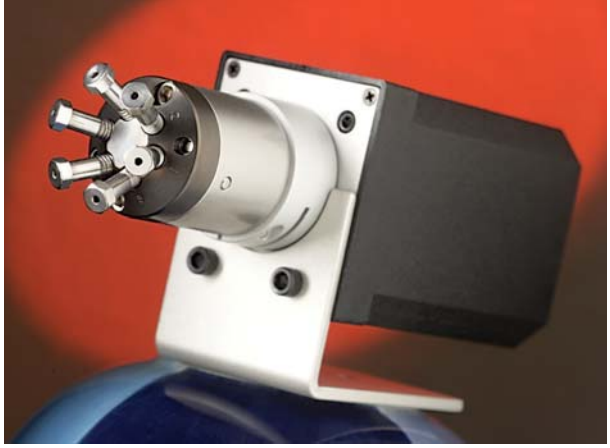




VALCO CHEMINERT CATALOG

VICI

TOOLS FOR SCIENCE AND MEDICINE

INJECTORS
VALVES
DETECTORS
FITTINGS
SYRINGES
TUBING

CATALOG 65 INT





CONTENTS


2 **New products**



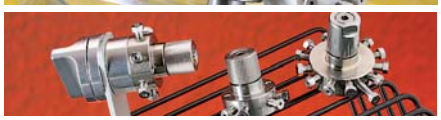
6 **Valco fittings**


56 **Cheminert fittings**


82 **Liquid handling**


86 **Tubing**


96 **Valve selection**


98 **Valco injectors and valves**

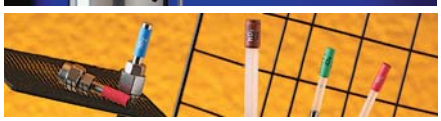

142 **Diaphragm valves**

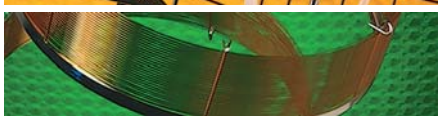

146 **Cheminert injectors and valves**


188 **Actuators and accessories**

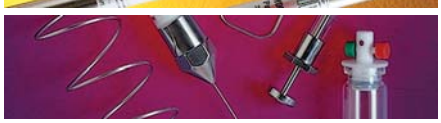

212 **Flow, pressure, and on-off controllers**


220 **Instrumentation**


228 **Calibration gas standards** from VICI Metronics


234 **GC capillary columns** from VICI Metronics


246 **Gas purification** from VICI Metronics


248 **Syringes** from VICI Precision Sampling

252 **General reference**

270 **Index by product number**

286 **Index by name of product**

IBC **Ordering information**

Certified Management System SQS ISO 9001 / ISO 14001

To order

EUROPE, MIDDLE EAST, ASIA, and AFRICA

VICI AG International

Sales + 41 41 925 6200
Fax + 41 41 925 6201
Email order@vici.ch

Parkstrasse 2
CH-6214 Schenkon
Switzerland

NORTH AMERICA (except Canada), **SOUTH and CENTRAL AMERICA, AUSTRALIA and NEW ZEALAND**

VICI Valco Instruments Co. Inc.

Sales (713) 688-9345
(800) 367-8424 *
**USA and Canada only*
Fax (713) 688-8106
Email sales_usa@vici.com

P.O. Box 55603
Houston, TX 77255
USA

CANADA

VICI Valco Instruments Canada

Phone (866) 297-2626
(613) 342-2600
Fax: (613) 342-0111
Email canada@vici.com

26 Water Street East
Brockville, Ontario
Canada K6V 1A1

REGULATIONS

CE RoHS REACH

As a worldwide supplier of products for the analytical instrument market, we work hard to make sure those products comply with regulatory requirements around the world. All machined products (valves, fittings, etc.) are *fully* RoHS/REACH/WEEE compliant. Most of the electrical products we manufacture are also CE tested and certified. Only a few legacy products are not CE certified.

See page 263 for a list of non-CE items.

Welcome to VICI

VICI is an acronym for Valco Instruments Company Inc. VICI now defines multiple companies which manufacture various products for the analytical industry.

VICI Valco Instruments

For over 40 years, Valco Instruments has been the leading designer and manufacturer of standard and custom components for precision analytical, biomedical, and biocompatible instrumentation. In addition to Valco and Cheminert® valves and fittings, we offer a wide range of related products such as electric and pneumatic actuators, tubing and sampling loops, heated enclosures, valve sequence and temperature controllers, gas purifiers, GC detectors, and digital interfaces.



Fafnir, one of a long line of Valco Saint Bernards, at the Houston, Texas office

VICI AG International

VICI AG International, in Schenkon, Switzerland, is an independent site for the manufacturing of Valco and Cheminert valves and the handling of all VICI product lines in Europe, Africa, the Middle East, and the Far East. Present certification is ISO 9001:2008 and 14001:2004.

VICI Metronics

VICI Metronics, Inc. is the leading manufacturer of devices and instruments that are used in the generation of calibration gas standards. The line includes Dynacal and G-Cal permeation tubes, Dynacalibrator calibration gas generators, and gas monitors. Metronics is the leading provider of explosives, narcotics, and chemical warfare dopants for TSA airport security (ammonia, DCM), law enforcement, border patrol, military, and other trace detection industry professionals.

We offer high performance gas specific purifers suitable for use in GC/MS and LC/MS systems. The helium, hydrogen, nitrogen, and air purifiers remove sulfur and nitrogen compounds, halocarbons, hydrocarbons, moisture, oxygen, and other contaminants.

The Metronics facility also houses production of and support for Valco-Bond and ValcoPLOT capillary columns.



Our engineering/development facility on Waterbury Drive in Houston



VICI AG International in Schenkon, Switzerland



VICI Metronics
Poulsbo, Washington

VICI Precision Sampling

Your resource for syringes, Mininert® valves, probes, and tubing. Our pre-cut stainless steel tubing is available in standard lengths, or cut and bent to your specifications. All our syringes feature ultra smooth bores, easily replaceable parts, low dead volume, crisp clean gradations, and precision calibrations.

VICI Valco Canada

Products from all VICI companies are available in Canada directly from this location. We also supply and support our Canadian dealers and OEMs.



VICI Precision Sampling
Baton Rouge, Louisiana



VICI Valco Canada
Brockville, Ontario

CONTACT US

See box on facing page for:
VICI Valco Instruments
VICI AG International
VICI Valco Canada

VICI Metronics
Tel (877) 737-1887
(360) 697-9199
Fax (360) 697-6682
Email metronics@vici.com
columns@vici.com
26295 Twelve Trees Lane
Poulsbo, WA 98370

VICI Precision Sampling
Tel (800) 828-1653
(225) 927-1128
Fax (225) 923-1331
Email precision@vici.com
P.O. Box 15886
Baton Rouge, LA 70895

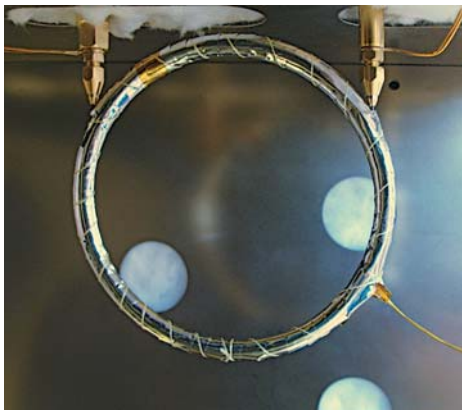
New products

THE LATEST FROM VICI

NEW

Fast GC conversion kit for 6890/7890 GCs

Components for Fast GC .....page 4



These kits include everything you need to turn your standard GC into a high-speed analytical machine. Just specify the column you want and we'll provide the rest. The typical kit takes just an hour to install, with complete step-by-step instructions included. All that's required is a small hole in the top of the column oven, and we even provide the drill bit!

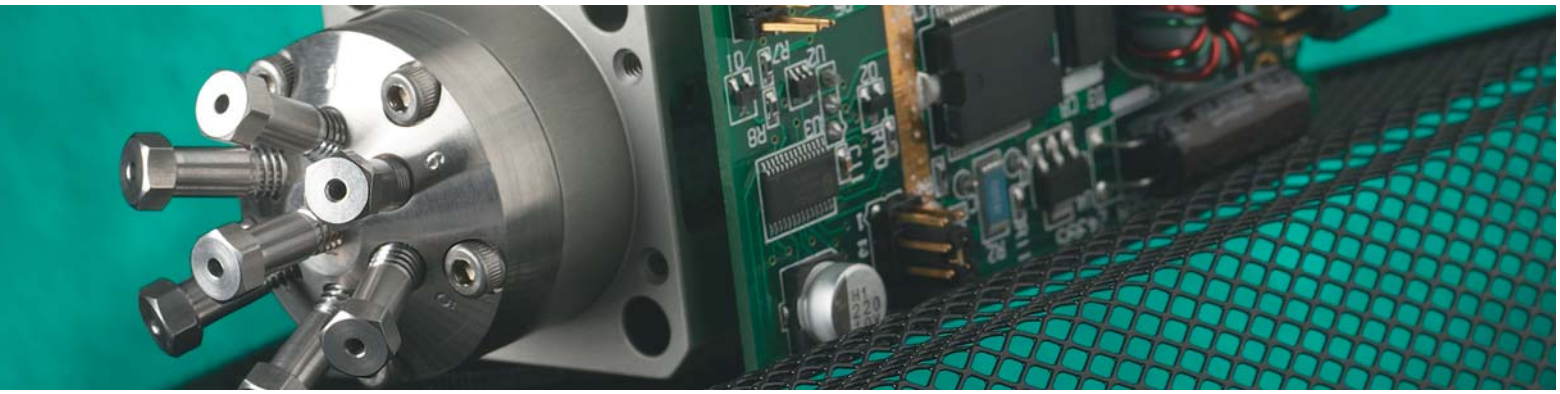
NEW

Fast GC components turbocharge analyses

Column temperature controller .....page 5



Our Fast GC controller provides programmable temperature control for analysis-optimized column bundles. The programmable controller coupled with a column bundle (we can provide one using our fused silica column or yours) slashes conventional analytical times. The result of years of research, these systems provide high throughput analyses at a fraction of the cost of a conventional GC.





NEW
Mini PDD detector helps pay for itself

miniPDD Model D-2-IM ..... page 222

The miniature D-2-IM consumes less than one fifth as much helium as its big brothers, our popular D-3 and D-4 pulsed discharge detectors. With the ever-increasing price of helium, this can represent savings of hundreds of dollars per year. With robust performance, easy maintenance, and nearly the same sensitivity as the larger models, the mini PDD is the clear choice for field portable applications and for labs concerned about operational costs.



NEW
New modular universal actuator to replace the microelectric

Modular universal actuator ..... page 194

This new version of the popular universal actuator gives greater flexibility for the instrument manufacturer working in the limited space frequently encountered in modern instruments. The design also makes it possible to mount the more sensitive electronics module away from the liquid end of the valve. The modular unit has all the features of the composite model, allowing instrument manufacturers to use a single motor and control software to operate virtually any Valco or Cheminert rotary valve, with greater programmability plus optional communication interfaces.



NEW
Special adapters ease connectivity to 360 micron tubing

Internal reducers for 360 µm tubing..... page 38
External to internal reducer for 360 µm tubing..... 39

Our unique 360 micron fittings permit direct connection to any capillary tubing with 360 µm OD. But making the transition to valves or other fittings with larger tubing meant using a union. Now you can minimize the number of connections using our IZR and EZR adapters. IZRs permit plumbing 360 µm tubing directly into a 1/16" or 1/32" Valco fitting detail, and the EZR permits the same connection to 1/16" external details. Available in PEEK or stainless steel.

NEW

Components for fast GC

The Problem

In the quest for more rapid chromatographic results, there are two distinct avenues – the small, portable instruments made specifically for use in the field, and traditional GCs which are modified to accelerate the analysis. The components developed by Valco engineering exceed the requirements of both approaches.

The Solution

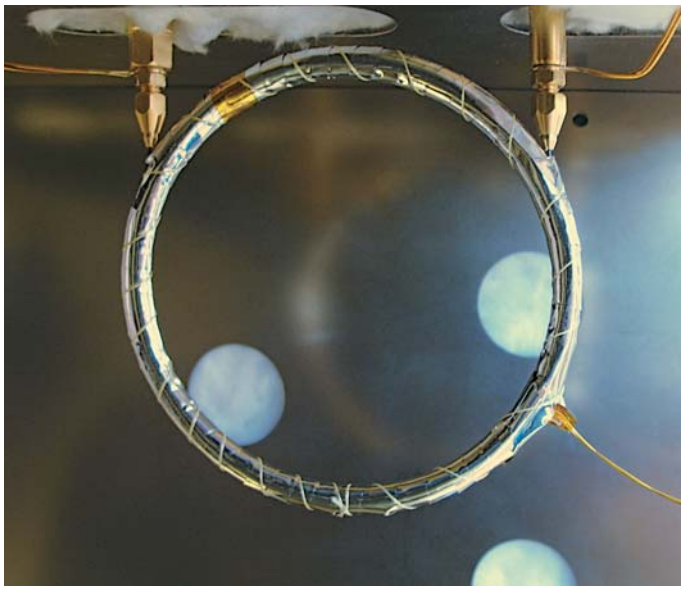
Valco now offers a variety of components which can be used individually or in concert with others to provide the optimal solution for the analysis.

- Resistively-heated low mass columns
- Fast temperature controller
- Pulsed discharge detector (PDD)

Our valves can provide the necessary sample injection, and resistively-heated columns dramatically decrease analysis time. The fast temperature controller offers provisions for multiple ramp temperature programming with a user-friendly Windows interface and a compact size suitable for use in the lab or in the field. Column temperature is controlled by regulating the amount of current applied to the wire-wrapped or nickel-clad capillary column.

We offer a variety of detector options to suit a wide array of applications – from our TCD to our popular PDDs (pulsed discharge detectors), which can be tuned for optimal analyte specificity. Our new miniPDD *(page 222)* is ideal for portable applications or for areas where helium use must be minimized.

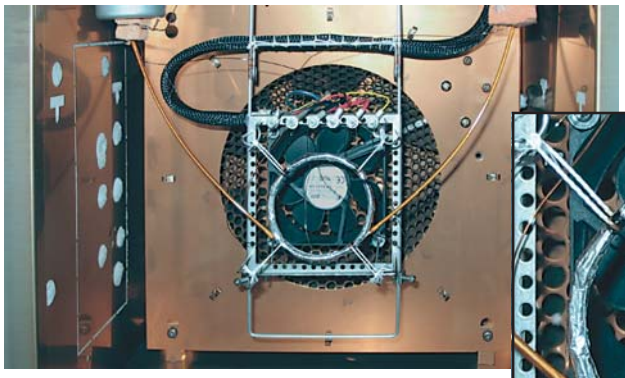
So whether you have a traditional lab GC that you want to turbo-charge or are building a portable GC for rapid analyses, our extensive line of fast GC components can help get the job done on time and on budget.

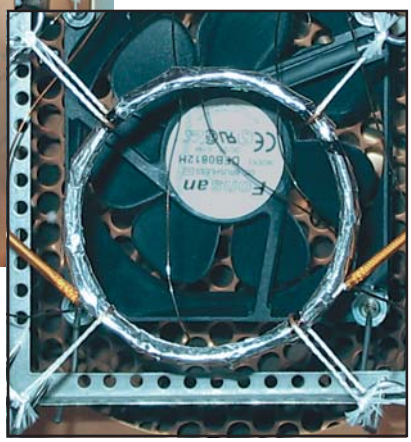


Column kit installed in Agilent 6890 column oven



View of relocated Agilent FID to permit use of fast GC column kit





Resistively-heated column installed in traditional column oven

TO DISCUSS YOUR REQUIREMENTS IN DETAIL, CONTACT OUR TECHNICAL DEPARTMENT

MORE INFORMATION

Fast GC temperature controller . . . . page 5
miniPDD 222
PDD Pulse discharge detector 223
TCD Thermal conductivity detector 227

NEW



Column temperature controller

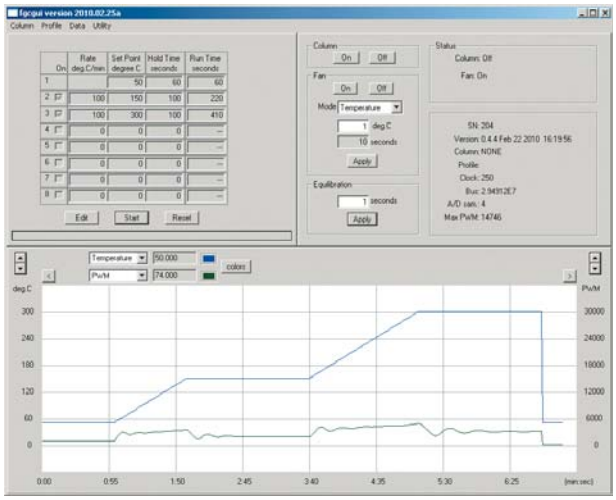
CE

- For use with nickel-wire and nickel-clad resistively-heated columns
- Programmable 8-state temperature profile
- Compatible with any GC or analyzer
- User-friendly Windows-based control and monitor program
- OEM and end user versions available

The VICI column heating unit is designed for precise temperature programming with rapid heating and cooling of a low mass nickel-clad or nickel-wire column. The column is resistively-heated by applying a low-voltage current to the column coating or wire, eliminating the need for a traditional GC column oven and heating element with their power and space requirements. Column temperature is controlled by regulating the amount of current, with a small fan for quickly cooling the low-mass column to near-ambient temperature.

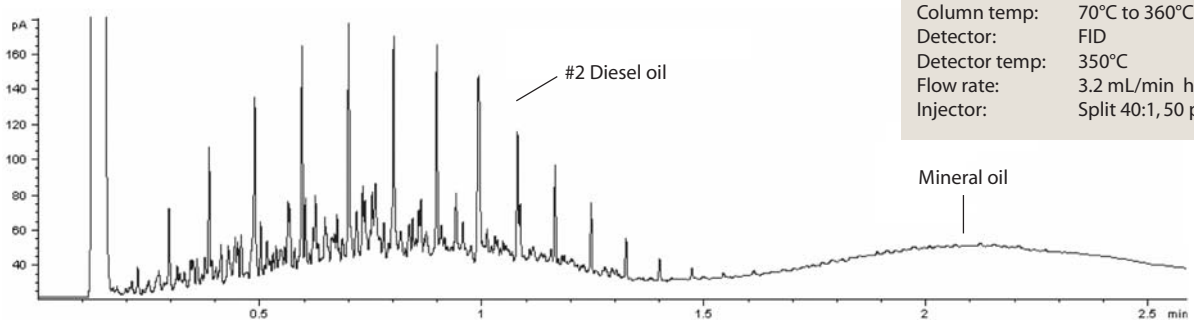
These features plus speed, compact size, and low power requirement make this unit an ideal component in fast, portable GCs, but it can be easily employed on any GC or analyzer.

The Windows-based control program *(screen capture below)* facilitates simple creation of temperature profiles with as many as eight states, and allows multiple columns to be tuned with each configuration saved for reloading. Multiple data parameters can be graphed, with data logged and analyzed.



