31248 (ea.)

##### *n*-Triacontane-d62

*n*-Triacontane-d62

500 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31816 (ea.)



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## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Florida

#### Florida TRPH Standard (17 components)

<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Hexacosane (C26) (630-01-3)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Triacosane (C30) (638-68-6)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Dotriacontane (C32) (544-85-4)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Tetraatriacontane (C34) (14167-59-0)
<i>n</i> -Octadecane (C18) (593-45-3)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Eicosane (C20) (112-95-8)	<i>n</i> -Octatriacontane (C38) (7194-85-6)
<i>n</i> -Docosane (C22) (629-97-0)	<i>n</i> -Tetracontane (C40) (4181-95-7)
<i>n</i> -Tetracosane (C24) (646-31-1)	

500 µg/mL each in hexane, 1 mL/ampul

cat.# 31266 (ea.)

2,000 µg/mL each in carbon disulfide, 1 mL/ampul

cat.# 31878 (ea.)

#### Florida TRPH Surrogate Mix

*n*-Nonatriacontane (C39) (7194-86-7)

3,000 µg/mL in carbon disulfide, 1 mL/ampul

cat.# 31456 (ea.)

3,000 µg/mL in carbon disulfide, 10 mL/ampul

cat.# 31877 (ea.)

Note: Reference standards containing greater than 99% carbon disulfide are classified as UN1131 carbon disulfide 3(6.1), I and are restricted from air transportation. Additional restrictions may apply to lower concentration materials depending on formulations. Contact standards@restek.com with any questions.

### Massachusetts

#### MA VPH Standard With Surrogate Rev. 1.1 (July 2004)

(16 components)

<i>n</i> -Pentane (C5) (109-66-0)	Naphthalene (91-20-3)
<i>n</i> -Nonane (C9) (111-84-2)	Toluene (108-88-3)
<i>n</i> -Decane (C10) (124-18-5)	1,2,4-Trimethylbenzene (95-63-6)
Benzene (71-43-2)	2,2,4-Trimethylpentane (isooctane) (540-84-1)
<i>n</i> -Butylcyclohexane (1678-93-9)	<i>m</i> -Xylene (108-38-3)
2,5-Dibromotoluene (SS) (615-59-8)	<i>o</i> -Xylene (95-47-6)
Ethylbenzene (100-41-4)	<i>p</i> -Xylene (106-42-3)
2-Methylpentane (107-83-5)	
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30604 (ea.)

#### MA VPH Matrix Spike Mix With Surrogate Rev. 1.1 (July 2004) (16 components)

<i>n</i> -Pentane (C5) (109-66-0)	Naphthalene (91-20-3)
<i>n</i> -Nonane (C9) (111-84-2)	Toluene (108-88-3)
<i>n</i> -Decane (C10) (124-18-5)	1,2,4-Trimethylbenzene (95-63-6)
Benzene (71-43-2)	2,2,4-Trimethylpentane (isooctane) (540-84-1)
<i>n</i> -Butylcyclohexane (1678-93-9)	<i>m</i> -Xylene (108-38-3)
2,5-Dibromotoluene (SS) (615-59-8)	<i>o</i> -Xylene (95-47-6)
Ethylbenzene (100-41-4)	<i>p</i> -Xylene (106-42-3)
2-Methylpentane (107-83-5)	
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	

50 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30605 (ea.)

### Massachusetts, *cont.*

#### MA Volatile Petroleum Hydrocarbon (VPH) Standard

(13 components)

<i>n</i> -Pentane (C5) (109-66-0)	1,000 µg/mL	Toluene (108-88-3)	1,500
<i>n</i> -Nonane (C9) (111-84-2)	1,000	1,2,4-Trimethylbenzene (95-63-6)	1,000
Benzene (71-43-2)	500	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	<i>m</i> -Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	<i>o</i> -Xylene (95-47-6)	1,000
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	1,500	<i>p</i> -Xylene (106-42-3)	1,000
Naphthalene (91-20-3)	1,000		

In P&T methanol, 1 mL/ampul

cat.# 30434 (ea.)

#### MA VPH Standard With Surrogate (14 components)

<i>n</i> -Pentane (C5) (109-66-0)	1,000 µg/mL	Naphthalene (91-20-3)	1,000
<i>n</i> -Nonane (C9) (111-84-2)	1,000	Toluene (108-88-3)	1,500
Benzene (71-43-2)	500	1,2,4-Trimethylbenzene (95-63-6)	1,000
2,5-Dibromotoluene (SS) (615-59-8)	1,000	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	<i>m</i> -Xylene (108-38-3)	1,000
2-Methylpentane (107-83-5)	1,500	<i>o</i> -Xylene (95-47-6)	1,000
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	1,500	<i>p</i> -Xylene (106-42-3)	1,000

In P&T methanol, 1 mL/ampul

cat.# 30452 (ea.)

#### MA VPH Matrix Spike Mix With Surrogate

(14 components)

<i>n</i> -Pentane (C5) (109-66-0)	Naphthalene (91-20-3)
<i>n</i> -Nonane (C9) (111-84-2)	Toluene (108-88-3)
Benzene (71-43-2)	1,2,4-Trimethylbenzene (95-63-6)
2,5-Dibromotoluene (SS) (615-59-8)	2,2,4-Trimethylpentane (isooctane) (540-84-1)
Ethylbenzene (100-41-4)	<i>m</i> -Xylene (108-38-3)
2-Methylpentane (107-83-5)	<i>o</i> -Xylene (95-47-6)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	<i>p</i> -Xylene (106-42-3)

2,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30454 (ea.)

#### MA VPH Surrogate Standard

2,5-Dibromotoluene (615-59-8)

1,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30435 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30453 (ea.)

## Quantity Discounts Available

- Buy 3 Standards, Get 10% Off
- Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.



## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Massachusetts, *cont.*

#### Massachusetts APH Mix (26 components)

Benzene  
1,3-Butadiene  
Butylcyclohexane  
Cyclohexane  
*n*-Decane  
2,3-Dimethylheptane  
2,3-Dimethylpentane  
*n*-Dodecane  
Ethylbenzene  
*n*-Heptane  
*n*-Hexane  
Isopentane  
Isopropylbenzene  
*p*-Isopropyltoluene  
Methyl *tert*-butyl ether  
1-Methyl-3-ethylbenzene  
Naphthalene  
*n*-Nonane  
*n*-Octane  
Toluene  
1,2,3-Trimethylbenzene  
1,3,5-Trimethylbenzene  
*n*-Undecane  
*o*-Xylene  
*m/p*-Xylene (combined)

#### cylinder design



**Spectra (Linde)**  
**104 L Cylinders:**  
Aluminum construction  
Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas @ 1,800 psi  
CGA-180 outlet fitting.  
Weight: 1.5 lb/0.7 kg



**Scotty (Air Liquide)**  
**110 L Cylinders:**  
Aluminum construction  
Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas @ 1,800 psi  
CGA-180 outlet fitting.  
Weight: 2.2 lb/1 kg  
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34540 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800psi

cat.# 26366 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psig (Pi-marked cylinder)

cat.# 34540-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

#### MA EPH Aromatic Hydrocarbon Standard

(17 components)

Acenaphthene (83-32-9)  
Acenaphthylene (208-96-8)  
Anthracene (120-12-7)  
Benzo(a)anthracene (56-55-3)  
Benzo(a)pyrene (50-32-8)  
Benzo(b)fluoranthene (205-99-2)  
Benzo(k)fluoranthene (207-08-9)  
Benzo(ghi)perylene (191-24-2)  
Chrysene (218-01-9)

Dibenz(a,h)anthracene (53-70-3)  
Fluoranthene (206-44-0)  
Fluorene (86-73-7)  
Indeno(1,2,3-cd)pyrene (193-39-5)  
2-Methylnaphthalene (91-57-6)  
Naphthalene (91-20-3)  
Phenanthrene (85-01-8)  
Pyrene (129-00-0)

1,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31458 (ea.)

#### MA EPH Aliphatic Hydrocarbon Standard

(14 components)

*n*-Nonane (C9) (111-84-2)  
*n*-Decane (C10) (124-18-5)  
*n*-Dodecane (C12) (112-40-3)  
*n*-Tetradecane (C14) (629-59-4)  
*n*-Hexadecane (C16) (544-76-3)  
*n*-Octadecane (C18) (593-45-3)  
*n*-Nonadecane (C19) (629-92-5)

*n*-Eicosane (C20) (112-95-8)  
*n*-Docosane (C22) (629-97-0)  
*n*-Tetracosane (C24) (646-31-1)  
*n*-Hexacosane (C26) (630-01-3)  
*n*-Octacosane (C28) (630-02-4)  
*n*-Triacosane (C30) (638-68-6)  
*n*-Hexatriacontane (C36) (630-06-8)

1,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31459 (ea.)

#### MA EPH Matrix Spike Mix (10 components)

*n*-Nonane (C9) (111-84-2)  
*n*-Tetradecane (C14) (629-59-4)  
*n*-Nonadecane (C19) (629-92-5)  
*n*-Eicosane (C20) (112-95-8)  
*n*-Octacosane (C28) (630-02-4)  
Acenaphthene (83-32-9)  
Anthracene (120-12-7)  
Chrysene (218-01-9)  
Naphthalene (91-20-3)  
Pyrene (129-00-0)

250 µg/mL each in acetone, 1 mL/ampul

cat.# 31460 (ea.)

#### 5- $\alpha$ -Androstane

5- $\alpha$ -Androstane (438-22-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31065 (ea.)

#### MA EPH Surrogate Spike Mix (2 components)

1-Chlorooctadecane (3386-33-2)  
*o*-Terphenyl (84-15-1)

4,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31479 (ea.)

#### 1-Chlorooctadecane

1-Chlorooctadecane (3386-33-2)

10,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31098 (ea.)

#### Naphthalene-d8

Naphthalene-d8 (1146-65-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31043 (ea.)

#### MA Fractionation Surrogate Spike Mix (2 components)

2-Bromonaphthalene (580-13-2)  
2-Fluorobiphenyl (321-60-8)

4,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31480 (ea.)

#### MA Fractionation Check Mix (31 components)

##### PAHs:

Acenaphthene (83-32-9)  
Acenaphthylene (208-96-8)  
Anthracene (120-12-7)  
Benzo(a)anthracene (56-55-3)  
Benzo(a)pyrene (50-32-8)  
Benzo(b)fluoranthene (205-99-2)  
Benzo(k)fluoranthene (207-08-9)  
Benzo(ghi)perylene (191-24-2)  
Chrysene (218-01-9)  
Dibenz(a,h)anthracene (53-70-3)  
Fluoranthene (206-44-0)  
Fluorene (86-73-7)  
Indeno(1,2,3-cd)pyrene (193-39-5)  
2-Methylnaphthalene (91-57-6)  
Naphthalene (91-20-3)  
Phenanthrene (85-01-8)  
Pyrene (129-00-0)

##### Hydrocarbons:

*n*-Nonane (C9) (111-84-2)  
*n*-Decane (C10) (124-18-5)  
*n*-Dodecane (C12) (112-40-3)  
*n*-Tetradecane (C14) (629-59-4)  
*n*-Hexadecane (C16) (544-76-3)  
*n*-Octadecane (C18) (593-45-3)  
*n*-Nonadecane (C19) (629-92-5)  
*n*-Eicosane (C20) (112-95-8)  
*n*-Docosane (C22) (629-97-0)  
*n*-Tetracosane (C24) (646-31-1)  
*n*-Hexacosane (C26) (630-01-3)  
*n*-Octacosane (C28) (630-02-4)  
*n*-Triacosane (C30) (638-68-6)  
*n*-Hexatriacontane (C36) (630-06-8)

25 µg/mL each in hexane, 1 mL/ampul

cat.# 31481 (ea.)

## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Michigan

#### Michigan GRO Mix (14 components)

Benzene (71-43-2)	Naphthalene (91-20-3)
1,2-Dibromoethane (106-93-4)	Toluene (108-88-3)
1,2-Dichloroethane (107-06-2)	1,2,4-Trimethylbenzene (95-63-6)
Ethylbenzene (100-41-4)	1,3,5-Trimethylbenzene (108-67-8)
Isopropylbenzene (cumene) (98-82-8)	<i>m</i> -Xylene (108-38-3)
2-Methylnaphthalene (91-57-6)	<i>o</i> -Xylene (95-47-6)
Methyl <i>tert</i> -butyl-ether (MTBE) (1634-04-4)	<i>p</i> -Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30468 (ea.)

### Mississippi

#### DRO Mix (Tennessee/Mississippi) (16 components)

<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Octadecane (C18) (593-45-3)
<i>n</i> -Undecane (C11) (1120-21-4)	<i>n</i> -Nonadecane (C19) (629-92-5)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Tridecane (C13) (629-50-5)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Docosane (C22) (629-97-0)
<i>n</i> -Pentadecane (C15) (629-62-9)	<i>n</i> -Tricosane (C23) (638-67-5)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Heptadecane (C17) (629-78-7)	<i>n</i> -Pentacosane (C25) (629-99-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31214 (ea.)

#### Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	<i>m</i> -Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	<i>o</i> -Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	<i>p</i> -Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul  
cat.# 30486 (ea.)

### New Jersey

#### NJDEP EPH 10/08 Rev. 2 Aliphatics Calibration

##### Standard (20 components)

<i>n</i> -Nonane (C9) (111-84-2)	<i>n</i> -Hexacosane (C26) (630-01-3)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Triacontane (C30) (638-68-6)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Dotriacontane (C32) (544-85-4)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Tetracontane (C34) (14167-59-0)
<i>n</i> -Octadecane (C18) (593-45-3)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Eicosane (C20) (112-95-8)	<i>n</i> -Octatriacontane (C38) (7194-85-6)
<i>n</i> -Heneicosane (C21) (629-94-7)	<i>n</i> -Tetracontane (C40) (4181-95-7)
<i>n</i> -Docosane (C22) (629-97-0)	2-Methylnaphthalene (91-57-6)
<i>n</i> -Tetracosane (C24) (646-31-1)	Naphthalene (91-20-3)

2,000 µg/mL each in hexane:carbon disulfide (80:20), 1 mL/ampul  
cat.# 30540 (ea.)

#### NJDEP EPH 10/08 Rev. 2 Aromatics Calibration

##### Standard (18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	2-Methylnaphthalene (91-57-6)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(ghi)perylene (191-24-2)	Phenanthrene (85-01-8)
Benzo(k)fluoranthene (207-08-9)	Pyrene (129-00-0)
Chrysene (218-01-9)	1,2,3-Trimethylbenzene (526-73-8)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 30541 (ea.)

#### NJDEP EPH 10/08 Rev. 2 Aliphatics Matrix Spike Mix (18 components)

<i>n</i> -Nonane (C9) (111-84-2)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Hexacosane (C26) (630-01-3)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Triacontane (C30) (638-68-6)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Dotriacontane (C32) (544-85-4)
<i>n</i> -Octadecane (C18) (593-45-3)	<i>n</i> -Tetracontane (C34) (14167-59-0)
<i>n</i> -Eicosane (C20) (112-95-8)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Heneicosane (C21) (629-94-7)	<i>n</i> -Octatriacontane (C38) (7194-85-6)
<i>n</i> -Docosane (C22) (629-97-0)	<i>n</i> -Tetracontane (C40) (4181-95-7)

200 µg/mL each in pentane, 5 mL/ampul  
cat.# 30542 (ea.)

#### NJDEP EPH 10/08 Rev. 2 Aromatics Matrix Spike Mix (18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	2-Methylnaphthalene (91-57-6)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(ghi)perylene (191-24-2)	Phenanthrene (85-01-8)
Benzo(k)fluoranthene (207-08-9)	Pyrene (129-00-0)
Chrysene (218-01-9)	1,2,3-Trimethylbenzene (526-73-8)

200 µg/mL each in acetone:toluene (50:50), 5 mL/ampul  
cat.# 30543 (ea.)

Save time with prepacked  
sample prep cartridges!

### EPH Fractionation Tubes

See page 398.





## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### New Jersey, *cont.*

#### NJDEP EPH 10/08 Rev. 2 Aliphatics Fractionation

##### Check Mix (18 components)

<i>n</i> -Nonane (C9) (111-84-2)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Hexacosane (C26) (630-01-3)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Triacosane (C30) (638-68-6)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Dotriacontane (C32) (544-85-4)
<i>n</i> -Octadecane (C18) (593-45-3)	<i>n</i> -Tetraatriacontane (C34) (14167-59-0)
<i>n</i> -Eicosane (C20) (112-95-8)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Heneicosane (C21) (629-94-7)	<i>n</i> -Octatriacontane (C38) (7194-85-6)
<i>n</i> -Docosane (C22) (629-97-0)	<i>n</i> -Tetracontane (C40) (4181-95-7)

400 µg/mL each in hexane, 5 mL/ampul

cat.# 30544 (ea.)

#### NJDEP EPH 10/08 Rev. 2 Aromatics Fractionation

##### Check Mix (16 components)

Acenaphthene (83-32-9)	Chrysene (218-01-9)
Acenaphthylene (208-96-8)	Dibenz(a,h)anthracene (53-70-3)
Anthracene (120-12-7)	Fluoranthene (206-44-0)
Benz(a)anthracene (56-55-3)	Fluorene (86-73-7)
Benzo(a)pyrene (50-32-8)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(b)fluoranthene (205-99-2)	Phenanthrene (85-01-8)
Benzo(ghi)perylene (191-24-2)	Pyrene (129-00-0)
Benzo(k)fluoranthene (207-08-9)	1,2,3-Trimethylbenzene (526-73-8)

400 µg/mL each in hexane:toluene (50:50), 5 mL/ampul

cat.# 30545 (ea.)

### Northwest U.S. Regional Method (Oregon & Washington)

Also see Washington, page 510.

#### Glycols Standard (2 components)

Ethylene glycol (107-21-1)  
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul

cat.# 30471 (ea.)

#### NW TPH-Dx Surrogate Mix Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-Fluorobiphenyl	321-60-8	D	10,000	31096
<i>o</i> -Terphenyl	84-15-1	D	10,000	31097
<i>p</i> -Terphenyl	92-94-4	D	10,000	31095
Pentacosane (C25)	629-99-2	D	10,000	31487

D = methylene chloride

### Pennsylvania

#### PA DEP UST Standard (11 components)

Benzene (71-43-2)	Naphthalene (91-20-3)
1,2-Dibromoethane (EDB) (106-93-4)	Toluene (108-88-3)
1,2-Dichloroethane (107-06-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Isopropyl benzene (cumene) (98-82-8)	<i>p</i> -Xylene (106-42-3)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30433 (ea.)

### Tennessee/Mississippi

#### DRO Mix (Tennessee/Mississippi) (16 components)

<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Octadecane (C18) (593-45-3)
<i>n</i> -Undecane (C11) (1120-21-4)	<i>n</i> -Nonadecane (C19) (629-92-5)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Tridecane (C13) (629-50-5)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Docosane (C22) (629-97-0)
<i>n</i> -Pentadecane (C15) (629-62-9)	<i>n</i> -Tricosane (C23) (638-67-5)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Heptadecane (C17) (629-78-7)	<i>n</i> -Pentacosane (C25) (629-99-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31214 (ea.)

#### Gasoline Component Standard (10 components)

Benzene (71-43-2)	500 µg/mL	2,2,4-Trimethylpentane (isooctane) (540-84-1)	1,500
Ethylbenzene (100-41-4)	500	<i>m</i> -Xylene (108-38-3)	1,000
Heptane (142-82-5)	500	<i>o</i> -Xylene (95-47-6)	1,000
2-Methylpentane (107-83-5)	1,500	<i>p</i> -Xylene (106-42-3)	1,000
Toluene (108-88-3)	1,500		
1,2,4-Trimethylbenzene (95-63-6)	1,000		

10,000 µg/mL total in P&T methanol, 1 mL/ampul

cat.# 30486 (ea.)

## Reference Standards Documentation Search

Locate SDSs, certificates, & data packs by cat. # or lot #

[www.restek.com/documentation](http://www.restek.com/documentation)





## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Texas

#### Texas TNRCC Method 1006

##### TNRCC 1006 Retention Time Marker Mix (9 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Hexadecane (C16) (544-76-3)
<i>n</i> -Heptane (C7) (142-82-5)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Pentatriacontane (C35) (630-07-9)
<i>n</i> -Dodecane (C12) (112-40-3)	

200 µg/mL in pentane, 1 mL/ampul

cat.# 31814 (ea.)

#### Texas TNRCC Method 1005

##### TNRCC 1005 Retention Time Markers Mix

(4 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Pentatriacontane (C35) (630-07-9)

200 µg/mL each in pentane, 1 mL/ampul

cat.# 31698 (ea.)

##### TX TPH Locator Mix (3 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	

200 µg/mL each in pentane, 1 mL/ampul

cat.# 31482 (ea.)

##### TX TPH Calibration Mix (2 components)

Diesel fuel #2 composite (68334-30-5)  
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in pentane, 1 mL/ampul

cat.# 31483 (ea.)

##### TX TPH Matrix Spike Mix (2 components)

Diesel fuel #2 composite (68334-30-5)  
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31484 (ea.)

#### Texas TNRCC Method 1005, *cont.*

##### Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Pentatriacontane (C35) (630-07-9)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Hexadecane (C16) (544-76-3)	

200 µg/mL each in pentane, 1 mL/ampul

cat.# 31639 (ea.)

##### $\alpha,\alpha,\alpha$ -Trifluorotoluene

$\alpha,\alpha,\alpha$ -Trifluorotoluene (98-08-8)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30083 (ea.)

##### 1-Chlorooctane

1-Chlorooctane (111-85-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30084 (ea.)

##### 1-Chlorooctadecane

1-Chlorooctadecane (3386-33-2)

10,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31098 (ea.)



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## Hydrocarbons, Leaking Underground Storage Tank (LUST): State-Specific Methods, *cont.*

### Washington

Also see Northwest U.S. Regional Method, page 508.

#### WA VPH Marker Standard (9 components)

<i>n</i> -Pentane (C5) (109-66-0)	1-Methylnaphthalene (90-12-0)
<i>n</i> -Hexane (C6) (110-54-3)	Naphthalene (91-20-3)
<i>n</i> -Octane (C8) (111-65-9)	Toluene (108-88-3)
<i>n</i> -Decane (C10) (124-18-5)	1,2,3-Trimethylbenzene (526-73-8)
<i>n</i> -Dodecane (C12) (112-40-3)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30450 (ea.)

#### WA VPH Standard (15 components)

<i>n</i> -Pentane (C5) (109-66-0)	Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)
<i>n</i> -Hexane (C6) (110-54-3)	Naphthalene (91-20-3)
<i>n</i> -Octane (C8) (111-65-9)	Toluene (108-88-3)
<i>n</i> -Decane (C10) (124-18-5)	1,2,3-Trimethylbenzene (526-73-8)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>m</i> -Xylene (108-38-3)
Benzene (71-43-2)	<i>o</i> -Xylene (95-47-6)
Ethylbenzene (100-41-4)	<i>p</i> -Xylene (106-42-3)
1-Methylnaphthalene (90-12-0)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30451 (ea.)

#### WA EPH Aromatic Hydrocarbon Mix (6 components)

Acenaphthene (83-32-9)	Pyrene (129-00-0)
Benzo(ghi)perylene (191-24-2)	Toluene (108-88-3)
Naphthalene (91-20-3)	1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31488 (ea.)

#### WA EPH Aliphatic Hydrocarbon Mix (6 components)

<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Hexadecane (C16) (544-76-3)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Tetratriacontane (C34) (14167-59-0)

1,000 µg/mL each in hexane, 1 mL/ampul  
cat.# 31489 (ea.)

#### WA EPH Aromatic Hydrocarbon Standard

(18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benzo(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	2-Methylnaphthalene (91-57-6)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Benzo(ghi)perylene (191-24-2)	Pyrene (129-00-0)
Chrysene (218-01-9)	1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31469 (ea.)

### Washington, *cont.*

#### WA EPH Fractionation Check Mix (22 components)

<i>n</i> -Octane (C8) (111-65-9)	Benzo(b)fluoranthene (205-99-2)
<i>n</i> -Decane (C10) (124-18-5)	Benzo(k)fluoranthene (207-08-9)
<i>n</i> -Dodecane (C12) (112-40-3)	Benzo(ghi)perylene (191-24-2)
<i>n</i> -Hexadecane (C16) (544-76-3)	Chrysene (218-01-9)
<i>n</i> -Heneicosane (C21) (629-94-7)	Dibenz(a,h)anthracene (53-70-3)
<i>n</i> -Tetratriacontane (C34) (14167-59-0)	Fluoranthene (206-44-0)
Acenaphthene (83-32-9)	Fluorene (86-73-7)
Acenaphthylene (208-96-8)	Indeno(1,2,3-cd)pyrene (193-39-5)
Anthracene (120-12-7)	Naphthalene (91-20-3)
Benzo(a)anthracene (56-55-3)	Phenanthrene (85-01-8)
Benzo(a)pyrene (50-32-8)	Pyrene (129-00-0)

25 µg/mL each in hexane, 1 mL/ampul  
cat.# 31491 (ea.)

### Wisconsin

#### PVOC/GRO Mix (Wisconsin) (10 components)

Benzene (71-43-2)	1,2,4-Trimethylbenzene (95-63-6)
Ethylbenzene (100-41-4)	1,3,5-Trimethylbenzene (108-67-8)
Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)	<i>m</i> -Xylene (108-38-3)
Naphthalene (91-20-3)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30095 (ea.)

#### DRO Mix (EPA/Wisconsin) (10 components)

<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Docosane (C22) (629-97-0)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Hexacosane (C26) (630-01-3)
<i>n</i> -Octadecane (C18) (593-45-3)	<i>n</i> -Octacosane (C28) (630-02-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31064 (ea.)



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## Hydrocarbons, Polycyclic Aromatic (PAHs)

### Method 610

#### (Polycyclic Aromatic Hydrocarbons [PAHs])

##### SV Calibration Mix #5/610 PAH Mix (16 components)

Acenaphthene (83-32-9)	Chrysene (218-01-9)
Acenaphthylene (208-96-8)	Dibenz(a,h)anthracene (53-70-3)
Anthracene (120-12-7)	Fluoranthene (206-44-0)
Benz(a)anthracene (56-55-3)	Fluorene (86-73-7)
Benzo(a)pyrene (50-32-8)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Benzo(ghi)perylene (191-24-2)	Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31011 (ea.)

##### 610 PAH Calibration Mix A (16 components)

For LC-fluorescence detection.

Acenaphthene (83-32-9)	1,000 µg/mL	Chrysene (218-01-9)	500
Acenaphthylene (208-96-8)	1,000	Dibenz(a,h)anthracene (53-70-3)	500
Anthracene (120-12-7)	1,000	Fluoranthene (206-44-0)	500
Benz(a)anthracene (56-55-3)	500	Fluorene (86-73-7)	1,000
Benzo(a)pyrene (50-32-8)	500	Indeno(1,2,3-cd)pyrene (193-39-5)	500
Benzo(b)fluoranthene (205-99-2)	500	Naphthalene (91-20-3)	1,000
Benzo(k)fluoranthene (207-08-9)	500	Phenanthrene (85-01-8)	500
Benzo(ghi)perylene (191-24-2)	500	Pyrene (129-00-0)	500

In methylene chloride, 1 mL/ampul

cat.# 31264 (ea.)

##### 610 PAH Calibration Mix B (16 components)

For LC-UV detection.

Acenaphthene (83-32-9)	1,000 µg/mL	Chrysene (218-01-9)	100
Acenaphthylene (208-96-8)	2,000	Dibenz(a,h)anthracene (53-70-3)	200
Anthracene (120-12-7)	100	Fluoranthene (206-44-0)	200
Benz(a)anthracene (56-55-3)	100	Fluorene (86-73-7)	200
Benzo(a)pyrene (50-32-8)	100	Indeno(1,2,3-cd)pyrene (193-39-5)	100
Benzo(b)fluoranthene (205-99-2)	200	Naphthalene (91-20-3)	1,000
Benzo(k)fluoranthene (207-08-9)	100	Phenanthrene (85-01-8)	100
Benzo(ghi)perylene (191-24-2)	200	Pyrene (129-00-0)	100

In methylene chloride:methanol (1:1), 1 mL/ampul

cat.# 31455 (ea.)

### Method 8100

#### (Polycyclic Aromatic Hydrocarbons [PAHs])

##### PAH Supplement Mix for Method 8100 (8 components)

Benzo(j)fluoranthene (205-82-3)	Dibenzo(a,e)pyrene (192-65-4)
Dibenz(a,h)acridine (226-36-8)	Dibenzo(a,h)pyrene (189-64-0)
Dibenz(a,j)acridine (224-42-0)	Dibenzo(a,i)pyrene (189-55-9)
7H-Dibenzo(c,g)carbazole (194-59-2)	3-Methylcholanthrene (56-49-5)

1,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31857 (ea.)

##### SV Calibration Mix #5/610 PAH Mix (16 components)

See cat.# 31011 (above).

### Method 8310

#### (Polycyclic Aromatic Hydrocarbons [PAHs])

##### EPA Method 8310 PAH Mixture (18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	1-Methylnaphthalene (90-12-0)
Benzo(b)fluoranthene (205-99-2)	2-Methylnaphthalene (91-57-6)
Benzo(ghi)perylene (191-24-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Chrysene (218-01-9)	Pyrene (129-00-0)

500 µg/mL each in acetonitrile:toluene (92:8), 1 mL/ampul

cat.# 31874 (ea.)

##### EPA Method 8310 Surrogate Standard

Decafluorobiphenyl (434-90-2)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 31842 (ea.)

##### EPA Method 8310 Quality Control Check

(18 components)

Acenaphthene (83-32-9)	100 µg/mL	Dibenz(a,h)anthracene (53-70-3)	10
Acenaphthylene (208-96-8)	100	Fluoranthene (206-44-0)	10
Anthracene (120-12-7)	100	Fluorene (86-73-7)	100
Benz(a)anthracene (56-55-3)	10	Indeno(1,2,3-cd)pyrene (193-39-5)	10
Benzo(a)pyrene (50-32-8)	10	1-Methylnaphthalene (90-12-0)	100
Benzo(b)fluoranthene (205-99-2)	10	2-Methylnaphthalene (91-57-6)	100
Benzo(ghi)perylene (191-24-2)	10	Naphthalene (91-20-3)	100
Benzo(k)fluoranthene (207-08-9)	5	Phenanthrene (85-01-8)	100
Chrysene (218-01-9)	10	Pyrene (129-00-0)	10

In acetonitrile, 1 mL/ampul

cat.# 31843 (ea.)

##### 8270 Calibration Mix #5, Revised (18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	1-Methylnaphthalene (90-12-0)
Benzo(b)fluoranthene (205-99-2)	2-Methylnaphthalene (91-57-6)
Benzo(ghi)perylene (191-24-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Chrysene (218-01-9)	Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31995 (ea.)

##### Certified PAHs in Diesel (7 components)

<b>Certified for:</b>	1-Methylnaphthalene*
Acenaphthene*	2-Methylnaphthalene*
Acenaphthylene*	Naphthalene*
Fluorene*	Phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul

cat.# 31673 (ea.)

\*Concentration differs from lot to lot. See online data pack for certified concentrations.

## Hydrocarbons, Polycyclic Aromatic (PAHs), *cont.*

### Miscellaneous

#### MA EPH Aromatic Hydrocarbon Standard

(17 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	2-Methylnaphthalene (91-57-6)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Benzo(ghi)perylene (191-24-2)	Pyrene (129-00-0)
Chrysene (218-01-9)	

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31458 (ea.)

#### MA Fractionation Surrogate Spike Mix (2 components)

2-Bromonaphthalene (580-13-2)  
2-Fluorobiphenyl (321-60-8)

4,000 µg/mL each in hexane, 1 mL/ampul  
cat.# 31480 (ea.)

#### MA Fractionation Check Mix (31 components)

##### PAHs:

Acenaphthene (83-32-9)  
Acenaphthylene (208-96-8)  
Anthracene (120-12-7)  
Benz(a)anthracene (56-55-3)  
Benzo(a)pyrene (50-32-8)  
Benzo(b)fluoranthene (205-99-2)  
Benzo(k)fluoranthene (207-08-9)  
Benzo(ghi)perylene (191-24-2)  
Chrysene (218-01-9)  
Dibenz(a,h)anthracene (53-70-3)  
Fluoranthene (206-44-0)  
Fluorene (86-73-7)  
Indeno(1,2,3-cd)pyrene (193-39-5)  
2-Methylnaphthalene (91-57-6)  
Naphthalene (91-20-3)  
Phenanthrene (85-01-8)  
Pyrene (129-00-0)

##### Hydrocarbons:

*n*-Nonane (C9) (111-84-2)  
*n*-Decane (C10) (124-18-5)  
*n*-Dodecane (C12) (112-40-3)  
*n*-Tetradecane (C14) (629-59-4)  
*n*-Hexadecane (C16) (544-76-3)  
*n*-Octadecane (C18) (593-45-3)  
*n*-Nonadecane (C19) (629-92-5)  
*n*-Eicosane (C20) (112-95-8)  
*n*-Docosane (C22) (629-97-0)  
*n*-Tetracosane (C24) (646-31-1)  
*n*-Hexacosane (C26) (630-01-3)  
*n*-Octacosane (C28) (630-02-4)  
*n*-Triacosane (C30) (638-68-6)  
*n*-Hexatriacontane (C36) (630-06-8)

25 µg/mL each in hexane, 1 mL/ampul  
cat.# 31481 (ea.)

#### NJDEP EPH 10/08 Rev. 2 Aromatics Matrix Spike Mix

(18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	2-Methylnaphthalene (91-57-6)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(ghi)perylene (191-24-2)	Phenanthrene (85-01-8)
Benzo(k)fluoranthene (207-08-9)	Pyrene (129-00-0)
Chrysene (218-01-9)	1,2,3-Trimethylbenzene (526-73-8)

200 µg/mL each in acetone:toluene (50:50), 5 mL/ampul  
cat.# 30543 (ea.)

#### WA EPH Aromatic Hydrocarbon Standard

(18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	2-Methylnaphthalene (91-57-6)
Benzo(b)fluoranthene (205-99-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Benzo(ghi)perylene (191-24-2)	Pyrene (129-00-0)
Chrysene (218-01-9)	1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31469 (ea.)

#### WA EPH Aromatic Hydrocarbon Mix (6 components)

Acenaphthene (83-32-9)	Pyrene (129-00-0)
Benzo(ghi)perylene (191-24-2)	Toluene (108-88-3)
Naphthalene (91-20-3)	1,2,3-Trimethylbenzene (526-73-8)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31488 (ea.)

#### Naphthalene-d8

Naphthalene-d8 (1146-65-2)

2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31043 (ea.)

#### NJDEP EPH 10/08 Rev. 2 Aromatics Fractionation

Check Mix (16 components)

Acenaphthene (83-32-9)	Chrysene (218-01-9)
Acenaphthylene (208-96-8)	Dibenz(a,h)anthracene (53-70-3)
Anthracene (120-12-7)	Fluoranthene (206-44-0)
Benz(a)anthracene (56-55-3)	Fluorene (86-73-7)
Benzo(a)pyrene (50-32-8)	Indeno(1,2,3-cd)pyrene (193-39-5)
Benzo(b)fluoranthene (205-99-2)	Phenanthrene (85-01-8)
Benzo(ghi)perylene (191-24-2)	Pyrene (129-00-0)
Benzo(k)fluoranthene (207-08-9)	1,2,3-Trimethylbenzene (526-73-8)

400 µg/mL each in hexane:toluene (50:50), 5 mL/ampul  
cat.# 30545 (ea.)

#### Method 525.2 Fortification Recovery Standard

*p*-Terphenyl-d14 (1718-51-0)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31828 (ea.)

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## Hydrocarbons, Polycyclic Aromatic (PAHs), *cont.*

### Miscellaneous, *cont.*

#### SV Internal Standard Mix (6 components)

Acenaphthene-d10 (15067-26-2)      Naphthalene-d8 (1146-65-2)  
Chrysene-d12 (1719-03-5)      Perylene-d12 (1520-96-3)  
1,4-Dichlorobenzene-d4 (3855-82-1)      Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul 31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul 31006	31006.15	31006.25

#### Revised SV Internal Standard Mix (7 components)

Acenaphthene-d10 (15067-26-2)      Naphthalene-d8 (1146-65-2)  
Chrysene-d12 (1719-03-5)      Perylene-d12 (1520-96-3)  
1,4-Dichlorobenzene-d4 (3855-82-1)      Phenanthrene-d10 (1517-22-2)  
1,4-Dioxane-d8 (17647-74-4)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul 31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul 31886	—	—

#### B/N Surrogate Mix (4/89 SOW) (3 components)

2-Fluorobiphenyl (321-60-8)      *p*-Terphenyl-d14 (1718-51-0)  
Nitrobenzene-d5 (4165-60-0)

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul 31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul 31062	31062.15	—
5,000 µg/mL each in methylene chloride, 5 mL/ampul 31086	—	—
5,000 µg/mL each in methylene chloride, 10 mL/ampul 33028	—	33028.25

#### Revised B/N Surrogate Mix (4 components)

2-Fluorobiphenyl (321-60-8)      *p*-Terphenyl-d14 (1718-51-0)  
Nitrobenzene-d5 (4165-60-0)      Pyrene-d10 (1718-52-1)

Each	15-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul 31887	31887.15
5,000 µg/mL each in methylene chloride, 1 mL/ampul 31888	31888.15
5,000 µg/mL each in methylene chloride, 5 mL/ampul 31889	—

## Hydrocarbons, Petroleum

### Fuels & Products

#### Aviation Gas

##### Aviation Gas Standard

100-octane, low-lead fuel used in piston-type aircraft.

Aviation gas (8006-69-1)

50,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30207 (ea.)

## Hydrocarbons, Petroleum, *cont.*

### Fuels & Products, *cont.*

#### BTEX

See page 484.

#### Creosote Oil

##### Creosote Oil Standard

- For total petroleum hydrocarbon pattern recognition of creosote oil.
- High concentration—50,000 µg/mL in methylene chloride.

Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene).

Creosote oil (8001-58-9)

50,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31838 (ea.)

#### Diesel

See pages 484–485.

#### Fuel Oil

##### Fuel Oil #4 Standard

Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. The fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38 °C (100 °F), measured using ASTM D-445.

Fuel oil #4 (68476-31-3)

5,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31216 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31244 (ea.)

## Reference Standards Documentation Search

### Search by cat. # or lot #

- SDSs
- Certificates
- Data packs

[www.restek.com/documentation](http://www.restek.com/documentation)



## Hydrocarbons, Petroleum, *cont.*

### Fuels & Products, *cont.*

#### Fuel Oil, *cont.*

##### Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

Fuel oil #6 (68553-00-4)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31248 (ea.)

##### Fuel Oil Degradation Mix (4 components)

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.<sup>1</sup> To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

Heptadecane (C17) (629-78-7)

Octadecane (C18) (593-45-3)

Pristane (2,6,10,14-tetramethylpentadecane) (1921-70-6)

Phytane (2,6,10,14-tetramethylhexadecane) (638-36-8)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31240 (ea.)

<sup>1</sup>Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

#### Gasoline

See page 489.

#### Hydraulic Oil

##### Hydraulic Oil Standard

- For total petroleum hydrocarbon pattern recognition of hydraulic oil.
- High concentration—50,000 µg/mL in methylene chloride.

Hydraulic oil (64741-89-5)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31839 (ea.)

#### Jet Fuel

##### JP-5 Military Fuel Standard

JP-5 Military fuel (8008-20-6)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31252 (ea.)

##### JP-8 Military Fuel Standard

JP-8 Military fuel (94114-58-6)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31262 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31254 (ea.)

##### Jet Fuel A Standard

Jet fuel A (64742-47-8)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31215 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31242 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31243 (ea.)

#### Kerosene

##### Kerosene Standard

Prepared from a single-source (one-refinery) product.

Kerosene: unweathered (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31229 (ea.)

##### Kerosene Composite Standard

Kerosene composite (84742-81-0)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul  
cat.# 31257 (ea.)

#### Leaking Underground Storage Tank (LUST)

See pages 497–510.





Restek® Safe Cracker

Included with every reference standard shipment for added convenience.



## Hydrocarbons, Petroleum, *cont.*

### Fuels & Products, *cont.*

#### Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

We prepare our solutions from an equal-volume blend of Type I, II, and III mineral spirits.

#### Mineral Spirits Standards (Unweathered)

5,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31225 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31260 (ea.)

#### Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

Stoddard solvent (8052-41-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30487 (ea.)

#### Motor Oil

##### Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31464 (ea.)

##### Used Motor Oil Composite Standard

Prepared from an equal-volume blend from five gasoline-powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

Used motor oil composite (64742-65-0)

50,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31464 (ea.)

#### Stoddard Solvent

See cat.# 30487 (left).

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## Hydrocarbons, Petroleum, *cont.*

### Retention Time Markers

Used during initial sample screening to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

#### Leaking Underground Storage Tank Retention Time Standard (7 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Triacontane (C30) (638-68-6)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Tetracontane (C40) (4181-95-7)
<i>n</i> -Tetracosane (C24) (646-31-1)	

25 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31200 (ea.)

#### Retention Time Marker (3 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Dodecane (C12) (112-40-3)
<i>n</i> -Decane (C10) (124-18-5)	

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30483 (ea.)

#### TNRCC 1005 Retention Time Markers Mix

(4 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Pentatriacontane (C35) (630-07-9)

200 µg/mL each in pentane, 1 mL/ampul  
cat.# 31698 (ea.)

#### TNRCC 1006 Retention Time Marker Mix (9 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Hexadecane (C16) (544-76-3)
<i>n</i> -Heptane (C7) (142-82-5)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Pentatriacontane (C35) (630-07-9)
<i>n</i> -Dodecane (C12) (112-40-3)	

200 µg/mL in pentane, 1 mL/ampul  
cat.# 31814 (ea.)

#### Retention Time Marker—Alaska (4 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Pentacosane (C25) (629-99-2)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Hexatriacontane (C36) (630-06-8)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31819 (ea.)

#### Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Heneicosane (C21) (629-94-7)
<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Pentatriacontane (C35) (630-07-9)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Hexadecane (C16) (544-76-3)	

200 µg/mL each in pentane, 1 mL/ampul  
cat.# 31639 (ea.)

#### CCME F1 Retention Time Marker (3 components)

<i>n</i> -Hexane (C6) (110-54-3)
<i>n</i> -Decane (C10) (124-18-5)
Toluene (108-88-3)

2,000 µg/mL each in methanol, 1 mL/ampul  
cat.# 30611 (ea.)



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See page 193–202.

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## Hydrocarbons, Petroleum, *cont.*

### Total Petroleum Hydrocarbons (TPH)

#### Method 418.1 (Total Recoverable Petroleum Hydrocarbons [TRPH])

##### 418.1 Calibration Mix (3 components)

Method 418.1 is an infrared spectrophotometric method for determining Total Recoverable Petroleum Hydrocarbons (TRPH). Dilute this mixture 1:200 to make the stock mixture specified in section 6.5.2 of Method 418.1.

Chlorobenzene (108-90-7)	25.0% (v/v)
<i>n</i> -Hexadecane (C16) (544-76-3)	37.5%
2,2,4-Trimethylpentane (isooctane) (540-84-1)	37.5%

1 mL/ampul

cat.# 30080 (ea.)

### Miscellaneous

#### Glycols Standard (2 components)

Ethylene glycol (107-21-1)  
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul

cat.# 30471 (ea.)

#### NW TPH-Dx Surrogate Mix Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-Fluorobiphenyl	321-60-8	D	10,000	31096
<i>o</i> -Terphenyl	84-15-1	D	10,000	31097
<i>p</i> -Terphenyl	92-94-4	D	10,000	31095
Pentacosane (C25)	629-99-2	D	10,000	31487

D = methylene chloride

#### TX TPH Locator Mix (3 components)

*n*-Hexane (C6) (110-54-3)                      *n*-Octacosane (C28) (630-02-4)  
*n*-Decane (C10) (124-18-5)

200 µg/mL each in pentane, 1 mL/ampul

cat.# 31482 (ea.)

#### TX TPH Calibration Mix (2 components)

Diesel fuel #2 composite (68334-30-5)  
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in pentane, 1 mL/ampul

cat.# 31483 (ea.)

#### TX TPH Matrix Spike Mix (2 components)

Diesel fuel #2 composite (68334-30-5)  
Unleaded gasoline composite (8006-61-9)

10,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31484 (ea.)

### Miscellaneous, *cont.*

#### CCME PHC Calibration Mix (3 components)

- Meets CCME 2001 Petroleum Hydrocarbons in Soil Method—Tier 1.
- Primary reference calibration standards for quantification of four fractions.

*n*-Decane (C10) (124-18-5)

*n*-Tetratriacontane (C34) (14167-59-0)

*n*-Hexadecane (C16) (544-76-3)

5,000 µg/mL each in toluene, 1 mL/ampul

cat.# 31684 (ea.)

#### $\alpha,\alpha,\alpha$ -Trifluorotoluene

$\alpha,\alpha,\alpha$ -Trifluorotoluene (98-08-8)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30083 (ea.)

#### 1-Chlorooctane

1-Chlorooctane (111-85-3)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30084 (ea.)

#### 1-Chlorooctadecane

1-Chlorooctadecane (3386-33-2)

10,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31098 (ea.)

### Weathered Petrochemical Solutions

See pages 480–481.

## Compound Index for Reference Standards

See pages 586–592.



## Isocyanates

### ASTM Method D5836-03/OSHA 42, OSHA 47, NIOSH 5522 (Analysis of Isocyanates in Indoor Air by LC)

ASTM D5836 and OSHA 42 are test methods for determining 2,4-toluene diisocyanate (2,4-TDI) and 2,6-TDI in the workplace atmosphere. OSHA 47 is for 4,4'-methylenediphenyl isocyanate (4,4'-MDI) in indoor air, and NIOSH Method 5522 is for 2,4-TDI; 2,6-TDI; 4,4'-MDI; and 1,6-hexamethylene diisocyanate (1,6-HDI) in air. Restek offers the 1-(2-pyridyl) piperazine (1-2pp) derivative.

### Isocyanates Singles

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2,6-TDIP	195625-39-9	DMSO	1,000	33000
2,4-TDIP	72375-21-4	DMSO	1,000	33001
1,6-HDIP	72375-27-0	DMSO	1,000	33002
4,4'-MDIP	72375-24-7	DMSO	1,000	33003

DMSO = dimethyl sulfoxide

## Jet Fuel

See page 514.

## Kerosene

See page 514.

## Ketones

### VOA Calibration Mix #1 (ketones) (4 components)

Acetone (67-64-1)  
2-Butanone (MEK) (78-93-3)  
2-Hexanone (591-78-6)  
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul  
cat.# 30006 (ea.)

### Ketones Mix, 524.2 Rev. 4.1 (5 components)

Acetone (67-64-1)  
2-Butanone (MEK) (78-93-3)  
1,1-Dichloro-2-propanone (513-88-2)  
2-Hexanone (591-78-6)  
4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul  
cat.# 30602 (ea.)

## Quantity Discounts Available

- Buy 3 Standards, Get 10% Off
- Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

## Ketones, cont.

### Aldehyde-Ketone-DNPH TO-11A Calibration Mix

(15 components)

Acetaldehyde-DNPH (1019-57-4)	Formaldehyde-DNPH (1081-15-8)
Acetone-DNPH (1567-89-1)	Hexaldehyde-DNPH (1527-97-5)
Acrolein-DNPH (888-54-0)	Isovaleraldehyde-DNPH (2256-01-1)
Benzaldehyde-DNPH (1157-84-2)	Propionaldehyde-DNPH (725-00-8)
<i>n</i> -Butylaldehyde-DNPH (1527-98-6)	<i>m</i> -Tolualdehyde-DNPH (2880-05-9)
Crotonaldehyde-DNPH (1527-96-4)	<i>o</i> -Tolualdehyde-DNPH (1773-44-0)
2,5-Dimethylbenzaldehyde-DNPH (152477-96-8)	<i>p</i> -Tolualdehyde-DNPH (2571-00-8)
	Valeraldehyde-DNPH (2057-84-3)

15 µg/mL each in acetonitrile, 1 mL/ampul\*  
cat.# 31808 (ea.)

\*The reported concentrations reflect the amount of aldehyde or ketone in the mixture. The concentration of derivatized aldehyde or ketone is not reported.

## Leaking Underground Storage Tank (LUST)

See pages 497–510.

## Nitriles

### 8240 Nitriles Mix (7 components)

Acrylonitrile (107-13-1)	Methyl methacrylate (80-62-6)
Ethyl methacrylate (97-63-2)	Propionitrile (107-12-0)
Malononitrile (109-77-3)	Styrene (100-42-5)
Methacrylonitrile (126-98-7)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30215 (ea.)

## Method 603 (Acrolein & Acrylonitrile)

### Acrolein/Acrylonitrile (2 components)

Acrolein (107-02-8)  
Acrylonitrile (107-13-1)

2,000 µg/mL each in DI water, 1 mL/ampul  
cat.# 30600 (ea.)

Must ship overnight on ice.

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

### Acrolein

Acrolein (107-02-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul  
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

### Acrylonitrile

Acrylonitrile (107-13-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30246 (ea.)

## Nitroaromatics & Nitramines

See pages 486–487.

## Nitrosamines

### Method 521 (Nitrosamines)

#### Nitrosamine Calibration Mix, Method 521

(7 components)

N-Nitrosodiethylamine (55-18-5)      N-Nitrosomethylethylamine (10595-95-6)  
 N-Nitrosodimethylamine (62-75-9)      N-Nitrosopiperidine (100-75-4)  
 N-Nitrosodi-*n*-butylamine (924-16-3)      N-Nitrosopyrrolidine (930-55-2)  
 N-Nitrosodi-*n*-propylamine (621-64-7)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
 cat.# 31898 (ea.)

#### N-Nitrosodimethylamine-d6

N-Nitrosodimethylamine-d6 (17829-05-9)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
 cat.# 33910 (ea.)

#### N-Nitrosodi-*n*-propylamine-d14

N-Nitrosodi-*n*-propylamine-d14 (93951-96-3)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
 cat.# 33911 (ea.)

### Method 522 (1,4-Dioxane)

#### Tetrahydrofuran-d8

Tetrahydrofuran-d8 (1693-74-9)

2,000 µg/mL in P&T methanol, 1 mL/ampul  
 cat.# 30112 (ea.)

#### 1,4-Dioxane-d8

1,4-Dioxane-d8 (17647-74-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul  
 cat.# 30614 (ea.)

#### 1,4-Dioxane

1,4-Dioxane (123-91-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul  
 cat.# 30287 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul  
 cat.# 31853 (ea.)

1.9 mg/mL in dimethyl sulfoxide, 1 mL/ampul  
 cat.# 36294 (ea.)

### Method 607 (Nitrosamines)

#### 607 Nitrosamines Calibration Mix (3 components)

N-Nitrosodimethylamine (62-75-9)      N-Nitrosodiphenylamine (86-30-6)  
 N-Nitroso-di-*n*-propylamine (621-64-7)

2,000 µg/mL each in methanol, 1 mL/ampul  
 cat.# 31032 (ea.)

## Oil & Grease

### Method 1664 (Oil & Grease)

#### Method 1664 Oil & Grease Standard (2 components)

*n*-Hexadecane (C16) (544-76-3)  
 Stearic acid (57-11-4)

2,000 µg/mL each in acetone, 10 mL/ampul  
 cat.# 31954 (ea.)

#### Method 1664 Oil & Grease Mix (2 components)

*n*-Hexadecane (C16) (544-76-3)  
 Stearic acid (57-11-4)

4,000 µg/mL each in acetone, 5 mL/ampul  
 cat.# 31457 (ea.)

## EPA 521 & 522 Cartridge



- Activated charcoal for extraction of nitrosamines and dioxane in drinking water.
- Batch tested to ensure low background and consistent recoveries.
- High-quality polypropylene tubes and frits to minimize interference.
- Specially treated charcoal and frits to minimize fines that result from inconsistent recoveries.

See page 398.

Disks are also available on page 402.



## Organometallics/Organotin

Complete data pack available for audit compliance.

### Butyltin Chloride Calibration Mixture (4 components)

*n*-Butyltin trichloride (1118-46-3)      Tetrabutyltin (1461-25-2)  
Dibutyltin dichloride (683-18-1)      Tributyltin chloride (1461-22-9)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31472 (ea.)

### Tributyltin Chloride Calibration Mixture

Tributyltin chloride (1461-22-9)  
2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31478 (ea.)

### Phenyltin Chloride Calibration Mixture (4 components)

Diphenyltin dichloride (1135-99-5)      Tetraphenyltin (595-90-4)  
Phenyltin trichloride (1124-19-2)      Triphenyltin chloride (639-58-7)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31473 (ea.)

### Tri-*n*-propyltin Chloride Surrogate

Tri-*n*-propyltin chloride  
2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31476 (ea.)

### Triphenyltin Chloride Surrogate

Triphenyltin chloride (3342-67-4)  
2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31477 (ea.)

### Tetra-*n*-propyltin Internal Standard

Tetra-*n*-propyltin (2176-98-9)  
2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31474 (ea.)

## Oxygenates/Ethers

### California Oxygenates Mix (5 components)

*tert*-Amyl methyl ether (TAME) (994-05-8)      2,000 µg/mL  
*tert*-Butanol (TBA) (75-65-0)      10,000  
Diisopropyl ether (DIPE) (108-20-3)      2,000  
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)      2,000  
Methyl *tert*-butyl ether (MTBE) (1634-04-4)      2,000

In P&T methanol, 1 mL/ampul  
cat.# 30465 (ea.)

### Oxygenates (6 components)

*tert*-Amyl ethyl ether (TAE) (919-94-8)      2,000 µg/mL  
*tert*-Amyl methyl ether (TAME) (994-05-8)      2,000  
*tert*-Butanol (TBA) (75-65-0)      10,000  
Diisopropyl ether (DIPE) (108-20-3)      2,000  
Ethyl-*tert*-butyl ether (ETBE) (637-92-3)      2,000  
Methyl *tert*-butyl ether (MTBE) (1634-04-4)      2,000

In P&T methanol, 1 mL/ampul  
cat.# 30626 (ea.)

### Single-Component Oxygenates

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
<i>tert</i> -Amyl alcohol	75-85-4	PTM	10,000	30631
<i>tert</i> -Amyl ethyl ether (TAE)	919-94-8	PTM	2,000	30617
<i>tert</i> -Amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
<i>tert</i> -Butanol (TBA)	75-65-0	PTM	50,000	30470
<i>tert</i> -Butanol-d9	25725-11-5	PTM	20,000	30618
Diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
Ethanol	64-17-5	PTM	2,000	30288
Ethanol	64-17-5	W	10,000	30466
Ethyl- <i>tert</i> -butyl ether (ETBE)	637-92-3	PTM	2,000	30628
Methanol	67-56-1	W	10,000	30467
Methyl <i>tert</i> -butyl ether (MTBE)	1634-04-4	PTM	2,000	30402

PTM = purge-and-trap grade methanol; W = DI water



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## Pesticides, Carbamate

### Method 531.1, 531.2 (Carbamates)

#### 531.1 Internal Standard

4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC) (672-99-1)

100 µg/mL in methanol, 1 mL/ampul

cat.# 32274 (ea.)

#### 531.1 Performance Check Mix (4 components)

Aldicarb sulfoxide	100 µg/mL	3-Hydroxycarbofuran	2
BDMC	10	Methiocarb	20

In methanol, 1 mL/ampul

cat.# 32275 (ea.)

#### 531.1 Carbamate Pesticide Calibration Mixture

(10 components)

Aldicarb (116-06-3)	3-Hydroxycarbofuran (16655-82-6)
Aldicarb sulfone (1646-88-4)	Methiocarb (2032-65-7)
Aldicarb sulfoxide (1646-87-3)	Methomyl (16752-77-5)
Carbaryl (Sevin) (63-25-2)	Oxamyl (23135-22-0)
Carbofuran (1563-66-2)	Propoxur (Baygon) (114-26-1)

100 µg/mL each in methanol, 1 mL/ampul

cat.# 32273 (ea.)

#### 531.2 Carbamate Pesticide Calibration Mixture

(11 components)

- Complete set of materials for N-methylcarbamoyloximes and N-methylcarbamates.
- New mix satisfies latest update of EPA Method 531.2.
- Formulated in acetonitrile for stability and convenience for LC analysis.

Aldicarb (116-06-3)	Methiocarb (2032-65-7)
Aldicarb sulfone (1646-88-4)	Methomyl (16752-77-5)
Aldicarb sulfoxide (1646-87-3)	1-Naphthol (90-15-3)
Carbaryl (Sevin) (63-25-2)	Oxamyl (23135-22-0)
Carbofuran (1563-66-2)	Propoxur (Baygon) (114-26-1)
3-Hydroxycarbofuran (16655-82-6)	

100 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32435 (ea.)

## Pesticides, Chlordane & Toxaphene

### Chlordane, Toxaphene Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Chlordane	57-74-9	H	1,000	32021
Chlordane	57-74-9	I	5,000	32072
Chlordane	57-74-9	M	2,000	32016
Toxaphene	8001-35-2	H	1,000	32005
Toxaphene	8001-35-2	I	5,000	32071
Toxaphene	8001-35-2	M	2,000	32015

H = hexane; I = isoctane; M = methanol

## Pesticides, Chlorinated Disinfection By-Products, Pesticides & Herbicides

### Method 551 (Chlorinated Disinfection By-Products, Pesticides & Herbicides)

#### 551.1 Surrogate Standard

Decafluorobiphenyl (434-90-2)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 31855 (ea.)

#### Method 551.1 Pesticide/Herbicide Mix (16 components)

Alachlor (15972-60-8)	Heptachlor epoxide (isomer B) (1024-57-3)
Atrazine (1912-24-9)	Hexachlorobenzene (118-74-1)
Bromacil (314-40-9)	Hexachlorocyclopentadiene (77-47-4)
Cyanazine (Bladex) (21725-46-2)	Methoxychlor (72-43-5)
Endrin (72-20-8)	Metolachlor (51218-45-2)
Endrin aldehyde (7421-93-4)	Simazine (122-34-9)
Endrin ketone (53494-70-5)	Trifluralin (1582-09-8)
γ-BHC (Lindane) (58-89-9)	
Heptachlor (76-44-8)	

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 32438 (ea.)

#### Chloral Hydrate

Chloral hydrate (302-17-0)

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 30609 (ea.)

#### Disinfection By-Product Mix (7 components)

Bromochloroacetonitrile (83463-62-1)	1,1-Dichloro-2-propanone (513-88-2)
Chloropicrin (76-06-2)	Trichloroacetonitrile (545-06-2)
Dibromoacetonitrile (3252-43-5)	1,1,1-Trichloro-2-propanone (918-00-3)
Dichloroacetonitrile (3018-12-0)	

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 30616 (ea.)

## Reference Standards Documentation Search

Search by cat. # or lot #

- SDSs
- Certificates
- Data packs

[www.restek.com/documentation](http://www.restek.com/documentation)



## Pesticides, Chlorinated/Organochlorine/Organohalide

### Method 508 (Chlorinated Pesticides)

#### 508.1 Internal Standard

Pentachloronitrobenzene (82-68-8)

100 µg/mL in ethyl acetate, 1 mL/ampul

cat.# 32091 (ea.)

#### 508.1 Surrogate

4,4'-Dibromobiphenyl (92-86-4)

500 µg/mL in ethyl acetate, 1 mL/ampul

cat.# 32092 (ea.)

#### 508.1 GC Degradation Check Mix (2 components)

4,4'-DDT (50-29-3)

Endrin (72-20-8)

100 µg/mL each in ethyl acetate, 1 mL/ampul

cat.# 32093 (ea.)

#### 508 Performance Check Mix (4 components)

δ-BHC (319-86-8)

0.4 µg/mL

DCPA methyl ester (Chlorthal-dimethyl)

Chlorothalonil (1897-45-6)

0.5

(1861-32-1)

0.5

Chlorpyrifos (2921-88-2)

0.02

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 32045 (ea.)

#### 508.1 Calibration Mix #1 (17 components)

Aldrin (309-00-2)

Endosulfan I (959-98-8)

α-BHC (319-84-6)

Endosulfan II (33213-65-9)

β-BHC (319-85-7)

Endosulfan sulfate (1031-07-8)

δ-BHC (319-86-8)

Endrin (72-20-8)

γ-BHC (Lindane) (58-89-9)

Endrin aldehyde (7421-93-4)

4,4'-DDD (72-54-8)

Heptachlor (76-44-8)

4,4'-DDE (72-55-9)

Heptachlor epoxide (isomer B)

4,4'-DDT (50-29-3)

(1024-57-3)

Dieldrin (60-57-1)

Methoxychlor (72-43-5)

500 µg/mL each in ethyl acetate, 1 mL/ampul

cat.# 32094 (ea.)

#### 508.1 Calibration Mix #2 (11 components)

Chlorobenzilate (510-15-6)

Etridiazole (2593-15-9)

*cis*-Chlordane (5103-71-9)

Hexachlorobenzene (118-74-1)

*trans*-Chlordane (5103-74-2)

*cis*-Permethrin\* (52645-53-1)

Chloroneb (2675-77-6)

*trans*-Permethrin\* (52645-53-1)

DCPA methyl ester (Chlorthal-dimethyl)

Propachlor (1918-16-7)

(1861-32-1)

Trifluralin (1582-09-8)

500 µg/mL each in ethyl acetate, 1 mL/ampul

cat.# 32095 (ea.)

\*500 µg/mL total permethrin. Exact content of each isomer is listed on certificate of analysis.

#### 508.1 Calibration Mix #3 (8 components)

Alachlor (15972-60-8)

Hexachlorocyclopentadiene (77-47-4)

Atrazine (1912-24-9)

Metolachlor (51218-45-2)

Chlorothalonil (1897-45-6)

Metribuzin (21087-64-9)

Cyanazine (bladex) (21725-46-2)

Simazine (122-34-9)

500 µg/mL each in ethyl acetate, 1 mL/ampul

cat.# 32096 (ea.)

#### Toxaphene Solutions

Toxaphene (8001-35-2)

1,000 µg/mL in hexane, 1 mL/ampul

cat.# 32005 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32015 (ea.)

5,000 µg/mL in isooctane, 1 mL/ampul

cat.# 32071 (ea.)

#### Organochlorine Pesticide System Evaluation Mix

(2 components)

- Designed for daily assessment of system performance.
- Reveals active sites in the injection port and/or GC column.
- Prepared in MTBE—low expansion volume helps minimize backflash.

4,4'-DDT (50-29-3)

200 µg/mL

Endrin (72-20-8)

100 µg/mL

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 32417 (ea.)

#### Decachlorobiphenyl, 508A

Decachlorobiphenyl (BZ #209) (2051-24-3)

200 µg/mL in acetone, 1 mL/ampul

cat.# 32029 (ea.)

200 µg/mL in acetone, 5 mL/ampul

cat.# 32030 (ea.)

10 µg/mL in isooctane, 1 mL/ampul

cat.# 32289 (ea.)

#### 508.1 Pesticide Kit

Contains 1 mL each of these mixtures.

32045: 508 Performance Check Mix

32091: 508.1 Internal Standard Mix

32092: 508.1 Surrogate Mix

32093: 508.1 GC Degradation Check Mix

32094: 508.1 Calibration Mix #1

32095: 508.1 Calibration Mix #2

32096: 508.1 Calibration Mix #3

cat.# 32097 (kit)

kit



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## Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

### Method 508 (Chlorinated Pesticides), *cont.*

#### Endrin Standard

Endrin (72-20-8)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32463 (ea.)

#### Endrin Ketone Standard

Endrin ketone (53494-70-5)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32464 (ea.)

#### Endosulfan I Standard

Endosulfan I (959-98-8)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32465 (ea.)

#### Endosulfan II Standard

Endosulfan II (33213-65-9)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32466 (ea.)

#### Endosulfan Sulfate Standard

Endosulfan sulfate (1031-07-8)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32467 (ea.)

#### Endrin Aldehyde Standard

Endrin aldehyde (7421-93-4)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32468 (ea.)

### Method 505 (Organohalide Pesticides & PCBs)

#### 505 Organohalide Pesticide Mix (16 components)

Aldrin (309-00-2)	Heptachlor epoxide (isomer B) (1024-57-3)
Alachlor (15972-60-8)	Hexachlorobenzene (118-74-1)
Atrazine (1912-24-9)	Hexachlorocyclopentadiene (77-47-4)
γ-BHC (Lindane) (58-89-9)	Methoxychlor (72-43-5)
cis-Chlordane (5103-71-9)	cis-Nonachlor (5103-73-1)
trans-Chlordane (5103-74-2)	trans-Nonachlor (39765-80-5)
Dieldrin (60-57-1)	Simazine (122-34-9)
Endrin (72-20-8)	
Heptachlor (76-44-8)	

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32024 (ea.)

#### Toxaphene Solutions

See cat.#s 32005, 32015, and 32071 on page 521.

### Method 608 (Organochlorine Pesticides & PCBs)

#### 608 Calibration Mix (16 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
α-BHC (319-84-6)	Endosulfan II (33213-65-9)
β-BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
δ-BHC (319-86-8)	Endrin (72-20-8)
γ-BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
4,4'-DDD (72-54-8)	Heptachlor (76-44-8)
4,4'-DDE (72-55-9)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDT (50-29-3)	
Dieldrin (60-57-1)	

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul

cat.# 32022 (ea.)

#### 608 Complete Kit

Contains 1 mL each of these mixtures.

32022: 608 Calibration Mix  
32006: Aroclor 1016  
32007: Aroclor 1221  
32008: Aroclor 1232  
32009: Aroclor 1242  
32010: Aroclor 1248  
32011: Aroclor 1254  
32012: Aroclor 1260  
32005: toxaphene  
32021: chlordane

Contains 1 mL each of these mixtures.

cat.# 32060 (kit)

kit



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Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

Method 8080, 8081 (Chlorinated Pesticides)

**Organochlorine Pesticide Mix AB #1** (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
α-BHC (319-84-6)	Endosulfan II (33213-65-9)
β-BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
δ-BHC (319-86-8)	Endrin (72-20-8)
γ-BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
cis-Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
trans-Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B)
4,4'-DDE (72-55-9)	(1024-57-3)
4,4'-DDT (50-29-3)	Methoxychlor (72-43-5)
Dieldrin (60-57-1)	

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul  
cat.# 32291 (ea.)

**Organochlorine Pesticide Mix AB #2** (20 components)

Aldrin (309-00-2)	8 µg/mL	Endosulfan I (959-98-8)	8
α-BHC (319-84-6)	8	Endosulfan II (33213-65-9)	16
β-BHC (319-85-7)	8	Endosulfan sulfate (1031-07-8)	16
δ-BHC (319-86-8)	8	Endrin (72-20-8)	16
γ-BHC (Lindane) (58-89-9)	8	Endrin aldehyde (7421-93-4)	16
cis-Chlordane (5103-71-9)	8	Endrin ketone (53494-70-5)	16
trans-Chlordane (5103-74-2)	8	Heptachlor (76-44-8)	8
4,4'-DDD (72-54-8)	16	Heptachlor epoxide (isomer B)	
4,4'-DDE (72-55-9)	16	(1024-57-3)	8
4,4'-DDT (50-29-3)	16	Methoxychlor (72-43-5)	80
Dieldrin (60-57-1)	16		

In hexane:toluene (1:1), 1 mL/ampul  
cat.# 32292 (ea.)

**Organochlorine Pesticide Mix AB #3** (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
α-BHC (319-84-6)	Endosulfan II (33213-65-9)
β-BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
δ-BHC (319-86-8)	Endrin (72-20-8)
γ-BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
cis-Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
trans-Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B)
4,4'-DDE (72-55-9)	(1024-57-3)
4,4'-DDT (50-29-3)	Methoxychlor (72-43-5)
Dieldrin (60-57-1)	

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul  
cat.# 32415 (ea.)

**Pesticide Surrogate Mix** (2 components)

Decachlorobiphenyl (2051-24-3)	200 µg/mL
2,4,5,6-Tetrachloro- <i>m</i> -xylene (877-09-8)	100
200 µg/mL each in acetone, 1 mL/ampul	
cat.# 32000 (ea.)	
200 µg/mL each in acetone, 5 mL/ampul	
cat.# 32457 (ea.)	

**Pesticide Surrogate Mix** (2 components)

Decachlorobiphenyl (2051-24-3)	200 µg/mL
2,4,5,6-Tetrachloro- <i>m</i> -xylene (877-09-8)	100
In acetone, 1 mL/ampul	
cat.# 32453 (ea.)	

**TCLP Pesticide Mix** (5 components)

γ-BHC (Lindane) (58-89-9)	Heptachlor epoxide (isomer B)
Endrin (72-20-8)	(1024-57-3)
Heptachlor (76-44-8)	Methoxychlor (72-43-5)
2,000 µg/mL each in methanol, 1 mL/ampul	
cat.# 32013 (ea.)	

**TCLP Toxaphene Mix**

Toxaphene (8001-35-2)
2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

**TCLP Chlordane Mix**

Chlordane (57-74-9)
2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32016 (ea.)

**SOM01.1 (Pesticides), QA Mixes**

**Pesticide Surrogate Mix** (2 components)

Decachlorobiphenyl (2051-24-3)	200 µg/mL
2,4,5,6-Tetrachloro- <i>m</i> -xylene (877-09-8)	100
In acetone, 1 mL/ampul	
cat.# 32453 (ea.)	

**Organochlorine Pesticide Resolution Check Mix (with surrogates)** (22 components)

Aldrin (309-00-2)	10 µg/mL	Endosulfan I (959-98-8)	10
α-BHC (319-84-6)	10	Endosulfan II (33213-65-9)	20
β-BHC (319-85-7)	10	Endosulfan sulfate (1031-07-8)	20
δ-BHC (319-86-8)	10	Endrin (72-20-8)	20
γ-BHC (Lindane) (58-89-9)	10	Endrin aldehyde (7421-93-4)	20
cis-Chlordane (5103-71-9)	10	Endrin ketone (53494-70-5)	20
trans-Chlordane (5103-74-2)	10	Heptachlor (76-44-8)	10
Decachlorobiphenyl (SS) (2051-24-3)	20	Heptachlor epoxide (isomer B)	
Dieldrin (60-57-1)	20	(1024-57-3)	10
4,4'-DDD (72-54-8)	20	Methoxychlor (72-43-5)	100
4,4'-DDE (72-55-9)	20	2,4,5,6-Tetrachloro- <i>m</i> -xylene (SS)	
4,4'-DDT (50-29-3)	20	(877-09-8)	10

In hexane:toluene (90:10), 1 mL/ampul  
cat.# 32454 (ea.)

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**Pesticides, Chlorinated/Organochlorine/Organohalide, cont.**

**04.2, 04.1, 03.2, 3/90, 4/89, and 2/88 SOW (Pesticides), QA Mixes**

**Pesticide Surrogate Mix (2 components)**

See cat.#s 32000 and 32457 on page 524.

**2,4,5,6-Tetrachloro-*m*-xylene**

2,4,5,6-Tetrachloro-*m*-xylene (877-09-8)

200 µg/mL in acetone, 1 mL/ampul

cat.# 32027 (ea.)

200 µg/mL in acetone, 5 mL/ampul

cat.# 32028 (ea.)

**Decachlorobiphenyl (BZ #209)**

Decachlorobiphenyl (BZ #209) (2051-24-3)

200 µg/mL in acetone, 1 mL/ampul

cat.# 32029 (ea.)

200 µg/mL in acetone, 5 mL/ampul

cat.# 32030 (ea.)

10 µg/mL in isooctane, 1 mL/ampul

cat.# 32289 (ea.)

**Dibutylchlorendate**

Dibutylchlorendate (1770-80-5)

200 µg/mL in acetone, 1 mL/ampul

cat.# 32025 (ea.)

**Florisil® Cartridge Check Standard (2,4,5-Trichlorophenol)**

2,4,5-Trichlorophenol (95-95-4)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32017 (ea.)

**Organochlorine Pesticide System Evaluation Mix**

(2 components)

- Designed for daily assessment of system performance.
- Reveals active sites in the injection port and/or GC column.
- Prepared in MTBE—low expansion volume helps minimize backflash.

4,4'-DDT (50-29-3) 200 µg/mL  
Endrin (72-20-8) 100 µg/mL

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 32417 (ea.)

**Pesticide Performance Evaluation Mix (6 components)**

α-BHC (319-84-6)	1 µg/mL	4,4'-DDT (50-29-3)	10
β-BHC (319-85-7)	1	Endrin (72-20-8)	5
γ-BHC (Lindane) (58-89-9)	1	Methoxychlor (72-43-5)	25

In hexane, 1 mL/ampul

cat.# 32002 (ea.)

**Pesticide Performance Evaluation Mix w/Surrogates**

(8 components)

α-BHC (319-84-6)	1 µg/mL	Endrin (72-20-8)	5
β-BHC (319-85-7)	1	Methoxychlor (72-43-5)	25
γ-BHC (Lindane) (58-89-9)	1	2,4,5,6-Tetrachloro- <i>m</i> -xylene (SS)	2
4,4'-DDT (50-29-3)	10	(877-09-8)	
Decachlorobiphenyl (SS) (2051-24-3)	2		

In hexane, 1 mL/ampul

cat.# 32074 (ea.)



**tech tip**

**Working with solutions containing decachlorobiphenyl**

Decachlorobiphenyl has poor solubility in most organic solvents. The maximum concentration that can be prepared in acetone, hexane, or isooctane is 200 µg/mL. Temperature will affect the solubility as well. Storing solutions at reduced temperatures will cause decachlorobiphenyl to precipitate.

Products containing decachlorobiphenyl must be sonicated for a minimum of 10 minutes prior to opening the ampul. Because each ultrasonic bath operates at a different energy level, 10 minutes is a guideline only. Longer sonication time will not affect product quality.

These precautions apply to working solutions prepared in your laboratory as well. The amount of compound that precipitates depends on concentration AND temperature. If you store your standards at a temperature lower than 4 °C (even dilute solutions), allow extra sonication time.

**CLP Pesticides Mixtures, QA Mixes**

**Pesticide Matrix Spike Mix (6 components)**

Aldrin (309-00-2)	25 µg/mL	Dieldrin (60-57-1)	50
γ-BHC (Lindane) (58-89-9)	25	Endrin (72-20-8)	50
4,4'-DDT (50-29-3)	50	Heptachlor (76-44-8)	25

In acetone, 1 mL/ampul

cat.# 32018 (ea.)



For complete listing of PCB reference standards, see pages 530–531.

**Low-Concentration Pesticides Mixtures, QA Mixes**

**L/C Pesticide Lab Control Sample (7 components)**

γ-BHC (Lindane) (58-89-9)	10 µg/mL	Endosulfan sulfate (1031-07-8)	20
<i>trans</i> -Chlordane (5103-74-2)	10	Endrin (72-20-8)	20
4,4'-DDE (72-55-9)	20	Heptachlor epoxide (isomer B)	10
Dieldrin (60-57-1)	20	(1024-57-3)	

In acetone, 1 mL/ampul

**also available**

200+ compound multiresidue pesticides standard kits for LC-MS/MS and GC-MS/MS!



See pages 568–571.

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

CLP Pesticides Mixtures, Calibration Mixes

**Pesticide Standard Mix A** (9 components)

$\alpha$ -BHC (319-84-6)	5 $\mu$ g/mL	Endosulfan I (959-98-8)	5
$\gamma$ -BHC (Lindane) (58-89-9)	5	Endrin (72-20-8)	10
4,4'-DDD (72-54-8)	10	Heptachlor (76-44-8)	5
4,4'-DDT (50-29-3)	10	Methoxychlor (72-43-5)	50
Dieldrin (60-57-1)	10		

In hexane:toluene (90:10), 1 mL/ampul  
cat.# 32297 (ea.)

**Pesticide Standard Mix B** (11 components)

Aldrin (309-00-2)	5 $\mu$ g/mL	Endosulfan II (33213-65-9)	10
$\beta$ -BHC (319-85-7)	5	Endosulfan sulfate (1031-07-8)	10
$\delta$ -BHC (319-86-8)	5	Endrin aldehyde (7421-93-4)	10
<i>cis</i> -Chlordane (5103-71-9)	5	Endrin ketone (53494-70-5)	10
<i>trans</i> -Chlordane (5103-74-2)	5	Heptachlor epoxide (isomer B) (1024-57-3)	5
4,4'-DDE (72-55-9)	10		

In hexane:toluene (90:10), 1 mL/ampul  
cat.# 32298 (ea.)

**Organochlorine Pesticide Mix AB #1** (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
$\alpha$ -BHC (319-84-6)	Endosulfan II (33213-65-9)
$\beta$ -BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
$\delta$ -BHC (319-86-8)	Endrin (72-20-8)
$\gamma$ -BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
<i>cis</i> -Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
<i>trans</i> -Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDE (72-55-9)	Methoxychlor (72-43-5)
4,4'-DDT (50-29-3)	
Dieldrin (60-57-1)	

200  $\mu$ g/mL each in hexane:toluene (1:1), 1 mL/ampul  
cat.# 32291 (ea.)

**Organochlorine Pesticide Mix AB #2** (20 components)

Aldrin (309-00-2)	8 $\mu$ g/mL	Endosulfan I (959-98-8)	8
$\alpha$ -BHC (319-84-6)	8	Endosulfan II (33213-65-9)	16
$\beta$ -BHC (319-85-7)	8	Endosulfan sulfate (1031-07-8)	16
$\delta$ -BHC (319-86-8)	8	Endrin (72-20-8)	16
$\gamma$ -BHC (Lindane) (58-89-9)	8	Endrin aldehyde (7421-93-4)	16
<i>cis</i> -Chlordane (5103-71-9)	8	Endrin ketone (53494-70-5)	16
<i>trans</i> -Chlordane (5103-74-2)	8	Heptachlor (76-44-8)	8
4,4'-DDD (72-54-8)	16	Heptachlor epoxide (isomer B) (1024-57-3)	8
4,4'-DDE (72-55-9)	16	Methoxychlor (72-43-5)	80
4,4'-DDT (50-29-3)	16		
Dieldrin (60-57-1)	16		

In hexane:toluene (1:1), 1 mL/ampul

cat.# 32292 (ea.)

**Organochlorine Pesticide Mix AB #3** (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
$\alpha$ -BHC (319-84-6)	Endosulfan II (33213-65-9)
$\beta$ -BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
$\delta$ -BHC (319-86-8)	Endrin (72-20-8)
$\gamma$ -BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
<i>cis</i> -Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
<i>trans</i> -Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDE (72-55-9)	Methoxychlor (72-43-5)
4,4'-DDT (50-29-3)	
Dieldrin (60-57-1)	

2,000  $\mu$ g/mL each in hexane:toluene (1:1), 1 mL/ampul  
cat.# 32415 (ea.)

Pesticides Calibration Mixtures

Components of these products are at 16x the contract-required quantitation level (CRQL) and can be used to prepare calibration mixes at 4x CRQL and at 1x CRQL by serial dilution.

**Pesticide Standard Mix A w/Surrogates** (11 components)

$\alpha$ -BHC (319-84-6)	8 $\mu$ g/mL	Endosulfan I (959-98-8)	8
$\gamma$ -BHC (Lindane) (58-89-9)	8	Endrin (72-20-8)	16
4,4'-DDD (72-54-8)	16	Heptachlor (76-44-8)	8
4,4'-DDT (50-29-3)	16	Methoxychlor (72-43-5)	80
Decachlorobiphenyl (SS) (2051-24-3)	16	2,4,5,6-Tetrachloro- <i>m</i> -xylene (SS) (877-09-8)	8
Dieldrin (60-57-1)	16		

In hexane, 1 mL/ampul

cat.# 32003 (ea.)

