Valco Fittings

The two piece compression fitting (**Figure 1**), in which a ferrule is compressed onto the tube as a nut is tightened, offers reliability in high pressure situations and in connecting metal tubing. Valco excels in all critical areas of the design and manufacture of such fittings. Quality considerations, which cannot be ignored if an analytical system is to reach and maintain optimum performance levels, include interchangeability, counterbore tolerances, ID/OD concentricity, mixing potential, cleaning procedures, and the method employed to "make up" the ferrule on the tube.

No Tubing Deformation

The basic concept of compression fittings carries the inherent danger of tube deformation (**Figure 2**). While some manufacturers emphasize this positively as a method of ensuring that the tubing doesn't blow out of the ferrule, the flow anomalies introduced by the restricted ID make these fittings a poor choice for many instrument applications.

Valco metal ferrules cut a ring near the end of the tube (**Figure 3**), which prevents tube release at high pressures without significantly deforming and restricting the tube interior. Because our ferrules have a sharp edge at the ID near the nose, this usually takes only about 1/4 turn beyond the point where the ferrule first starts to grab the tubing. There is so little tube distortion that they are routinely used with glass-lined tubing! Only Valco's polymer fittings rely on friction to hold a tube.

CAUTION!
The analytical devices market has attracted numerous companies which copy Valco/Cheminert designs. Please exercise caution in the use of copies, which may not be compatible with the original versions in this catalog.

Because of VICI's high volume production and dedicated machinery, our fittings are often less expensive and of consistently higher quality than competing copies.

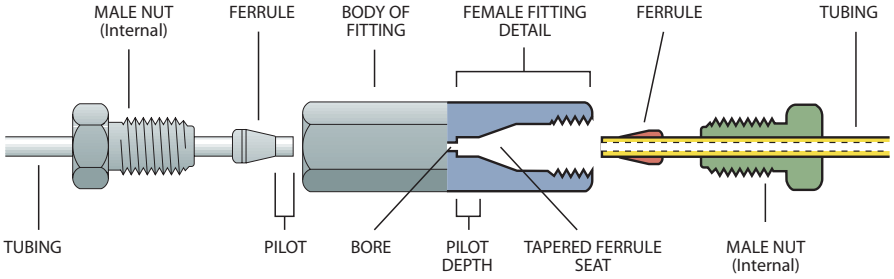


Figure 1
Valco compression fitting

TECH TIP
For optimal zero dead volume connections, make sure your tubing meets the best industry standards—OD tolerance should be nominal dimension ± .002".

Fractional dimension	Nominal dimension
1/32"	.031
1/16"	.062
1/8"	.125
1/4"	.250
3/8"	.375
1/2"	.500

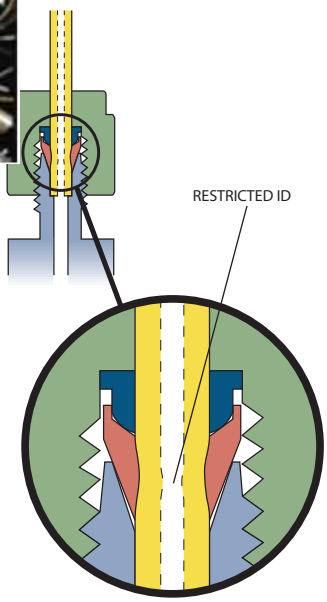


Figure 2
ID restriction
in common compression fitting

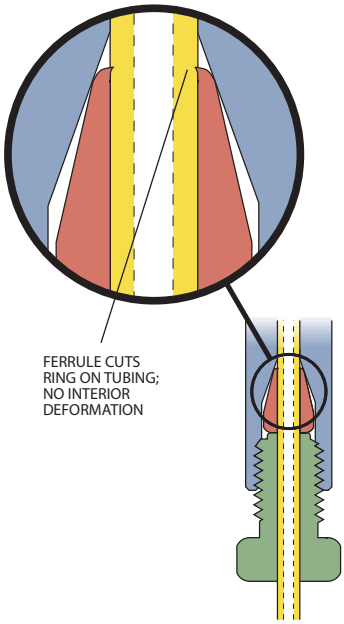


Figure 3
No ID restriction
in Valco compression fitting

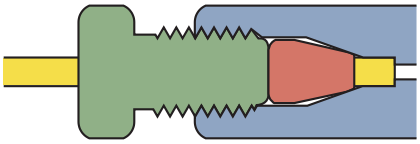
Interchangeability

Valco fitting details are designed with a consistent pilot depth, permitting reliable interchangeability as connections are revised or fittings are replaced. This interchangeability extends throughout the Valco and Cheminert fitting and valve product lines. Indeed, the Valco standard has been so widely copied that Valco and Cheminert fittings are, in general, fully interchangeable with those of our major competitors. In initial installations, Valco ferrules will often improve other manufacturers' fitting connections.

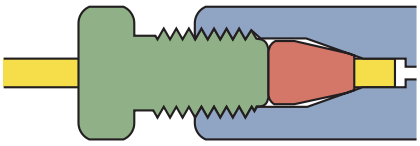
Because of variations in tubing OD and in pilot and taper designs from manufacturer to manufacturer, the amount of tubing extending beyond the made up ferrule can vary. (The most radical variation is in the fittings manufactured by Waters. Based on the old Swagelok design, they have a pilot depth considerably longer than standard.) **Figure 4a** shows a properly made up fitting. If that same fitting is installed in a detail which was designed for a slightly longer tube extension (as in **Figure 4b**), dead volume will be introduced. In the opposite case, with the pilot shorter than the pilot depth (**Figure 4c**), the tube will bottom out before the ferrule has sealed. However, our tests prove that except in the most extreme cases, a Valco ferrule will "creep" on the tubing until it reaches the bottom of the ferrule taper, making a proper seal.

Reliably Clean

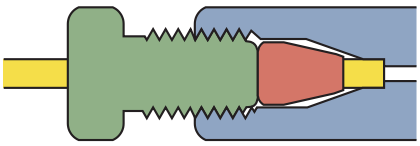
Most of our state of the art CNC machines use water-based lubricants. After each part comes off the machine, it is cleaned with water-soluble detergents and then rinsed in hot deionized water. Finally, every metal fitting that we make is given a thorough cleaning with steam from deionized water at 140°C. Any critical parts processed with oil-based lubricants are baked to remove all traces. The practical result of the extra effort is this: you don't have to be concerned about solvent residues.



a. Tubing seats correctly at bottom of detail



b. Tubing doesn't reach bottom of detail, introducing dead volume



c. Tubing reaches bottom of detail before ferrule seats

Figure 4

Introduction

Precision Machining, Finishing, and Tolerances

The machining methods used by different manufacturers to finish the detail of compression fittings vary in several ways that affect performance, as shown below. The fitting in **Figure 5** is the best choice for high performance fittings, as the tube fits squarely into the bottom of the detail. This is the detail used in Valco and Cheminert high pressure fittings.

Some fitting manufacturers omit a critical finishing operation which makes the bottom of the detail square, leaving the shape of the typical tapered drill bit instead. This results in the fitting shown in **Figure 6**, which introduces extra volume and mixing potential. VICI uses proprietary tooling specifically designed to produce the same high precision detail in every Valco and Cheminert fitting.

Although sometimes the tube end may seal in the bottom of the detail, the intent is for the seal to be made at the ferrule. This leaves the possibility of seepage up around the tube and into the minute cavities between the end of the ferrule and the bottom of the ferrule seat. The probability of this seepage increases when there is an excessive variance between the tubing OD and the diameter of the counterbored pilot in which it sits, and between the ferrule OD and the ferrule ID at the point where it "bites" or crimps the tubing. The possibility is virtually eliminated in VICI's fittings, which are manufactured with the precise dimensions that chromatographic applications demand. Use of VICI precut tubing, which is manufactured to quality standards in excess of most commercial tubing, further assures the best fitting connection.

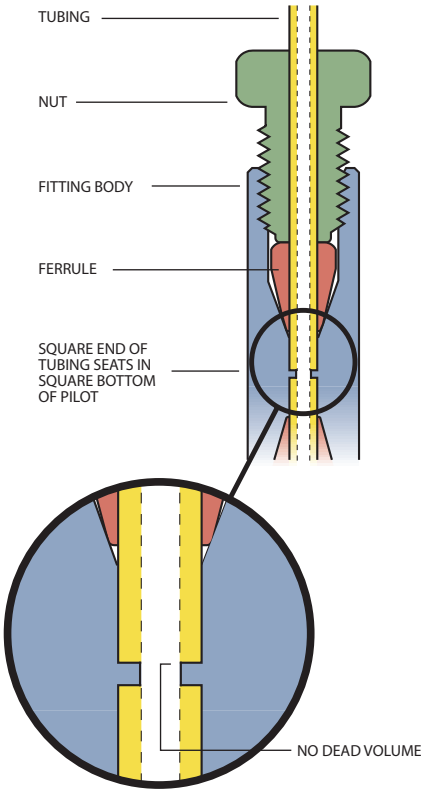


Figure 5
Valco/Cheminert high pressure compression fitting

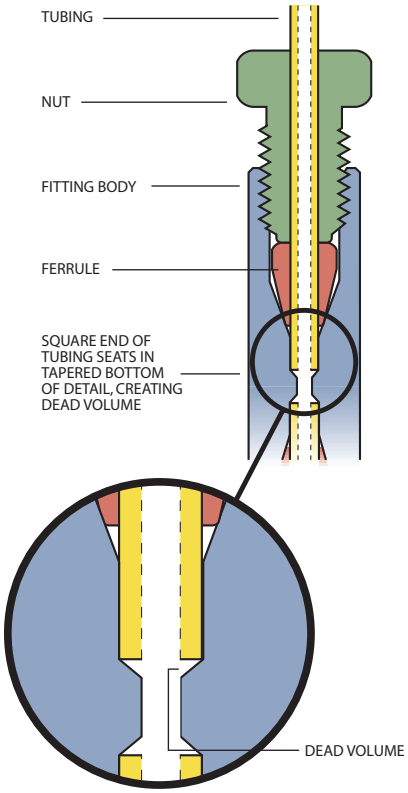


Figure 6
Poor quality compression fitting

Comparison of Compression Fitting Designs

The potential for dead volume and mixing is a consideration in other aspects of fitting design as well, and varies considerably among manufacturers. For example, the common gas distribution reducing union in **Figure 7** illustrates two problems for instrumentation: a large connecting volume, and various steps and restrictions which cause mixing. While there are many uses for these fittings upstream of the analytical system (such as bulk gas distribution), they cause problems when used downstream in critical applications.

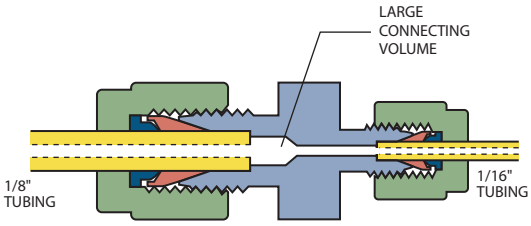


Figure 7
Common commercial reducing union

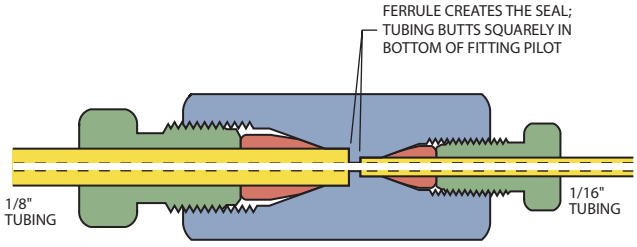


Figure 8
Valco zero dead volume reducing union

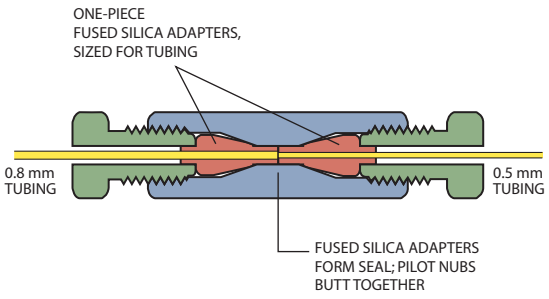


Figure 9
Valco zero dead volume through-bore union

Additional difficulties may be encountered if this type of fitting is loosened and retightened repeatedly. The male threaded part can become flared to the point where it is impossible to get the nut on, and the tube end often flares out in the fitting detail so that it's difficult to remove the tube.

The Valco internal union (**Figure 8**) has a larger mass surrounding the ferrule, so that even with repeated remakes or overtightening, it's impossible to flare the fitting as in the external design. When a union is selected with a bore to match the ID of the connecting tubing, mixing and dead volume are virtually eliminated.

For connection of fused silica tubing of the same or differing sizes, the through-bore union shown in **Figure 9** is recommended. This fitting permits the use of our one-piece fused silica adapters to effect a true zero dead volume connection. The ferrule features an integrated pilot which adapts to the ID of the unions, resulting in an inert, zero volume connection.

Every Valco and Cheminert fitting is manufactured to exacting specifications. Fitting concentricity – the relationship of the center of one fitting to another – is held to within 10% of the bore size (0.05 mm in a typical 1/16" union with 0.5 mm bore), which is better than that of commonly used *tubing*. This results in fittings which contribute no "extra column effects" or loss of efficiency to the chromatographic system.

Internal nuts – stainless steel

Nuts with product numbers starting with Z are for use with all standard Valco internal fittings and most valves. They may be used with fittings from other manufacturers as well. The L (long) and XL (extra-long) types are for situations where the fitting head may be otherwise inaccessible or where interference between fittings exists, as on many Valco multiposition valves. Standard material is 300 series stainless.

Stainless nuts

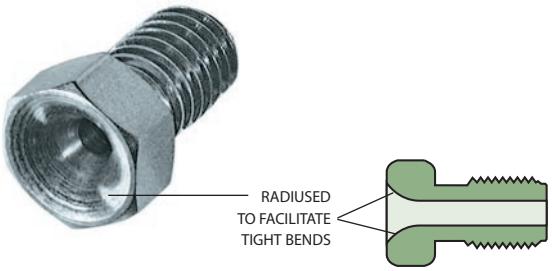
Package of 10:	*Length*	*Prod No*	*Price*
1/32" nut	.30"	ZN.5-10	
1/32" nut	.45"	LZN.5-10	
1/16" nut	.43"	ZN1-10	
1/16" nut	.50"	MZN1-10	
1/16" nut	.75"	LZN1-10	
1/16" nut	1.00"	XLZN1-10	
1/8" nut	.57"	ZN2-10	
1/8" nut	.82"	LZN2-10	
1/8" nut	1.07"	XLZN2-10	
1/4" nut	.70"	ZN4-10	
1/4" nut	1.11"	LZN4-10	

NEW Specialty nuts – stainless steel

These special purpose nuts facilitate a tight bend as the tube exits the fitting, and can also help prevent kinks in very thin wall tubing. Quick bend nuts are available in standard length (.43") and in a short version (.30") for certain custom applications. Note that the short version (ZSN1) can *only* be used in certain applications. Call for more information.

Stainless nuts

Description	*Length*	*Prod No*	*Price*	
1/16", standard	.43"	ZN1Q		
1/16", short	.30"	ZSN1		



Specialty nut
Standard length

MORE INFORMATION

TECH TIP
Fittings for **360 micron** tubing are available on pages 57-58.

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

External nuts – stainless steel

External nuts are used with external fittings, such as our column end fittings (ECEF series) and external unions (EZU and EZRU series). They may also be used with Valco ferrules on Parker CPI and Swagelok type fittings. Standard material is 300 series stainless.

* PTFE-coated threads standard.

	Stainless nuts	
Description	*Prod No*	*Price*
1/32″ external nut	EN.5	
1/32″ external nut, knurled	EN.5KN	
1/16" external nut	EN1	
1/8" external nut	EN2	
1/4" external nut	EN4 *	
3/8" external nut	EN6 *	
1/2" external nut	EN8 *	
1" external nut	EN1K *	

Plugs – stainless steel and high pressure

Stainless plugs consist of a zero volume nut with a ferrule made up on a solid rod. For high pressure applications such as UHPLC, SFE, and SFC (>7000 psi), we recommend the special high pressure plugs with the ferrule and rod machined as a single, solid piece.

		Stainless plugs		High pressure Stainless plugs	
Description	*Length of nut**	*Prod No*	*Price*	*Prod No*	*Price*
1/32"	.30"	ZP.5		ZP.5H	
1/16"	.43"	ZP1		ZP1H	
1/16"	.75"	LZP1		LZP1H	
1/8"	.57"	ZP2		ZP2H	
1/8"	.82"	LZP2		LZP2H	
1/4"	.70"	ZP4		–	

Caps – stainless steel

A cap is essentially a piece of hex stock with a zero volume fitting detail machined into it, but with no through-hole.

		Stainless caps	
Description	*Length of nut**	*Prod No*	*Price*
1/32"	.30"	ZC.5	
1/16"	.43"	ZC1	
1/8"	.57"	ZC2	
1/4"	.70"	ZC4	

MORE INFORMATION

PEEK plugs . . pages 64, 71
PEEK plugs for high pressure Cheminert valves 64
PEEK caps 57, 64

Ferrules

Valco metal ferrules cut a ring near the end of the tube, preventing tube release at high pressures without significantly deforming and restricting the tube interior. (However, if the hardness of the tubing is equal to or greater than that of the ferrule, deformation of the tube rather than a cut ring is likely.) Make up usually takes only about a 1/4 turn beyond the point where the ferrule first starts to grab the tubing. Polymeric ferrules seal by the increased friction from compression.

Valco zero volume ferrules may be used with all Valco fittings and with those of most other manufacturers. The maximum pressure limit is generally determined by the yield strength of the tubing. The maximum pressure for softer materials (such as brass and polymers) is lower, and depends on the tubing used. If in doubt about a particular combination, consult our technical staff.

For trace gas analysis, use gold-plated ferrules to achieve sealing with $<10^{-9}$ cc/atm/sec leakage.

MORE INFORMATION
For more detailed information on metals, refer to the discussion on pages 254-255.

Metal ferrules

	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Package of 10:	**Stainless, Type 303**		**Stainless, Type 316**		**Stainless, Gold-plated**	
1/32"	ZF.5-10		ZF.5S6-10	$40	ZF.5GP-10	
1/16"	ZF1-10		ZF1S6-10	30	ZF1GP-10	
1/8"	ZF2-10		ZF2S6-10	22	ZF2GP-10	
1/4"	–		ZF4S6-10	19	ZF4GP-10	
Sold individually:	**Hastelloy C**		**Nickel**		**Titanium**	
1/32"	ZF.5HC		ZF.5NI	$9	ZF.5TI	
1/16"	ZF1HC		ZF1NI	8	ZF1TI	
1/8"	ZF2HC		ZF2NI	8	ZF2TI	
1/4"	ZF4HC		ZF4NI	9	ZF4TI	
Package of 10:	**Brass**					
1/32"	ZF.5B-10					
1/16"	ZF1B-10					
1/8"	ZF2B-10					
1/4"	ZF4B-10					

– Not available
Larger sizes and/or specific materials may be available on special order.

METALS AT A GLANCE

Hastelloy C ® .....HC
Resistant to pitting; Resists oxidizing atmospheres

Nickel ..... NI
Resistant to caustics, high temp halogens, and hydrogen halides

Stainless steel, Gold-plated .....GP
More inert than standard stainless

Stainless steel, Type 303
GC, gas lines, general purpose

Stainless steel, Type 316 ..... S6
LC with high chloride ion in solutions

Titanium .....TI
Outstanding resistance to most media except hydrofluoric acids

Brass ..... B
Not recommended for most chromatographic applications

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

MORE INFORMATION

PEEK ferrules .... page 63
Grooved PEEK ferrules..... 63

For more detailed information on polymers, refer to the discussion on page 256.

POLYMERS AT A GLANCE

CTFE ..... KF
Resists all inorganic corrosives. Produced as Kel-F ®

FEP ..... FEP
Chemical resistance equals PTFE, but lower creep and higher friction

PTFE, Glass-filled..... TFG
Inert, mechanically stable

PTFE, Virgin..... TF
Inert; very soft, easily cold flows. Produced as Teflon ®

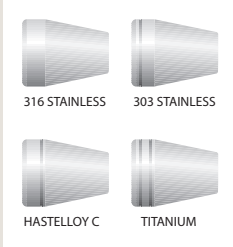
Polyimide, Graphite....GV
Soft, easy to form ferrules

Polyimide, Valcon..... V
High temp, graphite reinforced

Polyimide, Virgin..... V1
High temp, electrical insulator

FERRULE IDENTIFICATION

To differentiate among the most commonly ordered metal ferrules, ring(s) are engraved on the non-sealing surfaces.



Polymeric ferrules

	Prod No	Price	Prod No	Price	Prod No	Price
Package of 10:	**PTFE, Virgin**		**PTFE, Glass-filled**		**FEP**	
1/32"	ZF.5TF-10		ZF.5TFG-10		ZF.5FEP-10	
1/16"	ZF1TF-10		ZF1TFG-10		ZF1FEP-10	
1/8"	ZF2TF-10		ZF2TFG-10		ZF2FEP-10	
1/4"	ZF4TF-10		ZF4TFG-10		ZF4FEP-10	
3/8"	ZF6TF-10		ZF6TFG-10		ZF6FEP-10	
1/2"	ZF8TF-10		ZF8TFG-10		ZF8FEP-10	

Package of 10:	**PFA**		**CTFE**	
1/32"	ZF.5PFA-10		ZF.5KF-10	
1/16"	ZF1PFA-10		ZF1KF-10	
1/8"	ZF2PFA-10		ZF2KF-10	
1/4"	ZF4PFA-10		ZF4KF-10	
3/8"	ZF6PFA-10		ZF6KF-10	
1/2"	ZF8PFA-10		ZF8KF-10	

Package of 5:	**Polyimide, Graphite**	**Polyimide, Valcon**	**Polyimide, Virgin**
1/32"	ZF.5GV-5	ZF.5V-5	ZF.5V1-5
1/16"	ZF1GV-5	ZF1V-5	ZF1V1-5
1/8"	ZF2GV-5	ZF2V-5	ZF2V1-5
1/4"	ZF4GV-5	ZF4V-5	ZF4V1-5
3/8"	ZF6GV-5	ZF6V-5	ZF6V1-5
1/2"	ZF8GV-5	ZF8V-5	ZF8V1-5

Reducing Ferrules

Reducing ferrules provide an inexpensive way to connect small temporary transfer lines to valves or fittings designed for larger tubing. For long term use, we recommend our reducing unions, internal reducers (IZRs), or external reducers (EZRs), as appropriate.

Internal ZDV (zero dead volume) reducing ferrules are designed for use with all standard Valco internal style fittings – that is, those with a male nut and female fitting detail. The ferrule features an integral pilot which fills the pilot cavity (the space between the end of the ferrule and the bottom of the detail), yielding a zero dead volume fitting.

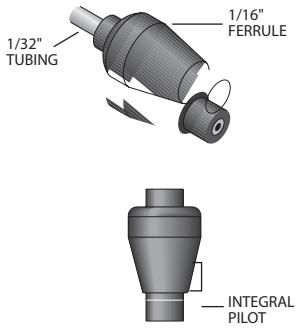
External ZDV reducing ferrules are designed for use with all standard external style fittings – that is, those with a female nut and a male fitting detail. This ferrule has a slightly longer pilot than the internal version, to accommodate the longer external detail. The result is a zero dead volume fitting. A single groove indicates that the ferrule has the longer pilot and is for use in an external detail.

Standard reducing ferrules can be used where mixing is not a problem, such as with liquid or gas delivery. A 1/16" to 1/32" ferrule of this style is simply a 1/16" ferrule with a 1/32" hole.

nternal reducing ferrules

Use these ferrules in internal type fitting details, with nuts that have external threads.

	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Package of 5:	**PTFE, Glass-filled**		**PEEK**		**Polyimide, Valcon**	
1/16" to 1/32"	ZRF1.5TFG-5		ZRF1.5PK-5		ZRF1.5V-5	
1/8" to 1/32"	ZRF2.5TFG-5		ZRF2.5PK-5		ZRF2.5V-5	
1/8" to 1/16"	ZRF21TFG-5		ZRF21PK-5		ZRF21V-5	
1/4" to 1/16"	ZRF41TFG-5		ZRF41PK-5		ZRF41V-5	
1/4" to 1/8"	ZRF42TFG-5		ZRF42PK-5		ZRF42V-5	
Package of 5:	**CTFE**		**Polyimide, Virgin**			
1/16" to 1/32"	ZRF1.5KF-5		ZRF1.5V1-5			
1/8" to 1/32"	ZRF2.5KF-5		ZRF2.5V1-5			
1/8" to 1/16"	ZRF21KF-5		ZRF21V1-5			
1/4" to 1/16"	ZRF41KF-5		ZRF41V1-5			
1/4" to 1/8"	ZRF42KF-5		ZRF42V1-5			



Internal reducing ferrule
(ZRF)

PEEK reducing ferrule and internal nut
(Order nut separately.)

MORE INFORMATION

Internal reducers (IZR) . . . . . page 34
External reducers (EZR) 35
Ferrule removal kits. . . . 16

For 1/16" and 1/32" reducing ferrules with smaller ODs for use with fused silica, see the FS and FSR adapters on pages 16-17.

TECH TIP
Fittings for **360 micron** tubing are available on pages 57-58.

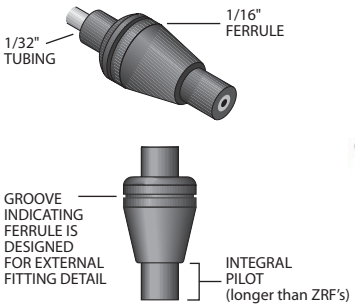
TECH TIP
If you are doing resistive heating of traps or columns, note that our virgin polyimide reducing ferrules are effective electrical insulators.

Virgin polyimide is produced as Vespel ®.

External reducing ferrules

Use these ferrules in external type fitting details, with nuts that have internal threads.

	Prod No	Price	Prod No	Price	Prod No	Price
Package of 5:	**PTFE, Glass-filled**		**PEEK**		**Polyimide, Valcon**	
1/16" to 1/32"	EZRF1.5TFG-5		EZRF1.5PK-5		EZRF1.5V-5	
1/8" to 1/32"	EZRF2.5TFG-5		EZRF2.5PK-5		EZRF2.5V-5	
1/8" to 1/16"	EZRF21TFG-5		EZRF21PK-5		EZRF21V-5	
1/4" to 1/16"	EZRF41TFG-5		EZRF41PK-5		EZRF41V-5	
1/4" to 1/8"	EZRF42TFG-5		EZRF42PK-5		EZRF42V-5	
Package of 5:	**CTFE**					
1/16" to 1/32"	EZRF1.5KF-5					
1/8" to 1/32"	EZRF2.5KF-5					
1/8" to 1/16"	EZRF21KF-5					
1/4" to 1/16"	EZRF41KF-5					
1/4" to 1/8"	EZRF42KF-5					



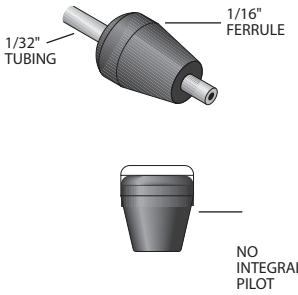
External reducing ferrule
(EZRF)

PEEK reducing ferrule and external nut
(Order nut separately.)

Standard reducing ferrules

Use these ferrules for bulk distribution only, since the resulting connection will not be zero dead volume. These ferrules can be used in either internal or external type fitting details.

	Prod No	Price	Prod No	Price	Prod No	Price
Package of 5:	**PTFE, Glass-filled**		**PEEK**		**Polyimide, Valcon**	
1/16" to 1/32"	RF1.5TFG-5		RF1.5PK-5		RF1.5V-5	
1/8" to 1/32"	RF2.5TFG-5		RF2.5PK-5		RF2.5V-5	
1/8" to 1/16"	RF21TFG-5		RF21PK-5		RF21V-5	
1/4" to 1/16"	RF41TFG-5		RF41PK-5		RF41V-5	
1/4" to 1/8"	RF42TFG-5		RF42PK-5		RF42V-5	
Package of 5:	**CTFE**					
1/16" to 1/32"	RF1.5KF-5					
1/8" to 1/32"	RF2.5KF-5					
1/8" to 1/16"	RF21KF-5					
1/4" to 1/16"	RF41KF-5					
1/4" to 1/8"	RF42KF-5					



Standard reducing ferrule
(RF)

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Fused Silica Adapters

Fused silica adapters are available in Valcon polyimide for use up to 350°C and in PEEK for lower temperature applications (up to 175°C). Valcon polyimide is a unique graphite-reinforced composite, specially prepared to maximize mechanical stability at high temperatures. Small blocks are subjected to extreme loads by a process known as hot isostatic pressing, with individual ferrules subsequently machined from these blocks. The result of this two-step process is a fused silica adapter with high temperature stability which far exceeds that of parts produced by conventional molding. Note that the determining factor in adapter size selection is the fused silica tubing's outer diameter, or OD. Typical ODs for common columns are included in the product number tables.

One piece fused silica adapter (FS)

The one piece FS adapter, essentially a reducing ferrule, is recommended for use in fittings where the polyimide ferrule will not be removed. Connections are made and disconnected by loosening the fitting nut and sliding the tube out.

Package of 5:		Polyimide, Valcon		PEEK		Polyimide, Virgin	
		Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
1/32" Adapters	Tubing OD:						
	< 0.25 mm	FS.25-5		FS.25PK-5		FS.25V1-5	
	0.25 ≤ 0.40 mm	FS.4-5		FS.4PK-5		FS.4V1-5	
	0.40 ≤ 0.50 mm	FS.5-5		FS.5PK-5		FS.5V1-5	
	0.50 ≤ 0.80 mm	ZF.5V-5		ZF.5PK-5		ZF.5V1-5	
1/16" Adapters	Tubing OD:						
	<0.25 mm	FS1.2-5		FS1.2PK-5		FS1.2V1-5	
	0.25 ≤ 0.30 mm	FS1.25-5		FS1.25PK-5		FS1.25V1-5	
	0.30 ≤ 0.35 mm	FS1.3-5		FS1.3PK-5		FS1.3V1-5	
	0.35 ≤ 0.40 mm	FS1.4-5		FS1.4PK-5		FS1.4V1-5	
	0.40 ≤ 0.50 mm	FS1.5-5		FS1.5PK-5		FS1.5V1-5	
	0.50 ≤ 0.80 mm	FS1.8-5		FS1.8PK-5		FS1.8V1-5	
	0.80 ≤ 0.90 mm	FS1.9-5		FS1.9PK-5		FS1.9V1-5	
	0.90 ≤ 1.0 mm	FS11.0-5		FS11.0PK-5		FS11.0V1-5	

Ferrule removal kit

These tapered tools have teeth designed to grip and remove fused silica adapters if they get stuck in a fitting detail. Each kit has two sizes of tools, so they can retrieve 1/32" and 1/16" adapters.

Prod No	*Price*
FRK1	$23

TEMPERATURE RATINGS
Polyimide adapters can be used at temperatures up to 350°C.

PEEK adapters are not recommended for use above 175°C.

TECH TIP
Virgin polyimide adapters are effective electrical insulators, making them the ideal choice for capillary electrophoresis.

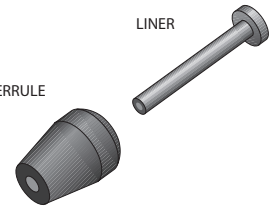
Virgin polyimide is produced as Vespel®.

TECH TIP
If a fused silica tube breaks off in a through-type union, remove the nuts and the tube opposite the broken one. Clear the fitting by passing a drill or wire of the appropriate diameter into the unbroken side and through the center of the fitting.

Our **ferrule removal kit**, left, can be used to remove ferrules from all types of fittings.

WHICH ADAPTER FOR WHICH COLUMN?

Column ID	Typical column OD	1/32" adapter	1/16" adapter
< 0.20 mm	0.25 mm	FS.25	FS1.25
0.25 mm	0.4 mm	FS.4	FS1.4
0.32 mm	0.5 mm	FS.5	FS1.5
0.53 mm	0.8 mm	ZF.5V	FS1.8

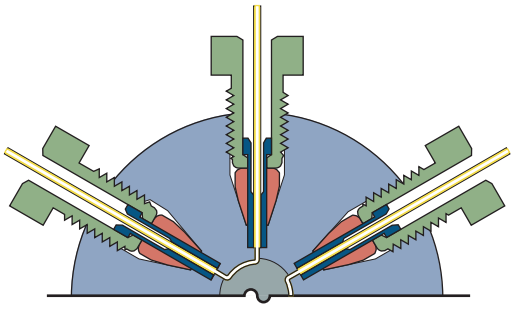


Removable fused silica adapters (FSR)

The FSR adapter is the only adapter recommended for use in valves. It consists of a liner which slides over the fused silica tubing and a ferrule which makes up on the liner. The polyimide liner has an enlarged diameter at one end which is captured by the nut, so the liner and the tube within it are removed as the nut is unscrewed from the valve. The 1/16" FSR adapter includes a special counter-bored 1/16" nut. The 1/32" FSR adapter uses standard Valco 1/32" nuts.

Package of 5:		**Polyimide, Valcon** *Prod No*	*Price*
1/32"			
Removable adapters	Tubing OD:		
	< 0.25 mm	FSR.25-5	
	0.30 ≤ 0.35 mm	FSR.3-5	
	0.35 ≤ 0.40 mm	FSR.4-5	
	0.40 ≤ 0.50 mm	FSR.5-5	
1/32"			
Replacement liners	Tubing OD:		
	< 0.25 mm	FSL.25-5	
	0.25 ≤ 0.40 mm	FSL.4-5	
	0.40 ≤ 0.50 mm	FSL.5-5	

Package of 5:		**Polyimide, Valcon** *Prod No*	*Price*	**PEEK** *Prod No*	*Price*
1/16"					
Removable adapters	Tubing OD:				
	< 0.15 mm	–		FS1R.15PK-5	
	< 0.20 mm	FS1R.2-5		FS1R.2PK-5	
	0.20 ≤ 0.40 mm	FS1R.4-5		FS1R.4PK-5	
	0.40 ≤ 0.50 mm	FS1R.5-5		FS1R.5PK-5	
	0.50 ≤ 0.80 mm	FS1R.8-5		FS1R.8PK-5	
	0.90 ≤ 1.0 mm	FS1R1.0-5		FS1R1.0PK-5	
1/16"					
Replacement liners	Tubing OD:				
	< 0.15 mm	–		FS1L.15PK-5	
	< 0.20 mm	FS1L.2-5		FS1L.2PK-5	
	0.20 ≤ 0.40 mm	FS1L.4-5		FS1L.4PK-5	
	0.40 ≤ 0.50 mm	FS1L.5-5		FS1L.5PK-5	
	0.50 ≤ 0.80 mm	FS1L.8-5		FS1L.8PK-5	
	0.90 ≤ 1.0 mm	FS1L1.0-5		FS1L1.0PK-5	



Removable FSR adapters in a valve

MORE INFORMATION

Fused silica
Unions . pp 18-19, 58, 61
Fittings 18-21
A pin vise and drill index are useful for enlarging the inner diameters of the FS adapters.
Pin vise and drill index 55

REPLACEMENT PARTS

Ferrules		*(package of 5)*
1/32" Polyimide	ZF.5V-5	$30
1/16" Polyimide	ZF1V-5	25
	(package of 10)	
1/16" PEEK	ZF1PK-10	33
Nuts		*(package of 10)*
1/32" SS	ZN.5-10	29
Special nuts for FSRs:		
1/16" SS	ZCN1-10	30
1/16" SS long	LZCN1-10	45

100 µm = .004"
150 µm = .006"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Fused Silica Fittings

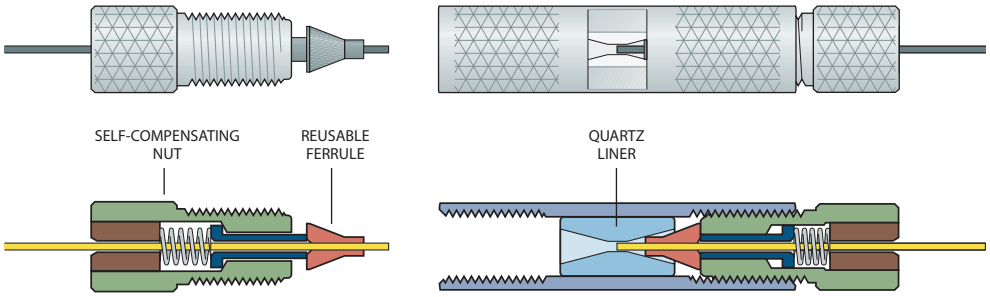
The patented design of our fused silica fittings ensures stable, leak-free connections at temperatures up to 400°C, and undistorted ferrules that are easily removed and reused. Columns may be changed without the risk of the leaks which can devastate systems such as mass spectrometers or atomic emission detectors. This is accomplished with a spring-loaded self-compensating nut which provides a constant sealing force as the temperature varies.

Self-compensating nuts are currently employed in two basic designs: a fused silica-lined union and an injector/detector nut for Agilent 6890 and 5890 GCs.

Fused silica unions

The fused silica union* has a quartz liner, providing an inert connection zone of minimal volume. Since the seal occurs only at the ferrule tip, the total sealing force is minimized, leaving the ferrule undistorted and reusable.
Note: The ferrules used in this union are unique, due to the seal at the tip. Standard ferrules will not work in this union.

Description	*Prod No*	*Price*
Fused silica union	FSKZU1	
Replacement liner	FSQ1	
Replacement nut	FSZN1	



Fused silica union
with self-compensating nut

Replacement ferrules for fused silica unions and self-compensating nuts (Agilent injector nuts)

These reusable ferrules seal at the tip, and are different from standard ferrules. Order for use with FSKZU1 fused silica unions and FSZNA-HP nuts on these two pages.

Package of 10:		*Prod No*	*Price*
Column ID:	.20 –.25 mm	FS1.35-R10	
	.32 mm	FS1.45-R10	
	.53 mm	FS1.75-R10	

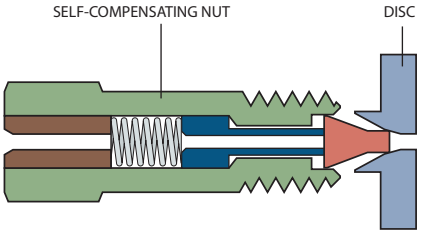
*U.S. patent numbers 5,234,235 and 4,991,883.

100 µm	=	.004"
150 µm	=	.006"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

Injector nut for Agilent 6890 and 5890, Series I and II

This self-compensating nut is a direct replacement for the standard nut on the split/splitless injectors of Agilent 6890 and 5890 series GCs. This retrofit offers enhanced ferrule reusability and temperature stability, resulting in fingertight leak-free connections over the full programmed temperature range of mass spectrometry and gas chromatography. To use this nut, the split/splitless disk must also be upgraded; the new disk will also work with older HP nuts and ferrules.

	Prod No	*Price*
Injector nut system Includes nut and seal disk	FSZA-HP	
Replacement parts		
Self-compensating nut	FSZNA-HP	
HP-5890 split/splitless seal disk	SEAL1-HP	

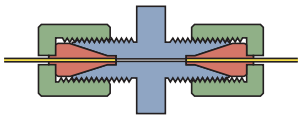


Self-compensating nut
for the 6890/5890 GC

1/32" Ultra low mass external unions

The 1/32" external union is specially designed for use with capillary columns in GC. It has very low mass and does not require wrenches to seal. Use only with one-piece fused silica adapters, since metal ferrules will distort the detail. Order fused silica adapters separately *(see box at left)*.

Bore	*Prod No*	*Price*
0.25 mm	EU.5	
0.50 mm	EU.5L	
1/32"	EU.5T	



1/32" external union
for use with capillary columns in GC

MORE INFORMATION
1/32" fused silica adapter ferrules..... page 16

1/32" FUSED SILICA FERRULES
(package of 5)

Tubing OD:

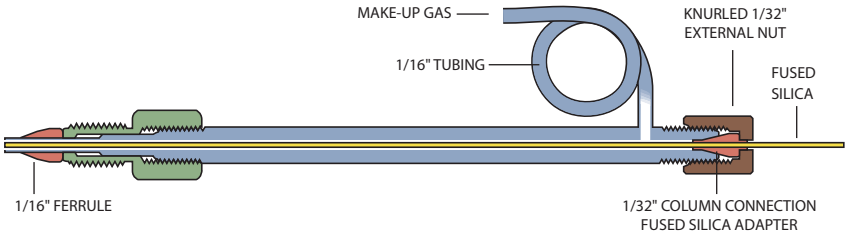
	≤ 0.25 mm	FS.25-5	$25
0.25 mm	≤ 0.4 mm	FS.4-5	25
0.4 mm	≤ 0.5 mm	FS.5-5	25
0.5 mm	≤ 0.8 mm	ZF.5V-5	25

Fused Silica Adapters

Fused silica make-up adapters

The fused silica make-up adapter connects a fused silica capillary column to a valve or detector while adding a make-up gas. In the reverse mode it works like a splitter, without the uneven or erratic split seen with basic tees. Two lengths are available. Order 1/32" fused silica adapter ferrules separately *(see box on facing page)*.

Description	*Length*	*Bore*	*Prod No*	*Price*
1/16" to 1/32"	1.5"	0.5 mm	FSMUAS1.5M	
	1.5"	0.75 mm	FSMUAS1.5	
	1.5"	1.0 mm	FSMUAS1.5L	
	3.5"	0.75 mm	FSMUA1.5	



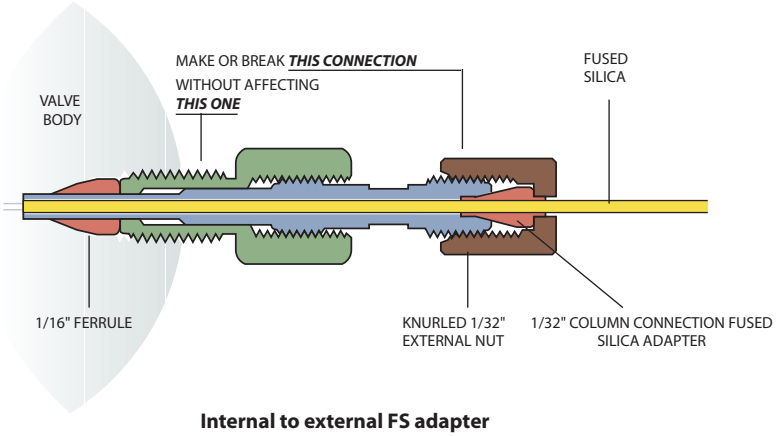
Fused silica make-up adapter
(FSMUA1.5)

100 µm	=	.004"
150 µm	=	.006"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

Internal to external reducer/adapters

Internal fittings provide the smallest possible fitting volume. But there are situations, such as when you're using graphite ferrules which tend to become lodged in internal details, when an external fitting might be more desirable. A typical situation of that nature is the connection of a fused silica capillary to a valve. Our unique design permits the 1/32" nut to be tightened without affecting the 1/16" connection. Order 1/32" fused silica adapter ferrules separately *(see box below)*.

Description	*Bore*	*Prod No*	*Price*
1/16" to 1/32"	0.25 mm	IZERA1.5C	
	0.5 mm	IZERA1.5M	
	1.0 mm	IZERA1.5	



Internal to external FS adapter
(IZERA1.5)
shown installed in a valve

MORE INFORMATION
1/32" fused silica adapter ferrules..... page 16

CAUTION
Polymeric ferrules are strongly recommended for 1/16" and 1/32" external details. Metal ferrules may distort the fitting.

1/32" FUSED SILICA FERRULES
(package of 5)

Tubing OD:

	≤ 0.25 mm	FS.25-5	$30
0.25 mm	≤ 0.4 mm	FS.4-5	30
0.4 mm	≤ 0.5 mm	FS.5-5	30
0.5 mm	≤ 0.8 mm	ZF.5V-5	30

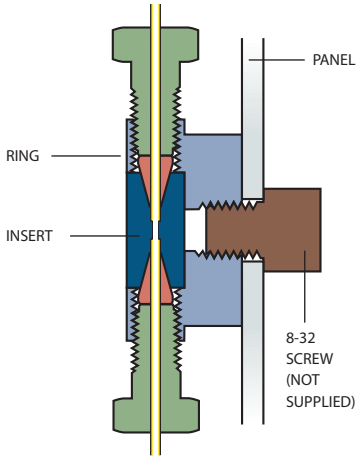
Microvolume Connectors

Micro-unions, -tees, -crosses, and -Y's have a unique two-piece design which allows us to provide an extremely small bore in a conventional ferrule and nut fitting. The actual connection area is separated from the nut threads, with the ferrule detail in a metal or polymer insert and the threads machined into a stainless steel or polymer ring. Since the insert has a much smaller diameter than a standard one-piece fitting, it can be drilled with much shorter tools; and, since a shorter drill has less tendency to wander or break, holes as small as .006" (0.15 mm) can be machined with the same high degree of concentricity found in all Valco fittings.

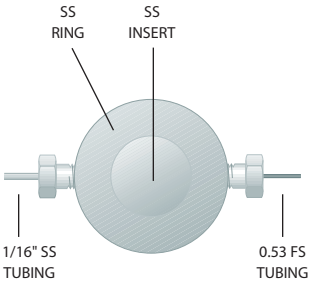
Valco microvolume fittings make it possible to couple 100 micron ID capillary GC, HPLC, or CZE columns without special nuts and ferrules. A stainless ring with one of the plastic inserts provides electrical insulation within the insert, while the PEEK ring achieves total isolation.

The ring containing the threads is made from PEEK or stainless steel. Inserts are made of stainless steel, Hastelloy C, Titanium, PEEK, or CTFE. PEEK rings are not as robust as stainless steel, and are not usable above 75°C. The stainless steel ring with a metal insert can operate at up to 10,000 psi for HPLC or SFC.

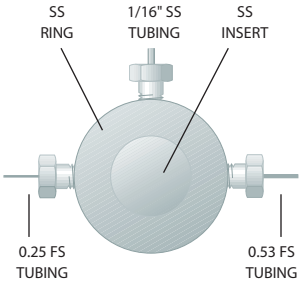
All standard Valco zero dead volume reducing ferrules (ZRF, FS, and FSR) will work in these fittings. They are uniquely designed to fill the void between the fitting pilot and the smaller tubing OD, eliminating any dead volume in the fitting. (Reducing ferrules such as Valco's RF series should be avoided, since they leave dead volume.)



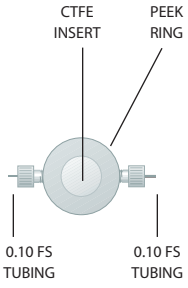
Panel mounting



Stainless to fused silica union
1/16" fittings



Make-up adapter
1/16" fittings



CZE union
1/32" fittings

MORE INFORMATION

100 µm	=	.004"
150 µm	=	.006"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

olume connectors

nd ferrules. With metal inserts: ferrules are the same material as the insert, and ring and nuts are stainless steel. With polymer inserts:
e material as the insert, and ring and nuts are PEEK.

	Stainless steel		Hastelloy C		Titanium		PEEK		CTFE	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
0.15 mm bore										
Union	MU.5XCS6		MU.5XCHC		MU.5XCTI		MU.5XCPK		MU.5XCKF	
Tee	MT.5XCS6		MT.5XCHC		MT.5XCTI		MT.5XCPK		MT.5XCKF	
Y	MY.5XCS6		MY.5XCHC		MY.5XCTI		MY.5XCPK		MY.5XCKF	
Cross	MX.5XCS6		MX.5XCHC		MX.5XCTI		MX.5XCPK		MX.5XCKF	
0.25 mm bore										
Union	MU.5CS6		MU.5CHC		MU.5CTI		MU.5CPK		MU.5CKF	
Tee	MT.5CS6		MT.5CHC		MT.5CTI		MT.5CPK		MT.5CKF	
Y	MY.5CS6		MY.5CHC		MY.5CTI		MY.5CPK		MY.5CKF	
Cross	MX.5CS6		MX.5CHC		MX.5CTI		MX.5CPK		MX.5CKF	

1/16" Microvolume connectors

Includes ring, nuts, and ferrules. With metal inserts: ferrules are the same material as the insert, and ring and nuts are stainless steel. With polymer inserts: ferrules are the same material as the insert, and ring and nuts are PEEK.

Insert Material:	Stainless steel		Hastelloy C		Titanium		PEEK		CTFE	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No.*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
0.15 mm bore										
Union	MU1XCS6		MU1XCHC		MU1XCTI		MU1XCPK		MU1XCKF	
Tee	MT1XCS6		MT1XCHC		MT1XCTI		MT1XCPK		MT1XCKF	
Y	MY1XCS6		MY1XCHC		MY1XCTI		MY1XCPK		MY1XCKF	
Cross	MX1XCS6		MX1XCHC		MX1XCTI		MX1XCPK		MX1XCKF	
0.25 mm bore										
Union	MU1CS6		MU1CHC		MU1CTI		MU1CPK		MU1CKF	
Tee	MT1CS6		MT1CHC		MT1CTI		MT1CPK		MT1CKF	
Y	MY1CS6		MY1CHC		MY1CTI		MY1CPK		MY1CKF	
Cross	MX1CS6		MX1CHC		MX1CTI		MX1CPK		MX1CKF	

Replacement components

	1/32" connectors		1/16" connectors	
Description	*Prod No*	*Price*	*Prod No*	*Price*
SS ring for union, tee, or cross	MRX.5S6		MRX1S6	
SS ring for Y	MRY.5S6		MRY1S6	
PEEK ring for union, tee, or cross	MRX.5PK		MRX1PK	
PEEK ring for Y	MRY.5PK		MRY1PK	
Nuts for SS ring	ZN.5		ZN1	
Nuts for PEEK ring	ZN.5FPK		ZN1FPK	

Inserts for any connector:
To order an insert, add an "I" after the "M" in the product number, and deduct $5 from the connector price.
For example, to order an insert for a 1/16" microvolume union MU1CS6, order part number MIU1CS6.

OPTIONS
0.50, 0.75, and 1.0 mm bores are available in most materials and configurations.

NANOVOLUME CONNECTIONS
For 0.10 mm (100 µm) bore fittings, see pages 57- 60.

Unions

Unions join two pieces of tubing of the same OD. Select the union with the bore that matches the ID of the tubing. If the IDs are different, choose the union with a bore which matches the smaller tube bore. Standard material is 300 series stainless steel.

- **Internal** unions have female threads and a fitting detail for zero volume fittings. The nuts have male (external) threads.
- **External** unions have male threads, requiring a nut with internal threads.
- **External/internal** unions have male threads on one end and female threads on the other, for connecting a standard zero dead volume fitting to an existing tube which already has an external nut made up on it.

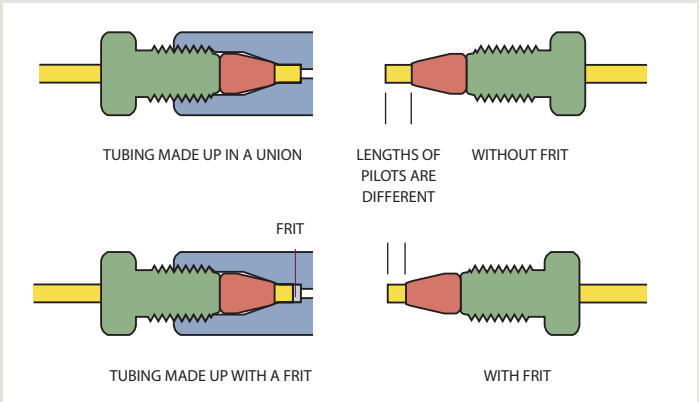
Internal fittings are almost always the best with tubing of 1/8" OD or smaller. They make a stronger connection and offer the lower volume necessary for high performance instrumentation. Also, because 1/16" external fittings have very thin, easily distorted walls, they are not as durable as 1/16" internal fittings. In sizes larger than 1/8", external fittings are generally easier to make up because of less thread friction.

Bulkhead versions can be mour through an instrument panel or bracket. The fitting body is unde so that it bites into the panel when the mounting nut is tightened, eliminating the need for a lock washer. An O-ring can be installed between the body and the panel to allow operation in purged environments. Typically the mounting nut goes inside the instrument, so that the long threaded portion will be out of sight. In the external/internal bulkhead unions, the mounting nut is on the side with the Valco internal fitting.

TECH TIP

Filtering capability can be added to a union by inserting a screen or frit into it before making up the fittings. However, when a fitting detail has a screen or frit in it, the pilot depth is reduced, so that the ferrule makes up closer to the tube end than it otherwise would. If that tube is used in any other Valco fitting, it will introduce unswept volume. Our filter design takes this into account, allowing our fittings to remain truly interchangeable.

Filters . . . . . pages 50-52
Frits and screens. 53



0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

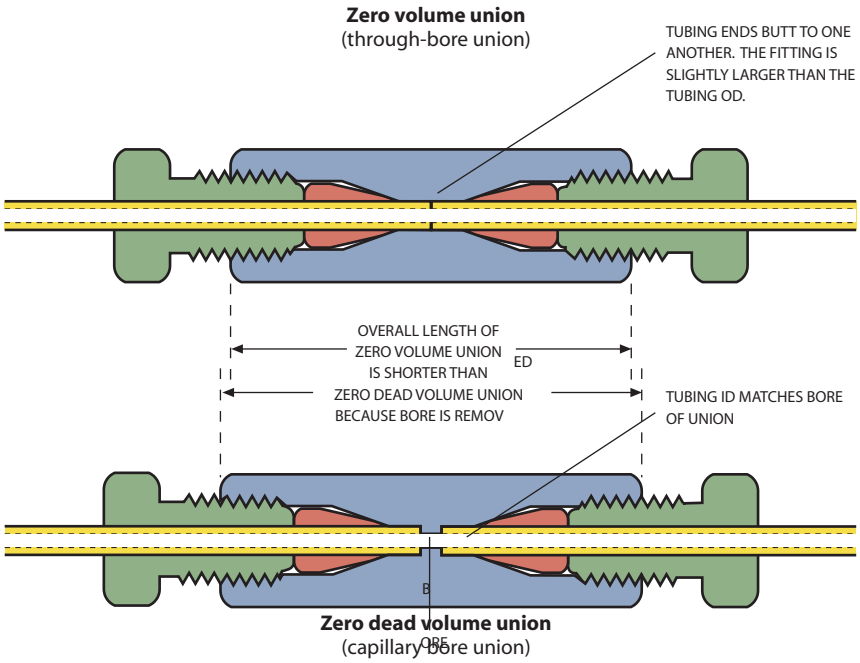
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Zero Volume vs. Zero Dead Volume

A true zero volume fitting is one in which no part of the fitting actually becomes a part of the flow path. The only Valco fittings which fit this description are our through-bore unions, which allow tubing to butt end-to-end. (So these are only zero volume if the tube ends are perfectly square.)

All other fittings are designed with zero *dead* volume: that is, there is no volume introduced by the fitting which is not cleanly swept.



MORE INFORMATION
Reducing unions to connect two tubes with different ODs . . . . . p 29-31
Unions with 1/4-28 fittings 72

TECH TIP
Through-bore Union Installation
Because the tubing will pass all the way through a through-bore union, we suggest making up the first tube in a standard Valco fitting to establish the proper length of tubing extending beyond the ferrule. Install this made-up connection in the through-bore union; then the second tube can be butted against it for a zero volume connection.

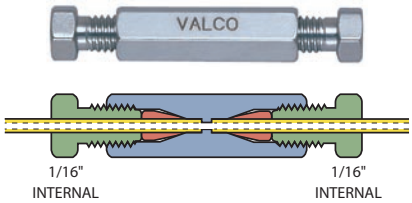
Unions

Internal unions – stainless steel

Standard material is 300 series stainless. Also available in Hastelloy C, gold-plated stainless, and titanium.

Standard internal unions

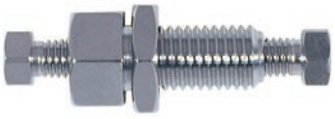
Tubing OD	*Bore*	*Prod No*	*Price*
1/32"	0.15 mm	ZU.5XC	
	0.25 mm	ZU.5	
	0.50 mm	ZU.5L	
	1/32"	ZU.5T	
1/16"	0.15 mm	ZU1XC	
	0.25 mm	ZU1C	
	0.50 mm	ZU1M	
	0.75 mm	ZU1	
	1.0 mm	ZU1L	
	1/16"	ZU1T	
1/8"	0.75 mm	ZU2	
	2.0 mm	ZU2L	
	1/8"	ZU2T	
1/4"	0.75 mm	ZU4	
	4.6 mm	ZU4L	
	1/4"	ZU4T	



Internal union – metal
Standard bore version
(ZU1)
Ends of tubing seat squarely
at bottoms of fitting details

Bulkhead internal unions

Tubing OD	*Bore*	*Prod No*	*Price*	**Bulkhead panel hole diameter**
1/32"	0.15 mm	ZBU.5XC		5/16"
	0.25 mm	ZBU.5		5/16"
	0.50 mm	ZBU.5L		5/16"
	1/32"	ZBU.5T		5/16"
1/16"	0.15 mm	ZBU1XC		5/16"
	0.25 mm	ZBU1C		5/16"
	0.50 mm	ZBU1M		5/16"
	0.75 mm	ZBU1		5/16"
	1.0 mm	ZBU1L		5/16"
	1/16"	ZBU1T		5/16"
1/8"	0.75 mm	ZBU2		7/16"
	2.0 mm	ZBU2L		7/16"
	1/8"	ZBU2T		7/16"
1/4"	0.75 mm	ZBU4		5/8"
	4.6 mm	ZBU4L		5/8"
	1/4"	ZBU4T		5/8"



Bulkhead internal union – metal
(ZBU1)

MORE INFORMATION
Internal unions, high pressure PEEK . . p 57, 65

For special materials and/or smaller bores:
Microvolume connectors offer a complete range of 1/32" and 1/16" unions in various metals and polymers, with bore sizes ranging from .006" (0.15 mm) to .040" (1.0 mm). Refer to pages 22-23.

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

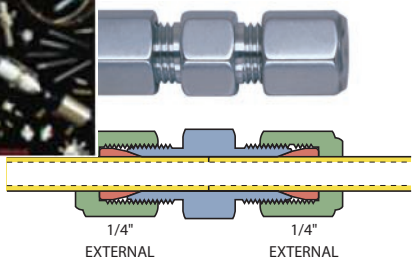
7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

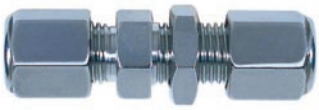
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

5/16" = .312" = 7.9 mm
3/8" = .375" = 9.5 mm
7/16" = .437" = 11.1 mm



External union
Through-bore version
(EU4T)
Ends of tubing butt together



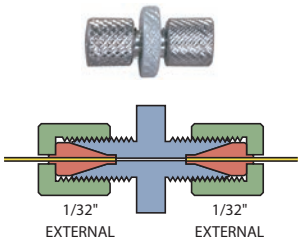
Bulkhead external union
(EBU2L)

External unions

Standard material is 300 series stainless. Also available in Hastelloy C and gold-plated stainless.

Note: Because 1/16" external fittings have very thin, easily distorted walls, they are not as durable as 1/16" internal fittings. We recommend the use of external/internal unions (below) when connecting to an installed external nut.

Tubing OD	*Bore*	**Standard** *Prod No*	*Price*	**Bulkhead** *Prod No*	*Price*	**Bulkhead panel hole diameter**
1/16"	See note above					
1/8"	1.0 mm	EU2		–		–
	2.0 mm	EU2L		EBU2L		5/16"
	1/8"	EU2T		EBU2T		5/16"
1/4"	2.0 mm	EU4		EBU4		7/16"
	4.6 mm	EU4L		EBU4L		7/16"
	1/4"	EU4T		EBU4T		7/16"

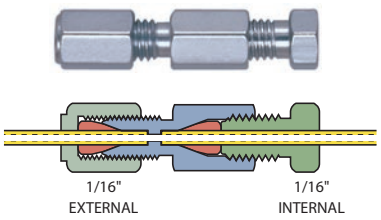


1/32" external union
(EU.5)
For use with GC capillary columns

External unions – 1/32" ultra low mass

The 1/32" external union is specially designed for use with capillary columns in GC. It is very low mass and does not require wrenches to seal. Use *only* with one-piece fused silica adapters, since metal ferrules will distort the detail. Order fused silica adapters separately *(page 16)*. Standard material is 300 series stainless.

Bore	*Prod No*	*Price*
0.25 mm	EU.5	
0.50 mm	EU.5L	
1/32"	EU.5T	



External/internal union
Standard bore
(EZU1)
Adapts existing external fittings
to Valco zero volume internal fittings

Bulkhead external/internal union
(EZBU1)

External/internal unions

Standard material is 300 series stainless. Also available in Hastelloy C and gold-plated stainless.

Tubing OD	*Bore*	**Standard** *Prod No*	*Price*	**Bulkhead** *Prod No*	*Price*	**Bulkhead panel hole diameter**
1/32"	0.25 mm	EZU.5		–		–
	0.50 mm	EZU.5L		–		–
1/16"	0.25 mm	EZU1C		EZBU1C		5/16"
	0.50 mm	EZU1M		EZBU1M		5/16"
	0.75 mm	EZU1		EZBU1		5/16"
	1/16"	EZU1T		EZBU1T		5/16"
1/8"	1.0 mm	EZU2		EZBU2		7/16"
	2.0 mm	EZU2L		EZBU2L		7/16"
	1/8"	EZU2T		EZBU2T		7/16"

Reducing Unions

Reducing unions join two tubes of different outside diameters. Standard material is 300 series stainless.

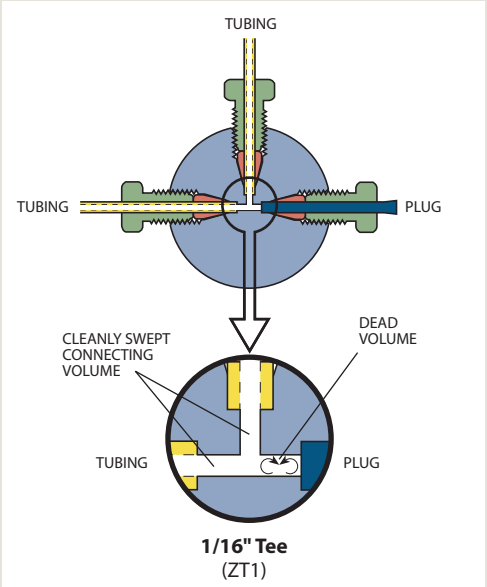
- Internal reducing unions have female threads and a fitting detail for zero volume fittings. The nuts have male (external) threads.
- External reducing unions have male threads, requiring a nut with internal threads.
- External/internal and internal/external reducing unions have male threads on one end and female threads on the other. We recommend the use of external/internal fittings when connecting to an existing external nut.

Internal fittings are almost always the best with tubing of 1/8" OD or smaller. They make a stronger connection and offer the lower volume necessary for high performance instrumentation. Also, because 1/16" external fittings have very thin, easily distorted walls, they are not as durable as 1/16" internal fittings. In sizes larger than 1/8", external fittings are generally easier to make up because of less thread friction.

Bulkhead versions can be mounted through an instrument panel or on a bracket. The fitting body is undercut so that it bites into the panel when the mounting nut is tightened, eliminating the need for a lock washer. An O-ring can be installed between the body and the panel to allow operation in purged environments. Typically the mounting nut goes inside the instrument, so that the long threaded portion will be out of sight. In the external/internal bulkhead unions, the mounting nut is on the side with the Valco internal fitting.

DEAD VOLUME

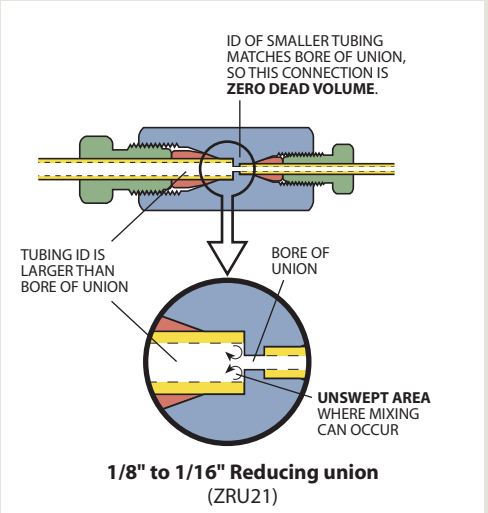
"Dead volume" is created in obvious situations such as the one shown.



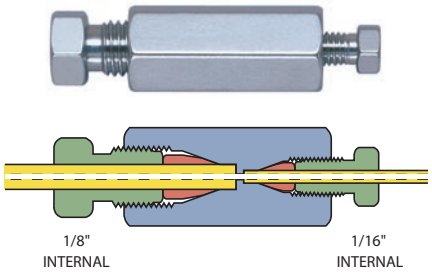
1/16" Tee
(ZT1)

UNSWEPT VOLUME

Even in connections which are by most definitions "zero dead volume", unswept volume may be created where large ID transitions occur. The amount of mixing depends on the amount of mismatch in the IDs.



1/8" to 1/16" Reducing union
(ZRU21)



Internal reducing union – metal
Standard bore
(ZRU21)

Internal reducing unions – stainless steel

These unions connect two sizes of tubing, using zero dead volume internal fittings on each end. In the bulkhead version, the bulkhead nut is on the side with smaller tubing.

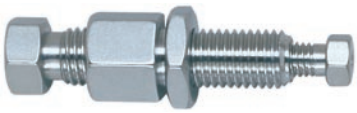
Standard material is 300 series stainless. Also available in Hastelloy C, gold-plated stainless, and titanium.

Standard internal reducing unions

Tubing OD	*Bore*	*Prod No*	*Price*
1/16" to 1/32"	0.15 mm	ZRU1.5XC	
	0.25 mm	ZRU1.5	
	0.50 mm	ZRU1.5L	
	1/32"	ZRU1.5T	
1/8" to 1/32"	0.25 mm	ZRU2.5	
	0.50 mm	ZRU2.5L	
	1/32"	ZRU2.5T	
1/8" to 1/16"	0.25 mm	ZRU21C	
	0.75 mm	ZRU21	
	1/16"	ZRU21T	
1/4" to 1/16"	0.25 mm	ZRU41C	
	0.75 mm	ZRU41	
	1/16"	ZRU41T	
1/4" to 1/8"	0.75 mm	ZRU42	
	2.0 mm	ZRU42L	
	1/8"	ZRU42T	

Bulkhead internal reducing unions

Tubing OD	*Bore*	*Prod No*	*Price*	**Bulkhead panel hole diameter**
1/16" to 1/32"	0.25 mm	ZBRU1.5		5/16"
	0.50 mm	ZBRU1.5L		5/16"
	1/32"	ZBRU1.5T		5/16"
1/8" to 1/32"	0.25 mm	ZBRU2.5		5/16"
	0.50 mm	ZBRU2.5L		5/16"
	1/32"	ZBRU2.5T		5/16"
1/8" to 1/16"	0.25 mm	ZBRU21C		5/16"
	0.75 mm	ZBRU21		5/16"
	1/16"	ZBRU21T		5/16"
1/4" to 1/16"	0.25 mm	ZBRU41C		7/16"
	0.75 mm	ZBRU41		7/16"
	1/16"	ZBRU41T		7/16"
1/4" to 1/8"	0.75 mm	ZBRU42		7/16"
	2.0 mm	ZBRU42L		7/16"
	1/8"	ZBRU42T		7/16"



Bulkhead internal reducing union – metal
(ZBRU21)

MORE INFORMATION

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

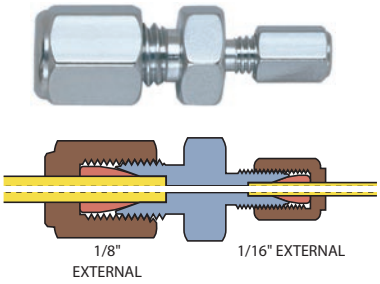
Reducing Unions

External reducing unions

These unions connect two sizes of tubing, using external fittings on each end. Standard material is 300 series stainless. Custom bulkhead versions are available in OEM quantities.

Standard external reducing unions

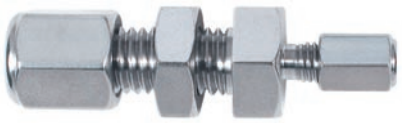
Tubing OD	*Bore*	*Prod No*	*Price*
1/8" to 1/16"	0.75 mm	ERU21	
	1.00 mm	ERU21L	
	1/16"	ERU21T	
1/4" to 1/16"	0.75 mm	ERU41	
	1/16"	ERU41T	
1/4" to 1/8"	1.0 mm	ERU42	
	2.0 mm	ERU42L	
	1/8"	ERU42T	



External reducing union
Standard bore
(ERU21)

Bulkhead external reducing unions

Tubing OD	*Bore*	*Prod No*	*Price*	**Bulkhead panel hole diameter**
1/8" to 1/16"	1.0 mm	EBRU12L		5/16"
	1/16"	EBRU12T		5/16"
1/4" to 1/16"	1.0 mm	EBRU14L		7/16"
	1/16"	EBRU14T		7/16"
1/4" to 1/8"	2.0 mm	EBRU24L		7/16"



Bulkhead external reducing union
(EBRU12L)

TECH TIP
Note: Because 1/16" external fittings have very thin, easily distorted walls, they are not as durable as 1/16" internal fittings. We recommend the use of 1/16" internal fittings when possible.

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

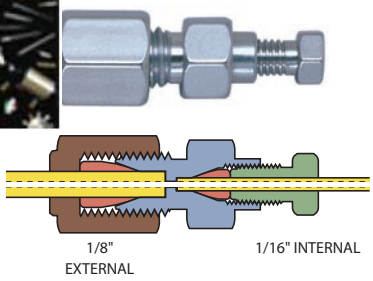
7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

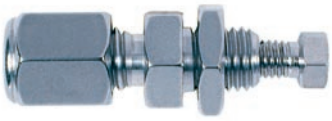
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

5/16" = .312" = 7.9 mm
3/8" = .375" = 9.5 mm
7/16" = .437" = 11.1 mm



External/internal reducing union
Standard bore
(EZRU21)



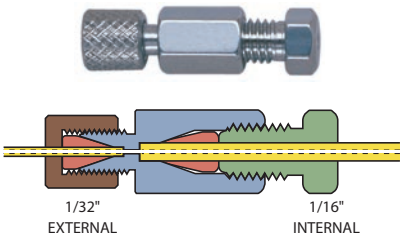
Bulkhead external/internal reducing union
(EZBRU21)

External/internal reducing unions

In these reducing unions, the larger size tubing is made up with an external fitting and the smaller size tubing is made up with an internal fitting. In the bulkhead version, the bulkhead nut is on the side with the internal fitting. Other configurations, such as an external nut on the locking nut side, are available on special request.

Standard material is 300 series stainless. Also available in Hastelloy C, gold-plated stainless, and titanium.

		Standard		Bulkhead		Bulkhead
Tubing OD	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*	**panel hole diameter**
1/16" to 1/32"	0.25 mm	EZRU1.5		–		–
	0.50 mm	EZRU1.5L		EZBRU1.5L		5/16"
	1/32"	EZRU1.5T		EZBRU1.5T		5/16"
1/8" to 1/32"	0.25 mm	EZRU2.5		–		–
	0.50 mm	EZRU2.5L		EZBRU2.5L		5/16"
	1/32"	EZRU2.5T		EZBRU2.5T		5/16"
1/8" to 1/16"	0.25 mm	EZRU21C		–		–
	0.75 mm	EZRU21		EZBRU21		5/16"
	1/16"	EZRU21T		EZBRU21T		5/16"
1/4" to 1/16"	0.25 mm	EZRU41C		–		–
	0.75 mm	EZRU41		EZBRU41		7/16"
	1/16"	EZRU41T		EZBRU41T		7/16"
1/4" to 1/8"	1.0 mm	EZRU42		EZBRU42		7/16"
	2.0 mm	EZRU42L		EZBRU42L		7/16"
	1/8"	EZRU42T		EZBRU42T		



Internal/external reducing union
Standard bore
(EZRU.51)

Bulkhead internal/external reducing union
(EZBRU.51)

Internal/external reducing unions

These reducing unions are the opposite of the ones above. The larger size tubing is made up with an internal fitting and the smaller size tubing is made up with an external fitting. In the bulkhead version, the bulkhead nut is on the side with the internal fitting. Standard material is 300 series stainless.

Internal/external reducing unions are typically used to connect 1/16" stainless steel tubing to fused silica tubing.

Only polymeric ferrules should be used with 1/32" external details – metal ferrules will distort them. These unions include a stainless steel ferrule for the 1/16" SS tube, but because of the variety of fused silica ODs and corresponding ferrules, a 1/32" fused silica adapter must be ordered separately. *(See page 16.)*

		Standard		Bulkhead		Bulkhead
Tubing OD	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*	**panel hole diameter**
1/16" to 1/32"	0.25 mm	EZRU.51		EZBRU.51		5/16"
	0.50 mm	EZRU.51L		EZBRU.51L		5/16"
	1/32"	EZRU.51T		EZBRU.51T		5/16"

MORE INFORMATION

Tees and Crosses

Tees

Tees connect three lines. Standard material is 300 series stainless. Also available in Hastelloy C, gold plated stainless, and titanium.

Tubing OD	*Bore*	*Prod No*	*Price*
1/32"	0.25 mm	ZT.5	
	0.50 mm	ZT.5L	
1/16"	0.25 mm	ZT1C	
	0.50 mm	ZT1M	
	0.75 mm	ZT1	
	1.00 mm	ZT1L	
1/8"	0.75 mm	ZT2	
	2.00 mm	ZT2L	
1/4"	1.00 mm	ZT4	
	4.60 mm	ZT4L	

Crosses

Crosses connect four lines. Standard material is 300 series stainless. Also available in Hastelloy C, gold plated stainless, and titanium.

Tubing OD	*Bore*	*Prod No*	*Price*
1/32"	0.25 mm	ZX.5	
	0.50 mm	ZX.5L	
1/16"	0.25 mm	ZX1C	
	0.50 mm	ZX1M	
	0.75 mm	ZX1	
	1.00 mm	ZX1L	
1/8"	0.75 mm	ZX2	
	2.00 mm	ZX2L	
1/4"	1.00 mm	ZX4	
	4.60 mm	ZX4L	

MORE INFORMATION

PEEK tees. . . . pages 57, 64
PEEK crosses 57, 64

SPECIAL METALS AND/OR SMALLER BORES

See microvolume connectors: 1/32" and 1/16" tees, crosses, Y's, and unions in various metals and polymers, with smaller bores.

Microvolume connectors . . . .pp 22-23
High pressure PEEK connectors. . 63-66
Nanovolume connectors 57-61

TECH TIP

To join tubes of different ODs, use the fitting sized for the largest tube along with IZR reducers for the smaller tubes.

IZR reducer. . . . . page 34

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

1/16" Manifolds

1/16" manifolds connect 4 - 16 inlet lines to a single outlet, and are often used to connect the outlets from several columns to a single detector. The unique angled entry of our design reduces dispersion to a minimum. Available with 1.00 mm inlet/outlet bore. Standard materials are PEEK or 300 series stainless.

	Inlet bore	*Outlet bore*	*Material*	*Prod No*	*Price*
4 inlets	0.25 mm	0.75 mm	Stainless steel	Z4M1	
	0.25 mm	0.75 mm	PEEK	Z4M1PK	
6 inlets	0.25 mm	0.75 mm	Stainless steel	Z6M1	
	0.25 mm	0.75 mm	PEEK	Z6M1PK	
8 inlets	0.25 mm	0.75 mm	Stainless steel	Z8M1	
	0.25 mm	0.75 mm	PEEK	Z8M1PK	
10 inlets	0.25 mm	0.75 mm	Stainless steel	Z10M1	
	0.25 mm	0.75 mm	PEEK	Z10M1PK	
12 inlets	0.25 mm	0.75 mm	Stainless steel	Z12M1	
	0.25 mm	0.75 mm	PEEK	Z12M1PK	
14 inlets	0.25 mm	0.75 mm	Stainless steel	Z14M1	
	0.25 mm	0.75 mm	PEEK	Z14M1PK	
16 inlets	0.40 mm	0.75 mm	PEEK	Z16M1PK	

1/8" Manifolds

1/8" manifolds connect 4 - 12 inlet lines to a single outlet, and are typically used in a gas distribution system to minimize the number of fitting connections. A manifold pipe fitting version is also available. (*See page 37.*) Standard material is 300 series stainless steel.

	Inlet bore	*Outlet bore*	*Prod No*	*Price*
4 inlets	2.00 mm	2.00 mm	Z4M2	
6 inlets	2.00 mm	2.00 mm	Z6M2	
8 inlets	2.00 mm	2.00 mm	Z8M2	
10 inlets	2.00 mm	2.00 mm	Z10M2	
12 inlets	2.00 mm	2.00 mm	Z12M2	

TECH TIP
A manifold used with an SD flowpath multiposition valve allows HPLC column selection with a single valve. See page 139 for an illustration.

SD UW valves. . . . . .pg 132

Internal Reducers

NEW Internal reducers — *for 360 µm tubing*

Directly connect 360 µm tubing into a 1/32" Valco valve or fitting detail, providing a positive leak-free seal with zero dead volume. The same patented design as our larger internal reducers (below). Both versions have a stainless steel body.

Tubing OD	*Nut/ferrule material*	*Prod No*	*Price*
1/32" to 360 µm	Stainless	C360IZR.5S6	
	PEEK	C360IZR.5S6PKG	

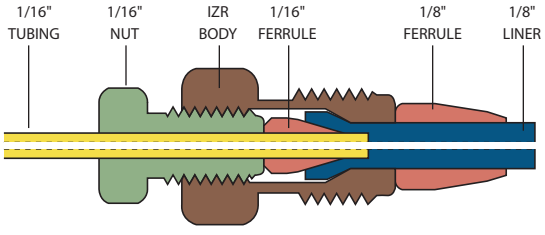
Internal reducers

Valco's patented internal reducer (IZR) allows smaller tubing to be used in valves with fitting details for larger tubing, forming a positive leak-free seal with zero dead volume. The small line from your system goes directly into the IZR and the sample goes directly into the valve, without the short pieces of connecting tubing required if a reducing union was used instead. (A reducing ferrule would also work, but makes a seal of less integrity.) Once the fitting is installed, only one wrench is required to remove and reinstall it.

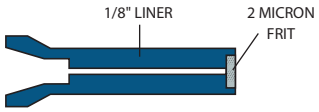
A second version has a 2 micron stainless steel frit pressed into the end of the liner, adding filtering capability. However, we suggest using these only as a final or backup filter, with a standard filter (*see page 52*) as the primary filter. Because IZRs have a much smaller surface area than the standard filter, they tend to plug too often if used in a stand-alone capacity.

Patent No. 4,173,363.

		Without frit		**With 2µ frit**	
Tubing OD	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
1/16" to 1/32"	0.25 mm	IZR1.5		IZR1.5F	
	0.50 mm	IZR1.5L		IZR1.5LF	
	1/32"	IZR1.5T		–	
1/8" to 1/16"	0.25 mm	IZR21C		IZR21CF	
	0.50 mm	IZR21		IZR21F	
	1.00 mm	IZR21L		IZR21LF	
	1/16"	IZR21T		–	
1/4" to 1/16"	1.00 mm	IZR41		IZR41F	
1/4" to 1/8"	1.00 mm	IZR42		IZR42F	
1/4" to 1/8"	2.00 mm	IZR42L		IZR42LF	



Valco's unique internal reducer
(IZR21)



IZR liner with pressed-in frit

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

External to internal adapters (injector/detector adapters)

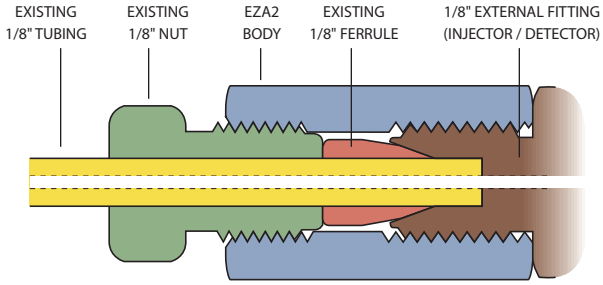
EZAs (external adapters) and EZRs (external reducers) adapt an external tee or union or the external type fittings common on injectors and detectors to Valco zero dead volume connections. Since EZAs are commonly used to connect an external fitting to an existing tube already made up with a Valco internal fitting, a nut and ferrule are not included.

Only one wrench is required to change tubes after the fitting is made up. While an external to internal union or reducing union plus a length of tubing can accomplish the same thing, these adapters do the trick with a single fitting.

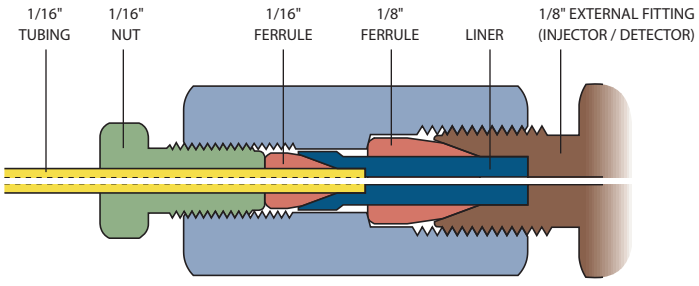
Standard material is 300 series stainless. The EZA does not include a nut or ferrule. The EZR includes a liner, one nut, and two ferrules.

Patent No. 4,173,363

Description	*Bore*	*Prod No*	*Price*
External to internal adapters			
1/16" ext. to 1/16" int.	–	EZA1	
1/8" ext. to 1/8" int.	–	EZA2	
External reducers			
1/16" ext. to 1/32" int.	0.25 mm	EZR1.5	
	1/32"	EZR1.5T	
1/8" ext. to 1/32" int.	0.25 mm	EZR2.5	
1/8" ext. to 1/16" int.	0.50 mm	EZR21	
	1/16"	EZR21T	
1/4" ext. to 1/16" int.	1.00 mm	EZR41	
	1/16"	EZR41T	
1/4" ext. to 1/8" int.	1.00 mm	EZR42	
	1/8"	EZR42T	



External to internal adapter (EZA2)



External to internal reducer (EZR21)

MORE INFORMATION

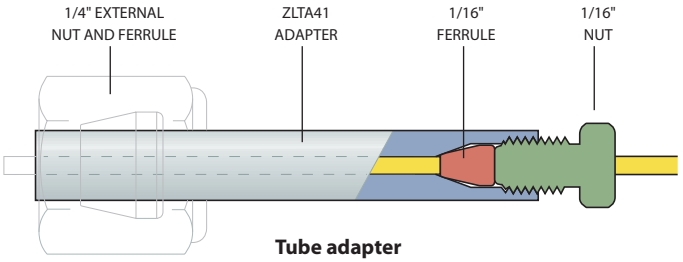
Ferrules ..... page 12
Nuts 10

Special Fittings

Tube adapters

These external adapters are ideal for connecting 1/16" tubing to a detector or injector with a 1/4" fitting. The shorter size is used with 1/4" external fittings while the longer works with 1/4" internal or external fittings. (1/16" nut and ferrule are included; 1/4" nut and ferrule are not.) Standard material is 300 series stainless.

Description	*Bore*	*Prod No*	*Price*
1/4" to 1/16"			
0.975" long	1/16"	ZTA41	
2.075" long	1/16"	ZLTA41	
2.800" long	1/16"	ZXLTA41	



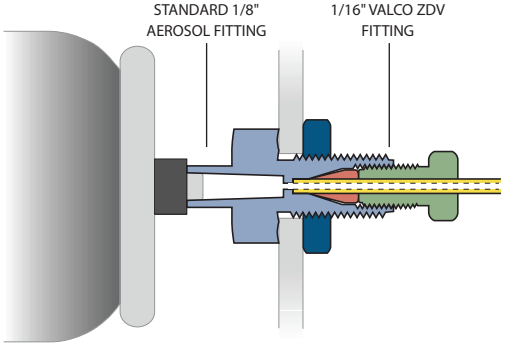
Tube adapter
(ZLTA41)

Aerosol adapter bulkhead union

This unique fitting provides an easy, direct method of connecting the nozzle of a standard aerosol can to a 1/16" Valco zero dead volume fitting.

As with all Valco bulkhead fittings, the flange is undercut to act as a "lock nut" against the instrument wall. Standard material is 300 series stainless.

Description	*Prod No*	*Price*
Aerosol adapter bulkhead union	ZBAA1	



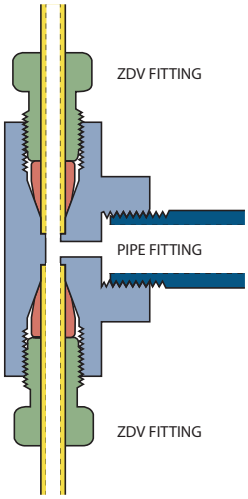
Aerosol adapter bulkhead union
(ZBAA1)

0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

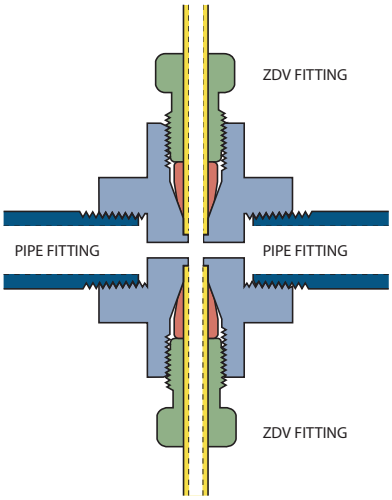
Manifold pipe adapters

These manifolds, which go from one or two pipe fittings to three or more Valco zero dead volume fittings, minimize the number of connections between a regulator and the various carrier gas lines in a chromatographic system. The models with two pipe fittings go a step further, allowing the support of a gauge, a second regulator, or a valve leading to a separate system. Additional Valco zero dead volume fittings can be machined on a special order basis. Standard material is 300 series stainless. Also available in Hastelloy C and titanium by special order.

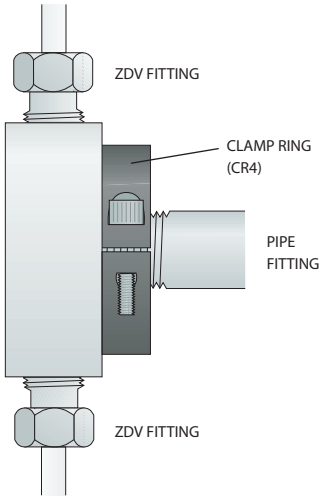
Description	*Bore*	*Prod No*	*Price*
One 1/8" female pipe to:			
three 1/16" ZDV fittings	1.0 mm	FP1Z3M21	
three 1/8" ZDV fittings	2.0 mm	FP1Z3M22	
three 1/4" ZDV fittings	4.6 mm	FP1Z3M24	
One 1/4" female pipe to:			
three 1/16" ZDV fittings	1.0 mm	FP1Z3M41	
three 1/8" ZDV fittings	2.0 mm	FP1Z3M42	
three 1/4" ZDV fittings	4.6 mm	FP1Z3M44	
Two 1/8" female pipe to:			
three 1/16" ZDV fittings	1.0 mm	FP2Z3M21	
three 1/8" ZDV fittings	2.0 mm	FP2Z3M22	
three 1/4" ZDV fittings	4.6 mm	FP2Z3M24	
Two 1/4" female pipe to:			
three 1/16" ZDV fittings	1.0 mm	FP2Z3M41	
three 1/8" ZDV fittings	2.0 mm	FP2Z3M42	
three 1/4" ZDV fittings	4.6 mm	FP2Z3M44	



One pipe fitting
to Valco ZDV fittings



Two pipe fittings
to Valco ZDV fittings



Adapter with optional mounting clamp ring

Pipe Adapters

Male pipe to Valco internal adapters

Male pipe adapters make a minimum volume connection from the female pipe fittings on pressure gauges and regulators to Valco zero dead volume internal fittings. Standard material is 300 series stainless. Also available in Hastelloy C and titanium.

Description	*Bore*	*Prod No*	*Price*
1/8" NPT male to:			
1/16" ZDV fitting	1.0 mm	PZA21	
1/16" ZDV fitting	1/16"	PZA21T	
1/8" ZDV fitting	1.0 mm	PZA22	
1/4" NPT male to:			
1/16" ZDV fitting	1.0 mm	PZA41	
1/8" ZDV fitting	1.0 mm	PZA42	
1/8" ZDV fitting	2.0 mm	PZA42L	
1/4" ZDV fitting	4.6 mm	PZA44L	
1/2" NPT male to:			
1/16" ZDV fitting	1.0 mm	PZA81	
1/8" ZDV fitting	1.0 mm	PZA82	
1/8" ZDV fitting	2.0 mm	PZA82L	
1/4" ZDV fitting	4.6 mm	PZA84L	

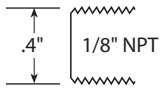
MORE INFORMATION
Our manifold pipe adapters on page 37 allow you to connect one or two pipe fittings to three Valco zero dead volume fittings.

Female pipe to Valco internal adapters

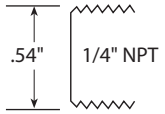
Female pipe adapters make a minimum volume connection from the male pipe fittings typically found in gas distribution plumbing to Valco zero dead volume internal fittings. Standard material is 300 series stainless. Also available in Hastelloy C and titanium.

Description	*Bore*	*Prod No*	*Price*
1/8" NPT female to:			
1/16" ZDV fitting	1.0 mm	FPZA21	
1/8" ZDV fitting	1.0 mm	FPZA22	
1/8" ZDV fitting	2.0 mm	FPZA22L	
1/4" NPT female to:			
1/16" ZDV fitting	1.0 mm	FPZA41	
1/8" ZDV fitting	1.0 mm	FPZA42	
1/8" ZDV fitting	2.0 mm	FPZA42L	
1/4" ZDV fitting	4.6 mm	FPZA44L	
1/2" NPT female to:			
1/16" ZDV fitting	1.0 mm	FPZA81	
1/8" ZDV fitting	1.0 mm	FPZA82	
1/8" ZDV fitting	2.0 mm	FPZA82L	
1/4" ZDV fitting	4.6 mm	FPZA84L	

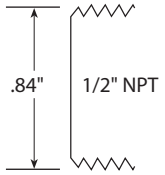
TECH TIP
NPT, National Pipe Thread, is a standard developed a long time ago by people without rulers. 1/8" NPT is nowhere close to 1/8"! Measure the diameter of the fitting across the narrow end. You can also count the number of threads in a 1" section. Then look at the diagrams below to determine the correct size needed.



27 threads per inch



18 threads per inch



14 threads per inch

Male pipe to Valco external adapters

Male pipe adapters make a minimum volume connection from the female pipe fittings typically found on pressure gauges and regulators to Valco external fittings. Standard material is 300 series stainless.

Note: We do not manufacture adapters with 1/16" external fittings because they have very thin, easily distorted walls. We recommend use of the PZAs on the facing page.