SPECS

Programmable temperature states		8
Fan modes		4
Max ramp rate	5m column	1,200°C/min
	15m column	500°C/min
Accuracy	Isothermal	0.1°C
	Programmed	<0.5°C, in most cases
Interfaces		USB, I²C



#2 DIESEL PLUS MINERAL OIL

Column:	VB-5 5 m x 0.10 mm x 0.10 µm, Nickel-wire
Column temp:	70°C to 360°C at 120°C/min
Detector:	FID
Detector temp:	350°C
Flow rate:	3.2 mL/min helium
Injector:	Split 40:1, 50 psi, 280°C

Valco fittings

THE INDUSTRY STANDARD

The compression fitting (**Figure 1**), in which a one- or two-piece 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.

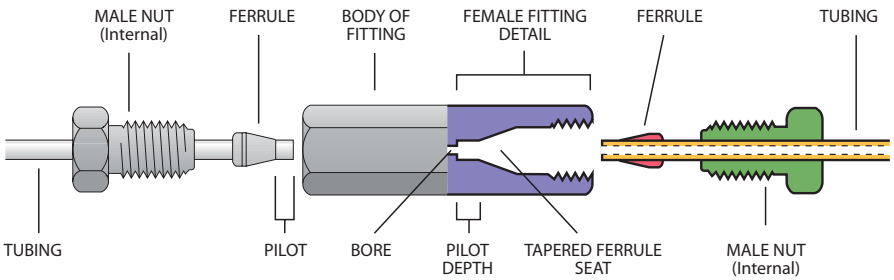


Figure 1
Valco compression fitting

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.

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



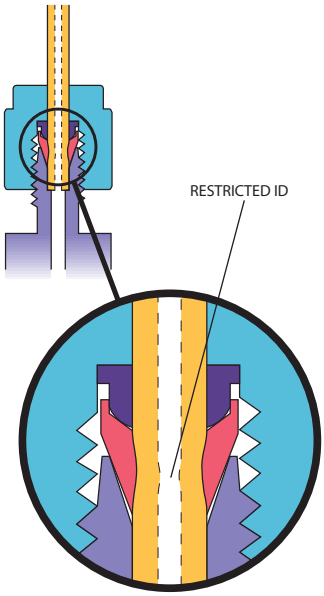


Figure 2
ID restriction
in common compression fitting

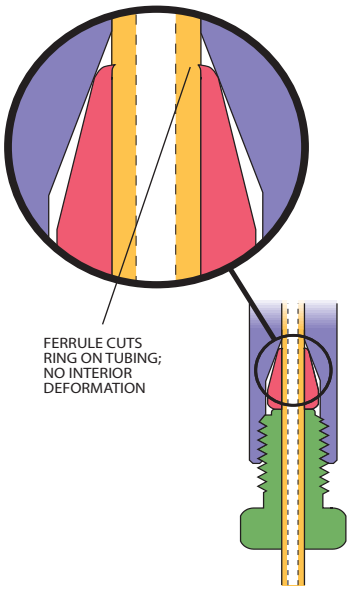


Figure 3
No ID restriction
in Valco compression fitting

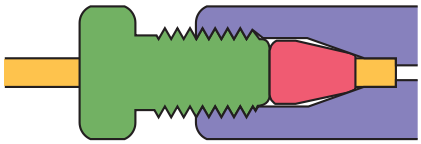
Interchangeability

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.

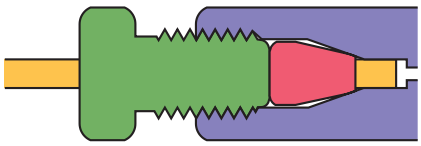
Because of variations in tubing OD and in pilot and taper designs from manufacturer to manufacturer, the amount of tubing extending beyond the made up ferrule can vary. (The most radical variation is in the fittings manufactured by Waters. Based on the old Swagelok design, they have a pilot depth considerably 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

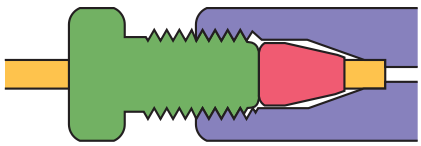
Most of our state of the art CNC machines use water-based lubricants. After each part comes off the machine, it is cleaned with water-soluble detergents and then rinsed in hot deionized water. Finally, every metal fitting that we make is given a thorough cleaning with steam from deionized water at 140°C. 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

* An exception is the longer pilot depth on Cheminert high pressure valves with polymeric stators.

VALCO FITTINGS

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.

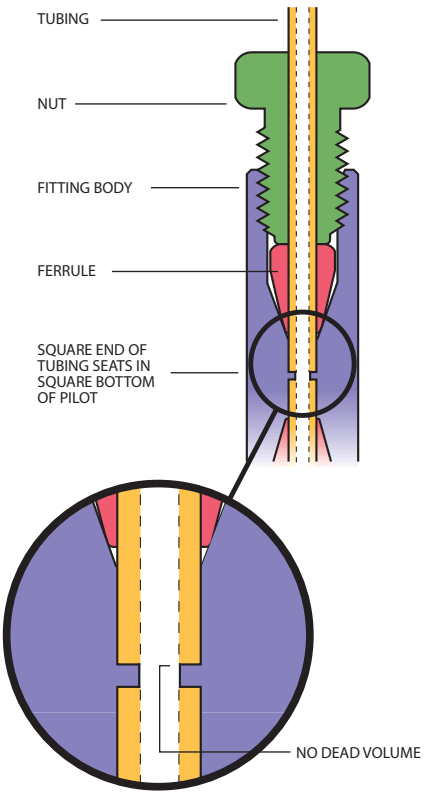


Figure 5
Valco/Cheminert high pressure compression fitting

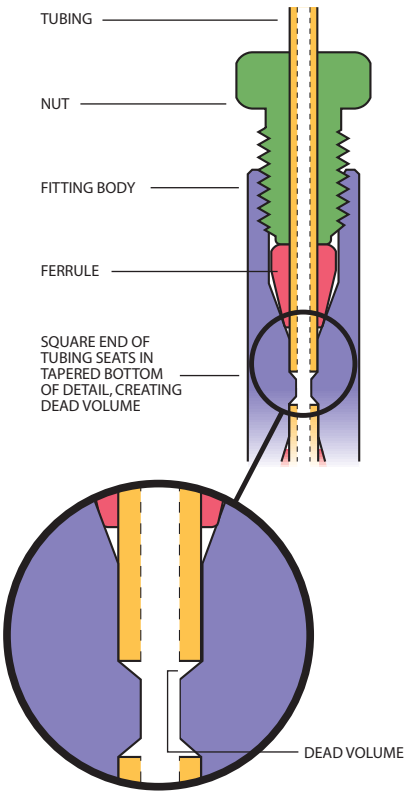


Figure 6
Poor quality compression fitting

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.

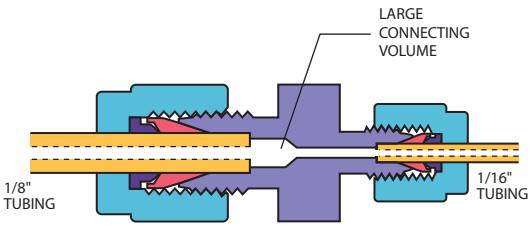


Figure 7
Common commercial reducing union

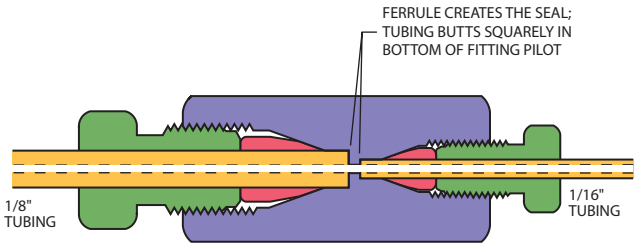


Figure 8
Valco zero dead volume reducing union

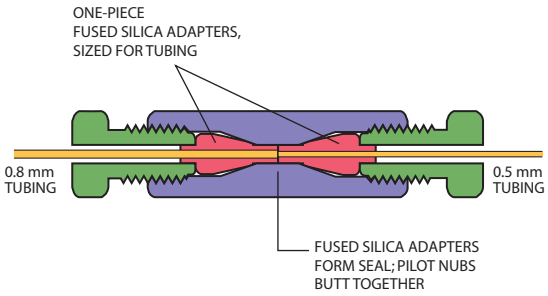


Figure 9
Valco zero dead volume through-bore union

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.

Valco metal compression fittings can be used safely at UHPLC and SFC pressures when the fitting size is 1/16" or smaller. Our fittings of this type have been tested at pressures exceeding 50,000 psi. The pressure limitation with these is generally the safe working pressure of the tubing, and not the fitting itself.

VALCO FITTINGS

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*
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	.625"	IZN1-10
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

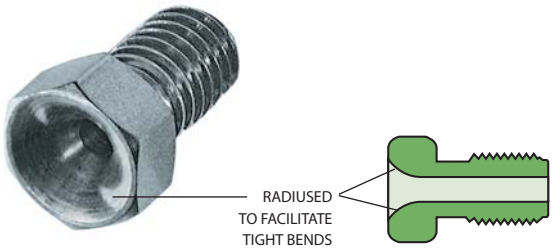


Controlled radius nuts – stainless steel and PEEK

These patented* special purpose nuts facilitate a tight bend as the tube exits the fitting, and can also help prevent kinks in very thin wall tubing. Controlled radius nuts are available in a range of sizes. Note that the short version (ZSN1R) can *only* be used in certain applications. Call for more information.

Description	*Length*	*Prod No*
Stainless steel		
1/16", standard	.43"	ZN1R
1/16" , short	.30"	ZSN1R
1/8", standard	.57"	ZN2R
PEEK		
1/16", hex	.45"	ZN1RPK
1/16", fingertight	.88"	ZN1RFPK





Controlled radius nut
Standard length

*U.S. patent number 6,247,731.

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

MORE INFORMATION
PEEK nuts ..... page 63
HPLC column end fittings 42-46
Reducing unions
Internal.....29
External.....30
External/internal.....31
Internal/external.....31
Unions
Internal.....26
External.....27
External/internal.....27

CONVERSIONS

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*
1/32″ e xternal 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 plug**	*Prod No*	*Prod No*
1/32"	.49"	ZP.5	ZP.5H
1/16"	.75"	ZP1	ZP1H
1/16"	1.13"	LZP1	LZP1H
1/8"	1.00"	ZP2	ZP2H
1/8"	1.40"	LZP2	LZP2H
1/4"	1.20"	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 cap**	*Prod No*
1/32"	.55"	ZC.5
1/16"	.77"	ZC1
1/8"	1.01"	ZC2
1/4"	1.24"	ZC4

MORE INFORMATION

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

VALCO FITTINGS

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.

Metal ferrules

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

FERRULE IDENTIFICATION

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



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 ions in solutions

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

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

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

CONVERSIONS

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 ferrules



Package of 10:	Prod No PTFE, Virgin	Prod No PTFE, Glass-filled	Prod No 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	PEEK
1/32"	ZF.5PFA-10	ZF.5KF-10	ZF.5PK-10
1/16"	ZF1PFA-10	ZF1KF-10	ZF1PK-10
1/8"	ZF2PFA-10	ZF2KF-10	ZF2PK-10
1/4"	ZF4PFA-10	ZF4KF-10	ZF4PK-10
3/8"	ZF6PFA-10	ZF6KF-10	ZF6PK-10
1/2"	ZF8PFA-10	ZF8KF-10	ZF8PK-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

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

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

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

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

MORE INFORMATION

Grooved PEEK ferrules . . . . . page 63

VALCO FITTINGS

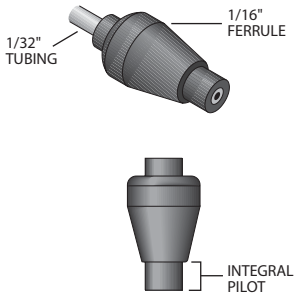
Reducing ferrules provide an inexpensive way to connect small temporary transfer lines to valves or fittings designed for larger tubing. For long term use, we recommend our reducing unions, internal reducers (IZRs), or external reducers (EZRs), as appropriate.

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.

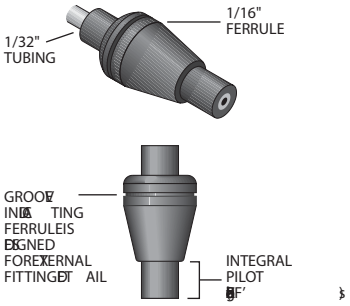
External ZDV reducing ferrules are designed for use with all standard external style fittings – that is, those with a female nut and a male fitting detail. This ferrule has a slightly longer pilot than the internal version, to accommodate the longer external detail. The result is a zero dead volume fitting.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

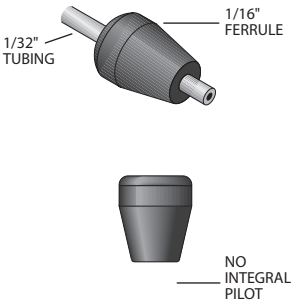




Internal reducing ferrule
(ZRF)



External reducing ferrule
(EZRF)



Standard reducing ferrule
(RF)

Internal reducing ferrules

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

	Prod No	*Prod No*	*Prod No*
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	



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

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 ®.

MORE INFORMATION
Internal reducers (IZR) . . . . . page 38
External reducers (EZR) 39
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.

OPTION
Available in Virgin Polyimide.

External reducing ferrules

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

Package of 5:	*Prod No* **PTFE, Glass-filled**	*Prod No* **PEEK**	*Prod No* **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



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.

Package of 5:	*Prod No* **PTFE, Glass-filled**	*Prod No* **PEEK**	*Prod No* **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

CONVERSIONS

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

VALCO FITTINGS

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** *Prod No*	**PEEK** *Prod No*	**Polyimide, Virgin** *Prod No*
1/32" Adapters			
Tubing OD:			
< 0.20 mm	FS.2-5	FS.2PK-5	—
0.20 ≤ 0.25 mm	FS.25-5	FS.25PK-5	FS.25V1-5
0.25 ≤ 0.36 mm	FS.36-5	FS.36PK-5	—
0.36 ≤ 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:			
< 0.20 mm	FS1.2-5	FS1.2PK-5	FS1.2V1-5
0.20 ≤ 0.25 mm	FS1.25-5	FS1.25PK-5	FS1.25V1-5
0.25 ≤ 0.30 mm	FS1.3-5	FS1.3PK-5	FS1.3V1-5
0.30 ≤ 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 kits

Remove polymeric ferrules stuck in fitting details. One version is for 1/32" and 360 micron ferrules, and the other version is for 1/16" and 1/8" ferrules.

	Prod No
For 360 µm, FS, and 1/32"	FRK1
For 1/16" and 1/8"	FRK2



For 360 µm and 1/32" ferrules

For 1/16" and 1/8" ferrules

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

OPTIONS
Other sizes may be available in some materials. Contact Tech Support for availability.

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

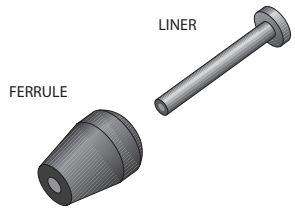
PEEK adapters are not recommended for use above 175°C.

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.

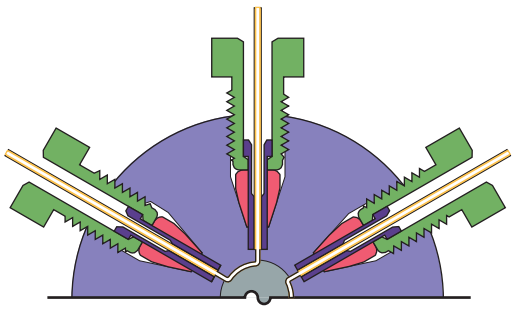


Removable fused silica adapters (FSR)

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 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 counterbored 1/16" nut. The 1/32" FSR adapter uses a standard Valco 1/32" nut.

Package of 5:	**Polyimide, Valcon** *Prod No*
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*	**PEEK** *Prod No*
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 . . . . pages 19, 61
Fittings 16-21, 58-61

A pin vise and drill index are useful for enlarging the inner diameters of the FS adapters.

Pin vise and drill index 55

CONVERSIONS

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

REPLACEMENT PARTS

Ferrules

(package of 5)	
1/32" Polyimide	ZF.5V-5
1/16" Polyimide	ZF1V-5
(package of 10)	
1/16" PEEK	ZF1PK-10

Nuts

(package of 10)	
1/32" SS	ZN.5-10
Special nuts for FSRs:	
1/16" SS	ZCN1-10
1/16" SS long	LZCN1-10

VALCO FITTINGS

Injector nut for Agilent 6850, 6890, 7820, 7890, and 5890, Series I and II



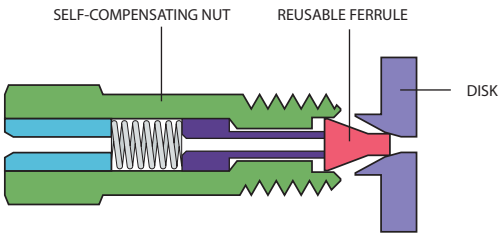
This self-compensating nut is a direct replacement for the standard nut on the split/splitless injectors of the Agilent GCs listed above. This retrofit offers enhanced ferrule reusability and temperature stability, resulting in fingertight leak-free connections over the full programmed temperature range of mass spectrometry and gas chromatography.

The 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.

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
Injector nut system		FSZA-HP
Includes nut and seal disk		
Replacement parts		
Self-compensating nut		FSZNA-HP
HP-5890 split/splitless seal disk		SEAL1-HP
Reusable ferrules, pkg/10 *		
Column ID:	.20 –.25 mm	FS1.35-R10
	.32 mm	FS1.45-R10
	.53 mm	FS1.75-R10

*These reusable ferrules seal at the tip, and are different from standard ferrules.



Self-compensating nut
for Agilent GCs

Replacement ferrules

for injector nuts, above

These reusable ferrules seal at the tip, and are different from standard ferrules. For use with FSZNA-HP nuts above.

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



CONVERSIONS

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

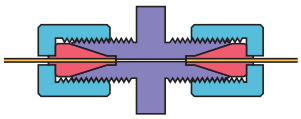
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm



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, below.

Bore	*Prod No*
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

1/32" One piece fused silica adapters (FS)

The 1/32" one piece FS adapter is recommended for use in 1/32" ultra low mass external unions, and 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.

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.

Package of 5:	**Polyimide, Valcon** *Prod No*	**PEEK** *Prod No*	**Polyimide, Virgin** *Prod No*
Tubing OD:			
< 0.20 mm	FS.2-5	FS.2PK-5	—
0.20 ≤ 0.25 mm	FS.25-5	FS.25PK-5	FS.25V1-5
0.25 ≤ 0.36 mm	FS.36-5	FS.36PK-5	—
0.36 ≤ 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

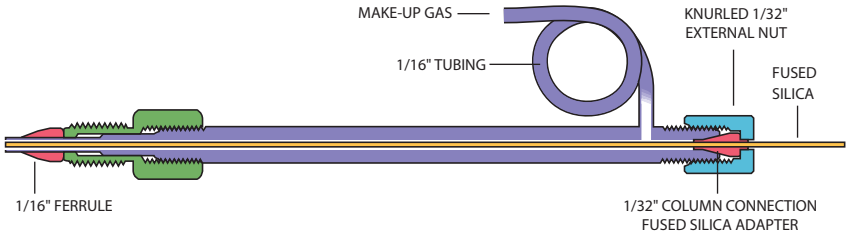
VALCO FITTINGS

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*
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)

CONVERSIONS

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

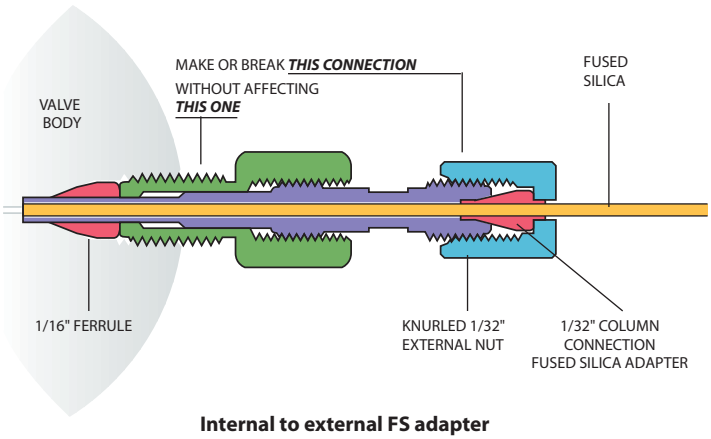
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm



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 or loosened without affecting the 1/16" connection. Order 1/32" fused silica adapter ferrules separately *(see box below)*.