**Pesticide Standard Mix B w/Surrogates** (13 components)

Aldrin (309-00-2)	8 $\mu$ g/mL	Endosulfan sulfate (1031-07-8)	16
$\beta$ -BHC (319-85-7)	8	Endrin aldehyde (7421-93-4)	16
$\delta$ -BHC (319-86-8)	8	Endrin ketone (53494-70-5)	16
<i>cis</i> -Chlordane (5103-71-9)	8	Heptachlor epoxide (isomer B) (1024-57-3)	8
<i>trans</i> -Chlordane (5103-74-2)	8		
4,4'-DDE (72-55-9)	16	2,4,5,6-Tetrachloro- <i>m</i> -xylene (SS) (877-09-8)	8
Decachlorobiphenyl (SS) (2051-24-3)	16		
Endosulfan II (33213-65-9)	16		

In hexane, 1 mL/ampul

cat.# 32004 (ea.)

**Pesticide Kit #3**

Calibration mixes only for CLP 04.1. Includes pesticide standard mixes A & B at 16x CRQL with surrogates.

Contains 1 mL each of these mixtures.

32003: Pesticide Standard Mix A w/Surrogates

32004: Pesticide Standard Mix B w/Surrogates

32005: Toxaphene

32007: Aroclor 1221

32008: Aroclor 1232

32009: Aroclor 1242

32010: Aroclor 1248

32011: Aroclor 1254

32039: Aroclor 1016/1260

cat.# 32404 (kit)

kit

Chlordane & Toxaphene Solutions

Volume is 1 mL/ampul. Concentration is  $\mu$ g/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Chlordane	57-74-9	H	1,000	32021
Chlordane	57-74-9	I	5,000	32072
Chlordane	57-74-9	M	2,000	32016
Toxaphene	8001-35-2	H	1,000	32005
Toxaphene	8001-35-2	I	5,000	32071
Toxaphene	8001-35-2	M	2,000	32015

H = hexane; I = isooctane; M = methanol

## Pesticides, Nitrogen & Phosphorus

### Method 507 (Nitrogen & Phosphorus Pesticides)

#### Organonitrogen Pesticide Mix #1 (Rev), Method 525.2 (37 components)

Alachlor (15972-60-8)	Molinate (2212-67-1)
Ametryn (834-12-8)	Napropamide (Devrinol) (15299-99-7)
Atraton (1610-17-9)	Norflurazon (27314-13-2)
Atrazine (1912-24-9)	Pebulate (1114-71-2)
Bromacil (314-40-9)	Prometon (1610-18-0)
Butachlor (23184-66-9)	Prometryne (7287-19-6)
Butylate (2008-41-5)	Propachlor (1918-16-7)
Chlorpropham (101-21-3)	Propazine (139-40-2)
Cyanazine (Bladex) (21725-46-2)	Propyzamide (23950-58-5)
Cycloate (1134-23-2)	Simazine (122-34-9)
Diphenamid (957-51-7)	Simetryn (1014-70-6)
EPTC (759-94-4)	Tebuthiuron (34014-18-1)
Etridiazole (2593-15-9)	Terbacil (5902-51-2)
Fenarimol (60168-88-9)	Terbutryn (886-50-0)
Fluridone (Sonar) (59756-60-4)	Triadimefon (43121-43-3)
Hexazinone (Velpar) (51235-04-2)	Tricyclazole (Beam) (41814-78-2)
Metolachlor (51218-45-2)	Trifluralin (1582-09-8)
Metribuzin (21087-64-9)	Vernolate (1929-77-7)
MGK-264 (113-48-4)	

500 µg/mL each in acetone, 1 mL/ampul

cat.# 33012 (ea.)

#### Organophosphorus Pesticide Mix #1 (Rev), Method 525.2 (7 components)

Chlorpyrifos (2921-88-2)	Methyl paraoxon (Parathion methyl-O-analog) (950-35-6)
Dichlorvos (DDVP) (62-73-7)	Mevinphos (7786-34-7)
Disulfoton sulfone (2497-06-5)	Stirofos (tetrachlorvinphos) (961-11-5)
Ethoprop (ethoprophos) (13194-48-4)	

500 µg/mL each in acetone, 1 mL/ampul

cat.# 33013 (ea.)

#### Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2 (6 components)

Carboxin (5234-68-4)	Fenamiphos (22224-92-6)
Diazinon (333-41-5)	Merphos (150-50-5)
Disulfoton (298-04-4)	Terbufos (13071-79-9)

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 32423 (ea.)

## Compound Index for Reference Standards



See pages 586–592.

## Pesticides, Organophosphorus

### Method 8140, 8141 (Organophosphorus Pesticides)

The preparation of accurate and stable OP standards is complicated by their sensitivity to light, pH, heat, and water. Restek has overcome these issues through our ongoing research into OP pesticide mixtures to save your lab time and effort.

- Solvents are assayed to ensure low water content.
- Reference mixtures are stored in deactivated amber ampuls, under an inert atmosphere.
- Purity is determined by a combination of methods: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.

#### 8140/8141 Internal Standards & Surrogates

##### NPD Detector:

Internal Standard: 1-Bromo-2-nitrobenzene (cat.# 32279)

Surrogate: 4-Chloro-3-nitrobenzotrifluoride (cat.# 32282)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32279 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32282 (ea.)

##### FPD Detector:

Internal Standard: None recommended

Surrogate: Tributylphosphate (cat.# 32280) and Triphenylphosphate (cat.# 32281)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32280 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32281 (ea.)

#### 8140/8141 OP Pesticide Calibration Mix A

(20 components)

Azinphos methyl (86-50-0)	Fenthion (55-38-9)
Chlorpyrifos (2921-88-2)	Merphos (150-50-5)
Coumaphos (56-72-4)	Methyl parathion (298-00-0)
Demeton, O & S (8065-48-3)	Mevinphos (7786-34-7)
Diazinon (333-41-5)	Naled (300-76-5)
Dichlorvos (DDVP) (62-73-7)	Phorate (298-02-2)
Disulfoton (298-04-4)	Prothiofos (34643-46-4)
Ethoprophos (13194-48-4)	Stirofos (tetrachlorvinphos) (961-11-5)
Fenchlorphos (Ronnel) (299-84-3)	Sulprofos (35400-43-2)
Fensulfothion (115-90-2)	Trichloronate (327-98-0)

200 µg/mL each in hexane:acetone (95:5), 1 mL/ampul

cat.# 32277 (ea.)

#### 8141 OP Pesticide Calibration Mix B (7 components)

Dimethoate (60-51-5)	Parathion (ethyl parathion) (56-38-2)
EPN (2104-64-5)	Sulfotepp (3689-24-5)
Malathion (121-75-5)	TEPP (tetraethylpyrophosphate) (107-49-3)
Monocrotophos (6923-22-4)	

200 µg/mL each in hexane:acetone (95:5), 1 mL/ampul

cat.# 32278 (ea.)



## Pesticides, Organophosphorus, *cont.*

### International-Specific

#### Canadian Drinking Water OP Pesticides Mix

(9 components)

Azinphos methyl (86-50-0)	Parathion (ethyl parathion) (56-38-2)
Chlorpyrifos (2921-88-2)	Phorate (298-02-2)
Diazinon (333-41-5)	Temephos (Abate) (3383-96-8)
Dimethoate (60-51-5)	Terbufos (13071-79-9)
Malathion (121-75-5)	

1,000 µg/mL each in acetonitrile, 1 mL/ampul  
cat.# 31867 (ea.)

#### Organophosphorus Pesticide Mix, European

Formulation (16 components)

Acephate (30560-19-1)	200 µg/mL	Methamidophos (10265-92-6)	500
Azinphos methyl (86-50-0)	400	Methidathion (950-37-8)	200
Chlorpyrifos (2921-88-2)	100	Omethoate (1113-02-6)	1,000
Demeton-S-methyl (919-86-8)	200	Pirimiphos methyl (29232-93-7)	100
Dichlorvos (DDVP) (62-73-7)	500	Profenofos (41198-08-7)	200
Dimethoate (60-51-5)	200	Prothiofos (34643-46-4)	200
Ethion (563-12-2)	200	Pyrazophos (13457-18-6)	500
Malathion (121-75-5)	200	Tolclofos-methyl (57018-04-9)	100

In acetone, 1 mL/ampul

cat.# 32418 (ea.)

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See **page 74** for details.



## Pesticides, Pesticides & Flame Retardants

### Method 527 (Pesticides & Flame Retardants—GC-MS)

#### Method 525.2 Internal Standard Mix (3 components)

Acenaphthene-d10 (15067-26-2)	Phenanthrene-d10 (1517-22-2)
Chrysene-d12 (1719-03-5)	

1,000 µg/mL each in acetone, 1 mL/ampul  
cat.# 31825 (ea.)

#### Method 525.2 Surrogate Standard Mix (4 components)

2-Nitro- <i>m</i> -xylene (81-20-9)	Pyrene-d10 (1718-52-1)
Perylene-d12 (1520-96-3)	Triphenylphosphate (115-86-6)

1,000 µg/mL each in acetone, 1 mL/ampul  
cat.# 31826 (ea.)

#### PBDE Mix (5 components)

2,2',4,4',5,5'-Hexabromobiphenyl (59080-40-9)
2,2',4,4',5,5'-Hexabromodiphenyl ether (BDE-153) (68631-49-2)
2,2',4,4',5-Pentabromodiphenyl ether (BDE-99) (60348-60-9)
2,2',4,4',6-Pentabromodiphenyl ether (BDE-100) (189084-64-8)
2,2',4,4'-Tetrabromodiphenyl ether (BDE-47) (5436-43-1)

50 µg/mL each in isoctane:ethyl acetate (4:1), 1 mL/ampul  
cat.# 33098 (ea.)

#### Pesticides Mix #1, Method 527 (16 components)

Atrazine (1912-24-9)	Mirex (2385-85-5)
Bifenthrin (82657-04-3)	Nitrofen (1836-75-5)
Esbiol (Bioallethrin, S-cyclopentyl isomer) (28434-00-6)	Norflurazon (27314-13-2)
Bromacil (314-40-9)	Oxychlorane (27304-13-8)
Esfenvalarate (66230-04-4)	Prometryne (7287-19-6)
Fenvalarate (51630-58-1)	Propazine (139-40-2)
Hexazinone (Velpar) (51235-04-2)	Thiobencarb (28249-77-6)
Kepone (143-50-0)	Vinclozolin (50471-44-8)

500 µg/mL each in ethyl acetate, 1 mL/ampul  
cat.# 33007 (ea.)

#### Pesticides Mix #2, Method 527 (5 components)

Chlorpyrifos (2921-88-2)	Parathion (Ethyl parathion) (56-38-2)
Dimethoate (60-51-5)	Terbufos sulfone (56070-16-7)
Malathion (121-75-5)	

500 µg/mL each in ethyl acetate, 1 mL/ampul  
cat.# 33008 (ea.)

## Pesticides, Phenylurea

### Method 532 (Phenylurea Pesticides)

#### Phenylurea Pesticide Mixture (8 components)

Difluzenzuron (35367-38-5)	Propanil (709-98-8)
Diuron (330-54-1)	Siduron (1982-49-6)
Fluometuron (2164-17-2)	Tebuthiuron (34014-18-1)
Linuron (330-55-2)	Thidiazuron (51707-55-2)

200 µg/mL each in acetonitrile:acetone (90:10), 1 mL/ampul  
cat.# 32434 (ea.)



## Pesticides, State-Specific

### Minnesota Department of Agriculture List 1 Pesticides

#### Minnesota Ag List 1 Pesticides Mix A (16 components)

Acetochlor (34256-82-1)	Metolachlor (51218-45-2)
Alachlor (15972-60-8)	Metribuzin (21087-64-9)
Atrazine (1912-24-9)	Pendimethalin (40487-42-1)
Cyanazine (Bladex) (21725-46-2)	Prometon (1610-18-0)
Desethylatrazine (6190-65-4)	Propachlor (1918-16-7)
Desisopropylatrazine (1007-28-9)	Propazine (139-40-2)
Dimethenamid (87674-68-8)*	Simazine (122-34-9)
Ethalfuralin (55283-68-6)	Trifluralin (1582-09-8)

200 ppm each in acetone, 1 mL/ampul

cat.# 32406 (ea.)

\*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.<sup>1</sup> CAS # 87674-68-8 manufactured by several companies under various trade names.

<sup>1</sup>Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their website at: [www.mda.state.mn.us](http://www.mda.state.mn.us)

#### Minnesota Ag List 1 Pesticides Mix B (6 components)

Chlorpyrifos (2921-88-2)	Phorate (298-02-2)
EPTC (759-94-4)	Terbufos (13071-79-9)
Fonofos (944-22-9)	Triallate (2303-17-5)

200 ppm each in acetone, 1 mL/ampul

cat.# 32407 (ea.)

#### Minnesota Ag List 1 Pesticide Kit

Contains 1 mL each of these mixtures.  
32406: Minnesota Ag List Pesticides Mix A  
32407: Minnesota Ag List Pesticides Mix B  
Contains 1 mL each of these mixtures.

cat.# 32408 (kit)

kit

## Quantity Discounts Available

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Not available for all standards. Contact your local Restek® representative for more details.

## Phenols

### Method 528 (Phenols)

- Reference materials for U.S. EPA Method 528.
- Fortification solution formulated based on MS sensitivity to each analyte.

#### Internal Standard Mix, EPA 528 (2 components)

3-Nitro- <i>o</i> -xylene (83-41-0)	1,000 µg/mL
2,3,4,5-Tetrachlorophenol (4901-51-3)	2,000

In methylene chloride, 1 mL/ampul

cat.# 31696 (ea.)

#### Phenol Calibration Mix, EPA 528 (12 components)

4-Chloro-3-methylphenol (59-50-7)	2-Methylphenol ( <i>o</i> -cresol) (95-48-7)
2-Chlorophenol (95-57-8)	2-Nitrophenol (88-75-5)
2,4-Dichlorophenol (120-83-2)	4-Nitrophenol (100-02-7)
2,4-Dimethylphenol (105-67-9)	Pentachlorophenol (87-86-5)
4,6-Dinitro-2-methylphenol (Dinitro- <i>o</i> -cresol) (534-52-1)	Phenol (108-95-2)
2,4-Dinitrophenol (51-28-5)	2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31694 (ea.)

### Method 604 (Phenols)

#### 604 Phenols Calibration Mix (11 components)

4-Chloro-3-methylphenol (59-50-7)	2,4-Dinitrophenol (51-28-5)
2-Chlorophenol (95-57-8)	2-Nitrophenol (88-75-5)
2,4-Dichlorophenol (120-83-2)	4-Nitrophenol (100-02-7)
2,4-Dimethylphenol (105-67-9)	Pentachlorophenol (87-86-5)
4,6-Dinitro-2-methylphenol (Dinitro- <i>o</i> -cresol) (534-52-1)	Phenol (108-95-2)
	2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31029 (ea.)

### Method 8040 (Phenols)

#### 8040 Surrogate Mix (2 components)

2-Fluorophenol (367-12-4)
2,4,6-Tribromophenol (118-79-6)

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31090 (ea.)

#### 8040 Phenols Mix #1 (9 components)

4-Chloro-3-methylphenol (59-50-7)	2-Nitrophenol (88-75-5)
2,4-Dichlorophenol (120-83-2)	4-Nitrophenol (100-02-7)
4,6-Dinitro-2-methylphenol (Dinitro- <i>o</i> -cresol) (534-52-1)	Pentachlorophenol (87-86-5)
3-Methylphenol ( <i>m</i> -cresol) (108-39-4)	Phenol (108-95-2)
	2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31088 (ea.)

#### 8040 Phenols Mix #2 (9 components)

<i>sec</i> -Butyl-4,6-dinitrophenol (dinoseb) (88-85-7)	2,4-Dinitrophenol (51-28-5)
2-Chlorophenol (95-57-8)	2-Methylphenol ( <i>o</i> -cresol) (95-48-7)
2,6-Dichlorophenol (87-65-0)	4-Methylphenol ( <i>p</i> -cresol) (106-44-5)
2,4-Dimethylphenol (105-67-9)	2,3,4,6-Tetrachlorophenol (58-90-2)
	2,4,5-Trichlorophenol (95-95-4)

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31089 (ea.)

## Phthalates (Phthalate Esters)

### Method 506 (Phthalate & Adipate Esters)

#### 506 Calibration Mix (7 components)

Benzyl butyl phthalate (85-68-7)	Diethylphthalate (84-66-2)
Bis(2-ethylhexyl)adipate (103-23-1)	Dimethylphthalate (131-11-3)
Bis(2-ethylhexyl)phthalate (117-81-7)	Di- <i>n</i> -octyl phthalate (117-84-0)
Di- <i>n</i> -butylphthalate (84-74-2)	

1,000 µg/mL in isooctane, 1 mL/ampul

cat.# 31845 (ea.)

### Method 606 (Phthalate Esters)

#### 606 Phthalate Esters Calibration Mix (6 components)

Bis(2-ethylhexyl)phthalate (117-81-7)	Diethylphthalate (84-66-2)
Benzyl butyl phthalate (85-68-7)	Dimethylphthalate (131-11-3)
Di- <i>n</i> -butyl phthalate (84-74-2)	Di- <i>n</i> -octyl phthalate (117-84-0)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31031 (ea.)

### Method 8061A (Phthalate Esters)

#### Benzyl Benzoate (Internal Standard)

Benzyl benzoate (120-51-4)

5,000 µg/mL in hexane, 1 mL/ampul

cat.# 31847 (ea.)

#### EPA Method 8061A Phthalate Esters Mixture

(15 components)

Benzyl butyl phthalate (85-68-7)	Diethylphthalate (84-66-2)
Bis(2- <i>n</i> -butoxyethyl)phthalate (117-83-9)	Di- <i>n</i> -hexyl phthalate (84-75-3)
Bis(2-ethoxyethyl)phthalate (605-54-9)	Dimethylphthalate (131-11-3)
Bis(2-ethylhexyl)phthalate (117-81-7)	Di-nonyl phthalate (84-76-4)
Bis(2-methoxyethyl)phthalate (117-82-8)	Di- <i>n</i> -octyl phthalate (117-84-0)
Bis(4-methyl-2-pentyl)phthalate (146-50-9)	Dipentylphthalate (131-18-0)
Di- <i>n</i> -butylphthalate (84-74-2)	Phthalic acid dicyclohexyl ester (84-61-7)
	Phthalic acid diisobutyl ester (84-69-5)

1,000 µg/mL each in hexane:acetone (80:20), 1 mL/ampul

cat.# 33227 (ea.)

## Polychlorinated Biphenyls (PCBs)

### PCB Aroclors

#### 608 Complete Kit

Contains 1 mL each of these mixtures.

32022: 608 Calibration Mix  
32006: Aroclor 1016  
32007: Aroclor 1221  
32008: Aroclor 1232  
32009: Aroclor 1242  
32010: Aroclor 1248  
32011: Aroclor 1254  
32012: Aroclor 1260  
32005: toxaphene  
32021: chlordanes

Contains 1 mL each of these mixtures.

cat.# 32060 (kit)

kit

#### PCB Kit #1

1,000 µg/mL each in hexane, 1 mL/ampul

32006: Aroclor 1016  
32007: Aroclor 1221  
32008: Aroclor 1232  
32009: Aroclor 1242  
32010: Aroclor 1248  
32011: Aroclor 1254  
32012: Aroclor 1260

cat.# 32089 (kit)

kit

#### PCB Kit #2

200 µg/mL each in isooctane, 1 mL/ampul

32064: Aroclor 1016  
32065: Aroclor 1221  
32066: Aroclor 1232  
32067: Aroclor 1242  
32068: Aroclor 1248  
32069: Aroclor 1254  
32070: Aroclor 1260

cat.# 32090 (kit)

kit

#### PCB Kit #3

1,000 µg/mL each in hexane, 1 mL/ampul

32007: Aroclor 1221  
32008: Aroclor 1232  
32009: Aroclor 1242  
32010: Aroclor 1248  
32011: Aroclor 1254  
32039: Aroclor 1016/1260

cat.# 32400 (kit)

kit

#### PCB Kit #4

200 µg/mL each in isooctane, 1 mL/ampul

32065: Aroclor 1221  
32066: Aroclor 1232  
32067: Aroclor 1242  
32068: Aroclor 1248  
32069: Aroclor 1254  
32299: Aroclor 1016/1260

cat.# 32401 (kit)

kit

## Polybrominated Diphenyl Ethers (PBDEs)

See page 528.

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See pages 464-465.



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## Polychlorinated Biphenyls (PCBs), *cont.*

### PCB Aroclors, *cont.*

#### Aroclor Solutions

Volume is 1 mL/ampul. Concentration is µg/mL unless otherwise noted.

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	H	1,000	32006
Aroclor 1016	12674-11-2	I	200	32064
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1221	11104-28-2	H	1,000	32007
Aroclor 1221	11104-28-2	I	200	32065
Aroclor 1232	11141-16-5	H	1,000	32008
Aroclor 1232	11141-16-5	I	200	32066
Aroclor 1242	53469-21-9	H	1,000	32009
Aroclor 1242	53469-21-9	I	200	32067
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1248	12672-29-6	H	1,000	32010
Aroclor 1248	12672-29-6	I	200	32068
Aroclor 1254	11097-69-1	H	1,000	32011
Aroclor 1254	11097-69-1	I	200	32069
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1260	11096-82-5	H	1,000	32012
Aroclor 1260	11096-82-5	I	200	32070
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088
Aroclor 1262	37324-23-5	H	1,000	32409
Aroclor 1268	11100-14-4	H	1,000	32410
Aroclor 1016/1260		H	1,000	32039
Aroclor 1016/1260		I	200	32299
Aroclor 1016/1260		A	400	32456

A = acetone; H = hexane; I = isooctane; TO = transformer oil (PCB-free)

### please note

We test our transformer oil solvent to ensure that it is PCB-free.

## PCB Congeners

### Method 525.2 (Semivolatile Organics)

#### Method 525.2 PCB Congener Mix (8 components)

2-Chlorobiphenyl (BZ #1) (2051-60-7)  
2,3-Dichlorobiphenyl (BZ #5) (16605-91-7)  
2,4,5-Trichlorobiphenyl (BZ #29) (15862-07-4)  
2,2',4,4'-Tetrachlorobiphenyl (BZ #47) (2437-79-8)  
2,2',3',4,6-Pentachlorobiphenyl (BZ #98) (60233-25-2)  
2,2',4,4',5,6'-Hexachlorobiphenyl (BZ #154) (60145-22-4)  
2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ #171) (52663-71-5)  
2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ #200) (40186-71-8)

200 µg/mL each in acetone, 1 mL/ampul

cat.# 32420 (ea.)

### PCB Congeners, *cont.*

#### Method 8082, 8082A (PCBs)

#### PCB Congener Mix, Method 8082A (19 components)

2-Chlorobiphenyl (BZ #1) (2051-60-7)  
2,3-Dichlorobiphenyl (BZ #5) (16605-91-7)  
2,2',5-Trichlorobiphenyl (BZ #18) (37680-65-2)  
2,4',5-Trichlorobiphenyl (BZ #31) (16606-02-3)  
2,2',3,5'-Tetrachlorobiphenyl (BZ #44) (41464-39-5)  
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)  
2,3',4,4'-Tetrachlorobiphenyl (BZ #66) (32598-10-0)  
2,2',3,4,5'-Pentachlorobiphenyl (BZ #87) (38380-02-8)  
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)  
2,3,3',4',6-Pentachlorobiphenyl (BZ #110) (38380-03-9)  
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)  
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ #141) (52712-04-6)  
2,2',3,5,5',6-Hexachlorobiphenyl (BZ #151) (52663-63-5)  
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)  
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ #170) (35065-30-6)  
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)  
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ #183) (52663-69-1)  
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ #187) (52663-68-0)  
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ #206) (40186-72-9)

100 µg/mL each in isooctane, 1 mL/ampul

cat.# 32416 (ea.)

### Miscellaneous

#### PCB Congeners

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289

I = isooctane

#### PCB Congener Standard #1 (6 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)  
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)  
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)  
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)  
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)  
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32290 (ea.)

#### PCB Congener Standard #2 (7 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)  
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)  
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)  
2,3',4,4',5-Pentachlorobiphenyl (BZ #118) (31508-00-6)  
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)  
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)  
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32294 (ea.)

## Polycyclic Aromatic Hydrocarbons (PAHs)

See pages 511–513.

## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs)

### Individual Semivolatile Surrogate and Internal Standards for EPA Methods

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Anthracene-d10	1719-06-08	D	2,000	31037
Decafluorobiphenyl	434-90-2	D	2,000	31041
Decafluorobiphenyl	434-90-2	A	1,000	31855
4,4'-Dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040
2-Fluorobiphenyl	321-60-8	D	2,000	31091
2-Fluorophenol	367-12-4	D	2,000	31047
Naphthalene-d8	1146-65-2	D	2,000	31043
N-Nitrosodimethylamine-d6	17829-05-9	D	1,000	33910
Pentafluorophenol	771-61-9	D	2,000	31048
Phenanthrene-d10	1517-22-2	D	2,000	31045
Phenol-d6	13127-88-3	D	2,000	31049
p-Terphenyl-d14	1718-51-0	D	1,000	31828
2,4,6-Tribromophenol	118-79-6	M	1,000	31401

A = acetone; D = methylene chloride; M = methanol

### SV Internal Standard Mix (6 components)

Acenaphthene-d10 (15067-26-2)      Naphthalene-d8 (1146-65-2)  
 Chrysene-d12 (1719-03-5)      Perylene-d12 (1520-96-3)  
 1,4-Dichlorobenzene-d4 (3855-82-1)      Phenanthrene-d10 (1517-22-2)

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

### Method 525, 525.1, 525.2 (Semivolatile Organics)

#### Method 525.2 Internal Standard Mix (3 components)

Acenaphthene-d10 (15067-26-2)      Phenanthrene-d10 (1517-22-2)  
 Chrysene-d12 (1719-03-5)  
 1,000 µg/mL each in acetone, 1 mL/ampul  
 cat.# 31825 (ea.)

#### Method 525.2 Surrogate Standard Mix (4 components)

2-Nitro-m-xylene (81-20-9)      Pyrene-d10 (1718-52-1)  
 Perylene-d12 (1520-96-3)      Triphenylphosphate (115-86-6)  
 1,000 µg/mL each in acetone, 1 mL/ampul  
 cat.# 31826 (ea.)

#### Method 525.2 Herbicide Mix (3 components)

Acetochlor (34256-82-1)      Metolachlor (51218-45-2)  
 Alachlor (15972-60-8)  
 100 µg/mL in methanol, 1 mL/ampul  
 cat.# 33211 (ea.)

#### Method 525.2 Semivolatile Mix (revised)

(28 components)

Acenaphthylene (208-96-8)      Di-n-butylphthalate (84-74-2)  
 Anthracene (120-12-7)      2,4-Dinitrotoluene (121-14-2)  
 Benz(a)anthracene (56-55-3)      2,6-Dinitrotoluene (606-20-2)  
 Benzo(a)pyrene (50-32-8)      Di-n-octylphthalate (117-84-0)  
 Benzo(b)fluoranthene (205-99-2)      Fluoranthene (206-44-0)  
 Benzo(ghi)perylene (191-24-2)      Fluorene (86-73-7)  
 Benzo(k)fluoranthene (207-08-9)      Hexachlorobenzene (118-74-1)  
 Benzyl butyl phthalate (85-68-7)      Hexachlorocyclopentadiene (77-47-4)  
 Bis(2-ethylhexyl)adipate (103-23-1)      Indeno(1,2,3-cd)pyrene (193-39-5)  
 Bis(2-ethylhexyl)phthalate (117-81-7)      Isophorone (78-59-1)  
 Chrysene (218-01-9)      Naphthalene (91-20-3)  
 Dibenz(a,h)anthracene (53-70-3)      Pentachlorophenol (87-86-5)\*  
 Diethylphthalate (84-66-2)      Phenanthrene (85-01-8)  
 Dimethylphthalate (131-11-3)      Pyrene (129-00-0)

1,000 µg/mL each in acetone, 1 mL/ampul\*  
 cat.# 31899 (ea.)

\*pentachlorophenol at 4,000 µg/mL.

#### Method 525.2 PCB Congener Mix (8 components)

2-Chlorobiphenyl (BZ #1) (2051-60-7)  
 2,3-Dichlorobiphenyl (BZ #5) (16605-91-7)  
 2,4,5-Trichlorobiphenyl (BZ #29) (15862-07-4)  
 2,2',4,4'-Tetrachlorobiphenyl (BZ #47) (2437-79-8)  
 2,2',3',4,6-Pentachlorobiphenyl (BZ #98) (60233-25-2)  
 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ #154) (60145-22-4)  
 2,2',3,3',4,4',6-Heptachlorobiphenyl (BZ #171) (52663-71-5)  
 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ #200) (40186-71-8)

200 µg/mL each in acetone, 1 mL/ampul  
 cat.# 32420 (ea.)



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See pages 464-465 or visit [www.restek.com/iso](http://www.restek.com/iso)



## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

### Method 525, 525.1, 525.2 (Semivolatile Organics), *cont.*

#### Organochlorine Pesticide Mix AB # 3 (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
$\alpha$ -BHC (319-84-6)	Endosulfan II (33213-65-9)
$\beta$ -BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
$\delta$ -BHC (319-86-8)	Endrin (72-20-8)
$\gamma$ -BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
<i>cis</i> -Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
<i>trans</i> -Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDE (72-55-9)	Methoxychlor (72-43-5)
4,4'-DDT (50-29-3)	
Dieldrin (60-57-1)	

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul  
cat.# 32415 (ea.)

#### Organophosphorus Pesticide Mix #1 (Rev), Method 525.2 (7 components)

Chlorpyrifos (2921-88-2)	Methyl paraoxon (Parathion methyl-O-analog) (950-35-6)
Dichlorvos (DDVP) (62-73-7)	Mevinphos (7786-34-7)
Disulfoton sulfone (2497-06-5)	Stirofos (tetrachlorvinphos) (961-11-5)
Ethoprop (ethoprophos) (13194-48-4)	

500 µg/mL each in acetone, 1 mL/ampul  
cat.# 33013 (ea.)

#### Organonitrogen Pesticide Mix #1 (Rev), Method 525.2

(37 components)

Alachlor (15972-60-8)	Molinate (2212-67-1)
Ametryn (834-12-8)	Napropamide (Devrinol) (15299-99-7)
Atraton (1610-17-9)	Norflurazon (27314-13-2)
Atrazine (1912-24-9)	Pebulate (1114-71-2)
Bromacil (314-40-9)	Prometon (1610-18-0)
Butachlor (23184-66-9)	Prometryne (7287-19-6)
Butylate (2008-41-5)	Propachlor (1918-16-7)
Chlorpropham (101-21-3)	Propazine (139-40-2)
Cyanazine (Bladex) (21725-46-2)	Propyzamide (23950-58-5)
Cycloate (1134-23-2)	Simazine (122-34-9)
Diphenamid (957-51-7)	Simetryn (1014-70-6)
EPTC (759-94-4)	Tebuthiuron (34014-18-1)
Etridiazole (2593-15-9)	Terbacil (5902-51-2)
Fenarimol (60168-88-9)	Terbutryn (886-50-0)
Fluridone (Sonar) (59756-60-4)	Triadimefon (43121-43-3)
Hexazinone (Velpar) (51235-04-2)	Tricyclazole (Beam) (41814-78-2)
Metolachlor (51218-45-2)	Trifluralin (1582-09-8)
Metribuzin (21087-64-9)	Vernolate (1929-77-7)
MGK-264 (113-48-4)	

500 µg/mL each in acetone, 1 mL/ampul  
cat.# 33012 (ea.)

#### Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2

(6 components)

Carboxin (5234-68-4)	Fenamiphos (22224-92-6)
Diazinon (333-41-5)	Merphos (150-50-5)
Disulfoton (298-04-4)	Terbufos (13071-79-9)

1,000 µg/mL each in acetone, 1 mL/ampul  
cat.# 32423 (ea.)

#### Organochlorine Pesticide Mix #2 (Rev), Method 525.2

(8 components)

Chlorobenzilate (510-15-6)	Heptachlor epoxide (isomer A) (28044-83-9)
Chloroneb (2675-77-6)	<i>trans</i> -Nonachlor (39765-80-5)
Chlorothalonil (1897-45-6)	<i>cis</i> -Permethrin (61949-76-6)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)	<i>trans</i> -Permethrin (61949-77-7)

500 µg/mL each in acetone, 1 mL/ampul  
cat.# 33011 (ea.)

#### Method 525.2 Fortification Recovery Standard

*p*-Terphenyl-d14 (1718-51-0)

1,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31828 (ea.)

#### Method 525.2 GC-MS Performance Check Mix

(3 components)

4,4'-DDT (50-29-3)
DFTPP (decafluorotriphenylphosphine) (5074-71-5)
Endrin (72-20-8)

1,000 µg/mL each in acetone, 1 mL/ampul  
cat.# 31827 (ea.)

## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

### Method 625 (Semivolatiles)

#### Semivolatiles MegaMix® Standard, EPA Method 625 (54 components)

MEGAMIX®

Acenaphthene (83-32-9)	2,4-Dinitrophenol (51-28-5)
Acenaphthylene (208-96-8)	2,4-Dinitrotoluene (121-14-2)
Anthracene (120-12-7)	2,6-Dinitrotoluene (606-20-2)
Benzo(a)anthracene (56-55-3)	Di- <i>n</i> -octylphthalate (117-84-0)
Benzo(a)pyrene (50-32-8)	Diphenylamine (122-39-4)*
Benzo(b)fluoranthene (205-99-2)	Fluoranthene (206-44-0)
Benzo(ghi)perylene (191-24-2)	Fluorene (86-73-7)
Benzo(k)fluoranthene (207-08-9)	Hexachlorobenzene (118-74-1)
Benzyl butyl phthalate (85-68-7)	Hexachloro-1,3-butadiene (87-68-3)
Bis(2-chloroethoxy)methane (111-91-1)	Hexachlorocyclopentadiene (77-47-4)*
Bis(2-chloroethyl)ether (111-44-4)	Hexachloroethane (67-72-1)
Bis(2-ethylhexyl)phthalate (117-81-7)	Indeno(1,2,3- <i>cd</i> )pyrene (193-39-5)
4-Bromophenyl phenyl ether (101-55-3)	Isophorone (78-59-1)
4-Chloro-3-methylphenol (59-50-7)	Naphthalene (91-20-3)
2-Chloronaphthalene (91-58-7)	Nitrobenzene (98-95-3)
2-Chlorophenol (95-57-8)	2-Nitrophenol (88-75-5)
4-Chlorophenyl phenyl ether (7005-72-3)	4-Nitrophenol (100-02-7)
Chrysene (218-01-9)	N-Nitrosodimethylamine (62-75-9)*
Dibenz(a,h)anthracene (53-70-3)	N-Nitroso-di- <i>n</i> -propylamine (621-64-7)
1,2-Dichlorobenzene (95-50-1)	2,2'-Oxybis(1-chloropropane) (108-60-1)
1,3-Dichlorobenzene (541-73-1)	Pentachlorophenol (87-86-5)
1,4-Dichlorobenzene (106-46-7)	Phenanthrene (85-01-8)
2,4-Dichlorophenol (120-83-2)	Phenol (108-95-2)
Diethylphthalate (84-66-2)	Pyrene (129-00-0)
2,4-Dimethylphenol (105-67-9)	1,2,4-Trichlorobenzene (120-82-1)
Dimethylphthalate (131-11-3)	2,4,6-Trichlorophenol (88-06-2)
Di- <i>n</i> -butylphthalate (84-74-2)	
4,6-Dinitro-2-methylphenol (Dinitro- <i>o</i> -cresol) (534-52-1)	

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31829 (ea.)

\*Listed as an "additional compound" in Method 625 (listed compound N-nitrosodiphenylamine decomposes to MegaMix® component diphenylamine). The six other "additional compounds" are components in other Restek® reference mixes used for Method 625: benzidine is included in cat.# 31030 (page 537); β-BHC, δ-BHC, endosulfan I, endosulfan II, endrin are in cat.# 32291 (page 524) and cat.# 32415 (page 537).

### Method 625 (Semivolatiles), *cont.*

#### 625 Kit

Because most laboratories do not routinely analyze pesticides, PCBs, toxaphene, and chlordane in their calibration mixtures for Method 625, these mixtures are not included in the 625 kit. They may be purchased separately or in the 608 complete kit. See page 523.

Contains 1 mL each of these mixtures.

31029: 604 Phenols Mix  
31030: 605 Benzidines Mix  
31031: 606 Phthalate Esters Mix  
31032: 607 Nitrosamines Mix  
31033: 609 Nitroaromatics/Isophorone Mix  
31011: 610 PAH Mix (SV Calibration Mix #5)  
31034: 611 Haloethers Mix  
31035: 612 Chlorinated Hydrocarbons Mix

cat.# 31036 (kit)

kit

### TCLP

#### TCLP B/N Mix (7 components)

1,4-Dichlorobenzene (106-46-7)	Hexachloroethane (67-72-1)
2,4-Dinitrotoluene (121-14-2)	Nitrobenzene (98-95-3)
Hexachlorobenzene (118-74-1)	Pyridine (110-86-1)
Hexachlorobutadiene (87-68-3)	

2,000 µg/mL each in acetone, 1 mL/ampul  
cat.# 31028 (ea.)

### Method 3500 (Organic Extraction Surrogates)

#### High-Concentration Surrogates and Matrix Spike Mixtures for SW-846

- Highest concentrations commercially available—reduces cost per sample extract.
- Convenient 1 mL and 5 mL packaging.

See Method 8270, pages 535–538.

### also available

#### Rxi®-5Sil MS Columns for EPA Methods 625 and 8270

Guaranteed for low GC-MS bleed, excellent phenol response, and the resolution needed to quantify critical pairs and structural isomers.

See **page 32–33** for more information.



## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

### Method 8270C, 8270D (Semivolatile Organic Compounds)

#### SV Internal Standard Mix (6 components)

- High purity for consistent results.
- Free quality assurance data package available online.
- Highest concentrations commercially available.

Each	15-pk.	25-pk.
Acenaphthene-d10 (15067-26-2) Chrysene-d12 (1719-03-5) 1,4-Dichlorobenzene-d4 (3855-82-1)	Naphthalene-d8 (1146-65-2) Perylene-d12 (1520-96-3) Phenanthrene-d10 (1517-22-2)	
2,000 µg/mL each in methylene chloride, 1 mL/ampul 31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul 31006	31006.15	31006.25

#### Revised SV Internal Standard Mix (7 components)

Each	15-pk.	25-pk.
Acenaphthene-d10 (15067-26-2) Chrysene-d12 (1719-03-5) 1,4-Dichlorobenzene-d4 (3855-82-1) 1,4-Dioxane-d8 (17647-74-4)	Naphthalene-d8 (1146-65-2) Perylene-d12 (1520-96-3) Phenanthrene-d10 (1517-22-2)	
2,000 µg/mL each in methylene chloride, 1 mL/ampul 31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul 31886	—	—

#### B/N Surrogate Mix (4/89 SOW) (3 components)

- High purity for consistent results.
- Free quality assurance data package available online.
- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes reduce cost per sample extract.

Each	15-pk.	25-pk.
2-Fluorobiphenyl (321-60-8) Nitrobenzene-d5 (4165-60-0)	<i>p</i> -Terphenyl-d14 (1718-51-0)	
1,000 µg/mL each in methylene chloride, 1 mL/ampul 31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul 31062	31062.15	—
5,000 µg/mL each in methylene chloride, 5 mL/ampul 31086	—	—
5,000 µg/mL each in methylene chloride, 10 mL/ampul 33028	—	33028.25

#### Revised B/N Surrogate Mix (4 components)

Each	15-pk.
2-Fluorobiphenyl (321-60-8) Nitrobenzene-d5 (4165-60-0)	<i>p</i> -Terphenyl-d14 (1718-51-0) Pyrene-d10 (1718-52-1)
1,000 µg/mL each in methylene chloride, 1 mL/ampul 31887	31887.15
5,000 µg/mL each in methylene chloride, 1 mL/ampul 31888	31888.15
5,000 µg/mL each in methylene chloride, 5 mL/ampul 31889	—

#### Acid Surrogate Mix (4/89 SOW) (3 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

Each	15-pk.	25-pk.
2-Fluorophenol (367-12-4) Phenol-d6 (13127-88-3)	2,4,6-Tribromophenol (118-79-6)	
2,000 µg/mL each in methanol, 1 mL/ampul 31025	31025.15	31025.25
10,000 µg/mL each in methanol, 1 mL/ampul 31063	31063.15	—
10,000 µg/mL each in methanol, 5 mL/ampul 31087	—	—
10,000 µg/mL each in methanol, 10 mL/ampul 33029	—	33029.25

#### B/N Matrix Spike Mix (6 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

Each	15-pk.
Acenaphthene (83-32-9) 1,4-Dichlorobenzene (106-46-7) 2,4-Dinitrotoluene (121-14-2)	N-Nitroso-di- <i>n</i> -propylamine (621-64-7) Pyrene (129-00-0) 1,2,4-Trichlorobenzene (120-82-1)
1,000 µg/mL each in methanol, 1 mL/ampul 31004	31004.15
5,000 µg/mL each in methanol, 1 mL/ampul 31074	—
5,000 µg/mL each in methanol, 5 mL/ampul 31084	—

#### Acid Matrix Spike Mix (5 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

Each	15-pk.
4-Chloro-3-methylphenol (59-50-7) 2-Chlorophenol (95-57-8) 4-Nitrophenol (100-02-7)	Pentachlorophenol (87-86-5) Phenol (108-95-2)
2,000 µg/mL each in methanol, 1 mL/ampul 31014	31014.15
10,000 µg/mL each in methanol, 1 mL/ampul 31061	31061.15
10,000 µg/mL each in methanol, 5 mL/ampul 31071	—





## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

### Method 8270C, 8270D (Semivolatile Organic Compounds), *cont.*

#### GC-MS Tuning Mixture (4 components)

Benzidine (92-87-5)  
 4,4'-DDT (50-29-3)  
 Decafluorotriphenylphosphine (DFTPP) (5074-71-5)  
 Pentachlorophenol (87-86-5)  
 1,000 µg/mL each in methylene chloride, 1 mL/ampul  
 cat.# 31615 (ea.)

#### SV Tuning Compound

Decafluorotriphenylphosphine (DFTPP) (5074-71-5)  
 2,500 µg/mL in methylene chloride, 1 mL/ampul  
 cat.# 31001 (ea.)

#### PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)  
 Neat, 1 mL/ampul  
 cat.# 30482 (ea.)

No data pack available.

#### 8270 B/N Calibration Check Mix (7 components)

Acenaphthene (83-32-9)	Diphenylamine (122-39-4)
Benzo(a)pyrene (50-32-8)	Fluoranthene (206-44-0)
1,4-Dichlorobenzene (106-46-7)	Hexachlorobutadiene (87-68-3)
Di- <i>n</i> -octyl phthalate (117-84-0)	

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
 cat.# 31616 (ea.)

#### 8270 Acid Calibration Check Mix (6 components)

4-Chloro-3-methylphenol (59-50-7)	Pentachlorophenol (87-86-5)
2,4-Dichlorophenol (120-83-2)	Phenol (108-95-2)
2-Nitrophenol (88-75-5)	2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
 cat.# 31617 (ea.)

#### SV System Performance Check Mix (SPCC)

(4 components)

2,4-Dinitrophenol (51-28-5)	4-Nitrophenol (100-02-7)
Hexachlorocyclopentadiene (77-47-4)	N-Nitroso-di- <i>n</i> -propylamine (621-64-7)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
 cat.# 31689 (ea.)



#### 8270 MegaMix® Standard (76 components)

- Fewest mixtures needed for calibration and matrix spikes.
- Mixtures formulated for maximum stability.
- Contains most routinely analyzed compounds.

Acenaphthene (83-32-9)	2,4-Dinitrophenol (51-28-5)
Acenaphthylene (208-96-8)	2,4-Dinitrotoluene (121-14-2)
Aniline (62-53-3)	2,6-Dinitrotoluene (606-20-2)
Anthracene (120-12-7)	Di- <i>n</i> -octyl phthalate (117-84-0)
Azobenzene (103-33-3) <sup>1</sup>	Diphenylamine (122-39-4) <sup>2</sup>
Benzo(a)anthracene (56-55-3)	Fluoranthene (206-44-0)
Benzo(a)pyrene (50-32-8)	Fluorene (86-73-7)
Benzo(b)fluoranthene (205-99-2)	Hexachlorobenzene (118-74-1)
Benzo(ghi)perylene (191-24-2)	Hexachlorobutadiene (87-68-3)
Benzo(k)fluoranthene (207-08-9)	Hexachlorocyclopentadiene (77-47-4)
Benzyl alcohol (100-51-6)	Hexachloroethane (67-72-1)
Benzyl butyl phthalate (85-68-7)	Indeno(1,2,3- <i>cd</i> )pyrene (193-39-5)
Bis(2-chloroethoxy)methane (111-91-1)	Isophorone (78-59-1)
Bis(2-chloroethyl)ether (111-44-4)	1-Methylnaphthalene (90-12-0)
Bis(2-ethylhexyl)adipate (103-23-1)	2-Methylnaphthalene (91-57-6)
Bis(2-ethylhexyl)phthalate (117-81-7)	2-Methylphenol ( <i>o</i> -cresol) (95-48-7)
4-Bromophenyl phenyl ether (101-55-3)	3-Methylphenol ( <i>m</i> -cresol) (108-39-4)*
Carbazole (86-74-8)	4-Methylphenol ( <i>p</i> -cresol) (106-44-5)*
4-Chloroaniline (106-47-8)	Naphthalene (91-20-3)
4-Chloro-3-methylphenol (59-50-7)	2-Nitroaniline (88-74-4)
2-Chloronaphthalene (91-58-7)	3-Nitroaniline (99-09-2)
2-Chlorophenol (95-57-8)	4-Nitroaniline (100-01-6)
4-Chlorophenyl phenyl ether (7005-72-3)	Nitrobenzene (98-95-3)
Chrysene (218-01-9)	2-Nitrophenol (88-75-5)
Dibenz(a,h)anthracene (53-70-3)	4-Nitrophenol (100-02-7)
Dibenzofuran (132-64-9)	N-Nitrosodimethylamine (62-75-9)
1,2-Dichlorobenzene (95-50-1)	N-Nitroso-di- <i>n</i> -propylamine (621-64-7)
1,3-Dichlorobenzene (541-73-1)	2,2'-Oxybis(1-chloropropane) (108-60-1)
1,4-Dichlorobenzene (106-46-7)	Pentachlorophenol (87-86-5)
2,4-Dichlorophenol (120-83-2)	Phenanthrene (85-01-8)
Diethylphthalate (84-66-2)	Phenol (108-95-2)
2,4-Dimethylphenol (105-67-9)	Pyrene (129-00-0)
Dimethylphthalate (131-11-3)	Pyridine (110-86-1)
Di- <i>n</i> -butyl phthalate (84-74-2)	2,3,4,6-Tetrachlorophenol (58-90-2)
1,2-Dinitrobenzene (528-29-0)	2,3,5,6-Tetrachlorophenol (935-95-5)
1,3-Dinitrobenzene (99-65-0)	1,2,4-Trichlorobenzene (120-82-1)
1,4-Dinitrobenzene (100-25-4)	2,4,5-Trichlorophenol (95-95-4)
4,6-Dinitro-2-methylphenol (Dinitro- <i>o</i> -cresol) (534-52-1)	2,4,6-Trichlorophenol (88-06-2)

1,000 µg/mL each in methylene chloride, 1 mL/ampul\*  
 cat.# 31850 (ea.)

\*3-methylphenol and 4-methylphenol concentration is 500 µg/mL.

<sup>1</sup>1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

<sup>2</sup>N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.



#### 8270 Matrix Spike Mix (76 components)

Same as 8270 MegaMix® standard list above.

Each	15-pk.
200 µg/mL each in methanol:methylene chloride (80:20), 5 mL/ampul*	
31687	31687.15
200 µg/mL each in methanol:methylene chloride (80:20), 10 mL/ampul*	
33073	—

\*3-methylphenol and 4-methylphenol concentration is 100 µg/mL.



8270 MegaMix® standard and 8270 matrix spike mix include 3-methylphenol and 4-methylphenol at 1/2 x concentration of other components.

### also available

#### Rxi®-5Sil MS Columns

Provide high response for 2,4-dinitrophenol, show excellent peak shape of pyridine, and produce outstanding resolution of PAHs.

See page 75.





Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*Method 8270C, 8270D (Semivolatile Organic Compounds), *cont.*

## 605 Benzidines Calibration Mix (2 components)

Benzidine (92-87-5)	
3,3'-Dichlorobenzidine (91-94-1)	
2,000 µg/mL each in methanol, 1 mL/ampul	
	cat.# 31030 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul	
	cat.# 31834 (ea.)

## 8270 Benzidines Mix (3 components)

Benzidine (92-87-5)	3,3'-Dimethylbenzidine ( <i>o</i> -tolidine)
3,3'-Dichlorobenzidine (91-94-1)	(119-93-7)
2,000 µg/mL each in methanol, 1 mL/ampul	
	cat.# 31688 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul	
	cat.# 31852 (ea.)

## 8270/Appendix IX Kit

Contains 1 mL each of these mixtures.  
 31850: 8270 MegaMix Standard  
 31834: 605 Benzidines Calibration Mix  
 32459: Appendix IX Mix #1, Revised (Methapyrilene is not included in this revised standard.)  
 32460: Methapyrilene Standard  
 31806: Appendix IX Mix #2

cat.# 31815 (kit)

kit

## Appendix IX Mix #1, Revised (17 components)

2-Acetylaminofluorene (53-96-3)	N-Nitrosodibutylamine (924-16-3)
4-Aminobiphenyl (92-67-1)	N-Nitrosodiethylamine (55-18-5)
<i>p</i> -Dimethylaminoazobenzene (60-11-7)	N-Nitrosomethylethylamine (10595-95-6)
3,3'-Dimethylbenzidine ( <i>o</i> -tolidine)	N-Nitrosomorpholine (59-89-2)
(119-93-7)	N-Nitrosopiperidine (100-75-4)
$\alpha,\alpha$ -Dimethylphenethylamine	N-Nitrosopyrrolidine (930-55-2)
(phentermine) (122-09-8)	5-Nitro- <i>o</i> -tolidine (99-55-8)
1-Naphthylamine (1-aminonaphthalene)	1,4-Phenylenediamine (106-50-3)
(134-32-7)	2-Picoline (109-06-8)
2-Naphthylamine (2-aminonaphthalene)	<i>o</i> -Tolidine (95-53-4)
(91-59-8)	
2,000 µg/mL each in methylene chloride, 1 mL/ampul	
	cat.# 32459 (ea.)

## Appendix IX Mix #2 (32 components)

Acetophenone (98-86-2)	Hexachloropropene (1888-71-7)
Aramite (140-57-8)	Isodrin (465-73-6)
Atrazine (1912-24-9)	Isosafrole ( <i>cis</i> & <i>trans</i> ) (120-58-1)
Benzaldehyde (100-52-7)	Kepone (143-50-0)
Biphenyl (92-52-4)	3-Methylcholanthrene (56-49-5)
$\epsilon$ -Caprolactam (105-60-2)	Methyl methanesulfonate (66-27-3)
Chlorobenzilate (510-15-6)	1,4-Naphthoquinone (130-15-4)
1-Chloronaphthalene (90-13-1)	4-Nitroquinoline-N-oxide (56-57-5)
Diallate (2303-16-4)	Pentachlorobenzene (608-93-5)
Dibenz(a,j)acridine (224-42-0)	Pentachloroethane (76-01-7)
2,6-Dichlorophenol (87-65-0)	Pentachloronitrobenzene (quintozone)
7,12-Dimethylbenz(a)anthracene (57-97-6)	(82-68-8)
1,4-Dioxane (123-91-1)	Phenacetin (62-44-2)
Diphenyl ether (101-84-8)	Propyzamide (23950-58-5)
Ethyl methacrylate (97-63-2)	Safrole (94-59-7)
Ethyl methanesulfonate (62-50-0)	1,2,4,5-Tetrachlorobenzene (95-94-3)
	1,3,5-Trinitrobenzene (99-35-4)

1,000 µg/mL each in methylene chloride, 1 mL/ampul  
 cat.# 31806 (ea.)

## Methapyrilene Standard

Methapyrilene hydrochloride (135-23-9)
2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 32460 (ea.)

## Organophosphorus Pesticide Mix, 8270/Appendix IX

(9 components)

Dimethoate (60-51-5)	Parathion (ethyl parathion) (56-38-2)
Disulfoton (298-04-4)	Phorate (298-02-2)
Famphur (52-85-7)	Sulfotepp (3689-24-5)
Methyl parathion (298-00-0)	Zinophos (thionazine) (297-97-2)
O,O,O-Triethyl phosphorothioate	
(126-68-1)	
2,000 µg/mL in methylene chloride, 1 mL/ampul	
cat.# 32419 (ea.)	

## Organochlorine Pesticide Mix AB # 3 (20 components)

Aldrin (309-00-2)	Endosulfan I (959-98-8)
$\alpha$ -BHC (319-84-6)	Endosulfan II (33213-65-9)
$\beta$ -BHC (319-85-7)	Endosulfan sulfate (1031-07-8)
$\delta$ -BHC (319-86-8)	Endrin (72-20-8)
$\gamma$ -BHC (Lindane) (58-89-9)	Endrin aldehyde (7421-93-4)
<i>cis</i> -Chlordane (5103-71-9)	Endrin ketone (53494-70-5)
<i>trans</i> -Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B)
4,4'-DDE (72-55-9)	(1024-57-3)
4,4'-DDT (50-29-3)	Methoxychlor (72-43-5)
Dieldrin (60-57-1)	
2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul	
cat.# 32415 (ea.)	

## 8270 Calibration Mix #1 (19 components)

Benzoic acid (65-85-0)	2-Methylphenol ( <i>o</i> -cresol) (95-48-7)
4-Chloro-3-methylphenol (59-50-7)	3-Methylphenol ( <i>m</i> -cresol) (108-39-4)
2-Chlorophenol (95-57-8)	4-Methylphenol ( <i>p</i> -cresol) (106-44-5)
2,4-Dichlorophenol (120-83-2)	2-Nitrophenol (88-75-5)
2,6-Dichlorophenol (87-65-0)	4-Nitrophenol (100-02-7)
2,4-Dimethylphenol (105-67-9)	Pentachlorophenol (87-86-5)
4,6-Dinitro-2-methylphenol	Phenol (108-95-2)
(Dinitro- <i>o</i> -cresol) (534-52-1)	2,3,4,6-Tetrachlorophenol (58-90-2)
2,4-Dinitrophenol (51-28-5)	2,4,5-Trichlorophenol (95-95-4)
Dinoseb (88-85-7)	2,4,6-Trichlorophenol (88-06-2)
2,000 µg/mL each in methylene chloride, 1 mL/ampul	
cat.# 31618 (ea.)	

## 8270 Calibration Mix #2 (11 components)

Aniline (62-53-3)	3-Nitroaniline (99-09-2)
Benzidine (92-87-5)	4-Nitroaniline (100-01-6)
4-Chloroaniline (106-47-8)	N-Nitrosodimethylamine (62-75-9)
3,3'-Dichlorobenzidine (91-94-1)	N-Nitrosodi- <i>n</i> -propylamine (621-64-7)
Diphenylamine (122-39-4)*	Pyridine (110-86-1)
2-Nitroaniline (88-74-4)	
2,000 µg/mL each in methylene chloride:methanol (85:15), 1 mL/ampul	
cat.# 31619 (ea.)	

\*N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*Method 8270C, 8270D (Semivolatile Organic Compounds), *cont.***8270 Calibration Mix #3** (23 components)

Aramite (140-57-8)	Hexachlorobutadiene (87-68-3)
Bis(2-chloroethyl)ether (111-44-4)	Hexachlorocyclopentadiene (77-47-4)
Bis(2-chloroethoxy)methane (111-91-1)	Hexachloroethane (67-72-1)
4-Bromophenyl phenyl ether (101-55-3)	Hexachloropropene (1888-71-7)
Chlorobenzilate (510-15-6)	Isodrin (465-73-6)
2-Chloronaphthalene (91-58-7)	Kepone (143-50-0)
4-Chlorophenyl phenyl ether (7005-72-3)	2,2'-Oxybis(1-chloropropane) (108-60-1)
1,2-Dichlorobenzene (95-50-1)	Pentachlorobenzene (608-93-5)
1,3-Dichlorobenzene (541-73-1)	Pentachloronitrobenzene (quintozone) (82-68-8)
1,4-Dichlorobenzene (106-46-7)	1,2,4,5-Tetrachlorobenzene (95-94-3)
1,3-Dinitrobenzene (99-65-0)	1,2,4-Trichlorobenzene (120-82-1)
Hexachlorobenzene (118-74-1)	

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31620 (ea.)

**8270 Calibration Mix #4** (22 components)

Acetophenone (98-86-2)	2,6-Dinitrotoluene (606-20-2)
Azobenzene (103-33-3)*	Ethyl methanesulfonate (62-50-0)
Benzyl alcohol (100-51-6)	Isophorone (78-59-1)
Bis(2-ethylhexyl)phthalate (117-81-7)	Isosafrole ( <i>cis</i> & <i>trans</i> ) (120-58-1)
Benzyl butyl phthalate (85-68-7)	Methyl methanesulfonate (66-27-3)
Dibenzofuran (132-64-9)	1,4-Naphthoquinone (130-15-4)
Diethylphthalate (84-66-2)	Nitrobenzene (98-95-3)
Dimethylphthalate (131-11-3)	4-Nitroquinoline-N-oxide (56-57-5)
Di- <i>n</i> -butyl phthalate (84-74-2)	Phenacetin (62-44-2)
Di- <i>n</i> -octyl phthalate (117-84-0)	Safrole (94-59-7)
2,4-Dinitrotoluene (121-14-2)	1,3,5-Trinitrobenzene (99-35-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31621 (ea.)

\*1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

**3-Methylcholanthrene Standard**

3-Methylcholanthrene (56-49-5)

2,000 µg/mL in methylene chloride, 1 mL/ampul  
cat.# 31996 (ea.)

**8270 Calibration Mix #5, Revised** (18 components)

Acenaphthene (83-32-9)	Dibenz(a,h)anthracene (53-70-3)
Acenaphthylene (208-96-8)	Fluoranthene (206-44-0)
Anthracene (120-12-7)	Fluorene (86-73-7)
Benz(a)anthracene (56-55-3)	Indeno(1,2,3- <i>cd</i> )pyrene (193-39-5)
Benzo(a)pyrene (50-32-8)	1-Methylnaphthalene (90-12-0)
Benzo(b)fluoranthene (205-99-2)	2-Methylnaphthalene (91-57-6)
Benzo(ghi)perylene (191-24-2)	Naphthalene (91-20-3)
Benzo(k)fluoranthene (207-08-9)	Phenanthrene (85-01-8)
Chrysene (218-01-9)	Pyrene (129-00-0)

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31995 (ea.)

**8270 Calibration Mix #6** (10 components)

Diallate ( <i>cis</i> & <i>trans</i> ) (2303-16-4)	Phorate (298-02-2)
Dimethoate (60-51-5)	Propylamide (23950-58-5)
Disulfoton (298-04-4)	O,O,O-Triethyl phosphorothioate (126-68-1)
Famphur (52-85-7)	Zinophos (Thionazine) (297-97-2)
Methyl parathion (298-00-0)	
Parathion (ethyl parathion) (56-38-2)	

2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 31623 (ea.)

**Aramite**

Aramite (140-57-8)

2,000 µg/mL in hexane, 1 mL/ampul

cat.# 31624 (ea.)

**1,2-Diphenylhydrazine**

1,2-Diphenylhydrazine (122-66-7)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31497 (ea.)

No data pack available.

Note that 1,2-diphenylhydrazine is an unstable compound that will oxidize to azobenzene, thereby decreasing the concentration of 1,2-diphenylhydrazine over time. For accurate calibration results, it is recommended that the concentrations of 1,2-diphenylhydrazine and azobenzene be combined. Please contact Restek® Technical Service if you have any questions about this issue.

**TCLP Acid Mix** (6 components)

2-Methylphenol ( <i>o</i> -cresol) (95-48-7)	Pentachlorophenol (87-86-5)
3-Methylphenol ( <i>m</i> -cresol) (108-39-4)	2,4,5-Trichlorophenol (95-95-4)
4-Methylphenol ( <i>p</i> -cresol) (106-44-5)	2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31027 (ea.)

**TCLP B/N Mix** (7 components)

1,4-Dichlorobenzene (106-46-7)	Hexachloroethane (67-72-1)
2,4-Dinitrotoluene (121-14-2)	Nitrobenzene (98-95-3)
Hexachlorobenzene (118-74-1)	Pyridine (110-86-1)
Hexachlorobutadiene (87-68-3)	

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31028 (ea.)

**8270/Appendix IX Calibration Kit (2,000 µg/mL)**

Contains 1 mL each of these mixtures.

- 31618: 8270 Calibration Mix #1
- 31619: 8270 Calibration Mix #2
- 31620: 8270 Calibration Mix #3
- 31621: 8270 Calibration Mix #4
- 31995: 8270 Calibration Mix #5, Revised
- 31996: 3-Methylcholanthrene Standard
- 31623: 8270 Calibration Mix #6
- 32459: Appendix IX Mix #1, Revised (Methapyrilene is not included in this revised standard.)
- 32460: Methapyrilene Standard

cat.# 31627 (kit)

kit

**8270 Calibration Kit (2,000 µg/mL)**

Contains 1 mL each of these mixtures.

- 31618: 8270 Calibration Mix #1
- 31619: 8270 Calibration Mix #2
- 31620: 8270 Calibration Mix #3
- 31621: 8270 Calibration Mix #4
- 31995: 8270 Calibration Mix #5, Revised
- 31996: 3-Methylcholanthrene Standard

cat.# 31626 (kit)

kit

## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

### SOM01.1 (Semivolatiles), QA Mixes

#### SOM01.1 Deuterated Monitoring Compound Mix SIM Compounds (2 components)

Fluoranthene-d10 (93951-69-0)  
2-Methylnaphthalene-d10 (7297-45-2)  
2,000 µg/mL each in methylene chloride, 1 mL/ampul  
cat.# 33913 (ea.)

### 04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes

#### SV Internal Standard Mix (6 components)

Each	15-pk.	25-pk.
Acenaphthene-d10 (15067-26-2)	Naphthalene-d8 (1146-65-2)	
Chrysene-d12 (1719-03-5)	Perylene-d12 (1520-96-3)	
1,4-Dichlorobenzene-d4 (3855-82-1)	Phenanthrene-d10 (1517-22-2)	
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

#### Revised SV Internal Standard Mix (7 components)

Each	15-pk.	25-pk.
Acenaphthene-d10 (15067-26-2)	Naphthalene-d8 (1146-65-2)	
Chrysene-d12 (1719-03-5)	Perylene-d12 (1520-96-3)	
1,4-Dichlorobenzene-d4 (3855-82-1)	Phenanthrene-d10 (1517-22-2)	
1,4-Dioxane-d8 (17647-74-4)		
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	—	—

#### Acid Surrogate Standard Mix (3/90 SOW) (4 components)

2-Chlorophenol-d4 (93951-73-6)	Phenol-d6 (13127-88-3)	
2-Fluorophenol (367-12-4)	2,4,6-Tribromophenol (118-79-6)	
1,500 µg/mL each in methanol, 1 mL/ampul		
cat.# 31003 (ea.)		
7,500 µg/mL each in methanol, 1 mL/ampul		
cat.# 31073 (ea.)		
7,500 µg/mL each in methanol, 5 mL/ampul		
cat.# 31083 (ea.)		

#### Acid Surrogate Mix (4/89 SOW) (3 components)

Each	15-pk.	25-pk.
2-Fluorophenol (367-12-4)	2,4,6-Tribromophenol (118-79-6)	
Phenol-d6 (13127-88-3)		
2,000 µg/mL each in methanol, 1 mL/ampul		
31025	31025.15	31025.25
10,000 µg/mL each in methanol, 1 mL/ampul		
31063	31063.15	—
10,000 µg/mL each in methanol, 5 mL/ampul		
31087	—	—
10,000 µg/mL each in methanol, 10 mL/ampul		
33029	—	33029.25

### 04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes, *cont.*

#### Revised B/N Surrogate Mix (4 components)

Each	15-pk.
2-Fluorobiphenyl (321-60-8)	p-Terphenyl-d14 (1718-51-0)
Nitrobenzene-d5 (4165-60-0)	Pyrene-d10 (1718-52-1)
1,000 µg/mL each in methylene chloride, 1 mL/ampul	
31887	31887.15
5,000 µg/mL each in methylene chloride, 1 mL/ampul	
31888	31888.15
5,000 µg/mL each in methylene chloride, 5 mL/ampul	
31889	—

#### CLP 04.1 BNA Surrogate Mix (8 components)

2-Chlorophenol-d4 (93951-73-6)	1,500 µg/mL	Nitrobenzene-d5 (4165-60-0)	1,000
Phenol-d6 (13127-88-3)		Phenol-d6 (13127-88-3)	1,500
1,2-Dichlorobenzene-d4 (2199-69-1)	1,000	p-Terphenyl-d14 (1718-51-0)	1,000
2-Fluorobiphenyl (321-60-8)	1,000	2,4,6-Tribromophenol (118-79-6)	1,500
2-Fluorophenol (367-12-4)	1,500		
In methylene chloride, 1 mL/ampul			
		cat.# 31493 (ea.)	

#### B/N Surrogate Standard Mix (3/90 SOW) (4 components)

1,2-Dichlorobenzene-d4 (2199-69-1)	Nitrobenzene-d5 (4165-60-0)	
2-Fluorobiphenyl (321-60-8)	p-Terphenyl-d14 (1718-51-0)	
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
cat.# 31002 (ea.)		
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
cat.# 31072 (ea.)		
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
cat.# 31082 (ea.)		

#### B/N Surrogate Mix (4/89 SOW) (3 components)

Each	15-pk.	25-pk.
2-Fluorobiphenyl (321-60-8)	p-Terphenyl-d14 (1718-51-0)	
Nitrobenzene-d5 (4165-60-0)		
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	—
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	—	—
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	—	33028.25

#### Acid Matrix Spike Mix (5 components)

4-Chloro-3-methylphenol (59-50-7)	Pentachlorophenol (87-86-5)	
2-Chlorophenol (95-57-8)	Phenol (108-95-2)	
4-Nitrophenol (100-02-7)		
1,500 µg/mL each in methanol, 1 mL/ampul		
cat.# 31005 (ea.)		
7,500 µg/mL each in methanol, 1 mL/ampul		
cat.# 31075 (ea.)		
7,500 µg/mL each in methanol, 5 mL/ampul		
cat.# 31085 (ea.)		



**Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.***

**04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes, *cont.***

**CLP 04.1 B/N Matrix Spike Mix (4 components)**

Acenaphthene (83-32-9)                      N-Nitroso-di-*n*-propylamine (621-64-7)  
 2,4-Dinitrotoluene (121-14-2)            Pyrene (129-00-0)  
 1,000 µg/mL each in methanol, 1 mL/ampul  
 cat.# 31492 (ea.)

**B/N Matrix Spike Mix (6 components)**

Acenaphthene (83-32-9)                      N-Nitroso-di-*n*-propylamine (621-64-7)  
 1,4-Dichlorobenzene (106-46-7)            Pyrene (129-00-0)  
 2,4-Dinitrotoluene (121-14-2)            1,2,4-Trichlorobenzene (120-82-1)

Each	15-pk.
1,000 µg/mL each in methanol, 1 mL/ampul 31004	31004.15
5,000 µg/mL each in methanol, 1 mL/ampul 31074	—
5,000 µg/mL each in methanol, 5 mL/ampul 31084	—

**Low-Concentration Semivolatiles, QA Mixes**

**SV Tuning Compound**

Decafluorotriphenylphosphine (DFTPP) (5074-71-5)  
 2,500 µg/mL in methylene chloride, 1 mL/ampul  
 cat.# 31001 (ea.)

**PFTBA (MS Tuning Compound)**

Perfluorotributylamine (PFTBA) (311-89-7)  
 Neat, 1 mL/ampul  
 cat.# 30482 (ea.)

No data pack available.



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Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*4/89 and 3/90 SOW (Semivolatiles),  
Calibration Mixes, *cont.***8270 Benzidines Mix** (3 components)Benzidine (92-87-5)                      3,3'-Dimethylbenzidine (*o*-tolidine)  
3,3'-Dichlorobenzidine (91-94-1)                      (119-93-7)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31688 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31852 (ea.)

**CLP Semivolatile Calibration Kit #2**  
(without pesticides)

Contains 1 mL each of these mixtures.

31007: SV Calibration Mix #1 (anilines)  
31008: SV Calibration Mix #2 (phenols)  
31009: SV Calibration Mix #3 (base neutrals)  
31010: SV Calibration Mix #4 (base neutrals)  
31011: SV Calibration Mix #5 (PAHs)  
31013: SV Calibration Mix #7 (dichlorobenzenes)  
31026: 3,3'-dichlorobenzidine

cat.# 31462 (kit)

kit

**Semivolatile Calibration Kit #3 (with benzidine)**

Contains 1 mL each of these mixtures.

31007: SV Calibration Mix #1 (anilines)  
31008: SV Calibration Mix #2 (phenols)  
31009: SV Calibration Mix #3 (base neutrals)  
31010: SV Calibration Mix #4 (base neutrals)  
31011: SV Calibration Mix #5 (PAHs)  
31013: SV Calibration Mix #7 (dichlorobenzenes)  
31030: 605 Benzidines Calibration Mix (benzidine & 3,3'-dichlorobenzidine)

cat.# 31463 (kit)

kit

## 03.2 (Semivolatiles), Calibration Mixes

**OLC 03.2 SVOA Deuterated Monitoring Compounds**  
(DMC) (16 components)Acenaphthylene-d8 (93951-97-4)                      Fluorene-d10 (81103-79-9)  
Anthracene-d10 (1719-06-8)                      4-Methylphenol-d8 (190780-66-6)  
Benzo(a)pyrene-d12 (63466-71-7)                      Nitrobenzene-d5 (4165-60-0)  
Bis-(2-chloroethyl)ether-d8 (93952-02-4)                      2-Nitrophenol-d4 (93951-78-1)  
4-Chloroaniline-d4 (191656-33-4)                      4-Nitrophenol-d4 (93951-79-2)  
2-Chlorophenol-d4 (93951-73-6)                      Phenol-d5 (4165-62-2)  
2,4-Dichlorophenol-d3 (93951-74-7)                      Pyrene-d10 (1718-52-1)  
Dimethylphthalate-d6 (85448-30-2)  
4,6-Dinitro-2-methylphenol-d2  
(93951-76-9)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31810 (ea.)

**N-Nitrosodimethylamine-d6**

N-Nitrosodimethylamine-d6 (17829-05-9)

1,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 33910 (ea.)

03.2 (Semivolatiles), Calibration Mixes, *cont.***Fortification Mix** (7 components)4,6-Dinitro-2-methylphenol                      3-Nitroaniline (99-09-2)  
(Dinitro-*o*-cresol) (534-52-1)                      4-Nitroaniline (100-01-6)  
2,4-Dinitrophenol (51-28-5)                      4-Nitrophenol (100-02-7)  
2-Nitroaniline (88-74-4)                      2,4,5-Trichlorophenol (95-95-4)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31813 (ea.)

**3,3'-Dichlorobenzidine**

3,3'-Dichlorobenzidine (91-94-1)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31835 (ea.)

**Hexachlorophene**

Hexachlorophene (70-30-4)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31811 (ea.)

Low-Concentration Semivolatiles,  
Calibration Mixes**L/C Phenol Mix A** (6 components)4,6-Dinitro-2-methylphenol                      Pentachlorophenol (87-86-5)  
(Dinitro-*o*-cresol) (534-52-1)                      2,4,6-Tribromophenol (SS) (118-79-6)  
2,4-Dinitrophenol (51-28-5)                      2,4,5-Trichlorophenol (95-95-4)  
4-Nitrophenol (100-02-7)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31208 (ea.)

Must be calibrated at a level different from the other listed semivolatile compounds.

**L/C Aniline Mix A** (3 components)2-Nitroaniline (88-74-4)                      4-Nitroaniline (100-01-6)  
3-Nitroaniline (99-09-2)

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31210 (ea.)

Must be calibrated at a level different from the other listed semivolatile compounds.

**L/C Aniline Mix B**

4-Chloroaniline (106-47-8)

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31211 (ea.)

**Additional Required Low-Concentration**  
**Semivolatile Mixes:**31024: B/N Surrogate Mix (4/89 SOW)                      page 535  
31009: SV Calibration Mix #3                      page 542  
31010: SV Calibration Mix #4                      page 542  
31011: SV Calibration Mix #5                      page 542  
31026: 3,3'-dichlorobenzidine                      page 542  
31001: SV Tuning Compound (DFTPP)                      page 536

Note: Pesticides are not included in the EPA CLP semivolatile analytical method.

## Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

### GPC Calibration Mix

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

#### CLP GPC Calibration Mix (5 components)

Bis(2-ethylhexyl) phthalate (117-81-7)	10 mg/mL
Corn oil (8001-30-7)	250
Methoxychlor (72-43-5)	2.0
Perylene (198-55-0)	0.2
Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul

cat.# 32019 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32023 (ea.)

No data pack available.

#### Revised GPC Calibration Mix (5 components)

Bis(2-ethylhexyl) phthalate (117-81-7)	5 mg/mL
Corn oil (8001-30-7)	250
Methoxychlor (72-43-5)	1.0
Perylene (198-55-0)	0.2
Sulfur (7704-34-9)	0.8

In methylene chloride, 1 mL/ampul

cat.# 32041 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32042 (ea.)

No data pack available.

## did you know?

Our **Pesticide Matrix Spike Mix** (cat.# 32018, page 525) can be used as a GPC calibration verification solution.

## Toxicity Characteristic Leaching Procedure (TCLP)

### Method 1311 (Toxicity Characteristic Leaching Procedure [TCLP])

#### TCLP VOA Mix (11 components)

Benzene (71-43-2)	1,2-Dichloroethane (107-06-2)
2-Butanone (MEK) (78-93-3)	1,1-Dichloroethene (75-35-4)
Carbon tetrachloride (56-23-5)	Tetrachloroethene (127-18-4)
Chlorobenzene (108-90-7)	Trichloroethene (79-01-6)
Chloroform (67-66-3)	Vinyl chloride (75-01-4)
1,4-Dichlorobenzene (106-46-7)	

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul

cat.# 30024 (ea.)

#### TCLP Acid Mix (6 components)

2-Methylphenol ( <i>o</i> -cresol) (95-48-7)	Pentachlorophenol (87-86-5)
3-Methylphenol ( <i>m</i> -cresol) (108-39-4)	2,4,5-Trichlorophenol (95-95-4)
4-Methylphenol ( <i>p</i> -cresol) (106-44-5)	2,4,6-Trichlorophenol (88-06-2)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31027 (ea.)

#### TCLP B/N Mix (7 components)

1,4-Dichlorobenzene (106-46-7)	Hexachloroethane (67-72-1)
2,4-Dinitrotoluene (121-14-2)	Nitrobenzene (98-95-3)
Hexachlorobenzene (118-74-1)	Pyridine (110-86-1)
Hexachlorobutadiene (87-68-3)	

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31028 (ea.)

#### TCLP Pesticide Mix (5 components)

γ-BHC (Lindane) (58-89-9)	Heptachlor epoxide (isomer B) (1024-57-3)
Endrin (72-20-8)	Methoxychlor (72-43-5)
Heptachlor (76-44-8)	

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 32013 (ea.)

#### TCLP Herbicide Mix (2 components)

2,4-D (free acid) (94-75-7)
2,4,5-TP (Silvex) (free acid) (93-72-1)

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 32014 (ea.)

#### TCLP Toxaphene Mix

Toxaphene (8001-35-2)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32015 (ea.)

#### TCLP Chlordane Mix

Chlordane (57-74-9)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32016 (ea.)

## Compound Index for Reference Standards

See pages 586–592.





## Trihalomethanes

### Method 501.1, 501.2, 501.3 (Trihalomethanes)

#### 501 Trihalomethane Mix (4 components)

Bromodichloromethane (75-27-4)	Chloroform (67-66-3)
Bromoform (75-25-2)	Dibromochloromethane (124-48-1)
200 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 30036 (ea.)	
2,000 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 30211 (ea.)	

#### DW-VOC Mix #1 (8 components)

Benzene (71-43-2)	1,1-Dichloroethene (75-35-4)
Carbon tetrachloride (56-23-5)	1,1,1-Trichloroethane (71-55-6)
1,4-Dichlorobenzene (106-46-7)	Trichloroethene (79-01-6)
1,2-Dichloroethane (107-06-2)	Vinyl chloride (75-01-4)
2,000 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 30219 (ea.)	

#### DW-VOC Mix #2 (12 components)

Chlorobenzene (108-90-7)	Styrene (100-42-5)
1,2-Dichlorobenzene (95-50-1)	Tetrachloroethene (127-18-4)
<i>cis</i> -1,2-Dichloroethene (156-59-2)	Toluene (108-88-3)
<i>trans</i> -1,2-Dichloroethene (156-60-5)	<i>m</i> -Xylene (108-38-3)
1,2-Dichloropropane (78-87-5)	<i>o</i> -Xylene (95-47-6)
Ethylbenzene (100-41-4)	<i>p</i> -Xylene (106-42-3)
2,000 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 30220 (ea.)	

#### DW-VOC Mix #3 (3 components)

Methylene chloride (dichloromethane) (75-09-2)	1,2,4-Trichlorobenzene (120-82-1)
	1,1,2-Trichloroethane (79-00-5)
2,000 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 30235 (ea.)	

#### DW-VOC Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.  
30211: 501 Trihalomethane Mix  
30219: DW-VOC Mix #1  
30220: DW-VOC Mix #2  
30235: DW-VOC Mix #3  
Contains 1 mL each of these mixtures.

cat.# 30221 (kit)

kit

## Reference Standards Documentation Search

Locate SDSs, certificates,  
& data packs by cat. #  
or lot #

[www.restek.com/documentation](http://www.restek.com/documentation)



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## Volatile Organics

### Individual VOA Surrogate and Internal Standards for EPA Methods

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Benzene-d6	1076-43-3	PTM	2,000	30025
2-Bromochlorobenzene	694-80-4	PTM	2,000	30228
4-Bromochlorobenzene	106-39-8	PTM	2,000	30230
Bromochloromethane	74-97-5	PTM	2,000	30225
2-Bromo-1-chloropropane	3017-95-6	PTM	2,000	30226
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
Chlorobenzene-d5	3114-55-4	PTM	2,000	30223
1-Chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040
1,2-Dichlorobenzene-d4	2199-69-1	PTM	2,000	30049
1,4-Dichlorobutane	110-56-5	PTM	2,000	30227
1,2-Dichloroethane-d4	17060-07-0	PTM	2,000	30027
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Ethylbenzene-d5	20302-26-5	PTM	2,000	30028
Ethylbenzene-d10	25837-05-2	PTM	2,000	30029
Fluorobenzene	462-06-6	PTM	2,000	30030
Pentafluorobenzene	363-72-4	PTM	2,000	30031
Toluene-d8	2037-26-5	PTM	2,000	30224
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

### Method 501.1, 501.2, 501.3 (Trihalomethanes)

See page 545.

