



Air Monitoring Products

air sampling canisters
 thermal desorption unit tubes
 gas sampling bags
 sample cylinders
 gas standards
 accessories
 applications



Chromatography Products

www.restek.com

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 Australian Distributors; Importers & Manufacturers



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Air Monitoring Products, From Our Lab to Yours

At Restek, we are proud to offer a diversified line of high quality products for sampling organics in air, for both the environmental and petroleum markets. Our innovative products reflect our customers' needs and the latest technology. We invite your comments and ideas.

Email me at Irene.degraff@restek.com.

Irene DeGraff

Air & SPE Product Marketing Manager



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SilcoCan™ Canisters

SilcoCan™ Air Monitoring Canisters

Ideal for low-level reactive sulfur (1-20ppb), TO-14, or TO-15 compounds

Features

Siltek® treated.

High-purity, 3/4-turn valve with stainless steel diaphragms.

Vacuum/pressure gauge (optional).

Variety of sizes.

Stable to 250°C.

Siltek® valve available (add suffix "-650" to cat.#).

Benefits

High inertness—ensures sample stability.

No sample adsorption at the valve, for more accurate results; easy to use.

Ascertain internal conditions at a glance.

Meet extensive range of sampling needs.

Heat canister to 250°C for superior cleaning.

Completely passive sample pathway for maximum sample stability.

Optional gauge

- Quickly confirm vacuum or pressure inside canister.
- Monitor pressure changes.
- Fully protected by canister frame.
- Can be heated to 90°C during cleaning.

Newest surface technology

To ensure sample stability, SilcoCan™ canisters are deactivated with Restek's innovative Siltek® surface treatment, which chemically bonds a fused silica 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.



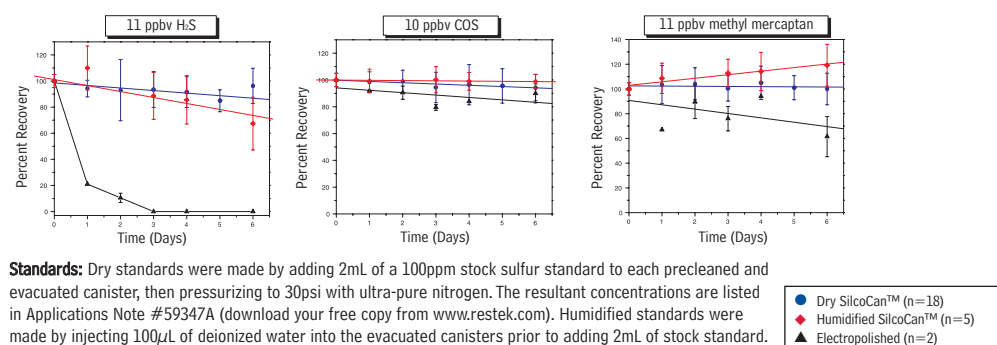
did you know?

SilcoCan™ Canisters are cleaned prior to shipping.

- Excellent stability for long-term storage of sulfur-containing volatile organic compounds.
- More accurate sampling.

Whether you are monitoring for TO-14, TO-15, or reactive sulfur compounds, SilcoCan™ canisters are your best choice for inertness. In Tedlar® bags, the stability of low-level (100ppbv) sulfur volatile organic compounds (VOCs) is poor, even within 24 hours of sampling. Sulfur compounds react with the metal surface in electropolished canisters, so these canisters are unsuitable for collecting and storing low-level sulfur VOCs. SilcoCan™ air monitoring canisters, which feature a Siltek® treated surface, offer excellent storage stability for sulfur VOCs at very low levels (1–20ppbv), under dry or humid conditions. The versatility of the SilcoCan™ canister makes it an excellent choice for collecting and storing TO-14 or TO-15 compounds (Figure 2).

Figure 1 SilcoCan™ canisters effectively store very low levels of sulfur compounds.

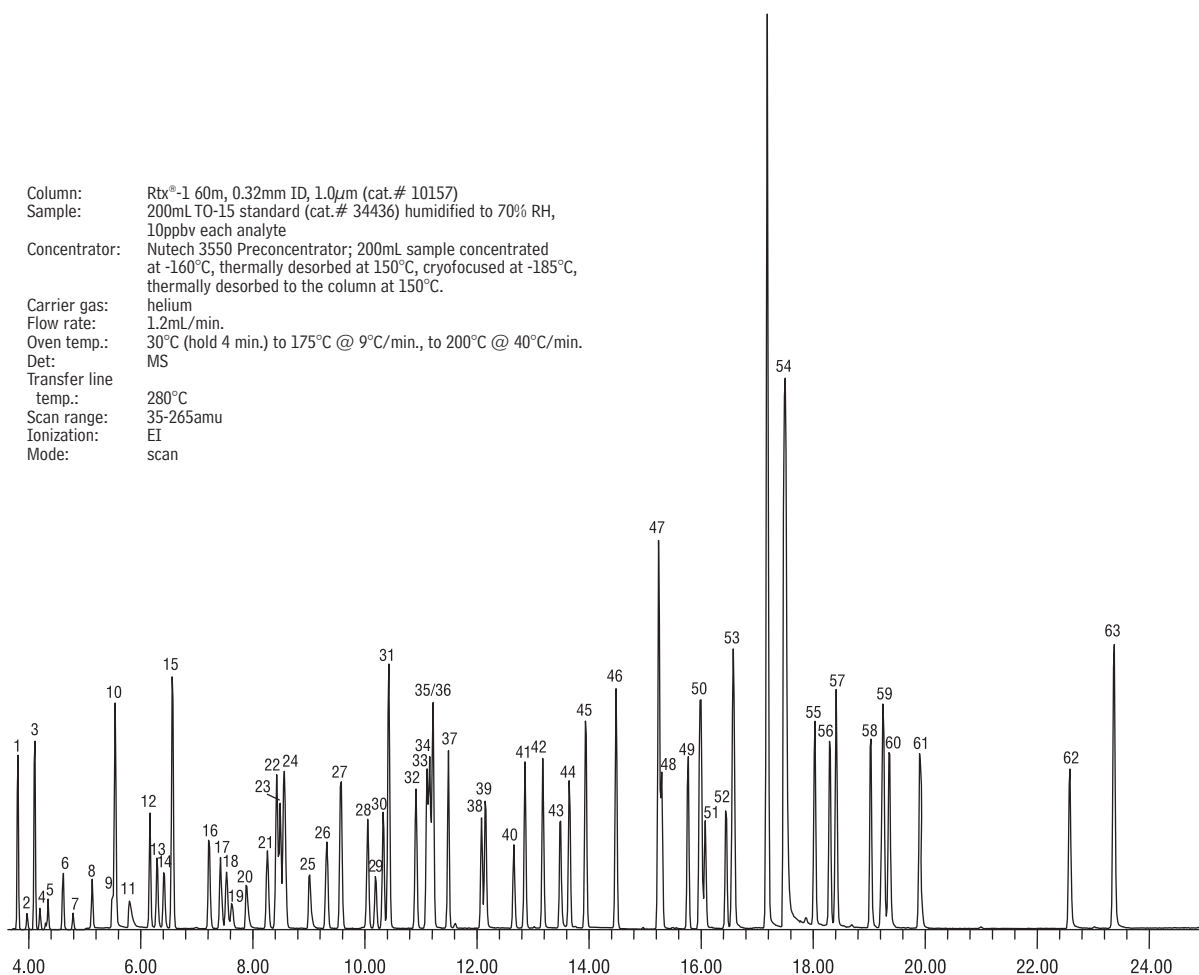


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Canisters are the gold standard for ambient VOC monitoring.

Figure 2 TO-15 volatile organics at 10ppbv exhibit excellent stability after 15 days in a SilcoCan™ canister.

Column: Rtx®-1 60m, 0.32mm ID, 1.0µm (cat.# 10157)
 Sample: 200mL TO-15 standard (cat.# 34436) humidified to 70% RH, 10ppbv each analyte
 Concentrator: Nutech 3550 Preconcentrator; 200mL sample concentrated at -160°C, thermally desorbed at 150°C, cryofocused at -185°C, thermally desorbed to the column at 150°C.
 Carrier gas: helium
 Flow rate: 1.2mL/min.
 Oven temp.: 30°C (hold 4 min.) to 175°C @ 9°C/min., to 200°C @ 40°C/min.
 Det: MS
 Transfer line temp.: 280°C
 Scan range: 35-265amu
 Ionization: EI
 Mode: scan



GC_EV00731

| Compound | ppbv | 16. Freon® TF | 9.6 | 33. bromodichloromethane | 10.0 | 50. <i>m</i> - & <i>p</i> -xylene | 16.0 |
|------------------------------|------|--------------------------------------|------|---------------------------------------|------|-----------------------------------|------|
| 1. dichlorofluoromethane | 9.2 | 17. <i>trans</i> -1,2-dichloroethene | 9.2 | 34. trichloroethene | 9.8 | 51. bromoform | 8.3 |
| 2. chloromethane | 9.6 | 18. 1,1-dichloroethane | 9.5 | 35. 1,4-dioxane | 12.0 | 52. styrene | 7.6 |
| 3. dichlorotetrafluoroethane | 8.6 | 19. methyl <i>tert</i> -butyl ether | 9.2 | 36. 2,2,4-trimethylpentane | 10.0 | 53. 1,1,2,2-tetrachloroethane | 8.3 |
| 4. vinyl chloride | 8.5 | 20. methyl ethyl ketone | 9.0 | 37. <i>n</i> -heptane | 9.4 | 54. <i>o</i> -xylene | 8.0 |
| 5. 1,3-butadiene | 8.6 | 21. <i>cis</i> -1,2-dichloroethene | 9.3 | 38. <i>cis</i> -1,3-dichloropropene | 12.0 | 55. 2-chlorotoluene | 10.0 |
| 6. bromomethane | 8.8 | 22. bromochloromethane | 10.0 | 39. methyl isobutyl ketone | 10.0 | 56. 4-ethyltoluene | 9.4 |
| 7. chloroethane | 7.9 | 23. <i>n</i> -hexane | 9.2 | 40. <i>trans</i> -1,3-dichloropropene | 11.0 | 57. 1,3,5-trimethylbenzene | 10.0 |
| 8. bromoethene | 8.5 | 24. chloroform | 9.9 | 41. 1,1,2-trichloroethane | 11.0 | 58. 1,2,4-trimethylbenzene | 10.0 |
| 9. acetone | 8.9 | 25. tetrahydrofuran | 8.4 | 42. toluene | 12.0 | 59. 1,3-dichlorobenzene | 10.0 |
| 10. trichlorofluoromethane | 9.7 | 26. 1,2-dichloroethane | 9.0 | 43. methyl butyl ketone | 11.0 | 60. 1,4-dichlorobenzene | 10.0 |
| 11. isopropyl alcohol | 9.2 | 27. 1,1,1-trichloroethane | 9.4 | 44. dibromochloromethane | 12.0 | 61. 1,2-dichlorobenzene | 10.0 |
| 12. 1,1-dichloroethene | 9.5 | 28. benzene | 9.2 | 45. 1,2-dibromoethane | 12.0 | 62. 1,2,4-trichlorobenzene | 12.0 |
| 13. methylene chloride | 8.7 | 29. carbon tetrachloride | 8.3 | 46. tetrachloroethene | 12.0 | 63. hexachlorobutadiene | 11.0 |
| 14. 3-chloropropene | 8.7 | 30. cyclohexane | 9.3 | 47. chlorobenzene-d5 | 10.0 | | |
| 15. carbon disulfide | 8.8 | 31. 1,4-difluorobenzene | 10.0 | 48. chlorobenzene | 8.0 | | |
| | | 32. 1,2-dichloropropane | 9.8 | 49. ethylbenzene | 9.0 | | |

SilcoCan™ Canisters, Canister Carrying Supplies

Get the ultimate insurance plan—order your SilcoCan™ canister with a Siltek® treated valve.

also available

For additional gauge and valve options, see [page 9](#).

SilcoCan™ Air Monitoring Canisters

- High quality, metal-to-metal seal, $\frac{2}{3}$ -turn valve with stainless steel diaphragms.
- Sizes to support a wide range of sampling needs.
- 2-port or 3-port valve available; 3-port valve includes 30" Hg/60psi vacuum/pressure gauge (other gauges available).
- Unsurpassed inertness, even for sulfur-containing or brominated compounds.
- For critical applications, order a Siltek® treated valve—add suffix “-650” to the catalog number of the canister.

| Description | qty. | 1L Volume | 3L Volume | 6L Volume | 15L Volume |
|--|------|-----------|-----------|-----------|------------|
| | | cat.# | cat.# | cat.# | cat.# |
| SilcoCan Canister, $\frac{1}{4}$ " Valve | ea. | 24180 | 24181 | 24182 | 24183 |
| SilcoCan Canister, Siltek Treated $\frac{1}{4}$ " Valve | ea. | 24180-650 | 24181-650 | 24182-650 | 24183-650 |
| SilcoCan Canister with Gauge, $\frac{1}{4}$ " Valve | ea. | 24140 | 24141 | 24142 | 24143 |
| SilcoCan Canister with Gauge, Siltek Treated $\frac{1}{4}$ " Valve | ea. | 24140-650 | 24141-650 | 24142-650 | 24143-650 |
| SilcoCan Canister with No Valve | ea. | 22090 | 22091 | 22092 | 22093 |

Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4×10^{-6} cc/sec. The all-stainless steel construction eliminates contamination and withstands temperatures from -100°C to 250°C. Other features include a compression outlet fitting and a $\frac{1}{4}$ " inlet and outlet.