Description	*Bore*	*Prod No*
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

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

MORE INFORMATION
1/32" fused silica adapter ferrules . . . . . page 19

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

Tubing OD:

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

VALCO FITTINGS

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.

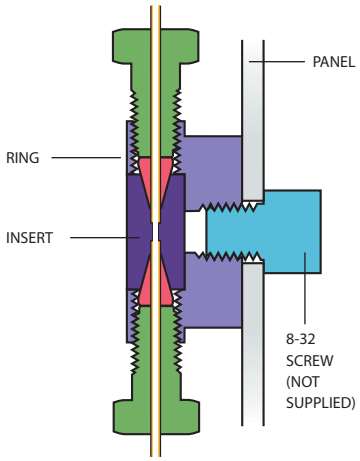
Valco microvolume fittings make it possible to couple 100 micron ID capillary GC, HPLC, or CZE columns without special nuts and ferrules.

A stainless ring with one of the plastic inserts provides electrical insulation within the insert, while the PEEK ring achieves total isolation.

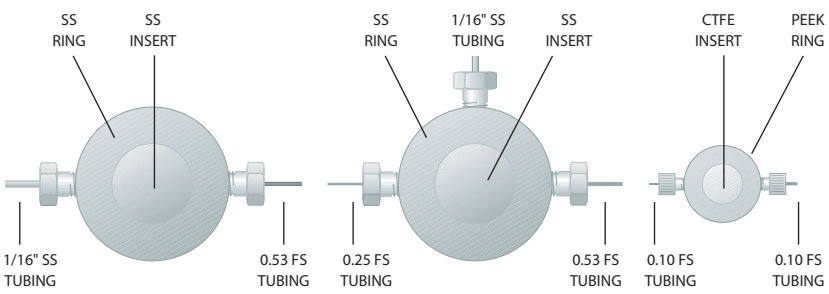
The ring containing the threads is made from PEEK or stainless steel. Inserts are made of stainless steel, Hastelloy C, Titanium, PEEK, or CTFE. PEEK rings are not as robust as stainless steel, and are not usable above 75°C. The stainless steel ring with a metal insert can operate at up to 10,000 psi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

FS fused silica adapters. . . . . page 16
FSR fused silica adapters. 17
ZRF internal reducing ferrules 14

Ferrules
Metal. 12
Polymeric 13

CONVERSIONS

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

1/32" 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	*Prod No*	*Prod No*	*Prod No*	*Prod No*
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	*Prod No*	*Prod No*	*Prod No*	*Prod No*
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

Description	1/32" connectors *Prod No*	1/16" connectors *Prod No*
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.
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.

NANOBORE CONNECTIONS
For 0.10 mm (100 µm) bore fittings, see pages 57-61.

VALCO FITTINGS

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.

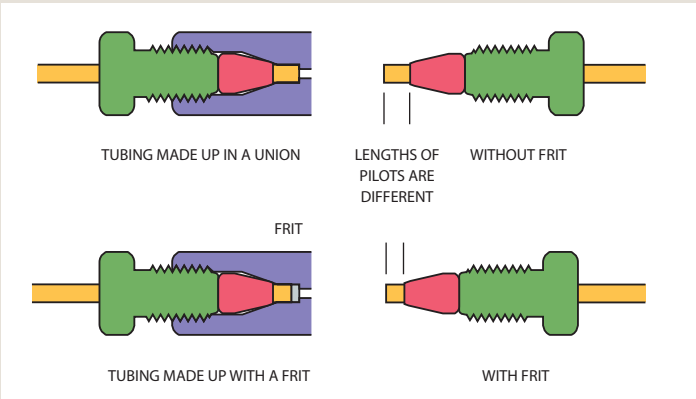


Bulkhead versions can be mounted through an instrument panel or on a bracket. The fitting body is undercut so that it bites into the panel when the mounting nut is tightened, eliminating the need for a lock washer. An O-ring can be installed between the body and the panel to allow operation in purged 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.

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 48-52
Frits and screens. 53



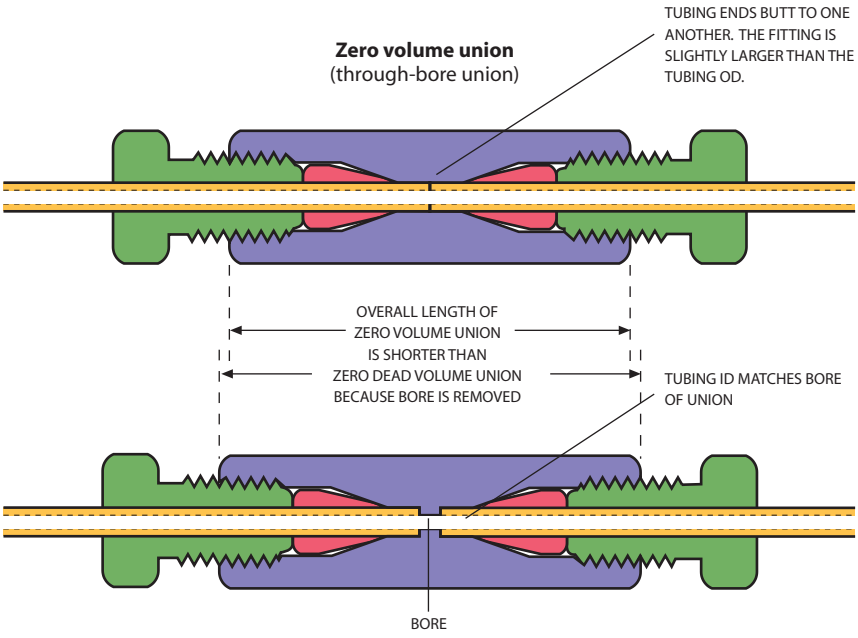
CONVERSIONS

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.



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.

MORE INFORMATION
Reducing unions to connect two tubes with different ODs . . . . . p 28-31
Unions with 1/4-28 fittings 72-73

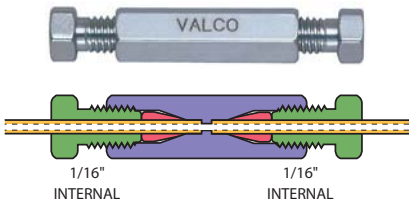
VALCO FITTINGS

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*
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*	**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.

CONVERSIONS

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

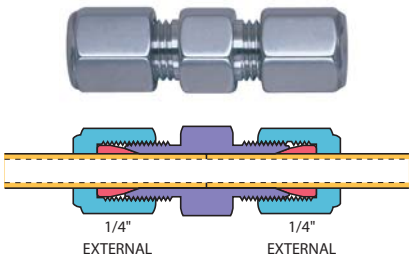
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

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

External 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.



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

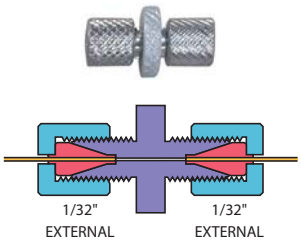


Bulkhead external union
(EBU2L)

Tubing OD	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*	**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"

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.

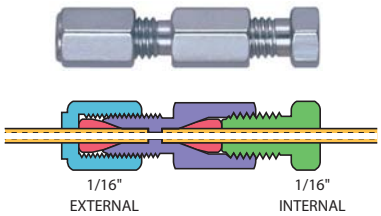


1/32" external union
(EU.5)
For use with GC capillary columns

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

External/internal unions

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



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

Tubing OD	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*	**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"



Bulkhead external/internal union
(EZBU1)

TECH TIP
1/16", 1/8", and 1/4" external Valco fitting components are compatible with Parker and Swagelok fittings.

VALCO FITTINGS

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.

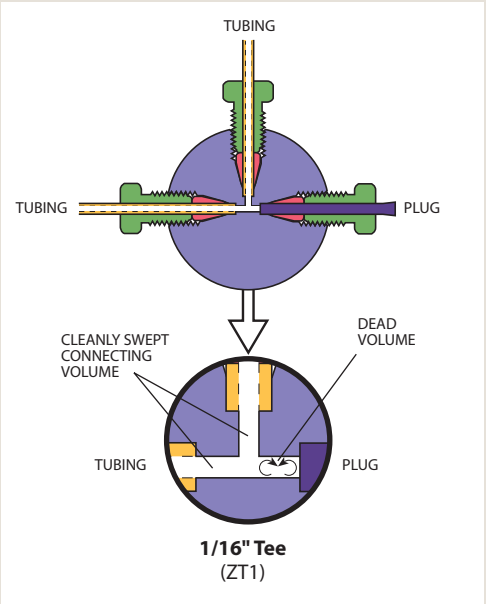
Internal fittings are almost always the best with tubing of 1/8" OD or smaller. They make a stronger connection and offer the lower volume necessary for high performance instrumentation. Also, because 1/16" external fittings have very thin, easily distorted walls, they are not as durable as 1/16" internal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

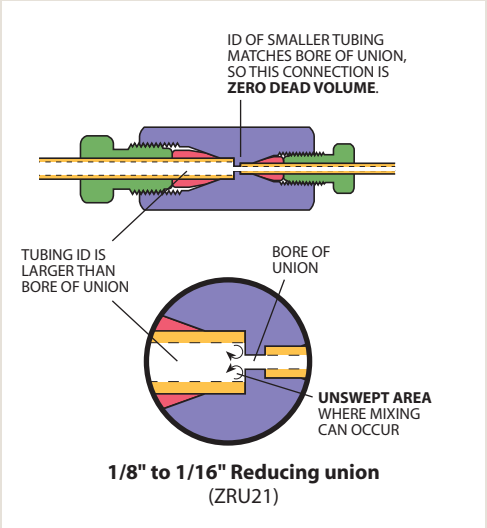
"Dead volume" is created in obvious situations such as the one shown.



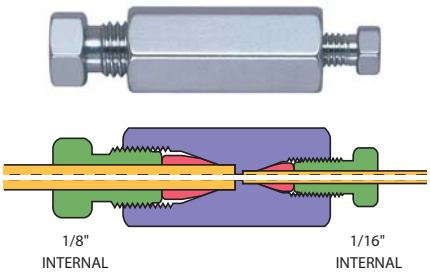
1/16" Tee
(ZT1)

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*
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*	**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

Internal reducing unions, high pressure PEEK . . . . . pages 57, 65
External/internal reducing unions 31
Internal/external reducing unions 31
Standard unions 24-27
Unions with 1/4-28 fittings 72-73

CONVERSIONS

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

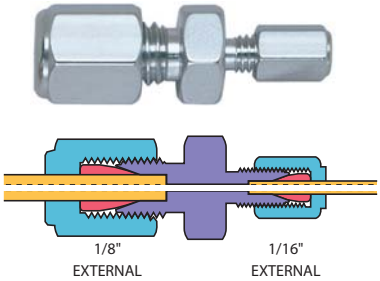
VALCO FITTINGS

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*
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"	0.75 mm	ERU42
	2.0 mm	ERU42L
	1/8"	ERU42T



External reducing union
Standard bore
(ERU21)

Bulkhead external reducing unions

Tubing OD	*Bore*	*Prod No*	**Bulkhead panel hole diameter**
1/8" to 1/16"	1.0 mm	EBRU12L6	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
1/16", 1/8", and 1/4" external Valco fitting components are compatible with Parker and Swagelok fittings.

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.

CONVERSIONS

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"

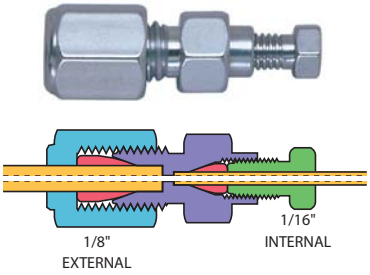
7.0 mm = .275"
10.0 mm = .400"

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)



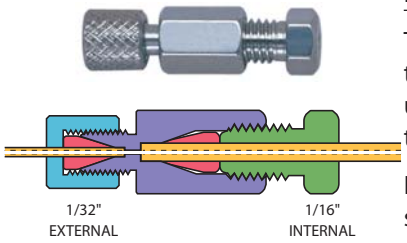
Bulkhead external/internal reducing union
(EZBRU21)

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.

Tubing OD	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*	**Bulkhead 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	7/16"



Internal/external reducing union
Standard bore
(EZRU.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.

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.)* Only polymeric or soft metal ferrules should be used with 1/32" external details.

Tubing OD	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*	**Bulkhead panel hole 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"



Bulkhead internal/external reducing union
(EZBRU.51)

TECH TIP
1/16", 1/8", and 1/4" external Valco fitting components are compatible with Parker and Swagelok fittings.

MORE INFORMATION
Fused silica adapters. . . . page 16-17
Polymeric ferrules 13
External unions. 27
Internal reducing unions 29
Internal unions 26

VALCO FITTINGS

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*
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*
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



SURFACE MOUNTING TEES AND CROSSES

1/8" and 1/4" tees and crosses have two threaded mounting holes (8-32). For 1/32" and 1/16", order mounting kit below. Mounting kit includes:

- Standard bracket SABB
- Clamp ring CR4
- Screws and nuts.

Mounting kit . . . . DVBRKIT

Some configurations are available with two through holes. Consult factory.

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 . . 62-66
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 38

MORE INFORMATION

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





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*
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	0.25 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 34.*) Standard material is 300 series stainless steel.

	Inlet bore	*Outlet bore*	*Prod No*
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



SURFACE MOUNTING MANIFOLDS

Mounting kit DVBRKIT

TECH TIP

A manifold used with an SD flowpath multi-position valve allows HPLC column selection with a single valve. See page 141 for an illustration.

SD UW valves. . . page 134

CONVERSIONS

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

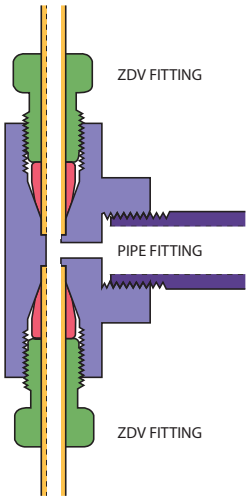
VALCO FITTINGS

Manifold pipe adapters

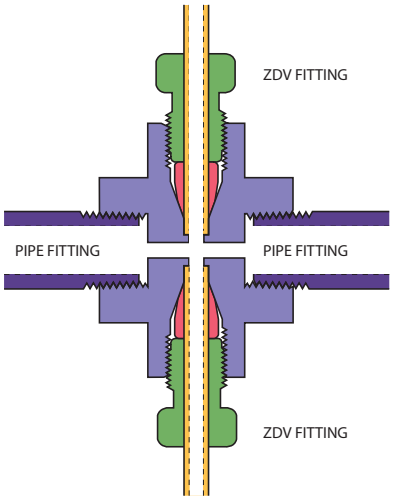
These manifolds, which go from one or two pipe fittings to three or more Valco zero dead volume fittings, minimize the number of connections between a regulator and the various carrier gas lines in a chromatographic system. The models with two pipe fittings go a step further, allowing the support of 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.



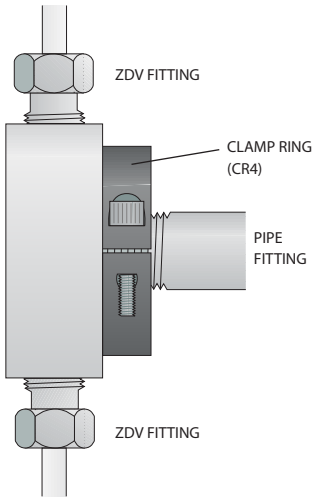
Description	*Bore*	*Prod No*
One 1/8" female pipe to:		
three 1/16" ZDV fittings	1.0 mm	FP1Z3M21
three 1/8" ZDV fittings	2.0 mm	FP1Z3M22
three 1/4" ZDV fittings	4.6 mm	FP1Z3M24
One 1/4" female pipe to:		
three 1/16" ZDV fittings	1.0 mm	FP1Z3M41
three 1/8" ZDV fittings	2.0 mm	FP1Z3M42
three 1/4" ZDV fittings	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

SURFACE MOUNTING MANIFOLDS

Mounting kit DVBRKIT

CONVERSIONS

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



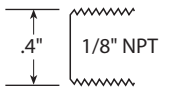
Male pipe to Valco internal adapters

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.

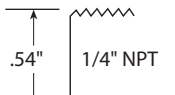
Description	*Bore*	*Prod No*
1/8" NPT male to:		
1/16" ZDV fitting	1.0 mm	PZA21
1/16" ZDV fitting	1/16"	PZA21T
1/8" ZDV fitting	1.0 mm	PZA22
1/4" NPT male to:		
1/16" ZDV fitting	1.0 mm	PZA41
1/8" ZDV fitting	1.0 mm	PZA42
1/8" ZDV fitting	2.0 mm	PZA42L
1/4" ZDV fitting	4.6 mm	PZA44L
1/2" NPT male to: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

TECH TIP

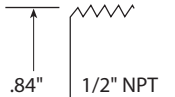
NPT, National Pipe Thread, is a standard developed a long time ago by people without rulers. 1/8" NPT is nowhere close to 1/8"! Measure the diameter of the fitting across the narrow end. You can also count the number of threads in a 1" section. Then look at the diagrams below to determine the correct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



27 threads per inch



18 threads per inch



14 threads per inch

MORE INFORMATION

Pipe to Valco external adapters. . . . . page 36

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*
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



VALCO FITTINGS

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 previous page.



Description	*Bore*	*Prod No*
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

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 previous page.

Description	*Bore*	*Prod No*
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



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 page12.)*

MORE INFORMATION

Our manifold pipe adapters on page 34 allow you to connect one or two pipe fittings to three Valco zero dead volume fittings.