Description	*Bore*	*Prod No*	*Price*
1/8" NPT male to:			
1/8" external fitting	2.0 mm	PEA22	
1/4" external fitting	4.6 mm	PEA24	
1/4" NPT male to:			
1/8" external fitting	2.0 mm	PEA42	
1/4" external fitting	4.6 mm	PEA44	
1/2" NPT male to:			
1/8" external fitting	2.0 mm	PEA82	
1/4" external fitting	4.6 mm	PEA84	

TECH TIP
Because of their dead volume and the risk of thread leaks, pipe fittings are a poor choice for trace gas analysis. Thread sealants, particularly PTFE tape, cannot boost their performance to adequate levels. For trace gas applications, choose Valco zero dead volume fittings with gold-plated stainless ferrules. *(See page 12.)*

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Female pipe to Valco external adapters

Female pipe adapters make a minimum volume connection from the male pipe fittings typically found in gas distribution plumbing to Valco external fittings. Standard material is 300 series stainless.

Note: We do not manufacture adapters with 1/16" external fittings because they have very thin, easily distorted walls. We recommend use of the FPZAs on the facing page.

Description	*Bore*	*Prod No*	*Price*
1/8" NPT female to:			
1/8" external fitting	2.0 mm	FPEA22	
1/4" external fitting	4.6 mm	FPEA24	
1/4" NPT female to:			
1/8" external fitting	2.0 mm	FPEA42	
1/4" external fitting	4.6 mm	FPEA44	
1/2" NPT female to:			
1/8" external fitting	2.0 mm	FPEA82	
1/4" external fitting	4.6 mm	FPEA84	

Syringe Adapters

NEW Zero dead volume fill ports

The ZVISF-1 is a unique fill port fitting designed so that a leaktight seal is formed against the face of the bottom of the fitting detail instead of at the end of an angular ferrule, resulting in a true zero dead volume connection with no carry over or sample loss. The polymer bushing snaps into the knurled PEEK nut, providing the convenience of a one-piece fitting. An ultrathin metal sleeve surrounds and supports the portion of the bushing which extends into the pilot of the fitting detail, preventing the bushing from mushrooming and getting stuck in the pilot as the fitting is tightened.

For use with 22 gauge blunt tip needle.

Description		*Prod No*	*Price*
For high pressure 1/16" Cheminert injectors with polymeric stators (C2, C3, C4, and C52 series)			
Most applications	PFA bushing	ZVISF-1PFAH	
High throughput applications	High density polyethylene bushing	ZVISF-1PEH	
For low pressure 1/16" Cheminert injectors, fittings, and most Valco injectors			
Most applications	PFA bushing	ZVISF-1PFA	
High throughput applications	High density polyethylene bushing	ZVISF-1PE	

Fill ports *for 1/16" polymeric Cheminert valves*

These fill ports provide direct syringe connections to polymeric valves and fittings. Since the fitting detail in the high pressure Cheminert valve is unique, be sure to order the high pressure version for polymeric HPLC injectors. For use with 22 gauge blunt tip needle.

Description	*Prod No*	*Price*
For high pressure injectors (C2, C3, C4, and C52 series injectors)	C-VISF-1H	
For fittings and low pressure injectors (C22Z and C62Z series injectors)	C-VISF-1	
Replacement liners and ferrules		
Liner for C-VISF-1	VISL-1	
Liner for C-VISF-1H	VISL-1H	
Ferrule for C-VISF-1 (or 1H)	ZF1VISF	

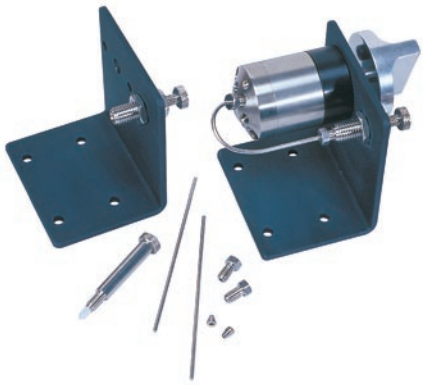
Fill ports *for metal Valco and Cheminert valves*

Fill ports provide direct syringe connections to valves and fittings, with the polymeric ferrule compressing a liner to seal around the needle. These fill ports are for use with metal valves.

Description	*Prod No*	*Price*
For use with blunt tip needle		
For 1/16" fittings and injectors - 22 ga	VISF-1	
For 1/32" fittings and injectors - 26 ga	VISF.5FPK	
For use with 2" 22 gauge blunt tip needle		
For 1/16" fittings and injectors	VISF-2	
For 1/8" fittings and injectors	VISF-A	
Replacement liners and ferrules		
Liner for VISF-1	VISL-1	
Liner for VISF-2 or VISF-A	VISL-2	
Ferrule for VISF-1 or VISF-2	ZF1VISF	

TECH TIP
When using Cheminert Nanovolume® CN2 injectors and valves, use fill ports designed just for them.

Nanovolume fill ports ..... page 60



for Cheminert C2 and C4 valves

Loop fill port assembly

The loop fill port assembly, for use with Cheminert high pressure valves (C2 and C4 series), permits sample loading and manual injection from the front of the valve. It includes an aluminum bracket, two syringe fill ports (for 3/4" or 2" needles), a bulkhead union, and two pieces of stainless tubing: one piece is 0.013" ID with a volume of 7 µl, and the other is 0.50 mm ID and 17 µl.

Description	*Prod No*	*Price*
Loop fill port assembly	C-LFP	

Female luer adapters

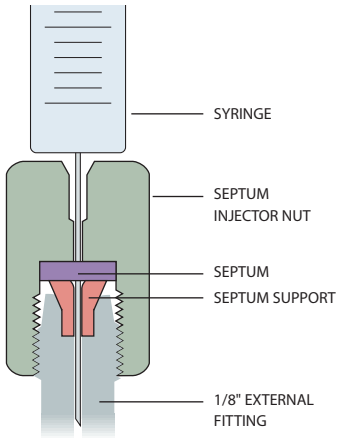
Female luer adapters provide direct syringe connections to zero dead volume fittings and valves.

Description		*Prod No*	*Price*
Female luer to:	1/32" fitting	ZLA-.5	
	1/16" fitting	ZLA-1	
	1/8" fitting	ZLA-2	

Septum injector nuts

Septum injector nuts are a simple way to provide syringe access to any point of a gas or liquid system. The injector nut includes a Valcon T polyimide septum support which accepts a standard 1/4" GC septum. The nut's 1/8" external fitting detail can connect directly to common external type fittings, or can be adapted to Valco internal fittings using an external/internal union or reducing union.

Description	*Prod No*	*Price*
Septum injector nut with support	EN2SI	
Replacement support	ZF2SI	
Septum, low bleed, pkg. of 10	SI4G	



Septum injector nut
with septum and support (EN2SI)

MORE INFORMATION
External/internal reducing unions . . pg 31
External/internal unions 27

Cheminert valves
Model C2 . . . . . 158, 161
Model C4 . . . . . 159, 162

0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

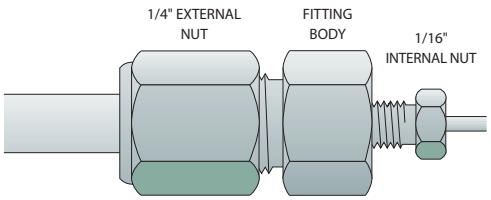
HPLC Column End Fittings

Although our column end fittings look like ordinary reducing unions, they are machined with a conical recess to match a specific column ID so that there are no abrupt or irregular diameter changes which can cause loss of theoretical plates. *(See illustrations, below.)* This optimization results in an assortment of column end fittings for each column OD. To receive full benefit of this design, use column end fittings only with the specific column ID for which they are intended. We can design special fittings for unusual sizes or OEM use.

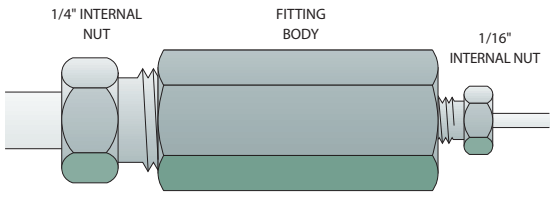
If a temporary frit is used during column packing, the frit OD should match the column OD. Permanent frits should have an OD matched to the column ID, and should be pressed in to give the lowest dead volume. Our frits are available in a variety of pore sizes, and we offer titanium and Hastelloy C frits for systems sensitive to exposed stainless steel.

All column end fittings are rated to 10,000 psi. However, the functional limit is dictated by the yield strength of the tubing used with the fitting. Standard 1/4", 3/8", and 1/2" columns are usually packed at 8,000-10,000 psi, which is right at the yield strength for the tubing commonly used. Columns with 1" ID have a yield strength of 6,000-8,000 psi, and the fitting will not hold if the system pressure exceeds that limit.

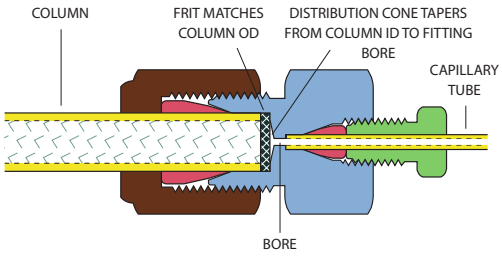
The newest addition to the line is the Nanovolume® column end fitting. *(See page 62.)* These all-PEEK fittings feature fingertight zero dead volume connections with 100 or 150 micron bore. PEEK sleeves permit use with any fused silica tubing.

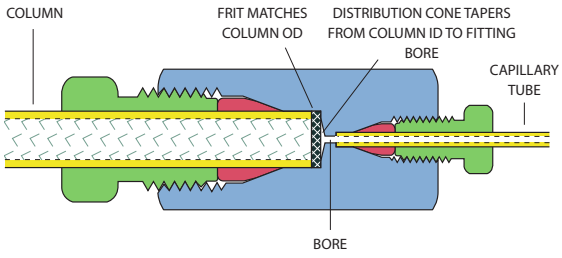


External column end fitting
1/4" to 1/16", 4.6 mm column ID, with removable frit
(ECEF414.6F)



Internal column end fitting
1/4" to 1/16", 4.6 mm column ID, with removable frit
(CEF414.6F)





MORE INFORMATION
Frits . . . . . page 45

TECH TIP
Standard column end fittings are Type 316 stainless, but since the column wall and frit form over 99% of the column surface area, standard fittings with titanium frits can generally be used on inert columns.

TECH TIP
When packing columns, use Valco "through-type" unions to couple the column to the packing reservoir.

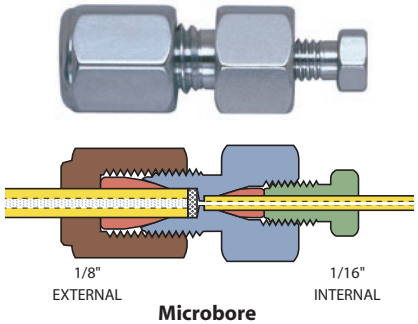
Size	*Prod No*
1/16" union	ZU1T
1/8" union	ZU2T
1/4" union	ZU4T

Through-type unions for packing columns . . . . . page 26

Microbore column end fittings *(1.0 mm – 2.0 mm column ID)*

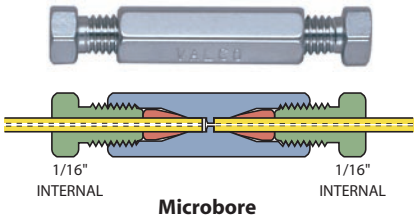
Standard material is Type 316 stainless.

	Bore	Column ID	Without frit Prod No	Price	Removable 2µ frit Prod No	Price
External column end fittings						
1/16" to 1/16"	0.25 mm	1.0 mm	ECEF111.0		ECEF111.0F	
1/8" to 1/16"	0.25 mm	1.0 mm	ECEF211.0		ECEF211.0F	



Microbore external column end fitting
(ECEF211.0F)

	Bore	Column ID	Without frit Prod No	Price	Removable 2µ frit Prod No	Price
Internal column end fittings						
1/16" to 1/32"	0.25 mm	1.0 mm	CEF1.5		CEF1.5F	
1/16" to 1/16"	0.25 mm	1.0 mm	CEF1		CEF1F	
1/8" to 1/32"	0.25 mm	1.0 mm	CEF2.51.0		CEF2.51.0F	
1/8" to 1/16"	0.25 mm	1.0 mm	CEF211.0		CEF211.0F	
1/8" to 1/16"	0.25 mm	2.0 mm	CEF212.0		CEF212.0F	



Microbore internal column end fitting
(CEF1F)

NANOBORE COLUMN END FITTINGS
See our complete line of 100 µm and 150 µm bore fittings on page 62.

100 µm = .004"
150 µm = .006"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

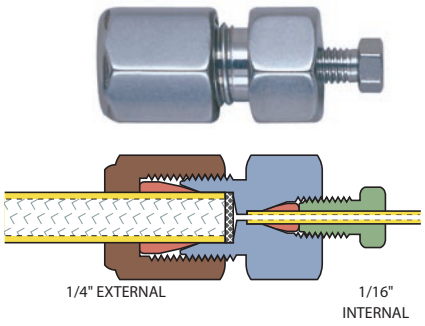
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

HPLC Column End Fittings

Analytical column end fittings *(2.0 mm – 4.6 mm column ID)*

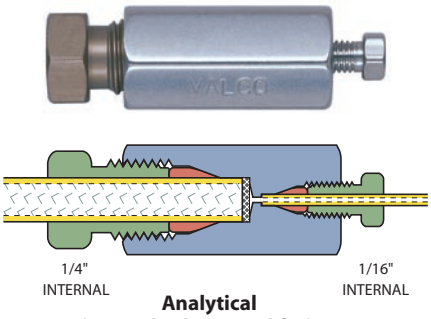
Standard material is Type 316 stainless.

	Bore	Column ID	Without frit Prod No	Price	Removable 2µ frit Prod No	Price
External column end fittings						
1/4" to 1/16"	0.4 mm	2.1 mm	ECEF412.1		ECEF412.1F	
1/4" to 1/16"	0.4 mm	3.0 mm	ECEF413.0		ECEF413.0F	
1/4" to 1/16"	0.4 mm	4.0 mm	ECEF414.0		ECEF414.0F	
1/4" to 1/16"	0.4 mm	4.6 mm	ECEF414.6		ECEF414.6F	



Analytical external column end fitting with removable frit (ECEF414.6F)

	Bore	Column ID	Without frit Prod No	Price	Removable 2µ frit Prod No	Price
Internal column end fittings						
1/4" to 1/16"	0.4 mm	2.1 mm	CEF412.1		CEF412.1F	
1/4" to 1/16"	0.4 mm	3.0 mm	CEF413.0		CEF413.0F	
1/4" to 1/16"	0.4 mm	4.0 mm	CEF414.0		CEF414.0F	
1/4" to 1/16"	0.4 mm	4.6 mm	CEF414.6		CEF414.6F	



Analytical internal column end fitting with removable frit (CEF414.6F)

NANOBORE COLUMN END FITTINGS
See our complete line of 100 µm and 150 µm bore fittings on page 62.

100 µm = .004"
150 µm = .006"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
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7.0 mm = .275"
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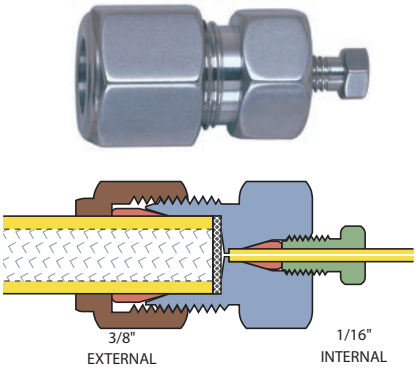
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Semi-preparative and preparative column end fittings

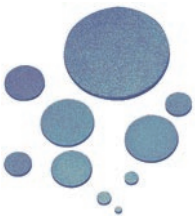
Standard material is Type 316 stainless.

	Bore	Column ID	Without frit Prod No	Price	Removable 2µ frit Prod No	Price
External column end fittings						
3/8" to 1/16"	0.40 mm	6.0 mm	ECEF616.0		ECEF616.0F	
3/8" to 1/16"	0.40 mm	7.0 mm	ECEF617.0		ECEF617.0F	
1/2" to 1/16"	0.75 mm	9.0 mm	ECEF819.0		ECEF819.0F	
1/2" to 1/16"	0.75 mm	10.0 mm	ECEF8110.0		ECEF8110.0F	
1" to 1/16"	0.75 mm	20.0 mm	ECEF1K1		ECEF1K1F	



Semi-preparative external column end fitting
(ECEF616.0F)

Replacement frits

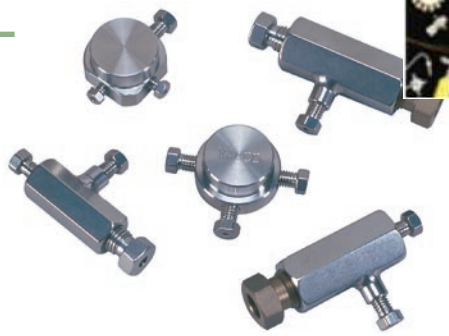


1/16", 1/8" and 1/4" frits are sold in packages of 10. 3/8", 1/2", and 1" frits are sold individually. Other sizes may be available or special-ordered in OEM quantities.

	Pore Size	Frit thickness	Stainless steel Prod No	Price	Hastelloy C Prod No	Price	Titanium Prod No	Price
Package of 10:								
1/16" frits	0.5µ	0.75 mm	.5FR1-10		.5FR1HC-10		–	
	2µ	0.75 mm	2FR1-10		2FR1HC-10		2FR1TI-10	
	10µ	0.75 mm	10FR1-10		–		–	
1/8" frits	0.5µ	1.00 mm	.5FR2-10		–		–	
	2µ	1.00 mm	2FR2-10		2FR2HC-10		2FR2TI-10	
	10µ	1.00 mm	10FR2-10		–		–	
1/4" frits	0.5µ	1.00 mm	.5FR4-10		–		–	
	2µ	1.00 mm	2FR4-10		2FR4HC-10		2FR4TI-10	
	10µ	1.00 mm	10FR4-10		10FR4HC-10		–	
Each:								
3/8" frits	2µ	1.00 mm	2FR6		2FR6HC		2FR6TI	
1/2" frits	2µ	1.00 mm	2FR8		2FR8HC		2FR8TI	
1" frits	2µ	1.50 mm	2FR1K		2FR1KHC		2FR1KTI	

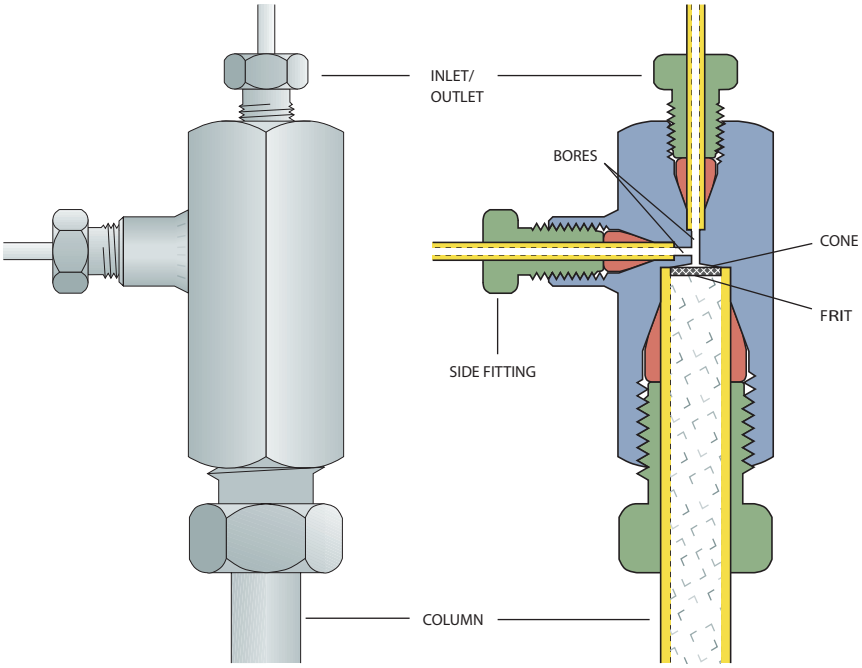
Post-Column Reaction Tee Fittings

Post-column reaction tee fitting



The tee column end fitting (TCEF) has a third connection perpendicular to the normal flowpath. The TCEF permits post-column derivation, or may be used as a curtain flow column inlet fitting. Standard material is Type 316 stainless.

Column OD	*Cone OD*	*Inlet/outlet OD*	*Bore*	*Side OD*	*Bore*	*Prod No*	*Price*
1/16"	1.0 mm	1/32"	0.25 mm	1/32"	0.25 mm	TCEF1.5.5C	
1/16"	1.0 mm	1/32"	0.90 mm	1/32"	0.25 mm	TCEF1.5.5T	
1/16"	1.0 mm	1/16"	0.25 mm	1/16"	0.25 mm	TCEF111	
1/8"	1.0 mm	1/16"	0.50 mm	1/16"	0.50 mm	TCEF211	
1/8"	1.0 mm	1/16"	1.65 mm	1/16"	0.40 mm	TCEF211T	
1/4"	4.6 mm	1/16"	0.25 mm	1/16"	0.25 mm	TCEF411C	
1/4"	4.6 mm	1/16"	0.75 mm	1/16"	0.75 mm	TCEF411	
1/4"	4.6 mm	1/16"	1.65 mm	1/16"	0.75 mm	TCEF411T	
1/4"	4.6 mm	1/8"	0.75 mm	1/16"	0.75 mm	TCEF421	
3/8"	6.0 mm	1/16"	0.75 mm	1/16"	0.75 mm	TCEF611	
3/8"	6.0 mm	1/16"	1.65 mm	1/16"	0.75 mm	TCEF611T	
1/2"	9.0 mm	1/16"	0.75 mm	1/16"	0.75 mm	TCEF811	
1/2"	9.0 mm	1/16"	1.65 mm	1/16"	0.75 mm	TCEF811T	



Post-column reaction fitting
(TCEF411)

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

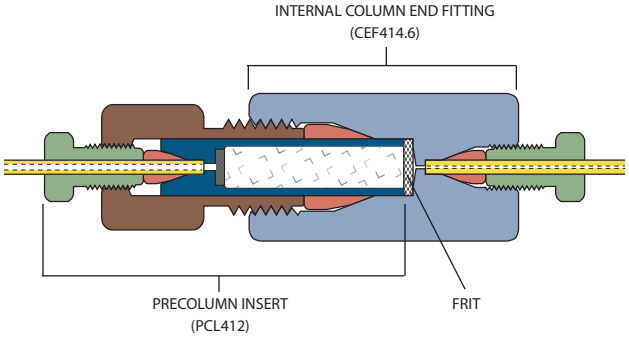
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Precolumns (guard columns)

Precolumns are available in 2 cm and 5 cm lengths, and can be filled with either 5µ packing or 37 - 44µ pellicular packing. Both lengths are used in conjunction with a column end fitting. When packed for high efficiency they can be used as analytical columns, but a more typical use is as a guard column installed between the injector and the analytical column. Standard material is Type 316 stainless.

Description	*Prod No*	*Price*
1/4" x 2 cm precolumn system	PCS412F	
Includes:		
One precolumn insert		
One internal column end fitting		
One 2µ frit		
1/4" x 5 cm precolumn system	PCS415F	
Includes:		
One precolumn insert		
One external column end fitting		
One 2µ frit		
Precolumns (for use with existing column end fittings)		
1/4" x 2 cm precolumn insert	PCL412	
1/4" x 5 cm precolumn insert	PCL415	



1/4" x 2 cm precolumn system
(PCS412F)

Fingertight HPLC cartridge precolumns

This cartridge-based system is designed for use as a precolumn or concentrator column in HPLC and FIA applications. It is particularly suited to applications requiring frequent changes: snap-on seals are replaceable, the cartridge is reusable, and the tubing connections are stable since the end fittings do not rotate as the assembly is tightened. Standard material is Type 316 stainless, with PEEK seals and 2µ titanium frits.

Description	*Prod No*	*Price*
0.25 ml (4.0 mm ID x 2 cm)		
Fin gertight cartridge assembly	SFECH412	
Replaceable cartridge	SFEC42	

NOTE:
As a courtesy to our OEM customers, VICI does not supply pre-packed columns.

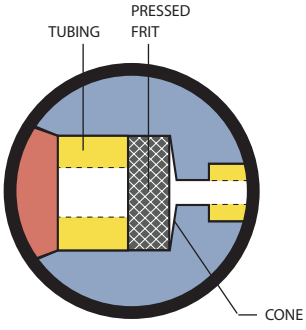
Filters

There are many flow elements of analytical instruments which require protection from foreign particles, such as orifices that may become plugged or surfaces that may get scratched. However, conventional filtering devices may have too large a volume to be consistent with good system performance – particularly in chromatographic applications.

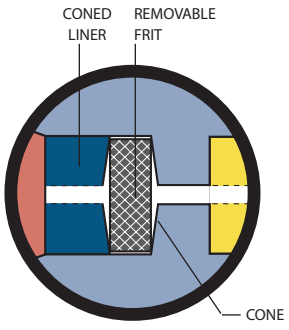
Valco's unique patented* filter design results in extremely low internal volume and simplifies filter element replacement. Filter bodies are "coned" for uniform flow and maximum filter surface area. The filters are made entirely of metal, so they can be used at any instrumentation temperature. While the standard metal is 316 series stainless, filters can be made from alloys that can be used in virtually any application.

We offer a choice of three different filtering elements. All styles are available in bulkhead configurations for mounting on a panel or instrument wall. (Please note that since frits and screens have significantly different thicknesses, they cannot be used interchangeably in the same filter body.)

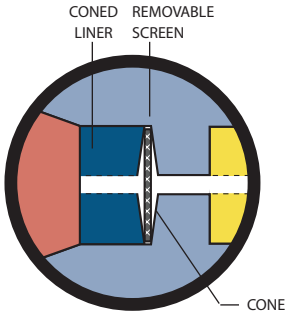
- **Pressed frits**, permanently installed in the filter, are recommended where contaminants are the exception and not the rule. The frits are 2µ stainless.
- **Removable frits** are the best choice for maximum filtration, or if the application requires Hastelloy C or titanium. However, they allow more mixing and tend to clog more than screens. A 2µ frit is included with the filter, but 0.5, 2, and 10µ replacement frits are available in three materials.
- **Removable screens** plug less rapidly and provide lower pressure drop than frits. Since they are thinner, there is less mixing and dispersal than might occur with a frit, but frits provide better filtration. A 2µ screen is included with the filter, and 2 and 10µ stainless replacement screens may be ordered.



Pressed frit



Removable frit



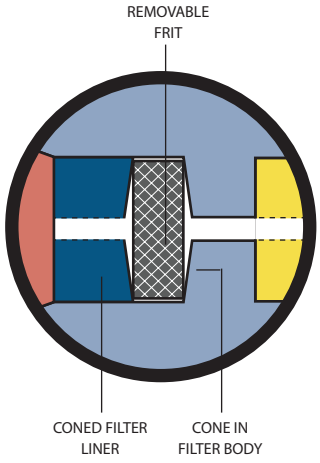
Removable screen

* Patent Numbers 4,281,679 and 4,173,363

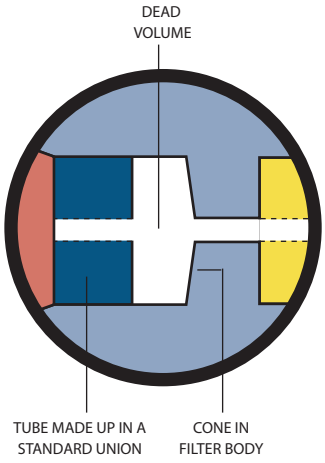
MORE INFORMATION

Filters with removable frits are designed to compensate for the thickness of the filter element – the resulting pilot depths are identical with the rest of the Valco product line, facilitating interchangeability of *made up* fittings. Therefore, although our filters look very much like our unions, they are not interchangeable with unions; a filter with its frit removed should not be substituted for a union, because the space designed for the frit introduces dead volume into the system. In addition, since filter bodies are coned, they will have dead volume when used as a union even if the tubing is made up in the filter with a longer, non-standard pilot length.

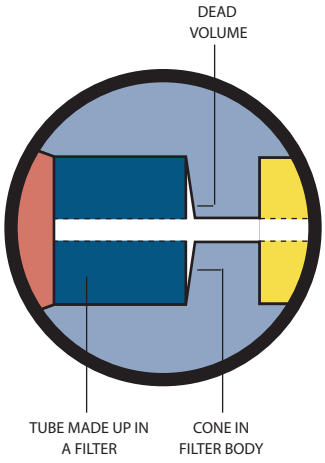
An arrow imprinted on all filter bodies serves to differentiate them from unions and to indicate recommended flow direction.



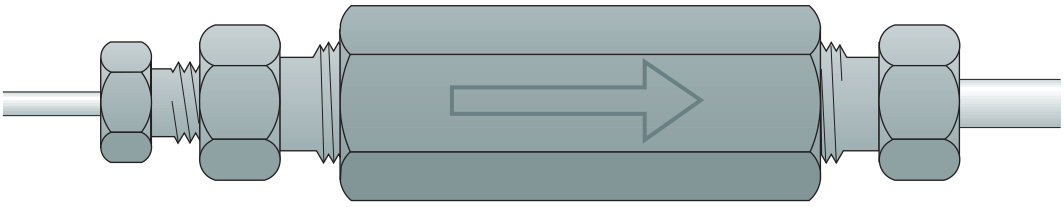
Filter with removable frit
Coned for uniform flow and maximum filter surface



Filter with frit removed being used as a reducing union
Dead volume is created where frit should be



Filter with frit removed being used as a reducing union
Cone in filter body creates dead volume

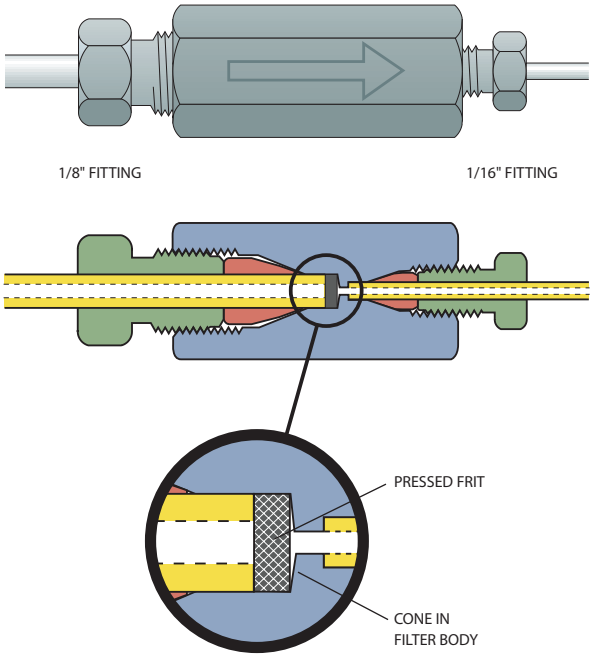


Arrow imprinted on filter body showing recommended direction of flow

Filters with a pressed frit

Pressed frit filters contain a permanently installed stainless steel 2µ frit, and are recommended for applications where contaminants are the exception and not the rule – that is, when the sample is generally clean but you wish to guard against the stray burr from a carelessly prepared tube end that might find its way into the flowpath. Standard material is Type 316 stainless.

		Standard		Bulkhead	
Description	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
1/16" to 1/32"	0.25 mm	ZRUF1.5		ZBRUF1.5	
1/16" to 1/16"	0.75 mm	ZUF1		ZBUF1	
1/8" to 1/16"	0.75 mm	ZRUF21		ZBRUF21	
1/8" to 1/8"	0.75 mm	ZUF2		ZBUF2	
1/4" to 1/8"	2.00 mm	ZRUF42		ZBRUF42	
1/4" to 1/4"	4.60 mm	ZUF4		ZBUF4	



Reducing filter with a pressed frit
1/8" to 1/16"
(ZRUF21)

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

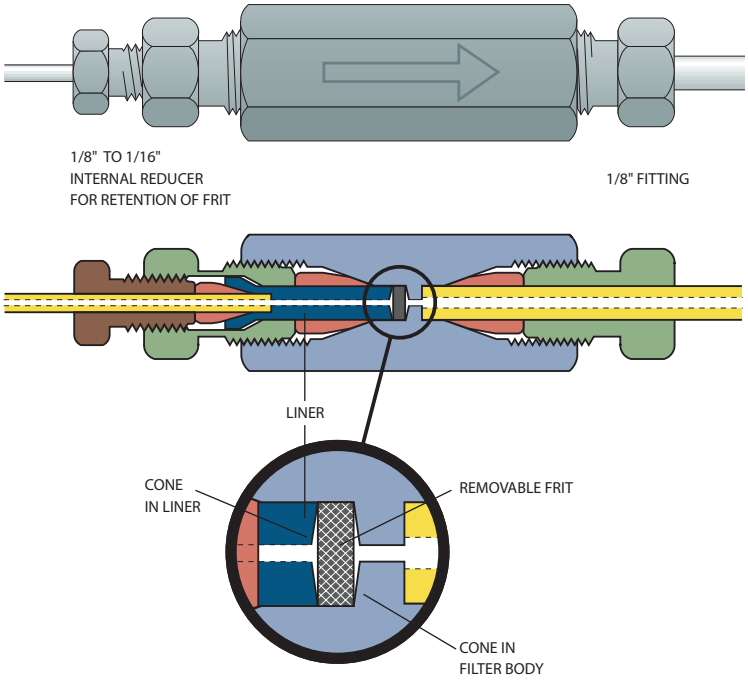
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Filters with a removable frit

These filters come with a removable 2µ frit. The standard frit can be replaced with any frit of the proper diameter, *but not by a screen*. These filters are suitable for streams with frequent contamination, since the filtering element is easily changed. Standard material is Type 316 series stainless.

Patent Numbers 4,281,679 and 4,173,363

		Standard		Bulkhead	
Description	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
1/32" to 1/32"	0.25 mm	ZUFR.5F		ZBUFR.5F	
1/16" to 1/32"	0.25 mm	ZRUFR1.5F		ZBRUFR1.5F	
1/16" to 1/16"	0.25 mm	ZUFR1CF		ZBUFR1CF	
	0.50 mm	ZUFR1F		ZBUFR1F	
1/8" to 1/16"	0.75 mm	ZRUFR21F		ZBRUFR21F	
1/8" to 1/8"	2.00 mm	ZUFR2F		ZBUFR2F	
1/4" to 1/16"	1.00 mm	ZRUFR41F		ZBRUFR41F	
1/4" to 1/8"	2.00 mm	ZRUFR42F		ZBRUFR42F	



Reducing filter with a removable frit
1/8" to 1/16"
(ZRUFR21F)

TECH TIP
Should you use a filter with a frit or one with a screen?

Screens have much higher flow capacity (Cv), but frits are the best choice for maximum filtration or if your application requires Hastelloy C or titanium. However, since they are thicker than screens, frits allow more mixing, and the downside of their superior filtration is that they clog more often than screens.

Note! The difference in thickness also means that frits and screens cannot be used interchangeably in the same fitting body:

A frit must always be replaced with a frit.

A screen must always be replaced with a screen.

Replacement frits ..... page 53

Filters

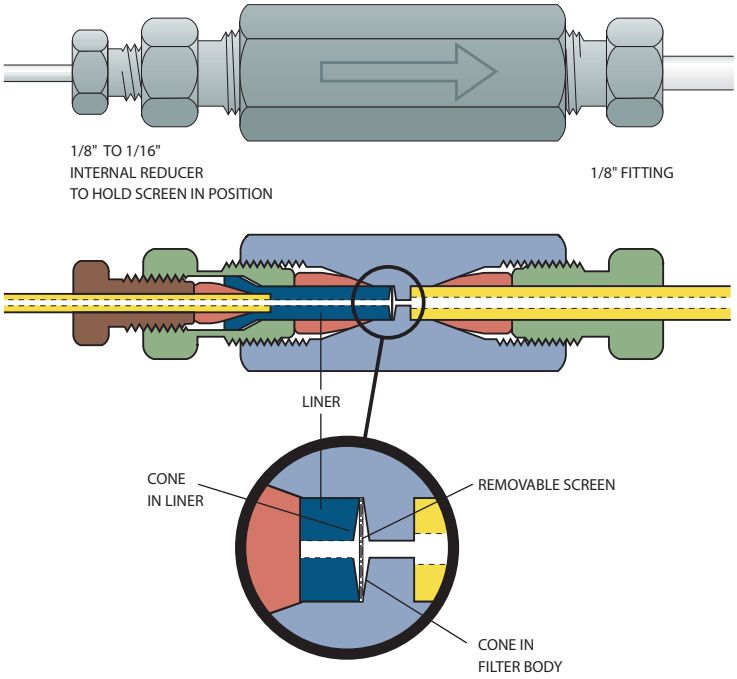
ilters with a removable screen

F hese filters come with a removable 2µ screen. The standard screen can be replaced with any screen of the proper diameter, *but not by a frit*. These filters are suitable for streams with frequent contamination, since the filtering element is easily changed. Standard material is Type 316 series stainless.

atent Numbers 4,281,679 and 4,173,363

P

		Standard		Bulkhead	
Description	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
1/32" to 1/32"	0.25 mm	ZUFR.5		ZBUFR.5	
1/16" to 1/32"	0.25 mm	ZRUFR1.5		ZBRUFR1.5	
1/16" to 1/16"	0.25 mm	ZUFR1C		ZBUFR1C	
	0.50 mm	ZUFR1		ZBUFR1	
1/8" to 1/16"	0.75 mm	ZRUFR21		ZBRUFR21	
1/8" to 1/8"	2.00 mm	ZUFR2		ZBUFR2	
1/4" to 1/16"	1.00 mm	ZRUFR41		ZBRUFR41	
1/4" to 1/8"	2.00 mm	ZRUFR42		ZBRUFR42	



Reducing filter with a removable screen
1/8" to 1/16"
(ZRUFR21)

TECH TIP
Should you use a filter with a frit or one with a screen?

Screens have much higher flow capacity (Cv), but frits are the best choice for maximum filtration or if your application requires Hastelloy C or titanium. However, since they are thicker than screens, frits allow more mixing, and the downside of their superior filtration is that they clog more often than screens.

Note! The difference in thickness also means that frits and screens cannot be used interchangeably in the same fitting body:

A frit must always be replaced with a frit.

A screen must always be replaced with a screen.

Replacement screens..... page 53

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

5/16" = .312" = 7.9 mm
3/8" = .375" = 9.5 mm
7/16" = .437" = 11.1 mm

Replacement frits

Other sizes may be available or special ordered in OEM quantities.
Note: If a filter was ordered with a removable frit, the frit ***cannot*** be replaced with a screen.

			Stainless Steel		Hastelloy C		Titanium	
Package of 10:	*Pore Size*	*Frit Thickness*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
1/16" frits	0.5µ	0.75 mm	.5FR1-10		.5FR1HC-10		–	
	2µ	0.75 mm	2FR1-10		2FR1HC-10		2FR1TI-10	
	10µ	0.75 mm	10FR1-10		–		–	
1/8" frits	0.5µ	1.00 mm	.5FR2-10		.5FR2HC-10		–	
	1µ	1.00 mm	1FR2-10		1FR2HC-10		–	
	2µ	1.00 mm	2FR2-10		2FR2HC-10		2FR2TI-10	
	10µ	1.00 mm	10FR2-10		–		–	
1/4" frits	0.5µ	1.00 mm	.5FR4-10		–		–	
	2µ	1.00 mm	2FR4-10		2FR4HC-10		2FR4TI-10	
	10µ	1.00 mm	10FR4-10		10FR4HC-10		–	

WHICH FRIT FITS MY FILTER?
1/16" frit fits:
ZUFR.5F
ZBUFR.5F

ZRUFR1.5F
ZBRUFR1.5F

1/8" frit fits:
ZUFR1CF
ZBUFR1CF

ZUFR1F
ZBUFR1F

ZRUFR21F
ZBRUFR21F

1/4" frit fits:
ZUFR2F
ZBUFR2F

ZRUFR41F
ZBRUFR41F

ZRUFR42F
ZBRUFR42F

WHICH SCREEN FITS MY FILTER?
1/16" screen fits:
ZUFR.5
ZBUFR.5

ZRUFR1.5
ZBRUFR1.5

1/8" screen fits:
ZUFR1C
ZBUFR1C

ZUFR1
ZBUFR1

ZRUFR21
ZBRUFR21

1/4" screen fits:
ZUFR2
ZBUFR2

ZRUFR41
ZBRUFR41

ZRUFR42
ZBRUFR42

Replacement screens

Other sizes may be available or special ordered in OEM quantities.
Note: If a filter was ordered with a removable screen, the screen ***cannot*** be replaced with a frit.

			Stainless Steel	
Package of 10:	*Pore Size*	*Screen Thickness*	*Prod No*	*Price*
1/32" screens	0.5µ	0.040 mm	.5SR.5-10	
	1µ	0.050 mm	1SR.5-10	
	2µ	0.075 mm	2SR.5-10	
	10µ	0.125 mm	10SR.5-10	
1/16" screens	0.5µ	0.040 mm	.5SR1-10	
	1µ	0.050 mm	1SR1-10	
	2µ	0.075 mm	2SR1-10	
	10µ	0.125 mm	10SR1-10	
1/8" screens	0.5µ	0.040 mm	.5SR2-10	
	1µ	0.050 mm	1SR2-10	
	2µ	0.075 mm	2SR2-10	
	10µ	0.125 mm	10SR2-10	
1/4" screens	0.5µ	0.040 mm	.5SR4-10	
	1µ	0.050 mm	1SR4-10	
	2µ	0.075 mm	2SR4-10	
	10µ	0.125 mm	10SR4-10	

Tools

Custom socket wrench

This 1/4" socket wrench with a slot to slip over 1/16" tubing works great for all types of 1/4" hex nuts (such as Valco 1/16" ZDV fitting nuts). It's especially useful when nuts are difficult to access with an open end wrench.

Prod No	*Price*
SWH4	

Ferrule removal kit

When polymeric ferrules get stuck in a fitting detail, these little ferrule spears will save you from becoming so irritated that you tear up your entire lab in frustration. Each kit includes two sizes of tapered stabbers for retrieving capillary size ferrules.

Prod No	*Price*
FRK1	

Hex key set

The hex key set has a wrench to fit any socket head screw on any VICI valve or actuator. Includes the following sizes: .050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", and 5/32".

Prod No	*Price*
HKS	

TECH TIP

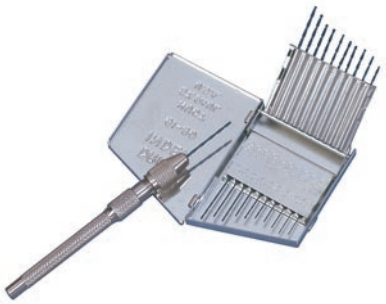
If a fused silica tube breaks off in a through-type union, remove the nuts and the tube opposite the broken one. Clear the fitting by passing a drill or wire of the appropriate diameter into the unbroken side and through the center of the fitting.

Our ferrule removal kit can be used to remove ferrules from tee and cross fittings.

Open end wrenches

Size	*For use with*	*Prod No*	*Price*
3/16" x 1/4"	1/32" and 1/16" nuts	OEW	
3/8" x 7/16"	1/8" nuts	OEW-2	
1/2" x 9/16"	1/4" nuts	OEW-3	

Pin vise and drill index



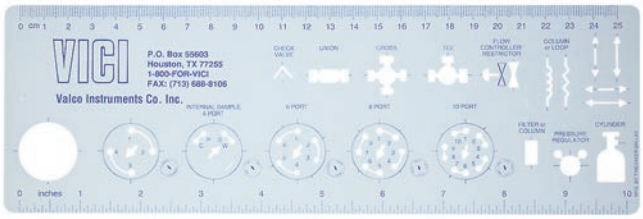
The drill index has drills sized from 0.0135" to 0.039" (0.34 to 1 mm). These are useful tools when a fused silica tube breaks in a union (see Tech Tip on the facing page) and for enlarging the inner diameter of fused silica adapters.

Prod No	*Price*
PV	

Template

This tool is just what you need when you're working out plumbing and valve switching schematics. It features templates for two position valves with 4, 6, 8, and 10 ports with indications of both positions, as well as various flow symbols. For added convenience, the sides are edged with metric and inch rulers.

Prod No	*Price*
TEMPLATE1	



MORE INFORMATION

Tools for valves
Pencil magnet . . . . p 210
Valve spanner handle. 211
Tightening tools for PEEK fittings. 67
Tubing accessories 90

Cheminert® Fittings and Accessories

Cheminert fittings are ideally suited for applications requiring an inert, biocompatible, metal-free flowpath. Wetted materials are PFA, FEP, CTFE, or PEEK, and uniform flow passages minimize mixing. All connections have zero dead volume.

MORE INFORMATION

TECH TIP

For optimal zero dead volume connections, make sure your tubing meets the best industry standards. OD tolerance should be nominal dimension ± .002".

Fractional dimension	Nominal dimension
1/32"	.031
1/16"	.062
1/8"	.125
1/4"	.250
3/8"	.375
1/2"	.500

10,000 psi = 689.5 bar
20,000 psi = 1,378.9 bar

50 µm = .002"
100 µm = .004"
150 µm = .006"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
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27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

High Pressure Fittings

Cheminert high pressure fittings are rated at 5000 psi with fingertight nuts, well beyond the burst strength of most PEEK tubing. These fittings are machined from high quality inert polymers to the same exacting tolerances as our popular Valco zero dead volume fittings, and the taper angle and detail design conform to the industry standard established by the Valco line.

High Pressure Nanovolume® Fittings

Nanovolume generally refers to components with bore sizes of 100-150 µm (.004" - .006"). The minimal transfer volume contributed by nanovolume components makes them especially beneficial in applications with flow rates in the µl/min range, when the transfer volume can be critical.

NEW 360 Micron Nanovolume Fittings

Our newest high pressure fittings permit direct connection of 360 micron OD fused silica, PEEK, stainless, or electroformed nickel tubing without the use of liners. The ferrule snaps into the nut so that the fitting is "one-piece", but the ferrule remains free to rotate as the nut is tightened so that the tube doesn't twist. Because of the compact size and fine 2-56 threads, a leak-free connection that seals at pressures in excess of 20,000 psi can be easily formed with the available manual tool.

1/32" Nanovolume Fittings

1/32" Cheminert nanovolume fittings, with 100 µm or 150 µm bore, are ideal for high resolution capillary chromatography. Rated at 5,000 psi with fingertight nuts, they will remain leak-tight well beyond the burst strength of most PEEK tubing. These fittings are machined from high quality inert polymers to the same exacting tolerances as our popular Valco zero dead volume fittings, and the taper angle and detail design conform to the industry standard established by the Valco line.

360 µm Nanovolume Fittings *NEW*

- For direct connection of 360 µm tubing
- Work with metal, fused silica, or PEEK
- Up to 20,000 psi with metal tubing
- Snap-in rotating ferrule for "one-piece" fitting with no tubing twist
- Eliminate use of troublesome liners

Our new high pressure fittings permit direct connection of 360 micron OD fused silica, PEEK, stainless, or electroformed nickel tubing without the use of liners. The ferrule snaps into the nut so that the fitting is "one-piece", but the ferrule remains free to rotate as the nut is tightened so that the tube doesn't twist. Because of the compact size and fine 2-56 threads, a leak-free connection that seals at pressures in excess of 20,000 psi can be easily formed with the available manual tool.

360 µm fittings are dedicated for use with either fused silica, metal, or PEEK tubing; components cannot be mixed or used with a different tubing material.

Tees and crosses offer a choice of three bore sizes, and feature a "quick-mount" base with adhesive backing to make sure that the fitting is stable and fragile tubing doesn't get broken. There is also a quick-mount PEEK union.

MORE INFORMATION

Nanovolume fittings
For fused silica tubing, 10,000+ psi . . . . . pg 58
For metal tubing, up to 20,000 psi. . . . 58

1/32" Nanovolume fittings 59-60
Injectors with 360 micron fittings. . 152

For PEEK or fused silica tubing — up to 10,000 psi

These fittings are constructed from premium grade natural PEEK material. They are intended for use with PEEK or fused silica tubing at pressures up to 10,000 psi, or the maximum pressure for which the tubing is rated, whichever is lower. Quick-mount versions have integral base with double stick tape to secure fittings to a surface.

Nut/ferrules, caps, plugs, tightening tool

for 360 µm tubing

	Prod No	*Price*
Nut/ferrule	C360NFPKG	
Cap	C360CPKG	
Plug	C360PPK	
Tightening tool	C360ET	

Unions and reducing unions

for 360 µm tubing

Bore size:	**50 micron**		**100 micron**		**150 micron**	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Union, quick mount	C360QUPKG2		C360QUPKG4	$65	C360QUPKG6	
Union	C360UPKG2		C360UPKG4	48	C360UPKG6	
Reducing union, 1/16" to 360 µm	—		—		C360RU1PK6	

Tees and crosses

for 360 µm tubing

Bore size:	**50 micron**		**100 micron**		**150 micron**	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Tee, quick mount	C360QTPKG2		C360QTPKG4	$82	C360QTPKG6	
Cross, quick mount	C360QXPKG2		C360QXPKG4	100	C360QXPKG6	

NEW 360 µm Nanovolume Fittings

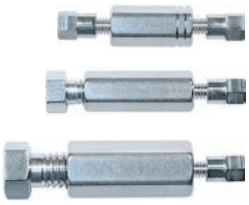
For fused silica tubing — 10,000 psi and above

These fittings are constructed from HPLC grade stainless steel, with stainless steel nut and a special ferrule which is precision machined from electroformed nickel. For optimal sealing characteristics, the ferrule is gold plated.

Nut/ferrules and caps — *for 360 µm FS tubing*

	Prod No	*Price*
Nut/ferrule	C360NFFS	
Cap	C360CFS	

Unions and reducing unions — *for 360 µm FS tubing*



Bore size:	**50 micron**		**100 micron**		**150 micron**	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Union	C360UFS2		C360UFS4		C360UFS6	
Reducing unions, 1/32" to 360 µm	C360RU.5FS2		C360RU.5FS4		C360RU.5FS6	
Reducing unions, 1/16" to 360 µm	—		—		C360RU1FS6	

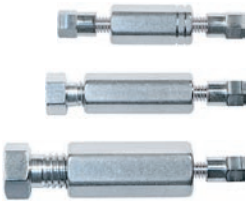
For metal tubing — up to 20,000 psi

Our highest pressure Nanovolume fittings are constructed of HPLC grade stainless steel, including stainless steel nut and ferrule. These fittings are optimized for use with stainless or electroformed nickel tubing.

Nut/ferrules and caps — *for 360 µm tubing*

	Prod No	*Price*
Nut/ferrule	C360NFS6	
Cap	C360C	

Unions and reducing unions — *for 360 µm tubing*



Bore size:	**50 micron**		**100 micron**		**150 micron**	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Union	C360US62		C360US64		C360US66	
Reducing unions, 1/32" to 360 µm	C360RU.5S62		C360RU.5S64		C360RU.5S66	
Reducing unions, 1/16" to 360 µm	—		—		C360RU1S66	

NEW **INTERNAL REDUCERS FOR 360 µm TUBING**

Directly connect 360 µm tubing into a 1/32" Valco valve or fitting detail, providing a positive leak-free seal with zero dead volume.
The same patented design as our larger internal reducers (page 34).
Both versions have a stainless steel body.

Tubing OD	*Nut/ferrule material*	*Prod No*	*Price*
1/32" to 360 µm	Stainless	C360IZR.5S6	$34
	PEEK	C360IZR.5S6PK	34

MORE INFORMATION

TECH TIP

Use these **metal 360 micron nuts** with nano injectors:
C72MU . . . . . p 152
C72MX 152

50 µm = .002"
100 µm = .004"
150 µm = .006"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Nanovolume Fittings for 1/32" Tubing

Designed for high resolution capillary HPLC, Cheminert nanovolume connectors include our one-piece 1/32" fingertight fittings, with a patented collapsible ferrule that makes fingertight nanovolume connections a snap. These fittings work with a variety of tubing, including PEEK, fused silica, and 1/32" electroformed nickel. Liners adapt the fittings for use with fused silica.

To avoid potential confusion, all fittings utilizing the Cheminert collapsible ferrule are made of black PEEK; fittings with a standard Valco ZDV fitting detail are natural PEEK.

Nuts and ferrules

for 1/32" tubing

Valves and fittings are supplied with the appropriate quantity of nuts and ferrules. However, if additional fittings are required, they may be ordered separately. The two internal nuts include collapsible ferrules as an integral part of the fitting; the external nut must be used with the separate ferrule listed below.

		Prod No	*Price each:*
	**Internal nut** with collapsible ferrule *For use with:* *Fittings on pages 60-62* *6 port valve CN2-4346, page 154* *4 port internal sampling injector CN4-4344, page 155*	C-NNFFPK	
	**Internal nut** with collapsible ferrule *For use with:* *10 port nanovolume valve CN2-4340*, page 154	C-NNFLFPK	
	**External nut** *For use with:* *Unions on page 61* *Column end fittings on page 62* Note: Requires collapsible PEEK ferrule, below	C-EN.5FPKB	
	Collapsible PEEK ferrule *For use with:* *External nut, above*	ZGF.5PK	

Plugs

for 1/32" tubing

		Prod No	*Price each:*
	**Internal plug** *For use with:* *Fittings on page 60* *Nanovolume valves on pages 154-155*	C-NPFPK	

MORE INFORMATION

TECH TIP

Use these **collapsible ferrule-nuts** with:

and with injectors:

Nanovolume Unions, Tees, Y's, and Crosses for 1/32" Tubing

Unions — *for 1/32" tubing*

	100 µm bore		150 µm bore	
	Prod No	*Price*	*Prod No*	*Price*
Union for 1/32" PEEK or electroformed nickel tubing Does not require or include liners.	C-NEU.5XFPK	$43	C-NEU.5FPK	

Reducing unions — *for 1/32" tubing*

	200 µm bore
	Prod No
Reducing union, 1/32" to 1/16" tubing, natural PEEK	ZERU1.5FPK

Tees, y's, and crosses — *for 1/32" tubing or FS* tubing*

		100 µm bore		150 µm bore	
		Prod No	*Price*	*Prod No*	*Price*
Tee	1/32" tubing or fused silica*	C-NTXFPK	$105	C-NTFPK	
Y	1/32" tubing or fused silica*	C-NYXFPK	105	C-NYFPK	
Cross	1/32" tubing or fused silica*	C-NXXFPK	120	C-NXFPK	

*A liner is needed for use with fused silica. Order 27 mm length, page 61.

Fill ports — *for 1/32" nanovolume® valves*

These fill ports provide direct syringe connections to Model CN2 nanovolume valves. For use with 26 gauge blunt tip needle.

	Prod No
Fill port for 1/32" CN2 series HPLC injectors	C-NVISF

1/32" Nanovolume frits

These frits are the answer to filtration of 1/32" nanovolume fitting connections. A mere .25 mm (0.010") thin and 1/32" in diameter, they can be placed in any 1/32" fitting detail and add minimal volume. Price is for a package of 5 frits.

Pkg/5:	*Pore size*	*Prod No*
	0.2 micron	.2FR.5-5
	0.5 micron	.5FR.5-5

MORE INFORMATION
Unions for fused silica
. . . p. 18, 19, 57-58, 61

100 µm = .004"
150 µm = .006"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

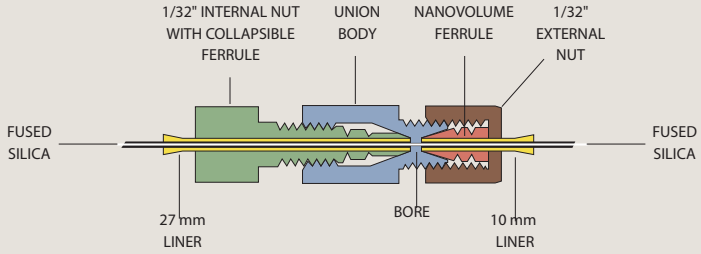
TECH TIP
Liners adapt nanovolume fittings for use with fused silica tubing. They are included with nanovolume **unions** for fused silica, but must be ordered separately for other fittings.

Liners . . . . . page 61

Nanovolume Unions and Liners for FS Tubing

Unions *for fused silica tubing*

	FS tubing OD	100 µm bore Prod No	150 µm bore Prod No
Union for fused silica tubing Includes liners.	125 -175 µm	C-NEU.5XFPK.15	C-NEU.5FPK.15
	175 -225 µm	C-NEU.5XFPK.20	C-NEU.5FPK.20
	225 -275 µm	C-NEU.5XFPK.25	C-NEU.5FPK.25
	275 -325 µm	C-NEU.5XFPK.30	C-NEU.5FPK.30
	325 -375 µm	C-NEU.5XFPK.35	C-NEU.5FPK.35



Union for use with fused silica
liners included
(C-NEU.5FPK.35)

Liners for 1/32" connectors *for use with fused silica tubing*

Use these liners with nanovolume connectors to adapt to the most common sizes of fused silica tubing. Natural PEEK.

The 27 mm liners are for internal nuts with collapsible ferrules. 10 mm liners are for use with external nuts. Sold in packages of 5.

27 mm liners
Use with internal nuts C-NNFFPK or C-NNFLFPK

For tubing OD	Prod No
125 - 175 µm	C-NL.15L-5
175 - 225 µm	C-NL.20L-5
225 - 275 µm	C-NL.25L-5
275 - 325 µm	C-NL.30L-5
325 - 375 µm	C-NL.35L-5

10 mm liners
Use with external nut C-EN.5FPKB

For tubing OD	Prod No
125 - 175 µm	C-NL.15S-5
175 - 225 µm	C-NL.20S-5
225 - 275 µm	C-NL.25S-5
275 - 325 µm	C-NL.30S-5
325 - 375 µm	C-NL.35S-5

MORE INFORMATION

TECH TIP
Use **27 mm liners**

with internal nuts with collapsible ferrules:

Use **10 mm liners**

with external nuts:

Nanovolume Column End Fittings for FS Capillaries

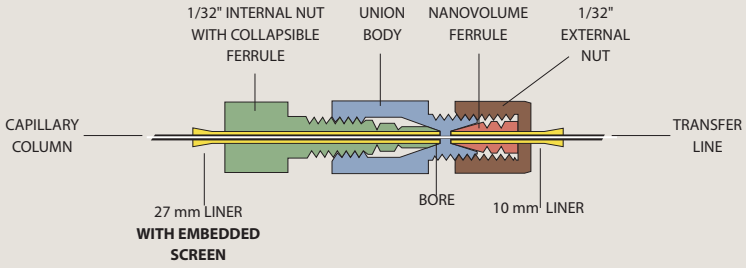
Nanovolume column end fittings include two liners to adapt the 1/32" fitting to fused silica. The 27 mm liner, used inside the internal nut, has a 1 µm 316 stainless steel screen embedded in the PEEK to provide closure for fused silica columns. The 10 mm liner is used with the external nut.

Like other nanovolume fittings, they include our one-piece 1/32" fingertight fittings, with a patented* collapsible ferrule. To avoid potential confusion, all fittings utilizing the Cheminert collapsible ferrule are made of black PEEK. The liners are natural PEEK.

Screen embedded in end of liner for column end fittings

Column end fittings *for 1/32" tubing*

		100 µm bore	150 µm bore
Each:	*For tubing OD*	*Prod No*	*Prod No*
Column end fitting for fused silica tubing Includes liners	125 - 175 µm	C-NEF.5XFPK.15S1	C-NEF.5FPK.15S1
	175 - 225 µm	C-NEF.5XFPK.20S1	C-NEF.5FPK.20S1
	225 - 275 µm	C-NEF.5XFPK.25S1	C-NEF.5FPK.25S1
	275 - 325 µm	C-NEF.5XFPK.30S1	C-NEF.5FPK.30S1
	325 - 375 µm	C-NEF.5XFPK.35S1	C-NEF.5FPK.35S1



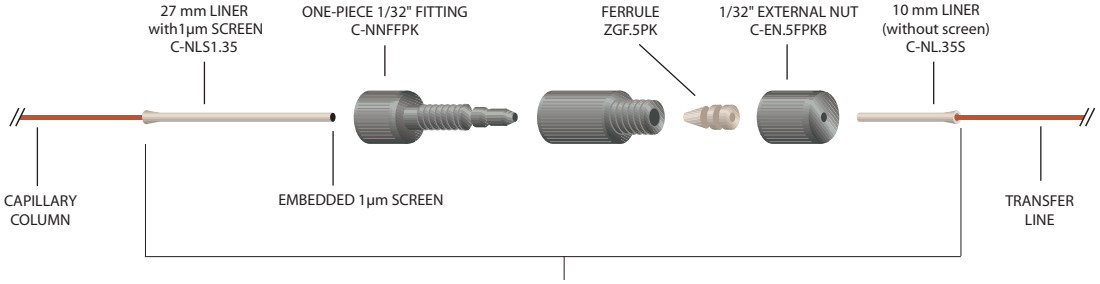
Cross-section
Column end fitting (C-NEF.5FPK.35S1)

Replacement liners for column end fittings *for FS capillaries*

Use these liners with nanovolume column end fittings to adapt to the most common sizes of fused silica tubing. Natural PEEK, with embedded screen to provide full closure for fused silica capillaries.
Sold individually.

27 mm liners for column end fittings

For tubing OD	*Prod No*
125 - 175 µm	C-NL S1.15
175 - 225 µm	C-NLS1.20
225 - 275 µm	C-NLS1.25
275 - 325 µm	C-NLS1.30
325 - 375 µm	C-NLS1.35



Column end fitting for 360 µm fused silica columns
(C-NEF.5FPK.35S1)

*U.S. patent no. 6,575,501.

MORE INFORMATION
Liners for 1/32" fittings . . page 61

TECH TIP
Liners with embedded screens are also available for 1/16" PEEK tubing. Consult the factory for sizes and product numbers.

No twist one-piece fittings

10-32 for 1/16" tubing

These new fittings offer the convenience of a one-piece fitting while solving a problem inherent to such designs. In other one-piece designs, the ferrule rotates against the fitting detail, creating particulates. The no twist design has a separate ferrule that snaps into the nut, so it's attached but still free to avoid rotation during tightening.

Since the ferrule is not machined onto the nut, it can be made from a different material. PEEK nut with PEEK ferrule, or PEEK nut with CTFE ferrule – the possibilities are endless.

Package of 5:	**Glass-filled PEEK ferrule**	**PEEK ferrule**	**CTFE ferrule**
Nut type Length	*Prod No*	*Prod No*	*Prod No*
PEEK, hex short	ZNF1PKG-5	ZNF1PK-5	ZNF1KF-5
PEEK, hex medium	MZNF1PKG-5	MZNF1PK-5	MZNF1KF-5
PEEK, hex long	LZNF1PKG-5	LZNF1PK-5	LZNF1KF-5
PEEK, fingertight	ZNF1FPKG-5	ZNF1FPK-5	ZNF1FKF-5

Optional ferrule materials available – FEP, PFA, PTFE, and glass-filled PTFE. Call for availability. Some 1/32" versions are available. Call for details.

Patent No. 7,316,777

Internal nuts – high pressure PEEK

PEEK nuts are used in Cheminert polymeric valves with zero dead volume fittings. They can also be used as alternatives to standard stainless steel Valco nuts when polymeric ferrules are used (up to approximately 175°C). Fingertight nuts have a knurled surface designed to provide sufficient sealing force on the ferrule without wrenches. Hex style nuts allow wrench tightening; however, since they are polymeric, they can break and are recommended for use only when space is limited and fingers won't fit.

Caution: PEEK nuts are intended for use only with polymeric ferrules, which seal with lower force than their stainless steel counterparts. Overtightening can result in breakage.

Package of 10:	*Prod no*	*Length*
1/32" fingertight	ZN.5FPK-10	.42"
1/32" fingertight	LZN.5FPK-10	.54"
1/16" fingertight	ZN1FPK-10	.88"
1/16" hex	ZN1PK-10	.45"
1/16" hex	MZN1PK-10	.62"
1/16" hex	LZN1PK-10	.87"
1/8" hex	ZN2PK-10	.62"

Ferrules – high pressure PEEK

PEEK ferrules seal by the increased friction from compression.

Package of 10:	*Prod No*	*Pkg of 10:*
1/32"	ZF.5PK-10	1/4"
1/16"	ZF1PK-10	3/8"
1/8"	ZF2PK-10	1/2"

Ferrules – grooved PEEK

These patented ferrules* feature a grooved design that permits the ferrule to grip the tube in multiple places. They work great on tubing that is softer than the ferrule material. For example, PEEK grooved ferrules work well on PTFE or FEP tubing. They are not generally recommended if the tubing is the same material as the ferrule.

Package of 10:	*Prod No*
1/32"	ZGF.5PK-10
1/16"	ZGF1PK-10

MORE INFORMATION
Tightening tool for hex-head PEEK nuts. . 67

POLYMERS AT A GLANCE

PEEK . . . . . PK
Chemical resistance; up to 225°C

100 µm	=	.004"
150 µm	=	.006"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

High Pressure PEEK Fittings

Plugs and caps – high pressure PEEK

Polymeric plugs and caps are available in knurled finger-tight and wrench-tight hex nut designs, for use in valves or fittings. See discussion of PEEK nuts on page 63. PEEK caps include a PEEK nut and ferrule. For high pressure polymeric valve plugs, see below. For low pressure valve plugs, see page 71.

		PEEK plugs	PEEK caps
Description	*Length of nut**	*Prod No*	*Prod No*
1/32" fingertight	.42"	ZP.5FPK	ZC.5FPK
1/32" fingertight	.54"	LZP.5FPK	––
1/16" fingertight	.87"	ZP1FPK	ZC1FPK
1/16" hex	.62"	MZP1PK	ZC1PK
1/16" long hex	.87"	LZP1PK	––
1/8" hex	.62"	ZP2PK	ZC2PK

PEEK plugs for high pressure polymeric valves

These PEEK plugs are for use ***only*** in Cheminert HPLC polymeric valves (C1-C5 series) since the fitting detail in these valves is unique.

Description	*Length of nut**	*Prod No*
1/16" hex	.62"	C-MZP1PK
1/16" long hex	.87"	C-LZP1PK
1/16" fingertight	.88"	C-ZP1FPK

Tees and crosses – high pressure PEEK

Tees connect three lines. Crosses connect four lines. The 1/32" and 1/16" nuts are fingertight; 1/8" nuts are hex, for wrench tightening.

		PEEK tees	PEEK crosses
Tubing OD	*Bore*	*Prod No*	*Prod No*
1/32"	0.25 mm	ZT.5FPK	ZX.5FPK
	0.50 mm	ZT.5LFPK	ZX.5LFPK
1/16"	0.25 mm	ZT1CFPK	ZX1CFPK
	0.50 mm	ZT1MFPK	ZX1MFPK
	0.75 mm	ZT1FPK	ZX1FPK
	1.00 mm	ZT1LFPK	ZX1LFPK
1/8"	0.75 mm	ZT2PK	ZX2PK
	2.00 mm	ZT2LPK	ZX2LPK

POLYMERS AT A GLANCE

PEEK . . . . . PK
Chemical resistance; up to 225°C

TECH TIP

Ferrules for high pressure PEEK fittings are available in PEEK and PFA.

PEEK ferrules . . . . page 63
PFA ferrules 13

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

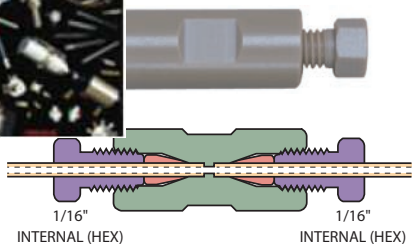
4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

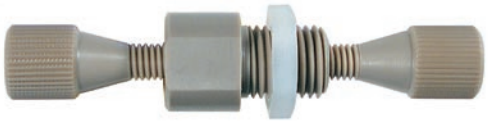
27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

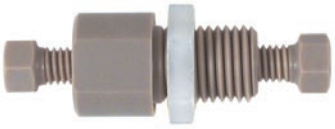
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm



Internal union – PEEK
Standard bore version
(ZU1PK)



Bulkhead fingertight internal union – PEEK
(ZBU1FPK)

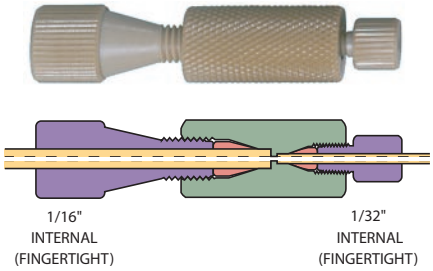


Bulkhead hex internal union – PEEK
(ZBU1PK)

Internal unions – high pressure PEEK

The 1/32" nuts are fingertight; 1/16" nuts are available in a choice of fingertight or hex; and 1/8" nuts are hex, for wrench tightening.

Tubing OD	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*	**Bulkhead panel hole diameter**
1/32" fingertight				
	0.25 mm	ZU.5FPK	ZBU.5FPK	5/16"
	0.50 mm	ZU.5LFPK	ZBU.5LFPK	5/16"
	1/32"	ZU.5TFPK	ZBU.5TFPK	5/16"
1/16" fingertight				
	0.25 mm	ZU1CFPK	ZBU1CFPK	3/8"
	0.50 mm	ZU1MFPK	ZBU1MFPK	3/8"
	0.75 mm	ZU1FPK	ZBU1FPK	3/8"
	1/16"	ZU1TFPK	ZBU1TFPK	3/8"
1/16" hex				
	0.25 mm	ZU1CPK	ZBU1CPK	3/8"
	0.50 mm	ZU1MPK	ZBU1MPK	3/8"
	0.75 mm	ZU1PK	ZBU1PK	3/8"
	1/16"	ZU1TPK	ZBU1TPK	3/8"
1/8" hex	0.75 mm	ZU2PK	ZBU2PK	7/16"
	2.0 mm	ZU2LPK	ZBU2LPK	7/16"
	1/8"	ZU2TPK	ZBU2TPK	7/16"



Internal reducing union – PEEK
Standard bore
(ZRU1.5FPK)

Bulkhead internal reducing union – PEEK
(ZBRU1.5FPK)

Internal reducing unions – high pressure PEEK

These unions connect two different sizes of tubing, with zero dead volume internal fittings on each end. In the bulkhead version, the bulkhead nut is on the side with smaller tubing. The 1/32" and 1/16" nuts are fingertight; 1/8" nuts are hex, for wrench tightening. A version with 1/16" and 1/8" hex nuts is also available.

Tubing OD	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*	**Bulkhead panel hole diameter**
1/16" to 1/32"	0.25 mm	ZRU1.5FPK	ZBRU1.5FPK	5/16"
	0.50 mm	ZRU1.5LFPK	ZBRU1.5LFPK	5/16"
	1/32"	ZRU1.5TFPK	ZBRU1.5TFPK	5/16"
1/8" to 1/32"	0.25 mm	ZRU2.5FPK	ZBRU2.5FPK	3/8"
	0.50 mm	ZRU2.5LFPK	ZBRU2.5LFPK	3/8"
	1/32"	ZRU2.5TFPK	ZBRU2.5TFPK	3/8"
1/8" to 1/16"	0.25 mm	ZRU21CFPK	ZBRU21CFPK	3/8"
	0.75 mm	ZRU21FPK	ZBRU21FPK	3/8"
	1.00 mm	ZRU21LFPK	ZBRU21LFPK	3/8"
	1/16"	ZRU21TFPK	ZBRU21TFPK	3/8"

High Pressure Specialty PEEK Fittings

One-piece fingertight fittings – color-coded PEEK

These molded fingertight fittings are rated to 5000 psi (350 bar), so they can be used in virtually any HPLC fitting detail with 10-32 threads. Six colors allow easy identification of tubing lines.

Package of 5:

Color	*Prod No*
Natural	JR-55020-5
Black	JR-55021-5
Red	JR-55022-5
Yellow	JR-55023-5
Blue	JR-55024-5
Green	JR-55025-5

One-piece PEEK fingertight fittings – narrow hex-head

This natural PEEK machined fitting has a narrow hex head and 10-32 threads.

Package of 5:

Color	*Prod No*
Natural	JR-5508-5

Color-It fingertight adapters

Use Color-It snap-on extensions to color-code our 1/4" hex-head nuts, and turn the nut into a fingertight fitting at the same time. Color-It adapters are available in six different colors, and can be used with PEEK and stainless hex-head nuts.

Package of 5:

Color	*Prod No*
Blue	JR-55010-5
Yellow	JR-55011-5
Green	JR-55012-5
Black	JR-55013-5
White	JR-55014-5
Red	JR-55015-5

Package of 12:

Color	*Prod No*
Multi-color (2 of each color)	JR-55016-12

MORE INFORMATION
Color-coded PEEK tubing . . . page 89

CAUTION
One-piece combination nuts and ferrules are not for high pressure gas service.

0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

PEEK starter kit

In LC applications involving proteins, peptides, nucleic acids, or other samples of biological origin, metal systems may interact with samples or release transition metals that will deactivate columns. The PEEK starter kit facilitates replacement of stainless steel tubing, fittings, ferrules, mobile phase filters, etc., to create a biocompatible environment for samples and mobile phase.

	Prod No
PEEK starter kit	JR-35P

Includes:

1	Plastic box
10	PEEK one-piece fittings, 10-32
5	PEEK handtight fittings
5	PEEK nuts, hex-head long
20	PEEK ferrules, double-ended 1/16"
1	PEEK union, HP body only, 10-32
2	Tubing elbows 90°
2	Tubing elbows 180°
1	PEEK filter, in-line, incl. PAT frit 5 µm
1	Clean-cut tubing cutter
1	Last Drop PTFE filter 5 µm
3m	PEEK tubing, 1/16" x 0.25 mm ID, blue stripe
3m	PEEK tubing, 1/16" x 0.50 mm ID, orange stripe
1	Tweezers

Tightening tools for PEEK fittings

These handy tools make it fast and easy to tighten PEEK hex-head fittings. The red version is for use with the C360 series fittings shown on page 57. The green tool is for any 1/32" PEEK fitting with a 3/16" hex head nut, and the blue version fits the 1/4" hex common in fittings for 1/16" tubing.

Color	*For use with*	*Prod No*
Red	360 µm fittings	C360ET
Green	1/32" fittings	CNFT
Blue	1/16" fittings	ZNFT

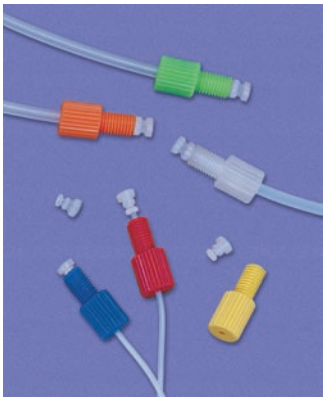
MORE INFORMATION

Hex-head PEEK fittings
- 360 µm..... page 57
- 1/32".....63-65
- 1/16"
  - High pressure...63-65
  - Low pressure 71

Low Pressure Flangeless Tube End Fittings

Cheminert low pressure fittings are ideally suited for flow injection analysis, low pressure liquid chromatography, and stream sampling devices. They may be safely used at pressures up to 500 psi and temperatures to 50°C. Two designs of low pressure tube end fittings are available. *Flangeless* tube end fittings utilize our new collapsible ferrule, which grips the tubing as the fitting is tightened without significantly reducing the tube ID. *Standard* tube end fittings are retained on polymeric tubing by a flange formed with a Cheminert flanging tool.

Flangeless tube end fittings *1/4-28*

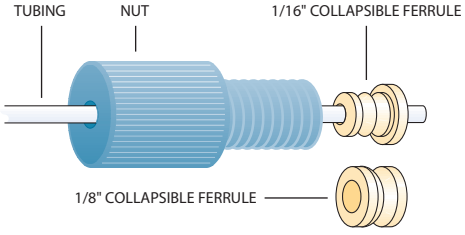


Flangeless tube end fittings eliminate the flanging tool required with standard tube end fittings. The nut turns on the tubing as freely as with our flanged fitting, eliminating the possibility of cracking or unscrewing that can occur when plastic tubing is subjected to twisting as fittings are connected.

Cheminert flangeless fittings include our patented* collapsible ferrule design. This innovative design utilizes a one-piece ferrule engineered to collapse as it is tightened. The collapse takes place in a very narrow area, resulting in a very effective seal with virtually no distortion of the tubing ID and no dead volume. The assembly is rated at 500 psi liquid when tightened by hand. Since only the tubing and the ferrule come into contact with the solution, the result is an inert system. Use CTFE ferrules for soft tubing (PTFE, FEP, etc.), but use PEEK ferrules for harder tubing (PEEK, ETFE, polyurethane, etc.)

Cheminert tube end fittings work with any 1/16" or 1/8" OD polymeric tubing, and come in twelve different colors for system color coding.

Flangeless fittings with CTFE ferrules		**1/16" OD**		**1/8" OD**	
	(pkg/5)	*Prod No*	*Price*	*Prod No*	*Price*
	Black	CFL-1BK		CFL-2BK	
	Blue	CFL-1BE		CFL-2BE	
	Brown	CFL-1BR		CFL-2BR	
	Dark gray	CFL-1DG		CFL-2DG	
	Green	CFL-1G		CFL-2G	
	Lavender/pink	CFL-1L		CFL-2L	
	Natural	CFL-1N		CFL-2N	
	Orange	CFL-1E		CFL-2E	
	Purple	CFL-1P		CFL-2P	
	Red	CFL-1R		CFL-2R	
	White	CFL-1W		CFL-2W	
	Yellow	CFL-1Y		CFL-2Y	
	Assorted *(pkg/12, one of each color)* with ferrule:				
	CTFE	CFL-1A		CFL-2A	
	PEEK	CFL-1A-PK		CFL-2A-PK	
Replacements					
PEEK ferrules	*(pkg/10)*	CFL-CB1PK		CFL-CB2PK	
CTFE ferrules	*(pkg/10)*	CFL-CB1KF		CFL-CB2KF	
PEEK nuts	*(pkg/5)*	CFL-1PK		CFL-2PK	
Setting tool		CST		CST	



Flangeless tube end fitting

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

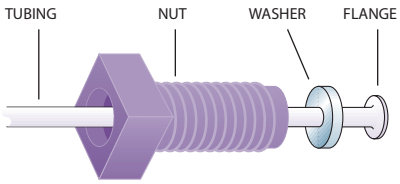
Patent No. 6,575,501

Standard flanged tube end fittings *1/4-28*

The basic component of the Cheminert system is the polypropylene nut, retained on PTFE or FEP tubing by a flange formed with a Cheminert flanging tool *(page 70)*. This is an excellent method for connecting fluorocarbon tubing, as there is no reduction of the inside diameter and no binding or twisting of the tubing when the fitting is tightened. A mating of the parts is achieved with zero dead volume, making this an ideal fitting for biological systems.

Cheminert tube end fittings come in twelve different colors for system color coding, and are available for 1/16" or 1/8" OD fluorocarbon tubing. (While in theory other polymers could be molded to form a flange, only fluorocarbons such as PTFE or FEP have low-temperature malleability and good form retention at operating temperatures.) Tube end fittings attach directly to Cheminert valves and fittings, and are easily joined to each other with a union. Tightening by hand is all that is required to make a leak-free seal at 500 psi liquid, although for long term reliability a wrench could be used to apply an additional 1/8 turn.

Packages include the same number of washers as fittings.



Flanged tube end fitting

Flanged fittings		1/16" OD		1/8" OD	
	(pkg/10)	*Prod No*	*Price*	*Prod No*	*Price*
	Black	CF-1BK		CF-2BK	
	Blue	CF-1BE		CF-2BE	
	Brown	CF-1BR		CF-2BR	
	Dark gray	CF-1DG		CF-2DG	
	Green	CF-1G		CF-2G	
	Lavender/pink	CF-1L		CF-2L	
	Natural	CF-1N		CF-2N	
	Orange	CF-1E		CF-2E	
	Purple	CF-1P		CF-2P	
	Red	CF-1R		CF-2R	
	White	CF-1W		CF-2W	
	Yellow	CF-1Y		CF-2Y	
	Assorted *(pkg/12, one of each color)*	CF-1A		CF-2A	
Washers	*(pkg/10)*	CF-W1		CF-W2	

MORE INFORMATION

High pressure fittings .....pp 63-66
PTFE and FEP tubing.....90

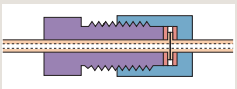
TECH TIP

To make up standard flanged tube end fittings, use the flanging tool on page 70.

A flanging starter kit, complete with flanging tool, flanging tips, and an array of tubing and fittings, is also available. *(See page 70.)*

TECH TIP

Use our external nut tube end fittings to make true zero volume butt connections without a coupling.



External nuts for flanged tube ends *1/4-28*

External nuts with female 1/4-28 threads are designed for use on tubing with a flanged end, just like the standard tube end fittings. Use them instead of a union or coupling to make a zero volume butt connection.

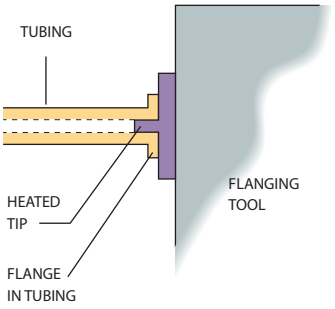
Package of 5:		PEEK		CTFE	
	Tubing OD	*Prod No*	*Price*	*Prod No*	*Price*
	1/16"	CEN1PK		CEN1KF	
	1/8"	CEN2PK		CEN2KF	

Flanging Tool, Starter Kit

Cheminert flanging tools

The flanging tool makes the flange which retains the standard 1/4-28 tube end fitting and washer on PTFE or FEP tubing. With this tool, lengths of tubing may be easily assembled to any required dimension. The time required is approximately 5 to 10 seconds per flange.

Flanging tools are available for 110 VAC or 230 VAC, and come complete with tips for 0.75 mm, 1.0 mm, and 2.00 mm ID tubing, a tubing holder for gripping the tubing during the flanging operation, a razor blade for tube cutting, and instructions.



Flange being made on tubing

		Prod No	*Price*
Flanging tools	110 VAC	CFT-110	
	230 VAC	CFT-220	
Flanging tool accessories			
Flanging tips			
	for tubing ID ≤ 0.25 mm	CFT-TXC	
	for tubing ID ≤ 0.75 mm	CFT-TC	
	for tubing ID ≤ 1.00 mm	CFT-TM	
	for tubing ID ≤ 1.50 mm	CFT-TL	
	for tubing ID ≤ 2.00 mm	CFT-TXL	
Razor blades *(pkg /10)*		CFT-R	
Tubing holder		CFT-H	

Cheminert starter kits

Starter kits come in either 1/16" or 1/8" versions, with flanging tools for 110 VAC or 230 VAC.

	110 VAC		**230 VAC**	
	Prod No	*Price*	*Prod No*	*Price*
Starter kits				
1/16" tubing	CFT1K-110		CFT1K-220	
1/8" tubing	CFT2K-110		CFT2K-220	

The starter kit includes:

- 1 flanging tool with 3 flanging tips
- 1 tubing holder
- 20 standard tube end fittings
- 20 stainless steel washers
- 10 couplings
- 20 feet of PTFE tubing
  (1/16" OD x 0.030" ID
  or
  1/8" OD x .060" ID)
- 1 male luer adapter
- 1 female luer adapter
- 1 plug
- 1 tee
- 1 glass connector

MORE INFORMATION

Standard tube end fittings ..... page 69
Stainless steel washers 69
Couplings 72
Male luer adapter 76
Female luer adapter ... 76
Plug 71
Tee 74
Glass connector 75

Starter Kit, Low Pressure Plugs and Caps

Easy-Flange kit

The Easy-Flange flange-rolling tool uses mechanical force to form a flange on 1/16" - 1/8" OD PTFE tubing, offering an excellent non-electric alternative to the heated flanging tool.

The quality of the flange is excellent, since it is formed without stressing the tubing by heat. The specially designed negative conical profile of the flange-forming component yields an ideal shape for maximum sealing properties.

	Prod No	*Price*
Easy-Flange kit	JR-201540	
Includes:		
Plastic box		
Flanging discs with:		
0.5 mm SS pin for PEEK tubing		
0.8 mm polymer pin		
0.8 mm titanium pin		
1.3 mm polymer pin		
1.3 mm titanium pin		
Clean-cut tubing cutter		
PTFE tubing, 1/16" x 0.75 mm ID, 6 ft.		

Plugs *1/4-28*

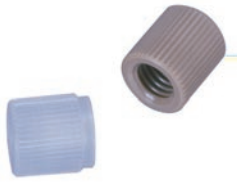
Plugs can be used to close off an unused port in a 1/4-28 valve or manifold.

	PEEK		**CTFE**	
Package of 5:	*Prod No*	*Price*	*Prod No*	*Price*
	CPPK		CPKF	

Low pressure PEEK plugs *10-32*

These all-PEEK plugs are for use in Cheminert PEEK fittings and low pressure polymeric valves (C20Z and C30Z series). For high pressure polymeric valves (C1-C5 series), use plugs on page 64.

		PEEK	
*Package of 1:Length of nut**		*Prod No*	*Price*
1/16" hex	.62"	MZP1PK	
1/16" long hex	.87"	LZP1PK	
1/16" fingertight	.88"	ZP1FPK	



Caps *1/4-28*

Caps are used to close off lines with 1/4-28 tube end fittings.

	PEEK		**CTFE**	
Package of 5:	*Prod No*	*Price*	*Prod No*	*Price*
	CCPK-5		CCKF-5	

MORE INFORMATION

Clean-cut tubing cutter ..... page 90
Tightening tool for hex-head PEEK nuts. . 67

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

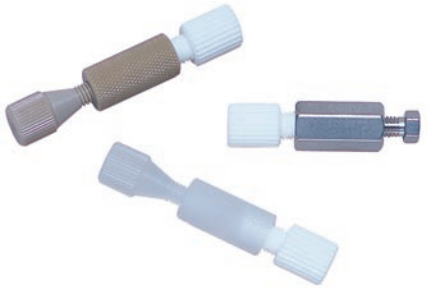
Low Pressure Unions

Unions — *Cheminert to Cheminert* — *1/4-28 to 1/4-28*

Includes flangeless 1/4-28 fittings for tubing OD indicated. Polypropylene unions are for use with flanged tubing only.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*	Polypropylene *Prod No*	*Price*
1/16"	0.25 mm	CUCPK		CUCKF		–	
1/16"	0.50 mm	CUPK		CUKF		–	
1/16"	0.75 mm	CUMPK		CUMKF		–	
1/8"	1.50 mm	CULPK		CULKF		–	
1/8"	Butt connection	CUTPK		CUTKF		CUTPP * (* pkg/5)	

Unions — *Cheminert to 1/16" ZDV* — *1/4-28 to 10-32*



Includes flangeless 1/4-28 and ZDV 10-32 fittings for 1/16" tubing.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*	316 Stainless *Prod No*	*Price*
1/16"	0.25 mm	CZUCPK		CZUCKF		CZUCS6	
1/16"	0.50 mm	CZUPK		CZUKF		CZUS6	
1/16"	0.75 mm	CZUMPK		CZUMKF		CZUMS6	

Unions — *Cheminert to 1/4" tubing* — *1/4-28 to 1/2-20*

Includes flangeless 1/4-28 and 1/2-20 fittings.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*
1/8" to 1/4"	1.50 mm	CU4LPK		CU4LKF	

Components	*Prod No*	*Price*
1/2-20 nut, CTFE	CFL-4KF	
1/2-20 nut, Delrin	CFL-4D	
CTFE ferrule	CFL-CB4KF-S	

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
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7.0 mm = .275"
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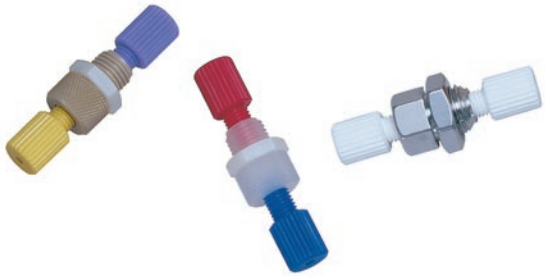
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Bulkhead unions — *Cheminert to Cheminert* — *1/4-28 to 1/4-28*

Includes flangeless 1/4-28 fittings for tubing OD indicated.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*	316 Stainless *Prod No*	*Price*
1/16"	0.25 mm	CBUCPK		CBUCKF		CBUCS6	
1/16"	0.50 mm	CBUPK		CBUKF		CBUS6	
1/16"	0.75 mm	CBUMPK		CBUMKF		CBUMS6	
1/8"	1.50 mm	CBULPK		CBULKF		CBULS6	



Bulkhead unions — *Cheminert to 1/16" ZDV* — *1/4-28 to 10-32*

Includes flangeless 1/4-28 and ZDV 10-32 fittings for 1/16" OD tubing.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*	316 Stainless *Prod No*	*Price*
1/16"	0.25 mm	CZBUCPK		CZBUCKF		CZBUCS6	
1/16"	0.50 mm	CZBUPK		CZBUKF		CZBUS6	
1/16"	0.75 mm	CZBUMPK		CZBUMKF		CZBUMS6	

Low Pressure Tees, Crosses, and Manifolds

Tees *1/4-28*

Includes flangeless 1/4-28 fittings for tubing OD indicated.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*
1/16"	0.25 mm	CTCPK		CTCKF	
1/16"	0.50 mm	CTPK		CTKF	
1/16"	0.75 mm	CTMPK		CTMKF	
1/8"	1.50 mm	CTLPK		CTLKF	

Crosses *1/4-28*

Includes flangeless 1/4-28 fittings for tubing OD indicated.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*
1/16"	0.25 mm	CXCPK		CXCKF	
1/16"	0.50 mm	CXPK		CXKF	
1/16"	0.75 mm	CXMPK		CXMKF	
1/8"	1.50 mm	CXLPK		CXLKF	

Manifolds *1/4-28*

Includes flangeless 1/4-28 fittings for tubing OD indicated.

Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*
5 ports					
1/16"	0.75 mm	C5M1PK		C5M1KF	
1/8"	1.50 mm	C5M2PK		C5M2KF	
9 ports					
1/16"	0.75 mm	C9M1PK		C9M1KF	
1/8"	1.50 mm	C9M2PK		C9M2KF	

MORE INFORMATION

Flangeless tube end fittings ..... page 68

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
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1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Mixing tees

1/4-28

Includes flangeless 1/4-28 fittings for tubing OD indicated.

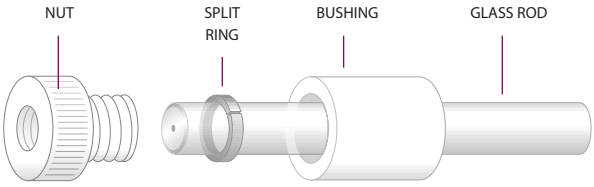
Tubing OD	*Bore*	PEEK *Prod No*	*Price*	CTFE *Prod No*	*Price*
1/16"	0.75 mm	CM1XPK		CM1XKF	
1/8"	1.50 mm	CM2XPK		CM2XKF	

Glass connectors

1/4-28 female to 1/4" glass tube

Glass connectors join a Cheminert tube end fitting to 1/4" OD glass tubing. They are available as individual components or as complete assemblies. Assemblies include a bushing and nut, a polypropylene or CTFE split ring, and a 1/4" OD x 3-1/4" long piece of 1 mm or 2 mm ID glass tube. This connector works only with our glass tubes.