Dimensions/Weights of SilcoCan™ Air Canisters

| Can Volume | Dimensions (height x sphere diameter) | | Weight | |
|------------|---------------------------------------|---------------|---------|--------|
| 1 liter | 8.5 x 5.25" | 21.6 x 13.3cm | 2.5 lbs | 1.13kg |
| 3 liter | 11.5 x 7.25" | 29.2 x 18.4cm | 4 lbs | 1.81kg |
| 6 liter | 12.5 x 9.25" | 31.8 x 23.5cm | 7 lbs | 3.18kg |
| 15 liter | 17 x 12.25" | 43.2 x 31.1cm | 13 lbs* | 5.90kg |

*16 lbs shipped UPS Air, 22 lbs shipped Fed Ex (USA).

for example
applications

see [pages 26–31](#)

Quickly confirm vacuum or pressure. Request a high-quality gauge mounted on your SilcoCan™ or TO-Can™ canister.

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 60psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

| Gauge | Suffix |
|--------------|--------|
| 30" Hg/15psi | -651 |
| 30" Hg/30psi | -652 |

*No price difference for these substituted gauges.

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. These boxes also accommodate our passive sampling kit. 4 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 6L SilcoCan™ or TO-Can™ canisters tightly without foam.
- Weight: 9 lbs.
- Inside dimensions: length 18", width $9\frac{1}{8}$ ", height $12\frac{1}{2}$ " (46 x 23 x 32cm).
- No organic contaminants from foam or plastics.

| Description | qty. | cat.# |
|-------------------------------|------|-------|
| Deluxe Canister Carrying Case | ea. | 24226 |



Improved TO-Can™ Air Monitoring Canisters (Summa Can Equivalent)

Optimized for EPA Methods TO-14 and TO-15, and ASTM D5466

- Proprietary electropolished surface that maintains compound stability.
- High quality, metal-to-metal seal, $\frac{2}{3}$ -turn valve with stainless steel diaphragms.
- 2-port or 3-port valve available; 3-port valve includes 30" Hg/60psi vacuum/pressure gauge (other gauges available).

| Features | Benefits |
|---|--|
| Metal to metal seat, valve with stainless steel diaphragms. | No sample adsorption, for more accurate results. |
| Vacuum/pressure gauge (optional). | Ascertain internal conditions at a glance. |
| Stable to 250°C. | Heat canister to 250°C for superior cleaning. |

US EPA Compendium of Air Methods TO-14 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-14/TO-15 compounds during storage. The frame surrounds the electropolished canister, eliminating the need for weld marks on the sphere, thereby preventing active sites on the canister. The Parker Hannifin metal-to-metal diaphragm valve supports the excellent performance of the canister.

The unique holder attaches the handle and base to the canister without welds, and protects the canister, tube stub, and valve. The $\frac{2}{3}$ -turn diaphragm valve has a metal-to-metal seat and a temperature limit of 250°C. We leak check the system with helium to ensure the TO-Can™ canister and valve are leak-tight, then pressurize the canister with contaminant-free nitrogen before we ship it.

| Description | qty. | 1L Volume | | 3L Volume | | 6L Volume | | 15L Volume | |
|---|------|-----------|--|-----------|--|-----------|--|------------|--|
| | | cat.# | | cat.# | | cat.# | | cat.# | |
| TO-Can Canister, $\frac{1}{4}$ " Valve | ea. | 24172 | | 24173 | | 24174 | | 24175 | |
| TO-Can Canister with Gauge, $\frac{1}{4}$ " Valve | ea. | 24176 | | 24177 | | 24178 | | 24179 | |
| TO-Can Canister with No Valve | ea. | 22094 | | 22095 | | 22096 | | 22097 | |

Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4×10^{-6} cc/sec. The all-stainless steel construction eliminates contamination and withstands temperatures from -100°C to 250°C. Other features include a compression outlet fitting and a $\frac{1}{4}$ " inlet and outlet. For additional gauge and valve options, see page 9.

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 60psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

| Gauge | Suffix |
|--------------|--------|
| 30" Hg/15psi | -651 |
| 30" Hg/30psi | -652 |

*No price difference for these substituted gauges.

TO-Can™ Canisters with Swagelok® SS4H Bellows-Sealed Valve

- All metal flow path prevents sample adsorption, giving more accurate results.
- Withstands temperatures of up to 300°C.
- Rugged performance in the field.

Restek now offers Swagelok® SS4H canister valves on our TO-Can™ canisters. Valves are bellows-sealed for durability and meet all EPA requirements for air monitoring by methods TO-14 and TO-15.

| Description | qty. | 1 Liter Volume | | 3 Liter Volume | | 6 Liter Volume | | 15 Liter Volume | |
|---|------|----------------|--|----------------|--|----------------|--|-----------------|--|
| | | cat. | | cat. | | cat. | | cat. | |
| TO-Can Canister with $\frac{1}{4}$ " Swagelok SS4H Bellows-Sealed Valve | ea. | 22105 | | 22106 | | 22107 | | 22108 | |

Replacement valves are available on page 9.

also available

We also offer sampling kits, sampling bags, and a range of gas reference standards to meet your environmental gas sampling requirements. See **pages 11 and 17–24**.

**please note**

- SUMMA® canister equivalent.
- Excellent analyte recovery—even after 14 days of storage.

did you know?

TO-Can™ Canisters are cleaned prior to shipping.



Quickly confirm vacuum or pressure. Request a high-quality gauge mounted on your SilcoCan™ or TO-Can™ canister.

new!



How to Extend Canister Life

What reduces canister performance and longevity? Leakage is the most common reason for canister failure, but contamination and damage to the fused silica lining can also send canisters to the scrap yard prematurely. Here are some tips to protect your investment:



Neil Mosesman
Marketing Manager
20+ years of service!

1. Prevent leaks

Use proper handling to avoid these 3 leading causes of leaks.

a. Particles in the valve

You can prevent particles from entering the valve by always using a 2 or 7µm particulate filter during sampling and on your canister cleaning equipment. Also, protect the valve inlet by replacing 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 ¼ 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 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 can 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 80°C on the gauge and 90°C on Restek's Veriflow 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 fused silica lined cans. See #3 below for proper cleaning of fused silica lined cans.

3. Avoid damage to fused silica lined cans

Be sure to follow method recommendations when cleaning your canisters to avoid damaging the fused silica 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.

Reconditioning Service for SilcoCan™ or TO-Can™ Canisters

Normal wear and tear on a canister may result in valve damage and leakage. We offer a reconditioning service in which we will replace the valve, clean, and leak test the canister for much less than the cost to replace the entire canister. If you would like this service, please follow the instructions below:

1. Contact Customer Service at 800-356-1688, ext. 3, or contact your Restek representative and place an order for part number 560838 using your company purchase order.
2. Obtain a return authorization number to affix on the outside of the shipping container.
3. Clean canister before shipment to Restek.
4. Return canister intact. Do not remove valves or gauges that were part of the original canister.



Alternative Gauges and Valves for Air Monitoring Canisters

1/4" Replacement Valves for Air Monitoring Canisters*

- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms.
- 2-port or 3-port valve available; 3-port valve includes 30" Hg/60psi vacuum/pressure gauge (other gauges available).

| Description | qty. | Non-Treated Valve | | qty. | Siltek®-Treated Valve | |
|---------------------------------|------|-------------------|--|------|-----------------------|--|
| | | cat. # | | | cat. # | |
| 1/4" Replacement Valve (2-port) | ea. | 24145 | | ea. | 24144 | |
| 1/4" Replacement Valve (3-port) | ea. | 24147 | | ea. | 24146 | |

*All Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested to 4×10^{-9} cc/sec. The all-stainless steel construction eliminates contamination and withstands temperatures from -100°C to 250°C. Other features include a compression outlet fitting and a 1/4" inlet and outlet.



Canister valve
(Siltek®-treated)

Swagelok® SS4H Bellows-Sealed Valve, 1/4-inch, 2-Port, Stainless Steel

- 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!

Restek now offers Swagelok® SS4H canister valves. These popular, rugged valves are available separately or already assembled on our TO-Can™ canisters. Valves are bellows-sealed for durability and meet all EPA requirements for air monitoring by methods TO-14 and TO-15.

| Description | qty. | cat. |
|--|------|-------|
| Replacement 1/4" Swagelok SS4H Bellows-Sealed Valve | 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. | | |

new!



Replacement Combination Vacuum/Pressure Gauges

2-inch vacuum/pressure gauges, 316 stainless steel with 1/8" NPT fitting and center back mount.

| Description | qty. | cat. # |
|-----------------------------------|------|--------|
| 30"Hg/15psi Vacuum/Pressure Gauge | ea. | 24100 |
| 30"Hg/30psi Vacuum/Pressure Gauge | ea. | 24104 |
| 30"Hg/60psi Vacuum/Pressure Gauge | ea. | 24108 |

Vacuum Gauges

High-quality vacuum gauges with 316 stainless steel wetted surfaces. 30" Hg.

| Description | qty. | cat. # |
|-----------------------------------|------|--------|
| 2-Inch Vacuum Gauge; 1/8" NPT | ea. | 24269 |
| 2-Inch Vacuum Gauge; 1/4" NPT | ea. | 24270 |
| 1 1/2-Inch Vacuum Gauge; 1/8" NPT | ea. | 24120 |



Ashcroft Test Gauges

- Accurate measurement of vacuum to 30"Hg and pressure to 60psi.
- Available in both analog and digital formats.
- Accuracy to +/- 0.25%.

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 |

new!





Canister and passive air sampling kit must be purchased separately.

new!

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" Swagelok® inlet and outlet fittings, highly inert stainless steel flow path, and water-proof exterior for outdoor use.

| Description | qty. | cat.# |
|-----------------------------|------|-------|
| Canister Air Sampling Timer | ea. | 24267 |



did you know?

SilcoCan™ and TO-Can™ Canisters are Cleaned Prior to Shipping

After assembly, every Restek SilcoCan™ and TO-Can™ canister is evacuated to 50mTorr, then pressurized with humidified nitrogen to 30psi. The cleaning system is programmed to repeat this cycle three times to ensure thorough cleaning. We ship our canisters clean and under pressure at 30psi with dry nitrogen.



The ultimate in controlled heating, for reliably cleaning your air canisters!

Air Canister Heating Jacket

- Closely simulates oven environment—heats entire canister and valve.
- Two temperature settings, 75°C and 150°C.*
- Prevents sample condensation, for accurate subsampling.
- Easily fits canister up to 6 liters.
- Lightweight; comfortable to the touch when heated.
- Connect up to five Canister Heating Jackets to one 15 amp circuit.

| Description | qty. | cat.# |
|--|------|-------|
| Air Canister Heating Jacket (110 volt) | ea. | 24123 |

*Not CE certified.

Humidification Chamber

When cleaning SilcoCan™ or TO-Can™ canisters, it is important to use humidified air or nitrogen to help remove volatile organic contaminants. We incorporated our humidification chamber into the design of our cleaning system. Restek's humidification chamber is made of acrylic and withstands pressure up to 90psi. 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.



Humidification Chamber

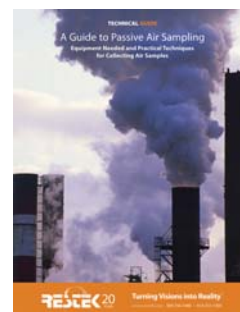
Restek's canister cleaning system with humidification chamber.

| Description | qty. | cat.# |
|------------------------|------|-------|
| Humidification Chamber | ea. | 24282 |

Passive Air Sampling Kits

- Provide accurate integrated sampling without a sampling pump.
- Siltek® treated components ensure a very inert surface.
- 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 TO-Can™ air sampling canister for TO-14A and TO-15 methods. Use the Siltek® treated version with SilcoCan™ canisters, when collecting low-level volatile sulfur compounds, or other active compounds.



free literature

A Guide to Passive Air Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

Download your free copy from www.restek.com.

Technical Guide
lit. cat.# 59977B

| 400cc | Canister Volume*/Sampling Time | | | | Flow (sccm) | Orifice size | Siltek® Treated Sampling Kits | Stainless Steel Sampling Kits |
|--------|--------------------------------|---------|----------|----------|-------------|--------------|-------------------------------|-------------------------------|
| | 1 Liter | 3 Liter | 6 Liter | 15 Liter | | | | |
| 8 hour | 24 hour | 48 hour | 125 hour | — | 0.5–2 | 0.0008" | 24217 | 24216 |
| 2 hour | 4 hour | 12 hour | 24 hour | 60 hour | 2–4 | 0.0012" | 24160 | 24165 |
| 1 hour | 2 hour | 6 hour | 12 hour | 30 hour | 4–8 | 0.0016" | 24161 | 24166 |
| — | 1 hour | 4 hour | 8 hour | 20 hour | 8–20 | 0.0020" | 24162 | 24167 |
| — | — | 2 hour | 3 hour | 8 hour | 20–40 | 0.0030" | 24163 | 24168 |
| — | — | — | 1.5 hour | 4 hour | 40–80 | 0.0060" | 24164 | 24169 |
| — | — | — | 0.5 hour | 1 hour | 80–350 | 0.0090" | 22101 | 22100 |

*Air sampling canisters sold separately.