Pipe to Valco internal adapters. . . . . page 35

CONVERSIONS

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

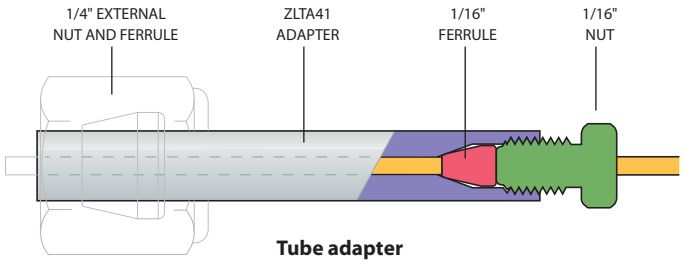
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

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	*Length*	*Bore*	*Prod No*
1/4" to 1/16"	0.7"	1/16"	ZTA41
	1.8"	1/16"	ZLTA41
	2.8"	1/16"	ZXLTA41



Tube adapter
(ZLTA41)

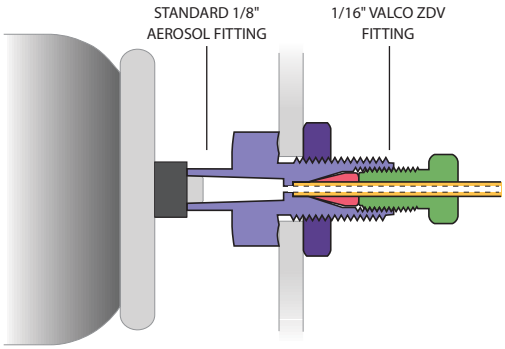
Aerosol adapter bulkhead union



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*
Aerosol adapter bulkhead union	ZBAA1



Aerosol adapter bulkhead union
(ZBAA1)

VALCO FITTINGS

Internal reducers *NEW* *for 360 µm tubing*

Directly connect 360 µm tubing into a 1/16" or 1/32" Valco valve or fitting detail, providing a positive leak-free seal with zero dead volume. These are the same design as our larger internal reducers *(illustration below)*. All versions have a stainless steel body, with 360 µm nut/ferrule material as indicated.

Tubing OD	*Nut/ferrule material*	*For use with*	*Prod No*
1/32" to 360 µm	Stainless/stainless	Metal tubing	C360IZR.5TS6
	PEEK/ GF* PEEK	PEEK tubing	C360IZR.5TS6PK
	SS/gold-plated nickel	Fused silica	C360IZR.5TS6FS
1/16" to 360 µm	Stainless/stainless	Metal tubing	C360IZR1S6
	PEEK/GF* PEEK	PEEK tubing	C360IZR1S6PK
	SS/aluminum	Fused silica	C360IZR1S6AL
	SS/gold-plated nickel	Fused silica	C360IZR1S6FS



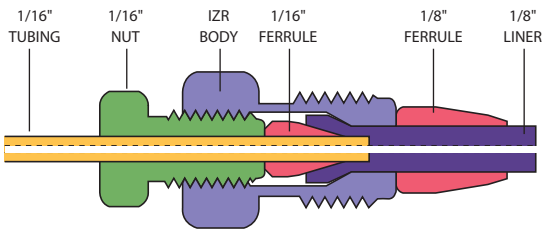
* glass-filled

Internal reducers

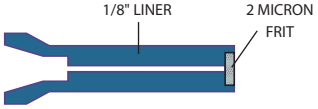
Valco's internal reducer (IZR) allows smaller tubing to be used in valves with fitting details for larger tubing, forming a positive leak-free seal with zero dead volume. The small line from your system goes directly into the IZR and the sample goes directly into the valve, without the short pieces of 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 pages 48-52*) 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.

		Without frit	**With 2µ frit**
Tubing OD	*Bore*	*Prod No*	*Prod No*
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

360 MICRON FITTINGS
See our extensive line of 360 µm fittings . .pp 57-58

CONVERSIONS

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 reducer *NEW* *for 360 µm tubing*



Directly connect 360 µm tubing into a 1/32" Valco external union or the external type fittings common on injectors and detectors with a Valco zero dead volume connection.

Tubing OD	*Nut/ferrule material*	*Bore*	*For use with*	*Prod No*
1/32" to 360 µm	Stainless	150 µm	Metal tubing	C360EZR.5XC

External to internal adapters (injector/detector adapters)

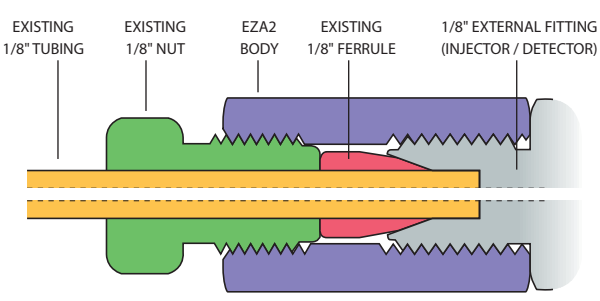


EZAs (external adapters) and EZRs (external reducers) adapt an external tee or union or the external type fittings common on injectors and detectors to Valco zero dead volume connections. Since EZAs are commonly used to connect an external fitting to an existing tube already made up with a Valco internal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

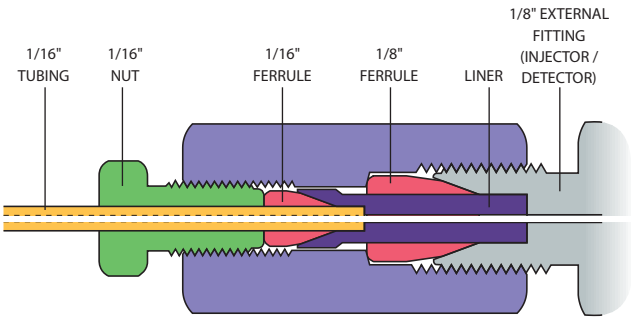
Only one wrench is required to change tubes after the fitting is made up. While an external to internal union or reducing union plus a length of tubing can accomplish the same thing, these adapters do the trick with a single fitting.

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.

Description	*Bore*	*Prod No*
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)

VALCO FITTINGS

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*
For high pressure 1/16" ZDV 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" ZDV 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*
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 Valco and metal 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.

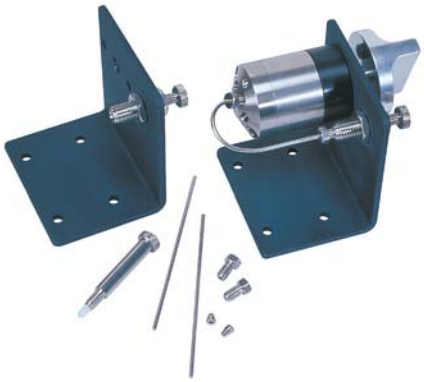
Description	*Prod No*
For use with blunt tip needle	
For 1/32" fittings and injectors - 26 ga	VISF.5FPK
For 1/16" fittings and injectors - 22 ga	VISF-1
For use with 2" 22 gauge blunt tip needle	
For 1/16" fittings and injectors	VISF-2
For 1/8" fittings and injectors	VISF-A
Replacement liners and ferrules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











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*
Loop fill port assembly	C-LFP



Female luer adapters

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

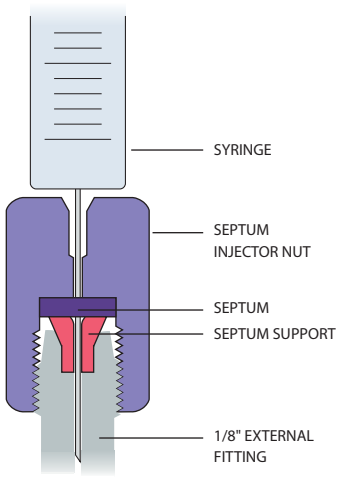
Description		*Prod No*
Female luer to:	1/32" fitting	ZLA-.5
	1/16" fitting	ZLA-1
	1/8" fitting	ZLA-2

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*
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 . . . . . 160, 163
Model C4 . . . . . 161, 164

CONVERSIONS

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

VALCO 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.

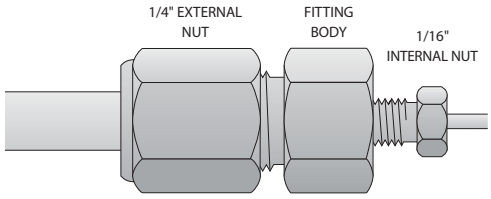
If a temporary frit is used during column packing, the frit OD should match the column OD. Permanent frits should have an OD matched to the column ID, and should be pressed in to give the lowest dead volume.

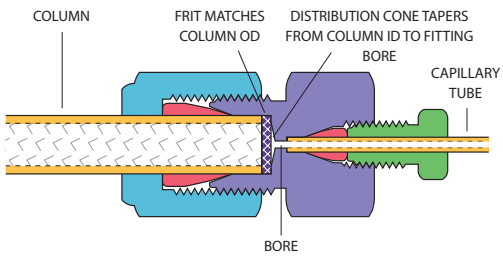
Our frits are available in a variety of pore sizes, and we offer titanium and Hastelloy C frits for systems sensitive to exposed stainless steel.

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.

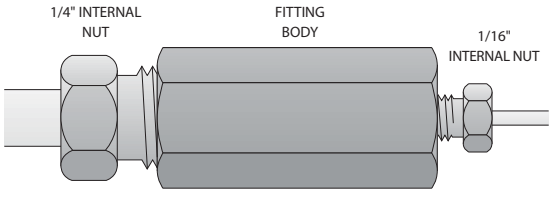
The newest addition to the line is the Nanovolume® column end fitting. *(See page 61.)* These all-PEEK fittings feature fingertight zero dead volume connections with 100 or 150 micron bore. PEEK sleeves permit use with any fused silica tubing.

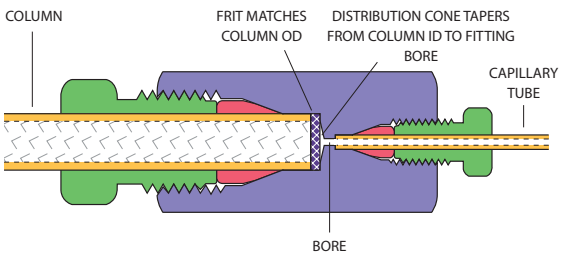






External column end fitting
1/4" to 1/16", 4.6 mm column ID, with removable frit
(ECEF414.6F)





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

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

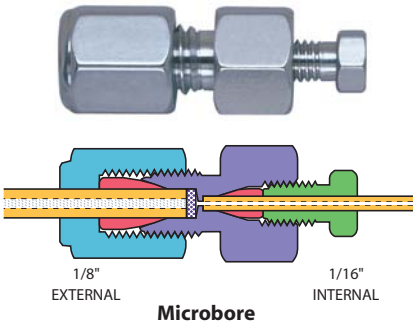
Through-type unions for packing columns..... page 26

MORE INFORMATION
Frits..... page 45

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

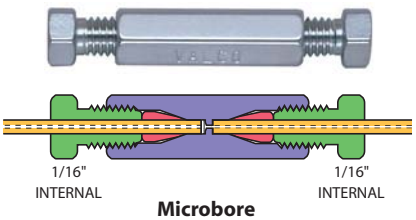
Standard material is Type 316 stainless.

	Bore	Column ID	Without frit Prod No	Removable 2µ frit Prod No
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	Removable 2µ frit Prod No
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 61.

CONVERSIONS

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

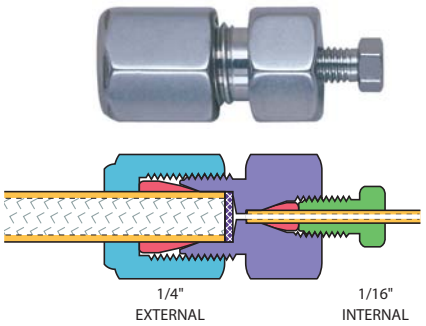
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

VALCO FITTINGS

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

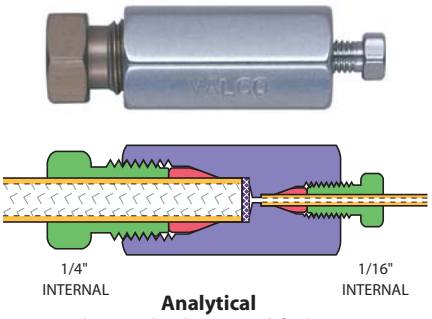
Standard material is Type 316 stainless.

	Bore	Column ID	Without frit Prod No	Removable 2µ frit Prod No
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	Removable 2µ frit Prod No
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 61.

CONVERSIONS

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"

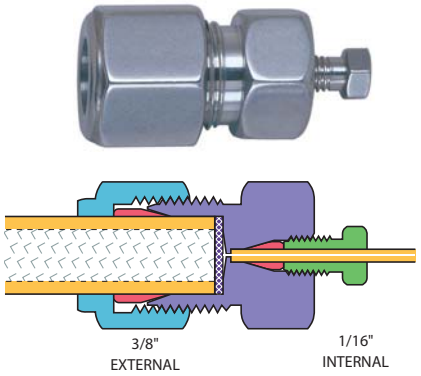
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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

Semi-preparative and preparative column end fittings

Standard material is Type 316 stainless.

	Bore	Column ID	Without frit Prod No	Removable 2µ frit Prod No
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.

Package of 10:		*Pore Size*	*Frit thickness*	Stainless steel *Prod No*	Hastelloy C *Prod No*	Titanium *Prod No*
	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

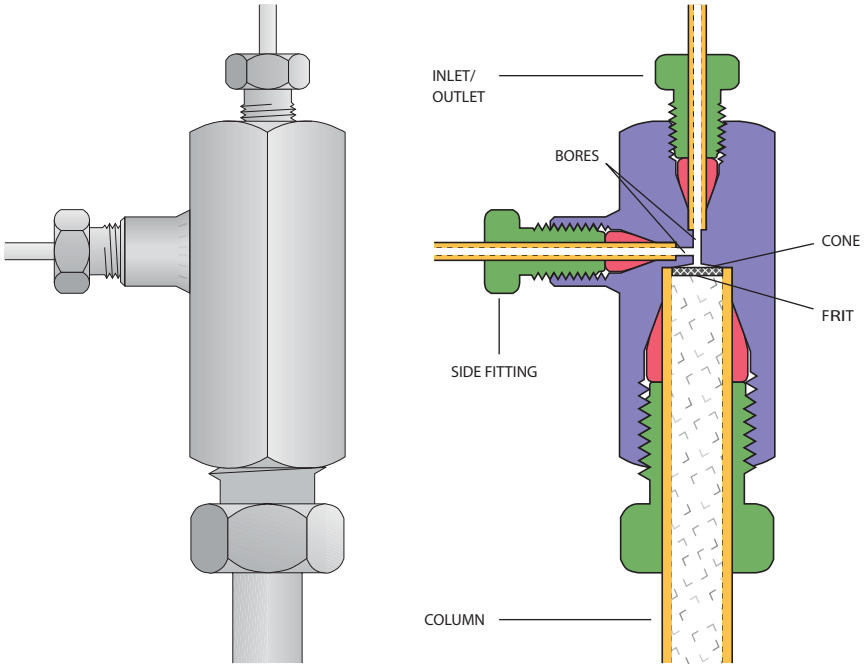
VALCO FITTINGS

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*
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"	0.75 mm	1/16"	0.75 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)

TECH TIP
Tee column end fittings (TCEFs) for 1/16" OD tubing/columns have a round profile. For other sizes, they are made of hexagonal bar stock.

CONVERSIONS

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

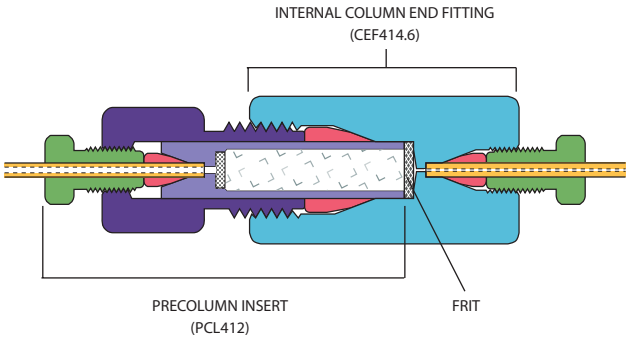
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm



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*
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*
0.25 ml (4.0 mm ID x 2 cm)	
Fingertight cartridge assembly	SFECH412
Replaceable cartridge	SFEC42

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

VALCO FITTINGS

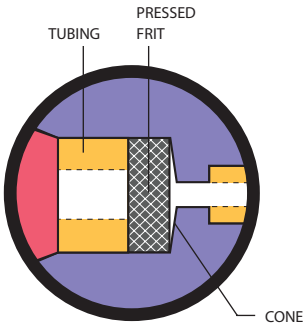
There are many flow elements of analytical instruments which require protection from foreign particles, such as orifices that may become plugged or surfaces that may get scratched. However, conventional filtering devices may have too large a volume to be consistent with good system performance – particularly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

Valco's unique 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.

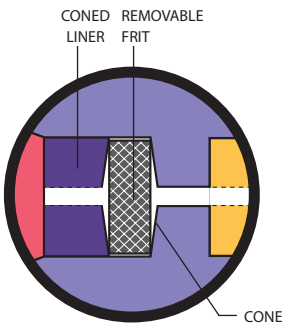
We offer a choice of three different filtering elements. All styles are available in bulkhead configurations for mounting on a panel or instrument wall. (Please note that since frits and screens have significantly different thicknesses, they cannot be used interchangeably in the same filter body.)

- **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.

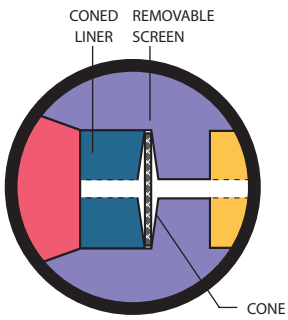




Pressed frit



Removable frit



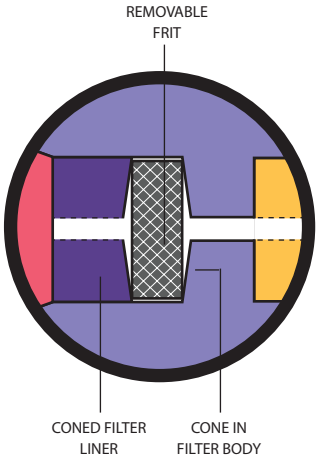
Removable screen

MORE INFORMATION

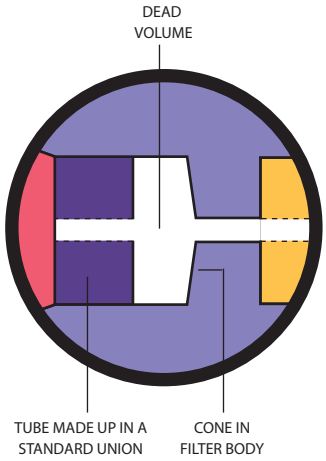
Biocompatible filter . p 78
In-line filters for 1/4-28 fittings 78
Mobile phase filters 79-80

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.

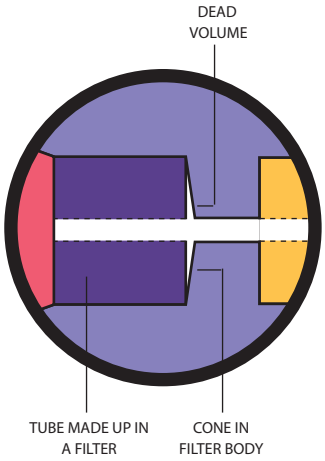
An arrow imprinted on all filter bodies serves to differentiate them from unions and to indicate recommended flow direction.