Description	Acetal *Prod No*	*Price*	CTFE *Prod No*	*Price*
Complete assembly				
1 mm ID glass tubing	CGC41		CGC41KF	
2 mm ID glass tubing	CGC42		CGC42KF	
Components				
Bushing	CGCB		CGCBKF	
Nut	CGCN		CGCNKF	
Glass rod, 3-1/4" long				
1 mm ID	CGCG41		–	
2 mm ID	CGCG42		–	
Split rings *(package of 5)*	CGCR		CGCRKF	



Glass connector

Adapters

Tube adapters

1/4-28

Tube adapters have male 1/4-28 threads going to 1/4" or 1/8" OD tubing.

Tubing		**PEEK**		**CTFE**		**316 Stainless**	
OD	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
1/8"	1.5 mm	CTA2PK		CTA2KF		CTA2S6	
1/4"	1.5 mm	CTA4PK		CTA4KF		CTA4S6	

Luer adapters

Luer to 1/4-28 or 10-32

Luer adapters make a leak-tight connection from male or female luer to 1/4-28 threads.

		PEEK		**CTFE**		**PFA**	
Description	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Female luer							
to 1/4-28	1.50 mm	CFLAPK		CFLAKF		CFLAPFA	
to 10-32	0.75 mm	ZUFLPK		ZUFLKF		–	
Male luer							
to 1/4-28	1.50 mm	CMLAPK		CMLAKF		CMLAPFA	

Luer adapter bulkhead unions

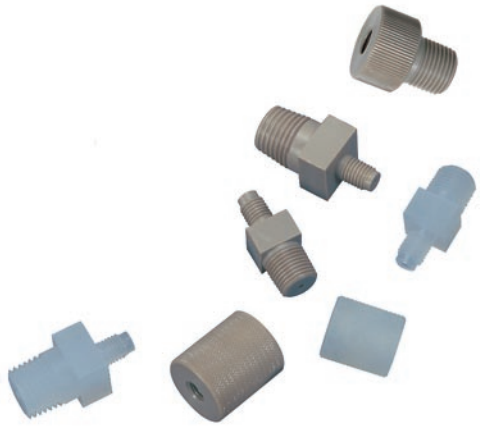
Luer to 1/4-28 or 10-32

Our luer adapter bulkhead union connects a male or female luer to 1/4-28 or 10-32 fittings. These are the ideal fittings for through-the-panel syringe injections. The 1/4-28 versions include flangeless fittings for 1/16" OD tubing. Versions with 10-32 connections (for 1/16" OD tubing) include a fingertight PEEK nut and a ferrule of the same material as the union.

		PEEK		**CTFE**	
Description	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
Female luer					
to 1/4-28	1.50 mm	CBUFLPK		CBUFLKF	
to 10-32	1.00 mm	ZBUFLPK		ZBUFLKF	
Male luer					
to 10-32	1.00 mm	ZBUMLPK		ZBUMLKF	

Pipe adapters

1/4-28 to NPT



Versions adapt male or female 1/4-28 fittings to male or female NPT.

		PEEK		CTFE	
NPT	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
Female 1/4-28 to male NPT					
1/8"	1.5 mm	CPA2PK		CPA2KF	$18
1/4"	1.5 mm	CPA4PK		CPA4KF	
Male 1/4-28 to male NPT					
1/8"	1.5 mm	CEPA2PK		CEPA2KF	
1/4"	1.5 mm	CEPA4PK		CEPA4KF	
Female 1/4-28 to female NPT					
1/8"	1.5 mm	CFPA2PK		CFPA2KF	
1/4"	1.5 mm	CFPA4PK		CFPA4KF	

Cheminert 1/4-28 to Valco 10-32 ZDV adapter

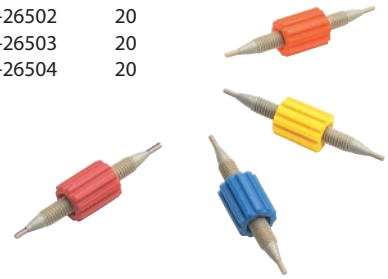
This adapter permits Valco 10-32 fittings to be installed into any 1/4-28 fitting detail. (Nut and ferrule are not included.)

Description	*Bore*	*Prod No*	*Price*
Port adapter	0.50 mm	ZLCA1PK	

One-piece fingertight column coupler

Choose from a variety of coupler IDs, indicated by the color of the sleeve (which parallels the color-coding of our PEEK tubing on page 89). A unique feature of this column coupler is that it adapts automatically to fit all pilot lengths – Valco, Waters, Upchurch, Rheodyne, etc. Since the tubing bottoms out in any fitting detail, added void volume is minimal. Material is PEEK.

Color	*Bore*	*Prod No*	*Price*
Red	0.13 mm ID	JR-26501	$20
Yellow	0.17 mm ID	JR-26502	20
Blue	0.25 mm ID	JR-26503	20
Orange	0.50 mm ID	JR-26504	20



0.25 mm = .010"
0.50 mm = .020"
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1.0 mm = .040"
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27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
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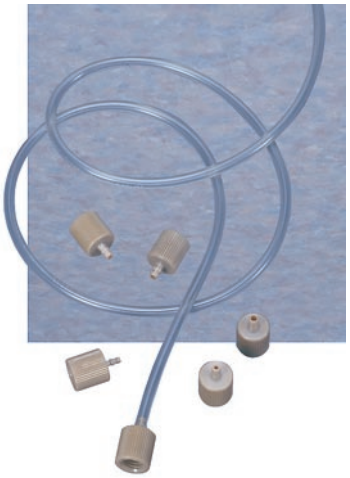
1/2" = 12.7 mm

Filters and Perifit Fittings

Perifit fittings for peristaltic pump tubing



The Cheminert Perifit is a unique fitting with a barb on one end and a 1/4-28 female fitting on the other end, for connecting a FIA line with the most commonly used peristaltic tubing. The fitting is compact and easy to install while providing a secure, trouble-free connection. A Perifit can be used as a "stop" on standard inexpensive Tygon® tubing, eliminating the need to buy the more expensive pre-cut tubing with pre-installed stops. Unlike many competitive systems, Perifits are reusable as the tubing wears.

Three sizes of Perifits are available to cover the range of tubing most commonly used in FIA.

For use with tubing sizes	*Prod No*	*Price*
0.50 to 1.02 mm ID	C-PFS	
1.12 to 1.65 mm ID	C-PFM	
1.85 to 2.29 mm ID	C-PFL	
Kit with 2 of each size above	C-PF	

In-line filters *1/4-28*

These convenient filters can be simply dropped into any 1/4-28 fitting detail. Constructed of PTFE and CTFE, with 316 stainless low-pressure-drop screen. (Fitting shown is not included.)

Pore size	*Prod No*	*Price*
2 micron	CFE-S2	
10 micron	CFE-S10	
75 micron	CFE-S75	

Biocompatible filter

This all-PEEK filter can be placed in any 1/16" line, providing filtration to 0.5 microns. The filter can be changed without tools, since both the filter housing and the fittings are designed to be hand tightened.

Tubing OD	*Bore*	*Prod No*	*Price*
1/16"	0.5 mm	ZU1FPK.5	

Replacement elements (PEEK-encapsulated titanium)

Pore size	*Prod No*	*Price*
0.5 micron	C-F1.5TI	

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
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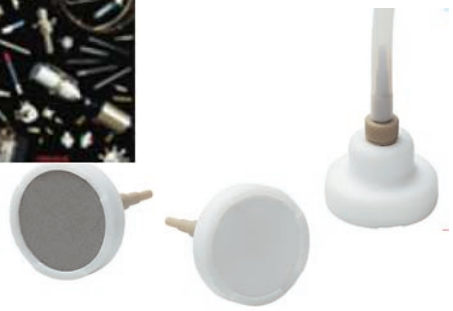


Last Drop mobile phase filter

The Last Drop mobile phase filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. The flat filter element sits parallel to the bottom of the reservoir, allowing the Last Drop to filter all but the last 2% of the mobile phase from the reservoir without drawing air into the system. Compare this with conventional cylindrical filters that can begin to draw air into the system when nearly 10% of the solvent remains in the reservoir.

The Last Drop mobile phase filter consists of a 316 stainless or PTFE filter element pressed into an inert PTFE housing. The top of the housing has a PEEK tripod which slips into 1.5, 2.2, or 3.5 mm ID pump inlet lines. It will also work with our 1/16" and 1/8" flangeless fittings.

Use the metal-free PTFE version for sensitive biochromatography applications where metal surfaces may corrode or interact with samples.

	Filter element	*Prod No*	*Price*
Last drop filter, 2.5µm	PTFE	JR-9000-0520	
	Stainless steel	JR-9000-0530	

Last Drop filter/spargers

The Last Drop filter/sparger combines filtration and sparging in a single unit. The PTFE housing contains a mobile phase filter with either a stainless steel or a PTFE filter element. The filter/sparger features a PEEK tripod connector for the solvent line, and a nut and ferrule for the sparging line.

	Filter element	*Prod No*	*Price*
Last drop filter/sparger			
2.5 µm filter, 10 µm sparger	PTFE	JR-9000-0602	
	Stainless steel	JR-9000-0640	

Filters

No-Met biocompatible mobile phase filter

Stainless steel in the flowpath is not acceptable in a growing number of applications involving the separation of biomolecules. High salt buffers can corrode stainless steel, and the metal ions released from metallic filters may contaminate or otherwise react with the biomolecules of interest.

The No-Met polyethylene filter is designed for these applications, with inert polymeric fittings and 20 µm filter effectively eliminating metal contamination from the fluid path. Use them for IC and biochromatography applications.

Because they are hydrophobic, No-Met filters may initially require some priming with methanol or acetonitrile.

	Prod No	*Price*
No-met mobile phase filter, 1/8"	JR-32178	
Replacement element	JR-32179	

Stainless steel mobile phase filters and helium spargers

Mobile phase filters protect your HPLC system from small particles in the mobile phase. These filters are made from 316 stainless and PEEK or PTFE, and are suitable for use with most solvents.

Helium spargers offer an inexpensive way to prepare and maintain mobile phases free of dissolved gases. Connect these spargers to a regulated supply of helium gas (0-400 ml/min) to remove dissolved gases from the mobile phase. Spargers are made from 10 micron porosity stainless steel.

Tubing OD	*Porosity*	*Suggested Max. Flow Rate (ml/min)*	*Prod No*	*Price*
1/16"	2 µm	8	JR-367016-2	
1/16"	10 µm	20	JR-367016-10	
1/16"	20 µm	20	JR-367016-20	
1/8"	2 µm	8	JR-367008-2	
1/8"	10 µm	20	JR-367008-10	
1/8"	20 µm	20	JR-367008-20	

Mobile phase filters *Direct connect*

Cheminert mobile phase filters provide point-of-use filtering of common HPLC or FIA solvents. They are designed to connect directly to 1/8" OD PTFE or PEEK tubing using a simple press fit. The filter housing is PTFE and includes a 2 or 10 micron titanium frit.

Pore size	*Prod No*	*Price*
2 micron	C-MPFTI2	
10 micron	C-MPFTI10	

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Mobile phase or solvent reservoirs *1/4-28*

These high density polyethylene reservoirs for in-line solvent use come with polypropylene caps, 1/4-28 flangeless fittings, and 1/8" PTFE tubes for one or two lines plus vent. Plugs are included for conversion to solvent storage when the reservoir is removed from the system. Optional PTFE filters with titanium frits are available on the facing page.

Capacity	*Cap*	*Prod No*	*Price*
0.5 liter	2-hole	C-MPR2	
0.5 liter	3-hole	C-MPR3	
0.5 liter	plain	C-BOT16	
1.0 liter	plain	C-BOT32	

VICI-cap

The VICI-cap is the most economical way to helium sparge and deliver HPLC mobile phases. The insert is manufactured from PTFE with an EPDM* O-ring and a polypropylene screw cap.

The VICI-cap is available for either GL45 or S40 threaded bottles. It has a 1/4-28 female port and three ports for tubing insertion: two 1/8" tubing ports and a 1/16" tubing port. The tubing ports are made so that you push the tubing through the hole, while 1/4-28 fittings provide the best connection. Unused ports can be plugged as required.

	Prod No	*Price*
VICI-cap GL-45	JR-9000-0001	
VICI-cap S40	JR-9000-0006	

Valves for vials

The screw-cap Mininert is available in a variety of sizes. The crimp-top valve for 13 mm ID glassware slides into the neck of the vial and features a threaded flange, which is turned to provide a leak-tight fit.

Pkg/12:	*Cap/thread size*	*Prod No*	*Price*
	13 mm-425	PS-614158	
	15 mm-425	PS-614160	
	18 mm-400	PS-614161	
	20 mm-400	PS-614170	
	24 mm-400	PS-614163	
	Crimp top	PS-614250	

*Ethylene Propylene Diene Monomer

MORE INFORMATION

Bulkhead connectors .... page 73
Flangeless fittings 68
Plugs..... 71
Polymeric tubing..... 90

TECH TIP

The VICI-cap is not usable for building up a helium atmosphere within the solvent bottle. It is only designed for continuous helium sparging.

Liquid Handling Products

Diluter/Dispensers, M Series

- Full liquid handling functionality
- Self-priming
- No syringes
- Largest volume range available
- Easy to use Wizard format does away with math problems and charts

Cheminert M Series diluter/dispensers simplify the sample preparation process for dispensing and diluting liquids. The user-friendly Wizard format eliminates all the math calculations and charts usually associated with diluting and dispensing applications. Just enter the dilution ratio and the final volume, and the correct volume is calculated and automatically dispensed for each ratio.

For multiple dispenses, you simply enter the volume and the number of dispense repetitions, and the Wizard calculates the total volume to be aspirated. It's that easy!

The diluter/dispenser is built around a patented syringe-free, bi-directional, positive displacement pump. This design approach gives the largest volume range available, and eliminates the inconvenience of having to change and refill syringes.

Additional Features

"Smart" hand probe
The hand probe signals the operator when an aspirate or dispense step is completed. The unique design also allows the use of fixed or disposable probe tips, as well as other accessories.

Program memory
Up to 100 programs can be permanently stored.

Multi-solvent option
A multiposition stream selection valve can be easily integrated with the pump for multi-solvent applications.

Printer option
Print out methods, sequential steps, time/date/operator stamp, titration and tubing volume values.

Patents pending

M10 Diluter/Dispensers

	Prod No	*Price*
10 nl - 10 ml – M10 diluter/dispenser	CD10-4841-M1A	

M50 Diluter/Dispensers

	Prod No
50 µl - 50 ml – M50 diluter/dispenser	CD50-8182-M2A

Applications

- Simple dispensing of reagents using the manual dispense mode
- Micro dispensing in microplates and genomic arrays
- Dilutions for AA, ICP, GC, and HPLC samples
- Serial dilutions for all samples
- Multi-sample and reagent additions, micro-plates, tube to plate, tube to tube
- Small and large volume dispensing of reagents
- Titrations

Liquid Handling Pumps, M Series

The Cheminert® M Series liquid handling pump* is a syringe-free pump capable of delivering a bidirectional flow over six orders of magnitude.

The M Series is a positive displacement pump, which means that it is self-priming and tolerant of any gas which may find its way into the fluid lines. There is no separate fill cycle, and the capacity is unlimited.

RS-232 and RS-485 communication protocols are incorporated into the microprocessor-driven controller. (USB interface requires an adapter.) The included software package controls flow rates, flow direction, and metered volumes.

Operating principle

At the core of the pump is a polymeric rotor housing four 1/8" diameter pistons in sapphire cylinders. As the microstepper motor turns the rotor, the pistons float on a stationary cam; at any given moment, one piston is filling, one is dispensing, and the other two are in transit between the fill and dispense positions.

M6 pumps — *10 nl - 10 ml*

	Prod No
M6 pump with:	
Controller and stepper motor	CP2-4841-100M1
Stepper motor (no controller)	CP2-4841-100SM
M6 pump only	CP2-4841-100D

M50 pumps — *50 µl - 50 ml*

	Prod No
M50 pump with:	
Controller and stepper motor	CP3-8182-625M2
Stepper motor (no controller)	CP3-8182-625SM2
M50 pump only	CP3-8182-625D

Accessories and replacement parts

	Prod No
Pump motor	
M6	CP-DSM
M50	CP-DSM2
Controller, MicroLynx-4	CP-CM1-P

SPECS

	M6	M50
Continuous minimum dispense	100 nl	50 µl
Continuous maximum dispense	5 ml/min	25 ml/min
Maximum back pressure	100 psi	100 psi
Gravimetric precision		
for 125 µl	0.5%	0.8%
for 1.25 ml	0.05%	0.1%
Pump internal volume (µl)	100 ± 2 µl	625 ± 10 µl

Applications

- Flow cytometry, cell and drug perfusion
- HTS and robotic systems
- Infusion and micro-dialysis
- Micro diluters/dispensers for nl to ml range applications
- Micro liquid transfers (nl) for micro arrays
- Microtiter plate dispensing using multiposition valves

* Patent No. 6,079,313

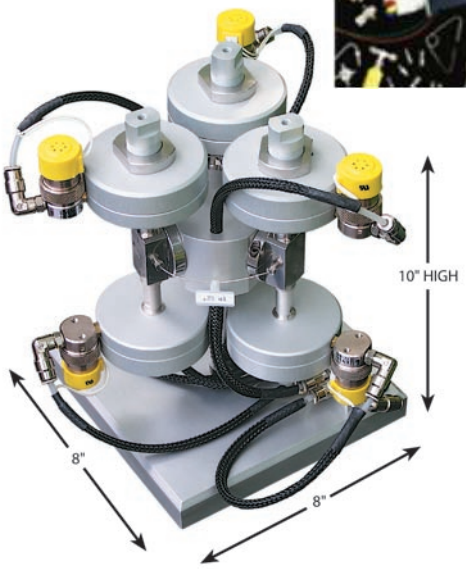
Ultra-High Pressure Injector System

40,000 psi ultra-high pressure injector system

The VICI 40K injector is comprised of six miniature air actuated needle valves, plumbed to simulate the flow path of a conventional rotor/stator injector. An integral controller sends the on/off positioning signals to each valve, coordinating them to perform load, inject, and flush functions. For more information, contact our technical department.

There are three methods for sending positioning commands to the injector:

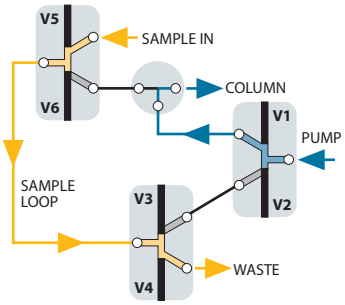
- Manual control with the pushbuttons on the controller
- Laboratory computer via serial port communication
- Contact closure inputs



Ultra-high pressure injector system

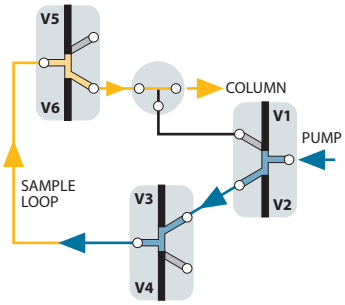
Prod No	*Price*
SPSS40	

Ultra-high pressure injector system schematic



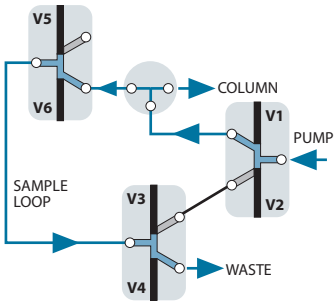
Load

V1 Open V4 Open
V2 Closed V5 Open
V3 Closed V6 Closed



Inject

V1 Closed V4 Closed
V2 Open V5 Closed
V3 Open V6 Open



Flush

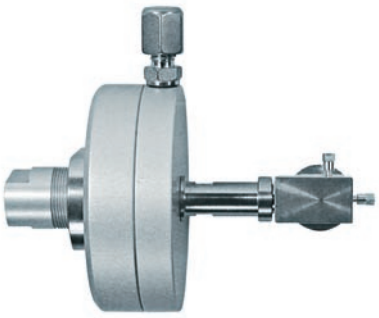
V1 Open V4 Open
V2 Closed V5 Closed
V3 Closed V6 Open

Patent No. 6,079,313

NEW 40,000 psi ultra-high pressure valves

The ultra-high pressure valves that are the heart of our SPSS40 *(previous page)* are now available individually, in 1/16", 1/32", and 360 micron versions. There are three types – a two port on/off valve, a dual on/off valve, and a 3-way prime/purge valve. *(See page 213 for flowpath schematics.)* The dual on/off configuration has two individually controlled outlets with a common inlet (or vice versa), emulating a rotary three way valve.

Implementation requires a single three-way solenoid: application of 50 psi opens the valve; venting the air allows the spring to return the valve to the closed position. A fitting for 1/8" air supply tubing is included; two fittings are included for dual valves. *(Fitting: prod no EAOR21. See page 219.)*



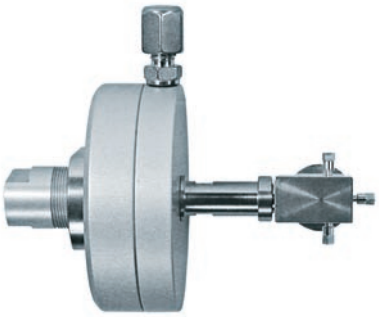
On/off valve
360 µm ZDV fittings

On/off valves

SPECS

Temp	Pressure
50°C	40,000 psi

Fitting size	Bore	Prod No	Price
360 µm	0.15 mm	ASFVO40K360	
1/32"	0.15 mm	ASFVO40K.5	
1/16"	0.15 mm	ASFVO40K1	



Prime/purge valve
360 µm ZDV fittings

Prime/purge valves

SPECS

Temp	Pressure
50°C	40,000 psi

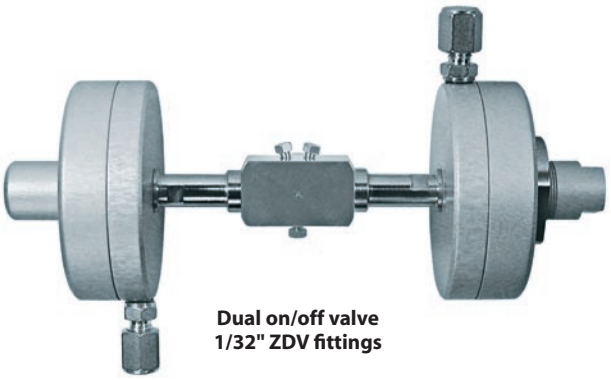
Fitting size	Bore	Prod No	Price
360 µm	0.15 mm	ASFV40K360	
1/32"	0.15 mm	ASFV40K.5	
1/16"	0.15 mm	ASFV40K1	

Dual on/off valves

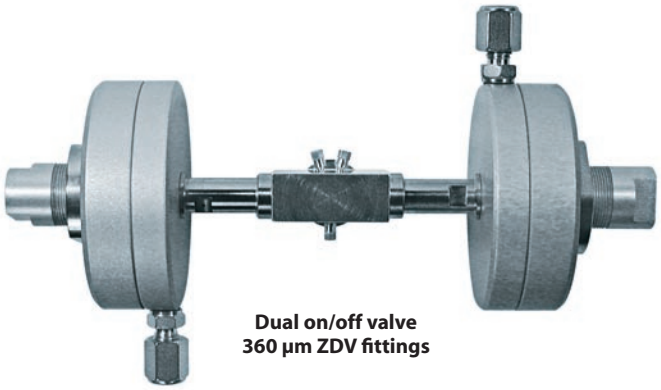
SPECS

Temp	Pressure
50°C	40,000 psi

Fitting size	Bore	Prod No	Pri
360 µm	0.15 mm	ASFVOD40K360	
1/32"	0.15 mm	ASFVOD40K.5	
1/16"	0.15 mm	ASFVOD40K1	

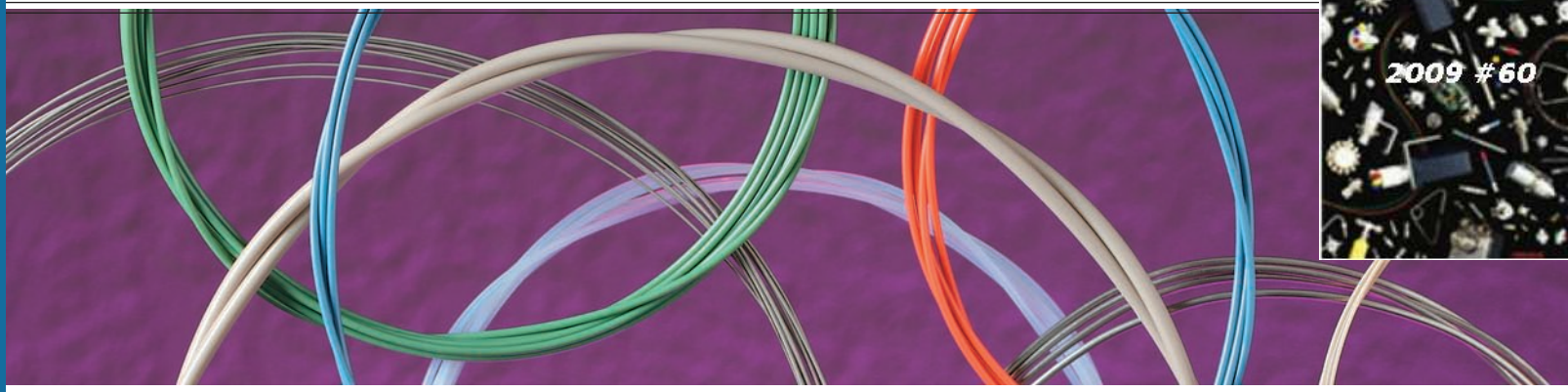


Dual on/off valve
1/32" ZDV fittings



Dual on/off valve
360 µm ZDV fittings

TECH TIP
Three dual on/off valves comprise the ultra-high pressure injector system, SPSS40, on the facing page.



Tubing

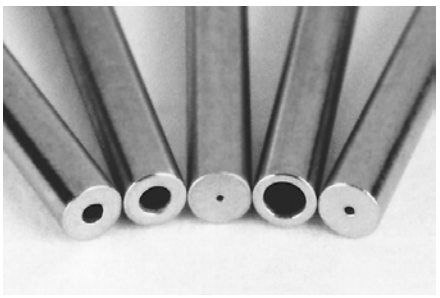
We offer chromatography grade tubing in ODs of 360 µm, 1/32", 1/16", and 1/8". Tubing can be ordered in economical pre-cut standard lengths, or can be custom cut to meet your specific instrumentation requirements. All VICI metal tubing is chromatographic grade seamless drawn tubing of the highest available quality. Stainless tubing is 316 series.

Cutting and Cleaning

The improper cutting and cleaning of metal tubing is the largest single cause of chromatographic problems and premature valve failure. The use of our precision cut and finished tubing with VICI fittings and valves maintains the flow uniformity and cleanliness that high performance systems require.

VICI's electrolytic cutting process yields polished tubing with flat ends, minimizing the potential for dead volumes or leaks caused by the uneven ends and burrs left by the tools common in the general laboratory environment – wire cutters, files, jewelers' saws, and most tubing cutters. These non-precision cutters are likely to generate particulates and deform inner and outer diameters, which can introduce dead volume and flow anomalies.

Each piece of VICI pre-cut metal tubing is specially cleaned with micro-filtered steam from deionized water to remove both organic and inorganic contaminants, representing a major improvement over the common practice of using organic solvents to "clean" tubing. Our test reports have been confirmed by most of the major instrument suppliers: the VICI process provides analytically clean tubing.



Electrolytically cut and polished

File cut

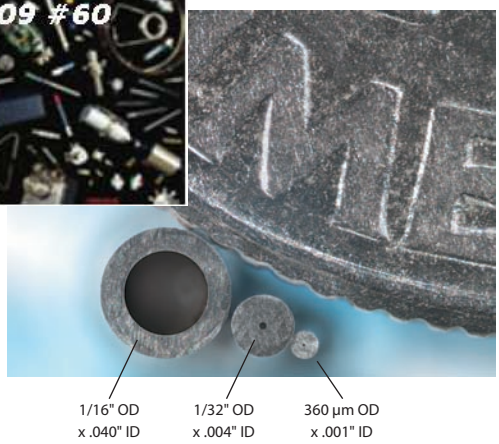
Plier cut

TECH TIP
Forty years of Valco experience show that the particles left in poorly cut tubing are the number one cause of valve damage.

TECH TIP
For optimal zero dead volume connections, make sure your tubing meets the best industry standards—OD tolerance should be nominal dimension ± .002".

Fractional dimension	Nominal dimension
1/32"	.031
1/16"	.062
1/8"	.125
1/4"	.250
3/8"	.375
1/2"	.500

Electroformed Nickel Tubing

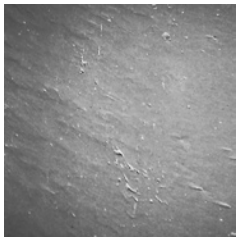


Three sizes of electroformed nickel tubing

Our microbore EFNi tubing is made by electroplating nickel over a diamond-drawn mandrel in a continuous process. When the mandrel is removed, an internal surface with a mirror-like 1-2 microinch finish remains. The ductile nature of nickel allows the tubing to be easily manipulated. Unlike glass- or silica-lined stainless, EFNi can accept tight bends and cutting without heating, and does not release damaging glass fragments or silica particles.

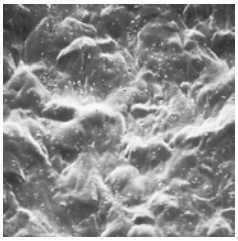
A comparison of the interiors of commonly used tubing (below) shows the quality of the electroformed nickel tubing surface. (All photos are x500 magnification.) The rough interior surface of the mill-drawn Nickel 200 tubing has potential for carryover or cross contamination, and both the Nickel 200 and the stainless steel contain pits, voids, striations, and particles – problems which intensify as the ID decreases.

Custom IDs/ODs are available upon request.



Electroformed nickel (EFNi)

Nickel 200 alloy



Type 316 stainless steel

PRICING PER FOOT
For pricing purposes, the length is rounded up to the next foot. For example, a 5" piece is charged as one foot; an 18" piece as two feet. The price per foot is based on the length of each piece, not the total quantity ordered. Cutting and cleaning charges are included in the price per foot for EFNi tubing.

0.05 mm = .002"
0.10 mm = .004"
0.12 mm = .005"

0.25 mm = .010"
0.50 mm = .020"
0.75 mm = .030"

1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

4.6 mm = .180"
6.0 mm = .236"
6.4 mm = .253"

7.0 mm = .275"
10.0 mm = .400"

27.0 mm = 1.08"

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

360 µm OD EFNi tubing — *Custom lengths*

Prices are per foot. See pricing note in box at left.

Tubing ID	*Prod No*	*Max length*	*1-9 feet*	*10-24 feet*	*25-50 feet*
.001"	TEFNI.101	1 foot			
.002"	TEFNI.102	2 feet			
.004"	TEFNI.104	20 feet			
.005"	TEFNI.105	30 feet			
.007"	TEFNI.110	50 feet			

1/32" OD EFNi tubing — *Custom lengths*

Prices are per foot. See pricing note in box at left.

Tubing ID	*Prod No*	*Max length*	*1-9 feet*	*10-24 feet*	*25-50 feet*
.002"	TEFNI.502	2 feet			
.004"	TEFNI.504	20 feet			
.005"	TEFNI.505	30 feet			
.007"	TEFNI.507	50 feet			
.010"	TEFNI.510	50 feet			
.012"	TEFNI.512	50 feet			
.015"	TEFNI.515	50 feet			
.020"	TEFNI.520	50 feet			

1/16" OD EFNi tubing — *Custom lengths*

Prices are per foot. See pricing note in box at left.

Tubing ID	*Prod No*	*Max length*	*1- 9 feet*	*10-24 feet*	*25-50 feet*
.020"	TEFNI120	50 feet			
.030"	TEFNI130	50 feet			
.040"	TEFNI140	50 feet			

PEEK Tubing – Natural

PEEK tubing has the strength required to withstand continuous use at HPLC pressure without swelling or bursting, and is not affected by halide salts, high strength buffers, or other aggressive mobile phases that corrode stainless steel. The polymer surface will not leach metal ions into the eluent or extract metal-sensitive components from the sample. Note however that dichloromethane, THF, and DMSO may cause swelling in PEEK, and concentrated nitric and sulphuric acid will attack PEEK.

OD and ID tolerances for our PEEK tubing are ±.0005" for 360 micron and 1/32" tubing; ±.0005" for 1/16" tubing with ID up to .010" and ±.001" for IDs above .010"; and ±.003" for 1/8".

360 µm PEEK tubing

Custom lengths

Custom-length 360 µm PEEK tubing is square-cut and ready to use. Specify the length required, in inches or feet. For pricing of custom length tubing, the length is rounded up to the next foot. For example, a 5" piece is charged as one foot; an 18" piece as two feet.

	.002" ID		.004" ID		.005" ID		.006" ID	
	Prod No	*Price/ft*	*Prod No*	*Price/ft*	*Prod No*	*Price/ft*	*Prod No*	*Price/ft*
Priced per foot	TPK.102		TPK.104		TPK.105		TPK.106	

1/32" OD PEEK tubing

	.0025" ID		.005" ID	.010" ID	.015" ID
Length	*Prod No*	*Price*	*Prod No*	*Prod No*	*Prod No*
10 feet	TPK.502-10FT		TPK.505-10FT	TPK.510-10FT	TPK.515-10FT
25 feet	TPK.502-25FT		TPK.505-25FT	TPK.510-25FT	TPK.515-25FT
100 feet	TPK.502-100FT		TPK.505-100FT	TPK.510-100FT	TPK.515-100FT

1/16" OD PEEK tubing

	.006" ID		.010" ID	.020" ID	.030" ID
Length	*Prod No*	*Price*	*Prod No*	*Prod No*	*Prod No*
10 feet	TPK106-10FT		TPK110-10FT	TPK120-10FT	TPK130-10FT
25 feet	TPK106-25FT		TPK110-25FT	TPK120-25FT	TPK130-25FT
100 feet	TPK106-100FT		TPK110-100FT	TPK120-100FT	TPK130-100FT

1/8" OD PEEK tubing

	.060" ID	
Length	*Prod No*	*Price*
10 feet	TPK260-10FT	
25 feet	TPK260-25FT	
100 feet	TPK260-100FT	

MORE INFORMATION

Polymeric tubing

PTFE ..... page 90
FEP..... 90
ETFE..... 90

CUSTOM PEEK TUBING

We offer PEEK tubing custom-manufactured to meet your specific OD, ID, and color requirements. The OD range is .014" (360 micron) to 1/8", with a minimum ID of .002" for tubing up to 1/16" OD. (Maximum ID varies according to the OD.) Color coding can be solid or striped.

PEEK TUBING ELBOWS

Tubing elbows (90° and 180°) are ideal for routing 1/16" PEEK tubing through an LC system. These elbows are proportioned to bend PEEK tubing at the optimum radius for maximum chemical resistance and burst pressure. Installation is simple – just snap the tubing into the elbow.

Package of 5:	*Prod No*
90° elbow	JR-357090-5
180° elbow	JR-357180-5

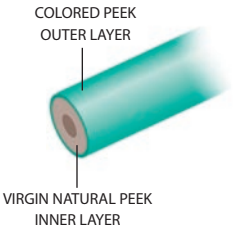
PEEK Tubing – Color-coded

Color-coded tubing helps you identify the ID of your PEEK tubing – each ID is coded with a different color. Use this tubing where maximum chemical resistance and biocompatibility are required.

NEW 1/16" OD dual layer color-coded PEEK tubing — *Custom lengths*

Our dual layer PEEK tubing eliminates any concern that a critical sample stream could be contaminated by pigments used to color code the tubing. It looks like any other color-coded tubing at first glance, but a closer look reveals that the pigmented layer* surrounds a separate but integrally-bonded inner layer of natural PEEK.

Tubing ID	*Color*	*bar*	*psi*	*Prod No*	*Price per foot*
.004"	Black	460	6700	JR-TD-5804	
.005"	Red	420	6100	JR-TD-6007	
.007"	Yellow	400	5800	JR-TD-6008	
.010"	Blue	386	5600	JR-TD-6009	
.020"	Orange	350	4500	JR-TD-6010	
.030"	Green	240	3500	JR-TD-6011	



1/16" OD striped color-coded PEEK tubing — *Custom lengths*

A stripe* is added to the outside, so dye never contacts the fluid stream.

Specify the length required, in inches or feet. For pricing custom tubing, the length is rounded up to the next foot. For example, a 5" piece is charged as one foot; an 18" piece as two feet.

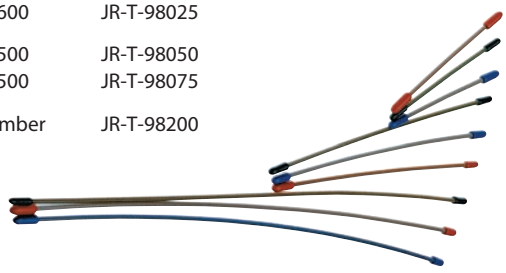
Tubing ID	*Color*	*bar*	*psi*	*Prod No*	*Price per foot*
.004"	Black	460	6700	JR-T-5804	
.005"	Red	420	6100	JR-T-5999	
.007"	Yellow	400	5800	JR-T-6000	
.010"	Blue	386	5600	JR-T-6001	
.020"	Orange	350	4500	JR-T-6002	
.030"	Green	240	3500	JR-T-6003	
.040"	Grey	165	2400	JR-T-60031	

1/16" OD striped color-coded PEEK tubing — *Pre-cut kits*

A stripe* is added to the outside, so dye never contacts the fluid stream.

Includes 15 pieces of tubing; 5 each of 5 cm, 10 cm, and 20 cm pre-cut lengths.

Tubing ID	*Color*	*bar*	*psi*	*Prod No*	*Price*
.005"	Red	420	6100	JR-T-98013	
.007"	Yellow	400	5800	JR-T-98017	
.010"	Blue	386	5600	JR-T-98025	
.020"	Orange	350	4500	JR-T-98050	
.030"	Green	240	3500	JR-T-98075	
Super kit, one of each above product number (75 pieces total)				JR-T-98200	



*All colorants used in the manufacture of this tubing are RoHS-compliant (Reduction of Hazardous Substances)

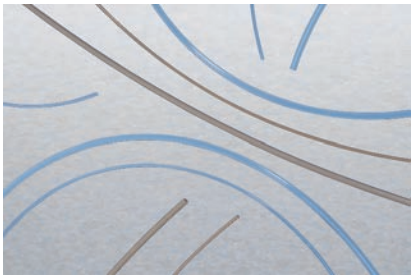
10 ft	=	3.05 m
25 ft	=	7.62 m
100 ft	=	30.48 m

50 µm	=	.002"
100 µm	=	.004"
125µm	=	.005"
150 µm	=	.006"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

Polymeric Tubing

Polymeric tubing is square cut and ready to use. Each package of polymeric tubing contains one piece of the specified length.

See also PEEK tubing, pages 88-89.



1/16" OD polymeric tubing

		.006" ID		.010" ID		.015" ID		.020" ID		.030" ID	
		Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
PTFE											
	10 feet	TTF106-10FT		TTF110-10FT	$15	TTF115-10FT		TTF120-10FT		TTF130-10FT	
	25 feet	TTF106-25FT		TTF110-25FT	35	TTF115-25FT		TTF120-25FT		TTF130-25FT	
	100 feet	TTF106-100FT		TTF110-100FT	130	TTF115-100FT		TTF120-100FT		TTF130-100FT	
FEP											
	10 feet	–		TFEP110-10FT	16	–		TFEP120-10FT		TFEP130-10FT	
	25 feet	–		TFEP110-25FT	39	–		TFEP120-25FT		TFEP130-25FT	
	100 feet	–		TFEP110-100FT	156	–		TFEP120-100FT		TFEP130-100FT	
ETFE											
	10 feet	–		TTZ110-10FT	25	–		TTZ120-10FT		TTZ130-10FT	
	25 feet	–		TTZ110-25FT	57	–		TTZ120-25FT		TTZ130-25FT	
	100 feet	–		TTZ110-100FT	210	–		TTZ120-100FT		TTZ130-100FT	

1/8" OD polymeric tubing

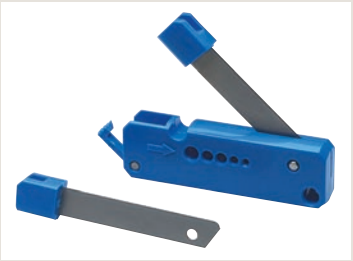
		.030" ID		.060" ID		.085" ID	
		Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
PTFE							
	10 feet	TTF230-10FT		TTF260-10FT		TTF285-10FT	
	25 feet	TTF230-25FT		TTF260-25FT		TTF285-25FT	
	100 feet	TTF230-100FT		TTF260-100FT		TTF285-100FT	
FEP							
	10 feet	–		TFEP260-10FT		–	
	25 feet	–		TFEP260-25FT		–	
	100 feet	–		TFEP260-100FT		–	
ETFE							
	10 feet	–		TTZ260-10FT		–	
	25 feet	–		TTZ260-25FT		–	
	100 feet	–		TTZ260-100FT		–	

– Not available

CLEAN-CUT POLYMER TUBING CUTTER

For leak-free tubing connections in an LC system, right angles and clean cuts are essential. The Clean-Cut makes burr-free perpendicular cuts on polymeric tubing without distorting the outside diameter or closing the inside diameter. The handy pocket-sized tool features a unique safety locking mechanism to secure the blade when not in use.

	Prod No
Clean-Cut tubing cutter	JR-797
Replacement blade	JR-798



TUBING CLIP – THE LC TUBING ORGANIZER

The tubing clip holds 1/16" and 1/8" polymer tubing precisely where you want them in your beakers, flasks, bottles, etc. up to 4 mm wall thickness. The stainless steel spring ensures a long lifetime.

Package of 5:	*Prod No*
Tubing clip	JR-9001-5

MORE INFORMATION

PEEK tubing
- Natural ..... page 88
- Color-coded 89
- Striped 89

TUBING POLYMERS

- PTFE Inert; very soft, easily cold flows. Produced as Teflon®
- FEP Chemically resistant like PTFE, but lower creep and higher friction. More transparent than PTFE.
- ETFE Resistant to most chemical attack; some chlorinated solvents will cause tubing to swell. Produced as Tefzel®

10 ft	=	3.05 m
25 ft	=	7.62 m
100 ft	=	30.48 m

Metal Tubing – Custom Lengths

Metal tubing is electrolytically cut and deburred, and steam cleaned. Specify the length required, in inches or feet. For pricing of custom length tubing, the length is rounded up to the next foot. For example, a 5" piece is charged as one foot; an 18" piece as two feet. Add $2 cutting/cleaning charge for each length.

316 stainless — *Custom lengths*

	1/32" OD		1/16" OD		1/8" OD
Tubing ID	*Prod No*	*Price/ft*	*Prod No*	*Price/ft*	*Prod No*
.005"	TSS.505		TSS105		–
.007"	TSS.507		–		–
.010"	TSS.510		TSS110		–
.015"	–		TSS115		–
.020"	TSS.520		TSS120		–
.026"	–		TSS126		–
.030"	–		TSS130		TSS230
.040"	–		TSS140		TSS240
.060"	–		–		TSS260
.070"	–		–		TSS267
.085"	–		–		TSS285

Nickel 200 — *Custom lengths*

	1/32" OD	1/16" OD	1/8" OD
Tubing ID	*Prod No*	*Prod No*	*Prod No*
.005"	–	TNI105	–
.010"	TNI.510	–	–
.020"	TNI.520	TNI120	–
.030"	–	TNI130	–
.040"	–	TNI140	–
.085"	–	–	TNI285

Hastelloy C — *Custom lengths*

	1/32" OD	1/16" OD	1/8" OD
Tubing ID	*Prod No*	*Prod No*	*Prod No*
.030"	–	THC130	–
.070"	–	–	THC270

Inconel 600 — *Custom lengths*

	1/32" OD	1/16" OD	1/8" OD
Tubing ID	*Prod No*	*Prod No*	*Prod No*
.061"	–	–	TINCO261
.082"	–	–	TINCO282

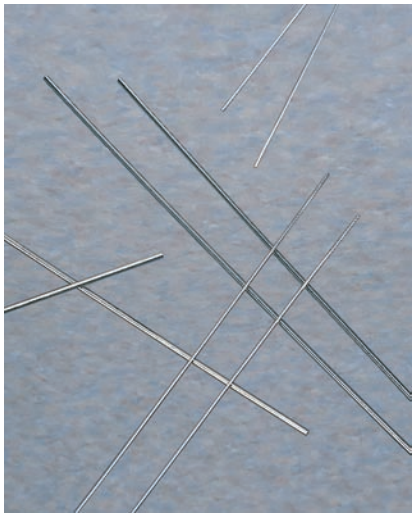
– Not normally available

50 µm	=	.002"
100 µm	=	.004"
125µm	=	.005"
150 µm	=	.006"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

Stainless Steel Tubing – Pre-cut Lengths

These packages of pre-cut Type 316 stainless tubing provide an economical solution to the problems that are caused by "seat-of-the-pants" cutting in the lab or field. They are priced to give a savings over the $2 per cut charge for custom-cut tubing.

All tubing is electrolytically cut and specially steam-cleaned with micro-filtered steam from deionized water, which removes both organic and inorganic contaminants.



1/32" OD stainless tubing

Pre-cut lengths

	.005" ID	.010" ID	.020" ID
Length	*Prod No*	*Prod No*	*Prod No*
2 pieces per package			
5 cm	T5N5D	T5N10D	T5N20D
10 cm	T10N5D	T10N10D	T10N20D
20 cm	T20N5D	T20N10D	T20N20D
30 cm	T30N5D	T30N10D	T30N20D
50 cm	T50N5D	T50N10D	T50N20D
100 cm	–	T100N10D	T100N20D
10 pieces per package			
5 cm	T5N5-10	T5N10-10	T5N20-10
10 cm	T10N5-10	T10N10-10	T10N20-10
20 cm	T20N5-10	T20N10-10	T20N20-10
30 cm	T30N5-10	T30N10-10	T30N20-10
50 cm	T50N5-10	T50N10-10	T50N20-10
100 cm	–	T100N10-10	T100N20-10
50 pieces per package			
5 cm	T5N5-50	T5N10-50	T5N20-50
10 cm	T10N5-50	T10N10-50	T10N20-50
20 cm	T20N5-50	T20N10-50	T20N20-50
30 cm	T30N5-50	T30N10-50	T30N20-50
50 cm	T50N5-50	T50N10-50	T50N20-50
100 cm	–	T100N10-50	T100N20-50
100 pieces per package			
5 cm	T5N5-100	T5N10-100	T5N20-100
10 cm	T10N5-100	T10N10-100	T10N20-100
20 cm	T20N5-100	T20N10-100	T20N20-100
30 cm	T30N5-100	T30N10-100	T30N20-100
50 cm	T50N5-100	T50N10-100	T50N20-100
100 cm	–	T100N10-100	T100N20-100

TECH TIP
Forty years of Valco experience show that the particles left in poorly cut tubing are the number one cause of valve damage.

5 cm	=	1.97"
10 cm	=	3.94"
20 cm	=	7.87"
30 cm	=	11.82"
50 cm	=	19.68"
100 cm	=	39.37"
0.12 mm	=	.005"
0.25 mm	=	.010"
0.50 mm	=	.020"
0.75 mm	=	.030"
1.0 mm	=	.040"
1.5 mm	=	.060"
2.0 mm	=	.080"
4.6 mm	=	.180"
6.0 mm	=	.236"
6.4 mm	=	.253"
7.0 mm	=	.275"
10.0 mm	=	.400"
27.0 mm	=	1.08"
1/32"	=	0.8 mm
1/16"	=	1.6 mm
1/8"	=	3.2 mm
1/4"	=	6.4 mm
3/8"	=	9.5 mm
1/2"	=	12.7 mm

Stainless Steel Tubing – Pre-Cut Lengths

" OD stainless tubing

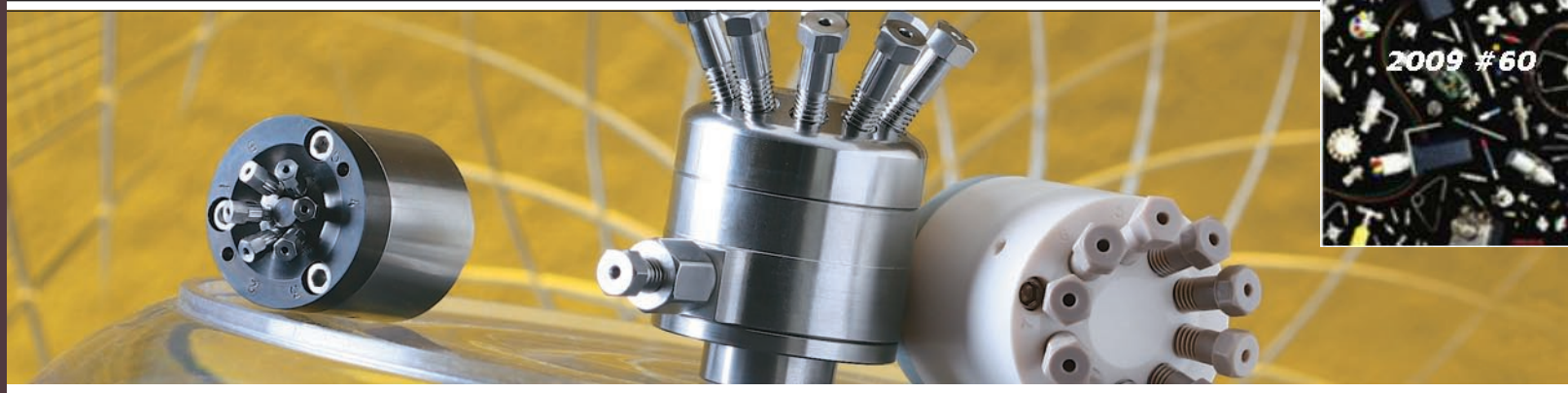
Pre-cut lengths

Length	.005" ID Prod No	.010" ID Prod No	.020" ID Prod No	.030" ID Prod No	.040" ID Prod No
s per package					
5 cm	T5C5D	T5C10D	T5C20D	T5C30D	T5C40D
10 cm	T10C5D	T10C10D	T10C20D	T10C30D	T10C40D
20 cm	T20C5D	T20C10D	T20C20D	T20C30D	T20C40D
30 cm	T30C5D	T30C10D	T30C20D	T30C30D	T30C40D
50 cm	T50C5D	T50C10D	T50C20D	T50C30D	T50C40D
100 cm	–	T100C10D	T100C20D	T100C30D	T100C40D
10 pieces per package					
5 cm	T5C5-10	T5C10-10	T5C20-10	T5C30-10	T5C40-10
10 cm	T10C5-10	T10C10-10	T10C20-10	T10C30-10	T10C40-10
20 cm	T20C5-10	T20C10-10	T20C20-10	T20C30-10	T20C40-10
30 cm	T30C5-10	T30C10-10	T30C20-10	T30C30-10	T30C40-10
50 cm	T50C5-10	T50C10-10	T50C20-10	T50C30-10	T50C40-10
100 cm	–	T100C10-10	T100C20-10	T100C30-10	T100C40-10
50 pieces per package					
5 cm	T5C5-50	T5C10-50	T5C20-50	T5C30-50	T5C40-50
10 cm	T10C5-50	T10C10-50	T10C20-50	T10C30-50	T10C40-50
20 cm	T20C5-50	T20C10-50	T20C20-50	T20C30-50	T20C40-50
30 cm	T30C5-50	T30C10-50	T30C20-50	T30C30-50	T30C40-50
50 cm	T50C5-50	T50C10-50	T50C20-50	T50C30-50	T50C40-50
100 cm	–	T100C10-50	T100C20-50	T100C30-50	T100C40-50
100 pieces per package					
5 cm	T5C5-100	T5C10-100	T5C20-100	T5C30-100	T5C40-100
10 cm	T10C5-100	T10C10-100	T10C20-100	T10C30-100	T10C40-100
20 cm	T20C5-100	T20C10-100	T20C20-100	T20C30-100	T20C40-100
30 cm	T30C5-100	T30C10-100	T30C20-100	T30C30-100	T30C40-100
50 cm	T50C5-100	T50C10-100	T50C20-100	T50C30-100	T50C40-100
100 cm	–	T100C10-100	T100C20-100	T100C30-100	T100C40-100

VOLUME CHART

Tubing ID	Volume µl/cm	Volume µl/in	Tubing ID	Volume µl/cm	Volume µl/in
.005"	0.13	0.32	.030"	4.56	11.58
.010"	0.51	1.29	.040"	8.11	20.59
.015"	1.14	2.90	.060"	18.24	46.33
.020"	2.03	5.15	.070"	24.83	63.06
.025"	3.17	8.04	.085"	36.61	92.99

Typical ID tolerances for our tubing are ±.001". This is much tighter than normal commercial grades of tubing; however, it is enough to result in noticeable error if exact volumes are not measured.



Valve Selection

Following is an overview of the many types of valves available from VICI.

Valco Injectors and Valves for GC

pages 96–99, 102–111

For nearly 40 years Valco valves have been the industry standard in gas chromatography. Models are available with 3, 4, 6, 8, 10, 12, or 14 ports, with 1/32", 1/16", 1/8", or 1/4" fittings, and with bore sizes from 0.25 mm (.010") to 4 mm (.156"). In addition, Valco valves offer the widest range of rotor and body materials of any valve available, with alloys and polymer composites capable of meeting virtually any system requirement. All models can be ordered in manual, pneumatic, or electrically actuated versions.

Valco Injectors and Valves for HPLC

pages 96–99, 112–116

A pioneer and industry leader in products for HPLC, Valco continues to offer the market's most diverse line in terms of number of ports, fitting sizes, materials of construction, and actuation. 3, 4, 6, 8, 10, 12 port versions are offered, with 1/32", 1/16", or 1/8" fittings. As with the GC line, Valco valves offer the widest range of rotor and body materials of any valves available, with alloys and polymer composites capable of meeting virtually any system requirement. All models can be ordered in manual, pneumatic, or electrically actuated versions.

Valco Selectors

pages 100–101, 122–133

One inherent benefit of the Valco conical rotary design is that it allows multiple planes of ports, facilitating a variety of unique multiposition configurations useful for stream selection, column selection, or trapping. Versions are available for GC and HPLC applications, with 1/16", 1/8", or 1/4" fittings, with bore sizes from 0.40 to 4.0 mm (.016" to .156"). Selectors are available for up to 16 streams (34 ports), all with Valco's trademark flexibility in terms of actuation and material options.

Diaphragm Valves for GC

pages 140–143

A diaphragm valve consists of plungers and ports arranged in a circular pattern, with the plungers controlled by the reciprocating action of two air actuated pistons. Extremely long lifetime (typically 1,000,000 cycles at ambient temperature; approximately 500,000 cycles at elevated temperatures), very short actuation time (10 milliseconds), minimum internal dead volume, and reliability have made this type of valve very successful in process gas chromatography for both sample injection and column switching. Our miniature version features 1/16" or 1/32" zero dead volume fittings, and is the first to offer a 10 port configuration in addition to the 6 port and internal sample 4 port models.

Cheminert Injectors for Nanovolume® HPLC and UHPLC

pages 146, 152–155

New nanovolume® injectors feature a uniform flowpath as small as 100 microns, with specially designed fittings for 1/32" or 360 micron PEEK, fused silica, or Valco electroformed nickel tubing. Models are rated from 5,000 to 20,000 psi, with most having a proprietary coated stainless stator and high-strength PAEK rotor to ensure long periods of maintenance-free operation.

Cheminert Injectors and Valves for HPLC and UHPLC

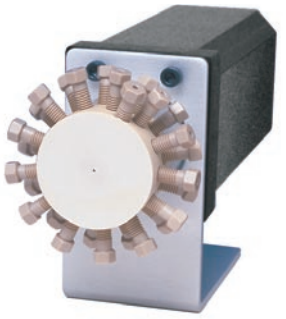
pages 147, 156–163

The Cheminert line includes 4, 6, 8, and 10 port versions. The submicroliter injector has an injection volume as small as 10 nanoliters. Valves feature 1/16" zero dead volume fittings, with bore sizes from 0.15 mm (.006") to 0.75 mm (.030"). Most models are available in manual, air, or electrically actuated versions, and some can be ordered with a proprietary coated stainless stator and high-strength PAEK rotor to ensure long periods of maintenance-free operation.

Cheminert Injectors and Valves for Low Pressure Applications

pages 148, 164–167

Cheminert's two position design offers 4, 6, 8, or 10 port configurations. The design features a choice of Valco 1/16" zero dead volume fittings or 1/4-28 Cheminert internal fittings for 1/16" or 1/8" OD tubing. All models are available in manual, air, or electrically actuated versions.



Cheminert Selectors

pages 150-151, 170–177

Choose among 4, 6, 8, 10, 14, 20, 24, or 26 position stream selection valves, in high pressure and low pressure models. A variety of configurations are available with bore sizes from 0.10 mm (.004") for HPLC column selection to 4.6 mm (.180") for applications requiring minimal restriction across the valve. Metal or all-polymeric valves can be ordered, with models available in manual, pneumatic, or electrically actuated versions.

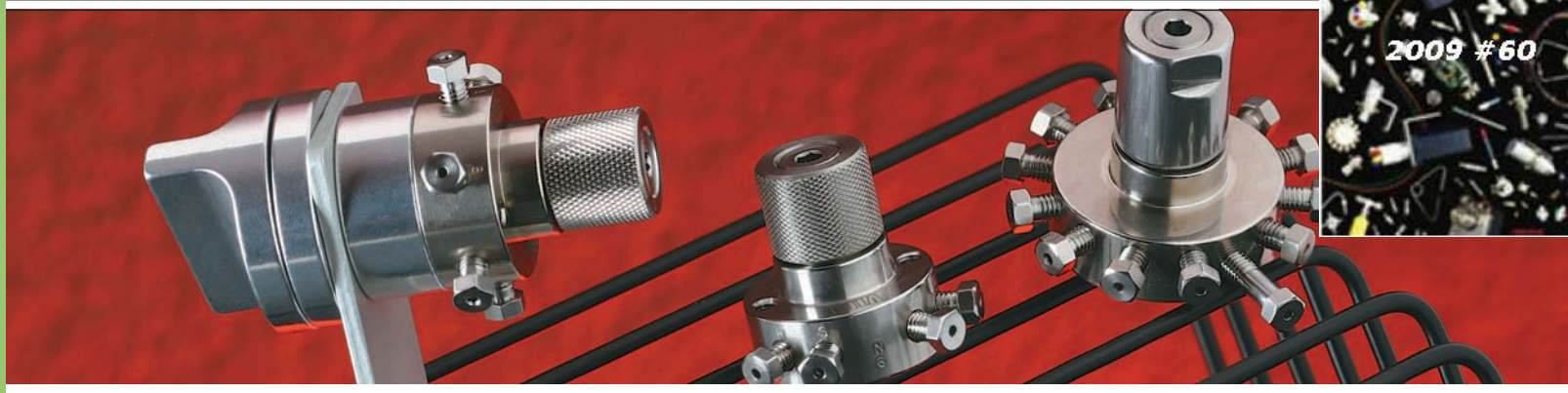
40,000 psi Ultra-High Pressure Injector System

page 84

The VICI 40K injector is comprised of six miniature air actuated needle valves, plumbed to simulate the flow path of a conventional rotor/stator injector. An integral controller sends the on/off positioning signals to each valve, coordinating them to perform load, inject, and flush functions.

FOR OEMs

See our injectors for autosamplers and our new low and high pressure integrated motor/injector and motor/selector assemblies designed specifically to be built into OEM systems.



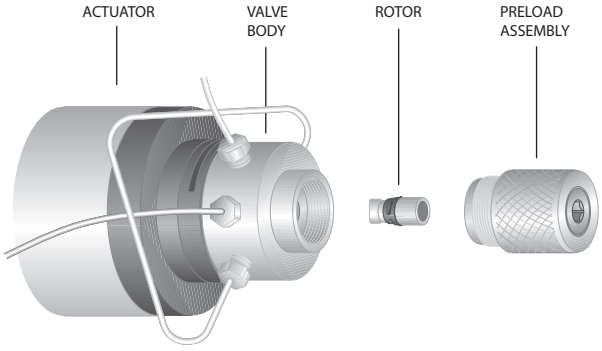
Valco Injectors and Valves

- 1/32", 1/16", 1/8", or 1/4" Valco ZDV fittings
- 3, 4, 6, 8, 10, 12, and 14 port and internal sample two position versions
- Five multiposition flowpath configurations with as many as 16 positions
- A variety of materials for hostile environments and continuous use at elevated temperature
- Can be configured for use at temperatures up to 350°C or pressures up to 10,000 psi

The Valco design lends itself to a unique variety of connecting slots and port arrangements. The rotor is held in place by a preload assembly, which allows rotor replacement without removing loops and tubing and without disengaging the valve from the actuator or mounting bracket.

In addition, the preload assembly ensures that the valve is always reassembled to the factory-set tension.

Two position injector and valve descriptions are on page 99; product numbers and prices begin on page 102. For information on **selectors**, refer to pages 100-101.



MORE INFORMATION

TECH TIP

For optimal zero dead volume connections, make sure your tubing meets the best industry standards. The OD tolerance should be nominal dimension ± .002".

Fractional dimension	Nominal dimension
1/32"	.031
1/16"	.062
1/8"	.125
1/4"	.250
3/8"	.375
1/2"	.500

Materials of Construction

The standard valve body material is Nitronic 60, a gall-resistant stainless steel which has proven superior to Type 316 or 303 in the majority of applications. Valves may also be ordered in Hastelloy C-22, Inconel 600, Type 316 stainless, Monel 400, Nickel 200, Nitronic 50, or Titanium.

Medium temperature GC valves have a rotor made of Valcon E, a polyaryletherketone/PTFE composite. The high temperature versions use a polyimide/PTFE/carbon composite designated Valcon T. Valcon H, a carbon-fiber-reinforced, PTFE-lubricated inert polymer, is standard in HPLC valves.

Appropriate fittings are supplied with all valves. Valves rated at 1000 psi or less have Type 303 stainless ferrules; those rated above 1000 psi have Type 316 stainless ferrules. A valve ordered with an optional body material is supplied with ferrules of the same material as the body, with Type 316 stainless nuts.

SPECIAL BODY MATERIAL—CODES AND PRICES

TWO POSITION VALVES

Body material	*Code*	**1/32" and 1/4" fittings**	**1/16" and 1/8" fittings**
HPLC grade Stainless steel	SS	Standard	Standard
Hastelloy C-22	HC		
Inconel 600	IN		
Monel 400	M4		
Nickel	NI		
Nitronic 50	N5		
Titanium *	TI		

* Not available for WT, UWT, or T series valves (high temperature) due to material temperature limit.

MULTIPOSITION VALVES

Body material	*Code*	**1/16" and 1/8" fittings** *SC and SD flowpaths*	**1/16" and 1/8" fittings** *SF and ST flowpaths*	**1/4" fittings** *SD, SC, SF flowpaths*
HPLC grade Stainless steel	SS	Standard, most versions	Standard, most versions	Standard
Hastelloy C-22	HC			
Inconel 600	IN			
Monel 400	M4			
Nickel	NI			
Nitronic 50	N5			
Titanium *	TI			

* Not available for WT, UWT, or T series valves (high temperature) due to material temperature limit.

Specifying a Special Body Material

To specify a special valve body material, add the material code to the end of the valve product number, and add the amount listed in charts opposite to the base price.

Example:
An A4C6WE (air actuated 1/16" 6 port WE valve with a 4" standoff) made of Hastelloy C-22 would be designated A4C6WEHC.
The cost is $830 + $170 = $1000.

Due to design requirements, several special grades of stainless steel may be used where "HPLC grade" is noted. The specific types include Nitronic 60, Type 316 stainless steel, and Type 316L stainless steel. VICI will select the material to be used based on availability and quality. HPLC grade stainless is the standard material for all Valco two position valves and high pressure multiposition valves.

MORE INFORMATION
Materials

Leak Testing

The standard test methods for cross-port and outport leakage insure valve performance at pressures and temperatures up to the specifications listed. For valves used on mass spectrometers or for ultra-trace fixed gas analysis, we recommend an optional test method utilizing a helium mass spectrometer, which provides data on mechanical leaks and on those due to seal porosity and permeability. With this method, we can certify leak rates as low as 10^{-10} cc-atm/sec.

Please consult the factory prior to ordering, since the minimum leak rate will vary widely depending on valve configuration.

Leak Rates for Gas Sampling Valves

The actual minimum leak rates attainable vary widely with seal material and valve type. In general, the acceptable leak rates fall into three ranges. (See chart below.)

In order to seal to less than 10^{-7}, the valve loading tension is increased, which somewhat lowers the maximum operating temperature and the valve lifetime. Currently, only select material can seal to 10^{-8} in most valve styles. Valcon M rotor material can seal to 10^{-10}, but has a temperature limit of 50°C.

Not all valves can achieve these leak rates. As a general rule, the larger the valve seal and port size, the higher the leak rate.

Test Method for Liquid Sampling Valves

The standard test method for liquid valves is a pressure drop over time for both crossport and outport leakage, using isopropanol at the specified test pressure. This test is designed to ensure proper performance at the specification limit.

RANGES FOR ACCEPTABLE LEAK RATES

10^{-4} to 10^{-5} cc-atm/sec	**Commercial use** Not normally sold by VICI
10^{-6} to 10^{-7} cc-atm/sec	**General GC use** Standard tension and components
10^{-8} to 10^{-10} cc-atm/sec	**Ultra trace gas analysis** (ppb range) Higher tension and specially processed stator and rotor material

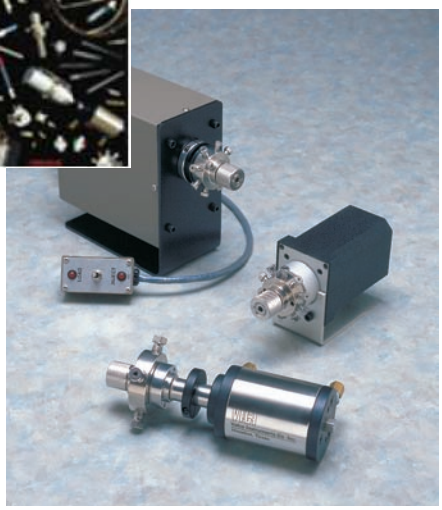
OPTIONAL LEAK TESTING with Helium Mass Spectrometer

To order a valve certified to have helium leak rates less than 10^{-7} cc-atm/sec, add the suffix "Z" to the valve product number and $175 to the price.

Certified valves are supplied with gold-plated stainless steel ferrules.

We can generally tell you what leak rate is possible prior to manufacturing the valve.

About Two Position Injectors and Switching Valves



Two position injectors and switching valves have many applications, as shown in the section beginning on page 117. In this catalog, Valco two position valves are divided into GC and HPLC sections, with the GC section starting on page 102 and the HPLC section on page 112.

Sample Injectors

Since the most common method of sample injection utilizes a 6 port valve with an external sample loop, 6 port valves are often referred to as "injectors". However, as the Applications section shows, 6 port valves can do more than inject sample, and 8 and 10 port valves can be sample injectors at the same time they're also being backflushers or column switchers. One more variation is the 4 port internal sampling valve (pages 102–103 and 112), which is used when the sample size must be smaller than the smallest available loop. The internal sample "loop" is actually an engraved connecting slot on the rotor which is sized to contain a specified amount of sample.

Sample Loops

Loops are electrolytically cut and electrochemically polished to ensure square, burr-free ends, then cleaned with microfiltered steam from deionized water. Standard material is Type 316 stainless, but loops can be supplied in electroformed nickel, Hastelloy C, Nickel 200, titanium, or several polymers. Consult the factory for availability.

Valco sample loops are accurately sized for each valve type. The volume tolerance matches the ID tolerance of the tubing, which is typically ±0.001". This results in a variance ranging from 30% with tubing of 0.005" diameter to 5% for loops made from tubing 0.040" in diameter.

SPECIFICATIONS

VALCO TWO POSITION VALVES

Valve type	*Standard rotor material*	*Max pressure*	*Max temp*	*Max pressure*	*Max temp*
		Internal sample injectors		**Sampling and switching valves**	
GC					
W and UW	Valcon E	1000 psi liq	175°C	400 psi gas	225°C
	Valcon T	–	–	300 psi gas	330°C
MW	Valcon E2	–	–	100 psi gas	75°C
HPLC					
W and UW	Valcon H	5000 psi liq	75°C	5000 psi liq	75°C

VALVE TYPES

	Fitting size	*Standard port diameter*
W Type	1/32"	0.25 mm (.010")
	1/16"	0.40 mm (.016")
UW Type	1/16"	0.75 mm (.030")
	1/8"	0.75 mm (.030")
MW Type	1/4"	4.0 mm (.156")

For special port diameters, please consult the factory.

OPTIONAL ROTORS

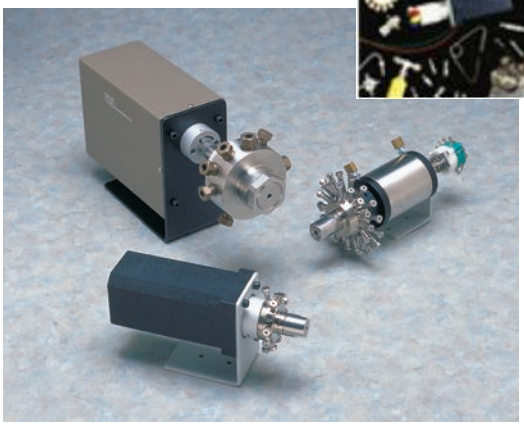
Valcon M	400 psi	50°C
Valcon P	400 psi	175°C
Valcon R	400 psi	75°C
Valcon TF	200 psi	50°C

See page 257 for a discussion of these optional rotor materials.

MORE INFORMATION

About Selectors

Instead of the back and forth switching of two position valves, selectors (multiposition valves) step incrementally through continuous revolutions (bi-directionally with the microelectric actuator). While we can supply older models, all the valves in this catalog have a preload assembly. This design allows the rotor to be inspected or replaced without taking the valve off the actuator, and valves ordered with a microelectric actuator are permanently aligned.



Flowpath Configurations

SD (dead-ended) valves select one of 4 to 16 dead-ended streams, directing it through the valve outlet to a sample valve, pressure sensor, detector, column, etc. The same configuration can also direct one stream to a number of outlets for fraction collection.

SC (common outlet) selectors are similar to SDs, except that instead of being dead-ended the non-selected streams flow to a common outlet.

SF (flow-through) selectors are similar to SDs and SCs, selecting a stream and sending it to the outlet. However, SFs allow the non-selected streams to flow through individual outlets instead of a common outlet.

ST (trapping) selectors are used for multi-column, multi-sample, or multi-trap operations.

STF (trapping/flow-through) selectors are similar to STs, with the single difference being that the non-selected streams are returned to their own vents or sources rather that being dead-ended or trapped as they are in the standard ST configuration.

PORT DIAMETERS—
Low pressure (MW)

Fitting size	No. of Positions	Standard port diameter
SD		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 10	4.0 mm (.156")
SC		
1/16"	4 - 16	1.0 mm (.040")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 8	4.0 mm (.156")
SF		
1/16"	4 - 16	1.0 mm (.040")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 8	4.0 mm (.156")
ST		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")
STF		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")

PORT DIAMETERS—
High pressure (UW)

Fitting size	No. of Positions	Standard port diameter
SD		
1/16"	4 - 12	0.40 mm (.016")
1/8"	4, 6, 8	0.75 mm (.030")
ST		
1/16"	4,6	0.40 mm (.016")

MORE INFORMATION

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High pressure
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ST. 133

Loops, if required, are found on corresponding valve pages.

For special port diameters, please consult the factory.

Low Pressure Selectors

Valco **MW Type** selectors are available with 1/16", 1/8", or 1/4" fittings. (For port diameters, refer to the chart on the preceding page.) The 1/16" and 1/8" selectors can be ordered with 4, 6, 8, 10, 12, or 16 positions, in any of the five flowpath configurations. Selectors with 1/4" fittings are available in SD, SC, and SF flowpaths: SDs have 4, 6, 8, or 10 positions; SCs and SFs have 4, 6, or 8.

Although not shown in this catalog, MW selectors are also available in a higher temperature version. While actual specifications vary with the configuration, typical specifications are 200 psi and 330°C. Consult our technical staff for more information.

SPECIFICATIONS

VALCO SELECTORS – Low pressure (MW)

Fittings size	*Number of positions*	*Standard rotor material*	*Max pressure*	*Max temp*	*Max pressure*	*Max temp*	*Max pressure*	*Max temp*
			SD Dead-end flowpath		**SC Common outlet flowpath**			
1/16"	4 - 16	Valcon E	400 psi gas	200°C	200 psi gas	200°C	Note: All low pressure 1/16" and 1/8" valves are also available in versions up to 330°C.	
1/8"	4 - 8	Valcon E	400 psi gas	200°C	200 psi gas	200°C		
	10 - 16	Valcon E	200 psi gas	200°C	200 psi gas	200°C		
1/4"	4 - 8	Valcon E2	100 psi gas	75°C	100 psi gas	75°C		
			SF Flow-through flowpath		**ST Trapping flowpath**		**STF Trapping/Flow-through flowpath**	
1/16"	4 - 16	Valcon E	200 psi gas	200°C	200 psi gas	200°C	200 psi gas	200°C
1/8"	4 - 16	Valcon E	200 psi gas	200°C	200 psi gas	200°C	200 psi gas	200°C
1/4"	4 - 8	Valcon E2	100 psi gas	75°C	–	–	–	–

High Pressure Selectors

Valco **UW Type** high pressure selectors are available in SD and ST flowpaths. SD selectors with 1/16" fittings are available in 4, 6, 8, 10, or 12 positions, while 1/8" selectors can be ordered with 4, 6, 8, or 10 positions. ST flowpath UW selectors have 1/16" fittings, with either 4 or 6 positions. (For port diameters, refer to the chart on the preceding page.)

SPECIFICATIONS

VALCO SELECTORS – High pressure (UW)

Fittings size	*Number of positions*	*Standard rotor material*	*Max pressure*	*Max temp*	*Max pressure*	*Max temp*
			SD Dead-end flowpath		**ST Trapping flowpath**	
1/16"	4 - 12	Valcon E	5000 psi liq	75°C	5000 psi liq	75°C
1/8"	4 - 8	Valcon E	5000 psi liq	75°C	–	–

Internal sample injectors, 1/32" fittings, 0.25 mm ports (.010")

Med temp
Internal sample
1/32" **0.25 mm**

Includes 2" standoff. Manual version is not available without standoff.

Standard electric actuator:
110 VAC for USA;
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

SPECS
1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

Sample volume	.06 µl		.1 µl		.2 µl		.5 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual with standoff	2NI4WE.06	$775	2NI4WE.1		2NI4WE.2		2NI4WE.5	
With air actuator	A2NI4WE.06		A2NI4WE.1		A2NI4WE.2		A2NI4WE.5	
With standard electric actuator	E2NI4WE.06		E2NI4WE.1		E2NI4WE.2		E2NI4WE.5	
With microelectric actuator	EP2NI4WE.06		EP2NI4WE.1		EP2NI4WE.2		EP2NI4WE.5	
Replacement valve	DNI4WE.06		DNI4WE.1		DNI4WE.2		DNI4WE.5	
Replacement rotor	SSANI4WE.06		SSANI4WE.1		SSANI4WE.2		SSANI4WE.5	

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*

Internal sample injectors, 1/16" fittings, 0.40 mm ports (.016")

W Type

Med temp
Internal sample
1/16" **0.40 mm**

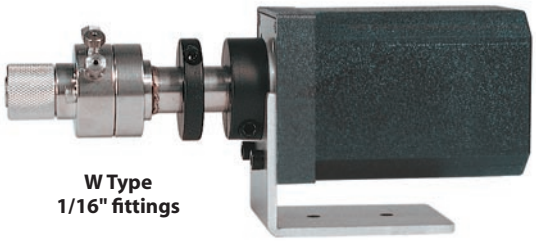
Includes 2" standoff. Manual version has no standoff.

Standard electric actuator:
110 VAC for USA;
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

SPECS
1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

Sample volume	.06 µl		.1 µl		.2 µl		.5 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	CI4WE.06		CI4WE.1		CI4WE.2		CI4WE.5	
Manual with standoff	2CI4WE.06		2CI4WE.1		2CI4WE.2		2CI4WE.5	
With air actuator	A2CI4WE.06		A2CI4WE.1		A2CI4WE.2		A2CI4WE.5	
With standard electric actuator	E2CI4WE.06		E2CI4WE.1		E2CI4WE.2		E2CI4WE.5	
With microelectric actuator	EP2CI4WE.06		EP2CI4WE.1		EP2CI4WE.2		EP2CI4WE.5	
Replacement valve	DCI4WE.06		DCI4WE.1		DCI4WE.2		DCI4WE.5	
Replacement rotor	SSACI4WE.06		SSACI4WE.1		SSACI4WE.2		SSACI4WE.5	

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*



W Type
1/16" fittings

MORE INFORMATION

ole injectors, 1/16" fittings, 0.75 mm ports (.030")

UW Type

SPECS
0 psi liq
5°C max
lve body
Valcon E rotor

Includes 2" standoff.
Manual version has no standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Med temp
Internal sample
1/16" **0.75 mm**

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*

Sample volume	.2 µl		.5 µl		1 µl		2 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	CI4UWE.2		CI4UWE.5		CI4UWE1		CI4UWE2	
Manual with standoff	2CI4UWE.2		2CI4UWE.5		2CI4UWE1		2CI4UWE2	
With air actuator	A2CI4UWE.2		A2CI4UWE.5		A2CI4UWE1		A2CI4UWE2	
With std electric actuator	E2CI4UWE.2		E2CI4UWE.5		E2CI4UWE1		E2CI4UWE2	
With microelectric actuator	ED2CI4UWE.2		ED2CI4UWE.5		ED2CI4UWE1		ED2CI4UWE2	
Replacement valve	DCI4UWE.2		DCI4UWE.5		DCI4UWE1		DCI4UWE2	
Replacement rotor	SSACI4UWE.2		SSACI4UWE.5		SSACI4UWE1		SSACI4UWE2	

Internal sample injectors, 1/8" fittings, 0.75 mm ports (.030")

UW Type

SPECS
1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

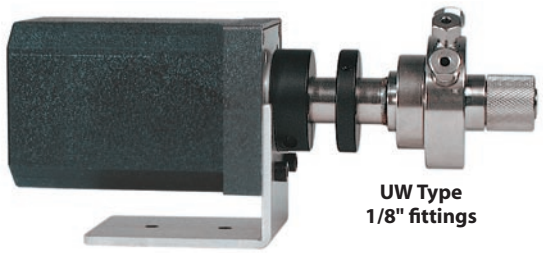
Includes 2" standoff.
Manual version has no standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Med temp
Internal sample
1/8" **0.75 mm**

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*

Sample volume	.2 µl		.5 µl		1 µl		2 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	I4UWE.2		I4UWE.5		I4UWE1		I4UWE2	
Manual with standoff	2I4UWE.2		2I4UWE.5		2I4UWE1		2I4UWE2	
With air actuator	A2I4UWE.2		A2I4UWE.5		A2I4UWE1		A2I4UWE2	
With std electric actuator	E2I4UWE.2		E2I4UWE.5		E2I4UWE1		E2I4UWE2	
With microelectric actuator	ED2I4UWE.2		ED2I4UWE.5		ED2I4UWE1		ED2I4UWE2	
Replacement valve	DI4UWE.2		DI4UWE.5		DI4UWE1		DI4UWE2	
Replacement rotor	SSAI4UWE.2		SSAI4UWE.5		SSAI4UWE1		SSAI4UWE2	



UW Type
1/8" fittings

Capillary GC

Sampling and switching valves, 1/32" fittings, 0.25 mm ports (.010")

Med temp

1/32" **0.25 mm**

Includes 4" standoff. Manual version not available without standoff.

Standard electric actuator:
- 110 VAC for USA
- 110/230 VAC to 24 VDC power supply for international

Microelectric actuator:
- 24 VDC, with 110/230 VAC to 24 VDC power supply

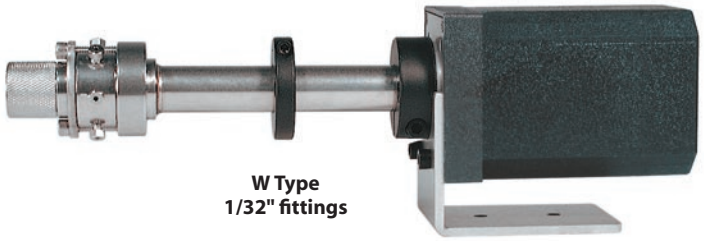
Sample loops are not included with valves. Order separately.

SPECS
400 psi gas
225°C max
Nitronic 60 valve body
Valcon E rotor

For 300 psi, 350°C max, see facing page.

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual with standoff	4N4WE		4N6WE		4N8WE		4N10WE	
With air actuator	A4N4WE		A4N6WE		A4N8WE		A4N10WE	
With standard electric actuator	E4N4WE		E4N6WE		E4N8WE		E4N10WE	
With microelectric actuator	EH4N4WE		EH4N6WE		EH4N8WE		EH4N10WE	
Replacement valve	DN4WE		DN6WE		DN8WE		DN10WE	
Replacement rotor	SSAN4WE		SSAN6WE		SSAN8WE		SSAN10WE	

OPTIONS
- 3 and 12 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*



W Type
1/32" fittings

1/32" Stainless steel loops *for W Type valves*

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
2 µl	SL2NW		25 µl	SL25NW	
5 µl	SL5NW		50 µl	SL50NW	
10 µl	SL10NW		100 µl	SL100NW	
15 µl	SL15NW		250 µl	SL250NW	
20 µl	SL20NW		500 µl	SL500NW	

MORE INFORMATION

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Nickel 200, PEEK, and PTFE

switching valves, 1/32" fittings, 0.25 mm ports (.010")

W Type

SPECS
psi gas
)°C max
ve body
Valcon T rotor

For 400 psi, 225°C max, see facing page

Includes 4" standoff. Manual version not available without standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

High temp
1/32" **0.25 mm**

OPTIONS
- 3 and 12 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*

4 Ports

	Prod No	*Price*
Manual with standoff	4N4WT	$725
With air actuator	A4N4WT	885
With standard electric actuator	E4N4WT	1205
With microelectric actuator	EH4N4WT	1375
Replacement valve	DN4WT	635
Replacement rotor	SSAN4WT	75

6 Ports

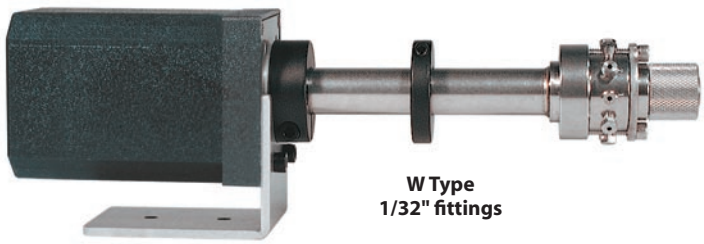
Prod No	*Price*
4N6WT	$780
A4N6WT	940
E4N6WT	1260
EH4N6WT	1430
DN6WT	690
SSAN6WT	75

8 Ports

Prod No	*Price*
4N8WT	$835
A4N8WT	995
E4N8WT	1315
EH4N8WT	1485
DN8WT	745
SSAN8WT	75

10 Ports

Prod No	*Price*
4N10WT	$835
A4N10WT	995
E4N10WT	1315
EH4N10WT	1485
DN10WT	745
SSAN10WT	75



W Type
1/32" fittings

1/32" Stainless steel loops

for W Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
2 µl	SL2NW	$25.00	25 µl	SL25NW	$25.00
5 µl	SL5NW	25.00	50 µl	SL50NW	27.50
10 µl	SL10NW	25.00	100 µl	SL100NW	27.50
15 µl	SL15NW	25.00	250 µl	SL250NW	31.25
20 µl	SL20NW	25.00	500 µl	SL500NW	37.50

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Nickel 200, PEEK, and PTFE

Sampling and switching valves, 1/16" fittings, 0.40 mm (.016")

Med temp

1/16" **0.40 mm**

Includes 4" standoff
Manual version has no standoff

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C4WE		C6WE		C8WE		C10WE	
Manual with standoff	4C4WE		4C6WE		4C8WE		4C10WE	
With air actuator	A4C4WE		A4C6WE		A4C8WE		A4C10WE	
With standard electric actuator	E4C4WE		E4C6WE		E4C8WE		E4C10WE	
With microelectric actuator	EH4C4WE		EH4C6WE		EH4C8WE		EH4C10WE	
Replacement valve	DC4WE		DC6WE		DC8WE		DC10WE	
Replacement rotor	SSAC4WE		SSAC6WE		SSAC8WE		SSAC10WE	

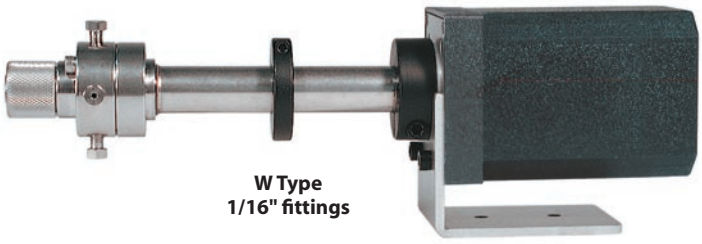
SPECS

400 psi gas
225°C max
Nitronic 60 valve body
Valcon E rotor

For 300 psi, 350°C max, see page 108.

OPTIONS

- 3 and 12 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*



W Type
1/16" fittings

MORE INFORMATION

1/16" Stainless steel loops *for W Type valves*

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
2 µl	SL2CW		100 µl	SL100CW	
5 µl	SL5CW		250 µl	SL250CW	
10 µl	SL10CW		500 µl	SL500CW	
15 µl	SL15CW		1 ml	SL1KCW	
20 µl	SL20CW		2 ml	SL2KCW	
25 µl	SL25CW		5 ml	SL5KCW	
50 µl	SL50CW		10 ml	SL10KCW	

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

d switching valves, 1/16" fittings, 0.75 mm ports (.030")

UW Type

SPECS

0 psi gas
5°C max
lve body
Valcon E rotor

For 300 psi, 330°C max, see page 109.

Includes 4" standoff.
Manual version has no standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

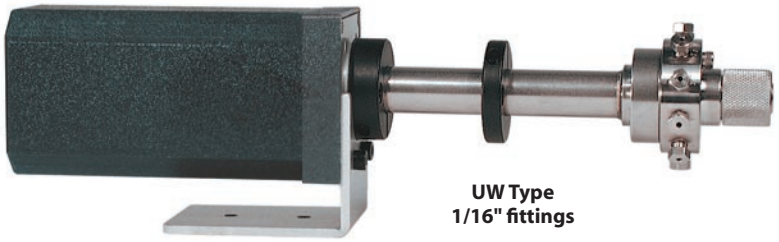
Sample loops are not included with valves. Order separately.

Med temp
1/16" **0.75 mm**

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C4UWE		C6UWE	$570	C8UWE		C10UWE	
Manual with standoff	4C4UWE		4C6UWE	615	4C8UWE		4C10UWE	
With air actuator	A4C4UWE		A4C6UWE	775	A4C8UWE		A4C10UWE	
With standard electric actuator	E4C4UWE		E4C6UWE	1095	E4C8UWE		E4C10UWE	
With microelectric actuator	ED4C4UWE		ED4C6UWE	1325	ED4C8UWE		ED4C10UWE	
Replacement valve	DC4UWE		DC6UWE	525	DC8UWE		DC10UWE	
Replacement rotor	SSAC4UWE		SSAC6UWE	75	SSAC8UWE		SSAC10UWE	

OPTIONS

- 3, 12 and 14 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Larger bore available



UW Type
1/16" fittings

1/16" Stainless steel loops

for UW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
5 µl	SL5CUW		100 µl	SL100CUW	
10 µl	SL10CUW		250 µl	SL250CUW	
15 µl	SL15CUW		500 µl	SL500CUW	
20 µl	SL20CUW		1 ml	SL1KCUW	
25 µl	SL25CUW		2 ml	SL2KCUW	
50 µl	SL50CUW		5 ml	SL5KCUW	
			10 ml	SL10KCUW	

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

High Temperature GC

Sampling and switching valves, 1/16" fittings, 0.40 mm ports (.016")

High temp

1/16" **0.40 mm**

Includes 4" standoff

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.




	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual with standoff	4C4WT		4C6WT		4C8WT		4C10WT	
With air actuator	A4C4WT		A4C6WT		A4C8WT		A4C10WT	
With standard electric actuator	E4C4WT		E4C6WT		E4C8WT		E4C10WT	
With microelectric actuator	EH4C4WT		EH4C6WT		EH4C8WT		EH4C10WT	
Replacement valve	DC4WT		DC6WT		DC8WT		DC10WT	
Replacement rotor	SSAC4WT		SSAC6WT		SSAC8WT		SSAC10WT	

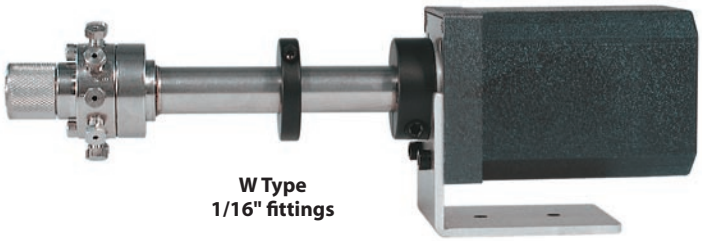
SPECS

300 psi gas
350°C max
Nitronic 60 valve body
Valcon T rotor

For 400 psi, 225°C max, see page 106.

OPTIONS

- 3 and 12 port valves available
  UW type: 3, 12, and 14 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*



W Type
1/16" fittings

MORE INFORMATION

1/16" Stainless steel loops *for W Type valves*

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
2 µl	SL2CW		100 µl	SL100CW	
5 µl	SL5CW		250 µl	SL250CW	
10 µl	SL10CW		500 µl	SL500CW	
15 µl	SL15CW		1 ml	SL1KCW	
20 µl	SL20CW		2 ml	SL2KCW	
25 µl	SL25CW		5 ml	SL5KCW	
50 µl	SL50CW		10 ml	SL10KCW	

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

l switching valves, 1/16" fittings, 0.75 mm ports (.030")

UW Type

SPECS
) psi gas
0°C max
lve body
Valcon T rotor

For 400 psi, 225°C max, see page 107.