1. Veriflo® SC423XL flow controller

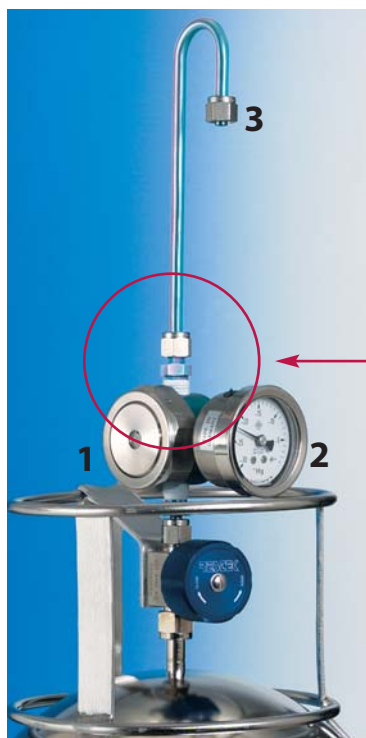
This flow controller is the heart of the sampling train. It is a high-quality device designed to maintain a constant mass flow as the pressure changes from 30" Hg to 5" Hg (we recommend you stop sampling at or before 5" Hg of vacuum). All wetted parts of the flow controller can be Siltek® treated.

2. Stainless steel vacuum gauge

Fitted to the flow controller, the gauge monitors canister vacuum change during sampling.

3. 1/4-inch Siltek® sample inlet

The 0.3m x 1/4-inch 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.



All fitting connections are 1/4" tube, except where noted.



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. To select the correct critical orifice for your sample, see table above. Available in stainless steel, or Siltek® treated for optimum inertness.

please note

For individual components, see page 12.

Buy only the parts you need!

Replacement Orifices

Use these orifices with a Veriflo® 423XL flow controller to change the flow range for alternative sampling times.

| Flow (sccm) | Orifice size | Siltek® Treated | | Stainless Steel | |
|----------------|-----------------|-----------------|--|-----------------|--|
| | | cat. # | | cat. # | |
| 0.5–2 | 0.0008" | 24219 | | 24218 | |
| 2–4 | 0.0012" | 24233 | | 24245 | |
| 4–8 | 0.0016" | 24234 | | 24246 | |
| 8–20 | 0.0020" | 24235 | | 24247 | |
| 20–40 | 0.0030" | 24236 | | 24248 | |
| 40–80 | 0.0060" | 24237 | | 24249 | |
| 80–350 | 0.0090" | 22099 | | 22098 | |

2µm Frit Filters

For use in critical orifice fitting. Includes washers.

| Description | qty. | cat. # |
|---|-------|--------|
| Siltek Replacement Frit Filter | 3-pk. | 24171 |
| Stainless Steel Replacement Frit Filter | 3-pk. | 24170 |

Veriflo® Flow Controllers

Veriflo® 423XL flow controllers are offered in a Siltek® and a 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.

| Flow (sccm) | Orifice size | Siltek® Treated | | Stainless Steel | |
|----------------|-----------------|-----------------|--|-----------------|--|
| | | cat. # | | cat. # | |
| 0.5–2 | 0.0008" | 24232 | | 24229 | |
| 2–4 | 0.0012" | 24255 | | 24260 | |
| 4–8 | 0.0016" | 24256 | | 24261 | |
| 8–20 | 0.0020" | 24257 | | 24262 | |
| 20–40 | 0.0030" | 24258 | | 24263 | |
| 40–80 | 0.0060" | 24259 | | 24264 | |
| 80–350 | 0.0090" | 22103 | | 22102 | |
| — | no orifice | 24238 | | 24239 | |

7µm In-Line Filter

This 316 stainless steel filter is designed to collect particles larger than 7 microns. We offer a Siltek® version and a stainless steel version. 1/4" compression fitting on both ends.

| Description | qty. | cat. # |
|------------------------------------|------|--------|
| Siltek 7µm In-Line Filter | ea. | 24265 |
| Stainless Steel 7µm In-Line Filter | ea. | 24266 |

Note: frit only is not replaceable.

Sample Inlets

- 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.

| Description | qty. | Siltek® Treated | | Stainless Steel | |
|---------------------------|------|-----------------|--|-----------------|--|
| | | cat. # | | cat. # | |
| Sample Inlet, 6" Length | ea. | 26210 | | 26209 | |
| Sample Inlet, 1.5" Length | ea. | 26212 | | 26211 | |



Critical orifice



Frit filters
(top: Siltek® treated)
(bottom: stainless steel)



Flow controller



new!



Miniature Air Sampling Canisters

- Ideal for indoor air, personal, emergency response, or soil gas sampling.
- 400cc or 1,000cc.
- Low pressure applications not exceeding 40psig.
- Available with quick-connect fitting that is compatible with sampling and analysis instruments.
- Also available with nontreated or Sulfinert® treated valve.

These small canisters are designed for controlled sampling, such as personal air sampling, as an alternative to tube and pump samplers. The 1,000cc canister is suitable for sampling volatile organic compounds in air according to US EPA Methods TO-14 and TO-15.

Restek offers these products in stainless steel or with Sulfinert® treatment, for greatest inertness. We continue to offer passive coating technologies that are unmatched in the air sampling industry—try a Sulfinert® treated canister and achieve the ultimate in analyte stability.

Miniature Air Sampling Canisters with Quick-Connect Stem Fittings

| Description | Volume | qty. | cat.# |
|--|--------|------|-------|
| Electro-Polished Miniature Canister with Quick-Connect Stem Fitting | 400cc | ea. | 24188 |
| | 1000cc | ea. | 24194 |
| Sulfinert Treated Miniature Canister with Quick-Connect Stem Fitting | 400cc | ea. | 24189 |
| | 1000cc | ea. | 24195 |
| | 400cc | ea. | 24190 |
| Sulfinert Treated Miniature Canister with Sulfinert Treated Quick-Connect Stem Fitting | 1000cc | ea. | 24196 |

Quick-Connect Fittings for Miniature Air Sampling Canisters

Connection: 1/4" tube fitting.

| Description | qty. | cat.# |
|---|------|-------|
| Quick-Connect Stem Fitting | ea. | 24185 |
| Sulfinert Treated Quick-Connect Stem Fitting | 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.

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.

Miniature Air Sampling Canisters with Metal-Seated Diaphragm Valve

| Description | Volume | qty. | cat.# |
|---|--------|------|-------|
| Electro-Polished Miniature Canister with Metal-Seated Diaphragm Valve | 400cc | ea. | 24191 |
| | 1000cc | ea. | 24197 |
| Sulfinert Treated Miniature Canister with Metal-Seated Diaphragm Valve | 400cc | ea. | 24192 |
| | 1000cc | ea. | 24198 |
| Sulfinert Treated Miniature Canister with Sulfinert Treated Diaphragm Valve | 400cc | ea. | 24193 |
| | 1000cc | ea. | 24199 |

Miniature Air Sampling Canisters with Nut & Ferrule

| Description | Volume | qty. | cat.# |
|---|--------|------|-------|
| Electro-Polished Miniature Canister with Nut & Ferrule | 400cc | ea. | 24205 |
| | 1000cc | ea. | 24206 |
| Sulfinert Treated Miniature Canister with Nut & Ferrule | 400cc | ea. | 24207 |
| | 1000cc | ea. | 24208 |

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 |



Dimensions:
400cc = 2.75" diameter,
5.35" long (7 x 13.6cm)
1,000cc = 2.75" diameter,
11.92" long (7 x 30cm)



Thermal Desorption Unit Tubes



new!

method applications

| Method | Application |
|------------|-------------|
| US EPA | TO-17 |
| ASTM | D-6196 |
| 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.
 (<10L total volume)
 Long-term storage caps are
 supplied with conditioned tubes

Thermal Desorption Unit (TDU) Tubes

- Variety of sorbents to collect a wide range of VOCs.
- Use glass tubes for maximum inertness in active sampling.
- Choose stainless steel tubes for either active or passive sampling. No sampling pump necessary for passive sampling with diffusion caps!
- Individually etched with unique serial number for convenient sample identification.
- Available unconditioned or preconditioned and ready to sample. Tubes are reusable after thermal desorption.

High-quality thermal desorption tubes by Markes International are now available from Restek. These sorbent tubes are suitable for ppt to ppm concentrations of volatile organic compounds (VOCs) in ambient, indoor, and industrial hygiene environments. Available in both stainless steel and glass (for thermally labile VOCs), they fit Markes ULTRA-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 | Applications |
|---|--|
| Tenax TA | Vapor phase organics from C6/7 to C26 |
| Graphitized Carbon | Vapor phase organics from C5/6 to C14 |
| Tenax GR/Carbopack B | Vapor phase organics from <i>n</i> -C5/6 to <i>n</i> -C20 (EPA Methods TO-14/TO-15/TO-17) |
| Carbopack B/Carbosieve SIII | Vapor phase organics from <i>n</i> -C2/3 to <i>n</i> -C12/14 (EPA Methods TO-14/TO-15/TO-17) |
| Tenax TA/Graphitized Carbon/Carboxen 1000 | Vapor phase organics from C2/3 to C20 |
| Carbopack C/Carbopack B/Carbosieve SIII | Vapor phase organics from <i>n</i> -C2/3 to <i>n</i> -C16/20 (EPA Methods TO-14/TO-15/TO-17) |

Thermal Desorption Unit Tubes, Unconditioned and Conditioned & Capped

| Description | qty. | Unconditioned | | Conditioned & Capped | |
|--|--------|-----------------|-------|----------------------|-------|
| | | Stainless Steel | Glass | Stainless Steel | Glass |
| TDU Tubes, Tenax TA | 10-pk. | 24056 | 24062 | 24080 | 24086 |
| TDU Tubes, Graphitized Carbon | 10-pk. | 24057 | 24063 | 24081 | 24087 |
| TDU Tubes, Tenax GR/Carbopack B | 10-pk. | 24058 | 24064 | 24082 | 24088 |
| TDU Tubes, Carbopack B/Carbosieve SIII | 10-pk. | 24059 | 24065 | 24083 | 24089 |
| TDU Tubes, Tenax TA/Graphitized Carbon/Carboxen 1000 | 10-pk. | 24060 | 24066 | 24084 | 24090 |
| TDU Tubes, Carbopack C/Carbopack B/Carbosieve SIII | 10-pk. | 24061 | 24067 | 24085 | 24091 |

Thermal Desorption Unit Tubes, Empty

- Empty tubes for direct desorption of VOCs in liquids, solids, or pastes.
- Stainless steel: front sorbent retaining gauze fitted, rear gauze and gauze retaining spring supplied.
- Glass: with glass frit positioned 15mm from sampling end.

| Description | qty. | Stainless Steel | Glass |
|------------------|--------|-----------------|-------|
| TDU Tubes, Empty | 10-pk. | 24054 | 24055 |

Thermal Desorption Unit Tubes, Calibration

| Description | qty. | Stainless Steel | Glass |
|--|--------|-----------------|-------|
| TDU Tubes, Calibration, Tenax TA 1cm Bed | 10-pk. | 24075 | 24076 |
| Description | qty. | cat. | |
| Calibration Solution Loading Rig | ea. | 24077 | |
| Calibration Solution Loading Rig 9.5mm Replacement Septa | 10-pk. | 24078 | |
| Certified Reference Standard, 100ng BTX on Tenax TA | 10-pk. | 24079 | |

Thermal Desorption Unit Tubes, Accessories

| Description | Benefits/Uses | qty. | cat. |
|--|---|--------|-------|
| 1/4" Brass Cap and PTFE Ferrules | Use for 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 |
| 1/2" 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 |



24061



24062



24067



24054



24055



24071



24070



24074



Thermal Desorption Tubes vs. Canister Sampling

Which VOC Sampling Technique is Right for You?

Thermal desorption 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 |
|---------------------|--|--|
| Methods | US EPA TO-17 ASTM D6196 ISO 16017 ISO 16000-6 NIOSH 2549 | US EPA TO-14, TO-15 ASTM D5466 OSHA PV2120 NIOSH Protocol Draft |
| | World-wide acceptance | Gold standard for US ambient air market |
| Applications | 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 |
| Handling | Light weight for personal monitoring and general ease of use | Larger and heavier; more costly to ship |
| Sampling | 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, 15L max |
| Analysis | Tube dimensions are instrument specific | Compatible with all manufacturer sample concentrators |
| | 1 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. |
| Storage | Sample storage at 4°C recommended for multi-bed tubes to prevent potential migration of compounds to more retentive sorbent which maybe difficult to recover. | Room temperature |
| Cleaning | 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. |
| Cost | ~130 each | ~700 each |



tech guides

Thermal desorption application guides are available for a broad range of markets. Request your FREE copy today using these part numbers.

Environmental Air Monitoring and Occupational Health & Safety
EVTG1034

Residual Volatiles & Materials Emissions Testing
GNTG1035

Defense & Forensic
CFTG1036

Food, Flavor, Fragrance & Odor Profiling
FFTG1037

Ultra-Clean Resin, PUFs

Sampling Supplies for Semivolatiles in Air

Everything you need for sampling semivolatile compounds in air: Ultra-Clean resin, PUF sampling cartridges.



Restek's Ultra-Clean resin 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, GC tested and certified by TO-13 protocol.
- Available in 100 gram quantities.