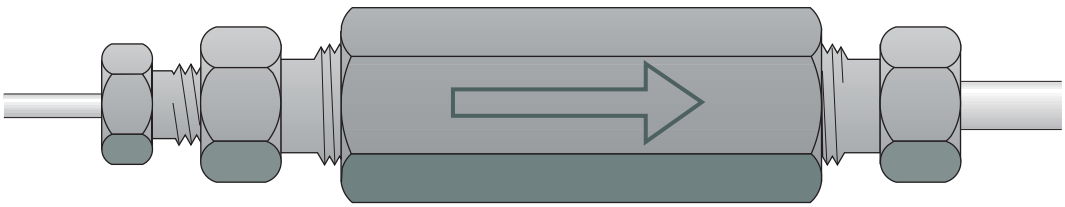
Filter with removable frit
Coned for uniform flow and maximum filter surface



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

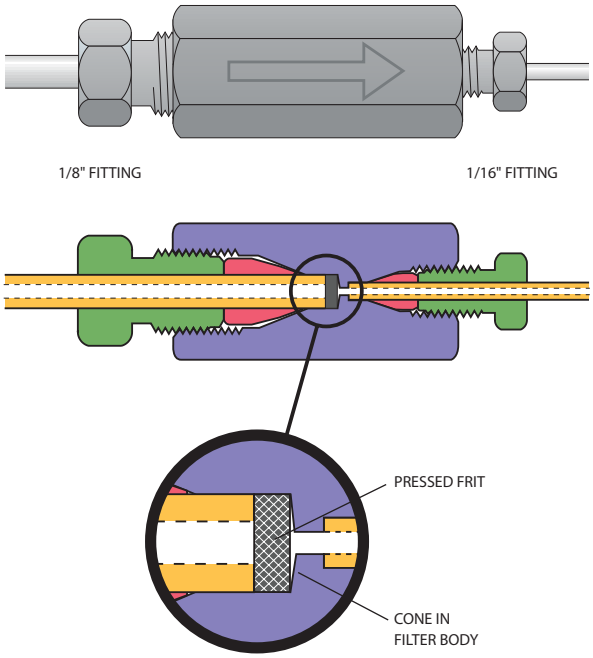
VALCO FITTINGS

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.



Description	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*
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)

CONVERSIONS

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

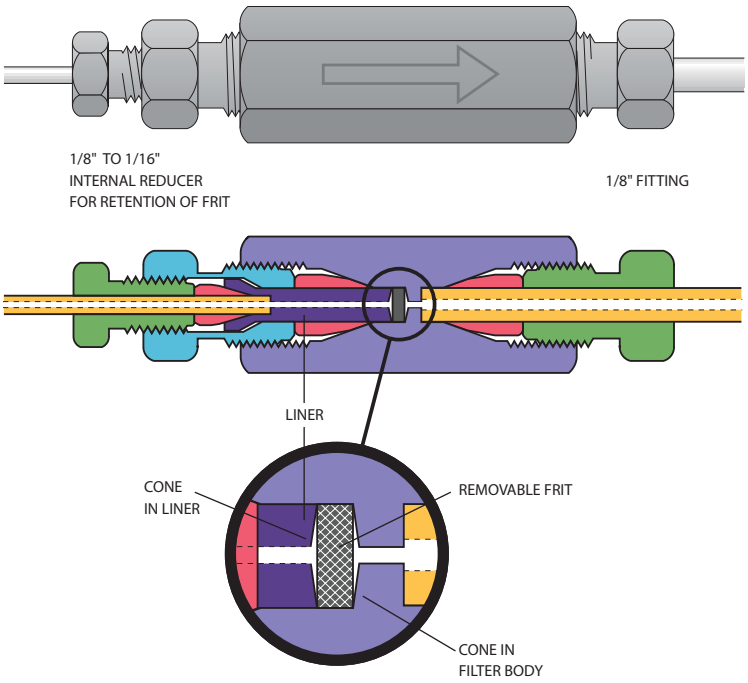
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm



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.

Description	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*
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

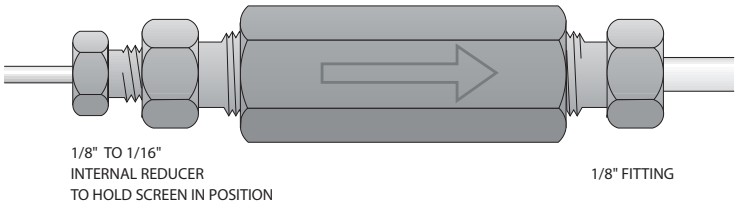
VALCO FITTINGS

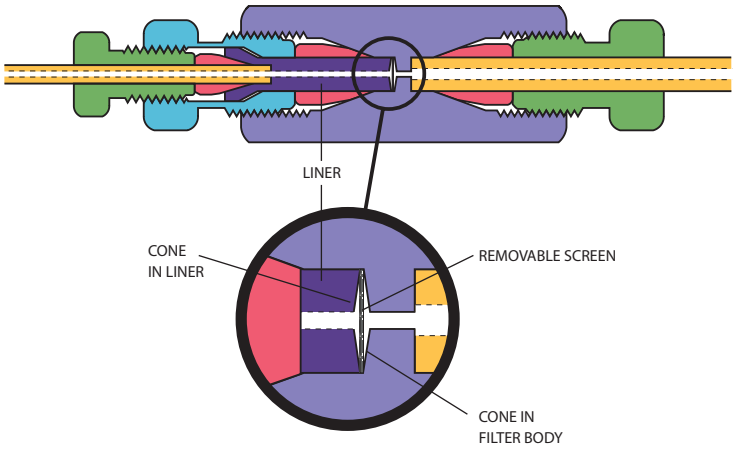
Filters with a removable screen

These 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.



Description	*Bore*	**Standard** *Prod No*	**Bulkhead** *Prod No*
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

CONVERSIONS

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"

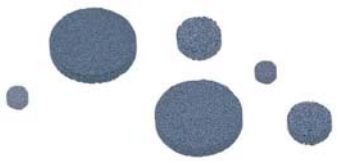
27.0 mm = 1.08"

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.

		Pore Size	*Frit Thickness*	**Stainless Steel** *Prod No*	**Hastelloy C** *Prod No*	**Titanium** *Prod No*
Pkg of 5:	1/32" frits	0.2µ	0.25 mm	.2FR.5-5	—	—
		0.5µ	0.25 mm	.5FR.5-5	—	—
		2µ	0.25 mm	2FR.5-5	—	—
Pkg 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	—	—
Pkg of 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	—	—
Pkg of 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. 20µ and 75µ screens are also available.
Note: If a filter was ordered with a removable screen, the screen ***cannot*** be replaced with a frit.

Package of 10:	*Pore Size*	*Screen Thickness*	**Stainless Steel** *Prod No*
1/32" screens	<1µ	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	<1µ	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	<1µ	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	<1µ	0.040 mm	.5SR4-10
	1µ	0.050 mm	1SR4-10
	2µ	0.075 mm	2SR4-10
	10µ	0.125 mm	10SR4-10

TECH TIP

Our screen materials are described in terms of *nominal* micron retention. For example, a screen with a 2 µ pore size will retain *most* particles 2 µ or larger, but the *absolute* retention will be of particles 7-8 µ in diamter or larger. This is true only of the smallest pore screens:

Pore size	*Nominal* retention	*Absolute* retention
<1µ	<1µ	5-6µ
1µ	1µ	6-7µ
2µ	2µ	7-8µ
10µ	10µ	11-13µ

VALCO FITTINGS

Custom socket wrenches

These socket wrenches have a slot to slip over the tubing, making them especially useful when nuts are difficult to access with an open end wrench. The SWH4 works with all types of 1/4" hex nuts, such as Valco 1/16" ZDV fitting nuts. The SWH3 fits our 1/32" nuts.

Size	*Prod No*
3/16"	SWH3
1/4"	SWH4



Ferrule removal kits

Remove polymeric ferrules stuck in fitting details. One version is for 1/32" and 360 micron ferrules, and the other version is for 1/16" and 1/8" ferrules.

	Prod No
For 360 µm, FS, and 1/32"	FRK1
For 1/16" and 1/8"	FRK2



For 360 µm and 1/32" ferrules



For 1/16" and 1/8" ferrules

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
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*
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

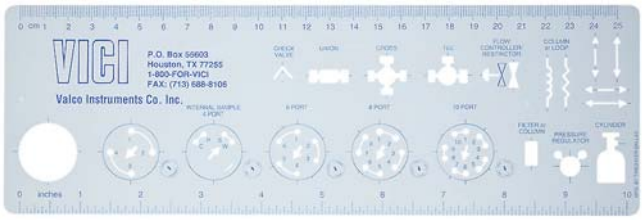
PV

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



Mirror

Helpful to get access to valve serial numbers and to check discharge on pulsed discharge detectors (PDD).

Prod No

MR



MORE INFORMATION

Tools for valves
Pencil magnet . . . . p 210
Valve spanner handle. 211
Tightening tools for PEEK fittings. 67
Tubing accessories .90, 92

Cheminert® fittings

INERT AND BIOCOMPATIBLE

Cheminert fittings are available for high and low pressure applications, and 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.

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

VICI Nanovolume® fittings generally have bore sizes of 100-150 µm (.004"-.006"), with some as small as 50 µm (.002"). 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.

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" fittings, with 50 - 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.

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

MORE INFORMATION

High pressure Cheminert fittings.....pp 57-67
Low pressure Cheminert fittings 68-77
Nanovolume® fittings 57-61
Valco fittings 6-55

CONVERSIONS

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





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

Our new high pressure fittings permit direct connection of 360 micron OD fused silica, PEEK, stainless, or electro-formed 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.

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

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 an integral base with double stick tape to secure fittings to a surface.

*or burst pressure of tubing

Nut/ferrules, caps, plugs, tightening tool

for 360 µm tubing

	Prod No
Nut/ferrule	C360NFPK
Cap	C360CPK
Plug	C360PPK
Tightening tool	C360ET

Unions and reducing unions

for 360 µm tubing



Bore size:	50 micron *Prod No*	100 micron *Prod No*	150 micron *Prod No*
Union, quick mount	C360QUPK2	C360QUPK4	C360QUPK6
Union	C360UPK2	C360UPK4	C360UPK64
Reducing union, 1/16" to 360 µm	—	—	C360RU1PK6

Tees and crosses

for 360 µm tubing



Bore size:	50 micron *Prod No*	100 micron *Prod No*	150 micron *Prod No*
Tee, quick mount	C360QTPK2	C360QTPK4	C360QTPK6
Cross, quick mount	C360QXPK2	C360QXPK4	C360QXPK6

DIRECT CONNECTIONS TO 1/32" AND 1/16"

Valco 360 micron reducers directly connect 360 µm tubing to 1/16" or 1/32" Valco valve or fitting details, providing a positive leak-free seal with zero dead volume.

Internal fittings . . . pg 38



MORE INFORMATION

Nanovolume® fittings
For fused silica tubing, 10,000+ psi liq . . pg 58
For metal tubing, up to 20,000 psi liq . 58
1/32" Nanovolume® fittings 59-61
Injectors with 360 micron fittings. . 154

CONVERSIONS

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

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

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

For fused silica tubing — 10,000 psi liq and above*

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

*or burst pressure of tubing

Nut/ferrules and caps

for 360 µm FS tubing

	Prod No
 Nut/ferrule	C360NFFS
 Cap	C360CFS

Unions and reducing unions

for 360 µm FS tubing

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

For metal tubing — up to 40,000 psi liq**

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.

**or burst pressure of tubing. Higher pressures may be possible with smaller IDs. Consult factory.

Nut/ferrules and caps

for 360 µm tubing

	Prod No
 Nut/ferrule	C360NFS6
 Cap	C360C

Unions and reducing unions

for 360 µm tubing

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

NOTE
For metal 360 µm tees and crosses, contact the factory.

DIRECT CONNECTIONS TO 1/32" AND 1/16"
Valco 360 micron reducers directly connect 360 µm tubing to 1/16" or 1/32" Valco valve or fitting details, providing a positive leak-free seal with zero dead volume.

Internal fittings .... p 38
External fittings..... 39



TECH TIP
Use these **metal 360 micron nuts** with nano injectors:

C72MU ..... p 154
C72MX 154

MORE INFORMATION

360 µm Nanovolume® fittings for use below 10,000 psi liq. . 57
360 µm tubing
Electroformed nickel. 87
PEEK 90
1/32" Nanovolume® fittings 59-61

CONVERSIONS

50 µm	= .002"
100 µm	= .004"
150 µm	= .006"
1/32"	= 0.8 mm
1/16"	= 1.6 mm



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, ferrules, and plugs

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
	**Internal nut** with collapsible ferrule *For use with: Fittings on pages 59-61*	C-NNFFPK
	**External nut** *For use with: Unions on page 60* *Column end fittings on page 61* Note: Requires collapsible PEEK ferrule, below	C-EN.5FPKB
	**Collapsible PEEK ferrule** *For use with: External nut, above*	ZGF.5PK
	**Internal plug** *For use with: Fittings on page 59-60*	C-NPFPK

Unions

for 1/32" tubing

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

Reducing unions

1/16" to 1/32" tubing

	150 µm bore Prod No
 Reducing union, 1/16" to 1/32" tubing	C-NERU1FPK

Tees, y's, and crosses

for 1/32" tubing or FS tubing*

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

*A liner is needed for use with fused silica. Order 27 mm length, page 60.



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

TECH TIP
Our liners adapt Nanovolume® tees, Y's, and crosses for use with fused silica tubing. They must be ordered separately.



Liners . . . . . page 60

MORE INFORMATION

360 µm fittings . .pp 57-58
1/32" Nanovolume® column end fittings . . 61
Tubing
PEEK 90
Electroformed nickel. 87
Unions for fused silica tubing. 60

TECH TIP
Use our internal nuts with collapsible ferrules for old style Cheminert CN2 and CN4 valves.

C-NNFFPK
For use with:
6 port valve CN2-4346
4 port internal sampling injector CN4-4344



C-NNFLFPK
For use with:
10 port valve CN2-4340



C-NVISF fill port for 26 gauge needles
For use with: CN2 valves.



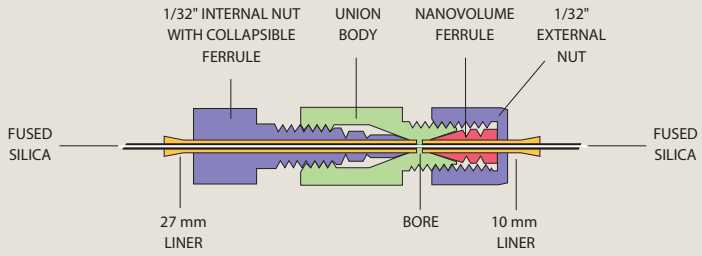
Consult factory regarding CN2 and CN4 valves.

CHEMINERT FITTINGS

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 natural PEEK liners to adapt 1/32" connectors to the most common sizes of fused silica tubing.

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

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
	2 micron	2FR.5-5

TECH TIP
Use **27 mm liners**

with internal nuts with collapsible ferrules:



Use **10 mm liners**

with external nuts:



MORE INFORMATION

360 µm fittings . .pp 57-58
1/32" Nanovolume® Fittings 59-61
External nuts 59
Internal nuts with collapsible ferrules . 59
Liners for column end fittings 61
More unions for fused silica 19, 58



Screen embedded in end of liner for column end fittings



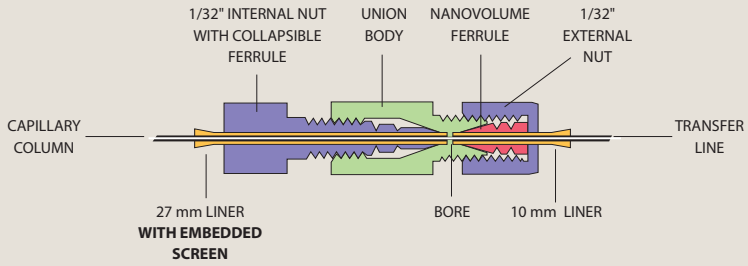
Nanovolume® column end fittings include two liners to adapt the 1/32" fitting to fused silica. The 27 mm liner, used inside the internal nut, has a 1 µm 316 stainless steel screen embedded in the PEEK to provide closure for fused silica columns. The 10 mm liner is used with the external nut.

The design utilizes 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.

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

Column end fittings *for fused silica capillary columns*

Each:	*For tubing OD*	**100 µm bore** *Prod No*	**150 µm bore** *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)

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

CONVERSIONS

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

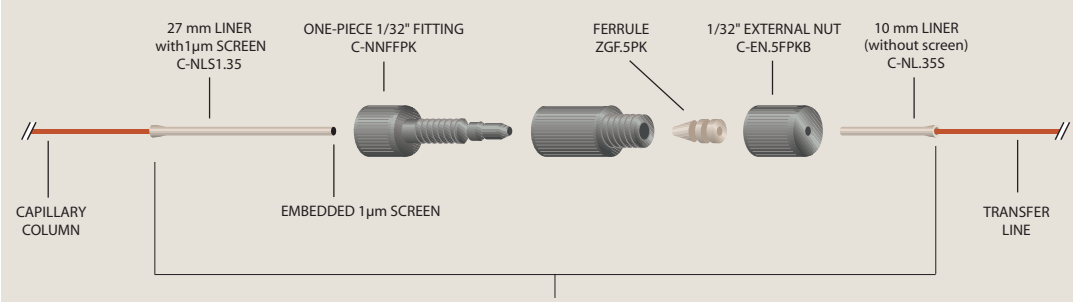
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

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)

CHEMINERT FITTINGS

No twist one-piece fittings *for 1/32" and1/16" tubing*



These patented* 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.

Optional ferrule materials available – FEP, PFA, PTFE, and glass-filled PTFE. Call for availability.

Package of 5:		**Glass-filled PEEK ferrule**	**PEEK ferrule**	**CTFE ferrule**
	Length	*Prod No*	*Prod No*	*Prod No*
1/32" hex	Short	ZNF.5PKG-5	ZNF.5PK-5	—
1/16" hex	Short	ZNF1PKG-5	ZNF1PK-5	ZNF1KF-5
	Medium	MZNF1PKG-5	MZNF1PK-5	MZNF1KF-5
	Long	LZNF1PKG-5	LZNF1PK-5	LZNF1KF-5
1/16" fingertight		ZNF1FPKG-5	ZNF1FPK-5	ZNF1FKF-5

* Patent No. 7,316,777

CONVERSIONS

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 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 125°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 and glass-filled PEEK

PEEK ferrules seal by the increased friction from compression. Use PEEK ferrules with PEEK fittings and glass-filled PEEK with stainless steel fittings.

	PEEK	**Glass-filled PEEK**
Package of 10:	*Prod No*	*Prod No*
1/32"	ZF.5PK-10	ZF.5PKG-10
1/16"	ZF1PK-10	ZF1PKG-10
1/8"	ZF2PK-10	ZF2PKG-10
1/4"	ZF4PK-10	ZF4PKG-10
3/8"	ZF6PK-10	ZF6PKG-10
1/2"	ZF8PK-10	ZF8PKG-10



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 recommended for use with PEEK tubing.

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

* Patent no. 6,575,501.

POLYMERS AT A GLANCE

PEEK . . . . . PK
Chemical resistance; up to 125°C

MORE INFORMATION

Tightening tool for hex-head PEEK nuts. . 67

CHEMINERT FITTINGS

Plugs and caps – high pressure PEEK

PEEK plugs and caps are available in knurled fingertight 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.



Description	*Length of nut**	**PEEK plugs** *Prod No*	**PEEK caps** *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 PAEK valves (C1-C5 series) since the fitting detail in these valves has an extended pilot length.



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.