Includes 4" standoff

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

High temp
1/16" **0.75 mm**


4 Ports

	Prod No	*Price*
Manual with standoff	4C4UWT	
With air actuator	A4C4UWT	
With standard electric actuator	E4C4UWT	
With microelectric actuator	ED4C4UWT	
Replacement valve	DC4UWT	
Replacement rotor	SSAC4UWT	


6 Ports

Prod No	*Price*
4C6UWT	
A4C6UWT	
E4C6UWT	
ED4C6UWT	
DC6UWT	
SSAC6UWT	

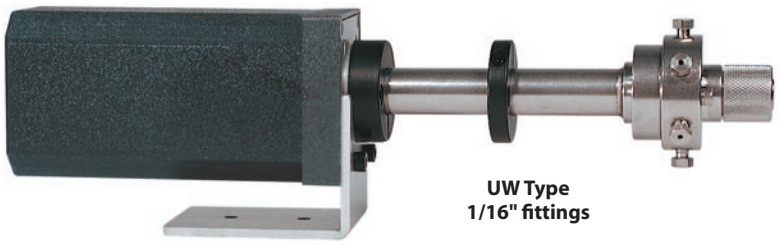

8 Ports

Prod No	*Price*
4C8UWT	
A4C8UWT	
E4C8UWT	
ED4C8UWT	
DC8UWT	
SSAC8UWT	


10 Ports

Prod No	*Price*
4C10UWT	$670
A4C10UWT	
E4C10UWT	
ED4C10UWT	
DC10UWT	
SSAC10UWT	

OPTIONS
- 3, 12 and 14 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Larger bore available

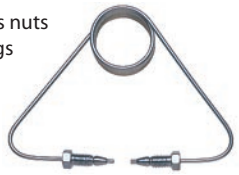


UW Type
1/16" fittings

1/16" Stainless steel loops

for UW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.



Volume	*Prod No*	*Price*
5 µl	SL5CUW	
10 µl	SL10CUW	
15 µl	SL15CUW	
20 µl	SL20CUW	
25 µl	SL25CUW	
50 µl	SL50CUW	

Volume	*Prod No*	*Price*
100 µl	SL100CUW	
250 µl	SL250CUW	
500 µl	SL500CUW	
1 ml	SL1KCUW	
2 ml	SL2KCUW	
5 ml	SL5KCUW	
10 ml	SL10KCUW	

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

Sampling and switching valves, 1/8" fittings, 0.75 mm ports (.030")

Med temp

1/8" **0.75 mm**

Includes 4" standoff. Manual version has no standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately (*see facing page*).




	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	4UWE		6UWE		8UWE		n/a	
Manual with standoff	44UWE		46UWE		48UWE		410UWE	
With air actuator	A44UWE		A46UWE		A48UWE		A410UWE	
With standard electric actuator	E44UWE		E46UWE		E48UWE		E410UWE	
With microelectric actuator	ED44UWE		ED46UWE		ED48UWE		ED410UWE	
Replacement valve	D4UWE		D6UWE		D8UWE		D10UWE	
Replacement rotor	SSA4UWE		SSA6UWE		SSA8UWE		SSA10UWE	

SPECS

400 psi gas
225°C max
Nitronic 60 valve body
Valcon E rotor

For 300 psi, 330°C max, see facing page.

OPTIONS

- 3, 12, and 14 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Larger bore available

Sampling and switching valves, 1/4" fittings, 4.0 mm ports (.156")

MW Type

Low temp

1/4" **4.0 mm**

Includes 4" standoff. Manual version not available without standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not available.



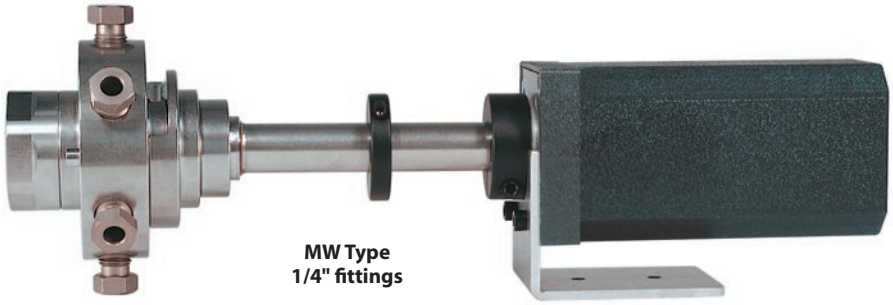
	4 Ports		6 Ports		8 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual with standoff	4VL4MWE2		4VL6MWE2		4VL8MWE2	
With air actuator	A4VL4MWE2		A4VL6MWE2		A4VL8MWE2	
With std electric actuator	E4VL4MWE2		E4VL6MWE2		E4VL8MWE2	
With microelectric actuator	ET4VL4MWE2		ET4VL6MWE2		ET4VL8MWE2	
Replacement valve	DVL4MWE2		DVL6MWE2		DVL8MWE2	
Replacement rotor	SSAVL4MWE2		SSAVL6MWE2		SSAVL8MWE2	

SPECS

100 psi gas
75°C max
Nitronic 60 valve body
Valcon E2 rotor

OPTIONS

- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*



MW Type
1/4" fittings

switching valves, 1/8" fittings, 0.75 mm ports (.030")

UW Type

SPECS
psi gas
°C max
e body
Valcon T rotor

For 400 psi, 225°C max, see facing page.

Includes 4" standoff. Manual version not available without standoff.

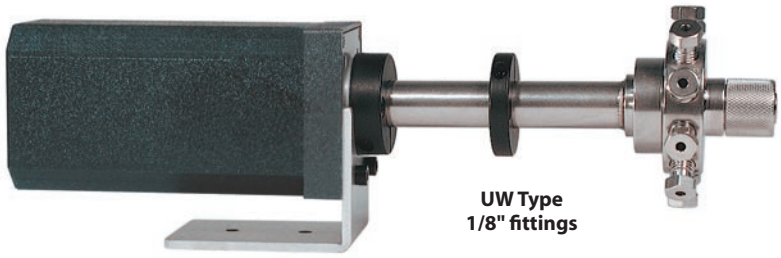
Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

High temp
1/8" **0.75 mm**

OPTIONS
- 3, 12, and 14 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Larger bore available

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual with standoff	44UWT		46UWT		48UWT		410UWT	
With air actuator	A44UWT		A46UWT		A48UWT		A410UWT	
With standard electric actuator	E44UWT		E46UWT		E48UWT		E410UWT	
With microelectric actuator	ED44UWT		ED46UWT		ED48UWT		ED410UWT	
Replacement valve	D4UWT		D6UWT		D8UWT		D10UWT	
Replacement rotor	SSA4UWT		SSA6UWT		SSA8UWT		SSA10UWT	



UW Type
1/8" fittings

MORE INFORMATION

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops <100 µl are made from 1/16" OD tubing with brazed or welded 1/8" tube ends.

1/8" Stainless steel loops

for UW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
10 µl	SL10UW		250 µl	SL250UW	
15 µl	SL15UW		500 µl	SL500UW	
20 µl	SL20UW		1 ml	SL1KUW	
25 µl	SL25UW		2 ml	SL2KUW	
50 µl	SL50UW		5 ml	SL5KUW	
100 µl	SL100UW		10 ml	SL10KUW	
			20 ml	SL20KUW	

HPLC Injectors

Internal sample injectors, 1/16" fittings, 0.40 mm ports (.016") 0.25 mm column port diameter (.010")

5,000 psi
Internal sample
1/16" **0.40 mm**

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

Sample volume	.06 µl		.1 µl		.2 µl		.5 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	CI4W.06		CI4W.1		CI4W.2		CI4W.5	
With air actuator	ACI4W.06		ACI4W.1		ACI4W.2		ACI4W.5	
With standard electric actuator	ECI4W.06		ECI4W.1		ECI4W.2		ECI4W.5	
With microelectric actuator	EPCI4W.06		EPCI4W.1		EPCI4W.2		EPCI4W.5	
Replacement valve	DCI4W.06		DCI4W.1		DCI4W.2		DCI4W.5	
Replacement rotor	SSACI4W.06		SSACI4W.1		SSACI4W.2		SSACI4W.5	

OPTIONS
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- 1/32" fittings with 0.25 mm bore (.010") also available. Consult factory for product number and pricing.

W Type
1/16" fittings

UW Type
1/16" fittings

Internal sample injectors, 1/16" fittings, 0.75 mm ports (.030")

UW Type

5,000 psi
Internal sample
1/16" **0.75 mm**

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

Sample volume	.2 µl		.5 µl		1 µl		2 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	CI4UW.2		CI4UW.5		CI4UW1		CI4UW2	
With air actuator	ACI4UW.2		ACI4UW.5		ACI4UW1		ACI4UW2	
With standard electric actuator	ECI4UW.2		ECI4UW.5		ECI4UW1		ECI4UW2	
With microelectric actuator	EDCI4UW.2		EDCI4UW.5		EDCI4UW1		EDCI4UW2	
Replacement valve	DCI4UW.2		DCI4UW.5		DCI4UW1		DCI4UW2	
Replacement rotor	SSACI4UW.2		SSACI4UW.5		SSACI4UW1		SSACI4UW2	

OPTIONS
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- 1/32" fittings with 0.25 mm bore (.010") also available. Consult factory for product number and pricing.

switching valves, 1/16" fittings, 0.40 mm ports (.016")

W Type

SPECS
) psi liq
°C max
Nitronic 60 valve body
Valcon H rotor

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

5,000 psi
Analytical
1/16" **0.40 mm**

OPTIONS

- 3 and 12 port valves available
- 2", 3", 4", and 6" standoffs
- 1/32" and 1/16" versions available with 0.25 mm (.010") bore
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C4W		C6W		C8W		C10W	
With air actuator	AC4W		AC6W		AC8W		AC10W	
With standard electric actuator	EC4W		EC6W		EC8W		EC10W	
With microelectric actuator	EPC4W		EPC6W		EPC8W		EPC10W	
Replacement valve	DC4W		DC6W		DC8W		DC10W	
Replacement rotor	SSAC4W		SSAC6W		SSAC8W		SSAC10W	

W Type
1/16" fittings

MORE INFORMATION

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

1/16" Stainless steel loops

for W Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
2 µl	SL2CW		100 µl	SL100CW	
5 µl	SL5CW		250 µl	SL250CW	
10 µl	SL10CW		500 µl	SL500CW	
15 µl	SL15CW		1 ml	SL1KCW	
20 µl	SL20CW		2 ml	SL2KCW	
25 µl	SL25CW		5 ml	SL5KCW	
50 µl	SL50CW		10 ml	SL10KCW	

Injectors and switching valves, 1/16" fittings, 0.75 mm ports (.030")

5,000 psi
Semi-prep
1/16" **0.75 mm**

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C4UW		C6UW		C8UW		C10UW	
With air actuator	AC4UW		AC6UW		AC8UW		AC10UW	
With standard electric actuator	EC4UW		EC6UW		EC8UW		EC10UW	
With microelectric actuator	EDC4UW		EDC6UW		EDC8UW		EDC10UW	
Replacement valve	DC4UW		DC6UW		DC8UW		DC10UW	
Replacement rotor	SSAC4UW		SSAC6UW		SSAC8UW		SSAC10UW	

OPTIONS
- 3, 12, and 14 port valves available
- 2", 3", 4", and 6" standoffs
- 1/32" and 1/16" versions available with 0.25 mm (.010") bore
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Larger bore available.

UW Type
1/16" fittings

1/16" Stainless steel loops *for UW Type valves*

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
3 µl	SL3CUW		100 µl	SL100CUW	
5 µl	SL5CUW		250 µl	SL250CUW	
10 µl	SL10CUW		500 µl	SL500CUW	
15 µl	SL15CUW		1 ml	SL1KCUW	
20 µl	SL20CUW		2 ml	SL2KCUW	
25 µl	SL25CUW		5 ml	SL5KCUW	
50 µl	SL50CUW		10 ml	SL10KCUW	

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

switching valves, 1/8" fittings, 0.75 mm (.030")

UW Type

SPECS
0 psi liq
5°C max
lve body
Valcon H rotor

Manual 10 port includes 2" standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply

Sample loops are not included with valves. Order separately.

5,000 psi
Semi-prep
1/8" **0.75 mm**

OPTIONS
- 3 and 12 port valves available
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Larger bore available. *(see page 116)*

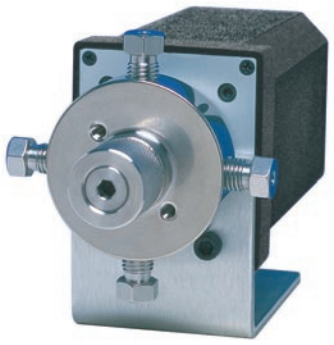
4 Ports

6 Ports

8 Ports

10 Ports

	4 Ports		6 Ports		8 Ports		10 Ports	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	4UW		6UW		8UW		210UW	$720
With air actuator	A4UW		A6UW		A8UW		A10UW	
With standard electric actuator	E4UW		E6UW		E8UW		E10UW	1200
With microelectric actuator	ED4UW		ED6UW		ED8UW		ED10UW	1430
Replacement valve	D4UW		D6UW		D8UW		D10UW	
Replacement rotor	SSA4UW		SSA6UW		SSA8UW		SSA10UW	



UW Type
1/8" fittings

MORE INFORMATION

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops < 100 µl are made from 1/16" OD tubing with brazed or welded 1/8" tube ends.

1/8" Stainless steel loops

for UW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
10 µl	SL10UW		250 µl	SL250UW	
15 µl	SL15UW		500 µl	SL500UW	
20 µl	SL20UW		1 ml	SL1KUW	
25 µl	SL25UW		2 ml	SL2KUW	
50 µl	SL50UW		5 ml	SL5KUW	
100 µl	SL100UW		10 ml	SL10KUW	
			20 ml	SL20KUW	

Injectors and switching valves, 1/8" fittings, large bore

5,000 psi
Prep
1/8" **Large bore**

Manual 10 port includes 2" standoff.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample loops are not included with valves. Order separately.

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

4 Ports
1.7 mm (.067")

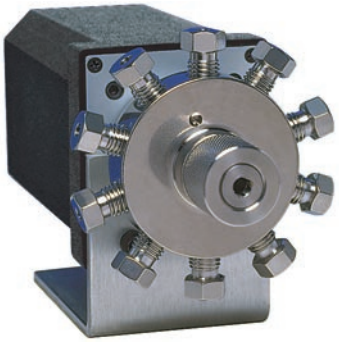
6 Ports
1.7 mm (.067")

8 Ports
1.3 mm (.050")

10 Ports
1.0 mm (.040")

	4 Ports 1.7 mm (.067")		6 Ports 1.7 mm (.067")		8 Ports 1.3 mm (.050")		10 Ports 1.0 mm (.040")	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	L4UW		L6UW		L8UW		2L10UW	
With air actuator	AL4UW		AL6UW		AL8UW		AL10UW	
With standard electric actuator	EL4UW		EL6UW		EL8UW		EL10UW	
With microelectric actuator	EDL4UW		EDL6UW		EDL8UW		EDL10UW	
Replacement valve	DL4UW		DL6UW		DL8UW		DL10UW	
Replacement rotor	SSAL4UW		SSAL6UW		SSAL8UW		SSAL10UW	

OPTIONS
- 3 port valve available
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-255)*
- Smaller bore available. *(see page 115)*



UW Type
1/8" fittings

MORE INFORMATION
Actuators
- Air ..... page 195
- Manual 204
- Microelectric .. 188-189
- Standard elec 193

Materials
- Metals 254-255
- Polymers 256
- Valve rotors 257

Standoff assemblies 205

1/8" Stainless steel loops *for UW Type valves*

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

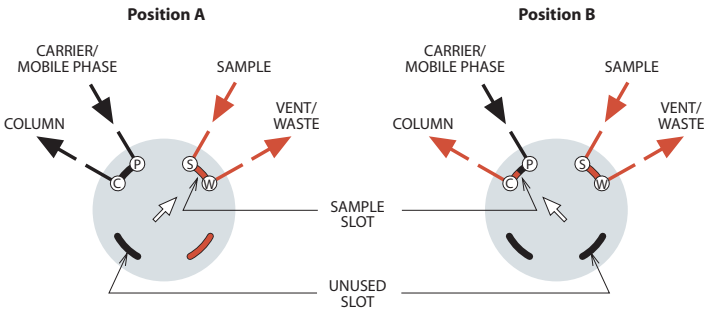
Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
100 µl	SL100UW		2 ml	SL2KUW	
250 µl	SL250UW		5 ml	SL5KUW	
500 µl	SL500UW		10 ml	SL10KUW	
1 ml	SL1KUW		20 ml	SL20KUW	

ABOUT LOOPS
- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops < 100 µl are made from 1/16" OD tubing with brazed or welded 1/8" tube ends..

These illustrations show basic sample injection techniques using Valco two position valves. With rare exceptions, there is no difference between switching valves and external volume sampling valves, so the same valve can be used for either function.

The unique advantage of 8 and 10 port valves is that they reduce extra column volume by combining sampling and switching functions in a single valve. This minimizes expense, maintenance, service, and risk of leaks as compared to multiple 6 port valve systems.

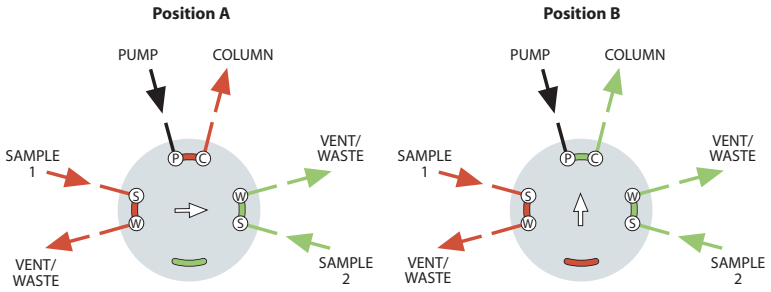
4 port internal sample injector



MICROVOLUME SAMPLE INJECTION

The internal sample (fixed volume) flowpath is used when very small sample volumes are required. The sample size is determined by a passage engraved on the valve rotor, allowing precise, repeatable injections. In Position A, the sample flows through the sample passage while the mobile phase flows through to the column. The third passage is inactive. In Position B, the sample passage is in line with the column and the mobile phase injects the contents of the sample passage onto the column. The passage which was inactive in Position A allows the sample to continue flowing without interruption.

6 port internal sample injector



DUAL MICROVOLUME SAMPLE INJECTION

This microvolume injector can be used to alternate between two different samples. Each time the valve is switched, a sample is injected. By connecting the two sample inlets in series, the valve injects the sample each time the valve switches. This is particularly useful in heavy duty cycle operations to minimize valve wear. The valve can also be used to make alternating injections of the same sample onto two different columns by swapping sample/waste and pump/column connections.

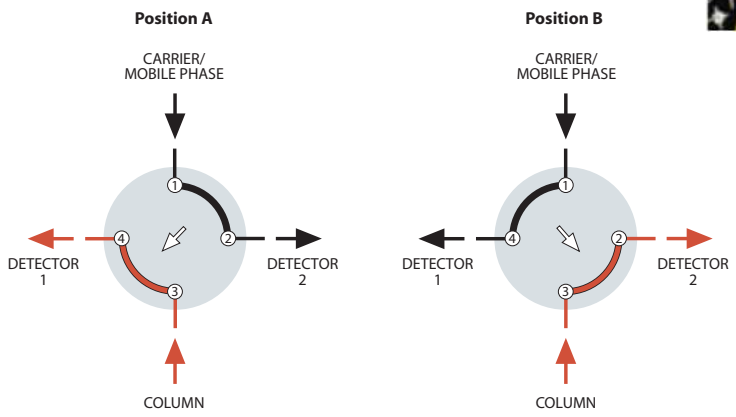
Note: This CI6 valve is not shown in this catalog. Call for details.

Two Position Applications

4 port switching valve

DETECTOR SELECTION FROM TWO COLUMNS OR ONE COLUMN AND AUXILIARY CARRIER

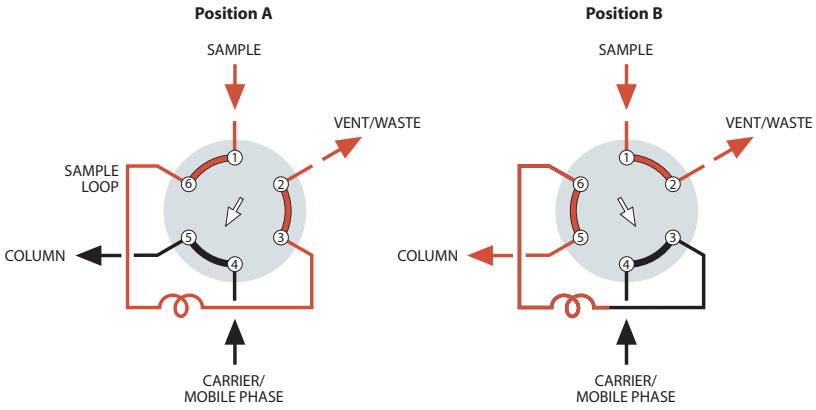
This unique configuration allows analyses of different parts of one analysis with two different detectors, without splitting or multiple injections. For example, fixed gases can be analyzed with a thermal conductivity detector, followed by the analysis of a hydrocarbon fraction with a flame ionization detector.



6 port external sample injector

SAMPLE INJECTION

With the valve in Position A, sample flows through the external loop while the mobile phase flows directly through to the chromatographic column. When the valve is switched to Position B, the sample contained in the sample loop and valve flow passage is displaced by the mobile phase and is carried onto the column.
Note: This is especially critical for partially-filled loops. The flow direction of the mobile phase through the loop should be opposite (backflush) to the flow direction during the loading of the loop.

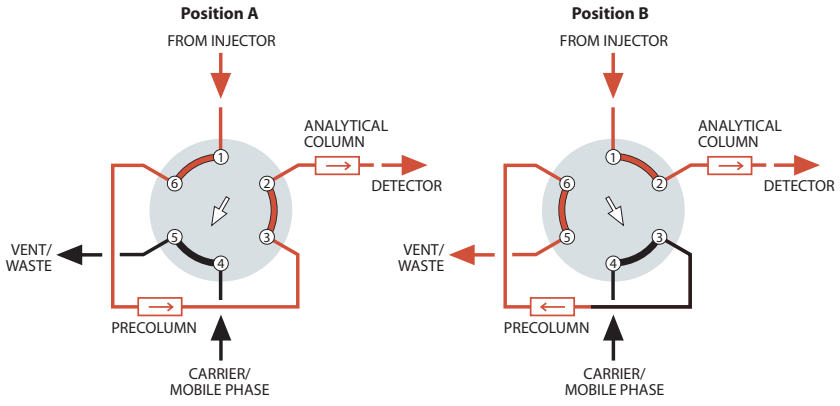


6 port column switching

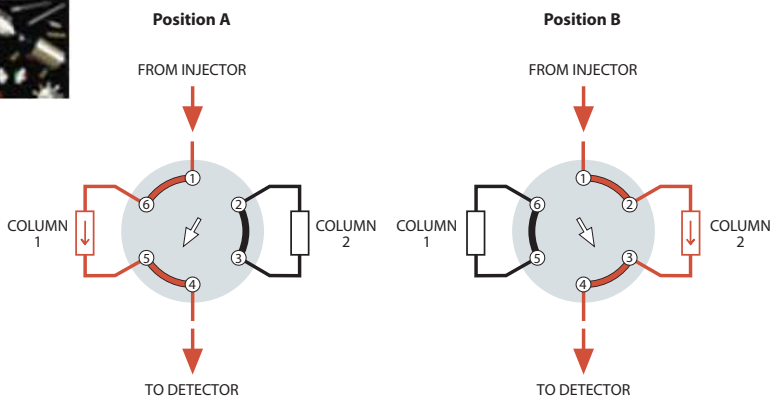
BACKFLUSH OF PRECOLUMN TO VENT

This plumbing scheme allows slower eluting components (end cut) which are not of interest to be backflushed to vent. Often a shorter version of the analytical column is used as the precolumn. Once all the components of interest have entered the main column (at port 2), the valve switches, backflushing the precolumn to vent and reducing analysis time.

Note: An auxiliary source of carrier or mobile phase is required for this application.



6 port column selection

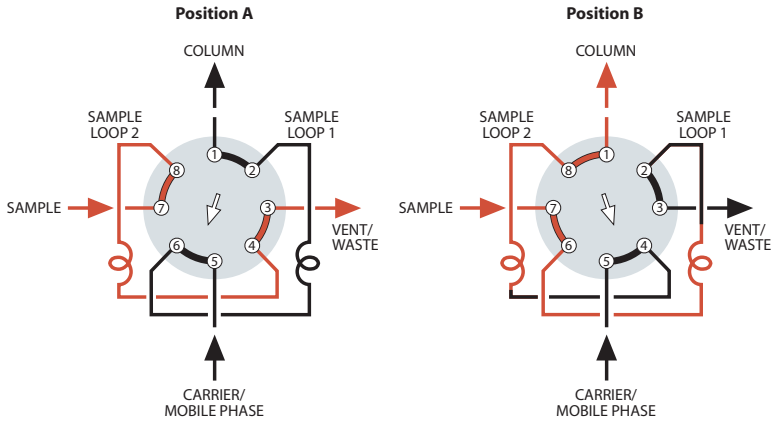


TWO COLUMN SELECTION

When two different columns are required at frequent intervals at similar oven temperatures, a 6 port valve can provide rapid selection of the one to be used. The column not in use is protected by a blanket of inert mobile phase and may be rapidly brought to equilibrium when required.

Note: If flow must be maintained to the non-selected column, an 8 or 10 port valve is required.

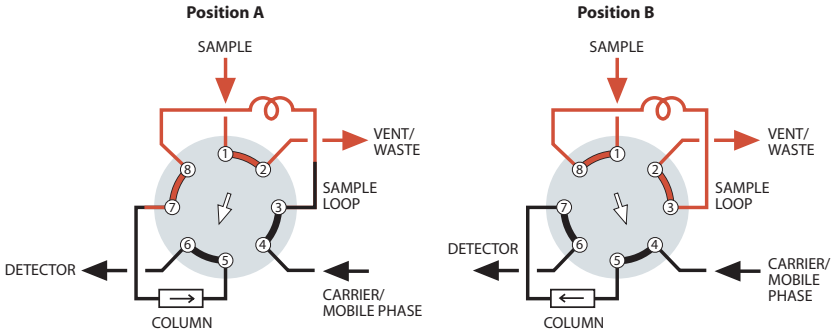
8 port dual external sample injector



SAME SAMPLE TO DIFFERENT LOOPS

In a dual external sample loop configuration, sample is injected in both positions. In Position A, Loop 2 is loaded while the mobile phase flows through Loop 1 and onto the column. In Position B, the Loop 2 sample is injected into the column and another sample is loaded into Loop 1. When the valve is returned to Position A, the Loop 1 sample is injected onto the column and Loop 2 is reloaded.

8 port sampling/switching



LOOP SAMPLING WITH BACKFLUSH TO DETECTOR

One valve functions as both a sampling and a backflush valve, simplifying operation and reducing cost. When components of interest are detected, the strongly retained components are backflushed and removed from the column without temperature programming.

Two Position Applications

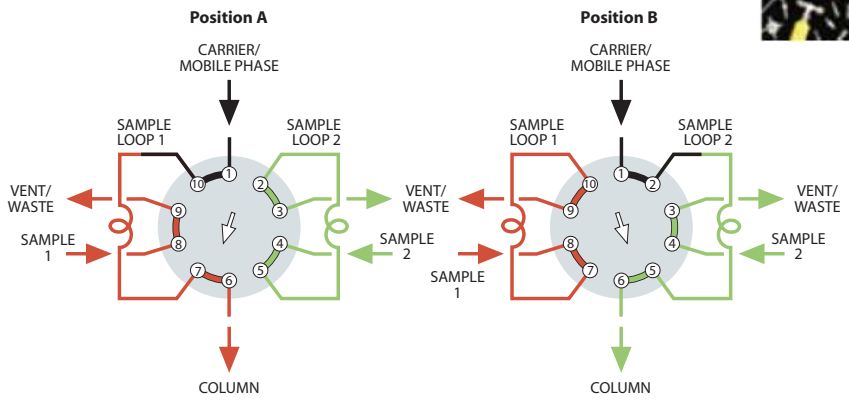
10 port dual external sampling

TWO DIFFERENT SAMPLES TO SAME COLUMN

A 10 port valve permits alternate injections from the two loops, which may be identical or of different sizes. This technique replaces a 4 port sample selector and a 6 port sample injector.

In Position A, Loop 2 is loaded with sample 2 while the mobile phase flows through Loop 1 and onto the column.

In Position B, the Loop 2 sample is injected onto the column and Loop 1 is loaded with sample 1. When the valve is returned to Position A, the Loop 1 sample is injected onto the column and Loop 2 is reloaded with sample 2.

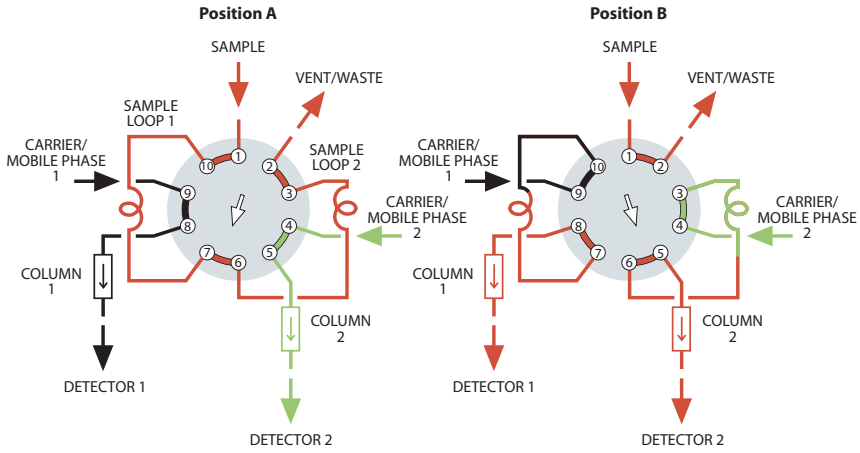


10 port dual external sampling

SIMULTANEOUS INJECTION OF THE SAME SAMPLE ONTO SEPARATE COLUMNS

In Position A, sample fills the two loops in series. In Position B, the sample is simultaneously injected into two separate flow systems. A single autosampler used with this flowpath can automate two analytical procedures for the same sample.

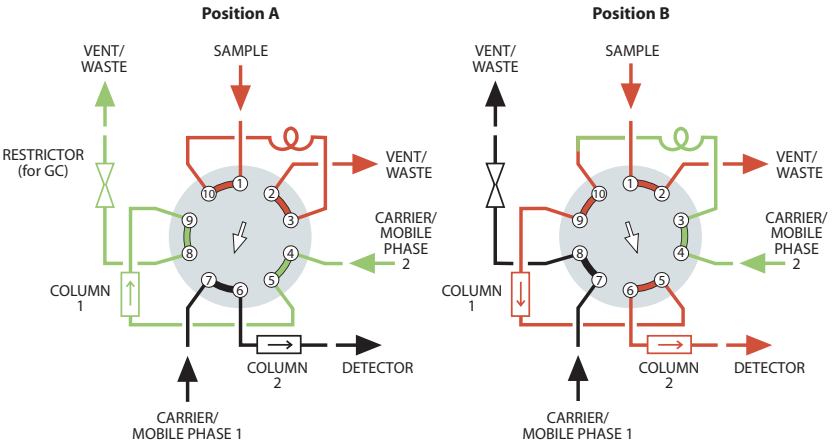
In an important non-chromatographic application, the roles of carrier and sample are reversed, permitting two different quantities of two different materials to be dispensed together, as in automatic dilution.



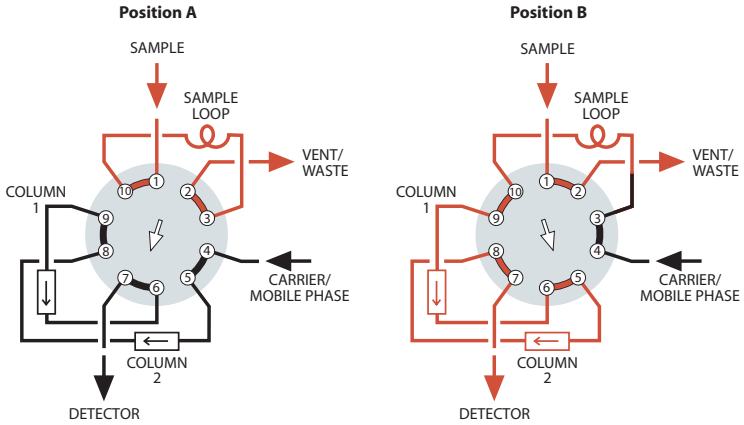
10 port sampling/switching

LOOP SAMPLING WITH BACKFLUSH OF PRE-COLUMN TO VENT

When components of interest have low boiling points, this plumbing scheme allows "heavy" components with long retention times to be backflushed to waste. After the sample loop is loaded in Position A, the valve is switched to Position B to inject the sample onto column 1. As soon as all components of interest have entered column 2, the valve is switched back to Position A. Column 1 is backflushed to vent during the analysis, reducing the total analysis time.



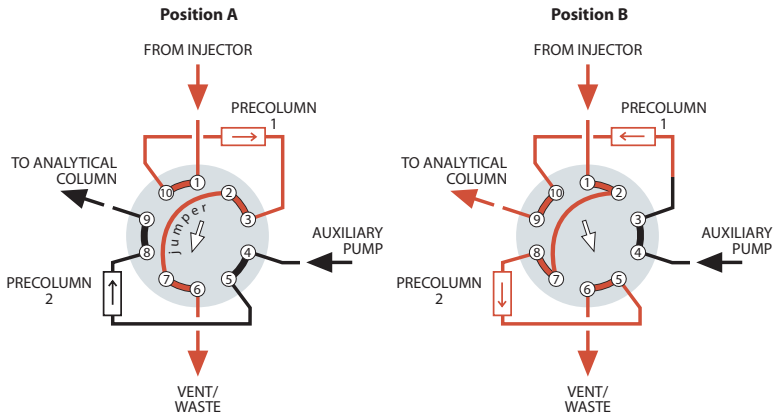
10 port sampling/switching



LOOP SAMPLING WITH TWO COLUMN SEQUENCE REVERSAL

This is ideal for fixed-gas-from-CO_2 analysis where no "high boilers" are present. Column 1 is packed with a porous polymer and Column 2 with molecular sieve. The sample loop is loaded in Position A. When the valve is switched, the loop contents are sent onto Column 1. As the inorganic gases and methane leave Column 1 and enter Column 2, the valve is returned to Position A, reversing the column sequence. CO_2 now leaves Column 1, becoming the first peak. The inorganics and methane are separated by the molesieve and pass through the porous polymer column to the detector.

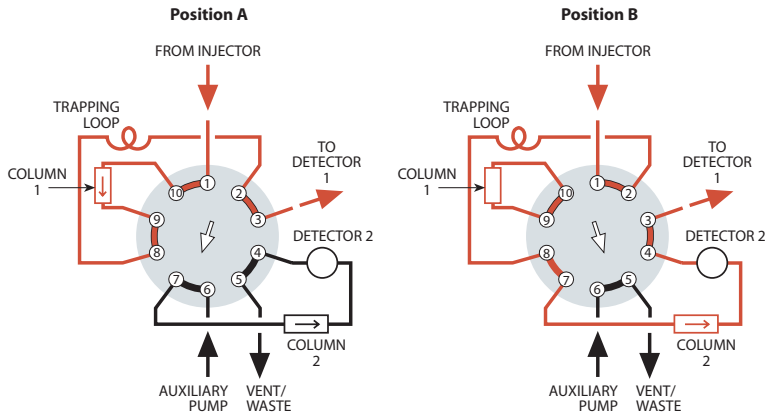
10 port column switching



SAMPLE ENRICHMENT (CLEANUP) USING DUAL PRECOLUMNS

Sample is injected by a separate injector onto one of two precolumns (stripper). Early eluting components vent at port 6 while components of interest are retained on the stripper. When the valve is switched, a new injection is made onto the second stripper while components retained on the first stripper are backflushed onto the analytical column at port 9.
Note: This application requires an auxiliary pump at port 4.

10 port column switching

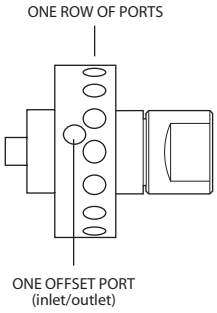


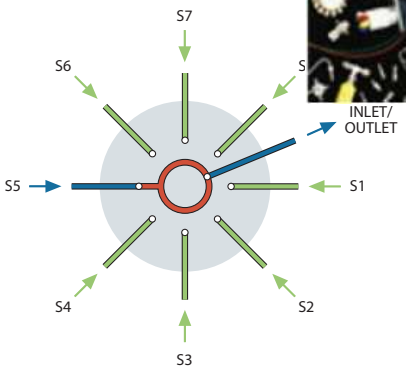
HEART CUT TRAPPED IN A LOOP AND INJECTED ONTO A SECOND COLUMN

Sample is injected (using a separate injector) onto an analytical column. Early eluting components (front cut) pass through a trapping loop and are detected (at port 3). The valve is then switched, and the center (or heartcut) which was retained in the trapping loop is injected onto the second column to the detector (at port 4). Late eluting components (end cut) are trapped on the first column. When the valve is switched again, the end cut passes through the trapping loop to the first detector, completing the analysis.

Dead-end flowpath – SD configuration

SD valves select one of 4 to 16 dead-ended streams. The selected stream flows from the outlet to a sample valve, pressure sensor, detector, column, etc. The same flowpath can also be used to direct one stream to a number of outlets in applications such as fraction collection. For an application suggestion, see page 134.





1/16" fittings, 0.75 mm ports (.030")

MW Type

Low pressure

SD Dead-end

1/16" **0.75 mm**

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international

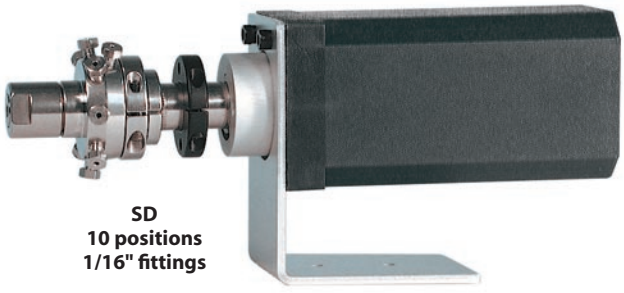
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

SPECS
400 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Larger bore available except 16 position

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2CSD6MWE		2CSD10MWE		2CSD12MWE		2CSD16MWE	
With air actuator	A2CSD6MWE		A2CSD10MWE		A2CSD12MWE		A2CSD16MWE	
With standard electric actuator	E2CSD6MWE		E2CSD10MWE		E2CSD12MWE		E2CSD16MWE	
With microelectric actuator	EMT2CSD6MWE		EMT2CSD10MWE		EMT2CSD12MWE		EMT2CSD16MWE	
Replacement valve	DCSD6MWE		DCSD10MWE		DCSD12MWE		DCSD16MWE	
Replacement rotor	SSACSD6MWE		SSACSD10MWE		SSACSD12MWE		SSACSD16MWE	



SD
10 positions
1/16" fittings

MORE INFORMATION

1/8" fittings, 1.0 mm ports (.040")

MW Type

SPECS
4-8 Positions:
400 psi gas
200°C max
10-16 Positions:
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
SD Dead-end
1/8" **1.0 mm**

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Larger bore available

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2SD6MWE		2SD10MWE		2SD12MWE		2SD16MWE	
With air actuator	A2SD6MWE		A2SD10MWE		A2SD12MWE		A2SD16MWE	
With standard electric actuator	E2SD6MWE		E2SD10MWE		E2SD12MWE		E2SD16MWE	
With microelectric actuator	EMT2SD6MWE		EMT2SD10MWE		EMT2SD12MWE		EMT2SD16MWE	
Replacement valve	DSD6MWE		DSD10MWE		DSD12MWE		DSD16MWE	
Replacement rotor	SSASD6MWE		SSASD10MWE		SSASD12MWE		SSASD16MWE	

1/4" fittings, 4.0 mm ports (.156")

MW Type

SPECS
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.

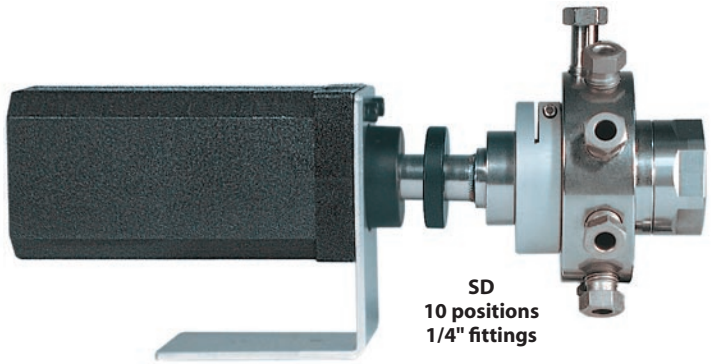
Manual version not available.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
SD Dead-end
1/4" **4.0 mm**

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

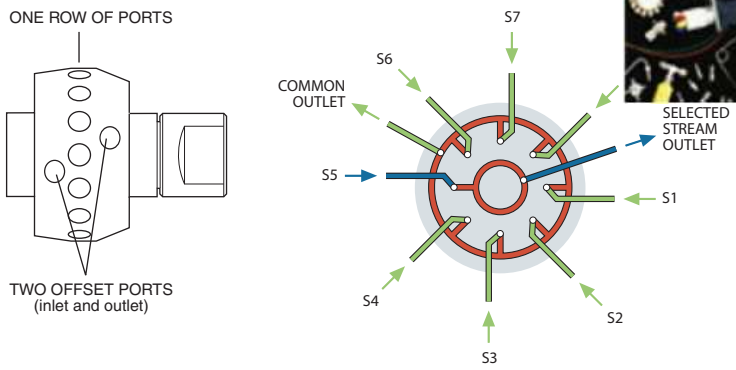
	4 Position		6 Position		8 Position		10 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
With air actuator	AH2VLSD4MWE2		AH2VLSD6MWE2		AH2VLSD8MWE2		AH2VLSD10MWE2	
With std electric actuator	E2VLSD4MWE2		E2VLSD6MWE2		E2VLSD8MWE2		E2VLSD10MWE2	
With microelectric actuator	EMT2VLSD4MWE2		EMT2VLSD6MWE2		EMT2VLSD8MWE2		EMT2VLSD10MWE2	
Replacement valve	DVLSD4MWE2		DVLSD6MWE2		DVLSD8MWE2		DVLSD10MWE2	
Replacement rotor	SSAVLSD4MWE2		SSAVLSD6MWE2		SSAVLSD8MWE2		SSAVLSD10MWE2	



SD
10 positions
1/4" fittings

Common outlet flowpath – SC configuration

SC selectors are similar to the SD configuration, except that instead of being dead-ended the non-selected streams flow to a common outlet. For an application suggestion, see page 135.



1/16" fittings, 1.0 mm ports (.040")

MW Type

Low pressure

SC Common outlet

1/16" **1.0 mm**

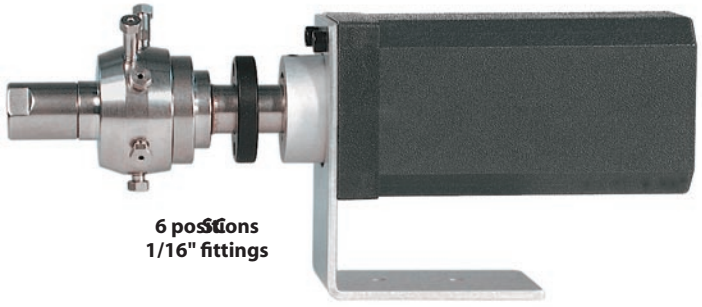
Includes 2" standoff. Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2CSC6MWE		2CSC10MWE		2CSC12MWE		2CSC16MWE	
With air actuator	A2CSC6MWE		A2CSC10MWE		A2CSC12MWE		A2CSC16MWE	
With standard electric actuator	E2CSC6MWE		E2CSC10MWE		E2CSC12MWE		E2CSC16MWE	
With microelectric actuator	EMT2CSC6MWE		EMT2CSC10MWE		EMT2CSC12MWE		EMT2CSC16MWE	
Replacement valve	DCSC6MWE		DCSC10MWE		DCSC12MWE		DCSC16MWE	
Replacement rotor	SSACSC6MWE		SSACSC10MWE		SSACSC12MWE		SSACSC16MWE	



6 positions
1/16" fittings

MORE INFORMATION

1/8" fittings, 1.0 mm ports (.040")

MW Type

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
SC Common outlet
1/8" **1.0 mm**

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Larger bore available except 16 position

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2SC6MWE		2SC10MWE		2SC12MWE		2SC16MWE	
With air actuator	A2SC6MWE		A2SC10MWE		A2SC12MWE		A2SC16MWE	
With standard electric actuator	E2SC6MWE		E2SC10MWE		E2SC12MWE		E2SC16MWE	
With microelectric actuator	EMT2SC6MWE		EMT2SC10MWE		EMT2SC12MWE		EMT2SC16MWE	
Replacement valve	DSC6MWE		DSC10MWE		DSC12MWE		DSC16MWE	
Replacement rotor	SSASC6MWE		SSASC10MWE		SSASC12MWE		SSASC16MWE	

1/4" fittings, 4.0 mm ports (.156")

MW Type

SPECS
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

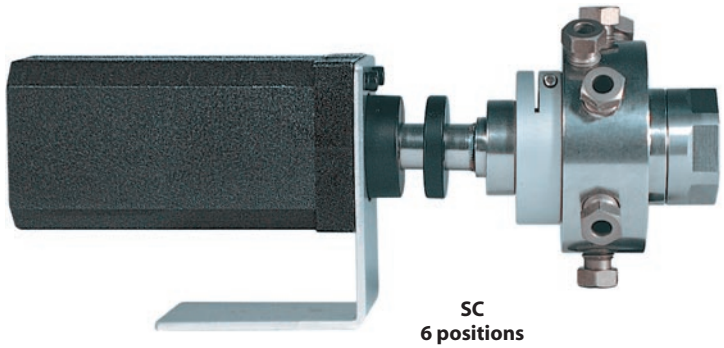
Manual version not available.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
SC Common outlet
1/4" **4.0 mm**

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

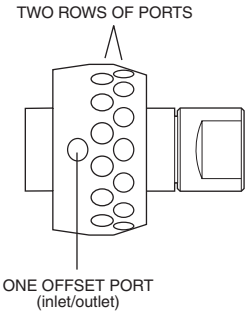
	4 Position		6 Position		8 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
With air actuator	AH2VLSC4MWE2		AH2VLSC6MWE2		AH2VLSC8MWE2	
With std electric actuator	E2VLSC4MWE2		E2VLSC6MWE2		E2VLSC8MWE2	
With microelectric actuator	EMT2VLSC4MWE2		EMT2VLSC6MWE2		EMT2VLSC8MWE2	
Replacement valve	DVLSC4MWE2		DVLSC6MWE2		DVLSC8MWE2	
Replacement rotor	SSAVLSC4MWE2		SSAVLSC6MWE2		SSAVLSC8MWE2	

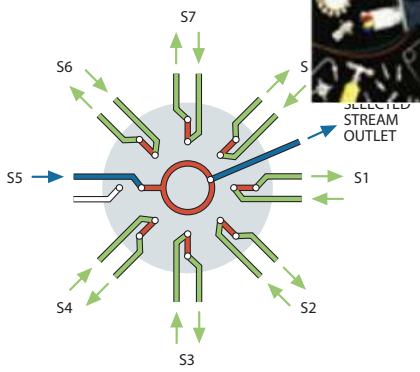


SC
6 positions
1/4" fittings

Flow-through flowpath – SF configuration

SD and SC valves select and isolate one of 4 to 16 streams, with the remainder dead-ended in the SD and flowing to a common outlet in the SC. The SF selector is similar, but carries the evolution a step further with the non-selected streams flowing through individual outlets. For an application suggestion, see page 136.





1/16" fittings, 1.0 mm ports (.040")

MW Type

Low pressure

SF Flow-through

1/16" **1.0 mm**

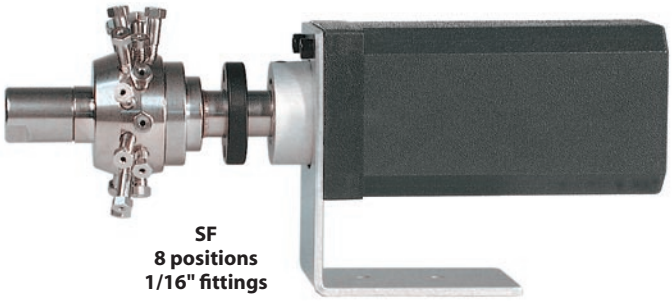
Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2CSF6MWE		2CSF10MWE		2CSF12MWE		2CSF16MWE	
With air actuator	A2CSF6MWE		A2CSF10MWE		A2CSF12MWE		A2CSF16MWE	
With standard electric actuator	E2CSF6MWE		E2CSF10MWE		E2CSF12MWE		E2CSF16MWE	
With microelectric actuator	EMT2CSF6MWE		EMT2CSF10MWE		EMT2CSF12MWE		EMT2CSF16MWE	
Replacement valve	DCSF6MWE		DCSF10MWE		DCSF12MWE		DCSF16MWE	
Replacement rotor	SSACSF6MWE		SSACSF10MWE		SSACSF12MWE		SSACSF16MWE	



SF
8 positions
1/16" fittings

MORE INFORMATION

1/8" fittings, 1.0 mm ports (.040")

MW Type

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
SF Flow-through
1/8" **1.0 mm**

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Larger bore available except 16 position

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2SF6MWE		2SF10MWE		2SF12MWE		2SF16MWE	
With air actuator	A2SF6MWE		A2SF10MWE		A2SF12MWE		A2SF16MWE	
With standard electric actuator	E2SF6MWE		E2SF10MWE		E2SF12MWE		E2SF16MWE	
With microelectric actuator	EMT2SF6MWE		EMT2SF10MWE		EMT2SF12MWE		EMT2SF16MWE	
Replacement valve	DSF6MWE		DSF10MWE		DSF12MWE		DSF16MWE	
Replacement rotor	SSASF6MWE		SSASF10MWE		SSASF12MWE		SSASF16MWE	

1/4" fittings, 4.0 mm ports (.156")

MW Type

SPECS
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

Manual version is not available.

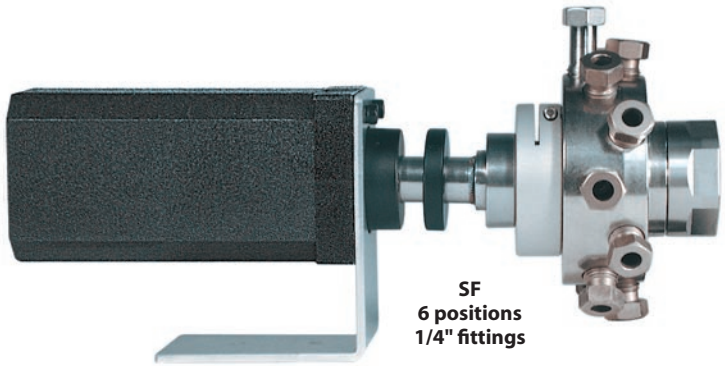
Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
SF Flow-through
1/4" **4.0 mm**

OPTIONS

- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

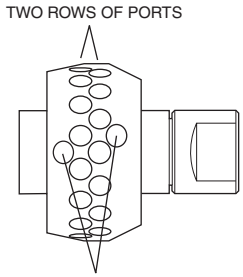
	4 Position		6 Position		8 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
With air actuator	AH2VLSF4MWE2		AH2VLSF6MWE2		AH2VLSF8MWE2	
With std electric actuator	E2VLSF4MWE2		E2VLSF6MWE2		E2VLSF8MWE2	
With microelectric actuator	EMT2VLSF4MWE2		EMT2VLSF6MWE2		EMT2VLSF8MWE2	
Replacement valve	DVLSF4MWE2		DVLSF6MWE2		DVLSF8MWE2	
Replacement rotor	SSAVLSF4MWE2		SSAVLSF6MWE2		SSAVLSF8MWE2	

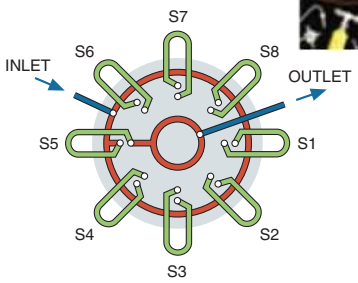


SF
6 positions
1/4" fittings

Trapping flowpath – ST configuration

ST selectors are used for multi-column, multi-sample, or multi-trap operations, and are available for use with 4 to 16 loops, or positions. For an application suggestion, see page 137.





1/16" fittings, 0.75 mm ports (.030")

MW Type

Low pressure
ST Trapping
1/16" **0.75 mm**

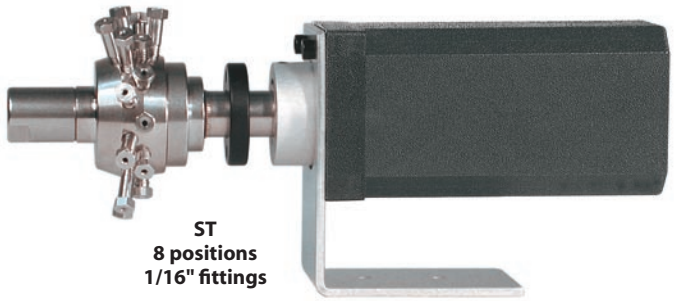
Includes 2" standoff. Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2CST6MWE		2CST10MWE		2CST12MWE		2CST16MWE	
With air actuator	A2CST6MWE		A2CST10MWE		A2CST12MWE		A2CST16MWE	
With standard electric actuator	E2CST6MWE		E2CST10MWE		E2CST12MWE		E2CST16MWE	
With microelectric actuator	EMT2CST6MWE		EMT2CST10MWE		EMT2CST12MWE		EMT2CST16MWE	
Replacement valve	DCST6MWE		DCST10MWE		DCST12MWE		DCST16MWE	
Replacement rotor	SSACST6MWE		SSACST10MWE		SSACST12MWE		SSACST16MWE	



ST
8 positions
1/16" fittings

1/16" Stainless steel loops

for MW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately. When a set of loops is ordered, loops will be supplied from the same lot.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
50 µl	SL50CSTP		1 ml	SL1KCSTP	
100 µl	SL100CSTP		2 ml	SL2KCSTP	
250 µl	SL250CSTP		5 ml	SL5KCSTP	
500 µl	SL500CSTP		10 ml	SL10KCSTP	

MORE INFORMATION

1/8" fittings, 1.0 mm ports (.040")

MW Type

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
ST Trapping
1/8" **1.0 mm**

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Larger bore available except 16 position

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2ST6MWE		2ST10MWE		2ST12MWE		2ST16MWE	
With air actuator	A2ST6MWE		A2ST10MWE		A2ST12MWE		A2ST16MWE	
With standard electric actuator	E2ST6MWE		E2ST10MWE		E2ST12MWE		E2ST16MWE	
With microelectric actuator	EMT2ST6MWE		EMT2ST10MWE		EMT2ST12MWE		EMT2ST16MWE	
Replacement valve	DST6MWE		DST10MWE		DST12MWE		DST16MWE	
Replacement rotor	SSAST6MWE		SSAST10MWE		SSAST12MWE		SSAST16MWE	

ABOUT LOOPS
- Other materials are available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- 1/16" loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.
- 1/8" loops < 100 µl are made from 1/16" OD tubing with brazed or welded 1/8" tube ends.

1/8" Stainless steel loops

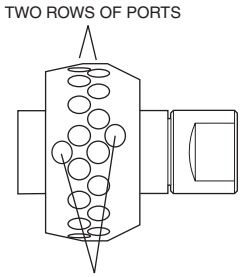
for MW Type valves

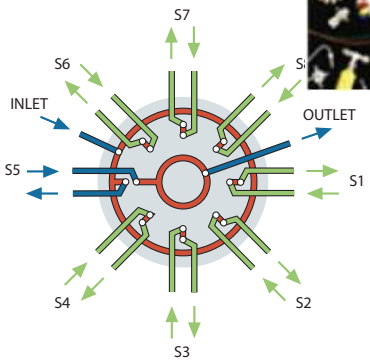
Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately. When a set of loops is ordered, loops will be supplied from the same lot.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
100 µl	SL100STP		1 ml	SL1KSTP	
250 µl	SL250STP		2 ml	SL2KSTP	
500 µl	SL500STP		5 ml	SL5KSTP	
			10 ml	SL10KSTP	

Trapping/flow-through flowpath – STF configuration

The STF selector is a variation of the ST flowpath, with the single difference that the non-selected streams are returned to their own vents or sources rather than being dead-ended or trapped as they are in the standard ST configuration. For an application suggestion, see page 138.





1/16" fittings, 0.75 mm ports (.030")

MW Type

Low pressure

STF Trap/ flow-throw

1/16" **0.75 mm**

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

OPTIONS
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2CSTF6MWE		2CSTF10MWE		2CSTF12MWE		2CSTF16MWE	
With air actuator	A2CSTF6MWE		A2CSTF10MWE		A2CSTF12MWE		A2CSTF16MWE	
With standard elec actuator	E2CSTF6MWE		E2CSTF10MWE		E2CSTF12MWE		E2CSTF16MWE	
With microelectric actuator	EMT2CSTF6MWE		EMT2CSTF10MWE		EMT2CSTF12MWE		EMT2CSTF16MWE	
Replacement valve	DCSTF6MWE		DCSTF10MWE		DCSTF12MWE		DCSTF16MWE	
Replacement rotor	SSACSTF6MWE		SSACSTF10MWE		SSACSTF12MWE		SSACSTF16MWE	

MORE INFORMATION

1/8" fittings, 1.0 mm ports (.040")

MW Type

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

Includes 2" standoff.
Ask about closemount assembly if valve will not be heated.

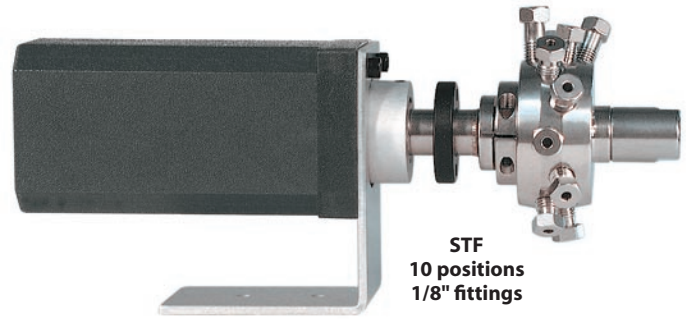
Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

Low pressure
STF Trap/ flow-throw
1/8" **1.0 mm**

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Larger bore available except 16 position

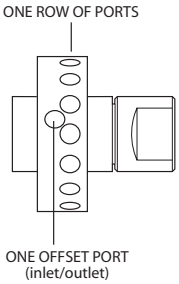
	6 Position		10 Position		12 Position		16 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	2STF6MWE		2STF10MWE		2STF12MWE		2STF16MWE	
With air actuator	A2STF6MWE		A2STF10MWE		A2STF12MWE		A2STF16MWE	
With standard elec actuator	E2STF6MWE		E2STF10MWE		E2STF12MWE		E2STF16MWE	
With microelectric actuator	EMT2STF6MWE		EMT2STF10MWE		EMT2STF12MWE		EMT2STF16MWE	
Replacement valve	DSTF6MWE		DSTF10MWE		DSTF12MWE		DSTF16MWE	
Replacement rotor	SSASTF6MWE		SSASTF10MWE		SSASTF12MWE		SSASTF16MWE	

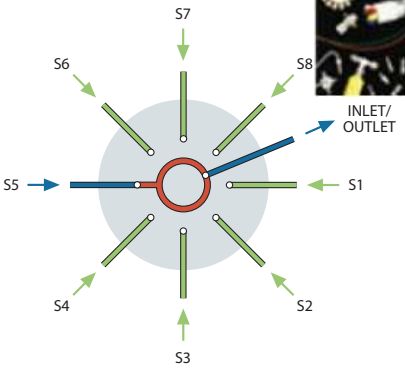


STF
10 positions
1/8" fittings

Dead-end flowpath – SD configuration

SD valves select one of 4 to 16 dead-ended streams. The selected stream flows from the valve outlet to a sample valve, pressure sensor, detector, column, etc. This configuration may also be used to direct one stream to a number of outlets for applications such as fraction collection. For an application suggestion, see page 139.





1/16" fittings, 0.4 mm ports (.016")

UW Type

5,000 psi
SD Dead-end
1/16" **0.40 mm**

Standard electric actuators:
110 VAC for USA;
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

OPTIONS

- 8 and 12 positions available
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Low pressure, high temperature versions available
- Larger bore available except 10 and 12 positions

SPECS
5000 psi
75°C max
Nitronic 60 body
Valcon E rotor

	4 Position		6 Position		10 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	CSD4UW		CSD6UW		CSD10UW	
With air actuator	ACSD4UW		ACSD6UW		ACSD10UW	
With standard electric actuator	ECSD4UW		ECSD6UW		ECSD10UW	
With microelectric actuator	EMTCSD4UW		EMTCSD6UW		EMTCSD10UW	
Replacement valve	DCSD4UW		DCSD6UW		DCSD10UW	
Replacement rotor	SSACSD4UW		SSACSD6UW		SSACSD10UW	

1/8" fittings, 0.75 mm ports (.030")

UW Type

5,000 psi
SD Dead-end
1/8" **0.75 mm**

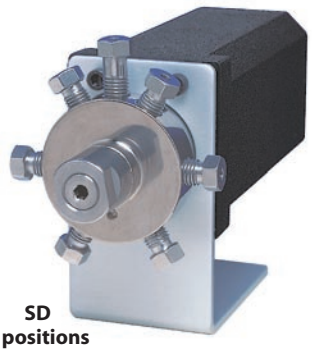
Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply)

OPTIONS

- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see page 254-255)*
- Low pressure, high temperature versions available
- Larger bore available except 8 position

SPECS
5000 psi liq
75°C max
Nitronic 60 body
Valcon E rotor

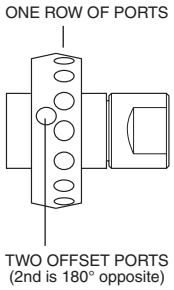
	4 Position		6 Position		8 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual (not recommended)	SD4UW		SD6UW		SD8UW	
With air actuator	ASD4UW		ASD6UW		ASD8UW	
With standard electric actuator	ESD4UW		ESD6UW		ESD8UW	
With microelectric actuator	EMTSD4UW		EMTSD6UW		EMTSD8UW	
Replacement valve	DSD4UW		DSD6UW		DSD8UW	
Replacement rotor	SSASD4UW		SSASD6UW		SSASD8UW	

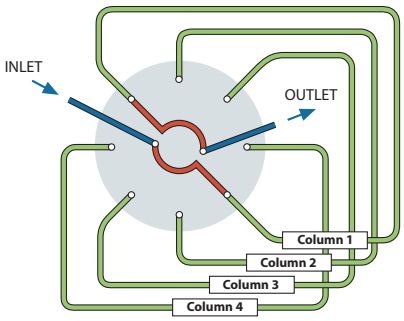


SD
6 positions
1/8" fittings

Both column ends selected – ST configuration

ST selectors are used for multi-column, multi-sample, or multi-trap operations. This valve can be used between an injector and detector to permit manual or automated HPLC column selection. For an application suggestion, see page 139.





1/16" fittings, 0.4 mm ports (.016")

UW Type

SPECS
5000 psi liq
75°C max
Nitronic 60 body
Valcon E rotor

Manual versions are not available.

Standard electric actuators:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international
Microelectric actuators:
24 VDC (includes a 110/230 VAC to 24 VDC power supply).

5,000 psi
ST Trapping
1/16" **0.40 mm**

OPTIONS
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*
- Low pressure, high temperature versions available. (Consult factory.)

	4 Columns or Loops		6 Columns or Loops	
	Prod No	*Price*	*Prod No*	*Price*
With air actuator	ACST4UW		ACST6UW	
With standard electric actuator	ECST4UW		ECST6UW	
With microelectric actuator	EMTCST4UW		EMTCST6UW	
Replacement valve	DCST4UW		DCST6UW	
Replacement rotor	SSACST4UW		SSACST6UW	

ST
4 position
1/16" fittings

MORE INFORMATION

ABOUT LOOPS
- Other materials are available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, PEEK, PTFE, and Titanium
- Loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

1/16" Stainless steel loops

for UW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.
When a set of loops is ordered, loops will be supplied from the same lot.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
10 µl	SL10CSTUW		250 µl	SL250CSTUW	
15 µl	SL15CSTUW		500 µl	SL500CSTUW	
20 µl	SL20CSTUW		1 ml	SL1KCSTUW	
25 µl	SL25CSTUW		2 ml	SL2KCSTUW	
50 µl	SL50CSTUW		5 ml	SL5KCSTUW	
100 µl	SL100CSTUW		10 ml	SL10KCSTUW	

Selector Applications

SD flowpath — low pressure

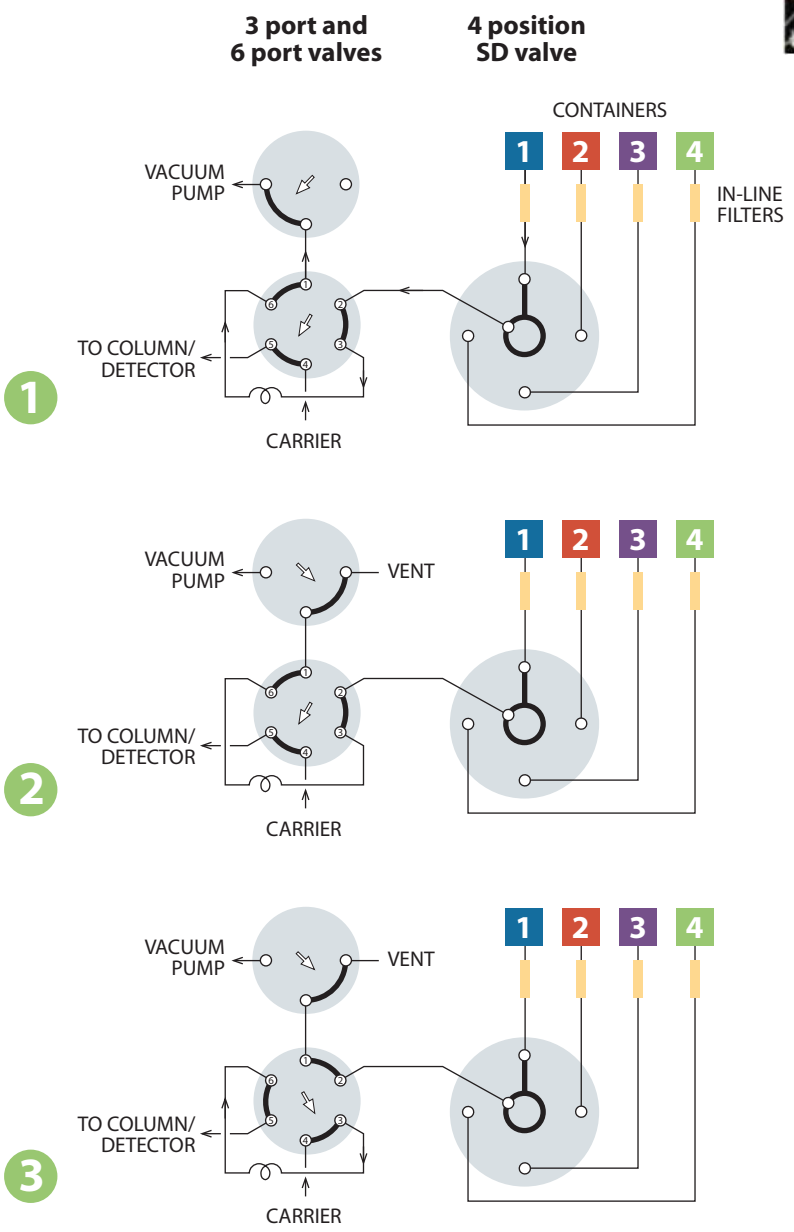
STREAM SELECTION WITH DEAD-ENDED STREAMS

SD valves select one of 4 to 16 dead-ended streams. The selected stream flows from the valve outlet to a sample valve, pressure sensor, detector, column, etc. The same configuration may also be used to direct one stream to a number of outlets for applications such as fraction collection.

This example illustrates automated sampling of non-pressurized containers.

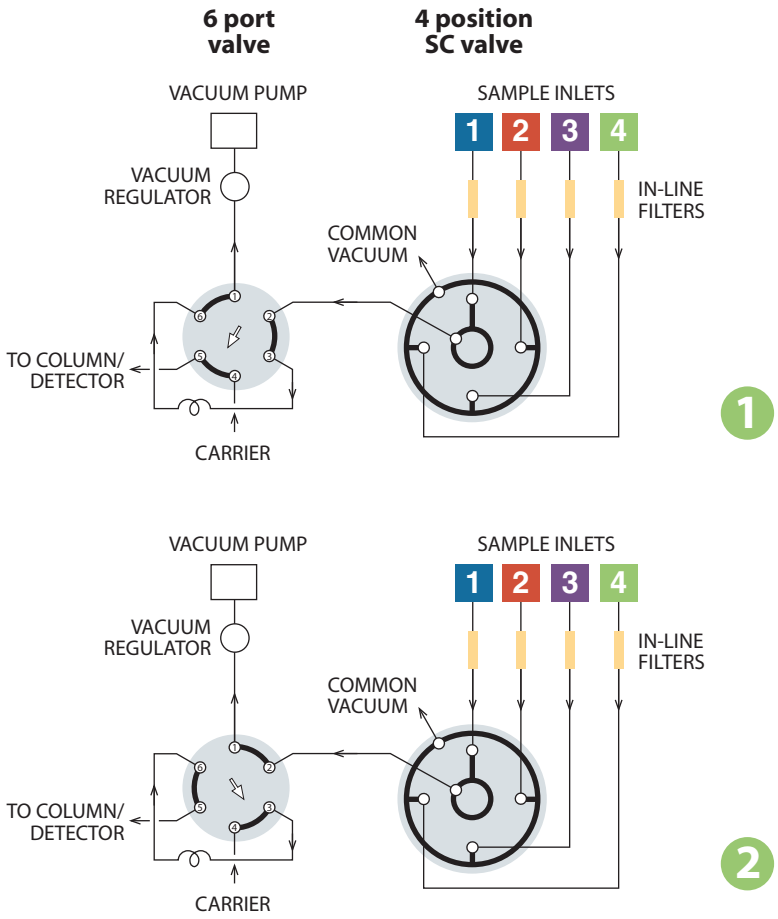
1 A vacuum pump is used to move sample from the containers to a 6 port sampling valve. 2 The 3 port valve is used to block the vacuum flow through the sampling valve to allow the sample within the loop to equilibrate at atmospheric pressure. 3 The 6 port valve is then switched, injecting the sample. This method eliminates any possible effect from pressure differences among the containers, providing accurate and repeatable results. All three valves can be automated with air or electric actuators for unattended operation.

The SD flowpath isolates the unselected sample streams, but the potential exists for extraneous sample or contaminants to be in the lines when containers are first connected. To avoid problems, either prepurge each line or allow sufficient sampling time for the line to purge prior to injection.



MORE INFORMATION

SC flowpath



STREAM SELECTION WITH CONTINUOUS FLOW TO A COMMON OUTLET

SC selectors are similar to the SD configuration, except that instead of being dead-ended the non-selected streams flow to a common outlet. They are also available in 4, 6, 8, 10, 12, or 16 position versions.

The SC configuration is ideal for air quality monitoring, illustrated in this example.

The application is essentially the same as the one shown for the SD selectors on the previous page, except that the non-selected streams are continuously pulled through the valve, insuring that the most current sample will be provided as each point is selected for analysis. (1) The sample loop on the 6 port valve is loaded from Stream 1. (2) The 6 port valve is switched, injecting the sample. Both valves can be automated with air or electric actuators for unattended operation.

TECH TIP

Because the most common cause of valve failure is stray particulates entering the valve, we strongly recommend the use of in-line filters at sample entry points.

Our ZUFR filters feature inexpensive and easily replaceable low pressure drop filter screens (2 or 10 micron). The filters are available in 1/16", 1/8", and 1/4" standard, reducing, and bulkhead versions.

Filters ..... pages 52

MORE INFORMATION

Actuators
Air ..... page 194
Microelectric .. 190-191
Standard elec.....
SC prices..... 124-125

Selector Applications

SF flowpath

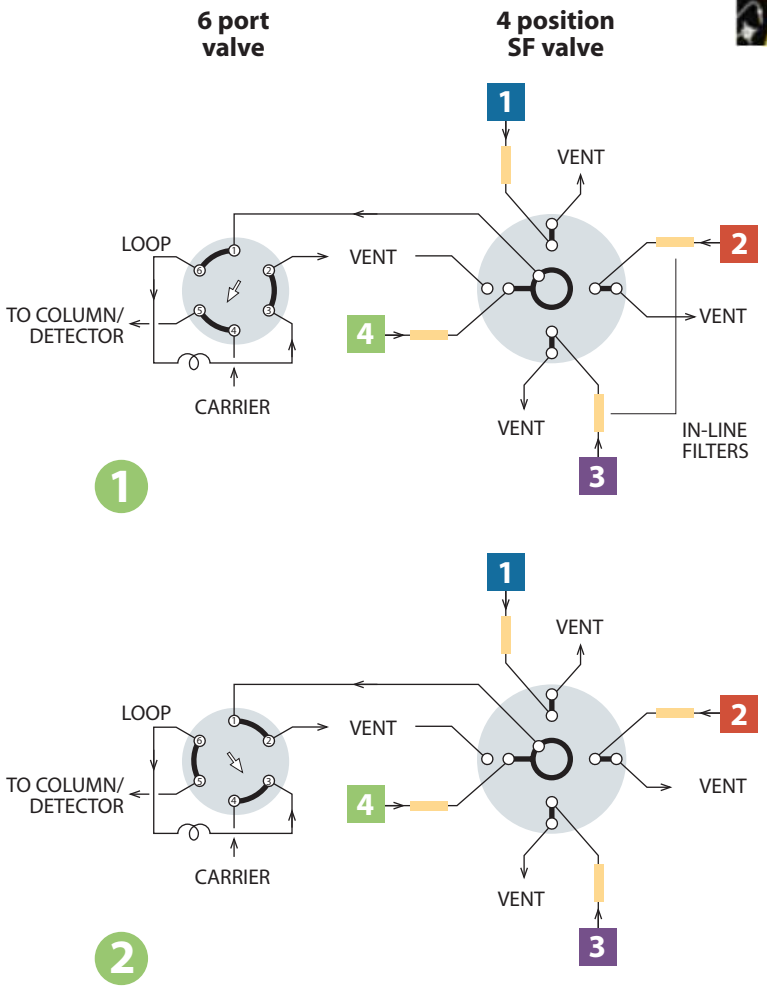
STREAM SELECTION WITH CONTINUOUS FLOW TO INDIVIDUAL OUTLETS

SD and SC valves select and isolate one of 4 to 16 streams, with the remainder dead-ended in the SD and flowing to a common outlet in the SC. The SF selector is similar, but carries the evolution a step further with the non-selected streams flowing through individual outlets.

This is the ideal solution when reactions or process streams with differing upstream pressures must be analyzed, and can also provide independent containment of toxic or noxious streams. An SF selector together with a 6 port sampling valve and pneumatic or electric actuators comprise a complete sampling system for the automated analysis of up to 16 sample points.

Note that streams 1 and 4 are vented while streams 2 and 3 are returned to their sources in this example.

Mode 1 shows sample loading from stream 4, while mode 2 shows sample injected onto the analytical column.

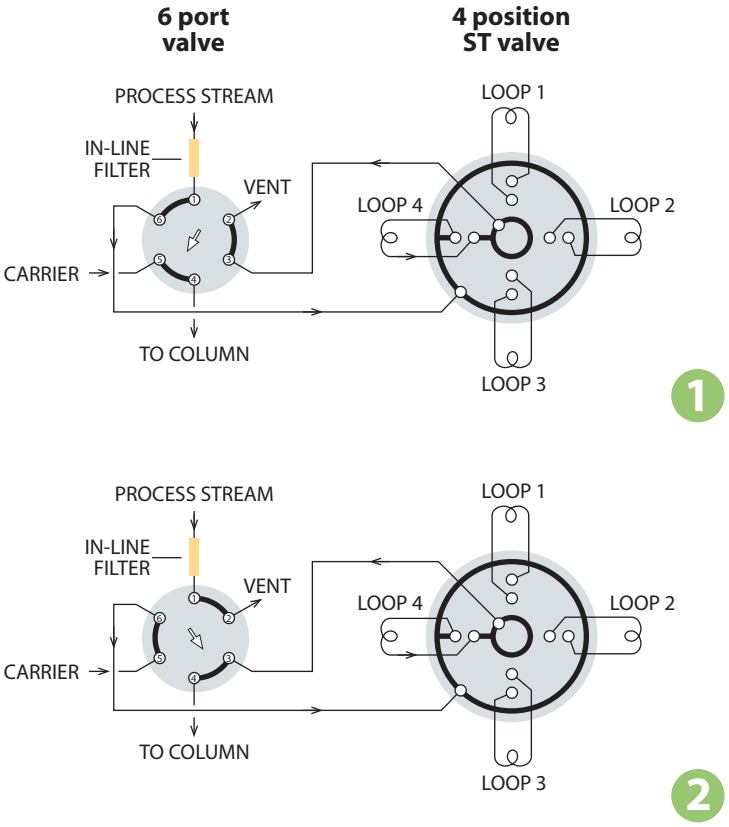


MORE INFORMATION

Actuators
- Air ..... page 194
- Microelectric .. 190-191
- Standard elec.....193

SF prices
..... 126-127

ST flowpath — low pressure



SAMPLE TRAPPING APPLICATIONS FOR 4 TO 16 STREAMS

ST selectors are used for multi-column, multi-sample, or multi-trap operations. The ST configuration is available in both MW and UW type designs.

A typical application, shown here, is the collection of fractions at timed intervals for analysis at a later time. Valves can be ordered with matched loops already installed.

In this example, the 6 port valve shown is used to select between 1 collection/trapping and 2 analysis/desorption. Both valves can be supplied with pneumatic or electric actuators to automate these functions.

MORE INFORMATION

ST prices
Low pressure .. 128-129
High pressure 133
Application
High pressure ST ...139

TECH TIP

Because the most common cause of valve failure is stray particulates entering the valve, we strongly recommend the use of in-line filters at sample entry points.

Our ZUFR filters feature inexpensive and easily replaceable low pressure drop filter screens (2 or 10 micron). The filters are available in 1/16", 1/8", and 1/4" standard, reducing, and bulkhead versions.

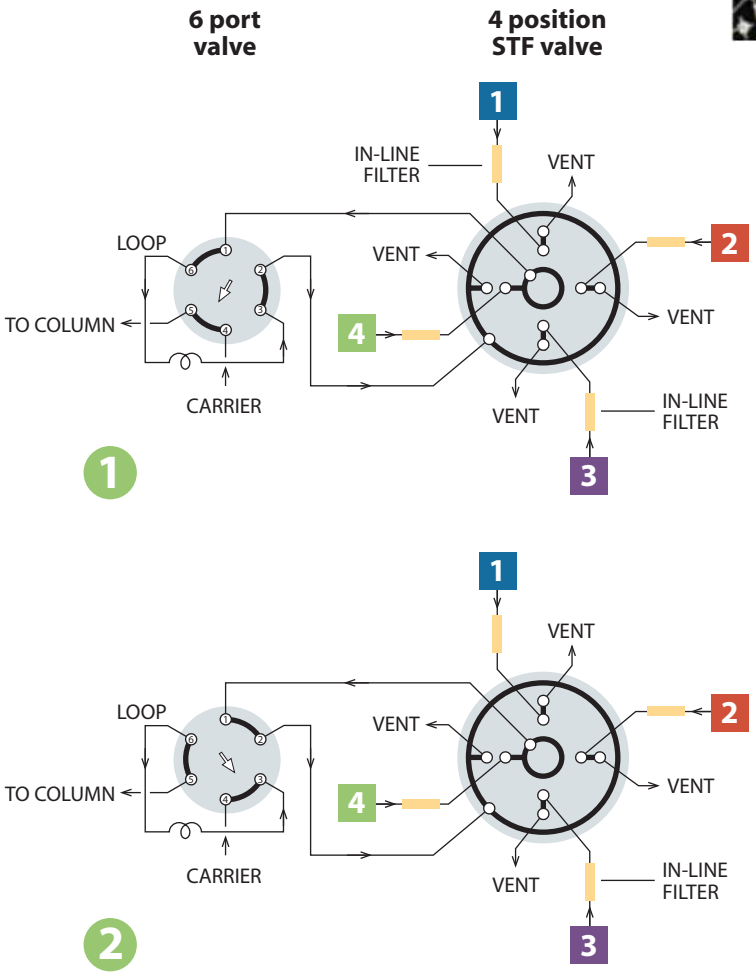
Filters ..... page 52

STF flowpath

SAMPLE TRAPPING WITH CONTINUOUS FLOW TO INDIVIDUAL OUTLETS

The STF selector is a variation of the ST flowpath, with the single difference that the non-selected streams are returned to their own vents or sources rather than being dead-ended or trapped as they are in the standard ST configuration. This is ideal for reactor processes in which removal of substantial amounts of sample would upset the equilibrium within the reactor, or if the stream is toxic or noxious and must be isolated.

An STF selector on an air or electric actuator along with a similarly equipped 6 port valve comprise a complete sampling system for the automated analysis of up to 16 sampling points.



TECH TIP

Because the most common cause of valve failure is stray particulates entering the valve, we strongly recommend the use of in-line filters at sample entry points.

Our ZUFR filters feature inexpensive and easily replaceable low pressure drop filter screens (2 or 10 micron).

The filters are available in 1/16", 1/8", and 1/4" standard, reducing, and bulkhead versions.

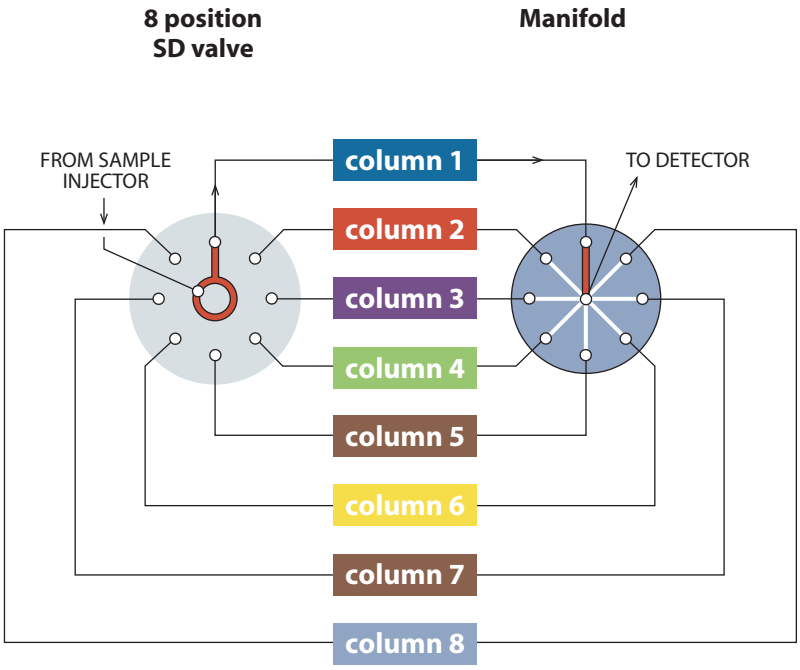
Filters . . . . . page 52

MORE INFORMATION

Actuators
Air . . . . . page 194-195
Microelectric . . 188-191
Standard elec. 193

STF prices 130-131

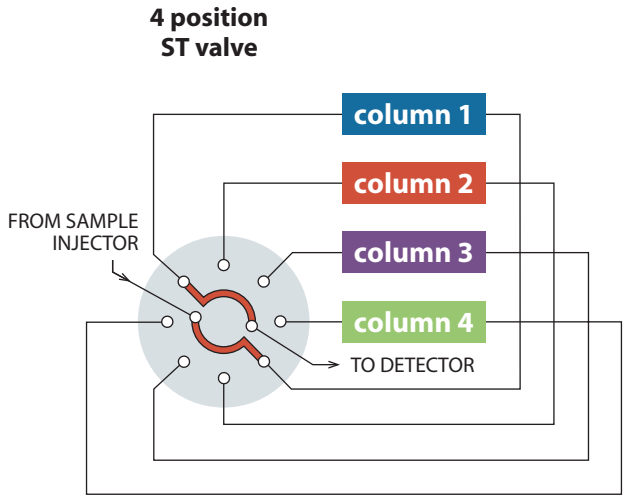
SD flowpath — high pressure



HPLC COLUMN SELECTION FOR UP TO 10 COLUMNS

This example illustrates an SD (UW type) selector used for HPLC column selection. This allows multiple columns to be installed permanently in the system, eliminating instrument downtime and leakage potential resulting from having to change columns repeatedly. The SDUW valve selects only column inlets – the column outlets are connected to the detector via a low-volume manifold. The manifold is sold separately.

ST flowpath — high pressure



HPLC COLUMN SELECTION FOR 4 OR 6 COLUMNS

Up to 6 HPLC columns can be rapidly accessed by column selection valves, eliminating the instrument downtime involved in exchanging columns and the leakage due to repeated changing of tubing fittings. The columns are installed as a part of the loop system, as shown in this drawing. A 6 position valve can support 6 columns.

MORE INFORMATION

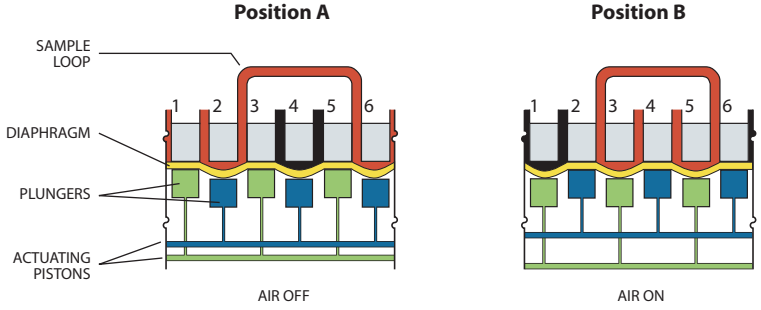
Diaphragm Valves

- Only 35 mm (1.375") in diameter
- >1,000,000 cycle lifetime
- Three configurations – 6 port, 10 port, and 4 port internal sample
- Built in actuator
- 1/16" or 1/32" Valco zero dead volume fittings

The VICI mini diaphragm valve is designed for trouble-free use in applications requiring minimal maintenance and maximum lifetime, making it an ideal choice for the process industry, automated lab analyzers, or continuous-monitoring environmental analyses.

Design

The mini diaphragm valve consists of plungers and ports arranged in a circular pattern, with the plungers controlled by the reciprocation action of two air actuated pistons. Maintenance procedures are greatly simplified, since a single screw holds the valve together and locating pins ensure proper alignment. Extremely long lifetime, very short actuation time (10 milliseconds), minimum internal dead volume, and reliability have made this type of valve very successful in process gas chromatography for both sample injection and column switching.



TECH TIP

For optimal zero dead volume connections, make sure your tubing meets the best industry standards. OD tolerance should be nominal dimension ± .002".

Fractional dimension	Nominal dimension
1/32"	.031
1/16"	.062
1/8"	.125
1/4"	.250
3/8"	.375
1/2"	.500

Dimensions

Valve diameter is 35 mm (1.375"), height is 42 mm (1.625"), and weight is less than 255 g (9 oz).

Valve Fittings

The valve cap has Valco 1/32" or 1/16" ZDV fitting details – a rugged design which allows easy replacement of tubing or of the valve itself.

Standard bore size is 0.40 mm (.016"). Optional bore sizes are 0.25 mm (.010") and 0.75 mm (.030").

Lifetime

Diaphragm valve lifetime can exceed 1,000,000 cycles at ambient temperature or 500,000 cycles at 175°C.

Temperature/Pressure Specifications

The standard valve can be operated at temperatures up to 175°C, at 300 psi. The specially-formed diaphragm also permits sampling at subambient pressures.

Materials of Construction

The cap is Nitronic 60 stainless (optional Hastelloy C or Type 316 stainless), with remaining metal parts of 300 series stainless. The diaphragm is formed from a specialized polyimide.

Actuation

Actuator air (50-60 psi) is supplied to a side port with 10-32 female threads, permitting use of a variety of compression or barbed fittings. A 3-way solenoid is required for actuation. See information box below.

MORE INFORMATION
Materials
Metals..... pp 254-255

Valve descriptions
Cheminert injectors and valves 144-149
Cheminert selectors ..144, 150-151
Valco injectors and valves 96-99
Valco selectors .. 100-101

Valve prices
Cheminert HPLC. 152-163
Cheminert low pressure..... 164-167
Cheminert selectors 170-177
Valco GC 102-111
Valco HPLC..... 112-116
Valco selectors .. 122-133

ACTUATION
A 3-way solenoid is required for actuation.

31E1-120VAC	$120
31E1-220VAC	120

Ordering Information

Diaphragm valves, 1/32" fittings, 0.25 mm ports (.010")

Process GC
1/32" **0.25 mm**

Includes stainless steel nuts and ferrules.

A 3-way solenoid is required for actuation. Order separately.

4 port
.5 µl internal sample

Prod No	*Price*
DV12-1114-.5	

4 port
1 µl internal sample

Prod No	*Price*
DV12-1114-1	

6 port
sampling/switching

Prod No	*Price*
DV12-1116	

10 port
multifunctional

Prod No	*Price*
DV12-1110	

SPECS
Internal sa
750 psi liq
50°C max
Sampling/switching:
300 psi gas
175°C max
Nitronic 60 valve body
Polyimide diaphragm

Diaphragm valves, 1/16" fittings, 0.40 mm ports (.016")

Process GC
1/16" **0.40 mm**

Includes stainless steel nuts and ferrules.

A 3-way solenoid is required for actuation. Order separately

4 port
.5 µl internal sample

Prod No	*Price*
DV22-2114-.5	

4 port
1 µl internal sample

Prod No	*Price*
DV22-2114-1	

6 port
sampling/switching

Prod No	*Price*
DV22-2116	

10 port
multifunctional

Prod No	*Price*
DV22-2110	

SPECS
Internal sample:
750 psi liq
50°C max
Sampling/switching:
300 psi gas
175°C max
Nitronic 60 valve body
Polyimide diaphragm

Diaphragm valves, 1/16" fittings, 0.75 mm ports (.030")

Process GC
1/16" **0.75 mm**

Includes stainless steel nuts and ferrules.

A 3-way solenoid is required for actuation. Order separately.