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 but still meet TO-13 method requirements, we do the cleaning for you! Ultra-Clean resin complies with the specified maximum contamination levels—we test each batch by capillary GC/flame ionization detector to ensure cleanliness.

method applications

| Method | Applications |
|------------|--------------|
| EPA 23 | Dioxins |
| EPA TO-13A | PAHs |
| ASTM D6209 | PAHs |

| Description | cat.# | 1-4 bottles | 5-9 bottles | 10+ bottles |
|------------------------------|-------|-------------|-------------|-------------|
| Ultra-Clean Resin, 100 grams | 24230 | | | |



SDVB Resin

- Styrene/divinylbenzene, equivalent to XAD-2 resin.
- Untreated, packaged in 1kg plastic containers.
- Spherical, 20 to 60 mesh particles.

| Description | qty. | cat.# |
|-------------|------|-------|
| SDVB Resin | 1kg | 24053 |

Cleaned Polyurethane Foam (PUF) Cartridges

- Precleaned and ready to use for collection of semivolatiles (pesticides, PCBs, PAHs).
- Both large high-volume (220-280L/min.) and small low-volume (1-5L/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 organophosphorous pesticides, carbamate, pyrethrin, triazine, and urea pesticides | 22116 |
| EPA IP-7 | Polycyclic aromatic hydrocarbons (PAHs) | 22114 |
| EPA IP-8 | Organochlorine and organophosphorous pesticides, carbamate, pyrethrin, triazine, and urea pesticides | 22116 |
| ASTM D4861 | Organochlorine and organophosphorous 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 |



Large PUF Cartridge



Small PUF Cartridge

new!

| Description | qty. | cat.# |
|---|------|-------|
| Cleaned PUF Plug (7.6cm length, 6cm diameter) | ea. | 24295 |
| Large PUF Cartridge, 65mm OD x 125mm length, 75mm PUF | ea. | 22114 |
| Large PUF/XAD Cartridge, 65mm OD x 125mm length, 25mm PUF/10g XAD-2/50mm PUF | ea. | 22115 |
| Small PUF Cartridge, 22mm OD x 100mm length, 76mm PUF | ea. | 22116 |
| Small PUF/XAD Cartridge, 22mm OD x 100mm length, 30mm PUF/1.5g XAD-2/30mm PUF | ea. | 22117 |



Cali-5-Bond Gas Sampling Bags

- Totally nonpermeable and opaque, providing UV protection.
- Chemically inert—extremely rugged and portable.
- Extra strength—5 mil (0.14mm) thick.
- Easy to use.

Cali-5-Bond air and gas sampling bags provide a simple, reliable, and economic method of collecting air, gas, and liquid samples. The 5-layer construction (made by a patented process) ensures the physical integrity of any sample taken, providing a truly representative sample of the collection environment. Both grab and time-integrated samples can be taken with the use of a sampling pump. The twist-type valve with hose-barb connection enables secure attachment of $\frac{3}{16}$ " ID sample tubing. The septum port allows easy access via a gas-tight syringe. Bags should not be used at temperatures above 50°C (125°F) and should never be over inflated.

| Description | | qty. | cat.# |
|-------------|-----------|-------|-------|
| 0.5L | 6" x 8" | 5-pk. | 24092 |
| 1L | 8" x 8" | 5-pk. | 24093 |
| 2L | 8" x 12" | 5-pk. | 24094 |
| 5L | 8" x 23" | 5-pk. | 24095 |
| 10L | 16" x 15" | 5-pk. | 24096 |
| 22L | 16" x 25" | 5-pk. | 24097 |
| 44L | 24" x 25" | 5-pk. | 24098 |

new!



AIR MONITORING

Tedlar® Sampling Bags

- Find the bags you need—we offer sizes from 0.5 liters to 100 liters.
- Unique all-in-one septum and valve fitting make these lightweight and easy to use.
- Polypropylene or stainless steel valve.

The unique design of these Tedlar® sample bags incorporates the sampling septum directly in the valve, providing easier use and lighter weight than other styles. We offer two types of bags: one with a polypropylene valve and one with a stainless steel valve. Both valves conveniently connect to $\frac{3}{16}$ " ID Teflon® tubing.

| Description | | Polypropylene Valve | | Stainless Steel Valve | |
|--------------------|----------------|---------------------|-------|-----------------------|--|
| | | qty. | cat.# | cat.# | |
| 0.5L | 6" x 6" | 10-pk. | 22049 | 22038 | |
| 1L | 7" x 7" | 10-pk. | 22050 | 22039 | |
| 3L | 9.5" x 10" | 10-pk. | 22051 | 22040 | |
| 5L | 12" x 12.5" | 10-pk. | 22052 | 22041 | |
| 10L | 11.75" x 22" | 10-pk. | 22053 | 22042 | |
| 12L | 13" x 24" | 10-pk. | 22054 | 22043 | |
| 25L | 17.5" x 24" | 5-pk. | 22055 | 22044 | |
| 40L | 24" x 24.25" | 5-pk. | 22056 | 22045 | |
| 80L | 28.25" x 32.5" | 5-pk. | 22057 | 22046 | |
| 100L | 28" x 36" | 3-pk. | 22058 | 22047 | |
| Replacement Septum | | 10-pk. | 22059 | 22048 | |



please **note**

Gas standards are subject to hazardous materials shipping fees by most freight carriers.

it's a **fact**

Higher concentration =
MORE STANDARD
for your money!

cylinder
design**Spectra 104L Cylinders:****Aluminum construction**

Size: 8 x 24 cm.

Volume/Pressure:

104 liters of gas
@ 1,800psi

CGA-180

outlet fitting.

Weight:

1.5 lbs./0.7 kg

**Scotty 110L Cylinders**

(Pi-marked Cylinders for
EU Regulations):

Aluminum construction

Size: 8.3 x 29.5 cm.

Volume/Pressure:

110 liters of gas
@ 1,800psi

CGA-180

outlet fitting.

Weight:

2.2 lbs./1 kg

U.S. D.O.T. Specs:

3AL2216

ordering **note**

Other cylinder sizes available
on request.

also **available**

See **page 20** for high-purity
regulator.

Environmental Air Monitoring Gas Standards

Our high-quality air monitoring gas calibration standards are provided by Spectra Gases and Scott Specialty Gases. Mixes are produced gravimetrically using NIST (National Institute of Science and Technology) traceable weights. 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. 12-month stability on all cylinders unless otherwise specified.

TO-14A Calibration Mix (39 components)

benzene
bromomethane
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
1ppm in nitrogen, 104 liters @ 1,800psi
cat. # 34400 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34400-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi

cat. # 34421 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34421-PI (ea.)

TO-14A 41 Component Mix (41 components)

acrylonitrile
benzene
bromomethane
1,3-butadiene
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi

cat. # 34430 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34430-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi

cat. # 34431 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34431-PI (ea.)

TO-14A 43 Component Mix (43 components)

acrylonitrile
benzene
bromomethane
1,3-butadiene
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
3-chloropropene
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
4-ethyltoluene
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi

cat. # 34432 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34432-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi

cat. # 34433 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34433-PI (ea.)

TO-14A GC/MS Tuning Mix

4-bromofluorobenzene

1ppm in nitrogen, 104 liters @ 1,800psi

cat. # 34406 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34406-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi

cat. # 34424 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34424-PI (ea.)

TO-14A Aromatics Mix (14 components)

benzene
chlorobenzene
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
ethyl benzene
styrene
toluene
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1ppm in nitrogen, 104 liters @ 1,800psi

cat. # 34404 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34404-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi

cat. # 34423 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder)

cat. # 34423-PI (ea.)

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 | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34402 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34402-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34422 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34422-PI (ea.) | |

TO-14A Internal Standard Mix

| | |
|--|---------------------|
| bromochloromethane | 1,4-difluorobenzene |
| chlorobenzene-d5 | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34412 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34412-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34427 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34427-PI (ea.) | |

TO-14A Internal Standard/Tuning Mix

| | |
|--|---------------------|
| bromochloromethane | chlorobenzene-d5 |
| 1-bromo-4-fluorobenzene | 1,4-difluorobenzene |
| (4-bromofluorobenzene) | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34408 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34408-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34425 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34425-PI (ea.) | |

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 | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34434 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34434-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34435 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34435-PI (ea.) | |

*Stability of this compound cannot be guaranteed.

TO-15 64 Component Mix

(64 components)

| | |
|--|--|
| acetone | trichlorofluoromethane |
| acrolein | (Freon® 11) |
| benzene | dichlorodifluoromethane |
| benzyl chloride* | (Freon® 12) |
| bromodichloromethane | 1,1,2-trichloro-1,2,2-trifluoroethane (Freon® 113) |
| bromoform | 1,2-dichlorotetrafluoroethane (Freon® 114) |
| bromomethane | heptane |
| 1,3-butadiene | hexachloro-1,3-butadiene |
| 2-butanone (MEK) | hexane |
| carbon disulfide* | 2-hexanone (MBK) |
| carbon tetrachloride | 4-methyl-2-pentanone (MIBK) |
| chlorobenzene | methylene chloride |
| chloroethane | methyl <i>tert</i> -butyl ether (MTBE) |
| chloroform | methyl methacrylate |
| 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 |
| 1,2-dichloroethane | 1,2,4-trichlorobenzene |
| 1,1-dichloroethene | 1,1,1-trichloroethane |
| <i>cis</i> -1,2-dichloroethene | 1,1,2-trichloroethane |
| <i>trans</i> -1,2-dichloroethene | trichloroethene |
| 1,2-dichloropropane | 1,2,4-trimethylbenzene |
| <i>cis</i> -1,3-dichloropropene | 1,3,5-trimethylbenzene |
| <i>trans</i> -1,3-dichloropropene | vinyl acetate |
| 1,4-dioxane | vinyl chloride |
| ethanol* | <i>m</i> -xylene |
| ethyl acetate | (1,2-dibromoethane) |
| ethyl benzene | 4-ethyltoluene |
| ethylene dibromide | |
| (1,2-dibromoethane) | |
| 4-ethyltoluene | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34436 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34436-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34437 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34437-PI (ea.) | |

*Stability of this compound cannot be guaranteed.

TO-14A/TO-15/TO-17 Performance Test Standard

Restek is pleased to offer the Performance Testing/VOC Audit Sample Program in cooperation with Spectra Gases. This is an on-going testing program in which laboratories, and/or other users of VOC standards, are able to evaluate their own capabilities, as well as compare their results and accuracy against other laboratories. As a participant in the program, you will receive a disposable cylinder, directly from Spectra Gases, containing multiple unknown TO-14A/TO-15 components at varying concentrations that are to be identified, quantified, and reported via the Spectra Gases P-T Audit Program forms. The results will be published and distributed for peer review. To ensure confidentiality, all participating laboratories will be anonymous, and only the individual laboratory will know their own results. To provide statistical analysis, the audit sample will be shipped to all laboratories at the same time, once a year during the fourth quarter.

170 liters @ 2,015psi

cat. # 34560 (ea.)

updated!

new!

Pi-marked Gas Cylinders Now Available for EU Countries

Our new Pi-marked gas standards from Scott Specialty Gases meet the requirements of Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers.

new!

cylinder design**TO-14A/TO-15/TO-17 Performance Test Standard**

Size: 5A disposable (3.2" x 12")

Volume/Pressure:

170L @ 2,015psi

CGA 180 outlet fitting

Weight: 2.2lbs.

cylinder
design

Spectra 104L Cylinders:

Aluminum construction

Size: 8 x 24 cm.

Volume/Pressure:

104 liters of gas

@ 1,800psi

CGA-180

outlet fitting.

Weight:

1.5 lbs./0.7 kg



Scotty 110L Cylinders

(Pi-marked Cylinders for EU Regulations):

Aluminum construction

Size: 8.3 x 29.5 cm.

Volume/Pressure:

110 liters of gas

@ 1,800psi

CGA-180

outlet fitting.

Weight:

2.2 lbs./1 kg

U.S. D.O.T. Specs:

3AL2216



BTEX Gas Mix

| | |
|--|------------------|
| benzene | <i>m</i> -xylene |
| ethylbenzene | <i>o</i> -xylene |
| toluene | <i>p</i> -xylene |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34414 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34414-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34428 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34428-PI (ea.) | |

BTEX and MTBE Gas Mix

| | |
|--|------------------|
| benzene | <i>m</i> -xylene |
| ethylbenzene | <i>o</i> -xylene |
| methyl <i>tert</i> -butyl ether (MTBE) | <i>p</i> -xylene |
| toluene | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34541 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34541-PI (ea.) | |
| 100ppb in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34542 (ea.) | |
| 100ppb in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34542-PI (ea.) | |

Sulfur 5-Component Mix

| | |
|--|------------------|
| 12-month stability. +/- 10% accuracy. | |
| carbonyl sulfide | hydrogen sulfide |
| dimethyl sulfide | methyl mercaptan |
| ethyl mercaptan | |
| 1ppm in nitrogen, 110 liters @ 1,800psi | |
| cat. # 34561 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34561-PI (ea.) | |

new!