#### Antifoam Agent for Purge-and-Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap—and possibly the GC column. Our silica-containing antifoam agent is effective over a wide pH range and will not conflict with chromatography of target analytes. To use properly, see the instructions on the product certificate or on the product page (search “31822” at [www.restek.com](http://www.restek.com)).

Neat, 1 mL/ampul

cat.# 31822 (ea.)

No data pack available.

### Quantity Discounts Available

— Buy 3 Standards, Get 10% Off

— Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

### Method 502.1, 502.2 (Volatile Halogenated Organics)

#### 502.2 Internal Standard #1

1-Chloro-2-fluorobenzene (348-51-6)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30040 (ea.)

#### 502.2 Internal Standard Mix #2 (2 components)

2-Bromo-1-chloropropane (3017-95-6)

Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30041 (ea.)

#### 8021/502.2 Surrogate Mix #1 (3 components)

1-Bromo-2-chloroethane (107-04-0)

Fluorobenzene (462-06-6)

1-Chloro-3-fluorobenzene (625-98-9)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30463 (ea.)

### Volatiles MegaMix® Standard With Gases

MEGAMIX®

(60 components)

Benzene (71-43-2)	1,3-Dichloropropane (142-28-9)
Bromobenzene (108-86-1)	2,2-Dichloropropane (594-20-7)
Bromochloromethane (74-97-5)	1,1-Dichloropropene (563-58-6)
Bromodichloromethane (75-27-4)	cis-1,3-Dichloropropene (10061-01-5)
Bromoform (75-25-2)	trans-1,3-Dichloropropene (10061-02-6)
Bromomethane (methyl bromide) (74-83-9)	Ethylbenzene (100-41-4)
n-Butylbenzene (104-51-8)	Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
sec-Butylbenzene (135-98-8)	Isopropylbenzene (cumene) (98-82-8)
tert-Butylbenzene (98-06-6)	4-Isopropyltoluene (p-Cymene) (99-87-6)
Carbon tetrachloride (56-23-5)	Methylene chloride (dichloromethane) (75-09-2)
Chlorobenzene (108-90-7)	Naphthalene (91-20-3)
Chloroethane (ethyl chloride) (75-00-3)	n-Propylbenzene (103-65-1)
Chloroform (67-66-3)	Styrene (100-42-5)
Chloromethane (methyl chloride) (74-87-3)	1,1,1,2-Tetrachloroethane (630-20-6)
2-Chlorotoluene (95-49-8)	1,1,2,2-Tetrachloroethane (79-34-5)
4-Chlorotoluene (106-43-4)	Tetrachloroethene (127-18-4)
Dibromochloromethane (124-48-1)	Toluene (108-88-3)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)	1,2,3-Trichlorobenzene (87-61-6)
1,2-Dibromoethane (EDB) (106-93-4)	1,2,4-Trichlorobenzene (120-82-1)
Dibromomethane (74-95-3)	1,1,1-Trichloroethane (71-55-6)
1,2-Dichlorobenzene (95-50-1)	1,1,2-Trichloroethane (79-00-5)
1,3-Dichlorobenzene (541-73-1)	Trichloroethene (79-01-6)
1,4-Dichlorobenzene (106-46-7)	Trichlorofluoromethane (CFC-11) (75-69-4)
Dichlorodifluoromethane (CFC-12) (75-71-8)	1,2,3-Trichloropropane (96-18-4)
1,1-Dichloroethane (75-34-3)	1,2,4-Trimethylbenzene (95-63-6)
1,2-Dichloroethane (107-06-2)	1,3,5-Trimethylbenzene (108-67-8)
1,1-Dichloroethene (75-35-4)	Vinyl chloride (75-01-4)
cis-1,2-Dichloroethene (156-59-2)	m-Xylene (108-38-3)
trans-1,2-Dichloroethene (156-60-5)	o-Xylene (95-47-6)
1,2-Dichloropropane (78-87-5)	p-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30603 (ea.)

## Volatile Organics

Method 502.1, 502.2 (Volatile Halogenated Organics), *cont.***502.2 MegaMix® Standard** (54 components)

Includes all target analytes except the six gases, which are available separately as 502.2 Calibration Mix #1.

Benzene (71-43-2)	1,1-Dichloropropene (563-58-6)
Bromobenzene (108-86-1)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
Bromochloromethane (74-97-5)	<i>trans</i> -1,3-Dichloropropene (10061-02-6)
Bromodichloromethane (75-27-4)	Ethylbenzene (100-41-4)
Bromoform (75-25-2)	Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
<i>n</i> -Butylbenzene (104-51-8)	Isopropylbenzene (cumene) (98-82-8)
<i>sec</i> -Butylbenzene (135-98-8)	4-Isopropyltoluene ( <i>p</i> -cymene) (99-87-6)
<i>tert</i> -Butylbenzene (98-06-6)	Methylene chloride (dichloromethane) (75-09-2)
Carbon tetrachloride (56-23-5)	Naphthalene (91-20-3)
Chlorobenzene (108-90-7)	<i>n</i> -Propylbenzene (103-65-1)
Chloroform (67-66-3)	Styrene (100-42-5)
2-Chlorotoluene (95-49-8)	1,1,1,2-Tetrachloroethane (630-20-6)
4-Chlorotoluene (106-43-4)	1,1,2,2-Tetrachloroethane (79-34-5)
Dibromochloromethane (124-48-1)	Tetrachloroethene (127-18-4)
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)	Toluene (108-88-3)
1,2-Dibromoethane (EDB) (106-93-4)	1,2,3-Trichlorobenzene (87-61-6)
Dibromomethane (74-95-3)	1,2,4-Trichlorobenzene (120-82-1)
1,2-Dichlorobenzene (95-50-1)	1,1,1-Trichloroethane (71-55-6)
1,3-Dichlorobenzene (541-73-1)	1,1,2-Trichloroethane (79-00-5)
1,4-Dichlorobenzene (106-46-7)	Trichloroethene (79-01-6)
1,1-Dichloroethane (75-34-3)	1,2,3-Trichloropropane (96-18-4)
1,2-Dichloroethane (107-06-2)	1,2,4-Trimethylbenzene (95-63-6)
1,1-Dichloroethene (75-35-4)	1,3,5-Trimethylbenzene (108-67-8)
<i>cis</i> -1,2-Dichloroethene (156-59-2)	<i>m</i> -Xylene (108-38-3)
<i>trans</i> -1,2-Dichloroethene (156-60-5)	<i>o</i> -Xylene (95-47-6)
1,2-Dichloropropane (78-87-5)	<i>p</i> -Xylene (106-42-3)
1,3-Dichloropropane (142-28-9)	
2,2-Dichloropropane (594-20-7)	

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30432 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30431 (ea.)

**502.2 Calibration Mix #1 (gases)** (6 components)

Bromomethane (methyl bromide) (74-83-9)	Dichlorodifluoromethane (CFC-12) (75-71-8)
Chloroethane (ethyl chloride) (75-00-3)	Trichlorofluoromethane (CFC-11) (75-69-4)
Chloromethane (methyl chloride) (74-87-3)	Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30042 (ea.)

**502.2 Calibration Mix #2** (14 components)

Bromodichloromethane (75-27-4)	2,2-Dichloropropane (594-20-7)
Bromoform (75-25-2)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
Carbon tetrachloride (56-23-5)	<i>trans</i> -1,3-Dichloropropene (10061-02-6)
Chloroform (67-66-3)	Methylene chloride (dichloromethane) (75-09-2)
1,1-Dichloroethane (75-34-3)	1,1,1-Trichloroethane (71-55-6)
1,1-Dichloroethene (75-35-4)	Trichloroethene (79-01-6)
<i>trans</i> -1,2-Dichloroethene (156-60-5)	
1,3-Dichloropropane (142-28-9)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30043 (ea.)

**502.2 Calibration Mix #3** (14 components)

Bromochloromethane (74-97-5)	1,2-Dichloropropane (78-87-5)
Dibromochloromethane (124-48-1)	1,1-Dichloropropene (563-58-6)
1,2-Dibromo-3-chloropropane (96-12-8)	1,1,1,2-Tetrachloroethane (630-20-6)
1,2-Dibromoethane (EDB) (106-93-4)	1,1,2,2-Tetrachloroethane (79-34-5)
Dibromomethane (74-95-3)	Tetrachloroethene (127-18-4)
1,2-Dichloroethane (107-06-2)	1,1,2-Trichloroethane (79-00-5)
<i>cis</i> -1,2-Dichloroethene (156-59-2)	1,2,3-Trichloropropane (96-18-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30044 (ea.)

**502.2 Calibration Mix #4** (9 components)

Benzene (71-43-2)	Styrene (100-42-5)
<i>tert</i> -Butylbenzene (98-06-6)	Toluene (108-88-3)
Chlorobenzene (108-90-7)	1,3,5-Trimethylbenzene (108-67-8)
Isopropylbenzene (cumene) (98-82-8)	<i>m</i> -Xylene (108-38-3)
<i>n</i> -Propylbenzene (103-65-1)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30045 (ea.)

**502.2 Calibration Mix #5** (10 components)

Bromobenzene (108-86-1)	Ethylbenzene (100-41-4)
<i>n</i> -Butylbenzene (104-51-8)	1,2,4-Trichlorobenzene (120-82-1)
<i>sec</i> -Butylbenzene (135-98-8)	1,2,4-Trimethylbenzene (95-63-6)
2-Chlorotoluene (95-49-8)	<i>o</i> -Xylene (95-47-6)
1,3-Dichlorobenzene (541-73-1)	<i>p</i> -Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30046 (ea.)

**502.2 Calibration Mix #6** (7 components)

4-Chlorotoluene (106-43-4)	4-Isopropyltoluene ( <i>p</i> -cymene) (99-87-6)
1,2-Dichlorobenzene (95-50-1)	Naphthalene (91-20-3)
1,4-Dichlorobenzene (106-46-7)	1,2,3-Trichlorobenzene (87-61-6)
Hexachlorobutadiene (87-68-3)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30047 (ea.)

**502.2 VOA Calibration Kit #1** (2,000 µg/mL)

Contains 1 mL each of these mixtures.

30042: 502.2 Calibration Mix #1  
30043: 502.2 Calibration Mix #2  
30044: 502.2 Calibration Mix #3  
30045: 502.2 Calibration Mix #4  
30046: 502.2 Calibration Mix #5  
30047: 502.2 Calibration Mix #6

cat.# 30444 (kit)

kit

**502.2 VOA Calibration Kit #2** (2,000 µg/mL)

Contains 1 mL each of these mixtures.

30042: 502.2 Calibration Mix #1  
30431: 502.2 MegaMix Standard

cat.# 30445 (kit)

kit

**502.2 VOA Calibration Kit #3** (200 µg/mL)

Contains 1 mL each of these mixtures.

30439: 502.2 Calibration Mix #1  
30432: 502.2 MegaMix Standard

cat.# 30446 (kit)

kit

**Volatile Organics, cont.**

**Method 504.1 (Ethylene Dibromide/ Dibromochloropropane)**

**504.1 Calibration Mix** (3 components)

1,2-Dibromo-3-chloropropane (96-12-8)      1,2,3-Trichloropropane (96-18-4)  
1,2-Dibromoethane (EDB) (106-93-4)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30239 (ea.)

**Method 522 (1,4-Dioxane)**

See page 519.

**Method 524.1, 524.2 (Volatile Organics)**

**524 Internal Standard/Surrogate Mix** (3 components)

1-Bromo-4-fluorobenzene (BFB)      1,2-Dichlorobenzene-d4 (2199-69-1)  
(460-00-4)      Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30201 (ea.)

**Surrogate Standard** (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
 $\alpha,\alpha,\alpha$ -Trifluorotoluene (98-08-8)

2,500 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30484 (ea.)

**524.2 Surrogate Standard** (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
1,2-Dichlorobenzene-d4 (2199-69-1)

2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30607 (ea.)

**PFTBA (MS Tuning Compound)**

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul  
cat.# 30482 (ea.)

No data pack available.

**Antifoam Agent for Purge-and-Trap Samples**

Foam generated as purge gas passes through a sample can enter the analytical trap—and possibly the GC column. Our silica-containing antifoam agent is effective over a wide pH range and will not conflict with chromatography of target analytes. To use properly, see the instructions on the product certificate or on the product page (search “31822” at [www.restek.com](http://www.restek.com)).

Neat, 1 mL/ampul  
cat.# 31822 (ea.)

No data pack available.

**Method 524.1, 524.2 (Volatile Organics), cont.**

**Volatiles MegaMix® Standard With Gases**



(60 components)

- Benzene (71-43-2)
- Bromobenzene (108-86-1)
- Bromochloromethane (74-97-5)
- Bromodichloromethane (75-27-4)
- Bromoform (75-25-2)
- Bromomethane (methyl bromide) (74-83-9)
- n*-Butylbenzene (104-51-8)
- sec*-Butylbenzene (135-98-8)
- tert*-Butylbenzene (98-06-6)
- Carbon tetrachloride (56-23-5)
- Chlorobenzene (108-90-7)
- Chloroethane (ethyl chloride) (75-00-3)
- Chloroform (67-66-3)
- Chloromethane (methyl chloride) (74-87-3)
- 2-Chlorotoluene (95-49-8)
- 4-Chlorotoluene (106-43-4)
- Dibromochloromethane (124-48-1)
- 1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)
- 1,2-Dibromoethane (EDB) (106-93-4)
- Dibromomethane (74-95-3)
- 1,2-Dichlorobenzene (95-50-1)
- 1,3-Dichlorobenzene (541-73-1)
- 1,4-Dichlorobenzene (106-46-7)
- Dichlorodifluoromethane (CFC-12) (75-71-8)
- 1,1-Dichloroethane (75-34-3)
- 1,2-Dichloroethane (107-06-2)
- 1,1-Dichloroethene (75-35-4)
- cis*-1,2-Dichloroethene (156-59-2)
- trans*-1,2-Dichloroethene (156-60-5)
- 1,2-Dichloropropane (78-87-5)
- 1,3-Dichloropropane (142-28-9)
- 2,2-Dichloropropane (594-20-7)
- 1,1-Dichloropropene (563-58-6)
- cis*-1,3-Dichloropropene (10061-01-5)
- trans*-1,3-Dichloropropene (10061-02-6)
- Ethylbenzene (100-41-4)
- Hexachloro-1,3-butadiene (hexachlorobutadiene) (87-68-3)
- Isopropylbenzene (cumene) (98-82-8)
- 4-Isopropyltoluene (*p*-Cymene) (99-87-6)
- Methylene chloride (dichloromethane) (75-09-2)
- Naphthalene (91-20-3)
- n*-Propylbenzene (103-65-1)
- Styrene (100-42-5)
- 1,1,1,2-Tetrachloroethane (630-20-6)
- 1,1,1,2,2-Tetrachloroethane (79-34-5)
- Tetrachloroethene (127-18-4)
- Toluene (108-88-3)
- 1,2,3-Trichlorobenzene (87-61-6)
- 1,2,4-Trichlorobenzene (120-82-1)
- 1,1,1-Trichloroethane (71-55-6)
- 1,1,2-Trichloroethane (79-00-5)
- Trichloroethene (79-01-6)
- Trichlorofluoromethane (CFC-11) (75-69-4)
- 1,2,3-Trichloropropane (96-18-4)
- 1,2,4-Trimethylbenzene (95-63-6)
- 1,3,5-Trimethylbenzene (108-67-8)
- Vinyl chloride (75-01-4)
- m*-Xylene (108-38-3)
- o*-Xylene (95-47-6)
- p*-Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30603 (ea.)

**502.2 Calibration Mix #1 (gases)** (6 components)

- Bromomethane (methyl bromide) (74-83-9)
- Chloroethane (ethyl chloride) (75-00-3)
- Chloromethane (methyl chloride) (74-87-3)
- Dichlorodifluoromethane (CFC-12) (75-71-8)
- Trichlorofluoromethane (CFC-11) (75-69-4)
- Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30042 (ea.)

**Ketones Mix, 524.2 Rev. 4.1** (5 components)

- Acetone (67-64-1)
- 2-Butanone (MEK) (78-93-3)
- 1,1-Dichloro-2-propanone (513-88-2)
- 2-Hexanone (591-78-6)
- 4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul  
cat.# 30602 (ea.)

**Oxygenates Standard** (5 components)

- tert*-Amyl ethyl ether (TAEE) (919-94-8)      2,000 µg/mL
- tert*-Amyl methyl ether (TAME) (994-05-8)      2,000
- tert*-Butanol (TBA) (75-65-0)      10,000
- Diisopropyl ether (DIPE) (108-20-3)      2,000
- Ethyl-*tert*-butyl ether (ETBE) (637-92-3)      2,000

In P&T methanol, 1 mL/ampul  
cat.# 30619 (ea.)



## Volatile Organics, cont.

### Method 524.1, 524.2 (Volatile Organics), cont.

#### Drinking Water VOA MegaMix® Standard, 524.2 Rev. 4.1 (73 components)

MEGAMIX®

Acrylonitrile (107-13-1)  
Allyl chloride (3-chloropropene) (107-05-1)  
Benzene (71-43-2)  
Bromobenzene (108-86-1)  
Bromochloromethane (74-97-5)  
Bromodichloromethane (75-27-4)  
Bromoform (75-25-2)  
*n*-Butylbenzene (104-51-8)  
*sec*-Butylbenzene (135-98-8)  
*tert*-Butylbenzene (98-06-6)  
Carbon disulfide (75-15-0)  
Carbon tetrachloride (56-23-5)  
Chloroacetonitrile (107-14-2)  
Chlorobenzene (108-90-7)  
1-Chlorobutane (Butyl chloride) (109-69-3)  
Chlorodibromomethane (dibromochloromethane) (124-48-1)  
Chloroform (67-66-3)  
2-Chlorotoluene (95-49-8)  
4-Chlorotoluene (106-43-4)  
1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)  
1,2-Dibromoethane (ethylene dibromide) (106-93-4)  
Dibromomethane (74-95-3)  
1,2-Dichlorobenzene (95-50-1)  
1,3-Dichlorobenzene (541-73-1)  
1,4-Dichlorobenzene (106-46-7)  
*trans*-1,4-Dichloro-2-butene (110-57-6)  
1,1-Dichloroethane (75-34-3)  
1,2-Dichloroethane (107-06-2)  
1,1-Dichloroethene (75-35-4)  
*cis*-1,2-Dichloroethene (156-59-2)  
*trans*-1,2-Dichloroethene (156-60-5)  
1,2-Dichloropropane (78-87-5)  
1,3-Dichloropropane (142-28-9)  
2,2-Dichloropropane (594-20-7)  
1,1-Dichloropropene (563-58-6)

*cis*-1,3-Dichloropropene (10061-01-5)  
*trans*-1,3-Dichloropropene (10061-02-6)  
Diethyl ether (ethyl ether) (60-29-7)  
Ethylbenzene (100-41-4)  
Ethyl methacrylate (97-63-2)  
Hexachloro-1,3-butadiene (87-68-3)  
Hexachloroethane (67-72-1)  
Iodomethane (methyl iodide) (74-88-4)  
Isopropylbenzene (cumene) (98-82-8)  
4-Isopropyltoluene (*p*-cymene) (99-87-6)  
Methacrylonitrile (126-98-7)  
Methyl acrylate (96-33-3)  
Methyl *tert*-butyl ether (MTBE) (1634-04-4)  
Methylene chloride (dichloromethane) (75-09-2)  
Methyl methacrylate (80-62-6)  
Naphthalene (91-20-3)  
Nitrobenzene (98-95-3)  
2-Nitropropane (79-46-9)  
Pentachloroethane (76-01-7)  
Propionitrile (ethylcyanide) (107-12-0)  
*n*-Propylbenzene (103-65-1)  
Styrene (100-42-5)  
1,1,1,2-Tetrachloroethane (630-20-6)  
1,1,2,2-Tetrachloroethane (79-34-5)  
Tetrachloroethene (127-18-4)  
Tetrahydrofuran (109-99-9)  
Toluene (108-88-3)  
1,2,3-Trichlorobenzene (87-61-6)  
1,2,4-Trichlorobenzene (120-82-1)  
1,1,1-Trichloroethane (71-55-6)  
1,1,2-Trichloroethane (79-00-5)  
Trichloroethene (79-01-6)  
1,2,3-Trichloropropane (96-18-4)  
1,2,4-Trimethylbenzene (95-63-6)  
1,3,5-Trimethylbenzene (108-67-8)  
*m*-Xylene (108-38-3)  
*o*-Xylene (95-47-6)  
*p*-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30601 (ea.)

#### 524 Calibration Mix #7A (5 components)

Acetone (67-64-1)  
2-Butanone (MEK) (78-93-3)  
2-Hexanone (591-78-6)  
4-Methyl-2-pentanone (MIBK) (108-10-1)  
Tetrahydrofuran (109-99-9)

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul

cat.# 30300 (ea.)

#### 524 Calibration Mix #7B (7 components)

Acrylonitrile (107-13-1)  
Allyl chloride (3-chloropropene) (107-05-1)  
Ethyl methacrylate (97-63-2)  
Methyl acrylate (96-33-3)  
Methyl methacrylate (80-62-6)  
Nitrobenzene (98-95-3)  
Pentachloroethane (76-01-7)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30304 (ea.)

#### 524 Calibration Mix #7 Kit

Contains 1 mL each of these mixtures.

30300: 524 Calibration Mix #7A  
30304: 524 Calibration Mix #7B

cat.# 30202 (kit)

kit

#### 524 Calibration Mix #8 (12 components)

Carbon disulfide (75-15-0)  
Chloroacetonitrile (107-14-2)  
1-Chlorobutane (Butyl chloride) (109-69-3)  
*trans*-1,4-Dichloro-2-butene (110-57-6)  
1,1-Dichloro-2-propanone (513-88-2)  
Diethyl ether (ethyl ether) (60-29-7)  
Hexachloroethane (67-72-1)  
Iodomethane (methyl iodide) (74-88-4)  
Methacrylonitrile (126-98-7)  
Methyl *tert*-butyl ether (MTBE) (1634-04-4)  
2-Nitropropane (79-46-9)  
Propionitrile (107-12-0)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30203 (ea.)

#### 524 Rev. 4.0 Volatile Organics Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.

30201: 524 Internal Standard/Surrogate Mix  
30042: 502.2 Calibration Mix #1  
30043: 502.2 Calibration Mix #2  
30044: 502.2 Calibration Mix #3  
30045: 502.2 Calibration Mix #4  
30046: 502.2 Calibration Mix #5  
30047: 502.2 Calibration Mix #6  
30300: 524 Calibration Mix #7A  
30304: 524 Calibration Mix #7B  
30203: 524 Calibration Mix #8

cat.# 30204 (kit)

kit

#### 524 Rev. 4.0 VOA Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.

30042: 502.2 Calibration Mix #1  
30431: 502.2 MegaMix Standard  
30300: 524 Calibration Mix #7A  
30304: 524 Calibration Mix #7B  
30203: 524 Calibration Mix #8  
30201: 524 Surrogate/Internal Standard Mix

cat.# 30447 (kit)

kit

## Compound Index for Reference Standards

See pages 586–592.



Volatile Organics, *cont.*

Method 524.3 (Purgeable Organics in Drinking Water)

UCMR3 Method 524.3 Standard (9 components)

Bromochloromethane (74-97-5)	600 µg/mL	Chlorodifluoromethane (CFC-22) (75-45-6)	800
Bromomethane (methyl bromide) (74-83-9)	2,000	Chloromethane (methyl chloride) (74-87-3)	2,000
1,3-Butadiene (106-99-0)	1,000	1,1-Dichloroethane (75-34-3)	300
sec-Butylbenzene (135-98-8)	400	n-Propylbenzene (103-65-1)	300
		1,2,3-Trichloropropane (96-18-4)	300

In P&T methanol, 1 mL/ampul

cat.# 30642 (ea.)

EPA 524.3 Reference Standards

- Full 82-component EPA 524.3 list using as few as three ampuls—reduce prep time and chances for error or contamination.
- EPA 524.3 VOA MegaMix® ampul includes oxygenates group—no need to order separately.
- Volatile gases prepared separately—replace shorter-life components without wasting money on full list.
- Two options for internal and surrogate standards—separate or combined mix.
- Certified reference materials (CRMs) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also ideal for surface water and groundwater testing.

In support of the U.S. Safe Drinking Water Act (SDWA), Restek offers a complete set of EPA 524.3 reference standards for the monitoring of purgeable organic compounds in drinking water—using as few as three ampuls! In addition, this collection of certified reference materials (CRMs) also covers the seven volatile organic compounds (VOCs) included in the Unregulated Contaminant Monitoring Rule 3 (UCMR3), which requires monitoring of all public drinking water systems with 10,000 or more customers.

524.3 VOA MegaMix® Standard

(69 components)



- Allyl chloride (3-chloropropene) (107-05-1)
- tert-Amyl ethyl ether (TAE) (919-94-8)
- tert-Amyl methyl ether (TAME) (994-05-8)
- Benzene (71-43-2)
- Bromobenzene (108-86-1)
- Bromochloromethane (74-97-5)
- Bromodichloromethane (75-27-4)
- Bromoform (75-25-2)
- tert-Butanol (TBA) (75-65-0)
- n-Butylbenzene (104-51-8)
- sec-Butylbenzene (135-98-8)
- tert-Butylbenzene (98-06-6)
- Carbon disulfide (75-15-0)
- Carbon tetrachloride (56-23-5)
- Chloroform (108-90-7)
- Chloroform (67-66-3)
- 1-Chlorobutane (butyl chloride) (109-69-3)
- 2-Chlorotoluene (95-49-8)
- 4-Chlorotoluene (106-43-4)
- Dibromochloromethane (124-48-1)
- 1,2-Dibromo-3-chloropropane (96-12-8)
- Dibromomethane (74-95-3)
- 1,2-Dibromoethane (EDB) (106-93-4)
- 1,2-Dichlorobenzene (95-50-1)
- 1,3-Dichlorobenzene (541-73-1)
- 1,4-Dichlorobenzene (106-46-7)
- 1,1-Dichloroethane (75-34-3)
- 1,2-Dichloroethane (107-06-2)
- 1,1-Dichloroethene (75-35-4)
- cis-1,2-Dichloroethene (156-59-2)
- trans-1,2-Dichloroethene (156-60-5)
- 1,2-Dichloropropane (78-87-5)
- 1,3-Dichloropropane (142-28-9)
- 1,1-Dichloropropene (563-58-6)

- cis-1,3-Dichloropropene (10061-01-5)
- trans-1,3-Dichloropropene (10061-02-6)
- Diethyl ether (ethyl ether) (60-29-7)
- Diisopropyl ether (DIPE) (108-20-3)
- Ethylbenzene (100-41-4)
- Ethyl-tert-butyl ether (ETBE) (637-92-3)
- Ethyl methacrylate (97-63-2)
- Hexachlorobutadiene (87-68-3)
- Hexachloroethane (67-72-1)
- Iodomethane (methyl iodide) (74-88-4)
- Isopropylbenzene (cumene) (98-82-8)
- 4-Isopropyltoluene (p-cymene) (99-87-6)
- Methyl acetate (79-20-9)
- Methyl-tert-butyl ether (MTBE) (1634-04-4)
- Methylene chloride (dichloromethane) (75-09-2)
- Naphthalene (91-20-3)
- Pentachloroethane (76-01-7)
- n-Propylbenzene (103-65-1)
- Styrene (100-42-5)
- Tetrachloroethene (127-18-4)
- 1,1,1,2-Tetrachloroethane (630-20-6)
- 1,1,2,2-Tetrachloroethane (79-34-5)
- Tetrahydrofuran (109-99-9)
- Toluene (108-88-3)
- 1,2,3-Trichlorobenzene (87-61-6)
- 1,2,4-Trichlorobenzene (120-82-1)
- 1,1,1-Trichloroethane (71-55-6)
- 1,1,2-Trichloroethane (79-00-5)
- Trichloroethene (79-01-6)
- 1,2,3-Trichloropropane (96-18-4)
- 1,2,4-Trimethylbenzene (95-63-6)
- 1,3,5-Trimethylbenzene (108-67-8)
- m-Xylene (108-38-3)
- o-Xylene (95-47-6)
- p-Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat # 30013 (ea.)

524.3 Gas Calibration Mix (7 components)

- Bromomethane (methyl bromide) (74-83-9)
- 1,3-Butadiene (106-99-0)
- Chlorodifluoromethane (CFC-22) (75-45-6)
- Chloromethane (methyl chloride) (74-87-3)
- Dichlorodifluoromethane (CFC-12) (75-71-8)
- Trichlorofluoromethane (CFC-11) (75-69-4)
- Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30014 (ea.)

524.3 Internal Standard Mix (3 components)

- Chlorobenzene-d5 (3114-55-4)
- 1,4-Difluorobenzene (540-36-3)
- 1,4-Dichlorobenzene-d4 (3855-82-1)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30015 (ea.)

524.3 Surrogate Standard (3 components)

- 1-Bromo-4-fluorobenzene (BFB) (460-00-4)
- Methyl-d3-tert-butyl ether (29366-08-3)
- 1,2-Dichlorobenzene-d4 (2199-69-1)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30016 (ea.)

524.3 Internal Standard/Surrogate Mix (6 components)

- 1-Bromo-4-fluorobenzene (BFB) (460-00-4)
- Methyl-d3-tert-butyl ether (29366-08-3)
- Chlorobenzene-d5 (3114-55-4)
- 1,2-Dichlorobenzene-d4 (2199-69-1)
- 1,4-Dichlorobenzene-d4 (3855-82-1)
- 1,4-Difluorobenzene (540-36-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30017 (ea.)

RESTEK CHROMALYTICS® in AUSTRALIA : Contact +81 3 9762 2034

55

Distributor

SHOPPE  
www.chromalytic.net.au  
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Volatile Organics, *cont.*

## Method 601 (Purgeable Hydrocarbons)

## VOA Purgeable Halocarbon Mix #1 (23 components)

Bromodichloromethane (75-27-4)	1,1-Dichloroethene (75-35-4)
Bromoform (75-25-2)	<i>trans</i> -1,2-Dichloroethene (156-60-5)
Carbon tetrachloride (56-23-5)	1,2-Dichloropropane (78-87-5)
Chlorobenzene (108-90-7)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
2-Chloroethyl vinyl ether (110-75-8)	<i>trans</i> -1,3-Dichloropropene (10061-02-6)
Chloroform (67-66-3)	Methylene chloride (dichloromethane) (75-09-2)
Dibromochloromethane (124-48-1)	1,1,2,2-Tetrachloroethane (79-34-5)
1,2-Dichlorobenzene (95-50-1)	Tetrachloroethene (127-18-4)
1,3-Dichlorobenzene (541-73-1)	1,1,1-Trichloroethane (71-55-6)
1,4-Dichlorobenzene (106-46-7)	1,1,2-Trichloroethane (79-00-5)
1,1-Dichloroethane (75-34-3)	Trichloroethene (79-01-6)
1,2-Dichloroethane (107-06-2)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30212 (ea.)

## Method 603 (Acrolein &amp; Acrylonitrile)

## Acrolein/Acrylonitrile (2 components)

Acrolein (107-02-8)  
Acrylonitrile (107-13-1)

2,000 µg/mL each in DI water, 1 mL/ampul  
cat.# 30600 (ea.)

Must ship overnight on ice.

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

## Acrolein

Acrolein (107-02-8)  
5,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul  
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

## Acrylonitrile

Acrylonitrile (107-13-1)  
2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30246 (ea.)

## Reference Standards Search

Search by compound name, synonym, or CAS #.

[www.restek.com/reference](http://www.restek.com/reference)



## Method 624 (Purgeable Halocarbons)

## Volatiles MegaMix® Standard, EPA Method 624 (26 components)

MEGAMIX®

Benzene (71-43-2)	<i>trans</i> -1,2-Dichloroethene (156-60-5)
Bromodichloromethane (75-27-4)	1,2-Dichloropropane (78-87-5)
Bromoform (75-25-2)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
Carbon tetrachloride (56-23-5)	<i>trans</i> -1,3-Dichloropropene (10061-02-6)
Chlorobenzene (108-90-7)	Ethylbenzene (100-41-4)
2-Chloroethyl vinyl ether (110-75-8)	Methylene chloride (dichloromethane) (75-09-2)
Chloroform (67-66-3)	1,1,2,2-Tetrachloroethane (79-34-5)
Dibromochloromethane (124-48-1)	Tetrachloroethene (127-18-4)
1,2-Dichlorobenzene (95-50-1)	Toluene (108-88-3)
1,3-Dichlorobenzene (541-73-1)	1,1,1-Trichloroethane (71-55-6)
1,4-Dichlorobenzene (106-46-7)	1,1,2-Trichloroethane (79-00-5)
1,1-Dichloroethane (75-34-3)	Trichloroethene (79-01-6)
1,2-Dichloroethane (107-06-2)	
1,1-Dichloroethene (75-35-4)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30497 (ea.)

## 624 Internal Standard Mix (3 components)

Bromochloromethane (74-97-5) 1,4-Dichlorobutane (110-56-5)  
2-Bromo-1-chloropropane (3017-95-6)

1,500 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30023 (ea.)

## 624 Surrogate Standard Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4) Pentafluorobenzene (363-72-4)  
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30243 (ea.)

## Surrogate Standard (2 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
 $\alpha,\alpha,\alpha$ -Trifluorotoluene (98-08-8)

2,500 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30484 (ea.)

## 624 Calibration Mix #1 (gases) (5 components)

Bromomethane (methyl bromide) (74-83-9) Trichlorofluoromethane (CFC-11) (75-69-4)  
Chloroethane (ethyl chloride) (75-00-3) Vinyl chloride (75-01-4)  
Chloromethane (methyl chloride) (74-87-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30020 (ea.)

## 624 Calibration Mix #2 (12 components)

Benzene (71-43-2) 1,2-Dichloropropane (78-87-5)  
Carbon tetrachloride (56-23-5) Methylene chloride (dichloromethane) (75-09-2)  
Chlorobenzene (108-90-7) Tetrachloroethene (127-18-4)  
2-Chloroethyl vinyl ether (110-75-8) 1,1,2-Trichloroethane (79-00-5)  
Dibromochloromethane (124-48-1) Trichloroethene (79-01-6)  
1,1-Dichloroethane (75-34-3)  
1,1-Dichloroethene (75-35-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30021 (ea.)





**Volatile Organics, cont.**

**Method 624 (Purgeable Halocarbons), cont.**

**624 Calibration Mix #3** (14 components)

Bromodichloromethane (75-27-4)	<i>trans</i> -1,2-Dichloroethene (156-60-5)
Bromoform (75-25-2)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
Chloroform (67-66-3)	<i>trans</i> -1,3-Dichloropropene (10061-02-6)
1,2-Dichlorobenzene (95-50-1)	Ethylbenzene (100-41-4)
1,3-Dichlorobenzene (541-73-1)	1,1,2,2-Tetrachloroethane (79-34-5)
1,4-Dichlorobenzene (106-46-7)	Toluene (108-88-3)
1,2-Dichloroethane (107-06-2)	1,1,1-Trichloroethane (71-55-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30022 (ea.)

**624 Complete Kit**

Contains 1 mL each of these mixtures.  
30020: 624 Calibration Mix #1  
30021: 624 Calibration Mix #2  
30022: 624 Calibration Mix #3  
30023: 624 Internal Standard Mix  
30243: 624 Surrogate Standard Mix

cat.# 30244 (kit)

kit

**624 Kit**

Contains 1 mL each of these mixtures.  
30020: 624 Calibration Mix #1  
30021: 624 Calibration Mix #2  
30022: 624 Calibration Mix #3  
30023: 624 Internal Standard Mix

cat.# 30055 (kit)

kit

**Method 8010 (Halogenated Volatile Organics)**

**624 Internal Standard Mix** (3 components)

Bromochloromethane (74-97-5)	1,4-Dichlorobutane (110-56-5)
2-Bromo-1-chloropropane (3017-95-6)	

1,500 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30023 (ea.)

**502.2 Calibration Mix #1 (gases)** (6 components)

Bromomethane (methyl bromide) (74-83-9)	Dichlorodifluoromethane (CFC-12) (75-71-8)
Chloroethane (ethyl chloride) (75-00-3)	Trichlorofluoromethane (CFC-11) (75-69-4)
Chloromethane (methyl chloride) (74-87-3)	Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30042 (ea.)

**Method 8010 (Halogenated Volatile Organics), cont.**

**BTEX Standard** (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul  
cat.# 30488 (ea.)

**i tech tip**

To analyze compounds listed in Methods 8010 and 8020 concurrently, add BTEX standard to the calibration curve mix.

**BTEX Gas Mix** (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

**cylinder design**

Cylinder Construction: aluminum  
Cylinder Fitting: CGA-180 outlet

**Spectra (Linde) 104 L Cylinders:**

Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas  
@ 1,800 psi  
Weight: 1.5 lb/0.7 kg



**Scotty (Air Liquide) 110 L Cylinders:**

Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas  
@ 1,800 psi  
Weight: 2.2 lb/1 kg  
U.S. DOT Specs: 3AL2216



1 ppm in nitrogen, 104 liters @ 1,800 psi  
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi  
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi  
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi  
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)  
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

**also available**

High-Purity VOC Regulators

See page 453.





Volatile Organics, *cont.*

## Method 8011 (1,2-Dibromoethane &amp; 1,2-Dibromo-3-chloropropane)

## 8011 Calibration Mix—EDB/DBCP (2 components)

1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)  
1,2-Dibromoethane (EDB) (106-93-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30062 (ea.)

## Method 8020 (Aromatic Volatile Organics)

## Internal and Surrogate Standards for Method 8020

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-Bromo-4-fluorobenzene (BFB)	460-00-4	PTM	2,000	30026
1,4-Difluorobenzene	540-36-3	PTM	2,000	30032
Fluorobenzene	462-06-6	PTM	2,000	30030
α,α,α-Trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

## 8020A Calibration Mix (10 components)

Benzene (71-43-2)	Ethylbenzene (100-41-4)
Chlorobenzene (108-90-7)	Toluene (108-88-3)
1,2-Dichlorobenzene (95-50-1)	<i>m</i> -Xylene (108-38-3)
1,3-Dichlorobenzene (541-73-1)	<i>o</i> -Xylene (95-47-6)
1,4-Dichlorobenzene (106-46-7)	<i>p</i> -Xylene (106-42-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30222 (ea.)

## Method 8021 (Volatile Organics)

## 502.2 Internal Standard Mix #2 (2 components)

2-Bromo-1-chloropropane (3017-95-6)  
Fluorobenzene (462-06-6)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30041 (ea.)

## 8021/502.2 Surrogate Mix #1 (3 components)

1-Bromo-2-chloroethane (107-04-0) Fluorobenzene (462-06-6)  
1-Chloro-3-fluorobenzene (625-98-9)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30463 (ea.)

## Restek® innovation!

## Xylene-Free, Highly Purified Chloroprene Standard

The R&D chemists at Restek developed a novel procedure that produces a pure, quantitative chloroprene solution specially stabilized in purge-and-trap grade methanol. The entire procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene. The final solution is specially stabilized, allowing analysts to make dilutions for working standards in unmodified purge-and-trap grade methanol.

**Note:** Because chloroprene is not analyzed by many laboratories, it is not included in our 8240 VOA mixes. Chloroprene is included in our 8260B MegaMix® calibration mix. Refer to **page 555**.

## Method 8240 (Volatile Organic Compounds [VOCs])

## 502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) (74-83-9)	Dichlorodifluoromethane (CFC-12) (75-71-8)
Chloroethane (ethyl chloride) (75-00-3)	Trichlorofluoromethane (CFC-11) (75-69-4)
Chloromethane (methyl chloride) (74-87-3)	Vinyl chloride (75-01-4)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30042 (ea.)

## VOA Calibration Mix #1 (ketones) (4 components)

Acetone (67-64-1)	2-Hexanone (591-78-6)
2-Butanone (MEK) (78-93-3)	4-Methyl-2-pentanone (MIBK) (108-10-1)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul  
cat.# 30006 (ea.)

## VOA Purgeable Halocarbon Mix #1 (23 components)

Bromodichloromethane (75-27-4)	1,1-Dichloroethene (75-35-4)
Bromoform (75-25-2)	<i>trans</i> -1,2-Dichloroethene (156-60-5)
Carbon tetrachloride (56-23-5)	1,2-Dichloropropane (78-87-5)
Chlorobenzene (108-90-7)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
2-Chloroethyl vinyl ether (110-75-8)	<i>trans</i> -1,3-Dichloropropene (10061-02-6)
Chloroform (67-66-3)	Methylene chloride (dichloromethane) (75-09-2)
Dibromochloromethane (124-48-1)	1,1,2,2-Tetrachloroethane (79-34-5)
1,2-Dichlorobenzene (95-50-1)	Tetrachloroethene (127-18-4)
1,3-Dichlorobenzene (541-73-1)	1,1,1-Trichloroethane (71-55-6)
1,4-Dichlorobenzene (106-46-7)	1,1,2-Trichloroethane (79-00-5)
1,1-Dichloroethane (75-34-3)	Trichloroethene (79-01-6)
1,2-Dichloroethane (107-06-2)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30212 (ea.)

## 8240 Volatiles Mix #1A (12 components)

Allyl chloride (3-chloropropene) (107-05-1)	<i>trans</i> -1,4-Dichloro-2-butene (110-57-6)
Benzyl chloride (100-44-7)	1,4-Dioxane (123-91-1)
1,2-Dibromo-3-chloropropane (96-12-8)	Iodomethane (methyl iodide) (74-88-4)
1,2-Dibromoethane (EDB) (106-93-4)	Pentachloroethane (76-01-7)
Dibromomethane (74-95-3)	1,1,1,2-Tetrachloroethane (630-20-6)
<i>cis</i> -1,4-Dichloro-2-butene (1476-11-5)	1,2,3-Trichloropropane (96-18-4)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30217 (ea.)

## 8240 Volatiles Mix #2A (3 components)

Carbon disulfide (75-15-0)	Pyridine (110-86-1)
2-Picoline (109-06-8)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30218 (ea.)

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See **pages 464–465**.

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Volatile Organics, *cont.*

Method 8240 (Volatile Organic Compounds [VOCs]), *cont.*

**8240 Nitriles Mix** (7 components)

Acrylonitrile (107-13-1)	Methyl methacrylate (80-62-6)
Ethyl methacrylate (97-63-2)	Propionitrile (107-12-0)
Malononitrile (109-77-3)	Styrene (100-42-5)
Methacrylonitrile (126-98-7)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30215 (ea.)

**8240 Alcohols Mix** (5 components)

Allyl alcohol (2-propen-1-ol) (107-18-6)	Isobutyl alcohol (78-83-1)
2-Chloroethanol (107-07-3)	Propargyl alcohol (107-19-7)
Ethanol (64-17-5)	

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30214 (ea.)

**Glycols Standard** (2 components)

Ethylene glycol (107-21-1)  
Propylene glycol (57-55-6)

50,000 µg/mL each in DI water, 1 mL/ampul  
cat.# 30471 (ea.)

**BTEX Standard** (6 components)

Benzene (71-43-2)	<i>m</i> -Xylene (108-38-3)
Ethylbenzene (100-41-4)	<i>o</i> -Xylene (95-47-6)
Toluene (108-88-3)	<i>p</i> -Xylene (106-42-3)

200 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul  
cat.# 30488 (ea.)

**BTEX Gas Mix** (6 components)

Benzene (71-43-2)  
Ethylbenzene (100-41-4)  
Toluene (108-88-3)  
*m*-Xylene (108-38-3)  
*o*-Xylene (95-47-6)  
*p*-Xylene (106-42-3)

1 ppm in nitrogen, 104 liters @ 1,800 psi  
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi  
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi  
(Pi-marked cylinder)  
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi  
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi  
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi  
(Pi-marked cylinder)  
cat.# 34428-PI (ea.)

**cylinder design**



**Spectra (Linde)**

**104 L Cylinders:**

Aluminum construction  
Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas @ 1,800 psi  
CGA-180 outlet fitting.  
Weight: 1.5 lb/0.7 kg



**Scotty (Air Liquide)**

**110 L Cylinders:**

Aluminum construction  
Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas @ 1,800 psi  
CGA-180 outlet fitting.  
Weight: 2.2 lb/1 kg  
U.S. DOT Specs: 3AL2216

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

**8260A Internal Standard Mix** (3 components)

Chlorobenzene-d5 (3114-55-4)	Fluorobenzene (462-06-6)
1,4-Dichlorobenzene-d4 (3855-82-1)	
2,500 µg/mL each in P&T methanol, 1 mL/ampul	
	cat.# 30241 (ea.)

**8260 Internal Standard Mix** (4 components)

Chlorobenzene-d5 (3114-55-4)	1,4-Difluorobenzene (540-36-3)
1,4-Dichlorobenzene-d4 (3855-82-1)	Pentafluorobenzene (363-72-4)
2,500 µg/mL each in P&T methanol, 1 mL/ampul	
	cat.# 30074 (ea.)

**8260A Surrogate Mix** (4 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)	1,2-Dichloroethane-d4 (17060-07-0)
Dibromofluoromethane (1868-53-7)	Toluene-d8 (2037-26-5)
2,500 µg/mL each in P&T methanol, 1 mL/ampul	
	cat.# 30240 (ea.)

**8260 Surrogate Mix** (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)	Dibromofluoromethane (1868-53-7)
	Toluene-d8 (2037-26-5)
2,500 µg/mL each in P&T methanol, 1 mL/ampul	
	cat.# 30073 (ea.)

**8260B Matrix Spike Mix** (5 components)

Benzene (71-43-2)	Toluene (108-88-3)
Chlorobenzene (108-90-7)	Trichloroethylene (79-01-6)
1,1-Dichloroethene (75-35-4)	
2,500 µg/mL each in P&T methanol, 1 mL/ampul	
	cat.# 30479 (ea.)

**8240/8260 System Performance Check Mix**

(5 components)

Bromoform (75-25-2)	1,1-Dichloroethane (75-34-3)
Chlorobenzene (108-90-7)	1,1,2,2-Tetrachloroethane (79-34-5)
Chloromethane (methyl chloride) (74-87-3)	
2,000 µg/mL each in P&T methanol, 1 mL/ampul	
	cat.# 30075 (ea.)

**1-Bromo-4-fluorobenzene (BFB)**

1-Bromo-4-fluorobenzene (BFB) (460-00-4)  
2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30026 (ea.)  
2,500 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30067 (ea.)  
10,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30082 (ea.)

**1,4-Dioxane-d8**

1,4-Dioxane-d8 (17647-74-4)  
2,000 µg/mL in P&T methanol, 1 mL/ampul  
cat.# 30614 (ea.)

Volatile Organics, *cont.*Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

## PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul

cat.# 30482 (ea.)

No data pack available.

## 8260B MegaMix® Calibration Mix

(76 components)

Acetonitrile (75-05-8)  
 Acrylonitrile (107-13-1)  
 Allyl chloride (3-chloropropene) (107-05-1)  
 Benzene (71-43-2)  
 Bromobenzene (108-86-1)  
 Bromochloromethane (74-97-5)  
 Bromodichloromethane (75-27-4)  
 Bromoform (75-25-2)  
*n*-Butylbenzene (104-51-8)  
*sec*-Butylbenzene (135-98-8)  
*tert*-Butylbenzene (98-06-6)  
 Carbon disulfide (75-15-0)  
 Carbon tetrachloride (56-23-5)  
 Chlorobenzene (108-90-7)  
 2-Chloroethanol (107-07-3)  
 Chloroform (67-66-3)  
 Chloroprene (2-chloro-1,3-butadiene) (126-99-8)  
 2-Chlorotoluene (95-49-8)  
 4-Chlorotoluene (106-43-4)  
 Dibromochloromethane (124-48-1)  
 1,2-Dibromo-3-chloropropane (DBCP) (96-12-8)  
 1,2-Dibromoethane (EDB) (106-93-4)  
 Dibromomethane (74-95-3)  
 1,2-Dichlorobenzene (95-50-1)  
 1,3-Dichlorobenzene (541-73-1)  
 1,4-Dichlorobenzene (106-46-7)  
*cis*-1,4-Dichloro-2-butene (1476-11-5)  
*trans*-1,4-Dichloro-2-butene (110-57-6)  
 1,1-Dichloroethane (75-34-3)  
 1,2-Dichloroethane (107-06-2)  
 1,1-Dichloroethene (75-35-4)  
*cis*-1,2-Dichloroethene (156-59-2)  
*trans*-1,2-Dichloroethene (156-60-5)  
 1,2-Dichloropropane (78-87-5)  
 1,3-Dichloropropane (142-28-9)  
 2,2-Dichloropropane (594-20-7)  
 1,1-Dichloropropene (563-58-6)  
*cis*-1,3-Dichloropropene (10061-01-5)  
*trans*-1,3-Dichloropropene (10061-02-6)

2,000 µg/mL each in P&amp;T methanol, 1 mL/ampul

cat.# 30633 (ea.)

## 8260B MegaMix® Calibration Mix, Revised (75 components)

Same list as above, but without pentachloroethane.

2,000 µg/mL each in P&amp;T methanol, 1 mL/ampul

cat.# 30152 (ea.)

## 2-Chloroethyl Vinyl Ether

2-Chloroethyl vinyl ether (110-75-8)

2,000 µg/mL in P&amp;T methanol, 1 mL/ampul

cat.# 30265 (ea.)

## 8260B MegaMix® Calibration Mix Kit

Contains 1 mL each of these mixtures.

30633: 8260B MegaMix Calibration Mix

30265: 2-chloroethyl vinyl ether

MEGAMIX®

cat.# 30475 (kit)

kit

## 8240/8260 Calibration Check Mix (6 components)

Chloroform (67-66-3) Ethylbenzene (100-41-4)  
 1,1-Dichloroethene (75-35-4) Toluene (108-88-3)  
 1,2-Dichloropropane (78-87-5) Vinyl chloride (75-01-4)  
 2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30427 (ea.)

## 502.2 Calibration Mix #1 (gases) (6 components)

Bromomethane (methyl bromide) Dichlorodifluoromethane (CFC-12) (74-83-9) (75-71-8)  
 Chloroethane (ethyl chloride) (75-00-3) Trichlorofluoromethane (CFC-11) (75-69-4)  
 Chloromethane (methyl chloride) (74-87-3) Vinyl chloride (75-01-4)

200 µg/mL each in P&amp;T methanol, 1 mL/ampul

cat.# 30439 (ea.)

2,000 µg/mL each in P&amp;T methanol, 1 mL/ampul

cat.# 30042 (ea.)

## 8260B Acetate Mix (5 components)

*n*-Butyl acetate (123-86-4) *n*-Propyl acetate (109-60-4)  
 Ethyl acetate (141-78-6) Vinyl acetate (108-05-4)  
 Isopropyl acetate (108-21-4)

2,000 µg/mL each in P&amp;T methanol, 1 mL/ampul

cat.# 30477 (ea.)

## 8260B Acetate Mix (Revised) (7 components)

*n*-Amyl acetate (628-63-7) Methyl acetate (79-20-9)  
 Butyl acetate (123-86-4) Propyl acetate (109-60-4)  
 Ethyl acetate (141-78-6) Vinyl acetate (108-05-4)  
 Isopropyl acetate (108-21-4)

2,000 µg/mL each in P&amp;T methanol, 1 mL/ampul

cat.# 30489 (ea.)

## California Oxygenates Mix (5 components)

*tert*-Amyl methyl ether (TAME) (994-05-8) 2,000 µg/mL  
*tert*-Butanol (TBA) (75-65-0) 10,000  
 Diisopropyl ether (DIPE) (108-20-3) 2,000  
 Ethyl *tert*-butyl ether (ETBE) (637-92-3) 2,000  
 Methyl *tert*-butyl ether (MTBE) (1634-04-4) 2,000

In P&amp;T methanol, 1 mL/ampul

cat.# 30465 (ea.)

## Oxygenates (6 components)

*tert*-Amyl ethyl ether (TAE) (919-94-8) 2,000 µg/mL  
*tert*-Amyl methyl ether (TAME) (994-05-8) 2,000  
*tert*-Butanol (TBA) (75-65-0) 10,000  
 Diisopropyl ether (DIPE) (108-20-3) 2,000  
 Ethyl *tert*-butyl ether (ETBE) (637-92-3) 2,000  
 Methyl *tert*-butyl ether (MTBE) (1634-04-4) 2,000

In P&amp;T methanol, 1 mL/ampul

cat.# 30626 (ea.)



Volatile Organics, *cont.*

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

Single-Component Oxygenates Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
<i>tert</i> -Amyl alcohol	75-85-4	PTM	10,000	30631
<i>tert</i> -Amyl ethyl ether (TAE)	919-94-8	PTM	2,000	30617
<i>tert</i> -Amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
<i>tert</i> -Butanol (TBA)	75-65-0	PTM	50,000	30470
<i>tert</i> -Butanol-d9	25725-11-5	PTM	20,000	30618
Diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
Ethanol	64-17-5	PTM	2,000	30288
Ethanol	64-17-5	W	10,000	30466
Ethyl- <i>tert</i> -butyl ether (ETBE)	637-92-3	PTM	2,000	30628
Methanol	67-56-1	W	10,000	30467
Methyl <i>tert</i> -butyl ether (MTBE)	1634-04-4	PTM	2,000	30402

PTM = purge-and-trap grade methanol; W = DI water

also available

Rtx®-VMS Column

Your best choice for EPA Method 8260

- Fastest cycle times for VOCs.
- Tuned selectivity for VOCs.
- Excellent separation of gases.

See page 78 for more information.



Acrolein

Acrolein (107-02-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul

cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

1,2-Dichlorotetrafluoroethane (CFC-114)

1,2-Dichlorotetrafluoroethane (CFC-114) (76-14-2)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30476 (ea.)

Chloroprene

A pure, quantitative chloroprene solution, specially stabilized in purge-and-trap grade methanol to allow dilutions for working standards in unmodified purge-and-trap methanol. The entire preparation procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene.

Chloroprene (126-99-8)

5,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30238 (ea.)

Vinyl Acetate

Vinyl acetate (108-05-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30216 (ea.)

8260A Volatile Organics Kit (2,000 µg/mL)

Changes in this revision of the method include modification of the recommended internal standard and surrogate solutions.

Contains 1 mL each of these mixtures.

- 30042: 502.2 Calibration Mix #1
- 30043: 502.2 Calibration Mix #2
- 30044: 502.2 Calibration Mix #3
- 30045: 502.2 Calibration Mix #4
- 30046: 502.2 Calibration Mix #5
- 30047: 502.2 Calibration Mix #6
- 30067: 4-bromofluorobenzene (2,500 µg/mL)
- 30240: 8260A Surrogate Mix (2,500 µg/mL)
- 30241: 8260A Internal Standard Mix (2,500 µg/mL)
- 30075: 8240/8260 System Performance Check Mix
- 30005: VOA Matrix Spike Mix (2,500 µg/mL)

cat.# 30242 (kit)

kit

8260 Volatile Organics Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.

- 30042: 502.2 Calibration Mix #1
- 30043: 502.2 Calibration Mix #2
- 30044: 502.2 Calibration Mix #3
- 30045: 502.2 Calibration Mix #4
- 30046: 502.2 Calibration Mix #5
- 30047: 502.2 Calibration Mix #6
- 30067: 4-bromofluorobenzene (2,500 µg/mL)
- 30073: 8260 Surrogate Mix (2,500 µg/mL)
- 30074: 8260 Internal Standard Mix (2,500 µg/mL)
- 30075: 8240/8260 System Performance Check Mix
- 30005: VOA Matrix Spike Mix (2,500 µg/mL)

cat.# 30076 (kit)

kit

TCLP VOA Mix (11 components)

- Benzene (71-43-2)
- 2-Butanone (MEK) (78-93-3)
- Carbon tetrachloride (56-23-5)
- Chlorobenzene (108-90-7)
- Chloroform (67-66-3)
- 1,4-Dichlorobenzene (106-46-7)
- 1,2-Dichloroethane (107-06-2)
- 1,1-Dichloroethene (75-35-4)
- Tetrachloroethene (127-18-4)
- Trichloroethene (79-01-6)
- Vinyl chloride (75-01-4)

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul

cat.# 30024 (ea.)



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## Volatile Organics, *cont.*

### SOM01.1 (Volatiles), QA Mixes

#### SOM01.1 VOA Non-Ketone Deuterated Monitoring Compounds (11 components)

Benzene-d6 (1076-43-3)	1,2-Dichloropropane-d6 (93952-08-0)
Chloroethane-d5 (19199-91-8)	1,3-Dichloropropene-d4 (202656-23-3)*
Chloroform-d (865-49-6)	1,1,1,2-Tetrachloroethane-d2 (33685-54-0)
1,2-Dichlorobenzene-d4 (2199-69-1)	Toluene-d8 (2037-26-5)
1,2-Dichloroethane-d4 (17060-07-0)	Vinyl chloride-d3 (6745-35-3)
1,1-Dichloroethene-d2 (22280-73-5)	

500 µg/mL each in deuterated methanol (MeOD), 1 mL/ampul  
cat.# 30624 (ea.)

\*Mix of *cis* and *trans* isomers. Exact proportions will be reported on the data sheet.

#### SOM01.1 VOA Ketone Deuterated Monitoring Compounds (2 components)

2-Butanone-d5 (24313-50-6)
2-Hexanone-d5 (4840-82-8)

500 µg/mL each in deuterium oxide (D<sub>2</sub>O), 1 mL/ampul  
cat.# 30625 (ea.)

#### SOM01.1 VOA DMC Kit

500 µg/mL. 1 mL each of these mixtures.

30624: Non-Ketones

30625: Ketones

500 µg/mL. 1 mL each of these mixtures.

cat.# 30630 (kit)

kit

### 04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes

#### CLP 04.1 VOA Internal Standard/SMC Spike Mix

(6 components)

Bromochloromethane (74-97-5)	1,2-Dichloroethane-d4 (17060-07-0)
1-Bromo-4-fluorobenzene (BFB) (460-00-4)	1,4-Difluorobenzene (540-36-3)
Chlorobenzene-d5 (3114-55-4)	Toluene-d8 (2037-26-5)

2,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30457 (ea.)

#### VOA Internal Standard Mix (3 components)

Bromochloromethane (74-97-5)	Chlorobenzene-d5 (3114-55-4)
1,4-Difluorobenzene (540-36-3)	

2,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30011 (ea.)

#### VOA Surrogate Spike Mix (3 components)

1-Bromo-4-fluorobenzene (BFB) (460-00-4)	1,2-Dichloroethane-d4 (17060-07-0)
	Toluene-d8 (2037-26-5)

2,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30004 (ea.)

#### VOA Matrix Spike Mix (5 components)

Benzene (71-43-2)	Toluene (108-88-3)
Chlorobenzene (108-90-7)	Trichloroethene (79-01-6)
1,1-Dichloroethene (75-35-4)	

2,500 µg/mL each in P&T methanol, 1 mL/ampul

### 04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes, *cont.*

#### VOA Tuning Compound

1-Bromo-4-fluorobenzene (BFB) (460-00-4)

5,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30003 (ea.)

#### PFTBA (MS Tuning Compound)

Perfluorotributylamine (PFTBA) (311-89-7)

Neat, 1 mL/ampul

cat.# 30482 (ea.)

No data pack available.

#### L/C VOA Lab Control Sample

We prepare the L/C VOA lab control sample in two parts. Sample #1 contains all compounds except vinyl chloride because this compound is extremely volatile and must be replaced frequently. Sample #2 contains vinyl chloride.

#### L/C VOA Lab Control Sample #1 (11 components)

Benzene (71-43-2)	1,2-Dichloropropane (78-87-5)
Bromoform (75-25-2)	<i>cis</i> -1,3-Dichloropropene (10061-01-5)
Carbon tetrachloride (56-23-5)	Tetrachloroethene (127-18-4)
1,2-Dibromoethane (EDB) (106-93-4)	1,1,2-Trichloroethane (79-00-5)
1,4-Dichlorobenzene (106-46-7)	Trichloroethene (79-01-6)
1,2-Dichloroethane (107-06-2)	

2,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30092 (ea.)

#### L/C VOA Lab Control Sample #2 (Vinyl chloride)

Vinyl chloride (75-01-4)

2,500 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30093 (ea.)

#### L/C VOA Internal Standard Mix (3 components)

Chlorobenzene-d5 (3114-55-4)	1,4-Difluorobenzene (540-36-3)
1,4-Dichlorobenzene-d4 (3855-82-1)	

2,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30091 (ea.)



Volatile Organics, cont.

04.2 and 04.1 (Volatiles), Calibration Mixes

CLP 04.1 VOA CAL2000 MegaMix® Standard **MEGAMIX®**

(40 components)

- |  |   |
|--|---|
| Benzene (71-43-2)                            | <i>trans</i> -1,3-Dichloropropene (10061-02-6)            |
| Bromodichloromethane (75-27-4)               | Ethylbenzene (100-41-4)                                   |
| Bromoform (75-25-2)                          | Isopropylbenzene (cumene) (98-82-8)                       |
| Carbon disulfide (75-15-0)                   | Methyl acetate (79-20-9)                                  |
| Carbon tetrachloride (56-23-5)               | Methyl <i>tert</i> -butyl ether (MTBE) (1634-04-4)        |
| Chlorobenzene (108-90-7)                     | Methylcyclohexane (108-87-2)                              |
| Chloroform (67-66-3)                         | Methylene chloride (dichloromethane) (75-09-2)            |
| Cyclohexane (110-82-7)                       | Styrene (100-42-5)  |
| Dibromochloromethane (124-48-1)              | 1,1,2,2-Tetrachloroethane (79-34-5)                       |
| 1,2-Dibromo-3-chloropropane (DBCP) (96-12-8) | Tetrachloroethene (127-18-4)                              |
| 1,2-Dibromoethane (EDB) (106-93-4)           | Toluene (108-88-3)  |
| 1,2-Dichlorobenzene (95-50-1)                | 1,2,4-Trichlorobenzene (120-82-1)                         |
| 1,3-Dichlorobenzene (541-73-1)               | 1,1,1-Trichloroethane (71-55-6)                           |
| 1,4-Dichlorobenzene (106-46-7)               | 1,1,2-Trichloroethane (79-00-5)                           |
| 1,1-Dichloroethane (75-34-3)                 | Trichloroethene (79-01-6)                                 |
| 1,2-Dichloroethane (107-06-2)                | 1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113) (76-13-1) |
| 1,1-Dichloroethene (75-35-4)                 | <i>m</i> -Xylene (108-38-3)                               |
| <i>cis</i> -1,2-Dichloroethene (156-59-2)    | <i>o</i> -Xylene (95-47-6)                                |
| <i>trans</i> -1,2-Dichloroethene (156-60-5)  | <i>p</i> -Xylene (106-42-3)                               |
| 1,2-Dichloropropane (78-87-5)                |   |
| <i>cis</i> -1,3-Dichloropropene (10061-01-5) |   |

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30456 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

- |   |  |
|---|--|
| Bromomethane (methyl bromide) (74-83-9)   | Dichlorodifluoromethane (CFC-12) (75-71-8) |
| Chloroethane (ethyl chloride) (75-00-3)   | Trichlorofluoromethane (CFC-11) (75-69-4)  |
| Chloromethane (methyl chloride) (74-87-3) | Vinyl chloride (75-01-4)                   |

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30042 (ea.)

VOA Calibration Mix #1 (ketones) (4 components)

- |                            |  |
|----------------------------|--|
| Acetone (67-64-1)          | 2-Hexanone (591-78-6)                  |
| 2-Butanone (MEK) (78-93-3) | 4-Methyl-2-pentanone (MIBK) (108-10-1) |

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul

cat.# 30006 (ea.)

CLP 04.1 VOA Kit #3

Contains 1 mL each of these mixtures.

30006: VOA Calibration Mix #1 (ketones)

30042: 502.2 Calibration Mix #1 (gases)

30456: CLP 04.1 VOA CAL2000 MegaMix Standard

cat.# 30460 (kit)

kit

3/90 SOW (Volatiles), Calibration Mixes

CLP VOA CAL2000 MegaMix® Standard **MEGAMIX®**

(28 components)

- |  |  |
|--|--|
| Benzene (71-43-2)                            | <i>trans</i> -1,3-Dichloropropene (10061-02-6) |
| Bromodichloromethane (75-27-4)               | Ethylbenzene (100-41-4)                        |
| Bromoform (75-25-2)                          | Methylene chloride (dichloromethane) (75-09-2) |
| Carbon disulfide (75-15-0)                   | Styrene (100-42-5)                             |
| Carbon tetrachloride (56-23-5)               | 1,1,2,2-Tetrachloroethane (79-34-5)            |
| Chlorobenzene (108-90-7)                     | Tetrachloroethene (127-18-4)                   |
| Chloroform (67-66-3)                         | Toluene (108-88-3)                             |
| Dibromochloromethane (124-48-1)              | 1,1,1-Trichloroethane (71-55-6)                |
| 1,1-Dichloroethane (75-34-3)                 | 1,1,2-Trichloroethane (79-00-5)                |
| 1,2-Dichloroethane (107-06-2)                | Trichloroethene (79-01-6)                      |
| 1,1-Dichloroethene (75-35-4)                 | <i>m</i> -Xylene (108-38-3)                    |
| <i>cis</i> -1,2-Dichloroethene (156-59-2)    | <i>o</i> -Xylene (95-47-6)                     |
| <i>trans</i> -1,2-Dichloroethene (156-60-5)  | <i>p</i> -Xylene (106-42-3)                    |
| 1,2-Dichloropropane (78-87-5)                |  |
| <i>cis</i> -1,3-Dichloropropene (10061-01-5) |  |

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30632 (ea.)

Vinyl Acetate

Vinyl acetate (108-05-4)

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30216 (ea.)

CLP VOA CAL2000 MegaMix® Kit **MEGAMIX®**

Contains 1 mL each of these mixtures.

30632: CLP VOA CAL2000 MegaMix Standard

30216: vinyl acetate

cat.# 30438 (kit)

kit

VOA Calibration Mix #2 (7 components)

- |                            |                             |
|----------------------------|-----------------------------|
| Benzene (71-43-2)          | Vinyl acetate (108-05-4)    |
| Carbon disulfide (75-15-0) | <i>o</i> -Xylene (95-47-6)  |
| Ethylbenzene (100-41-4)    | <i>p</i> -Xylene (106-42-3) |
| Toluene (108-88-3)         |                             |

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30007 (ea.)

VOA Calibration Mix #3 (10 components)

- |                                |  |
|--------------------------------|--|
| Carbon tetrachloride (56-23-5) | Methylene chloride (dichloromethane) (75-09-2) |
| Chlorobenzene (108-90-7)       | 1,1,2-Trichloroethane (79-00-5)                |
| Chloroform (67-66-3)           | Trichloroethene (79-01-6)                      |
| 1,1-Dichloroethane (75-34-3)   | <i>m</i> -Xylene (108-38-3)                    |
| 1,1-Dichloroethene (75-35-4)   |  |
| 1,2-Dichloropropane (78-87-5)  |  |

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30008 (ea.)

VOA Calibration Mix #4 (12 components)

- |   |  |
|---|--|
| Bromodichloromethane (75-27-4)              | <i>cis</i> -1,3-Dichloropropene (10061-01-5)   |
| Bromoform (75-25-2)                         | <i>trans</i> -1,3-Dichloropropene (10061-02-6) |
| Dibromochloromethane (124-48-1)             | Styrene (100-42-5)                             |
| 1,2-Dichloroethane (107-06-2)               | 1,1,2,2-Tetrachloroethane (79-34-5)            |
| <i>cis</i> -1,2-Dichloroethene (156-59-2)   | Tetrachloroethene (127-18-4)                   |
| <i>trans</i> -1,2-Dichloroethene (156-60-5) | 1,1,1-Trichloroethane (71-55-6)                |

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30009 (ea.)



Volatile Organics, *cont.*3/90 SOW (Volatiles), Calibration Mixes, *cont.*

## VOA Calibration Mix #5 (gases) (4 components)

Bromomethane (methyl bromide) Chloromethane (methyl chloride (74-87-3)  
(74-83-9) Vinyl chloride (75-01-4)  
Chloroethane (ethyl chloride) (75-00-3)

2,000 µg/mL each in P&T methanol, 1 mL/ampul  
cat.# 30010 (ea.)

## CLP VOA Calibration Kit #2

Contains 1 mL each of these mixtures.  
30006: VOA Calibration Mix #1 (ketones)  
30010: VOA Calibration Mix #5 (gases)  
30632: CLP VOA CAL2000 MegaMix Standard  
30216: Vinyl acetate

cat.# 30442 (kit)

kit

## OLC 03.2 (Volatiles), Calibration Mixes

## OLC 03.2 VOA MegaMix® Standard

(42 components)

Benzene (71-43-2) *trans*-1,3-Dichloropropene (10061-02-6)  
Bromochloromethane (74-97-5) Ethylbenzene (100-41-4)  
Bromodichloromethane (75-27-4) Isopropylbenzene (cumene) (98-82-8)  
Bromoform (75-25-2) Methyl acetate (79-20-9)  
Carbon disulfide (75-15-0) Methylcyclohexane (108-87-2)  
Carbon tetrachloride (56-23-5) Methyl *tert*-butyl ether (MTBE)  
Chlorobenzene (108-90-7) (1634-04-4)  
Chloroform (67-66-3) Methylene chloride (dichloromethane)  
Cyclohexane (110-82-7) (75-09-2)  
Dibromochloromethane Styrene (100-42-5)  
(chlorodibromomethane) (124-48-1) 1,1,2,2-Tetrachloroethane (79-34-5)  
1,2-Dibromo-3-chloropropane (DBCP) Tetrachloroethene (127-18-4)  
(96-12-8) Toluene (108-88-3)  
1,2-Dibromoethane (EDB) (106-93-4) 1,2,3-Trichlorobenzene (87-61-6)  
1,2-Dichlorobenzene (95-50-1) 1,2,4-Trichlorobenzene (120-82-1)  
1,3-Dichlorobenzene (541-73-1) 1,1,1-Trichloroethane (71-55-6)  
1,4-Dichlorobenzene (106-46-7) 1,1,2-Trichloroethane (79-00-5)  
1,1-Dichloroethane (75-34-3) Trichloroethene (79-01-6)  
1,2-Dichloroethane (107-06-2) 1,1,2-Trichlorotrifluoroethane (CFC-113)  
1,1-Dichloroethene (75-35-4) (76-13-1)  
*cis*-1,2-Dichloroethene (156-59-2) *m*-Xylene (108-38-3)\*  
*trans*-1,2-Dichloroethene (156-60-5) *o*-Xylene (95-47-6)  
1,2-Dichloropropane (78-87-5) *p*-Xylene (106-42-3)\*  
*cis*-1,3-Dichloropropene (10061-01-5)

2,000 µg/mL each in P&T methanol, 1 mL/ampul\*  
cat.# 30492 (ea.)

\**m*-xylene and *p*-xylene concentration is 1,000 µg/mL.

## Additional VOA Calibration Mixes Required:

30006: VOA Calibration Mix #1 page 558  
30007: VOA Calibration Mix #2 page 558  
30008: VOA Calibration Mix #3 page 558  
30009: VOA Calibration Mix #4 page 558  
30010: VOA Calibration Mix #5 see above  
30003: VOA Tuning Compound page 557

## International-Specific

## Canada

## C50 in Toluene

*n*-Pentacontane (C50) (6596-40-3)  
10 µg/mL in toluene, 1 mL/ampul  
cat.# 31685 (ea.)

## CCME F1 Retention Time Marker (3 components)

*n*-Hexane (C6) (110-54-3) Toluene (108-88-3)  
*n*-Decane (C10) (124-18-5)  
2,000 µg/mL each in methanol, 1 mL/ampul  
cat.# 30611 (ea.)

## CCME PHC Calibration Mix (3 components)

*n*-Decane (C10) (124-18-5) *n*-Tetratriacontane (C34) (14167-59-0)  
*n*-Hexadecane (C16) (544-76-3)  
5,000 µg/mL each in toluene, 1 mL/ampul  
cat.# 31684 (ea.)

## Canadian Drinking Water Triazine Herbicides Mix

(7 components)

Alachlor (15972-60-8) Metribuzin (21087-64-9)  
Atrazine (122-34-9) Prometryne (7287-19-6)  
Cyanazine (Bladex) (21725-46-2) Simazine (122-34-9)  
Metolachlor (51218-45-2)  
500 µg/mL each in acetone, 1 mL/ampul  
cat.# 31864 (ea.)

## Canadian Drinking Water OP Pesticides Mix

(9 components)

Azinphos methyl (86-50-0) Parathion (ethyl parathion) (56-38-2)  
Chlorpyrifos (2921-88-2) Phorate (298-02-2)  
Diazinon (333-41-5) Temephos (Abate) (3383-96-8)  
Dimethoate (60-51-5) Terbufos (13071-79-9)  
Malathion (121-75-5)  
1,000 µg/mL each in acetonitrile, 1 mL/ampul  
cat.# 31867 (ea.)

## Canada - Atlantic Provinces

## Atlantic RBCA EPH Mix (11 components)

*n*-Decane (C10) (124-18-5) Acenaphthene (83-32-9)  
*n*-Dodecane (C12) (112-40-3) Anthracene (120-12-7)  
*n*-Hexadecane (C16) (544-76-3) Benzo(a)pyrene (50-32-8)  
*n*-Heneicosane (C21) (629-94-7) Chrysene (218-01-9)  
*n*-Octacosane (C28) (630-02-4) Naphthalene (91-20-3)  
*n*-Dotriacontane (C32) (544-85-4)  
1,000 µg/mL each in hexane:methylene chloride (85:15), 1 mL/ampul  
cat.# 31872 (ea.)

## Atlantic RBCA VPH Mix (12 components)

*n*-Hexane (C6) (110-54-3) 1-Methyl-3-ethylbenzene (620-14-4)  
*n*-Heptane (C7) (142-82-5) Toluene (108-88-3)  
*n*-Octane (C8) (111-65-9) 1,2,4-Trimethylbenzene (95-63-6)  
*n*-Decane (C10) (124-18-5) 1,3,5-Trimethylbenzene (108-67-8)  
Benzene (71-43-2) *o*-Xylene (95-47-6)  
Ethylbenzene (100-41-4) *p*-Xylene (106-42-3)  
1,000 µg/mL each in P&T methanol, 1 mL/ampul

## International-Specific, *cont.*

### Europe

#### Organophosphorus Pesticide Mix, European

##### Formulation (16 components)

Acephate (30560-19-1)	200 µg/mL	Methamidophos (10265-92-6)	500
Azinphos methyl (86-50-0)	400	Methidathion (950-37-8)	200
Chlorpyrifos (2921-88-2)	100	Omethoate (1113-02-6)	1,000
Demeton-S-methyl (919-86-8)	200	Pirimiphos methyl (29232-93-7)	100
Dichlorvos (DDVP) (62-73-7)	500	Profenofos (41198-08-7)	200
Dimethoate (60-51-5)	200	Prothiofos (34643-46-4)	200
Ethion (563-12-2)	200	Pyrazophos (13457-18-6)	500
Malathion (121-75-5)	200	Tolclofos-methyl (57018-04-9)	100

In acetone, 1 mL/ampul

cat.# 32418 (ea.)

#### PCB Congener Standard #1 (6 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)  
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)  
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)  
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)  
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)  
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32290 (ea.)

#### PCB Congener Standard #2 (7 components)

2,4,4'-Trichlorobiphenyl (BZ #28) (7012-37-5)  
2,2',5,5'-Tetrachlorobiphenyl (BZ #52) (35693-99-3)  
2,2',4,5,5'-Pentachlorobiphenyl (BZ #101) (37680-73-2)  
2,3',4,4',5'-Pentachlorobiphenyl (BZ #118) (31508-00-6)  
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ #138) (35065-28-2)  
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ #153) (35065-27-1)  
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ #180) (35065-29-3)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32294 (ea.)

### Japan

#### Japan Calibration Mix (9 components)

Acrylonitrile	Dichloromethane
Benzene	Tetrachloroethylene
1,3-Butadiene	Trichloroethylene
Chloroform	Vinyl chloride
1,2-Dichloroethane	

#### Cylinder design

Cylinder Construction: aluminum  
Cylinder Fitting: CGA-180 outlet

##### Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm  
Volume/Pressure:  
104 liters of gas  
@ 1,800 psi  
Weight: 1.5 lb/0.7 kg



##### Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm  
Volume/Pressure:  
110 liters of gas  
@ 1,800 psi  
Weight: 2.2 lb/1 kg  
U.S. DOT Specs: 3AL2216



1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi

cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)

cat.# 34418-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

#### also available

High-Purity VOC Regulators

See page 453.



#### Drinking Water Odor Standard (2 components)

- Reference mix of the two most common odor-causing compounds.
- Convenient concentration for purge-and-trap analysis:  
100 µg/mL in methanol.

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10 ppt), and purge-and-trap analyses usually are used to quantify them.

(+/-)-Geosmin (16423-19-1)

2-Methylisoborneol (MIB) (2371-42-8)

100 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30608 (ea.)



## International-Specific, *cont.*

### ISO/DIS 9377 Water Quality Testing

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as diesel #2/motor oil and diesel #2/mineral oil.

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography–flame ionization detection (GC-FID) method.

#### Diesel #2/Motor Oil (2 components)

Diesel fuel #2 composite (68334-30-5)  
Motor oil (64742-65-0)

5,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31682 (ea.)

#### Diesel #2/Mineral Oil (2 components)

Diesel fuel #2 composite (68334-30-5)  
Mineral oil (8042-47-5)

5,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31676 (ea.)

#### Standard Mixture Stock Solution (2 components)

Diesel #2 (additive-free) (68334-30-5)  
Mineral oil (additive-free [i.e., USP grade] bp 325–460 or C18–C32 retention time range) (8042-47-5)

5,000 µg/mL each in cyclohexane, 1 mL/ampul (prepares 8 mL of 1.25 µg/µL calibration curve high point). Total hydrocarbon concentration is 10,000 µg/mL.

cat.# 31630 (ea.)

#### Quality Control Standard Mixture, Revised

(2 components)

- Updated reference materials for GC analysis of TPH in water.
- Determination of hydrocarbon oil index—applicable to drinking, surface, waste, and treated water.

Diesel #2 (additive-free) (68334-30-5)  
Motor oil (additive-free bp 325–460 or C18–C32 retention time range) (64742-65-0)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one 900 mL quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.

cat.# 31641 (ea.)

#### Quality Control Standard Mixture (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Environmentally safer than previous methods.
- Calibration standard available as diesel #2/motor oil and diesel #2/mineral oil.

Diesel #2 (additive-free) (68334-30-5)  
Mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range) (8042-47-5)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.

cat.# 31631 (ea.)

#### System Performance Test Standard Mixture of *n*-Alkanes (16 components)

<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Hexacosane (C26) (630-01-3)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Triacosane (C29) (638-68-6)
<i>n</i> -Hexadecane (C16) (544-76-3)	<i>n</i> -Dotriacontane (C32) (544-85-4)
<i>n</i> -Octadecane (C18) (593-45-3)	<i>n</i> -Tetratriacontane (C34) (14167-59-0)
<i>n</i> -Eicosane (C20) (112-95-8)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Docosane (C22) (629-97-0)	<i>n</i> -Octatriacontane (C38) (7194-85-6)
<i>n</i> -Tetracosane (C24) (646-31-1)	<i>n</i> -Tetracontane (C40) (4181-95-7)

50 µg/mL each in hexane, 1 mL/ampul

cat.# 31678 (ea.)