4 port
.5 µl internal sample

Prod No	*Price*
DV22-3114-.5	

4 port
1 µl internal sample

Prod No	*Price*
DV22-3114-1	

6 port
sampling/switching

Prod No	*Price*
DV22-3116	

10 port
multifunctional

Prod No	*Price*
DV22-3110	

SPECS
Internal sample:
750 psi liq
50°C max
Sampling/switching:
300 psi gas
175°C max
Nitronic 60 valve body
Polyimide diaphragm

6 port
1/16" fittings

1/16" Stainless steel loops *for DV valves*

Each loop includes two stainless steel nuts and ferrules.
Order special fittings separately.
For 1/32" loops, use NW loops *(page 104)*.

Volume	*Prod No*	*Price*
2 µl	CSL2	
5 µl	CSL5	
10 µl	CSL10	
20 µl	CSL20	
50 µl	CSL50	
100 µl	CSL100	

Volume	*Prod No*	*Price*
250 µl	CSL250	
500 µl	CSL500	
1 ml	CSL1K	
2 ml	CSL2K	
5 ml	CSL5K	
10 ml	CSL10K	

Replacement diaphragms

Description	*Prod No*	*Price*
Polyimide diaphragm		
for .010" or .016"	DV22-21D	
for .030"	DV22-31D	
PTFE diaphragm	DV22-22D	

MORE INFORMATION
More applications . . pp 117-121

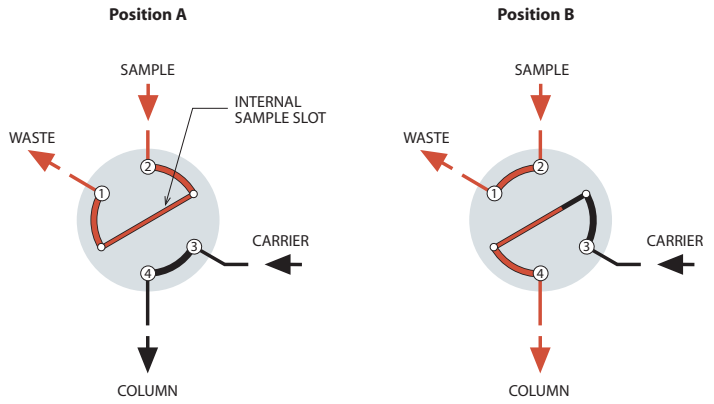
OPTIONS
- Mounting kit
  Use this ring to attach diaphragm valves to a surface.

Prod No	*Price*
DVBRKIT	$20

- Materials:
  Hastelloy C
  Type 316 stainless

For more information, refer to the metals discussion on pages 254-255 .

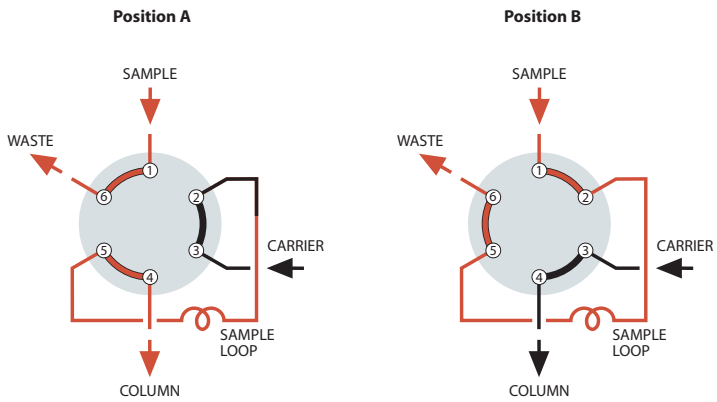
4 port sample injector



MICROVOLUME SAMPLE INJECTION

The internal sample (fixed volume) flowpath is used when very small sample volumes are required. The sample size is determined by a passage engraved on the valve cap, allowing precise, repeatable injections. In Position A, the sample flows through the sample passage while the carrier flows through to the column. In Position B, the sample passage is in line with the column and the carrier injects the contents of the sample passage into the column.

6 port sample injector



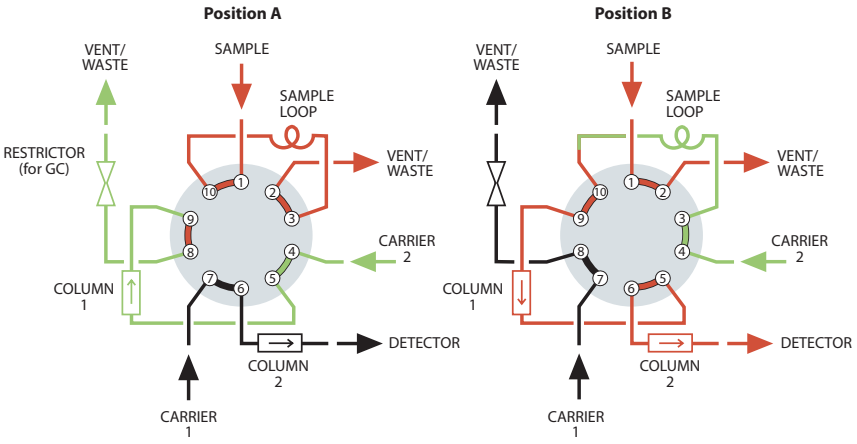
SAMPLE INJECTION

With the valve in Position A, sample flows through the external loop while the carrier flows directly through to the column. When the valve is switched to Position B, the sample contained in the sample loop and valve flow passage is injected into the column.

MORE INFORMATION

More applications .....pages 118-119

10 port sample injector



LOOP SAMPLING WITH BACKFLUSH OF PRE-COLUMN TO VENT

When components of interest are low boiling, this plumbing scheme allows "heavy" components with long retention times to be backflushed to waste. After the sample loop is loaded in Position A, the valve is switched to Position B to inject the sample into column 1. As soon as all components of interest have entered column 2, the valve is switched back to Position A. Column 1 is backflushed to vent during the analysis, reducing the total analysis time.

MORE INFORMATION

More applications .....pages 120-121

Cheminert® Injectors and Valves

- Pressure ratings from 100 psi to 20,000 psi
- Inert, biocompatible construction
- Easy field service
- Automated operation – pneumatic or electric
- 4, 6, 8, and 10 port and internal sample two position models
- Multiposition stream selection versions with up to 26 positions

Design

The basic Cheminert design involves a flat rotor which is engraved with slots which connect the ports. A stator is held at a constant, preset force against the rotor. When repairs are required, all that is necessary for rotor access is the removal of two or three screws. Remove the old rotor and replace it, put the screws back in and tighten them, and the valve is ready for use at the factory-set pressure specification. No adjustments are possible, much less required. Other advantages of the design include easy panel mounting, low actuating torque, and compact size. The flat plate design offers flow paths for basic flow switching, sample injection, and stream selection up to 10 positions (26 positions in some models).

Two position valve descriptions, product numbers, and prices begin on page 146.

Selector (multiposition valve) information may be found on pages 150-151.

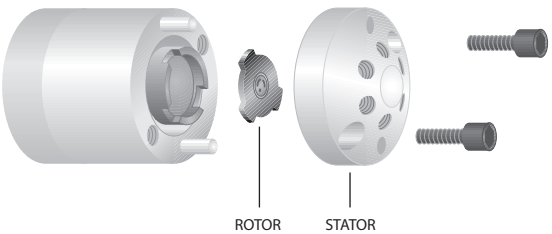
OEM injectors and selectors are on pages 178-185.

Materials of Construction

UHPLC models have stators of specially coated stainless steel, with PAEK rotors. **HPLC** models have stators of Nitronic 60 stainless steel, PAEK, Hastelloy C, or titanium, all of which are compatible with common HPLC solvents. Many are available with a proprietary long-life coating. Valcon H rotors are used with metal stators, and Valcon E with PAEK. **Low pressure** models have PPS stators and rotors of Valcon E2, a proprietary reinforced PTFE composite.

Metal valves are supplied with stainless nuts, with ferrules of the same material as the stator. Fittings for polymeric valves vary with the valve design. The valve price lists contain more detailed information.

Sample injection loops are available in a variety of materials, and are found on the pages with their corresponding valves.



TECH TIP

For optimal zero dead volume connections, make sure your tubing meets the best industry standards. OD tolerance should be nominal dimension ± .002".

Fractional dimension	Nominal dimension
1/32"	.031
1/16"	.062
1/8"	.125
1/4"	.250
3/8"	.375
1/2"	.500

Injectors and Switching Valves

The applications section beginning on pages 168-169 gives an overview of the many functions which can be performed by two position valves. Since the most common method of sample injection utilizes a 6 port valve with an external sample loop, 6 port valves are often referred to as "injectors". However, as the Applications section illustrates, 6 port valves can do more than inject sample, and 8 and 10 port valves can be sample injectors at the same time they're also used for backflushing or column switching.

One more variation is the 4 port internal sample injector, which is used when the sample size must be smaller than the smallest available loop. The internal sample "loop" is actually an engraved connecting slot on the rotor, sized to contain a specified amount of sample.

All these valves (except manual Models C1 and C1CF) are compatible with all VICI actuation options, with position feedback available for manual valves.

Stream Selectors (Multiposition Valves)

Selectors move in continuous revolutions by incremental steps, unlike the back and forth switching of two position valves. Each step selects one of 4 to 26 streams, directing it through the valve outlet to a sample valve, pressure sensor, detector, column, etc. The same valve can also direct one stream to a number of outlets for fraction collection.

In the standard models, the non-selected streams are dead-ended. However, some valves can be ordered with an optional rotor that returns each stream to its source. Consult the factory for more information.

MORE INFORMATION

Nanovolume® HPLC Injectors and Switching Valves

Cheminert nanovolume injectors and switching valves are ideal for high speed, high throughput techniques which demand a valve and fitting system that minimize internal volume and eliminate dead volume. A proprietary rotor material and stator coating achieve pressures to 20,000 psi, suitable for the most demanding analytical techniques. All models are compatible with any VICI actuation option.

NEW Injectors with 360 micron fittings, 100 or 150 micron bore

Models C72MU and C72MX p. 152

- 360 µm Cheminert fittings
- Choice of 100 or 150 µm flowpath
- 10,000, 15,000, and 20,000 psi versions
- 4, 6, 8, or 10 ports (4 or 6 in 20,000 psi versions)
- Coated stator

These injectors incorporate our unique fittings which permit direct connection of 360 micron OD fused silica, PEEK, stainless, or electroformed nickel tubing.

Injectors with 1/32" Cheminert fittings, 100 micron bore

Models CN2 and CN4 pp. 154-155

- 1/32" Cheminert fittings
- 100 or 150 µm flowpath
- 5,000 psi rating
- 6 or 10 ports
- Internal sample version with sample size of 4, 10, or 20 nanoliters
- Uncoated PAEK stator

Injectors with 1/32" Valco fittings, 100 or 150 micron bore

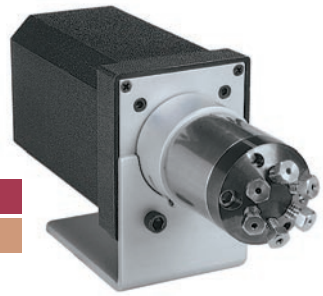
Models C72NX and C74NX p. 153

- 1/32" Valco fittings
- Choice of 100 or 150 µm flowpath
- 10,000, 15,000, and 20,000 psi versions
- 4, 6, 8, or 10 ports (4 or 6 in 20,000 psi versions)
- Internal sample version with sample size of 4, 10, or 20 nanoliters
- Coated stator

Selectors with 1/32" or 1/16" Valco fittings, 100 - 250 micron bore

Model C75NX p. 170
Model C75H p. 171

- 1/32" or 1/16" Valco fittings
- 150 or 250 µm flowpath
- 10,000, 15,000, and 20,000 psi versions
- 4, 6, 8, or 10 ports (4 or 6 in 20,000 psi versions)
- Coated stator



Model C72
page 156
15,000 psi
10,000 psi

NEW UHPLC Injectors and Switching Valves

New this year from VICI are UHPLC **Models C72X** and **C72H** valves, with pressure ratings of 15,000 psi and 10,000 psi, respectively. They can be used as injectors or switching valves.

Microbore **Models C74X** and **C74H** are equivalent internal volume sample injectors, with sample sizes ranging from 4 nanoliters to 50 nanoliters.

HPLC Injectors and Switching Valves

Model C2
Microbore, page 158
Analytical, page 161
5,000 psi

Microbore

Model C2 valves can be used as injectors or switching valves.

Model C4 is an internal volume sample injector with sample sizes ranging from 10 nl to 50 nl.

Model C6 continuous flow injector is designed to maintain pump flow during most of the switching cycle, virtually eliminating pressure spikes.

Model C1 is a through-the-handle (front-loading) injector designed for direct replacement of existing competitive models. All Model C1 injectors are manual, with position feedback standard.

Model C1CF is a 6 port through-the-handle continuous flow injector. An engraving on the stator maintains pump flow between ports 5 and 4 during most of the switching cycle, virtually eliminating pressure spikes. Because the handle is integral to the design, all Model C1CF valves are manual, with position feedback standard.

Analytical

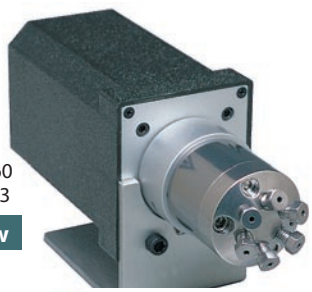
Models C2, C6, and **C1** are also available for analytical injection and switching, with port sizes of 0.40 mm (.016"). **Model C4** offers internal volume sample sizes ranging from 0.1 to 0.5 µl.

Semi-Preparative HPLC

Model C2 valves are available with flow passages optimized for semi-preparative HPLC. Choose from 4, 6, 8, or 10 port versions. Contact our sales or technical support departments for more information.

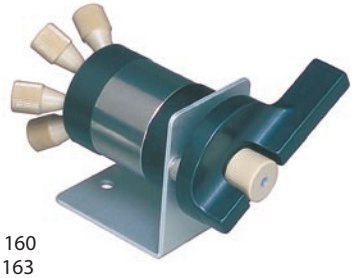
Autosampler Replacements

We supply direct replacements for injectors in many popular autosamplers. Call technical support to determine which replacement is best for your application.



Model C4
Microbore, page 159
Analytical, page 162
5,000 psi
Internal sample

Model C6
Microbore, page 160
Analytical, page 163
Continuous flow



Model C1
Microbore, page 160
Analytical, page 163
Through-handle

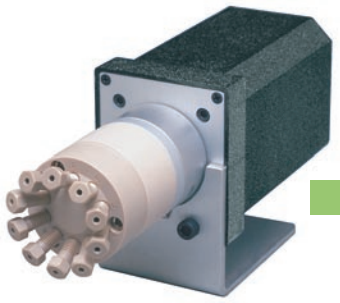
Low Pressure Injectors and Switching Valves

With Valco Zero Dead Volume (ZDV) Fittings

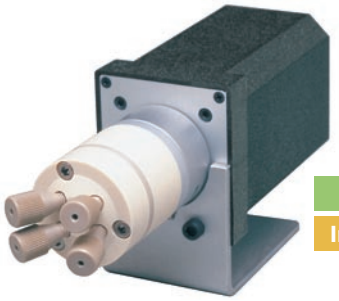
C20Z valves with zero dead volume fittings (10-32 thread) are shipped with standard PEEK nuts and ferrules. Zero dead volume fingertight fittings and nuts and ferrules of other materials may be ordered separately. Standard specifications are 100 psi gas/250 psi liquid at 75°C. On request, the pressure rating can be as high as 600 psi liquid. ***Caution:*** Metal fittings will damage the threads and details of C20Z series valves. Use of metal fittings in a C20Z valve voids the warranty.

The **Model C22Z** is a conventional two position sample injector and switching valve, with 4, 6, 8, or 10 ports. Sample injection requires a loop, ordered separately.

The **Model C24Z** is an internal sample injector, for applications in which the sample size is smaller than that of any available external loop. Sample sizes available are 0.2, 0.5, and 1 µl.



Model C22Z
page 164
10-32 ZDV



Model C24Z
page 166
10-32 ZDV
Internal sample

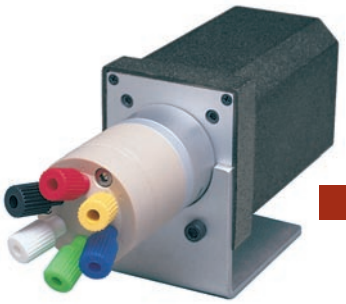
With Cheminert 1/4-28 Fittings

C20 Series valve caps have female threads for direct connection of lines – no couplings are required. C20 Series valves are available in 4, 6, 8, and 10 port versions. Standard specifications are 100 psi gas/250 psi liquid at 75°C.

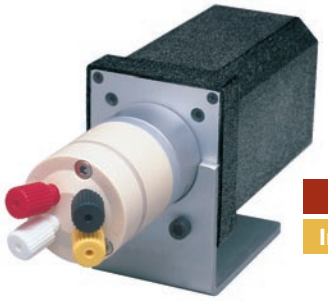
Multicolored Cheminert 1/4-28 flangeless fittings for 1/16" or 1/8" OD tubing (depending on the valve model) are included.

Model C22 valves are used for sample injection or switching. (Functionally equivalent to Model C22Z) Sample injection requires a loop, ordered separately.

The **Model C24** is an internal sample injector like the C24Z, available with 0.5, 1.0, or 2.0 µl sample size.



Model C22
page 165
1/4-28 Int.



Model C24
page 167
1/4-28 Int.
Internal sample

MORE INFORMATION

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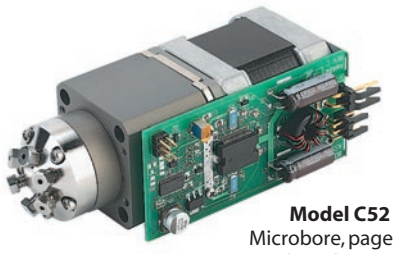
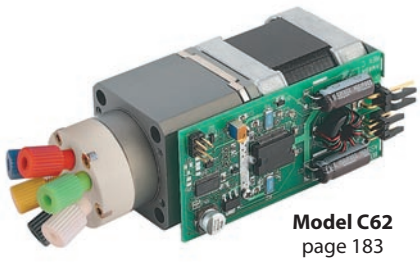
CAUTION
Metal fittings will damage the threads and details of C20Z series valves (models C22Z, C24Z, C25Z). Use of metal fittings in a C20Z valve voids the warranty.

TECH TIP
Our life tests indicate that these valves will typically give more than 100,000 cycles before requiring any service. This assumes that the fluid used is free of particulates and not reactive toward the valve components. If the stream may contain particulates, or if it has high salt content which could precipitate within the sample lines, use an in-line filter.
Note: Valves with purge ports are available on request.



Model C52
Microbore, page 178
Analytical, page 180
5,000 psi



Model C62
page 183
Low pressure

NEW Integrated Motor/Injector Assemblies for OEMs

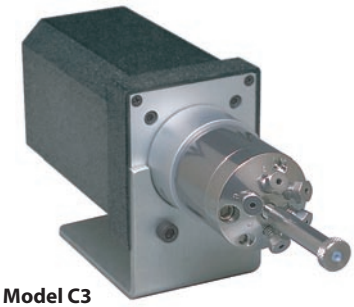
Cheminert's new **Model C52** (HPLC) and **Model C62** (low pressure) injectors are integrated motor/valve assemblies designed specifically to be built into an OEM system. Using the well-proven Cheminert injector designs and the 24 volt motor from our popular microelectric actuators, the C52 and C62 need only to be connected to the instrument's power supply.

Control is simplified to require a single contact closure; the injector's position is determined by whether the closure is held high or low. There's even an easy way for the instrument to confirm the valve's position by sensing the output from a built-in sensor.

In the default control mode, a contact closure moves the injector from load to inject, where it remains until the contact is broken and the injector reverts to the load position. A simple jumper change shifts the mode to dual contact closure, in which one contact closure shifts the injector to inject and a second is required to shift it back to load. Jumper settings can also be modified to change the motor's degree of rotation so it can be used with any of the valve models available.

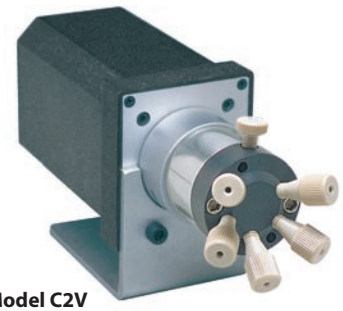
All these features are built into a compact and lightweight package and are available in 4, 6, 8, and 10 port configurations.

Autosampler and Other OEM Injectors



Model C3
Microbore, page 179
Analytical, page 181
Centered port

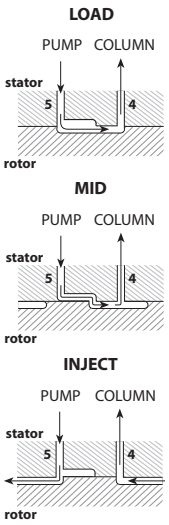
Model C3 is a unique injector with a syringe injection port centered on the rear face of the valve (opposite the handle or actuator), allowing convenient syringe insertion when the valve is mounted on an actuator inside an instrument.



Model C2V
Microbore, page 179
Analytical, page 181
Vertical port

Model C2V is designed specifically for use in an autosampler. It is like the standard C2 except that the sample port is perpendicular to the valve axis. This permits the valve and actuator to be installed horizontally, while the syringe loads the injector vertically.

MODEL C1CF FLOWPATH



OEM SELECTOR VALVES

See pages 151, 184-185 for selector (multiposition) valves for OEMs.

UNIVERSAL ACTUATOR

The new universal actuator for OEMs operates virtually any Valco or Cheminert rotary valve – two position and selector alike – greatly simplifying the electronic aspect of instrument design.
See page 192.

Stream Selectors

UHPLC and High Pressure Selectors

NEW **Model C75** selectors offer presure ratings of 15,000 psi and 10,000 psi with 1/32" and 1/16" fittings.

The **Model C5**, with Valco ZDV fitting details, is available with 4, 6, 8, or 10 positions. Stators are available in Nitronic 60 stainless, titanium, and Hastelloy C-22, with rotors of Valcon H, all of which are compatible with common HPLC solvents. PAEK stators are used in combination with Valcon E rotors.

The C5 valve is the backbone of the Cheminert **HPLC column selector system**, which includes two stream selection valves mounted on a single microelectric actuator. Columns are not included.

Model C75
pages 170 and 171
15,000 psi
10,000 psi

Model C5
page 172
5,000 psi

HPLC column selector system
page 173
5,000 psi
Column selector system

Low Pressure Selectors

With Valco Zero Dead Volume Fittings

Model C25Z valves have Valco ZDV fitting details, and are available in 4, 6, 8, 10, 12, and 14 position models.

Model C35Z valves have 1/16" Valco ZDV details, and are available in 20, 24, and 26 position models. This is a tapered rotor valve limited to 100 psi liquid. Rotors are made from Valcon E2, with valve body made from PPS.

With Cheminert 1/4-28 Fittings

The **Model C25** has female 1/4-28 threaded fitting details for direct connection of lines – no couplings are required. The C25 is available in 4, 6, 8, and 10 position models. Multicolored Cheminert 1/16" or 1/8" flangeless fittings are included. Order other fittings separately as required. Rotors are made of Valcon E2, a proprietary reinforced PTFE composite, with stators of PPS.

With Cheminert 1/2-20 Fittings

Model C45 valves feature 1/2-20 threaded fitting details for use with 1/4" OD tubing. This is a tapered rotor valve with large bore for high flow applications. Rotors are made from Valcon E2, with valve body made from PPS. Available in 4 and 6 port configurations.

Model C25Z
page 174
Low pressure
10-32 ZDV

Model C25
page 175
Low pressure
1/4-28 Internal

Model C35Z
page 176
Low pressure
10-32 ZDV

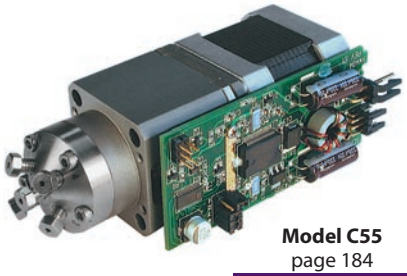
Model C45
page 177
Low pressure
1/2-20 Int.

NEW Integrated Motor/Stream Selectors for OEMs

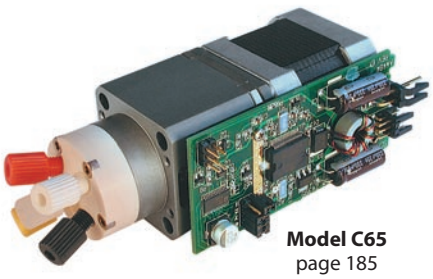
Cheminert's new **Model C55** (HPLC) and **Model C65** (low pressure) stream selectors are integrated motor/valve assemblies designed specifically to be built into an OEM system. The compact, lightweight package is available in 4, 6, 8, and 10 position configurations.

Using the well-proven Cheminert stream selector design and the 24 volt motor from our popular microelectric actuators, the Models C55, C65, and C65Z need only to be connected to an instrument's power supply. A single momentary contact closure steps the valve to the next position; a separate contact closure moves the valve to position 1 (Home).

See how our stream selectors can simplify your instrument design and minimize time to market – all while trimming your costs.



Model C55
page 184
5,000 psi



Model C65
page 185
Low pressure

UNIVERSAL ACTUATOR
The new universal actuator for OEMs operates virtually any Valco or Cheminert rotary valve – two position and selector alike – greatly simplifying the electronic aspect of instrument design.
See page 192.

MORE INFORMATION

TECH TIP
Caution:

Metal fittings will damage the threads and details of C25Z, C35Z, and C65Z series valves.

Use of metal fittings in these valves voids the warranty.

SPECIFICATIONS

CHEMINERT MULTIPOSITION VALVES

Model	*Stator material*	*Std rotor material*	*Max pressure*	*Max temp*	*Number of positions*
High Pressure					
C5	Metal	Valcon H	5000 psi liq	75°C	4, 6, 8, 10
	PAEK	Valcon E	5000 psi liq	50°C	4, 6, 8, 10
Low Pressure					
C25Z	PPS	Valcon E2	100 psi gas/ 250 psi liq	75°C	4, 6, 8, 10, 12, 14
C25	PPS	Valcon E2	100 psi gas/ 250 psi liq	75°C	4, 6, 8, 10
C35Z	PPS	Valcon E2	100 psi liq	50°C	20, 24, 26
C45	PPS	Valcon TF	100 psi liq	50°C	4, 6, 8
OEM – High Pressure					
C55	Metal	Valcon H	5000 psi liq	50°C	4, 6, 8, 10
	PAEK	Valcon E	5000 psi liq	50°C	4, 6, 8, 10
OEM – Low Pressure					
C65Z	PPS	Valcon E2	100 psi gas/ 250 psi liq	50°C	4, 6, 8, 10
C65	PPS	Valcon E2	100 psi gas/ 250 psi liq	50°C	4, 6, 8, 10

PORT DIAMETERS

Model	*Fitting size*	*Standard port diameter*	
High Pressure			(.006")
C5	1/16" ZDV	0.15 mm	
		0.25 mm	(.010")
		0.40 mm	(.016")
		0.75 mm	(.030")
Low Pressure			
C25Z	1/16" ZDV	0.75 mm	(.030")
C25	1/4-28 for 1/16" tubing	0.75 mm	(.030")
	1/4-28 for 1/8" tubing	1.50 mm	(.060")
C35Z	1/16" ZDV	0.75 mm	(.030")
C45	1/2-20 for 1/4" tubing	4.6 mm	(.180")
OEM – High Pressure			
C55	1/16" ZDV	0.25 mm	(.010")
		0.40 mm	(.016")
		0.75 mm	(.030")
OEM – Low Pressure			
C65Z	1/16" ZDV	0.75 mm	(.030")
C65	1/4-28 for 1/16" tubing	0.75 mm	(.030")
	1/4-28 for 1/8" tubing	1.50 mm	(.060")

NEW UHPLC Nanovolume Injectors with 360 µm fittings

NEW 20,000 psi UHPLC Nanovolume valves
360 micron fittings, 100 micron bore (.004")

Mo

20,000 psi
360µm **100 µm**

Includes stainless 360 micron fittings.

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

4 Port

6 Port

	Prod No	*Price*	*Prod No*	*Price*
Coated stainless stator				
Manual	C72MU-4694		C72MU-4696	
With pneumatic actuator	C72MU-4694A		C72MU-4696A	
With standard electric actuator	C72MU-4694E		C72MU-4696E	
With microelectric actuator	C72MU-4694EH		C72MU-4696EH	
Replacement valve	C72MU-4694D		C72MU-4696D	
Replacement rotor	C72M-46R4		C72M-46R6	
Replacement stator	C72M-4C94		C72M-4C96	

SPECS
20,000 psi li
50°C max
Stainless w/ inert coating stator
Valcon E3 rotor

OPTIONS
- 150 micron (.006") bore
- Internal sample injector (4 - 20 nl)
- 10,000 and 15,000 psi versions available

Model C72MU
360 micron fittings
(Model C72MX is similar)

NEW 15,000 psi UHPLC Nanovolume valves
360 micron fittings, 150 micron bore (.006")

Model C72MX

15,000 psi
360µm **150 µm**

Includes stainless 360 micron fittings.

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

6 Port

10 Port

	Prod No	*Price*	*Prod No*	*Price*
Coated stainless stator				
Manual	C72MX-6696		C72MX-6690	
With pneumatic actuator	C72MX-6696A		C72MX-6690A	
With standard electric actuator	C72MX-6696E		C72MX-6690E	
With microelectric actuator	C72MX-6696EH		C72MX-6690ED	
Replacement valve	C72MX-6696D		C72MX-6690D	
Replacement rotor	C72M-66R6		C72M-66R0	
Replacement stator	C72M-6C96		C72M-6C90	

SPECS
15,000 psi liq
50°C max
Stainless w/ inert coating stator
Valcon E3 rotor

OPTIONS
- 100 micron (.004") bore
- Internal sample injector (4 - 20 nl)
- 10,000 psi version available
- 4 and 8 port versions available

MORE INFORMATION
360 micron nanovolume fittings ..... page 58

UHPLC Nanovolume Injectors with 1/32" Valco stainless fittings *NEW*

NEW 15,000 psi UHPLC Nanovolume valves
1/32" Valco stainless fittings, 150 micron bore (.006")

Model C72NX

SPECS
15,000 psi liq
50°C max
Stainless w/ inert coating stator
Valcon E3 rotor

Includes 1/32" Valco stainless steel fittings.

Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

* The 6 port valve includes a 5 µl loop of the stator material.

15,000 psi
1/32" **150 µm**

OPTIONS
- 100 micron (.004") bore
- 250 micron (.010") bore
- 10,000 psi version available
- 4 and 8 port versions available

	6 Port *		10 Port	
	Prod No	*Price*	*Prod No*	*Price*
Coated stainless stator				
Manual	C72NX-6696		C72NX-6690	
With pneumatic actuator	C72NX-6696A		C72NX-6690A	
With standard electric actuator	C72NX-6696E		C72NX-6690E	
With microelectric actuator	C72NX-6696EH		C72NX-6690ED	
Replacement valve	C72NX-6696D		C72NX-6690D	
Replacement rotor	C72N-66R6		C72N-66R0	
Replacement stator	C72N-6C96		C72N-6C90	

Model C72NX
1/32" Valco stainless fittings

Sample loops *for C72NX valves*

Each stainless loop includes two stainless 1/32" Cheminert nanovolume fittings.

	Stainless	
Volume	*Prod No*	*Price*
1 µl	CSLN1K	$35.00
2 µl	CSLN2K	45.00
5 µl	CSLN5K	52.50

Model C74NX
1/32" Valco stainless fittings

NEW 15,000 psi UHPLC Nanovolume internal sample injectors
1/32" Valco stainless fittings, 150 micron bore (.006")

Model C74NX

SPECS
15,000 psi liq
50°C max
Stainless w/ inert coating stator
Valcon E3 rotor

Includes 1/32" Valco stainless steel fittings.

Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

15,000 psi
Internal sample
1/32" **150 µm**

OPTIONS
- 250 micron (.010") bore
- 10,000 and 20,000 psi versions available

	4 nanoliters		10 nanoliters		20 nanoliters	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Coated stainless stator						
Manual	C74NX-6694-.004		C74NX-6694-.01		C74NX-6694-.02	
With pneumatic actuator	C74NX-6694-.004A		C74NX-6694-.01A		C74NX-6694-.02A	
With standard electric actuator	C74NX-6694-.004E		C74NX-6694-.01E		C74NX-6694-.02E	
With microelectric actuator	C74NX-6694-.004EH		C74NX-6694-.01EH		C74NX-6694-.02EH	
Replacement valve	C74NX-6694-.004D		C74NX-6694-.01D		C74NX-6694-.02D	
Replacement rotor	C74N-66R-.004		C74N-66R-.01		C74N-66R-.02	
Replacement stator	C74N-6C9		C74N-6C9		C74N-6C9	

MORE INFORMATION

1/32" Valco fittings .... pages 10, 12
1/16" nanovolume injectors
C72X 156
C74X 157

Nanovolume Injectors with 1/32" Cheminert Fittings

5,000 psi Nanovolume valves, 1/32"Cheminert fittings, 100 micron ports (.004")

5,000 psi
1/32" **100 µm**

Includes 1/32" PEEK Cheminert nanovolume fittings.

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

* The 6 port valve includes a 250 nl PEEK loop.

	6 Port*		10 Port	
	Prod No	*Price*	*Prod No*	*Price*
PAEK stator				
Manual	CN2-4346		CN2-4340	
With microelectric actuator	CN2-4346EH		CN2-4340EH	
Replacement valve	CN2-4346D		CN2-4340D	
Replacement rotor	CN2-43R6		CN2-43R0	
Replacement stator	CN2-4C46I		CN2-4C40I	

50°C max
PAEK stator
Valcon E rotor

OPTIONS
- 150 micron (.006") bore

Model CN2
1/32" Cheminert fittings

Sample loops *for CN2 valves*

Each PEEK loop includes two PEEK Cheminert nanovolume fittings.

	PEEK	
Volume	*Prod No*	*Price*
250 nl	CNSL250PK	
500 nl	CNSL500PK	
1 µl	CNSL1KPK	
2 µl	CNSL2KPK	
5 µl	CNSL5KPK	

MORE INFORMATION
1/32" PEEK Cheminert fitting (nut with collapsible ferrule) p. 59

5,000 psi Nanovolume internal sample injector, 1/32"Cheminert fittings, 100 micron ports (.004")

Model CN4

SPECS
5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes 1/32" PEEK Cheminert nanovolume fittings.

Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Internal sample
1/32" **100 µm**

OPTIONS
- 150 micron (.006") bore

Sample volume	4 nanoliters		10 nanoliters		20 nanoliters	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
PAEK stator						
Manual	CN4-4344-.004		CN4-4344-.01		CN4-4344-.02	
With microelectric actuator	CN4-4344-.004EH		CN4-4344-.01EH		CN4-4344-.02EH	
Replacement valve	CN4-4344-.004D		CN4-4344-.01D		CN4-4344-.02D	
Replacement rotor	CN4-43R-.004		CN4-43R-.01		CN4-43R-.02	
Replacement stator	CN4-4C4I		CN4-4C4I		CN4-4C4I	

Model CN4 1/32" Cheminer fittings

MORE INFORMATION
1/32" PEEK Cheminert fitting (nut with collapsible ferrule) p. 59

Microbore UHPLC

NEW 15,000 psi UHPLC microbore valves, 1/16" Valco fittings, 0.25 mm ports (.010")

15,000 psi | **Microbore** | **1/16"** | **0.25 mm**

Includes stainless steel nuts and ferrules.

Standard electric actuator:
- 110 VAC for USA
- 110/230 VAC to 24 VDC power supply for international.

Microelectric actuator:
- 24 VDC, with 110/230 VAC to 24 VDC power supply.

* The 6 port valve includes a 5 µl stainless steel sample loop.

SPECS
15,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

OPTIONS
0.15 mm ports (.006")




	4 Port		6 Port*		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C72X-1694		C72X-1696		C72X-1698		C72X-1690	
With pneumatic actuator	C72X-1694A		C72X-1696A		C72X-1698A		C72X-1690A	
With standard electric actuator	C72X-1694E		C72X-1696E		C72X-1698E		C72X-1690E	
With microelectric actuator	C72X-1694EH		C72X-1696EH		C72X-1698ED		C72X-1690ED	
Replacement valve	C72X-1694D		C72X-1696D		C72X-1698D		C72X-1690D	
Replacement rotor	C72-16R4		C72-16R6		C72-16R8		C72-16R0	
Replacement stator	C72-1C94		C72-1C96		C72-1C98		C72-1C90	

NEW 10,000 psi UHPLC microbore valves, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C72H

10,000 psi | **Microbore** | **1/16"** | **0.25 mm**

Includes stainless steel nuts and ferrules.

Standard electric actuator:
- 110 VAC for USA
- 110/230 VAC to 24 VDC power supply for international.

Microelectric actuator:
- 24 VDC, with 110/230 VAC to 24 VDC power supply.

* The 6 port valve includes a 5 µl stainless steel sample loop.

SPECS
10,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

OPTIONS
0.15 mm ports (.006")




	4 Port		6 Port*		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Pr ice*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C72H-1694		C72H-1696		C72H-1698		C72H-1690	
With pneumatic actuator	C72H-1694A		C72H-1696A		C72H-1698A		C72H-1690A	
With standard electric actuator	C72H-1694E		C72H-1696E		C72H-1698E		C72H-1690E	
With microelectric actuator	C72H-1694EH		C72H-1696EH		C72H-1698ED		C72H-1690ED	
Replacement valve	C72H-1694D		C72H-1696D		C72H-1698D		C72H-1690D	
Replacement rotor	C72-16R4		C72-16R6		C72-16R8		C72-16R0	
Replacement stator	C72-1C94		C72-1C96		C72-1C98		C72-1C90	

Stainless steel sample loops

for C72X and C72H valves

Each loop includes two stainless steel nuts and ferrules.
Metal loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
2 µl	CSL2		50 µl	CSL50		1 ml	CSL1K	
5 µl	CSL5		100 µl	CSL100		2 ml	CSL2K	
10 µl	CSL10		250 µl	CSL250		5 ml	CSL5K	
20 µl	CSL20		500 µl	CSL500		10 ml	CSL10K	

Model C72H
(C72X similar)
1/16" ZDV fittings

NEW 15,000 psi UHPLC microbore internal sample injectors, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C74X

SPECS
15,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

Includes stainless steel nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

15,000 psi
Microbore
Internal sample
1/16" 0.25 mm

OPTIONS
0.15 mm ports (.006")

	10 nanoliters		20 nanoliters		50 nanoliters	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C74X-1694-.01		C74X-1694-.02		C74X-1694-.05	
With pneumatic actuator	C74X-1694-.01A		C74X-1694-.02A		C74X-1694-.05A	
With standard electric actuator	C74X-1694-.01E		C74X-1694-.02E		C74X-1694-.05E	
With microelectric actuator	C74X-1694-.01EH		C74X-1694-.02EH		C74X-1694-.05EH	
Replacement valve	C74X-1694-.01D		C74X-1694-.02D		C74X-1694-.05D	
Replacement rotor	C74-16R-.01		C74-16R-.02		C74-16R-.05	
Replacement stator	C74-1C9		C74-1C9		C74-1C9	

NEW 10,000 psi UHPLC microbore internal sample injectors, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C74H

SPECS
10,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

Includes stainless steel nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

10,000 psi
Microbore
Internal sample
1/16" 0.25 mm

OPTIONS
0.15 mm ports (.006")

	10 nanoliters		20 nanoliters		50 nanoliters	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C74H-1694-.01		C74H-1694-.02		C74H-1694-.05	
With pneumatic actuator	C74H-1694-.01A		C74H-1694-.02A		C74H-1694-.05A	
With standard electric actuator	C74H-1694-.01E		C74H-1694-.02E		C74H-1694-.05E	
With microelectric actuator	C74H-1694-.01EH		C74H-1694-.02EH		C74H-1694-.05EH	
Replacement valve	C74H-1694-.01D		C74H-1694-.02D		C74H-1694-.05D	
Replacement rotor	C74-16R-.01		C74-16R-.02		C74-16R-.05	
Replacement stator	C74-1C9		C74-1C9		C74-1C9	

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Materials
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Model C74H (C74X similar) 1/16" ZDV fittings

Microbore HPLC

Microbore valves, 1/16" Valco fittings, 0.25 mm ports (.010")

5,000 psi
Microbore
1/16" **0.25 mm**

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

* The 6 port valve includes a 5 µl loop of the stator material.


4 Port


6 Port*


8 Port


10 Port

	4 Port Prod No	4 Port Price	6 Port* Prod No	6 Port* Price	8 Port Prod No	8 Port Price	10 Port Prod No	10 Port Price
N60 stainless stator								
Manual	C2-1004		C2-1006		C2H-1008		C2H-1000	
With pneumatic actuator	C2-1004A		C2-1006A		C2H- 1008A		C2H-1000A	
With standard electric actuator	C2-1004E		C2-1006E		C2H-1008E		C2H-1000E	
With microelectric actuator	C2-1004EH		C2-1006EH		C2H-1008EH		C2H-1000EH	
Replacement valve	C2-1004D		C2-1006D		C2H-1008D		C2H-1000D	
Replacement rotor	C2-10R4		C2-10R6		C2-10R8H		C2-10R0H	
Replacement stator	C-1C04		C-1C06		C-1C08H		C-1C00H	
PAEK stator								
Manual	C2-1344		C2-1346		C2H-1348		C2H-1340	
With pneumatic actuator	C2-1344A		C2-1346A		C2H-1348A		C2H-1340A	
With standard electric actuator	C2-1344E		C2-1346E		C2H-1348E		C2H-1340E	
With microelectric actuator	C2-1344EH		C2-1346EH		C2H-1348EH		C2H-1340EH	
Replacement valve	C2-1344D		C2-1346D		C2H-1348D		C2H-1340D	
Replacement rotor	C2-13R4		C2-13R6		C2-13R8H		C2-13R0H	
Replacement stator	C-1C44		C-1C46		C-1C48H		C-1C40H	
Titanium stator								
Manual	C2-1034		C2-1036		C2H-1038		C2H-1030	
With pneumatic actuator	C2-1034A		C2-1036A		C2H-1038A		C2H-1030A	
With standard electric actuator	C2-1034E		C2-1036E		C2H-1038E		C2H-1030E	
With microelectric actuator	C2-1034EH		C2-1036EH		C2H-1038EH		C2H-1030EH	
Replacement valve	C2-1034D		C2-1036D		C2H-1038D		C2H-1030D	
Replacement rotor	C2-10R4		C2-10R6		C2-10R8H		C2-10R0H	
Replacement stator	C-1C34		C-1C36		C-1C38H		C-1C30H	

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

- Continuous flow version is available as Model C6. *See page 160.*
- Hastelloy C stators
- Loop fill port assembly for injection from front of the valve. *See page 41.*
- 0.15 mm (0.006") bore

Order loops from page 159.

Model C2
1/16" ZDV fittings

MORE INFORMATION

Microbore nanoliter sample injector, 1/16" Valco fittings, 0.15 mm ports (.006")

Model C4

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Microbore
Internal sample
1/16" 0.15 mm

OPTIONS

- 100, 200, and 500 nl sample volumes are also available in 0.25 mm bore. *See page 162.*
- Loop fill port assembly for injection from front of the valve. *See page 41.*
- 0.25 mm (0.010") bore

Sample volume	10 nanoliters		20 nanoliters		50 nanoliters	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator						
Manual	C4-0004-.01		C4-0004-.02		C4-0004-.05	
With pneumatic actuator	C4-0004-.01A		C4-0004-.02A		C4-0004-.05A	
With standard electric actuator	C4-0004-.01E		C4-0004-.02E		C4-0004-.05E	
With microelectric actuator	C4-0004-.01EH		C4-0004-.02EH		C4-0004-.05EH	
Replacement valve	C4-0004-.01D		C4-0004-.02D		C4-0004-.05D	
Replacement rotor	C4-00R-.01		C4-00R-.02		C4-00R-.05	
Replacement stator	C4-0C0		C4-0C0		C4-0C0	
PAEK stator						
Manual	C4-0344-.01		C4-0344-.02		C4-0344-.05	
With pneumatic actuator	C4-0344-.01A		C4-0344-.02A		C4-0344-.05A	
With standard electric actuator	C4-0344-.01E		C4-0344-.02E		C4-0344-.05E	
With microelectric actuator	C4-0344-.01EH		C4-0344-.02EH		C4-0344-.05EH	
Replacement valve	C4-0344-.01D		C4-0344-.02D		C4-0344-.05D	
Replacement rotor	C4-03R-.01		C4-03R-.02		C4-03R-.05	
Replacement stator	C4-0C4		C4-0C4		C4-0C4	

Model C4
1/16" ZDV fittings

Sample loops *for C1, C2, C2V, C3, and C6 valves*

Each metal loop includes two stainless steel nuts and ferrules.
Each PEEK loop includes two PEEK nuts and ferrules.

	Stainless Steel		PEEK (for PAEK stators)		Titanium	
Volume	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
2 µl	CSL2		CZSL2PK		–	
5 µl	CSL5		CZSL5PK		–	
10 µl	CSL10		CZSL10PK		CSL10TI	
20 µl	CSL20		CZSL20PK		CSL20TI	
50 µl	CSL50		CZSL50PK		CSL50TI	
100 µl	CSL100		CZSL100PK		CSL100TI	
250 µl	CSL250		CZSL250PK		CSL250TI	
500 µl	CSL500		CZSL500PK		CSL500TI	
1 ml	CSL1K		CZSL1KPK		CSL1KTI	
2 ml	CSL2K		CZSL2KPK		–	
5 ml	CSL5K		CZSL5KPK		–	
10 ml	CSL10K		–		–	

ABOUT LOOPS

- Other materials are available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, and PTFE *(see pages 254-256).*
- Metal loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

Microbore HPLC

Microbore through-the-handle injector, 1/16" Valco fittings, 0.25 mm ports (.010")

5,000 psi | Microbore | Through-handle | 1/16" | 0.25 mm

Available only in manual version. Position feedback included.

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 5 µl loop of the stator material.

Model C1 and C1CF 1/16" ZDV fittings

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
6 port injector	C1-1006		C1-1346	
Replacement rotor	C1-10R6		C1-13R6	
Replacement stator	C-1C06		C-1C46	

	Prod No	*Price*
Replacement injector fitting	C-261	

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS
- Titanium and Hastelloy stators available.
- 0.40 mm bore (.016") on page 163.

Microbore continuous flow through-the-handle injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C1CF

5,000 psi | Microbore | Continuous flow | Through-handle | 1/16" | 0.25 mm

Available only in manual version. Position feedback included.

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 5 µl loop of the stator material.

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
6 port injector	C1CF-1006		C1CF-1346	
Replacement rotor	C1-10R6		C1-13R6	
Replacement stator	C6-1C06		C6-1C46	

	Prod No	*Price*
Replacement injector fitting	C-261	

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS
- 0.40 mm bore (.016") on page 163.

Microbore continuous flow injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C6

5,000 psi | Microbore | Continuous flow | 1/16" | 0.25 mm

Includes stainless steel nuts and ferrules.

* Includes a 5 µl loop of the stator material.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.

Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
Manual	C6-1006		C6-1346	
With pneumatic actuator	C6-1006A		C6-1346A	
With standard electric actuator	C6-1006E		C6-1346E	
With microelectric actuator	C6-1006EH		C6-1346EH	
Replacement valve	C6-1006D		C6-1346D	
Replacement rotor	C2-10R6		C2-13R6	
Replacement stator	C6-1C06		C6-1C46	

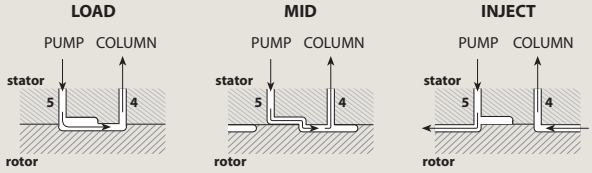
Model C6 1/16" ZDV fittings

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Order loops from page 159.

C1CF and C6 CONTINUOUS FLOWPATH
An engraving on the stator maintains pump flow between ports 5 and 4 during most of the switching cycle, virtually eliminating pressure spikes.



Analytical valves, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C2

5,000 psi | **Analytical** | **1/16"** | **0.40 mm**

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

* The 6 port valve includes a 20 µl loop of the stator material.

OPTIONS

- Continuous flow version is available as Model C6. *See page 163.*
- Hastelloy C stators
- Semi-prep version with 0.75 mm ports (.030") available
- Loop fill port assembly for injection from front of the valve. *See page 41.*

Order loops from page 159.

OPTIONAL FLOWPATH

Model C2 6 port valves can also be ordered with a dual 3-way rotor, as described in EPA Method 555.

To specify this flowpath, substitute "6X" for "6" in the valve or rotor product number.

	4 Port		6 Port*		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator								
Manual	C2-2004		C2-2006		C2H-2008		C2H-2000	
With pneumatic actuator	C2-2004A		C2-2006A		C2H-2008A		C2H-2000A	
With standard electric actuator	C2-2004E		C2-2006E		C2H-2008E		C2H-2000E	
With microelectric actuator	C2-2004EH		C2-2006EH		C2H-2008EH		C2H-2000EH	
Replacement valve	C2-2004D		C2-2006D		C2H-2008D		C2H-2000D	
Replacement rotor	C2-20R4		C2-20R6		C2-20R8H		C2-20R0H	
Replacement stator	C-2C04		C-2C06		C-2C08H		C-2C00H	
PAEK stator								
Manual	C2-2344		C2-2346		C2H-2348		C2H-2340	
With pneumatic actuator	C2-2344A		C2-2346A		C2H-2348A		C2H-2340A	
With standard electric actuator	C2-2344E		C2-2346E		C2H-2348E		C2H-2340E	
With microelectric actuator	C2-2344EH		C2-2346EH		C2H-2348EH		C2H-2340EH	
Replacement valve	C2-2344D		C2-2346D		C2H-2348D		C2H-2340D	
Replacement rotor	C2-23R4		C2-23R6		C2-23R8H		C2-23R0H	
Replacement stator	C-2C44		C-2C46		C-2C48H		C-2C40H	
Titanium stator								
Manual	C2-2034		C2-2036		C2H-2038		C2H-2030	
With pneumatic actuator	C2-2034A		C2-2036A		C2H-2038A		C2H-2030A	
With standard electric actuator	C2-2034E		C2-2036E		C2H-2038E		C2H-2030E	
With microelectric actuator	C2-2034EH		C2-2036EH		C2H-2038EH		C2H-2030EH	
Replacement valve	C2-2034D		C2-2036D		C2H-2038D		C2H-2030D	
Replacement rotor	C2-20R4		C2-20R6		C2-20R8H		C2-20R0H	
Replacement stator	C-2C34		C-2C36		C-2C38H		C-2C30H	

Model C2
1/16" ZDV fittings

AUTOSAMPLER REPLACEMENT VALVES

The Cheminert Model C2 6 port valve is an excellent replacement for the valve originally supplied in many autosamplers, including autosamplers manufactured by Beckman, Gilson, Spark-Holland, CTC, Thermo Fisher, and Varian.

Call technical support to determine which replacement is best for your application.

Analytical HPLC

Analytical internal sample injector, 1/16" Valco fittings, 0.25 mm ports (.010")

5,000 psi
Analytical
Internal sample
1/16" 0.25 mm

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	0.1 µl		0.2 µl		0.5 µl	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator						
Manual	C4-1004-.1		C4-1004-.2		C4-1004-.5	
With pneumatic actuator	C4-1004-.1A		C4-1004-.2A		C4-1004-.5A	
With standard electric actuator	C4-1004-.1E		C4-1004-.2E		C4-1004-.5E	
With microelectric actuator	C4-1004-.1EH		C4-1004-.2EH		C4-1004-.5EH	
Replacement valve	C4-1004-.1D		C4-1004-.2D		C4-1004-.5D	
Replacement rotor	C4-10R-.1		C4-10R-.2		C4-10R-.5	
Replacement stator	C4-1C0		C4-1C0		C4-1C0	
PAEK stator						
Manual	C4-1344-.1		C4-1344-.2		C4-1344-.5	
With pneumatic actuator	C4-1344-.1A		C4-1344-.2A		C4-1344-.5A	
With standard electric actuator	C4-1344-.1E		C4-1344-.2E		C4-1344-.5E	
With microelectric actuator	C4-1344-.1EH		C4-1344-.2EH		C4-1344-.5EH	
Replacement valve	C4-1344-.1D		C4-1344-.2D		C4-1344-.5D	
Replacement rotor	C4-13R-.1		C4-13R-.2		C4-13R-.5	
Replacement stator	C4-1C4		C4-1C4		C4-1C4	
Titanium stator						
Manual	C4-1034-.1		C4-1034-.2		C4-1034-.5	
With pneumatic actuator	C4-1034-.1A		C4-1034-.2A		C4-1034-.5A	
With standard electric actuator	C4-1034-.1E		C4-1034-.2E		C4-1034-.5E	
With microelectric actuator	C4-1034-.1EH		C4-1034-.2EH		C4-1034-.5EH	
Replacement valve	C4-1034-.1D		C4-1034-.2D		C4-1034-.5D	
Replacement rotor	C4-10R-.1		C4-10R-.2		C4-10R-.5	
Replacement stator	C4-1C3		C4-1C3		C4-1C3	

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

- .05 µl sample volumes are also available.
- Loop fill port assembly for injection from front of the valve. *See page 41.*

Model C4
1/16" ZDV fittings

MORE INFORMATION

Analytical through-the-handle injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C1

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS
- Titanium stator available.
- 0.25 mm bore (.010") on page 160.

Available only in manual version. Position feedback included.

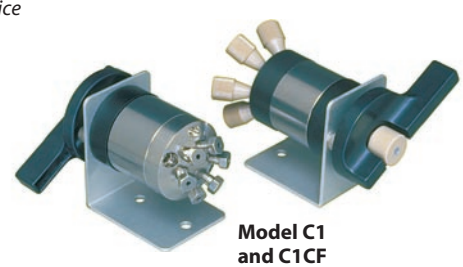
Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 20 µl loop of the stator material.

5,000 psi | **Analytical** | **Through-handle** | **1/16"** | **0.40 mm**

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
6 port injector	C1-2006		C1-2346	
Replacement rotor	C1-20R6		C1-23R6	
Replacement stator	C-2C06		C-2C46	

	Prod No	*Price*
Replacement injector fitting	C-261	



Model C1 and C1CF 1/16" ZDV fittings

Analytical continuous flow through-the-handle injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C1CF

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS
- 0.25 mm bore (.010") on page 160.

Available only in manual version. Position feedback included.

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 20 µl loop of the stator material.

5,000 psi | **Analytical** | **Continuous flow** | **Through-handle** | **1/16"** | **0.40 mm**

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
6 port injector	C1CF-2006		C1CF-2346	
Replacement rotor	C1-20R6		C1-23R6	
Replacement stator	C6-2C06		C6-2C46	
Prod No	*Price*			

Replacement injector fitting	C-261

Analytical continuous flow injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C6

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Order loops from page 159.

Includes stainless steel nuts and ferrules.

Includes a 20 µl loop of the stator material.

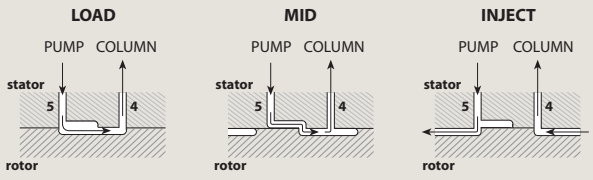
Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.

Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi | **Analytical** | **Continuous flow** | **1/16"** | **0.40 mm**

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
Manual	C6-2006		C6-2346	
With pneumatic actuator	C6-2006A		C6-2346A	
With standard electric actuator	C6-2006E		C6-2346E	
With microelectric actuator	C6-2006EH		C6-2346EH	
Replacement valve	C6-2006D		C6-2346D	
Replacement rotor	C2-20R6		C2-23R6	
Replacement stator	C6-2C06		C6-2C46	

C1CF and C6
CONTINUOUS FLOWPATH
An engraving on the stator maintains pump flow between ports 5 and 4 during most of the switching cycle, virtually eliminating pressure spikes.



Model C6
1/16" ZDV fittings

Low Pressure

Valves with 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Low pressure
10-32 ZDV
1/16" **0.75 mm**

Includes Valco ZDV PEEK nuts and ferrules.

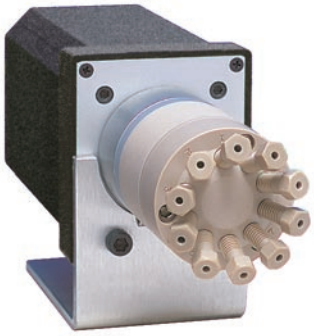
Standard electric actuator:
- 110 VAC for USA
- 110/230 VAC to 24 VDC power supply for international.

Microelectric actuator:
- 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample loops are not included with valves. Order separately.




	4 Port		6 Port		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C22Z-3184		C22Z-3186		C22Z-3188		C22Z-3180	
With pneumatic actuator	C22Z-3184A		C22Z-3186A		C22Z-3188A		C22Z-3180A	
With standard electric actuator	C22Z-3184E		C22Z-3186E		C22Z-3188E		C22Z-3180E	
With microelectric actuator	C22Z-3184EH		C22Z-3186EH		C22Z-3188EH		C22Z-3180EH	
Replacement valve	C22Z-3184D		C22Z-3186D		C22Z-3188D		C22Z-3180D	
Replacement rotor	C12-314		C12-316		C12-318		C12-310	
Replacement stator	C22Z-384		C22Z-386		C22Z-388		C22Z-380	



Model C22Z
1/16" ZDV fittings

SPECS

100 psi gas/
75°C max
PPS stator
Valcon E2 rotor

OPTIONS

- Purge option
- Other polymeric rotors and stators are available.

  Consult the factory for prices and information.

PURGE OPTION

The purge option permits a flow of liquid or gas to flush the valve interior of potentially toxic or corrosive components. We recommend this option for applications using materials (such as salt solutions) that could damage the metal parts of the valve.

Consult our technical staff for details.

Sample loops *for Model C22Z*

Loops include PEEK nuts and ferrules. Loops smaller than 500 µl are made from 1/16" OD tubing; loops 500 µl or bigger are made from 1/8" OD tubing with polymeric unions and 1/16" ends.

	FEP		PTFE		PEEK	
Volume	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
5 µl	CZSL5FEP		CZSL5TF		CZSL5PK	
10 µl	CZSL10FEP		CZSL10TF		CZSL10PK	
20 µl	CZSL20FEP		CZSL20TF		CZSL20PK	
50 µl	CZSL50FEP		CZSL50TF		CZSL50PK	
100 µl	CZSL100FEP		CZSL100TF		CZSL100PK	
250 µl	CZSL250FEP		CZSL250TF		CZSL250PK	
500 µl	CZSL500FEP		CZSL500TF		CZSL500PK	
1 ml	CZSL1KFEP		CZSL1KTF		CZSL1KPK	
2 ml	CZSL2KFEP		CZSL2KTF		CZSL2KPK	

MORE INFORMATION

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Valves with 1/4-28 fitting details for 1/16" tubing, 0.75 mm ports (.030")

Model C22

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/16" tubing.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample loops are not included with valves. Order separately.

Low pressure
1/4-28 Internal
1/16" **0.75 mm**




	4 Port		6 Port		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C22-3184		C22-3186		C22-3188		C22-3180	
With pneumatic actuator	C22-3184A		C22-3186A		C22-3188A		C22-3180A	
With standard electric actuator	C22-3184E		C22-3186E		C22-3188E		C22-3180E	
With microelectric actuator	C22-3184EH		C22-3186EH		C22-3188EH		C22-3180EH	
Replacement valve	C22-3184D		C22-3186D		C22-3188D		C22-3180D	
Replacement rotor	C22-314		C22-316		C22-318		C22-310	
Replacement stator	C22-384		C22-386		C22-388		C22-380	

Valves with 1/4-28 fitting details for 1/8" tubing, 1.50 mm ports (.060")

Model

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/8" tubing.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample loops are not included with valves. Order separately.

Low pressure
1/4-28 Internal
1/8" **1.50 mm**

	4 Port		6 Port		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C22-6184		C22-6186		C22-6188		C22-6180	
With pneumatic actuator	C22-6184A		C22-6186A		C22-6188A		C22-6180A	
With standard electric actuator	C22-6184E		C22-6186E		C22-6188E		C22-6180E	
With microelectric actuator	C22-6184EH		C22-6186EH		C22-6188EH		C22-6180EH	
Replacement valve	C22-6184D		C22-6186D		C22-6188D		C22-6180D	
Replacement rotor	C22-614		C22-616		C22-618		C22-610	
Replacement stator	C22-684		C22-686		C22-688		C22-680	

Sample loops

for Model C22

Loops include flangeless fittings with white color nuts. Loops smaller than 500 µl are made from 1/16" OD tubing; loops 500 µl or bigger are made from 1/8" OD tubing.

	FEP		PTFE		PEEK	
Volume	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
20 µl	CFSL20FEP		CFSL20TF	$17.50	CFSL20PK	
50 µl	CFSL50FEP		CFSL50TF		CFSL50PK	
100 µl	CFSL100FEP		CFSL100TF		CFSL100PK	
250 µl	CFSL250FEP		CFSL250TF		CFSL250PK	
500 µl	CFSL500FEP		CFSL500TF		CFSL500PK	
1 ml	CFSL1KFEP		CFSL1KTF		CFSL1KPK	
2 ml	CFSL2KFEP		CFSL2KTF		CFSL2KPK	

Model C22
1/4-28 fittings

Internal sample injectors, 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

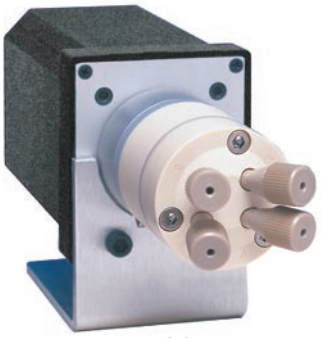
Low pressure
Internal sample
10-32 ZDV
1/16" **0.40 mm**

Includes Valco ZDV PEEK nuts and ferrules.

Standard electric actuator:
- 110 VAC for USA
- 110/230 VAC to 24 VDC power supply for international.

Microelectric actuator:
- 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	**0.2 µl**		**0.5 µl**		**1 µl**	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C24Z-2184-.2		C24Z-2184-.5		C24Z-2184-1	
With pneumatic actuator	C24Z-2184-.2A		C24Z-2184-.5A		C24Z-2184-1A	
With standard electric actuator	C24Z-2184-.2E		C24Z-2184-.5E		C24Z-2184-1E	
With microelectric actuator	C24Z-2184-.2EH		C24Z-2184-.5EH		C24Z-2184-1EH	
Replacement valve	C24Z-2184-.2D		C24Z-2184-.5D		C24Z-2184-1D	
Replacement rotor	C24-10R-.2		C24-10R-.5		C24-10R-1	
Replacement stator	C24Z-1C8		C24Z-1C8		C24Z-1C8	



Model C24Z
1/16" ZDV fittings

SPECS

100 psi gas/
75°C max
PPS stator
Valcon E2 rotor

OPTIONS

- 2.0 µl sample volumes are also available.
- Purge option. *See more information below.*
- Other polymeric rotors and stators are available. Consult the factory for prices and information.

PURGE OPTION

The purge option permits a flow of liquid or gas to flush the valve interior of potentially toxic or corrosive components. We recommend this option for applications using materials (such as salt solutions) that could damage the metal parts of the valve.

Consult our technical staff for details.

MORE INFORMATION

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assemblies

Internal sample injectors, 1/4-28 for 1/16" tubing, 0.50 mm ports (.020")

Model C24

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/16" tubing.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

Low pressure
Internal sample
1/4-28 Internal
1/16" **0.50 mm**

OPTIONS
- 0.2 µl sample volumes are also available.
- Purge option
- Other polymeric rotors and stators are available. Consult the factory for prices and information.

Sample volume	**0.5 µl**		**1 µl**		**2 µl**	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C24-2184-.5		C24-2184-1		C24-2184-2	
With pneumatic actuator	C24-2184-.5A		C24-2184-1A		C24-2184-2A	
With standard electric actuator	C24-2184-.5E		C24-2184-1E		C24-2184-2E	
With microelectric actuator	C24-2184-.5EH		C24-2184-1EH		C24-2184-2EH	
Replacement valve	C24-2184-.5D		C24-2184-1D		C24-2184-2D	
Replacement rotor	C24-10R-.5		C24-10R-1		C24-10R-2	
Replacement stator	C24-1C8		C24-1C8		C24-1C8	

Model C24
1/4-28 fittings

Injector and Switching Valve Applications

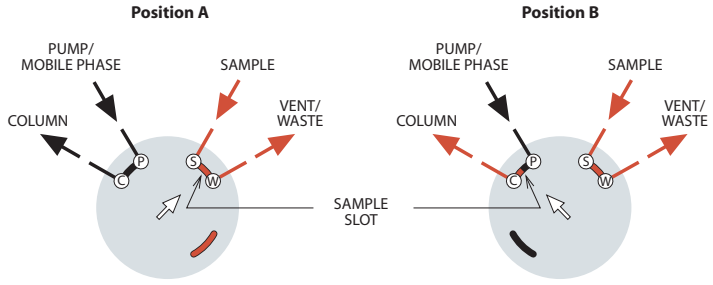
These illustrations show basic sample injection techniques using Valco two position valves. With rare exceptions, there is no difference between switching valves and external volume sampling valves, so the same valve can be used for either function.

The unique advantage of 8 and 10 port valves is that they reduce extra column volume by combining sampling and switching functions in a single valve. This minimizes expense, maintenance, service, and risk of leaks as compared to multiple 6 port valve systems.

4 port internal sample injector

MICROVOLUME SAMPLE INJECTION

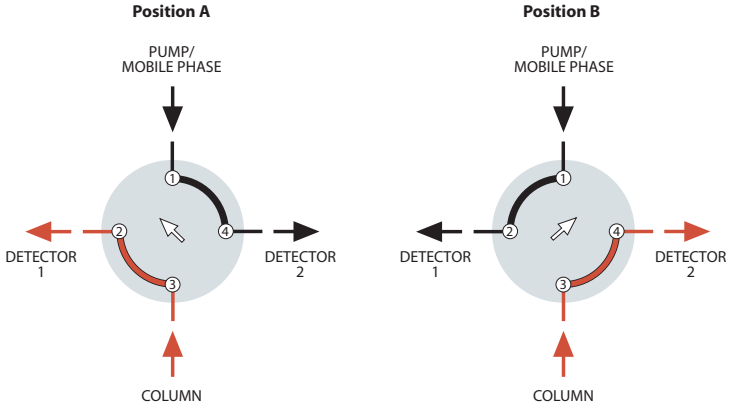
The internal sample (fixed volume) flowpath is used when very small sample volumes are required. The sample size is determined by a passage engraved on the valve rotor, allowing precise, repeatable injections. In Position A, the sample flows through the sample passage while the mobile phase flows through to the column. The third passage is inactive. In Position B, the sample passage is in line with the column and the mobile phase injects the contents of the sample passage into the column. The passage which was inactive in Position A allows the sample to continue flowing without interruption.



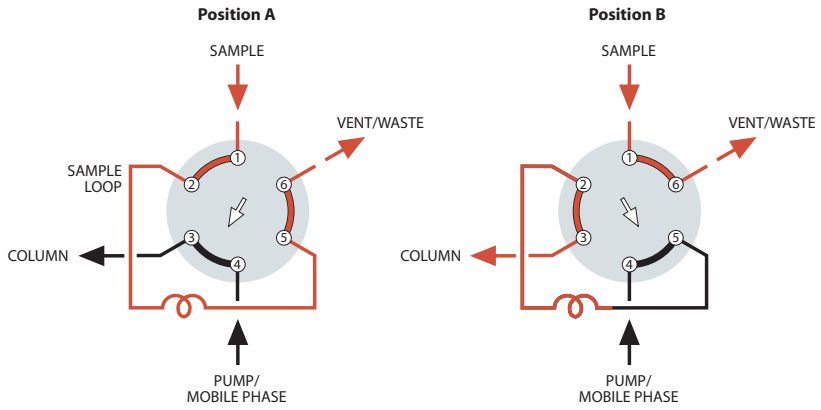
4 port switching valve

DETECTOR SELECTION FROM TWO COLUMNS OR ONE COLUMN AND AUXILIARY CARRIER

This unique configuration allows analyses of different parts of one analysis with two different detectors, without splitting or multiple injections.



6 port external sample injector

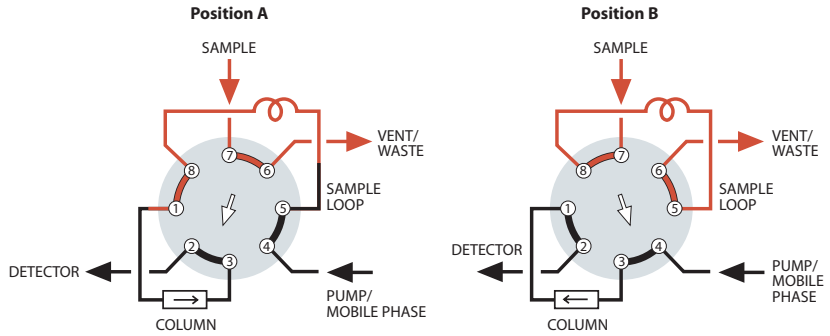


SAMPLE INJECTION

With the valve in Position A, sample flows through the external loop while the mobile phase flows directly through to the column. When the valve is switched to Position B, the sample contained in the sample loop and valve flow passage is displaced by the mobile phase and is carried into the column.
Note: Especially for partial-filled loops, the flow direction of the mobile phase through the loop should be opposite (backflush) to the flow direction during the loading of the loop.

More applications .....pages 118-119

8 port sampling/switching

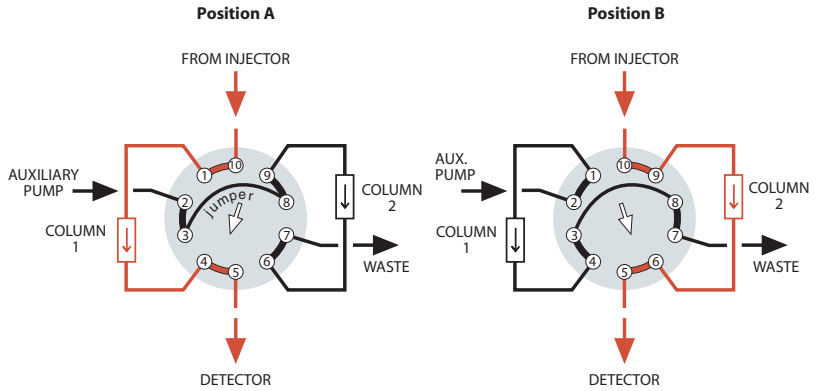


LOOP SAMPLING WITH BACKFLUSH TO DETECTOR

One valve performs the functions of sampling and backflush valves, simplifying operation and reducing cost. When components of interest are detected, the strongly retained components are backflushed and removed from the column without temperature programming.

More applications ..... page 119

10 port sampling/switching



ALTERNATE COLUMN REGENERATION

When columns must be regenerated following each analysis, this technique permits automation of the process. While one column performs the analysis, the second column undergoes regeneration through use of an auxiliary pump. Once the first analysis is complete, the valve is switched and the regenerated column is ready for analytical use.

More applications .....pages 120-121

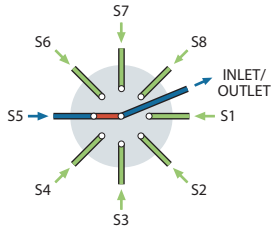
NEW Selectors – Nanovolume UHPLC

NEW 15,000 psi UHPLC Nanovolume selectors, 1/32" Valco fittings, 150 micron ports (.006")

15,000 psi
Stream selector
1/32" **150 µm**

Includes 1/32" Valco stainless steel fittings.

Manual version not available.
Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



15,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

OPTIONS
- 100 micron (.004") bore
- 250 micron (.010") bore
- 10,000 and 20,000 psi versions available
- 4 positions

	6 Position		8 Position		10 Position	
	Prod No	*Pric e*	*Prod No*	*Price*	*Prod No*	*Price*
Coated stainless stator						
With pneumatic actuator	C75NX-6696A		C75NX-6698A		C75NX-6690A	
With standard electric actuator	C75NX-6696E		C75NX-6698E		C75NX-6690E	
With microelectric actuator	C75NX-6696EMH		C75NX-6698EMT		C75NX-6690EMT	
Replacement valve	C75NX-6696D		C75NX-6698D		C75NX-6690D	
Replacement rotor	C75N-66R6		C75N-66R8		C75N-66R0	
Replacement stator	C75N-6C96		C75N-6C98		C75N-6C90	

Model C75NX
1/32" Valco stainless fittings

NEW 10,000 psi UHPLC microbore selectors, 1/16" Valco fittings, 250 micron ports (.010")

Model C75H

SPECS
10,000 psi liq
50°C max
Stainless stator
with inert coating
Valcon E3 rotor

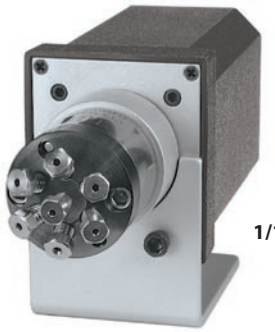
OPTIONS
- 150 micron (.006") bore
- 15,000 psi version available
- 4 positions

Includes 1/16" Valco stainless steel fittings.

Manual version not available.
Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

10,000 psi
Stream selector
1/16" **250 µm**

	6 Position		8 Position		10 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Coated stainless stator						
With pneumatic actuator	C75H-1696A		C75H-1698A		C75H-1690A	
With standard electric actuator	C75H-1696E		C75H-1698E		C75H-1690E	
With microelectric actuator	C75H-1696EMH		C75H-1698EMT		C75H-1690EMT	
Replacement valve	C75H-1696D		C75H-1698D		C75H-1690D	
Replacement rotor	C75-16R6		C75-16R8		C75-16R0	
Replacement stator	C75-1C96		C75-1C98		C75-1C90	



Model C75H 1/16" Valco stainless fittings

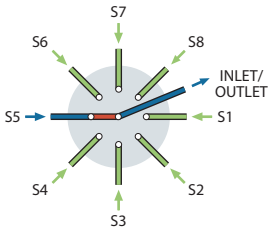
Selectors – High Pressure

HPLC stream selector, 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

5,000 psi
Stream selector
10-32 ZDV
1/16" **0.40 mm**

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



	4 Position		6 Position		8 Position		10 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator								
Manual	C5-2004		C5-2006		C5H-2008		C5H-2000	
With pneumatic actuator	C5-2004A		C5-2006A		C5H-2008A		C5H-2000A	
With standard electric actuator	C5-2004E		C5-2006E		C5H-2008E		C5H-2000E	
With microelectric actuator	C5-2004EMH		C5-2006EMH		C5H-2008EMT		C5H-2000EMT	
Replacement valve	C5-2004D		C5-2006D		C5H-2008D		C5H-2000D	
Replacement rotor	C5-20R4		C5-20R6		C5-20R8H		C5-20R0H	
Replacement stator	C5-2C04		C5-2C06		C5-2C08H		C5-2C00H	
PAEK stator								
Manual	C5-2344		C5-2346		C5H-2348		C5H-2340	
With pneumatic actuator	C5-2344A		C5-2346A		C5H-2348A		C5H-2340A	
With standard electric actuator	C5-2344E		C5-2346E		C5H-2348E		C5H-2340E	
With microelectric actuator	C5-2344EMH		C5-2346EMH		C5H-2348EMT		C5H-2340EMT	
Replacement valve	C5-2344D		C5-2346D		C5H-2348D		C5H-2340D	
Replacement rotor	C5-23R4		C5-23R6		C5-23R8H		C5-23R0H	
Replacement stator	C5-2C44		C5-2C46		C5-2C48H		C5-2C40H	
Titanium stator								
Manual	C5-2034		C5-2036		C5H-2038		C5H-2030	
With pneumatic actuator	C5-2034A		C5-2036A		C5H-2038A		C5H-2030A	
With standard electric actuator	C5-2034E		C5-2036E		C5H-2038E		C5H-2030E	
With microelectric actuator	C5-2034EMH		C5-2036EMH		C5H-2038EMT		C5H-2030EMT	
Replacement valve	C5-2034D		C5-2036D		C5H-2038D		C5H-2030D	
Replacement rotor	C5-20R4		C5-20R6		C5-20R8H		C5-20R0H	
Replacement stator	C5-2C34		C5-2C36		C5-2C38H		C5-2C30H	

Model C5
6 positions
1/16" ZDV fittings

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

- 2", 3", 4", and 6" standoffs
- Hastelloy C stator
- Optional 0.15 mm (.006") and 0.25 mm (.010") bores available
- Optional 0.75 mm (.030") bore for Prep HPLC available

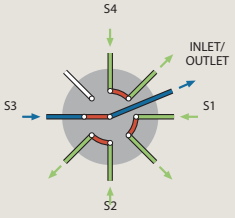
MORE INFORMATION

Manifolds ..... page 33

OPTIONAL FLOWPATH

Model C5F, the flow-through version, is similar to the C5 but its non-selected streams continue flowing through individual outlets. 3, 4, and 5 positions are available.

Consult the factory for C5F prices and information.



Model C5F
schematic diagram

HPLC column selector system with 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

Model C5

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

The system comprises two stream selection valves mounted on a single microelectric actuator, which can be controlled manually, via remote logic level signal, or by RS-232 interface (RS-485 optional). See plumbing diagram below.

Includes stainless steel nuts and ferrules of the stator material.

Valves with PAEK stators have PEEK nuts and ferrules.

Includes microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Column selector system
10-32 ZDV
1/16" **0.40 mm**

OPTIONS

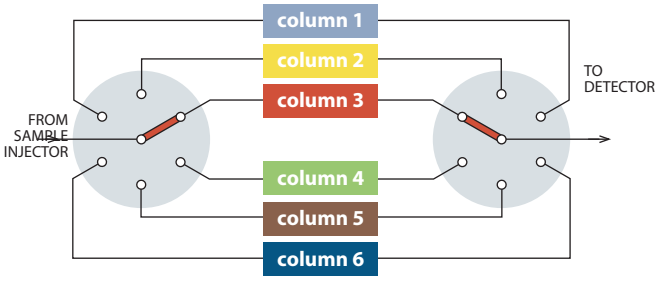
- 2", 3", 4", and 6" standoffs
- Hastelloy C stator
- Optional 0.25 mm (.010") bore available
- Optional 0.75 mm (.030") bore for Prep HPLC available

	6 Column		8 Column		10 Column	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator						
System	C5-2006EMTD		C5H-2008EMTD		C5H-2000EMTD	
Replacement valve	C5-2006D		C5H-2008D		C5H-2000D	
Replacement rotor	C5-20R6		C5-20R8H		C5-20R0H	
Replacement stator*	C5-2C06		C5-2C08H		C5-2C00H	
PAEK stator						
System	C5-2346EMTD		C5H-2348EMTD		C5H-2340EMTD	
Replacement valve	C5-2346D		C5H-2348D		C5H-2340D	
Replacement rotor	C5-23R6		C5-23R8H		C5-23R0H	
Replacement stator*	C5-2C46		C5-2C48H		C5-2C40H	

** See note on ordering stators, below.*

RS-232 interface cable

Prod No	*Price*
I-22697	



Model C5 system

Columns not included

MORE INFORMATION

ORDERING STATORS

Valves for dual drive assemblies have mirror image stators. Consult Technical Support for correct product number before ordering.

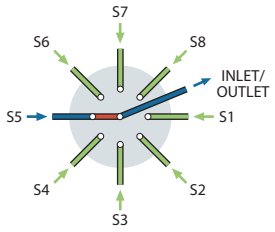
Both valves use the same rotor.

Stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Low pressure
Stream selector
10-32 ZDV
1/16" **0.75 mm**

Includes Valco ZDV PEEK nuts and ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



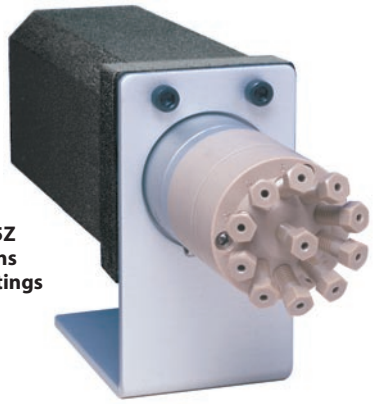
SPECS

100 psi gas/ 2[illegible] psi liq
75°C max
PPS stator
Valcon E2 rotor

OPTIONS

- 4 and 12 positions available
- 2", 3", 4", and 6" standoffs
- Other polymeric materials are available. Consult the factory.

	6 Position		8 Position		10 Position		14 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C25Z-3186		C25Z-3188		C25Z-3180		C25Z-31814	
With pneumatic act.	C25Z-3186A		C25Z-3188A		C25Z-3180A		C25Z-31814A	
With std electric act.	C25Z-3186E		C25Z-3188E		C25Z-3180E		C25Z-31814E	
With microelectric act.	C25Z-3186EMH		C25Z-3188EMH		C25Z-3180EMH		C25Z-31814EMH	
Replacement valve	C25Z-3186D		C25Z-3188D		C25Z-3180D		C25Z-31814D	
Replacement rotor	C15-310		C15-310		C15-310		C25Z-325	
Replacement stator	C25Z-386		C25Z-388		C25Z-380		C25Z-38-14	

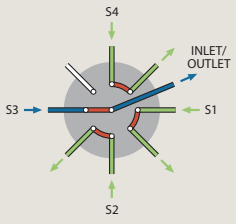


Model C25Z
10 positions
1/16" ZDV fittings

OPTIONAL FLOWPATH

Model C25ZF, the flow-through version, is similar to the C25Z but its non-selected streams continue flowing through individual outlets, instead of being dead-ended. 3, 4, 5, 6, and 7 positions are available.

Consult the factory for C25ZF prices and information.



Stream selector, 1/4-28 fittings for 1/16" tubing, 0.75 mm ports (.030")

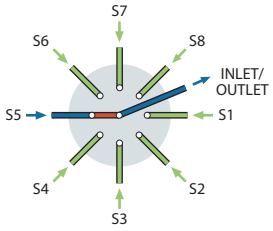
Model C25

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

OPTIONS
- 2", 3", 4", and 6" standoffs
- CTFE stator

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/16" tubing.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



Low pressure
Stream selector
1/4-28 Internal
1/16" **0.75 mm**

	4 Position		6 Position		8 Position		10 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C25-3184		C25-3186		C25-3188		C25-3180	
With pneumatic act.	C25-3184A		C25-3186A		C25-3188A		C25-3180A	
With std electric act.	C25-3184E		C25-3186E		C25-3188E		C25-3180E	
With microelec act.	C25-3184EMH		C25-3186EMH		C25-3188EMH		C25-3180EMH	
Replacement valve	C25-3184D		C25-3186D		C25-3188D		C25-3180D	
Replacement rotor	C25-314		C25-316		C25-318		C25-310	
Replacement stator	C25-384		C25-386		C25-388		C25-380	

Stream selector, 1/4-28 fittings for 1/8" tubing, 1.50 mm ports (.060")

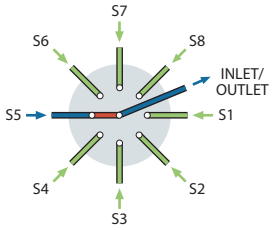
Model C25

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

OPTIONS
- 2", 3", 4", and 6" standoffs
- CTFE stator

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/8" tubing.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



Low pressure
Stream selector
1/4-28 Internal
1/8" **1.50 mm**

	4 Position		6 Position		8 Position		10 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
Manual	C25-6184		C25-6186		C25-6188		C25-6180	
With pneumatic act.	C25-6184A		C25-6186A		C25-6188A		C25-6180A	
With std electric act.	C25-6184E		C25-6186E		C25-6188E		C25-6180E	
With microelec act.	C25-6184EMH		C25-6186EMH		C25-6188EMH		C25-6180EMH	
Replacement valve	C25-6184D		C25-6186D		C25-6188D		C25-6180D	
Replacement rotor	C25-614		C25-616		C25-618		C25-610	
Replacement stator	C25-684		C25-686		C25-688		C25-680	

MORE INFORMATION

OPTIONAL FLOWPATH

Model C25F is the flow-through versionof C25. (See discussion on facing page.) 3, 4, 5, 6, and 7 positions are available.

Consult the factory for C25F prices and information.

Model C25
10 position
1/4-28 fittings

Selectors – Low Pressure

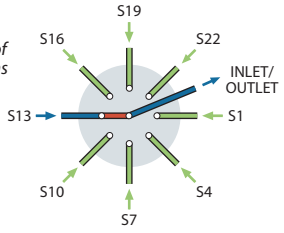
Stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Low pressure
Stream selector
10-32 ZDV
1/16" **0.75 mm**

Includes Valco ZDV PEEK nuts and ferrules.

Available only with microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

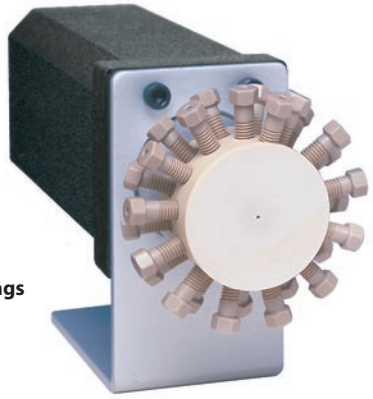
(For clarity, only eight of the twenty-four streams are illustrated.)



SPECS
100 psi liq
50°C max
PPS stator
Valcon E2 rotor

OPTIONS
- Optional bore: 0.5 mm (.020") 1.0 mm (.040")
- 2", 3", 4", and 6" standoffs
- Consult the factory for optional materials.

	20 Position		24 Position		26 Position	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
With microelectric actuator	C35Z-31820EMT		C35Z-31824EMT		C35Z-31826EMT	
Replacement valve	C35Z-31820D		C35Z-31824D		C35Z-31826D	
Replacement rotor	C35Z-31R20		C35Z-31R20		C35Z-31R20	



Model C35Z
26 positions
1/16" ZDV fittings

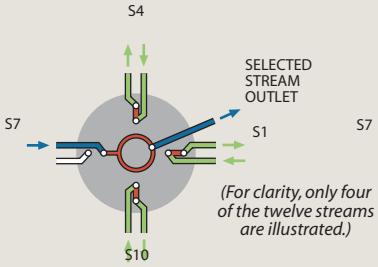
OPTIONAL FLOWPATHS

Model C35Z valves select and isolate one of 20-26 streams, with the remainder dead-ended.

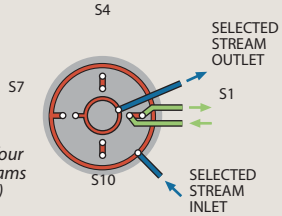
Model C35ZF, the flow-through version, is similar to the C35Z but its non-selected streams continue flowing through individual outlets. 10, 12, and 13 positions are available.

Model C35ZT, the trapping version, is similar to the C35ZF but has a second selected port. Non-selected streams continue flowing. 10, 12, and 13 positions are available.

Call for pricing and information.



Model C35ZF schematic



Model C35ZT schematic

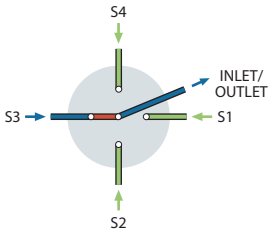
Stream selector, 1/2-20 fittings for 1/4" tubing, 4.6 mm ports (.180")

Model C45

SPECS
100 psi liq
50°C max
PPS stator
Valcon TF rotor

Manual version not available.
Includes Cheminert 1/2-20 flangeless fittings for 1/4" tubing, Delrin nuts and CTFE ferrules.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



Low pressure
Stream selector
1/2-20 Internal
1/4" 4.6 mm

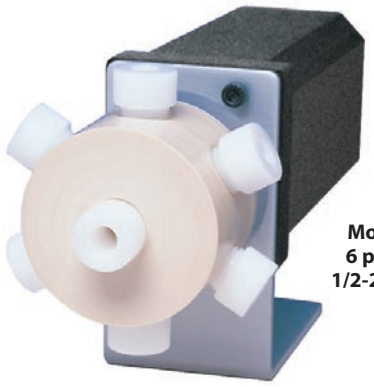
OPTIONS
- 2", 3", 4", and 6" standoffs
- Consult the factory for optional materials.
- 8 position selectors are available with 3 mm (.120") ports

	4 Position		6 Position	
	Prod No	*Price*	*Prod No*	*Price*
With pneumatic actuator	C45-9784A		C45-9786A	
With std electric actuator	C45-9784E		C45-9786E	
With microelectric actuator	C45-9784EMT		C45-9786EMT	
Replacement valve	C45-9784D		C45-9786D	
Replacement rotor	C45-97R4		C45-97R6	

Fittings for C45 valves

For additional 1/2-20 fittings and adapters, see page 72.

	Prod No	*Price*
Delrin nut	CFL-4D	
CTFE nut	CFL-4KF	
PPS nut	CFL-4PPS	
CTFE ferrule	CFL-CB4KF-S	



Model C45
6 positions
1/2-20 fittings

MORE INFORMATION

OEM – Microbore HPLC

NEW Integrated motor/valve, 1/16" Valco fittings, 0.25 mm ports (.010")

5,000 psi | **Microbore** | **Integrated** | **1/16"** | **0.25 mm** | CE

See page 149 for detailed information on Model C52 valves.

Also available in vertical port version. Contact the factory.

Includes stainless steel nuts and ferrules of the stator material.

Valves with PAEK stators have PEEK nuts and ferrules.