Tubing OD	*Bore*	**PEEK tees** *Prod No*	**PEEK crosses** *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)..... page 256
Chemical resistance; up to 125°C

TECH TIP

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

PEEK ferrules 63
PFA ferrules 13

MORE INFORMATION

Low pressure plugs.... 71
Tightening tool for hex-head PEEK nuts.. 67

CONVERSIONS

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"

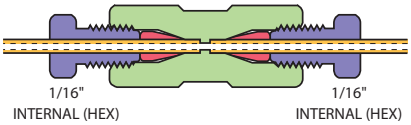
7.0 mm = .275"
10.0 mm = .400"

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)

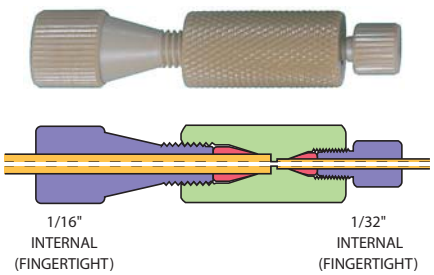


Bulkhead hex internal union – PEEK
(ZBU1PK)

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"



Nanovolume® reducing union – PEEK
(ZERU1.5FPK)

Internal/external reducing union – high pressure PEEK

Tubing OD	*Bore*	*Prod No*
1/16" to 1/32"	0.20 mm	ZERU1.5FPK

CHEMINERT 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

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

MORE INFORMATION
Color-coded PEEK tubing . . . page 91

CONVERSIONS

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 fingertight 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 Valco and Cheminert fittings

These handy tools make it fast and easy to tighten hex-head fittings. The red version is for use with the C360 series fittings shown on pages 57-58. The green tool is for any 1/32" fitting with a 3/16" hex head nut, and the blue version fits the 1/4" hex common in fittings for 1/16" tubing. The black tool is designed especially for the unique 1/16" tube fittings with 6-40 threads used in the new C25G selector on page 178.

Color	*For use with*	*Prod No*
Red	360 µm fittings	C360ET
Green	1/32" fittings (6-40 threads)	CNFT
Blue	1/16" fittings	ZNFT
Black	6-40 fittings for C25G valves	CGFT

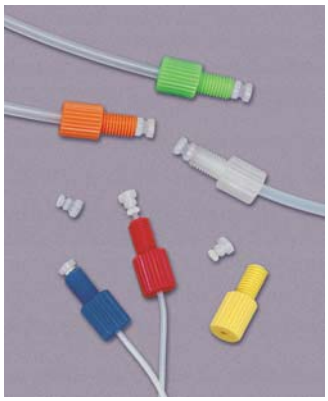
MORE INFORMATION

Hex-head PEEK fittings
360 µm . . . . . page 57
1/32" 62-63
1/16"
High pressure . . . 62-63
Low pressure 71
C25G selectors 178

CHEMINERT 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 a 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*



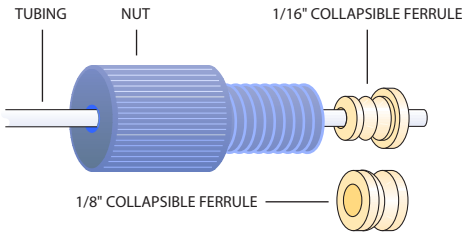
Flangeless tube end fittings eliminate the flanging tool required with standard tube end fittings. The nut turns on the tubing as freely as with our flanged fitting, eliminating the possibility of cracking or unscrewing that can occur when plastic tubing is subjected to twisting as fittings are connected.

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 occurs in a 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.

Cheminert tube end fittings come in twelve different colors for system color coding, and work with any 1/16" or 1/8" OD polymeric tubing. Use CTFE ferrules for soft tubing (PTFE, FEP, etc.) and PEEK ferrules for harder tubing (PEEK, ETFE, polyurethane, etc.)

* Patent No. 6,575,501

Flangeless fittings with CTFE ferrules	**1/16" OD**	**1/8" OD**
(pkg/5)	*Prod No*	*Prod No*
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 flangeless fittings *(pkg/12, one of each color)*		
with CTFE ferrule	CFL-1A	CFL-2A
with PEEK ferrule	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

CONVERSIONS

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

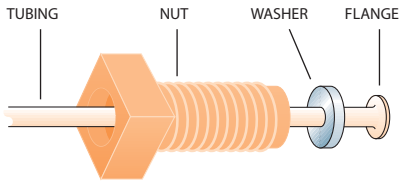
Standard flanged tube end fittings *1/4-28*



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, PFA, 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.



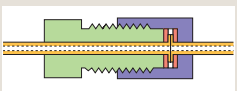
Flanged tube end fitting

Flanged fittings *(pkg/10)*	**1/16" OD** *Prod No*	**1/8" OD** *Prod No*
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 flangeless fittings (pkg/12, one of each color)	CF-1A	CF-2A
Washers (pkg/10)	CF-W1	CF-W2

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.



MORE INFORMATION
High pressure fittings .....pp 57-67
PTFE and FEP tubing.....92

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.

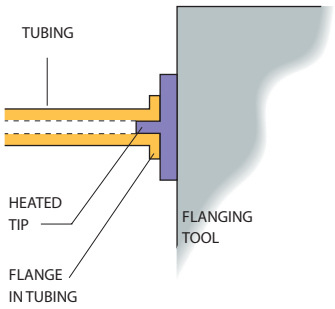
Package of 5: *Tubing OD*	**PEEK** *Prod No*	**CTFE** *Prod No*
1/16"	CEN1PK	CEN1KF
1/8"	CEN2PK	CEN2KF

CHEMINERT FITTINGS

Cheminert flanging tools (Non-CE)

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.



Forming a tubing flange

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



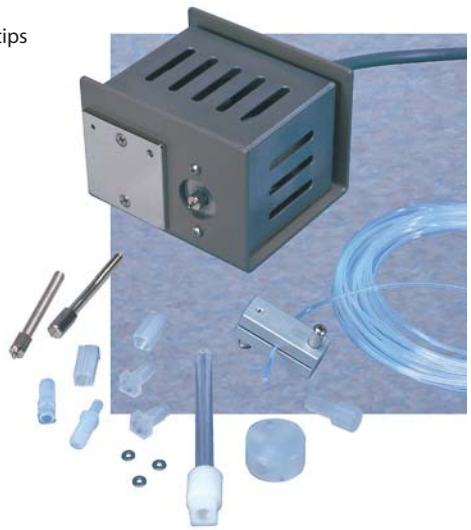
Cheminert starter kits (Non-CE)

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

	110 VAC *Prod No*	**230 VAC** *Prod No*
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 72-73
Male luer adapter 76
Female luer adapter ... 76
Plug 71
Tee 74
Glass connector 73



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
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	
6 feet of PTFE tubing, 1/16" x 0.75 mm ID	



Plugs *1/4-28 and 1/2-20*

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

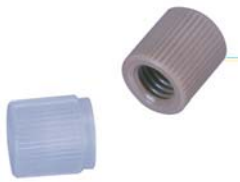
		PEEK *Prod No*	**CTFE** *Prod No*	**Delrin** *Prod No*
Pkg/5:	1/4-28	CPPK	CPKF	—
Pkg/1:	1/2-20	—	CP-4K	CP-4D



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 the plugs on page 64.

Package of 1:	*Length of nut**	**PEEK** *Prod No*
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.

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

MORE INFORMATION

Clean-cut tubing cutter ..... page 92
Tightening tool for hex-head PEEK nuts. . 67

CONVERSIONS

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

CHEMINERT FITTINGS

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

PEEK and CTFE unions include flangeless 1/4-28 fittings for tubing OD indicated. Polypropylene union bodies are for use with flanged tubing only and do not include any fittings.

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*
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



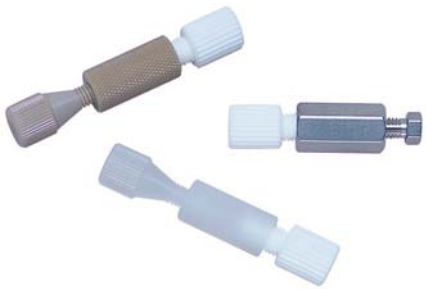
Package/5:		**Polypropylene** *Prod No*
1/8"	Butt	CUTPP



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

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*	**316 Stainless** *Prod No*
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*

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

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



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

CONVERSIONS

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

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

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*	**316 Stainless** *Prod No*
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*

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

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



CHEMINERT FITTINGS

Tees *1/4-28*

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*
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*

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*
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*

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*
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

CONVERSIONS

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



Mixing tees

1/4-28

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

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

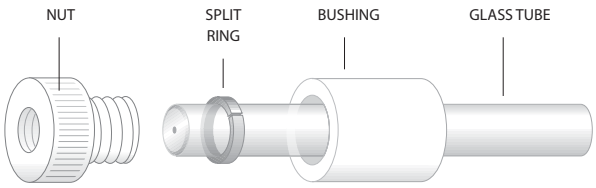


Glass connectors

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

Glass connectors join a Cheminert tube end fitting to 1/4" OD glass tubing. Complete 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*	**CTFE** *Prod No*
Complete assembly		
1 mm ID glass tubing	CGC41	CGC41KF
2 mm ID glass tubing	CGC42	CGC42KF
Components		
Bushing	CGCB	CGCBKF
Nut	CGCN	CGCNKF
Glass tube, 3-1/4" long		
1 mm ID	CGCG41	—
2 mm ID	CGCG42	—
Split rings (package of 5)	CGCR	CGCRKF



Glass connector

CHEMINERT FITTINGS

Tube adapters *1/4-28*

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*	**316 Stainless** *Prod No*
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.

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



Luer adapter bulkhead unions *Luer to 1/4-28 or 10-32*

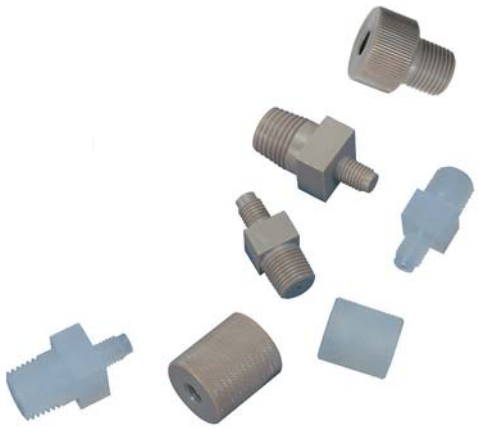
Our luer adapter bulkhead union connects a male or female luer to 1/4-28 or 10-32 fittings. These are the ideal fittings for through-the-panel syringe injections. The 1/4-28 versions include flangeless fittings for 1/16" OD tubing. Versions with 10-32 connections (for 1/16" OD tubing) include a fingertight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

Description	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*
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*	*Prod No*
Female 1/4-28 to male NPT			
1/8"	1.5 mm	CPA2PK	CPA2KF
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



10-32 NUT NOT INCLUDED

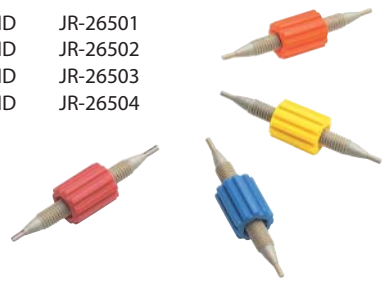
This adapter permits Valco 10-32 fittings to be installed into any 1/4-28 fitting detail. (Nut and ferrule are not included.)

Description	*Bore*	*Prod No*
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 91). 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*
Red	0.13 mm ID	JR-26501
Yellow	0.17 mm ID	JR-26502
Blue	0.25 mm ID	JR-26503
Orange	0.50 mm ID	JR-26504



CONVERSIONS

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"

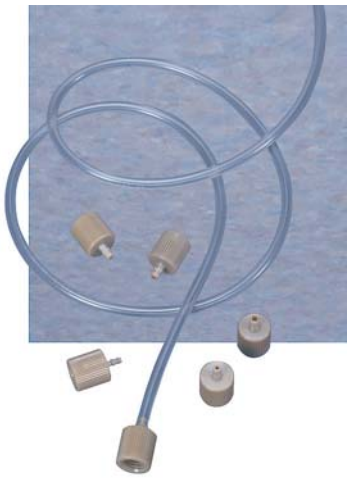
27.0 mm = 1.08"

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

CHEMINERT 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*
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 a 316 stainless low-pressure-drop screen. (Fitting shown is not included.)



Pore size	*Prod No*
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 tightened by hand.



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

Replacement elements (PEEK-encapsulated titanium)

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

CONVERSIONS

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



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 in which metal surfaces may corrode or interact with samples.

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



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*
2 micron	C-MPFTI2
10 micron	C-MPFTI10

CHEMINERT FITTINGS

No-Met biocompatible mobile phase filter



In the growing number of applications involving the separation of biomolecules, stainless steel in the flowpath is not acceptable. 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. They can be used up to a maximum flow rate of 500 ml/min*.

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

* Flow rates measured with methanol/water (1:1), ultrasonically degassed. Flow rates can vary with solvent and tubing ID.

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*
1/16"	2 µm	35	JR-367016-2
1/16"	10 µm	35	JR-367016-10
1/16"	20 µm	35	JR-367016-20
1/8"	2 µm	35	JR-367008-2
1/8"	10 µm	100	JR-367008-10
1/8"	20 µm	120	JR-367008-20

* Flow rates measured with methanol/water (1:1), ultrasonically degassed. Flow rates can vary with solvent and tubing ID.

CONVERSIONS

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 at the bottom of page 79.

Capacity	*Cap*	*Prod No*
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 caps

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

VICI caps fit GL45 threaded bottles, and are available with 2, 3, or 4 ports with 1/4-28 threads for 1/8" or 1/16" tubing. Unused ports can be plugged as required.

Each VICI cap includes the cap with insert and o-ring, and the appropriate number of PPS nuts, ETFE ferrules, and colored polypropylene fingertight sleeves for solvent line identification.

*Ethylene Propylene Diene Monomer

		Prod No
VICI-cap	2 ports	JR-S-11001
	3 ports	JR-S-11002
	4 ports	JR-S-11003



Valves for vials

Screw-cap Mininert valves are 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

TECH TIP
The VICI cap is intended only for continuous helium sparging, not for building up a helium atmosphere within the solvent bottle.

MORE INFORMATION
Bulkhead connectors .... page 73
Flangeless fittings 68
Plugs..... 71
Polymeric tubing..... 90-92

Liquid handling

PUMPS AND ULTRA-HIGH PRESSURE VALVES

Diluter/dispensers, M series
(Non-CE)

- 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. A 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, 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.

M10 Diluter/Dispensers

	Prod No
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

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.

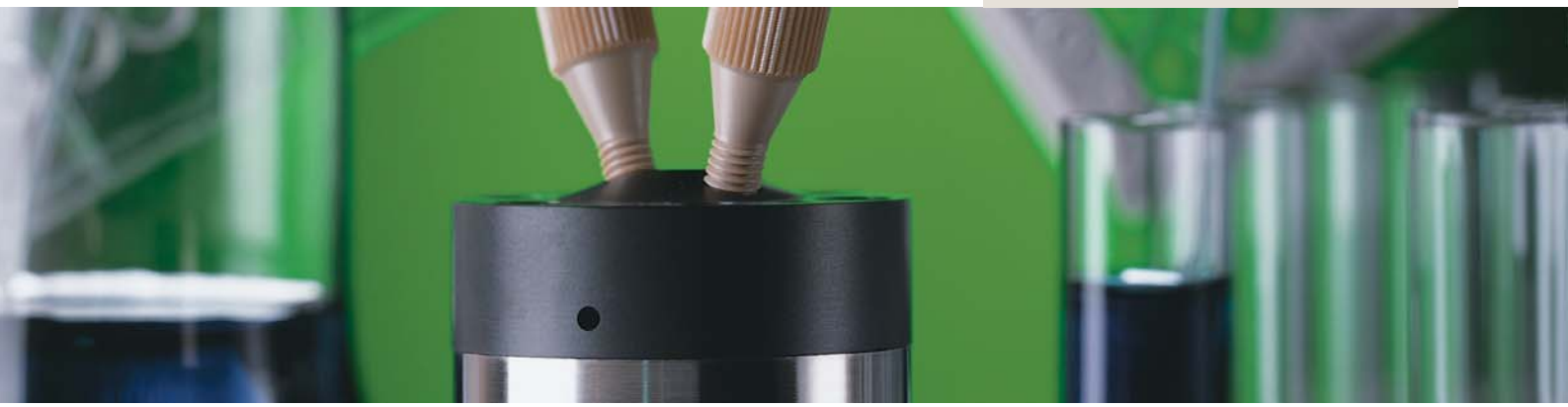
Program memory
Up to 100 programs can be permanently stored.

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.

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

CE

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.



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

TECH TIP
Use a standoff assembly if the motor must be separated from the pump head. Standoffs are available in lengths of 2", 3", 4", and 6".

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
Standoff assembly *	2"	2SOAMPCP
	3"	3SOAMPCP
	4"	4SOAMPCP
	6"	6SOAMPCP

* Note: Adding a standoff will change the backlash. Consult factory for further information.

LIQUID HANDLING

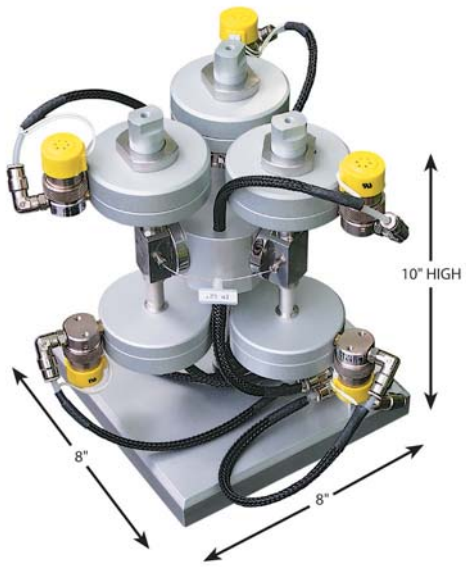
40,000 psi ultra-high pressure injector system

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.

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

For more information, contact our technical department.