#### Extraction Solvent Stock Solution #1 (2 components)

<i>n</i> -Decane (C10) (124-18-5)	20 µL/L
<i>n</i> -Tetracontane (C40) (4181-95-7)	20 mg/L

In hexane, 5 mL/ampul

cat.# 31679 (ea.)

#### Extraction Solvent Stock Solution #2 (2 components)

<i>n</i> -Decane (C10) (124-18-5)	20 µL/L
<i>n</i> -Tetracontane (C40) (4181-95-7)	20 mg/L

In hexane, 20 mL/ampul

cat.# 31680 (ea.)

#### Stearyl Stearate Test Solution

Stearyl stearate (2778-96-3)

2,000 µg/mL in hexane, 10 mL/ampul

cat.# 31681 (ea.)

2,000 µg/mL in cyclohexane, 10 mL/ampul (enough to check one Florisil cartridge)

cat.# 31636 (ea.)

#### Florisil® Cartridge Quality Control Standard Mixture, Rev. 2 (2 components)

Diesel fuel #2 composite (68334-30-5)  
Mineral oil (8042-47-5)

1,000 µg/mL each in hexane, 10 mL/ampul

cat.# 31677 (ea.)

#### *n*-Tetracontane (C40)

*n*-Tetracontane (C40) (4181-95-7)

Neat, 100 mg

cat.# 31859 (ea.)

#### *n*-Decane (C10)

*n*-Decane (C10) (124-18-5)

Neat, 1 mL/ampul

cat.# 31858 (ea.)

#### Stearyl Stearate

Stearyl stearate (2778-96-3)

Neat, 100 mg

cat.# 31860 (ea.)



# Reference Standards

## Foods, Flavors & Fragrances



Derivatization Reagents.....	472–473
Fatty Acid Methyl Esters (FAMES).....	563–564
Fatty Acids.....	565
FAPAS®.....	565
Fragrance Allergens.....	566
Fragrances.....	566
Medical Cannabis.....	566
Melamine.....	567
MN Dept. of Agriculture Pesticides.....	567
Multiresidue Pesticides.....	568–571
Packaging.....	572
Phthalate Esters.....	530
Plastic Container Testing.....	572
Polycyclic Aromatic Hydrocarbons (PAHs).....	572
QuEChERS.....	573–575



## Derivatization Reagents

See pages 472–473.

## Fatty Acid Methyl Esters (FAMES)

### Marine Oil FAME Mix (20 components)

Chain	Description	% by Weight
C14:0	Methyl myristate (124-10-7)	6.0
C14:1	Methyl myristoleate (56219-06-8)	1.0
C16:0	Methyl palmitate (112-39-0)	16.0
C16:1	Methyl palmitoleate (1120-25-8)	5.0
C18:0	Methyl stearate (112-61-8)	8.0
C18:1	Methyl oleate (112-62-9)	13.0
C18:1	Methyl vaccenate (1937-63-9)	4.0
C18:2	Methyl linoleate (112-63-0)	2.0
C18:3	Methyl linolenate (301-00-8)	2.0
C20:0	Methyl arachidate (1120-28-1)	1.0
C20:1	Methyl 11-eicosenoate (2390-09-2)	9.0
C20:2	Methyl 11,14-eicosadienoate (2493-02-7)	1.0
C20:4	Methyl arachidonate (2566-89-4)	3.0
C20:3	Methyl 11,14,17-eicosatrienoate (55682-88-7)	1.0
C20:5	Methyl eicosapentaenoate (2734-47-6)	10.0
C22:0	Methyl behenate (929-77-1)	1.0
C22:1	Methyl erucate (1120-34-9)	3.0
C22:6	Methyl docosahexaenoate (301-01-9)	12.0
C24:0	Methyl lignocerate (2442-49-1)	1.0
C24:1	Methyl nervonate (2733-88-2)	1.0

cat.# 35066 (100 mg)

No data pack available.

### cis/trans FAME Mix (8 components)

Description	% by Weight
methyl elaidate (C18:1 <i>trans</i> -9)	10.0
methyl linoleate (C18:2 <i>cis</i> -9,12)	20.0
methyl oleate (C18:1 <i>cis</i> -9)	10.0
methyl petroselinate (C18:1 <i>cis</i> -6)	8.0
methyl petroselaideate (C18:1 <i>trans</i> -6)	8.0
methyl stearate (C18:0)	20.0
methyl transvaccenate (C18:1 <i>trans</i> -11)	12.0
methyl vaccenate (C18:1 <i>cis</i> -11)	12.0

10 mg/mL total in methylene chloride, 1 mL/ampul

cat.# 35079 (ea.)

No data pack available.

### NLEA FAME Mix (28 components)

Chain	% by Weight	Chain	% by Weight
C4:0	1.5	C18:1 ( <i>trans</i> -9)	2.5
C6:0	1.5	C18:1 ( <i>cis</i> -9)	15.0
C8:0	2.0	C18:2 (all- <i>trans</i> -9,12)	2.5
C10:0	2.5	C18:2 (all- <i>cis</i> -9,12)	10.0
C11:0	2.5	C18:3 (all- <i>cis</i> -9,12,15)	5.0
C12:0	5.0	C20:0	2.5
C13:0	2.5	C20:1 ( <i>cis</i> -11)	1.5
C14:0	2.5	C20:5 (all- <i>cis</i> -5,8,11,14,17)	2.5
C14:1 ( <i>cis</i> -9)	1.5	C22:0	2.5
C15:0	1.5	C22:1 ( <i>cis</i> -13)	1.5
C16:0	10.0	C22:6 (all- <i>cis</i> -4,7,10,13,16,19)	2.5
C16:1 ( <i>cis</i> -9)	5.0	C23:0	1.5
C17:0	2.5	C24:0	2.5
C18:0	5.0	C24:1 ( <i>cis</i> -15)	2.5

30 mg/mL total in methylene chloride, 1 mL/ampul

cat.# 35078 (ea.)

No data pack available.

## Fatty Acid Methyl Esters (FAMES), cont.

### Food Industry FAME Mix (37 components)

Chain	% by Weight	Chain	% by Weight
C4:0	4.0	C18:2 (all- <i>cis</i> -9,12)	2.0
C6:0	4.0	C18:3 (all- <i>cis</i> -6,9,12)	2.0
C8:0	4.0	C18:3 (all- <i>cis</i> -9,12,15)	2.0
C10:0	4.0	C20:0	4.0
C11:0	2.0	C20:1 ( <i>cis</i> -11)	2.0
C12:0	4.0	C20:2 (all- <i>cis</i> -11,14,)	2.0
C13:0	2.0	C20:3 (all- <i>cis</i> -8,11,14)	2.0
C14:0	4.0	C20:3 (all- <i>cis</i> -11,14,17)	2.0
C14:1 ( <i>cis</i> -9)	2.0	C20:4 (all- <i>cis</i> -5,8,11,14)	2.0
C15:0	2.0	C20:5 (all- <i>cis</i> -5,8,11,14,17)	2.0
C15:1 ( <i>cis</i> -10)	2.0	C21:0	2.0
C16:0	6.0	C22:0	4.0
C16:1 ( <i>cis</i> -9)	2.0	C22:1 ( <i>cis</i> -13)	2.0
C17:0	2.0	C22:2 (all- <i>cis</i> -13,16)	2.0
C17:1 ( <i>cis</i> -10)	2.0	C22:6 (all- <i>cis</i> -4,7,10,13,16,19)	2.0
C18:0	4.0	C23:0	2.0
C18:1 ( <i>trans</i> -9)	2.0	C24:0	4.0
C18:1 ( <i>cis</i> -9)	4.0	C24:1 ( <i>cis</i> -15)	2.0
C18:2 (all- <i>trans</i> -9,12)	2.0		

30 mg/mL total in methylene chloride, 1 mL/ampul

cat.# 35077 (ea.)

No data pack available.

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## Fatty Acids

### EP 2.4.22 Composition of Fatty Acids by GC Mix 1

(6 components)

Description	% by Weight	Description	% by Weight
Methyl arachidate (C20:0)	40	Methyl oleate (C18:1 [ <i>cis</i> 9])	20
Methyl dodecanoate (C12:0)	5	Methyl palmitate (C16:0)	10
Methyl myristate (C14:0)	5	Methyl stearate (C18:0)	20

100 mg total

cat.# 35100 (ea.)

No data pack available.

### EP 2.4.22 Composition of Fatty Acids by GC Mix 2

(5 components)

Description	% by Weight	Description	% by Weight
Methyl caproate (C6:0)	10	Methyl dodecanoate (C12:0)	20
Methyl caprylate (C8:0)	10	Methyl myristate (C14:0)	40
Methyl decanoate (C10:0)	20		

100 mg total

cat.# 35101 (ea.)

No data pack available.

## Standard Methods for the Examination of Water and Wastewater Method 5560: Organic and Volatile Acids

The measurement of organic acids, either by adsorption and elution from a chromatographic column or by distillation, can be used as a control test for anaerobic digestion. The chromatographic separation method is presented for organic acids (5560B), while a method using distillation (5560C) is presented for volatile acids. A new method using gas chromatography is included for the determination of acetic, propionic, butyric, isobutyric, valeric, and isovaleric acids (5560D).

### Free Fatty Acids Test Standard (6 components)

Acetic acid (64-19-7)	Isovaleric acid (503-74-2)
Butyric acid (C4:0) (107-92-6)	Propionic acid (79-09-4)
Isobutyric acid (79-31-2)	Valeric acid (109-52-4)

1,000 µg/mL each in water, 1 mL/ampul

cat.# 35272 (ea.)

## Food Analysis Performance Assessment Scheme (FAPAS®)

### FAPAS® Food Testing Program\*

#### FAPAS® Series 5 OC Pesticide Mix 1 (19 components)

Equal concentration of all compounds. Suitable for GC-MS analysis.

Aldrin (309-00-2)	Dieldrin (60-57-1)
α-BHC (319-84-6)	α-Endosulfan (I) (959-98-8)
β-BHC (319-85-7)	β-Endosulfan (II) (33213-65-9)
γ-BHC (Lindane) (58-89-9)	Endosulfan sulfate (1031-07-8)
<i>cis</i> -Chlordane (5103-71-9)	Endrin (72-20-8)
<i>trans</i> -Chlordane (5103-74-2)	Heptachlor (76-44-8)
4,4'-DDD (72-54-8)	Heptachlor epoxide (isomer B) (1024-57-3)
4,4'-DDE (72-55-9)	Hexachlorobenzene (118-74-1)
2,4'-DDT (789-02-6)	Oxychlordane (27304-13-8)
4,4'-DDT (50-29-3)	

100 µg/mL each in acetone, 1 mL/ampul

cat.# 32412 (ea.)

#### FAPAS® Series 5 OC Pesticide Mix 2 (19 components)

Varied concentrations. Suitable for GC-ECD analysis.

Aldrin (309-00-2)	10 µg/mL	Dieldrin (60-57-1)	20
α-BHC (319-84-6)	10	α-Endosulfan (I) (959-98-8)	10
β-BHC (319-85-7)	10	β-Endosulfan (II) (33213-65-9)	20
γ-BHC (Lindane) (58-89-9)	10	Endosulfan sulfate (1031-07-8)	20
<i>cis</i> -Chlordane (5103-71-9)	10	Endrin (72-20-8)	20
<i>trans</i> -Chlordane (5103-74-2)	10	Heptachlor (76-44-8)	10
4,4'-DDD (72-54-8)	20	Heptachlor epoxide (isomer B) (1024-57-3)	10
4,4'-DDE (72-55-9)	20	Hexachlorobenzene (118-74-1)	10
2,4'-DDT (789-02-6)	20	Oxychlordane (27304-13-8)	10
4,4'-DDT (50-29-3)	20		

In acetone, 1 mL/ampul

cat.# 32414 (ea.)

#### FAPAS® Series 9 OP Pesticide Mix 1 (10 components)

Equal concentration of all compounds. Suitable for GC-FPD, GC-NPD, and GC-MS analysis.

Chlorpyrifos (2921-88-2)	Fenitrothion (122-14-5)
Chlorpyrifos-methyl (5598-13-0)	Malathion (121-75-5)
Diazinon (333-41-5)	Methacryphos (62610-77-9)
Dichlorvos (DDVP) (62-73-7)	Phosphamidon (13171-21-6)
Etrifophos (38260-54-7)	Pirimiphos-methyl (29232-93-7)

100 µg/mL each in acetone, 1 mL/ampul

cat.# 32413 (ea.)

\*Use of Restek® calibration mixtures by laboratories participating in the FAPAS® program is voluntary; no endorsement of any Restek® product has been made by the Central Science Laboratory. To obtain further information regarding the FAPAS® program, or to participate, contact [fapas@csli.gov.uk](mailto:fapas@csli.gov.uk)



## Custom Standards

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## Fragrance Allergens

### Fragrance Allergen Standards Kit

- Highly stable formulation has a minimum shelf life of 18 months.
- Fully resolves 31 fragrance allergens with one analysis on an Rxi®-17 column.
- Ideal for GC-MS analysis following IFRA methodology.
- Helps you meet EU requirements defined in the European Cosmetics Directive.
- All components included at 400 ppm to allow dilution for calibration curves and use with different solvents.
- Exceeds purity requirements outlined in IFRA method.

#### MTBE Solvent Blank

methyl *tert*-butyl ether (MTBE) (1634-04-4) Neat

#### 1-Fluoronaphthalene (Internal Standard)

1-fluoronaphthalene (321-38-0) 20 µg/mL

#### Fragrance Allergen Standard A (Includes Internal Standard)

$\alpha$ -amylcinnamaldehyde\*† (122-40-7) 400 µg/mL  
 cinnamal\* (104-55-2) 400  
 citral\*† (5392-40-5) 400  
 3,7-dimethyl-7-hydroxyoctanal\* (107-75-5) 400  
 1-fluoronaphthalene (321-38-0) 20  
 $\alpha$ -hexylcinnamaldehyde\*† (101-86-0) 400  
 linal\* (80-54-6) 400  
 lylal\*† (31906-04-4) 400  
 phenylacetaldehyde\*\* (122-78-1) 400

#### Fragrance Allergen Standard B (Includes Internal Standard)

$\alpha$ -amylcinnamic alcohol\*† (101-85-9) 400 µg/mL  
 benzyl alcohol\* (100-51-6) 400  
 cinnamyl alcohol\* (104-54-1) 400  
 citronellol\* (106-22-9) 400  
 eugenol\* (97-53-0) 400  
 farnesol\*† (4602-84-0) 400  
 1-fluoronaphthalene (321-38-0) 20  
 geraniol\* (106-24-1) 400  
 isoeugenol\* (97-54-1) 400  
 linalool\* (78-70-6) 400  
 4-methoxybenzyl alcohol\* (105-13-5) 400  
 methyl eugenol\*\* (93-15-2) 400

#### Fragrance Allergen Standard C (Includes Internal Standard)

4-allylanisole\*\* (140-67-0) 400 µg/mL  
 benzyl benzoate\* (120-51-4) 400  
 benzyl cinnamate\* (103-41-3) 400  
 benzyl salicylate\* (118-58-1) 400  
 camphor\*\* (76-22-2) 400  
 1,8-cineole\*\* (470-82-6) 400  
 coumarin\* (91-64-5) 400  
 1-fluoronaphthalene (321-38-0) 20  
 limonene\* (138-86-3) 400  
*iso*- $\alpha$ -methylionone\* (127-51-5) 400  
 methyl 2-nonyanoate\*\* (111-80-8) 400  
 methyl 2-octynoate\* (111-12-6) 400  
 safrrole\*\* (94-59-7) 400

\*Compound listed in 7th Amendment to the European Cosmetics Directive.  
 \*\*Additional potential allergens included in this formulation.  
 †Compounds defined as two isomers resulting in two chromatographic peaks.

Contains 1 mL each of these mixtures (in methyl *tert*-butyl ether).  
 cat.# 33105 (kit)

kit

## Fragrances

### Fragrance Materials Test Mix (12 components)

- Performance evaluation for essential oils and fragrance chemicals.
- System suitability mixture for GC systems and analytical columns.
- Convenient 0.5 mL quantity for easy dilution to recommended working solution.

The Fragrance Materials Association (FMA) has proposed a method for analyzing essential oils on polar and nonpolar capillary GC columns. A performance evaluation mixture should be used to aid in detecting inlet problems, stationary phase degradation, loss of resolution, changes in sensitivity, and the presence of reactive sites in the sample pathway. Our test mix is consistent with the mixture proposed by the FMA. The required 5% test solution is made by diluting the 0.5 mL of neat mixture to 10 mL with acetone. The working solution will be stable for up to one week if transferred to a dark container and stored refrigerated.

Benzoic acid (65-85-0)	1.0%	Geraniol (106-24-1)	0.6%
Benzyl salicylate (118-58-1)	36.2%	Hydroxycitronellal (3,7-Dimethyl-7-hydroxyoctanal) (107-75-5)	5.0%
1,8-Cineole (Eucalyptol) (470-82-6)	0.5%	d-Limonene (5989-27-5)	20.0%
<i>trans</i> Cinnamaldehyde (14371-10-9)	0.5%	Cinnamyl alcohol (104-54-1)	0.3%
Cinnamyl acetate (103-54-8)	0.3%	Ethyl butyrate (105-54-4)	36.2%
Cinnamyl alcohol (104-54-1)	0.3%	Vanillin (121-33-5)	0.1%

Neat, 0.5 mL in an amber ampul

cat.# 31807 (ea.)

No data pack available.

## Medical Cannabis

### Cannabinoids Standard (3 components)

Cannabidiol (13956-29-1)  
 Cannabinol (521-35-7)  
 delta-9-Tetrahydrocannabinol ( $\Delta^9$ -THC) (1972-08-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul  
 cat.# 34014 (ea.)

### Medical Marijuana Singles

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol (CBG)	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
delta-8-Tetrahydrocannabinol ( $\Delta^8$ -THC)	5957-75-5	PTM	1,000	34090
delta-9-Tetrahydrocannabinol ( $\Delta^9$ -THC)	1972-08-3	M	1,000	34067
delta-9-Tetrahydrocannabinolic acid A ( $\Delta^9$ -THCA-A)	23978-85-0	PTM	1,000	34093
Tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
(±)11-nor-9-carboxy- $\Delta^9$ -THC	104874-50-2	M	100	34068

ACN = acetonitrile; M = methanol; PTM = purge-and-trap grade methanol

## Melamine

### Melamine Analysis Kit

Kit includes:

**Column:**

Rxi-5Sil MS w/5-meter Integra-Guard

**Standards:**

33247: 1 mL Melamine Stock Standard	(1,000 µg/mL)
33248: 1 mL Cyanuric Acid Stock Standard	(1,000 µg/mL)
33249: 1 mL Ammelide Stock Standard	(1,000 µg/mL)
33250: 1 mL Ammeline Stock Standard	(1,000 µg/mL)
33251: 1 mL Benzoguanamine Internal Standard	(1,000 µg/mL)
33253: 1 mL Melamine Mix Standard	(1,000 µg/mL)

**Derivatization Reagent:**

35607: BSTFA w/1% TMCS, 25 g vial

**Accessories:**

50 mL empty centrifuge tubes, 10-pk.  
13 mm, 0.45 µm nylon syringe filters, 20-pk.

**Easy-to-follow instructions** with procedural checklists to assist with laboratory documentation.

Contains contents listed above.

cat.# 33254 (kit)

kit

\*Kit contains a 10-pk. of tubes and 20-pk. of filters. 50-pk. of tubes (cat.# 26239) and 100-pk. of filters (cat.# 26147) sold separately.

### Melamine and Related Analogs Stock Standard

(4 components)

Ammelide (645-93-2)	Cyanuric Acid (108-80-5)
Ammeline (645-92-1)	Melamine (108-78-1)

1,000 µg/mL each in diethylamine:water (20:80), 1 mL/ampul  
cat.# 33253 (ea.)

### Melamine Stock Standard

Melamine (108-78-1)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul  
cat.# 33247 (ea.)

### Cyanuric Acid Stock Standard

Cyanuric acid (108-80-5)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul  
cat.# 33248 (ea.)

### Ammelide Stock Standard

Ammelide (645-93-2)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul  
cat.# 33249 (ea.)

### Ammeline Stock Standard

Ammeline (645-92-1)

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul  
cat.# 33250 (ea.)

### Benzoguanamine Internal Standard

Benzoguanamine (91-76-9)

1,000 µg/mL in pyridine, 1 mL/ampul  
cat.# 33251 (ea.)

## MN Dept. of Agriculture Pesticides

### Minnesota Ag List 1 Pesticides Mix A (16 components)

Acetochlor (34256-82-1)	Metolachlor (51218-45-2)
Alachlor (15972-60-8)	Metribuzin (21087-64-9)
Atrazine (1912-24-9)	Pendimethalin (40487-42-1)
Cyanazine (Bladex) (21725-46-2)	Prometon (1610-18-0)
Desethylatrazine (6190-65-4)	Propachlor (1918-16-7)
Desisopropylatrazine (1007-28-9)	Propazine (139-40-2)
Dimethenamid (87674-68-8)*	Simazine (122-34-9)
Ethalfuralin (55283-68-6)	Trifluralin (1582-09-8)

200 ppm each in acetone, 1 mL/ampul

cat.# 32406 (ea.)

\*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.<sup>1</sup> CAS # 87674-68-8 manufactured by several companies under various trade names.

<sup>1</sup>Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their website at: [www.mda.state.mn.us](http://www.mda.state.mn.us)

### Minnesota Ag List 1 Pesticides Mix B (6 components)

Chlorpyrifos (2921-88-2)	Phorate (298-02-2)
EPTC (759-94-4)	Terbufos (13071-79-9)
Fonofos (944-22-9)	Triallate (2303-17-5)

200 ppm each in acetone, 1 mL/ampul

cat.# 32407 (ea.)

### Minnesota Ag List 1 Pesticide Kit

Contains 1 mL each of these mixtures.

32406: Minnesota Ag List Pesticides Mix A

32407: Minnesota Ag List Pesticides Mix B

Contains 1 mL each of these mixtures.

cat.# 32408 (kit)

kit

### also available

Rxi®-5Sil MS Column

Ideal for pesticide and melamine analysis.

See **page 32**.



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# Multiresidue Pesticides

## Multiresidue Pesticides

### GC Multiresidue Pesticide Kit

- Accurately identify and quantify pesticide residues by GC-MS/MS in fruits, vegetables, botanicals, and herbals like tea, ginseng, ginger, Echinacea, and dietary supplements.
- Comprehensive 203-compound kit covers food safety lists by the FDA, USDA, and other global governmental agencies; individual ampuls also sold separately.
- Formulated and grouped for maximum long-term stability\* and well-balanced chromatographic performance, even for early eluting compounds.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Optimized multiresidue pesticide method is offered free of charge; downloadable XLS file includes conditions and transition tables.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.
- Restek is your complete supplier for world-class GC-MS/MS multiresidue pesticide analysis: reference and internal standards, Rxi®-5ms GC columns, Q-sep® QuEChERS sample prep, Sky® inlet liners, accessories, and more!



#### Cat.# 32563: GC Multiresidue Pesticide Standard #1 (16 components)

*Organophosphorus Compounds*  
 Azinphos ethyl (2642-71-9)  
 Azinphos methyl (86-50-0)  
 Chlorpyrifos (2921-88-2)  
 Chlorpyrifos methyl (5598-13-0)  
 Diazinon (333-41-5)  
 EPN (2104-64-5)  
 Fenitrothion (122-14-5)  
 Isazophos (42509-80-8)  
 Phosalone (2310-17-0)  
 Phosmet (732-11-6)  
 Pirimiphos ethyl (23505-41-1)  
 Pirimiphos methyl (29232-93-7)  
 Pyraclofos (77458-01-6)  
 Pyrazophos (13457-18-6)  
 Pyridaphenthion (119-12-0)  
 Quinalphos (13593-03-8)

#### Cat.# 32564: GC Multiresidue Pesticide Standard #2 (40 components)

*Organochlorine Compounds*  
 Aldrin (309-00-2)  
 alpha-BHC (319-84-6)  
 beta-BHC (319-85-7)  
 delta-BHC (319-86-8)  
 gamma-BHC (Lindane) (58-89-9)  
 Chlorbenseide (103-17-3)  
 cis-Chlordane (5103-71-9)  
 trans-Chlordane (5103-74-2)  
 Chlorfensulfon (Oxev) (80-33-1)  
 Chloroneb (2675-77-6)  
 2,4'-DDD (53-19-0)  
 4,4'-DDD (72-54-8)  
 2,4'-DDE (3424-82-6)  
 4,4'-DDE (72-55-9)  
 2,4'-DDT (789-02-6)  
 4,4'-DDT (50-29-3)  
 4,4'-Dichlorobenzophenone (90-98-2)  
 Dieldrin (60-57-1)  
 Endosulfan I (959-98-8)  
 Endosulfan II (33213-65-9)  
 Endosulfan ether (3369-52-6)  
 Endosulfan sulfate (1031-07-8)  
 Endrin (72-20-8)  
 Endrin aldehyde (7421-93-4)  
 Endrin ketone (53494-70-5)  
 Ethylan (Perthane) (72-56-0)  
 Fenson (80-38-6)

Heptachlor (76-44-8)  
 Heptachlor epoxide (Isomer B) (1024-57-3)  
 Hexachlorobenzene (118-74-1)  
 Isodrin (465-73-6)  
 2,4'-Methoxychlor (30667-99-3)  
 4,4'-Methoxychlor olefin (2132-70-9)  
 Mirex (2385-85-5)  
 cis-Nonachlor (5103-73-1)  
 trans-Nonachlor (39765-80-5)  
 Pentachloroanisole (1825-21-4)  
 Pentachlorobenzene (608-93-5)  
 Pentachlorothioanisole (1825-19-0)  
 Tetradifon (116-29-0)

*Organonitrogen Compounds*  
 Benfluralin (1861-40-1)  
 Biphenyl (92-52-4)  
 Chlorothalonil (1897-45-6)  
 Dichlofluanid (1085-98-9)  
 Dichloran (99-30-9)  
 3,4-Dichloroaniline (95-76-1)  
 2,6-Dichlorobenzonitrile (Dichlobenil) (1194-65-6)  
 Diphenylamine (122-39-4)  
 Ethalfluralin (55283-68-6)  
 Fluchloralin (33245-39-5)  
 Isopropalin (33820-53-0)  
 Nitralin (4726-14-1)  
 Nitrofen (1836-75-5)  
 Oxyfluorfen (42874-03-3)  
 Pendimethalin (40487-42-1)  
 Pentachloroaniline (527-20-8)  
 Pentachlorobenzonitrile (20925-85-3)  
 Pentachloronitrobenzene (Quintozene) (82-68-8)  
 Prodiamine (29091-21-2)  
 Profuralin (26399-36-0)  
 2,3,5,6-Tetrachloroaniline (3481-20-7)  
 Tetrachloronitrobenzene (Tecnazene) (117-18-0)  
 THPI (Tetrahydrophthalimide) (1469-48-3)  
 Tolyfluanid (731-27-1)  
 Trifluralin (1582-09-8)

#### Cat.# 32565: GC Multiresidue Pesticide Standard #3 (25 components)

*Organonitrogen Compounds*  
 Benfluralin (1861-40-1)  
 Biphenyl (92-52-4)  
 Chlorothalonil (1897-45-6)  
 Dichlofluanid (1085-98-9)  
 Dichloran (99-30-9)  
 3,4-Dichloroaniline (95-76-1)  
 2,6-Dichlorobenzonitrile (Dichlobenil) (1194-65-6)  
 Diphenylamine (122-39-4)  
 Ethalfluralin (55283-68-6)  
 Fluchloralin (33245-39-5)  
 Isopropalin (33820-53-0)  
 Nitralin (4726-14-1)  
 Nitrofen (1836-75-5)  
 Oxyfluorfen (42874-03-3)  
 Pendimethalin (40487-42-1)  
 Pentachloroaniline (527-20-8)  
 Pentachlorobenzonitrile (20925-85-3)  
 Pentachloronitrobenzene (Quintozene) (82-68-8)  
 Prodiamine (29091-21-2)  
 Profuralin (26399-36-0)  
 2,3,5,6-Tetrachloroaniline (3481-20-7)  
 Tetrachloronitrobenzene (Tecnazene) (117-18-0)  
 THPI (Tetrahydrophthalimide) (1469-48-3)  
 Tolyfluanid (731-27-1)  
 Trifluralin (1582-09-8)

#### Cat.# 32566: GC Multiresidue Pesticide Standard #4 (28 components)

*Organonitrogen Compounds*  
 Acetochlor (34256-82-1)  
 Alachlor (15972-60-8)  
 Allidochlor (93-71-0)  
 Clomazone (Command) (81777-89-1)  
 Cycloate (1134-23-2)  
 Diallate (cis & trans) (2303-16-4)  
 Dimethachlor (50563-36-5)  
 Diphenamid (957-51-7)  
 Fenpropathrin (39515-41-8)  
 Fluquinconazole (136426-54-5)  
 Flutolanil (66332-96-5)  
 Linuran (330-55-2)  
 Metazachlor (67129-08-2)  
 Methoxychlor (72-43-5)  
 Metolachlor (51218-45-2)  
 N-(2,4-Dimethylphenyl)formamide (60397-77-5)  
 Norflurazon (27314-13-2)  
 Oxadiazon (19666-30-9)  
 Pebulate (1114-71-2)  
 Pretilachlor (51218-49-6)  
 Prochloraz (67747-09-5)  
 Propachlor (1918-16-7)  
 Propanil (709-98-8)  
 Propisochlor (86763-47-5)  
 Propyzamide (23950-58-5)  
 Pyridaben (96489-71-3)  
 Tebufenpyrad (119168-77-3)  
 Triallate (2303-17-5)

#### Cat.# 32567: GC Multiresidue Pesticide Standard #5 (34 components)

*Organonitrogen Compounds*  
 Atrazine (1912-24-9)  
 Bupirimate (41483-43-6)  
 Captafol (2425-06-1)  
 Captan (133-06-2)  
 Chlorfenapyr (122453-73-0)  
 Cyprodinil (121552-61-2)  
 Etofenprox (80844-07-1)  
 Etridiazole (2593-15-9)  
 Fenarimol (60168-88-9)  
 Fipronil (120068-37-3)  
 Fludioxonil (131341-86-1)  
 Fluridone (Sonar) (59756-60-4)  
 Flusilazole (85509-19-9)  
 Flutriafol (76674-21-0)

Folpet (133-07-3)  
 Hexazinone (Velpar) (51235-04-2)  
 Iprodione (36734-19-7)  
 Lenacil (2164-08-1)  
 MGK-264 (113-48-4)  
 Myclobutanil (88671-89-0)  
 Paclobutrazol (76738-62-0)  
 Penconazole (66246-88-6)  
 Procyimdone (32809-16-8)  
 Propargite (2312-35-8)  
 Pyrimethanil (53112-28-0)  
 Pyriproxyfen (95737-68-1)  
 Tebuconazole (107534-96-3)  
 Terbacil (5902-51-2)  
 Terbutylazine (5915-41-3)  
 Triadimefon (43121-43-3)  
 Triadimenol (55219-65-3)  
 Tricyclazole (Beam) (41814-78-2)  
 Triflumizole (68694-11-1)  
 Vinclozolin (50471-44-8)

#### Cat.# 32568: GC Multiresidue Pesticide Standard #6 (18 components)

*Synthetic Pyrethroid Compounds*  
 Acrinathrin (101007-06-1)  
 Anthraquinone (84-65-1)  
 Bifenthrin (82657-04-3)  
 Bioallethrin (584-79-2)  
 Cyfluthrin (68359-37-5)  
 lambda-Cyhalothrin (91465-08-6)  
 Cypermethrin (52315-07-8)  
 Deltamethrin (52918-63-5)  
 Fenvalerate (51630-58-1)  
 Flucythrinate (70124-77-5)  
 tau-Fluvalinate (102851-06-9)  
 cis-Permethrin (61949-77-6)  
 trans-Permethrin (61949-77-7)  
 Phenothrin (cis & trans) (26002-80-2)  
 Resmethrin (10453-86-8)  
 Tefluthrin (79538-32-2)  
 Tetramethrin (7696-12-0)  
 Transfluthrin (118712-89-3)

#### Cat.# 32569: GC Multiresidue Pesticide Standard #7 (10 components)

*Herbicide Methyl Esters*  
 Acequinocyl (57960-19-7)  
 Bromopropylate (18181-80-1)  
 Carfentrazone ethyl (128639-02-1)  
 Chlorobenzilate (510-15-6)

Chlorophram (101-21-3)  
 Chlozolinate (84332-86-5)  
 DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)  
 Fluazifop-p-butyl (79241-46-6)  
 Metalaxyl (57837-19-1)  
 2-Phenylphenol (90-43-7)

#### Cat.# 32570: GC Multiresidue Pesticide Standard #8 (24 components)

*Organophosphorus Compounds*  
 Bromfenvinfos-methyl (13104-21-7)  
 Bromfenvinphos (33399-00-7)  
 Bromophos ethyl (4824-78-6)  
 Bromophos methyl (2104-96-3)  
 Carbophenothion (786-19-6)  
 Chlorfenvinphos (470-90-6)  
 Chlorthiophos (60238-56-4)  
 Coumaphos (56-72-4)  
 Edifenphos (17109-49-8)  
 Ethion (563-12-2)  
 Fenamiphos (22224-92-6)  
 Fenchlorphos (Ronnell) (299-84-3)  
 Fenthion (55-38-9)  
 Iodofenphos (18181-70-9)  
 Leptophos (21609-90-5)  
 Malathion (121-75-5)  
 Methacrifos (62610-77-9)  
 Profenofos (41198-08-7)  
 Prothiofos (34643-46-4)  
 Sulfotepp (3689-24-5)  
 Sulprofos (35400-43-2)  
 Terbufos (13071-79-9)  
 Tetrachlorvinfos (22248-79-9)  
 Tolclofos-methyl (57018-04-9)

#### Cat.# 32571: GC Multiresidue Pesticide Standard #9 (8 components)

*Organophosphorus Compounds*  
 Disulfoton (298-04-4)  
 Fonofos (944-22-9)  
 Methyl parathion (298-00-0)  
 Mevinphos (7786-34-7)  
 Parathion (Ethyl parathion) (56-38-2)  
 Phorate (298-02-2)  
 Piperonyl butoxide (51-03-6)  
 Triazophos (24017-47-8)

Contains 1 mL each of these mixtures.

cat.# 32562 (kit)

kit

\* NOTE: When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating these standards, we extensively studied the 203 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mixture separately to ensure accurate results for every compound.



## Multiresidue Pesticides, *cont.*

### GC Multiresidue Pesticide Standard #1 (16 components)

Organophosphorus Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32563 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #2 (40 components)

Organochlorine Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32564 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #3 (25 components)

Organonitrogen Compounds

100 µg/mL each in toluene:acetonitrile (99:1), 1 mL/ampul

cat.# 32565 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #4 (28 components)

Organonitrogen Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32566 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #5 (34 components)

Organonitrogen Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32567 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #6 (18 components)

Synthetic Pyrethroid Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32568 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #7 (10 components)

Herbicide Methyl Esters

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32569 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #8 (24 components)

Organophosphorus Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32570 (ea.)

NEW!

### GC Multiresidue Pesticide Standard #9 (8 components)

Organophosphorus Compounds

100 µg/mL each in toluene, 1 mL/ampul

cat.# 32571 (ea.)

NEW!

### Labeled Pesticide Residue Internal Standards for Food Analysis

- Isotopically labeled to provide the best approach for pesticide residue quantification.
- Multiple options let you choose internal and surrogate standards that will mitigate matrix effects.
- Economically priced and compatible with both LC-MS and GC-MS applications; even helpful for optimizing LC-MS/MS system performance.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Restek is your complete supplier for world-class food safety analysis: pesticide reference standard mixes and internal/surrogate standards, GC and LC columns, QuEChERS, and more!

Compound	CAS #	Solvent	Conc.	cat.#
Atrazine-d5	163165-75-1	ACN	100	31984
Carbaryl-d7	362049-56-7	ACN	100	31985
Diazinon-d10 (diethyl-d10)	100155-47-3	ACN	100	31986
Dichlorvos-d6	203645-53-8	A	100	31987
Dimethoate-d6	1219794-81-6	ACN	100	31988
Diuron-d6	1007536-67-5	ACN	100	31989
Linuron-d6	330-55-2	ACN	100	31990

A = acetone; ACN = acetonitrile

Volume is 1 mL/ampul. Concentration is µg/mL.

## Quantity Discounts Available

- Buy 3 Standards, Get 10% Off
- Buy 5 Standards, Get 20% Off

Not available for all standards. Contact your local Restek® representative for more details.

# Multiresidue Pesticides

## Multiresidue Pesticides, *cont.*

### LC Multiresidue Pesticide Kit

- Accurately detect and quantify pesticides of global food safety concern in a wide range of fruits, vegetables, and other commodities by LC-MS/MS.
- Full kit contains 204 compounds of interest, covering many LC-determined pesticides listed by government agencies; individual ampuls also sold separately.
- Formulated and grouped for maximum long-term stability\* and well-balanced chromatographic performance, even for early eluting compounds.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Optimized multiresidue pesticide method is offered free of charge; downloadable XLS file includes conditions and transition tables.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.
- Restek is your complete supplier for world-class LC-MS/MS multiresidue pesticide analysis: reference and internal standards, Ultra and Pinnacle® DB LC columns, Q-sep® QuEChERS sample prep products, accessories, and more!



#### Cat. # 31972: LC Multiresidue Pesticide Standard #1 (13 components)

##### Organophosphorus Compounds

Acephate (30560-19-1)  
Carbaryl (Sevin) (63-25-2)  
Dicrotophos (141-66-2)  
Dimethoate (60-51-5)  
Dimethomorph (110488-70-5)  
Isocarbophos (24353-61-5)  
Methamidophos (10265-92-6)  
Mevinphos (7786-34-7)  
Monocrotophos (6923-22-4)  
Omethoate (1113-02-6)  
Temephos (Abate) (3383-96-8)  
Trichlorfon (Dylox) (52-68-6)  
Vamidothion (Vamidoate) (2275-23-2)

#### Cat. # 31973: LC Multiresidue Pesticide Standard #2 (16 components)

##### Carbamate/Uron Compounds

Alanycarb (83130-01-2)  
Aldicarb (116-06-3)  
Aldicarb sulfone (1646-88-4)  
Aldicarb sulfoxide (1646-87-3)  
Benfuracarb (82560-54-1)  
Butocarboxim (34681-10-2)  
Butoxycarboxim (34681-23-7)  
Ethiofencarb (29973-13-5)  
Furathiocarb (65907-30-4)  
Methabenzthiazuron (18691-97-9)  
Methiocarb (2032-65-7)  
Methomyl (16752-77-5)  
Oxamyl (23135-22-0)  
Tebuthiuron (34014-18-1)  
Thidiazuron (51707-55-2)  
Thiophanate-methyl (23564-05-8)

#### Cat. # 31974: LC Multiresidue Pesticide Standard #3 (38 components)

##### Carbamate/Uron Compounds

Bendiocarb (22781-23-3)  
Bifenazate (149877-41-8)  
Carbofuran (1563-66-2)  
Chlorfluazuron (71422-67-8)  
Chloroxuron (1982-47-4)  
Chlortoluron (15545-48-9)  
Cycluron (2163-69-1)

Diethofencarb (87130-20-9)  
Diflufenbuzon (35367-38-5)  
Dioxacarb (6988-21-2)  
Diuron (330-54-1)  
Fenobucarb (BPMC) (3766-81-2)  
Fenoxycarb (79127-80-3)  
Fenuron (101-42-8)  
Flufenoxuron (101463-69-8)  
Fluometuron (2164-17-2)  
Forchlorfenuron (68157-60-8)  
Hexaflumuron (86479-06-3)  
3-Hydroxycarbofuran (16655-82-6)  
Indoxacarb (173584-44-6)  
Iprovalicarb (140923-17-7)  
Isoprocab (2631-40-5)  
Isoproturon (34123-59-6)  
Linuron (330-55-2)  
Lufenuron (103055-07-8)  
Metobromuron (3060-89-7)  
Monolinuron (1746-81-2)  
Neburon (555-37-3)  
Novaluron (116714-46-6)  
Pirimicarb (23103-98-2)  
Primicarb (2631-37-0)  
Propham (122-42-9)  
Propoxur (Baygon) (114-26-1)  
Pyraclostrobin (175013-18-0)  
Siduron (1982-49-6)  
Teflubenzuron (83121-18-0)  
Thiobencarb (28249-77-6)  
Triflumuron (64628-44-0)

#### Cat. # 31975: LC Multiresidue Pesticide Standard #4 (63 components)

##### Organonitrogen Compounds

Abamectin (71751-41-2)  
Acetamidiprid (135410-20-7)  
Ametryn (834-12-8)  
Amitraz (33089-61-1)  
Azoxyrobin (131860-33-8)  
Benalaxyl (71626-11-4)  
Benzoximate (29104-30-1)  
Boscalid (188425-85-6)  
Butafenacil (134605-64-4)  
Carbentamide (16118-49-3)  
Carfentrazone-ethyl (128639-02-1)  
Chlorantraniliprole (500008-45-7)  
Clofentezine (74115-24-5)  
Cymoxanil (57966-95-7)  
Cyprodinil (121552-61-2)

Cyromazine (66215-27-8)  
Dimoxystrobin (149961-52-4)  
Dinotefuran (165252-70-0)  
Doramectin (117704-25-3)  
Eprinomectin (123997-26-2)  
Famoxadim (131807-57-3)  
Fenazaquin (120928-09-8)  
Fenhexamid (126833-17-8)  
Fenpyroximate (111812-58-9)  
Flonicamid (158062-67-0)  
Fluazinam\*\* (79622-59-6)  
Fludioxonil (131341-86-1)  
Fluoxastrobin (361377-29-9)  
Flutolanil (66332-96-5)  
Furalaxyl (57646-30-7)  
Halofenozide (112226-61-6)  
Imazalil (35554-44-0)  
Imidacloprid (138261-41-3)  
Ivermectin (70288-86-7)  
Kresoxim-methyl (143390-89-0)  
Mandipropamid (34726-62-2)  
Mepanipyrim (110235-47-7)  
Mepronil (55814-41-0)  
Metaflumizone (139968-49-3)  
Metalaxyl (57837-19-1)  
Methoxyfenozide (161050-58-4)  
Moxidectin (113507-06-5)  
Myclobutanil (88671-89-0)  
Nitenpyram (120738-89-8)  
Oxadixyl (77732-09-3)  
Picoxystrobin (117428-22-5)  
Piperonyl butoxide (51-03-6)  
Prochloraz (67747-09-5)  
Prometon (1610-18-0)  
Pymetrozine (123312-89-0)  
Pyracarbolid (24691-76-7)  
Pyrimethanil (53112-28-0)  
Pyriproxyfen (95737-68-1)  
Quinoxifen (124495-18-7)  
Rotenone (83-79-4)  
Sebumeton (26259-45-0)  
Spiroxamine (118134-30-8)  
Tebufenozide (112410-23-8)  
Tebufenpyrad (119168-77-3)  
Terbumeton (33693-04-8)  
Triadimefon (43121-43-3)  
Trifloxystrobin (141517-21-7)  
Zoxamide (156052-68-5)

#### Cat. # 31976: LC Multiresidue Pesticide Standard #5 (30 components)

##### Organonitrogen Compounds

Acibenzolar-S-methyl (135158-54-2)  
Bupirimate (41483-43-6)  
Buprofezin (69327-76-0)  
Carboxin (5234-68-4)  
Clethodim (99129-21-2)  
Clothianidin (210880-92-5)  
Cyazofamid (120116-88-3)  
Ethiprole (181587-01-9)  
Ethofumesate (26225-79-6)  
Fenamidone (161326-34-7)  
Fipronil (120068-37-3)  
Flubendimide (272451-65-7)  
Flufenacet (Fluthiamide) (142459-58-3)  
Hexythiazox (78587-05-0)  
Mefenacet (73250-68-7)  
Mesotrione (104206-82-8)  
Ivermectin (70288-86-7)  
Metribuzin (21087-64-9)  
Prometryne (7287-19-6)  
Propargite (2312-35-8)  
Prothioconazole (178928-70-6)  
Pyridaben (96489-71-3)  
Simetryn (1014-70-6)  
Sulfentrazone (122836-35-5)  
Terbutryn (886-50-0)  
Thiabendazole (148-79-8)  
Thiacloprid (111988-49-9)  
Thiamethoxam (153719-23-4)  
Thiofanox (39196-18-4)  
Tricyclazole (Beam) (41814-78-2)

#### Cat. # 31977: LC Multiresidue Pesticide Standard #6 (28 components)

Organonitrogen Compounds  
Baycor (Bitertanol) (55179-31-2)  
Bromuconazole (116255-48-2)  
Cyproconazole (113096-99-4)  
Diclobutrazol (75736-33-3)  
Difenoconazole (119446-68-3)  
Diniconazole (83657-24-3)  
Epoconazole (135319-73-2)  
Etaconazole (60207-93-4)  
Ethinilol (23947-60-6)  
Etoazole (153233-91-1)  
Fenarimol (60168-88-9)  
Fenbuconazole (114369-43-6)  
Fluquinconazole (136426-54-5)  
Flusilazole (85509-19-9)  
Flutriafol (76674-21-0)  
Fuberidazole (3878-19-1)

Hexaconazole (79983-71-4)  
Iproconazole (125225-28-7)  
Metconazole (125116-23-6)  
Nuarimol (63284-71-9)  
Carboxin (5234-68-4)  
Paclobutrazol (76738-62-0)  
Penconazole (66246-88-6)  
Propiconazole (Tilt) (60207-90-1)  
Tebuconazole (107534-96-3)  
Tetraconazole (112281-77-3)  
Triadimenol (55219-65-3)  
Triflumizole (68694-11-1)  
Triticonazole (131983-72-7)

#### Cat. # 31978: LC Multiresidue Pesticide Standard #7 (7 components)

##### Organonitrogen Compounds

Emamectin-benzoate (155569-91-8)  
Methoprotetryne (841-06-5)  
Metribuzin (21087-64-9)  
Prometryne (7287-19-6)  
Propargite (2312-35-8)  
Prothioconazole (178928-70-6)  
Pyridaben (96489-71-3)  
Simetryn (1014-70-6)  
Sulfentrazone (122836-35-5)  
Terbutryn (886-50-0)  
Thiabendazole (148-79-8)  
Thiacloprid (111988-49-9)  
Thiamethoxam (153719-23-4)  
Thiofanox (39196-18-4)  
Tricyclazole (Beam) (41814-78-2)

#### Cat. # 31979: LC Multiresidue Pesticide Standard #8

##### Organonitrogen Compounds

Hydramethylnon (67485-29-4)

#### Cat. # 31980: LC Multiresidue Pesticide Standard #9 (7 components)

##### Carbamate/Uron Compounds

Aminocarb (2032-59-9)  
Desmedipham (13684-56-5)  
Formetanate HCL (23422-53-9)  
Mexacarbate (Zectran) (315-18-4)  
Monceren (Pencycuron) (66063-05-6)  
Phenmedipham (13684-63-4)  
Propomocarb free base (24579-73-5)

#### Cat. # 31981: LC Multiresidue Pesticide Standard #10

##### Carbamate/Uron Compounds

Carbendazim (10605-21-7)

Contains 1 mL each of these mixtures.

cat. # 31971 (kit)

kit

\* NOTE: When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating these standards, we extensively studied the 204 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.

\*\* NOTE: In this standard, fluazinam should only be used for qualitative analysis. A single-component standard (cat. # 31982) is available for quantitative analysis.

**Multiresidue Pesticides, cont.****LC Multiresidue Pesticide Standard #1** (13 components)

Organophosphorus Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31972 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #7** (7 components)

Organonitrogen Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31978 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #2** (16 components)

Carbamate/Uron Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31973 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #8** (hydramethylInon)

Organonitrogen Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31979 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #3** (38 components)

Carbamate/Uron Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31974 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #9** (7 components)

Carbamate/Uron Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31980 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #4** (63 components)

Organonitrogen Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31975 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #10** (carbendazim)

Carbamate/Uron Compounds

100 µg/mL each in methanol, 1 mL/ampul

cat.# 31981 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #5** (30 components)

Organonitrogen Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31976 (ea.)

**NEW!****Fluazinam Standard**

Fluazinam (79622-59-6)

100 µg/mL in acetonitrile, 1 mL/ampul

cat.# 31982 (ea.)

**NEW!****LC Multiresidue Pesticide Standard #6** (28 components)

Organonitrogen Compounds

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31977 (ea.)

**NEW!**

## Searching Online for Reference Standards?



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Enter a compound name, synonym, or CAS # in our **Reference Standards Search Tool**.
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also available: GC Multiresidue Pesticide Kit | See page 568.

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## Packaging

### MOSH/MOAH Standard (9 components)

- Developed specifically for using LC coupled with GC-FID to accurately determine hydrocarbons found in mineral oils, which can migrate from packaging into food.
- This 9-component mix contains non-interfering internal standards as well as both mineral oil saturated hydrocarbon (MOSH) and mineral oil aromatic hydrocarbon (MOAH) markers to correctly cut fractions.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.
- Restek is your complete supplier for world-class MOSH/MOAH analysis: reference standards, Allure® silica LC columns, Rxi®-5Sil MS GC columns, accessories, and more!

Bicyclohexyl (92-51-3)	300 µg/mL
Cholestane (5-alpha-cholestane) (481-21-0)	600
1-Methylnaphthalene (90-12-0)	300
2-Methylnaphthalene (91-57-6)	300
<i>n</i> -Pentylbenzene (538-68-1)	300
Perylene (198-55-0)	600
1,3,5-Tri- <i>tert</i> -butylbenzene (1460-02-2)	300
<i>n</i> -Tridecane (C13) (629-50-5)	150
<i>n</i> -Undecane (C11) (1120-21-4)	300

150-600 µg/mL each in toluene, 1 mL/ampul

cat.# 31070 (ea.)



## Phthalate Esters

See page 530.

## Plastic Container Testing

### ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography—is a “consensus” or “referee” method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product for their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, LC separation, and UV detection. Restek offers a variety of reversed-phase LC columns suitable for these separations. Restek also designed a reference standard to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

### ASTM D6042-96 Calibration Mix (7 components)

BHT (128-37-0)	Irganox 3114 (27676-62-6)
Erucamide slip (112-84-5)	Irganox 1010 (6683-19-8)
Vitamin E (59-02-9)	Irganox 1076 (2082-79-3)
Irgafos 168 (31570-04-4)	

50 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31628 (ea.)

## Polycyclic Aromatic Hydrocarbons (PAHs)

### EFSA PAH4 Standard (4 components)

- European Food Safety Authority (EFSA) PAH4 compounds prepared in toluene solvent.
- High 1,000 µg/mL concentration—dilute as needed to economically prepare custom mixes.
- Low volatility—longer shelf life and more accurate results.
- High miscibility—compatible with QuEChERS solvents.
- Certified reference material (CRM) meets strict ISO quality requirements.
- Pair with Rxi®-PAH GC column for easy separation of EFSA PAH4 compounds from common interferences in food and environmental samples. See page 84 for more details.

Benz[a]anthracene (56-55-3)	Benzo[b]fluoranthene (205-99-2)
Benzo[a]pyrene (50-32-8)	Chrysene (218-01-9)

1,000 µg/mL each in toluene, 1 mL/ampul

cat.# 32469 (ea.)



See pages 511–513 for additional PAH standards.

**Restek® Safe Cracker**

Included with every reference standard shipment for added convenience.



## QuEChERS

### QuEChERS Performance Standards

- Designed for use in all QuEChERS methods for pesticides in fruits and vegetables, including the original unbuffered method, AOAC 2007.01, and EN15662.
- Ideal for initial method evaluations and ongoing method performance validations.
- Precise formulation improves data quality and operational efficiency; spend more time running samples and less time sourcing and preparing standards.
- Quantitatively analyzed to confirm the composition and stability of each mixture.
- Produced and tested in accordance with ISO Guide 34 and 17025 accreditation.

#### QuEChERS Performance Standards Kit

- Kit contains organochlorine, organonitrogen, organophosphorus, and carbamate pesticides commonly used on fruits and vegetables.
- Volatile, polar, active, base-sensitive, and nonvolatile compounds are included to allow comprehensive evaluation of QuEChERS extraction and cleanup efficiencies, and optimization of GC and LC instrumental conditions.
- Analytes are divided into three ampuls based on compatibility for maximum stability and shelf life.\*

Contains 1 mL each of these mixtures.

31153: QuEChERS Performance Standard A  
31154: QuEChERS Performance Standard B  
31155: QuEChERS Performance Standard C

300 µg/mL each in acetonitrile/acetic acid (99.9:0.1), 1 mL/ampul.  
Blend equal volumes of all three ampuls for a 100 µg/mL final solution.  
cat.# 31152 (kit)




\*When combining compounds with different functionalities, chemical stability can be an issue. The analytes in this kit are separated into three mixes to ensure maximum long-term storage stability. For analysis, a fresh working standard should be prepared by combining the three kit mixes in a 1:1:1 ratio to prepare a 100 µg/mL working standard solution. Once blended, Restek does not recommend storing working standards or subsequent dilutions for future use.

Restek Offers a Full  
Line of Certified  
Reference Materials

See pages 464–465.



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#### QuEChERS Performance Standard A (16 components)

Acephate (30560-19-1)	Fenthion (55-38-9)
Azinphos methyl (86-50-0)	Malathion (121-75-5)
Chlorpyrifos (2921-88-2)	Methamidophos (10265-92-6)
Coumaphos (56-72-4)	Mevinphos (7786-34-7)
Diazinon (333-41-5)	Omethoate (1113-02-6)
Dichlofluanid (1085-98-9)	Phosalone (2310-17-0)
Dichlorvos (DDVP) (62-73-7)	Pirimiphos methyl (29232-93-7)
Dimethoate (60-51-5)	Propargite (2312-35-8)

300 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 1 mL/ampul  
cat.# 31153 (ea.)



#### QuEChERS Performance Standard B (7 components)

gamma-BHC (Lindane) (58-89-9)	Endosulfan sulfate (1031-07-8)
Chlorothalonil (1897-45-6)	Endrin (72-20-8)
4,4'-DDT (50-29-3)	2-Phenylphenol (90-43-7)
Dicofol (Keltthane) (115-32-2)	

300 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 1 mL/ampul  
cat.# 31154 (ea.)



#### QuEChERS Performance Standard C (17 components)

Bifenthrin (82657-04-3)	Iprodione (36734-19-7)
Captan (133-06-2)	Metalaxyl (57837-19-1)
Carbaryl (sevin) (63-25-2)	Methiocarb (2032-65-7)
Cyprodinil (121552-61-2)	Myclobutanil (88671-89-0)
Deltamethrin (52918-63-5)	cis-Permethrin (61949-76-6)
Fenhexamid (126833-17-8)	trans-Permethrin (61949-77-7)
Fenpropathrin (39515-41-8)	Thiabendazole (148-79-8)
Folpet (133-07-3)	Vinclozolin (50471-44-8)
Imazalil (35554-44-0)	

300 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 1 mL/ampul  
cat.# 31155 (ea.)



QuEChERS, *cont.*

QuEChERS Standards

- Ready to use for QuEChERS extractions—no dilutions necessary.
- Support for GC and LC with MS, MS/MS, and selective detectors.

Pesticide analysis is fast and simple using QuEChERS methods. Use these cost-effective QuEChERS standards for even greater lab efficiency. Standards are compatible with all major methods, including mini-multiresidue, AOAC, and European procedures. Save time with convenient mixes or make your own blend using our full line of single-component solutions.

QuEChERS Internal Standard Mix for GC-ECD Analysis

(4 components)

PCB 18 (37680-65-2)	Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8)
PCB 28 (7012-37-5)	
PCB 52 (35693-99-3)	
50 µg/mL each in acetonitrile, 5 mL/ampul	
cat.# 33265 (ea.)	

QuEChERS Internal Standard Mix for GC-NPD and LC-MS/MS Analysis (2 components)

Triphenylphosphate (115-86-6)	20 µg/mL
Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8)	50 µg/mL
In acetonitrile, 5 mL/ampul	
cat.# 33266 (ea.)	

QuEChERS Internal Standard Mix for GC-MS Analysis

(6 components)

PCB 18 (37680-65-2)	50 µg/mL	Triphenylphosphate (115-86-6)	20
PCB 28 (7012-37-5)	50	Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8)	50
PCB 52 (35693-99-3)	50		
Triphenylmethane (519-73-3)	10		
In acetonitrile, 5 mL/ampul			
cat.# 33267 (ea.)			

QuEChERS Internal Standard Mix for LC-MS/MS Analysis

Nicarbazin (bis-nitrophenyl urea) (330-95-0)
10 µg/mL in acetonitrile, 5 mL/ampul
cat.# 33261 (ea.)

QuEChERS Quality Control Standards for GC-MS Analysis

<b>Cat.# 33268:</b>	<b>Cat.# 33264:</b>
PCB 138 (35065-28-2)	Anthracene (120-12-7)
PCB 153 (35065-27-1)	
50 µg/mL each in acetonitrile, 5 mL/ampul	
cat.# 33268 (ea.)	
100 µg/mL in acetonitrile, 5 mL/ampul	
cat.# 33264 (ea.)	

QuEChERS Single-Component Reference Standards

Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263
triphenylmethane (5 mL)	519-73-3	ACN	10	33260
triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259

ACN = acetonitrile



QuEChERS Products

Your Total Solution for QuEChERS Methods

- Tubes
- Standards
- Columns
- Accessories

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**QuEChERS, cont.**

**QuEChERS Standards for AOAC Official Method 2007.01**

- Ready to use for generating test mixes, calibration standards, and spiking experiments.
- Reliable standards produced according to specifications defined in AOAC Official Method 2007.01.
- Cost-effective QuEChERS standards can be used without dilutions for greater lab efficiency.

Following QuEChERS methods is even quicker and easier when you use Restek® method-specific chemical standards for AOAC Official Method 2007.01 (Pesticide Residues in Foods by Acetonitrile Extraction and Partitioning with Magnesium Sulfate). Our suite of AOAC QuEChERS standards includes internal standards mix, triphenylphosphate (TPP) solution, and QC spike mix. Each standard can be used directly without dilutions because they are formulated to the exact concentrations prescribed by AOAC Method 2007.01.

**AOAC QuEChERS IS Solution (2 components)**

α-BHC-d6 (α-HCH-d6) (86194-41-4)  
Parathion-d10 (350820-04-1)

40 µg/mL each in acetonitrile, 5 mL/ampul  
cat.# 31963 (ea.)

**AOAC QuEChERS Triphenylphosphate Solution**

Triphenylphosphate (115-86-6)

2 µg/mL in acetonitrile:acetic acid (99:1), 5 mL/ampul  
cat.# 31964 (ea.)

**AOAC QuEChERS QC Spike Mix (27 components)**

- |                                 |                               |
|---------------------------------|-------------------------------|
| Atrazine (1912-24-9)            | Imidacloprid (138261-41-3)    |
| Azoxystrobin (131860-33-8)      | Kresoxim methyl (143390-89-0) |
| Bifenthrin (82657-04-3)         | Linuron (330-55-2)            |
| Carbaryl (Sevin) (63-25-2)      | Methamidophos (10265-92-6)    |
| Chlorothalonil (1897-45-6)      | Methomyl (16752-77-5)         |
| Chlorpyrifos (2921-88-2)        | cis-Permethrin (61949-76-6)   |
| Chlorpyrifos methyl (5598-13-0) | trans-Permethrin (61949-77-7) |
| lambda-Cyhalothrin (91465-08-6) | Procymidone (32809-16-8)      |
| Cyprodinil (121552-61-2)        | Pymetrozine (123312-89-0)     |
| 2,4'-DDD (53-19-0)              | Tebuconazole (107534-96-3)    |
| Dichlorvos (DDVP) (62-73-7)     | Thiabendazole (148-79-8)      |
| Endosulfan sulfate (1031-07-8)  | Tolylfluanid (731-27-1)       |
| Ethion (563-12-2)               | Trifluralin (1582-09-8)       |
| Imazalil (35554-44-0)           |                               |

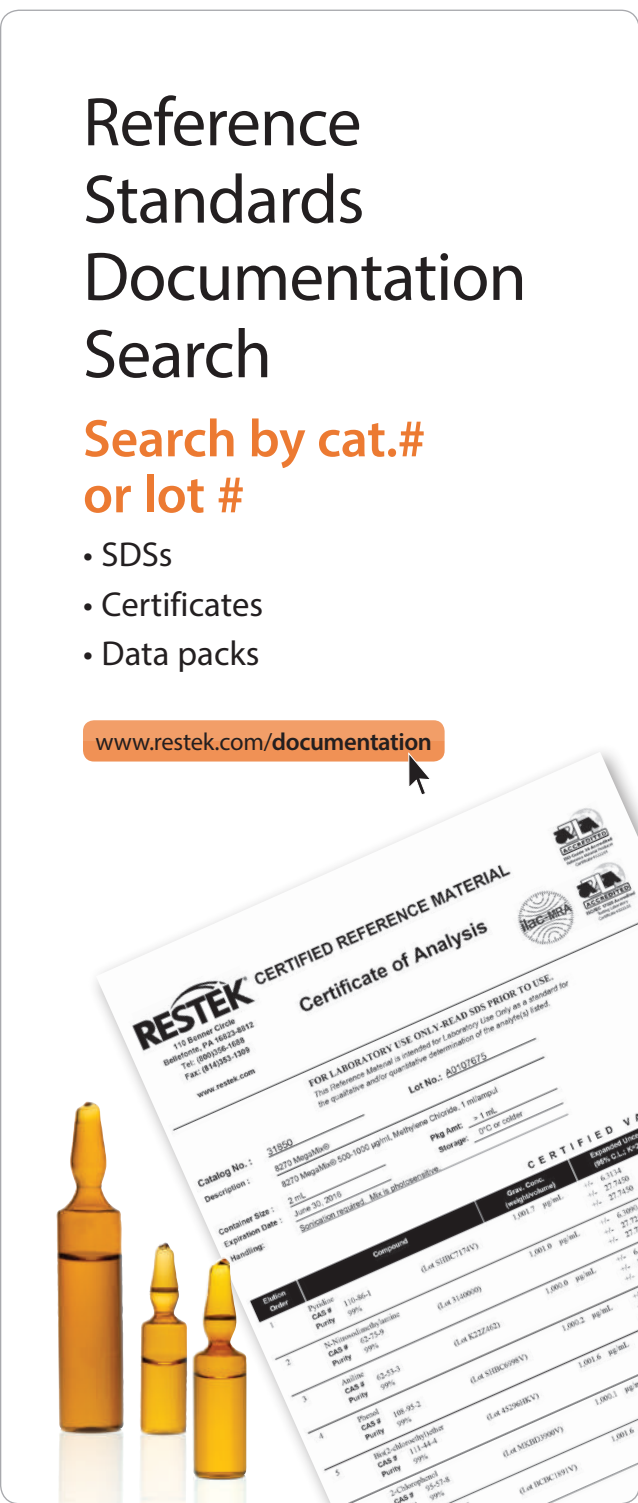
40 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 5 mL/ampul  
cat.# 31999 (ea.)

# Reference Standards Documentation Search

Search by cat.# or lot #

- SDSs
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# Reference Standards

## Petroleum & Petrochemical



Biodiesel .....	577
Finished Motor Oil & Aviation Gasoline .....	578
Leaking Underground Storage Tank (LUST) ..	497–510
PCBs in Transformer Oil .....	578
Simulated Distillation .....	579
Spark Ignition Engine Fuels.....	580–581





## Biodiesel

### ASTM Method D6584-10 and EN14105 (Biodiesel)

#### Determining Free and Total Glycerin in B100 Biodiesel Methyl Esters by GC

In the manufacture of biodiesel fuel, triglycerides are split into their monoalkyl ester components via transesterification. The fatty acid monoalkyl esters can be used as fuel in diesel engines. Amounts of free glycerin and total glycerin indicate the quality of the conversion of the oil or fat to monoalkyl esters. D6584-10 and DIN EN14105 are test methods for quantitative determination of free glycerin, total glycerin, and mono-, di-, and triglycerides in biodiesel fuel methyl esters by GC, after silylation of the sample with N-methyl-N-(trimethylsilyl) trifluoroacetamide (MSTFA).

#### (s)-(-)-1,2,4-Butanetriol

(s)-(-)-1,2,4-Butanetriol (42890-76-6)

1,000 µg/mL in pyridine, 1 mL/ampul

cat.# 33024 (ea.)

1,000 µg/mL in pyridine, 5 mL/ampul

cat.# 33032 (ea.)

#### Diolein (1,3-di[*cis*-octadecenoyl]glycerol)

Diolein (1,3-di[*cis*-octadecenoyl]glycerol) (2465-32-9)

5,000 µg/mL in pyridine, 1 mL/ampul

cat.# 33022 (ea.)

#### Glycerin

Glycerin (56-81-5)

500 µg/mL in pyridine, 1 mL/ampul

cat.# 33020 (ea.)

#### Monolein (1-mono[*cis*-9-octadecenoyl]-*rac*-glycerol)

Monolein (1-mono[*cis*-9-octadecenoyl]-*rac*-glycerol) (111-03-5)

5,000 µg/mL in pyridine, 1 mL/ampul

cat.# 33021 (ea.)

#### Monopalmitin

Monopalmitin (524-44-9)

5,000 µg/mL in pyridine, 1 mL/ampul

cat.# 33026 (ea.)

#### Tricaprin (1,2,3-tricaprinoylglycerol)

Tricaprin (1,2,3-tricaprinoylglycerol) (621-71-6)

8,000 µg/mL in pyridine, 1 mL/ampul

cat.# 33025 (ea.)

8,000 µg/mL in pyridine, 5 mL/ampul

cat.# 33033 (ea.)

#### Triolein (1,2,3-tri[*cis*-octadecenoyl]glycerol)

Triolein (1,2,3-tri[*cis*-octadecenoyl]glycerol) (122-32-7)

5,000 µg/mL in pyridine, 1 mL/ampul

cat.# 33023 (ea.)

#### Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

Diesel:biodiesel (80:20) (67784-80-9)

5,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31880 (ea.)



## MXT<sup>®</sup> Capillary Columns

### Ideal for High-Temperature GC Analysis

- Metal tubing won't become brittle at high temperatures (430 °C).\*
- Exclusive Siltek<sup>®</sup> layer provides an internal surface with excellent inertness.
- Can be tightly coiled well under 4.5" without breaking, even under stress.

\*Maximum temperature of finished column may vary by phase.

See **page 104**.

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## Finished Motor Oil & Aviation Gasoline

### ASTM D3606-10 (Determination of Benzene & Toluene in Finished Motor & Aviation Gasoline by GC)

#### ASTM D3606 Calibration Kit Without Internal Standard

Contains 25 mL each of these mixtures.

- 30647: ASTM D3606 Calibration Standard #1 Without Internal Standard
- 30648: ASTM D3606 Calibration Standard #2 Without Internal Standard
- 30649: ASTM D3606 Calibration Standard #3 Without Internal Standard
- 30650: ASTM D3606 Calibration Standard #4 Without Internal Standard
- 30651: ASTM D3606 Calibration Standard #5 Without Internal Standard
- 30652: ASTM D3606 Calibration Standard #6 Without Internal Standard
- 30653: ASTM D3606 Calibration Standard #7 Without Internal Standard

cat.# 30672 (kit)

kit

Find complete compound lists for our **D3606 reference standards** at

[www.restek.com/D3606standards](http://www.restek.com/D3606standards)

#### ASTM D3606 Calibration Kit With MEK Internal Standard

Contains 1 mL each of these mixtures.

- 30654: ASTM D3606 Calibration Standard #1 With MEK Internal Standard
- 30655: ASTM D3606 Calibration Standard #2 With MEK Internal Standard
- 30656: ASTM D3606 Calibration Standard #3 With MEK Internal Standard
- 30657: ASTM D3606 Calibration Standard #4 With MEK Internal Standard
- 30658: ASTM D3606 Calibration Standard #5 With MEK Internal Standard
- 30659: ASTM D3606 Calibration Standard #6 With MEK Internal Standard
- 30660: ASTM D3606 Calibration Standard #7 With MEK Internal Standard

cat.# 30673 (kit)

kit

#### ASTM D3606 Calibration Kit With *sec*-Butanol Internal Standard

Contains 1 mL each of these mixtures.

- 30661: ASTM D3606 Calibration Standard #1 With *sec*-Butanol Internal Standard
- 30662: ASTM D3606 Calibration Standard #2 With *sec*-Butanol Internal Standard
- 30663: ASTM D3606 Calibration Standard #3 With *sec*-Butanol Internal Standard
- 30664: ASTM D3606 Calibration Standard #4 With *sec*-Butanol Internal Standard
- 30665: ASTM D3606 Calibration Standard #5 With *sec*-Butanol Internal Standard
- 30666: ASTM D3606 Calibration Standard #6 With *sec*-Butanol Internal Standard
- 30667: ASTM D3606 Calibration Standard #7 With *sec*-Butanol Internal Standard

cat.# 30674 (kit)

kit

#### ASTM D3606 Backflush Standard

2,2,4-Trimethylpentane (isooctane) (540-84-1)

5% vol/vol in nonane, 1 mL/ampul

cat.# 30671 (ea.)

## PCBs in Transformer Oil

### ASTM Method D4059-00 (PCB Standards in Oil)

ASTM Method D4059-00 is used for determining PCB concentrations in various types of transformer oil using GC-ECD detection. The analyst must dilute transformer oil samples in a solvent prior to injection. The oil in the sample has been shown to quench the ECD. Calibration mixtures of PCBs in transformer oil must be prepared and diluted identically to eliminate the detector quenching bias resulting when samples are analyzed.

We prepare these solutions in a mineral oil-based transformer oil (Exxon® Univolt® N-61), which has been tested to ensure it is PCB-free.

#### PCB-Free Transformer Oil

Neat, 5 mL

cat.# 32424 (ea.)

Neat, 50 mL

cat.# 32425 (ea.)

No data pack available.

#### Aroclor Standards

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088

TO = transformer oil (PCB-free)

also available

D3606 Application Column  
(2 column set)

See **page 138** for details.



## Simulated Distillation

### ASTM Simulated Distillation Petroleum Fractions

#### ASTM D2887-12 Calibration Standard (20 components)

American Society for Testing and Materials (ASTM International) Method D2887-12 is used to determine the boiling range distribution of petroleum products and fractions having a final boiling point of 538 °C (1,000 °F) or lower, a boiling range greater than 55 °C (131 °F), and a vapor pressure sufficiently low to permit sampling at ambient temperature.

<i>n</i> -Pentane (C5) (109-66-0)	<i>n</i> -Hexadecane (C16) (544-76-3)
<i>n</i> -Hexane (C6) (110-54-3)	<i>n</i> -Heptadecane (C17) (629-78-7)
<i>n</i> -Heptane (C7) (142-82-5)	<i>n</i> -Octadecane (C18) (593-45-3)
<i>n</i> -Octane (C8) (111-65-9)	<i>n</i> -Eicosane (C20) (112-95-8)
<i>n</i> -Nonane (C9) (111-84-2)	<i>n</i> -Tetracosane (C24) (646-31-1)
<i>n</i> -Decane (C10) (124-18-5)	<i>n</i> -Octacosane (C28) (630-02-4)
<i>n</i> -Undecane (C11) (1120-21-4)	<i>n</i> -Dotriacontane (C32) (544-85-4)
<i>n</i> -Dodecane (C12) (112-40-3)	<i>n</i> -Hexatriacontane (C36) (630-06-8)
<i>n</i> -Tetradecane (C14) (629-59-4)	<i>n</i> -Tetracontane (C40) (4181-95-7)
<i>n</i> -Pentadecane (C15) (629-62-9)	<i>n</i> -Tetratetracontane (C44) (7098-22-8)

1% w/w in carbon disulfide, 1 g solution/ampul

cat.# 31674 (ea.)

5% w/w, Neat, 1 g /ampul

cat.# 31675 (ea.)

No data pack available.

#### ASTM Methods D2887 and D3710-95

These calibration mixtures are made with pure, highly characterized neat material and are prepared using NIST-traceable balances and weights. Each ampul is supplied with a data sheet indicating the exact concentration and a sample chromatogram.

#### D2887 Calibration Mix (17 components)

Compound	Conc. (% w/w)	Compound	Conc. (% w/w)
<i>n</i> -Hexane (C6) (110-54-3)	6	<i>n</i> -Octadecane (C18) (593-45-3)	5
<i>n</i> -Heptane (C7) (142-82-5)	6	<i>n</i> -Eicosane (C20) (112-95-8)	2
<i>n</i> -Octane (C8) (111-65-9)	8	<i>n</i> -Tetracosane (C24) (646-31-1)	2
<i>n</i> -Nonane (C9) (111-84-2)	8	<i>n</i> -Octacosane (C28) (630-02-4)	1
<i>n</i> -Decane (C10) (124-18-5)	12	<i>n</i> -Dotriacontane (C32) (544-85-4)	1
<i>n</i> -Undecane (C11) (1120-21-4)	12	<i>n</i> -Hexatriacontane (C36) (630-06-8)	1
<i>n</i> -Dodecane (C12) (112-40-3)	12	<i>n</i> -Tetracontane (C40) (4181-95-7)	1
<i>n</i> -Tetradecane (C14) (629-59-4)	12	<i>n</i> -Tetratetracontane (C44) (7098-22-8)	1
<i>n</i> -Hexadecane (C16) (544-76-3)	10		

Packaged 1 mL/ampul

cat.# 31222 (ea.)

No data pack available.

#### D3710-95 Calibration Mix (16 components)

Compound	Conc. (% vol/vol)	Compound	Conc. (% w/w)
<i>n</i> -Pentane (C5) (109-66-0)	8	<i>n</i> -Pentadecane (C15) (629-62-9)	2
<i>n</i> -Hexane (C6) (110-54-3)	6	<i>n</i> -Butylbenzene (104-51-8)	4
<i>n</i> -Heptane (C7) (142-82-5)	10	2,4-Dimethylpentane (108-08-7)	6
<i>n</i> -Octane (C8) (111-65-9)	5	2-Methylbutane (Isopentane) (78-78-4)	10
<i>n</i> -Decane (C10) (124-18-5)	4	2-Methylpentane (107-83-5)	6
<i>n</i> -Dodecane (C12) (112-40-3)	4	<i>n</i> -Propylbenzene (103-65-1)	5
<i>n</i> -Tridecane (C13) (629-50-5)	2	Toluene (108-88-3)	12
<i>n</i> -Tetradecane (C14) (629-59-4)	2	<i>p</i> -Xylene (106-42-3)	14

Packaged 1 mL/ampul

cat.# 31223 (ea.)

No data pack available.

### ASTM Method 6352-04 (Polywax® Standards)

#### Polywax® Standards

These high molecular weight hydrocarbon waxes are useful for simulated distillation and other high-temperature GC work.

Supports ASTM Methods D2887, D6352, D7169, D7398, and D7500.

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Polywax 500	9002-88-4	Neat	1 g	36224
Polywax 655	9002-88-4	Neat	1 g	36225
Polywax 850	9002-88-4	Neat	1 g	36226
Polywax 1,000	9002-88-4	Neat	1 g	36227

No data pack available.

### Petroleum Standards

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and have been verified by one or more analytical methods.

#### Sulfur Simulated Distillation Standard (SSDS)

30 ppm total sulfur by weight from ethanethiol  
 60 ppm total sulfur by weight from 1-propanethiol  
 30 ppm total sulfur by weight from 1-butanethiol  
 60 ppm total sulfur by weight from 1-pentanethiol  
 30 ppm total sulfur by weight from 1-hexanethiol  
 60 ppm total sulfur by weight from 1-heptanethiol  
 30 ppm total sulfur by weight from 3,5-dimethylbenzenethiol  
 60 ppm total sulfur by weight from 1-octanethiol  
 30 ppm total sulfur by weight from 1-nonanethiol  
 60 ppm total sulfur by weight from 1-decanethiol  
 30 ppm total sulfur by weight from 1-pentadecanethiol  
 60 ppm total sulfur by weight from 1-hexadecanethiol  
 30 ppm total sulfur by weight from 1-octadecanethiol  
 Balance: toluene:isooctane (1:15)

1 mL amber ampul.

cat.# 33049 (ea.)

#### Speciated Sulfur System Suitability Checkout Standard (SSSSCS)

0.50 ppm total sulfur by weight from dimethylsulfide  
 35.0 ppm total sulfur by weight from tertiary butyl mercaptan  
 50.0 ppm total sulfur by weight from thiopene  
 15.0 ppm total sulfur by weight from dimethyl disulfide  
 25.0 ppm total sulfur by weight from benzothiophene  
 Balance: isooctane

1 mL amber ampul.

cat.# 33050 (ea.)

Restek Offers a Full Line of Certified Reference Materials



See pages 464-465.

[www.restek.com/iso](http://www.restek.com/iso)



# Spark Ignition Engine Fuels

## Spark Ignition Engine Fuels

### ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels)

ASTM Methods D6729, D6730, and D6733 are designed for the determination of the individual hydrocarbons present in spark engine ignition fuels, as well as fuel blends containing oxygenates such as methyl *tert*-butyl ether, ethyl *tert*-butyl ether, *tert*-butanol, ethanol, etc.

These standards are produced for refineries performing detailed hydrocarbon analysis (DHA) of crude oil feedstocks and fuels. They help with calibrating complex hydrocarbon analyses and provide the greatest number of gravimetrically determined values for quantitative calibration to help our customers optimize production and maximize profitability—while fulfilling requirements such as ASTM Methods D6729, D6730, and D6733.

#### Oxy Set-Up Blend (30 components)

Gravimetrically prepared and NIST-traceable.

Benzene	1.00%	1-Methylcyclopentene	0.50%
<i>tert</i> -Butanol	0.50%	1-Methyl-2-ethylbenzene	0.50%
Cyclohexane	28.9%	1-Methylnaphthalene	0.25%
<i>n</i> -Decane	1.00%	5-Methylnonane	0.20%
2,3-Dimethylbutane	0.50%	Naphthalene	0.50%
<i>trans</i> -1,2-Dimethylcyclopentane	0.50%	<i>n</i> -Nonane	2.00%
2,3-Dimethylheptane	0.20%	<i>n</i> -Octane	2.00%
Dodecane	0.25%	<i>n</i> -Pentane	2.00%
Ethanol	8.00%	1,2,3,5-Tetramethylbenzene	0.25%
Ethylbenzene	25.0%	Toluene	7.00%
3-Ethylpentane	0.20%	Tridecane	0.25%
<i>n</i> -Heptane	2.00%	2,2,3-Trimethylpentane	0.52%
<i>n</i> -Hexane	2.00%	2,3,3-Trimethylpentane	0.50%
2-Methylbutene-2	2.50%	Undecane	0.50%
Methyl <i>tert</i> -butyl ether	10.0%	<i>p</i> -Xylene	1.00%

2 mL prescored ampul

cat.# 33034 (ea.)

#### DHA PONA Standard (188 components)

This standard is a qualitative mixture of various gasoline and refinery materials prepared to provide nearly every component that may be encountered in feedstock and finished gasolines. Some oxygenates have been added to allow this blend to be used by refineries for detailed hydrocarbon analysis (DHA) method setup and to fulfill requirements such as ASTM Methods D6729, D6730, and D6733.