	4 Port		6 Port*		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator								
With integrated actuator	C52-1004I		C52-1006I		C52-1008I		C52-1000I	
With motor/sensor only	C52-1004I-S		C52-1006I-S		C52-1008I-S		C52-1000I-S	
With motor only	C52-1004IX		C52-1006IX		C52-1008IX		C52-1000IX	
Replacement rotor	C2-10R4		C2-10R6		C2-10R8H		C2-10R0H	
Replacement stator	C52-1C04		C52-1C06		C52-1C08		C52-1C00	
PAEK stator								
With integrated actuator	C52-1344I		C52-1346I		C52-1348I		C52-1340I	
With motor/sensor only	C52-1344I-S		C52-1346I-S		C52-1348I-S		C52-1340I-S	
With motor only	C52-1344IX		C52-1346IX		C52-1348IX		C52-1340IX	
Replacement rotor	C2-13R4		C2-13R6		C2-13R8H		C2-13R0H	
Replacement stator	C52-1C44		C52-1C46		C52-1C48		C52-1C40	

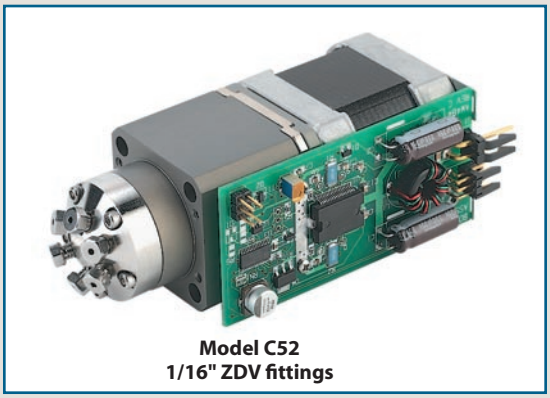
SPECS

5,000 psi liq
40°C max
N60 stainless stator
Valcon H rotor

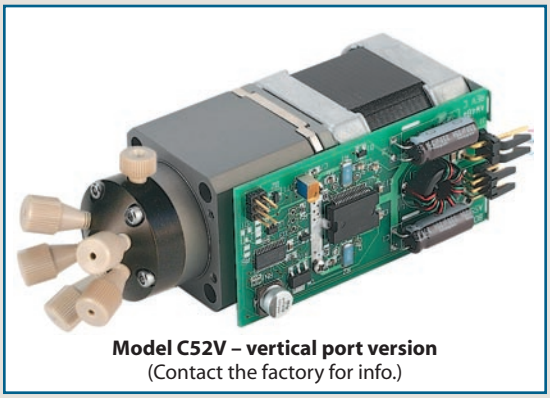
5,000 psi liq
40°C max
PAEK stator
Valcon E rotor

OPTIONS

- **Vertical port version.** (Model C52V) Contact the factory for more information.
- Optional 0.40 mm (.016") and 0.75 mm ports (.030") available
- Titanium and Hastelloy stators available



Model C52
1/16" ZDV fittings



Model C52V – vertical port version
(Contact the factory for info.)

Sample loops *for C52 injectors*

Each metal loop includes two stainless steel nuts and ferrules.
Each PEEK loop includes two PEEK nuts and ferrules.

	Stainless Steel		PEEK (for PAEK stators)	
Volume	*Prod No*	*Price*	*Prod No*	*Price*
2 µl	CSL2		CZSL2PK	
5 µl	CSL5		CZSL5PK	
10 µl	CSL10		CZSL10PK	
20 µl	CSL20		CZSL20PK	
50 µl	CSL50		CZSL50PK	
100 µl	CSL100		CZSL100PK	
250 µl	CSL250		CZSL250PK	
500 µl	CSL500		CZSL500PK	
1 ml	CSL1K		CZSL1KPK	
2 ml	CSL2K		CZSL2KPK	
5 ml	CSL5K		CZSL5KPK	
10 ml	CSL10K		–	

MORE INFORMATION

Materials
Metals . . . . page 254-255
Polymers 256
Valve rotors. 257

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, and PTFE *(see pages 254-255).*
- Metal loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

Microbore centered port injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C3

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 5 µl loop of the stator material. Includes syringe fill port for 22 gauge 3/4" and 2" needle.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Microbore
Centered port
1/16" **0.25 mm**

OPTIONS
- Titanium and Hastelloy stators available

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
Manual	C3-1006		C3-1346	
With pneumatic actuator	C3-1006A		C3-1346A	
With standard electric actuator	C3-1006E		C3-1346E	
With microelectric actuator	C3-1006EH		C3-1346EH	
Replacement valve	C3-1006D		C3-1346D	
Replacement rotor	C2-10R6		C2-13R6	
Replacement stator	C3-1C06		C3-1C46	

Model C2V
1/16" ZDV fittings

Order loops from page 159.

Microbore vertical port injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C2V

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 5 µl loop of the stator material.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Microbore
Vertical port
1/16" **0.25 mm**

OPTIONS
- Titanium and Hastelloy stators available

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
Manual	C2V-1006		C2V-1346	
With pneumatic actuator	C2V-1006A		C2V-1346A	
With standard electric actuator	C2V-1006E		C2V-1346E	
With microelectric actuator	C2V-1006EH		C2V-1346EH	
Replacement valve	C2V-1006D		C2V-1346D	
Replacement rotor	C2-10R6		C2-13R6	
Replacement stator	C2V-1C06		C2V-1C46	

Model C3
1/16" ZDV fittings

Order loops from page 159.

NEW Integrated motor/valve, 1/16" Valco fittings, 0.40 mm ports (.016")

5,000 psi | **Analytical** | **Integrated** | **1/16"** | **0.40 mm**

CE

See page 149 for detailed information on Model C52 valves.

Includes stainless steel nuts and ferrules of the stator material.

Valves with PAEK stators have PEEK nuts and ferrules.

	4 Port		6 Port*		8 Port		10 Port	
	Prod No	*Price*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
N60 stainless stator								
With integrated actuator	C52-2004I		C52-2006I		C52-2008I		C52-2000I	
With motor/sensor only	C52-2004I-S		C52-2006I-S		C52-2008I-S		C52-2000I-S	
With motor only	C52-2004IX		C52-2006IX		C52-2008IX		C52-2000IX	
Replacement rotor	C2-20R4		C2-20R6		C2-20R8H		C2-20R0H	
Replacement stator	C52-2C04		C52-2C06		C52-2C08		C52-2C00	
PAEK stator								
With integrated actuator	C52-2344I		C52-2346I		C52-2348I		C52-2340I	
With motor/sensor only	C52-2344I-S		C52-2346I-S		C52-2348I-S		C52-2340I-S	
With motor only	C52-2344IX		C52-2346IX		C52-2348IX		C52-2340IX	
Replacement rotor	C2-23R4		C2-23R6		C2-23R8H		C2-23R0H	
Replacement stator	C52-2C44		C52-2C46		C52-2C48		C52-2C40	

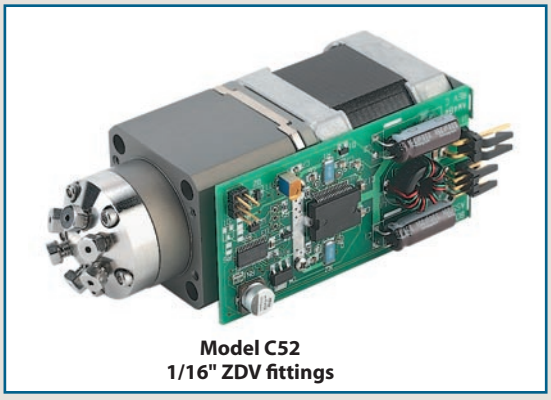
SPECS

5,000 psi liq
40°C max
N60 stainless stator
Valcon H rotor

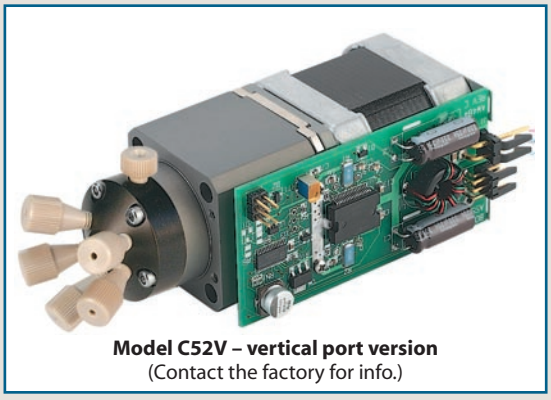
5,000 psi liq
40°C max
PAEK stator
Valcon E rotor

OPTIONS

- **Vertical port version.** (Model C52V) Contact the factory for more information.
- Optional 0.25 mm (.010") and 0.75 mm ports (.030") available
- Titanium and Hastelloy stators available



Model C52
1/16" ZDV fittings



Model C52V – vertical port version
(Contact the factory for info.)

Sample loops *for C52 injectors*

Each metal loop includes two stainless steel nuts and ferrules.
Each PEEK loop includes two PEEK nuts and ferrules.

	Stainless Steel		PEEK (for PAEK stators)	
Volume	*Prod No*	*Price*	*Prod No*	*Price*
2 µl	CSL2		CZSL2PK	
5 µl	CSL5		CZSL5PK	
10 µl	CSL10		CZSL10PK	
20 µl	CSL20		CZSL20PK	
50 µl	CSL50		CZSL50PK	
100 µl	CSL100		CZSL100PK	
250 µl	CSL250		CZSL250PK	
500 µl	CSL500		CZSL500PK	
1 ml	CSL1K		CZSL1KPK	
2 ml	CSL2K		CZSL2KPK	
5 ml	CSL5K		CZSL5KPK	
10 ml	CSL10K		–	–

MORE INFORMATION

OOPS ABOUT L

- Metal materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, and PTFE *(see pages 254-256).*
- Metal loops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

Analytical centered port injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C3

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

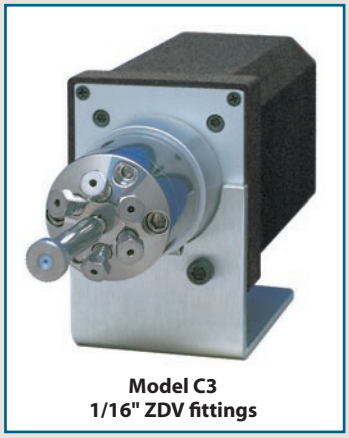
Includes one 20 µl loop of the stator material. Includes syringe fill port for 22 gauge 3/4" and 2" needle.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Analytical
Centered port
1/16" **0.40 mm**

OPTIONS
- Titanium and Hastelloy stators available

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
Manual	C3-2006		C3-2346	
With pneumatic actuator	C3-2006A		C3-2346A	
With standard electric actuator	C3-2006E		C3-2346E	
With microelectric actuator	C3-2006EH		C3-2346EH	
Replacement valve	C3-2006D		C3-2346D	
Replacement rotor	C2-20R6		C2-23R6	
Replacement stator	C3-2C06		C3-2C46	



Model C3
1/16" ZDV fittings

Order loops from page 159.

Analytical vertical port injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C2V

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.

Includes one 20 µl loop of the stator material.

Standard electric actuator:
110 VAC for USA
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.

5,000 psi
Analytical
Vertical port
1/16" **0.40 mm**

OPTIONS
- Titanium and Hastelloy stators available

	N60 stainless stator		PAEK stator	
	Prod No	*Price*	*Prod No*	*Price*
Manual	C2V-2006		C2V-2346	
With pneumatic actuator	C2V-2006A		C2V-2346A	
With standard electric actuator	C2V-2006E		C2V-2346E	
With microelectric actuator	C2V-2006EH		C2V-2346EH	
Replacement valve	C2V-2006D		C2V-2346D	
Replacement rotor	C2-20R6		C2-23R6	
Replacement stator	C2V-2C06		C2V-2C46	

Model C2V
1/16" ZDV fittings

Order loops from page 159.

OEM – Low Pressure

NEW Integrated motor/valve, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Low pressure
Integrated
10-32 ZDV
1/16" **0.75 mm**

CE

Includes Valco ZDV PEEK nuts and ferrules.

Sample loops are not included with valves. Order separately.

SPECS
100 psi gas/
50°C max
PPS stator
Valcon E2 rotor

OPTIONS
- Other polymeric rotors and stators are available

Consult the factory for prices and information.

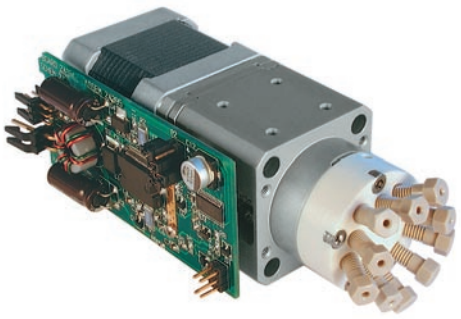

4 Port


6 Port


8 Port


10 Port

	4 Port Prod No	Price	6 Port Prod No	Price	8 Port Prod No	Price	10 Port Prod No	Price
With motor, sensor, & controller	C62Z-3184I		C62Z-3186I		C62Z-3188I		C62Z-3180I	
With motor and sensor only	C62Z-3184I-S		C62Z-3186I-S		C62Z-3188I-S		C62Z-3180I-S	



Model C62Z
1/16" ZDV fittings

Sample loops *for Model C62Z*

Loops include PEEK nuts and ferrules. Loops less than 500 µl are made from 1/16" OD tubing; loops 500 µl or greater are made from 1/8" OD tubing with polymeric unions and 1/16" ends.

Volume	FEP Prod No	Price	PTFE Prod No	Price	PEEK Prod No	Price
5 µl	CZSL5FEP		CZSL5TF		CZSL5PK	
10 µl	CZSL10FEP		CZSL10TF		CZSL10PK	
20 µl	CZSL20FEP		CZSL20TF		CZSL20PK	
50 µl	CZSL50FEP		CZSL50TF		CZSL50PK	
100 µl	CZSL100FEP		CZSL100TF		CZSL100PK	
250 µl	CZSL250FEP		CZSL250TF		CZSL250PK	
500 µl	CZSL500FEP		CZSL500TF		CZSL500PK	
1 ml	CZSL1KFEP		CZSL1KTF		CZSL1KPK	
2 ml	CZSL2KFEP		CZSL2KTF		CZSL2KPK	

MORE INFORMATION
Materials

NEW Integrated motor/valve, 1/4-28 fitting details for 1/16" tubing, 0.75 mm ports (.030") *Model C62*

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

Includes multicolored Cheminert flangeless fittings for 1/16" tubing.

Sample loops are not included with valves. Order separately.

Low pressure
Integrated
1/4-28 Internal
1/16" **0.75 mm**

CE

	4 Port	6 Port	8 Port	10 Port
	Prod No	*Prod No*	*Prod No*	*Prod No*
With motor, sensor, & controller	C62-3184I	C62-3186I	C62-3188I	C62-3180I
With motor and sensor only	C62-3184I-S	C62-3186I-S	C62-3188I-S	C62-3180I-S

NEW Integrated motor/valve, 1/4-28 fitting details for 1/8" tubing, 1.50 mm ports (.060") *Model C62*

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

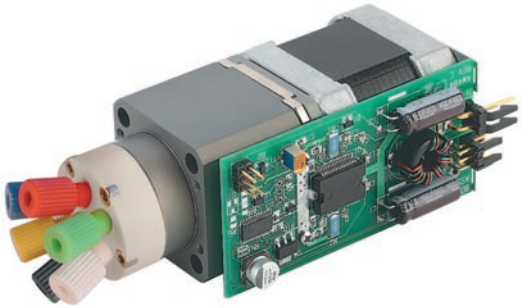
Includes multicolored Cheminert flangeless fittings for 1/8" tubing.

Sample loops are not included with valves. Order separately.

Low pressure
Integrated
1/4-28 Internal.
1/8" **1.50 mm**

CE

	4 Port	6 Port	8 Port	10 Port
	Prod No	*Prod No*	*Prod No*	*Prod No*
With motor, sensor, & controller	C62-6184I	C62-6186I	C62-6188I	C62-6180I
With motor and sensor only	C62-6184I-S	C62-6186I-S	C62-6188I-S	C62-6180I-S



Model C62
1/4-28 fittings

Sample loops *for Model C62*

Loops include flangeless fittings with natural color nuts. Loops less than 500 µl are made from 1/16" OD tubing; loops 500 µl or greater are made from 1/8" OD tubing.

	FEP	PTFE	PEEK
Volume	*Prod No*	*Prod No*	*Prod No*
20 µl	CFSL20FEP	CFSL20TF	CFSL20PK
50 µl	CFSL50FEP	CFSL50TF	CFSL50PK
100 µl	CFSL100FEP	CFSL100TF	CFSL100PK
250 µl	CFSL250FEP	CFSL250TF	CFSL250PK
500 µl	CFSL500FEP	CFSL500TF	CFSL500PK
1 ml	CFSL1KFEP	CFSL1KTF	CFSL1KPK
2 ml	CFSL2KFEP	CFSL2KTF	CFSL2KPK

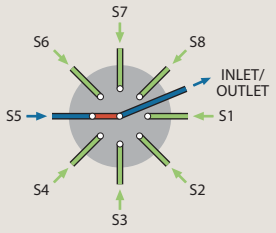
NEW Integrated motor/stream selector, 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

5,000 psi
Integrated
Stream selector
10-32 ZDV
1/16" **0.40 mm**

CE

Includes stainless steel nuts and ferrules of the stator material.

Valves with PAEK stators have PEEK nuts and ferrules.



	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
N60 stainless stator				
With integrated actuator	C55-2004I	C55-2006I	C55-2008I	C55-2000I
With motor/sensor only	C55-2004I-S	C55-2006I-S	C55-2008I-S	C55-2000I-S
With motor only	C55-2004IX	C55-2006IX	C55-2008IX	C55-2000IX
Replacement rotor	C5-20R4	C5-20R6	C5-20R8H	C5-20R0H
Replacement stator	C55-2C04	C55-2C06	C55-2C08	C55-2C00
PAEK stator				
With integrated actuator	C55-2344I	C55-2346I	C55-2348I	C55-2340I
With motor/sensor only	C55-2344I-S	C55-2346I-S	C55-2348I-S	C55-2340I-S
With motor only	C55-2344IX	C55-2346IX	C55-2348IX	C55-2340IX
Replacement rotor	C5-23R4	C5-23R6	C5-23R8H	C5-23R0H
Replacement stator	C55-2C44	C55-2C46	C55-2C48	C55-2C40

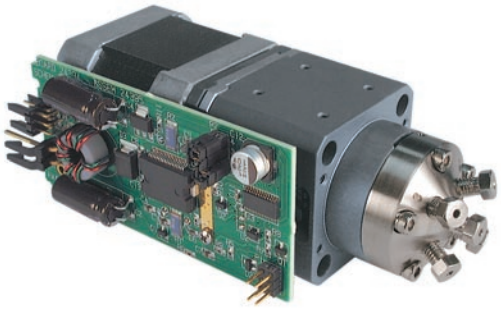
SPECS

5000 psi liq
50°C max
Metal stator
Valcon H rotor

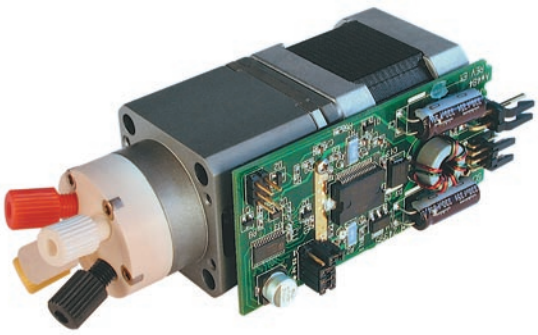
5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

- Optional bore:
  0.25 mm (.010")
  0.75 mm (.030")
- 4 and 8 positions available



Model C55
1/16" ZDV fittings



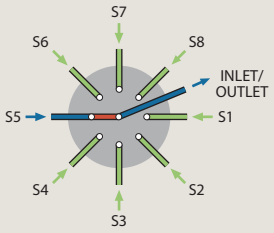
Model C65
1/4-28 fittings

NEW Integrated motor/stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Model C65Z

SPECS
100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

Includes Valco ZDV PEEK nuts and ferrules.



Low pressure
Integrated
Stream selector
10-32 ZDV
1/16" **0.75 mm**

CE

	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
With integrated actuator	C65Z-3184I	C65Z-3186I	C65Z-3188I	C65Z-3180I
With motor and sensor only	C65Z-3184I-S	C65Z-3186I-S	C65Z-3188I-S	C65Z-3180I-S

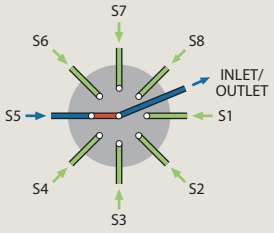
NEW Integrated motor/stream stream selector, 1/4-28 fittings for 1/16" tubing, 0.75 mm ports (.030")

Model C65

SPECS
100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

Includes multicolored Cheminert flangeless fittings for 1/16" tubing.

See photo on facing page.



Low pressure
Integrated
Stream selector
1/4-28 Internal
1/16" **0.75 mm**

CE

	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
With integrated actuator	C65-3184I	C65-3186I	C65-3188I	C65-3180I
With motor and sensor only	C65-3184I-S	C65-3186I-S	C65-3188I-S	C65-3180I-S

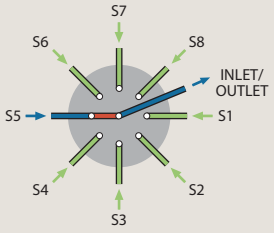
NEW Integrated motor/stream stream selector, 1/4-28 fittings for 1/8" tubing, 1.50 mm ports (.060")

Model C65

SPECS
100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

Includes multicolored Cheminert flangeless fittings for 1/8" tubing.

See photo on facing page.



Low pressure
Integrated
Stream selector
1/4-28 Internal
1/8" **1.50 mm**

CE

	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
With integrated actuator	C65-6184I	C65-6186I	C65-6188I	C65-6180I
With motor and sensor only	C65-6184I-S	C65-6186I-S	C65-6188I-S	C65-6180I-S

Actuators and Accessories

Two position valves switch back and forth between Load and Inject, or Position A and Position B. Selectors operate in continuous revolutions by incremental steps. There are several ways to actuate each type of valve, along with a number of supporting controllers and devices to interface the actuators with computer-controlled systems.

With the exception of low pressure Cheminert selectors, we recommend that selectors be purchased with air or electric actuators. While a manual detent assembly is available, the higher turning torque of our other selector designs makes them more difficult to position accurately by hand.

Manual Actuation

Simplicity and low cost are the main advantages of manual actuation. Some models can be ordered with position feedback, an option which sends a signal to start a data system when the valve is switched.

Knobs
page 204

Air Actuation

Air actuators are useful in situations where any spark could be disastrous or where there is no electricity available. They are small, relatively inexpensive, very rugged and dependable, and field-serviceable. Low gas consumption and lightweight, compact construction make the air actuator suitable for aerospace flight hardware applications as well as laboratory or process applications.

With the addition of a DVI (digital valve interface) to translate the timed event signals into the necessary air pulses, air actuators can be automatically switched by a data system, integrator, or controller such as our DVSP (digital valve sequence programmer) or SVI (serial valve interface).

Air actuator
Two position, page 195
Selector, page 194

MORE INFORMATION

Actuators

Controllers and Accessories

Mounting Hardware

Electric Actuation

The **microelectric actuator** features automatic valve alignment, high-speed switching, compact size, 24 VDC power input, and reversible direction (in the selector model).

If lower cost outranks those factors in your consideration, our **standard electric actuator** (110/230 VAC) offers a dependable, economical solution.

Both types of electric actuators can be operated manually with a controller assembly that features position-indicating LEDs and a toggle switch, but can be easily connected to an external data system for fully automated control. The microelectric actuator has built-in multidrop RS-232 (RS-485 optional) for bidirectional communications. The SVI (serial valve interface) was designed specifically to interface our standard electric actuators with RS-232 compatible systems, allowing control of up to six actuators via modem, BASIC program, or Valco-supplied PC software.

The new **universal actuator** operates virtually any Valco or Cheminert rotary valve – two position and selector alike – greatly simplying the electronic aspect of instrument design.

Microelectric actuator
Two position, page 189
For selectors (multiposition), page 190

Standard electric actuator
Two position and selector, page 193

Universal actuator
page 192

Standoff Assemblies

All valves, no matter what their actuation mode, can be ordered with a standoff assembly. The standoff is an extension shaft mounted between the handle or actuator and the valve, allowing the valve to be installed within a heated zone while the actuator or handle remains outside at ambient temperature. The standoff extends through the oven wall, and is secured by a clamp ring supplied with the assembly. Standard standoff assembly lengths are 2", 3", 4", and 6". Other lengths can be special-ordered at additional cost.

Standoff assemblies
page 205

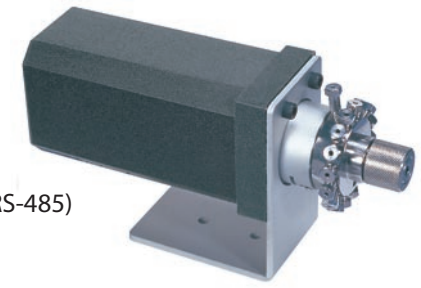
Right Angle Drive

Some installations don't allow the valve and actuator to be installed in a typical in-line configuration. The RAD (right angle drive) is a 90° gearbox which permits the actuator or handle to be installed at a right angle to the valve. The RAD fits all VICI electric and air actuators.

R ight angle drive
page 204

Microelectric Actuators

- CE certified
- Automatic alignment
- Manual control with position indication
- Remote control by contact closures or TTL logic level signals
- RS-232 bidirectional communication (optional RS-485)
- Two position and selector versions
- Universal power supply, 110/230 VAC to 24 VDC



The microelectric actuator offers Valco dependability in a unit which is less than half the size of our standard model. The actuator consists of a control module, a stepper motor/gearbox assembly, a manual remote control, interconnecting cables, and a 110/230 VAC to 24 VDC power supply. The composite version combines the stepper motor/gearbox assembly with the control module. The RS-232 interface cable, if required, must be ordered separately.

Since different valve models have varying actuation torque requirements, there are five microelectric actuator models for two position valves – EQ, EH, EP, ED, and ET – and two versions for multiposition – EMH and EMT. Consult the chart on the respective ordering information page to determine which model meets your requirements. When a valve and actuator are ordered at the same time, the proper actuator is supplied automatically.

An actuator can be specified with closemount hardware, with a standoff, or with just the standoff mounting hardware, if your valve already has a standoff. The microelectric actuator is designed for room temperature use. Valves which will be mounted in ovens require a standoff assembly, which locates the actuator out of the heated zone.

MORE INFORMATION

Microelectric actuators
For two position 189
For selectors . . . 190-191

Mounting Hardware

Closemount hardware . . . . . page 208
Right angle drive 204
Standoff assembly 205
Standoff mounting hardware 205

TECH TIP

Electric actuators can be directly controlled by signals from microprocessor-based instruments, data systems, or valve programmers, unlike air actuators, which require an interface to convert the signal to an air pulse.

ORDER TIP

To purchase a ***valve with a microelectric actuator installed***, see valve ordering information.

Valco

Injectors and valves . . . . pp 102-116
Selectors 122-133

Cheminert

Injectors and valves 152-167
Selectors 170-177

- CE certified
- Stall-sensing circuitry – no mechanical microswitches
- High speed switching – <100 ms in EQ model
- A model for every valve we sell

The two position microelectric actuator features exclusive stall-sensing circuitry which eliminates problems associated with valve/actuator misalignment. Power to the actuator motor is switched off when the driver pin goes against the stop of the valve cutout – no sooner, no later – and it's all done without any mechanical microswitches. Not only does this mean that alignment problems are a thing of the past, it means that you can stock one actuator for valves that turn 30°, 36°, 45°, 60°, 90°, or anything in between.

During initialization, the valve rotates at moderate speed while the actuator waits to sense the stall. Once the rotation angle has been measured and confirmed by repetition, the angle is memorized and actuation takes place at maximum speed. Valve position memory is maintained even in the event of a power failure. There is nothing more to do unless you wish to install a valve with a different angle of rotation. In that event, cycling the actuator with no valve mounted sets up reinitialization.

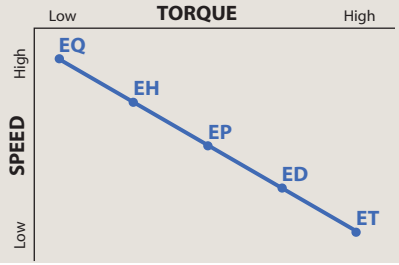
WHICH MODEL FOR WHICH TWO POSITION VALVE?

Fitting size	Valve type	Actuator model	Valve type	Actuator model
	Valco GC		Valco HPLC	
1/32"	W	EH	W	EP
1/16"	W	EH	W	EP
1/16"	UW	ED	UW	ED
1/8"	UW	ED	UW	ED
1/4"	MW	ET	—	—

Cheminert HPLC & Low Pressure

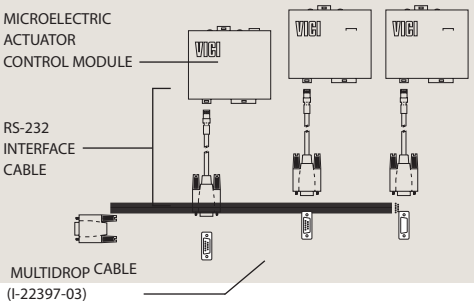
All valves	EH

SPEED AND TORQUE: Inversely proportional



TECH TIP

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric actuators.



Microelectric actuators *for two position valves*

Standard voltage 24 VDC. Includes autosensing 24 VDC power supply.
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.
Consult the chart below to determine which actuator model is best suited for your valve.

Description	With closemount assembly *Prod No*	With 2" standoff assembly *Prod No*	For use with existing standoff *Prod No*
Highest speed actuator	EQ	EQ2	EQS
High speed actuator	EH	EH2	EHS
Medium torque actuator	EP	EP2	EPS
High torque actuator	ED	ED2	EDS
Highest torque actuator	ET	ET2	ETS

RS-232 interface cable

Description	*Prod No*
RS-232 interface cable	I-22697

Multi-drop cables *for multiple microelectric actuators*

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric two position and multiposition actuators. Cables have one female DB9 and 2 to 8 male DB9 connectors – approximately 6" long.
Note: The RS-232 interface cable (I-22697), above, is required for ***each*** actuator.

No. of actuators to be controlled	*Prod No*
2	I-22897-02
3	I-22897-03
4	I-22897-04
5	I-22897-05
6	I-22897-06
8	I-22897-08

Microelectric Actuators for Selectors

- CE certified
- Direction reversal
- Position indication
  - LED display
  - RS-232 output
  - BCD 5V negative true output
- Manual control
  - Step and home functions
  - Clockwise and counterclockwise functions
- Remote control
  - Step and home functions with contact closure
  - Direct position access with BCD 5V negative true input
  - Direct position access with RS-232 input (RS-485 optional)
- Automatic self-alignment with keyed valves and standoffs

One actuator can be used on any selector, from 2 to 96 positions – you tell the actuator how many stops to make through its 360° of rotation. So you can stock only one type of actuator even if you have 4, 6, 8, 10, 12, and 16 position valves. Valve position memory is maintained even in the event of a power failure.

The direction reversal feature means that if a 6 position stream selection valve is on stream 1 and you select stream 6, you have the option of stepping "backwards" to stream 6 instead of passing through 2, 3, 4, and 5. The RS-232 input offers various commands like position access, direction control, shortest route, etc. (The RS-232 cable must be ordered separately.)

MORE INFORMATION

Microelectric actuators
For two position 189

Mounting Hardware

Closemount hardware . . . . . page 208
Right angle drive 204
Standoff assembly 205
Standoff mounting hardware 205

ORDER TIP

To purchase a ***valve with a microelectric actuator installed***, see valve ordering information.

Valco

Injectors and valves . . . . pp 102-116
Selectors 122-133

Cheminert

Injectors and valves 152-167
Selectors 170-177

Microelectric actuators *for selectors*

Standard voltage 24 VDC. Includes autosensing 24 VDC power supply.
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.
Consult the chart below to determine which actuator model is best suited for your valve.

Description	**With keyed closemount assembly** *Prod No*	**With keyed 2" standoff assembly** *Prod No*	**For use with existing standoff** *Prod No*
High speed actuator	EMH	EMH2	EMHS
High torque actuator	EMT	EMT2	EMTS

RS-232 interface cable

Description	*Prod No*
RS-232 interface cable	I-22697

Multi-drop cables *for multiple microelectric actuators*

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric two position and selector actuators. Cables have one female DB9 and 2 to 8 male DB9 connectors – approximately 6" long.
Note: The RS-232 interface cable (I-22697), above, is required for ***each*** actuator.

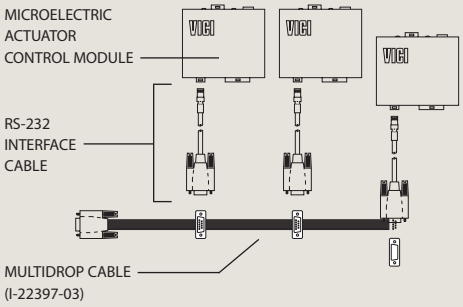
No. of actuators to be controlled	*Prod No*
2	I-22897-02
3	I-22897-03
4	I-22897-04
5	I-22897-05
6	I-22897-06
8	I-22897-08

WHICH MODEL FOR WHICH SELECTOR?

Valve model		Actuator model
Valco		
All valves		EMT
Cheminert high pressure		
C5	4, 6 positions	EMH
	8, 10 positions	EMT
C75NX		EMH
C75H		EMH
Cheminert low pressure		
C25Z		EMH
C25		EMH
C35Z		EMH
C45		EMT

TECH TIP

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric actuators.



ABOUT STANDOFFS

Keyed standoff assemblies are used with selector (multiposition) microelectric actuators, to key the valve body to the actuator and standoff so that the actuators can self-align and operate valves with any number of positions.

Valco selectors are not keyed unless ordered with a microelectric actuator. To install a microelectric actuator on an existing Valco selector, the key (pin) must be removed from the actuator clamp ring assembly. This can be done easily with a pair of pliers.

See page 207, top and bottom illustrations, for drawings of keyed standoff assemblies with multiposition microelectric actuators.

NEW OEM – Universal Actuators

- One actuator works with two position valves *and* selectors
- Simplified, universal communication protocol
- Variety of interfaces
- Three versions for various valve torque requirements


Shown with BCD option

The universal actuator allows instrument manufacturers to use a single motor and control software to operate virtually any Valco or Cheminert rotary valve. This simplifies the electronic aspect of instrument design and streamlines the development process.

All our Valco and Cheminert valves and selectors, with their wide range of turning torques, are covered by three actuator versions: high speed, medium speed/medium torque, and high torque. *(See charts below)*

Actuators listed below include universal 24 volt DC power supply and manual interface. An OEM version that excludes these items is also available. Current interface options include RS232/485, USB, and BCD.

While the actuators listed on this page are universal, the valve mounting hardware is not. The product numbers shown below do not include the hardware required for mounting a valve, since the necessary hardware depends on the valve type. If you are ordering the actuator for use with an *existing* valve, call our sales or technical staff to determine the correct hardware needed. If you want to order the universal actuator with a *new* valve, simply substitute the actuator product number in place of a different actuator and we'll provide the correct hardware. For example, to order the universal actuator in place of the air actuator in A4C6UWE, order p/n EUD4C6UWE, or to order C2-2006EH with a universal actuator, order C2-2006EUH.

NEW Universal actuators

	High speed (EUH)	Medium torque (EUD)	High torque (EUT)
Description	*Prod no*	*Prod no*	*Prod no*
Without interface	EUH	EUD	EUT
With RS-232/485	EUHA	EUDA	EUTA
With USB	EUHB	EUDB	EUTB
With BCD	EUHC	EUDC	EUTC

Refer to these charts to determine which of the three versions best suits the valves you use, or simply ask our sales or technical staff.

WHICH MODEL FOR WHICH SELECTOR?

Valco

	Actuator model
All valves	EUT

Cheminert

	Actuator model HPLC	*Actuator model* UHPLC
4 and 6 position *	EUH	EUH
8 and 10 position	EUD	EUD
	Low pressure	
Model C25 and C25Z	EUH	
Model C35Z	EUD	
Model C45	EUT	

* 20,000 psi versions use EUD.

WHICH MODEL FOR WHICH INJECTOR / TWO POSITION VALVE?

Valco

Fitting size	*Valve type*	*Actuator model* GC	*Actuator model* HPLC
1/32"	W	EUH	EUD
1/16"	W	EUH	EUD
1/16"	UW	EUD	EUD
1/8"	UW	EUD	EUD
1/4"	MW	EUT	—

Cheminert

	Actuator model HPLC	*Actuator model* UHPLC
4 and 6 ports *	EUH	EUH
8 and 10 ports	EUH	EUD
	Low pressure	
All valves	EUH	

*20,000 psi versions use EUD.


Cheminert HPLC selector on universal actuator


Cheminert LC injector on universal actuator


Valco GC selector on universal actuator

Two position standard electric actuators may be operated manually by a toggle switch or automatically by any data system with momentary contact closures or 5 VDC negative true logic outputs. A complete system, the actuator includes interface cable, power cord, and manual controller assembly with position indication.

Multiposition (selector) models work with any of our multiposition valves. The manual controller with LED display allows the user to step sequentially from one position to the next or to return to Position 1 (Home). A data system with momentary contact closures can direct the step and home functions; 5 VDC negative true logic outputs provide direct position access. A 20-conductor interface cable permits the system to step the actuator sequentially, move the actuator directly to any position, and read the actual valve position.

Standard electric actuators can be ordered with closemount hardware, a standoff, or just the standoff mounting hardware, if your valve already has a standoff. Valves which will be mounted in ovens require a standoff assembly so that the actuator is located out of the heated zone.

The actuator's rotation (two position) or number of positions (multiposition) must be properly matched to the valve's. If you are converting a manual valve to electric actuation and have any doubts about which actuator and hardware you need, call our sales or technical staff for assistance.

Standard electric actuators *for two position valves*

Standard voltage: 110 VAC. (230 VAC and 24 volt CE versions optional. Consult factory for product numbers and pricing.)
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

No. of ports in valve	Description	With closemount assembly Prod No	With 2" standoff assembly Prod No	For use with existing standoff Prod No
3, 4	90° rotation	E90	E902	E90S
6	60° rotation	E60	E602	E60S
8	45° rotation	E45	E452	E45S
10	36° rotation	E36	E362	E36S
12	30° rotation	E30	E302	E30S

Standard electric actuators *for selectors*

Standard voltage: 110 VAC. (230 VAC optional. Consult factory for product numbers and pricing.)
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

Description	With closemount assembly Prod No	With 2" standoff assembly Prod No	For use with existing standoff Prod No
4 position	E4	E42	E4S
4 x 2*	E4X2	E4X22	E4X2S
6 position	E6	E62	E6S
6 x 2**	E6X2	E6X22	E6X2S
8 position	E8	E82	E8S
10 position	E10	E102	E10S
12 position	E12	E122	E12S
16 position	E16	E162	E16S

* The 4 column selection valve, CST4UW, is an 8 position valve and needs a 4 x 2 actuator.
** The 6 column selection valve, CST6UW, is a 12 position valve and needs a 6 x 2 actuator.

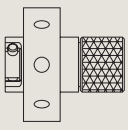
ORDER TIP
To purchase a ***valve with a standard electric actuator installed***, see valve ordering information.

Valco
Injectors and valves .... pp 102-116
Multiposition valves 122-133

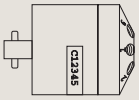
Cheminert
Injectors and valves 152-167
Multiposition valves 170-177

TECH TIP
Valco two position W and UW type valves and Cheminert valves have the following angles of rotation:

3 port	90°
4 port	90°
6 port	60°
8 port	45°
10 port	36°
12 port	30°
14 port	26°



Valco



Cheminert

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Controllers
DVSP.....page 196
Digital valve sequence programmer
SVI 197
Serial valve interface

Mounting Hardware
Closemount hardware..... 208
Right angle drive . 204
Standoff assembly 205
Standoff mounting hardware..... 205

Air Actuators

Air actuators offer reliable performance under the most stringent conditions. Low gas consumption and lightweight, compact construction make the air actuator suitable for aerospace flight hardware applications as well as laboratory or process applications.

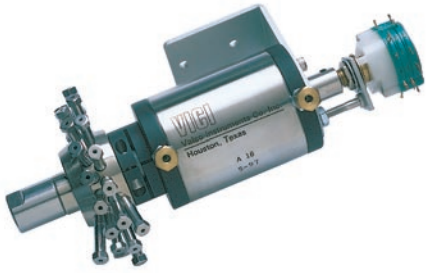
The standard air actuator is rated for up to 80 psig at temperatures up to 70°C. Generally speaking, valves which will be heated require a standoff assembly, which locates the air actuator out of the heated zone and supports both the valve and actuator. A high temperature model permits both valve and actuator to be mounted within an oven (175°C maximum), but it is not recommended for use below 50°C.

Air Actuators for Selectors

The recommended method for implementing a selector (multi-position) air actuator requires only a single 4-way solenoid. Up to 80 psig may be used without damaging the valve or actuator. Bottled instrument air or nitrogen is recommended.

If plant air from compressors must be used, an oil separator and water dryer are required.

Multiposition air actuators include a rotary switch which may be connected to a digital readout or your own design.



Standard air actuators *for selectors*

Temperature range 0-70°C
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

Description	With closemount assembly *Prod No*	With 2" standoff assembly *Prod No*	With standoff mounting hardware *Prod No*
4 position	A4	A42	A4S
6 position	A6	A62	A6S
8 position	A8	A82	A8S
10 position	A10	A102	A10S
12 position	A12	A122	A12S
16 position	A16	A162	A16S

High temperature air actuators *for selectors*

Temperature range 50-175°C
Standoff version includes a 4" standoff. 2", 3", and 6" standoffs are also available.

Description	With closemount assembly *Prod No*	With 4" standoff assembly *Prod No*	With standoff mounting hardware *Prod No*
4 position	AT4	AT44	AT4S
6 position	AT6	AT64	AT6S
8 position	AT8	AT84	AT8S
10 position	AT10	AT104	AT10S
12 position	AT12	AT124	AT12S
16 position	AT16	AT164	AT16S

Replacement O-rings

Includes a complete set of O-rings for a multiposition air actuator.

Description	*Prod No*	*Price*
Standard	ORMP	$16
High temp	ORTMP	20

TECH TIP
The actuator's rotation must be properly matched to the valve's. If you are converting a manual valve to air actuation and have any doubts about which actuator and hardware you need, call our sales or technical staff for assistance.

MORE INFORMATION
PFAF . . . . . page 199
Position feedback

Mounting Hardware
Closemount hardware . . . . . page 208
Right angle drive 204
Standoff assembly 205
Standoff mounting hardware 205

ORDER TIP
To purchase a ***valve with an air actuator installed***, go directly to valve ordering information.

MORE INFORMATION

HSSA. . . . . page 198
High speed switching accessory
PFAF 199
Position feedback

TECH TIP

Here's what you'll get when you order:

Air actuator with a **closemount assembly**

Air actuator with a **4" standoff assembly**

Air actuator **for use with an existing standoff**

The recommended method for implementing a two position air actuator is a manifold solenoid valve assembly (MSVA), a block-mounted pair of 3-way solenoids that pulses air to the actuator to switch it from position to position. If air is applied continuously, the continuous rotational force applied to the valve can cause sideloading, leaking, and additional wear.

Typical actuation pressure is 40 to 50 psig, but up to 80 psig may be used.

Ideally, only enough air pressure should be used to switch the valve in 1/3 to 1/2 second. Bottled instrument air or nitrogen is recommended. If plant air from compressors must be used, an oil separator and water dryer are required.

A high speed switching accessory (HSSA) can upgrade valve switching times to less than 30 ms with air or 8 ms with helium. A position feedback (PFAF) with contact closures in both positions is also available as an option.

Standard air actuators *for two position valves*

Temperature range 0-70°C
Standoff version includes a 4" standoff. 2", 3", and 6" standoffs are also available.

No. of ports in valve	*Description*	**With closemount assembly** *Prod No*	**With 4" standoff assembly** *Prod No*	**For use with existing standoff** *Prod No*
3, 4	90° rotation	A90	A904	A90S
6	60° rotation	A60	A604	A60S
8	45° rotation	A45	A454	A45S
10	36° rotation	A36	A364	A36S
12	30° rotation	A30	A304	A30S

High temperature air actuators *for two position valves*

Temperature range 50-175°C
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

No. of ports in valve	*Description*	**With closemount assembly** *Prod No*	**With 2" standoff assembly** *Prod No*	**For use with existing standoff** *Prod No*
3, 4	90° rotation	AT90	AT902	AT90S
6	60° rotation	AT60	AT602	AT60S
8	45° rotation	AT45	AT452	AT45S
10	36° rotation	AT36	AT362	AT36S
12	30° rotation	AT30	AT302	AT30S

Replacement O-rings

Includes a complete set of O-rings for a two position air actuator.

Description	*Prod No*
Standard	OR
High temp	ORT

Actuator compression fittings

Includes 1/8" compression to 10-32 male thread, plus 1/8" brass ferrule and hex nut.

Description	*Prod No*
3 piece fitting assembly	F-TCF

Digital Valve Sequence Programmer (DVSP)

The digital valve sequence programmer (DVSP) is an add-on or stand-alone timer/programmer with 4 intervals, settable in ranges of 0-99 seconds, 0-9.9 minutes, or 0-99 minutes. The DVSP is most commonly used for remote operation of electrical devices such as solenoid valves, Valco two position or multiposition electric actuators, and the Valco DVI (digital valve interface), which converts contact closures into pneumatic pulses for switching Valco two position air actuators.

The DVSP has two operational modes: in the AUTO mode, the DVSP will return to the first interval and begin another sequence after the last interval is completed, and in the SINGLE CYCLE mode it stops after completing one sequence. During a cycle or sequence, simple controls allow the user to stop the cycle, reset it to Interval 1, switch to the AUTO mode, or advance to the next interval. The DVSP can also be wired for remote operation by contact closure from a data system or other control device.

Each interval has one double pole, double throw relay, rated at 5 amps, which provides two sets of contacts with no connection from one side to the other. This means that a single interval can be used to perform two separate functions requiring differing voltage requirements. For example, one side of Relay A (Interval 1) can be used to switch an electric actuator (contact closure) while the other side is connected to 110/230 VAC and switches a 110/230 VAC solenoid valve at the same time as the electric actuator. In addition, Relay E supplies a two second contact. When solenoid valves are wired in series with this relay the result is "pulsed operation" of the air actuator, which avoids the potential valve and actuator problems associated with continuously-applied air pressure.

Both 12 VDC and 110/230 VAC power supplies are included within the DVSP, but the relays may be supplied with power from an external power source. For example, 24 VDC solenoid valves can be switched by the DVSP relays if the 24 volts is supplied to the relays from an external 24 VDC power supply.

DVSP
Digital valve sequence programmer

for all air and electric actuators

	Prod No
110 VAC	DVSP4
230 VAC	DVSP4-220

MORE INFORMATION

Actuators

Controllers and Interfaces

Mounting Hardware

The serial valve interface (SVI) is a device that converts commands from a computer, via a serial port, into positional control for two position and selectors (multiposition valves). Each SVI can control up to four air actuated (via a DVI, page 199) or electrically actuated two position valves and two electrically actuated selectors. The timing program can be run in the background, freeing the computer for other applications. Two serial ports (one male, one female) allow up to eight SVIs to be daisy-chained and run from a single serial communication port. In addition to controlling valves, the SVI can be used to control other devices which require logic level, BCD, or single line inputs.

The SVI is a self-contained unit, with its own 110 VAC (or 230 VAC Eurostandard) power supply. There is no need to open the computer to connect the SVI, because its DB-9 to DB-9 RS-232 cable connects to any available serial port. It also includes an interface cable for Valco two position actuators, and two Ansley 20-wire connectors for installation on the interface cable which comes as part of the multiposition electric actuator. For air actuated valves, optional interface cables are available for the DVI, which converts electrical signals to pneumatic pulses.

Software is supplied on a Windows-compatible CD. If different program functionality is needed, information is given in the manual which will assist in writing the necessary software.

SVI
Serial valve interface

for all air and standard electric actuators

	Prod No
110 VAC	SVI
230 VAC	SVI-220
DVI/SVI interface cable	I-22239

Solenoids and High Speed Accessory

41E1 4-Way solenoid air valve *for selector air actuators*

This 4-way solenoid air valve with 1/8" tube fittings is the simplest method of stepping a selector air actuator. Energizing the solenoid steps the valve to its next position, and de-energizing the solenoid resets the mechanical ratchet in the actuator. This implementation, not recommended for two position actuators, can be useful when only a limited number of external events is available on the data system.

	Prod No
110 VAC	41E1-120VAC
230 VAC	41E1-220VAC
24 VAC	41E1-24VAC
12 VDC	41E1-12VDC
24 VDC	41E1-24VDC

MSVA *for two position*
Manifold 3-way solenoid valve assembly *air actuators*

The recommended way to switch two position air actuated valves is to "pulse" a pair of 3-way solenoid valves. This method applies air to the actuator only during switching, and alleviates problems associated with continuous air pressure. The MSVA is a block-mounted pair of 3-way solenoid air valves with 1/8" tube connections, available in 12 VDC, 24 VDC, 24 VAC, 110 VAC, and 230 VAC models.

	Prod No
110 VAC	MSVA-110VAC
230 VAC	MSVA-220VAC
24 VAC	MSVA-24VAC
12 VDC	MSVA-12VDC
24 VDC	MSVA-24VDC

HSSA High speed switching accessory *for two position air actuators*

The HSSA is an add-on for our standard air actuators, providing increased air or helium flow for the fast actuation required in microbore chromatography or partial loop injections. Normal switching time for a C6W with 100 psi air is 180 ms. With the HSSA that drops to 20 ms; substitute 100 psi helium and the valve switches in 8 ms. Usually the HSSA is used in conjunction with the DVI discussed on page 199.

Prod No
HSSA

MORE INFORMATION

Actuators

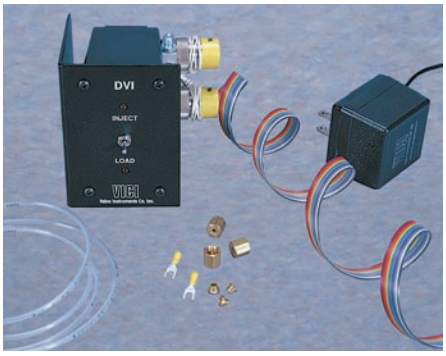
Controllers and Interfaces

Mounting Hardware

DVI Digital valve interface *for two position air actuators*

We highly recommend the DVI for use with two position air actuators. It sends a two second pulse of air to switch the valve and then vents the air, simulating switching by hand and eliminating the potential for damaging the valve or actuator with continuously-applied pressure. It also features LED position indication, manual and remote operation, and a contact closure output on arrival to the INJECT position, a feature which can be used to start a run or integration. The DVI is available for 110 or 230 VAC.

	Prod No
110 VAC	DVI
230 VAC	DVI-220



PFAF Position feedback *for two position air actuators*

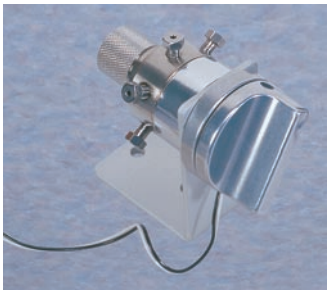
The optional position feedback (PFAF) can be field installed on any two position standard air actuator. Each position provides a contact closure for TTL logic level signals.

Prod No
PFAF

Position feedback *for manual valves*

An optional position feedback is available for manual Valco W type and Cheminert C2 and C4 series valves (standard on Cheminert C1 valves). The continuous contact closure, provided only while the valve is in the inject position, can remote start a chromatograph or data system.

Description	*Prod No*
For Valco W type valves	
4 port	PFW90
6 port	PFW60
8 and 10 port	PFW36
For Cheminert valves	
C2 series except 4 port	PFC2
C2 series, 4 port	PFC4
C4 series	PFC4



Purge Housings

Purge housings for Valco valves eliminate any possible diffusion from the atmosphere *into* the valve, or safely vent fugitive emissions *from* the valve. They are typically used in trace level analyses to isolate the valve from ambient air, but can also be used as a safety measure to isolate a valve against leaks into the atmosphere, such as when pyrophoric, toxic, or carcinogenic materials are present in the sample stream.

Two screws secure each half of the purge housing to the valve, so that the rear chamber of the housing (the preload assembly/spring side of the valve) can be removed for rotor inspection or replacement without affecting the actuator side of the housing.

Ideally, the purge housing should be ordered when a new valve is ordered, so that it can be factory-installed. Field installation of purge housings is generally not recommended. To order a new valve with a purge housing, add the suffix "PH" to the product number for the valve/actuator assembly, and add $200 to the price. The purge housing requires a standoff assembly, which can be 2", 3", 4", or 6" long.

All Valco two position valves with two threaded mounting holes will accommodate a purge housing without modification. Some two position valves must be modified at the factory to accept the housing. The charge for modifying an existing valve includes the new purge housing. Call our service department to make arrangements for this service.

Purge housings

for two position valves and selectors

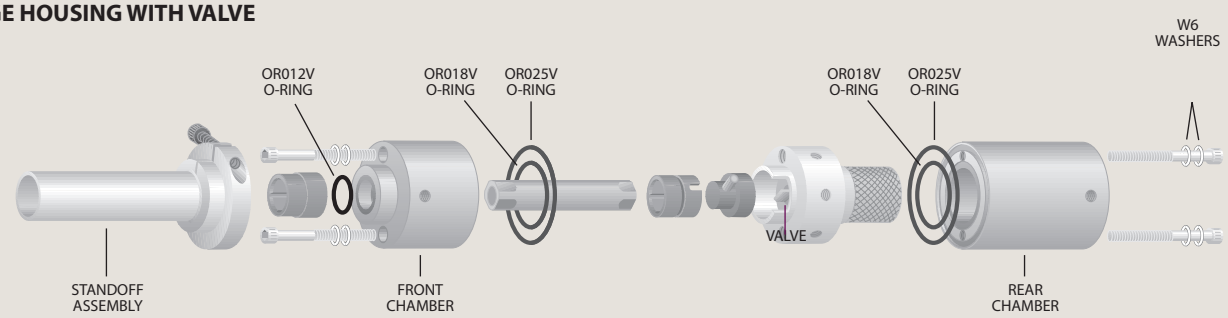
Description	*Prod No*		*Notes*
On a new valve	Add suffix PH to valve prod no	Add $200 to valve price	Requires standoff assembly. Multiposition valve requires an actuator.
On existing valve, factory installation	Contact factory		
On existing valve, for field installation	Not recommended		

SPECS

Maximum temperature:
175°C

Note: The purge housing limits the maximum temperature of the purged valve to 175°C, regardless of the valve specifications.

PURGE HOUSING WITH VALVE



Heated Valve Enclosures

These insulated enclosures allow valves to be operated at temperatures independent of other controlled zones of analytical instruments. The compact construction and minimum power dissipation enable mounting within larger, lower temperature zones without significantly raising the larger oven's minimum temperature or impairing its programmability.

All enclosures include a heater block and a heater cartridge with line cord. The product number chart lists the heater size typically required to heat the valve(s) to the indicated temperature. Holes are provided in the heater block for Perkin Elmer, Agilent, and Varian temperature sensors, with an additional thermocouple hole permitting temperature readout.

Since 1/32" W type valves are smaller, they require a special heater block; enclosures for 1/32" valves are denoted by asterisk (*) in the price chart below.

Note: Heated valve enclosures provide a way to heat valves. A GC's auxiliary temperature zone controller or a device such as our ITC (instrumentation temperature controller) is required to maintain the valves at a set temperature.

Includes insulated enclosure and heater assembly (standard heater block, heater cartridge, line cord). Standard voltage: 110 VAC. For a 230 VAC model, add -220 to the product number. Insulation is 1/2" thick, so internal dimensions are 1" smaller than the exterior size given below.

Heated valve enclosures *for two position valves and selectors*

Capacity	*Exterior dimensions (Interior approx 1" smaller)*	*Rating*	*Prod No*
1 valve	4" x 4-1/4" x 3-5/8"d	65W/350°C	HVEA
		* 65W/350°C	HVEAN
	4-1/4" x 5-1/8" x 3-5/8"d	65W/350°C	HVEB
		* 65W/350°C	HVEBN
	8" x 8" x 6"d	100W/350°C	HVEC
2 valves	8" x 5-1/4" x 4"d	125W/350°C	HVE2
3 valves	13-1/2" x 5-3/4" x 4"d	150W/350°C	HVE3
6 valves	13-3/4" x 8" x 6"d	300W/350°C	HVE6

** for use with 1/32" valves*

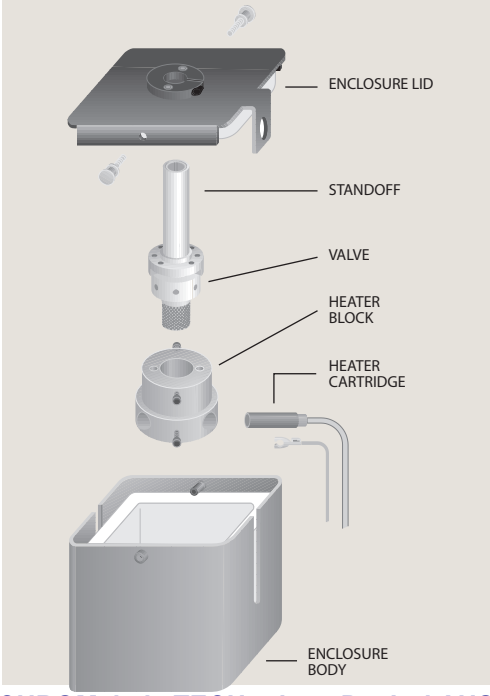
ORE INFORMATION

MC ..... page 203
Instrumentation temperature controller

Heated column enclosures 203
Heater assemblies 202
Heater blocks.....202

HEATED VALVE ENCLOSURE

For one valve (HV EA)



Heated Assemblies and Heater Blocks

Heater assemblies

A heater assembly includes a standard heater block, heater cartridge, and line cord. Heater cartridges are also available individually. Consult the factory for price and availability.

Standard voltage is 110 VAC. For a 230 VAC model, add -220 to the product number.

Description	*Rating*	*Prod No*
Heater assembly For use with HVEA or HVEB	65W/350°C	HA1
For use with HVEC	100W/350°C	HA1T
For use with HVE2	125W/350°C	HA2
For use with HVE3	150W/350°C	HA3
For use with HVE6	300W/350°C	HA6

Heater blocks *for single valves*

There are two single valve heater block designs: standard and low mass. The low mass heater block, which has a .075" diameter hole for sensor or thermocouple, works well for two position valves. The standard heater block is a high mass, multipurpose design which can be used with any Valco valve. It is designed so that sample loops or short columns can be wound directly on it.

Heater blocks do not include a heater cartridge.

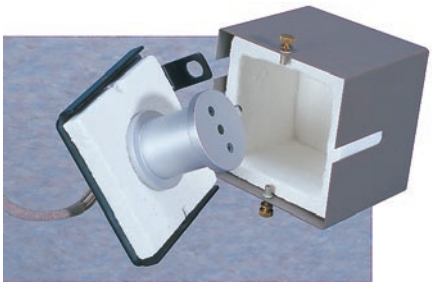
Description	*Prod No*
Low mass heater block, 1 valve	HBS
Standard heater block, 1 valve	HB
Standard heater block, 1 NW Type valve (1/32" fittings)	HB1N

Heater cartridges *for single valve heater blocks*

The cartridge size is 1.5" long by 3/8" diameter. Consult the factory to purchase cartridges for larger heater blocks.

Rating	*Prod No*
65W, 110 VAC	I-21208-32
65W, 220 VAC	I-21208-33
100W, 110 VAC	I-21208-05
100W, 220 VAC	I-21208-06

MORE INFORMATION
Heated valve enclosures ..... page 201



Heated column enclosures

Heated column enclosures allow a column to be operated at temperatures independent of other controlled zones in the instrument. They are similar in construction to our heated valve enclosures *(page 201)*, except instead of a valve heater block they contain a column mandrel which will accept 1/8" columns up to 10' long. The HCE2 can have a heated valve installed adjacent to the heated column, with a valve heater block ordered separately.

Includes one column mandrel, insulated enclosure, and heater assembly (standard heater block, heater cartridge, line cord). Standard voltage: 110 VAC. For a 230 VAC model, add -220 to the product number. Insulation is 1/2" thick, so internal dimensions are 1" smaller than the exterior size given below.

Capacity	*Exterior dimensions (Interior approx 1" smaller)*	*Rating*	*Prod No*
Heated column enclosure			
1 column	4" x 4-1/4" x 3-5/8"d	65W/350°C	HCE1
	4-1/4" x 5-1/8" x 3-5/8"d	65W/350°C	HCEB
	8" x 8" x 6"d	65W/350°C	HCEC
2 columns	8" x 5-1/4" x 4"d	65W/350°C	HCE2
Column mandrel (heater assembly not included with column mandrel)			CM

ITC Instrumentation temperature controller

The ITC is an isothermal proportional controller for use in the thermal systems common to analytical instrumentation, and is often used with heated valve enclosures. The desired temperature is set in 1°C increments on the front panel. A thermocouple sensor provides quick recognition of temperature changes. The power to the heater can be attenuated from 0-90% in 10% increments, an easy-to-use feature which improves temperature stability at the set point to 0.5°C. Maximum output current is 10 amps.

The ITC is available with a range of 0°C to 399°C, in 110 VAC or 230 VAC.

		Prod No
0°C to 399°C	110 VAC	ITC10399
	230 VAC	ITC10399-220
Replacement thermocouple		I-21014-01

MORE INFORMATION

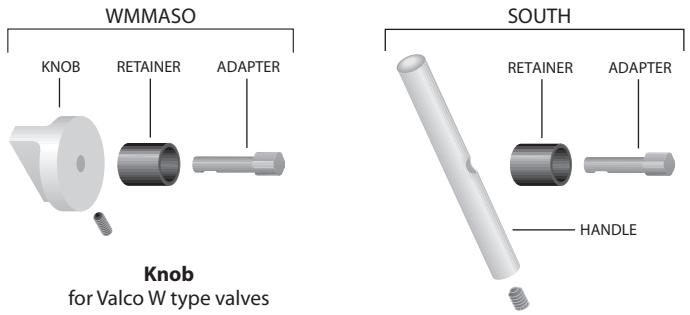
Heated valve enclosures ..... page 201

Knobs, Handles, and Right Angle Drives

Knobs and handles *for use with a standoff*

If you already have a spare standoff assembly *(see facing page)* but lack the knob or retainer, or have an actuated valve on a standoff which you'd like to convert to manual use, here's what you'll need. Includes knob or handle, retainer, and adapter.

	Prod No
Knob for a W type valve	WMMASO
T-handle for a UW type valve	SOUTH



Knob
for Valco W type valves

T-handle
for Valco UW type valves

RAD Right angle drive *for two position actuators*

Some installations don't allow the valve and actuator to be installed in a typical in-line configuration. The RAD is a 90° gearbox which permits the actuator or handle to be installed at a right angle to the valve. The RAD fits all VICI two position electric and air actuators. Not for use with 1/4" valves.

RAD with standoff includes a 2" standoff; 3", 4", and 6" standoffs are also available.

With closemount hardware	**With 2" standoff assembly**
Prod No	*Prod No*
RAD	2RAD

Standoff Assemblies

Valves which will be installed in ovens or heated zones require a standoff assembly, which locates the actuator out of the heated zone and supports both the valve and the handle or actuator. The 5/8" outside diameter standoff tube extends through the oven wall and is secured by means of a clamp ring supplied with the assembly.

If you are converting an actuated valve from a closemount to a standoff application, order the appropriate clamp ring and two screws in addition to the standoff assembly. Consult the factory for availability of non-standard lengths.

The microelectric actuator for selectors uses a special standoff assembly (SOMMP) which is keyed to both valve and actuator. The key guarantees proper alignment and positioning of the valve.

Product numbers show the most common length of standoffs: 4" for air actuators and manual knobs, 2" for microelectric and standard electric actuators. Standoff assemblies are available in lengths of 2", 3", and 6". To order a 6" standoff instead of a 4" one, change the 4 in the product number to a 6.

Standoff assemblies and mounting hardware

for actuators

	Standoff assembly *Prod No*	Clamp ring *Prod No*	Screws *Prod No*
Air actuators			
For Valco two position valves			
with 1 or 2 mounting holes	4SOA	CR3	HWSC-SC8-6
with no mounting holes	4SOAMP	CR3	HWSC-SC8-6
For Valco selectors	4SOAMP	CR3	HWSC-SC8-6
For Cheminert valves	4SOAMP	CR3	HWSC-SC8-6
Microelectric actuators			
For Valco two position valves			
with 1 or 2 mounting holes	2SOA	CR8	HWSC-SC8-8B
with no mounting holes	2SOAMP	CR8	HWSC-SC8-8B
For Valco multiposition valves			
(UW and MW Types only)	2SOAMMP	CR10	HWSC-SC8-8TDH
For Cheminert two position valves	2SOAMP	CR8	HWSC-SC8-8B
For Cheminert selectors	2SOAMMP	CR10	HWSC-SC8-8TDH
Standard electric actuators			
For Valco two position valves			
with 1 or 2 mounting holes	2SOA	CR3	HWSC-SC8-8B
with no mounting holes	2SOAMP	CR3	HWSC-SC8-8B
For Valco selectors	2SOAMP	CR3	HWSC-SC8-8B
For Cheminert valves	2SOAMP	CR3	HWSC-SC8-8B

Standoff assemblies

for manual valves

Includes knob, standoff assembly, retainer, and adapter. For illustration, see page 206, top.

	Prod No
For Valco W and UW Type two position valves rated less than 5,000 psi	
with 1 or 2 mounting holes	4SOWK
with no mounting holes	4SOWKMP
For Valco UW Type two position valves rated 5,000 psi and higher	
with 1 or 2 mounting holes	4SOUTH
with no mounting holes	4SOUTHMP
For Cheminert valves	4SOWKMP

MORE INFORMATION
For illustrations of standoffs on valves and actuators, see pages 206-207.

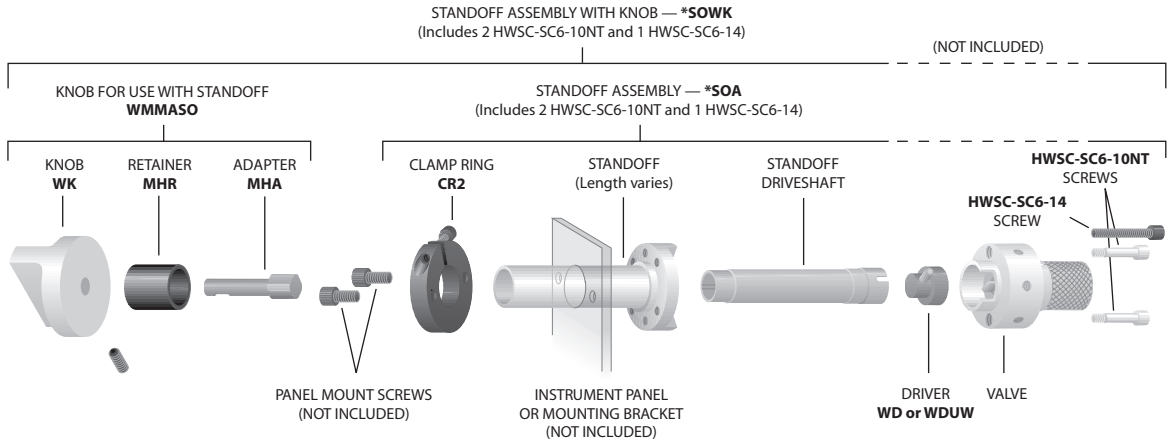
TECH TIP
If you need the ***actuator as well as the hardware***, you can order it complete with the appropriate hardware or with the required standoff already installed.

Actuators
Air ..... pages 194-195
Microelectric 188-191
Standard elec 193

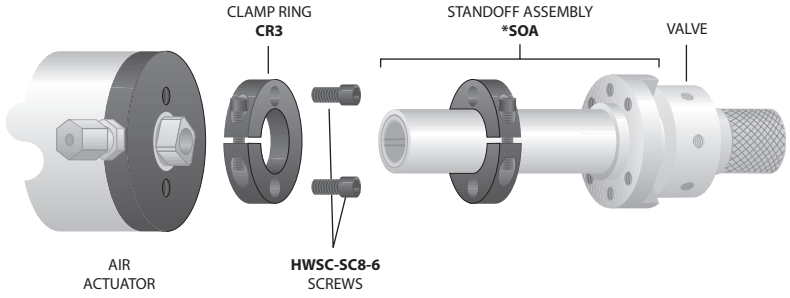
CONVERTING FROM CLOSEMOUNT TO A STANDOFF
If you are converting an actuated valve from a closemount to a standoff application, the clamp ring and screws which secure the standoff to the actuator are **not included** in the standoff assembly. Order clamp ring and screws in addition to the standoff assembly.

Standoff Assemblies

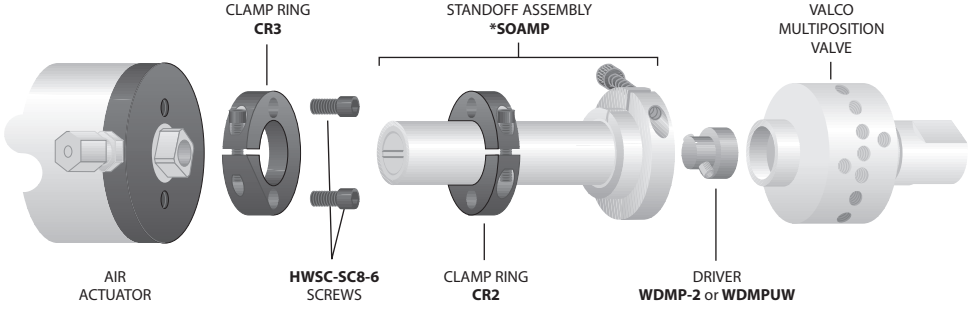
Standoff with
VALCO TWO POSITION VALVE – MANUAL



Standoff with
VALCO TWO POSITION VALVE – AIR ACTUATOR

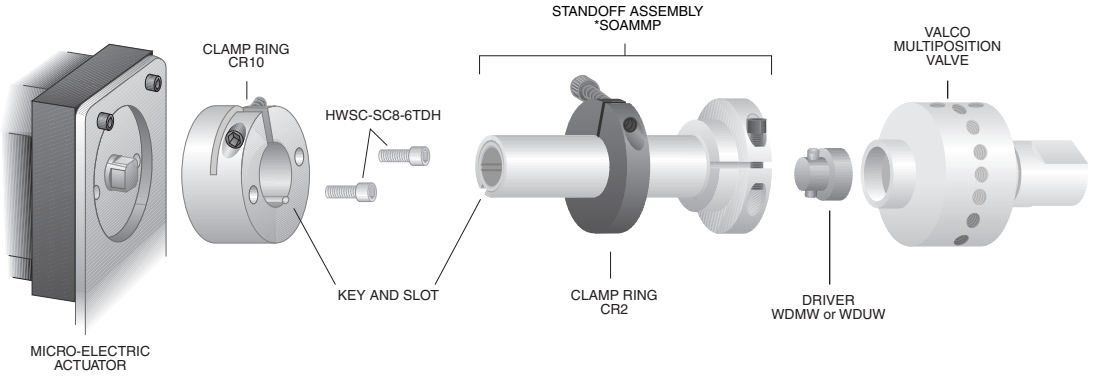


Standoff with
VALCO SELECTOR – AIR ACTUATOR



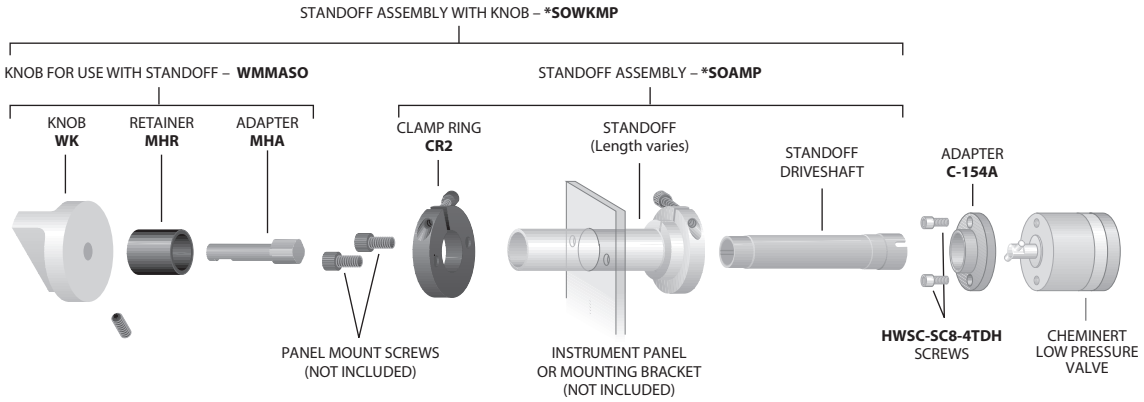
Keyed standoff with

VALCO SELECTOR – MICROELECTRIC ACTUATOR



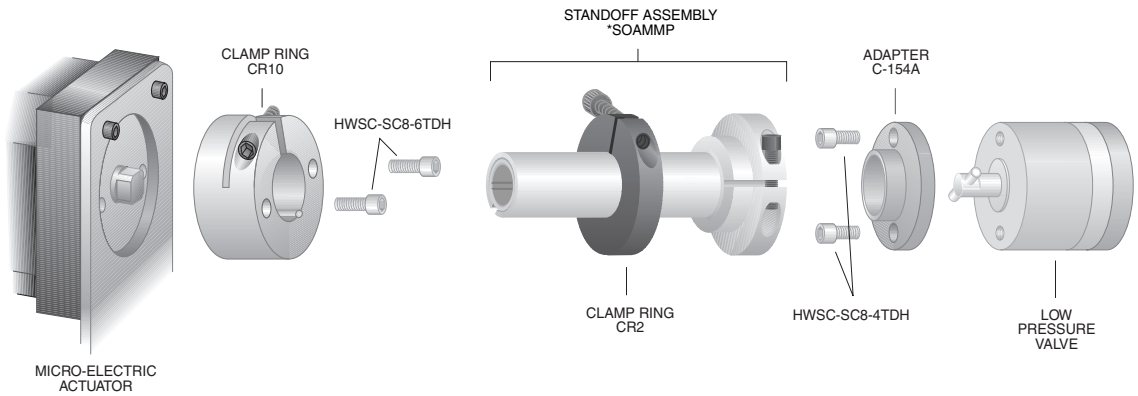
Standoff with

CHEMINERT TWO POSITION VALVE – MANUAL



Keyed standoff with

CHEMINERT SELECTOR – MICROELECTRIC ACTUATOR



Closemount Hardware

If a valve is not going to be heated beyond the temperature range of the actuator, closemount hardware often makes the cleanest installation.

Closemount hardware *for manual valves*

If you have a Valco W Type valve with no hardware and want a knob on it, or if you are converting an air or electrically actuated two position valve to manual use, this is what you need. There are two versions: one for valves with threaded mounting holes and one for valves with unthreaded mounting holes. (If your valve has no mounting holes, you will have to use it with a standoff.)

Description	*Prod No*
For valves with	
threaded mounting holes	WMMA
unthreaded mounting holes	WMMA10

Closemount hardware *for actuators*

Order the appropriate closemount hardware if you want to change your valve and actuator from a standoff to a closemount connection. Two mounting screws are included. If air and standard electric actuators require different mounting screws, two of each screw are included with the closemount hardware.

Description	*Prod No*
Air or standard electric actuators	
For Valco two position valves	
with 1 or 2 mounting holes	CMH
with no mounting holes	CMHMP
For Valco multiposition valves	CMHMP
For Cheminert valves	
high pressure design	CMH11H
low pressure design	CMH11L
(low pressure design includes required adapter)	
Microelectric actuators	
For Valco two position valves	
with 1 or 2 mounting holes	CMH12H
with no mounting holes	CMH12H
For Valco multiposition valves	
(UW and MW Types only)	CMH13
For Cheminert two position valves	
high pressure design	CMH12H
low pressure design	CMH12L
(low pressure design includes required adapter)	
For Cheminert multiposition valves	
high pressure design	CMH13H
low pressure design	CMH13L
(low pressure design includes required adapter)	

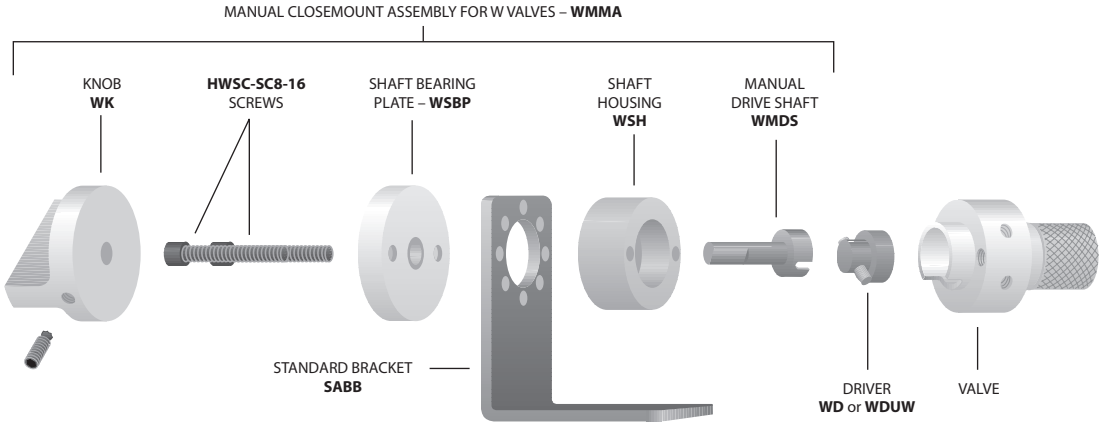
TECH TIP
If you need the ***actuator as well as the hardware***, you can order it complete with the appropriate hardware or with the required standoff already installed.

Actuators

Air ..... pages 194-195
Microelectric 188-191
Standard elec 193

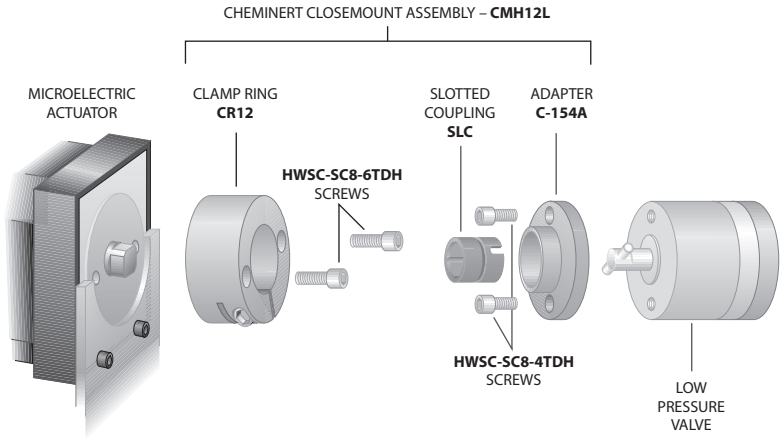
Closemount with

VALCO VALVE – MANUAL



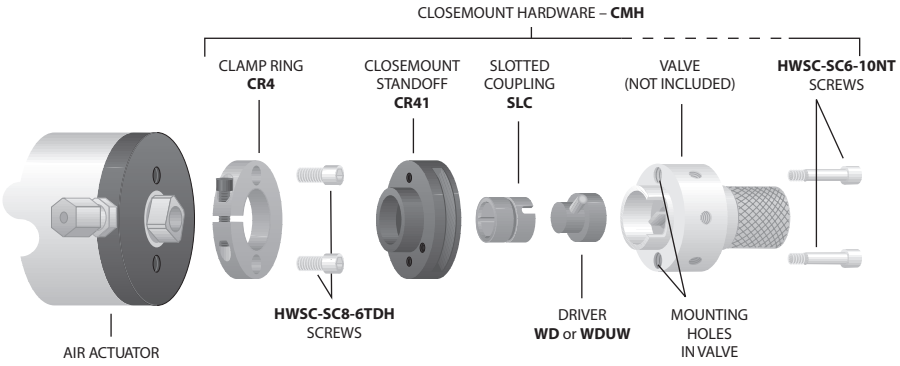
Closemount with

CHEMINERT VALVE (Low pressure two position) – MICROELECTRIC



Closemount with

VALCO VALVE (1 or 2 mounting holes) – AIR ACTUATOR



Tools

As a convenience to our customers, we stock several standard tools that are useful for working with valves, fittings, and other products from VICI. In addition, we offer custom tools which are designed and machined in our factory to facilitate use of specific VICI products.

Custom socket wrench

This 1/4" socket wrench with a slot to slip over 1/16" tubing is the perfect tool for installing fittings in some of our multiposition valves, in which the proximity of the ports makes it difficult to get a normal open end wrench in position.

Prod No

SWH4

Hex key set

The hex key set has a wrench to fit any socket head screw on any VICI valve or actuator. Includes .050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", and 5/32" sizes.

Prod No

HKS

Open end wrenches

Size	*For use with*	*Prod No*
3/16" x 1/4"	1/32" and 1/16" nuts	OEW
3/8" x 7/16"	1/8" nuts	OEW-2
1/2" x 9/16"	1/4" nuts	OEW-3

Pencil magnet

A pencil-type magnet is useful for removing the rotor from Valco valves when the rotor must be replaced or rotated. The process of disassembly and assembly is described in Technical Note 201, which may be requested by phoning or faxing. It may also be found in the support section at www.vici.com.

Prod No

PM

MORE INFORMATION

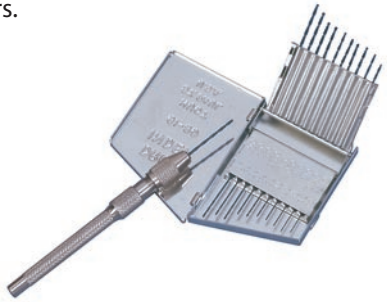
Ferrule removal kit. 54

Pin vise and drill index

The drill index has drills sized from 0.0135" to 0.039" (0.34 to 1 mm). These are useful tools when a fused silica tube breaks in a union, or for enlarging the inner diameter of fused silica adapters.

Prod No

PV

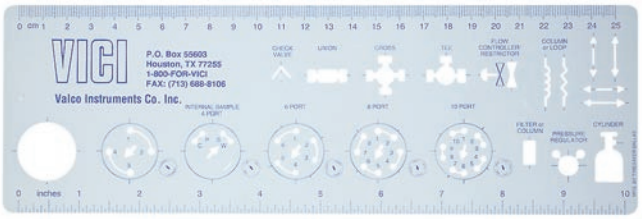


Template

This tool is just what you need when you're working out plumbing and valve switching schematics. It features templates for two position valves with 4, 6, 8, and 10 ports with indications of both positions, as well as various flow symbols. For added convenience, the sides are edged with metric and inch rulers.

Prod No

TEMPLATE1

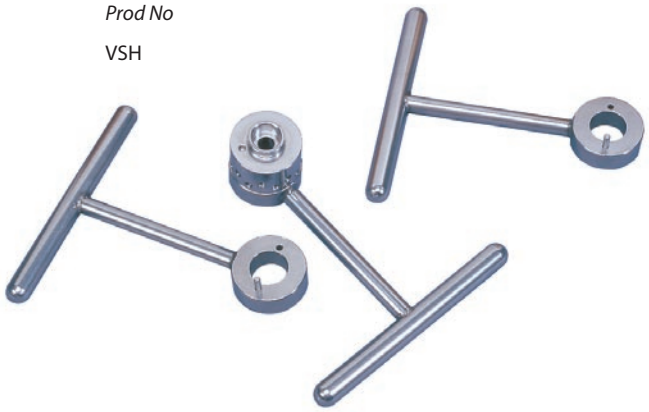


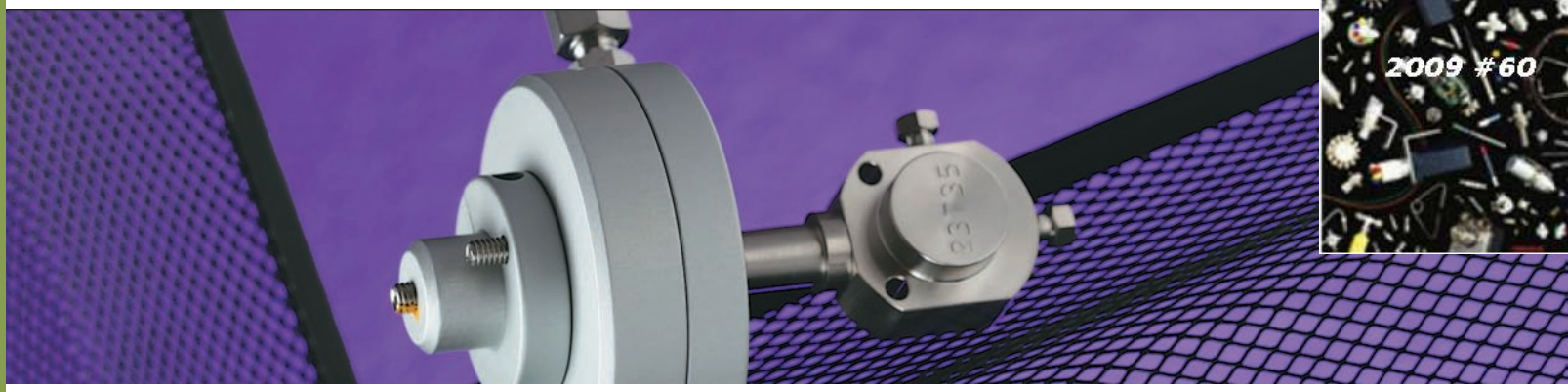
Valve spanner handle

A special tool for gripping a multiposition valve body. It is especially useful during valve alignment procedures.

Prod No

VSH





Flow, Pressure, and On/Off Control Devices

This section includes stainless needle valves, our combination on/off needle valves, high pressure prime/purge and on/off valves, and VICI pressure regulators and flow controllers.

Because cast parts can introduce porosity and contamination, every VICI control device is assembled from components which are precision-machined from bar stock. This assures that every item has the same high quality workmanship, with careful assembly and testing to rigid standards.

On/Off and Prime/Purge Valves

Valco high pressure on/off or prime/purge valves feature quality engineering, precision machining, and extremely low internal volume (< 2 µl), making them the ideal choice in the most demanding liquid or supercritical fluid chromatography or extraction systems.* The on/off function is self-explanatory; in prime/purge models, mobile phase flows around the needle when the valve is closed, relieving the back pressure from the column. When the valve opens, mobile phase vents to waste to prime the pump.

Standard models provide leak-tight operation up to 10,000 psi (690 bar) at 100°C, with high temperature versions rated up to 6,000 psi/300°C. A 1/16" fitting model with a larger bore and a 1/8" fitting model are available for high flow applications.

The valve needle is made from a special high strength alloy which is resistant even to the buffer salts which might accidentally precipitate inside the valve. Seals are fluorocarbon, with valve bodies machined from HPLC grade stainless steel, ensuring long lifetime in even the most demanding situations.

The on/off and prime/purge valves are available in manual or air/CO_2 actuated versions. The automated valves require a single three-way solenoid: application of 50 psi opens the valve; venting the air allows the spring to return the valve to the closed position.

*Not suitable for use with gases.

ULTRA-HIGH PRESSURE VALVES
See our new 40,000 psi on/off and prime/purge valves
page 85

On/off valves

SPECS

	Temp	Pressure
Standard temperature		
1/16"	100°C	10,000 psi
High temperature / high pressure		
1/16"	300°C	6,000 psi
1/8"	300°C	2,000 psi

Fitting size	Bore	Manual Prod No	Manual with 4" standoff Prod No	Air actuated with 1" standoff Prod No	Air actuated with 4" standoff Prod No
Standard temperature					
1/16"	0.50 mm	SFVO	–	ASFVO	–
	0.75 mm	SFVOL	–	ASFVOL	–
High temperature / high pressure					
1/16"	0.50 mm	SFVOHT	SFVOHT4	ASFVOHT	ASFVOHT4
	0.75 mm	–	–	ASFVOLHT	ASFVOLHT4
1/8"	1.50 mm	–	–	ASFVO2HT	ASFVO2HT4

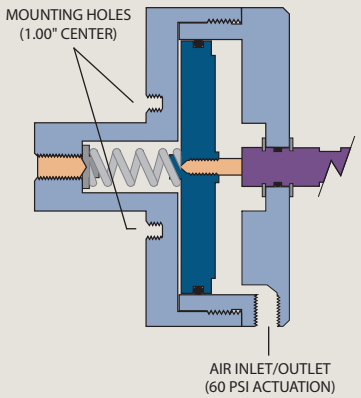
Prime/purge valves

SPECS

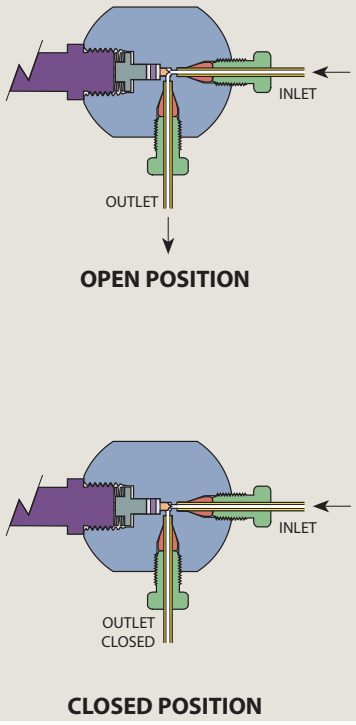
	Temp	Pressure
Standard temperature		
1/16"	100°C	10,000 psi
High temperature / high pressure		
1/16"	300°C	6,000 psi
1/8"	300°C	2,000 psi

Fitting size	Bore	Manual Prod No	Air actuated with 1" standoff Prod No	Air actuated with 4" standoff Prod No
Standard temperature				
1/16"	0.50 mm	SFV	ASFV	–
	0.75 mm	SFVL	ASFVL	–
High temperature / high pressure				
1/16"	0.50 mm	–	ASFVHT	ASFVHT4
	0.75 mm	–	ASFVLHT	ASFVLHT4
1/8"	1.50 mm	–	ASFV2HT	ASFV2HT4

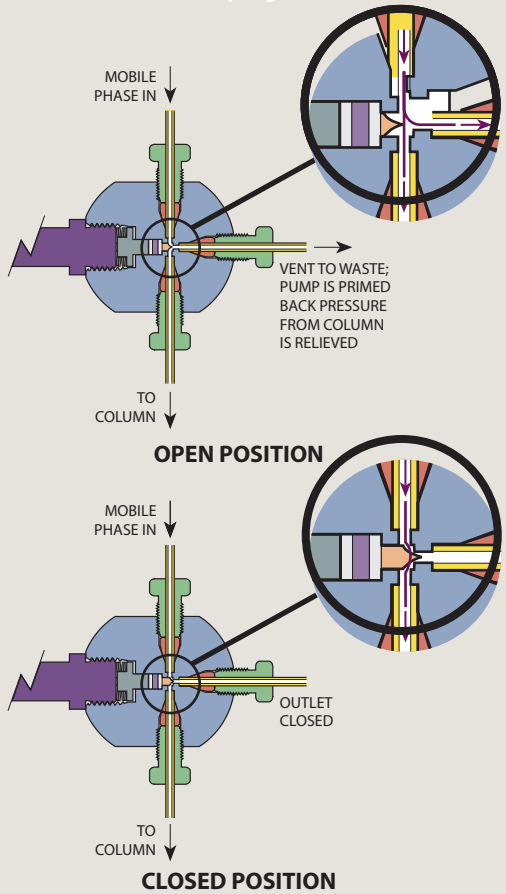
Air actuator option



On/off valve



Prime/purge valve



Combo Valves

A new generation needle and shut-off valve provides screwdriver-adjustable control and positive shut-off without damage to the needle. It is ideal for providing hydrogen and air to an FID, since the flow setting is not changed by turning the valve on and off. It can also be used to supply make-up or combustion gas in a wide variety of applications.