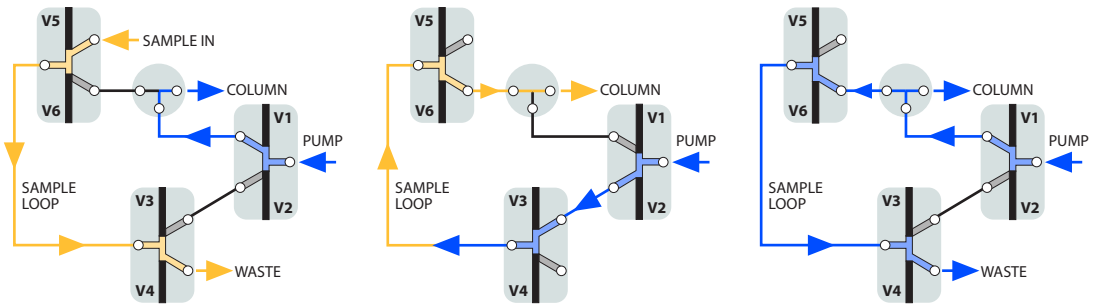


Ultra-high pressure injector system *for liquids*

Prod No

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

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, page 219)*



On/off valve
360 µm ZDV fittings

On/off valves

for liquids

SPECS Temp	SPECS Pressure	Fitting size	Bore	Prod No
50°C	40,000 psi liq	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

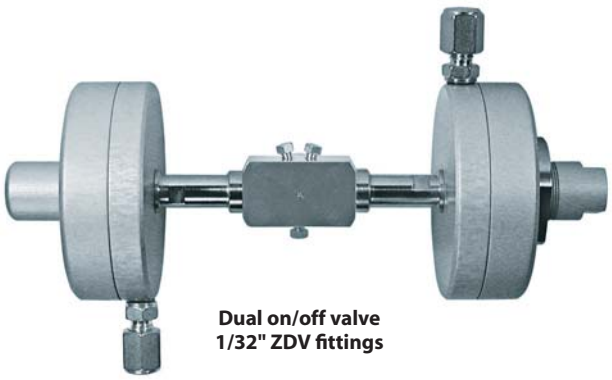
for liquids

SPECS Temp	SPECS Pressure	Fitting size	Bore	Prod No
50°C	40,000 psi liq	360 µm	0.15 mm	ASFV40K360
		1/32"	0.15 mm	ASFV40K.5
		1/16"	0.15 mm	ASFV40K1

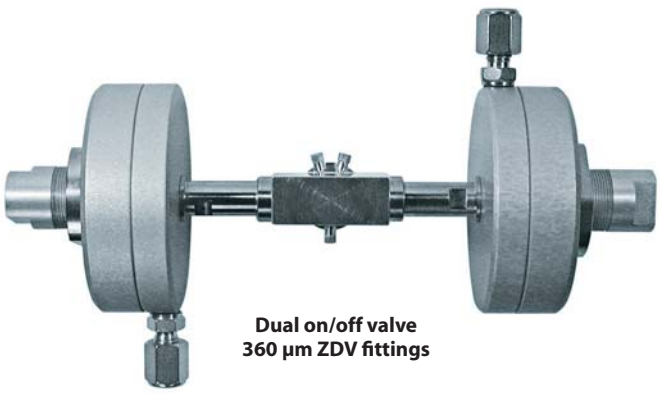
Dual on/off valves

for liquids

SPECS Temp	SPECS Pressure	Fitting size	Bore	Prod No
50°C	40,000 psi liq	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

STANDARD ON/OFF AND PRIME/ PURGE VALVES

2,000 psi to 10,000 psi valves . . . . . pp 212-213



TECH TIP

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

Tubing

METAL AND POLYMERIC

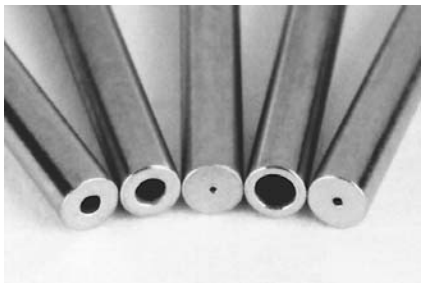
We offer chromatography grade tubing in ODs of 360 µm, 1/32", 1/16", and 1/8". Tubing can be ordered in economical pre-cut standard lengths, or can be custom cut to meet your specific instrumentation requirements. All VICI metal tubing is chromatographic grade seamless drawn tubing of the highest available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

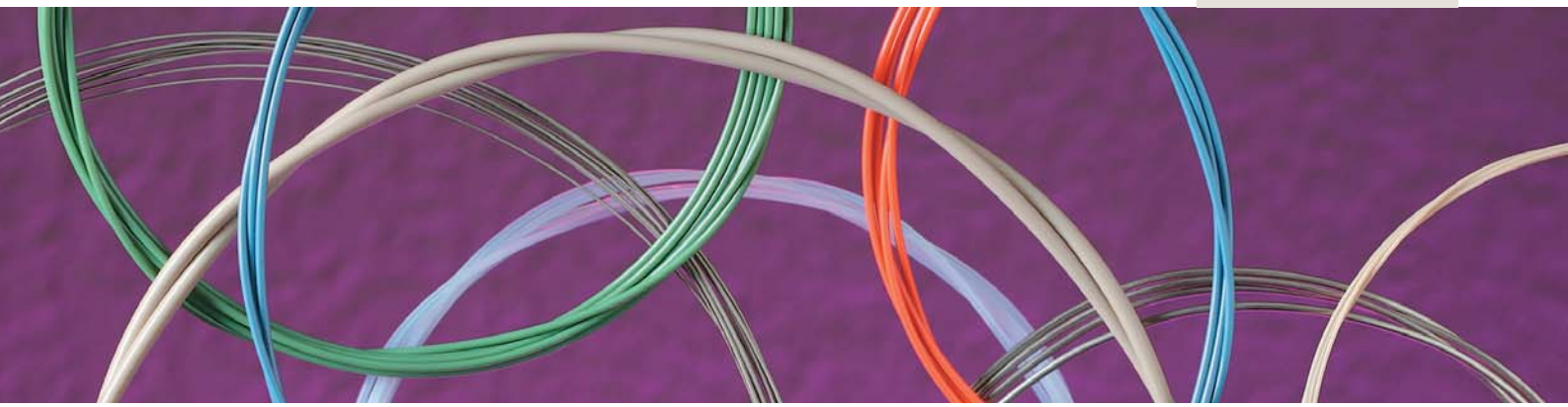


Plier cut

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





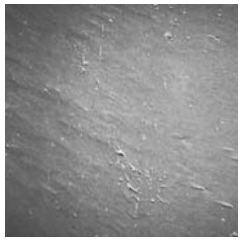
Three sizes of electroformed nickel tubing

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.

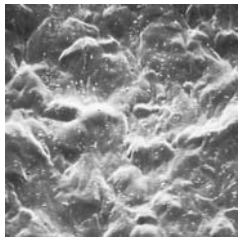
Custom IDs/ODs are available upon request.



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.

CONVERSIONS

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*
.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*
.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

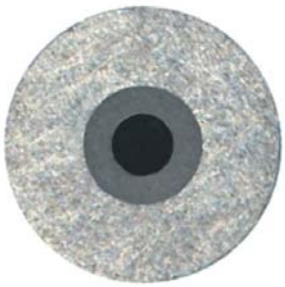
1/16" OD EFNi tubing — *Custom lengths*

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

Tubing ID	*Prod No*	*Max length*
.020"	TEFNI120	25 feet
.030"	TEFNI130	35 feet
.040"	TEFNI140	50 feet

TUBING

VICI electrochemically plates PEEK and fused silica tubing with pure nickel. This strengthens the tubing and allows direct connections using metal ferrules while maintaining the chemical benefits of the wetted surfaces inside.



Nickel-clad fused silica

- Inert, flexible transfer lines
- Improved heat transfer
- Thick wall version allows direct connection using metal ferrules
- Rated for up to 40,000 psi (dependant on size and plating thickness)

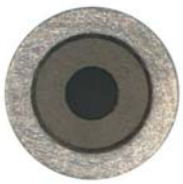
We take polyimide-coated fused silica (FS) and remove the polyimide layer. Then we electrochemically plate the FS with pure nickel. The resulting nickel-plated FS tube provides superior heat transfer to the FS lining, permitting use as a flexible transfer line with the best qualities of silica-lined stainless but with improved heat transfer and a shorter bend radius.

For high pressure applications, we recommend using our 1/32" 316 stainless ferrules.

1/32" OD tubing is available in IDs from 10 to 250 µm, permitting use of metal ferrules for improved leak-tight connections.

800µm (1/32") OD nickel-clad fused silica *Custom lengths*

Tubing ID	*Prod No*
10 µm	TNFS800360010
15 µm	TNFS800360015
20 µm	TNFS800360020
25 µm	TNFS800360025
50 µm	TNFS800360050
100 µm	TNFS800360100
180 µm	TNFS800360180
250 µm	TNFS800360250



Nickel-clad polyimide-coated fused silica

- Thin wall version for resistive heating offers improved heat transfer as compared to wire-wrapped designs
- Thin wall version results in column packages with even less mass, critical when temperature measurement is based on the change in resistance

Any polyimide-coated FS can be electroplated with pure nickel. This results in a ruggedized traditional FS column (or transfer line with deactivated FS), which can be resistively heated, if desired. Temperature is measured using the resistance of the nickel, removing any need for external sensors. A thin-wall, low mass version optimized for resistive heat applications is available in eight different diameters. We offer several options for tubing connections.

Please contact the factory to discuss your application.

TECH TIP
For best results, order clad tubings in the precise length required. Clean cuts are difficult to achieve with the tools normally available.

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 TNF tubing.



Nickel-clad PEEK

- Permits use of PEEK tubing at 30,000 psi
- Direct connection with metal ferrules

Since we can manufacture virtually any size of PEEK tubing from 360 µm OD/ .002" ID on up, the possibilities are endless. In any size, the mechanical properties of nickel combined with the chemical properties of PEEK produce enhanced performance with robust metal ferrule connections.

NEW Nickel-clad PEEK — *Custom lengths*

Tubing OD: *Tubing ID*	**800 µm (1/32")** *Prod No*	**1600 µm (1/16")** *Prod No*
50 µm	TNPK800360050	TNPK16001140050
75 µm	TNPK800360075	TNPK16001140075
100 µm	TNPK800360100	TNPK16001140100
125 µm	TNPK800360125	TNPK16001140125
180 µm	TNPK800360180	TNPK16001140180
205 µm	TNPK800360205	—
250 µm	TNPK800404250	TNPK16001140250
305 µm	TNPK800510305	TNPK16001140305
380 µm	TNPK800535380	—
510 µm	TNPK800660510	TNPK16001140510
760 µm	—	TNPK16001140760
1015 µm	—	TNPK160011401015

CONVERSIONS

50 µm = .002"
75 µm = .003"
100 µm = .004"

125 µm = .005"
150 µm = .006"
180 µm = .007"

205 µm = .008"
250 µm = .010"
305 µm = .012"

380 µm = .015"
510 µm = .020"

760 µm = .030"
1015 µm = .040"

800 µm = 1/32"
1600 µm = 1/16"

Natural PEEK tubing



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 meters

	.002" ID	.004" ID	.005" ID	.006" ID
	Prod No	*Prod No*	*Prod No*	*Prod No*
Priced per meter	TPK.102	TPK.104	TPK.105	TPK.106

1/32" OD PEEK tubing

	.0025" ID	.005" ID	.010" ID	.015" ID
Length	*Prod No*	*Prod No*	*Prod No*	*Prod No*
5 meters	TPK.502-5M	TPK.505-5M	TPK.510-5M	TPK.515-5M
10 meters	TPK.502-10M	TPK.505-10M	TPK.510-10M	TPK.515-10M
25 meters	TPK.502-25M	TPK.505-25M	TPK.510-25M	TPK.515-25M

1/16" OD PEEK tubing

	.006" ID	.010" ID	.020" ID	.030" ID
Length	*Prod No*	*Prod No*	*Prod No*	*Prod No*
5 meters	TPK106-5M	TPK110-5M	TPK120-5M	TPK130-5M
10 meters	TPK106-10M	TPK110-10M	TPK120-10M	TPK130-10M
25 meters	TPK106-25M	TPK110-25M	TPK120-25M	TPK130-25M

1/8" OD PEEK tubing

	.060" ID
Length	*Prod No*
5 meters	TPK260-5M
10 meters	TPK260-10M
25 meters	TPK260-25M

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

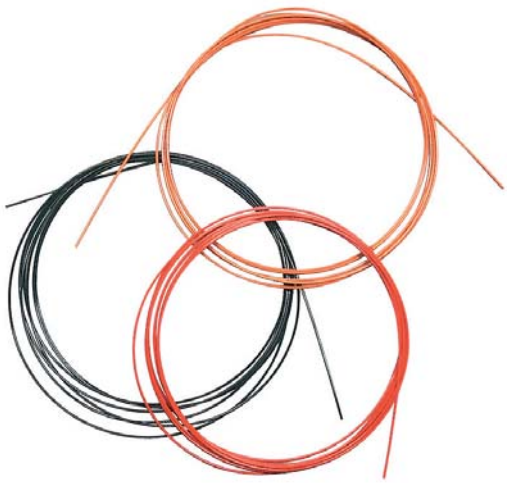
MORE INFORMATION

Polymeric tubing

PTFE ..... page 92
FEP..... 92
ETFE..... 92

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.



Color-coded PEEK tubing

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.

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 the 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*
.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.

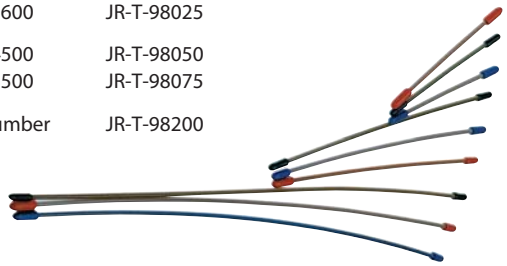
Tubing ID	*Color*	*bar*	*psi*	*Prod No*
.004"	Black	460	6700	JR-T-5804
.005"	Red	420	6100	JR-T-5999
.007"	Yellow	400	5800	JR-T-6000
.010"	Blue	386	5600	JR-T-6001
.020"	Orange	350	4500	JR-T-6002
.030"	Green	240	3500	JR-T-6003
.040"	Grey	165	2400	JR-T-60031

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*
.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 (Restriction of Hazardous Substances)

CONVERSIONS

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"

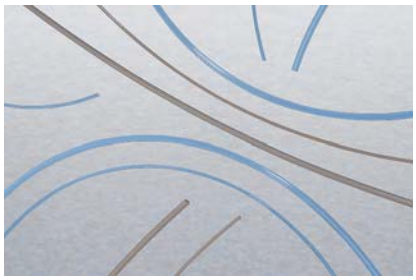
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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

PTFE, FEP, and ETFE 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 90-91.



1/16" OD polymeric tubing

		.006" ID	.010" ID	.015" ID	.020" ID	.030" ID
	Prod No	*Prod No*	*Prod No*	*Prod No*	*Prod No*	
PTFE						
	5 meters	TTF106-5M	TTF110-5M	TTF115-5M	TTF120-5M	TTF130-5M
	10 meters	TTF106-10M	TTF110-10M	TTF115-10M	TTF120-10M	TTF130-10M
	25 meters	TTF106-25M	TTF110-25M	TTF115-25M	TTF120-25M	TTF130-25M
FEP						
	5 meters	—	TFEP110-5M	—	TFEP120-5M	TFEP130-5M
	10 meters	—	TFEP110-10M	—	TFEP120-10M	TFEP130-10M
	25 meters	—	TFEP110-25M	—	TFEP120-25M	TFEP130-25M
ETFE						
	5 meters	—	TTZ110-5M	—	TTZ120-5M	TTZ130-5M
	10 meters	—	TTZ110-10M	—	TTZ120-10M	TTZ130-10M
	25 meters	—	TTZ110-25M	—	TTZ120-25M	TTZ130-25M

1/8" OD polymeric tubing

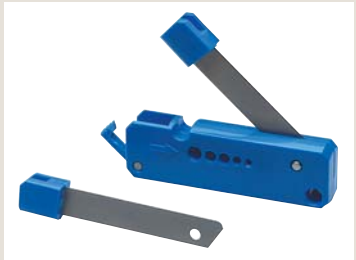
		.030" ID	.060" ID	.085" ID
	Prod No	*Prod No*	*Prod No*	
PTFE				
	5 meters	TTF230-5M	TTF260-5M	TTF285-5M
	10 meters	TTF230-10M	TTF260-10M	TTF285-10M
	25 meters	TTF230-25M	TTF260-25M	TTF285-25M
FEP				
	5 meters	—	TFEP260-5M	—
	10 meters	—	TFEP260-10M	—
	25 meters	—	TFEP260-25M	—
ETFE				
	5 meters	—	TTZ260-5M	—
	10 meters	—	TTZ260-10M	—
	25 meters	—	TTZ260-25M	—

– 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 90
- Color-coded 91
- Striped 91

CUSTOM LENGTHS

Custom lengths of PTFE tubing up to a maximum of 250' available on request. Additional charges may apply.

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®

CONVERSIONS

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

Metal tubing, bulk quantities

Bulk metal tubing is not electrolytically cut or cleaned. The annealing process provides tubing which is sufficiently clean for most chromatography applications. *(See note at left for custom-cleaned tubing.)*

To order, specify the length required in one meter increments.

316 stainless

Bulk quantities

Tubing ID	1/32" OD *Prod No*	1/16" OD *Prod No*	1/8" OD *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

Bulk quantities

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

Hastelloy C

Bulk quantities

Tubing ID	1/32" OD *Prod No*	1/16" OD *Prod No*	1/8" OD *Prod No*
.010"	—	THC110	—
.020"	—	THC120	—
.030"	—	THC130	—
.040"	—	THC140	—
.070"	—	—	THC270
.085"	—	—	THC285

Inconel 600

Bulk quantities

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

– Not normally available

CLEANED CUSTOM LENGTH TUBING

You can order custom length tubing which has been electrolytically cut, deburred, and steam cleaned. Please contact VICI or your local distributor for product numbers and pricing.

The maximum lengths available depends on the ID of the tubing:

Tubing ID	Max length
.005"	90 cm
.007"	150 cm
.010"	300 cm
.020"	600 cm
.026"	1200 cm
.030"	1500 cm
>.030"	1500 cm

Tubing up to 6 feet in length will be supplied straight. Longer tubes will be supplied coiled.

CONVERSIONS

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"

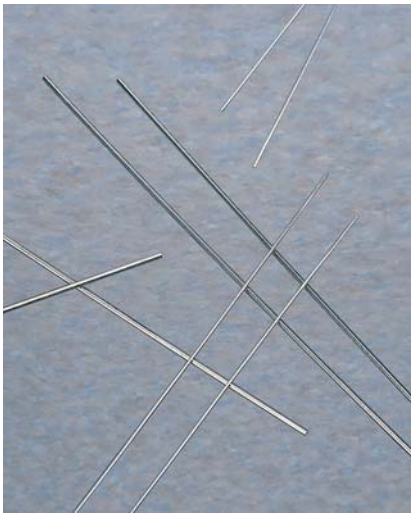
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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

Pre-cut stainless tubing

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 saving over the charge for custom-cut tubing.

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



1/32" OD stainless tubing

Pre-cut lengths

Length	.005" ID *Prod No*	.010" ID *Prod No*	.020" ID *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.

CONVERSIONS

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

1/16" 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
2 pieces 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	T50C1 0D	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

CLEANED CUSTOM LENGTH TUBING

You can order custom length tubing which has been electrolytically cut, deburred, and steam cleaned. Please contact VICI or your local distributor for product numbers and pricing.

The maximum lengths available depends on the ID of the tubing:

Tubing ID	Max length
.005"	90 cm
.007"	150 cm
.010"	300 cm
.020"	600 cm
.026"	1200 cm
.030"	1500 cm
>.030"	1500 cm

Tubing up to 6 feet in length will be supplied straight. Longer tubes will be supplied coiled.

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

QUICK OVERVIEW OF OUR LINE-UP

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

Valco Injectors and Valves for GC

pages 98-101, 104-113



For over 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 101, 114-118



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. Versions with 3, 4, 6, 8, 10, 12 port 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 102-103, 124-135



One inherent benefit of the Valco conical rotary design is that it allows multiple planes of ports, facilitating 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 142-145



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 UHPLC Injectors

pages 146-148, 154-157

Many current analytical techniques require systems capable of pressures as high as 20,000 psi. UHPLC injectors from Cheminert feature a proprietary rotor material and stator coating that permit these pressures. Injectors are available in a variety of configurations, including models with a vertical injection port.

Nanovolume® UHPLC injectors feature a uniform flowpath as small as 100 microns (.004"). Specially-designed fittings allow direct connection of 360 micron OD PEEK, fused silica, or electroformed nickel tubing. Versions are also available with standard 1/32" or 1/16" fittings. Microbore UHPLC injectors offer flowpaths of 0.25 mm (.010"), with a choice of 1/32" or 1/16" fittings.