For a full component list, visit [www.restek.com](http://www.restek.com) and search for "30731".

Neat, 0.15 mL in Autosampler Vial

cat.# 30731 (ea.)

No data pack available.

NEW!

#### DHA PiONA Standard (133 components)

Compound	Conc (wt/wt%)				
<b>Paraffins</b>		4-Methylheptane	0.286	<i>cis</i> -2-Pentene	0.21
N-Decane	1.736	2-Methylhexane	0.891	<i>trans</i> -2-Pentene	0.542
N-Dodecane	1.727	3-Methylhexane	0.451	<b>Naphthenes</b>	
N-Heptane	1.723	2-Methylnonane	0.3	Cyclohexane	0.954
N-Hexane	1.729	3-Methylnonane	1.001	Cyclopentane	1.891
N-Nonane	1.727	2-Methyloctane	0.245	<i>cis</i> -1,2-Dimethylcyclohexane	2.055
N-Octane	1.721	3-Methyloctane	1.329	<i>trans</i> -1,2-Dimethylcyclohexane	0.328
N-Pentadecane	1.734	2-Methylpentane	1.211	<i>trans</i> -1,4-Dimethylcyclohexane	0.941
N-Pentane	1.728	3-Methylpentane	1.998	<i>trans</i> -1,2-Dimethylcyclopentane	0.73
N-Tetradecane	1.735	2,2,3-Trimethylbutane	0.125	<i>cis</i> -1,3-Dimethylcyclopentane	0.06
N-Tridecane	1.723	2,2,3-Trimethylpentane	0.698	<i>trans</i> -1,3-Dimethylcyclopentane	1.16
N-Undecane	1.723	<b>Olefins</b>		Ethylcyclopentane	1.567
<b>Isoparaffins</b>		1-Decene	0.43	1-Ethyl-1-Methylcyclopentane	0.292
3,3-Diethylpentane	0.364	1-Heptene	1.29	Isobutylcyclohexane	0.733
2,3-Dimethylbutane	0.447	<i>cis</i> -2-Heptene	0.649	Isobutylcyclopentane	0.267
2,3-Dimethylheptane	0.22	<i>trans</i> -2-Heptene	0.101	Isopropylcyclopentane	0.261
2,5-Dimethylheptane	0.733	<i>cis</i> -3-Heptene	0.194	Methylcyclohexane	0.735
3,3-Dimethylheptane	0.335	<i>trans</i> -3-Heptene	0.712	Methylcyclopentane	1.184
3,4-Dimethylheptane	0.159	1-Hexene	2.137	<i>t</i> -1-Methyl-2(4-Methylphenyl)cyclopentane	0.718
3,5-Dimethylheptane	0.445	<i>cis</i> -2-Hexene	0.555	<i>t</i> -1-Methyl-2- <i>n</i> -Propylcyclohexane	
2,2-Dimethylhexane	0.149	<i>trans</i> -2-Hexene	0.31		
2,4-Dimethylhexane	0.276	2-Methyl-1,3-Butadiene	0.699		
2,5-Dimethylhexane	1.112	2-Methyl-1-Butene	0.42		
2,2-Dimethyloctane	0.398	3-Methyl-1-Butene	0.291		
3,3-Dimethyloctane	0.153	2-Methyl-1-Nonene	0.648		
2,2-Dimethylpentane	0.463	2-Methyl-2-Pentene	0.654		
2,3-Dimethylpentane	0.887	4-Methyl-1-Pentene	0.646		
2,4-Dimethylpentane	1.127	1-Nonene	1.313		
3,3-Dimethylpentane	0.438	<i>cis</i> -3-Nonene	0.434		
3-Ethylhexane	0.058	<i>cis</i> -3-Nonene	0.575		
3-Ethylheptane	0.203	<i>trans</i> -3-Nonene	0.44		
3-Ethylpentane	0.168	<i>cis</i> -4-Nonene	0.829		
Isopentane	0.304	1-Octene	2.155		
2-Methylheptane	0.899	<i>cis</i> -2-Octene	0.439		
3-Methylheptane	1.122	<i>trans</i> -2-Octene	0.656		
		1-Pentene	1.669		
				<b>Aromatics</b>	
				Benzene	1.899
				<i>N</i> -Butylbenzene	0.478
				<i>sec</i> -Butylbenzene	0.711
				<i>tert</i> -Butylbenzene	0.473
				<i>tert</i> -1-Butyl-4-Ethylbenzene	0.478
				<i>tert</i> -1-Butyl-2-Methylbenzene	0.478
				<i>tert</i> -1-Butyl-3,4,5-Trimethylbenzene	0.772
				1,2-Dimethyl-3-Ethylbenzene	0.495
				1,2-Dimethyl-4-Ethylbenzene	0.21
				1,3-Dimethyl-2-Ethylbenzene	0.184
				1,3-Dimethyl-5-Ethylbenzene	0.094
				1,4-Dimethyl-2-Ethylbenzene	0.478
				Ethylbenzene	1.897
				Hexylbenzene	1.186
				Isobutylbenzene	0.713
				Isopropylbenzene	0.48
				2-Methylbutylbenzene	0.027
				1-Methyl-2-Ethylbenzene	0.361
				1-Methyl-3-Ethylbenzene	0.643
				1-Methyl-4-Ethylbenzene	0.476
				1-Methyl-2-Isopropylbenzene	0.645
				1-Methyl-3-Isopropylbenzene	0.245
				1-Methyl-4-Isopropylbenzene	0.949
				1-Methyl-2- <i>n</i> -Propylbenzene	0.494
				1-Methyl-3- <i>n</i> -Propylbenzene	0.479
				1,3,5-Triethylbenzene	0.477
				Pentylbenzene	0.473
				<i>N</i> -Propylbenzene	0.711
				1,3,5-Tetramethylbenzene	0.198
				Toluene	2.839
				1,2,4-Triethylbenzene	0.233
				1,3,5-Triethylbenzene	0.48
				1,2,4-Triethylbenzene	0.475
				1,3,5-Trimethylbenzene	0.097
				<i>m</i> -Xylene	0.715
				<i>o</i> -Xylene	0.719
				<i>p</i> -Xylene	0.239

Neat, 0.15 mL in Autosampler Vial

cat.# 30730 (ea.)

No data pack available.

NEW!



## Spark Ignition Engine Fuels, *cont.*

### ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels), *cont.*

#### DHA Paraffins Standard (11 components)

Compound	Conc (wt/wt%)		
N-Decane	9.134	N-Octane	9.054
N-Dodecane	9.089	N-Pentadecane	9.123
N-Heptane	9.066	N-Pentane	9.094
N-Hexane	9.097	N-Tetradecane	9.128
N-Nonane	9.086	N-Tridecane	9.064
		N-Undecane	9.064

Neat, 0.15 mL in Autosampler Vial

cat.# 30725 (ea.)



No data pack available.

#### DHA Isoparaffins Standard (33 components)

Compound	Conc (wt/wt%)		
3,3-Diethylpentane	1.914	3-Ethylhexane	0.307
2,3-Dimethylbutane	2.352	3-Ethylheptane	1.068
2,3-Dimethylheptane	1.16	3-Ethylpentane	0.882
2,5-Dimethylheptane	3.86	Isopentane	1.599
3,3-Dimethylheptane	1.765	2-Methylheptane	4.731
3,4-Dimethylheptane	0.839	3-Methylheptane	5.909
3,5-Dimethylheptane	2.344	4-Methylheptane	1.508
2,2-Dimethylhexane	0.786	2-Methylhexane	4.689
2,4-Dimethylhexane	1.454	3-Methylhexane	2.374
2,5-Dimethylhexane	5.854	2-Methylnonane	1.582
2,2-Dimethyloctane	2.095	3-Methylnonane	5.272
3,3-Dimethyloctane	0.804	2-Methyloctane	1.289
2,2-Dimethylpentane	2.438	3-Methyloctane	6.995
2,3-Dimethylpentane	4.668	2-Methylpentane	6.377
2,4-Dimethylpentane	5.931	3-Methylpentane	10.517
3,3-Dimethylpentane	2.305	2,2,3-Trimethylbutane	0.66
		2,2,3-Trimethylpentane	3.673

Neat, 0.15 mL in Autosampler Vial

cat.# 30726 (ea.)



No data pack available.

#### DHA Olefins Standard (26 components)

Compound	Conc (wt/wt%)		
1-Decene	2.265	2-Methyl-2-Pentene	3.444
1-Heptene	6.787	4-Methyl-1-Pentene	3.398
<i>cis</i> -2-Heptene	3.418	1-Nonene	6.912
<i>trans</i> -2-Heptene	0.53	<i>trans</i> -2-Nonene	2.282
<i>cis</i> -3-Heptene	1.02	<i>cis</i> -3-Nonene	3.027
<i>trans</i> -3-Heptene	3.747	<i>trans</i> -3-Nonene	2.315
1-Hexene	11.249	<i>cis</i> -4-Nonene	4.365
<i>cis</i> -2-Hexene	2.921	1-Octene	11.339
<i>trans</i> -2-Hexene	1.632	<i>cis</i> -2-Octene	2.312
2-Methyl-1,3-Butadiene	3.68	<i>trans</i> -2-Octene	3.453
2-Methyl-1-Butene	2.211	1-Pentene	8.786
3-Methyl-1-Butene	1.534	<i>cis</i> -2-Pentene	1.107
2-Methyl-1-Nonene	3.412	<i>trans</i> -2-Pentene	2.852

Neat, 0.15 mL in Autosampler Vial

cat.# 30727 (ea.)



No data pack available.

#### DHA Naphthenes Standard (26 components)

Compound	Conc (wt/wt%)		
Cyclohexane	4.773	Methylcyclopentane	5.921
Cyclopentane	9.455	<i>t</i> -1-Methyl-2-(Methylphenyl)cyclopentane	3.592
<i>cis</i> -1,2-Dimethylcyclohexane	10.276	<i>t</i> -1-Methyl-2-N-Propylcyclohexane	4.637
<i>trans</i> -1,2-Dimethylcyclohexane	1.642	N-Propylcyclopentane	4.373
<i>trans</i> -1,4-Dimethylcyclohexane	4.705	1,1,2-Trimethylcyclohexane	1.842
<i>trans</i> -1,2-Dimethylcyclopentane	3.653	1,1,4-Trimethylcyclohexane	6.304
<i>cis</i> -1,3-Dimethylcyclopentane	0.3	<i>ctc</i> -1,2,3-Trimethylcyclohexane	3.676
<i>trans</i> -1,3-Dimethylcyclopentane	5.799	<i>ctc</i> -1,2,4-Trimethylcyclohexane	1.062
Ethylcyclopentane	7.837	<i>ctt</i> -1,2,4-Trimethylcyclohexane	1.839
1-Ethyl-1-Methylcyclopentane	1.459	<i>ccc</i> -1,3,5-Trimethylcyclohexane	2.343
Isobutylcyclohexane	3.666	<i>ccc</i> -1,2,3-Trimethylcyclopentane	0.795
Isobutylcyclopentane	1.334	<i>ctc</i> -1,2,3-Trimethylcyclopentane	3.738
Isopropylcyclopentane	1.305		
Methylcyclohexane	3.677		

Neat, 0.15 mL in Autosampler Vial

cat.# 30728 (ea.)



No data pack available.

#### DHA Aromatics Standard (37 components)

Compound	Conc (wt/wt%)		
Benzene	8.255	1-Methyl-3-Ethylbenzene	2.795
N-Butylbenzene	2.077	1-Methyl-4-Ethylbenzene	2.07
<i>sec</i> -Butylbenzene	3.09	1-Methyl-2-Isopropylbenzene	2.806
<i>tert</i> -Butylbenzene	2.058	1-Methyl-3-Isopropylbenzene	1.066
<i>tert</i> -1-Butyl-4-Ethylbenzene	2.076	1-Methyl-4-Isopropylbenzene	4.126
<i>tert</i> -1-Butyl-2-Methylbenzene	2.077	1-Methyl-2- <i>n</i> -Propylbenzene	2.148
<i>tert</i> -1-Butyl-3,4,5-Trimethylbenzene	3.355	1-Methyl-3- <i>n</i> -Propylbenzene	2.084
1,2-Dimethyl-3-Ethylbenzene	2.152	1-Methyl-4- <i>n</i> -Propylbenzene	2.073
1,2-Dimethyl-4-Ethylbenzene	0.915	Pentylbenzene	2.058
1,3-Dimethyl-2-Ethylbenzene	0.799	N-Propylbenzene	3.091
1,3-Dimethyl-5-Ethylbenzene	0.407	1,2,4,5-Tetramethylbenzene	0.86
1,4-Dimethyl-2-Ethylbenzene	2.076	Toluene	12.342
Ethylbenzene	8.248	1,2,4-Triethylbenzene	1.014
Hexylbenzene	5.155	1,3,5-Triethylbenzene	2.087
Isobutylbenzene	3.099	1,2,4-Trimethylbenzene	2.066
Isopropylbenzene	2.085	1,3,5-Trimethylbenzene	0.422
2-Methylbutylbenzene	0.118	<i>m</i> -Xylene	3.108
1-Methyl-2-Ethylbenzene	1.571	<i>o</i> -Xylene	3.125
		<i>p</i> -Xylene	1.041

Neat, 0.15 mL in Autosampler Vial

cat.# 30729 (ea.)



No data pack available.

## Compound Index for Reference Standards

See pages 586–592.



# Reference Standards Pharmaceutical



Diethylene & Ethylene Glycol.....	583
Fatty Acids.....	583
Pharmaceutical Compounds in Drinking Water.....	583
Plastic Container Testing.....	583
Residual Solvents.....	584-585



## Diethylene & Ethylene Glycol

Meet FDA Guidance for Industry: Testing of Glycerin for Diethylene Glycol with our diethylene glycol (DEG) and ethylene glycol limit standards. This guidance emphasizes the importance of screening raw material for the presence of diethylene glycol. Under cGMPs, drug manufacturers—not just glycerin manufacturers—must test glycerin prior to use to prevent DEG contamination in finished products. The FDA has worked extensively with the USP to modify the glycerin monograph, and these standards support the revised USP method.

### Glycerin Standard Mix (3 components)

Diethylene glycol (111-46-6)	0.5 mg/mL
Ethylene glycol (107-21-1)	0.5
Glycerin (56-81-5)	20
In P&T methanol, 1 mL/ampul	
cat.# 31891 (ea.)	

### Propylene Glycol Standard Mix (3 components)

Diethylene glycol (111-46-6)	0.5 mg/mL
Ethylene glycol (107-21-1)	0.5
Propylene glycol (57-55-6)	20
In P&T methanol, 1 mL/ampul	
cat.# 31892 (ea.)	

### Sorbitol Standard Mix (2 components)

Diethylene glycol (111-46-6)	
Ethylene glycol (107-21-1)	
0.8 mg/mL each in acetone:water (96:4), 1 mL/ampul	
cat.# 31893 (ea.)	

### Glycol Internal Standard Mix

2,2,2-Trichloroethanol (115-20-8)	
10 mg/mL in P&T methanol, 1 mL/ampul	
cat.# 31894 (ea.)	

## Fatty Acids

### Composition of Fatty Acids by GC

#### EP 2.4.22 Composition of Fatty Acids by GC Mix 1

(6 components)

Description	% by Weight	Description	% by Weight
Methyl arachidate (C20:0)	40	Methyl oleate (C18:1 [ <i>cis</i> 9])	20
Methyl dodecanoate (C12:0)	5	Methyl palmitate (C16:0)	10
Methyl myristate (C14:0)	5	Methyl stearate (C18:0)	20
100 mg total			
cat.# 35100 (ea.)			

No data pack available.

#### EP 2.4.22 Composition of Fatty Acids by GC Mix 2

(5 components)

Description	% by Weight	Description	% by Weight
Methyl caproate (C6:0)	10	Methyl dodecanoate (C12:0)	20
Methyl caprylate (C8:0)	10	Methyl myristate (C14:0)	40
Methyl decanoate (C10:0)	20		
100 mg total			
cat.# 35101 (ea.)			

No data pack available.

## Pharmaceutical Compounds in Drinking Water

### Pharmaceuticals Mix #1 (8 components)

Acetaminophen (103-90-2)	Erythromycin USP (114-07-8)
Caffeine (58-08-2)	Fluoxetine HCl (56296-78-7)
Carbamazepine (298-46-4)	Sulfamethoxazole (723-46-6)
Ciprofloxacin HCl (86393-32-0)	Trimethoprim (738-70-5)
200 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 31116 (ea.)	

### Steroids and Mixed Pharmaceuticals Mix

(10 components)

Bisphenol A (80-05-7)	4-para-Nonylphenol (84852-15-3)
Diclofenac sodium salt (15307-79-6)	4-tert-Octylphenol (140-66-9)
17-beta-Estradiol (50-28-2)	Primidone (125-33-7)
Estrone (53-16-7)	Progesterone (57-83-0)
17-alpha-Ethinylestradiol (57-63-6)	Testosterone (58-22-0)
200 µg/mL each in acetonitrile, 1 mL/ampul	
cat.# 31117 (ea.)	

### Pharmaceuticals Mix #2 (4 components)

Gemfibrozil (25812-30-0)	Naproxen (22204-53-1)
Ibuprofen (15687-27-1)	Triclosan (3380-34-5)
200 µg/mL each in P&T methanol, 1 mL/ampul	
cat.# 31118 (ea.)	

## Plastic Container Testing

### ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography—is a “consensus” or “referee” method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product for their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, LC separation, and UV detection. Restek offers a variety of reversed-phase LC columns suitable for these separations. Restek also designed a reference standard to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

### ASTM D6042-96 Calibration Mix (7 components)

BHT (128-37-0)	Irganox 3114 (27676-62-6)
Erucamide slip (112-84-5)	Irganox 1010 (6683-19-8)
Vitamin E (59-02-9)	Irganox 1076 (2082-79-3)
Irgafos 168 (31570-04-4)	
50 µg/mL each in isopropanol, 1 mL/ampul	
cat.# 31628 (ea.)	



## Residual Solvents

### USP <467>

The United States Pharmacopeia (USP) General Chapter <467> Residual Solvents is a widely used compendial method intended for identifying and quantifying residual solvents in drug substances, drug products, and excipients. In an attempt to better mirror the International Conference on Harmonization (ICH) guidelines, the USP has adopted a more comprehensive methodology in residual solvent testing—the current USP30/NF25. The ICH publishes a guideline (Q3C) listing the acceptable amounts of solvent residues that can be present. In the ICH guideline, residual solvents are summarized by class according to their toxicity. Class 1 compounds are carcinogenic compounds that pose a risk to both the consumer and the environment. The use of these solvents is to be avoided, but if they are used, they must be tightly controlled. Class 2 compounds are nongenotoxic animal carcinogens, and concentrations of these compounds should be limited. Chromatographic analysis is needed for both the Class 1 and Class 2 residual solvents.

### USP <467> Singles

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
acetonitrile	75-05-8	DMSO	2.05 mg/mL	36281
benzene	71-43-2	DMSO	10 mg/mL	36282
carbon tetrachloride	56-23-5	DMSO	20 mg/mL	36283
chlorobenzene	108-90-7	DMSO	1.8 mg/mL	36284
chloroform	67-66-3	DMSO	0.3 mg/mL	36285
cyclohexane	110-82-7	DMSO	19.4 mg/mL	36286
1,1-dichloroethene	75-35-4	DMSO	40 mg/mL	36287
1,2-dichloroethane	107-06-2	DMSO	25 mg/mL	36288
cis-1,2-dichloroethylene	156-59-2	DMSO	4.67 mg/mL	36289
trans-1,2-dichloroethylene	156-60-5	DMSO	4.67 mg/mL	36290
1,2-dimethoxyethane	110-71-4	DMSO	0.5 mg/mL	36291
N,N-dimethylacetamide	127-19-5	DMSO	5.45 mg/mL	36292
N,N-dimethylformamide	68-12-2	DMSO	4.4 mg/mL	36293
1,4-dioxane	123-91-1	DMSO	1.9 mg/mL	36294
2-ethoxyethanol	110-80-5	DMSO	0.8 mg/mL	36295
ethylbenzene	100-41-4	DMSO	1.84 mg/mL	36296
ethylene glycol	3775-85-7	DMSO	3.1 mg/mL	36297
formamide	75-12-7	DMSO	1.1 mg/mL	36298
hexane	8031-34-3	DMSO	1.45 mg/mL	36299
methanol	67-56-1	DMSO	15 mg/mL	36401
2-methoxyethanol	109-86-4	DMSO	0.25 mg/mL	36402
methylbutylketone	591-78-6	DMSO	0.25 mg/mL	36400
methylcyclohexane	108-87-2	DMSO	5.9 mg/mL	36403
methylene chloride (dichloromethane)	75-09-2	DMSO	3 mg/mL	36404
N-methylpyrrolidone	872-50-4	DMSO	2.65 mg/mL	36405
nitromethane	75-52-5	DMSO	0.25 mg/mL	36406
pyridine	110-86-1	DMSO	1 mg/mL	36407
sulfolane	126-33-0	DMSO	0.8 mg/mL	36413
tetrahydrofuran (THF)	109-99-9	DMSO	3.6 mg/mL	36408
tetralin	119-64-2	DMSO	0.5 mg/mL	36409
toluene	108-88-3	DMSO	4.45 mg/mL	36410
1,1,1-trichloroethane	71-55-6	DMSO	50 mg/mL	36411
trichloroethene	79-01-6	DMSO	0.4 mg/mL	36412
m-xylene	108-38-3	DMSO	6.51 mg/mL	36414
o-xylene	95-47-6	DMSO	0.97 mg/mL	36415
p-xylene	106-42-3	DMSO	1.52 mg/mL	36416

DMSO = dimethyl sulfoxide

### Residual Solvents Class 2 - Mix A (2013 Rev)

(16 components)



This mixture reflects the changes made in USP <467> effective August 2013 and replaces Restek® cat.# 36271.

Acetonitrile (75-05-8)	2.05 mg/mL	Methanol (67-56-1)	15
Chlorobenzene (108-90-7)	1.8	Methylcyclohexane (108-87-2)	5.9
Cyclohexane (110-82-7)	19.4	Methylene chloride (dichloromethane) (75-09-2)	3
cis-1,2-Dichloroethene (156-59-2)	4.675	Tetrahydrofuran (109-99-9)	3.6
trans-1,2-Dichloroethene (156-60-5)	4.675	Toluene (108-88-3)	4.45
1,4-Dioxane (123-91-1)	1.9	m-Xylene (108-38-3)	6.51
Ethylbenzene (100-41-4)	1.84	o-Xylene (95-47-6)	0.98
Isopropylbenzene (cumene) (98-82-8)	0.35	p-Xylene (106-42-3)	1.52

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36012 (ea.)

These mixtures reflect the changes made in USP30/NF25 effective July 1, 2008.

### Residual Solvents - Class 1 (5 components)

Benzene (71-43-2)	10 mg/mL	1,1-Dichloroethene (75-35-4)	40
Carbon tetrachloride (56-23-5)	20	1,1,1-Trichloroethane (71-55-6)	50
1,2-Dichloroethane (107-06-2)	25		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36279 (ea.)

### Residual Solvents Class 2 - Mix A (15 components)

Note: The USP <467> Class 2 residual solvents list was updated to add cumene in August 2013. See cat.# 36012 (above) for our updated reference standard.

Acetonitrile (75-05-8)	2.05 mg/mL	Methylcyclohexane (108-87-2)	5.90
Chlorobenzene (108-90-7)	1.80	Methylene chloride (dichloromethane) (75-09-2)	3.00
Cyclohexane (110-82-7)	19.40	Tetrahydrofuran (109-99-9)	3.45
cis-1,2-Dichloroethene (156-59-2)	4.70	Toluene (108-88-3)	4.45
trans-1,2-Dichloroethene (156-60-5)	4.70	m-Xylene (108-38-3)	6.51
1,4-Dioxane (123-91-1)	1.90	o-Xylene (95-47-6)	0.98
Ethylbenzene (100-41-4)	1.84	p-Xylene (106-42-3)	1.52
Methanol (67-56-1)	15.00		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36271 (ea.)

### Residual Solvents Class 2 - Mix B (8 components)

n-Hexane (C6) (110-54-3)	290 µg/mL	Nitromethane (75-52-5)	50
Chloroform (67-66-3)	60	Pyridine (110-86-1)	200
1,2-Dimethoxyethane (110-71-4)	100	Tetralin (119-64-2)	100
2-Hexanone (591-78-6)	50	Trichloroethene (79-01-6)	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36280 (ea.)

### Residual Solvents Class 2 - Mix C (8 components)

2-Ethoxyethanol (110-80-5)	800 µg/mL	2-Methoxyethanol (Methyl Cellosolve) (109-86-4)	250
Ethylene glycol (107-21-1)	3,100	N-Methylpyrrolidone (872-50-4)	2,650
Formamide (75-12-7)	1,100	Sulfolane (126-33-0)	800
N,N-Dimethylacetamide (127-19-5)	5,450		
N,N-Dimethylformamide (68-12-2)	4,400		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36270 (ea.)



Residual Solvents, *cont.*USP <467>, *cont.*

The Class 1 mixtures below reflect the requirements of USP23/NF18 effective January 1, 1995 to December 31, 1999. While these mixtures do not meet the current USP guidelines, many still use these mixtures to obtain a detectable benzene peak for the direct injection methods, Method I and Method V.

## USP &lt;467&gt; Calibration Mixture #3 (5 components)

Benzene (71-43-2)	100 µg/mL	Methylene chloride (dichloromethane)	
Chloroform (67-66-3)	50	(75-09-2)	500
1,4-Dioxane (123-91-1)	100	Trichloroethene (79-01-6)	100

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36004 (ea.)

## USP &lt;467&gt; Calibration Mixture #4 (5 components)

Benzene (71-43-2)	2 µg/mL	Methylene chloride (dichloromethane)	
Chloroform (67-66-3)	60	(75-09-2)	600
1,4-Dioxane (123-91-1)	380	Trichloroethene (79-01-6)	80

In methanol, 1 mL/ampul

cat.# 36006 (ea.)

## USP &lt;467&gt; Calibration Mixture #5 (5 components)

Benzene (71-43-2)	2 µg/mL	Methylene chloride (dichloromethane)	
Chloroform (67-66-3)	60	(75-09-2)	600
1,4-Dioxane (123-91-1)	380	Trichloroethene (79-01-6)	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36007 (ea.)

## USP &lt;467&gt; Calibration Mix #6 (4 components)

Chloroform (67-66-3)	60 µg/mL	Methylene chloride (dichloromethane)	
1,4-Dioxane (123-91-1)	380	(75-09-2)	600
		Trichloroethene (79-01-6)	80

In methanol, 1 mL/ampul

cat.# 36008 (ea.)

## USP &lt;467&gt; Calibration Mix #7 (4 components)

Chloroform (67-66-3)	60 µg/mL	Methylene chloride (dichloromethane)	
1,4-Dioxane (123-91-1)	380	(75-09-2)	600
		Trichloroethene (79-01-6)	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36009 (ea.)

## Ethylene Oxide

The test for ethylene oxide is specified in many individual drug monographs of USP24/NF19. The limit test concentration is currently 10 ppm. While the specific test solution and method will vary depending on the particular drug monograph, the solution below is suitable for most tests.

Ethylene oxide (75-21-8)

500 µg/mL in dimethyl sulfoxide, 1 mL/ampul

cat.# 36005 (ea.)

50 mg/mL in methylene chloride, 1 mL/ampul

cat.# 30620 (ea.)

Ethylene oxide is available in other solvents and concentrations. Request your custom formulation at [www.restek.com/solutions](http://www.restek.com/solutions)

## European Pharmacopoeia Method

## Residual Solvents - Class 1 (5 components)

Benzene (71-43-2)	10 mg/mL	1,1-Dichloroethene (75-35-4)	40
Carbon tetrachloride (56-23-5)	20	1,1,1-Trichloroethane (71-55-6)	50
1,2-Dichloroethane (107-06-2)	25		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36279 (ea.)

## European Pharmacopoeia/ICH Q3C(M) Class 2 Mix A, Revised (14 components)

<i>n</i> -Hexane (C6) (110-54-3)	290 µg/mL	Tetrahydrofuran (109-99-9)	720
Chlorobenzene (108-90-7)	360	Toluene (108-88-3)	890
Cyclohexane (110-82-7)	3,880	Trichloroethene (79-01-6)	80
<i>cis</i> -1,2-Dichloroethene (156-59-2)	1,870	<i>m</i> -Xylene (108-38-3)	1,302
<i>N,N</i> -Dimethylformamide (68-12-2)	880	<i>o</i> -Xylene (95-47-6)	195
Ethylbenzene (100-41-4)	369	<i>p</i> -Xylene (106-42-3)	304
Methylcyclohexane (108-87-2)	1,180		
Methylene chloride (dichloromethane) (75-09-2)	600		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36274 (ea.)

## European Pharmacopoeia/ICH Class 2 Mix B, Revised (10 components)

Acetonitrile (75-05-8)	410 µg/mL	2-Hexanone (591-78-6)	50
Chloroform (67-66-3)	60	Methanol (67-56-1)	3,000
1,2-Dimethoxyethane (110-71-4)	100	Nitromethane (75-52-5)	50
<i>N,N</i> -Dimethylacetamide (127-19-5)	1,090	Pyridine (110-86-1)	200
1,4-Dioxane (123-91-1)	380	Tetralin (119-64-2)	100

Prepared in water:dimethyl sulfoxide (80:20), 1 mL/ampul

cat.# 36270 (ea.)

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## Compound Index for Reference Standards

abamectin.....	570-571	amobarbital.....	466,478	benzidine.....	467,473,483,536-537,542-543
acenaphthene.....	466,484,501,506-508, 510-512,534-536,538,540-542,559	amphetamine.....	478	benzo[b]fluoranthene.....	467,506-508,510-512,532, 534,536,538,541-542,572
acenaphthene-d10.....	513,528,532,535,539	d-amphetamine.....	466,478	benzo[j]fluoranthene.....	511
acenaphthylene.....	466,484,501,506-508, 510-512,532,534,536,538,541-542	n-amyl acetate.....	483,555	benzo[k]fluoranthene.....	467,506-508,510-512,532, 534,536,538,541-542
acenaphthylene-d8.....	543	tert-amyl alcohol.....	466,520,556	benzo[ghi]perylene.....	467,506-508,510-512,532, 534,536,538,541-542
acephate.....	528,560,570-571,573	tert-amyl ethyl ether (TAEE).....	466,520,548,550,555-556	benzo[a]pyrene.....	467,506-508,510-512,532, 534,536,538,541-542,559,572
acequinocyl.....	568-569	tert-amyl methyl ether (TAME).....	466,504,520,548,550,555-556	benzo[e]pyrene.....	506,512
acetaldehyde.....	477,480	$\alpha$ -amylcinnamaldehyde.....	566	benzo(a)pyrene-d12.....	543
acetaldehyde-DNPH.....	483,518	$\alpha$ -amylcinnamic alcohol.....	566	benzoguanamine.....	467,567
acetaldehyde-2,4-DNPH.....	466,483	5- $\alpha$ -androstane.....	466,484,501,503,506	benzoic acid.....	467,537,542,566
acetaminophen.....	583	4-androstene-3,17-dione.....	495	benzoximate.....	570-571
acetamidrid.....	570-571	aniline.....	466,474,536-537	benzoylcegonine.....	467,478
acetic acid.....	565	anthracene.....	466,506-508,510-512,532, 534,536,538,541-542,559,574	benzphetamine.....	467,478
acetochlor.....	529,532,567-569	anthracene-d10.....	466,532,543	benzyl alcohol.....	475,536,538,542,566
acetone.....	444-446,466,474-475,477,518,548-549,553,558	anthraquinone.....	568-569	benzyl benzoate.....	467,530,566
acetone-DNPH.....	483,518	antifoam agent for purge-and-trap.....	466,546,548	benzyl butyl phthalate.....	530,532,534,536,538,541-542
acetone-2,4-DNPH.....	483	aprobarbital.....	466,478	benzyl chloride.....	444-446,553
acetonitrile.....	466,477,555,584-585	Aramite.....	466,537-538	benzyl cinnamate.....	566
acetophenone.....	466,537-538,541	argon.....	449	benzyl salicylate.....	566
2-acetylaminofluorene.....	537	Aroclor 1016.....	466,523,530-531,578	$\alpha$ -BHC.....	467,522-526,533,537,542,565,568-569
acetylene.....	447,449	Aroclor 1221.....	466,523,530-531	$\beta$ -BHC.....	467,522-526,533,537,542,565,568-569
acibenzolar-S-methyl.....	570-571	Aroclor 1232.....	466,523,530-531	$\delta$ -BHC.....	467,522-524,526,533,537,542,568-569
acifluorfen.....	466,491-494	Aroclor 1242.....	466,523,530-531,578	$\alpha$ -BHC-d6.....	575
acifluorfen methyl ester.....	466,491-493	Aroclor 1248.....	466,523,530-531	$\gamma$ -BHC.....	467,521-526,533,537,542,544,565,568-569,573
acrinathrin.....	568-569	Aroclor 1254.....	466,523,530-531,578	BHT.....	572,583
acrolein.....	445-446,466,518,551,556	Aroclor 1260.....	466,523,530-531,578	bicyclohexyl.....	572
acrolein-DNPH.....	483,518	Aroclor 1262.....	466,531	bifenazate.....	570-571
acrolein-2,4-DNPH.....	483	Aroclor 1268.....	466,531	bifenthrin.....	528,568-569,573,575
acrylamide.....	466	atraton.....	527,533	bioallethrin.....	568-569
acrylonitrile.....	444,447,466,488,518,549,551,554-555,560	atrazine.....	466,494,521-523,527-529, 533,537,541,559,567-569,575	biodiesel.....	468,484,498,501,577
alachlor.....	466,494,521-523,527,529,532-533,559,567-569	atrazine-d5.....	466-469,569	biphenyl.....	475,537,541,568-569
alanycarb.....	570-571	aviation gas.....	466,498,513	bis(2-ethoxyethyl)phthalate.....	530
aldicarb.....	521,570-571	azinphos-ethyl.....	568-569	bis(2-methoxyethyl)phthalate.....	530
aldicarb sulfone.....	521,570-571	azinphos-methyl.....	527-528,559-560,568-569,573	bis(2-n-butoxyethyl)phthalate.....	530
aldicarb sulfoxide.....	521,570-571	azobenzene.....	466,536,538	bis(2-chloroethoxy)methane.....	534,536,538,541-542
aldrin.....	466,522-526,533,537,542,565,568-569	azoxystrobin.....	570-571,575	bis(2-chloroethyl)ether.....	534,536,538,541-542
alidochlor.....	568-569	barbital.....	466,478	bis(2-chloroethyl)ether-d8.....	543
allyl alcohol.....	483,554	BDMC.....	467,521	bis(2-ethylhexyl)adipate.....	467,530,532,536
allyl chloride.....	445-446,466,549-550,553,555	benalaxyl.....	570-571	bis(2-ethylhexyl)phthalate.....	467,474,530,532,534, 536,538,541-542,544
4-allylanisole.....	566	beniocarb.....	570-571	bis(4-methyl,2-pentyl)phthalate.....	530
alprazolam.....	466,478	benfluralin.....	568-569	bisphenol A.....	583
ametryn.....	570-571	benfurcarb.....	570-571	bitertanol.....	570-571
4-aminobiphenyl.....	537	benzazon.....	466,491-494	boscalid.....	570-571
aminocarb.....	570-571	benzazon methyl ester.....	491-493	bromacil.....	521,527-528,533
2-amino-4,6-dinitrotoluene.....	486-487	benz[a]anthracene.....	467,506-508,510-512, 532,534,536,538,541-542,572	bromazepam.....	467,478
4-amino-2,6-dinitrotoluene.....	466,479,486-487	benzaldehyde.....	466,475,537,541	bromfeninfos-methyl.....	568-569
aminomethyl phosphonic acid (AMPA).....	466,494	benzaldehyde-DNPH.....	483,518	bromfeninfos.....	568-569
amidarone.....	478	benzaldehyde-2,4-DNPH.....	483	4-bromo-3,5-dimethylphenyl-N-methylcarbamate.....	467,521
amitraz.....	570-571	benzene.....	443-448,466,475,484,488-489,495-496, 500-502,504-508,510,544-560,580-581,584-585	1-bromo-4-fluorobenzene.....	443,496,548,550-551,554
amitriptyline.....	475	benzene-d6.....	466,546,557		
ammeline.....	466,567				

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## Compound Index for Reference Standards

bromobenzene	467,546-550,555
2-bromobutanoic acid	467,490
2-bromobutyrate	467,490
bromochloroacetic acid	490
bromochloroacetonitrile	485,521
2-bromochlorobenzene	467,546
4-bromochlorobenzene	467,546
1-bromo-2-chloroethane	467,546,553
bromochloromethane	443,467,496,546-548, 550-552,555,557,559
2-bromo-1-chloropropane	467,496,546,551-553
bromodichloroacetic acid	490
bromodichloromethane	444-446,467,496, 545-553,555,558-559
1-bromo-4-fluorobenzene	443,467,473,489,495-496,501-502, 546,548,551,553-554,557
bromoform	444-446,467,496,545-555,557-559
bromomethane	443-447,467,484,488,496,500, 506,546-548,550-555,558-560
2-bromonaphthalene	506,512
1-bromo-2-nitrobenzene	467,527
4-bromophenyl phenyl ether	534,536,538,541-542
bromophos ethyl	568-569
bromophos methyl	568-569
2-bromopropionic acid	467,490
bromopropylate	568-569
bromuconazole	570-571
bupirimate	568-571
bupropfenin	570-571
butabarbital	467,478
butachlor	527,533
butachlor ESA sodium salt	467,491
1,3-butadiene	444-447,449,467,488,506,550,560
butafenacil	570-571
butalbital	467,478
n-butane	444,446-447,449
1,2-butanediol	473-474
1,4-butanediol	467,478
2,3-butanediol	474
(s)-(-)-1,2,4-butanetriol	467,577
1-butanol	467
tert-butanol-d <sub>9</sub>	467,520,556
2-butanone	444-446,467,474,518,544,548-549,553,556,558
2-butanone-d <sub>5</sub>	557
1-butene	447,449
cis-2-butene	447,449
trans-2-butene	447,449
butocarboxim	570-571
butoxycarboxim	527,533,570-571
tert-butyl alcohol (TBA)	444,446,477,504,520,548,550,555,580
sec-butyl-4,6-dinitrophenol	529
tert-1-butyl-4-ethylbenzene	580-581
tert-1-butyl-2-methylbenzene	580-581
tert-1-butyl-3,4,5-trimethylbenzene	580-581
butyl acetate	483,555
n-butyl acetate	483,555
butylate	527,533
n-butylbenzene	546-550,555,579-581
sec-butylbenzene	546-550,555,580-581
tert-butylbenzene	546-550,555,580-581
butylcyclohexane	447,506
n-butylcyclohexane	505
tert-butyl disulfide	474
n-butylin trichloride	520
n-butyraldehyde-DNPH	483,518
n-butyraldehyde-2,4-DNPH	483
butyric acid	565
γ-butyrolactone (GBL)	467,478
C4:0	563
C6:0	563
C8:0	563
nC10-FAME	474
C10:0	563
nC11-FAME	474
C11:0	563
nC12-FAME	474
C12:0	563
C13:0	563
C14:0	563
C14:0 (methyl myristate)	563
C14:1 (cis-9)	563
C14:1 (methyl myristoleate)	563
C15:0	563
C15:1 (cis-10)	563
C16:0	563
C16:0 (methyl palmitate)	563
C16:1 (cis-9)	563
C16:1 (methyl palmitoleate)	563
C17:0	563
C17:1 (cis-10)	563
C18:0	563
C18:0 (methyl stearate)	563
C18:1 (cis-9)	563
C18:1 (trans-9)	563
C18:1 (methyl oleate)	563
C18:1 (methyl vaccenate)	563
C18:2 (all-cis-9,12)	563
C18:2 (all-trans-9,12)	563
C18:2 (methyl linoleate)	563
C18:3 (all-cis-6,9,12)	563
C18:3 (all-cis-9,12,15)	563
C18:3 (methyl linolenate)	563
C20:0	563
C20:0 (methyl arachidate)	563
C20:1 (cis-11)	563
C20:1 (methyl 11-eicosenoate)	563
C20:2 (all-cis-11,14)	563
C20:2 (methyl 11,14-eicosenoate)	563
C20:3 (all-cis-11,14,17)	563
C20:3 (all-cis-8,11,14)	563
C20:3 (methyl 11,14,17-eicosenoate)	563
C20:4 (all-cis-5,8,11,14)	563
C20:4 (methyl arachidonate)	563
C20:5 (all-cis-5,8,11,14,17)	563
C20:5 (methyl eicosapentaenoate)	563
C21:0	563
C22:0	563
C22:0 (methyl behenate)	563
C22:1 (cis-13)	563
C22:1 (methyl erucate)	563
C22:2 (all-cis-13,16)	563
C22:6 (all-cis-4,7,10,13,16,19)	563
C22:6 (methyl docosahexaenoate)	563
C23:0	563
C24:0	563
C24:0 (methyl lignocerate)	563
C24:1 (cis-15)	563
C24:1 (methyl nervonate)	563
caffeine	467,475,478,583
camphor	566
cannabichromene	467,478,566
cannabidiol	467,478,566
cannabigerol	467,478,566
cannabinol	467,478,566
e-caprolactam	467,537,541
captafol	568-569
captan	568-569,573
carbamazepine	583
carbaryl	521,570-571,573,575
carbaryl-d <sub>7</sub>	466-469,569
carbazole	467,536,541-542
carbendazim	467,570-571
carbetamide	570-571
carbofuran	521,570-571
carbon dioxide	449
carbon disulfide	444-446,467,549-550,553,555,558-559
carbon monoxide	449
carbon tetrachloride	443-447,467,484,488,496, 500,506,544-560,584-585
carbonyl sulfide	448
carbophenothion	568-569
carboxin	527,533,570-571
carfentrazone ethyl	568-571
chloral hydrate	467,485,521
chloramben	491-494
chloramben methyl ester	491-493
chlorantraniliprole	570-571
chlorbenside	568-569
chlordan (technical)	467,521,524,526,544
cis-chlordan	467,522-524,526,533,537,565,568-569
trans-chlordan	467,522-526,533,537,565,568-569
chloridiazepoxide	467,478
chlorfenapyr	568-569
chlorfensophos (Ovex)	568-569
chlorfenvinphos	568-569
chlorfluazuron	570-571
1-chloro-4-fluorobenzene	467,489,501-502
chloroacetonitrile	549
4-chloroaniline	467,536-537,541-543
4-chloroaniline-d <sub>4</sub>	543
chlorobenzene	443-447,467,474,484,488,495-496, 500,504,506,517,544-560,584-585
chlorobenzene-d <sub>5</sub>	443,467,546,550,554,557
chlorobenzilate	467,522,533,537-538,568-569
2-chlorobiphenyl	531-532
1-chlorobutane	549-550
chlorodibromoacetic acid	490
chlorodibromomethane	549
chlorodifluoromethane	550
chloroethane	444-446,467,488,496,546-548, 551-553,555,558-559
chloroethane-d <sub>5</sub>	557
2-chloroethanol	467,483,554-555
2-chloroethyl vinyl ether	467,496,551,553,555
1-chloro-2-fluorobenzene	467,546
1-chloro-3-fluorobenzene	546,553
chloroform	443-447,467,484,488,496,500,506, 544-556,558-560,584-585
chloroform-d	557
chloromethane	443-447,467,484,488,496,500,506, 546-548,550-555,558-560
4-chloro-3-methylphenol	529,534-537,539,541-542
1-chloronaphthalene	537
2-chloronaphthalene	467,495,534,536,538,541-542
chloroneb	522,533,568-569
4-chloro-3-nitrobenzotrifluoride	467,527
1-chlorooctadecane	467,484,501,506,509,517
1-chlorooctane	467,489,501,509,517
2-chlorophenol	474,529,534-537,539,541-542
2-chlorophenol-d <sub>4</sub>	539,543
4-chlorophenol	474
4-chlorophenyl phenyl ether	534,536,538,541-542
chloropicrin	485,521
chloroprene	467,555-556
3-chloroprene	444,446
3-chloropropene	444
chlorothalonil	522,533,568-569,573,575
2-chlorotoluene	444,446,546-550,555
4-chlorotoluene	546-550,555
chloroxuron	570-571
chloropham	527,533,568-569
chlorpyrifos	467,522,527-529,533,559-560, 565,567-569,573,575
chlorpyrifos methyl	565,568-569,575
chlorthiophos	568-569
chlortoluron	570-571
chlzolinate	568-569
cholestane	572
5-α-cholestane	572
chrysene	467,506-508,510-512,532,534, 536,538,541-542,559,572
chrysene-d <sub>12</sub>	513,528,532,535,539
1,8-cineole	566
cinnamal	566
trans-cinnamaldehyde	566
cinnamyl acetate	566
cinnamyl alcohol	566
ciprofloxacin	583
citral	566
citronellol	566
clethodim	570-571
clobazam	467,478
clofentazine	570-571
clomazone	568-569
clonazepam	467,478
clothianidin	570-571
cocaehtylene	467,478
cocaine	467,478
codeine	467,478
corn oil	474,544
coumaphos	527,568-569,573
coumarin	566
creosote oil	467,498,513
o-cresol	529
crotonaldehyde-DNPH	483,518
crotonaldehyde-2,4-DNPH	483
cumene	444,446
cyazofamid	467,494,521-522,527,529,533,559,567
cyanoacetic acid	467,567
cyazofamid	570-571
cycloate	527,533,568-569
cyclohexane	444-447,467,506,558-559,580-581,584-585
cyclopentane	447,580-581
cyclopropane	449
cycluron	570-571
cyfluthrin	568-569
cymoxanil	570-571
cypermethrin	568-569
cyproconazole	570-571
cyprodinil	568-571,573,575
cyromazine	570-571



## Compound Index for Reference Standards

2,4-D	467,491-494,544
2,4-D methyl ester	467,491-493
dalapon	467,490-494
dalapon methyl ester	467,490-493
2,4-DB	467,491-494
2,4-DB methyl ester	491-493
DCAA methyl ester	491
DCPA	491-493,522,533
DCPA diacid	467
DCPA methyl ester (chloral-dimethyl)	491-493,522,533,568-569
2,4-DDD	575
2,4'-DDD	467,568-569
4,4'-DDD	467,522-524,526,533,537,542,565,568-569
2,4'-DDE	467,568-569
4,4'-DDE	467,522-526,533,537,542,565,568-569
2,4'-DDT	467,565,568-569
4,4'-DDT	467,473,522-526,533,536-537,542,565,568-569,573
decachlorobiphenyl	468,522,524-526,531
decafluorobiphenyl	468,511,521,532
decafluorotriphenylphosphine (DFTPP)	468,473,533,536,540
decane	473-474
n-decane	447,468,479,497,502-510, 512,516-517,559,561,579-581
1-decene	580-581
deltamethrin	568-569,573
demeton-O	527
demeton-S	527
demeton-S-methyl	528,560
desethyl-atrazine	529,567
desisopropylatrazine	529,567
desmedipham	570-571
dextromethorphan HBr monohydrate	468,478
di-nonyl phthalate	530
diallate	537-538,568-569
diazepam	468,478
diazepam-D5	478
diazinon	527-528,533,559,565,568-569,573
diazinon-d10	466-469,569
dibenz[a,h]anthracene	468,506-508,510-512, 532,534,536,538,541-542
dibenz[a,h]acridine	511
dibenz[a,j]acridine	511,537
7H-dibenzo(c,g)carbazole	511
dibenzofuran	536,538,541-542
dibenzo[a,e]pyrene	511
dibenzo[a,h]pyrene	506,511-512
dibenzo[a,j]pyrene	511
dibromoacetic acid	490
dibromoacetonitrile	485,521
4,4'-dibromobiphenyl	468,522
dibromochloromethane	444-446,468,496,545-548, 550-551,553,555,558-559
1,2-dibromo-3-chloropropane	468,496,546-550, 553,555,558-559
1,2-dibromoethane	443-444,447,468,484,488,496,500, 506-508,546-550,552-555,557-560
dibromofluoromethane	554
dibromomethane	468,546-550,553,555
4,4'-dibromooctafluorobiphenyl	468,491,493,532
2,3-dibromopropionic acid	468,490
2,5-dibromotoluene	468,505
di-n-butyl phthalate	530,532,534,536,538,541-542
diethylchloroacetate	468,525
diethyltin dichloride	520
dicamba	468,491-494
dicamba methyl ester	468,491-493
dichlorofluanid	568-569,573
dichloran	568-569
dichloroacetic acid	490
dichloroacetonitrile	485,521
3,4-dichloroaniline	568-569,573
1,2-dichlorobenzene	444-446,468,474,495-496,504, 534,536,538,542,545-553,555,558-559
1,2-dichlorobenzene-d4	468,539,546,548,550,557
1,3-dichlorobenzene	444-446,468,495-496,504, 534,536,538,542,546-553,555,558-559
1,4-dichlorobenzene	444-446,468,495-496,504, 534-536,538,540,542,544-553,555-559
1,4-dichlorobenzene-d4	513,532,535,539,550,554,557
m-dichlorobenzene	443-444,447,484,488, 500,506,552,554,560
o-dichlorobenzene	443-444,447,484,488, 500,506,552,554,560
p-dichlorobenzene	443-444,447,484,488, 500,506,552,554,560
3,3'-dichlorobenzidine	468,483,537,541-543
3,5-dichlorobenzoic acid methyl ester	491-493
3,5-dichlorobenzoic acid	491-494
2,6-dichlorobenzonitrile (dichlobenil)	568-569
4,4'-dichlorobenzophenone	568-569
2,3-dichlorobiphenyl	531-532
1,4-dichlorobutane	468,496,546,551-552
cis-1,4-dichloro-2-butene	553,555
trans-1,4-dichloro-2-butene	468,549,553,555
dichlorodifluoromethane	443-447,468,484,488,496, 500,506,546-548,550,552-555,558,560
1,1-dichloroethane	443-447,468,484,488,496, 500,506,546-555,558-560
1,2-dichloroethane	443-447,468,484,488,496, 500,506-508,544-560,584-585
1,2-dichloroethane-d4	468,546,554,557
1,1-dichloroethene	443-447,468,484,488,496, 500,506,544-560,584-585
cis-1,2-dichloroethene	443-447,468,484,488,500,506, 545-550,552,554-555,558-560,584-585
trans-1,2-dichloroethene	444-446,468,496, 545-553,555,558-559,584
1,1-dichloroethene-d2	557
cis-1,2-dichloroethylene	443,468,584
trans-1,2-dichloroethylene	468,584
dichloromethane (also see methylene chloride)	447,488,560
2,4-dichlorophenol	529,534,536-537,541-542
2,6-dichlorophenol	468,529,537
2,4-dichlorophenol-d3	543
2,4-dichlorophenylacetic acid methyl ester	468,491-493
2,4-dichlorophenylacetic acid (2,4-DCAA)	468,491-493
1,2-dichloropropane	443-447,468,474,484,488,496, 500,506,545-555,557-560
1,3-dichloropropane	546-550,555
2,2-dichloropropane	468,546-549,555
1,2-dichloropropane-d6	557
1,1-dichloro-2-propanone	485,518,521,548-549
1,1-dichloropropene	546-550,555
cis-1,3-dichloropropene	443-447,468,484,488,496, 500,506,546-555,557-560
trans-1,3-dichloropropene	443-447,468,484,488,496, 500,506,546-555,558-560
1,3-dichloropropene-d4	557
2,2-dichloropropionic acid	467,490-494
2,3-dichloropropionic acid	468,490
dichlorotetrafluoroethane	443-444,447,484,488, 500,506,552,554,560
1,2-dichlorotetrafluoroethane	444-446,468,556
1,2-dichlorotetrafluoroethene	444
dichlorprop	468,491-494
dichlorprop methyl ester	468,491-493
dichlorvos	527-528,533,560,565,573,575
dichlorvos-d6	466-469,569
diclobutrazol	570-571
diclofenac	583
dicofof	573
dicrotophos	570-571
dicyclohexylamine	474
dieldrin	468,522-526,533,537,542,565,568-569
diesel	468,484,498,501,577
diesel fuel #2	468,480-481,484-485,498,561
diesel fuel #2 composite	468,484-485,497,503,509,517,551
diethanolamine	473-474
diethofencarb	570-571
m-diethylbenzene	447
p-diethylbenzene	447
diethylene glycol	583
diethylenetriamine	473-474
diethyl ether (ethyl ether)	468,474,549-550,555
3,3-diethylpentane	580-581
diethyl phthalate	530,532,534,536,538,541-542
difenoconazole	570-571
diflubenzuron	528,570-571
1,4-difluorobenzene	443,468,495,546,550,553-554,557
di-n-hexyl phthalate	530
diisopropyl ether (DIPE)	468,504,520,548,550,555-556
dimethachlor	568-569
dimethachlor ESA sodium salt	468,491
dimethenamid	529,567
dimethoate	527-528,537-538,559-560,570-571,573
dimethoate-d6	466-469,569
dimethomorph	570-571
1,2-dimethoxyethane	468,584-585
3,7-dimethyl-7-hydroxyoctanal	566
N,N-dimethylacetamide	468,584-585
p-dimethylaminoazobenzene	537
2,6-dimethylaniline	473-474
2,5-dimethylbenzaldehyde-DNPH	483,518
3,3'-dimethylbenzidine	483,537,543
7,12-dimethylbenzo(a)anthracene	537
2,2-dimethylbutane	447
2,3-dimethylbutane	447,580-581
cis-1,2-dimethylcyclohexane	580-581
trans-1,2-dimethylcyclohexane	580-581
trans-1,4-dimethylcyclohexane	580-581
trans-1,2-dimethylcyclopentane	580-581
cis-1,3-dimethylcyclopentane	580-581
trans-1,3-dimethylcyclopentane	580-581
dimethyldichlorosilane	468,472
1,2-dimethyl-3-ethylbenzene	580-581
1,2-dimethyl-4-ethylbenzene	580-581
1,3-dimethyl-2-ethylbenzene	580-581
1,3-dimethyl-5-ethylbenzene	580-581
1,4-dimethyl-2-ethylbenzene	580-581
N,N-dimethylformamide	468,584
2,3-dimethylheptane	447,506,580-581
2,5-dimethylheptane	580-581
3,3-dimethylheptane	580-581
3,4-dimethylheptane	580-581
3,5-dimethylheptane	580-581
2,2-dimethylhexane	580-581
2,4-dimethylhexane	580-581
2,5-dimethylhexane	580-581
2,2-dimethyloctane	580-581
3,3-dimethyloctane	580-581
2,2-dimethylpentane	580-581
2,3-dimethylpentane	447,506,580-581
2,4-dimethylpentane	447,579-581
3,3-dimethylpentane	580-581
2,4-dimethylphenol	529,534,536-537,541-542
2,6-dimethylphenol	474
N-(2,4-dimethylphenyl)formamide	568-569
$\alpha,\alpha,\alpha$ -dimethylphenylamine	537
dimethyl phthalate	530,532,534,536,538,541-542
dimethylphthalate-d6	543
dimethyl sulfide	448
dimoxystrobin	570-571
diniconazol	570-571
4,6-dinitro-2-methylphenol-d2	543
3,5-dinitroaniline	468,479,486-487
1,2-dinitrobenzene	468,479,486-487,536
1,3-dinitrobenzene	468,479,486-487,536,538
1,4-dinitrobenzene	468,487,536
4,6-dinitro-2-methylphenol	529,534,536-537,541-543
2,4-dinitrophenol	468,529,534,536-537,541-543
2,4-dinitrotoluene	468,479,486-487,495,532, 534-536,538,540-542,544
2,6-dinitrotoluene	468,479,486-487,495,532, 534,536,538,541-542
3,4-dinitrotoluene	468,479,486-487
dinoseb	468,491-494,529,537
dinoseb methyl ester	468,491-493
dinotefuran	570-571
di-n-octyl phthalate	468,530,532,534,536,538,541-542
diolefin (1,3-di[ <i>cis</i> -octadeconyl]glycerol)	468,577
dioxcarb	570-571
1,4-dioxane	444-446,468,480,519,537,553,555,584-585
1,4-dioxane-d8	468,513,519,535,539,554
dipentyl phthalate	530,570
diphenamid	527,533,568-569
diphenylamine	534,536-537,541,568-569
diphenyl ether	537
1,2-diphenylhydrazine	468,538
diphenyltin dichloride	520
diquat dibromide	494
disulfoton	527,533,537-538,568-569
disulfoton sulfone	527,533
diuron	468,528,570-571
diuron-d6	466-469,569
n-docosane	474,503-508,510,512,561
dodecane	473,580
n-dodecane	447,473-474,479,497,503-510, 512,516,559,561,579-581
2-dodecanol	474
doramectin	570-571
n-dotriacontane	504-505,507-508,559,561,579
doxepine	478
d5-doxepine	478
ecgonine	468,478
EDDP perchlorate	468,478
edifenphos	568-569
EGDN	468,479,486
n-eicosane	474,479,503-508,510,512,561,579
emamectin-benzoate	570-571
endosulfan ether	568-569



## Compound Index for Reference Standards

endosulfan I.....	468,522-524,526,533,537,542,568-569
$\alpha$ -endosulfan (I).....	565
endosulfan II.....	468,522-524,526,533,537,542,568-569
$\beta$ -endosulfan (II).....	565
endosulfan sulfate.....	468,522-526,533,537, 542,565,568-569,573,575
endrin.....	468,521-526,533,537,542,544,565,568-569,573
endrin aldehyde.....	521-524,526,533,537,542,568-569
endrin ketone.....	468,521,523-524,526,533,537,542,568-569
EPN.....	527,568-569
epoxiconazole.....	570-571
eprinomectin.....	570-571
EPTC.....	527,529,533,567
equilin.....	495
erbium perchlorate.....	475
erucamide.....	572,583
erythromycin.....	583
esbiol.....	528
esfenvalerate.....	528
17-beta-estradiol.....	495,583
estriol.....	495
estrone.....	495,583
etacnazole.....	570-571
ethylfluralin.....	529,567-569
ethane.....	447,449
ethane UHP.....	449
ethanol.....	444-446,468,474,477,483,504,520,554,556,580
ethanol (BAC).....	477
ethiofencarb.....	570-571
ethion.....	528,560,568-569,575
ethiprole.....	570-571
ethirimol.....	570-571
ethofumesate.....	570-571
ethoprop.....	527,533
ethoprophos.....	527
2-ethoxyethanol.....	468,584
ethyl acetate.....	444-446,474,477,483,555
ethylal (Perthane).....	568-569
ethylbenzene.....	443-448,468,475,484,488-489, 495-496,500-502,504-508,510,545-555, 558-560,580-581,584-585
ethylbenzene-d <sub>5</sub> .....	468,546
ethylbenzene-d <sub>10</sub> .....	468,546
ethyl- <i>tert</i> -butyl ether.....	468,504,520,548,550,555-556
ethyl butyrate.....	566
ethyl chloride.....	443-444,447,484,488,500,506,552,554,560
ethylcyclopentane.....	580-581
ethylene.....	447,449
ethylene diamine.....	468
ethylene dibromide.....	444-446
ethylene glycol.....	468,490,504,508,517,554,583-584
ethylene oxide.....	468,480,485,585
3-ethylhexane.....	580-581
2-ethylhexanoic acid.....	474
ethyl mercaptan.....	448
ethyl methacrylate.....	468,518,537,549-550,554-555
ethyl methanesulfonate.....	537-538
1-ethyl-2-methylbenzene.....	502
1-ethyl-3-methylbenzene.....	502
1-ethyl-4-methylbenzene.....	502
1-ethyl-1-methylcyclopentane.....	580-581
3-ethyloctane.....	580-581
3-ethylpentane.....	580-581
2-ethyltoluene.....	479
3-ethyltoluene.....	479
4-ethyltoluene.....	444-446
<i>m</i> -ethyltoluene.....	447,489,501
<i>o</i> -ethyltoluene.....	447,489,501
<i>p</i> -ethyltoluene.....	447,489,501
17-alpha-ethynyl estradiol.....	495,583
etofenprox.....	568-569
etoxazole.....	570-571
etridiazole.....	522,527,533,568-569
etrimphos.....	565
eugenol.....	566
famoxadone.....	570-571
famphur.....	537-538
farnesol.....	566
fenamidone.....	570-571
fenamiphos.....	527,533,568-569
fenarimol.....	527,533,568-571
fenazaquin.....	570-571
fenbuconazole.....	570-571
fenchlorphos (Ronne).....	568-569
fenhexamid.....	570-571,573
fenitrothion.....	565,568-569
fenobucarb.....	570-571
fenoxycarb.....	570-571
fenpropathrin.....	568-569,573
fenpropimorph.....	570-571
fenpyroximate.....	570-571
fenson.....	568-569
fensulfothion.....	527
fentanyl.....	468,478
nor-fentanyl oxalate.....	468,478
fenthion.....	527,568-569,573
fenuron.....	570-571
fenvalerate.....	528,568-569
fenprolil.....	568-571
flonicamid.....	570-571
fluaizifop- <i>p</i> -butyl.....	568-569
fluzinam.....	469,570-571
flubendiamide.....	570-571
fluchloralil.....	568-569
flucythrinate.....	568-569
fludioxinil.....	568-571
flufenacet.....	570-571
flufenoxuron.....	570-571
flunitrazepam.....	469,478
fluometuron.....	528,570-571
fluoranthene.....	469,506-508,510-512,532,534,536,538,541-542
fluoranthene-d <sub>10</sub> .....	539
fluorene.....	469,484,501,506-508,510-512, 532,534,536,538,541-542
fluorene-d <sub>10</sub> (BAC).....	543
fluorobenzene.....	469,495-496,546,548,551,553-554
2-fluorobiphenyl.....	469,484,501,506,508, 512-513,517,532,535,539
1-fluoronaphthalene.....	566
2-fluorophenol.....	469,529,532,535,539
fluoxastrobin.....	570-571
fluoxetine.....	583
fluquinconazole.....	568-571
flurazepam.....	469,478
fluridone.....	527,533,568-569
flusilazole.....	568-571
flutolanil.....	568-571
flutriafoal.....	568-571
tau-fluvalinate.....	568-569
folpet.....	568-569,573
fonofos.....	529,567-569
forchlorfenuron.....	570-571
formaldehyde-DNPH.....	469,483,518
formaldehyde-2,4-DNPH.....	469,483
formamide.....	469,584
formetanate.....	570-571
fructose.....	475
fuferidazole.....	570-571
fuel oil.....	469,498,503,513-514
furalaxyl.....	570-571
furathiocarb.....	570-571
gemfibrozil.....	583
(+/-)-geosmin.....	485,560
geraniol.....	566
glucose.....	475
DL-glutethimide.....	469,478
glycerin.....	469,577,583
glycolaldehyde-2,4-DNPH.....	469,483
glyphosate.....	469,494
halofenozide.....	570-571
haloperidol.....	478
1,6-HDIP.....	469,518
<i>n</i> -heneicosane.....	503,507-510,516,559
heptachlor.....	469,521-526,533,537,542,544,565,568-569
heptachlor epoxide.....	469,521-526,533,537,542,544,565,568-569
2,2',3,3',4,4',5'-heptachlorobiphenyl.....	531-532
2,2',3,4,4',5',6'-heptachlorobiphenyl.....	531,560
2,2',3,4,4',5',6'-heptachlorobiphenyl.....	531
2,2',3,4',5,5',6'-heptachlorobiphenyl.....	531
heptadecane.....	499,514
<i>n</i> -heptadecane.....	474,503,507-508,579
heptane.....	444-446,489,500,507-508
<i>trans</i> -2-heptene.....	580-581
<i>n</i> -heptane.....	447,474,506,509,516,559,579-581
1-heptene.....	580-581
<i>cis</i> -2-heptene.....	580-581
<i>cis</i> -3-heptene.....	580-581
<i>trans</i> -3-heptene.....	580-581
2,2',4,4',5,5'-hexabromodiphenyl ether.....	528
2,2',4,4',5,5'-hexabromodiphenyl.....	528
hexachlorobenzene.....	469,495,521-523,532,534,536, 538,541-542,544,565,568-569
2,2',3,4,4',5'-hexachlorobiphenyl.....	531,560
2,2',3,4,5,5'-hexachlorobiphenyl.....	531
2,2',3,5,5',6'-hexachlorobiphenyl.....	531
2,2',4,4',5,5'-hexachlorobiphenyl.....	531,560
2,2',4,4',5,6'-hexachlorobiphenyl.....	531-532
hexachlorobutadiene.....	495,534,536,538,542,544,547,550
hexachloro-1,3-butadiene.....	443-447,469,484,488,500,506, 534,541,546-549,552,554-555,560
hexachlorocyclopentadiene.....	469,495,521-523,532, 534,536,538,541-542
hexachloroethane.....	469,495,534,536,538,541-542,544,549-550
hexachlorophene.....	469,543
hexachloropropene.....	537-538
hexaconazole.....	570-571
<i>n</i> -hexacosane.....	504-508,510,512,561
hexadecane.....	519
<i>n</i> -hexadecane.....	473-474,479,503-510,512, 516-517,519,559,561,579
hexaflumuron.....	570-571
hexaldehyde-DNPH.....	483,518
hexaldehyde-2,4-DNPH.....	483
hexane.....	444-446,469,584
<i>n</i> -hexane.....	447,449,474,479,497,502,504, 506,509-510,516-517,559,579-581,584-585
1,6-hexanediol.....	474
hexanes.....	449
2-hexanone.....	444-446,518,548-549,553,558,584-585
2-hexanone-d <sub>5</sub> .....	557
<i>n</i> -hexatriacontane.....	497,502,504-509,512,516,561,579
hexazinone.....	527-528,533,568-569
1-hexene.....	447,580-581
<i>cis</i> -2-hexene.....	580-581
<i>trans</i> -2-hexene.....	580-581
hexobarbital.....	469,478
hexylbenzene.....	580-581
$\alpha$ -hexylcinnamaldehyde.....	566
hexythiazox.....	570-571
HMX.....	469,479,486-487
hydramethylnon.....	469,570-571
hydraulic oil.....	469,498,514
hydrocodone.....	469,478
hydrogen.....	449
hydrogen sulfide.....	448
hydromorphone.....	469,478
3-hydroxycarbofuran.....	521,570-571
hydroxycitronellal.....	566
ibuprofen.....	583
imazalil.....	570-571,573,575
imidacloprid.....	570-571,575
indeno[1,2,3- <i>cd</i> ]pyrene.....	469,506-508,510-512, 532,534,536,538,541-542
indoxacarb.....	570-571
iodofenphos.....	568-569
iodomethane.....	469,549-550,553,555
ipconazole.....	570-571
iprodione.....	568-569,573
iprovalicarb.....	570-571
Irgafos.....	572,583
Irganox.....	572,583
isazophos.....	568-569
isobutane.....	447,449
isobutyl alcohol.....	469,483,554-555
isobutylbenzene.....	469,580-581
isobutylcyclohexane.....	580-581
isobutylcyclopentane.....	580-581
isobutylene.....	449
isobutyric acid.....	565
isocarboxiphos.....	570-571
isodrin.....	537-538,568-569
isoeugenol.....	566
isooctane.....	505,517
isopentane.....	447,449,506,580-581
isophorone.....	486,495,532,534,536,538,541-542
isoprene.....	447
isoprocab.....	570-571
isopropalin.....	568-569
isopropanol.....	477
isopropyl acetate.....	483,555
isopropyl benzene.....	447,469,489,501-502,506-508, 546-550,555,558-559,580-581,584
isopropylcyclopentane.....	580-581
4-isopropyltoluene.....	546-550,555
<i>p</i> -isopropyltoluene.....	447,506
isoproturon.....	570-571
isosafole.....	537-538
isovaleraldehyde-DNPH.....	483,518
isovaleric acid.....	565
ivermectin.....	570-571
jet fuel.....	469,498,514

## Compound Index for Reference Standards

kepone.....	528,537-538
kerosene.....	469,480-481,498,514
kerosene composite.....	469,497,503,514
kreoxim-methyl.....	570-571
lactose.....	475
lambda-cyhalothrin.....	568-569,575
lenacil.....	568-569
leptophos.....	568-569
levorphanol.....	469,478
lilial.....	566
limonene.....	566
D-limonene.....	566
linalool.....	566
linuron.....	528,568-571,575
linuron-d6.....	466-469,569
lorazepam.....	469,478
lufenuron.....	570-571
lyral.....	566
malathion.....	527-528,559-560,565,568-569,573
malononitrile.....	518,554
maltose.....	475
mandipropamid.....	570-571
MCPA.....	492,494
MCPP.....	492,494
3,4-MDA HCl.....	469,478
3,4-MDEA HCl.....	469,478
4,4'-MDIP.....	469,518
3,4-MDMA HCl.....	469,478
mecoprop.....	492,494
mefenacet.....	570-571
melamine.....	469,567
mepanipyrin.....	570-571
meperidine.....	469,478
mephobarbital.....	469,478
meprobamate.....	469,478
mepronil.....	570-571
merphos.....	527,533
mesotrione.....	570-571
metaflumizone.....	570-571
metalaxyl.....	568-571,573
metazachlor.....	568-569
metconazole.....	570-571
methabenzthiazuron.....	570-571
methacrifos.....	568-569
methacriphos.....	565
methacrolein-2,4-DNPH.....	483
methacrylonitrile.....	469,518,549,554-555
methadone.....	469,478
methamidophos.....	528,560,570-571,573,575
(+)-methamphetamine.....	469,478
methane.....	449
methane UHP.....	449
methanol.....	469,474,477,504,520,556,584-585
methapyrilene.....	469,537
methaqualone.....	469,478
methidathion.....	528,560
methiocarb.....	521,570-571,573
methohexital.....	469,478
methomyl.....	521,570-571,575
methoprotrene.....	570-571
4-methoxybenzyl alcohol.....	475,566
methoxychlor.....	469,474,521-526,533,537,542,544,568-569
4,4'-methoxychlor olefin.....	568-569
2,4'-methoxychlor.....	568-569
2-methoxyethanol.....	469,584
methoxyfenozid.....	570-571
methyl arachidonate.....	564
methyl behenate.....	469,564
methyl chloride.....	443
methyl docosadienoate.....	564
methyl eicosadienoate.....	564
methyl eicosatrienoate.....	469,564
methyl eicosenoate.....	469,564
methyl elaidate (C18:1 trans-9).....	563
methyl erucate.....	469,564
methyl ethyl ketone-2,4-DNPH.....	483
methyl heneicosanoate.....	469,564
methyl homo $\gamma$ linolenate.....	564
methyl lignocerate.....	470,564
methyl linoleate (C18:2 cis-9,12).....	563
methyl nervonate.....	564
methyl nonadecanoate.....	470,564
methyl oleate (C18:1 cis-9).....	563
methyl pentadecanoate.....	564
methyl petroselaidate (C18:1 trans-6).....	563
methyl petroselinate (C18:1 cis-6).....	563

t-1-methyl-2-N-propylcyclohexane.....	580-581
methyl stearate (C18:0).....	563
methyl transvacenate (C18:1 trans-11).....	563
methyl tridecanoate.....	470,564
methyl vacenate (C18:1 cis-11).....	563
t-1-methyl-2(methylphenyl)cyclopentane.....	580-581
methyl acetate.....	483,550,555,558-559
methyl acrylate.....	549,555
methyl arachidate.....	469,564-565,583
methyl bromochloroacetate.....	490
2-methyl-1,3-butadiene.....	580-581
2-methylbutane.....	579
2-methyl-1-butene.....	580-581
2-methyl butene-2.....	580
2-methyl-2-butene.....	449
3-methyl-1-butene.....	580-581
methyl tert-butyl ether (MTBE).....	444-448,469,489,500-501,504-508,510,520,549-550,555-556,558-559,566,580
methyl d3-tert-butyl ether.....	550
methyl butyl ketone.....	469,584
2-methylbutylbenzene.....	580-581
methyl caprate.....	469,564
methyl caproate.....	469,564-565,583
methyl caprylate.....	469,564-565,583
3-methylcholanthrene.....	469,511,537-538
methylcyclohexane.....	447,469,558-559,580-581,584-585
methyl cyclopentane.....	447,580-581
1-methylcyclopentene.....	580
methyl decanoate.....	565,583
methyl dibromoacetate.....	490
methyl-2,3-dibromopropionate.....	469,490
methyl dichloroacetate.....	490
methyl dodecanoate.....	474,565,583
$\alpha$ -methylene- $\gamma$ -butyrolactone (AMGBL).....	470,478
methylene chloride.....	443-447,484,488,500,506,552,554,560,584
methylene chloride (dichloromethane).....	470,496,545-551,553,555,558-559,584-585
1-methyl-2-ethylbenzene.....	580-581
1-methyl-3-ethylbenzene.....	447,506,559,580-581
1-methyl-4-ethylbenzene.....	580-581
methyl ethyl ketone.....	477
methyl eugenol.....	566
methyl heptadecanoate.....	469,564
2-methylheptane.....	447,580-581
3-methylheptane.....	447,580-581
4-methylheptane.....	580-581
methyl heptanoate.....	564
2-methylhexane.....	447,580-581
3-methylhexane.....	447,580-581
iso- $\alpha$ -methylionone.....	566
2-methylisoborneol.....	485,560
1-methyl-2-isopropylbenzene.....	580-581
1-methyl-3-isopropylbenzene.....	580-581
1-methyl-4-isopropylbenzene.....	580-581
methyl laurate.....	470,564
methyl linoleate.....	470,564
methyl linolenate.....	470,564
methyl mercaptan.....	448
methyl methacrylate.....	444-446,470,518,549,554-555
methyl methanesulfonate.....	537-538
methyl monobromoacetate.....	490
methyl monochloroacetate.....	490
methyl myristate.....	470,564-565,583
1-methylnaphthalene.....	470,474,484,501,510-511,536,538,572,580
2-methylnaphthalene.....	470,484,501,506-507,510-512,536,538,541-542,572
2-methylnaphthalene-d10.....	539
2-methylnonane.....	580-581
3-methylnonane.....	580-581
5-methylnonane.....	580
methyl nonanoate.....	564
2-methyl-1-nonene.....	580-581
methyl-2-nonynoate.....	566
2-methyloctane.....	580-581
3-methyloctane.....	580-581
methyl-2-octynoate.....	566
methyl oleate.....	470,564-565,583
methyl palmitate.....	470,564-565,583
methyl palmitoleate.....	470,564
methyl paraoxon.....	527,533
methyl parathion.....	527,537-538,568-569
2-methylpentane.....	447,489,500,505,507-508,579-581
3-methylpentane.....	447,489,500,580-581
4-methyl-2-pentanone.....	444-446,470,518,548-549,553,558
2-methyl-2-pentene.....	580-581



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## Compound Index for Reference Standards