The valve body materials are anodized aluminum or stainless steel, with Viton O-ring seals. Maximum temperature is 100°C, and maximum inlet pressure is 100 psig. The valve can be panel-mounted in an 11/16" or 3/4" hole, using hardware supplied, and all are supplied with Valco 1/16" ZDV fittings. Other configurations are available in OEM quantity upon request.

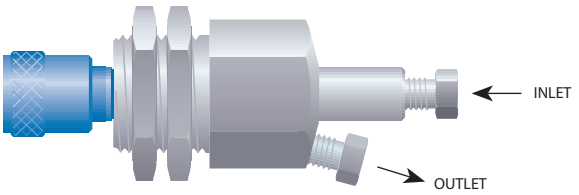
The standard knob is silver-colored and .62" long. Colored knobs for gas identification are available separately, in two lengths.

Combo valves

Maximum flow @ 40 psi He or N_2	Aluminum body *Prod No*	Stainless body *Prod No*
10 ml/min	CNV1A10S1	CNV1S10S1
50 ml/min	CNV1A50S1	CNV1S50S1
150 ml/min	CNV1A150S1	CNV1S150S1
250 ml/min	CNV1A250S1	CNV1S250S1
500 ml/min	CNV1A500S1	CNV1S500S1

SPECS
Inlet pressure:
100 psi
Maximum temperature:
100°C

Optional colored knobs	Standard (.62") *Prod No*	Long (1.25") *Prod No*
Green	CNVEKG	CNVEKLG
Red	CNVEKR	CNVEKLR
Blue	CNVEKU	CNVEKLU
Silver	CNVEKS	CNVEKLS
Black	CNVEKB	CNVEKLB



Very similar in function to the Valco combo valves, these are the original, hex-bodied combo valves made by the Condyne division of VICI Metronics for nearly 30 years. Condyne products have been transferred to the Valco Houston location, where a number of improvements have been made.

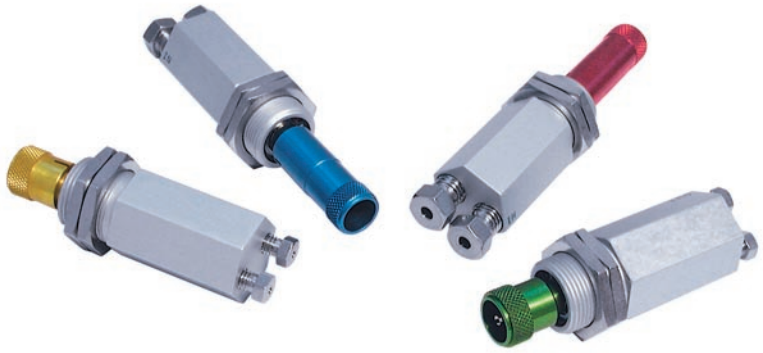
Standard construction features an anodized aluminum body with Viton O-ring seals. Maximum inlet pressure is 100 psi, with a maximum temperature of 100°C. The valve can be panel mounted through an 11/16" or 3/4" diameter hole. Valco 1/16" fittings are standard, but 1/8" fittings are also available. Nuts and ferrules are included.

Typically, the knob color is used as an indicator of the rated flow, but the standard knob can be changed if desired. A longer version of the knob is also available, as is an all brass valve (in OEM quantities). Consult the factory regarding these options.

Condyne combo valves

SPECS
Maximum inlet pressure:
100 psi
Maximum temperature:
100°C

Maximu m flow @ 40psi He or N2	*Knob color*	**1/16" Valco fittings** *Prod No*	**1/8" Valco fittings** *Prod No*
10 ml/min	Green	CVA10GS1	CVA10GS2
50 ml/min	Red	CVA50RS1	CVA50RS2
150 ml/min	Blue	CVA150US1	CVA150US2
500 ml/min	Black	CVA500BS1	CVA500BS2
1 liter/min	Yellow	CVA1KYS1	CVA1KYS2



Gas Flow Controllers

Flow controllers provide a stable flow rate under varying pressure. VICI flow controllers are precision machined from aluminum or stainless bar stock to eliminate the contamination often found in die cast parts. Positive flow shut-off is provided by an integral Viton-sealed adjustment valve.

With all our flow controllers, the inlet pressure must exceed the outlet pressure by 10 psi.

Model 100 gas flow controller

Fixed span upstream referenced flow controller

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N_2 at 40 psi). Any flow controller in this series can be ordered with a 10-turn Spectrol digital dial (3 or 4 digits), to permit a visual indication of the flow setting.

All flow rates listed below are based on N_2 at 40 psi inlet pressure. Maximum inlet pressure is 200 psi.

Flow rate /min	Aluminum body Viton diaphragm *Prod No*	Aluminum body SS diaphragm *Prod No*	SS body Viton diaphragm *Prod No*	SS body SS diaphragm *Prod No*
With standard control knob				
0 - 150 mL	FC10AV1K	FC10AS1K	FC10SV1K	FC10SS1K
0 - 250 mL	FC10AV2K	FC10AS2K	FC10SV2K	FC10SS2K
0 - 850 mL	FC10AV3K	FC10AS3K	FC10SV3K	FC10SS3K
0 - 1.2 L	FC10AV4K	FC10AS4K	FC10SV4K	FC10SS4K
0 - 4.5 L	FC10AV5K	FC10AS5K	FC10SV5K	FC10SS5K
0 - 10.0 L	FC10AV6K	FC10AS6K	FC10SV6K	FC10SS6K
With Spectrol 3-digit dial				
0 - 150 mL	FC10AV1S3	FC10AS1S3	FC10SV1S3	FC10SS1S3
0 - 250 mL	FC10AV2S3	FC10AS2S3	FC10SV2S3	FC10SS2S3
0 - 850 mL	FC10AV3S3	FC10AS3S3	FC10SV3S3	FC10SS3S3
0 - 1.2 L	FC10AV4S3	FC10AS4S3	FC10SV4S3	FC10SS4S3
0 - 4.5 L	FC10AV5S3	FC10AS5S3	FC10SV5S3	FC10SS5S3
0 - 10.0 L	FC10AV6S3	FC10AS6S3	FC10SV6S3	FC10SS6S3
With Spectrol 4-digit dial				
0 - 150 mL	FC10AV1S4	FC10AS1S4	FC10SV1S4	FC10SS1S4
0 - 250 mL	FC10AV2S4	FC10AS2S4	FC10SV2S4	FC10SS2S4
0 - 850 mL	FC10AV3S4	FC10AS3S4	FC10SV3S4	FC10SS3S4
0 - 1.2 L	FC10AV4S4	FC10AS4S4	FC10SV4S4	FC10SS4S4
0 - 4.5 L	FC10AV5S4	FC10AS5S4	FC10SV5S4	FC10SS5S4
0 - 10.0 L	FC10AV6S4	FC10AS6S4	FC10SV6S4	FC10SS6S4

SPECS

Preset max flow rates:
150 mL/min to 10 liters/min (N_2 at 40 psi).

Maximum inlet pressure:
200 psi

Maximum temperature:
100°C

Standard fittings:
- 1/8" external tube fittings (EAOR22)

Other fittings are available. Contact the factory for further information.

ALTERNATE FITTING TYPES

Models 100 and 300
The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are listed below. Order separately.

Internal fitting with O-ring seal	*Prod No*	*Price*
1/8" to 5/16-24	ZAOR22	$14
1/16" to 5/16-24	ZAOR12	14

Model 202
The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. Another adapter is listed below. Order separately.

1/8" NPT male pipe to Valco internal	*Prod No*	*Price*
1/8"	PZA22	$14

WHICH KIND OF CONTROLLER?

An **upstream-referenced** controller maintains the flow rate as long as the upstream (inlet) pressure is held constant.

A **downstream-referenced** controller maintains a constant flow under constant downstream (outlet) pressure.

Model 202 gas flow controller

Adjustable span upstream-referenced flow controller

SPECS

Flow range:
infinitely adjustable
Min: 5 mL/min
Max: 1.6 L/min
(N_2 at 40 psi)

Maximum inlet pressure:
200 psi

Maximum temperature:
100°C

Standard fittings:
- 1/8" NPT female pipe threads
- Pipe adapters to 1/16" OD tubing are included.

Other fittings are available. *(See facing page.)*

The Model 202 provides a user-variable span adjustment permitting it to be used for a variety of flow ranges. After the span is adjusted, the flow controller has a full 10 turns of resolution between the minimum and maximum flow rates. When equipped with a Spectrol digital dial, settings are reproducible to better than 1%.

	Aluminum body Viton diaphragm *Prod No*	Aluminum body SS diaphragm *Prod No*	SS body Viton diaphragm *Prod No*	SS body SS diaphragm *Prod No*
With standard control knob	FC22AV1K	FC22AS1K	FC22SV1K	FC22SS1K
With Spectrol 3-digit dial	FC22AV1S3	FC22AS1S3	FC22SV1S3	FC22SS1S3
With Spectrol 4-digit dial	FC22AV1S4	FC22AS1S4	FC22SV1S4	FC22SS1S4

Model 300 gas flow controller

Fixed span downstream-referenced flow controller

SPECS

Maximum flow rate:
1.6 L/min
with ambient downstream pressure

Maximum inlet pressure:
200 psi

Maximum temperature:
100°C

Standard fittings:
- 1/8" external tube fittings (EAOR22)

Other fittings are available. *(See facing page.)* Contact the factory for further information.

The Model 300 flow controller provides a stable flow rate when upstream pressure conditions vary, providing the downstream pressure remains constant.

All flow rates listed below are based on N_2 at 40 psi inlet pressure. Maximum inlet pressure is 200 psi.

Flow rate /min	Aluminum body Viton diaphragm *Prod No*	Aluminum body SS diaphragm *Prod No*	SS body Viton diaphragm *Prod No*	SS body SS diaphragm *Prod No*
With standard control knob				
0 - 200 mL	FC30AV1K	FC30AS1K	FC30SV1K	FC30SS1K
0 - 300 mL	FC30AV2K	FC30AS2K	FC30SV2K	FC30SS2K
0 - 800 mL	FC30AV3K	FC30AS3K	FC30SV3K	FC30SS3K
0 - 1.6 L	FC30AV4K	FC30AS4K	FC30SV4K	FC30SS4K
With Spectrol 3-digit dial				
0 - 200 mL	FC30AV1S3	FC30AS1S3	FC30SV1S3	FC30SS1S3
0 - 300 mL	FC30AV2S3	FC30AS2S3	FC30SV2S3	FC30SS2S3
0 - 800 mL	FC30AV3S3	FC30AS3S3	FC30SV3S3	FC30SS3S3
0 - 1.6 L	FC30AV4S3	FC30AS4S3	FC30SV4S3	FC30SS4S3
With Spectrol 4-digit dial				
0 - 200 mL	FC30AV1S4	FC30AS1S4	FC30SV1S4	FC30SS1S4
0 - 300 mL	FC30AV2S4	FC30AS2S4	FC30SV2S4	FC30SS2S4
0 - 800 mL	FC30AV3S4	FC30AS3S4	FC30SV3S4	FC30SS3S4
0 - 1.6 L	FC30AV4S4	FC30AS4S4	FC30SV4S4	FC30SS4S4
With screwdriver adjustable operator				
0 - 750 mL	FC31AV1			

MORE INFORMATION

Male pipe adapters
Internal..... page 38
External 39

Micrometering Valves

Micrometering (needle) valves combine the ease of connection associated with Valco zero dead volume fittings with convenient bulkhead mounting. The very low internal volume and precision design make this valve ideal for use as a gas control valve in chromatographic systems.

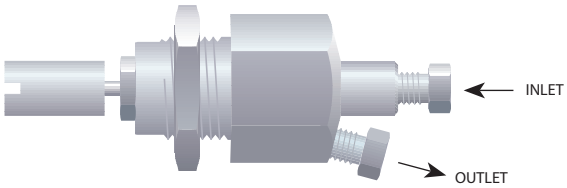
The Viton® model is rated at 225°C, while a version with Kalrez™ seals is capable of continuous operation at 315°C. This allows a needle valve to be mounted directly within a heated oven, facilitating control of flow switching in multidimensional systems while keeping the gases at oven temperature.

Valves are rated for maximum of 1000 psi gas. They are individually tested on a mass spectrometer leak detector to a helium leak rate specification of < 1 x 10^{-8} atm cc/sec.

An unlubricated version with a specially polished seat was designed to be used with our pulsed discharge detectors, and should be used upstream of any ultrapure gas system. There is also a 1/16" tube version.

1/16" micrometering valves *with Valco fittings*

Seal	*Lubrication*	*Prod No*
Standard: 2–225 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	ZBNV1
Viton	Non-lubricated	ZBNV1-D
Kalrez	Non-lubricated	ZBNV1-KZ
Fine control: 2–175 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	ZBNV1F
Viton	Non-lubricated	ZBNV1F-D
Kalrez	Non-lubricated	ZBNV1F-KZ
Low flow: 2–90 ml/min@ 40 psi N_2 inlet		
Viton	Lubricated	ZBNV1LF
Viton	Non-lubricated	ZBNV1LF-D
Kalrez	Non-lubricated	ZBNV1LF-KZ



1/16" micrometering valves *with 18" tubes*

Seal	*Lubrication*	*Prod No*
Standard: 2–225 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	BNV1
Viton	Non-lubricated	BNV1-D
Kalrez	Non-lubricated	BNV1-KZ
Low flow: 2–90 ml/min@ 40 psi N_2 inlet		
Viton	Lubricated	BNV1LF
Viton	Non-lubricated	BNV1LF-D
Kalrez	Non-lubricated	BNV1LF-KZ

Combo Pressure Regulators

The VICI combo regulator is a combination regulator and shut-off valve. The pressure is set using the screwdriver adjustment in the center of the on/off knob. Turning the knob counterclockwise provides positive shutoff, while clockwise rotation restores gas pressure to within 0.05 psi of the setpoint.

The regulator is machined from aluminum bar stock and then hard-anodized to provide contamination-free service. It features a stainless steel diaphragm and Viton®-sealed stainless poppet. The compact size (3" x 1.125" diameter) saves panel space and permits installation anywhere that an 11/16" hole can be located. Mounting hardware is supplied.

Available with outlet pressure ranges of 0-15 psi, 0-30 psi, or 0-60 psi, these regulators can be ordered with 1/16" or 1/8" Valco internal fittings or 1/8" external fittings. Other configurations are available in OEM quantities.

Maximum operating temperature is 100°C, and maximum supply pressure is 250 psig. The influence of supply pressure on outlet pressure is less than 0.1 psi per 10 psi change in supply pressure.

Combo pressure regulators

SPECS

Maximum inlet pressure:
250 psi

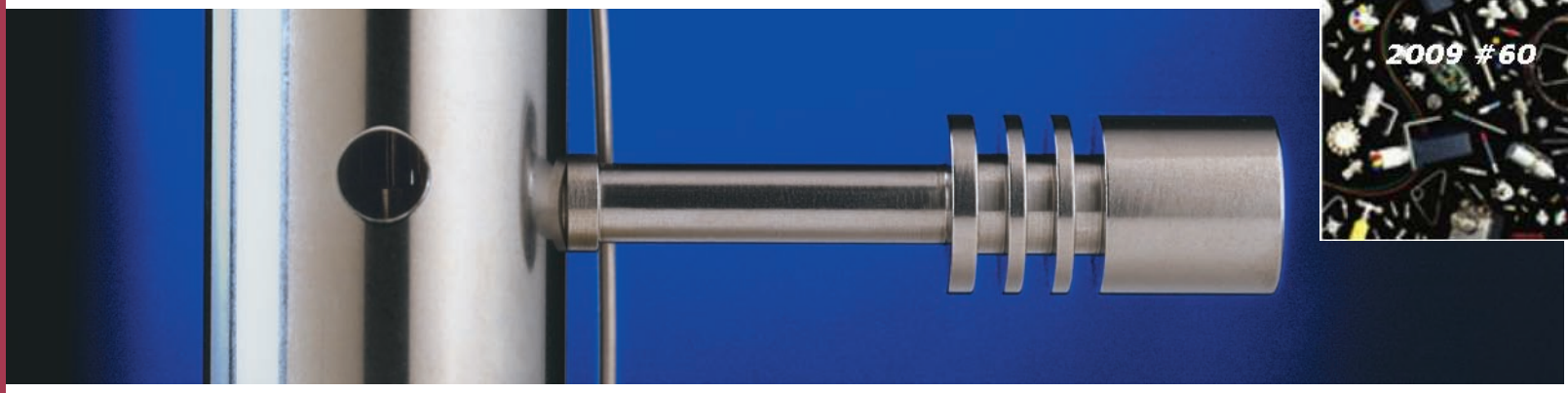
Maximum temperature:
100°C

Wetted materials:
- Anodized aluminum
- Stainless steel
- Viton

Pressure range:	**Valco internal fittings 1/16"** *Prod No*	**Valco internal fittings 1/8"** *Prod No*	**External fittings 1/8"** *Prod No*
0-15 psi	PR50A15Z1	PR50A15Z2	PR50A15E2
0-30 psi	PR50A30Z1	PR50A30Z2	PR50A30E2
0-60 psi	PR50A60Z1	PR50A60Z2	PR50A60E2

ADAPTERS USED FOR VALCO AND CONDYNE CONTROL DEVICES

Prod No	*Price*	*Used for*	*Description*
ZAOR11	$14	Diaphragm valve; optional on on/off valves	Valco 1/16" internal to 10-32 female
ZAOR12	14	Optional for Model 100 and 300 flow controllers	Valco 1/16" internal to 5/16-24 O-ring seal
ZAOR22	14	Optional for Model 100 and 300 flow controllers	Valco 1/8" internal to 5/16-24 O-ring seal
EAOR21	14	Air actuated prime/purge and on/off valves	External 1/8" to 10-32 O-ring seal
EAOR22	14	Standard on Model 100 and 300 flow controllers	External 1/8" to 5/16-24 O-ring seal



Instrumentation

Most of the components we supply to the instrumentation industry are from our valve and fitting lines. The rest, from our R&D 100 Award-winning pulsed discharge detectors to our application-dedicated trace gas analyzers, are primarily for gas detection and purification.

Pulsed Discharge Detectors

Non-Radioactive, Multiple Mode Electron Capture / Helium Photoionization

VICI PDDs (pulsed discharge detectors) utilize a stable, low powered, pulsed DC discharge in helium as an ionization source. Eluants from the column, flowing counter to the flow of helium from the discharge zone, are ionized by photons from the helium discharge. The bias electrode(s) focus the resulting electrons toward the collector electrode, where they cause changes in the standing current which are quantified as the detector output. Performance is equal to or better than detectors with conventional radioactive sources.

In the electron capture mode, the PDD is a selective detector for monitoring high electron affinity compounds such as freons, chlorinated pesticides, and other halogen compounds. For this type of compound, the minimum detectable quantity (MDQ) is at the femtogram (10^{-15}) or picogram (10^{-12}) level.

In the helium photoionization mode, the PDD is a universal, non-destructive, high sensitivity detector. The response to both inorganic and organic compounds is linear over a wide range. Response to fixed gases is positive (increase in standing current), with an MDQ in the low ppb range.

The PDD in helium photoionization mode is an ideal replacement for FIDs in petrochemical or refinery environments, where the hydrogen and flame can be problematic. In addition, when the discharge gas is doped with argon, krypton, or xenon (depending on the desired cutoff point), the PDD functions as a specific photoionization detector for selective determination of aliphatics, aromatics, amines, and other species.

R&D 100 AWARD WINNER

MORE INFORMATION

Pulsed discharge detectors
- Model D-2 .... page 221
- Model D-3 222
- Model D-4 223
- Model D-5 222

Plug-and-play detectors
- for Agilent 6890 222
- for Agilent 7890 222
- for other GCs 223

Model D-2

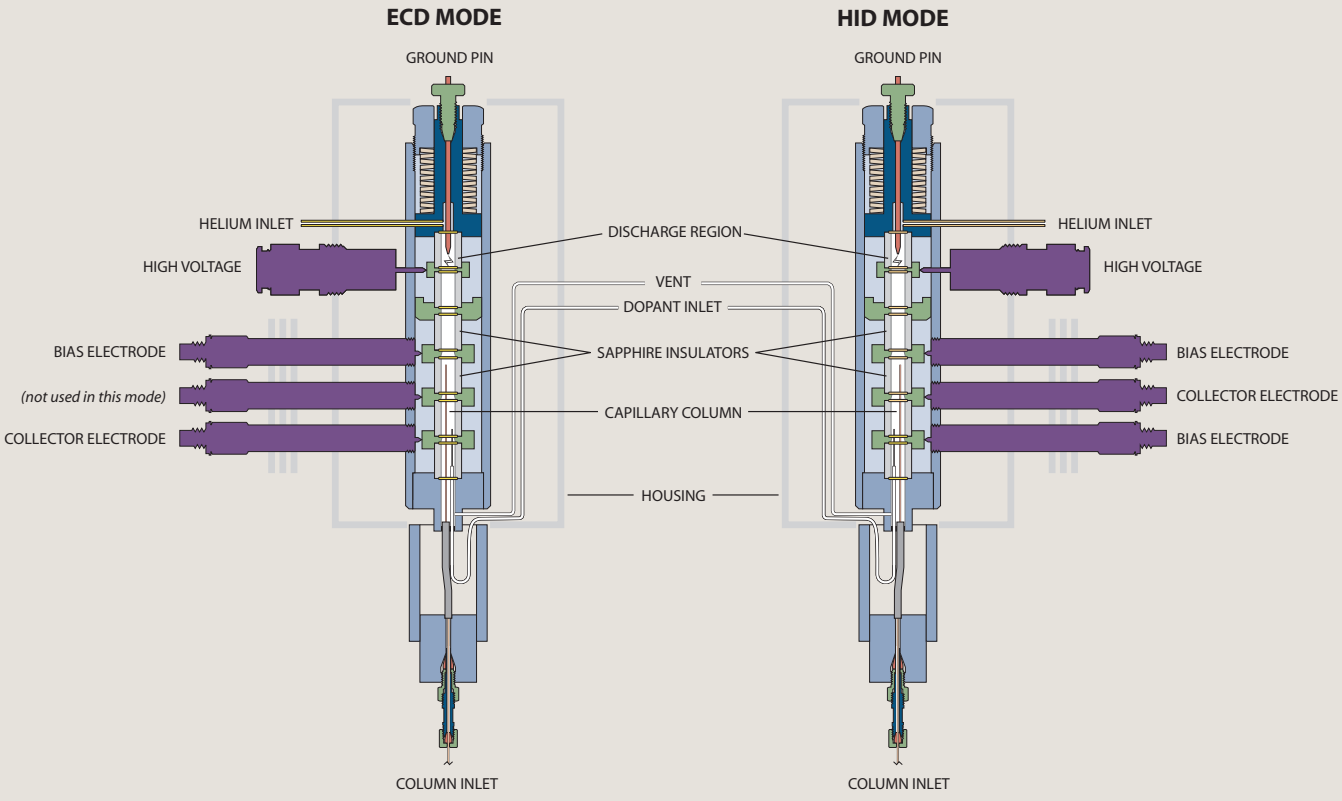
The D-2 is a dual mode, universal detector system which can be retro-fitted to your older GC. The D-2-I is optimized for trace level work in the helium photoionization mode. The stand-alone systems include detector, controller, electrometer, helium purifier, and power supply.

PDD Model D-2 *Stand-alone system*

Detector system includes detector cell, pulser, controller, electrometer, and helium purifier.

Description	110 VAC *Prod No*	230 VAC *Prod No*
Mode-selectable universal electron capture / photoionization detector system	D-2	D-2-220
Detectors optimized for trace level work in helium photoionization mode Optimized for packed column use	D-2-I	D-2-I-220

Model D-2



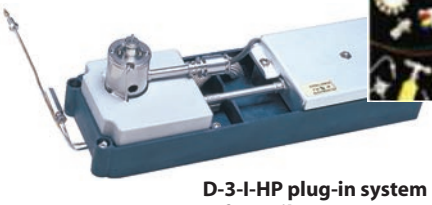
Pulsed Discharge Detectors

Plug-and-play detectors for Agilent 6890 and 7890

Model D-3 is designed for plug-and-play installation on the popular Agilent 6890 and 7890, and is optimized for trace level work in the helium photoionization mode

Model D-5 is a plug-and-play electron capture detector for the 6890.

All versions utilize the electonics and power supply of the host GC.



D-3-I-HP plug-in system for Agilent 6890 GC

PDD Model D-3 *Helium photoionization*

Detector optimized for trace level work in helium photoionization mode

		110 VAC		230 VAC
Description	*Prod No*		*Price*	*Prod No*
Plug-in system for Agilent 6890	D-3-I-HP			D-3-I-HP-220
Plug-in system for Agilent 7890	D-3-I-7890			D-3-I-7890-220

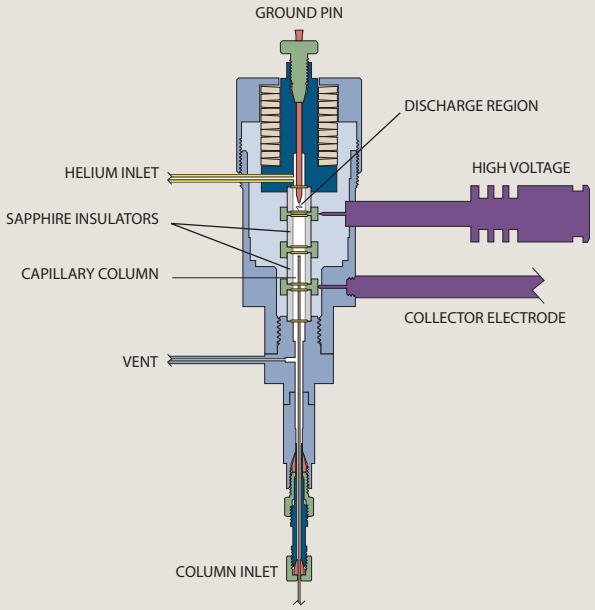
PDD Model D-5 *Electron capture*

Detector optimized for electron capture detection

		110 VAC		230 VAC
Description	*Prod No*		*Price*	*Prod No*
Plug-in system for Agilent 6890	D-5-6890			D-5-6890-220

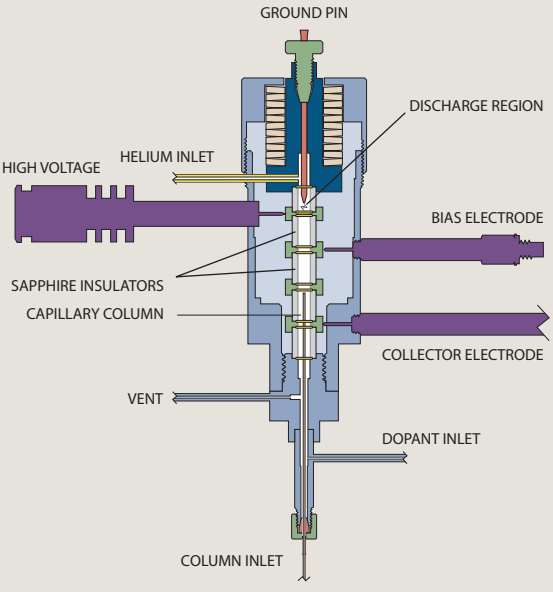
Model D-3 schematic

HELIUM PHOTOIONIZATION



Model D-5 schematic

ELECTRON CAPTURE



Plug-and-play detectors for other GCs

Pulsed Discharge Detector Model D-4 is available in versions for easy installation on most of the GCs in current use, including the Varian 3800, Shimadzu 14 and 17, ThermoFinnigan Trace, Mega, and Top, and Hewlett Packard 5890. The D-4 is single mode, optimized for trace level work in the helium photoionization mode.

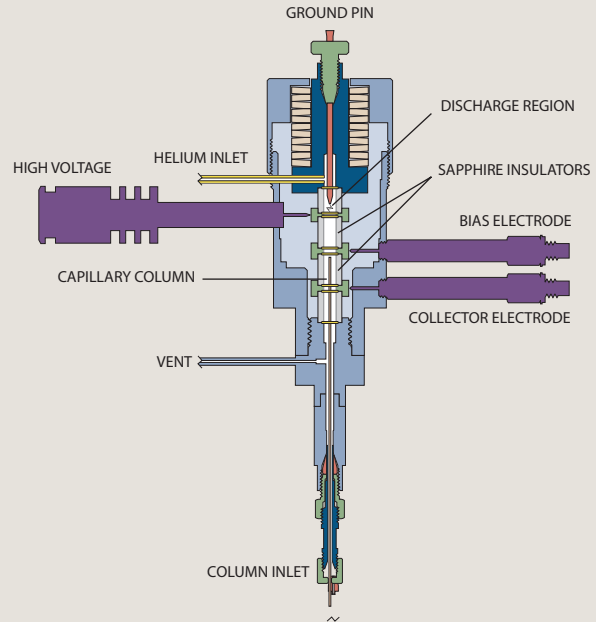
PDD Model D-4 *Helium photoionization*

Detectors optimized for trace level work in helium photoionization mode

	110 VAC	230 VAC
Description	*Prod No*	*Prod No*
Specialized detector for		
HP 5890	D-4-I-HP58	D-4-I-HP58-220
Shimadzu GC 14 *	D-4-I-SH14-R	D-4-I-SH14-R-220
Shimadzu GC 17 *	D-4-I-SH17-R	D-4-I-SH17-R-220
Thermo Trace GC *	D-4-I-TQ-R	D-4-I-TQ-R-220
Varian 3800 *	D-4-I-VA38-R	D-4-I-VA38-R-220
* Uses existing GC FID electrometer.		
For all other GCs	D-4-I	D-4-I-220

Model D-4 schematic

HELIUM PHOTOIONIZATION

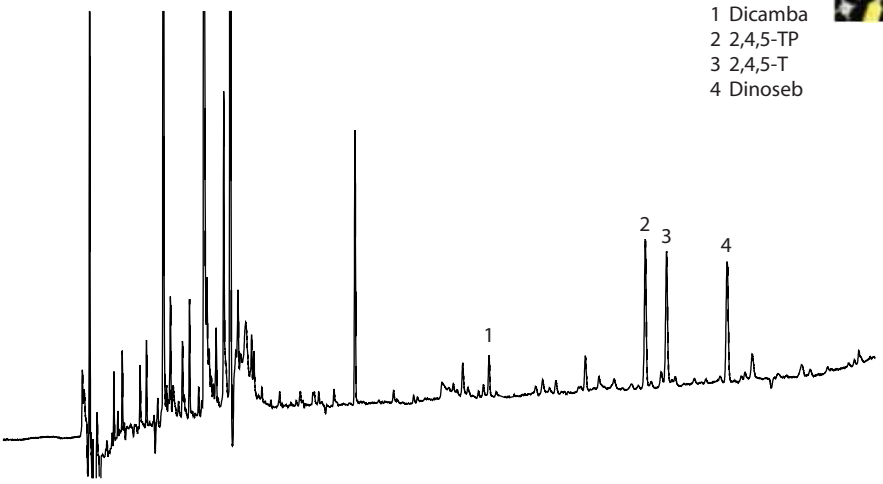


Pulsed Discharge Detector Applications

Model D-2

HERBICIDES IN SOIL SAMPLES USING EPA METHOD 8151

Detector:	PDD Model D-2
Mode:	Electron capture
Sample:	Environmental soil (1 g)
Detector temp:	320°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x 0.25 µm
Column temp:	60°C (2 min), 20°C/min to 180°C, 4°C/min to 220°C, 40°C/min to 300°C (5 min)
Injector temp:	200°C
Sample volume:	2 µL (solvent microextraction), 1:15 split
Discharge gas:	Helium
Dopant gas:	Helium/argon
Attenuation:	1

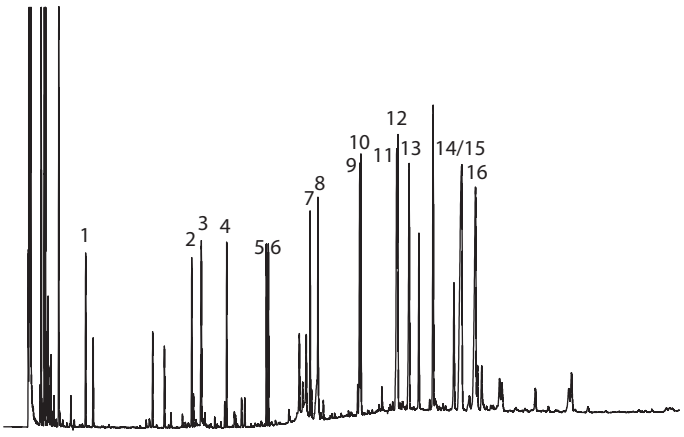


1 Dicamba
2 2,4,5-TP
3 2,4,5-T
4 Dinoseb

PDD Model D-2

PAH RESIDUES IN AN ENVIRONMENTAL SOIL SAMPLE SPIKE

Detector:	PDD Model D-2
Mode:	Helium photoionization
Sample:	Environmental soil (1 g)
Detector temp:	300°C
Column:	ValcoBond VB-35 30 m x 0.25 mm x 0.25 µm
Column temp:	120°C for 3 min, 15°C/min to 310°C for 15 min
Injector temp:	275°C
Sample volume:	2 µL (solvent microextraction), 1:15 split
Discharge gas:	Helium
Dopant gas:	none
Attenuation:	1

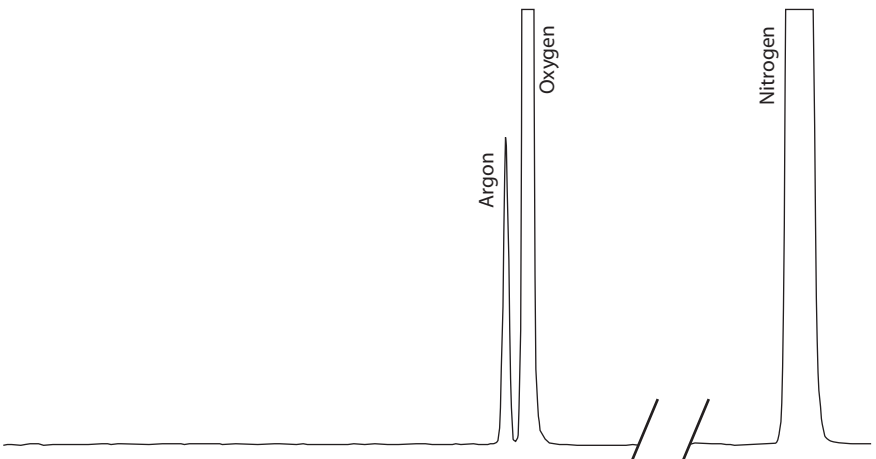


1 Naphthalene
2 Acenaphthalene
3 Acenaphthene
4 Fluorene
5 Phenanthrene
6 Anthracene
7 Fluoranthene
8 Pyrene
9 1,2 Benzanthracene
10 Chrysene
11 Benzo(b)fluoranthene
12 Benzo(k)fluoranthene
13 Benzo(a)pyrene
14 Indeno (1,2,3-C.d)pyrene
15 1,2:5,6-Dibenzanthracene
16 1,12-Benzoperylene

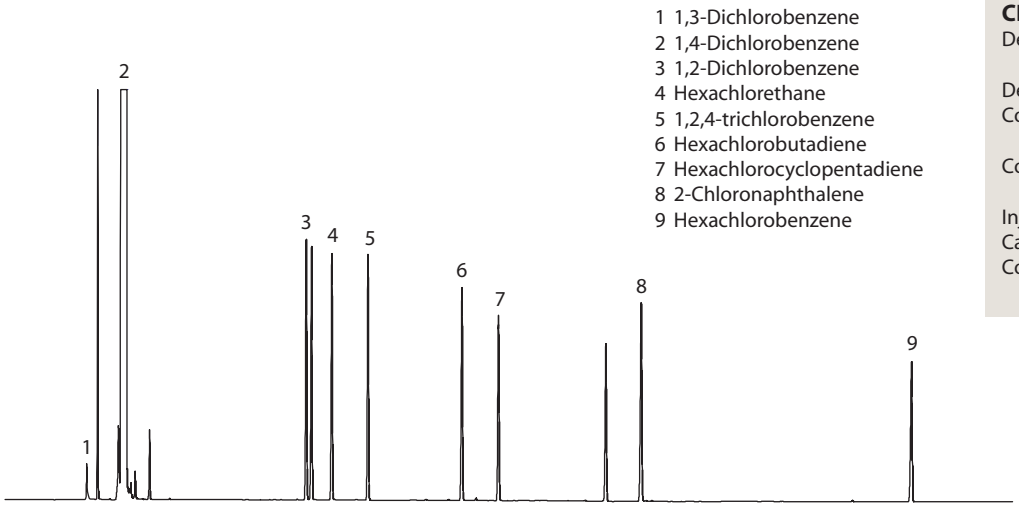
PDD Model D-3

AIR

Detector:	PDD Model D-3 Helium photoionization
Detector temp:	300°C
Column:	ValcoPLOT VP-Molesieve 30 m x 0.53 mm x 0.50 µm
Column temp:	Ambient
Injector temp:	250°C
Discharge gas:	Helium
Carrier gas:	Helium



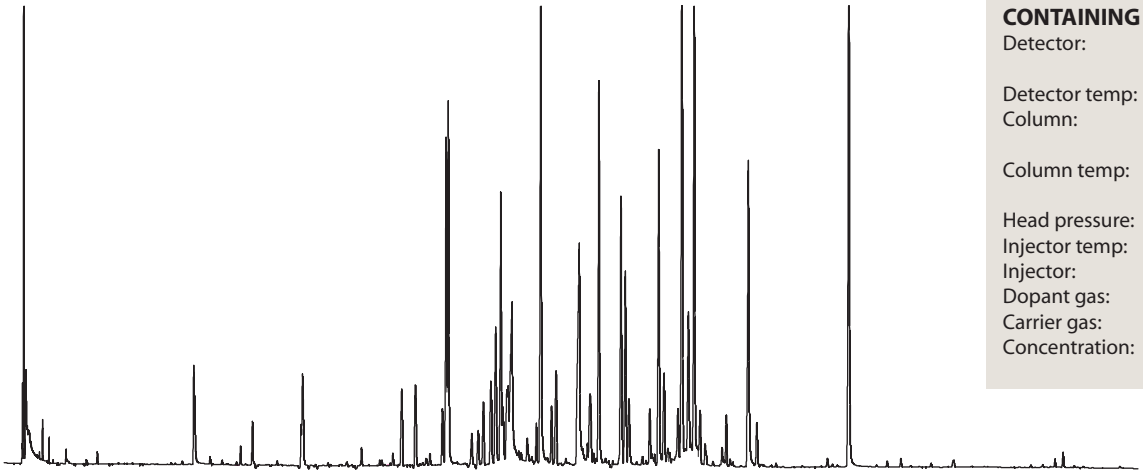
PDD Model D-3



CHLORINATED HYDROCARBONS

Detector:	PDD Model D-3 Helium photoionization
Detector temp:	280°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x .25 µm
Column temp:	60°C initial to 320°C at 10°C/min
Injector temp:	280°C
Carrier gas:	Helium
Concentration:	5 mg/ml

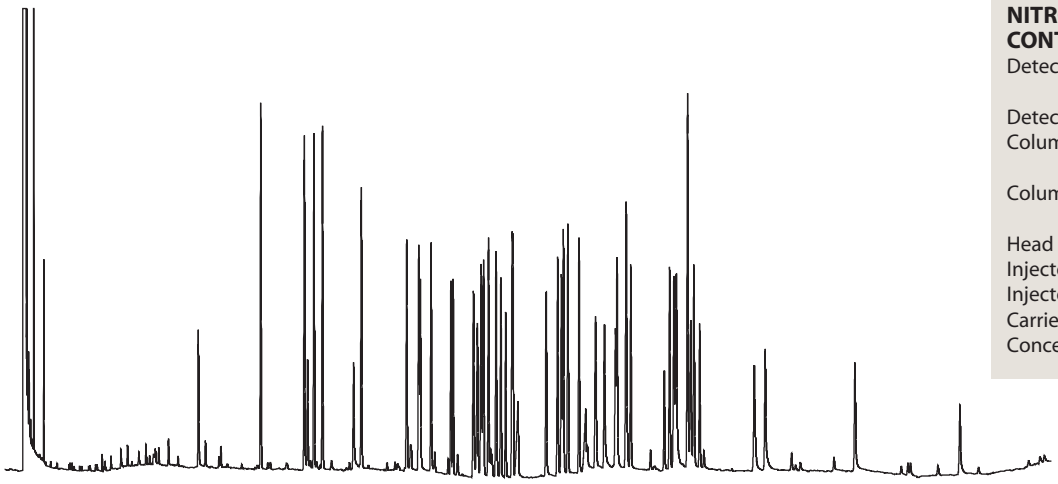
PDD Model D-5



NITROGEN- AND PHOSPHOROUS-CONTAINING PESTICIDES

Detector:	PDD Model D-5 Electron capture
Detector temp:	280°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x .25 µm
Column temp:	60°C initial to 320°C at 10°C/min
Head pressure:	15 psi
Injector temp:	280°C
Injector:	Split 1:10
Dopant gas:	3% Xenon in helium
Carrier gas:	Helium
Concentration:	0.8 mg/ml

PDD Model D-3



NITROGEN- AND PHOSPHOROUS-CONTAINING PESTICIDES

Detector:	PDD Model D-3 Helium photoionization
Detector temp:	280°C
Column:	ValcoBond VB-5 30 m x 0.25 mm x .25 µm
Column temp:	60°C initial to 320°C at 10°C/min
Head pressure:	15 psi
Injector temp:	280°C
Injector:	Split 1:10
Carrier gas:	Helium
Concentration:	2.5 mg/ml

Helium and Nitrogen Purifiers

Carrier gas purity is essential in any application requiring extreme sensitivity. Impurities limit detector sensitivity and can even destroy capillary columns. The Valco HP2 provides "point-of-use" purification of helium or other noble gases, such as Ar, Ne, Kr, and Xe, to sub-ppm levels of reactive gaseous impurities. The NP2 is similar, purifying nitrogen to sub-ppm levels of gaseous impurities.

The purification substrate in Valco gas purifiers is a non-evaporable gettering alloy. This stable alloy is contained in a welded assembly, so the purifiers can be used safely in industrial applications with minimal precautions. The getter is activated by heating, which eliminates the oxide film on the particle surface and allows helium to diffuse into the bulk of the getter particles. The HP2 and NP2 feature a self-regulating design which eliminates the possibility of thermal runaway and maintains the getter material at the optimum temperature.

Standard helium and nitrogen purifiers

Includes universal power supply.

	Helium purifier	Nitrogen purifier
Description	*Prod No*	*Prod No*
110 VAC	HP2	NP2
230 VAC	HP2-220	NP2-220

Replacement getter assembly

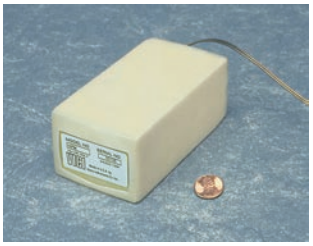
Helium	I-23572HP2
Nitrogen	I-23572NP2

HELIUM PURIFIER

- CE certified
- Gases purified: He, Ne, Ar, Kr, Xe, Rn
- Maximum operating pressure: 1000 psig
- Impurities removed: Outlet impurities less than 10ppb H_2O, H_2, O_2, N_2, NO, NH_3, CO, CO_2, and CH_4, based on 10ppm total inlet impurities. Other impurities removed include CF_4, CCl_4, SiH_4 and light hydrocarbons.
- Impurities ***not*** removed: He, Ne, Ar, Kr, Xe, Rn

NITROGEN PURIFIER

- CE certified
- Gases purified: N_2 only
- Impurities removed: Outlet impurities less than 10ppb H_2O, H_2, O_2, NO, NH_3, CO, CO_2, and CH_4, based on 10ppm total inlet impurities. Other impurities removed include CF_4, CCl_4, SiH_4 and light hydrocarbons.
- Impurities ***not*** removed: He, Ne, Ar, Kr, Xe, Rn, N_2



Miniature Gas Purifiers

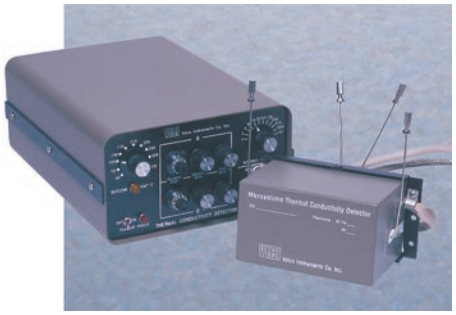
The Valco Miniature Helium Purifier (HPM) and Miniature Nitrogen Purifier (NPM) are designed to be installed in a gas chromatograph's flow path immediately upstream of the injector.

The HPM/NPM will remove any contaminants introduced by flow controllers, elastomeric tube seals, pressure regulators, crude traps, or other system components that are not completely clean and leak-tight.

Mini helium and nitrogen purifiers

Includes universal power supply.

Description	**Helium purifier** *Prod No*	**Nitrogen purifier** *Prod No*
110 VAC	HPM	NPM
230 VAC	HPM-220	NPM-220



Microvolume Thermal Conductivity Detector

Our dual filament TCD is a stand-alone unit consisting of the detector housing and a controller with electrometer and temperature controls. The detector cell includes two separate nickel/iron filaments, capable of independent or referenced (differential) operation. Cell volume and geometry are optimized for capillary chromatography and enhanced sensitivity at low flow rates. (Recommended total flow rate: 2-10 mL/min.) Thermal stability is maintained to ±0.02°C, resulting in a stable, noise-free signal. A single 0-1 millivolt attenuated output for a strip chart recorder is provided through the signal cable at the rear of the controller, with 0-1 volt and 0-10 volt unattenuated signals available through the remote signal cable.

TCD Thermal conductivity detectors

Description		**110 VAC** *Prod No*	**230 VAC** *Prod No*
Entire unit (cell and electronics)		TCD2-NIFE	TCD2-NIFE-220
Cell/oven assembly only	Dual filament	TCD2-NIFED	TCD2-NIFED-220
TCD controller only		TCD2-C	TCD2-C-220

Calibration Gas Standards and Calibration Gas Generators from VICI Metronics

VICI Metronics, Inc. in Poulsbo, Washington is the leading manufacturer of devices and instruments that are used in the generation of calibration gas standards, including Dynacal® and G-Cal permeation tubes and Dynacalibrator® and G-Cal calibration gas generators. The product line also includes gas purifiers, contaminant traps, and GC Industries oxygen and toxic gas monitors. Metronics is also the leading provider of explosives, narcotics, and chemical warfare dopants for TSA airport security (ammonia, DCM, and BHT), law enforcement, border patrol, military, and other trace detection industry professionals.

Calibration Gas Standards

The purpose of a calibration gas standard is to establish a reference point for the verification of an analysis. Permeation tube rates can be certified using standards traceable to NIST by the most basic and accurate laboratory procedure – measuring the gravimetric weight loss over a known period of time at a known temperature. Permeation rate data is already established for hundreds of different compounds, and rates for new compounds can be easily certified using NIST-traceable standards.

Advantages

Calibration devices from VICI Metronics offer several advantages over cylinder-supplied gas calibration standards. Multi-component gas mixtures can be easily generated with NIST traceability employing established EPA and ASTM protocols by using the appropriate combination of permeation devices. The technique also allows the removal of a single component from a gas mixture by simply removing the appropriate permeation device.

A wide range of concentrations can easily be generated by simply varying either the dilution flow rate and/or the set point temperature. In addition, their small size and inherent stability allow us to inventory thousands of devices for delivery from stock. Because of the size and the limited quantity of chemical fill, we can offer overnight delivery via air express.

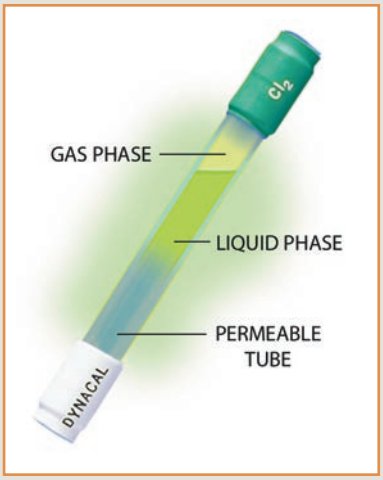
By contrast, bottled trace level (ppb and ppm) standards can be very expensive, and calibrations requiring multiple components over a wide range of concentrations require a large number of gas cylinders, consuming valuable lab space as well. Problems can also arise from degradation of the standard within the cylinder, from changes in cylinder pressure, and from interaction of calibration components and surfaces.

TO ORDER
For prices or more information about specific compounds available in permeation devices, contact VICI Metronics:

Toll-free 877–737–1887
Tel 360–697–9199
Fax.....360–697–6682

vicimetronics.com

Dynacal® Permeation Devices



- Ideal for lab environments
- Smaller than G-Cal devices
- More accurate than G-Cal devices
- Require a temperature-controlled environment
- Inexpensive calibration solution

Dynacal permeation devices are small, inert capsules containing a pure chemical compound in a two phase equilibrium between its gas phase and its liquid or solid phase. At a constant temperature, the device emits the compound through its permeable portion at a constant rate. Devices are typically inserted into a carrier flow to generate test atmospheres for calibrating gas analyzer systems, testing hazardous gas alarms, or conducting long-term studies of effects on materials or biological systems – in short, any situation requiring a stable concentration of a specific trace chemical.

MORE INFORMATION
G-Cal perm tubes. . .p. 232

COMPOUNDS AVAILABLE IN DYNACAL PERM DEVICES

Literally hundreds of compounds are available in our permeation devices. This list is merely representative of the range we offer. Contact us if you don't see what you're looking for.

Ammonia
Benzene
Carbon disulfides
Carbon tetrachloride
Chlorine
Dichloromethane
Dimethyl sulfide
Ethanol
Ethylene oxide
Freon
Formaldehyde
Hydrogen cyanide
Hydrogen fluoride
Hydrogen sulfide
Iodine
Isopropyl alcohol
Mercury
Methanol
Methyl bromide
MTBE
Nitrogen dioxide
Octane
Sulfur dioxide
Sulfur hexafluoride
Thiophene
Toluene
Vinyl acetate
Water

Xylenes

Tubular device

The tubular device, a sealed permeable cylinder containing the desired permeant reference material, is the most widely used of the various permeation devices. Release of the chemical occurs by permeation through the walls of the Teflon® tube for the entire length between the impermeable plugs. A wide range of rates can be achieved by varying the length and thickness of the tube, with typical rates ranging from 5 ng/min to 50,000 ng/min.

Extended life tubular device

Our unique extended life tubular (XLT) device is essentially a standard tubular device coupled to an impermeable stainless steel reservoir. This design offers a range of permeation rates corresponding to a tubular device but has a significantly enhanced lifetime – by a factor of 3 for a 5 cm (active length) device or a factor of 12 for a 1 cm device.

Wafer device

Wafer devices have only a small permeable window, or wafer, so permeation rates are typically lower than rates for tubular devices. Since permeation occurs only through the polymeric wafer, the permeation rate is controlled by varying the wafer material, the thickness of the wafer, and the diameter of the permeation opening. Gases whose high vapor pressure at normal permeation temperatures prevent their containment in a tubular device can be contained in a wafer device. Wafer devices are available in different styles to allow use in calibrators made by various manufacturers.

Dynacalibrator® Calibration Gas Generators

- Deliver precise concentrations from ppb to high ppm
- Use Dynacal® permeation devices as the trace gas source, with front panel access to the permeation chamber
- Proprietary constant temperature system controls chamber temperature at a set point with ±0.1°C accuracy
- Choice of plumbing and flow configurations

VICI Metronics Dynacalibrators allow you to verify the accuracy of analytical data from air pollution monitoring, industrial hygiene surveys, odor surveys, and other instruments measuring gas concentration. All models enable calibrations traceable to NIST standards for almost any gas analyzer, in the lab or in the field.

The design takes full advantage of all the conveniences inherent in our Dynacal® permeation devices to generate and deliver precise concentrations ranging from ppb to high ppm for hundreds of different compounds. Standard features on all our models, from the most basic Model 150 to the most fully-equipped Model 500, facilitate accurate, reproducible, trouble-free calibrations time after time.

Model 120 Portable Dynacalibrators®

- Completely portable
- Pump powered by rechargeable battery or a 12 VDC source (inverter with cigarette lighter plug provided)
- Available temperature control from 5°C above ambient to 100°C
- Utilizes permeation devices – no bulky cylinders

Standard features on Model 120 include a glass or Teflon® permeation chamber with screw cap access, solid state proportional temperature controller with digital readout of set point and chamber temperature, heater switch with LED indicator, flowmeter and flow control valve, span and overflow outlets, 12 VDC internal pump, activated charcoal scrubber, and molded fiberglass case.

Model 150 Dynacalibrators®

- Temperature control with an accuracy of ±0.01°C from 5°C above ambient to 110°C
- Ultra compact
- PPB to high PPM range

At only 6" wide x 15" deep x 7" high and 10.5 pounds, the Dynacalibrator 150 is a compact calibrator capable of delivering the precise concentrations you require. A passivated glass-coated stainless steel permeation chamber houses the permeation device(s). Carrier and dilution flow rates must be supplied and measured externally. The digital temperature controller maintains the chamber temperature at a set point with an accuracy of ±0.01°C, traceable to NIST standards. The wide range of temperature settings (5°C above ambient to 110°C) means the end user can generate a wide range of volumetric concentrations for both low and high vapor pressure chemical compounds, establishing or changing the desired volumetric concentration by simply varying the carrier flow.

Dynacalibrator® Calibration Gas Generators

Model 230 Dynacalibrators®

With a flexible flow metering system to maintain a constant carrier flow through the permeation chamber, the Model 230 allows the dilution flow to be varied over a wide range, generating the spectrum of concentrations required for checking analyzer linearity. Like all Dynacalibrators, its permeation chamber is big enough to accomodate several permeation devices, for higher output concentrations or multi-component mixtures.

Model 450 Dynacalibrators®

Ordinarily, the plumbing connections between the sample manifold, analyzer, and calibrator must be changed for each calibration. The Model 450's unique "through-port" feature eliminates this chore. The mode control switch selects among standby, zero, span 1 (low concentration), and span 2 (high concentration) modes.

Model 340 Dynacalibrators®
(not shown)

The Model 340 adds a front panel mode control switch to select between zero or span calibration modes. In the zero mode, scrubbed air is delivered to the span outlet, allowing the end user to establish zero before sampling.

Model 500 Dynacalibrators®
(not shown)

This innovative design features two separate permeation chambers with independent temperature control systems. The chambers can be used independently, or together to combine concentrations of trace components. Separate solenoid valves allow the carrier flows to be switched from the dilution stream to a vent port.

TO ORDER
For prices or more information about specific compounds available in permeation devices, contact VICI Metronics:

Toll-free 877–737–1887
Tel 360–697–9199
Fax 360–697–6682

vicimetronics.com

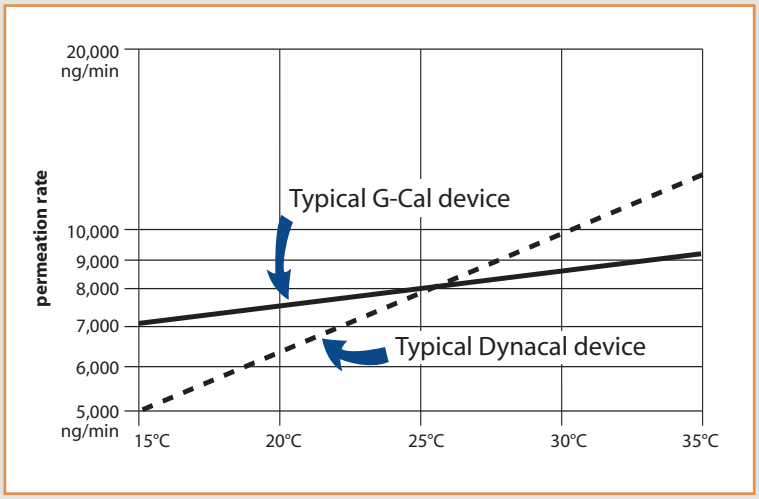
G-Cal Permeation Devices

- Excellent for use in the field
- Can be operated at room temperature
- Can handle Arsine and Phosphine
- Longer lifetime than Dynacal devices

Patented* G-Cal permeation tubes offer a proven and repeatable means of generating desired gas or vapor concentrations. The permeant gas escapes through the proprietary membrane system and mixes with a carrier gas (nitrogen is the most common) at a controlled flow rate to obtain a known mixture in ppm or ppb. Applications include calibration of gas monitoring systems and chromatographs, accuracy check of gas detectors, and generation of known test atmospheres for a specific application.

G-Cal devices exhibit the lowest temperature sensitivity among available similar products. The permeation rate through the polymeric membrane used in G-Cal devices changes only 1-3% per degree C, eliminating the need for a temperature-controlled chamber. Most G-Cal devices are guaranteed for 12 months operating life.

Over 100 different substances are available, including Arsine, Phosphine, and gas phase devices such as CO, NO, and Methane. Available permeation rates range from less than 100 ng/min to 50,000 ng/min. Each G-Cal device is individually calibrated and verified to generate a given mass output per unit time (ng/min) at a set point temperature. A graph which shows an estimated permeation rate vs. temperature from 0 to 50°C is included with each device.



Comparison of G-Cal permeation devices and Dynacal PTFE permeation devices

MORE INFORMATION
Dynacal perm tubes p. 229

COMPOUNDS AVAILABLE IN G-CAL PERM TUBES

Literally hundreds of compounds are available in our permeation devices. This list is merely representative of the range we offer. Contact us if you don't see what you're looking for.

Ammonia
Arsine *
Benzene
Carbon Dioxide *
Carbon Monoxide *
Carbonyl Sulfide
Chloroform
DMMP
Dichloromethane
Dimethyl Sulfide
Dimethyl Formamide
Ethyl Chloride
Ethyl Mercaptan
Ethylene Oxide
Formaldehyde
Freons
Hydrogen Fluoride
Hydrogen Sulfide
Methane *
Methanol
Methyl Mercaptan
Nitric Oxide *
Nitrogen *
Nitrogen Dioxide
Nitrous Oxide *
Oxygen *
Phosphine *
Propylene Oxide
Sulfur Dioxide
Sulfur Hexafluoride
Thiophene
Toluene
Vinyl Chloride
Water
Xylenes

** Available only in G-Cal permeation devices.*

* US Patent No. 4,399,942

G-Calibrators

- Portable and rugged; ideal for field use
- Ambient temperature from 15°C to 45°C
- Built-in pump
- Carrier gas flow rates from 100-1000 or 200-4000 cc/min
- Models with oven for constant temperature control at cold field sites

G-Calibrators are rugged portable units specifically designed to be used with our patented Series 23 G-Cal permeation devices to generate known concentrations (ppb to ppm) of various gases and liquid vapors. This combination offers the easiest method of calibrating toxic gas detection equipment, gas analyzers, and chromatographs commonly used in chemical, petrochemical, paper, power, and related industries.

Due to its patented permeation technology, the permeation rate of a G-Cal device remains fairly stable when exposed to changing temperatures. For most applications, this feature eliminates the need for the temperature-controlled oven.

Models with an oven have a single fixed temperature point (35° - 50°C). Models powered by a 12 VDC NiCad rechargeable battery also include a 110 VAC external charger. All G-Calibrators have stainless steel fittings and FEP Teflon® tubing throughout.

G-Calibrators *Calibration gas generators*

Flow range	*Oven*	*Battery*
100-1000 cc/min	no	1.5 VDC
	no	12 VDC NiCad
	yes	12 VDC NiCad
200-4000 cc/min	no	12 VDC NiCad
	yes	12 VDC NiCad

TO ORDER
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Fax.....360–697–6682

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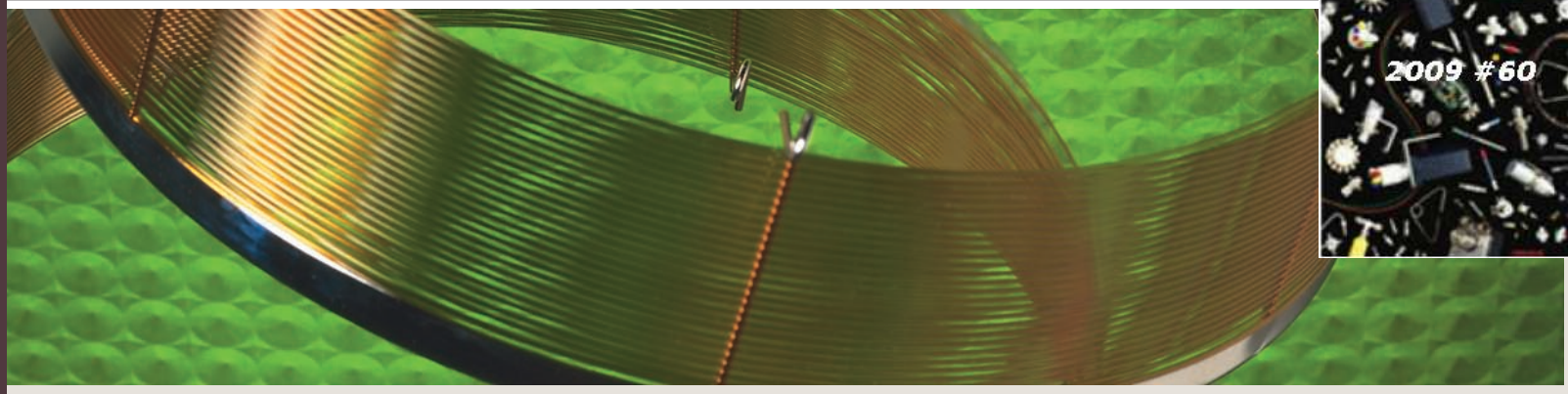


GC Capillary Columns from VICI Metronics

ValcoBond® and ValcoPLOT® capillary columns meet the highest quality standards for resolution, retention characteristics, inertness, bleed, and reproducibility.

ValcoBond® Capillary Columns

- Individually tested
- High temperature range
- Competitive pricing

We use proprietary liquid phase processing to produce low bleed characteristics while maintaining identical retention characteristics to the phases you are used to.

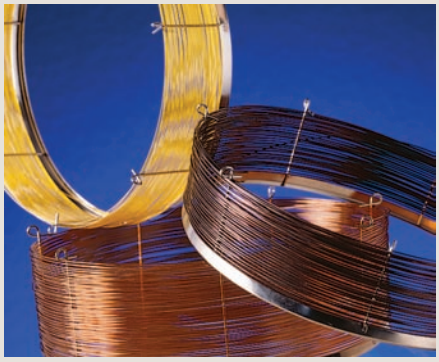
ValcoPLOT® Capillary Columns

- Widest polarity range
- Faster than micropacked
- Water tolerant

Now you can reduce run time by replacing your packed columns with ValcoPLOT HayeSep capillary PLOT columns, with phases available only from VICI. Our proprietary phase processing produces the first capillary PLOT columns with characteristics identical to HayeSep packed columns.

VALCOBOND PHASES *pages 235 - 238*

VB-FLUORO	***NEW!*** Bonded fluorosilicone phase
VB-1	100% dimethylpolysiloxane
VB-5	(5%-Phenyl)-methylpolysiloxane
VB-35	(35%-Phenyl)-methylpolysiloxane
VB-50/608	(50%-Phenyl)-methylpolysiloxane
VB-624	(6% Cyanopropyl-phenyl)-methylpolysiloxane
VB-1701	(14% Cyanopropyl-phenyl)-methylpolysiloxane
VB-Wax	Polyethylene glycol (PEG)



VALCOPLOT PHASES *pages 240 - 244*

ValcoPLOT Molesieve 5Å	
ValcoPLOT Metal Molesieve 5Å	
ValcoPLOT Alumina KCl	
ValcoPLOT Alumina Na_2So_4	
ValcoPLOT A	High purityDivinylbenzene/ethyleneglycoldimethacrylate
ValcoPLOT B	Divinylbenzene/polyethyleneimine
ValcoPLOT C	Divinylbenzene/acrylonitrile
ValcoPLOT D	High purity Divinylbenzene
ValcoPLOT N	Divinylbenzene/ethyleneglycoldimethacrylate
ValcoPLOT P	Divinylbenzene/styrene
ValcoPLOT Q	Divinylbenzene
ValcoPLOT R	Divinylbenzene/N-vinyl-2-pyrollidinone
ValcoPLOT S	Divinylbenzene/4-vinyl-pyridine

PRODUCTS FOR GC

Other useful products for gas chromatography include:

TO ORDER

For prices or more information about your specific application, contact VICI Metronics:

Toll-free 877–737–1887
Tel 360–697–9199
Fax. 360–697–6682

columns@vici.com

PRIMARY APPLICATIONS
Aldehydes
CFCs
Explosives
Ketones
PAHs
Silanes
Unsaturated compounds

VB-Fluoro Capillary Columns *NEW*

- 100% bonded Fluorosilicone
- High thermal stability
- Unique selectivity

VB-Fluoro capillary columns feature unique selectivity created by high fluorine affinity to analyte lone pair electrons. This is coupled with thermal stability similar to low polarity phases such VB-1 and VB-5.

Low bleed characteristics make VB-Fluoro columns well suited for MS and ECD applications, and the high thermal stability allows their use as a complementary column for most high temperature applications which commonly utilize low polarity stationary phases.

Primary applications include ketones, aldehydes, explosives, PAHs, silanes, CFCs, and unsaturated compounds.

VB-Fluoro columns are a good replacement for Rtx-200, DB-200, DB-210, and VF-200 columns.

VB-Fluoro

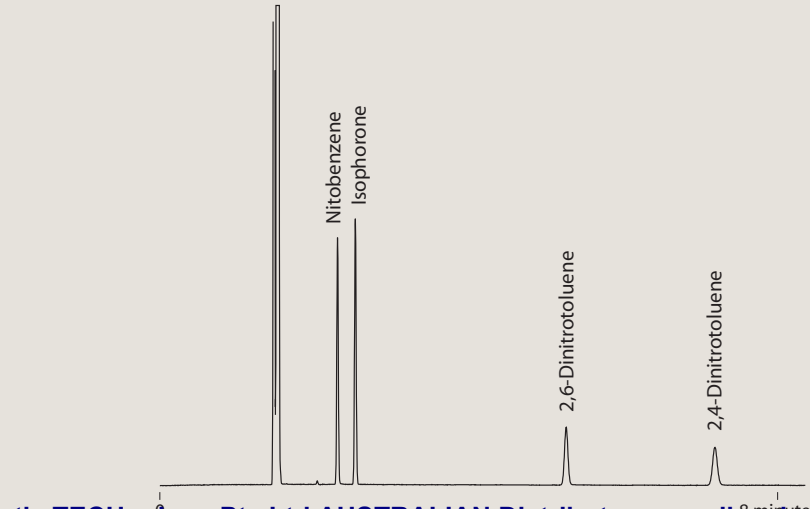
0.25 mm ID	*df*	*Prod No*
30 meters	0.25	CFS-N03025-025
0.53 mm ID		
30 meters	1.00	CFS-N03053-100

VB-Fluoro

ACRYLATE IMPURITIES

Column:	VB-Fluoro 30 m x .53 mm x 1.00 µm
Column temp:	40°C for 5 min, to 200°C @ 10°C/min
Carrier:	Hydrogen at 35 cm/sec
Injector:	Split 100:1
Detector:	FID

VB-Fluoro



EXPLOSIVES

Column:	VB-Fluoro 30 m x .53 mm x 1.00 µm
Column temp:	Isothermal 200°C
Carrier:	Hydrogen at 35 cm/sec
Injector:	Split 100:1
Detector:	FID

ValcoBond Columns

VB-1

100% dimethylpolysiloxane

REPLACES
DB-1, DB-1ms, HP-1, HP-1MS, Ultra-1, Rtx-1, Rtx-1MS, SPB-1, MDN-1, BP-1, CP-Sil 5 CB, GB-1, 007-1, OV-1, SE-30, AT-1 and ZB-1

0.10 mm ID	*df*	*Prod No*
10 meters	0.10	CFS-A01010-010B
10 meters	0.20	CFS-A01010-020B
10 meters	0.40	CFS-A01010-040B
20 meters	0.10	CFS-A02010-010B
20 meters	0.20	CFS-A02010-020B
20 meters	0.40	CFS-A02010-04 0B
0.18 mm ID	*df*	*Prod No*
10 meters	0.10	CFS-A01018-010B
10 meters	0.18	CFS-A01018-018B
10 meters	0.40	CFS-A01018-040B
30 meters	0.10	CFS-A03018-010B
30 meters	0.18	CFS-A03018-018B
30 meters	0.40	CFS-A03018-040B
30 meters	1.00	CFS-A03018-100B
40 meters	0.18	CFS-A04018-018B
40 meters	0.40	CFS-A04018-040B
0.25 mm ID	*df*	*Prod No*
15 meters	0.10	CFS-A01525-010B
15 meters	0.25	CFS-A01525-025B
15 meters	0.50	CFS-A01525-050B
15 meters	1.00	CFS-A01525-100B
15 meters	1.50	CFS-A01525-150B
30 meters	0.10	CFS-A03025-010B
30 meters	0.25	CFS-A03025-025B
30 meters	0.50	CFS-A03025-050B
30 meters	1.00	CFS-A03025-100B
30 meters	1.50	CFS-A03025-150B
60 meters	0.10	CFS-A06025-010B
60 meters	0.25	CFS-A06025-025B
60 meters	0.50	CFS-A06025-050B
60 meters	1.00	CFS-A06025-100B
60 meters	1.50	CFS-A06025-150B
0.32 mm ID	*df*	*Prod No*
15 meters	0.10	CFS-A01532-010B
15 meters	0.25	CFS-A01532-025B
15 meters	0.32	CFS-A01532-032B
15 meters	0.50	CFS-A01532-050B
15 meters	1.00	CFS-A01532-100B

0.32 mm ID, cont'd	*df*	*Prod No*
15 meters	2.00	CFS-A01532-200B
15 meters	3.00	CFS-A01532-300B
15 meters	4.00	CFS-A01532-400B
15 meters	5.00	CFS-A01532-500B
30 meters	0.10	CFS-A03032-010B
30 meters	0.25	CFS-A03032-025B
30 meters	0.32	CFS-A03032-032B
30 meters	0.50	CFS-A03032-050B
30 meters	1.00	CFS-A03032-100B
30 meters	2.00	CFS-A03032-200B
30 meters	3.00	CFS-A03032-300B
30 meters	4.00	CFS-A03032-400B
30 meters	5.00	CFS-A03032-500B
60 meters	0.10	CFS-A06032-010B
60 meters	0.25	CFS-A06032-025B
60 meters	0.32	CFS-A06032-032B
60 meters	0.50	CFS-A06032-050B
60 meters	1.00	CFS-A06032-100B
60 meters	2.00	CFS-A06032-200B
60 meters	3.00	CFS-A06032-300B
60 meters	4.00	CFS-A06032-400B
60 meters	5.00	CFS-A06032-500B
0.53 mm ID	*df*	*Prod No*
15 meters	0.15	CFS-A01553-015B
15 meters	0.50	CFS-A01553-050B
15 meters	1.00	CFS-A01553-100B
15 meters	1.50	CFS-A01553-150B
15 meters	3.00	CFS-A01553-300B
15 meters	5.00	CFS-A01553-500B
30 meters	0.15	CFS-A03053-015B
30 meters	0.50	CFS-A03053-050B
30 meters	1.00	CFS-A03053-100B
30 meters	1.50	CFS-A03053-150B
30 meters	3.00	CFS-A03053-300B
30 meters	5.00	CFS-A03053-500B
60 meters	1.00	CFS-A06053-100B
60 meters	1.50	CFS-A06053-150B
60 meters	3.00	CFS-A06053-300B
60 meters	5.00	CFS-A06053-500B

PRIMARY APPLICATI
- Amines
- Flavors
- Fragrances
- Hydrocarbons
- Pesticides
- PCBs
- Phenols
- Sulfur compounds
- EPA Methods 504, 551, 1618
- NIOSH Methods 1300-1301, 1400-1403, 1450, 1501, 2005

TO ORDER
For prices or more information about your specific application, contact VICI Metronics:

Toll-free 877–737–1887
Tel 360–697–9199
Fax. 360–697–6682

columns@vici.com

VB-35

(35%Phenyl)-methylpolysiloxane

REPLACES
DB-35, AT-35, MDN-35, DB-35ms, Rtx-35, BP-35, HP-35, Rtx-35MS, 007-11, HP-35MS, Sup-Herb, ZB-35

0.25 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-C01525-025B
15 meters	0.50	CFS-C01525-050B
30 meters	0.25	CFS-C03025-025B
30 meters	0.50	CFS-C03025-050B
60 meters	0.25	CFS-C06025-025B
60 meters	0.50	CFS-C06025-050B
0.32 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-C01532-025B
15 meters	0.50	CFS-C01532-050B
30 meters	0.25	CFS-C03032-025B
30 meters	0.50	CFS-C03032-050B

0.32 mm ID, cont'd	*df*	*Prod No*
60 meters	0.25	CFS-C06032-025B
60 meters	0.50	CFS-C06032-050B
0.53 mm ID	*df*	*Prod No*
15 meters	0.50	CFS-C01553-050B
15 meters	1.00	CFS-C01553-100B
30 meters	0.50	CFS-C03053-050B
30 meters	1.00	CFS-C03053-100B
60 meters	0.50	CFS-C06053-050B
60 meters	1.00	CFS-C06053-100B

PRIMARY APPLICATIONS
- Drugs
- Pesticides
- Herbicides
- PAHs
- Pharmaceuticals
- PCBs
- EPA Method 8081A (organochlorine pesticides)

VB-5

(5% Phenyl)-methylpolysiloxane

PRIMARY APPLICATIONS
- Drugs
- Herbicides
- Hydrocarbons
- PCBs
- Pesticides
- Phenols
- Semi-volatiles
- Sulfur compounds

0.10 mm ID	df	Prod No
10 meters	0.10	CFS-B01010-010B
10 meters	0.20	CFS-B01010-020B
20 meters	0.10	CFS-B02010-010B
20 meters	0.20	CFS-B02010-020B
0.18 mm ID	*df*	*Prod No*
10 meters	0.18	CFS-B01018-018B
10 meters	0.40	CFS-B01018-040B
20 meters	0.18	CFS-B02018-018B
20 meters	0.40	CFS-B02018-040B
30 meters	0.18	CFS-B03018-018B
30 meters	0.40	CFS-B03018-040B
40 meters	0.18	CFS-B04018-018B
40 meters	0.40	CFS-B04018-040B
0.25 mm ID	*df*	*Prod No*
15 meters	0.10	CFS-B01525-010B
15 meters	0.25	CFS-B01525-025B
15 meters	0.50	CFS-B01525-050B
15 meters	1.00	CFS-B01525-100B
30 meters	0.10	CFS-B03025-010B
30 meters	0.25	CFS-B03025-025B
30 meters	0.50	CFS-B03025-050B
30 meters	1.00	CFS-B03025-100B
60 meters	0.10	CFS-B06025-010B
60 meters	0.25	CFS-B06025-025B
60 meters	0.50	CFS-B06025-050B
60 meters	1.00	CFS-B06025-100B
0.32 mm ID	*df*	*Prod No*
15 meters	0.10	CFS-B01532-010B
15 meters	0.25	CFS-B01532-025B
15 meters	0.50	CFS-B01532-050B
15 meters	1.00	CFS-B01532-100B
15 meters	2.00	CFS-B01532-200B
15 meters	3.00	CFS-B01532-300B
15 meters	5.00	CFS-B01532-500B

0.32 mm ID, cont'd	df	Prod No
30 meters	0.10	CFS-B03032-010B
30 meters	0.25	CFS-B03032-025B
30 meters	0.50	CFS-B03032-050B
30 meters	1.00	CFS-B03032-100B
30 meters	2.00	CFS-B03032-200B
30 meters	3.00	CFS-B03032-300B
30 meters	5.00	CFS-B03032-500B
60 meters	0.10	CFS-B06032-010B
60 meters	0.25	CFS-B06032-025B
60 meters	0.50	CFS-B06032-050B
60 meters	1.00	CFS-B06032-100B
60 meters	2.00	CFS-B06032-200B
60 meters	3.00	CFS-B06032-300B
60 meters	5.00	CFS-B06032-500B
0.53 mm ID	*df*	*Prod No*
15 meters	0.50	CFS-B01553-050B
15 meters	1.00	CFS-B01553-100B
15 meters	1.50	CFS-B01553-150B
15 meters	2.00	CFS-B01553-200B
15 meters	2.65	CFS-B01553-265B
15 meters	3.00	CFS-B01553-300B
15 meters	5.00	CFS-B01553-500B
30 meters	0.50	CFS-B03053-050B
30 meters	1.00	CFS-B03053-100B
30 meters	1.50	CFS-B03053-150B
30 meters	2.65	CFS-B03053-265B
30 meters	3.00	CFS-B03053-300B
30 meters	5.00	CFS-B03053-500B
60 meters	1.00	CFS-B06053-100B
60 meters	1.50	CFS-B06053-150B
60 meters	2.00	CFS-B06053-200B
60 meters	2.65	CFS-B06053-265B
60 meters	3.00	CFS-B06053-300B
60 meters	5.00	CFS-B06053-500B

REPLACES
DB-5, DB-5ms, HP-5, HP-5MS, Ultra-5, Rtx-5, Rtx-5MS, Rtx-5sil MS, SPB-5, MDN-5, BP-5, CP-Sil 8 CB, GB-5, 007-5, OV-5, SE-54, AT-5, and ZB-5

VB-50/608

(50%Phenyl)-methylpolysiloxane

PRIMARY APPLICATIONS
- Drugs
- Pharmaceuticals
- Herbicides
- Steroids
- PAHs
- Tocopherols
- PCBs
- EPA Methods
- Pesticides
  - 508, 608 and 8080

0.25 mm ID	df	Prod No
15 meters	0.25	CFS-D01525-025B
15 meters	0.50	CFS-D01525-050B
30 meters	0.15	CFS-D03025-015B
30 meters	0.25	CFS-D03025-025B
30 meters	0.50	CFS-D03025-050B
60 meters	0.25	CFS-D06025-025B
60 meters	0.50	CFS-D06025-050B
0.32 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-D01532-025B
15 meters	0.50	CFS-D01532-050B
15 meters	1.00	CFS-D01532-100B
30 meters	0.25	CFS-D03032-025B
30 meters	0.50	CFS-D03032-050B
30 meters	1.00	CFS-D03032-100B

0.32 mm ID, cont'd	df	Prod No
60 meters	0.25	CFS-D06032-025B
60 meters	0.50	CFS-D06032-050B
60 meters	1.00	CFS-D06032-100B
0.53 mm ID	*df*	*Prod No*
15 meters	0.50	CFS-D01553-050B
15 meters	0.83	CFS-D01553-083B
15 meters	1.00	CFS-D01553-100B
30 meters	0.50	CFS-D03053-050B
30 meters	0.83	CFS-D03053-083B
30 meters	1.00	CFS-D03053-100B
60 meters	0.50	CFS-D06053-050B
60 meters	0.83	CFS-D06053-083B
60 meters	1.00	CFS-D06053-100B

REPLACES
DB-17, AT-50, SP-2250, DB-17ms, BPX-50, SP-17, DB-608, 007-17, SPB-608, HP-50+, SPB-50, ZB-50, Rtx-50

ValcoBond Columns

VB-Wax

100% bonded polyethylene glycol

REPLACES
DB-WAX, DB-WAXetr, HP-WAX, HP-InnoWAX, HP-20M, CB-WAX, Stabilwax, RtxWAX, SUPEROX II, SUPELCOWAX-10, BP-20, CP-WAX 52 CB, GB-WAX, 007-CW, OV-WAX, AT-WAX, and ZB-WAX

0.10 mm ID	*df*	*Prod No*
10 meters	0.10	CFS-G01010-010A
20 meters	0.10	CFS-G02010-010A
0.18 mm ID	*df*	*Prod No*
10 meters	0.18	CFS-G01018-018A
20 meters	0.18	CFS-G02018-018A
0.25 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-G01525-025A
30 meters	0.25	CFS-G03025-025A
60 meters	0.25	CFS-G06025-025A

0.32 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-G01532-025A
15 meters	0.50	CFS-G01532-050A
15 meters	1.00	CFS-G01532-100A
30 meters	0.25	CFS-G03032-025A
30 meters	0.50	CFS-G03032-050A
30 meters	1.00	CFS-G03032-100A
60 meters	0.25	CFS-G06032-025A
60 meters	0.50	CFS-G06032-050A
0.53 mm ID	*df*	*Prod No*
15 meters	0.50	CFS-G01553-050A
15 meters	1.00	CFS-G01553-100A
30 meters	0.50	CFS-G03053-050A
30 meters	1.00	CFS-G03053-100A
60 meters	1.00	CFS-G06053-100A

PRIMARY APPLICAT
Alcohols
Aldehydes
Aromatics
Flavors
Fragrances
Organic Acids
Solvents

VB-624/1301

(6% Cyanopropyl-phenyl)-methylpolysiloxane

REPLACES
DB-624, HP-624, HP-VOC, Rtx-624, Rtx-Volatiles, BP-624, Vocol, 007-624, 007-502, NON-PAKD, 624, ZB-624

0.18 mm ID	*df*	*Prod No*
10 meters	1.00	CFS-E01018-100A
20 meters	1.00	CFS-E02018-100A
30 meters	1.00	CFS-E03018-100A
40 meters	1.00	CFS-E04018-100A
0.20 mm ID	*df*	*Prod No*
25 meters	1.12	CFS-E02520-112A
0.25 mm ID	*df*	*Prod No*
15 meters	1.40	CFS-E01525-140A
30 meters	1.40	CFS-E03025-140A
60 meters	1.40	CFS-E06025-140A

0.32 mm ID	*df*	*Prod No*
15 meters	1.80	CFS-E01532-180A
30 meters	1.80	CFS-E03032-180A
60 meters	1.80	CFS-E06032-180A
0.53 mm ID	*df*	*Prod No*
15 meters	3.00	CFS-E01553-300A
30 meters	3.00	CFS-E03053-300A
60 meters	3.00	CFS-E06053-300A
75 meters	3.00	CFS-E07553-300A

PRIMARY APPLICATIONS
EPA Methods
- 501.3
- 502.2
- 503.1
- 524.2
- 601
- 602
- 8010
- 8015
- 8020
- 8240

VB-1701

(14% Cyanopropyl-phenyl)-methylpolysiloxane

REPLACES
DB-1701, 007-1701, HP-1701, CP-Sil 19 CB, Rtx-1701, SPB-1701, BP-10, ZB-1701

0.25 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-F01525-025A
15 meters	0.50	CFS-F01525-050A
30 meters	0.25	CFS-F03025-025A
30 meters	0.50	CFS-F03025-050A
60 meters	0.25	CFS-F06025-025A
60 meters	0.50	CFS-F06025-050A
0.32 mm ID	*df*	*Prod No*
15 meters	0.25	CFS-F01532-025A
15 meters	0.50	CFS-F01532-050A
15 meters	1.00	CFS-F01532-100A
30 meters	0.25	CFS-F03032-025A
30 meters	0.50	CFS-F03032-050A
30 meters	1.00	CFS-F03032-100A

0.32 mm ID, cont'd	*df*	*Prod No*
60 meters	0.25	CFS-F06032-025A
60 meters	0.50	CFS-F06032-050A
60 meters	1.00	CFS-F06032-100A
0.53 mm ID	*df*	*Prod No*
15 meters	0.50	CFS-F01553-050A
15 meters	1.00	CFS-F01553-100A
30 meters	0.50	CFS-F03053-050A
30 meters	1.00	CFS-F03053-100A
60 meters	0.50	CFS-F06053-050A
60 meters	1.00	CFS-F06053-100A

PRIMARY APPLICATIONS
Drugs
PAHs
PCBs
Pesticides
Phenols
Solvents
Tranquilizers

TO ORDER
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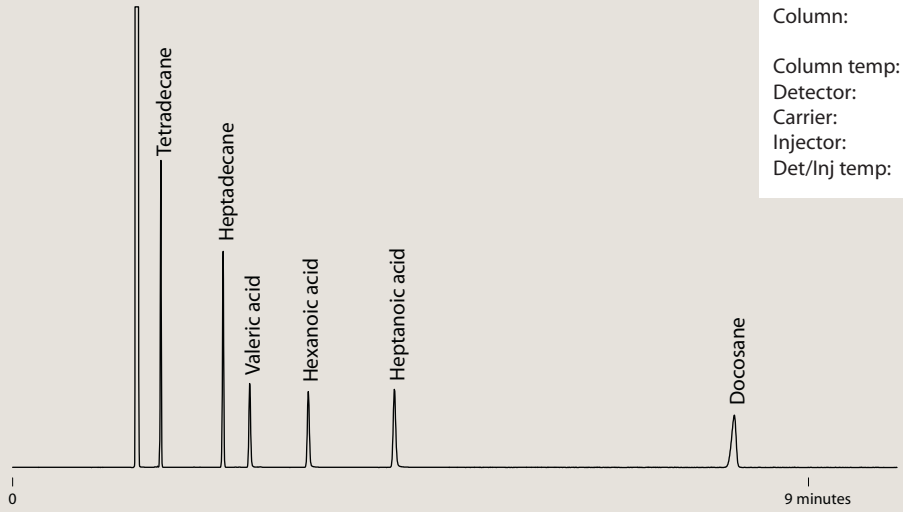
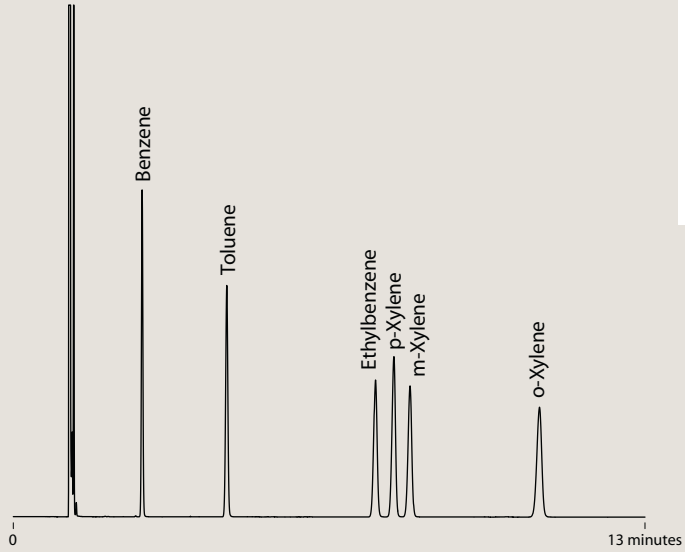
VB-Wax



FREE FATTY ACIDS

Column:	VB-Wax 30m x .25mm x .25µm
Column temp:	170°C isothermal
Detector:	FID
Carrier:	Hydrogen at 40 cm/sec
Injector:	Split 100:1
Det/Inj temp:	220°C

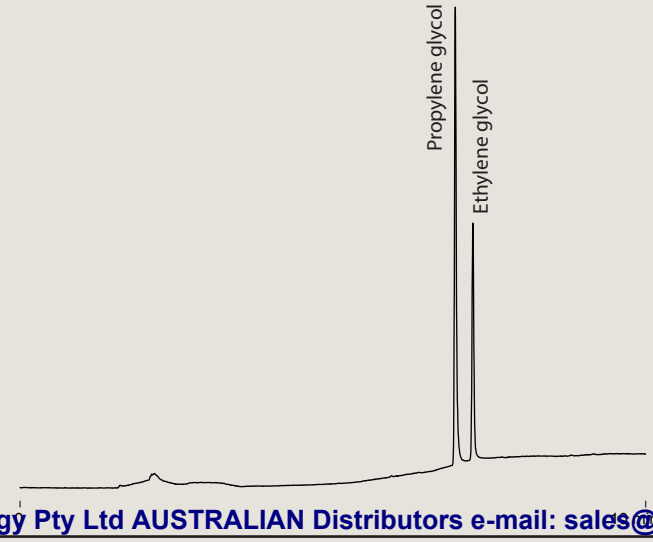
VB-Wax



BTEX

Column:	VB-Wax 30m x .25mm x .25µm
Column temp:	40°C isothermal
Detector:	FID
Carrier:	Hydrogen
Injector:	.5 µl 100:1 split
Det/Inj temp:	220°C

VB-Wax



GLYCOLS

Sample:	50 ppm EG, PG
Column:	VB-Wax 30m x .53mm x 1.00µm
Column temp:	80°C for 1 min, to 200°C @ 20°C/min, hold 5 min
Detector:	FID
Carrier:	Helium at 5 psi
Injector:	1 µl splitless, .5 min
Det/Inj temp:	220°C

Molesieve 5Å

Molesieve 5Å

REPLACES
GS-Molesieve 5A
HP-PLOT Molesieve
CP-Molesieve 5A
Rt-Msieve-5A
MXT-Msieve-51
PLT-5A

ValcoPLOT Molesieve 5Å PLOT columns offer greatly enhanced analytical efficiency at economical prices. Our thick film columns separate Ar/O_2 without the need for cryogenic equipment. ValcoPLOT Molesieve 5Å PLOT thin film columns offer fast elution of carbon monoxide with near perfect peak symmetry, and our proprietary bonding technology ensures that the particles stay put even when columns are used with valves.