Spectra Gas 7621 High-Purity VOC Regulator

- Single-stage, stainless steel.
- Two pressure gauges and CGA-180 fitting.
- 3,000psig maximum inlet pressure.
- Stainless steel diaphragm and Kel-F® seat.
- 1/8-inch tube compression outlet.
- Low internal volume: 3.03cc.
- Accurate pressure control even at low flow rates.
- Individually tested for leaks and impurities.

| Description | qty. | cat.# |
|---------------------------------|------|------------|
| 0–30psig outlet pressure gauge | ea. | 21572 |
| 0–100psig outlet pressure gauge | ea. | 21572-R100 |

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 | <i>n</i> -nonane |
| <i>n</i> -decane | <i>n</i> -octane |
| 2,3-dimethylheptane | toluene |
| 2,3-dimethylpentane | toluene-d8 (IS) |
| <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 | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34540 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34540-PI (ea.) | |

Japan Calibration Mix (9 components)

| | |
|--|---------------------|
| acrylonitrile | dichloromethane |
| benzene | tetrachloroethylene |
| 1,3-butadiene | trichloroethylene |
| chloroform | vinyl chloride |
| 1,2-dichloroethane | |
| 1ppm in nitrogen, 104 liters @ 1,800psi | |
| cat. # 34418 (ea.) | |
| 1ppm in nitrogen, 110 liters @ 1,800psi (Pi-marked Cylinder) | |
| cat. # 34418-PI (ea.) | |

ordering note

Other cylinder sizes available on request.

for reference
booksVisit www.restek.com

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) |

1ppm in nitrogen, 104 liters @ 1,800psi

cat. # 34420 (ea.)

1ppm in nitrogen, 110 liters @ 1,800psi (PI-marked Cylinder)

cat. # 34420-PI (ea.)

100ppb in nitrogen, 104 liters @ 1,800psi

cat. # 34429 (ea.)

100ppb in nitrogen, 110 liters @ 1,800psi (PI-marked Cylinder)

cat. # 34429-PI (ea.)

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 |

20-60ppb C in nitrogen, 104 liters @ 1,800psi

cat. # 34445 (ea.)

20-60ppb C in nitrogen, 110 liters @ 1,800psi (PI-marked Cylinder)

cat. # 34445-PI (ea.)



Silvia Martinez
Innovations Chemist
5+ years of service!

Silvia has
answers to your air
monitoring
questions!



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also available

Custom air standards!

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form.

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 sub-sample. The plunger stem is detachable, making sample storage easy.



1,000mL Jumbo Syringe

| SGE | | | Restek | |
|--------|---------------|--------|--------|-------|
| Volume | Model | cat.# | qty. | cat.# |
| 500mL | 500MAR-LL-GT | 009910 | ea. | 21275 |
| 1000mL | 1000MAR-LL-GT | 009920 | ea. | 21276 |
| 2000mL | 2000MAR-LL-GT | 009930 | ea. | 21277 |

Syringe O-Rings

| SGE | | | Restek | |
|----------------|--------|------|--------|--|
| Syringe Volume | cat.# | qty. | cat.# | |
| 500mL | 032527 | ea. | 21278 | |
| 1000mL | 032532 | ea. | 21279 | |



O-Rings for 1000mL & 500mL Syringes

Scott Transportable Pure Gases and Mixtures in 14-, 48-, and 110-Liter Sizes

We offer a wide range of Scott Transportable Gases, from pure gases for purging or calibrating to multi-component mixes which are ideal for peak identification work.

The 14-liter container has a CGA 160 connection for more precise integration with analytical systems. The 48-liter cylinder has a CGA 165 connection, and can deliver large volumes of sample. The 110-liter cylinder has a CGA 180 connection.

Scotty® 14

Contents: 14 liters
Pressure: 240psig (17 bar)
Outlet Fitting: CGA 160

Weight: 1.5 lbs/0.7 kg
Dimensions: 3" diameter x 11" height (7.6 x 28cm)
D.O.T. Specifications: 4B240

Please note: this cylinder is not approved for use in Canada.

Scotty® 48

Contents: 48 liters
Pressure: 300psig (21 bar)
Outlet Fitting: CGA 165

Weight: 1.75 lbs/0.8 kg
Dimensions: 4" diameter x 16 1/4" height (10.2 x 41cm)
D.O.T. Specifications: 39 NRC

Scotty® 110 (Pi-marked Cylinders for EU Regulations)

Contents: 110 liters
Pressure: 1800psig (124 bar)
Outlet Fitting: CGA 180

Weight: 2.2 lbs/1 kg
Dimensions: 3.25" diameter x 11.625" height (8.3 x 29.5cm)
D.O.T. Specifications: 3AL2216

| Description | Shelf Life | Scotty® 14 (14 Liter) cat. # | Scotty® 48 (48 Liter) cat. # | Scotty® 110 (110 Liter) cat. # |
|------------------------|------------|------------------------------------|------------------------------------|--------------------------------------|
| Pure Gases | | | | |
| Air, zero (THC < 1ppm) | 2 yrs. | 34448 | 34449 | 34449-PI |
| Argon, 99.995% | 2 yrs. | 34457 | — | 34457-PI |
| Carbon dioxide, 99.80% | 2 yrs. | 34451 | 34452 | 34452-PI |
| Hydrogen, 99.99% | 2 yrs. | 34453 | — | 34453-PI |
| Methane, 99.00% | 2 yrs. | 34454 | — | 34454-PI |
| Oxygen, 99.60% | 2 yrs. | 34455 | — | 34455-PI |

new!

Pi-marked Gas Cylinders Now Available for EU Countries

Our new Pi-marked gas standards from Scott Specialty Gases meet the requirements of Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

Two-Component Mixtures

| | | | | |
|---|--------|-------|-------|----------|
| Benzene in air (1ppm) | 1 yr. | — | 34458 | 34458-PI |
| Benzene in air (100ppm) | 1 yr. | — | 34459 | 34459-PI |
| 1,3-Butadiene in nitrogen (10ppm) | 2 yrs. | 34460 | 34461 | 34461-PI |
| Carbon dioxide in helium (100ppm) | 2 yrs. | 34462 | — | 34462-PI |
| Carbon dioxide in nitrogen (100ppm) | 2 yrs. | 34463 | 34464 | 34464-PI |
| Carbon dioxide in nitrogen (1000ppm) | 2 yrs. | 34465 | 34466 | 34466-PI |
| Ethylene in air (8-10ppm) | 2 yrs. | 34467 | 34468 | 34468-PI |
| Ethylene in helium (100ppm) | 2 yrs. | 34489 | — | 34489-PI |
| Hydrogen in helium (100ppm) | 2 yrs. | 34469 | — | 34469-PI |
| Hydrogen in nitrogen (1%) | 2 yrs. | 34471 | 34472 | 34472-PI |
| Hydrogen in nitrogen (100ppm) | 2 yrs. | 34473 | 34474 | 34474-PI |
| Methane in helium (100ppm) | 2 yrs. | 34476 | 34477 | 34477-PI |
| Methane in nitrogen (100ppm) | 2 yrs. | 34478 | — | 34478-PI |
| Methane in nitrogen (1%) | 2 yrs. | 34482 | 34483 | 34483-PI |
| Nitrogen in helium (100ppm) | 2 yrs. | 34479 | — | 34479-PI |
| Nitrous oxide in nitrogen (1ppm) | 2 yrs. | 34484 | 34485 | 34485-PI |
| Oxygen in helium (100ppm) | 2 yrs. | 34480 | — | 34480-PI |
| Oxygen in nitrogen (2%) | 2 yrs. | 34487 | 34488 | 34488-PI |
| Oxygen in nitrogen (6%) | 2 yrs. | 34491 | 34492 | 34492-PI |
| 1,1,1-Trichloroethane in nitrogen (10ppm) | 2 yrs. | — | 34493 | 34493-PI |
| Trichloroethylene in nitrogen (10ppm) | 2 yrs. | 34494 | 34495 | 34495-PI |
| Vinyl chloride in nitrogen (1ppm) | 2 yrs. | 34496 | 34497 | 34497-PI |
| Vinyl chloride in nitrogen (10ppm) | 2 yrs. | 34498 | 34499 | 34499-PI |
| Vinyl chloride in nitrogen (50ppm) | 2 yrs. | 34500 | — | 34500-PI |
| Vinyl chloride in nitrogen (100ppm) | 2 yrs. | 34501 | — | 34501-PI |
| Vinyl chloride in nitrogen (1000ppm) | 2 yrs. | 34502 | — | 34502-PI |



| Description | Shelf Life | Scotty® 14 (14 Liter) cat.# | Scotty® 48 (48 Liter) cat.# | Scotty® 110 (110 Liter) cat.# |
|---|------------|-----------------------------------|-----------------------------------|-------------------------------------|
| Multi-Component Mixtures | | | | |
| Carbon monoxide, carbon dioxide, hydrogen and oxygen in nitrogen (0.5% each) | 2 yrs. | 34504 | 34505 | 34505-PI |
| Carbon monoxide, carbon dioxide, hydrogen and oxygen in nitrogen (1% each) | 2 yrs. | 34507 | 34508 | 34508-PI |
| Carbon monoxide, carbon dioxide, methane, ethane, ethylene and acetylene in nitrogen (1% each) | 1 yr. | — | 34511 | 34511-PI |
| Carbon monoxide, carbon dioxide, nitrogen, and oxygen, (5% each) and methane and hydrogen (4% each) in helium | 2 yrs. | 34512 | — | 34512-PI |
| Carbon monoxide (7%), carbon dioxide (15%) and oxygen (5%) in nitrogen | 2 yrs. | 34514 | — | 34514-PI |
| Carbon monoxide (7%), oxygen (4%), carbon dioxide (15%) and methane (4.5%) in nitrogen | 2 yrs. | 34515 | 34516 | 34516-PI |
| C1-C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (15ppm each) | 2 yrs. | 34518 | 34519 | 34519-PI |
| C1-C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (100ppm each) | 2 yrs. | 34521 | 34522 | 34522-PI |
| C1-C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (1000ppm each) | 2 yrs. | 34524 | 34525 | 34525-PI |
| C1-C6 <i>n</i> -Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (100ppm each) | 2 yrs. | 34527 | 34528 | 34528-PI |
| C2-C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in helium (100ppm each) | 2 yrs. | 34529 | 34530 | 34530-PI |
| C2-C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in nitrogen (100ppm each) | 2 yrs. | 34531 | 34532 | 34532-PI |
| Branched Paraffins: 2,2-dimethylbutane, 2,2-dimethylpropane, isobutane, 2-methylbutane, 2-methylpentane, 3-methylpentane in nitrogen (15ppm each) | 2 yrs. | 34534 | — | 34534-PI |
| Methane, ethane, ethylene, acetylene, propane, propylene, <i>n</i> -butane, propyne in nitrogen (15ppm each) | 1 yr. | — | 34537 | 34537-PI |
| <i>n</i> -butane, isobutane, <i>cis</i> -2-butene, <i>trans</i> -2-butene, 1-butene, isobutylene, 1,3-butadiene, ethyl acetylene in nitrogen (15ppm each) | 1 yr. | — | 34539 | 34539-PI |

also available

Custom air standards!

Visit www.restek.com for our custom air standards ordering form.

Regulators for use with 14-liter and 48-liter Scott Transportable Gases

Specifications:

Maximum Inlet Pressure: 300psig
 Outlet Pressure Range: 2–10psig
 Maximum Delivery Pressure: 25psig
 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®

Use the CGA 160 inlet connection with 14-liter Scott Transportable Gases. Use the CGA 165 inlet connection with 48-liter Scott Transportable Gases.

| Description | qty. | cat.# |
|---|------|-------|
| Regulator with CGA 160 Inlet Connection | ea. | 22690 |
| Regulator with CGA 165 Inlet Connection | ea. | 22691 |



also available

Regulators with CGA-180 connections for the 110L cylinders are listed on page 20.

Syringe Adapter 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 Adapter Kit | kit | 21118 |



Natural Gas and Refinery Gas Standards

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 |
| n-butane | 0.300 | 1.000 | 3.000 |
| isopentane | 0.150 | 0.500 | 1.000 |
| n-pentane | 0.150 | 0.500 | 1.000 |
| hexanes plus EX2* | 0.100 | 0.250 | 0.500 |
| Concentration | mole | mole | mole |
| Volume | 13.16L @ 200psig | 13.16L @ 200psig | 5.5L @ 75psig |
| Ideal Heating Value (Dry BTU/SCF) | 1048 gross | 1142 gross | 1317 gross |

*Contact Restek or your Restek representative for a complete list of hexanes plus EX2.

**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 |
| n-butane | 4.000 | 4.000 | 4.000 |
| isobutylene | 2.000 | 1.000 | 1.000 |
| 1,3 butadiene | 3.000 | 3.000 | 3.000 |
| cis-2-butene | 2.000 | 2.000 | 2.000 |
| trans-2-butene | 2.000 | 3.000 | 3.000 |
| butene-1 | 2.000 | 2.000 | 2.000 |
| 2-methyl-2-butene | — | 0.200 | 0.200 |
| isopentane | 1.000 | 1.000 | 1.000 |
| n-pentane | 1.000 | 1.000 | 1.000 |
| cis-2-pentene | — | 0.400 | 0.400 |
| trans-2-pentene | — | 0.160 | 0.200 |
| pentene-1 | — | 0.400 | 0.400 |
| n-hexane | 0.500 | 0.100 | — |
| hexanes plus EX | — | — | 0.100 |
| Concentration | mole | mole | mole |
| Volume | 5.2L @ 70psig | 4.9L @ 60psig | 4.6L @ 60psig |

**Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

Mini-Regulator for natural gas and refinery gas standards

- 0–300psig inlet pressure range.
- 0–15psig outlet pressure range.
- Supplied with 0–15psig outlet pressure gauge, brass CGA 170 nut and nipple.

| Description | qty. | cat.# |
|----------------|------|-------|
| Mini-Regulator | ea. | 22032 |

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.