4-methyl-1-pentene	580-581	2-nitro- <i>m</i> -xylene	528,532	perylene	474,544,572
2-methylphenol	529,536-538,541-542,544	<i>cis</i> -nonachlor	523,568-569	perylene-d12	513,528,532,535,539
3-methylphenol	470,529,536-538,541,544	<i>trans</i> -nonachlor	523,533,568-569	PETN	470,479,486-487
4-methylphenol	529,536-538,541-542,544	2,2',3,3',4,4',5,5',6'-nonachlorobiphenyl	531	phenacetin	537-538
4-methylphenol-d8	543	<i>n</i> -nonadecane	474,503,506-508,512	phenanthrene	470,484,501,506-508,510-512,532,534,536,538,541-542
1-methyl-2- <i>n</i> -propylbenzene	580-581	nonanal	474	phenanthrene-d10	470,513,528,532,535,539
1-methyl-3- <i>n</i> -propylbenzene	580-581	<i>n</i> -nonane	444,446-447,474,504-508,512,579-581	phencyclidine	470,478
1-methyl-4- <i>n</i> -propylbenzene	580-581	2-nonanol	473-474	phendimetrazine	470,478
methyl stearate	470,564-565,583	2-nonanone	474	phenmedipham	570-571
methyl trichloroacetate	490	<i>n</i> -nonatricontane	470,505	phenmetrazine	470,478
methyl undecanoate	470,564	1-nonene	580-581	phenobarbital	470,478
methylpyrrolon	470,478	<i>trans</i> -2-nonene	580-581	phenol	470,529,534-537,539,541-542
metobromuron	570-571	<i>cis</i> -3-nonene	580-581	phenol-d5	543
metolachlor	494,521-522,527,529,532-533,559,567-569	<i>trans</i> -3-nonene	580-581	phenol-d6	470,532,535,539
metribuzin	470,494,522,527,529,533,559,567,570-571	<i>cis</i> -4-nonene	580-581	phenothrin ( <i>cis</i> & <i>trans</i> )	568-569
mevinphos	527,533,568-571,573	4- <i>para</i> -nonylphenol	583	phentermine	470,478
mexacarbate	570-571	norflurazon	527-528,533,568-569	phenylacetaldehyde	566
MGK-264	527,533,568-569	novaluron	570-571	1,4-phenylenediamine	537
military fuel	469,499,514	nuarimol	570-571	2-phenylphenol	568-569,573
mineral oil	485,561	2,2',3,3',4,4',5,5',6,6'-octachlorobiphenyl	531-532	phenyltin trichloride	520
mineral spirits	470,480,499,515	<i>n</i> -octacosane	470,497,504-507,509-510,512,516-517,559,561,579	phorate	527-529,537-538,559,567-569
Mirex	528,568-569	octadecane	499,514	phosalone	568-569,573
molinate	527,533	<i>n</i> -octadecane	474,479,503-508,510,512,561,579	phosmet	568-569
monceren	570-571	<i>n</i> -octane	447,474,479,505-506,509-510,516,559,579-581	phosphamidon	565
monobromoacetic acid	490	1-octanol	474	phthalic acid dicyclohexyl ester	530
monochloroacetic acid	490	<i>n</i> -octatriacontane	505,507-508,561	phthalic acid diisobutyl ester	530
monocrotophos	527,570-571	1-octene	580-581	phytane	499,514
Monolein (1-mono[ <i>cis</i> -9-octadecenyl]- <i>rac</i> -glycerol)	470,577	<i>cis</i> -2-octene	580-581	picloram	470,491-494
monolinuron	570-571	<i>trans</i> -2-octene	580-581	picloram methyl ester	470,491-493
monopalmitin	470,577	4- <i>tert</i> -octylphenol	583	2-picoline	537,553
morphine	470,478	omethoate	528,560,570-571,573	picoxystrobin	570-571
motor oil	485,561	oxadiazon	568-569	picric acid	470,479,486
motor oil composite	470,497,503,515	oxadixyl	570-571	piperonyl butoxide	568-571
moxidectin	570-571	oxamyl	521,570-571	pirimicarb	570-571
myclobutanil	568-571,573	oxazepam	470,478	pirimiphos methyl	528,560,565,568-569,573
N-methylpyrrolidone	470,584	2,2-oxybis (1-chloropropane)	534,536,538,541-542	pirimiphos ethyl	568-569
naled	527	oxychlorodane	528,565	poly (ethylene glycol) 200	470,480
naphthalene	444-447,470,475,484,489,500-501,505-508,510-512,532,534,536,538,541-542,546-550,555,559,580	oxycodone	470,478	poly (ethylene glycol) 400	470,480
naphthalene-d8	470,506,512-513,532,535,539	oxyluorfen	568-569	Polywax 500	470,579
1-naphthol	521	oxymorphone	470,478	Polywax 655	115,470,579
1,4-naphthoquinone	537-538	paclobutrazol	568-571	Polywax 850	470,579
1-naphthylamine	537	paraquat dichloride	494	Polywax 1000	115,470,579
2-naphthylamine	537	parathion	527-528,537-538,559,568-569	prazepam	470,478
napropamide	527,533	parathion-d10	575	pretiachlor	568-569
naproxen	583	PCB 18	470,574	primidone	583
neburon	570-571	PCB 28	470,574	pristane	499,514
nicarbazin	470,574	PCB 52	470,574	prochloraz	568-571
nicotine	470,478	PCB 138	470,574	procymidone	568-569,575
nitenpyram	570-571	PCB 153	470,574	prodiamide	568-569
nitralin	568-569	pebulate	527,533,568-569	profenofos	528,560,568-569
nitrazepam	470,478	penconazole	568-571	profluralin	568-569
3-nitro- <i>o</i> -xylene	529	pendimethalin	529,567-569	progesterone	583
2-nitroaniline	536-537,541-543	2,2',4,4',5'-pentabromodiphenyl ether	528	promecarb	570-571
3-nitroaniline	536-537,541-543	2,2',4,4',6'-pentabromodiphenyl ether	528	prometon	527,529,533,567,570-571
4-nitroaniline	536-537,541-543	pentachloroaniline	568-569	prometryn	494,527-528,533,559,570-571
4-nitroanisole	491,493	pentachloroanisole	470,491-493,568-569	propachlor	470,522,527,529,533,567-569
nitrobenzene	470,474,479,486-487,495,534,536,538,541-542,544,549,555	pentachlorobenzene	537-538,568-569	propadiene	449
nitrobenzene-d5	513,535,539,543	pentachlorobenzonitrile	568-569	propamocarb	570-571
nitrofen	528,568-569	2,2',3,4,5'-pentachlorobiphenyl	531	propane	447,449
nitrogen	449	2,2',3',4',6'-pentachlorobiphenyl	531-532	propanil	528,568-569
nitroglycerin	470,479,486-487	2,2',4,5,5'-pentachlorobiphenyl	531,560	1-propanol	474,477
nitroguanidine	470,479,486	2,3,3',4',6'-pentachlorobiphenyl	531	2-propanol	444-446,470,477
nitromethane	470,584-585	2,3',4,4',5'-pentachlorobiphenyl	531,560	propargite	568-571,573
2-nitrophenol	529,534,536-537,541-542	pentachloroethane	470,537,549-550,553,555	propargyl alcohol	483,554
2-nitrophenol-d4	543	pentachloronitrobenzene	470,522,537-538,568-569	propazine	527-529,533,567
4-nitrophenol	470,491-494,529,534-537,539,541-543	pentachlorophenol	470,473,491-494,529,532,534-539,541-544	propham	570-571
4-nitrophenol-d4	543	pentachlorothioanisole	568-569	propiconazole	570-571
2-nitropropane	470,549,555	<i>n</i> -pentacontane	470,559	propionaldehyde-DNPH	483,518
4-nitroquinoline-N-oxide	537-538	pentacosane	470,508,517	propionaldehyde-2,4-DNPH	483
N-nitroso-di- <i>n</i> -butylamine	519	<i>n</i> -pentacosane	497,502-503,507-508,516	propionic acid	565
N-nitrosodibutylamine	537	<i>n</i> -pentadecane	473-474,503,507-508,579-581	propionitrile	470,518,549,554-555
N-nitrosodiethylamine	519,537	perfluorobenzene	470,496,546,551,554	propisochlor	568-569
N-nitrosodimethylamine	470,519,534,536-537,542	perfluorophenol	470,532	propoxur	521,570-571
N-nitrosodimethylamine-d6	470,519,532,543	<i>n</i> -pentane	444,446-447,449,474,505,510,579-581	dextro-propoxyphene	468,478
N-nitrosodiphenylamine	470,519,542	<i>n</i> -pentatriacontane	497,509,516	propyl acetate	483,555
N-nitroso-di- <i>n</i> -propylamine-d14	470,519	pentazocine	470,478	<i>n</i> -propyl acetate	483,555
N-nitrosomethylethylamine	519,537	1-pentene	447,580-581	<i>n</i> -propylbenzene	444,446-447,489,501-502,546-550,555,579-581
N-nitrosomorpholine	537	<i>cis</i> -2-pentene	447,449,580-581		
N-nitrosopiperidine	519,537	<i>trans</i> -2-pentene	447,449,580-581	<i>n</i> -propylcyclopentane	580-581
N-nitroso-di- <i>n</i> -propylamine	470,519,534-537,540-542	pentene-1	449	propylene	444-447,449
N-nitrosopyrrolidone	519,537	pentobarbital	470,478	propylene glycol	490,504,508,517,554,583
2-nitrotoluene	470,479,486-487	pentylbenzene	580-581	propyzamide	527,533,537-538,568-569
3-nitrotoluene	470,479,486-487	<i>n</i> -pentylbenzene	572	prothioconazole	570-571
4-nitrotoluene	470,479,486-487	perfluorotributylamine (PFTBA)	470,473,536,540,548,555,557	prothiofos	527-528,560,568-569
5-nitro- <i>o</i> -toluidine	537	<i>cis</i> -permethrin	522,533,568-569,573,575	pymetrozine	570-571,575
		<i>trans</i> -permethrin	522,533,568-569,573,575	pyracarbolid	570-571



## Compound Index for Reference Standards

pyraclofos	568-569
pyraclostrobin	570-571
pyrazophos	528,560,568-569
pyrene	470,506-508,510-512,532,534-536,538,540-542
pyrene-d10	513,528,532,535,539,543
pyridaben	568-571
pyridaphenthion	568-569
pyridine	470,473-474,534,536-538,544,553,584-585
pyrimethanil	568-571
pyriproxyfen	568-571
quinalphos	568-569
quinclorac	492
quinclorac methyl ester	492
quinizarin	475
quinoxifen	570-571
RDX	471,479,486-487
resmethrin	568-569
ronnel	527
rotenone	570-571
SAE30 motor oil:SAE40 motor oil (1:1)	503
saflrole	537-538,566
secbumeton	570-571
secobarbital	471,478
siduron	528,570-571
Silvex	494,544
simazine	471,494,521-523,527,529,533,559,567
simetryne	527,533,570-571
spinetoram	570-571
spinosad	570-571
spirodiclofen	570-571
spiromesifen	570-571
spirotetramat	570-571
sproxamine	570-571
stearic acid	519
stearyl stearate	471,561
stirofos	527,533
stoddard solvent	471,480,499,515
styrene	443-447,471,484,488,500,506,518,545-550,552,554-555,558-560
sucrose	475
sulfamethoxazole	583
sulfentrazone	570-571
sulfolane	471,584
sulfotep	527,537,568-569
sulfur	474,544,579
sulprofos	527,568-569
2,4,5-T	491-494
2,4,5-T methyl ester	471,491-493
talbutal	471,478
2,4-TDIP	471,518
2,6-TDIP	471,518
tebuconazole	568-571,575
tebufenozide	570-571
tebufenpyrad	568-571
tebuhiuron	527-528,533,570-571
teflubenzuron	570-571
tefluthrin	568-569
temazepam	471,478
temephos	528,559,570-571
TEPP	527
terbacil	527,533,568-569
terbufos	527-529,533,559,567-569
terbufos sulfone	528
terbumeton	570-571
terbutylazine	568-569
terbutryn	527,533,570-571
o-terphenyl	471,484,501,503-504,506,508,517
p-terphenyl	471,484,501,508,517
p-terphenyl-d14	471,512-513,532-533,535,539
α-terpineol	471
testosterone	495,583
2,2',4,4'-tetrabromodiphenyl ether	528
tetrabutyltin	520
2,3,5,6-tetrachloroaniline	568-569
1,2,4,5-tetrachlorobenzene	537-538,541
2,2',3,5'-tetrachlorobiphenyl	531
2,2',4,4'-tetrachlorobiphenyl	531-532
2,2',5,5'-tetrachlorobiphenyl	531,560
2,3',4,4'-tetrachlorobiphenyl	531
1,1,1,2-tetrachloroethane	471,546-550,553,555
1,1,2,2-tetrachloroethane	443-447,471,484,488,496,500,506,546-555,558-560
1,1,2,2-tetrachloroethane-d2	557
tetrachloroethene	444-446,471,496,544-551,553,555-559
tetrachloroethylene	443-444,447,474,484,488,500,506,552,554,560
tetrachloronitrobenzene	568-569
2,3,4,5-tetrachlorophenol	529
2,3,4,6-tetrachlorophenol	471,529,536-537,541
2,3,5,6-tetrachlorophenol	536
2,4,5,6-tetrachloro-m-xylene	471,524-526
tetrachlorvinfos	568-569
tetraconazole	570-571
n-tetracontane	471,497,505,507-508,516,561,579
n-tetracosane	474,497,503-508,510,512,516,561,579
n-tetradecane	473-474,479,503-508,510,512,561,579-581
tetradifon	568-569
delta-8-tetrahydrocannabinol	471,566
delta-9-tetrahydrocannabinol	471,478,566
delta-9-tetrahydrocannabinolic acid A	471,566
tetrahydrofuran	444-446,471,549-550,555,584-585
tetrahydrofuran-d8	471,519,566
tetralin	471,584-585
tetramethrin	568-569
1,2,3,5-tetramethylbenzene	580
1,2,4,5-tetramethylbenzene	580-581
tetraphenyltin	520
tetra-n-propyltin	471,520
n-tetrateetracontane	579
n-tetriacontane	504-505,507-508,510,517,559,561,579
tetryl	471,479,486-487
(+/-)-11-nor-9-carboxy-delta-9-THC	471,478,566
thebaine	471,478
thiabendazole	570-571,573,575
thiacloprid	570-571
thiamethoxam	570-571
thidiazuron	528,570-571
thiobencarb	528,570-571
thiofanox	570-571
thionazin	538
thiophanate methyl	570-571
THPI (tetrahydrophthalimide)	568-569
thymol	566
Tinuvin P	471
tolclofos-methyl	528,560,568-569
m-tolualdehyde-DNPH	483,518
m-tolualdehyde-2,4-DNPH	483
o-tolualdehyde-DNPH	483,518
p-tolualdehyde-DNPH	483,518
toluene	443-448,471,475,479,484,488-489,495-496,500-502,504-508,510,512,516,545-555,557-560,579-581,584-585
toluene-d8	471,546,554,557
o-toluidine	537
tolyluanid	568-569,575
toxaphene	471,521-524,526,544
2,4,5-TP (Silvex)	471,491-494,544
2,4,5-TP (Silvex) methyl ester	471,491-493
transfluthrin	568-569
transformer oil	471,578
n-triacontane	497,504-508,512,516,561,579
n-triacontane-d62	471,503
triadimefon	527,533,568-571
triadimenol	568-571
triallate	529,567-569
triazolam	471,478
triazophos	568-569
tribromoacetic acid	490
2,4,6-tribromophenol	471,529,532,535,539,543
tributyl phosphate	471,527
1,3,5-tri-tert-butylbenzene	572
tributyltin chloride	471,520
Tricaprin (1,2,3-tricaprinolglycerol)	471,577
trichlorfon	570-571
trichloroacetic acid	490
trichloroacetonitrile	485,521
1,2,3-trichlorobenzene	471,510,546-550,555,559
1,2,4-trichlorobenzene	443-447,471,484,488,495,500,506,534-536,538,540,542,545-550,552,554-555,558-560
2,2',5-trichlorobiphenyl	531
2,4,4'-trichlorobiphenyl	531,560
2,4,5-trichlorobiphenyl	531-532
2,4',5-trichlorobiphenyl	531
2,4,5-TP (Silvex) methyl ester	471,491-493
1,1,1-trichloroethane	443-447,471,484,488,496,500,506,545-555,558-560,584-585
1,1,2-trichloroethane	443-447,471,484,488,496,500,506,545-555,557-560
2,2,2-trichloroethanol	583
trichloroethene	443-447,471,484,488,496,500,506,544-560,584-585
trichloroethylene	447,488,554,560
trichlorofluoromethane	443-447,471,484,488,496,500,506,546-548,550-555,558,560
trichloronate	527
2,4,5-trichlorophenol	471,525,529,536-538,541-544
2,4,6-trichlorophenol	471,529,534,536-538,541-542,544
1,2,3-trichloropropane	471,490,546-550,553,555
1,1,1-trichloro-2-propanone	485,521
1,1,2-trichlorotrifluoroethane	443-444,447,471,484,488,500,506,552,554-555,559-560
1,1,2-trichloro-1,2,2-trifluoroethane	444-446,558
trichlorosane	583
n-tricosane	503,507-508
tricyclazole	527,533,568-571
tridecane	580
n-tridecane	474,503,507-508,572,579-581
0,0,0-triethyl phosphorothioate	537-538
1,2,4-triethylbenzene	580-581
1,3,5-triethylbenzene	580-581
trifloxystrobin	570-571
triflumizole	568-571
triflumuron	570-571
α,α,α-trifluorotoluene	471,489,495-496,501-502,509,517,546,548,551,553
trifluralin	471,521-522,527,529,533,567-569,575
trimethoprim	583
1,2,3-trimethylbenzene	447,489,501-502,506-508,510,512
1,2,4-trimethylbenzene	443-447,471,479,484,488-489,500-502,505-508,510,546-550,552,554-555,559-560,580-581
1,3,5-trimethylbenzene	443-447,471,484,488-489,500-502,506-507,510,546-550,552,554-555,559-560,580-581
2,2,3-trimethylbutane	580-581
1,1,2-trimethylcyclohexane	580-581
1,1,4-trimethylcyclohexane	580-581
ctc-1,2,3-trimethylcyclohexane	580-581
ctc-1,2,4-trimethylcyclohexane	580-581
ctt-1,2,4-trimethylcyclohexane	580-581
ccc-1,3,5-trimethylcyclohexane	580-581
ccc-1,2,3-trimethylcyclopentane	580-581
ctc-1,2,3-trimethylcyclopentane	580-581
2,2,3-trimethylpentane	580-581
2,2,4-trimethylpentane	444-447,471,489,500,505,507-508,578
2,3,3-trimethylpentane	580
2,3,4-trimethylpentane	447
1,3,5-trinitrobenzene	471,479,486-487,537-538
2,4,6-trinitrotoluene	471,479,486-487
Triolein (1,2,3-tri[ <i>cis</i> -octadecenyl]glycerol)	471,577
triprenyltin chloride	471,520
triphenyl phosphate	471,527-528,532,574-575
triphenylmethane	471,574
triphenyltin chloride	520
tri-n-propyltin chloride	471,520
tris(1,3-dichloroisopropyl)phosphate	471,574
triticinazole	570-571
undecane	474,580
n-undecane	447,503,506-508,572,579-581
1-undecanol	474
unleaded gasoline	471,480-481,489,498
unleaded gasoline composite	471,489,497,502,509,517
uracil	475
used motor oil composite	471,497,515
valeraldehyde-DNPH	483,518
valeraldehyde-2,4-DNPH	483
valeric acid	565
γ-valerolactone	471,478
vamidothion	570-571
vanillin	566
vernolate	527,533
vinclozolin	528,568-569,573
vinyl acetate	444-446,471,483,555-556,558
vinyl bromide	444-446
vinyl chloride	443-447,471,484,488,496,500,506,544-548,550-560
vinyl chloride-d3	557
vitamin E	572,583
m-xylene	443-448,471,484,488-489,495-496,500-502,504-508,510,545-550,552-555,558-560,580-581,584-585
m/p-xylene (combined)	447,506
o-xylene	443-448,471,484,488-489,495-496,500-502,504-508,510,545-550,552-555,558-560,580-581,584-585
p-xylene	443-448,471,479,484,488-489,495-496,500-502,504-508,510,545-550,552-555,558-560,579-581,584
zinophos (thionazine)	537
zoxamide	570-571



10000	22	10122	41	10227-125	23,43	10536	47	10869	102
10000-600	22	10123	41	10228	42,96	10537	47	10900	80
10001	22	10123-124	23,41	10229	42,96	10538	47	10901	80
10001-600	22	10124	41	10235	42,96	10539	47	10902	80
10002	22	10125	41	10236	42,96	10540	47	10903	80
10002-600	22	10126	41	10237	42,96	10541	47	10904	80
10012	21	10127	41	10238	42,96	10542	47	10905	80
10013	21	10128	41	10238-600	42	10543	47	10906	80
10014	21	10129	41	10239	42,96	10550	47	10908	80
10022	21	10135	41	10240	42,96	10551	47	10909	80
10023	21	10136	41	10241	42,96	10552	47	10910	80
10026	72	10137	41	10242	42,96	10553	47	10915	80
10027	72	10138	41	10243	42,96	10554	47	10916	80
10029	21,28	10139	41	10244	42,96	10555	47	10919	80
10029-600	21,28	10140	41	10250	42,96	10557	47	10920	80
10032	21	10141	41	10251	42,96	10558	47	10921	80
10033	21	10142	41	10252	42,96	10567	47	10968	52
10034	21	10143	41	10253	42,96	10569	47	10968-124	23
10039	21,28	10144	41	10253-124	23,43	10570	47	10969	52
10039-600	21,28	10147	92	10254	42,96	10605	58,95	10970	52
10041	21	10148	92	10254-125	23,43	10608	58,95	10970-125	23
10042	21	10149	92	10254-600	42	10611	58,95	10971	52
10043	21	10150	41	10255	42,96	10620	58,95	10971-126	23
10043-600	21	10151	41	10256	42,96	10621	58,95	10972	52
10044	21	10152	41	10257	42,96	10622	58,95	10973	52
10044-600	21	10153	41	10258	42,96	10623	58,62,95	10974	52
10045	21,72	10154	41	10259	42,96	10623-124	23	10975	52
10045-600	21	10155	41	10260	42,96	10624	58,95	10986	80
10046	21	10155-126	23,41	10266	42,96	10625	58,95	10998	90
10046-600	21	10156	41	10267	42,96	10626	58,95	10999	90
10047	21	10157	41	10269	42,96	10627	58,95	11005	98
10048	21	10158	41	10270	42,96	10628	58,95	11007	98
10048-600	21	10159	41	10270-600	42	10635	58,95	11008	98
10049	21	10160	41	10272	42,96	10636	58,95	11009	98
10049-600	21	10165	92	10273	42,96	10637	58,95	11020	98
10054	21,28	10166	41	10275	42,96	10638	58,95	11021	98
10054-600	21,28	10167	41	10277	42,96	10639	58,95	11022	98
10059	21,28	10169	41	10279	42,96	10640	58,95	11023	98
10059-600	21,28	10170	41	10279-126	23,43,97	10641	58,95	11024	98
10064	21,28	10172	41	10281	42,96	10642	58,95	11025	98
10064-600	21,28	10173	41	10282	42,96	10643	58,95	11026	98
10065	21	10175	41	10283	42,96	10651	58,95	11027	98
10066	21	10176	41	10284	42,96	10652	58,95	11035	98
10067	21	10177	41	10285	42,96	10654	58,95	11036	98
10068	21	10178	41	10287	42,96	10654-125	23	11037	98
10069	21	10179	41	10288	42,96	10655	58,95	11038	98
10070	21	10179-126	23,41	10290	42,96	10655-126	23	11039	98
10073	21,28	10180	41	10291	91	10657	58,95	11040	98
10073-600	21,28	10181	41	10292	91	10658	58,95	11041	98
10075	22	10182	41	10293	91	10666	58,95	11042	98
10076	22	10183	41	10294	91	10667	58,95	11051	98
10077	22	10184	41	10295	66	10669	58,95	11052	98
10078	22	10185	41	10296	66	10670	58,95	11054	98
10079	22	10187	41	10323	45	10672	58,95	11055	98
10079-600	22	10188	41	10324	45	10673	59	11057	98
10080	22	10189	41	10338	45	10674	59	11058	98
10080-600	22	10190	41	10339	45	10708	55	11062	98
10081	22	10191	41	10353	45	10711	55	11065	98
10081-600	22	10192	41	10354	45	10714	55	11068	98
10082	22	10193	41	10355	45	10723	55	11120	72
10083	22	10194	41	10420	46	10724	55	11123	72
10084	22	10198	41	10421	46	10725	55	11126	72
10085	22	10199	93	10423	46	10726	55	11136	72
10086	22	10205	42,96	10424	46	10727	55	11139	72
10087	22	10206	42,96	10435	46	10728	55	11140	72
10090	22	10207	42,96	10437	46	10729	55	11141	72
10097	21	10208	42,96	10438	46	10730	55	11196	72
10098	21	10209	42,96	10439	46	10758	68	11197	72
10099	21	10210	42,96	10440	46	10759	68	11199	72
10100	21	10211	42,96	10453	46	10820	102	11223	74
10101	21	10220	42,96	10454	46	10821	102	11239	74
10102	21	10221	42,96	10455	46	10823	102	11240	74
10105	41	10222	42,96	10470	46	10824	102	11241	74
10106	41	10223	42,96	10485	46	10838	102	11242	74
10107	41	10223-124	23,43	10520	47	10839	102	11243	74
10108	41	10223-127	23,43	10521	47	10840	102	11244	74
10109	41	10223-600	42	10522	47	10851	102	11321	72
10110	41	10224	42,96	10523	47	10852	102	11323	72
10111	41	10224-125	23,43	10524	47	10854	102	11324	72
10112	41	10225	42,96	10526	47	10855	102	11325	72
10120	41	10226	42,96	10527	47	10857	102	11326	72
10121	41	10227	42,96	10535	47	10858	102	11335	101

11337.....	72	12497.....	83	13357.....	29	13724.....	31,71	15035.....	48
11338.....	101	12498.....	83	13367.....	29	13726.....	31,71	15036.....	48
11340.....	72	12499.....	83	13370.....	29	13727.....	31,71	15037.....	48
11350.....	101	12605.....	44	13373.....	29	13738.....	31,71	15038.....	48
11351.....	101	12606.....	44	13396.....	29	13739.....	31,71	15039.....	48
11352.....	101	12608.....	44	13397.....	29	13740.....	31,71	15040.....	48
11353.....	101	12608-124.....	23,44	13398.....	29	13753.....	31,71	15041.....	48
11354.....	101	12609.....	44	13399.....	29	13754.....	31,71	15042.....	48
11355.....	101	12611.....	44	13402.....	30	13820.....	34,82	15043.....	48
11366.....	101	12620.....	44	13409.....	30	13821.....	34	15044.....	48
11369.....	101	12620-124.....	23,44	13411.....	30	13823.....	34,82	15045.....	48
11385.....	101	12621.....	44	13420.....	30	13824.....	34	15050.....	48
12009.....	53	12623.....	44	13421.....	30	13835.....	34	15051.....	48
12011.....	53	12623-124.....	23,44	13422.....	30	13836.....	34	15052.....	48
12020.....	53	12623-127.....	23,44	13423.....	30	13837.....	34	15053.....	48
12021.....	53	12624.....	44	13424.....	30	13838.....	34	15054.....	48
12023.....	53	12624-125.....	23,44	13425.....	30	13839.....	34	15055.....	48
12023-124.....	23,53	12626.....	44	13426.....	30	13840.....	34	15056.....	48
12024.....	53	12627.....	44	13427.....	30	13850.....	34	15057.....	48
12025.....	53	12635.....	44	13435.....	30	13851.....	34	15058.....	48
12026.....	53	12635-127.....	23,44	13436.....	30	13852.....	34	15059.....	48
12027.....	53	12637.....	44	13437.....	30	13853.....	34	15060.....	48
12035.....	53	12638.....	44	13438.....	30	13854.....	34	15066.....	48
12036.....	53	12638-124.....	23,44	13439.....	30	13855.....	34	15067.....	48
12037.....	53	12638-127.....	23,44	13440.....	30	13856.....	34	15069.....	48
12038.....	53	12639.....	44	13441.....	30	13857.....	34	15070.....	48
12039.....	53	12640.....	44	13442.....	30	13858.....	34	15072.....	48
12040.....	53	12641.....	44	13450.....	30	13859.....	34	15073.....	48
12041.....	53	12642.....	44	13451.....	30	13865.....	38,81,87-88,94	15075.....	48
12042.....	53	12650.....	44	13452.....	30	13868.....	38,81,87-88,94	15082.....	48
12050.....	53	12652.....	44	13453.....	30	13869.....	38,81,87-88,94	15085.....	48
12051.....	53	12653.....	44	13454.....	30	13870.....	38,81,87-88,94	15088.....	48
12052.....	53	12654.....	44	13455.....	30	13871.....	38,81,87-88,94	15091.....	48
12053.....	53	12654-125.....	23,44	13456.....	30	13872.....	38,81,87-88,94	15110.....	62
12054.....	53	12655.....	44	13457.....	30	13873.....	38,81,87-88,94	15111.....	62
12055.....	53	12667.....	44	13467.....	30	13874.....	38,81,87-88,94	15112.....	62
12056.....	53	12670.....	44	13470.....	30	13875.....	38,81,87-88,94	15113.....	62
12057.....	53	12923.....	50	13481.....	30	13905.....	39	15114.....	62
12058.....	53	12924.....	50	13497.....	30	13906.....	39	15115.....	62
12066.....	53	12938.....	50	13498.....	30	13908.....	39	15116.....	62
12067.....	53	12939.....	50	13499.....	30	13909.....	39	15117.....	62
12069.....	53	12940.....	50	13502.....	35	13910.....	39	15118.....	62
12070.....	53	13100.....	103	13520.....	35	13923.....	39	15119.....	62
12072.....	53	13101.....	103	13523.....	35	13924.....	39	15120.....	62
12073.....	53	13102.....	103	13524.....	35	13950.....	39	15121.....	62
12082.....	53	13103.....	103	13525.....	35	13951.....	39	15123.....	62
12085.....	53	13104.....	103	13538.....	35	13952.....	39	15124.....	62
12088.....	53	13105.....	103	13539.....	35	13953.....	39	15125.....	62
12320.....	100	13106.....	103	13540.....	35	13954.....	39	15126.....	62
12323.....	100	13107.....	103	13552.....	35	13955.....	39	15127.....	62
12335.....	100	13108.....	103	13553.....	35	14020.....	54	15128.....	62
12338.....	100	13109.....	103	13554.....	35	14021.....	54	15129.....	62
12350.....	100	13110.....	103	13555.....	35	14022.....	54	15130.....	62
12351.....	100	13111.....	103	13569.....	35	14023.....	54	15131.....	62
12352.....	100	13112.....	103	13570.....	35	14024.....	54	15608.....	49
12353.....	100	13113.....	103	13605.....	32,67,75,77,85-86	14025.....	54	15609.....	49
12354.....	100	13199.....	56,83	13608.....	32,75,77,86	14026.....	54	15623.....	49
12355.....	100	13223.....	70	13620.....	32,67,75,77,85-86	14038.....	54	15624.....	49
12366.....	100	13226.....	70	13620-127.....	23,32	14039.....	54	15638.....	49
12369.....	100	13239.....	70	13621.....	32,75,77,86	14040.....	54	15639.....	49
12382.....	100	13302.....	29	13623.....	32,62,67,75,77,85-86	14051.....	54	15653.....	49
12385.....	100	13311.....	29	13623-124.....	23,32,85	14052.....	54	15654.....	49
12420.....	57	13320.....	29	13623-127.....	23,32	14054.....	54	16016.....	51
12423.....	57	13321.....	29	13624.....	32,75,77,86	14055.....	54	16020.....	51
12424.....	57	13323.....	29,62	13626.....	32,75,77,86	14057.....	54	16021.....	51
12425.....	57	13324.....	29	13635.....	32,75,77,86	14102.....	36,76	16023.....	51
12426.....	57	13326.....	29	13635-124.....	23,32	14111.....	36,76	16024.....	51
12427.....	57	13327.....	29	13638.....	32,75,77,85-86	14120.....	36,76	16025.....	51
12435.....	57	13335.....	29	13638-124.....	23,32,85	14121.....	36,76	16026.....	51
12436.....	57	13336.....	29	13638-127.....	23,32	14123.....	36,62,76	16038.....	51
12438.....	57	13337.....	29	13639.....	32,75,77,86	14124.....	36,76	16039.....	51
12439.....	57	13338.....	29	13639-125.....	23,32	14126.....	36,76	16040.....	51
12440.....	57	13339.....	29	13650.....	32,75,77,86	15020.....	48	16042.....	51
12441.....	57	13340.....	29	13653.....	32,75,77,86	15021.....	48	16043.....	51
12442.....	57	13341.....	29	13654.....	32,75,77,86	15022.....	48	16052.....	51
12443.....	57	13342.....	29	13654-125.....	23,32	15023.....	48,62	16053.....	51
12451.....	57	13350.....	29	13670.....	32,75,77,86	15024.....	48	16054.....	51
12452.....	57	13352.....	29	13697.....	32,75,77,86	15025.....	48	16055.....	51
12454.....	57	13353.....	29	13705.....	31,71	15026.....	48	16056.....	51
12455.....	57	13354.....	29	13708.....	31,71	15027.....	48	16057.....	51
12457.....	57	13355.....	29	13720.....	31,71	15028.....	48	16058.....	51
12458.....	57	13356.....	29	13723.....	31,62,71	15029.....	48	16066.....	51

Catalog # Product Index

16069.....	51	19744.....	126	20148.....	233,336	20262.....	263	20487.....	228,275
16070.....	51	19745.....	127	20149.....	233,336	20263.....	225	20504.....	272
16072.....	51	19746.....	127	20150.....	233,336	20264.....	225	20508.....	206
16076.....	51	19747.....	127	20158.....	233	20265.....	244	20509.....	206
16085.....	51	19748.....	127	20159.....	233	20266.....	244	20535.....	232
16085-126.....	23,51,97	19749.....	128	20162.....	393	20267.....	244	20536.....	232
16088.....	51	19750.....	128	20163.....	393	20268.....	244	20537.....	232
16091.....	51	19751.....	128	20164.....	375-376	20275.....	224	20543.....	269
16092.....	51	19752.....	128	20165.....	375	20276.....	230,275	20544.....	269
16093.....	51	19753.....	128	20166.....	375-376	20277.....	230,275	20584.....	457
17005.....	89	19754.....	128	20167.....	374,376	20278.....	230,275	20585.....	457
17006.....	89	19755.....	121	20168.....	374,376	20279.....	230,275	20586.....	457
17007.....	89	19756.....	121	20169.....	374,376	20280.....	226,229,269	20587.....	457
17008.....	89	19757.....	121	20170.....	374,376	20281.....	226,229,269	20588.....	457
17009.....	89	19758.....	121	20171.....	374	20282.....	226,229,269	20589.....	457
17010.....	89	19759.....	122	20172.....	374,376	20283.....	226,229,269	20600.....	292
17023.....	47	19760.....	122	20174.....	386	20284.....	226,229,269	20601.....	292
17024.....	47	19761.....	122	20175.....	386	20285.....	226,229,269	20610.....	306
17038.....	47	19762.....	122	20177.....	297	20286.....	233	20611.....	306
17039.....	47	19763.....	123	20178.....	389	20287.....	233	20612.....	222
17053.....	47	19764.....	126	20179.....	389	20294.....	216	20613.....	222
17054.....	47	19765.....	126	20181.....	217,247,280	20295.....	216	20618.....	282
17055.....	47	19767.....	127	20182.....	279	20296.....	234,260	20623.....	292
18004.....	65	19768.....	127	20185.....	318	20297.....	234,260	20624.....	292
18005.....	65	19769.....	127	20188.....	319,337	20298.....	234,260	20625.....	292
18006.....	65	19770.....	127	20189.....	319,337	20299.....	234,260	20626.....	293
18007.....	65	19771.....	128	20190.....	319,337	20301.....	273	20631.....	236,242-243
18074.....	69	19772.....	128	20191.....	319,337	20305.....	273	20634.....	246
18075.....	69	19773.....	125	20192.....	318	20308.....	273	20635.....	306
18076.....	99	19775.....	121	20193.....	318	20309.....	273	20636.....	293
18077.....	99	19776.....	122	20197.....	222	20310.....	273	20637.....	293
18078.....	99	19777.....	124	20198.....	222	20311.....	273	20638.....	292
18079.....	69	19778.....	124	20199.....	222	20314.....	273	20643.....	252
19000.....	137	19779.....	124	20200.....	224,230	20315.....	273	20645.....	250,274
19001.....	137	19780.....	124	20201.....	224,230,274	20316.....	273	20646.....	302
19002.....	137	19781.....	124	20202.....	224,230,274	20319.....	273	20647.....	302
19003.....	137	19782.....	128	20203.....	225	20320.....	273	20648.....	302
19004.....	137	19784.....	120	20204.....	225	20339.....	217,280	20652.....	258
19005.....	137	19785.....	120	20205.....	225	20342.....	272	20657.....	258
19006.....	137	19786.....	120	20206.....	225	20343.....	272	20662.....	303
19007.....	137	19804.....	141	20207.....	225	20344.....	272	20663.....	303
19008.....	137	19805.....	141	20208.....	225	20345.....	208	20664.....	303
19009.....	137	19806.....	141	20209.....	225	20346.....	208	20665.....	303
19010.....	137	19807.....	141	20210.....	225,274	20366.....	263	20666.....	303
19011.....	137	19808.....	140	20211.....	224	20375.....	265	20667.....	303
19012.....	137	19809.....	140	20212.....	224	20387.....	281	20668350.....	305
19013.....	137	19810.....	140	20213.....	224	20388.....	232	20668580.....	305
19014.....	137	19908.....	78	20215.....	225	20389.....	231	20668590.....	305
19015.....	137	19909.....	78	20217.....	225	20390.....	241	20670.....	256
19016.....	137	19915.....	78	20218.....	225	20391.....	241	20671.....	256
19017.....	137	19916.....	78	20219.....	225	20392.....	241,250,274	20672.....	256
19018.....	137	19919.....	78	20220.....	225	20393.....	241,250,274	20673.....	256
19019.....	137	19920.....	78	20221.....	225	20394.....	232	20674.....	276
19020.....	137	19974.....	78	20222.....	225	20395.....	232	20675.....	276
19021.....	137	19985.....	78	20223.....	225	20396.....	232	20676.....	276
19022.....	137	19988.....	78	20224.....	224,230,274	20397.....	232	20677.....	299,345
19023.....	137	20101.....	282	20225.....	225	20398.....	232	20680.....	300
19040.....	137	20106.....	282	20226.....	225	20399.....	232	20681.....	300
19041.....	137	20108.....	282	20227.....	224,230	20400.....	228-229	20682.....	300
19042.....	137	20109.....	282	20228.....	224,230,274	20401.....	228-229	20683.....	300
19043.....	137,140	20110.....	251,262,271,281	20229.....	224	20402.....	228-229	20684.....	300
19044.....	137,141	20112.....	282	20230.....	224	20403.....	228,275	20686.....	292
19045.....	137,140	20113.....	283	20231.....	224	20403-261.....	72,228,275	20697.....	298
19308.....	79	20114.....	217	20232.....	224	20404.....	228,275	20698.....	293
19309.....	79	20116.....	279	20233.....	224	20404-261.....	228,275	20699.....	293
19315.....	79	20117.....	236,283	20234.....	273	20405.....	228,230,275	20706.....	205
19316.....	79	20120.....	257	20238.....	225	20405-261.....	228,230,275	20707.....	205
19319.....	79	20122.....	283	20239.....	225	20406.....	228,230,275	20708.....	205
19320.....	79	20124.....	283	20240.....	225	20406-261.....	228,230,275	20709.....	205
19385.....	79	20133.....	390	20243.....	265	20409.....	245	20710.....	205
19388.....	79	20134.....	319	20244.....	265	20429.....	62,228-229	20712.....	204
19720.....	125	20135.....	222	20246.....	225,250,274	20430.....	228-229	20713.....	204
19721.....	125	20136.....	222	20248.....	225	20445.....	228,275	20714.....	204
19722.....	125	20137.....	231	20249.....	225	20449.....	228-229	20715.....	208
19723.....	125	20140.....	231	20250.....	225	20469.....	228,275	20716.....	208
19737.....	127	20141.....	231	20251.....	225	20474.....	241	20721.....	208
19738.....	127	20142.....	233	20252.....	225	20475.....	241	20722.....	208
19739.....	127	20143.....	233	20253.....	225	20476.....	240-241,267	20723.....	208
19740.....	127	20144.....	233	20254.....	225	20477.....	240-241	20724.....	208
19741.....	126	20145.....	233	20255.....	225	20480.....	228-229	20725.....	208
19742.....	126	20146.....	231	20257.....	225	20485.....	228,230,275	20726.....	206
19743.....	126	20147.....	233,336	20258.....	225	20486.....	228,230,275	20727.....	208

20728.....	208	20905.....	208	21020.....	212	21149.....	360	21271.....	394
20730.....	210	20906.....	208	21021.....	212	21150.....	276	21272.....	210
20731.....	210	20907.....	204	21022.....	205	21151.....	276	21273.....	210
20736.....	210	20908.....	204	21023.....	205	21152.....	357	21274.....	210
20737.....	210	20909.....	209	21024.....	209	21153.....	357	21275.....	393,457
20738.....	210	20910.....	210	21025.....	209	21154.....	359	21276.....	393,457
20741.....	210	20911.....	210	21026.....	210	21155.....	359	21277.....	393,457
20756.....	206	20912.....	204	21027.....	210	21156.....	206	21278.....	393,457
20759.....	209	20913.....	204	21028.....	214	21157.....	206	21279.....	393,457
20762.....	209	20914.....	204	21029.....	214	21159.....	266,281	21283.....	393
20771.....	206	20915.....	204	21030.....	208	21160.....	367	21284.....	376
20772.....	142,204,249	20916.....	214	21031.....	208	21161.....	367	21285.....	213
20773.....	204	20917.....	214	21032.....	205	21162.....	367	21286.....	213
20774.....	204	20936.....	214	21033.....	205	21163.....	367	21287.....	213
20775.....	208	20937.....	214	21034.....	239,278	21164.....	367	21288.....	213
20776.....	208	20938.....	214	21035.....	276	21165.....	367	21289.....	213
20777.....	208	20939.....	214	21036.....	224	21166.....	367	21290.....	213
20778.....	208	20940.....	214	21037.....	224	21167.....	367	21291.....	213
20779.....	208	20941.....	214	21038.....	224	21172.....	258	21292.....	213
20780.....	208	20942.....	214	21040.....	239	21174.....	357	21293.....	211
20781.....	205	20943.....	214	21041.....	239	21175.....	357	21294.....	211
20782.....	205	20944.....	214	21043.....	251,262,271	21176.....	360	21295.....	211
20783.....	205	20945.....	214	21044.....	278	21177.....	360	21296.....	211
20784.....	204	20946.....	214	21045.....	209	21178.....	360	21299.....	268
20785.....	204	20947.....	214	21046.....	209	21179.....	360	21301.....	257
20786.....	204	20948.....	214	21050.....	354	21192.....	361	21302.....	257
20787.....	272	20949.....	214	21051.....	354	21193.....	361	21303.....	248
20788.....	272	20950.....	214	21052.....	206	21194.....	361	21305.....	241
20792.....	208	20951.....	214	21053.....	206	21195.....	361	21306.....	241
20793.....	208	20952.....	214	21054.....	206	21196.....	358	21307.....	241
20795.....	204	20953.....	214	21055.....	206	21197.....	358	21308.....	241
20796.....	204	20954.....	206	21058.....	224	21198.....	358	21309.....	236
20797.....	204	20955.....	212	21059.....	225	21199.....	358	21313.....	252
20798.....	204	20956.....	212	21060.....	224	21202.....	378	21314.....	252
20799.....	204	20957.....	212	21061.....	225	21205.....	393	21315.....	241
20800.....	204	20964.....	248	21065.....	142	21206.....	393	21316.....	241
20801.....	205	20965.....	248	21066.....	142	21207.....	393	21317.....	241
20802.....	205	20966.....	248	21067.....	142	21208.....	393	21318.....	241
20819.....	211	20967.....	248	21073.....	207	21209.....	393	21319.....	241
20822.....	211	20970.....	208	21074.....	207	21210.....	374,376	21320.....	241
20823.....	205	20971.....	208	21075.....	207	21212.....	374,376	21321.....	306
20824.....	205	20972.....	205	21077.....	209	21213.....	376	21322.....	306
20827.....	210	20973.....	205	21079.....	209	21214.....	374	21323.....	251
20828.....	210	20974.....	206	21080.....	215	21215.....	374	21325.....	317
20829.....	210	20975.....	206	21081.....	215	21218.....	376	21327.....	305
20830.....	210	20976.....	212	21082.....	215	21220.....	375	21333.....	306
20832.....	210	20977.....	212	21083.....	215	21221.....	374	21334.....	304
20833.....	210	20978.....	212	21105.....	229	21223.....	374,376	21336.....	304
20834.....	210	20979.....	205	21106.....	229	21224.....	375-376	21337.....	304
20835.....	210	20980.....	204	21107.....	229	21228.....	375	21338.....	304
20836.....	210	20981.....	204	21108.....	229	21229.....	375	21339.....	304
20837.....	211	20982.....	204	21109.....	276	21230.....	374	21340.....	304
20838.....	211	20983.....	204	21110.....	205	21237.....	258	21347.....	305
20839.....	211	20984.....	204	21111.....	205	21238.....	240,267	21348.....	305
20840.....	211	20985.....	204	21112.....	208	21239.....	240	21349.....	305
20850.....	208	20986.....	204	21113.....	208	21240.....	240,245	21353.....	237
20851.....	208	20987.....	204	21114.....	215	21241.....	240,245	21356.....	339
20852.....	208	20989.....	206	21115.....	215	21242.....	240,242-243	21360-2.....	301
20853.....	210	20990.....	205	21116.....	215	21243.....	240,242-243	21361-5.....	301
20854.....	210	20991.....	205	21117.....	215	21244.....	240,267	21361-6.....	301
20859.....	209	20992.....	209	21118.....	453	21245.....	240	21360-7.....	301
20860.....	212	20993.....	209	21121.....	226,266	21246.....	240,250,274	21361-11.....	301
20861.....	212	20994.....	205	21122.....	226	21247.....	240,250,274	21384.....	231
20862.....	212	20995.....	205	21123.....	226	21248.....	240	21385.....	231
20863.....	212	20996.....	205	21124.....	226	21249.....	240	21386.....	231
20864.....	212	20997.....	204	21125.....	226	21250.....	394	21387.....	231,275
20868.....	212	20998.....	206	21126.....	226	21251.....	394	21388.....	231,275
20869.....	212	20999.....	216	21127.....	226	21252.....	394	21389.....	231,275
20870.....	212	21000.....	222,255	21128.....	226	21253.....	394	21392.....	268
20871.....	212	21001.....	255	21131.....	255	21254.....	394	21393.....	237
20881.....	261	21004.....	215	21132.....	255	21255.....	394	21394.....	454
20882.....	261	21005.....	214	21135.....	255	21256.....	394	21394-Pl.....	454
20883.....	238,242-243	21006.....	214	21136.....	255	21257.....	394	21399.....	239,278
20884.....	257	21007.....	225	21137.....	255	21258.....	394	21400.....	455
20895.....	204	21008.....	225	21138.....	255	21259.....	394	21401.....	455
20896.....	204	21009.....	240-241	21139.....	255	21260.....	392	21402.....	455
20899.....	210	21010.....	240-241	21140.....	359	21261.....	392	21409.....	234,241
20900.....	210	21011.....	241	21141.....	359	21262.....	392	21468.....	209
20901.....	209	21012.....	241	21142.....	359	21263.....	392	21469.....	209
20902.....	273	21015.....	233,251,262,271	21143.....	359	21264.....	392	21470.....	209
20903.....	273	21016.....	233,251,262,271	21147.....	360	21265.....	394	21471.....	209
20904.....	208	21018.....	251,262,271	21148.....	362	21270.....	394	21475.....	263



21476.....	263	21709.....	209	21823.....	310	21960.....	310	22091.....	421
21500.....	313	21710.....	241	21824.....	310	21961.....	310	22092.....	421
21502.....	313	21711.....	209	21825.....	310	21962.....	310	22093.....	421
21503.....	313	21712.....	209	21826.....	310	21982.....	287	22094.....	422
21505.....	313	21713.....	213	21827.....	310	21983.....	287	22095.....	422
21506.....	313	21714.....	209	21828.....	310	21984.....	288	22096.....	422
21508.....	313	21715.....	209	21829.....	310	21991.....	286,293	22097.....	422
21509.....	313	21716.....	209	21830.....	310	21992.....	293	22098.....	426
21511.....	313	21717.....	210	21831.....	310	21997.....	286,292	22099.....	426
21512.....	313	21718.....	210	21832.....	310	21999.....	286	22100.....	425
21514.....	313	21719.....	213	21833.....	288,310	22004.....	300	22101.....	425
21515.....	313	21720.....	360	21834.....	310	22005.....	300	22102.....	426
21517.....	313	21721.....	360	21835.....	310	22006.....	300	22103.....	426
21540.....	311	21722.....	360	21836.....	310	22007.....	300	22104.....	436
21541.....	311	21723.....	362	21837.....	310	22008.....	300	22111.....	454
21542.....	311	21724.....	357	21841.....	310	22010.....	286,292	22111-PI.....	454
21543.....	311	21725.....	357	21842.....	310	22011.....	292	22112.....	454
21544.....	311	21728.....	358	21843.....	310	22012.....	293	22112-PI.....	454
21545.....	311	21729.....	358	21844.....	310	22013.....	293	22113.....	454
21546.....	311	21730.....	358	21845.....	310	22014.....	292	22113-PI.....	454
21547.....	311	21731.....	358	21846.....	310	22015.....	292	22114.....	441
21548.....	311	21732.....	358	21847.....	310	22016.....	293	22115.....	441
21549.....	311,428	21733.....	358	21848.....	310	22017.....	293	22116.....	441
21550.....	311	21734.....	358	21878.....	238	22019.....	287	22117.....	441
21551.....	311	21741.....	364	21879.....	238	22020.....	287	22118.....	437
21552.....	311	21742.....	364	21883.....	239,257	22021.....	287	22119.....	437
21553.....	311	21743.....	364	21884.....	238	22022.....	287	22120.....	437
21554.....	311	21744.....	364	21891.....	209	22023.....	288	22121.....	424
21555.....	311	21745.....	364	21892.....	209	22025.....	288	22122.....	434
21556.....	311	21746.....	364	21893.....	261	22026.....	288	22123.....	434
21557.....	311	21749.....	364	21894.....	252,278	22027.....	288	22124.....	434
21558.....	311	21750.....	364	21895.....	265	22028.....	287	22126.....	430
21559.....	311	21751.....	364	21896.....	209	22029.....	287	22127.....	430
21572.....	453	21752.....	364	21896-200.1.....	209	22030.....	287	22128.....	248
21572-R100.....	453	21753.....	364	21897.....	209	22031.....	287	22129.....	299,345
21586.....	311	21754.....	364	21897-200.5.....	209	22032.....	453	22130.....	299,345
21587.....	311	21755.....	364	21898.....	268	22038.....	436	22131.....	299,345
21588.....	311	21761.....	367	21899.....	268	22039.....	436	22132.....	299,345
21589.....	311	21762.....	367	21900.....	310	22040.....	436	22133.....	299,345
21593580.....	305	21763.....	367	21901.....	310	22041.....	436	22134.....	299,345
21601.....	282	21764.....	367	21902.....	310,428	22042.....	436	22135.....	299,345
21610.....	246,294	21765.....	367	21903.....	310	22043.....	436	22136.....	302
21620.....	256	21766.....	367	21904.....	310	22044.....	436	22137.....	302
21621.....	256	21767.....	367	21905.....	310	22045.....	436	22138.....	302
21642.....	216	21768.....	367	21906.....	310	22046.....	436	22139.....	302
21646.....	300	21769.....	365	21907.....	310	22047.....	436	22140.....	303
21647.....	299-300,345	21770.....	365	21908.....	310	22049.....	436	22141.....	303
21648.....	299,345	21771.....	365	21909.....	310	22050.....	436	22142.....	303
21649.....	298	21772.....	365	21910.....	310	22051.....	436	22143.....	303
21650.....	142	21773.....	365	21911.....	310,428	22052.....	436	22144.....	295
21651.....	142	21774.....	365	21915.....	310	22053.....	436	22145.....	295
21653.....	298	21775.....	355	21916.....	310	22054.....	436	22146.....	295
21655.....	298	21776.....	355-356	21917.....	310	22055.....	436	22147.....	295
21657.....	294	21777.....	355-356	21918.....	310	22056.....	436	22148.....	295
21666.....	302	21779.....	355	21919.....	310	22057.....	436	22149.....	295
21667.....	302	21780.....	355	21920.....	310	22058.....	436	22150.....	295
21668.....	302	21782.....	355	21923.....	310	22061.....	288	22151.....	295
21669.....	302	21787.....	356	21924.....	310	22062.....	288	22152.....	295
21671.....	297	21788.....	356	21925.....	310	22064.....	246,294	22153.....	295
21682.....	256	21795.....	360	21926.....	310	22065.....	237,247,280	22154.....	295
21683.....	256	21796.....	369	21927.....	310	22066.....	283	22155.....	295
21685.....	248	21797.....	369	21928.....	310	22067.....	259	22156.....	299,345
21686.....	256	21798.....	369	21929.....	310	22068.....	245,254	22171.....	212
21687.....	256	21799.....	369	21930.....	310	22069.....	245,254	22172.....	212
21688.....	256	21800.....	310	21931.....	310	22071.....	255	22173.....	212
21689.....	256	21801.....	310	21932.....	310	22072.....	212	22174.....	212
21690.....	261	21802.....	310	21933.....	288,310	22073.....	212	22175.....	242
21691.....	248	21803.....	310	21934.....	310	22074.....	215	22176.....	242
21694.....	256	21804.....	310	21935.....	310	22075.....	215	22177.....	242
21695.....	256	21805.....	310	21936.....	310,428	22076.....	246	22178.....	242
21696.....	256	21806.....	310	21937.....	310	22077.....	257	22179.....	255
21697.....	256	21807.....	310	21941.....	310	22078.....	242-243,245	22180.....	255
21699.....	255	21808.....	310	21942.....	310	22079.....	265	22181.....	237
21700.....	206	21809.....	310	21943.....	310	22080.....	246	22182.....	266,277
21701.....	206	21810.....	310	21944.....	310	22081.....	292	22183.....	270,277
21702.....	206	21811.....	310	21945.....	310	22082.....	271	22184.....	261,277
21703.....	206	21815.....	310	21946.....	310	22083.....	240	22185.....	264,277
21704.....	206	21816.....	310	21947.....	310	22084.....	240	22186.....	248,277
21705.....	213	21817.....	310	21948.....	310	22085.....	240	22187.....	283
21706.....	213	21818.....	310	21957.....	310	22086.....	240	22188.....	316
21707.....	213	21819.....	310	21958.....	310	22089.....	268	22189.....	316
21708.....	209	21820.....	310	21959.....	310	22090.....	421	22190.....	316

Catalog # Product Index

22191	316	22289	214	22434	354	22535	311	22622	319
22192	316	22292	348,395	22435	354	22536	313	22623	319
22193	316	22294	348,395	22436	354	22537	313	22624	319
22194	316	22297	348,395	22437	354	22538	313	22627	319
22195	316	22298	348,395	22438	354	22539	313	22628	313
22196	316	22318	264	22439	354	22540	309	22629	313
22197	316	22319	264	22440	354	22541	309	22630	266
22198	316	22320	264	22441	367	22542	309	22631	266
22199	316	22328	256	22442	367	22543	309	22632	266
22200	316	22329	254	22443	367	22544	309	22633	238
22201	316	22330	270,278	22444	367	22545	309	22634	238
22204	316	22331	265	22445	303	22546	309	22635	238
22205	316	22333	266,278	22446	303	22547	309	22636	238
22209	316	22334	266,281	22447	303	22548	309	22637	238
22210	225	22335	261,278	22452	302	22549	309	22652	220,286
22211	225	22336	234	22454	271	22550	309	22653	220,286
22212	225	22337	258	22455	271,281	22551	309	22654	219-220,286
22213	224	22343	258	22456	289	22552	309	22655	219-220,286
22214	224	22344	288	22457	289	22553	309	22656	219,221
22215	224	22345	288	22458	289	22554	309	22656-R	221
22216	224	22346	288	22459	289	22555	309	22657	219-221,286
22217	224	22347	239	22460	289	22556	309	22658	219-220,286
22218	224	22348	239	22461	289	22557	309	22664	244
22219	225	22349	234	22462	289	22558	309	22665	244
22220	229	22350	234	22463	289	22559	309	22666	244
22221	226,229,269	22352	234	22464	290	22560	145	22667	244
22222	226,229,269	22353	207	22465	290	22561	309	22668	244
22223	226,234	22354	259	22466	290	22562	309	22669	244
22224	226,234	22355	259	22467	290	22563	309	22670	244
22225	226,234	22356	318	22468	290	22564	309	22671	244
22226	235,377	22357	318	22469	290	22565	309	22672	244
22227	235,377	22358	371	22470	290	22566	309	22673	244
22228	235,377	22359	371	22471	290	22567	309	22674	244
22229	235,377	22360	371	22472	290	22568	309	22683	260
22230	235,377	22361	371	22473	290	22569	309	22684	234
22231	267	22362	371	22474	290	22570	309	22685	252
22232	267	22363	258	22475	290	22571	309	22686	244
22233	267	22364320	301	22476	290	22573	309	22687	253
22234	267	22364330	301	22477	290	22574	309	22688	265
22235	267	22364350	301	22478	290	22575	309	22689	237
22236	267	22367	288	22479	290	22576	309	22690	453
22237	267	22368	302	22480	290	22577	309	22691	453
22238	267	22369	302	22481	290	22578	309	22692	258
22239	267	22370	302	22482	323	22579	309	22695	258
22240	267	22371	302	22483	323	22580	309	22697	368
22241	234	22372	302	22485	319	22581	309	22699	368
22242	234	22373	302	22486	319	22582	309	22700	368
22243	267	22374	302	22487	319	22583	309	22701	368
22244	267	22375	302	22488	315	22584	309	22702	368
22245	267	22376	303	22489	315	22585	309	22703	368
22246	267	22377	303	22490	315	22586	309	22704	368
22247	267	22378	303	22491	315	22587	309	22705	368
22248	267	22379	303	22492	315	22588	309	22706	368
22249	267	22380	303	22493	315	22589	309	22707	356
22250	267	22400	204	22494	315	22590	309	22709	356
22251	384	22401	204	22495	315	22591	309	22710	356
22252	380,384	22402	204	22496	315	22592	309	22711	356
22253	380,384	22403	204	22497	315	22593	309	22712	356
22254	380,384	22404	204	22500	314	22594	309	22713	368
22255	380,384	22405	204	22501	314	22595	309	22714	368
22256	375	22406	204	22502	314	22596	309	22715	368
22266	214	22407	204	22503	314	22597	309	22716	368
22267	214	22408	204	22504	314	22600	294	22717	368
22268	206	22409	204	22505	314	22601	294	22718	368
22269	206	22410	204	22506	314	22602	294	22719	368
22270	206	22411	214	22507	314	22603	294	22720	368
22271	206	22412	214	22508	314	22604	294	22721	243
22272	206	22413	214	22509	314	22605	294	22722	243
22273	206	22414	214	22520	311	22606	294	22723	243
22274	212	22419	207	22521	311	22607	294	22724	242-243
22275	212	22420	207	22522	311	22608	264	22725	243
22276	212	22421	209	22523	311	22609	264	22726	243
22277	212	22422	209	22524	311	22610	309	22727	243
22278	213	22423	262	22525	311	22611	309	22728	242-243
22279	213	22424	142,249	22526	311	22612	309	22729	242-243
22282	273	22425	142,249	22527	311	22613	309	22730	243
22283	212	22426	142,249	22528	311	22614	309	22731	243
22284	212	22427	142,249	22530	311	22615	309	22732	242-243
22285	212	22428	142,249	22531	311	22616	309	22733	243
22286	212	22429	142,249	22532	311	22617	309	22734	243
22287	212	22430	142,249	22533	311	22618	309	22735	243
22288	214	22433	354	22534	311	22620	309	22736	243

22737.....	348,395	22867.....	311	22949.....	428	23074.....	253	23163.....	308
22741.....	348,395	22868.....	311	22950.....	436	23075.....	253	23164.....	308
22742.....	348,395	22869.....	311	22951.....	436	23078.....	256	23165.....	308
22743.....	348,395	22870.....	311	22952.....	436	23079.....	256	23166.....	308
22744.....	348,395	22871.....	311	22953.....	436	23080.....	269	23167.....	308
22745.....	348,395	22872.....	311	22954.....	441	23082.....	366	23168.....	308
22746.....	348,395	22873.....	311	22955.....	441	23083.....	366	23169.....	308
22747.....	348,395	22875.....	311	22956.....	441	23084.....	366	23170.....	308
22748.....	348,395	22876.....	311	22957.....	441	23085.....	366	23171.....	308
22749.....	380	22878.....	311	22964.....	441	23086.....	366	23172.....	308
22751.....	380	22879.....	311	22965.....	441	23087.....	366	23173.....	308
22753.....	380	22880.....	311	22966.....	436	23088.....	366	23174.....	308
22754.....	380	22881.....	311	22967.....	436	23089.....	366	23175.....	308
22755.....	380	22882.....	311	22968.....	436	23090.....	366	23176.....	308
22756.....	380	22883.....	311	22969.....	456	23091.....	366	23177.....	308
22757.....	380	22884.....	311	22970.....	456	23092.....	366	23178.....	308
22758.....	380	22885.....	311	22972.....	265	23093.....	366	23179.....	304,308
22759.....	380	22886.....	311	22973.....	204	23094.....	366	23180.....	308
22761.....	380	22887.....	311	22974.....	204	23095.....	366	23181.....	308
22762.....	380	22889.....	311	22975.....	204	23100.....	251,262,271,308	23182.....	308
22763.....	380	22890.....	311	22976.....	204	23101.....	308	23183.....	308
22764.....	380	22891.....	311	22979.....	206	23102.....	308	23184.....	304,308
22765.....	380	22892.....	311	22980.....	206	23103.....	308	23185.....	308
22766.....	373	22893.....	311	22983.....	205	23104.....	308	23186.....	304,308
22767.....	373	22894.....	311	22984.....	205	23105.....	308	23187.....	308
22768.....	373	22896.....	314	22985.....	205	23106.....	308	23188.....	308
22769.....	373	22897.....	314	22986.....	210	23107.....	308	23189.....	308
22770.....	373	22898.....	315	22987.....	210	23108.....	308	23190.....	308
22771.....	373	22899.....	315	22990.....	211	23109.....	308	23191.....	308
22772.....	373	22900.....	315	22991.....	211	23110.....	308	23192.....	308
22773.....	373	22901.....	315	22992.....	211	23111.....	308	23193.....	308
22774.....	373	22902.....	315	22993.....	211	23112.....	251,262,271,308	23194.....	308
22775.....	373	22903.....	315	22997.....	270,281	23113.....	308	23195.....	308
22776.....	373	22904.....	309	22998.....	281,317	23114.....	308	23196.....	308
22777.....	373	22905.....	309	22999.....	270,281,317	23115.....	308	23197.....	307
22778.....	373	22906.....	309	23001.....	317	23116.....	308	23198.....	316
22779.....	260	22907.....	309	23002.....	317	23117.....	308	23199.....	316
22780.....	260	22909.....	309	23004.....	317	23118.....	308	23200.....	316
22781.....	263	22910.....	309	23009.....	319	23119.....	308	23201.....	316
22782.....	235,260,263,265	22911.....	309	23010.....	255	23120.....	308	23202.....	316
22783.....	393	22912.....	309	23011.....	318	23121.....	308	23203.....	316
22784.....	393	22914.....	314	23012.....	318	23122.....	308	23204.....	316
22788.....	363	22915.....	314	23015.....	279	23123.....	308	23205.....	316
22789.....	363	22919.....	430	23018.....	237,247	23124.....	308	23206.....	316
22790.....	363	22920.....	430	23019.....	261	23125.....	308	23207.....	316
22791.....	363	22921.....	454	23020.....	276	23126.....	308	23208.....	316
22792.....	363	22921-PI.....	454	23026.....	279	23127.....	308	23209.....	316
22793.....	363	22922.....	454	23027.....	279	23128.....	308	23211.....	316
22800.....	246,294	22922-PI.....	454	23029.....	318	23129.....	304,308	23214.....	316
22809.....	235	22923.....	454	23030.....	318	23130.....	308	23215.....	316
22810.....	235	22923-PI.....	454	23031.....	246,294	23131.....	308	23250.....	214
22811.....	235	22924.....	454	23032.....	246,294	23132.....	308	23251.....	214
22812.....	235,260,263,265	22924-PI.....	454	23033.....	317	23133.....	308	23252.....	214
22813.....	235	22925.....	454	23034.....	257,281,317	23134.....	304,308	23253.....	214
22814.....	235	22925-PI.....	454	23035.....	245,254	23135.....	308	23254.....	214
22815.....	235,260,263,265	22926.....	454	23036.....	254	23136.....	304,308	23255.....	214
22820.....	246,294	22926-PI.....	454	23037.....	254	23137.....	308	23256.....	214
22831.....	367	22927.....	454	23038.....	264	23138.....	308	23257.....	214
22832.....	367	22927-PI.....	454	23039.....	246	23139.....	308	23300.1.....	197
22833.....	367	22928.....	454	23040.....	246	23140.....	308	23300.5.....	197
22834.....	367	22928-PI.....	454	23041.....	254	23141.....	307	23300.25.....	197
22835.....	367	22929.....	454	23042.....	246	23142.....	316	23301.1.....	197
22836.....	367	22929-PI.....	454	23043.....	254	23143.....	316	23301.5.....	197
22840.....	457	22930.....	428	23044.....	254	23144.....	316	23301.25.....	197
22841.....	457	22931.....	428	23045.....	254	23145.....	316	23302.1.....	197
22842.....	457	22932.....	428	23052.....	254	23146.....	316	23302.5.....	197
22843.....	457	22933.....	428	23053.....	254	23147.....	316	23302.25.....	197
22844.....	457	22934.....	428	23057.....	268	23148.....	316	23303.1.....	197
22845.....	457	22935.....	428	23058.....	268	23149.....	316	23303.5.....	197
22846.....	457	22936.....	428	23061.....	264	23150.....	308	23303.25.....	197
22847.....	457	22937.....	428	23062.....	264	23151.....	308	23305.1.....	197
22848.....	457	22938.....	428	23063.....	264	23152.....	308	23305.5.....	197
22849.....	457	22939.....	428	23064.....	254	23153.....	308	23305.25.....	197
22850.....	457	22940.....	428	23065.....	296	23154.....	308	23306.1.....	198
22855.....	258	22941.....	428	23066.....	296	23155.....	308	23306.5.....	198
22856.....	358	22942.....	428	23067.....	296	23156.....	308	23306.25.....	198
22857.....	358	22943.....	428	23068.....	296	23157.....	308	23307.1.....	198
22858.....	278	22944.....	428	23069.....	296	23158.....	308	23307.5.....	198
22863.....	311	22945.....	428	23070.....	296	23159.....	308	23308.1.....	197
22864.....	311	22946.....	428	23071.....	296	23160.....	308	23308.5.....	197
22865.....	311	22947.....	428	23072.....	253	23161.....	308	23308.25.....	197
22866.....	311	22948.....	428	23073.....	253	23162.....	308	23309.1.....	197

Catalog # Product Index

23309.5.....	197	23415.....	241	23466.1.....	199	23987.....	408	24130.....	454
23310.1.....	197	23416.....	241	23466.5.....	199	23988.....	408	24130-PI.....	454
23310.5.....	197	23417.....	241	23467.1.....	197	23989.....	408	24131.....	454
23310.25.....	197	23418.....	240	23467.5.....	197	23990.....	407	24131-PI.....	454
23311.1.....	198	23419.....	240	23467.25.....	197	23991.....	405	24132.....	454
23311.5.....	198	23420.....	240	23468.1.....	197	23992.....	405	24132-PI.....	454
23311.25.....	198	23428.10.....	198	23468.5.....	197	23993.....	407	24133.....	454
23312.1.....	197	23429.10.....	198	23471.1.....	201	23994.....	407	24133-PI.....	454
23312.5.....	197	23430.1.....	198	23471.10.....	201	23995.....	407	24134.....	454
23312.25.....	197	23430.5.....	198	23472.1.....	201	23996.....	415	24134-PI.....	454
23313.1.....	197	23431.10.....	198	23472.10.....	201	23997.....	405	24148.....	423
23313.5.....	197	23432.10.....	198	23897.....	380	23998.....	415	24151.....	432
23313.25.....	197	23433.10.....	198	23899.....	380	23999.....	416	24160.....	425
23314.1.....	197	23434.1.....	198	23900.....	380	24002.....	400	24161.....	425
23314.5.....	197	23434.5.....	198	23901.....	384	24003.....	400	24162.....	425
23314.25.....	197	23435.1.....	201	23902.....	384	24004.....	402	24163.....	425
23315.1.....	197	23435.5.....	201	23903.....	384	24008.....	400	24164.....	425
23315.5.....	197	23435.25.....	201	23904.....	384	24011.....	401	24165.....	425
23315.25.....	197	23436.1.....	202	23905.....	385	24014.....	400	24166.....	425
23316.1.....	197	23436.5.....	202	23907.....	380	24016.....	400	24167.....	425
23316.5.....	197	23437.1.....	202	23908.....	383	24017.....	402	24168.....	425
23316.25.....	197	23437.5.....	202	23909.....	383	24020.....	402	24169.....	425
23317.1.....	200	23438.1.....	202	23910.....	383	24021.....	402	24170.....	426,428
23317.5.....	200	23438.5.....	202	23911.....	383	24025.....	402	24171.....	426,428
23317.25.....	200	23439.1.....	202	23912.....	383	24029.....	402	24185.....	435
23318.1.....	201	23439.5.....	202	23913.....	383	24030.....	402	24186.....	435
23318.5.....	201	23439.25.....	202	23914.....	383	24031.....	397	24187.....	435
23318.25.....	201	23440.1.....	202	23915.....	383	24032.....	397	24188.....	435
23319.1.....	201	23440.5.....	202	23916.....	383	24034.....	397	24189.....	435
23319.5.....	201	23440.25.....	202	23917.....	383	24035.....	397	24190.....	435
23319.25.....	201	23441.1.....	202	23918.....	383	24036.....	397	24194.....	435
23320.1.....	201	23441.5.....	202	23919.....	383	24038.....	397	24195.....	435
23320.5.....	201	23441.25.....	202	23920.....	383	24048.....	402	24196.....	435
23321.1.....	201	23442.1.....	202	23921.....	383	24049.....	398	24205.....	435
23321.5.....	201	23442.5.....	202	23922.....	383	24050.....	397	24206.....	435
23321.25.....	201	23442.25.....	202	23923.....	383	24051.....	397	24207.....	435
23322.1.....	201	23443.1.....	202	23924.....	383	24052.....	397	24208.....	435
23322.5.....	201	23443.5.....	202	23925.....	383	24053.....	442	24215.....	432
23323.1.....	202	23444.1.....	202	23926.....	383	24054.....	439	24216.....	425
23323.5.....	202	23444.5.....	202	23927.....	383	24055.....	439	24217.....	425
23323.25.....	202	23445.1.....	202	23928.....	383	24056.....	439	24218.....	426
23324.1.....	202	23445.5.....	202	23929.....	383	24057.....	439	24219.....	426
23324.5.....	202	23446.1.....	202	23930.....	383	24058.....	439	24226.....	432
23324.25.....	202	23446.5.....	202	23931.....	383	24059.....	439	24229.....	426
23325.1.....	202	23447.1.....	202	23932.....	383	24060.....	439	24230.....	442
23325.5.....	202	23447.5.....	202	23933.....	383	24061.....	439	24232.....	426
23325.25.....	202	23448.1.....	202	23934.....	383	24062.....	439	24233.....	426
23326.1.....	202	23448.5.....	202	23935.....	383	24063.....	439	24234.....	426
23326.5.....	202	23449.1.....	200	23936.....	383	24064.....	439	24235.....	426
23326.25.....	202	23449.5.....	200	23938.....	383	24065.....	439	24236.....	426
23327.1.....	202	23450.1.....	200	23939.....	383	24066.....	439	24237.....	426
23327.5.....	202	23450.5.....	200	23940.....	383	24067.....	439	24238.....	426
23328.1.....	199	23451.1.....	200	23941.....	383	24068.....	440	24239.....	426
23328.5.....	199	23451.5.....	200	23942.....	383	24069.....	440	24245.....	426
23329.1.....	199	23452.1.....	200	23943.....	383	24070.....	440	24246.....	426
23329.5.....	199	23452.5.....	200	23944.....	383	24071.....	440	24247.....	426
23329.25.....	199	23453.1.....	200	23945.....	383	24072.....	440	24248.....	426
23330.1.....	199	23453.5.....	200	23946.....	383	24073.....	440	24249.....	426
23330.5.....	199	23454.1.....	200	23947.....	383	24074.....	440	24255.....	426
23331.1.....	199	23454.5.....	200	23948.....	383	24075.....	439	24256.....	426
23331.5.....	199	23455.1.....	201	23949.....	383	24076.....	439	24257.....	426
23332.1.....	199	23455.5.....	201	23966.....	408	24077.....	439	24258.....	426
23332.5.....	199	23456.1.....	201	23967.....	408	24078.....	439	24259.....	426
23333.1.....	197	23456.5.....	201	23968.....	408	24079.....	439	24260.....	426
23333.5.....	197	23457.1.....	201	23969.....	408	24080.....	439	24261.....	426
23333.25.....	197	23457.5.....	201	23970.....	408	24081.....	439	24262.....	426
23336.1.....	201	23458.1.....	201	23971.....	408	24082.....	439	24263.....	426
23336.5.....	201	23458.5.....	201	23972.....	408	24083.....	439	24264.....	426
23388.....	442	23458.25.....	201	23973.....	408	24084.....	439	24265.....	426
23389.....	442	23459.1.....	201	23974.....	408	24085.....	439	24266.....	426
23396.....	371	23459.5.....	201	23975.....	408	24086.....	439	24267.....	431
23397.....	371	23460.1.....	199	23976.....	408	24087.....	439	24268.....	424
23398.....	371	23460.5.....	199	23977.....	408	24088.....	439	24269.....	423
23399.....	371	23461.1.....	199	23978.....	408	24089.....	439	24270.....	423
23400.....	306	23461.5.....	199	23979.....	408	24090.....	439	24282.....	431
23401.....	306	23461.25.....	199	23980.....	408	24091.....	439	24285.....	424
23402.....	306	23462.1.....	199	23981.....	408	24100.....	423	24295.....	441
23406.....	240	23462.5.....	199	23982.....	408	24104.....	423	24323.....	245
23411.....	240	23463.1.....	199	23983.....	408	24108.....	423	24324.....	216
23412.....	240	23463.5.....	199	23984.....	408	24120.....	423,428	24351.....	357
23413.....	240	23465.1.....	199	23985.....	408	24121.....	435	24352.....	357
23414.....	240	23465.5.....	199	23986.....	408	24129.....	452	24353.....	357



Catalog # Product Index

24354.....	357	24545.....	388	24658.....	217,247,280,364	24769.....	387	24871.....	392
24355.....	357	24546.....	388	24659.....	364	24770.....	388	24880.....	391
24356.....	357	24547.....	388	24662.....	365	24771.....	388	24881.....	391
24357.....	357	24548.....	388	24663.....	365	24772.....	388	24882.....	391
24358.....	357	24549.....	388	24664.....	365	24773.....	388	24883.....	391
24359.....	357	24551.....	388	24665.....	365	24774.....	388	24884.....	391
24360.....	357	24555.....	388	24668.....	359	24775.....	388	24885.....	391
24361.....	357	24556.....	388	24669.....	359	24776.....	388	24886.....	391
24362.....	357	24557.....	389	24670.....	359	24777.....	388	24887.....	391
24363.....	357	24558.....	389	24671.....	358	24778.....	388	24888.....	391
24364.....	357	24559.....	389	24672.....	358	24779.....	388	24889.....	391
24365.....	357	24560.....	389	24673.....	358	24780.....	374	24890.....	391
24366.....	357	24561.....	389	24674.....	358	24781.....	374	24891.....	391
24367.....	357	24562.....	389	24675.....	362	24782.....	374	24892.....	391
24368.....	357	24563.....	389	24676.....	362	24783.....	374	24894.....	375-376
24369.....	357	24564.....	389	24677.....	362	24784.....	374	24895.....	374
24370.....	357	24567.....	389	24678.....	365	24785.....	374	24896.....	269
24383.....	357	24568.....	389	24679.....	365	24786.....	374	24898.....	391
24384.....	357	24571.....	389	24680.....	365	24787.....	374	24899.....	265
24384B.....	357	24572.....	389	24681.....	365	24789.....	375	24900.....	370
24384G.....	357	24575.....	389	24683.....	367	24790.....	374	24901.....	370
24384R.....	357	24576.....	389	24684.....	367	24791.....	374	24902.....	370
24384Y.....	357	24578.....	389	24685.....	367	24794.....	374	24903.....	370
24385.....	357	24581.....	389	24686.....	367	24795.....	374	24904.....	370
24386.....	357	24582.....	389	24691.....	355	24799.....	374	24905.....	370
24433.....	358	24584.....	389	24692.....	355	24802.....	390	24906.....	370
24434.....	358	24591.....	389	24693.....	355	24803.....	387,390	24907.....	370
24443.....	358	24592.....	374,376	24694.....	369,413-414	24804.....	390	24912.....	224
24444.....	358	24593.....	374	24699.....	252	24805.....	390	24913.....	297
24445.....	358	24594.....	374	24700.....	386	24806.....	390	24914.....	297
24446.....	358	24595.....	374,376	24701.....	386	24807.....	390	24915.....	297
24453.....	358	24596.....	374	24702.....	386	24808.....	392	24916.....	269
24454.....	358	24597.....	374	24703.....	386	24809.....	392	24917.....	269
24455.....	358	24598.....	374	24704.....	386	24810.....	381	24918.....	236
24456.....	358	24599.....	374	24705.....	386	24811.....	381	24919.....	376,390
24473.....	359	24600.....	374,376	24706.....	386	24812.....	381	24920.....	380
24474.....	359	24605.....	389-390	24707.....	386	24813.....	381	24921.....	380
24485.....	359	24606.....	390	24708.....	386	24814.....	381	24922.....	380,384
24486.....	359	24607.....	390	24709.....	386	24815.....	381	24923.....	378
24487.....	359	24608.....	390	24710.....	386	24816.....	381	24924.....	384
24488.....	359	24609.....	390	24711.....	386	24818.....	381	24925.....	380,384
24493.....	359	24615.....	391	24712.....	386	24819.....	253	24926.....	380,384
24494.....	359	24616.....	391	24713.....	386	24820.....	375	24927.....	384-385
24495.....	359	24617.....	382,386	24715.....	386	24821.....	375-376	24928.....	380,384
24496.....	359	24619.....	360	24716.....	386	24823.....	375	24929.....	380,384-385
24497.....	359	24620.....	360	24717.....	389	24824.....	375	24930.....	378
24498.....	359	24621.....	360	24718.....	387	24825.....	375	24932.....	380,384
24499.....	359	24622.....	360	24719.....	387	24826.....	375	24933.....	380,385
24500.....	359	24623.....	360	24720.....	387	24827.....	226,266	24934.....	384
24501.....	359	24624.....	360	24722.....	387	24828.....	226,266	24935.....	385
24502.....	359	24625.....	360	24724.....	389	24829.....	226,266	24937.....	270
24503.....	359	24626.....	362	24725.....	389	24830.....	388	24938.....	382,386
24504.....	359	24627.....	362	24726.....	389	24831.....	388	24939.....	386,390
24505.....	359	24628.....	362	24727.....	389	24833.....	388	24940.....	390
24506.....	359	24629.....	362	24728.....	389	24834.....	388	24941.....	392
24508.....	355	24630.....	361	24729.....	389	24835.....	388	24942.....	390
24510.....	355	24631.....	361	24730.....	389	24838.....	388	24943.....	390
24511.....	355	24632.....	361	24734.....	389	24839.....	388	24944.....	390
24512.....	355	24633.....	361	24735.....	389	24840.....	382	24945.....	392
24513.....	355	24634.....	361	24737.....	389	24841.....	382	24952.....	381
24516.....	355	24635.....	361	24738.....	389	24843.....	382	24953.....	381
24517.....	355	24636.....	361	24739.....	389	24844.....	382	24956.....	378
24518.....	355	24637.....	361	24741.....	389	24845.....	382	24961.....	384
24518A.....	355	24638.....	361	24742.....	389	24846.....	382	24962.....	384
24519.....	355	24639.....	361	24743.....	389	24848.....	225,250,274	24967.....	386
24520.....	355	24640.....	361	24747.....	382	24849.....	225,250,274	24969.....	269
24529.....	348,395	24641.....	361	24748.....	382	24852.....	378	24970.....	269
24530.....	382,386	24642.....	362	24749.....	382	24854.....	378	24971.....	268
24531.....	386	24643.....	362	24750.....	389	24855.....	378	24972.....	268
24532.....	386	24644.....	362	24752.....	389	24857.....	378	24973.....	269
24533.....	386	24645.....	362	24755.....	389	24858.....	378	24974.....	209
24534.....	386	24646.....	358	24757.....	389	24860.....	394	24975.....	209
24535.....	386	24647.....	358	24759.....	389,394	24861.....	394	24979.....	211
24536.....	386	24648.....	358	24760.....	389	24862.....	394	24980.....	327
24537.....	386	24649.....	358	24761.....	389	24863.....	394	24981.....	327
24538.....	386	24651.....	357	24762.....	389	24864.....	394	24982.....	327
24539.....	386	24652.....	357	24763.....	389-391	24865.....	394	24983.....	327
24540.....	386	24653.....	357	24764.....	390-391	24866.....	392	24984.....	327
24541.....	387	24654.....	364	24765.....	390-391	24867.....	392	24985.....	327
24542.....	387	24655.....	364	24766.....	387	24868.....	392	24986.....	326
24543.....	387	24656.....	364	24767.....	387	24869.....	392	24993.....	188
24544.....	387	24657.....	364	24768.....	387	24870.....	392	24994.....	188