PRIMARY APPLICATIONS
Gases

Fused silica

0.53 mm ID	*df*	*Prod No*
15 meters	20	CFS-X1553-200
15 meters	50	CFS-X1553-500
30 meters	20	CFS-X3053-200
30 meters	50	CFS-X3053-500

Stainless steel

0.53 mm ID	*df (µm)*	*Prod No*
15 meters	20	CSS-X1553-200
30 meters	20	CSS-X3053-200
30 meters	50	CSS-X3053-500

TO ORDER
For prices or more information about your specific application, contact VICI Metronics:

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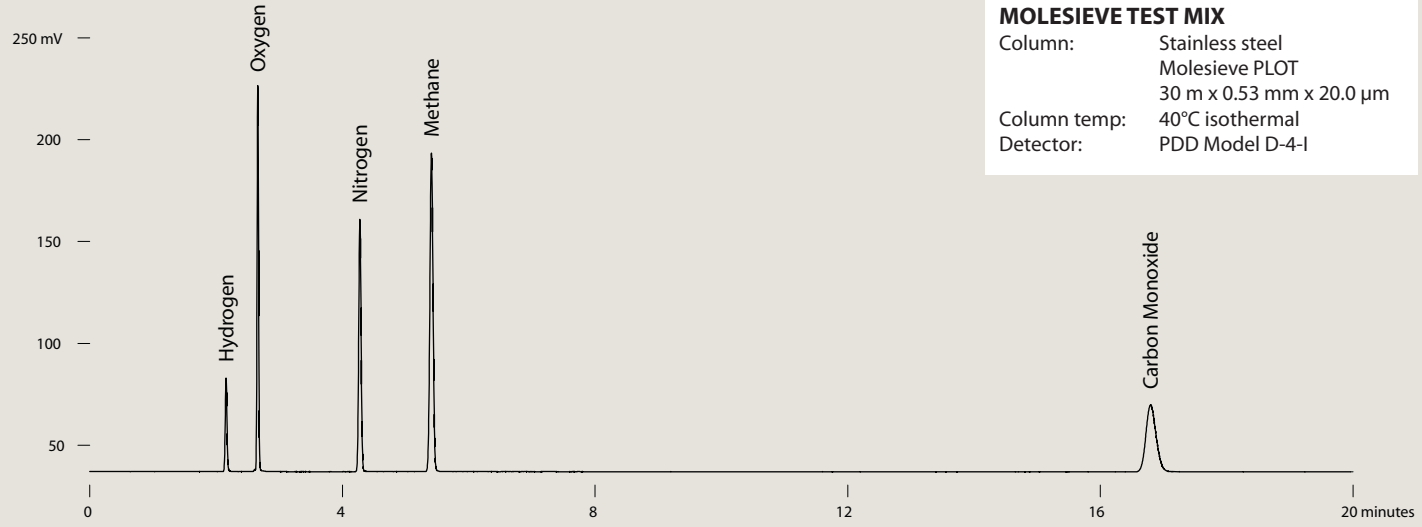
Tel 360–697–9199
Fax. 360–697–6682

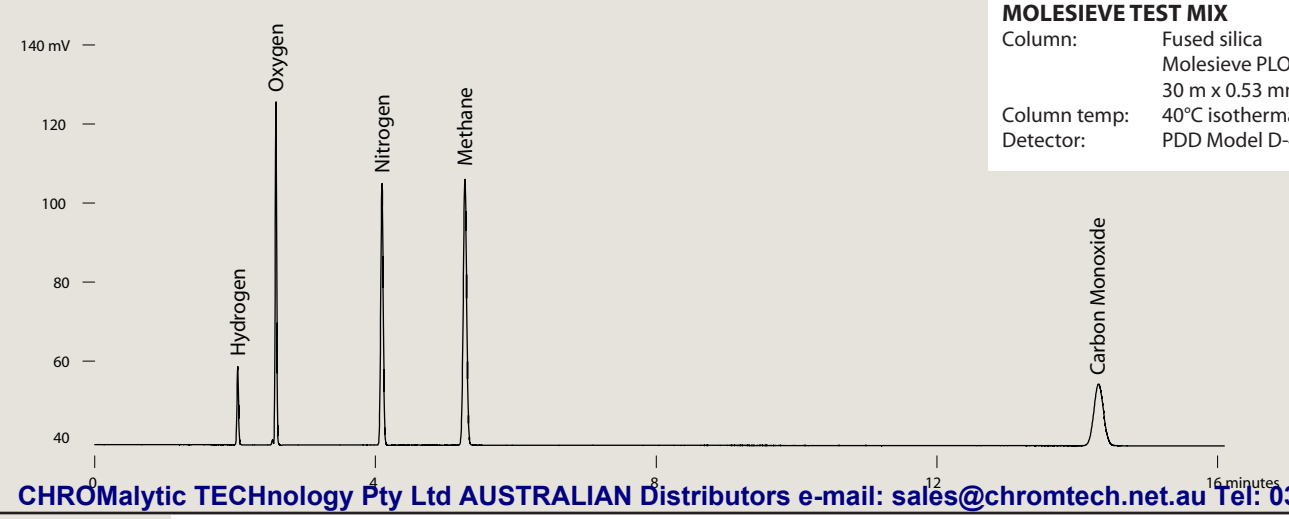
columns@vici.com

ValcoPLOT Molesieve 5Å – Stainless steel



MOLESIEVE TEST MIX
Column: Stainless steel Molesieve PLOT 30 m x 0.53 mm x 20.0 µm
Column temp: 40°C isothermal
Detector: PDD Model D-4-I

ValcoPLOT Molesieve 5Å – Fused silica

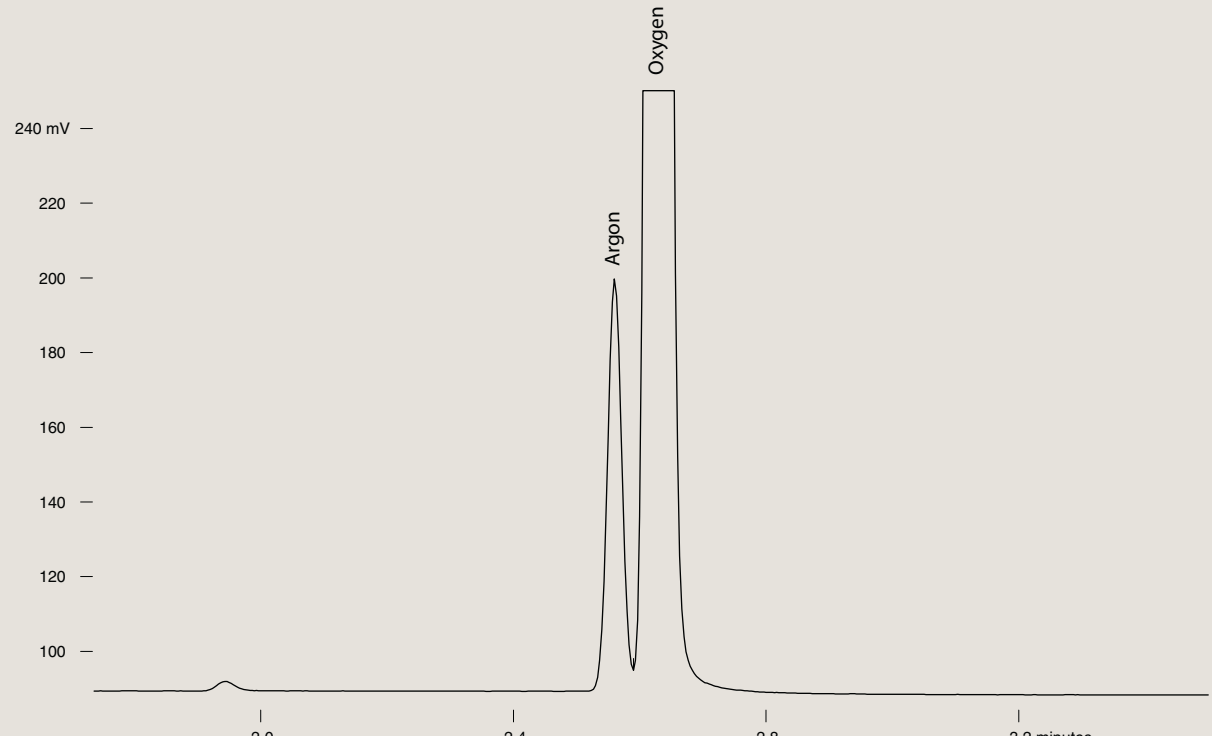


MOLESIEVE TEST MIX
Column: Fused silica Molesieve PLOT 30 m x 0.53 mm x 20.0 µm
Column temp: 40°C isothermal
Detector: PDD Model D-4-I

ValcoPLOT Molesieve 5Å – Fused silica

AIR

Column:	Fused silica Molesieve PLOT 30 m x 0.53 mm x 50.0 µm
Column temp:	40°C isothermal
Detector:	PDD Model D-4-I
Carrier:	Helium @ 25cm/sec



ValcoPLOT Columns

Alumina

Aluminum oxide

REPLACES
GS-Alumina
HP-PLOT Al203
CP-Al203/KCl
CP-Al203/Na2SO4
Rt-alumina-PLOT
Al203/KCl
Al203/Na2SO4

With ValcoPLOT Al_2O_3 PLOT columns there's no need for cryogenic equipment to analyze C1 - C5 hydrocarbons in a main stream of C1 - C5 hydrocarbons. ValcoPLOT Al_2O_3 columns are deactivated with small salt crystals stable to 200°C. KCl deactivation produces a relatively apolar column while Na_2SO_4 produces columns exhibiting increased retention of unsaturated hydrocarbons.

PRIMARY APPLICATIONS
C1 - C5 hydrocarbons

VP-Alumina/KCl

Fused silica

0.53 mm ID	df	Prod No
15 meters	10	CFS-Y1553-100
30 meters	10	CFS-Y3053-100
50 meters	10	CFS-Y5053-100

VP-Alumina/Na2SO4

Fused silica

0.53 mm ID	df	Prod No
15 meters	10	CFS-Z1553-100
30 meters	10	CFS-Z3053-100
50 meters	10	CFS-Z5053-100

ValcoPLOT A

High purity Divinylbenzene/ethyleneglycoldimethacrylate

Fused silica

0.32 mm ID	df (µm)	Prod No
15 meters	10	CFS-PA1532-100
30 meters	10	CFS-PA3032-100

0.53 mm ID	df	Prod No
15 meters	20	CFS-PA1553-200
30 meters	30	CFS-PA3053-200

PRIMARY APPLICATIONS
- Solvents
- Light gases
- Light hydrocarbons
- Residual solvents

ValcoPLOT D

High purity Divinylbenzene

Fused silica

0.32 mm ID	df	Prod No
15 meters	10	CFS-PD1532-100
30 meters	10	CFS-PD3032-100

0.53 mm ID	df	Prod No
15 meters	20	CFS-PD1553-200
30 meters	20	CFS-PD3053-200

PRIMARY APPLICATIONS
- Solvents
- Hydrocarbons
- Alcohols
- Sulfur compounds
- Residual solvents
- Halogenated hydrocarbons

ValcoPLOT Q

Divinylbenzene

Fused silica

0.32 mm ID	df	Prod No
15 meters	10	CFS-PQ1532-100
30 meters	10	CFS-PQ3032-100

0.53 mm ID	df	Prod No
15 meters	20	CFS-PQ1553-200
30 meters	20	CFS-PQ3053-200

PRIMARY APPLICATIONS
Note: We highly recommend ValcoPLOT D, which has similar retention characteristics but is made from higher purity raw materials.

TO ORDER
Toll-free 877–737–1887
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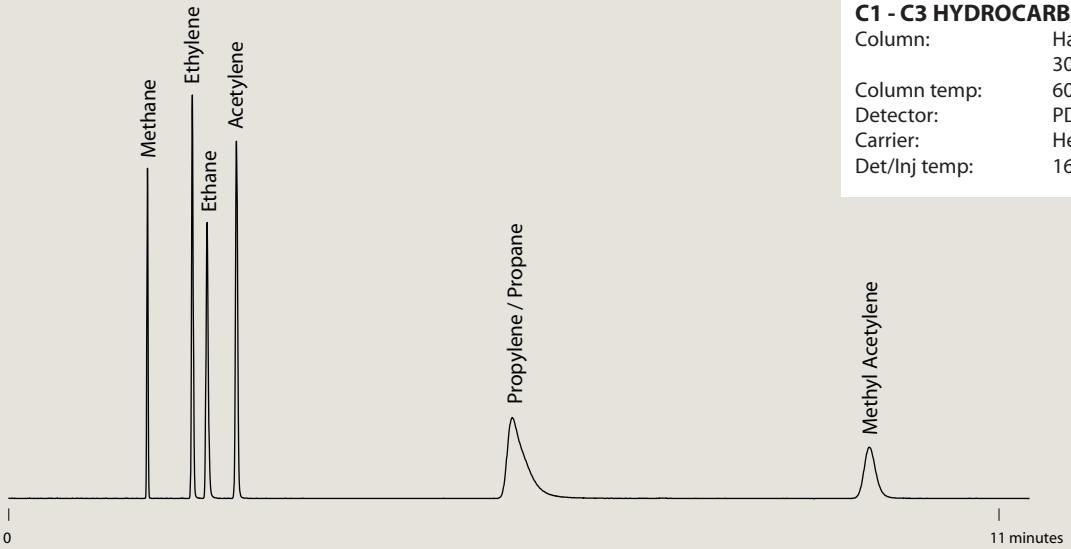
Fax. 360–697–6682
columns@vici.com

ValcoPLOT A



C1 - C3 HYDROCARBONS

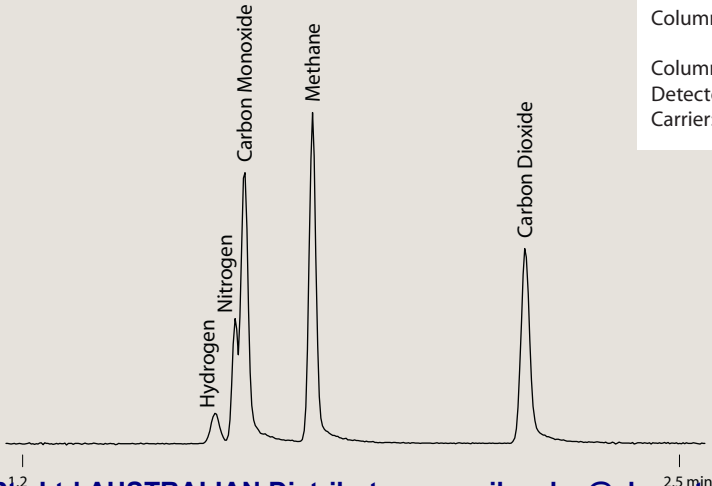
Column:	HayeSep A PLOT 30m x .53mm x 20.0µm
Column temp:	60°C isothermal
Detector:	PDD
Carrier:	Helium
Det/Inj temp:	165°C

ValcoPLOT D

C1 - C3 HYDROCARBONS

Column:	HayeSep D PLOT 30m x .53mm x 20.0µm
Column temp:	60°C isothermal
Detector:	PDD
Carrier:	Helium
Det/Inj temp:	250°C

ValcoPLOT D



GAS MIXTURE

Column:	HayeSep D PLOT 30m x .53mm x 20.0µm
Column temp:	40°C isothermal
Detector:	PDD
Carrier:	Helium

ValcoPLOT Columns

ValcoPLOT B — *Divinylbenzene/polyethyleneimine*

Fused silica

0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PB1532-100	15 meters	20	CFS-PB1553-200
30 meters	10	CFS-PB3032-100	30 meters	20	CFS-PB3053-200

ValcoPLOT C — *Divinylbenzene/acrylonitrile*

Fused silica

0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PC1532-100	15 meters	20	CFS-PC1553-200
30 meters	10	CFS-PC3032-100	30 meters	20	CFS-PC3053-200

ValcoPLOT N — *Divinylbenzene/ethyleneglycoldimethacrylate*

Fused silica

0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PN1532-100	15 meters	20	CFS-PN1553-200
30 meters	10	CFS-PN3032-100	30 meters	20	CFS-PN3053-200

ValcoPLOT P — *Divinylbenzene/styrene*

Fused silica

0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PP1532-100	15 meters	20	CFS-PP1553-200
30 meters	10	CFS-PP3032-100	30 meters	20	CFS-PP3053-200

ValcoPLOT R — *Divinylbenzene/N-vinyl-2-pyrollidinone*

Fused silica

0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PR1532-100	15 meters	20	CFS-PR1553-200
30 meters	10	CFS-PR3032-100	30 meters	20	CFS-PR3053-200

ValcoPLOT S — *Divinylbenzene/4-vinyl-pyridine*

Fused silica

0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PS1532-100	15 meters	20	CFS-PS1553-200
30 meters	10	CFS-PS3032-100	30 meters	20	CFS-PS3053-200

TO ORDER
For prices or more information about your specific application, contact VICI Metronics:

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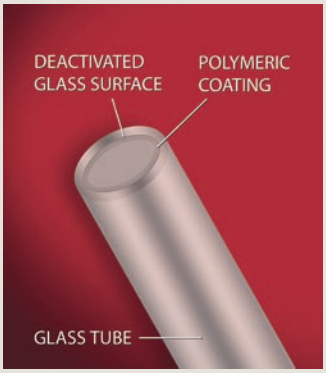
Reduced Breakdown Injection Port Liners



- Reduce breakdown of Endrin and DDT
- Increase the interval between liner changes

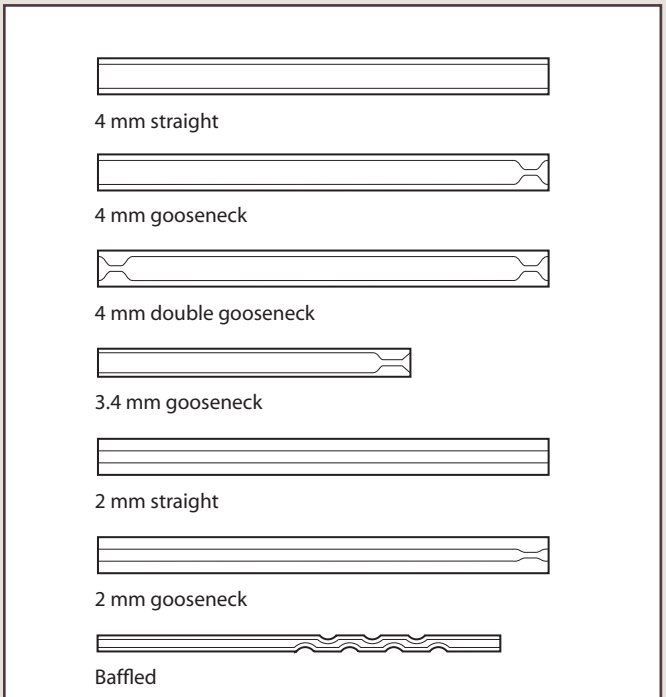
DDT and Endrin are easily degraded in the injection port; with non-deactivated liners and those filled with non-deactivated glass wool, Endrin breakdown can be as high as 98%. EPA method 8081A states, "If degradation of either DDT or Endrin exceeds 15%, take corrective action before proceeding with calibration."

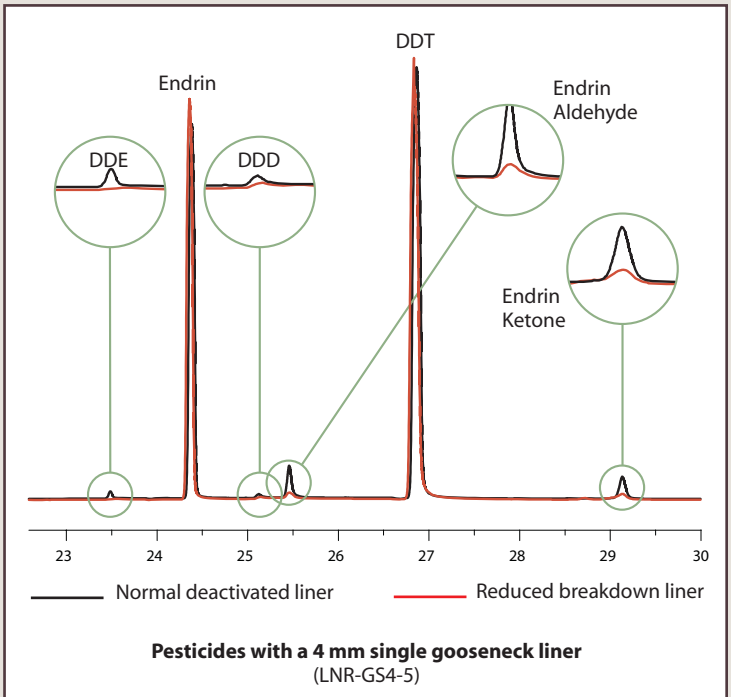
VICI reduced breakdown liners are produced by applying a highly-crosslinked siloxane over a conventionally deactivated liner. The resulting liner contributes less to breakdown than any other component of the injection system.

Reduced breakdown injection port liners

Package of 5 liners.

For injector	*Description*	*Prod No*
Agilent/Finnegan	2 mm straight splitless	LNR-HP2-5
	4 mm straight splitless	LNR-HP4-5
	2 mm gooseneck	LNR-GS2-5
	4 mm gooseneck	LNR-GS4-5
	4 mm double gooseneck	LNR-DGS4-5
Gerstel CIS-4/PTV	Baffled	LNR-CIS4-B-5
Varian CP-1177	2 mm gooseneck	LNR-VAR2-5
	4 mm gooseneck	LNR-VAR4-5
Varian 1078/1079	2 mm gooseneck	LNR-VARGS2-5
	3.4 mm gooseneck	LNR-VAR3.4-5





Pesticides with a 4 mm single gooseneck liner
(LNR-GS4-5)

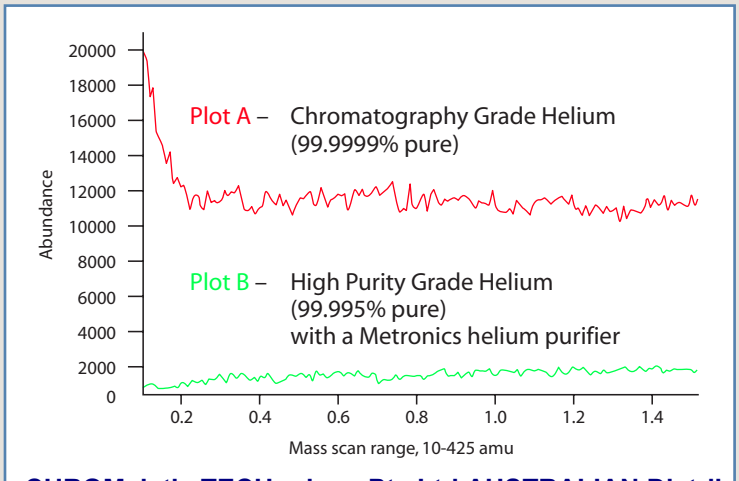
Gas Purifiers from VICI Metronics

Gas Specific Purifiers and Contaminant Traps

- Original equipment in Agilent® Mass Spec and LC Mass Spec
- Provide point-of-use gas purification of helium, hydrogen, methane, nitrogen, carbon dioxide, or air
- Reduce gas impurities from high PPM to low PPB levels
- Decrease baseline noise and increase GC/MS sensitivity
- Replace three traps with one purifier

Gas purity is critical to GC performance. Several types of contaminants are detrimental – notably moisture, hydrocarbons, and oxygen. VICI Metronics gas purifier modules are designed to be placed in-line with the GC carrier or detector gas supply to remove these contaminants from the analytical gases prior to their entering the GC. Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier.

VICI Metronics gas purifiers dramatically reduce contaminant levels and absorb a greater variety of contaminants than other gas purification products. Advanced materials and design features guarantee that the modules will produce gases that are at least a factor of ten higher than a 99.9999% "chromatography grade" cylinder of gas when the purifier is supplied by a 99.995% cylinder. The cost difference between the two grades of gas will pay for the cost of the gas purifier several times over during its operating life.



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For prices or more information about our gas purifiers, contact VICI Metronics:

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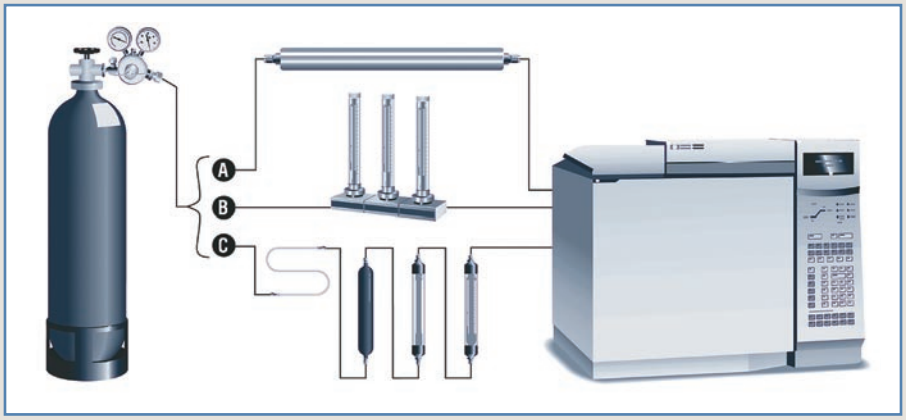
Fax. 360–697–6682

vicimetronics.com

Gas Specific Purifiers and Contaminant Traps

Every connection in your gas delivery system has the potential for leaks; the more fittings you have, the greater the potential. Using a VICI Metronics purifier or trap (A) minimizes the number of fittings as compared to a typical manifold system (B) or contaminant trap configuration with multiple components (C).



SPECS
22.5" long x 1.5" diameter (purifiers noted with * in the charts are are 12" long)
Max inlet pressure 1000 psi (6895 kPa)
Recommended flow 500 mL/min

Gas Specific Purifiers

Description	*1/8" fitting*	*1/4" fitting*
Helium purifier	P100-1	P100-2
Hydrogen purifier	P200-1	P200-2
Nitrogen purifier	P300-1	P300-2
Nitrogen purifier for LC/MS apps	P310-1	P310-2
Purifier for nitrogen generators	P350-1	P350-2
Air purifier	P400-1	P400-2
Methane purifier*	P500-1	P500-2
Carbon dioxide (gas) purifier	P600-1	P600-2
Carbon dioxide (liquid) purifier	P700-1	P700-2

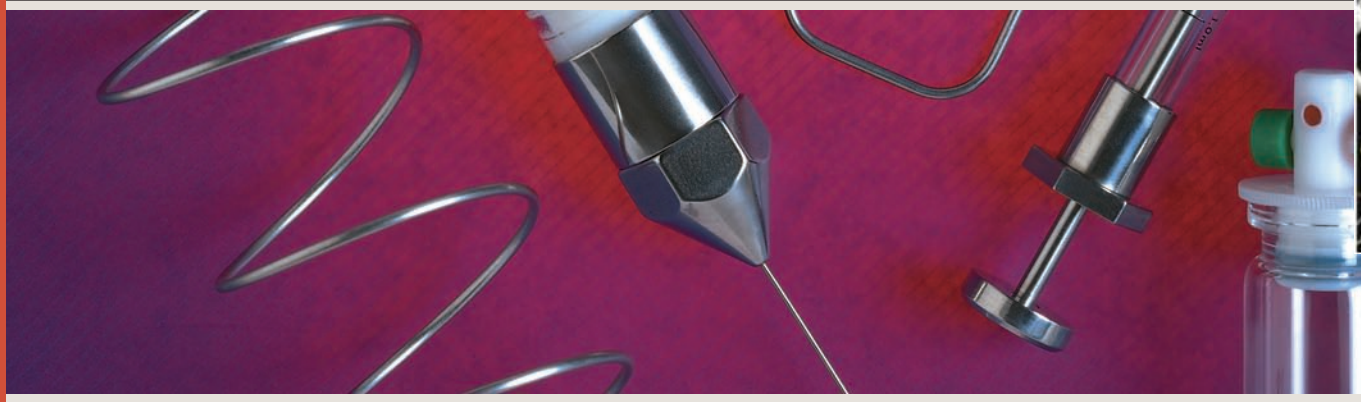
*12" long

Contaminant Traps

Description	*1/8" fitting*	*1/4" fitting*
Moisture trap	T100-1	T100-2
Hydrocarbon trap	T200-1	T200-2
Oxygen trap	T300-1	T300-2
Sulfur trap*	T400-1	T400-2
Sulfur trap	T401-1	T401-2
Mercury trap*	T700-1	T700-2

PPB at outlet *(based on 50 ppm nominal inlet concentration level)*

Description	*CO*	*CO_2*	*O_2*	*H_2O*	*Sulfur compounds*	*Non-methane hydrocarbons*
Helium purifier	<1	<1	<1	<1	<1	<3
Hydrogen purifier	<1	<1	<1	<1	<1	<3
Air purifier				<1		<3
Methane purifier	<1	<1	<1	<1	<1	<3
Nitrogen purifier	<1	<1	<1	<1	<1	<3
Nitrogen purifier for LC/MS apps				<25	<25	<25
Purifier for nitrogen generators				<25	<25	<25
Moisture trap				<1		
Hydrocarbon trap						<3
Oxygen trap			<1	<1		
Sulfur trap				<1	<1	



Analytical Syringes, Valves, Probes, and Custom Bent Tubing from VICI Precision Sampling

Micro Valves for GC and LC

- 200 psi, .060" bore
- Compact 1" design
- Convenient panel mount
- Variety of configurations

Simplify your liquid or gas handling application with a VICI Precision Sampling Micro valve. The unique design of the fitting detail allows a leak-free seal with no potential for rotor damage from overtightening. Internal parts are PEEK and PTFE.

(Fittings not included.
For example fittings, see page 68.)

Micro valves for GC and LC

1/4-28

	Prod No				
		3 PORT	4 PORT		
"T" flow path					
3 ports	660100			"T"	
4 ports	660110				
		2 PORT	4 PORT		
180° flow path					
2 ports	660200			180°	
4 ports	660210				
		2 PORT	3 PORT	4 PORT	
90° flow path					
2 ports	660300				90°
3 ports	660310				
4 ports	660320				

SPECS
200 psi
.060" bore
1/4-28 fitting detail
All polymer-based materials

MORE INFORMATION
1/4-28 fittings . . .pp 68-78

TO ORDER
Toll-free 800–828–1653
Tel 225–927–1128
Toll-free
fax 866–429–7741
Fax. 225–923–1331

FOR OUR COMPLETE LINE OF PRODUCTS
Visit our website at **vicipreciosionsampling.com** or call us for a catalog:

VICI Precision Sampling's patented Pressure-Lok® syringes feature a Teflon® (PTFE) plunger tip, stress-formed by a special process to assure a leak-tight seal. The self-lubricating plunger tip stays smooth for the life of the syringe, with none of the seizing or residue buildup associated with conventional all-metal plungers.

The needle is sealed by a PTFE sleeve or packing, which effectively isolates the sample from the needle cement, preventing any possible dissolution of the adhesive or contamination of the sample. All Pressure-Lok syringes feature ultra smooth bores, easily replaceable parts, low dead volume, crisp clean graduations, and precision calibration.

Series A-2

for GC

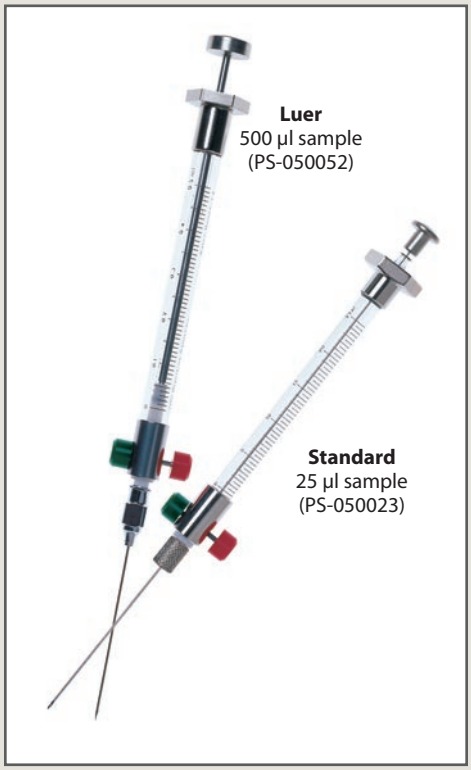
The A-2 features a push-button valve for 250 psi sample storage in syringes as small as 25 µl. Small liquid samples with low-boiling components are not lost through evaporation, as often occurs with ordinary syringes.

The positive rear stop (in 250 µl and larger sizes) prevents plunger blowout at elevated pressures. The Series A-2 syringe has all the standard Pressure- Lok features such as a PTFE plunger tip, PTFE-sealed needle, and ultrasmooth bore. Replacement components are available for easy repairs.

SPECS
Removable needles
Bevel, open end
Needle size:
.028" x .005" x 2" (25, 50, and 100 µl)
.029" x .012" x 2" (all other sample sizes)
250 psi max, gases and liquids

Sample size	Standard Prod No	Luer Prod No
25 µl	PS-050023	PS-050043
50 µl	PS-050024	PS-050044
100 µl	PS-050025	PS-050045
250 µl	PS-050031	PS-050051
500 µl	PS-050032	PS-050052
1 ml	PS-050033	PS-050053
2 ml	PS-050034	PS-050054
5 ml	PS-050035	PS-050055
10 ml	PS-050036	PS-050056

Replacement needles (Pkg/3) Size	Bevel, open end Prod No	Side port, taper Prod No
Pressure-Lok		
.028" x .005" x 2"	PS-943050	–
.029" x .012" x 2"	PS-943051	PS-943052
Luer		
.028" x .006" x 2"	PS-943060	–
.028" x .016" x 2"	PS-943061	PS-943062



SAFETY NOTE
To prevent possible injury, proper safety precautions should always be observed when pressurizing glass cylinders such as syringes.

Not for medical use.

NEEDLE TIPS


Blunt, open end


Bevel, open end


Side port, taper

Gas and Liquid Syringes

Series C-160 *for GC*

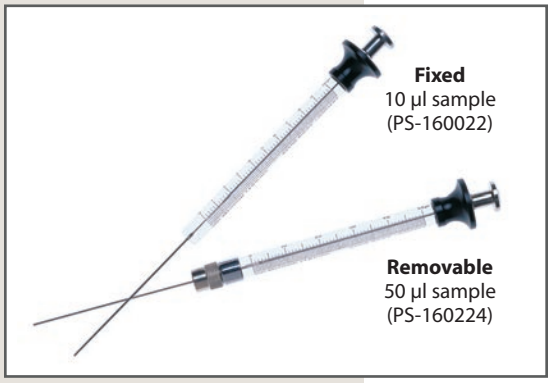
The C-160 offers day-in, day-out dependability at an economical price. A plunger tip of stress-formed virgin PTFE is self-lubricating and durable, and the PTFE needle seat at the rear of the needle prevents possible dissolution of the needle cement or contamination of the sample.

Choose between a fixed or removable needle version. Replacement needles are open end bevel type, sized .019" x .005" x 2.25", and come complete with an integral PTFE seal for a low dead volume connection and a leak-tight fit.

SPECS
Fixed and removable needles
Bevel, open end
Fixed needle size: .019" x .005" x 2"
Removable needle size: .019" x .005" x 2.25"
250 psi max, gases and liquids

Sample size	**Fixed needle** *Prod No*	**Removable needle** *Prod No*
5 µl	PS-160021	PS-160221
10 µl	PS-160022	PS-160222
25 µl	PS-160023	PS-160223
50 µl	PS-160024	PS-160224
100 µl	PS-160025	PS-160225

Replacement needles *(Pkg/3)*	**Bevel, open end**
Size	*Prod No*
.019" x .005" x 2.25"	PS-123050



MORE INFORMATION
Fill ports. . . . . page 40
Luer adapters 41

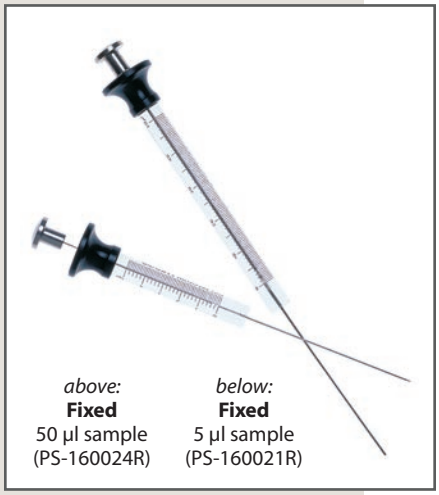
Syringes for Valco, Cheminert, and Rheodyne HPLC injectors

Syringes used to fill a loop on a sample injection valve have blunt, smooth ends. For a sample to be delivered with any repeatability, the end of the needle must contact the bottom of the valve's fitting detail uniformly and seal on the outside of the tip. All Precision Sampling syringes for valve injections have smooth, burr-free ends that fit the valve fitting details perfectly. The standard HPLC syringe is our basic C-160 with a 2" long 22 gauge blunt tip needle.

SPECS
Removable needles
Blunt tip, open end
Needle size: 22 gauge x 2"
250 psi max

Sample size	**Fixed needle** *Prod No*	**Removable needle** *Prod No*
5 µl	PS-160021R	PS-160221R
10 µl	PS-160022R	PS-160222R
25 µl	PS-160023R	PS-160223R
50 µl	PS-160024R	PS-160224R
100 µl	PS-160025R	PS-160225R

Replacement needles *(Pkg/3)*	
	Prod No
	PS-123050R



NEEDLE TIPS


Blunt, open end


Bevel, open end


Side port, taper

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FOR OUR COMPLETE LINE OF PRODUCTS
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Mininert Valves

Mininert push-button valves are highly dependable, leak-tight closures for screw-cap vials and other laboratory containers. When used with a glass vial, only PTFE and glass are in contact with the contents. Their unique features make Mininert valves the ideal closure for calibration standards, air- or moisture-sensitive fluids, derivatizing reagents, or volatile chemicals. Operation is extremely simple – push the green button to open the valve, insert the needle through the septum and take a sample, withdraw the needle, and push the red button to close the valve.

Valves for vials

The screw-cap Mininert is available in a variety of sizes. The crimp-top valve for 13 mm ID glassware slides into the neck of the vial and features a threaded flange which is turned to provide a leak-tight fit.

Pkg/12:	*Cap / thread size*	*Prod No*
	13 mm-425	PS-614158
	15 mm-425	PS-614160
	18 mm-400	PS-614161
	20 mm-400	PS-614170
	24 mm-400	PS-614163
	Crimp top	PS-614250

SPECS

TEMPERATU
Mininert valv
used at temp
to 105°F. How
use at high temperatures, the valve may leak slightly when cooled to room temperature.

MATERIALS
PTFE is highly inert and may be used with most common materials. It is particularly useful for working with most acids and organic solvents. However, problems may be encountered when used with organometallics and some strong bases. We recommend actual exposure tests before use with any material.

PRESSURE
The sealing ability of Mininert valves is more than adequate for containing most volatile liquids and gases at low pressures. Mininert valves have been used as high as 120 psi without leakage, but this is ***not*** a recommendation for pressurizing glass containers to these levels. Such pressurization of glass containers can be extremely dangerous.

Valves with threaded fittings

d control as
ion valve at
to male or
1/4-28 female to female. Termination valves are offered in 1/4-28 male or female and 1/8" NPT male or female.

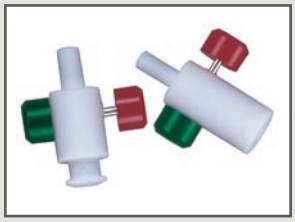
In-line valves	*Prod No*
1/4-28 male to male	PS-631205
1/4-28 female to female	PS-631206

Termination valves	
1/4-28 male	PS-631201
1/4-28 female	PS-631203
1/8" NPT male	PS-631202
1/8" NPT female	PS-631204

Replacement septa and septum installation tool

These silicone septa fit all Mininert valves. The installation tool is a handy device for quickly removing and replacing needle seal septa.

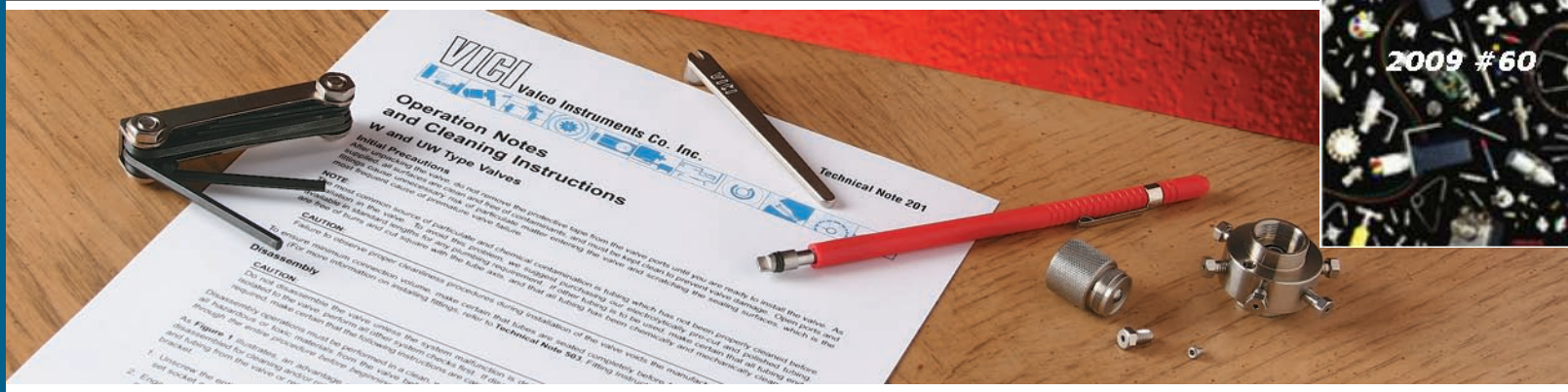
Septa, *pkg/50*	PS-644350
Installation tool	PS-644850



Mininert syringe valves

These convenient add-on valves allow our Series C and D syringes to store samples at up to 250 psi. The valve body is all PTFE, with a stainless steel stem. Also available to fit luer-tip syringes from any manufacturer. All accept traditional luer needles.

For C or D syringe	PS-654050
For Luer-tip syringe	PS-654051



General Reference

This section contains background information to supplement the product discussions on the preceding pages. You will find a glossary of terms, safety and trademark information, and discussions of the mechanical and chemical properties of the materials used in the manufacturing of our products. Additional information, including a complete library of technical notes and manuals, can be found in the support section of our website at **www.vici.com**.

Safety

Never tighten or loosen a fitting or valve connection while it is pressurized. Provisions should be made within the system to release pressure via suitable valve components.

2. Do not exceed pressure or temperature specifications. Note that in many cases, the system pressure is limited by the tubing used, not the fittings.
3. The use of toxic or hazardous fluids requires extra caution during operation or maintenance. The user is responsible for ensuring safe operation and for understanding the nature of the fluids and chemistry involved.
4. The use of thread lubricants or sealants is required only on tapered pipe threads. These sealants and lubricants may have different temperature limits or chemical compatibility than the valves or fittings.

CAUTION
The improper selection or use of components or systems described herein can cause personal injury or property damage.

The system designer and user are solely responsible for the selection of products suitable for the specific requirements of the application, as well as proper installation, operation, and maintenance of these products.

Compatibility with hazardous fluid streams, environmental conditions, and mechanical requirements are the responsibility of the user.

NORTH, CENTRAL, AND SOUTH AMERICA (except CANADA); AUSTRALIA and NEW ZEALAND

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Warranty

This Limited Warranty gives the Buyer specific legal rights, and a Buyer may also have other rights that vary from state to state.

For a period of 365 calendar days from the date of shipment, Valco Instruments Company, Inc. (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or nonconforming goods or parts without charge for material or labor OR at Seller's option demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods OR at Seller's option return of the goods and repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resulting from, or relating in any manner to these goods.

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items, such as but not limited to valve seals or ferrules. This warranty is VOID when repairs are performed by a non-authorized service center or representative.

If you have any problem locating an authorized service center or representative, please call, fax, or write the Service Department, listed at left.

At Seller's option, repairs or replacements will be made on site or at the factory. If repairs or replacements are to be made at the factory, Buyer shall return the goods prepaid and bear all the risks of loss until delivered to the factory. If Seller returns the goods, they will be delivered prepaid and Seller will bear all risks of loss until delivery to Buyer. Buyer and Seller agree that this Limited Warranty shall be governed by and construed in accordance with the laws of the State of Texas.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supersedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by the Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.

Properties of Metals

Stainless steel, Type 316

This is the standard tubing material for chromatography, suitable for a wide variety of applications. It is cold drawn seamless, not welded, with close tolerances held on both ID and OD. We neither recommend nor offer Type 304 stainless steel for analytical applications.

Austenitic stainless steels may be used for most chromatographic applications. Type 316 is most commonly used for HPLC because of its superior chloride ion resistance.

Stainless steel, Type 303

Recommended for GC use and general purpose connections, combining excellent machining characteristics with good resistance to corrosion and high temperature oxidation. Susceptible to attach by chlorides, iodides, and bromides.

Stainless steel, gold-plated

Improved inertness and high-integrity sealing for applications such as ultra pure gas analysis.

Electroformed nickel (EFNI)

We electroplate pure nickel over a diamond drawn mandrel in a continuous process, then carefully separate and remove the mandrel from the tubing. The result is an extremely inert and smooth interior surface (1–2 microinch finish). It is widely used for transfer lines, since it minimizes the potential for carryover or cross contamination often found with mill-drawn Nickel 200, due to its rough interior surface. Unlike glass- or silica-lined stainless, EFNI can easily accept tight bends and cutting without heating, and does not release damaging glass fragments or silica particles. Electroformed nickel has more in common with fused silica than drawn nickel tubing in terms of surface inertness and smoothness.

Hastelloy C® series

This is the material most often recommended for corrosion resistance – it works when nothing else will. This versatile nickel-chromium molybdenum alloy has excellent resistance to most acids, including strong oxidizers such as ferric and cupric chlorides; nitric, formic and acetic acids; wet chlorine; sea water and brine solutions; and mixtures containing nitric acid or oxidizing acids with chloride ions. VICI uses only HC-22 for fittings and valve stators, rather than the older and less corrosion resistant HC-276.

The best choice for most special applications where HPLC grade stainless cannot be used, Hastelloy C has excellent resistance to pitting, stress corrosion cracking, and oxidizing atmospheres up to temperatures well beyond any other standard components of the chromatographic system.

Inconel 600

One of the few metals which can be used with hot, strong solutions of magnesium chloride. Good for most severely corrosive environments at elevated temperatures. Resistant to sulfuric and hydrofluoric acid, and to all concentrations of phosphoric acid at room temperature. Poor resistance to nitric acid.

Monel 400

High resistance to hydrochloric, hydrofluoric, and sulfuric acid under reducing conditions. Attacked by oxidizing acid salts and hypochlorites. High resistance to chlorinated solvents and nearly all alkalis.

Nickel 200

Excellent resistance to caustics, high temperature halogens and hydrogen halides, and salts other than oxidizing halides. Good resistance to caustic soda and other alkalis except ammonium hydroxide.

The industry standard nickel alloy tubing, containing trace amounts of copper, carbon, silicon, and other elements which impart certain mechanical characteristics. Like our 316 stainless, this tubing is cold drawn to close ID and OD specifications, and is suitable for many applications where a relatively inert and low cost nickel is required. While more inert than 316 SS in most applications, it is still absorptive and has a relatively rough interior. Use electroformed nickel tubing for applications requiring a high level of inertness or finish.

Nitronic 50

Good resistance to chlorides, sulfuric acid, and sea water. Resistant to sulfur gases such as hydrogen sulfide and sulfur dioxide.

Nitronic 60

Chemical resistance is similar to Type 316 stainless, but its resistance to galling and oxidation make it superior to Type 316 or 303 in the majority of applications. This is the standard material in Valco and Cheminert metal valve lines.

MATERIAL AVAILABILITY BY PRODUCT LINE

Note: This list represents materials available in at least some of the products in the lines listed. Not all products in a line are available in all the materials mentioned.

Fittings

Cheminert
CTFE
PEEK
PFA
Polypropylene
Stainless steel, Type 316

Valco
300 series stainless steel
PEEK

Ferrules

Valco
CTFE
FEP
Hastelloy C
Nickel
PFA
Polyimide, graphite
Polyimide, Valcon
Polyimide, virgin
PTFE, virgin
PTFE, glass-filled
Stainless, Type 303
Stainless, Type 316
Stainless, gold-plated
Titanium
Brass

Cheminert
PEEK

Tubing

Electroformed nickel (EFNI)
ETFE
FEP
Hastelloy C
Nickel 200
PEEK
PTFE
Stainless steel, Type 316
Titanium

Valve rotors

Cheminert
Valcon E
Valcon E2
Valcon E3
Valcon H
Valcon M
Valcon P
Valcon T
Valcon TF

Diaphragm
A specialized polyimide

Valco
Valcon E
Valcon E2
Valcon H
Valcon M
Valcon P
Valcon R
Valcon T
Valcon TF

Valve stators/ bodies

Cheminert
CTFE
Hastelloy C
Nitronic 60 stainless
PAEK
PPS
PVDF
Stainless steel, Type 316
Titanium

Diaphragm
Hastelloy C
Nitronic 60
Stainless steel, Type 316

Valco
Hastelloy C
Inconel 600
Monel 400
Nickel 200
Nitronic 50
Nitronic 60
Stainless steel, Type 316
Titanium
Zirconium

Titanium

Although it is more difficult to machine than common alloys containing aluminum and vanadium, Valco uses Grade 2 pure titanium in order to avoid possible contamination of the sample stream with these metals.

Good for organic and inorganic salts except aluminum and calcium chlorides, and all alkalis except boiling concentrated potassium hydroxide. Good with dilute, low temperature formic, lactic, sulfuric, hydrochloric, and phosphoric acids, but rapidly attacked by hydrofluoric acid. Good with dilute nitric acid at low temperatures; corrodes at high concentrations and temperatures. Can ignite with fuming nitric acid. Attacked by oxalic acid, concentrated phosphoric acid, hot trichloroacetic acid, and zinc chloride.

Due to the nature of this metal, valves made of titanium typically have a shorter lifetime than HPLC grade stainless steel or Hastelloy C-22.

Zirconium

Excellent resistance to hydrochloric acid, good with hot sulfuric acid at concentrations up to 70% and boiling nitric acid at up to 90%. Attacked by hydrofluoric acid.

Brass

Used where a soft metal ferrule is desirable but no corrosive materials are present. Although Valco brass ferrules work as replacements in inexpensive commercial brass fittings, they are generally not recommended for chromatography applications.

Properties of Polymers

CTFE
Chlorotrifluoroethylene, is the generic name for the material produced as Kel-F® and as Aclar®. It is very resistant to all chemicals except THF and some halogenated solvents, and is resistant to all inorganic corrosive liquids, including oxidizing acids. CTFE can be used at temperatures up to 100°C. Swells in ketones.

ETFE
Ethyltrifluoroethylene is the generic name for the material such as Tefzel®. A fluoropolymer used for sealing surfaces, it is resistant to most chemical attack; however, some chlorinated chemicals will cause a physical swelling of ETFE tubing.

FEP
Fluorinated ethylene propylene is another member of the fluorocarbon family with similar chemical properties. It is generally more rigid than PTFE, with somewhat increased tensile strength. It is typically more transparent than PTFE, slightly less porous, and less permeable to oxygen. FEP is not as subject to compressive creep at room temperature as PTFE, and because of its slightly higher coefficient of friction is easier to retain in a compression fitting.

PAEK
Polyaryletherketone is the generic name for the family of polyketone compounds. (See PEEK.) PAEK includes PEK, PEEK, PEKK, and PEKEKK, which differ in physical properties and, to a lesser degree, in inertness.

VICI utilizes a range of proprietary PAEK-based composites (PEEK and others) for valve and fitting components. These composites resist all common HPLC solvents and dilute acids and bases. However, concentrated or prolonged use of halogenated solvents may cause the polymer to swell. Avoid concentrated sulfuric or nitric acids (over 10%).

PEEK
Considered relatively inert and biocompatible, polyetheretherketone tubing can withstand temperatures up to 100°C. Under the right circumstances, .005" – .020" ID tubing can be used up to 5000 psi for a limited time, and 0.030" to 3000 psi. Larger IDs are typically good to 500 psi. These limits are substantially reduced at elevated temperatures and in contact with some solvents or acids.

Its mechanical properties allow PEEK to replace stainless in many situations and in some environments where stainless would be too reactive. However, PEEK can be somewhat absorptive of solvents and analytes, notably methylene chloride, DMSO, THF, and high concentrations of sulfuric and nitric acid.

PEEK, glass-filled
This form of PEEK has better mechanical properties than natural PEEK, and performs extremely well in products such as ferrules.

PFA
Perfluoroalkoxy is a fluorocarbon with chemical and mechanical properties similar to FEP. More rigid than either PTFE or FEP. Commonly used for injection molded parts.

PPS
Polyphenylene sulphide is the generic name for the material produced as Fortron®, Ryton®, and others. It is very resistant to all solvents, acids, and bases.

PTFE
Polytetrafluoroethylene is the generic name for the class of materials such as Teflon®. It offers superior chemical resistance but is limited in pressure and temperature capabilities. Because it's so easy to handle, it is often used in low pressure situations where stainless steel might cause adsorption. PTFE tubing is relatively porous, and compounds of low molecular weight can diffuse through the tubing wall.

PTFE, glass-filled
This form of PTFE is nearly as inert as the virgin but is much more mechanically stable.

Polyimide, graphite
A graphite-filled polyimide. Due to its brittle nature, it is usually used only for reducing ferrules.

Polyimide, virgin
Not recommended for general use due to its tendency to be sticky and brittle at high temperatures. Often used as a high temperature electrical insulator.

Polyimide, Valcon
A high temperature (350°) graphite-reinforced polyimide composite used for all FS and FSR ferrules (fused silica adapters) and many standard ferrules. Valcon polyimide is specially prepared by a process know as Hot Isostatic Pressing (HIP) prior to being machined into individual adapters. This two step process yields a fused silica adapter with high temperature stability far exceeding that of parts produced by molding. It cannot be used with steam or with bases such as strong alkali and aqueous ammonia solutions.

Polypropylene
Widely used polymer for non-wetted parts. Attacked by strong oxidizers, aromatic and chlorinated hydrocarbons.

PVDF
PVDF, polyvinylidene fluoride, has excellent resistance to most mineral and organic acids, aliphatic and aromatic hydrocarbons, and halogenated solvents. Poor resistance to acetone, MEK, THF, and potassium and sodium hydroxide. Often supplied as Kynar®.

A variety of polymeric composites have been developed to meet a variety of customer requirements for rotors, since no single material will perform satisfactorily in all situations. This brief summary of each polymer's particular features and potential drawbacks is provided to allow the user to make a more informed valve selection. Consult our technical specialists for any additional questions. *VICI polymer composites are proprietary formulations: only the generic compound class can be discussed.*

The specifications in the following discussions are for two position valves. Multiposition selectors generally have lower pressure and temperature limits due to the more complex seal design. Actual specifications for each valve series are shown on the appropriate pages throughout the valve sections of the catalog. If a valve is to be used at a pressure higher than the given standard, please contact the factory for ordering information.

Valcon E

A polyaryletherketone/PTFE composite, the E material receives wide GC use in what had previously been a problematic gap between the optimum temperature ranges of P and T, and in HPLC applications where the temperature requirement is higher than what can be handled by the H material and where a lower pressure limit can be tolerated. (Standard specs are 400 psi at 225°C, but higher pressure ratings are possible at reduced temperatures.) However, this polymer cannot be used in prolonged contact with high concentrations of sulfuric and nitric acids, DMSO, THF, or liquid methylene chloride.

Valcon E2

A proprietary reinforced TFE composite, Valcon E2 works well at lower pressures and is suitable for temperatures up to 75°C. This material is resistant to most chemicals but should not be used in prolonged contact with high concentrations of sulfuric and nitric acids, DMSO, or liquid methylene chloride.

Valcon E3

This designation indicates a proprietary polyimide blend with chemical properties similar to Valcon T, but with higher compressive strength.

Valcon H

This composite, a carbon fiber reinforced, PTFE-lubricated inert engineering polymer, has long been the standard for typical HPLC applications in which pressures are around 5000 psi and temperatures are not more than 75°C. It is not unusual for these valves to be ordered for use at 7000 psi, and less frequently for use at 10,000 psi. However, at that point the lifetime may be shortened by as much as 50%.

Valcon H is the rotor material used in the W and UW series, where no rotor material letter is added (as: C10W or AC6UW).

Valcon M

This material, basically a hydrocarbon in structure, is the most impermeable to light gases of all the rotor materials currently available, with wide acceptance in low-temperature (50°C maximum) trace gas applications. Avoid use with aromatic hydrocarbons.

Valcon P

This composite, the majority of which is PTFE and carbon, was the standard choice for most GC applications before the development of Valcon E. (Standard specs are 400 psi at 175°C.) Routinely used at 1000 psi, 75°C, it can also be used at temperatures approaching 200°C with decreased sealing tension; however, at that point Valcon E is probably a better choice from a lifetime standpoint. Valcon E can replace P in most applications.

Valcon R

While rarely used today, Valcon R (a PTFE composite) still finds use in low temperature/pressure situations which require its nearly universal chemical inertness. Of the chemicals encountered in commercial practice, only molten sodium and fluorine at elevated temperatures and pressures produce any detrimental effects. Its most severe limitation is that it cannot go over 75°C, even at only 400 psi.

Valcon T

This polyimide/PTFE/carbon composite has been used successfully for many years and still cannot be surpassed when applications demand operating temperatures in the 250°C – 350°C range. (Standard specs for most series are 300 psi at 330°C.) However, at temperatures below 150°C there is a tendency for the seal material to stick to the valve body, making the valve difficult to turn and causing the rotor to crack in extreme cases. Literature provided at the time of purchase contains instructions for reconditioning the material if this condition should arise. The T material is susceptible to attack from steam, ammonia, hydrazines (anhydrous liquids or vapor), primary and secondary amines, and solutions having a pH of 10 or more. Chemical reagents which act as powerful oxidizing agents (nitric acid, nitrogen tetroxide, etc.) must also be avoided. Valcon T can be used in "hot" GPC/SEC applications with O-dichlorobenzene as a solvent.

Valcon TF

This is the series designation for a valve with a virgin PTFE seal. Its mechanical characteristics are poor compared to the other choices, but occasionally its use is dictated by the presence of oxidizing agents too strong even for the R material.

Glossary

A

Adapter: a type of fitting which provides a method of joining two components of differing thread types or systems.

Analytical column: a long narrow tube packed or coated with one of many available chemically diverse compounds that can separate the components in a sample according to their boiling point, polarity, molecular size, or combination thereof. A column of some kind is used with most chromatographic techniques.

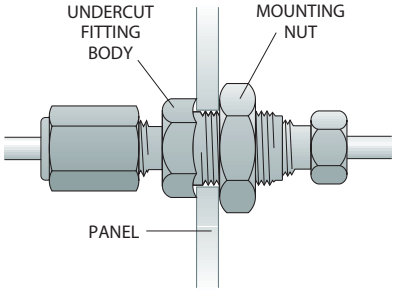
B

Backflush: the use of valving to reverse the flow through a column in order to "backflush" or purge heavier components from the column.

Biocompatibility: defines the materials used in a system (i.e. fittings, tubing, and valves) that do not change the bioactivity of the biological substances that come into contact with the surface of these materials. Note that in chromatographic systems, the tubing and column contribute over 99% of the surface area and the valves and fittings are insignificant.

Bore: the diameter of the minimum orifice through the fitting; see **capillary bore, through-type bore,** and **large bore**.

Bulkhead fitting: a type of fitting in which the fitting body is inserted through an instrument panel or mounting bracket, to which it is affixed with a mounting nut. The Valco fitting body is uniquely undercut so that it "bites" into the panel when the mounting nut is tightened, eliminating the need for a lock washer.



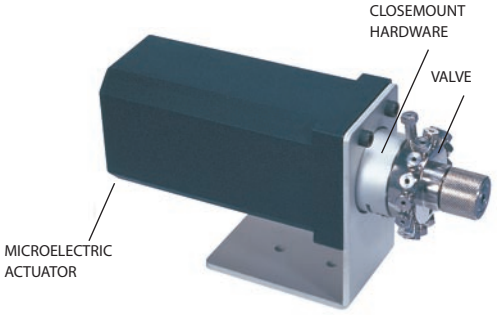
Butt connection: a type of connection in which the two tube ends are directly and squarely in contact, usually effected with a through-type union. Typically used with fused silica connections, or small bore metal tubing.

C

Cap: a cap is used to dead-end a piece of tubing with a nut ferrule attached.

Capillary bore: the smallest available standard orifice in a given fitting design (usually 0.25 mm). Typically denoted by suffix "C" in the product number.

Closemount hardware: the mounting components providing the most direct, shortest attachment of valve to actuator.



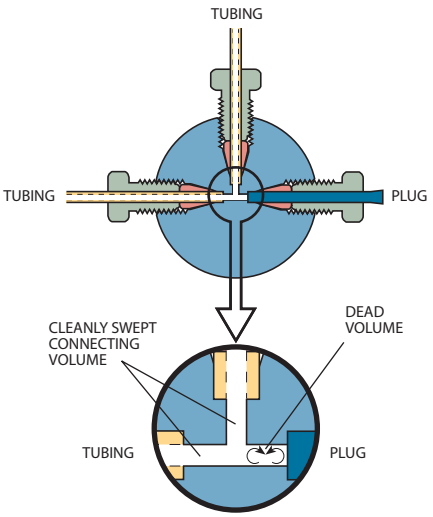
Compression fitting: a style of fitting in which a threaded nut compresses a tapered ferrule onto tubing as the nut is tightened. Valco metal ferrules cut a ring into the tubing wall while polymer types rely on surface compression to form a seal.

Connecting volume: the volume between two or more connections. This may be cleanly swept, thus not contributing to peak distortion, or may be "dead volume" such as that found in fittings with larger bores than the connecting tubing.

Cross: a type of distribution fitting which connects four pieces of tubing, arranging them in the pattern of a cross.

D

Dead volume: *(drawing at right)* any volume which a component introduces to a system that is not cleanly swept and relies on diffusion to clear the space. See **connecting volume**.

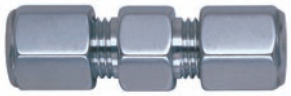


Detail: see **fitting detail**.

Distribution fitting: a generic term for tees, crosses, and manifolds, used to provide multiple access points to "distribute" a gas or liquid through a system. *CAUTION!* Using a distribution fitting in reverse to coalesce multiple streams may create dead volume. Special manifolds are available for this application.

E

External fitting: a type of compression fitting in which the fitting body has male threads; an external *nut* has female threads.



EXTERNAL UNION

EXTERNAL REDUCING UNION

F

FIA: Flow Injection Analysis. A simple and versatile analytical technique for automating wet chemical analyses based on the manipulation of a sample zone formed from the injection of the sample into a continuous stream of fluid used as a carrier.

Ferrule: one of the components of a compression fitting; the conical piece of metal or plastic that compresses onto the tube as it is forced into a tapered seat. Valco metal ferrules are unique in that they attach to and seal at the tube by cutting a shallow ring into it, instead of by actually swaging it. This is preferable since it introduces no flow restriction.

Filter: a type of union or reducing union which traps the particulates in a stream. The filtering element is typically a mesh screen or sintered frit.

Fitting detail: one of the components of a compression fitting; if the tube, nut, and ferrule comprise the male part of the fitting, the fitting detail is the female part. It includes the threads for the nut, the tapered ferrule seat, and the pilot.

Flanged fitting: a type of fitting used with fluoropolymer tubing (PTFE, FEP) in which a flange is made at the tube end. Connections are made at the flange either by compressing the flange into a flat detail (typically 1/4-28 threaded) or by butting two flanges together. A special flanging tool forms the flanges.

Flangeless fitting: similar in application to the flanged fitting, but the flange is not required. A ferrule system is used which grips/compresses the tube. This fitting type can be used with virtually any polymeric tubing since the tube end does not have to be formed, but simply square cut. Typically used in 1/4-28 threaded fittings, it is usually interchangeable with flanged fittings.

Frit: a filter element typically made of stainless, Hastelloy, Titanium, or polymers, usually 0.75 mm or 1 mm thick. Frits may provide better filtration than screens, but because they are thicker there is greater mixing potential, and they typically result in increased pressure drop.

G

GC: Gas Chromatography. An analytical method incorporating an injection system, analytical column, controlled temperature zone, and detector. An inert carrier gas moves the sample through the column, which separates the sample components into discrete bands which are measured as they pass through the detector.

Guard column: a column used in series between the injector and analytical column to prevent certain types of components from entering the analytical column.

H

HPLC: High Performance Liquid Chromatography. An analytical system consisting of an injector, pump, analytical column, and detector. Using a liquid mobile phase, the sample is pumped through the column, where it is separated into discrete sample component bands which are detected and measured as the bands elute from the column.

I

ID: internal diameter.

Inert: technically, unreactive with other substances; however, in the instrumentation field, "inert" is a relative term. Often polymers are termed inert but are soluble in some fluids and can react with some compounds.

Internal fitting: a type of compression fitting in which the fitting body has female threads; an internal *nut* has male threads.

INTERNAL UNION

INTERNAL REDUCING UNION

L

LC: Liquid Chromatography. Any of a variety of low to medium pressure techniques which use a liquid mobile phase as the carrier to move sample. Similar to HPLC.

Large bore: a bore that is larger than the standard for a given fitting; a fitting ordered with a large bore will have a larger flow orifice than the standard or capillary bore fitting of the same design. Denoted by suffix "L" in the product number.

Luer adapter: an adapter that connects a tapered luer fitting (square nib) of a syringe to a tube or tube fitting.

Glossary

M

Make up: the point at which a ferrule, nut, and tube are assembled in the fashion which will effect a leak-free seal. In most compression fittings, that is accomplished by compressing the tube with the small end of the ferrule. With Valco metal ferrules, the ferrule usually makes up on the tube by cutting a shallow ring in it.

Manifold: a type of distribution fitting in which a single source is directed to multiple outlets, or vice versa. *CAUTION!* Using a common distribution fitting in reverse to merge multiple streams may create dead volume. Special manifolds are available for this application.

Microbore column: a liquid chromatography column of narrow bore (typically 2 mm or less) for improved resolution.

N

Nanovolume: nanovolume generally refers to components with bore sizes less than 250 µm (0.010").

NPT: National Pipe Thread; a standardized tapered pipe fitting. See **pipe thread**.

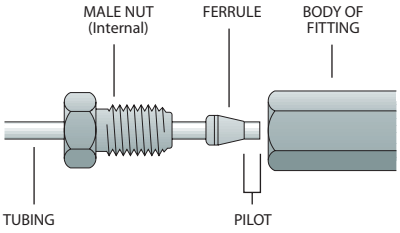
Nut: the tensioning component of a compression fitting. As the threaded nut is tightened into the fitting detail, it pushes the ferrule forward into the tapered ferrule seat, causing it to make up on the tube.

O

OD: outside diameter.

P

Pilot: the tubing which extends beyond the ferrule in a made-up fitting, or the integral portion of a ZRF internal reducing ferrule which extends beyond the ferrule. See also **pilot depth**.



Pilot depth: the length of the tubing diameter cavity beyond the tapered ferrule seat within a fitting detail. Valco fitting pilot depths are tightly controlled to facilitate the interchangeability of components without the risk of leaks or dead volume.

Pipe thread: the external or internal threads of a fitting designed to effect a metal-to-metal seal on the conical thread faces. This type of fitting does not "bottom out" in the detail. Typically used with PTFE tape or other compound to lubricate the threads; however, since the diffusion rate of air components through the PTFE tape is considerable, pipe fittings should not be used in systems where leakage rates are critical.

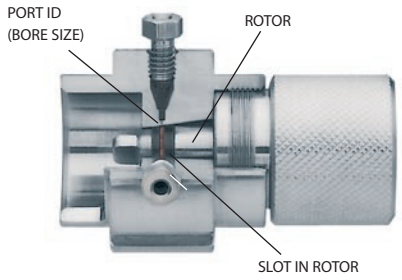
Port: the connection, orifice, seal, or septum, etc., through which sample may be added (injected) or withdrawn.

R

Reducing ferrule: a ferrule which allows a smaller tube to used in a fitting detail designed for a larger tube. Caution should be taken if standard reducing ferrules (RF) without integral pilots are used, since dead volume may be created in the fitting pilot depth.

Reducing union: a fitting which joins two tubes of different ODs. The bore of the fitting should typically match the ID of the smaller tube.

Rotor: the internal rotating part of a Valco valve. It contains the engraved slots which connect the ports on the stator or cap.



Rotor visible in cutaway valve

S

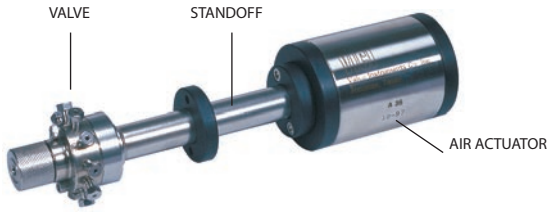
SFE: Supercritical Fluid Extraction. An extraction technique using a fluid in its supercritical state as the extraction medium. Some liquids and mixtures maintained above a critical temperature and pressure exhibit properties of both the liquid and gas phases of the element. These are defined as supercritical. CO_2 is a common supercritical fluid. Extreme caution must be used with supercritical CO_2, since uncontrolled expansion (leaks) can be very hazardous due to the substantial stored energy.

SFC: Supercritical Fluid Chromatography. An analytical technique using a supercritical fluid (see SFE) as the mobile phase/carrier.

Screen: a replaceable filter element generally made of Type 316 stainless steel, usually 0.003" thick. Screens clog less frequently than frits, and because they are thinner there is less mixing; however, they are less effective filters.

Sideloading: any force on the valve rotor other than the proper rotational force along the axis of the rotor, often resulting in leakage or increased wear. It is typically caused by actuation misalignment, over-rotation, or improper mounting of the valve.

Standard bore: a bore which was chosen as the standard for a particular fitting, typically based on the most common tubing ID used with that fitting.



Standoff: an extension between a valve and actuator which allows the valve to be installed in a different temperature zone from the actuator. Standoffs come in several different lengths.

Stator: the stationary component of a valve. Typically, it contains the fittings as well as one of the fluid sealing surfaces. In Valco valves, the stator is called the valve body.

T

Tee: a type of distribution fitting which connects three pieces of tubing, arranging them in the pattern of a "T".

Through-type bore: a bore which is slightly larger than the OD of the tubing which is used with the given fitting. A union with a through-type bore allows the tube ends to butt directly together, or for one tube to run completely through the fitting. Denoted by suffix "T" in the product number. In order to assure correct pilot lengths, we recommend that ferrules be made up on the tubing in a standard union.

U

Union: a fitting for connecting two pieces of tubing of the same OD.

Unswept volume: the volume of any portion of a fitting which is in the flowpath but which is a different diameter than the primary flow orifice through the tubing/fitting assembly, or any area not directly swept by the fluid flow. This can also be known as "dead volume" if it is very poorly swept.

W

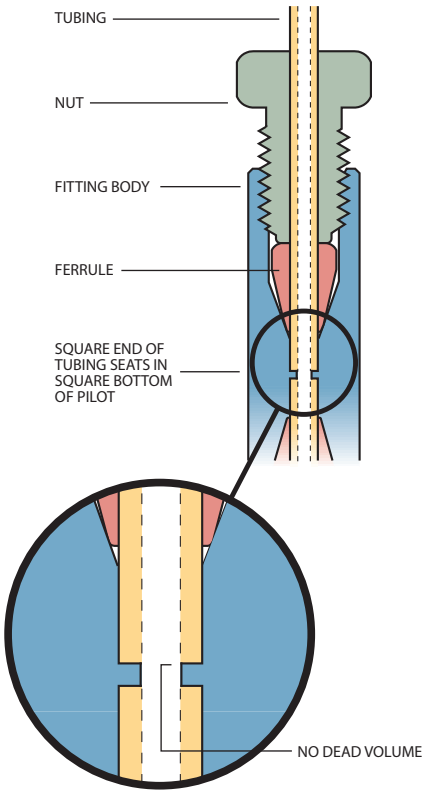
Wetted surfaces: the surfaces which are contacted by the sample stream.

Y

Y: a type of distribution fitting which connects three pieces of tubing, arranging them in the pattern of a "Y". Occasionally referred to as a "wye".

Z

Zero dead volume (ZDV): describes a connection which does not add volume to the system beyond what an extension of tubing would in its place.



Zero volume: while often used interchangeably with zero dead volume, it ideally describes a fitting design in which there is no internal volume, such as a through-type union designed to butt-fit two pieces of tubing.

Length, Pressure, and Temperature Conversions

LENGTH CONVERSIONS

mm	inches
0.12	.005"
0.15	.006"
0.25	.010"
0.40	.016"
0.50	.020"
0.75	.030"
1.0	.040"
1.5	.060"
2.0	.080"
4.6	.180"
6.0	.236"
6.4	.253"
7.0	.276"
10.0	.400"

inches	mm
1/32"	0.8
1/16"	1.6
1/8"	3.2
1/4"	6.4
3/8"	9.5
1/2"	12.7
1"	25.4

PRESSURE CONVERSIONS

psi	KPa	BAR	Atm	psi	KPa	BAR	Atm
1	6.8948	0.06895	0.06805	800	5515.84	55.16	54.44
10	68.948	0.6895	0.6805	825	5688.21	56.88375	56.14125
20	137.896	1.379	1.361	850	5860.58	58.6075	57.8425
30	206.844	2.0685	2.0415	875	6032.95	60.33125	59.54375
40	275.792	2.758	2.722	900	6205.32	62.055	61.245
50	344.74	3.4475	3.4025	925	6377.69	63.77875	62.94625
60	413.688	4.137	4.083	950	6550.06	65.5025	64.6475
70	482.636	4.8265	4.7635	975	6722.43	67.22625	66.34875
80	551.584	5.516	5.444	1000	6894.8	68.95	68.05
90	620.532	6.2055	6.1245	1100	7584.28	75.845	74.855
100	689.48	6.895	6.805	1200	8273.76	82.74	81.66
125	861.85	8.61875	8.50625	1300	8963.24	89.635	88.465
150	1034.22	10.3425	10.2075	1400	9652.72	96.53	95.27
175	1206.59	12.06625	11.90875	1500	10342.2	103.425	102.075
200	1378.96	13.79	13.61	1600	11031.68	110.32	108.88
225	1551.33	15.51375	15.31125	1700	11721.16	117.215	115.685
250	1723.7	17.2375	17.0125	1800	12410.64	124.11	122.49
275	1896.07	18.96125	18.71375	1900	13100.12	131.005	129.295
300	2068.44	20.685	20.415	2000	13789.6	137.9	136.1
325	2240.81	22.40875	22.11625	2500	17237	172.375	170.125
350	2413.18	24.1325	23.8175	3000	20684.4	206.85	204.15
375	2585.55	25.85625	25.51875	3500	24131.8	241.325	238.175
400	2757.92	27.58	27.22	4000	27579.2	275.8	272.2
425	2930.29	29.30375	28.92125	4500	31026.6	310.275	306.225
450	3102.66	31.0275	30.6225	5000	34474	344.75	340.25
475	3275.03	32.75125	32.32375	5500	37921.4	379.225	374.275
500	3447.4	34.475	34.025	6000	41368.8	413.7	408.3
525	3619.77	36.19875	35.72625	6500	44816.2	448.175	442.325
550	3792.14	37.9225	37.4275	7000	48263.6	482.65	476.35
575	3964.51	39.64625	39.12875	7500	51711	517.125	510.375
600	4136.88	41.37	40.83	8000	55158.4	551.6	544.4
625	4309.25	43.09375	42.53125	8500	58605.8	586.075	578.425
650	4481.62	44.8175	44.2325	9000	62053.2	620.55	612.45
675	4653.99	46.54125	45.93375	9500	65500.6	655.025	646.475
700	4826.36	48.265	47.635	10,000	68947.6	689.48	680.46
725	4998.73	49.98875	49.33625	15,000	103,421.4	1,034.21	1,020.69
750	5171.1	51.7125	51.0375	20,000	137,895.1	1,378.95	1,360.9
775	5343.47	53.43625	52.73875	40,000	275,790.3	2,757.9	2,721.84

TEMPERATURE CONVERSIONS

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-40	-40	35	95	110	230	185	365	260	500	335	635	650	1202
-35	-31	40	104	115	239	190	374	265	509	340	644	675	1247
-30	-22	45	113	120	248	195	383	270	518	345	653	700	1292
-25	-13	50	122	125	257	200	392	275	527	350	662	725	1337
-20	-4	55	131	130	266	205	401	280	536	375	707	750	1382
-15	5	60	140	135	275	210	410	285	545	400	752	775	1427
-10	14	65	149	140	284	215	419	290	554	425	797	800	1472
-5	23	70	158	145	293	220	428	295	563	450	842	825	1517
0	32	75	167	150	302	225	437	300	572	475	887	850	1562
5	41	80	176	155	311	230	446	305	581	500	932	875	1607
10	50	85	185	160	320	235	455	310	590	525	977	900	1652
15	59	90	194	165	329	240	464	315	599	550	1022	925	1697
20	68	95	203	170	338	245	473	320	608	575	1067	950	1742
25	77	100	212	175	347	250	482	325	617	600	1112	975	1787
30	86	105	221	180	356	255	491	330	626	625	1157	1000	1832

PATENTS

Among important US patents held by VICI are the following. Others are pending and may have been granted by the time of publication.

6,575,501	Collapsible bushing
6,247,731	Nut w/ controlled radius
6,511,528 6,099,619 5,858,068	Purification of CO_2
6,074,459	Ultra pure gas process
6,193,213	XL valves
6,030,436	Permeation tube
6,202,698	Diaphragm valve
5,153,519 5,317,271 5,394,090 5,394,091 5,394,092 5,541,519 5,532,599 5,528,150 5,594,346 5,767,683 5,858,068 6,133,740 6,842,008 6,933,771 7,091,044	Pulsed discharge detectors
5,234,235 4,991,883	Fused silica unions
5,329,966	Calibrated flow controllers
4,064,908	Combo valves
4,173,363 4,281,679	Internal reducers, filters, external reducers, and precolumns
4,196,654	Air actuators
4,022,065	HPLC injectors
5,741,126	Pump
7,316,777	No-twist one-piece fitting

TRADEMARKS

Cheminert	Valco Instruments Co. Inc. and VICI AG International
Condyne	VICI Metronics Inc.
Delrin	E.I. duPont de Nemours
Dynacal	VICI Metronics Inc.
Dynacalibrator	VICI Metronics Inc.
Fortron	Celanese
Hamilton	Hamilton
Hastelloy C	Haynes International
HayeSep	Hayes Separations, Inc.
IBM	International Business Machines
Inconel 600	Huntington Alloys, Inc.
Kalrez	DuPont Dow Elastomers
Kel-F	3M Company
Kynar	Elf Atochem North America Inc.
Metronics	VICI Metronics Inc.
Micro-Flo	Valco Instruments Co. Inc.
Mininert	Valco Instruments Co. Inc.
Monel 400	Huntington Alloys, Inc.
Nanovolume	Valco Instruments Co. Inc.
Nickel 200	Huntington Alloys, Inc.
Nitronic	Armco (AK Steel)
Parker	Parker Hannifin co.
Perifit	Valco Instruments Co. Inc.
Pressure-Flo	Valco Instruments Co. Inc.
Pressure-Lok	Valco Instruments Co. Inc.
Ryton	Phillips Petroleum Co.
Swagelok	Crawford Fitting Company
Teflon	E.I. duPont de Nemours
Tefzel	E.I. duPont de Nemours
Tygon	Norton Performance Plastics
ValcoBond	Valco Instruments Co. Inc.
ValcoPLOT	Valco Instruments Co. Inc.
Vespel	E.I. duPont de Nemours
Viton	DuPont Dow Elastomers
VICI	Valco Instruments Co. Inc. and VICI AG International
VICI Jour	Valco Instruments Co. Inc. and VICI AG International
Waters	Waters Associates

Decoding Cheminert Valve Product Numbers

Cheminert valve product numbers all begin with the valve model (C1, C22, C25Z, C72MU, etc.) and a hyphen. Following the valve model are four numbers – as shown at right, the position of each number determines the category of the specification; the number indicates the actual spec.

The final letters indicate actuatio
Internal sample injectors also inc
the sample size. (Keep in mind th
some combinations are not possible,
so check with sales for your actual
requirements.)

NOTE!
This chart is for decoding existing product numbers, ***not*** for inventing new ones. Some options can not work with certain valve types and designs!

VALVE TYPE

1. **Required**.

Nanovolume injectors

C72MH	*NEW*	10k psi	UHPLC injector, 360 µl fittings
C72MX	*NEW*	15k psi	UHPLC injector, 360 µl fittings
C72MU	*NEW*	20k psi	UHPLC injector, 360 µl fittings
C72NH	*NEW*	10k psi	UHPLC injector, 1/32" fittings
C72NX	*NEW*	15k psi	UHPLC injector, 1/32" fittings
C72NU	*NEW*	20k psi	UHPLC injector, 1/32" fittings
C74NX	*NEW*	15 psi	UHPLC internal sample injector, 1/32" fittings
CN2		5k psi	HPLC injector, 1/32" fittings
CN4		5k psi	HPLC internal sample injector, 1/32" fittings

UHPLC and HPLC injectors

C72H	*NEW*	10k psi	UHPLC microbore injector
C72X	*NEW*	15k psi	UHPLC microbore injector
C72U	*NEW*	20k psi	UHPLC microbore injector
C74H	*NEW*	10k psi	UHPLC internal sample injector
C74X	*NEW*	15k psi	UHPLC internal sample injector
C1		5k psi	Through-the-handle injector
C1CF		5k psi	Continuous flow through-the-handle injector
C2		5k psi	Microbore/analytical valve
C4		5k psi	Internal sample injector
C6		5k psi	Continuous flow injector

Low pressure injectors

C22Z		Injector with Valco ZDV fittings
C22		Injector with 1/4-28 fittings
C24Z		Internal sample injector, Valco ZDV fittings
C24		Internal sample injector, 1/4-28 fittings

Nanovolume selectors

C75NH	*NEW*	10k psi	UHPLC selector, 1/32" fittings
C75NX	*NEW*	15k psi	UHPLC selector, 1/32" fittings
C75NU	*NEW*	20k psi	UHPLC selector, 1/32" fittings
C75H	*NEW*	10k psi	UHPLC selector, 1/16" fittings
C75X	*NEW*	15k psi	UHPLC selector, 1/16" fittings
C75U	*NEW*	20k psi	UHPLC selector, 1/16" fittings

Selectors

C5	5k psi	HPLC stream selector
C25Z		Low pressure stream selector, Valco ZDV fittings
C25		Low pressure stream selector, 1/4-28 fittings
C35Z		Low pressure stream selector, Valco ZDV fittings
C45		Low pressure stream selector, 1/2-20 fittings

OEM injectors

C2V		5k psi	Vertical port injector
C3		5k psi	Centered port injector
C52	*NEW*	5k psi	HPLC integrated motor/valve
C52V	*NEW*	5k psi	HPLC integrated motor/valve with vertical port injector
C62Z	*NEW*	Low pressure integrated motor/valve, Valco ZDV fittings	
C62	*NEW*	Low pressure integrated motor/valve, 1/4-28 fittings	

OEM selectors

C55	*NEW*	5k psi	HPLC integrated motor/valve selector
C65Z	*NEW*	Low pressure integrated motor/valve selector, Valco ZDV fittings	
C65	*NEW*	Low pressure integrated motor/valve selector, 1/4-28 fittings	

- (HYPHEN)

2. **Required**.

Place a hyphen after the Cheminert valve type.

Decoding Cheminert Valve Product Numbers

Examples:

C1 - 1346

C1-1346: C1 through-the-handle injector, 0.25 mm ports, Valcon E rotor, PAEK stator, 6 ports, manual (blank = manual)

C5 - 2006EMH

C5-2006EMH: C5 stream selector, 0.40 mm ports, Valcon H rotor, Nitronic 60 stator, 6 positions, microelectric actuator

C22Z - 3180EH

C22Z-3180EH: C22Z low pressure injector with ZDV fittings, 0.75 mm ports, Valcon E2 rotor, PPS stator, 10 ports, microelectric actuator

C74NX - 6694-.01E

C74NX-6694-.01E: C74NX UHPLC nanovolume internal sample injector, 150 micron ports (.006"), Valcon E3 rotor, coated stainless stator, 4 ports, 10 nl internal sample size, standard electric actuator

PORT SIZE

3. **Required.**

0	0.15 mm (.006")
1	0.25 mm (.010")
2	50 µm (.002")* or 0.40 mm (.016")
3	0.75 mm (.030")
4	100 µm (.004")* or 1.00 mm (.040")
5	1.25 mm (.050")
6	150 µm (.006")* or 1.50 mm (.060")
7	2.00 mm (.080")
8	3.18 mm (.125")
9	4.60 mm (.180")

* for nanovolume valves

ROTOR MATERIAL

4. **Required.**

0	Valcon H
1	Valcon E2
2	Valcon T
3	Valcon E
4	Valcon M
5	[not used]
6	Valcon E3
7	Valcon TF
8	Valcon P

STATOR MATERIAL

5. **Required.**

0	Nitronic 60
1	CTFE
2	Hastelloy C **
3	Titanium **
4	PAEK
5	Valcon E4
6	[not used]
7	PVDF
8	PPS
9	Coated stainless

** These stator materials are coated when in a C72 / C74 / C75 series valve

PORTS / POSITIONS

6. **Required.**

Ports
(Two position)

4	4
6	6
8	8
0	10

Positions
(Selectors)

4	4
6	6
8	8
0	10
14	14
20	20
24	24
26	26

INTERNAL SAMPLE SIZE

7. Optional.
For internal sample inj.

.004	0.004 µl (4 nl)
.01	0.01 µl (10 nl)
.02	0.02 µl (20 nl)
.05	0.05 µl (50 nl)
.1	0.1 µl
.2	0.2 µl
.5	0.5 µl
1	1.0 µl
2	2.0 µl

Put a hyphen (-) before the sample size in the product number.

ACTUATOR

8. **Required.**

A	Air
E	Standard electric
	Microelectric, two position
EQ	• highest speed
EH	• high speed
EP	• medium torque
ED	• high torque
ET	• highest torque
	Microelectric, for selectors
EMH	• high speed
EMT	• high torque
[blank]	Manual
D	Driver only (for use with existing actuator)

NOTE!
This chart is for decoding existing product numbers, ***not*** for inventing new ones. Some options can not work with certain valve types and designs!

Decoding Valco Two Position Valve Product Numbers

2

The simplest way to determine a **Valco two position valve** product number is to call our sales department and discuss the features you require. But if you want to decipher an existing product number, refer to this chart and the examples on the facing page for guidelines. (Keep in mind that some combinations are not possible, so check with sales for your actual requirements.)

Every letter and number has a meaning in its proper order and sequence. The shaded columns indicate codes that are required in every product number, and the non-shaded columns offer possibilities of optional features.

NOTE!
This chart is for decoding existing product numbers, ***not*** for inventing new ones. Some options can not work with certain valve types and designs!

ACTUATOR	STANDOFF ASSEMBLY LENGTH	BORE SIZE	FITTINGS SIZE	INTERNAL SAMPLE INJECTOR
1. **Required**. Valve is shipped with manual knob unless specified otherwise.	2. Optional. Specify if required.	3. Optional. For standard bore, leave blank.	4. **Required**. For 1/8" fittings, leave blank.	5. Optional. Requires 4 ports. Also specify sample size (9).
A Air (0-70°C) AT Air (50-150°C) E Standard electric Microelectric EH • high speed EP • medium torque ED • high torque ET • highest torque [blank] Manual D Driver only (for use with existing actuator)	2 2" standoff 3 3" standoff 4 4" standoff 6 6" standoff	[blank] Standard bore L Large bore	N 1/32" C 1/16" [blank] 1/8" VL 1/4"	I

Decoding Valco Two Position Valve Product Numbers

Examples:

4 N 8 W T

4N8WT: Manual (blank = manual), 4" standoff, standard bore, 1/32" valve, 8 ports, W type, Valcon T rotor, standard Nitronic 60 body

EH C I 4 W E .1

EHCI4WE.1: Microelectric actuator, no standoff assembly, standard bore, 1/16" valve, internal sample, 4 ports, W type, Valcon E rotor, standard N60 body, 0.1 µl sample

A 3 6 UW P HC

A36UWPHC: Air actuator, 3" standoff, standard bore, 1/8" (blank = 1/8"), 6 ports, UW type, Valcon P rotor, Hastelloy C body material

E 2 L 6 UW P

E2L6UWP: Standard electric actuator, 2" standoff, large bore (.067" instead of .030"), 1/8" (blank = 1/8"), 6 ports, UW type, Valcon P rotor, standard Nitronic 60 body

NUMBER OF PORTS	VALVE TYPE	ROTOR MATERIAL	SPECIAL BODY MATERIAL	INTERNAL SAMPLE SIZE
6. **Required.**	7. **Required.**	8. **Required.**	9. Optional. Body material is Nitronic 60 SS unless specified otherwise.	10. Optional. Also specify "I" at Item 5.
3	W	[blank] Valcon H	S6 Type 316 SS	0.06 µl
4	UW	E Valcon E	HC Hastelloy C	0.1 µl
6	MW	E2 Valcon E2	IN Inconel 600	0.2 µl
8		M Valcon M	M4 Monel 400	0.5 µl
10		P Valcon P	NI Nickel 200	1.0 µl
12		R Valcon R	N5 Nitronic 50	2.0 µl
14		T Valcon T	TI Titanium	
		TF Valcon TF		

NOTE!
This chart is for decoding existing product numbers, ***not*** for inventing new ones. Some options can not work with certain valve types and designs!

Decoding Valco Selector Product Numbers

Product numbers for **Valco selectors**, like those for two position valves, are composed of letters and numbers which have their meaning based on the position in the product number. The simplest way to determine a Valco valve product number is to call our sales department and discuss the features you require. The chart below and the examples opposite may help decode the product number you have, or direct you toward all the featu you must specify for a selector. (K in mind that some combinations not possible, so check with sales for your actual requirements.)

The shaded columns indicate codes that are required in every product number, and the non-shaded columns offer possibilities of optional features.

NOTE!
This chart is for decoding existing product numbers, ***not*** for inventing new ones. Some options can not work with certain valve types and designs!

ACTUATOR	STANDOFF ASSEMBLY LENGTH	BORE SIZE	FITTINGS SIZE	FLOWPATH
1. **Required.** Valve is shipped with manual knob unless specified otherwise.	2. Optional. Specify if required.	3. Optional. For standard bore, leave blank.	4. **Required.** For 1/8" fittings, leave blank.	5. **Required.**
A Air (0-70°C) AH Air, high torque AT Air (50-150°C)	2 2" standoff	[blank] Standard bore	C 1/16"	SD
E Standard electric	3 3" standoff	L Large bore	[blank] 1/8"	SC
Microelectric EMH • high speed EMT • high torque	4 4" standoff		VL 1/4"	SF
[blank] Manual	6 6" standoff			ST
D Driver only (for use with existing actuator)				STF

Examples:

A 2 VL SC 6 MW E2

A2VLSC6MWE2: Air actuated, 2" standoff, 1/4" valve, SC flowpath, 6 positions, MW type, Valcon E2 rotor, standard Nitronic 60 body

EMT 4 C SD 4 UW

EMT4CSD4UW: Microelectric actuator, 4" standoff, 1/16" valve, SD flowpath, 4 positions, UW type, Valco H (blank = H) rotor, standard N60 body

E 3 ST 10 MW T HC

E3ST10MW5HC: Standard electric actuator, 3" standoff, 1/8" (blank = 1/8") valve, ST flowpath, 10 positions, MW type, Valcon T rotor, Hastelloy C body

NUMBER OF POSITIONS	VALVE TYPE	ROTOR MATERIAL	SPECIAL BODY MATERIAL
6. **Required.**	7. **Required.**	8. **Required.**	9. Optional. Body material is
6	Low pressure	E Valcon E	HC Hastelloy C
8	UW high pressure	E2 Valcon E2	IN Inconel 600
10		M Valcon M	M4 Monel 400
12		P Valcon P	NI Nickel 200
16		R Valcon R	N5 Nitronic 50
		T Valcon T	TI Titanium
		TF Valcon TF	

NOTE!
This chart is for decoding existing product numbers, ***not*** for inventing new ones. Some options can not work with certain valve types and designs!

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