CGA-170/110 connection.

U.S. D.O.T. Specs:

DOT-4B-240ET

Please note: This cylinder is not approved for use in Canada.



Sulfinert® Treated Swagelok® Sample Cylinders

- Stable storage of samples containing ppb levels of sulfur compounds.
- Manufactured by Swagelok®; US DOT rated to 1,800psi (12,411kPa) at room temperature.
- 304 grade stainless steel with 1/4" female NPT threads on both ends.

Ideal for collecting and storing samples, such as natural gas or beverage-grade carbon dioxide, because active compounds remain stable during transport.

| Description | Size | qty. | cat.# |
|---------------------------|--------|------|-------|
| Sulfinert Sample Cylinder | 75cc | ea. | 24130 |
| Sulfinert Sample Cylinder | 150cc | ea. | 24131 |
| Sulfinert Sample Cylinder | 300cc | ea. | 24132 |
| Sulfinert Sample Cylinder | 500cc | ea. | 24133 |
| Sulfinert Sample Cylinder | 1000cc | ea. | 24134 |
| Sulfinert Sample Cylinder | 2250cc | ea. | 21394 |

Sulfinert® Treated Alta-Robbins Sample Cylinder Valves

- All wetted parts are Sulfinert® treated for inertness.
- Compatible with Sulfinert® treated Swagelok® sample cylinders.
- Large, durable, Kel-F® seat ensures leak-free operation; temperature range: -40°C to 120°C.
- Valves rated to 3,500psig.

| Description | qty. | cat.# |
|---|------|-------|
| 1/4" NPT Exit | ea. | 21400 |
| 1/4" Compression Exit | ea. | 21401 |
| 1/4" NPT with Dip Tube* | ea. | 21402 |
| 1/4" NPT with 2,850psi Rupture Disc | ea. | 21403 |
| 1/4" NPT Male Inlet x 1/4" Female Outlet with 2,850psi Rupture Disc | ea. | 21404 |

*To order catalog #21402 (Sulfinert Alta-Robbins Sample Cylinder Valve, 1/4" NPT with Dip Tube), please call 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"/ 13.3cm). Note: End of part will not be treated after cutting tube to length.

Sulfinert® Treated Rupture Disc Tee

2,850psig (19,650kPa) rating; 1/4" NPT connections.

| Description | qty. | cat.# |
|---|------|-------|
| Sulfinert Treated Rupture Disc Tee (1/4" NPT connections) | ea. | 21396 |
| Replacement Rupture Disc (not Sulfinert treated) | ea. | 24298 |

Sulfinert® Treated Ultra-High Pressure Sample Cylinders and Valves

- Stable storage of samples containing sulfur compounds and mercury.
- Cylinders manufactured by Swagelok® and US DOT rated to 5,000psig.
- Valves rated to 6,000psig.
- 316 grade stainless steel with 1/4" female NPT threads on both ends.

Ideal for collecting samples at gas wellhead or other applications requiring sampling at extremely high pressures.

| Sample Cylinders | Size | qty. | cat.# |
|--|-------|------|-------|
| Sulfinert Sample Cylinder | 150cc | ea. | 22111 |
| Sulfinert Sample Cylinder | 300cc | ea. | 22112 |
| Sulfinert Sample Cylinder | 500cc | ea. | 22113 |
| Sample Cylinder Valves | | qty. | cat.# |
| Sulfinert Treated Sample Cylinder Valve, 1/4" Male NPT (both ends) | | ea. | 22109 |
| Sulfinert Treated Sample Cylinder Valve, 1/4" Male NPT x 1/4" Female NPT | | ea. | 22110 |

also **available**

Certificates are available upon request.



new!

Sulfinert® treatment means ULTIMATE inertness!

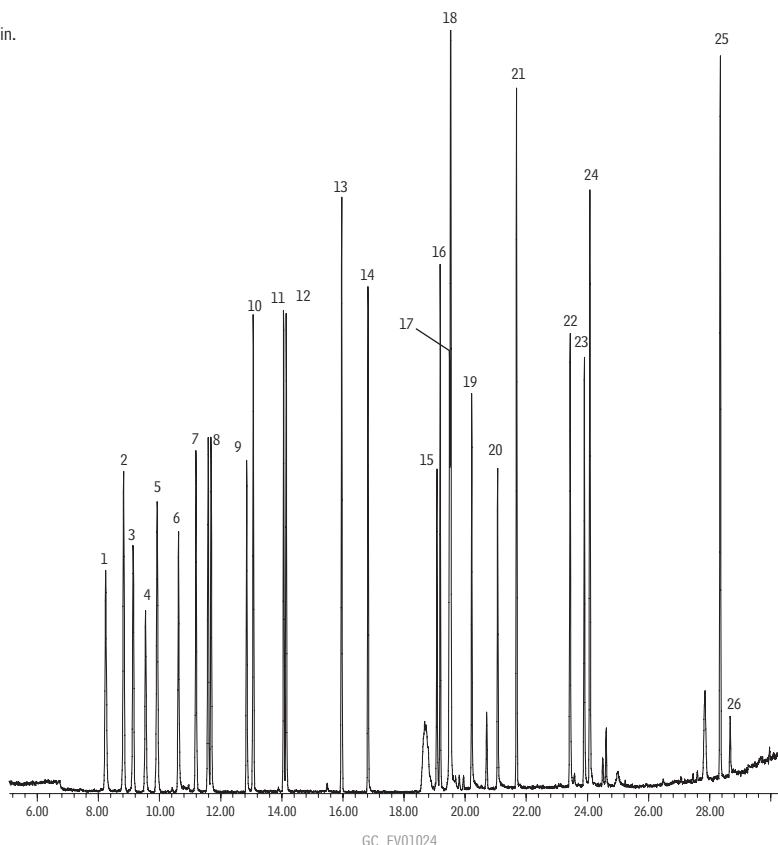


Microbial VOCs on Rxi®-1ms

Column: Rxi®-1ms, 60m, 0.25mm ID, 1.00µm (cat.# 13356)
 Sample: microbial volatile organic compounds, 50 ppbv, 60% RH
 Inj.: 1.0µL split (split ratio 10:1), 1mm split inlet liner (cat.# 20972)
 Inj. temp.: 200°C
 Carrier gas: helium, constant flow
 Flow rate: 1.5mL/min.
 Oven temp.: 10°C (hold 1 min.) to 260°C @ 8°C/min.
 Det: HP 6890/5973 GC/MS

Transfer line temp.: 260°C
 Scan range: 35 to 350amu
 Ionization: EI
 Mode: scan
 Other: Nutech 8900DS Preconcentrator
 Conditions:
 Sample = 200mL from canister
 Cryotrap = -160°C
 Desorb = 20°C
 Cryofocuser = 200°C
 Desorb = 200°C

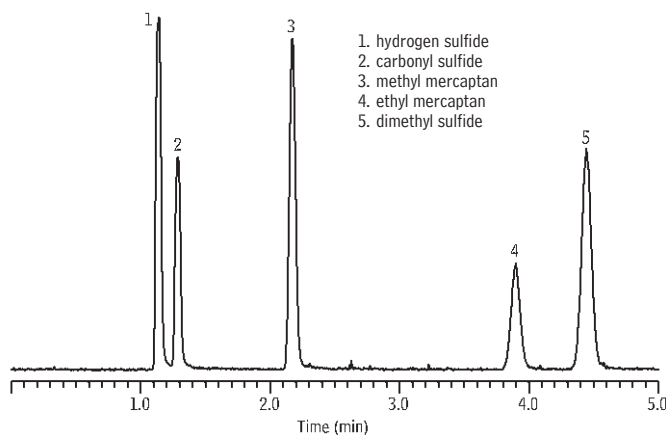
| Compound | Rt (min.) |
|-----------------------------------|-----------|
| 1. 2-butanone | 8.2390 |
| 2. 2-methyl-furan | 8.8180 |
| 3. 3-methyl-furan | 9.1400 |
| 4. 2-methyl-1-propanol | 9.5400 |
| 5. 2-methyl-2-butanol | 9.9190 |
| 6. 1-butanol | 10.6270 |
| 7. 3-methyl-2-butanol | 11.1840 |
| 8. 2-pentanol | 11.6920 |
| 9. 2-methyl-1-butanol | 12.8500 |
| 10. dimethyl-disulfide | 13.0640 |
| 11. 3-hexanone | 14.0580 |
| 12. 2-hexanone | 14.1440 |
| 13. chlorobenzene-d5 | 15.9590 |
| 14. 2-heptanone | 16.8240 |
| 15. 1-octen-3-ol | 19.0760 |
| 16. 3-octanone | 19.1760 |
| 17. 3-octanol | 19.4830 |
| 18. 2-pentyl-furan | 19.5260 |
| 19. 2-ethyl-1-hexanol | 20.2120 |
| 20. 1-octanol | 21.0630 |
| 21. 2-isopropyl-3-methoxypyrazine | 21.6780 |
| 22. isoborneol | 23.4290 |
| 23. α-terpineol | 23.9010 |
| 24. 2-methylisoborneol | 24.0790 |
| 25. geosmin | 28.3470 |
| 26. 1-dodecanol | 28.6680 |



GC_EV01024

Sulfur Compounds

Rxi®-1ms



GC_AR00861

1. hydrogen sulfide
2. carbonyl sulfide
3. methyl mercaptan
4. ethyl mercaptan
5. dimethyl sulfide

Column: Rxi®-1ms, 30m, 0.32mm ID, 4.00µm (cat.# 13396)
 Sample: hydrogen sulfide, carbonyl sulfide, methyl mercaptan, ethyl mercaptan, dimethyl sulfide, 100 ppbv each in helium
 Inj.: 1µL splitless, direct
 Sample loop temp.: 30°C
 Carrier gas: helium, constant pressure
 Linear velocity: 48cm/sec. @ 30°C
 Oven temp.: 30°C
 Det.: sulfur chemiluminescence detector
 Det. temp.: 800°C

Sample storage & transfer:
 SilcoCan™ air monitoring canister with Siltek® treated 1/4" valve (cat.# 24182-650);
 Sulfinert® treated gas sample loop, 1cc (cat.# 22848); Sulfinert® treated gas sample loop, 10cc (custom order)

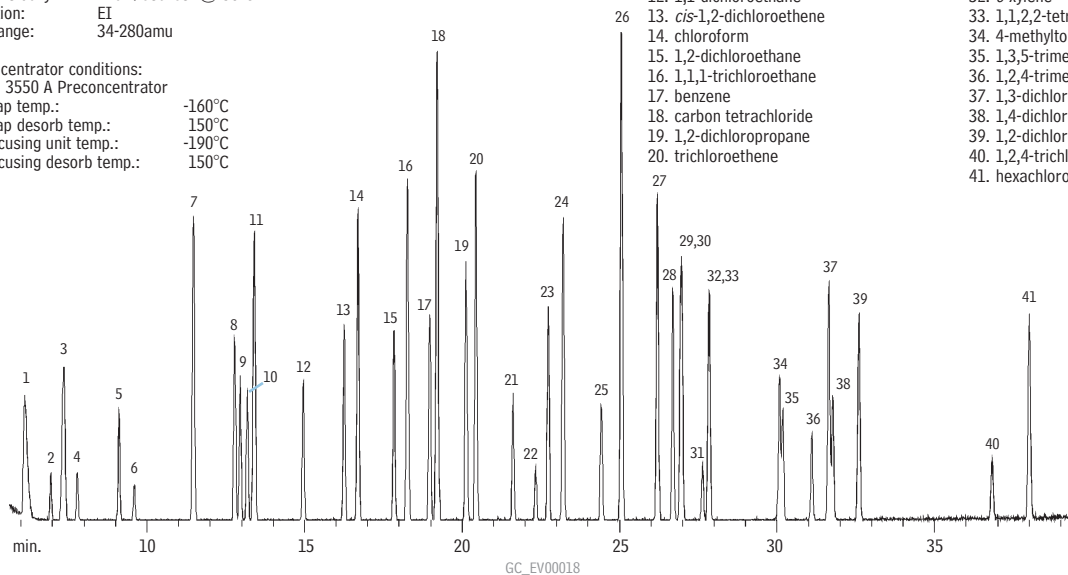
US EPA TO-14 Compounds

Rtx®-1

Column: Rtx®-1, 60m, 0.32mm ID, 3.0µm (cat.# 10187)
 Sample: 5mL of 2ppmv TO-14 standard.
 Oven temp.: 30°C (hold 4 min.) to 250°C @ 7°C/min. (hold 15 min.)
 Detector: MS
 Det. temp.: 250°C
 Carrier gas: helium
 Linear velocity: 21cm/sec. set @ 30°C
 Ionization: EI
 Scan range: 34-280amu

Preconcentrator conditions:
 Nutech 3550 A Preconcentrator
 Cryotrap temp.: -160°C
 Cryotrap desorb temp.: 150°C
 Cryofocusing unit temp.: -190°C
 Cryofocusing desorb temp.: 150°C