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24995.....	188	25115.....	347	25279.....	330	25394.....	414	25576.....	145
24996.....	188	25116.....	347	25280.....	330	25399.....	324	25577.....	145
24997.....	188	25117.....	347	25281.....	330	25400.....	144	25578.....	145
24998.....	427	25118.....	347	25282.....	327	25401.....	144	25579.....	145
24999.....	427	25119.....	347	25284.....	326	25404.....	334	25580.....	145
25008.....	342	25120.....	347	25287.....	327	25405.....	334	25581.....	145
25014.....	342	25121.....	347	25288.....	327	25408.....	334	25582.....	145
25015.....	336	25122.....	347	25289.....	327	25409.....	334	25583.....	145
25016.....	336	25123.....	347	25290.....	327	25410.....	334	25584.....	145
25017.....	346	25124.....	347	25291.....	327	25412.....	333	25585.....	145
25018.....	346	25125.....	347	25292.....	327	25417.....	333	25586.....	145
25020.....	346	25126.....	347	25294.....	327	25420.....	333	25587.....	145
25021.....	190	25127.....	347	25295.....	327	25428.....	331	25588.....	145
25022.....	189-190	25128.....	347	25300.....	340	25429.....	331	25589.....	145
25023.....	189-190	25129.....	347	25301.....	340	25431.....	325	25590.....	145
25028.....	144	25130.....	347	25302.....	340	25432.....	325	25591.....	145
25030.....	144	25131.....	347	25303.....	340	25433.....	325	25592.....	145
25032.....	145	25132.....	347	25304.....	340	25434.....	325	25593.....	145
25033.....	145	25133.....	347	25305.....	340	25435.....	325	25594.....	145
25034.....	145	25134.....	347	25306.....	337,340	25436.....	325	25595.....	145
25035.....	145	25135.....	347	25307.....	337,340	25437.....	325	25596.....	145
25036.....	145	25138.....	343	25308.....	337	25438.....	325	25597.....	145
25037.....	145	25139.....	323	25309.....	337	25466.....	323	25598.....	145
25038.....	145	25143.....	329	25310.....	337	25468.....	326	25599.....	145
25039.....	145	25144.....	329	25311.....	340,342	25469.....	326	25800.....	162
25040.....	190	25145.....	329	25312.....	340,342	25470.....	326	25801.....	162
25041.....	190	25146.....	329	25313.....	342	25471.....	326	25802.....	162
25042.....	144	25147.....	338	25314.....	342	25473.....	327	25803.....	162
25044.....	144	25148.....	338	25315.....	342	25474.....	328	25804.....	162
25045.....	145	25149.....	338	25319.....	340	25475.....	328	25805.....	162
25046.....	145	25150.....	338	25320.....	337	25476.....	328	25806.....	162
25047.....	145	25151.....	338	25321.....	339	25477.....	328	25807.....	162
25048.....	145	25152.....	338	25323.....	336	25478.....	328	25808.....	159
25049.....	145	25153.....	338	25324.....	336	25479.....	328	25809.....	188
25050.....	145	25154.....	338	25325.....	339	25480.....	328	25810.....	188
25051.....	145	25155.....	338	25326.....	338	25481.....	328	25811.....	188
25052.....	145	25156.....	338	25327.....	338	25482.....	328	25888.....	324
25053.....	145	25157.....	338	25328.....	338	25483.....	328	25889.....	323
25054.....	145	25158.....	338	25329.....	338	25484.....	328	25890.....	323
25055.....	145	25159.....	338	25330.....	338	25485.....	328	25891.....	370,410
25056.....	145	25176.....	323	25331.....	338	25486.....	328	25892.....	370,410
25057.....	189-190	25189.....	344	25332.....	338	25487.....	328	25893.....	370,410
25058.....	321	25194.....	344	25333.....	338	25488.....	328	25894.....	370,410
25059.....	324	25238.....	342	25334.....	338	25489.....	328	25895.....	370,410
25065.....	337	25239.....	342	25335.....	338	25492.....	333	25896.....	370,410
25066.....	337	25240.....	337	25336.....	338	25493.....	333	25897.....	370,410
25067.....	337	25241.....	337	25337.....	338	25494.....	333	25898.....	370,410
25068.....	337	25242.....	337	25338.....	338	25495.....	330	25915.....	321
25069.....	337	25243.....	337	25339.....	338	25496.....	330	25916.....	321
25070.....	337	25244.....	337	25341.....	343	25497.....	331	25917.....	321
25071.....	347	25245.....	337	25342.....	343	25498.....	332	25918.....	323
25072.....	347	25246.....	337	25343.....	343	25499.....	398	25919.....	326
25073.....	347	25247.....	337	25344.....	323	25500.....	143	25920.....	326
25074.....	347	25248.....	337	25345.....	323	25501.....	143	25921.....	327
25075.....	347	25249.....	337	25347.....	323	25502.....	143	25922.....	327
25076.....	347	25250.....	337	25349.....	321	25503.....	143	25923.....	327
25077.....	347	25251.....	337	25360.....	332	25504.....	143	25924.....	327
25078.....	347	25252.....	337	25361.....	332	25506.....	143	25925.....	341
25080.....	144	25253.....	337	25362.....	332	25507.....	143	25926.....	335
25081.....	144	25254.....	337	25363.....	332	25508.....	143	25927.....	335
25082.....	189	25255.....	337	25364.....	332	25509.....	143	25928.....	335
25083.....	189	25256.....	413	25365.....	332	25510.....	143	25929.....	335
25084.....	189	25257.....	413	25366.....	332	25511.....	143	25930.....	335
25087.....	189	25258.....	321	25367.....	332	25550.....	145	25931.....	335
25088.....	189	25259.....	321	25368.....	332	25551.....	145	25932.....	335
25095.....	336	25260.....	324	25369.....	332	25552.....	145	25933.....	335
25096.....	336	25261.....	324	25370.....	332	25553.....	145	25934.....	335
25100.....	347	25262.....	324	25371.....	332	25561.....	145	25935.....	335
25101.....	347	25263.....	324	25372.....	332	25562.....	145	25936.....	335
25102.....	347	25265.....	321	25373.....	332	25563.....	145	25937.....	335
25103.....	347	25266.....	323	25374.....	331	25564.....	145	25938.....	335
25104.....	347	25267.....	323	25375.....	331	25565.....	145	25939.....	335
25105.....	347	25268.....	323	25378.....	331	25566.....	145	25940.....	190,335
25106.....	347	25269.....	323	25380.....	331	25567.....	145	25941.....	331
25107.....	347	25270.....	321	25381.....	333	25568.....	145	25942.....	330
25108.....	347	25271.....	321	25382.....	333	25569.....	145	25943.....	330
25109.....	347	25272.....	321	25384.....	333	25570.....	145	25944.....	330
25110.....	347	25273.....	323	25385.....	333	25571.....	145	25945.....	330
25111.....	347	25275.....	321	25386.....	331	25572.....	145	25946.....	330
25112.....	347	25276.....	323	25387.....	331	25573.....	145	25947.....	330
25113.....	347	25277.....	323	25388.....	331	25574.....	145	25948.....	331
25114.....	347	25278.....	321	25393.....	414	25575.....	145	25949.....	331

25950.....	331	26128.....	398	26235.....	405	26319.....	455	26413.....	343
25951.....	331	26129.....	398	26236.....	405	26320.....	455	26414.....	343
25952.....	331	26130.....	400-401	26237.....	405	26322.....	455	26415.....	343
25953.....	331	26131.....	400-401	26238.....	405	26323.....	455	26416.....	338
25954.....	331	26132.....	412,414	26239.....	405	26324.....	455	26423.....	321
25955.....	332	26134.....	414	26242.....	405	26326.....	455	26424.....	321
25956.....	332	26135.....	403	26243.....	405	26327.....	455	26425.....	325
25957.....	332	26136.....	403	26244.....	405	26336.....	428	26426.....	327
25958.....	333	26137.....	403	26245.....	405	26337.....	428	26427.....	327
25959.....	413	26138.....	276	26246.....	415	26338.....	428	26428.....	331
25988.....	402	26139.....	276	26247.....	415	26339.....	428	26429.....	331
25990.....	189-190	26140.....	276	26248.....	415	26340.....	444	26430.....	329
25991.....	400-401	26141.....	276	26249.....	407	26341.....	444	26431.....	343
25992.....	401	26142.....	408	26250.....	401	26342.....	444	26432.....	429
25993.....	412	26143.....	408	26251.....	415	26343.....	444	26433.....	429
25994.....	412	26144.....	408	26252.....	434	26344.....	444	26434.....	429
25995.....	412	26145.....	408	26253.....	434	26345.....	444	26435.....	429
25996.....	412	26146.....	408	26254.....	434	26346.....	443	26436.....	429
25997.....	412	26147.....	408	26255.....	434	26347.....	443	26437.....	429
26000.....	399	26148.....	408	26256.....	434	26348.....	443	26438.....	429
26001.....	399	26149.....	408	26257.....	434	26349.....	443	26439.....	429
26002.....	399	26150.....	408	26258.....	434	26350.....	443	26456.....	435
26003.....	399	26151.....	408	26259.....	434	26351.....	443	26457.....	435
26004.....	399	26152.....	408	26260.....	414	26352.....	443	26458.....	435
26005.....	399	26153.....	408	26261.....	217,247,280	26353.....	443	26459.....	435
26007.....	399	26155.....	408	26262.....	217,247,280	26354.....	443	26460.....	435
26008.....	399	26156.....	408	26263.....	427	26355.....	443	26461.....	435
26009.....	399	26157.....	408	26264.....	427	26356.....	444	26492.....	349
26010.....	399	26158.....	408	26265.....	427	26357.....	445	26493.....	349
26011.....	399	26159.....	415	26266.....	427	26358.....	445	26494.....	349
26012.....	399	26160.....	415	26267.....	427	26359.....	445	26495.....	349
26013.....	399	26161.....	415	26268.....	427	26360.....	445	26496.....	349
26014.....	399	26162.....	415	26269.....	427	26361.....	448,484,488, 500,552,554	26497.....	349
26015.....	399	26166.....	413	26270.....	427	26362.....	448,484,488, 500,552,554	26498.....	349
26016.....	399	26167.....	414	26271.....	427	26363.....	448	26499.....	349
26017.....	399	26168.....	414	26272.....	427	26364.....	448	26516.....	344
26018.....	399	26169.....	414	26273.....	427	26366.....	447,506	26517.....	344
26019.....	399	26170.....	414	26274.....	427	26367.....	447,488,560	26518.....	344
26020.....	399	26172.....	414	26275.....	427	26368.....	447	26519.....	329
26021.....	399	26174.....	414	26276.....	427	26369.....	447	26520.....	321
26022.....	402	26176.....	412,414	26277.....	427	26370.....	447	26521.....	327
26023.....	402	26178.....	412,414	26278.....	427	26371.....	453	26522.....	322
26024.....	402	26180.....	413	26279.....	427	26372.....	453	26526.....	322
26030.....	397	26181.....	416	26280.....	427	26373.....	456	26527.....	322
26031.....	397	26182.....	416	26281.....	427	26374.....	456	26528.....	322
26032.....	398	26183.....	416	26282.....	427	26375.....	456	26529.....	322
26033.....	403	26184.....	413	26283.....	427	26376.....	456	26530.....	322
26035.....	397	26185.....	416	26284.....	427	26377.....	456	26531.....	322
26063.....	398	26187.....	413-414	26285.....	427	26378.....	456	26532.....	322
26065.....	398	26188.....	413-414	26286.....	427	26379.....	430	26533.....	322
26077.....	400	26189.....	414	26287.....	427	26380.....	430	26534.....	322
26078.....	400	26190.....	413	26288.....	427	26381.....	430	26535.....	322
26079.....	400	26191.....	414	26289.....	427	26382.....	430	26536.....	322
26080.....	400	26193.....	398	26290.....	427	26383.....	430	26537.....	322
26081.....	400	26194.....	398	26291.....	427	26384.....	430	26538.....	340
26082.....	400	26195.....	398	26292.....	427	26385.....	423	26539.....	340
26083.....	400-401	26204.....	403	26293.....	427	26386.....	423	26540.....	340
26084.....	400-401	26206.....	397	26294.....	427	26387.....	423	26541.....	340
26085.....	397	26207.....	397	26295.....	427	26388.....	423	26542.....	340
26086.....	397	26209.....	426	26296.....	427	26389.....	423	26543.....	341
26087.....	398	26210.....	426	26297.....	455	26390.....	423	26544.....	341
26088.....	398	26211.....	426	26298.....	455	26392.....	343	26545.....	341
26091.....	398	26212.....	426	26299.....	455	26393.....	323	26546.....	347
26092.....	398	26215.....	405	26300.....	455	26395.....	341	26547.....	331
26093.....	398	26216.....	405	26301.....	455	26396.....	341,343	26549.....	342
26096.....	413	26217.....	405	26302.....	455	26397.....	341,343	26550.....	341
26098.....	413	26218.....	405	26303.....	455	26398.....	341,343	26551.....	340
26100.....	413	26219.....	405	26304.....	455	26399.....	341,343	26552.....	379
26110.....	412-413	26220.....	405	26305.....	455	26400.....	346	26553.....	379
26112.....	413	26221.....	405	26306.....	455	26401.....	346	26554.....	379
26114.....	413	26222.....	405	26307.....	455	26402.....	346	26555.....	379
26116.....	413	26223.....	405	26308.....	455	26403.....	346	26556.....	379
26118.....	413	26224.....	405	26309.....	455	26404.....	346	26557.....	379
26119.....	413	26225.....	405	26310.....	455	26406.....	346	26558.....	379
26120.....	413	26226.....	405	26311.....	455	26407.....	347	26560.....	379
26121.....	369,413	26228.....	397	26312.....	455	26408.....	347	26562.....	357
26122.....	369,413	26229.....	413	26313.....	455	26409.....	343	26563.....	357
26123.....	405	26230.....	407	26314.....	455	26410.....	346	26564.....	358
26124.....	405	26231.....	407	26315.....	455	26411.....	343	26565.....	358
26125.....	405	26232.....	407	26316.....	455	26412.....	343	26566.....	358
26126.....	405	26233.....	407	26317.....	455			26567.....	358
26127.....	398	26234.....	407	26318.....	455			26568.....	358

Catalog # Product Index

26569.....	358	27142.....	223,236,260,263	29029.....	313	29111.....	314	29193.....	315
26570.....	358	27143.....	223,236,260,263	29030.....	313	29112.....	314	29194.....	314
26571.....	358	27145.....	223	29031.....	313	29113.....	314	29195.....	314
26572.....	359	27146.....	223	29032.....	313	29114.....	314	29196.....	314
26573.....	359	27148.....	223	29033.....	313	29115.....	315	29197.....	314
26574.....	359	27149.....	223	29034.....	313	29116.....	315	29198.....	314
26575.....	359	27151.....	223	29035.....	313	29117.....	315	29199.....	314
26576.....	359	27152.....	223	29036.....	313	29118.....	315	29200.....	314
26577.....	359	27154.....	223,265	29037.....	313	29119.....	315	29201.....	314
26578.....	359	27155.....	223,265	29038.....	313	29120.....	315	29202.....	314
26579.....	359	27184.....	245	29039.....	313	29121.....	315	29203.....	314
26580.....	359	27185.....	250,274	29040.....	313	29122.....	315	29204.....	314
26581.....	359	27190.....	257	29041.....	313	29123.....	315	29205.....	314
26582.....	360	27191.....	257	29042.....	313	29124.....	315	29206.....	314
26583.....	360	27192.....	257	29043.....	313	29125.....	315	29207.....	314
26584.....	360	27193.....	257	29044.....	313	29126.....	315	29208.....	314
26585.....	360	27194.....	253	29045.....	313	29127.....	315	29209.....	314
26586.....	362	27195.....	253	29046.....	313	29128.....	315	29210.....	314
26587.....	362	27196.....	253	29047.....	313	29129.....	315	29211.....	314
26588.....	364	27197.....	340	29048.....	313	29130.....	315	29212.....	314
26589.....	364	27198.....	340	29049.....	313	29131.....	315	29213.....	314
26590.....	359	27199.....	245	29050.....	313	29132.....	315	29214.....	314
26591.....	359	27200.....	246	29051.....	313	29133.....	315	29215.....	314
26592.....	359	27201.....	291	29052.....	313	29134.....	315	29216.....	314
26593.....	359	27202.....	291	29053.....	313	29135.....	315	29217.....	314
26594.....	359	27203.....	291	29054.....	313	29136.....	315	29218.....	314
26595.....	359	27204.....	291	29055.....	313	29137.....	315	29219.....	314
26596.....	359	27205.....	291	29056.....	313	29138.....	315	29220.....	314
26597.....	359	27206.....	291	29057.....	313	29139.....	315	29221.....	314
27061.....	224	27207.....	291	29058.....	313	29140.....	315	29222.....	314
27062.....	224	27400.....	421	29059.....	313	29141.....	315	29223.....	314
27063.....	224	27401.....	421	29060.....	313	29142.....	315	29224.....	314
27064.....	224	27402.....	421	29061.....	313	29143.....	315	29225.....	314
27065.....	224	27403.....	421	29062.....	313	29144.....	315	29226.....	314
27066.....	224	27404.....	421	29063.....	313	29145.....	315	29227.....	314
27067.....	224	27405.....	421	29064.....	313	29146.....	315	29228.....	314
27068.....	224	27406.....	421	29065.....	313	29147.....	315	29229.....	314
27069.....	224	27407.....	421	29066.....	313	29148.....	315	29230.....	314
27070.....	225	27408.....	421	29067.....	314	29149.....	315	29231.....	314
27071.....	225	27409.....	421	29068.....	314	29150.....	315	29232.....	314
27072.....	225	27410.....	421	29069.....	314	29151.....	315	29233.....	314
27073.....	225	27411.....	421	29070.....	314	29152.....	315	29234.....	314
27074.....	225	27412.....	421	29071.....	314	29153.....	315	29235.....	314
27075.....	225	27413.....	421	29072.....	314	29154.....	315	29236.....	314
27076.....	225	27414.....	421	29073.....	314	29155.....	315	29237.....	314
27077.....	225	27415.....	421	29074.....	314	29156.....	315	29238.....	314
27078.....	225	27416.....	422	29075.....	314	29157.....	315	29239.....	314
27079.....	225	27417.....	422	29076.....	314	29158.....	315	29240.....	314
27080.....	225	27418.....	422	29077.....	314	29159.....	315	29241.....	314
27081.....	225	27419.....	422	29078.....	314	29160.....	315	29242.....	314
27082.....	223,236	27420.....	422	29079.....	314	29161.....	315	29243.....	314
27083.....	223,236	27421.....	422	29080.....	314	29162.....	315	29244.....	314
27084.....	223,260,268	27422.....	422	29081.....	314	29163.....	315	29245.....	314
27085.....	223,260,268	27423.....	422	29082.....	314	29164.....	315	29246.....	314
27086.....	223,236,260,268	29000.....	313	29083.....	314	29165.....	315	29247.....	314
27087.....	223,236,260,268	29001.....	313	29084.....	314	29166.....	315	29248.....	314
27088.....	223,236,260	29002.....	313	29085.....	314	29167.....	315	29249.....	314
27089.....	223,236,260	29003.....	313	29086.....	314	29168.....	315	29250.....	314
27090.....	223,236,260,263,268	29004.....	313	29087.....	314	29169.....	315	29251.....	314
27091.....	223,236,260,263,268	29005.....	313	29088.....	314	29170.....	315	29252.....	314
27092.....	223	29006.....	313	29089.....	314	29171.....	315	29253.....	314
27093.....	223	29007.....	313	29090.....	314	29172.....	315	29254.....	314
27094.....	223	29008.....	313	29091.....	314	29173.....	315	29255.....	314
27095.....	223	29009.....	313	29092.....	314	29174.....	315	29256.....	314
27096.....	223,268	29010.....	313	29093.....	314	29175.....	315	29257.....	314
27097.....	223,268	29011.....	313	29094.....	314	29176.....	315	30003.....	467,473,557
27098.....	223,265	29012.....	313	29095.....	314	29177.....	315	30004.....	557
27099.....	223,265	29013.....	313	29096.....	314	29178.....	315	30005.....	557
27121.....	223,236	29014.....	313	29097.....	314	29179.....	315	30006.....	518,553,558
27122.....	223,236	29015.....	313	29098.....	314	29180.....	315	30007.....	558
27124.....	223	29017.....	313	29099.....	314	29181.....	315	30008.....	558
27125.....	223	29018.....	313	29100.....	314	29182.....	315	30009.....	558
27127.....	223	29019.....	313	29101.....	314	29183.....	315	30010.....	559
27128.....	223	29020.....	313	29102.....	314	29184.....	315	30011.....	557
27130.....	223	29021.....	313	29103.....	314	29185.....	315	30012.....	466,475
27131.....	223	29022.....	313	29104.....	314	29186.....	315	30013.....	550
27133.....	223,260	29023.....	313	29105.....	314	29187.....	315	30014.....	550
27134.....	223,260	29024.....	313	29106.....	314	29188.....	315	30015.....	550
27136.....	223,236,260	29025.....	313	29107.....	314	29189.....	315	30016.....	550
27137.....	223,236,260	29026.....	313	29108.....	314	29190.....	315	30017.....	550
27139.....	223,236,260	29027.....	313	29109.....	314	29191.....	315	30020.....	488,496,551
27140.....	223,236,260	29028.....	313	29110.....	314	29192.....	315	30021.....	496,551

RESTEK CHROMALYTICs in AUSTRALIA : Contact +81 3 9762 2034



Catalog # Product Index

30022.....	496,552	30227.....	468,546	30430.....	468	30620.....	468,485,585	31072.....	539
30023.....	496,551-552	30228.....	467,546	30431.....	547	30621.....	466	31073.....	539
30024.....	544,556	30230.....	467,546	30432.....	547	30622.....	467	31074.....	535,540
30025.....	466,546	30231.....	489,500,504	30433.....	508	30624.....	557	31075.....	539
30026.....	467,495,502, 546,553-554	30235.....	545	30434.....	505	30625.....	557	31081.....	471
30027.....	468,546	30236.....	504	30435.....	468,505	30626.....	520,555	31082.....	539
30028.....	468,546	30237.....	489,501	30436.....	471,480	30627.....	468,520,556	31083.....	539
30029.....	468,546	30238.....	467,556	30437.....	481	30628.....	468,520,556	31084.....	535,540
30030.....	469,495,546,553	30239.....	548	30438.....	558	30629.....	466,520,556	31085.....	539
30031.....	470,546	30240.....	554	30439.....	488,496,547-548, 552-553,555,558	30630.....	557	31086.....	513,535,539
30032.....	468,495,546,553	30241.....	554	30442.....	559	30631.....	466,520,556	31087.....	535,539
30036.....	545	30242.....	556	30444.....	547	30632.....	558	31088.....	529
30040.....	467,546	30243.....	496,551	30445.....	547	30633.....	555	31089.....	529
30041.....	546,553	30244.....	552	30446.....	547	30642.....	550	31090.....	529
30042.....	488,496,547-548, 552-553,555,558	30245.....	466	30447.....	549	30645.....	466,518,551,556	31091.....	469,532
30043.....	547	30246.....	466,518,551	30450.....	510	30646.....	466,518,551,556	31093.....	468,484,497,503
30044.....	547	30248.....	466	30451.....	510	30671.....	471,578	31094.....	469,497,503,514
30045.....	547	30249.....	466	30452.....	505	30672.....	578	31095.....	471,484,501,508,517
30046.....	547	30250.....	467	30453.....	468,505	30673.....	578	31096.....	469,484,501,508,517
30047.....	547	30251.....	467	30454.....	505	30674.....	578	31097.....	471,484,501, 503-504,508,517
30048.....	471,495,502,509, 517,546,553	30252.....	467	30455.....	558	30725.....	581	31098.....	467,484,501, 506,509,517
30049.....	468,546	30253.....	467	30456.....	557	30726.....	581	31116.....	583
30051.....	484,489,496, 500,552,554	30254.....	467	30457.....	558	30727.....	581	31117.....	583
30055.....	552	30258.....	467	30460.....	558	30728.....	581	31118.....	583
30062.....	496,553	30259.....	467	30461.....	502	30729.....	581	31152.....	573
30065.....	489,500	30261.....	467	30462.....	471	30730.....	580	31153.....	573
30066.....	467,489,501-502	30263.....	467	30463.....	546,553	30731.....	580	31154.....	573
30067.....	467,489,501-502,554	30264.....	467	30465.....	504,520,555	31001.....	468,473,536,540	31155.....	573
30068.....	471,489,501-502, 509,517	30265.....	467,555	30466.....	468,504,520,556	31002.....	539	31200.....	497,516
30069.....	489,500	30266.....	467	30467.....	469,504,520,556	31003.....	539	31206.....	513,532,535,539
30073.....	554	30267.....	467	30468.....	507	31004.....	535,540	31206.15.....	513,532,535,539
30074.....	554	30270.....	468	30469.....	467	31006.....	513,532,535,539	31206.25.....	513,532,535,539
30075.....	554	30271.....	468	30470.....	467,520,556	31006.15.....	513,532,535,539	31208.....	543
30076.....	556	30272.....	468	30471.....	490,504,508,517,554	31005.....	539	31210.....	543
30080.....	517	30274.....	468	30472.....	470	31007.....	542	31211.....	467,543
30081.....	471,489,497,502	30275.....	468	30474.....	467	31008.....	542	31214.....	503,507-508
30082.....	467,489,501-502,554	30276.....	468	30475.....	555	31009.....	542	31215.....	469,498,514
30083.....	471,489,501-502, 509,517	30277.....	468	30476.....	468,556	31010.....	542	31216.....	469,498,513
30084.....	467,489,501,509,517	30278.....	468	30477.....	483,555	31011.....	511,542	31218.....	469,498,503,514
30089.....	471	30279.....	468	30479.....	554	31012.....	542	31222.....	579
30091.....	557	30280.....	468	30482.....	470,473,536,540, 548,555,557	31013.....	542	31223.....	579
30092.....	557	30281.....	468	30483.....	497,516	31014.....	535	31224.....	479
30093.....	471,557	30282.....	468	30484.....	496,548,551	31014.15.....	535	31225.....	470,480,499,515
30095.....	489,500,510	30283.....	468	30485.....	489,501	31024.....	513,535,539	31229.....	469,480,498,514
30096.....	471,480,489,498	30284.....	468	30486.....	489,500,507-508	31024.15.....	513,535,539	31230.....	469,480
30097.....	471,480	30285.....	468	30487.....	471,480,499,515	31024.25.....	513,535,539	31231.....	469,480
30098.....	471,480	30286.....	468	30488.....	484,489,496, 500,552,554	31025.....	535,539	31232.....	469,480
30099.....	471,480	30287.....	468	30489.....	483,555	31025.15.....	535,539	31233.....	468,480,484,498
30100.....	481	30288.....	468,504,520,556	30492.....	559	31025.25.....	535,539	31234.....	468,480
30112.....	471,519,566	30289.....	468	30494.....	466	31026.....	468,483,542	31235.....	468,480
30152.....	555	30290.....	468	30495.....	466	31027.....	538,544	31236.....	468,480
30201.....	548	30292.....	469	30497.....	496,551	31028.....	534,538,544	31238.....	481
30202.....	549	30293.....	469	30498.....	468	31029.....	529	31239.....	481
30203.....	549	30294.....	469	30540.....	507	31030.....	483,537,542	31240.....	499,514
30204.....	549	30297.....	469	30541.....	507	31031.....	530	31242.....	469,498,514
30205.....	471,489,497,502	30299.....	470	30542.....	507	31032.....	519	31243.....	469,498,514
30206.....	471,489,497,502	30300.....	549	30543.....	507,512	31033.....	486,495	31244.....	469,498,513
30207.....	466,498,513	30304.....	549	30544.....	508	31035.....	495	31248.....	469,498,503,514
30208.....	466	30400.....	470	30545.....	508,512	31036.....	534	31252.....	469,499,514
30211.....	545	30401.....	470	30546.....	480	31037.....	466,532	31254.....	469,499,514
30212.....	551,553	30402.....	469,520,556	30547.....	480	31040.....	468,491,493,532	31256.....	469,497,503,514
30213.....	484,489,496, 500,552,554	30403.....	470	30548.....	468,480	31041.....	468,532	31257.....	469,497,503,514
30214.....	483,554	30404.....	470	30549.....	470,480	31043.....	470,506,512,532	31258.....	468,484,497,503
30215.....	518,554	30407.....	470	30559.....	470,480	31045.....	470,532	31259.....	468,484,497,503
30216.....	471,483,556,558	30409.....	470	30600.....	518,551	31047.....	469,532	31260.....	470,480,499,515
30217.....	553	30410.....	471	30601.....	549	31048.....	470,532	31262.....	469,499,514
30218.....	553	30411.....	471	30602.....	518,548	31049.....	470,532	31264.....	511
30219.....	545	30412.....	471	30603.....	546,548	31053.....	475	31266.....	505
30220.....	545	30413.....	471	30604.....	505	31061.....	535	31267.....	466
30221.....	545	30414.....	471	30605.....	505	31061.15.....	535	31268.....	466
30222.....	495,553	30415.....	471	30607.....	548	31062.....	513,535,539	31269.....	466
30223.....	467,546	30416.....	471	30608.....	485,560	31062.15.....	513,535,539	31270.....	467
30224.....	471,546	30418.....	471	30609.....	467,485,521	31063.....	535,539	31271.....	467
30225.....	467,546	30419.....	471	30611.....	516,559	31063.15.....	535,539	31272.....	467
30226.....	467,546	30420.....	471	30613.....	469	31064.....	510	31273.....	467
		30421.....	471	30614.....	468,519,554	31065.....	466,484,501,503,506	31274.....	467
		30422.....	471	30616.....	485,521	31066.....	471,484,501,503-504	31275.....	467
		30423.....	471	30617.....	466,520,556	31069.....	475	31276.....	468
		30424.....	471	30618.....	467,520,556	31070.....	572	31277.....	469
		30425.....	471	30619.....	548	31071.....	535	31278.....	469



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05

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Catalog # Product Index

31279	469	31617	536	31828	471,512,532-533	31998	495	32205	466
31280	470	31618	537	31829	534	31999	575	32206	467
31281	470	31619	537	31830	504	32000	524	32207	467
31282	470	31620	538	31831	504	32002	525	32208	466
31283	470	31621	538	31832	504	32003	526	32209	467
31284	467	31623	538	31833	467	32004	526	32211	467
31285	470	31624	466,538	31834	483,537,542	32005	471,521-522,526	32212	467
31291	468	31626	538	31835	468,483,542-543	32006	466,531	32215	467
31292	468	31627	538	31836	467	32007	466,531	32216	467
31296	470	31628	572,583	31837	469,483	32008	466,531	32217	467
31297	470	31629	471	31838	467,498,513	32009	466,531	32218	468
31298	470	31630	485,561	31839	469,498,514	32010	466,531	32226	467
31299	471	31631	485,561	31842	468,511	32011	466,531	32227	467
31400	471	31636	471,561	31843	511	32012	466,531	32228	469
31401	471,532	31639	509,516	31845	530	32013	524,544	32230	469
31402	471	31641	485,561	31847	467,530	32014	494,544	32231	469
31403	470	31644	468,490	31850	536	32015	471,521-522,524,526,544	32232	469
31409	468	31645	490	31852	483,537,543	32016	467,521,524,526,544	32233	469
31415	467	31646	490	31853	468,519	32017	471,525	32235	470
31420	467	31648	471,490	31855	468,521,532	32018	525	32236	471
31426	468	31650	468,490	31856	468,491,493	32019	474,544	32238	471
31427	470	31653	467,490	31857	511	32021	467,521,526	32239	467
31428	470	31655	468,490	31858	468,561	32022	523	32240	467
31429	470	31656	469,490	31859	471,561	32023	474,544	32241	467
31430	467	31657	470,479,486	31860	471,561	32024	523	32242	471
31435	469	31658	470,479,486	31861	468,472	32025	468,525	32243	471
31436	469	31659	470,479,486	31864	494,559	32027	471,525	32244	471
31439	471	31660	470,479,486	31867	528,559	32028	471,525	32245	471
31441	467	31661	468,479,486	31871	559	32029	468,522,525	32246	471
31442	468	31662	468,479,486	31872	559	32030	468,522,525	32247	468
31443	468	31663	468,479,486	31874	511	32039	531	32248	468
31444	468	31664	468,479,486	31877	470,505	32040	525	32249	468
31449	467	31665	469,479,486	31878	505	32041	474,544	32250	468
31450	487	31666	471,479,486	31879	467	32042	474,544	32251	468
31451	487	31667	471,479,486	31880	468,484,498,501,577	32045	522	32252	468
31452	468,479,486-487	31668	471,479,486	31881	467,490	32049	468,491-493	32253	467,490-494
31453	468,479,486-487	31669	471,479,486	31882	467,490	32050	468,491-493	32255	466
31455	511	31671	466,479,486	31885	513,535,539	32053	468,491,493	32256	466
31456	470,505	31672	470	31885.15	513,535,539	32054	491-493	32257	466
31457	519	31673	484,501,511	31886	513,535,539	32055	491-493	32261	467
31458	506,512	31674	579	31887	513,535,539	32056	467,490-494	32265	470,493
31459	506	31675	579	31887.15	513,535,539	32057	467,490-493	32266	470
31460	506	31676	485,561	31888	513,535,539	32058	492-493	32268	470
31462	543	31678	561	31888.15	513,535,539	32059	492-493	32273	521
31463	543	31679	561	31889	513,535,539	32060	523,530	32274	467,521
31464	470,497,503,515	31680	561	31891	583	32061	491,493	32275	521
31465	471,497,515	31681	471,561	31892	583	32062	491,493	32277	527
31469	510,512	31682	485,561	31893	583	32063	491	32278	527
31470	466	31684	517,559	31894	583	32064	466,531	32279	467,527
31472	520	31685	470,559	31896	490	32065	466,531	32280	471,527
31473	520	31687	536	31898	519	32066	466,531	32281	471,527
31474	471,520	31687.15	536	31899	532	32069	466,531	32282	467,527
31476	471,520	31688	483,537,543	31900	541	32070	466,531	32289	468,522,525,531
31477	471,520	31689	536	31902	541	32071	471,521-522,526	32290	531,560
31478	471,520	31694	529	31903	541	32072	467,521,526	32291	524,526
31479	506	31696	529	31904	541	32074	525	32292	524,526
31480	506,512	31698	497,509,516	31905	541	32076	466,531,578	32294	531,560
31481	506,512	31699	475	31954	519	32081	466,531,578	32297	526
31482	509,517	31800	467	31963	575	32082	466,531,578	32298	526
31483	509,517	31801	467	31964	471,575	32085	466,531,578	32299	531
31484	509,517	31802	467	31971	570	32086	466,531,578	32400	530
31487	470,508,517	31803	467	31972	571	32087	466,531,578	32401	530
31488	510,512	31804	467	31973	571	32088	466,531,578	32404	526
31489	510	31805	537	31975	571	32089	530	32406	529,567
31491	510	31806	537	31976	571	32090	530	32407	529,567
31492	540	31807	566	31977	571	32091	470,522	32408	529,567
31493	539	31808	483,518	31978	571	32092	468,522	32409	466,531
31494	542	31811	469,543	31979	469,571	32093	522	32410	466,531
31496	466	31813	543	31980	571	32094	522	32412	565
31497	468,538	31814	509,516	31981	467,571	32095	522	32413	565
31498	470,479,486	31815	537	31982	469,571	32096	522	32414	565
31499	470,479,486	31816	537	31984	466,569	32097	522	32415	524,526,533,537
31600	470,479,486	31817	503	31985	467,569	32098	467	32417	522,525
31601	468,479,486	31818	503	31986	468,569	32099	467	32418	528,560
31602	470,479,486	31819	497,502,516	31987	468,569	32100	467	32419	537
31607	486	31822	466,546,548	31988	468,569	32200	467	32420	531-532
31608	486	31825	528,532	31989	468,569	32201	467	32423	527,533
31610	486	31826	528,532	31990	469,569	32202	467	32424	471,578
31613	479	31827	533	31995	511,538	32203	467	32425	471,578
31614	504			31996	469,538	32204	466	32426	469,494
31615	473,536							32427	469,494
31616	536							32428	466,494
								32430	492,494

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Catalog # Product Index

32431	492,494	33256	470,574	34071	469,478	34438	449	34500-PI	450
32432	467,490-494	33257	470,574	34072	469,478	34439	449	34501	450
32434	528	33258	471,574	34077	467,478	34440	449	34501-PI	450
32435	521	33259	471,574	34078	467,478	34441	449	34502	450
32436	470	33260	471,574	34079	470,478	34442	449	34502-PI	450
32437	494	33261	470,574	34080	471,478	34443	449	34504	451
32438	521	33262	470,574	34081	468,478	34445	447	34505	451
32439	468,491-493	33263	470,574	34082	468,478	34445-PI	447	34505-PI	451
32443	492	33264	466,574	34083	468,478	34448	450	34507	451
32444	492	33265	574	34084	467,478	34449	450	34508	451
32450	468	33266	574	34085	470,478	34449-PI	450	34508-PI	451
32453	524	33267	574	34086	467,478	34451	450	34511	451
32454	524	33268	574	34090	471,566	34452	450	34511-PI	451
32456	531	33905	487	34091	467,478,566	34452-PI	450	34512	451
32457	524	33906	474	34092	467,478,566	34453	450	34512-PI	451
32459	537	33908	473	34093	471,566	34453-PI	450	34514	451
32460	469,537	33909	474	34094	467,478,566	34454	450	34514-PI	451
32461	495	33910	470,519,532,543	34392	446	34454-PI	450	34515	451
32463	468,523	33911	470,519	34393	446	34455	450	34516	451
32464	468,523	33912	471	34394	446	34457	450	34516-PI	451
32465	468,523	33913	539	34395	446	34457-PI	450	34518	451
32466	468,523	34000	467,478	34396	446	34458	450	34519	451
32467	468,523	34002	469,478	34397	446	34458-PI	450	34519-PI	451
32468	523	34003	469,478	34398	446	34459	450	34521	451
32469	572	34004	469,478	34399	446	34459-PI	450	34522	451
32562	568	34005	469,478	34400	444	34460	450	34522-PI	451
32563	569	34006	470,478	34400-PI	444	34461	450	34524	451
32564	569	34007	470,478	34402	443	34461-PI	450	34525	451
32565	569	34008	468,478	34402-PI	443	34462	450	34525-PI	451
32566	569	34009	471,478	34404	443	34462-PI	450	34527	451
32567	569	34010	467,478,566	34404-PI	443	34463	450	34528	451
32568	569	34011	467,478,566	34406	443	34464	450	34528-PI	451
32569	569	34014	566	34406-PI	443	34464-PI	450	34529	451
32570	569	34015	467,478	34408	443	34465	450	34530	451
32571	569	34016	467,478	34408-PI	443	34466	450	34530-PI	451
33000	471,518	34017	468,478	34410	444	34466-PI	450	34531	451
33001	471,518	34018	468,478	34410-PI	444	34467	450	34532	451
33002	469,518	34020	466,478	34412	443	34468	450	34532-PI	451
33003	469,518	34021	469,478	34412-PI	443	34468-PI	450	34534	451
33007	528	34022	467,478	34414	448,484,488,	34469	450	34534-PI	451
33008	528	34024	470,478		500,552,554	34469-PI	450	34537	451
33011	533	34025	470,478	34414-PI	448,484,488,	34471	450	34537-PI	451
33012	527,533	34026	470,478		500,552,554	34472	450	34539	451
33013	527,533	34027	470,478	34418	447,488,560	34472-PI	450	34539-PI	451
33017	466	34028	466,478	34418-PI	447,488,560	34473	450	34540	447,506
33020	469,577	34029	466,478	34420	447	34474	450	34540-PI	447,506
33021	470,577	34030	466,478	34420-PI	447	34474-PI	450	34541	448
33022	468,577	34031	467,478	34421	444	34476	450	34541-PI	448
33023	471,577	34032	467,478	34421-PI	444	34477	450	34542	448
33024	467,577	34033	469,478	34422	443	34477-PI	450	34542-PI	448
33025	471,577	34034	469,478	34422-PI	443	34478	450	34561	448
33026	470,577	34035	469,478	34423	443	34478-PI	450	34561-PI	448
33028	513,535,539	34036	470,478	34423-PI	443	34479	450	35000	474
33028.25	513,535,539	34037	470,478	34424	443	34479-PI	450	35002	473
33029	535,539	34038	471,478	34424-PI	443	34480	450	35004	475
33029.25	535,539	34039	471,478	34425	443	34480-PI	450	35005	475
33032	467,577	34042	466,478	34425-PI	443	34482	450	35006	474
33033	471,577	34043	467,478	34426	444	34483	450	35008	474
33034	580	34044	467,478	34426-PI	444	34483-PI	450	35010	564
33049	579	34045	467,478	34427	443	34484	450	35011	564
33050	579	34046	467,478	34427-PI	443	34485	450	35012	564
33073	536	34047	468,478	34428	448,484,488,	34485-PI	450	35013	564
33074	466,483	34049	469,478		500,552,554	34487	450	35014	564
33082	469,483	34050	469,478	34428-PI	448,484,488,	34488	450	35015	564
33091	469,483	34051	469,478		500,552,554	34488-PI	450	35022	564
33093	483	34053	470,478	34429	447	34489	450	35023	564
33098	528	34054	470,478	34429-PI	447	34489-PI	450	35024	564
33105	566	34055	470,478	34430	444	34491	450	35025	564
33202	467,491	34056	471,478	34430-PI	444	34492	450	35026	564
33203	468,491	34057	471,478	34431	444	34492-PI	450	35027	564
33204	487	34058	469,478	34431-PI	444	34493	450	35034	564
33205	468,487	34059	469,478	34432	444	34493-PI	450	35035	564
33211	532	34060	470,478	34432-PI	444	34494	450	35037	469,564
33227	530	34062	470,478	34433	444	34495	450	35039	469,564
33247	469,567	34063	469,478	34433-PI	444	34495-PI	450	35041	469,564
33248	467,567	34064	469,478	34434	445	34496	450	35042	470,564
33249	466,567	34065	470,478	34434-PI	445	34497	450	35043	470,564
33250	466,567	34066	467,478	34435	445	34497-PI	450	35044	470,564
33251	467,567	34067	471,478,566	34435-PI	445	34498	450	35045	470,564
33253	567	34068	471,478,566	34436	445	34499	450	35048	470,564
33254	567	34069	468,478	34436-PI	445	34499-PI	450	35049	470,564
33255	470,574	34070	469,478	34437-PI	445	34500	450	35050	469,564

Catalog # Product Index

35051.....	470,564	36297.....	468,584	45011.....	48	70193.....	107	70969.....	111
35052.....	470,564	36298.....	469,584	45012.....	48	70199.....	113	70971.....	111
35053.....	470,564	36299.....	469,584	49314.....	79	70205.....	108	70973.....	111
35054.....	470,564	36340.....	478	49315.....	79	70208.....	108	71811.....	107
35055.....	470,564	36341.....	478	49316.....	37,84	70220.....	108	71812.....	107
35056.....	469,564	36400.....	469,584	49317.....	37,84	70221.....	108	71813.....	107
35057.....	469,564	36401.....	469,504,584	49318.....	37,84	70222.....	108	71815.....	107
35059.....	469,564	36402.....	469,584	49914.....	78	70223.....	108	71816.....	107
35061.....	469,564	36403.....	469,584	49915.....	78	70224.....	108	71821.....	108
35062.....	469,564	36404.....	470,584	70044.....	106	70225.....	108	71822.....	108
35063.....	469,564	36405.....	470,584	70044-600.....	106	70226.....	108	71823.....	108
35064.....	470,564	36406.....	470,584	70045.....	106	70227.....	108	71824.....	108
35066.....	563	36407.....	470,584	70045-600.....	106	70228.....	108	71825.....	108
35076.....	474	36408.....	471,584	70046.....	106	70229.....	108	72020.....	109
35077.....	563	36409.....	471,584	70047.....	106	70236.....	108	72023.....	109
35078.....	563	36410.....	471,584	70080.....	106	70237.....	108	72040.....	109
35079.....	563	36411.....	471,584	70081.....	106	70238.....	108	72051.....	109
35100.....	565,583	36412.....	471,584	70083.....	106	70239.....	108	72052.....	109
35101.....	565,583	36413.....	471,584	70084.....	106	70240.....	108	72053.....	109
35103.....	474	36414.....	471,584	70086.....	106	70241.....	108	72055.....	109
35108.....	473	36415.....	471,584	70087.....	106	70250.....	108	72066.....	109
35202.....	474	36416.....	471,584	70101.....	107	70251.....	108	72070.....	109
35222.....	468	40101.....	41	70102.....	107	70252.....	108	72082.....	109
35226.....	474	40102.....	41	70104.....	115	70253.....	108	72085.....	109
35262.....	466	40103.....	41	70105.....	107	70254.....	108	72088.....	109
35272.....	565	40110.....	41	70106.....	107	70255.....	108	75038.....	110
35600.....	473	40111.....	41	70107.....	107	70257.....	108	75052.....	110
35601.....	473	40112.....	41	70109.....	107	70258.....	108	75053.....	110
35602.....	473	40201.....	42,96	70112.....	114	70267.....	108	75055.....	110
35603.....	473	40202.....	42,96	70114.....	107	70270.....	108	75058.....	110
35604.....	473	40203.....	42,96	70115.....	114	70277.....	108	75070.....	110
35606.....	473	40210.....	42,96	70116.....	107	70279.....	108	75073.....	110
35607.....	473	40211.....	42,96	70117.....	107	70281.....	108	75082.....	110
35608.....	473	40212.....	42,96	70118.....	114	70282.....	108	75085.....	110
35610.....	473	40402.....	46	70119.....	114	70283.....	108	75088.....	110
35611.....	473	40410.....	46	70120.....	107	70284.....	108	76055.....	109
35616.....	472	40411.....	46	70121.....	107	70285.....	108	76082.....	109
35617.....	472	40501.....	47	70122.....	107	70288.....	108	76085.....	109
35618.....	472	40502.....	47	70123.....	107	70289.....	113	76088.....	109
35619.....	472	40510.....	47	70124.....	107	70289-273.....	113	77005.....	112
35620.....	472	40511.....	47	70125.....	107	70290.....	113	77007.....	112
35621.....	472	40602.....	58,95	70126.....	107	70291.....	113	77008.....	112
35622.....	472	40701.....	55	70127.....	107	70292.....	113	77010.....	112
35623.....	472	40702.....	55	70128.....	107	70293.....	113	79712.....	129
35624.....	472	40703.....	55	70129.....	107	70294.....	113	79712-273.....	129
35625.....	472	40914.....	80	70130.....	114	70552.....	109	79714.....	129
36004.....	585	40915.....	80	70131.....	114	70555.....	109	79714-273.....	129
36005.....	468,485,585	40924.....	52	70132.....	114	70558.....	109	79716.....	129
36006.....	585	40925.....	52	70133.....	114	70569.....	109	79716-273.....	129
36007.....	585	41302.....	70	70134.....	114	70570.....	109	79717.....	129
36008.....	585	41303.....	70	70135.....	107	70620.....	110	79717-273.....	129
36009.....	585	41304.....	70	70137.....	107	70622.....	110	79718.....	129
36010.....	477	42001.....	53	70138.....	107	70623.....	110	79718-273.....	129
36011.....	477	42002.....	53	70139.....	107	70624.....	110	79723.....	129
36012.....	584	42003.....	53	70140.....	107	70625.....	110	79723-273.....	129
36224.....	470,579	42011.....	53	70142.....	107	70637.....	110	79728.....	129
36225.....	115,470,579	42012.....	53	70143.....	107	70638.....	110	79728-273.....	129
36226.....	470,579	42102.....	72	70150.....	107	70639.....	110	80000.....	135
36227.....	115,470,579	42301.....	72	70151.....	107	70640.....	110	80105.....	136
36256.....	477	42302.....	72	70152.....	107	70642.....	110	80106.....	136
36270.....	585	42902.....	50	70153.....	107	70651.....	110	80107.....	136
36271.....	584	43602.....	32,75,77,86	70154.....	107	70652.....	110	80116.....	136
36273.....	584	43604.....	32,75,77,86	70155.....	107	70654.....	110	80121.....	136
36274.....	585	43605.....	32,75,77,86	70156.....	107	70655.....	110	80122.....	136
36279.....	584-585	43607.....	32,67,75,77,86	70157.....	107	70657.....	110	80125.....	135
36280.....	584	43702.....	31,71	70158.....	107	70658.....	110	80126.....	135
36281.....	466,584	43800.....	29,63	70159.....	107	70666.....	110	80127.....	136
36282.....	466,584	43801.....	29,63	70167.....	107	70667.....	110	80128.....	135
36283.....	467,584	43802.....	29	70170.....	107	70669.....	110	80129.....	135
36284.....	467,584	43815.....	32,63,75,77,86	70173.....	107	70670.....	110	80205.....	136
36285.....	467,584	43816.....	32,63,75,77,86	70177.....	107	70672.....	110	80206.....	136
36286.....	467,584	43817.....	32,63,75,77,86	70179.....	107	70908.....	111	80207.....	136
36287.....	468,584	43820.....	36,63,76	70181.....	107	70909.....	111	80211.....	136
36288.....	468,584	43821.....	36,63,76	70182.....	107	70910.....	111	80216.....	136
36289.....	468,584	43830.....	58,63,95	70183.....	107	70916.....	111	80305.....	136
36290.....	468,584	43831.....	58,63,95	70184.....	107	70919.....	111	80311.....	136
36291.....	468,584	43835.....	48,63	70185.....	107	70922.....	111	80400.....	135
36292.....	468,584	43836.....	48,63	70187.....	107	70924.....	111	80401.....	135
36293.....	468,584	45001.....	48	70188.....	107	70925.....	111	80405.....	135
36294.....	468,519,584	45002.....	48	70189.....	107	70926.....	111	80409.....	135
36295.....	468,584	45003.....	48	70191.....	107	70927.....	111	80415.....	135
36296.....	468,584	45010.....	48	70192.....	107	70968.....	111	80416.....	135



80417.....	135	9100522.....	174	9102555.....	172	9106552.....	174	9109578.....	185
80425.....	135	9100525.....	174	910255E.....	172	9106555.....	174	9109579.....	185
80426.....	135	910052E.....	174	9102562.....	172	9106557.....	187	910957E.....	170
80427.....	135	9100532.....	174	9102565.....	172	9106558.....	187	9127312.....	173
80428.....	136	9100535.....	174	910256E.....	172	9106559.....	187	9127315.....	173
80429.....	136	910053E.....	174	9102572.....	172	910655E.....	174	912731E.....	173
80430.....	136	9100552.....	174	9102575.....	172	9106562.....	174	9127332.....	173
80433.....	135	9100555.....	174	910257E.....	172	9106565.....	174	9127335.....	173
80436.....	139	9100557.....	187	9103312.....	172	9106567.....	187	912733E.....	173
80437.....	139	9100558.....	187	9103315.....	172	9106568.....	187	9127352.....	173
80439.....	136	9100559.....	187	910331E.....	172	9106569.....	187	9127355.....	173
80440.....	136	910055E.....	174	9103332.....	172	910656E.....	174	912735E.....	173
80441.....	135	9100562.....	174	9103335.....	172	9106572.....	174	9127362.....	173
80442.....	135	9100565.....	174	910333E.....	172	9106575.....	174	9127365.....	173
80443.....	135	9100567.....	187	9103352.....	172	9106577.....	187	912736E.....	173
80444.....	135	9100568.....	187	9103355.....	172	9106578.....	187	912750210.....	191
80445.....	135	9100569.....	187	910335E.....	172	9106579.....	187	912750212.....	191
80446.....	135	910056E.....	174	9103362.....	172	910657E.....	174	9127512.....	173
80447.....	135	9100572.....	174	9103365.....	172	9107315.....	174	9127515.....	173
80448.....	135	9100575.....	174	910336E.....	172	910731E.....	174	912751E.....	173
80449.....	135	9100577.....	187	91035.....	187	9107335.....	174	9127522.....	173
80450.....	135	9100578.....	187	910350210.....	191	910733E.....	174	9127525.....	173
80451.....	136	9100579.....	187	910350212.....	191	9107355.....	174	912752E.....	173
80452.....	136	910057E.....	174	9103512.....	172	910735E.....	174	9127532.....	173
80453.....	136	9101312.....	173	9103514.....	172	9107365.....	174	9127535.....	173
80454.....	136	9101315.....	173	9103515.....	172	910736E.....	174	912753E.....	173
80455.....	136	910131E.....	173	9103517.....	186	91075.....	187	9127552.....	173
80456.....	136	9101332.....	173	9103518.....	186	910750210.....	191	9127555.....	173
80457.....	136	9101335.....	173	9103519.....	186	910750212.....	191	912755E.....	173
80458.....	136	910133E.....	173	910351E.....	172	9107515.....	174	9127562.....	173
80459.....	136	9101352.....	173	9103522.....	172	910751E.....	174	9127565.....	173
80461.....	135	9101355.....	173	9103525.....	172	9107525.....	174	912756E.....	173
80462.....	135	910135E.....	173	910352E.....	172	910752E.....	174	9127572.....	173
80463.....	135	9101362.....	173	9103532.....	172	9107535.....	174	9127575.....	173
80464.....	135	9101365.....	173	9103535.....	172	910753E.....	174	912757E.....	173
80465.....	135	910136E.....	173	910353E.....	172	9107555.....	174	915950210.....	180
80466.....	135	91015.....	187	9103552.....	172	910755E.....	174	9159523-700.....	180
80467.....	135	910150210.....	191	9103555.....	172	9107565.....	174	9159525-700.....	180
80468.....	135	910150212.....	191	9103557.....	186	910756E.....	174	916550210.....	181
80469.....	135	9101512.....	173	9103558.....	186	9107575.....	174	916550212.....	181
80470.....	135	9101515.....	173	9103559.....	186	910757E.....	174	9165565.....	181
80473.....	136	910151E.....	173	910355E.....	172	9109312.....	170	916556E.....	181
80474.....	136	9101522.....	173	9103562.....	172	9109315.....	170	9165575.....	181
80475.....	136	9101525.....	173	9103564.....	172	910931E.....	170	9165585.....	181
80476.....	136	910152E.....	173	9103565.....	172	9109332.....	170	9174312.....	171
80477.....	135	9101532.....	173	9103567.....	186	9109335.....	170	9174315.....	171
80478.....	135	9101535.....	173	9103568.....	186	910933E.....	170	917431E.....	171
80479.....	135	910153E.....	173	9103569.....	186	9109352.....	170	9174332.....	171
80480.....	136	9101552.....	173	910356E.....	172	9109355.....	170	9174335.....	171
80482.....	141	9101555.....	173	9103572.....	172	910935E.....	170	917433E.....	171
80483.....	141	910155E.....	173	9103575.....	172	9109362.....	170	9174352.....	171
80484.....	141	9101562.....	173	9103577.....	186	9109365.....	170	9174355.....	171
80485.....	141	9101565.....	173	9103578.....	186	910936E.....	170	917435E.....	171
80486.....	140	910156E.....	173	9103579.....	186	9109362.....	170	9174362.....	171
83606.....	138	9101572.....	173	910357E.....	172	910950210.....	191	9174365.....	171
88000.....	139	9101575.....	173	9106312.....	174	9109512.....	170	917436E.....	171
88004-875.....	139	910157E.....	173	9106315.....	174	9109515.....	170	91745.....	187
88012.....	136	9102312.....	172	910631E.....	174	9109517.....	185	917450210.....	191
88013.....	136	9102315.....	172	9106332.....	174	9109518.....	185	917450212.....	191
88014.....	136	910231E.....	172	9106335.....	174	9109519.....	185	9174512.....	171
88015.....	136	9102332.....	172	910633E.....	174	910951E.....	170	9174514.....	171
9100312.....	174	9102335.....	172	9106352.....	174	9109522.....	170	9174515.....	171
9100315.....	174	910233E.....	172	9106355.....	174	9109525.....	170	9174517.....	186
910031E.....	174	9102352.....	172	910635E.....	174	910952E.....	170	9174518.....	186
9100332.....	174	9102355.....	172	9106362.....	174	9109532.....	170	9174519.....	186
9100335.....	174	910235E.....	172	9106365.....	174	9109535.....	170	917451E.....	171
910033E.....	174	9102362.....	172	910636E.....	174	910953E.....	170	9174522.....	171
9100352.....	174	9102365.....	172	91065.....	187	9109552.....	170	9174525.....	171
9100355.....	174	910236E.....	172	910650210.....	191	9109555.....	170	917452E.....	171
910035E.....	174	91025.....	187	910650212.....	191	9109557.....	185	9174532.....	171
9100362.....	174	910250210.....	191	9106512.....	174	9109558.....	185	9174535.....	171
9100365.....	174	910250212.....	191	9106515.....	174	9109559.....	185	917453E.....	171
910036E.....	174	9102512.....	172	9106517.....	187	910955E.....	170	9174552.....	171
91005.....	187	9102515.....	172	9106518.....	187	9109562.....	170	9174555.....	171
910050210.....	191	910251E.....	172	9106519.....	187	9109565.....	170	9174557.....	186
910050212.....	191	9102522.....	172	910651E.....	174	9109567.....	185	9174558.....	186
9100512.....	174	9102525.....	172	9106522.....	174	9109568.....	185	9174559.....	186
9100515.....	174	910252E.....	172	9106525.....	174	9109569.....	185	917455E.....	171
9100517.....	187	9102532.....	172	910652E.....	174	910956E.....	170	9174562.....	171
9100518.....	187	9102535.....	172	9106532.....	174	9109572.....	170	9174564.....	171
9100519.....	187	910253E.....	172	9106535.....	174	9109575.....	170	9174565.....	171
910051E.....	174	9102552.....	172	910653E.....	174	9109577.....	185	9174567.....	186



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Catalog # Product Index

9174568.....	186	9178519.....	184	9219455.....	178	9314A1E.....	158	9413232.....	167
9174569.....	186	917851E.....	169	921945E.....	178	9314A32.....	158	9413252.....	167
917456E.....	171	9178522.....	169	9219462.....	178	9314A35.....	158	9413312.....	167
9174572.....	171	9178525.....	169	9219465.....	178	9314A3E.....	158	9413315.....	167
9174575.....	171	917852E.....	169	921946E.....	178	9314A52.....	158	941331E.....	167
9174577.....	186	9178532.....	169	9219472.....	178	9314A55.....	158	9413332.....	167
9174578.....	186	9178535.....	169	9219475.....	178	9314A5E.....	158	9413335.....	167
9174579.....	186	917853E.....	169	921947E.....	178	9314A62.....	158	941333E.....	167
917457E.....	171	9178552.....	169	921950210.....	178	9314A65.....	158	9413352.....	167
9175312.....	169	9178555.....	169	921950212.....	178	9314A6E.....	158	9413355.....	167
9175315.....	169	9178557.....	184	9304512.....	158	9409212.....	165	941335E.....	167
917531E.....	169	9178558.....	184	9304515.....	158	9409232.....	165	941350210.....	191
9175332.....	169	9178559.....	184	930451E.....	158	9409252.....	165	941350212.....	191
9175335.....	169	917855E.....	169	930453E.....	158	9409312.....	165	9413512.....	167
917533E.....	169	9178562.....	169	9304552.....	158	9409315.....	165	9413515.....	167
9175352.....	169	9178565.....	169	9304555.....	158	940931E.....	165	941351E.....	167
9175355.....	169	9178567.....	184	930455E.....	158	9409332.....	165	9413522.....	167
917535E.....	169	9178568.....	184	9304562.....	158	9409335.....	165	9413525.....	167
9175362.....	169	9178569.....	184	9304565.....	158	940933E.....	165	941352E.....	167
9175365.....	169	917856E.....	169	930456E.....	158	9409352.....	165	9413532.....	167
917536E.....	169	9178572.....	169	9304575.....	158	9409355.....	165	9413535.....	167
917550210.....	191	9178575.....	169	9304A12.....	158	940935E.....	165	941353E.....	167
917550212.....	191	9178577.....	184	9304A15.....	158	9409362.....	165	9413552.....	167
9175512.....	169	9178578.....	184	9304A1E.....	158	9409365.....	165	9413555.....	167
9175515.....	169	9178579.....	184	9304A32.....	158	940936E.....	165	941355E.....	167
9175517.....	184	917857E.....	169	9304A35.....	158	940950210.....	191	9413562.....	167
9175518.....	184	9179312.....	171	9304A3E.....	158	940950212.....	191	9413565.....	167
9175519.....	184	9179315.....	171	9304A52.....	158	9409512.....	165	941356E.....	167
917551E.....	169	917931E.....	171	9304A55.....	158	9409515.....	165	9413572.....	167
9175522.....	169	9179332.....	171	9304A5E.....	158	940951E.....	165	9413575.....	167
9175525.....	169	9179335.....	171	9304A62.....	158	9409522.....	165	941357E.....	167
917552E.....	169	917933E.....	171	9304A65.....	158	9409525.....	165	9414212.....	166
9175532.....	169	9179352.....	171	9304A6E.....	158	940952E.....	165	9414232.....	166
9175535.....	169	9179355.....	171	930950250.....	159	9409532.....	165	9414252.....	166
917553E.....	169	917935E.....	171	930950252.....	159	9409535.....	165	9414312.....	166
9175552.....	169	9179362.....	171	930950253.....	159	940953E.....	165	9414315.....	166
9175555.....	169	9179365.....	171	9309512.....	157	9409552.....	165	941431E.....	166
9175557.....	184	917936E.....	171	9309515.....	157	9409555.....	165	9414332.....	166
9175558.....	184	917950210.....	191	930951E.....	157	940955E.....	165	9414335.....	166
9175559.....	184	917950212.....	191	930953E.....	157	9409562.....	165	941433E.....	166
917555E.....	169	9179512.....	171	9309552.....	157	9409565.....	165	9414352.....	166
9175562.....	169	9179515.....	171	9309555.....	157	940956E.....	165	9414355.....	166
9175565.....	169	9179517.....	185	930955E.....	157	9409572.....	165	941435E.....	166
9175567.....	184	9179518.....	185	9309562.....	157	9409575.....	165	941450210.....	191
9175568.....	184	9179519.....	185	9309565.....	157	940957E.....	165	941450212.....	191
9175569.....	184	917951E.....	171	930956E.....	157	9410212.....	168	9414512.....	166
917556E.....	169	9179522.....	171	9309575.....	157	9410232.....	168	9414515.....	166
9175572.....	169	9179525.....	171	9309A0250.....	159	9410252.....	168	941451E.....	166
9175575.....	169	917952E.....	171	9309A0252.....	159	9410312.....	168	9414522.....	166
9175577.....	184	9179532.....	171	9309A0253.....	159	9410315.....	168	9414525.....	166
9175578.....	184	9179535.....	171	9309A12.....	157	941031E.....	168	941452E.....	166
9175579.....	184	917953E.....	171	9309A15.....	157	9410332.....	168	9414532.....	166
917557E.....	169	9179552.....	171	9309A1E.....	157	9410335.....	168	9414535.....	166
9177312.....	182	9179555.....	171	9309A32.....	157	941033E.....	168	941453E.....	166
9177315.....	182	9179557.....	185	9309A35.....	157	9410352.....	168	9414552.....	166
917731E.....	182	9179558.....	185	9309A3E.....	157	9410355.....	168	9414555.....	166
9177352.....	182	9179559.....	185	9309A52.....	157	941035E.....	168	941455E.....	166
9177354.....	182	917955E.....	171	9309A55.....	157	9410362.....	168	9414562.....	166
9177355.....	182	9179562.....	171	9309A5E.....	157	9410365.....	168	9414565.....	166
917735E.....	182	9179565.....	171	9309A62.....	157	941036E.....	168	941456E.....	166
917750210.....	182	9179567.....	185	9309A65.....	157	941050210.....	191	9414572.....	166
917750212.....	182	9179568.....	185	9309A6E.....	157	941050212.....	191	9414575.....	166
9177575.....	182	9179569.....	185	931450250.....	159	9410512.....	168	941457E.....	166
9178312.....	169	917956E.....	171	931450252.....	159	9410515.....	168	9416212.....	167
9178315.....	169	9179572.....	171	931450253.....	159	941051E.....	168	9416232.....	167
917831E.....	169	9179575.....	171	9314512.....	158	9410522.....	168	9416252.....	167
9178332.....	169	9179577.....	185	9314515.....	158	9410525.....	168	941650210.....	191
9178335.....	169	9179578.....	185	931451E.....	158	941052E.....	168	941650212.....	191
917833E.....	169	9179579.....	185	931453E.....	158	9410532.....	168	9416512.....	167
9178352.....	169	917957E.....	171	9314552.....	158	9410535.....	168	9416515.....	167
9178355.....	169	9181352.....	183	9314555.....	158	941053E.....	168	941651E.....	167
917835E.....	169	918150210.....	183	931455E.....	158	9410552.....	168	9416522.....	167
9178362.....	169	918150212.....	183	9314562.....	158	9410555.....	168	9416525.....	167
9178365.....	169	9181565.....	183	9314565.....	158	941055E.....	168	941652E.....	167
917836E.....	169	9219412.....	178	931456E.....	158	9410562.....	168	9416532.....	167
917850210.....	191	9219415.....	178	9314575.....	158	9410565.....	168	9416535.....	167
917850212.....	191	921941E.....	178	9314A0250.....	159	941056E.....	168	941653E.....	167
9178512.....	169	9219422.....	178	9314A0252.....	159	9410572.....	168	9416552.....	167
9178515.....	169	9219425.....	178	9314A0253.....	159	9410575.....	168	9416555.....	167
9178517.....	184	921942E.....	178	9314A12.....	158	941057E.....	168	941655E.....	167
9178518.....	184	9219452.....	178	9314A15.....	158	9413212.....	167	9416562.....	167

9416565	167	951050210	191	951431E	175	9519555	176
941656E	167	951050212	191	9514331	175	951955E	176
9416572	167	9510511	177	9514332	175	9519561	176
9416575	167	9510512	177	9514335	175	9519562	176
941657E	167	9510515	177	951433E	175	9519565	176
9418212	163	951051E	177	9514351	175	951956E	176
9418232	163	9510521	177	9514352	175	9519571	176
9418252	163	9510522	177	9514355	175	9519572	176
9418312	163	9510525	177	951435E	175	9519575	176
9418315	163	951052E	177	9514361	175	951957E	176
941831E	163	9510531	177	9514362	175	KT676001-4035	343
9418332	163	9510532	177	9514365	175	KT953751-0000	343
9418335	163	9510535	177	951436E	175	KT953753-0000	343
941833E	163	951053E	177	951450210	191	KT953761-0000	343
9418352	163	9510551	177	951450212	191	KT953771-0000	343
9418355	163	9510552	177	9514511	175	KT953781-0000	343
941835E	163	9510555	177	9514512	175	KT953825-0000	343
9418362	163	951055E	177	9514515	175	KT953826-0000	343
9418365	163	9510561	177	951451E	175	KT953827-0000	343
941836E	163	9510562	177	9514521	175	KT953828-0000	343
941850210	191	9510565	177	9514522	175	KT953829-0000	343
941850212	191	951056E	177	9514525	175	KT953830-0000	343
9418512	163	9510571	177	951452E	175	KT953835-0000	343
9418515	163	9510572	177	9514531	175	KT953845-0000	343
941851E	163	9510575	177	9514532	175		
9418522	163	951057E	177	9514535	175		
9418525	163	951250210	191	951453E	175		
941852E	163	951250212	191	9514551	175		
9418532	163	9512511	176	9514552	175		
9418535	163	9512512	176	9514555	175		
941853E	163	9512515	176	951455E	175		
9418552	163	951251E	176	9514561	175		
9418555	163	9512521	176	9514562	175		
941855E	163	9512522	176	9514565	175		
9418562	163	9512525	176	951456E	175		
9418565	163	951252E	176	9514571	175		
941856E	163	9512531	176	9514572	175		
9418572	163	9512532	176	9514575	175		
9418575	163	9512535	176	951457E	175		
941857E	163	951253E	176	951650210	191		
9419212	166	9512551	176	951650212	191		
9419232	166	9512552	176	9516511	176		
9419252	166	9512555	176	9516512	176		
9419312	166	951255E	176	9516515	176		
9419315	166	9512561	176	951651E	176		
941931E	166	9512562	176	9516521	176		
9419332	166	9512565	176	9516522	176		
9419335	166	951256E	176	9516525	176		
941933E	166	9512571	176	951652E	176		
9419352	166	9512572	176	9516531	176		
9419355	166	9512575	176	9516532	176		
941935E	166	951257E	176	9516535	176		
9419362	166	951350210	191	951653E	176		
9419365	166	951350212	191	9516551	176		
941936E	166	9513511	175	9516552	176		
941950210	191	9513512	175	9516555	176		
941950212	191	9513515	175	951655E	176		
9419512	166	951351E	175	9516561	176		
9419515	166	9513521	175	9516562	176		
941951E	166	9513522	175	9516565	176		
9419522	166	9513525	175	951656E	176		
9419525	166	951352E	175	9516571	176		
941952E	166	9513531	175	9516572	176		
9419532	166	9513532	175	9516575	176		
9419535	166	9513535	175	951657E	176		
941953E	166	951353E	175	951950210	191		
9419552	166	9513551	175	951950212	191		
9419555	166	9513552	175	9519511	176		
941955E	166	9513555	175	9519512	176		
9419562	166	951355E	175	9519515	176		
9419565	166	9513561	175	951951E	176		
941956E	166	9513562	175	9519521	176		
9419572	166	9513565	175	9519522	176		
9419575	166	951356E	175	9519525	176		
941957E	166	9513571	175	951952E	176		
9425212	164	9513572	175	9519531	176		
9425232	164	9513575	175	9519532	176		
9425252	164	951357E	175	9519535	176		
9470212	168,179	9514311	175	951953E	176		
9470232	168,179	9514312	175	9519551	176		
9470252	168,179	9514315	175	9519552	176		

## A

## Accessories

GC	
Inlet Liners	192-217
Instrument Supplies	218-283
Gas Management	284-319
Vials & Syringes	350-395
LC	320-349
Sample Preparation	396-417
Adaptors	See also Connectors
Micropacked Inlet Conversion Kits	142,249
Packed Column Inlet Adaptor Kits	142
Adsorbent, Bulk	442
Agilent GC Instrument Parts	234-258
Agilent HPLC Instrument Parts	321-323
Agilent Supplies, GC	
Air Diverter	246
Autosampler Supplies	258
Backpressure Regulator Kit	246
Cables	258
Capillary Column Nuts	238-239
Capillary Installation Gauge	239,252,278
Chemical Traps	246,294
Column Hanger	248
Compact Ferrules	225
Detector Supplies	
Cables	258
ECD/FID Dual-Purpose Make-Up Gas Kit	257
EZ No-Vent GC Column-Mass Spectrometer Connector	251
FID Collector Assemblies	254-255
FID Flow Measuring Adaptor	222,255
FID Gauge Pack	255
FID Ignitor	254-255
FID Jets	256,266
FID Maintenance Kits	255
FID/Injector Cleaning Kit	257
FID/NPD Adaptor Fitting	257
MSD Conversion Fitting	252
MSD Source Nut	252
Plug Nut, Injector/Detector	239,257
Direct Injection Inserts	248
Dual-Column Analysis	
Capillary Inlet Adaptor Fitting Kits	245,250,274
Ferrules	225,250,274
Reducing Nut	242-243,245
Electron Multipliers	253
EPC Test Kit	245
FID Maintenance Kits	255
Finger-Tight Nuts	239
GC-MS Consumables	251-253
Heater Block	245
Heater/Sensor Assembly	246
Injection Ports	242-244
Inlet Adaptor Fitting Kits	240,245,250,274
Inlet Liner Seals	234
Inlet Liners	142,197-198,203-206,215,249
Base-Deactivated	203
CIS4 and PTV	206
Direct Injection	198,206
Packing Materials and Tools	216-217
Siltek Metal	206,215
Sky	197-198
Split	197,205
Split/Splitless	197,205
Splitless	142,197,204,249
SPME	198,205
Uniliner	198,206
Inlet Maintenance Kits	237,255
Inlet Seals	241,250,267,274

Microseal Septa	235
O-Rings, Inlet Liner	234
PTV Seals	234,241
Septa	235-236
Septum Nuts	236,242-243
Septum-Purged Packed Column Port Weldment	248
Syringes	374-376,378,380-382,384
Tool Kit, MLE	248,264,270,277
Z-Belt	258
Agilent System Replacement Parts, GC	245-246
Agilent System Replacement Parts, HPLC	321-324
Air Compressor Traps	293
Air Diverter	246
Air (Zero) Generators	297,300
Air Sampling	
Section Table of Contents	418
Canister Supplies	432,434
Canisters	
Carrying Box Kit	432
Carrying Case	432
Cleaning System	430
Dual Canister Sampling Manifold	427
Gauges	422-424
Humidification Chamber	431
Miniature	435
Reconditioning Service	433
Sampling Timer	431
SilcoCan	421
TO-Can	422
Valves	423
Gas Standards	
BTEX Gas Mixture	448
Cylinder Stand	452
Japan Calibration	447
Natural Gas	449
Ozone Precursor	447
Refinery Gas	449
Scott Transportable Gases	450-451
TO-14A	443-444
TO-15	445-446
PUF Supplies	
Cartridges	441
Glass Holder	441
Plugs	441
Resin	442
Sample Inlets	426
Sampling Bags	436
Sampling Kits, Passive Air	425-428,434
Syringes	393,457
Test Gauges	424
Thermal Desorption Unit Tubes	439-440
Ultra-Clean Resin	442
Vacuum Bag Sampler	437
Valves	423
Alaska UST Reference Standards	502-503
Alicat Flow Calibrators	429
Allen (Hex Key) Wrenches	270,281,317
Allure HPLC Columns	180-181
Amine Column Test Mix	473
Analytical Reference	
Materials	See Reference Standards
Antifoam Agent for	
Purge-and-Trap Samples	466,546,548
APEX Supplies	207,259
Applications (Chromatograms)	www.restek.com
Aqueous C18 Columns	163,169,184
ARC-18 LC Columns	158
Arizona UST Reference Standards	504
Aroclor Reference Standards	466,530-531,578
Aromax LC Columns	173
ASE Extraction Systems, Parts and Supplies	412-416

ASTM Reference Standards	460-461
ATAS Accessories	259
ATAS Injector Liners	207
Autosampler	
Supplies for Agilent GCs	258
Syringes, GC	374-376,378,380-382,384,386
Syringes, HPLC	348,389,392,394-395
Vials	367
Aviation Gas Reference Standards	466,498,513

## B

Backpressure Regulators	
Gas	306
Gas Kit	246
Mobile Phase	346
Ball Valves	316
Base-Deactivated GC Accessories	
Fused Silica Guard Columns	22
Inlet Liners	203
Wool	216
Bench Organizers	338
Bender, Tubing	319
Biodiesel Reference	
Standards	467-471,484,498,501,577
Biphenyl LC Columns	153,157,165,170,176,185
Blank Ferrules	225
Bluestem Solvent Filter	343
Bonded Stationary Phases, Packed Column	132-133,135
Book Holders	338
Bottles, Mobile Phase	340
Bruker/Varian GC Supplies	
Capillary Installation Gauge	261,278
Capillary Nuts	261
EZ No-Vent GC-MS Connector	262
Inlet Liner Seals	234,260
Inlet Liners	
Direct Injection	208
For 1075/1077 GCs	208
For 1078/1079 GCs	199,209
For 1177 GCs	199,209
Sky	199
SPI	208
Split	208
Splitless	208
SPME	208
Uniliner	199,208-209
Inlet Spring, Siltek	261
Rethreading Tool	261
Septa	263
Syringes	378
Tool Kit, MLE	261,277
Brushes, Tube	282
BTEX Reference Standards	448,484,488-489,496,500-501,552,554
BTO Septa	223,236,260,263,265,268
Bubble Flowmeters	222
Bulk Adsorbents	403
Bulk Packing Materials	
GC	143-145
HPLC (Silica)	187
By-Pass Line for Tekmar Purge-and-Trap	276

## C

C18 LC Columns	158,166,171,175,186
Cables for Agilent GCs	258
Calibration Mixtures	See Reference Standards
California UST Reference Standards	504
Canister Supplies	434



- Canisters**  
 Carrying Cases ..... 432  
 Cleaning System ..... 430  
 Dual Canister Sampling Manifold ..... 427  
 Gauges ..... 422-424  
 Humidification Chamber ..... 431  
 Miniature ..... 435  
 Reconditioning Service ..... 433  
 Sampling Timer ..... 431  
 SilcoCan ..... 421  
 TO-Can ..... 422  
 Tripod ..... 432  
 Valves ..... 423
- Cannabis Reference Standards** ..... 566
- Capillary GC Column**  
 Bubble Flowmeters ..... 222  
 Caps ..... 278  
 Cutting Tools  
   *Sapphire Scribe* ..... 279  
   *Scoring Wafer* ..... 279  
   *Tubing Cutter* ..... 318  
 Evaluation Mixtures ..... 473-474  
 Ferrules ..... 224,230,274  
 Inlet Liners ..... See Inlet Liners  
 Installation Gauge ..... 239,261,266,270,278  
 Installation Tools ..... 277-283  
 Nuts ..... 238-239,242-243  
 Rinsing Reservoir ..... 222
- Capillary GC Columns** ..... See GC Columns, PLOT Columns, Packed Columns. See also column names (e.g., Rtx).
- Capillary HPLC Columns** ..... Please inquire.
- Capillary Tubing** ..... 312-315,322
- Capillary-Grade Hydrocarbon Trap** ..... 286,293
- Caps, Column End, Capillary GC** ..... 278
- Caps, Vial** ..... 350
- Carbamate Reference Standards** ..... 467,521
- CarboBlack**  
 Packings ..... 143  
 Solid Supports ..... 136,143
- CarboFrit Inlet Liner Packing Material** ..... 216
- CarboFrit Inserts** ..... 216
- CarboPrep Cartridges** ..... 397-398
- Carlo Erba Supplies** ... See Thermo Scientific GC Supplies
- Carrier Gas Purifiers** ..... See Gas Purifiers
- Catalog Number Index** ..... 593-611
- CE Instruments/ThermoQuest Supplies** ..... See Thermo Scientific GC Supplies
- Centrifuge, Q-sep 3000** ..... 407
- Ceramic Scoring Wafer** ..... 279
- Certified Reference Materials** ... See Reference Standards.
- Certified Vials** ..... 363
- CGA Fittings** ..... 304
- Check Valves, HPLC** ..... 323,325,327,328,332
- Chemical Standards** ..... See Reference Standards
- Chemical Traps** ..... 246,294
- Chiral Capillary GC Columns** ..... 103
- Chlordane Solutions** ..... 467,521-522,524,526,544
- Chloroprene Reference Standards** ..... 467,556
- Chromatograph Installation Kit** ..... 317
- Chromatograms (Applications)** ..... [www.restek.com](http://www.restek.com)
- Chromatography Columns** ..... See GC Columns, HPLC Columns, PLOT Columns, Packed Columns. See also column names (e.g., Rtx).
- Chromatography Seminars**... [www.restek.com/education](http://www.restek.com/education)
- Clean-Cut Tubing Cutter** ..... 337
- CLP Reference Standards** ..... 462
- Coatings, Tubing (Surface Treatments)**  
 Frequently Asked Questions ..... 312
- Collector Assemblies, FID** ..... 254-255
- Column Hanger for Agilent GCs** ..... 248
- Column Heater, HPLC** ..... 344
- Column Installation, GC**  
 Caps ..... 278  
 Gauge ..... 278  
 Kits  
   *Micropacked Columns* ..... 142  
   *Packed Columns* ..... 142  
 Nuts ..... 238  
 Tools ..... 277-283
- Column Selection**  
 GC  
   *Fused Silica* ..... 10-15  
   *PLOT* ..... 117-119  
 HPLC ..... 153-154
- Column Test Mixes**  
 GC ..... 473-474  
 HPLC ..... 475
- Columns** ..... See GC Columns, HPLC Columns, PLOT Columns, Packed Columns. See also column names (e.g., Rtx).
- Compact Ferrules for Agilent GCs** ..... 225
- Compact Steel Ruler** ..... 282
- Composite Fuel Reference Standards** ..... 469,471,489, 497-498,502,513
- Compound Index**  
 For Reference Standards ..... 586-592
- Connecticut UST Reference Standards** ..... 504
- Connectors, Column**  
 MXT  
   *MXT Low Dead-Volume* ..... 232  
   *MXT Low Dead-Volume "Y"* ..... 232  
   *Replacement Nuts and Ferrules* ..... 232  
 PEEK, HPLC ..... 336  
 Press-Tight  
   *Deactivated Universal* ..... 62,228-230,275  
   *Polyimide Resin* ..... 228,275  
   *Siltek-Deactivated* ..... 62,72,228-230,275  
   *Universal* ..... 62,228-230,275  
   *Universal Angled "Y"* ..... 72,228,275  
   *Universal "Y"* ..... 228,230,275  
 SeCure "Y" ..... 224,228,230,274-275  
 Valco ..... 231,233,336  
 Vu2-Union ..... 62,226,228-229,269
- Connectors, Tubing**  
 Brass ..... 251,262,271,288,304,307-308,310,428  
 PEEK ..... 336  
 Pipe ..... 251,262,271,288,304,307-311,428  
 Reducing ..... 251,262,271,288,304,307-310,428  
 Silcosteel-CR-Treated ..... 309,311,428  
 Siltek-Treated ..... 309,311,428  
 Stainless Steel ..... 251,262,271,288,304,307-308,310,428  
 Sulfinit-Treated ..... 309,311,428  
 Transfer Line Reducing Kit ..... 271  
 Tube ..... 251,262,271,288,304,307-311,428  
 Valco  
   *Male Pipe to Valco Internal Adaptor* ..... 233  
   *Nuts and Ferrules* ..... 233  
   *One-Piece Fused Silica Adaptor* ..... 233,251,262,271  
   *Treated* ..... 311  
   *Zero Dead-Volume Internal Union* ..... 233,336  
 Zero Dead-Volume ..... 233,336
- Controllers, Flow** ..... 426
- Copper Tubing** ..... 313
- Crimp-Top Vials** ..... 354,358,364  
 Aluminum Crimp Seals w/Septa ..... 357-360,362,364  
 Convenience Kits ..... 358  
 Limited Volume Inserts ..... 355-356  
 Limited Volume Vials ..... 357  
 Snap Seal Style ..... 354,357
- Crimp-Top WISP Vials** ..... 364
- Crimpers, Vial Cap**  
 Electronic ..... 371  
 Squeeze-Type ..... 371
- CRMs** ..... See Reference Standards.
- Cross-Reference Charts**  
 GC Columns ..... 16-17  
 PLOT Columns ..... 117  
 Syringes ..... 376  
 USP (GC) ..... 147  
 USP (HPLC) ..... 153
- Cross Unions** ..... See Connectors, Unions
- Custom**  
 Coated Packing Materials ..... 148  
 Columns  
   *Capillary GC* ..... Please inquire.  
   *HPLC* ..... Please inquire.  
   *Micropacked GC* ..... 149  
   *Packed GC* ..... 149  
 Request Forms  
   *Packed GC Columns* ..... 150  
   *Reference Standards* ..... [www.restek.com/solutions](http://www.restek.com/solutions)
- Cutters, Tubing** ..... 337
- Cyanopropyl SPE Cartridge** ..... 397
- Cyclohexyl SPE Cartridge** ..... 397
- Cylinder Holder** ..... 306
- Cylinder Stand** ..... 452
- Cylinder Valve Wrench** ..... 306
- Cylinders, Sample** ..... 454

## D

- D3606 Application Column Set, Packed Columns** ..... 138
- Deactivation**  
 Guard Columns ..... 21-22,72,106  
 Liner Packings  
   *Deactivated Wool* ..... 216  
 Liners  
   *Base-Deactivated* ..... 203  
   *Siltek-Deactivated* ..... 203
- Debubblers, HPLC** ..... 342
- Decappers, Vial**  
 Electronic ..... 371  
 Squeeze-Type ..... 371
- Degasser, HPLC** ..... 344
- Derivatization Reagents** ..... 472-473
- Detector Supplies**  
 Agilent GCs  
   *Cables* ..... 258  
   *ECD/FID Dual-Purpose Make-Up Gas Kit* ..... 257  
   *EZ No-Vent GC Column-Mass Spectrometer Connector* ..... 251  
   *FID/NPD Adaptor Fitting* ..... 257  
   *FID Base Weldment* ..... 254  
   *FID Collector Assemblies* ..... 254-255  
   *FID Collector Housing Kit* ..... 254  
   *FID Collector Mount* ..... 254  
   *FID Flow Measuring Adaptor* ..... 222,255  
   *FID Gauge Pack* ..... 255  
   *FID Ignitor* ..... 254-255  
   *FID Jet Removal Tool* ..... 256  
   *FID Jets* ..... 256  
   *FID Maintenance Kits* ..... 237,255  
   *FID Spanner Wrench* ..... 254  
   *MSD Conversion Fitting* ..... 252  
   *MSD Source Nut* ..... 252  
   *Plug Nut, Injector/Detector* ..... 239,257  
 Jet Reamers ..... 283

PerkinElmer GCs			
FID Jet	264		
FID Part Kit	264		
Nozzle Insulator	264		
Shimadzu GCs	266		
PID Lamps	276		
<b>Diaphragm Valves</b>	<b>420-423</b>		
<b>Diatomaceous Earth</b>	<b>403</b>		
<b>Diesel Reference Standards</b>			
Biodiesel Calibration Standards	577		
Diesel Fuel #2	468,480-481,484-485,497-498,503,561		
Diesel Internal Standards	466-467,469,471,484,501,503-504,506,508-509,517		
Diesel Surrogate Standards	466-467,469,471,484,501,503-504,506,508-509,517		
Diesel/Biodiesel Blend	468,484,498,501,577		
<b>Direct Injection Inlet Liners</b>			
For Agilent GCs	198,206		
For Bruker/Varian GCs	208-209		
For PerkinElmer GCs	211		
For Shimadzu GCs	213		
For Thermo Scientific GCs	214		
<b>Direct Injection Inserts</b>	<b>248</b>		
<b>Diskcover-47</b>			
Extraction Disk Holder	402		
Reservoir	402		
<b>Disks, SPE</b>	<b>402</b>		
<b>Distributors</b>	<b>www.restek.com/distributors</b>		
<b>DNP Reference Standards</b>	<b>466,469,483</b>		
<b>Dressing Tool</b>	<b>319,337</b>		
<b>Drinking Water Reference Standards</b>	<b>461</b>		
<b>Drug Prep I SPE Cartridge</b>	<b>398</b>		
<b>Drug Prep II SPE Cartridge</b>	<b>398</b>		
<b>Drug Reference Standards</b>	<b>466-471,478,566</b>		
<b>Dual-Column Analysis</b>			
Connectors			
SeCure "Y"	230,275		
Siltek Press-Tight	228-230,275		
Universal Angled "Y" Press-Tight	228,275		
Universal "Y" Press-Tight	228,230,275		
Ferrules	225,250,274		
For Agilent GCs			
Capillary Inlet Adaptor Fitting Kit	250		
Reducing Nut	245		
Inlet Adaptor Fitting Kits	250,274		
Packed Column Inlet Fittings			
Graphite Ferrules	224-225,230,274		
<b>Dual-Purpose Make-Up Gas Kit</b>	<b>257</b>		
<b>Dual Vespel Ring Inlet Seals</b>	<b>240,267</b>		
<b>E</b>			
<b>ECD/FID Dual-Purpose Make-Up Gas Kit</b>	<b>257</b>		
<b>ECD Vent Trap</b>	<b>293</b>		
<b>EFSA PAH Reference Standards</b>	<b>572</b>		
<b>Electron Multipliers</b>	<b>253</b>		
<b>Electronic Leak Detector</b>	<b>219-220,286</b>		
<b>Encapsulated Ferrules</b>	<b>224</b>		
<b>Environmental Analysis Reference Standards</b>	<b>458-460</b>		
<b>EPA Method Reference Standards</b>			
1311	494,544		
1614	528		
1664	519		
418.1	517		
500 Series Methods	461		
600 Series Methods	462		
8000 Series Methods	462		
CLP	462		
<b>European Pharmacopoeia Method</b>	<b>585</b>		
<b>Evaluation Mixtures, Column</b>	<b>473-475</b>		
<b>EXP Fittings</b>	<b>335</b>		
<b>EXP Guard Columns</b>	<b>159</b>		
<b>Explosives Reference Standards</b>	<b>479,486-487</b>		
<b>Extended Capillary Column Nuts</b>	<b>238</b>		
<b>Extraction System Parts</b>			
ASE	412-416		
SPE	400-402		
<b>EZ No-Vent GC Column-Mass Spectrometer Connector</b>	<b>251,262,271</b>		
<b>EZ Twist Top Split/Splitless Injection Port</b>	<b>242-243</b>		
<b>F</b>			
<b>FAMEWAX Capillary GC Column</b>	<b>83</b>		
<b>Fast GC Columns</b>	<b>63</b>		
<b>Fatty Acid Methyl Ester Mixtures</b>	<b>563-564</b>		
<b>Ferrule Removal Kit</b>	<b>231</b>		
<b>Ferrules</b>			
Blank	225		
Capillary	224		
Compact—for Agilent GCs	225		
Dual-Column	225,250,274		
Encapsulated	224		
EZ No-Vent	251,262,271		
For Agilent GCs	225		
For MXT Connectors	232		
For Shimadzu GCs	226,266		
For Thermo Scientific GCs	226,269		
M4 Fitting	226,269		
Reducing	225		
SeCure "Y" Connector	230		
Standard	225		
Two-Hole	225,250,274		
Vu2-Union Connector	229		
<b>FID Performance Evaluation Standard</b>	<b>473</b>		
<b>FID Supplies</b>	<b>See Detector Supplies</b>		
<b>Filters</b>			
For ASE Extraction Cells	413-414		
Gas	See Gas Purifiers		
In-Line, Air Sampling	426		
Inlet, HPLC	340,342		
Last Drop, HPLC	342		
Mobile Phase	340,342		
Passive Air Sampling	426		
Resprep SPE Flow Filter	402		
Syringe Filters	408		
UHPLC	188		
Vials, Thomson SINGLE STEP	410		
<b>Filtration Glassware</b>	<b>341,343</b>		
<b>Finger-Tight Nuts, GC</b>	<b>238</b>		
<b>Fire Debris Reference Standards</b>	<b>479-481,484,489,498,514</b>		
<b>Fisons Supplies</b>	<b>See Thermo Scientific GC Supplies</b>		
<b>Fittings</b>			
Brass	307,308,310		
CGA	304		
Column End, HPLC	347		
EXP HPLC	335		
Kits	307		
MSD Conversion	252		
Packed Column	134		
Packed Column Inlet Adaptor Kit	142		
Packed Column Reduction	134		
Pipe (Parker)	310-311		
Pipe (Swagelok)	304,307-309		
Pipe-to-Tube	288,304,307-311		
Reduction	288,304,307-310		
Silcosteel-CR-Treated	309,311		
Siltek-Treated	309,311		
Stainless Steel	307,308,310		
Sulfurnert-Treated	309,311		
Tube (Parker)	288,310-311		
Tube (Swagelok)	304,307-309		
Valco (Treated)	311		
VCO O-Ring Face Seal	316		
Welded Reducers, Packed Column	134		
Welded VCR, Packed Column	134		
<b>Flash Arrestor</b>	<b>304</b>		
<b>Flashlight</b>	<b>283,319</b>		
<b>Flexible Stainless Steel Hose</b>	<b>304</b>		
<b>Flip Seal Dual Vespel Ring Inlet Seals</b>	<b>240</b>		
<b>Florida UST Reference Standards</b>	<b>505</b>		



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**Florisil Cartridge Quality Control Standard** ..... 561  
**Florisil SPE Cartridge** ..... 397  
**Flow Calibrators** ..... 429  
**Flow Controller, Veriflow Air Sampling** ..... 426  
**Flowmeters** ..... 219–222,286  
**Food Testing Reference Standards** ..... 565–575  
**Fragrance Reference Standards** ..... 566  
**Frits**  
 Air Sampling ..... 426,428  
 HPLC ..... 189–190,347  
 SPE ..... 399  
**Fuel Oil Degradation Mix** ..... 499,514  
**Fuel Reference Standards** ..... See Reference Standards  
**Fused Silica**  
 Adaptors ..... See Connectors  
 Capillary Columns ..... See GC Columns  
 See also column names (e.g., Rtx)  
 GCxGC Columns ..... 60–62  
 Guard Columns ..... 21–22  
 Retention Gaps ..... 21–22

**G**

**Gas**  
 Cylinder Holder ..... 306  
 Filters ..... See Gas Purifiers  
 Flowmeters ..... 219–222,286  
 Generators  
 Hydrogen ..... 296  
 Hydrogen/Zero Air (FID Stations) ..... 297  
 Nitrogen ..... 298–299,345  
 Zero Air ..... 300  
 Zero Air/Hydrogen (FID Stations) ..... 297  
 Leak Detectors ..... 219–221,286  
 Management System ..... 286,292–293  
 Pressure Regulators ..... See Regulators  
 Purifiers  
 Overview ..... 285  
 Chemical and Vent Traps ..... 292–293  
 Restek Gas Management System ..... 286,292–293  
 Super-Clean Gas Purifiers ..... 287–288  
 VICI/Matsen Modules ..... 294  
 Reference Standards ..... 443–451  
 Sampling  
 Cylinders ..... 454  
 Loops ..... 457  
 Valves ..... 455,457

**Gas Management**  
 Section Table of Contents ..... 284  
 Fittings ..... 307–311  
 Flowmeters ..... 219,221  
 Gas Purification ..... 285  
 Generators ..... 295–300  
 Installation Tools ..... 317  
 Leak Detector ..... 219–220,286  
 Overview ..... 285  
 Regulators & Accessories ..... 301–304  
 Tubing & Fitting Tools ..... 318–319  
 Tubing & Valves ..... 312–316

**Gas-Tight Syringes** ..... 375,389–393,395  
**Gasoline Reference Standards**  
 Gasoline Internal Standards ..... 467,471,489,  
 501–502,509,517,554  
 Gasoline Range Organics ..... 489,500  
 Gasoline Surrogate Standards ..... 467,471,489,  
 501–502,509,517,554  
 Gasoline, Unleaded ..... 471,480–481,489,497–498,502

**Gauges**  
 FID ..... 255  
 Gap Inspection Gauge ..... 319  
 Test, Air ..... 424  
 Vacuum ..... 423,428  
 Vacuum ..... 423,428

**GC Accessories** ..... See Instrument Supplies, GC  
**GC Chromatograph Installation Kit** ..... 317  
**GC Column Test Mixes** ..... 473–474  
**GC Columns**  
 Section Table of Contents ..... 7  
 Application-Specific Columns  
 Clinical, Forensic & Toxicology ..... 65  
 Environmental ..... 66–81  
 Foods, Flavors & Fragrances ..... 82–89  
 Petroleum & Petrochemical ..... 90–93  
 Pharmaceutical ..... 94–97  
 Specially Deactivated ..... 98–103  
 Applications (Chromatograms) ..... www.restek.com  
 Chiral Columns ..... 103  
 Column Selection  
 Fused Silica ..... 10–15  
 PLOT ..... 117–119  
 Cross-Reference Chart  
 Fused Silica ..... 16–17  
 PLOT ..... 117  
 FAMEWAX ..... 83  
 Fast GC ..... 63  
 GCxGC Selectivity Kit ..... 62  
 General Purpose Columns ..... 40–59  
 Guard Columns  
 Overview ..... 18–19  
 Base-Deactivated ..... 22  
 Hydroguard ..... 22,106  
 Integra-Guard (Built-in) ..... 23  
 Intermediate-Polarity Deactivated ..... 21,72,106  
 Polar Deactivated ..... 21  
 Mass Spectroscopy ..... 23,29–30,32,34,44,49,  
 59,62–63,67,75,77,82,85–86  
**MXT Columns**  
 MXT-1 ..... 107  
 MXT-1301 ..... 109  
 MXT-1701 ..... 109  
 MXT-1HT SimDist ..... 114  
 MXT-200 ..... 110  
 MXT-2887 ..... 113  
 MXT-5 ..... 108  
 MXT-50 ..... 109  
 MXT-500 SimDist ..... 115  
 MXT-502.2 ..... 111  
 MXT-624 ..... 111  
 MXT-65TG ..... 112  
 MXT-Alumina BOND ..... 129  
 MXT-Biodiesel TG ..... 113  
 MXT-Msieve 5A ..... 129  
 MXT-Q-BOND ..... 129  
 MXT-S-BOND ..... 129  
 MXT-Volatiles ..... 111  
 MXT-WAX ..... 110  
 PLOT Column Particle Trap ..... 128  
 Retention Gaps ..... 21–23  
**Rt-Columns**  
 Rt-2560 ..... 56,83  
 Rt-Alumina BOND PLOT ..... 121–124  
 Rt-βDEXcst ..... 103  
 Rt-βDEXm ..... 103  
 Rt-βDEXsa ..... 103  
 Rt-βDEXse ..... 103  
 Rt-βDEXsm ..... 103  
 Rt-βDEXsp ..... 103  
 Rt-γDEXsa ..... 103  
 Rt-Msieve 5A PLOT ..... 125,127  
 Rt-Q-BOND PLOT ..... 126  
 Rt-QS-BOND PLOT ..... 127  
 Rt-S-BOND PLOT ..... 127  
 Rt-Silica BOND PLOT ..... 120  
 Rt-TCEP ..... 90  
 Rt-U-BOND PLOT ..... 128  
 Rt-XLSulfur Micropacked ..... 137,141

**Rt-XLSulfur Packed** ..... 137,141  
**Rtx-Columns**  
 Rtx-1 ..... 23,41  
 Rtx-1301 ..... 51  
 Rtx-1614 ..... 66  
 Rtx-1701 ..... 53  
 Rtx-20 ..... 45  
 Rtx-200 ..... 48,62–63  
 Rtx-200MS ..... 49  
 Rtx-225 ..... 54  
 Rtx-2330 ..... 55  
 Rtx-2887 ..... 93  
 Rtx-35 ..... 46  
 Rtx-35 Amine ..... 101  
 Rtx-440 ..... 50  
 Rtx-5 ..... 42–43,96  
 Rtx-5 Amine ..... 100  
 Rtx-5 DHA Tuning ..... 92  
 Rtx-5MS ..... 44  
 Rtx-50 ..... 47  
 Rtx-502.2 ..... 80  
 Rtx-624 ..... 52  
 Rtx-65 ..... 47  
 Rtx-65TG ..... 89  
 Rtx-BAC Plus 1 ..... 65  
 Rtx-BAC Plus 2 ..... 65  
 Rtx-Biodiesel TG ..... 91  
 Rtx-CLPesticides ..... 72  
 Rtx-CLPesticides2 ..... 72  
 Rtx-DHA ..... 92  
 Rtx-Dioxin2 ..... 68  
 Rtx-G27 ..... 43,97  
 Rtx-G43 ..... 51,97  
 Rtx-Mineral Oil ..... 69  
 Rtx-OPPesticides ..... 74  
 Rtx-OPPesticides2 ..... 74  
 Rtx-PCB ..... 70  
 Rtx-VMS ..... 78  
 Rtx-Volatile Amine ..... 99  
 Rtx-Volatiles ..... 80  
 Rtx-VRX ..... 79  
 Rtx-Wax ..... 57  
**Rxi-Columns**  
 Rxi-1ms ..... 29  
 Rxi-17 ..... 35  
 Rxi-17Sil MS ..... 36,76  
 Rxi-1HT ..... 39  
 Rxi-35Sil MS ..... 34,82  
 Rxi-5HT ..... 39  
 Rxi-5ms ..... 30  
 Rxi-5Sil MS ..... 32,67,75,77,85–86  
 Rxi-624Sil MS ..... 38,81,87–88,94  
 Rxi-PAH ..... 37,84  
 Rxi-XLB ..... 31,71  
 Selecting a Column  
 Fused Silica ..... 10–15  
 PLOT ..... 117–119  
 Stabilwax Columns  
 Stabilwax ..... 58,95  
 Stabilwax-DA ..... 98  
 Stabilwax-DB ..... 102  
 Stabilwax-MS ..... 59  
 Tubing Scorers, Fused Silica ..... 279  
**GC Phases Cross-Reference** ..... 16–17,117  
**GC-MS Cleaning Kit** ..... 253  
**GC-MS Tuning Mixture** ..... 473,536  
**GCxGC Columns** ..... 60–62  
**Generators** ..... 295–300  
**Gerstel GRAPHPACK Ferrules** ..... 226  
**Glassware**  
 Glass Impingers, Midget ..... 442  
 Membrane Filtration ..... 341,343  
**Glove Box Dispensers** ..... 338



<b>Graphite O-Rings</b> .....	234,260,263,265
<b>Graphite Sealing Ring</b> .....	268
<b>GRAPHPACK Ferrules</b> .....	226
<b>Grob Test Mix</b> .....	474
<b>Guard Column Holders, HPLC</b> .....	159,190
<b>Guard Column Parts, HPLC</b> .....	189-190
<b>Guard Columns</b>	
GC	
Overview .....	18-19
Base-Deactivated .....	22
Built-In (Integra-Guard) .....	23
Capillary GC.....	21-23
Fused Silica .....	21-23
Hydroguard Water-Resistant .....	22,106
Integra-Guard .....	23
Intermediate-Polarity Deactivated .....	21,106
MXT Stainless Steel.....	106
Polar-Deactivated.....	21
SFC/CE Narrow-Bore .....	21
HPLC	
Allure.....	180-181
EXP .....	159
Pinnacle II.....	178
Pinnacle DB.....	191
Raptor .....	159
Trident .....	189-191
Ultra.....	182-183,191
Viva.....	191
<b>Haloacetic Acid Reference Standards</b> .....	490
<b>HayeSep Packings</b> .....	145
<b>Headspace Vials</b>	
20 mm Aluminum Seals w/Septa, Assembled .....	367
Headspace Autosampler Vials.....	367
Screw Thread.....	366
Screw Thread Caps.....	366
<b>Helium Spargers</b> .....	340,342
<b>Herbicide Reference Standards</b> .....	491-494
<b>Hex Key (Allen) Wrenches</b> .....	270,281,317
<b>High-Purity V.O.C. Regulator</b> .....	393,453
<b>High-Temperature String</b> .....	282
<b>Hose, Flexible Stainless Steel</b> .....	304
<b>HPLC</b> .....	See LC
<b>HPLC Accessories</b> .....	320-349
<b>HPLC Pump Pressure Conversion Table</b> .....	154
<b>Hub-Cap Bottle Tops and Filter Kits</b> .....	340-341
<b>Humidification Chamber, Canister</b> .....	431
<b>Hydrocarbon Traps</b> .....	286,290,293
<b>Hydrogen Generators</b> .....	296
<b>Hydroguard Tubing</b> .....	22,106

<b>Ignitor, FID</b> .....	254-255
<b>In-Line Filters</b>	
Air Sampling.....	426
<b>Indicating Gas Purifiers</b>	
Hydrocarbon Trap.....	293
Moisture Trap.....	292
Oxygen Trap .....	286,292
<b>Injection Port Repair Tool</b> .....	237
<b>Injection Ports, Agilent GC</b> .....	242-244
<b>Inlet Adaptor Kits</b>	
Capillary GC .....	245,250,274
Micropacked Inlet Conversion Kits .....	142,249
Packed Column.....	142
<b>Inlet Conversion</b>	
Inlet Adaptor Kits .....	142
Packed Column to Capillary Column.....	272-274

<b>Inlet Liner</b>	
Packing Tool.....	217,280
Removal Tool .....	217,247,280
Seals	
For Agilent (Gerstel/CIS) .....	234,241
For Bruker/Varian .....	234,260
For Thermo Scientific.....	268
<b>Inlet Liners</b>	
Overview.....	192-196
APEX Liners .....	207
ATAS Liners .....	207
For Agilent GCs	
Base-Deactivated .....	203
CIS4 and PTV .....	198,206
Direct Injection .....	198,206
Siltek Metal.....	206
Sky .....	197-198
Split .....	197,205
Split/Splitless .....	197,205
Splitless .....	197,204
SPME .....	198,205
Uniliner.....	198,206
For Bruker/Varian GCs	
Direct Injection.....	208-209
For 1075/1077 GCs.....	208
For 1078/1079 GCs.....	199,209
For 1177 GCs .....	199,209
Sky .....	199
SPI.....	199,208
Split .....	199,208
Splitless .....	199,208
SPME .....	199,208
Uniliner.....	208-209
For PerkinElmer GCs	
Direct Injection.....	200,211
PSS.....	200,210
Sky.....	200
Split .....	200,210
Splitless .....	200,210
Uniliner.....	200,211
Zero Dilution .....	211
For Shimadzu GCs	
Direct Injection.....	201,213
PTV .....	201,213
Sky.....	201
Split .....	201,212
Splitless .....	201,212
SPME .....	213
Uniliner.....	201,213
For Thermo Scientific GCs	
Direct Injection (TRACE & Focus SSL) .....	214
Siltek Metal .....	215
Sky.....	202
Split (TRACE & Focus SSL).....	202,214
Splitless (TRACE & Focus SSL).....	202,214
Uniliner (TRACE & Focus SSL) .....	214
Deactivations.....	203
Packing Materials & Tools.....	216-217
Prepacked .....	216
Siltek .....	203
Uniliner Liners for Packed Injection Port Conversion ..	273
Vu-Tight .....	272
<b>Inlet Maintenance Kits</b> .....	237,255
<b>Inlet Seal Washers</b> .....	241
<b>Inlet Seals</b> .....	268
<b>Inlet Supplies</b> .....	See Instrument Supplies, GC
<b>Inserts, Vial</b> .....	353-356
<b>Installation Kits</b>	
Chromatograph .....	317
Packed and Micropacked Columns .....	142,204,249
<b>Instrument Replacement Parts, HPLC</b>	
For Agilent HPLC Systems .....	321-324
For PerkinElmer HPLC Systems .....	325

For Shimadzu HPLC Systems .....	326-327
For Thermo HPLC Systems .....	328
For Waters HPLC & ACQUITY UPLC Systems.....	329-334
<b>Instrument Supplies, GC</b>	
Section Table of Contents.....	218
Air Diverter .....	246
Backpressure Regulator Kit .....	246
Capillary Column Caps .....	278
Capillary Installation Gauges.....	239,261,266,270,278
Capillary Nuts .....	238-239,261
Chemical Traps for Agilent GCs .....	246,294
Claw and Holder Tool .....	217,247,280,364
Detector Supplies.....	See Detector Supplies
Direct Injection Inserts.....	248
Direct Injection Liner Adaptor.....	248
Dual-Column Analysis.....	See Dual-Column Analysis
Electron Multipliers.....	253
Finger-Tight Column Nuts.....	239
Flowmeters.....	219,221-222
For Agilent GCs	
Autosampler Supplies .....	258
Cables.....	258
Detector Supplies.....	254-257
Dual-Column Analysis .....	250
GC-MS Supplies.....	251-253
Injection Port Supplies .....	242-244
Inlet Liners .....	197-198,204-206
Inlet Supplies .....	234-241
Packed Column Supplies .....	248-249
Replacement Parts.....	245-246
Tools .....	247-248
For APEX Injectors.....	259
For ATAS Injectors .....	259
For Bruker/Varian GCs	
Direct Injection.....	199,208-209
Other Supplies .....	260-262
For PerkinElmer GCs	
Inlet Liners .....	200,210-211
Other Supplies .....	263-264
For Shimadzu GCs	
Inlet Liners .....	201,212-213
Other Supplies .....	265-266
For Thermo Scientific GCs	
Inlet Liners .....	202,214-215
Other Supplies .....	267-271
GC-MS Cleaning Kit .....	253
Injection Port Repair Tool .....	237
Injection Ports .....	236,238,240,242-245
Inlet Adaptor Fitting Kits .....	240,245,250,274
Inlet Liner Packing Tool.....	217,280
Inlet Liner Removal Tool .....	217,247,280
Inlet Liners .....	See Inlet Liners
Inlet Maintenance Kits .....	237,255
Inlet Seals.....	234,240-241,260,267-268
Installation Gauges,	
Capillary.....	239,252,261,266,270,278
Leak Detectors .....	219-220,286
Liner Packing Materials	
Base-Deactivated Wool.....	216
CarboFrit Inlet Liner Packing .....	216
CarboFrit Puller/Inserter Tool .....	216
Deactivated Wool.....	216
Inlet Liner Packing Tool.....	217,280
Inlet Liner Removal Tool .....	217,247,280
Wool Puller/Inserter Tool, Mini.....	217
Maintenance Kits.....	237,255
Microseal Septa .....	235,260,263,265
Moisture Control By-Pass Line	
for Tekmar Instruments .....	276
O-Rings, Inlet Liner .....	234,260
PID Lamps .....	276
Pump Oil.....	253
Purge-and-Trap Spargers.....	276



Reducing Nut .....242–243,245  
 Septa  
     *BTO Septa* .....223,236,260,263,265,268  
     *Microseal Septa* .....235,260,263,265  
     *Thermolite Septa* .....223,236,260,263,265  
     *Vial* .....350  
 Septum Nut Removal Tool for Agilent GCs .....236  
 Septum Nuts .....236,242–243  
 Septum-Purged Packed Column Port Weldment..... 248  
 Split Vent Line for Agilent GCs .....246,294  
 Tools .....277–283  
 Wool, Deactivated.....216  
**Instrument-Grade Tubing** ..... 313  
**Integra-Guard Columns**.....23  
**Interlock Vials**.....354  
**Intermediate-Polarity Deactivated**  
     Guard Columns .....21,72  
**International-Specific Reference Standards**..... 559–561

**J**  
**Japan Calibration Mix** ..... 447,488,560  
**Jet Fuel Reference Standards**..... 469,498,514  
**Jet Reamers** .....283  
**Jets, FID** .....256

**K**  
**Kerosene Reference**  
     Standards .....480–481,497–498,503,514

**L**  
**Lab Organizers**..... 338  
**Lamp, PID** ..... 276  
**Lamps, HPLC Detector** ..... 324–326,328,334  
**Last Drop Filter, HPLC** ..... 342  
**LC**

Section Table of Contents, Accessories..... 320  
 Section Table of Contents, Columns .....152  
 Accessories.....320–349  
 Applications (Chromatograms) ..... www.restek.com  
 Aqueous C18 Columns.....113,169,184  
 ARC-18 LC Columns.....158  
 Aromax LC Columns.....173  
 Biphenyl Columns.....157,165,170,176, 185  
 Bottle Tops.....340  
 Bulk Packing Materials.....187  
 C18 Columns.....158,166,171,175,186  
 Capillary Columns ..... Please inquire.  
 Column Hardware  
     *Column End Fittings* .....347  
     *Column Tubing* .....347  
     *Empty Columns* .....347  
     *Frits* .....347  
 Column Heater .....344  
 Column Packing Kit .....347  
 Column Test Mixes .....475  
 Columns  
     Section Table of Contents .....152  
     *Allure AK* .....180  
     *Allure Organic Acids* .....181  
     *Application-Specific* .....178–183  
     *Capillary Columns* ..... Please inquire.  
     *Pinnacle DB Aqueous C18* .....163  
     *Pinnacle DB Biphenyl* .....165  
     *Pinnacle DB C18* .....166  
     *Pinnacle DB C8* .....167  
     *Pinnacle DB Cyano* .....167  
     *Pinnacle DB IBD* .....164  
     *Pinnacle DB PAH* .....168  
     Pin

*Pinnacle DB Silica* .....168  
*Pinnacle II PAH* .....178  
*Prep Columns* .....184–187  
*Raptor ARC-18* .....158  
*Raptor Biphenyl* .....157  
*Raptor C18* .....158  
*Small Particle Columns* .....163–168  
*Superficially Porous Particle Columns* .....157–159  
*UHPLC* .....163–168  
*Ultra Amino* .....174  
*Ultra Aqueous C18* .....169  
*Ultra Aromax* .....173  
*Ultra Biphenyl* .....170  
*Ultra C1* .....173  
*Ultra C18* .....171  
*Ultra C4* .....172  
*Ultra C8* .....172  
*Ultra Carbamate* .....182  
*Ultra Cyano* .....174  
*Ultra IBD* .....169  
*Ultra PFP Propyl* .....171  
*Ultra Quat* .....183  
*Ultra Silica* .....174  
*USLC Columns* .....160–162  
*Viva Biphenyl* .....176  
*Viva C18* .....175  
*Viva C4* .....176  
*Viva C8* .....175  
*Viva PFP Propyl* .....176  
*Viva Silica* .....177

**Filters**  
*Bluestem Glass Solvent* .....343  
*Filter Kit* .....341  
*Last Drop Filter* .....342  
*Low-Pressure Slip-on Inlet Filter* .....340,342  
*Membrane Filtration Glassware* .....341,343  
*UHPLC* .....188

**Fittings & Tools**  
*Check Valves* .....323,325,327,328,332  
*EXP HPLC* .....335  
*PEEK Fitting Extractor* .....339  
*PEEK Inlet Connector* .....336  
*Piston Seal Insertion Tool* .....339  
*Piston Seals* .....323  
*Rheodyne Style Nut and Ferrule* .....336  
*Tube Fittings* .....336  
*Tubing Cutter* .....337  
*Tubing Cutter Dressing Tool* .....319,337  
*Universal Column Connector* .....336  
*ValvTool Wrench for 1/4-Inch Nuts* .....339  
 Guard Column Cartridge Systems .....189–191  
 Guard Columns

*Allure* .....180–181  
*Pinnacle II* .....178  
*Pinnacle DB* .....191  
*Raptor* .....159  
*Trident* .....189–191  
*Ultra* .....182–183,191  
*Viva* .....191  
 Injector & Autosampler Parts .....321,325,326,328,330  
 Instrument Replacement Parts, HPLC  
     For Agilent Systems .....321–324  
     For PerkinElmer Systems .....325  
     For Shimadzu Systems .....326–327  
     For Thermo Systems .....328  
     For Waters & ACQUITY .....329–334  
 Lamps .....324,325,326,328,334  
 Maintenance Kits .....321,329

**Mobile Phase**  
     Accessories .....341  
     Backpressure Regulators .....346  
     Bottle Tops .....340  
     Bottles .....340

*Debubblers* .....342  
*Degasser* .....344  
*Filter Kit* .....341  
*Filters* .....341–343  
*Flow Splitters* .....338  
*Mixers, In-Line* .....343  
*Pulse Dampers* .....342  
*Waste Overflow Indicator* .....341

**Organizers**  
*Book Holders* .....338  
*Deluxe BenchBooster Organizer* .....338  
*Glove Box Dispensers* .....338  
*HPLC 30 Column Storage Cabinet* .....338  
*LCLocker HPLC Organizer* .....338  
*Mini pHPerch Storage Unit* .....338  
*Open Supply Bins* .....338  
*TopLoader BalanceBank Storage Unit* .....338

PFP Propyl Columns .....166,175,176,185  
 Prep Columns .....184–187  
 Pump Parts .....323,325,327,328,331–333  
 Small Particle Columns .....163–168  
 Syringes

*Autosampler* .....348,395  
*Gas-Tight Syringes for Rheodyne & Valco Valves* .. 392  
*Microliter Liquid-Type Syringes* .....394  
*Priming Syringes for Waters HPLC Pumps* .. 389,394  
*Syringes for Waters U6K Valves* .....394

**Tools** .....339  
 Trident Direct Guard Column System .....189–190  
 Trident Guard Cartridges and Holders .....189–191  
 Tubing

*PEEK Tubing* .....337  
*PEEK Tubing Elbows* .....337  
*PTFE Tubing* .....337,340  
*Stainless Steel Tubing* .....337  
*Tubing Clip* .....337

UHPLC Columns .....163–168  
 Ultra Aromax .....173  
 US Pharmacopeia Cross Reference .....153  
 USLC Columns .....160–162  
 Valves .....346  
 Wide-Pore Columns .....175–177

**LC Accessories** ..... 320–349  
**LCLocker HPLC Organizer** ..... 338  
**Leak Detectors** .....219–220,286  
**Limited Volume Inserts for Vials** ..... 355–356  
**Limited Volume Vials** .....357,360  
**Liner Deactivations** ..... 203  
**Liner Packing Materials and Tools** ..... 216–217  
**Liners** ..... See Inlet Liners  
**Liquid Phase Cross-Reference (USP-GC)** .....147  
**Liquid Phases, GC** .....146  
**Los Angeles County WIP Reference Standards** .....504  
**Low-Pressure Inlet Filter, HPLC**  
     Slip-on.....342

**M**  
**M4 Fitting Ferrules** ..... 226,229,269  
**Make-Up Gas Kits for Agilent GCs** ..... 257  
**Manifold, SPE** .....400–401  
**Marijuana Reference Standards** .....566  
**Mass Spectrometry Electron Multipliers** ..... 253  
**Massachusetts UST Reference Standards** .....505–506  
**Medical Cannabis Reference Standards** .....566  
**Membrane Filtration** .....341,343  
**Merlin Microseal Septa** .....235,260,263,265  
**Merlin Microshot Injector** .....235,377  
**Mesh Sizes, GC Column Packings** ..... 148  
**Metering Valves** .....316  
**Methane Cylinder** .....222  
**Method Development Toolbox, USLC** .....162  
 Pin



**PerkinElmer HPLC Supplies**

Instrument Replacement Parts.....	325
Syringes, Autosampler.....	348,395

**Pesticide Reference Standards ..... 521-529****Petroleum Reference Standards**

Biodiesel.....	577
Finished Motor Oil & Aviation Gasoline.....	578
Leaking Underground Storage Tank (LUST) ....	497-510
PCBs in Transformer Oil.....	578
Simulated Distillation.....	579
Spark Ignition Engine Fuels.....	580-581
UST Monitoring.....	497-510

**PFP Propyl LC Columns ..... 166,171,176,185****Pharmaceutical Reference Standards**

Dihethylene & Ethylene Glycol.....	583
Fatty Acids.....	583
Pharmaceutical Compounds in Drinking Water.....	583
Plastic Container Testing.....	583
Residual Solvents	
<i>European Pharmacopoeia</i> .....	585
<i>USP</i> .....	584-585

**Phase Cross Reference**

Capillary GC Columns.....	16-17
HPLC (U.S. Pharmacopeia).....	153
PLOT Columns.....	117

**Phenol Reference Standards ..... 529****Photoionization (PID) Lamps ..... 276****Pinnacle DB HPLC Columns ..... 163-168****Pinnacle II HPLC Columns ..... 178****Pipe Fittings..... 304, 307-309****Piston**

Seal Insertion Tool.....	339
Seals.....	323

**Plastic Syringes..... 373****Plier Set..... 317****PLOT Columns**

MXT Columns	
<i>MXT-Alumina BOND</i> .....	129
<i>MXT-Msieve 5A</i> .....	129
<i>MXT-Q-BOND</i> .....	129
<i>MXT-S-BOND</i> .....	129
Particle Trap.....	128
Phase Cross-Reference Chart.....	117
Rt-Columns	
<i>Rt-Alumina BOND</i> .....	121-124
<i>Rt-Msieve 5A</i> .....	125
<i>Rt-Q-BOND</i> .....	126
<i>Rt-QS-BOND</i> .....	127
<i>Rt-S-BOND</i> .....	127
<i>Rt-Silica BOND</i> .....	120
<i>Rt-U-BOND</i> .....	128

**Plumbing Connectors..... See Connectors, Tubing****Plug Valves ..... 316****Pocket Magnifier..... 283****Polar Deactivated Fused Silica Guard Columns ..... 21****Poly Crimp Vials**

Cap with Septum.....	358
Seals.....	358

**Polycyclic Aromatic Hydrocarbon****Reference Standards ..... 511-513****Polyimide Resin ..... 228,275****Polywax Calibration Materials..... 115,470,579****Porapak Packings ..... 145****Porous Polymer**

Packed Columns.....	135
Packings.....	145
PLOT Columns.....	127

**Preconnected Guard Column/Transfer Line..... 227****Prep Columns, HPLC ..... 184-187****Press-Tight Connectors..... 227-228****Pressure Gauges ..... 294,423****Protocol Station..... 305****PTFE**

Ferrules, GC.....	226
Syringes, PTFE-Tip.....	386-387,389-390,394
Tubing Cutter.....	337
Tubing, HPLC.....	337,340

**PTFE Tape ..... 319****PTV Inlet Liners**

For Agilent GCs.....	206
For Shimadzu GCs.....	213

**PUF Supplies..... 441****Pulse Dampers, Mobile Phase..... 342****Pump Oil, GC ..... 253****Pump Parts, HPLC ..... 323,325,327,328,331-333****Purge-and-Trap Supplies**

Moisture Control By-Pass Line.....	276
Spargers.....	276

**Purifiers..... See Gas Purifiers****Q****QuEChERS Products, Q-sep**

Accessories.....	407
Bottle Top Solvent Dispenser.....	407
Centrifuge.....	407
Packets.....	404-405
Reference Standards.....	573-575
Tubes.....	404-405

**R****Raptor SPP LC Columns ..... 155-159****RAVE Air Valves ..... 423****Reamers ..... 283****Rechargeable S-Traps..... 292****Reconditioning Service: Air Canisters ..... 433****Reducing Ferrules ..... 225****Reducing Nut ..... 242-243,245****Reference Information****Seminars..... www.restek.com/education****Reference Standards**

Detailed Table of Contents.....	458-463
500 Series Methods.....	461
600 Series Methods.....	462
8000 Series Methods.....	462
Acrolein.....	518,551,556
Alaska UST.....	502-503
Aldehydes/Ketones.....	483,518
Amine Column Test Mix.....	473
Arizona UST.....	504
Aroclor Solutions.....	530-531,578
ASTM	

**D2887 Simulated Distillation Petrochemical..... 579****D3710 Simulated Distillation Petrochemical..... 579****D4059 PCB Standards in Oil..... 531,578****D6042 Plastic Container Testing..... 572,583****D6352 Polywax..... 115,470,579****E1387 Fire Debris Analysis..... 479****E1618 Fire Debris Analysis..... 479****Fire Debris Mixtures..... 479-481,484,489,498,514****PCBs in Oil..... 531,578****Petroleum & Petrochemical Mixtures..... 579****Simulated Distillation..... 579****Aviation Gas..... 498,513****Benzidine Mix..... 483,537,542****Biodiesel..... 484,498,501,577****Blood Alcohol..... 477****BTEX Gas Mixtures..... 484,488-489,****496,500-501,552,554****California UST..... 504****Canadian Environmental Methods..... 494,516,528,559****Cannabis..... 566****Carbamates..... 571****Chlordane..... 521-522,524,526,544****Chlorinated Acid Herbicides..... 491-494****Chloroprene..... 467,556****CLP****GPC Calibration Mix..... 474,544****Pesticides..... 524-526****Semivolatiles..... 539-543****Volatiles..... 557-559****CLP Methods..... 462****Column Evaluation Mixtures****GC Column Test Mixes..... 473-474****HPLC Column Test Mixes..... 475****Composite Fuels****Diesel Fuel #2 Composite..... 484,497,503****Kerosene Composite..... 497,503,514****Unleaded Gasoline Composite..... 489,497,502****Connecticut UST..... 504****Creosote Oil..... 498,513****Custom Request****Form..... www.restek.com/solutions****Derivatization Reagents..... 472-473****Diesel****Diesel Fuel #2..... 480-481,484,497-498,503****Diesel Internal****Standards... 484,501,503-504,506,508-509,517****Diesel Range Organics (DRO)..... 510****Diesel Surrogate****Standards... 484,501,503-504,506,508-509,517****Diesel/Biodiesel Blend..... 484,498,501,577****Disinfection Byproducts..... 485,521****DNPH Reference Standards..... 483****Drinking Water (500 Series)..... 461****Drinking Water Odor Standard..... 485,560****EFSA PAH..... 572****Drugs (Exempt)..... 478,566****EPA Methods****418.1..... 517****500 Series (Drinking Water)..... 461****600 Series (Wastewater)..... 462****8000 Series (Solid Waste)..... 462****CLP..... 462****1311..... 494,544****1664..... 519****418.1..... 517****Ethanol..... 504,520,556****Ethylene Oxide..... 485,585****European Pharmacopoeia Method..... 585****Evaluation Mixtures, Column..... 473-475,566****Explosives by GC..... 479,486-487****Explosives by HPLC..... 479,486-487****Fatty Acid Methyl Esters..... 564****Fire Debris..... 479-481,484,489,498,514****Florida UST..... 505****Food Testing..... 565-575****Forensic..... 478****Formaldehyde-DNPH Mix..... 483****Fragrance Allergens..... 566****Fragrance Materials Test Mix..... 566****Fuel Oil Degradation Mix..... 499,514****Gas Reference Standards, Air Sampling****BTEX Gas..... 443-444,447-448,484,****488,500,506,552,554,560****Japan Calibration..... 447,488,560****Natural Gas..... 449****Ozone Precursor..... 447****Refinery Gas..... 449****TO-14A..... 443-444,447,484,488,****500,506,552,554,560****TO-15..... 444-446****Transportable Gases..... 450-451****Gasoline****Gasoline Internal****Standards..... 489,501-502,509,517,554**



Gasoline Range Organics (GRO).....	489,500	Single Source Fuels		Reservoirs, SPE.....	399,402
Gasoline Surrogate		Aviation Gas.....	498,513	Residual Solvent Reference Standards.....	584-585
Standards.....	489,501-502,509,517,554	Fuel Oils.....	498,503,513-514	Resin	
Gasoline, Unleaded.....	480,489,497-498,502	Jet Fuel A.....	498,514	Polyimide.....	228,275
GC Column Test Mixtures.....	473-474	Solid Waste Methods (8000 Series).....	462	SDVB.....	442
GC-MS Tuning Mixture.....	473,536	State-Specific Environmental Methods.....	502-510,529	SPE Disk.....	402
Glycols.....	490,504,508,517,554	Stoddard Solvent.....	480,499,515	Ultra-Clean Resin.....	442
Grob Test Mix.....	474	TCLP Solid Waste.....	494,521-522,524,526,534,538,544,556	Resprep SPE	
Haloacetic Acids.....	490	Tennessee UST.....	508	12- & 24-Port Tube Manifold.....	400
Herbicides.....	490-494,521,532,544	Test Mixes.....	473-475,566	Diskcover-47 Extraction Disk Holder.....	402
HPLC Column Test Mixtures.....	475	Texas TNRC UST		Diskcover-47 Reservoir.....	402
Hydraulic Oil.....	498,514	Method 1005.....	509	Disks.....	402
International Reference Standards.....	559-561	Method 1006.....	509	Manifolds.....	400-401
Japan Calibration Mixture.....	447,488,560	TO-14A.....	443-444	Replacement Accessories.....	399
Jet Fuel.....	498,514	TO-15.....	444-446	Sample Delivery System.....	401
Kerosene.....	480-481,497-498,503,514	Toxaphene.....	521-524,526,544	SPE Flow Filter.....	402
Los Angeles County WIP.....	504	Toxicity Characteristic Leaching		Res-Sil Packings.....	144
Marijuana.....	566	Procedure.....	494,521-522,524,526,534,538,544,556	Retention Gaps.....	22,106
Massachusetts UST.....	505-506	Transformer Oil, PCB-Free.....	578	Rethreading Tools.....	237,247,261
Medical Cannabis.....	566	TRPH.....	517	Reversed Phase SPE Cartridge.....	397
Michigan UST.....	507	Tuning Mixture.....	473,536,540	Rinsing Reservoir, Capillary GC.....	222
Military Fuels.....	499,514	Unleaded Gasoline.....	480-481,489,497-498,502	Rt GC Columns	
Mineral Spirits.....	480,499,515	USP <467>.....	584-585	Rt-2560 Capillary.....	56,83
Mississippi UST.....	507	UST Monitoring.....	497-510	Rt-Alumina BOND PLOT.....	121-124
MOSH/MOAH.....	572	Fuels.....	477-501	Rt- $\beta$ DEXcst Chiral.....	103
Motor Oil		Military Fuels.....	499,514	Rt- $\beta$ DEXm Chiral.....	103
Motor Oil Composite.....	497,503,515	Mineral Spirits.....	480,499,515	Rt- $\beta$ DEXsa Chiral.....	103
Used Motor Oil Composite.....	497,515	Motor Oil.....	497,503,515	Rt- $\beta$ DEXse Chiral.....	103
Multiresidue Pesticides.....	568-571	Petroleum Hydrocarbons.....	484,489,501-510,512,517,520,554,556,584	Rt- $\beta$ DEXsm Chiral.....	103
Neat Compounds.....	466-471	Petroleum Volatiles.....	489,500-501	Rt- $\beta$ DEXsp Chiral.....	103
New Jersey UST.....	507-508	Retention Time Reference Standard.....	497,516	Rt- $\gamma$ DEXsa Chiral.....	103
Nitroaromatics.....	479,486-487	State-Specific Methods.....	502-510	Rt-MSieve 5A PLOT.....	125
Nitrogen/Phosphorus		Volatiles (VOA) Mixtures.....	546-559	Rt-Q-BOND PLOT.....	126
Pesticides.....	527-528,533,537,560	Washington UST.....	510	Rt-QS-BOND PLOT.....	127
Northwest UST Regional Method.....	508	Wastewater Methods (600 Series).....	462	Rt-S-BOND PLOT.....	127
Oil & Grease.....	519	Weathered Petrochemical.....	480-481	Rt-Silica BOND.....	120
Oregon UST.....	508	Well Investigation Program (WIP).....	504	Rt-TCEP Capillary.....	90
Organochlorine (OC) Pesticides.....	522-526	Wisconsin UST.....	510	Rt-U-BOND PLOT.....	128
Organometallics.....	520	<b>Refillable Hydrocarbon Trap.....</b>	<b>293</b>	Rt-XLSulfur Micropacked.....	137,141
Organophosphorus (OP) Pesticides.....	527	<b>Regulators</b>		Rt-XLSulfur Packed.....	137,141
Organotins.....	520	Backpressure Regulator, Gas.....	246,306	Rtx Capillary GC Columns	
Oxygenates.....	520,555	Backpressure Regulator, HPLC.....	346	Rtx-1.....	41
Ozone Precursors.....	447	Dual-Stage Regulators.....	301-303	Rtx-1301.....	51
Paraquat & Diquat.....	494	Flash Arrestor, Hydrogen.....	304	Rtx-1614.....	66
PCB		Flexible Stainless Steel Hose.....	304	Rtx-1701.....	53
Aroclor Solutions.....	530-531,578	High-Purity V.O.C.....	393,453	Rtx-20.....	45
PCB Congeners.....	531,560	Mini-Regulator.....	453	Rtx-200.....	48
PCB Standards in Oil.....	531,578	MINICYL Regulator.....	306	Rtx-200MS.....	49
Pennsylvania UST.....	508	Protocol Station.....	305	Rtx-225.....	54
Pesticides.....	521-529	Scott Transportable Gases.....	453	Rtx-2330 Capillary.....	55
Petroleum		Silcsteel Regulators.....	301	Rtx-2887.....	93
Biodiesel.....	577	Single-Stage Regulators.....	301-303	Rtx-35.....	46
Finished Motor Oil & Aviation Gasoline.....	578	Single-Stage V.O.C. Regulator		Rtx-35 Amine.....	101
Leaking Underground Storage Tank (LUST).....	497-510	Syringe Adaptor Kit.....	453	Rtx-440.....	50
PCBs in Transformer Oil.....	578	Switchover Systems.....	305	Rtx-5.....	42-43,96
Simulated Distillation.....	579	Tools		Rtx-5 Amine.....	100
Spark Ignition Engine Fuels.....	580-581	CGA Fittings.....	304	Rtx-5 DHA Tuning.....	92
UST Monitoring.....	497-510	Cylinder Valve Wrench.....	306	Rtx-5MS.....	44
Pharmaceuticals		Universal Cylinder Wrench.....	306	Rtx-50.....	47
Dihethylene & Ethylene Glycol.....	583	Wall-Mount Cylinder Holder.....	306	Rtx-502.2.....	80
Fatty Acids.....	583	Ultra-High-Purity		Rtx-624.....	52
Pharmaceutical Compounds in Drinking Water.....	583	Brass Regulators.....	302-303	Rtx-65.....	47
Plastic Container Testing.....	583	Stainless Steel Regulators.....	303	Rtx-65TG.....	89
Residual Solvents.....	584-585	<b>Replacement Parts, GC Instruments.....</b>	<b>See listings for instrument manufacturer.</b>	Rtx-BAC Plus 1.....	65
Phenols.....	529	<b>Replacement Parts,</b>		Rtx-BAC Plus 2.....	65
Phenylurea Pesticide Mixes.....	528	<b>HPLC Instruments.....</b>	<b>321-334</b>	Rtx-Biodiesel TG.....	91
Plastic Container Testing.....	572,583	<b>Request Forms</b>		Rtx-CLPesticides.....	72
Polybrominated Diphenylethers (PBDEs).....	528	Reference Standards.....	www.restek.com/solutions	Rtx-CLPesticides Kits.....	72
Polywax.....	115,579	Packed GC Columns.....	150	Rtx-CLPesticides2.....	72
QuEChERS Standards.....	574	<b>Reservoir, Capillary GC.....</b>	<b>222</b>	Rtx-DHA.....	92
Residual Solvents.....	485,585			Rtx-Dioxin2.....	68
Retention Time Reference Standards.....	497,516			Rtx-G27.....	43,97
Semivolatiles.....	532-544			Rtx-G43.....	51,97



Rtx-Mineral Oil.....	69	Manifolds, Resprep.....	400-401	Syringes.....	382,386
Rtx-OPPesticides.....	74	PEEK Washers.....	413-414	Tool Kit, MLE.....	266,277
Rtx-OPPesticides2.....	74	QuEChERS Products, Q-sep		Wrench Set.....	266,281
Rtx-PCB.....	70	<i>Bottle Top Solvent Dispenser</i> .....	407	<b>Shimadzu HPLC Instrument Parts</b> .....	326-327
Rtx-VMS.....	78	<i>Centrifuge</i> .....	407	<b>ShinCarbon Columns</b> .....	137,140
Rtx-Volatile Amine.....	99	<i>Packets</i> .....	404-405	<b>Short-Cap Vials</b> .....	359
Rtx-Volatiles.....	80	<i>Reference Standards</i> .....	573-575	<b>Shut-Off Valves</b> .....	316
Rtx-VRX.....	79	<i>Tube Racks</i> .....	407	<b>SilcoCan Air Sampling Canisters</b>	
Rtx-Wax.....	57	<i>Tubes</i> .....	405	Canisters.....	421
<b>Ruler, Compact Steel</b> .....	282	Sample Delivery System.....	401	Carrying Cases.....	432
<b>Rupture Disc Tees</b> .....	455	Syringe Filters.....	408	Cleaning System.....	430
<b>Rxi Capillary GC Columns</b>		Tools for ASE Systems.....	416	Gauges.....	422-423
Rxi-1ms.....	29	Tubes		Precleaned.....	431
Rxi-1T.....	35	<i>dSPE</i> .....	405	Reconditioning Service.....	433
Rxi-1TSil MS.....	36,76	<i>QuEChERS</i> .....	405	Supplies.....	430-432
Rxi-1HT.....	39	Vacuum Pressure Station.....	400	Valves & Gauges.....	423-424
Rxi-35Sil MS.....	34,82	<b>Sampling Bags, Air</b> .....	436	<b>Silcosteel Treated</b>	
Rxi-5HT.....	39	<b>Sampling Canisters, Air</b> .....	418-422,434-435	Filter.....	426
Rxi-5ms.....	30	<b>Sampling Kits, Passive Air</b> .....	425,427-428	Orifice.....	426
Rxi-5Sil MS.....	32-33,67,75,77,85-86	<b>Sampling Valves</b> .....	457	Regulators.....	301
Rxi-624Sil MS.....	38,81,87-88,94	<b>Sapphire Scribe</b> .....	279	Tubing.....	315
Rxi-PAH.....	37,84	<b>Scoring Wafer</b> .....	279	<b>Silcosteel-CR Treated</b>	
Rxi-XLB.....	31,71	<b>Screw-Thread Vials</b> .....	359-362,364	Fittings.....	311,428
		<b>Screwdrivers</b> .....	257,281,317	Tubing.....	315
		<b>SDVB Resin</b> .....	442	<b>Silica-Based SPE Cartridge</b> .....	397
		<b>Seals</b>		<b>Silica, Bulk HPLC Packing Materials</b> .....	187
		GC Inlet.....	240-241,267-268	<b>Siltek-Treated</b>	
		Insertion Tool, HPLC.....	339	Filter.....	426
		Pump, HPLC.....	323,325,327,328,331-333	Fittings.....	309,311,428
		Vial.....	350	Inlet Liners.....	203
		<b>SeCure "Y" GC Column Connector</b> .....	230	Inlet Liners, Metal	
		<b>Seminars</b> .....	<a href="http://www.restek.com/education">www.restek.com/education</a>	For Agilent GCs.....	206
		<b>Semivolatiles Reference Standards</b> .....	532-544	For Thermo Scientific GCs.....	215
		<b>Septa</b> .....	223,235-236,260,263,265,268	Orifice.....	426
		<b>Septa Holder Kits, Thermo Scientific</b> .....	268	Press-Tight Connectors.....	228-230,275
		<b>Septa, Vial</b> .....	350	Tubing.....	313-315
		<b>Septum Cap, Thermo Scientific</b> .....	268	<b>Similar Performance GC Phases</b>	
		<b>Septum Nuts</b> .....	236,242-243	Cross-Reference.....	16-17,117
		<b>Septum Puller</b> .....	236,283	Simulated Distillation Reference Standards.....	579
		<b>Septum Packed Purge Port Weldment</b> .....	248	Single Component Reference Standards.....	466-471
		<b>Shimadzu GC Supplies</b>		Single Source Fuels Reference Standards.....	498,513
		Capillary Installation Gauge.....	266,278	<b>SINGLE StEP Filter Vials</b> .....	410
		Capillary Nut.....	265	<b>Sky Liners</b> .....	193-202
		Ferrules.....	226,266	<b>Sleeves</b> .....	See Inlet Liners
		FID Jets.....	266	<b>Slide-Lock Tweezers</b> .....	282
		Injector Nut Kit, GC.....	265	<b>Soap Film Bubble Flowmeter</b> .....	222
		Injector Wrench.....	266,281	<b>Solid Phase Extraction</b> .....	See Sample Preparation
		Inlet Liners		<b>Solid Supports, GC</b>	
		<i>Direct Injection</i> .....	201,213	CarboBlack.....	136,143
		<i>PTV</i> .....	201,213	Chromosorb.....	135
		<i>Sky</i> .....	201	USP Cross-Reference.....	147
		<i>Split</i> .....	201,212	<b>Solid Waste Reference Standards</b> .....	462
		<i>Splitless</i> .....	201,212	<b>Solvent Debubbler</b> .....	342
		<i>SPME</i> .....	213	<b>Spargers, Purge-and-Trap</b> .....	276
		<i>Uniliner</i> .....	201,213	<b>SPE</b> .....	See Sample Preparation
		Merlin Microseal Adaptor Kit.....	265	<b>Specialty SPE Cartridges</b> .....	398
		O-Rings, Inlet Liner.....	265	<b>SPI Inlet Liners</b>	
		Septa, Plug.....	223,236,260,263,265,268	For Bruker/Varian GCs.....	199,208
		Septum Nut.....	265		

**S**

<b>Sample Cylinder Valves</b> .....	455
<b>Sample Cylinders</b> .....	454
<b>Sample Delivery System</b> .....	401
<b>Sample Inlets</b> .....	426
<b>Sample Loops</b> .....	457
<b>Sample Preparation</b>	
Section Table of Contents.....	396
Accessories	
Caps.....	399
Connectors.....	399
Female Luer End Cap.....	399
Frits.....	399
Resprep SPE Flow Filter.....	402
Tubes, Empty.....	399
ASE Extraction System Parts and Supplies.....	412-416
Bulk Adsorbents.....	403
Cartridges	
Bonded Reversed Phase.....	397
CarboPrep.....	397-398
Closed End.....	397
Florisol.....	397
Method Specific.....	398
Normal Phase.....	397
Pesticide Residue Cleanup.....	398
Reversed Bonded Phase.....	397
Specialty Cartridges.....	398
Centrifuge.....	407
Disks, Resprep.....	402
Filter Vials, Thomson SINGLE StEP.....	410
Flow Filters.....	402
Glassware	
Glass Impingers, Midget.....	442



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<b>Split Inlet Liners</b>			
For Agilent GCs	197,205		
For Bruker/Varian GCs	199,208		
For PerkinElmer GCs	200,210		
For Shimadzu GCs	201,212		
For Thermo Scientific GCs	202,214		
<b>Split Vent Line</b>	<b>246,294</b>		
<b>Splitless Inlet Liners</b>			
For Agilent GCs	197,204		
For Bruker/Varian GCs	199,208		
For PerkinElmer GCs	200,210		
For Shimadzu GCs	201,212		
For Thermo Scientific GCs	202,214		
<b>SPP LC Columns</b>	<b>155-159</b>		
<b>SSI Tube Cutting Machine</b>	<b>318</b>		
<b>Stabilwax Capillary GC Columns</b>			
Stabilwax	58,95		
Stabilwax-DA	98		
Stabilwax-DB	102		
Stabilwax-MS	59		
<b>Stainless Steel Tubing</b>	<b>313-315</b>		
<b>Standards</b>	<b>See Reference Standards</b>		
<b>State-Specific UST Reference Standards</b>	<b>502-510</b>		
<b>Stationary Phases</b>	<b>See GC Columns, HPLC Columns, PLOT Columns, Packed Columns.</b>		
	<b>See also column names (e.g., Rxi).</b>		
<b>Storage Rack for Vials</b>	<b>358</b>		
<b>Storage Units, HPLC</b>	<b>338</b>		
<b>Sulfonated-Treated</b>			
Fittings	311,428		
Gas Sampling Valves & Replacement Rotors	457		
Rupture Disc Tee	455		
Sample Cylinder Valves	455		
Sample Cylinders	454		
Sample Loops	457		
Tubing	313-315		
<b>Super Clean Gas Filters</b>	<b>287-291</b>		
<b>Superficial Porous Particle LC Columns</b>	<b>155-159</b>		
<b>SW-846</b>	<b>462</b>		
<b>Swagelok Fittings</b>	<b>304,307-309</b>		
<b>Swagelok Valves</b>	<b>316</b>		
<b>Swaging Tool</b>	<b>319</b>		
<b>Switchover Systems, Gas Cylinder</b>	<b>305</b>		
<b>Syringe Filters</b>	<b>408</b>		
<b>Syringes</b>			
Section Table of Contents	372		
Overview (Syringe Basics)	372-373		
A-2 Luer	393		
Air Sampling			
Jumbo	393,457		
Spare O-rings	393,457		
Autosampler			
For Agilent GCs	374-377		
For Bruker/Varian 8000 Series GCs	378		
For CTC GCs	379-380		
For HPLC	348,395		
For PerkinElmer GCs	381		
For Shimadzu GCs	382		
For Thermo Scientific GCs	383-385		
Cross-Reference Table for Agilent GCs	376		
Gas-Tight	375,389-393		
PTFE Tip	375,389-390,392		
With Shut-Off Valves	391		
HPLC			
Autosampler	348,395		
Gas-Tight for Rheodyne & Valco Valves	392		
Microliter Liquid-Type for Rheodyne & Valco Valves	394		
Priming for Waters HPLC Pumps	389,394		
Syringes for Waters U6K Valves	394		
Large Volume	374		
Luer-Lock Needles	389-391		
Micro-Volume	388		
Microliter Syringes	374,386-387		
Model V Valve	391		
Plastic	373		
Precision Sampling			
A-2 Luer Gas-Tight Syringes	393		
Heavy Duty Purge & Trap Syringe	393		
Luer-lock Valve Adaptor	393		
Replacement Needles			
For Agilent 7673/7683 Autosampler Syringes	375-376		
For Bruker/Varian 8000 Series Syringes	378		
For CTC Syringes	379-380		
For Gas-Tight Syringes for Rheodyne & Valco Valves	392		
For Gas-Tight Syringes with Shut-off Valves	389-391		
For HPLC Syringes	392,394		
For Luer-Lock Syringes	389-391		
For PerkinElmer Autosampler Syringes	381		
For PTFE Tip, Gas-Tight Syringes	387,390		
For Shimadzu Autosampler Syringes	382		
For Thermo Scientific	384-385		
For Waters U6K Valves	394		
Syringe Guides	391		
Syringe O-rings	393,457		
<b>T</b>			
<b>Table of Contents</b>	<b>1</b>		
<b>TCLP Solid Waste Reference Standards</b>	<b>494,521-522,524,526,534,538,544,556</b>		
<b>TDU (Thermal Desorption Unit) Tubes, Air Sampling</b>	<b>438-440</b>		
<b>Tedlar Gas Sampling Bags</b>	<b>436</b>		
<b>Tee Wrench</b>	<b>319</b>		
<b>Tees</b>			
Pipe & Tube Fittings	288,304,307-311		
Rupture Disc	455		
<b>Temperature Controller, HPLC</b>	<b>344</b>		
<b>Tenax Packings</b>	<b>145</b>		
<b>Tennessee UST Reference Standards</b>	<b>508</b>		
<b>Test Gauges, Air Sampling</b>	<b>424</b>		
<b>Test Mixes</b>			
GC	473-474		
HPLC	475		
<b>Texas UST Reference Standards</b>	<b>509</b>		
<b>Thermal Desorption Unit Tubes, Air Sampling</b>	<b>438-440</b>		
<b>Thermo Scientific GC Supplies</b>			
Adaptors for Capillary Columns	269		
Capillary Installation Gauge	270,278		
EZ No-Vent GC-MS Connector	271		
FID Jet	269		
Fixing Nut for TRACE & Focus SSL	269		
Graphite Ferrules for M4 Fittings	226,229,269		
Graphite Sealing Ring	268		
Hex Key Set, Metric	270,281,317		
Inlet Liner Seals	268		
Inlet Liners			
Direct Injection (TRACE & Focus SSL)	214		
Siltek Metal	215		
Sky	202		
Split (TRACE & Focus SSL)	202,214		
Splitless (TRACE & Focus SSL)	202,214		
Uniliner (TRACE & Focus SSL)	214		
Liner Cap	268		
Liner Cap Removing Tool	270		
Septa	223,268		
Septa Holder Kits for TRACE & Focus SSL	268		
Septum Cap for TRACE & Focus SSL	268		
Syringes	380,384		
Terminal Fitting Nut	269		
Tool Kit, MLE	270,277		
Transfer Line Reducing Kit	271		
Wrench Set, Metric	270,281		
<b>Thermo Scientific HPLC Supplies</b>			
Syringes, Autosampler	348,395		
<b>Thermo Separation HPLC Instrument Parts</b>	<b>328</b>		
<b>Thermolite Septa</b>	<b>223,236,260,263,265,268</b>		
<b>Thermometer</b>	<b>283</b>		
<b>Thomson SINGLE STEP® Filter Vials</b>	<b>410</b>		
<b>TO Air Sampling Reference Standards</b>			
TO-14A	443-444		
TO-15	445-446		
<b>TO-Can Air Sampling Canisters</b>			
Canisters	422		
Carrying Cases	432		
Cleaning System	430		
Gauges	422-423		
Reconditioning Service	433		
Supplies	430-432		
Valves	423-424		
<b>TO-Clean Ovens</b>	<b>430</b>		
<b>Toggle Valves</b>	<b>316</b>		
<b>Tools</b>			
5-in-1 Magnetic Screwdriver	317		
54-Piece Tool Kit	317		
ASE Extraction System	416		
Brushes			
Nylon	282		
Stainless Steel	282		
Capillary Column Installation			
Capillary Installation Gauge	239,252,261,266,270,278		
Ceramic Scoring Wafer	279		
Compact Steel Ruler	282		
High-Temperature String	282		
MLE Tool Kits	248,261,264,266,270,277		
Needle Files	282		
Pocket Magnifier	283		
Rethreading Tool	237,247,261		
Sapphire Scribe	279		
Slide-Lock Tweezers	282		
Stainless Steel Tube Brushes	282		
Wrench, Open-End, 1/4- to 3/16-Inch	232		
Wrench, Open-End, 1/4- to 5/16-Inch	281		
Claw and Holder	217,247,280,364		
Column Cutter, Capillary GC	279		
Cylinder Valve Wrench	306		
Flashlight	283,319		
Gap Inspection Gauge	319		
GC Installation Kit	317		
Hand Drill, Mini	283		
HPLC	339		
Injection Port Repair Tool	237		
Injector Wrench	237,247,266,280-281		
Inlet Liner Packing Tool	217,280		
Inlet Liner Removal Tool	217,247,280		
Maintenance Kits, GC	255,277		
Maintenance Kits, HPLC	321,329		
PEEK Fitting Extractor	339		
Piston Seal Insertion Tool	339		
Plier Set	317		
Ruler, 15 cm, Steel	282		
Screwdriver	317		
Septum Nut Removal Tool	236		
Swaging Tool	319		
Tool Kits, MLE	248,261,264,266,270,277		
Tubing			
Bender	319		
Cutter Dressing Tool	319,337		
Cutters	318,337		
Reamers	319		
ValvTool	339		

- Wrenches  
 Adjustable..... 317  
 Cylinder..... 306  
 Cylinder Valve..... 306  
 Injector..... 237,247,266,280-281  
 Open-End..... 232,251,262,271,281  
 Tee..... 319  
 ValvTool..... 339
- Toxaphene Solutions..... 521-524, 526, 544**  
**TRACE Supplies..... See Thermo Scientific GC Supplies**  
**Trademarks..... www.restek.com/patents-trademarks**  
**Transfer Lines (Guard Columns)**  
 Capillary GC..... 21-23  
 MXT Stainless Steel, GC..... 106
- Transportable Gases..... 450-451**  
**Traps**  
 Overview of Gas Purification..... 285  
 Air Compressor Hydrocarbons..... 293  
 Chemical Traps for Agilent GCs..... 246,294  
 ECD Vent..... 293  
 Gas Purifiers..... 286,292-294  
 Rechargeable Gas Purifiers  
 Molecular Sieve S-Trap..... 292  
 Refillable Hydrocarbon..... 293  
 Restek Gas Management System..... 286,292-293  
 Super-Clean..... 287-288  
 VICI mat/sen Gas-Specific Purifier Modules..... 294
- Trident HPLC Guard Columns..... 189-191**  
**TRPH Reference Standards..... 517**  
**Tube Brushes..... 282**  
**Tube Fittings..... 288, 304, 307-311**  
**Tubing**  
 Bender..... 319  
 Clips..... 337  
 Connectors..... See Connectors, Tubing  
 Copper..... 313  
 Cutter Dressing Tool..... 319,337  
 Cutters..... 318,337  
 Electropolished..... 313,315  
 HPLC Column..... 337,347  
 Hydroguard..... 22,315  
 Instrument-Grade..... 313  
 PEEK..... 337  
 PTFE..... 337,340  
 Reamers..... 319  
 Silcosteel-CR-Treated..... 313-315  
 Silcosteel-Treated..... 315  
 Siltek-Treated..... 313-315  
 Stainless Steel..... 313,315,337  
 Sulfinert-Treated..... 313-315  
 Swaging Tool..... 319
- Tuning Mixture..... 473, 536, 540**  
**Two-Hole Ferrules..... 225, 250, 274**
- U**  
**UHPLC Columns..... 163-168**  
**UHPLC Filters..... 188**  
**Ultra HPLC Columns..... 169-174, 182-187**  
**Ultra-Clean Resin..... 442**  
**UltraLine Filters..... 188**  
**UltraShield Filters..... 188**  
**Uniliner Inlet Liners**  
 For Agilent GCs..... 198,206  
 For Bruker/Varian GCs..... 208-209  
 For PerkinElmer GCs..... 211  
 For Shimadzu GCs..... 213  
 For Thermo Scientific GCs..... 214
- Unions..... See also Connectors**  
 Brass..... 251,262,271,288,304,307-308,310,428  
 PEEK..... 336  
 Pipe..... 251,262,271,288,304,307-311,428  
 Reducing..... 251,262,271,288,304,307-311,428  
 Silcosteel-CR Treated..... 309,311,428  
 Siltek/Sulfinert Treated..... 309,311,428  
 Stainless Steel..... 251,262,271,288,304,307-308,310,428  
 Transfer Line Reducing Kit..... 271  
 Tube..... 251,262,271,288,304,307-311,428  
 Zero Dead-Volume..... 233,336
- Unleaded Gasoline Reference Standards..... 480, 489, 497-498, 502**  
**US Pharmacopoeia Cross Reference..... 153**  
**USLC..... 160-162**  
**USP <467> Reference Standards..... 584-585**  
**UST Reference Standards..... 497-510**
- V**  
**Vacuum**  
 Bag Sampler, Air Sampling..... 437  
 Gauge..... 422-423,428  
 Pressure Station for Resprep SPE Systems..... 400
- Valco Fittings and Ferrules..... 231,233,311,336**  
**Valve Adaptor, Luer Lock Needles..... 393**  
**Valve Parts, HPLC..... 323,325,327,331**  
**Valves**  
 Air Canister..... 423  
 Ball..... 311,428  
 Check, HPLC..... 323,325,327,328,332  
 HPLC..... 346  
 Metering, GC..... 316  
 Plug..... 311,428  
 Sampling..... 457  
 Shut-off, GC..... 316  
 Sulfinert-Treated..... 457
- Varian GC Supplies..... See Bruker/Varian GC Supplies**  
**Vent for GC-MS..... 251,262,271**  
**Vent Trap..... 293**  
**Veriflo Flow Controller..... 426**  
**Vernier Knob..... 316**  
**Vespel Ring Inlet Seal, Dual..... 240,267**  
**Vials**  
 Section Table of Contents..... 350  
 Overview (Vial Basics)..... 350-353  
 2.0 mL Vials  
 8 mm Screw-Thread..... 360-361  
 9 mm Short-Cap, Screw-Thread..... 359  
 10 mm Screw-Thread..... 362  
 11 mm Crimp-Top..... 357-358  
 11 mm Poly Crimp..... 358  
 Certified Autosampler..... 363  
 Inserts..... 355
- Accessories**  
 Crimpers and Decappers..... 371  
 Sampling Valves, Mininert..... 370  
 Storage Racks..... 358  
 Certified..... 363  
 Convenience Kits..... 358-359,361  
 Crimp Top..... 357-358  
 Crimp Top Caps..... 357-358  
 Filter Vials, SINGLE STEP..... 370  
 Headspace..... 366-367  
 Inserts..... 355-356  
 Interlock..... 354
- Microsampling..... 354**  
**Micro-Vials..... 354**  
**Mininert Precision Sampling..... 370**  
**Poly Crimp..... 358**  
**Precleaned VOA..... 369**  
**Quick Reference Size Chart..... 352-353**  
**Sample Collection Vials for ASE..... 413-414**  
**Screw Thread..... 359-363**  
**Screw Thread Caps..... 359-360,362**  
**Septum Selection Guide..... 350**  
**Shell..... 365**  
**Short-Cap, Screw-Thread..... 359**  
**Versa Vial..... 368**  
**VOA Sampling Vials..... 369**  
**Well Plates..... 349**  
**WISP..... 364-365**  
**VICI Mat/Sen Gas-Specific Purifier Modules..... 294**  
**Viton O-Rings..... 234,265**  
**Viva HPLC Columns..... 175-177**  
**Volatiles (VOA) Reference Standards..... 546-549**  
**Vu-Tight..... 272**  
 Inlet Liners..... 272  
 Installation Fittings..... 272
- Vu2-Union Connectors..... 229**
- W**  
**Warranty..... 4**  
**Washington UST Reference Standards..... 510**  
**Waste Overflow Indicator, HPLC..... 341**  
**Wastewater Methods**  
 Reference Standards..... 462  
**Waters HPLC Instrument Parts..... 331,334**  
**Weathered Petrochemical**  
 Reference Standards..... 480-481  
**Well Investigation Program Reference Standards..... 504**  
**Well Plates..... 349**  
**Wide-Pore HPLC Columns..... 175-177**  
**Wisconsin UST Reference Standards..... 510**  
**WISP Vials..... 364-365**  
**Wool Puller/Insertor..... 217**  
**Wool, Deactivated..... 216**  
**Wrenches..... 251,262,271,281,317**  
 Adjustable..... 317  
 Cylinder..... 306  
 Cylinder Valve..... 306  
 Hex Key (Allen)..... 270,281,317  
 Inlet..... 237,247,266,280-281  
 Metric Set..... 270,281  
 Open-End..... 232,251,262,266,271,281  
 Spanner Wrench for Agilent GCs..... 254  
 Tee..... 319  
 ValvTool..... 339
- X**  
**XAD Equivalent Resin..... 442**
- Z**  
**Zero Air Generators..... 297,300**  
**Zero Dead-Volume Connectors..... 233,336**

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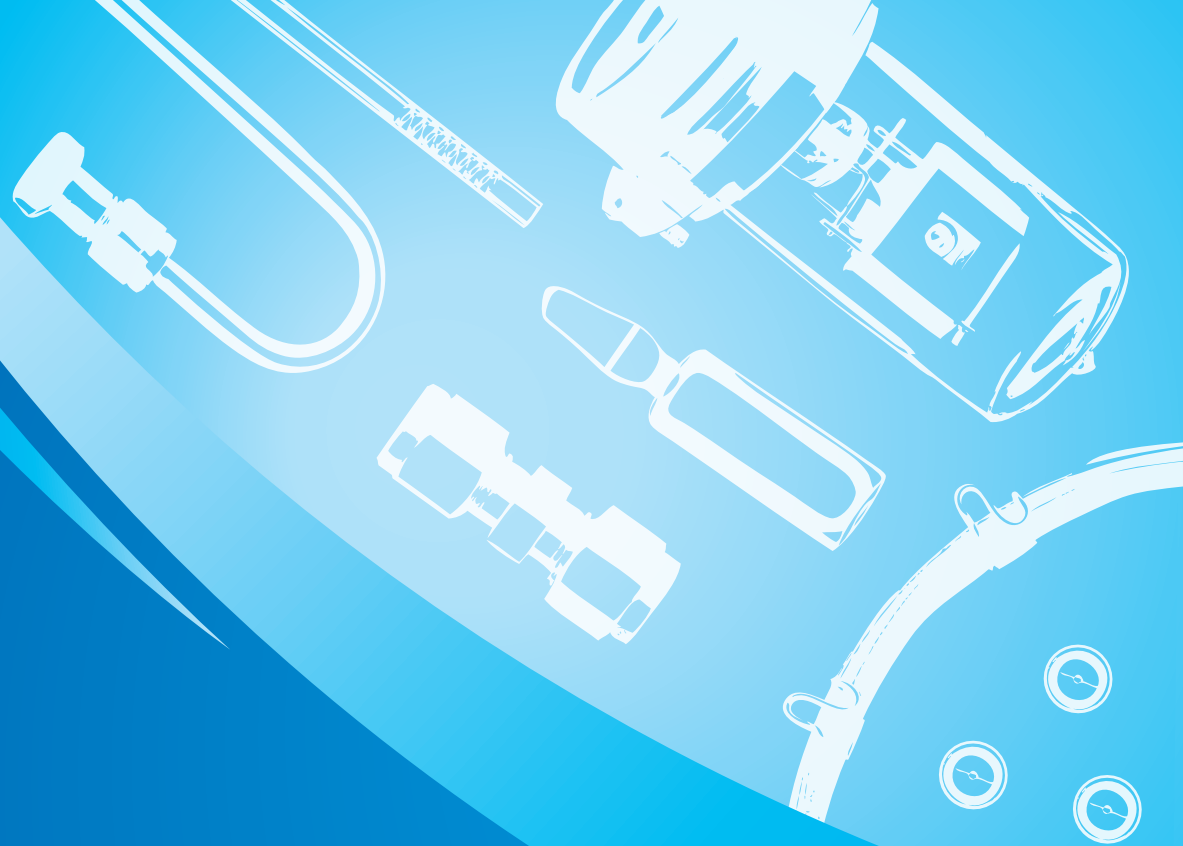
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