1. dichlorodifluoromethane
2. chloromethane
3. 1,2-dichlorotetrafluoroethane
4. vinyl chloride
5. bromomethane
6. chloroethane
7. trichlorofluoromethane
8. 1,1-dichloroethene
9. methylene chloride
10. 3-chloropropene
11. 1,1,2-trichloro-1,2,2-trifluoroethane
12. 1,1-dichloroethane
13. *cis*-1,2-dichloroethene
14. chloroform
15. 1,2-dichloroethane
16. 1,1,1-trichloroethane
17. benzene
18. carbon tetrachloride
19. 1,2-dichloropropane
20. trichloroethene
21. *cis*-1,3-dichloropropene
22. *trans*-1,3-dichloropropene
23. 1,1,2-trichloroethane
24. toluene
25. 1,2-dibromoethane
26. tetrachloroethene
27. chlorobenzene
28. ethylbenzene
29. *m*-xylene
30. *p*-xylene
31. styrene
32. *o*-xylene
33. 1,1,2,2-tetrachloroethane
34. 4-methyltoluene
35. 1,3,5-trimethylbenzene
36. 1,2,4-trimethylbenzene
37. 1,3-dichlorobenzene
38. 1,4-dichlorobenzene
39. 1,2-dichlorobenzene
40. 1,2,4-trichlorobenzene
41. hexachlorobutadiene

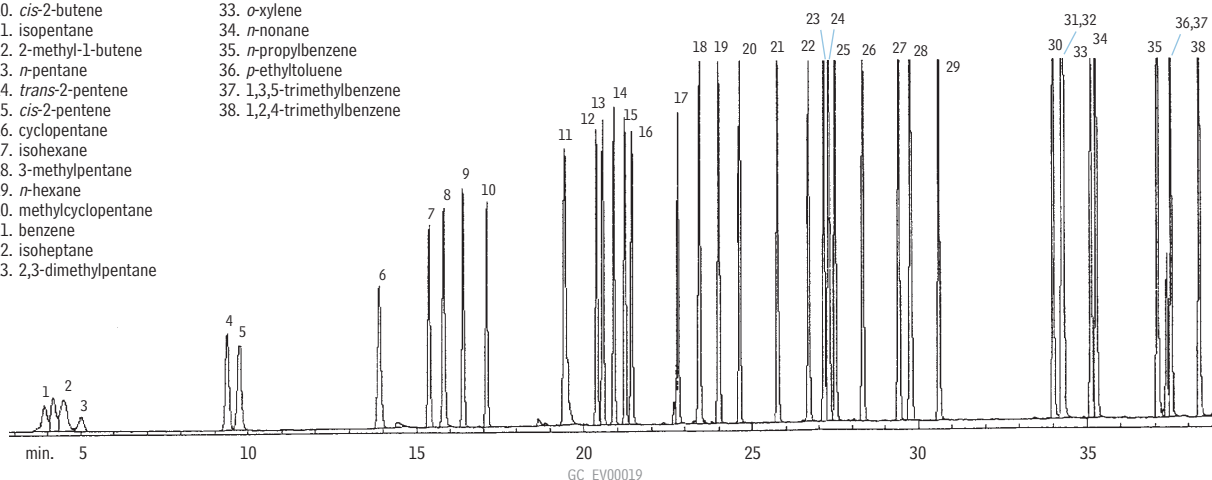


Ozone Precursors

Rtx®-1

Column: Rtx®-1, 60m, 0.32mm ID, 3.0µm (cat.# 10187)
 Sample: 0.5L of C2-C9 gas standard cryogenically concentrated;
 15nL/component desorbed onto column.
 Oven temp.: -60°C (hold 5 min.) to 100°C @ 8°C/min., to
 150°C @ 6°C/min., then to 240°C @ 8°C/min.
 Carrier gas: helium
 Linear velocity: 30cm/sec. (flow rate: 1.8cc/min.)
 FID sensitivity: 64 x 10¹² AFS

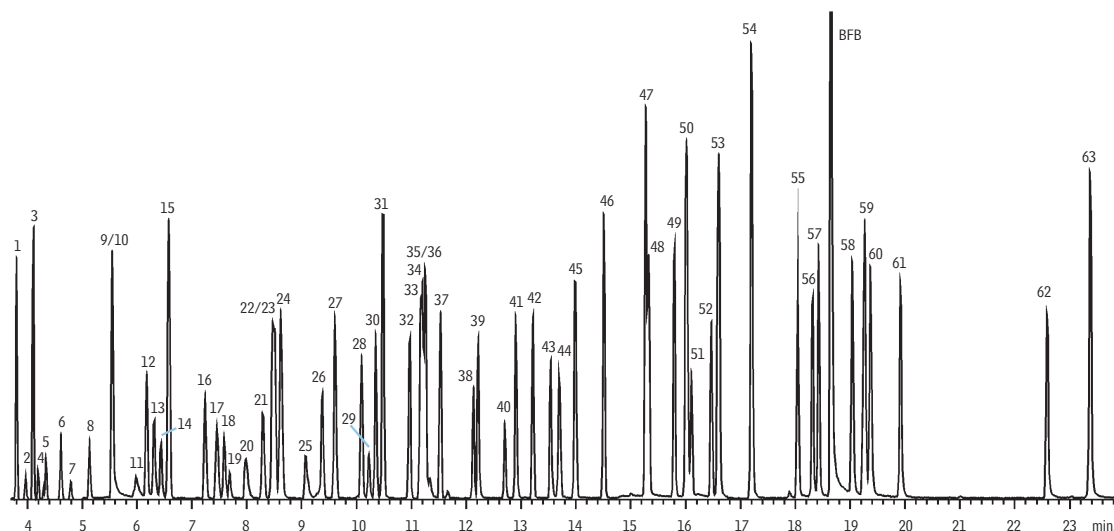
1. ethylene
2. acetylene
3. ethane
4. propylene
5. propane
6. isobutane
7. 1-butene
8. *n*-butane
9. *trans*-2-butene
10. *cis*-2-butene
11. isopentane
12. 2-methyl-1-butene
13. *n*-pentane
14. *trans*-2-pentene
15. *cis*-2-pentene
16. cyclopentane
17. isohexane
18. 3-methylpentane
19. *n*-hexane
20. methylcyclopentane
21. benzene
22. isooheptane
23. 2,3-dimethylpentane
24. 3-methylhexane
25. 2,2,4-trimethylpentane
26. *n*-heptane
27. methylcyclohexane
28. 2,2,3-trimethylpentane
29. toluene
30. ethylbenzene
31. *m*-xylene
32. *p*-xylene
33. *o*-xylene
34. *n*-nonane
35. *n*-propylbenzene
36. *p*-ethyltoluene
37. 1,3,5-trimethylbenzene
38. 1,2,4-trimethylbenzene



Permission to publish this chromatogram granted by Radian Corporation.

US EPA TO-14/TO-15 Compounds

Rtx®-1



GC_EV00379

Column: Rtx®-1, 60m, 0.32mm ID, 1.0µm (cat.# 10157)
 Sample: 200mL of 10ppbv TO-15 standard, injected into TO-Can™ canister and humidified to 70% RH.
 Concentrator: Nutech 3550 Preconcentrator
 200mL of sample concentrated at -160°C, thermally desorbed at 150°C, and cryofocused at -185°C
 Oven temp.: 30°C (hold 4 min.) to 175°C @ 9°C/min. to 220°C @ 40°C/min.
 Carrier gas: helium @ 1.2mL/min.
 Det.: Agilent 5971 MS
 Scan range: 35-265amu

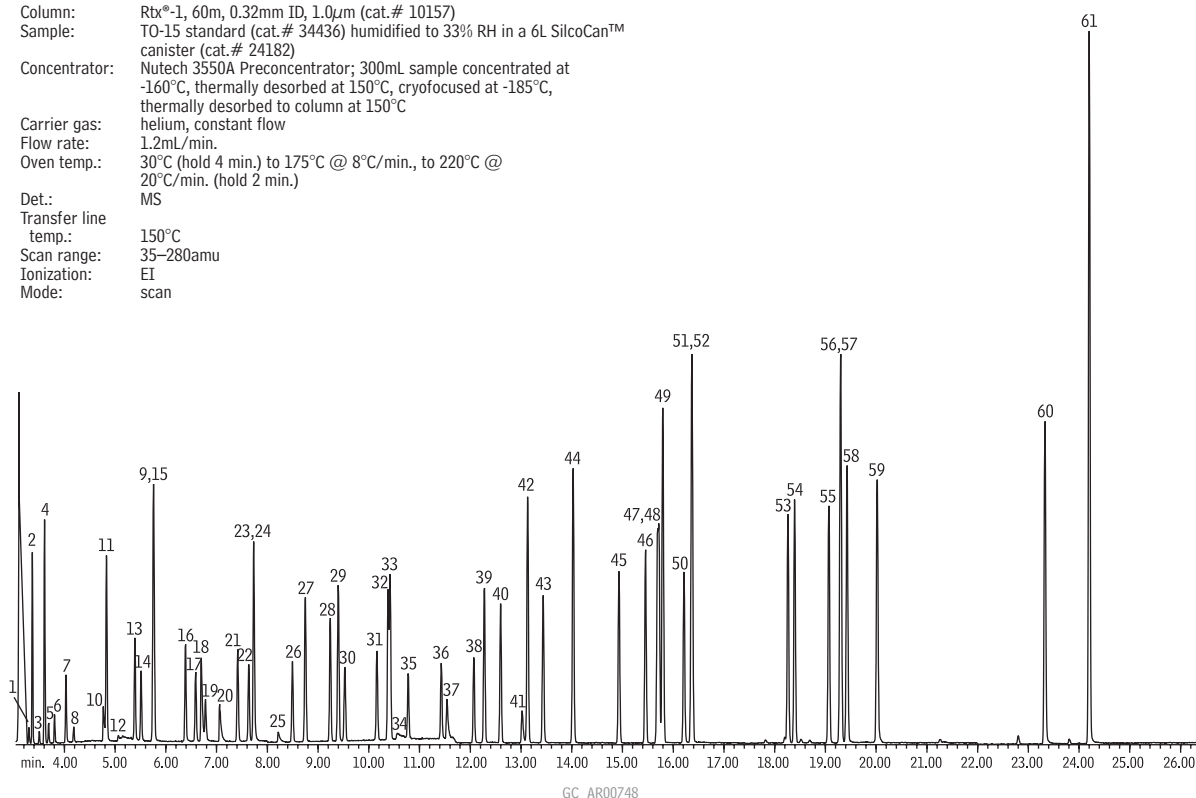
- | | | |
|--------------------------------------|---------------------------------------|-------------------------------|
| 1. dichlorofluoromethane | 23. <i>n</i> -hexane | 45. 1,2-dibromoethane |
| 2. chloromethane | 24. chloroform | 46. tetrachloroethene |
| 3. dichlorotetrafluoroethane | 25. tetrahydrofuran | 47. chlorobenzene-d5 (IS) |
| 4. vinyl chloride | 26. 1,2-dichloroethane | 48. chlorobenzene |
| 5. 1,3-butadiene | 27. 1,1,1-trichloroethane | 49. ethylbenzene |
| 6. bromomethane | 28. benzene | 50a. <i>m</i> -xylene |
| 7. chloroethane | 29. carbon tetrachloride | 50b. <i>p</i> -xylene |
| 8. bromoethene | 30. cyclohexane | 51. bromoform |
| 9. acetone | 31. 1,4-difluorobenzene (IS) | 52. styrene |
| 10. trichlorofluoromethane | 32. 1,2-dichloropropane | 53. 1,1,2,2-tetrachloroethane |
| 11. isopropyl alcohol | 33. bromodichloromethane | 54. <i>o</i> -xylene |
| 12. 1,1-dichloroethene | 34. trichloroethene | 55. 2-chlorotoluene |
| 13. methylene chloride | 35. 1,4-dioxane | 56. 4-ethyltoluene |
| 14. 3-chloropropene | 36. 2,2,4-trimethylpentane | 57. 1,3,5-trimethylbenzene |
| 15. carbon disulfide | 37. <i>n</i> -heptane | 58. 1,2,4-trimethylbenzene |
| 16. Freon® TF | 38. <i>cis</i> -1,3-dichloropropene | 59. 1,3-dichlorobenzene |
| 17. <i>trans</i> -1,2-dichloroethene | 39. methyl isobutyl ketone | 60. 1,4-dichlorobenzene |
| 18. 1,1-dichloroethane | 40. <i>trans</i> -1,3-dichloropropene | 61. 1,2-dichlorobenzene |
| 19. methyl <i>tert</i> -butyl ether | 41. 1,1,2-trichloroethane | 62. 1,2,4-trichlorobenzene |
| 20. methyl ethyl ketone | 42. toluene | 63. hexachlorobutadiene |
| 21. <i>cis</i> -1,2-dichloroethene | 43. methyl butyl ketone | |
| 22. bromochloromethane (IS) | 44. dibromochloromethane | |

Chromatogram courtesy of Gina Maio, Severn Trent Laboratories, Inc., Burlington, VT.

US EPA TO-15 Compounds

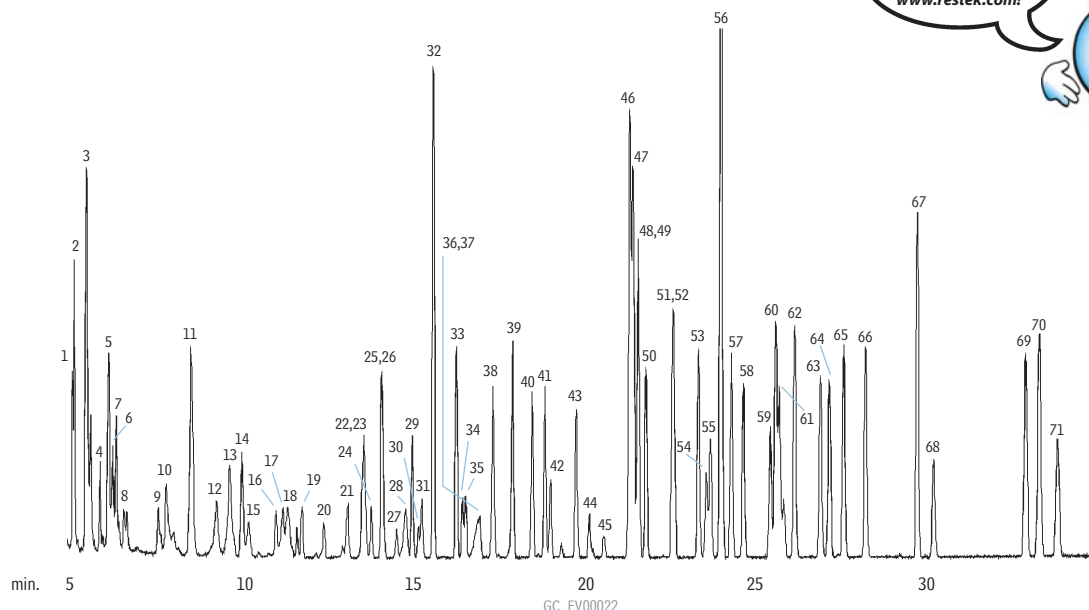
Rtx®-1

Column: Rtx®-1, 60m, 0.32mm ID, 1.0µm (cat.# 10157)
 Sample: TO-15 standard (cat.# 34436) humidified to 33% RH in a 6L SilcoCan™ canister (cat.# 24182)
 Concentrator: Nutech 3550A Preconcentrator; 300mL sample concentrated at -160°C, thermally desorbed at 150°C, cryofocused at -185°C, thermally desorbed to column at 150°C
 Carrier gas: helium, constant flow
 Flow rate: 1.2mL/min.
 Oven temp.: 30°C (hold 4 min.) to 175°C @ 8°C/min., to 220°C @ 20°C/min. (hold 2 min.)
 Det.: MS
 Transfer line temp.: 150°C
 Scan range: 35–280amu
 Ionization: EI
 Mode: scan



- | | | |
|--|---------------------------------------|-------------------------------|
| 1. propylene | 22. hexane | 43. 1,2-dibromoethane |
| 2. Freon®-12 (dichlorodifluoromethane) | 23. chloroform | 44. tetrachloroethylene |
| 3. chloromethane | 24. ethyl acetate | 45. chlorobenzene |
| 4. Freon®-114 (dichlorotetrafluoroethane) | 25. tetrahydrofuran | 46. ethylbenzene |
| 5. vinyl chloride | 26. 1,2-dichloroethane | 47. <i>p</i> -xylene |
| 6. 1,3-butadiene | 27. 1,1,1-trichloroethane | 48. <i>m</i> -xylene |
| 7. bromomethane | 28. benzene | 49. bromoform |
| 8. chloroethane | 29. carbon tetrachloride | 50. styrene |
| 9. carbon disulfide | 30. cyclohexane | 51. <i>o</i> -xylene |
| 10. acetone | 31. 1,2-dichloropropane | 52. 1,1,2,2-tetrachloroethane |
| 11. Freon®-11 (trichlorofluoromethane) | 32. trichloroethylene | 53. 4-ethyltoluene |
| 12. isopropyl alcohol | 33. bromodichloromethane | 54. 1,3,5-trimethylbenzene |
| 13. 1,1-dichloroethene | 34. 1,4-dioxane | 55. 1,2,4-trimethylbenzene |
| 14. methylene chloride | 35. heptane | 56. 1,3-dichlorobenzene |
| 15. Freon®-113 (1,1,2-trichloro-1,2,2-trifluoroethane) | 36. <i>cis</i> -1,3-dichloropropene | 57. benzyl chloride |
| 16. <i>trans</i> -1,2-dichloroethene | 37. methyl isobutyl ketone | 58. 1,4-dichlorobenzene |
| 17. 1,1-dichloroethane | 38. <i>trans</i> -1,3-dichloropropene | 59. 1,2-dichlorobenzene |
| 18. methyl <i>tert</i> -butyl ether | 39. 1,1,2-trichloroethane | 60. 1,2,4-trichlorobenzene |
| 19. vinyl acetate | 40. toluene | 61. hexachloro-1,3-butadiene |
| 20. methyl ethyl ketone | 41. methyl butyl ketone | |
| 21. <i>cis</i> -1,2-dichloroethene | 42. dibromochloromethane | |

Air Toxins Rtx®-502.2

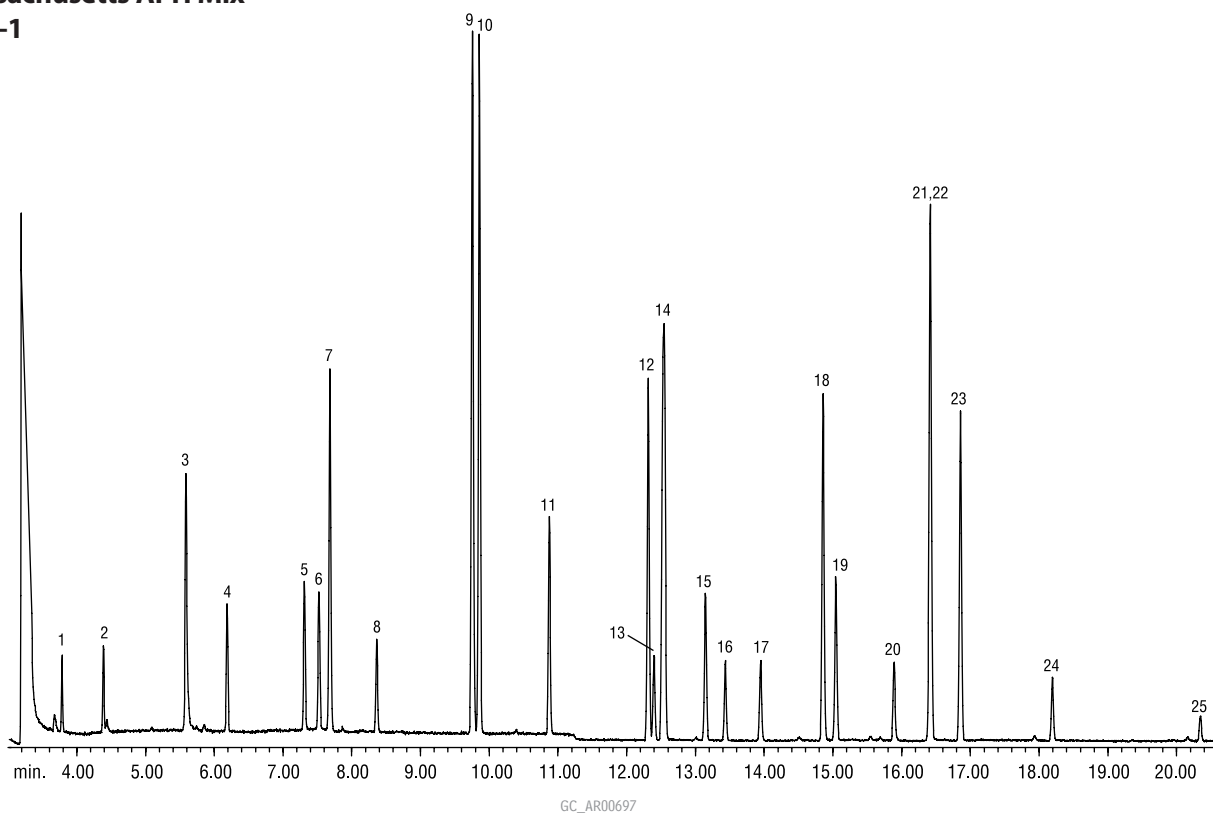


- | | | | |
|------------------------------|--------------------------------------|---------------------------|-------------------------------|
| 1. chlorodifluoromethane | 19. <i>trans</i> -1,2-dichloroethene | 37. bromodichloromethane | 55. 1,1,1,2-tetrachloroethane |
| 2. dichlorodifluoromethane | 20. 1,1-dichloroethane | 38. 4-methyl-2-pentanone | 56. 4-bromofluoromethane |
| 3. dichlorotetrafluoroethane | 21. methyl ethyl ketone | 39. octane | 57. <i>n</i> -propylbenzene |
| 4. chloromethane | 22. <i>cis</i> -1,2-dichloroethene | 40. toluene | 58. 1,3,5-trimethylbenzene |
| 5. butane | 23. methacrylonitrile | 41. 2-hexanone | 59. α -methylstyrene |
| 6. vinyl chloride | 24. chloroform | 42. 1,1,2-trichloroethane | 60. <i>tert</i> -butylbenzene |
| 7. 1,3-butadiene | 25. bromochloromethane | 43. tetrachloroethene | 61. 1,2,4-trimethylbenzene |
| 8. acetaldehyde | 26. tetrahydrofuran | 44. dibromochloromethane | 62. <i>sec</i> -butylbenzene |
| 9. bromomethane | 27. 1,1,1-trichloroethane | 45. 1,2-dibromoethane | 63. 1,3-dichlorobenzene |
| 10. chloroethane | 28. <i>n</i> -butanol | 46. chlorobenzene-d5 | 64. 1,4-dichlorobenzene |
| 11. trichlorofluoromethane | 29. heptane | 47. chlorobenzene | 65. butylbenzene |
| 12. isopropanol | 30. 1,2-dichloroethane | 48. <i>m</i> -xylene | 66. 1,2-dichlorobenzene |
| 13. acetone | 31. benzene | 49. <i>p</i> -xylene | 67. dodecane |
| 14. 1,1-dichloroethene | 32. 1,4-difluorobenzene | 50. 2-heptanone | 68. dibromochloropropane |
| 15. acetonitrile | 33. trichloroethene | 51. styrene | 69. 1,2,4-trichlorobenzene |
| 16. dichloromethane | 34. ethyl methacrylate | 52. <i>o</i> -xylene | 70. hexachlorobutadiene |
| 17. acrylonitrile | 35. 1,2-dichloropropane | 53. isopropylbenzene | 71. naphthalene |
| 18. 1-propanol | 36. 1,4-dioxane | 54. bromoform | |

Column: Rtx®-502.2, 60m, 0.32mm ID, 1.8 μ m (cat.# 10920)
 Sample: 500mL of 10ppbv standard concentrated on an AEROCAN 6000 using a glass bead trap at 165°C then desorbed at 200°C for 4 min. @ 1mL/min., cryofocused @ -175°C then desorbed @ 150°C
 Oven temp.: 35°C (hold 6 min.) to 120°C @ 15°C/min., then to 200°C @ 5°C/min., then to 220°C @ 25°C/min. (hold 10 min.)
 Det. & det. temp.: Agilent-5971A GC/MS, 280°C
 Carrier gas: helium @ 1mL/min.
 Linear velocity: 20cm/sec.
 Scan range: 28-260amu
 Solvent delay: 4 min.

Permission to publish this chromatogram granted by Tekmar Company.

Massachusetts APH Mix Rtx®-1



GC_AR00697

Column: Rtx®-1, 60m, 0.32mm ID, 1.0 μ m (cat.# 10157)
 Sample: Massachusetts APH Mix, (cat.# 34446)
 Concentrator: Nutech 3550A Air Preconcentrator, 100mL of a 40ppbv standard concentrated at -160°C, thermally desorbed at 150°C and cryofocused at -185°C
 Carrier gas: helium
 Flow rate: 1mL/min.
 Oven temp.: 35°C (hold 1 min.) to 220°C @ 8°C/min.
 Det: MS, Agilent 5971
 Transfer line temp.: 250°C
 Scan range: 35-280amu
 Ionization: EI
 Mode: scan

- | | |
|------------------------------------|--------------------------------|
| 1. 1,3-butadiene | 14a. <i>m</i> -xylene |
| 2. isopentane | 14b. <i>p</i> -xylene |
| 3. methyl <i>tert</i> -butyl ether | 15. <i>o</i> -xylene |
| 4. hexane | 16. nonane |
| 5. benzene | 17. isopropylbenzene |
| 6. cyclohexane | 18. 1-methyl-3-ethylbenzene |
| 7. 2,3-dimethylpentane | 19. 1,3,5-trimethylbenzene |
| 8. heptane | 20. decane |
| 9. toluene-D8 | 21. 1,2,3-trimethylbenzene |
| 10. toluene | 22. <i>p</i> -isopropyltoluene |
| 11. octane | 23. butylcyclohexane |
| 12. ethylbenzene | 24. undecane |
| 13. 2,3-dimethylheptane | 25. dodecane |

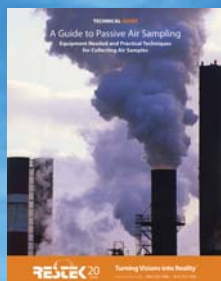
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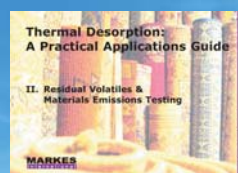
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