Cheminert HPLC Injectors and Valves

pages 146-149, 158-165

The Cheminert HPLC line includes 4, 6, 8, and 10 port versions. The submicroliter injector has an injection volume as small as 10 nanoliters, and Nanovolume® internal sample injectors offer a volume down to 4 nanoliters. Valves feature 1/32" and 1/16" zero dead volume fittings, with bore sizes from 100 µm (.006") to 0.75 mm (.030") for nanobore, microbore, and analytical applications. 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 146, 150, 166-169

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 152-153, 172-179

Choose among 4, 6, 8, 10, 14, 20, 24, or 28 position stream selection valves, in high pressure and low pressure models, plus UHPLC selectors for up to 10 streams. 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.

HPLC . . . . . pages 151, 180-183
Low pressure 151, 184-185
Selectors 153, 186-187



Valco valves

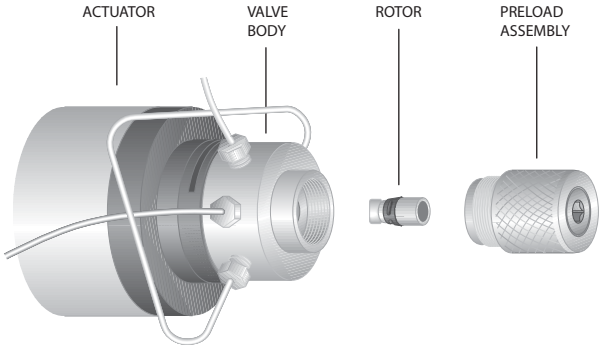
FOR INJECTION, SWITCHING, AND STREAM SELECTION

- 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 5,000 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 101; product numbers and prices begin on page 104. For information on **selectors**, refer to pages 102-3.



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

MORE INFORMATION

Decoding Valco valve product no's... 266-269

Valve descriptions
Cheminert injectors and valves..... 146-151
Cheminert selectors ..146, 152-153
Diaphragm..... 142-143
Valco two position....101
Valco selectors .. 102-103

Valco valve prices
GC 104-113
HPLC..... 114-118
Selector..... 124-135



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.

Specifying a Special Body Material

To specify a special valve body material, add the material code to the end of the valve product number. Contact the factory for the additional cost.

Example:
An A4C6WE (air actuated 1/16" 6 port WE valve with a 4" standoff) made of Hastelloy C-22 would be designated A4C6WEHC.

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.

SPECIAL BODY MATERIAL — CODES

TWO POSITION VALVES		MULTIPOSITION VALVES	
Body material	*Code*	*Body material*	*Code*
HPLC grade Stainless steel	SS	HPLC grade Stainless steel	SS
Hastelloy C-22	HC	Hastelloy C-22	HC
Inconel 600	IN	Inconel 600	IN
Monel 400	M4	Monel 400	M4
Nickel	NI	Nickel	NI
Nitronic 50	N5	Nitronic 50	N5
Titanium *	TI	Titanium *	TI

* Not available for WT, UWT, or T series valves (high temp) due to material temperature limit.

MORE INFORMATION
Materials
Metals. . . . . pp 254-255
Polymers 256
Valve rotors. 257

Reliably Clean

All finished valve bodies are ultrasonically cleaned with water soluble detergents and then rinsed with hot deionized water. Finally they are given a thorough cleaning with steam from deionized water.

During valve assembly each part is cleaned with isopropanol and dried with filtered and dehumidified air. The valves are then heated and switched prior to being leak tested.

Precautions

After unpacking the valve, do not remove the protective tape from the valve ports until you are ready to install the valve. As supplied, all surfaces are clean and free of contaminants, and must be kept clean to prevent valve damage. Open ports and fittings cause unnecessary risk of particulate matter entering the valve and scratching the sealing surfaces, which is the most frequent cause of premature valve failure.

The most common source of contamination is particulates from tubing or unfiltered samples, or samples which leave a solid residue on drying (e.g. buffers).

Care should be taken that particles do not enter the valve.

TECH TIP
See **Technical Note 201, "Operation Notes and Cleaning Instructions"** for more detailed information about unpacking and handling the valve.

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.

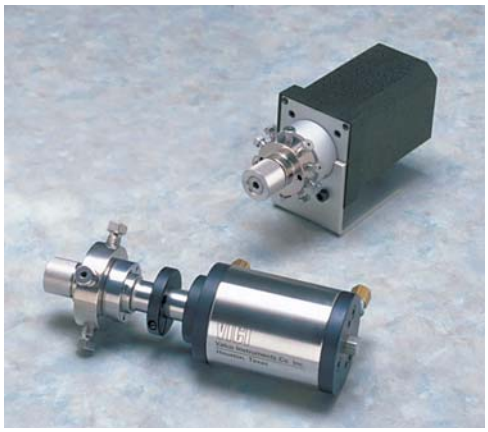
RANGES FOR ACCEPTABLE LEAK RATES

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 contact the factory for 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.



Two position injectors and switching valves have many applications, as shown in the section beginning on page 119. In this catalog, Valco two position valves are divided into GC and HPLC sections, with the GC section starting on page 104 and the HPLC section on page 114.

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 104-5 and 114)*, 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. However, with small volume loops, the tolerance on the ID of the tubing (±0.001") can have a significant effect on the volume. Therefore, loop volumes and loop appearance may differ from batch to batch.

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

Actuation . . pp 188-209

Applications . 119-123

Materials
Metals. 254-255
Polymers 256
Valve rotors. 257

Valve descriptions
Cheminert injectors and valves 146-151
Cheminert selectors . . 146, 152-153
Diaphragm 142-153
Valco selectors . . 102-103

Valco valve prices
GC 104-113
HPLC. 114-118
Selectors 124-135

VALCO VALVES

Instead of the back and forth switching of two position valves, selectors (multiposition valves) step incrementally through continuous revolutions (bi-directionally with universal and modular universal actuators). 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 than 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

Actuation . . pp 188-209

Applications . 119-123

Materials
Metals. 254-255
Polymers 256
Valve rotors. 257

Specifying a special body material 99

Selector prices
Low pressure
SD 124-125
SC. 126-127
SF 128-129
ST 130-131
STF. 132-133
High pressure
SD 134
ST. 135

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")

W Type

Med temp
Internal sample
1/32" 0.25 mm

Includes 2" standoff. Manual version is not available without standoff.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply



Sample volume	.06 µl *Prod No*	.1 µl *Prod No*	.2 µl *Prod No*	.5 µl *Prod No*
Manual with standoff	2NI4WE.06	2NI4WE.1	2NI4WE.2	2NI4WE.5
With air actuator	A2NI4WE.06	A2NI4WE.1	A2NI4WE.2	A2NI4WE.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

SPECS

1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

OPTIONS

- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-5)*

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.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply



Sample volume	.06 µl *Prod No*	.1 µl *Prod No*	.2 µl *Prod No*	.5 µl *Prod No*
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 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

SPECS

1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

OPTIONS

- 6 and 8 port valves available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-5)*



W Type
1/16" fittings

MORE INFORMATION

Actuators
Air ..... page 197
Manual.....204
Microelectric 190-1
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

Internal sample injectors, 1/16" fittings, 0.75 mm ports (.030")

UW Type

SPECS
1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

OPTIONS
- 6 and 8 port valves available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-5)*

Includes 2" standoff. Manual version has no standoff.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply



Med temp
Internal sample
1/16" 0.75 mm

Sample volume	.2 µl *Prod No*	.5 µl *Prod No*	1 µl *Prod No*	2 µl *Prod No*
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 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

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-5)*

Includes 2" standoff. Manual version has no standoff.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply



Med temp
Internal sample
1/8" 0.75 mm

Sample volume	.2 µl *Prod No*	.5 µl *Prod No*	1 µl *Prod No*	2 µl *Prod No*
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 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

Sampling and switching valves, 1/32" fittings, 0.25 mm ports (.010")

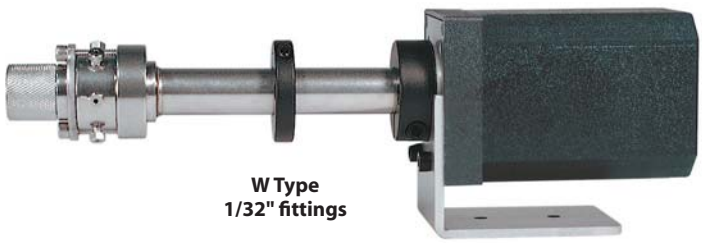
W Type

Med temp

1/32" **0.25 mm**

Includes 4" standoff. Manual version not available without standoff.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately.

	 4 Ports *Prod No*	 6 Ports *Prod No*	 8 Ports *Prod No*	 10 Ports *Prod No*
Manual with standoff	4N4WE	4N6WE	4N8WE	4N10WE
With air actuator	A4N4WE	A4N6WE	A4N8WE	A4N10WE
With microelectric actuator	EH4N4WE	EH4N6WE	EH4N8WE	EH4N10WE
Replacement valve	DN4WE	DN6WE	DN8WE	DN10WE
Replacement rotor	SSAN4WE	SSAN6WE	SSAN8WE	SSAN10WE



W Type
1/32" fittings

SPECS

400 psi gas
225°C max
Nitronic 60 valve body
Valcon E rotor

For 300 psi, 350°C max, see facing page.

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 254-5)*

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Nickel 200, PEEK, and PTFE
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Actuators
Air ..... page 197
Manual.....204
Microelectric 190-1
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

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*	*Volume*	*Prod No*
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

Sampling and switching valves, 1/32" fittings, 0.25 mm ports (.010")

W Type

SPECS

300 psi gas
350°C max
Nitronic 60 valve body
Valcon T rotor

For 400 psi, 225°C max, see facing page

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 254-5)*

Includes 4" standoff. Manual version not available without standoff.
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**

	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual with standoff	4N4WT	4N6WT	4N8WT	4N10WT
With air actuator	A4N4WT	A4N6WT	A4N8WT	A4N10WT
With microelectric actuator	EH4N4WT	EH4N6WT	EH4N8WT	EH4N10WT
Replacement valve	DN4WT	DN6WT	DN8WT	DN10WT
Replacement rotor	SSAN4WT	SSAN6WT	SSAN8WT	SSAN10WT



W Type
1/32" fittings

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Nickel 200, PEEK, and PTFE
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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*	*Volume*	*Prod No*
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

Sampling and switching valves, 1/16" fittings, 0.40 mm (.016")

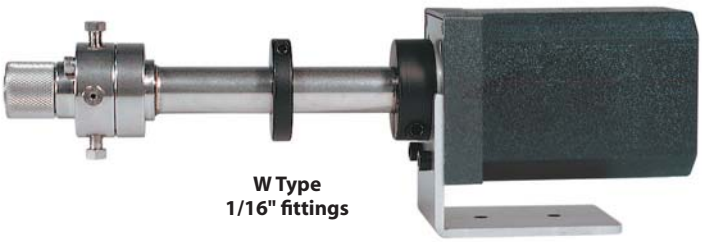
W Type

Med temp

1/16" **0.40 mm**

Includes 4" standoff Manual version has no standoff
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately.

	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual	C4WE	C6WE	C8WE	C10WE
Manual with standoff	4C4WE	4C6WE	4C8WE	4C10WE
With air actuator	A4C4WE	A4C6WE	A4C8WE	A4C10WE
With microelectric actuator	EH4C4WE	EH4C6WE	EH4C8WE	EH4C10WE
Replacement valve	DC4WE	DC6WE	DC8WE	DC10WE
Replacement rotor	SSAC4WE	SSAC6WE	SSAC8WE	SSAC10WE



W Type
1/16" fittings

SPECS

400 psi gas
225°C max
Nitronic 60 valve body
Valcon E rotor

For 300 psi, 350°C max, see page 110.

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 254-5)*
- Smaller and larger bores available in most configurations.

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Actuators
Air ..... page 197
Manual.....204
Microelectric 190-1
Universal 193
Materials
Metals..... 254-25 5
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

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*	*Volume*	*Prod No*
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

Sampling and switching valves, 1/16" fittings, 0.75 mm ports (.030")

UW Type

SPECS

400 psi gas
225°C max
Nitronic 60 valve body
Valcon E rotor

For 300 psi, 330°C max, see page 111.

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 254-5)*
- Larger bore available

Includes 4" standoff. Manual version has no standoff.
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** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual	C4UWE	C6UWE	C8UWE	C10UWE
Manual with standoff	4C4UWE	4C6UWE	4C8UWE	4C10UWE
With air actuator	A4C4UWE	A4C6UWE	A4C8UWE	A4C10UWE
With microelectric actuator	ED4C4UWE	ED4C6UWE	ED4C8UWE	ED4C10UWE
Replacement valve	DC4UWE	DC6UWE	DC8UWE	DC10UWE
Replacement rotor	SSAC4UWE	SSAC6UWE	SSAC8UWE	SSAC10UWE



UW Type
1/16" fittings

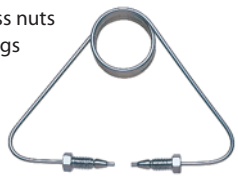
ABOUT LOOPS

- 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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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*	*Volume*	*Prod No*
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

Sampling and switching valves, 1/16" fittings, 0.40 mm ports (.016")

W Type

High temp

1/16" **0.40 mm**

Includes 4" standoff
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately.

	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual with standoff	4C4WT	4C6WT	4C8WT	4C10WT
With air actuator	A4C4WT	A4C6WT	A4C8WT	A4C10WT
With microelectric actuator	EH4C4WT	EH4C6WT	EH4C8WT	EH4C10WT
Replacement valve	DC4WT	DC6WT	DC8WT	DC10WT
Replacement rotor	SSAC4WT	SSAC6WT	SSAC8WT	SSAC10WT



W Type
1/16" fittings

SPECS

300 psi gas
350°C max
Nitronic 60 valve body
Valcon T rotor

For 400 psi, 225°C max, see page 108.

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 254-5)*
- Smaller and larger bores available in most configurations.

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Actuators
Air ..... page 197
Manual.....204
Microelectric 190-1
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

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*	*Volume*	*Prod No*
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

Sampling and switching valves, 1/16" fittings, 0.75 mm ports (.030")

UW Type

SPECS

300 psi gas
330°C max
Nitronic 60 valve body
Valcon T rotor

For 400 psi, 225°C max, see page 109.

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 254-5)*
- Larger bore available

Includes 4" standoff
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*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual with standoff	4C4UWT	4C6UWT	4C8UWT	4C10UWT
With air actuator	A4C4UWT	A4C6UWT	A4C8UWT	A4C10UWT
With microelectric actuator	ED4C4UWT	ED4C6UWT	ED4C8UWT	ED4C10UWT
Replacement valve	DC4UWT	DC6UWT	DC8UWT	DC10UWT
Replacement rotor	SSAC4UWT	SSAC6UWT	SSAC8UWT	SSAC10UWT



UW Type
1/16" fittings

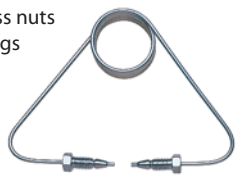
ABOUT LOOPS

- 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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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*	*Volume*	*Prod No*
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

Sampling and switching valves, 1/8" fittings, 0.75 mm ports (.030")

UW Type

Med temp

1/8" **0.75 mm**

Includes 4" standoff. Manual version has no standoff.
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** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual	4UWE	6UWE	8UWE	n/a
Manual with standoff	44UWE	46UWE	48UWE	410UWE
With air actuator	A44UWE	A46UWE	A48UWE	A410UWE
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 254-5)*
- 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.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not available.

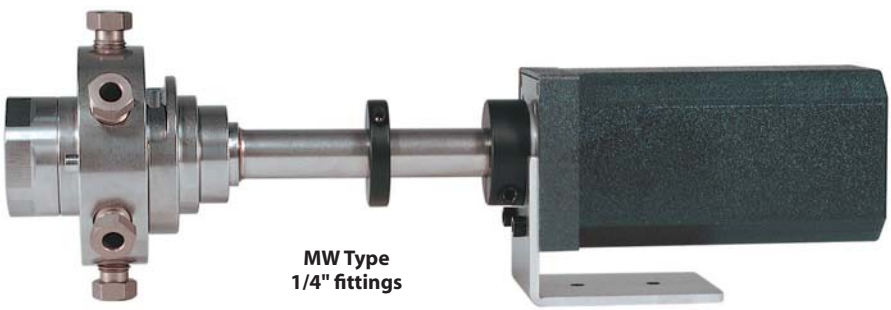
	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*
Manual with standoff	4VL4MWE2	4VL6MWE2	4VL8MWE2
With air actuator	A4VL4MWE2	A4VL6MWE2	A4VL8MWE2
With microelectric actuator	ET4VL4MWE2	ET4VL6MWE2	ET4VL8MWE2
Replacement valve	DVL4MWE2	DVL6MWE2	DVL8MWE2
Replacement rotor	SSAVL4MWE2	SSAVL6MWE2	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 254-5)*



MW Type
1/4" fittings

Sampling and switching valves, 1/8" fittings, 0.75 mm ports (.030")

UW Type

SPECS

300 psi gas
330°C max
Nitronic 60 valve body
Valcon T rotor

For 400 psi, 225°C max, see facing page.

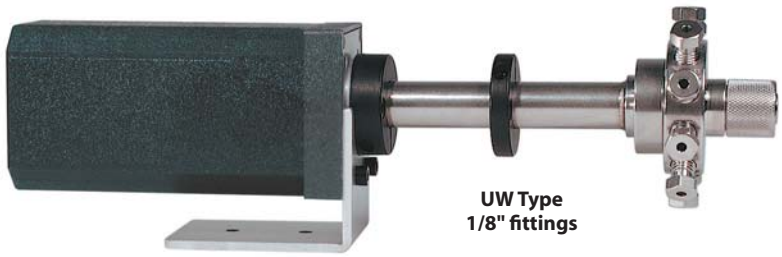
OPTIONS

- 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 254-5)*
- Larger bore available

Includes 4" standoff. Manual version not available without standoff.
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**

	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual with standoff	44UWT	46UWT	48UWT	410UWT
With air actuator	A44UWT	A46UWT	A48UWT	A410UWT
With microelectric actuator	ED44UWT	ED46UWT	ED48UWT	ED410UWT
Replacement valve	D4UWT	D6UWT	D8UWT	D10UWT
Replacement rotor	SSA4UWT	SSA6UWT	SSA8UWT	SSA10UWT



UW Type
1/8" fittings

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Actuators
Air ..... page 197
Manual 204
Microelectric 190-1
Universal 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*	*Volume*	*Prod No*
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

VALCO VALVES

Internal sample injectors, 1/16" fittings, 0.40 mm ports (.016") 0.25 mm column port diameter (.010")

W Type

5,000 psi
Internal sample
1/16" **0.40 mm**

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply



Sample volume	.06 µl *Prod No*	.1 µl *Prod No*	.2 µl *Prod No*	.5 µl *Prod No*
Manual	CI4W.06	CI4W.1	CI4W.2	CI4W.5
With air actuator	ACI4W.06	ACI4W.1	ACI4W.2	ACI4W.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



W Type
1/16" fittings

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

OPTIONS
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-5)*
- 1/32" fittings with 0.25 mm bore (.010") also available. Consult factory for product number and pricing.

Internal sample injectors, 1/16" fittings, 0.75 mm ports (.030")

UW Type

5,000 psi
Internal sample
1/16" **0.75 mm**

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply



Sample volume	.2 µl *Prod No*	.5 µl *Prod No*	1 µl *Prod No*	2 µl *Prod No*
Manual with 2" standoff	2CI4UW.2	2CI4UW.5	2CI4UW1	2CI4UW2
With air actuator	ACI4UW.2	ACI4UW.5	ACI4UW1	ACI4UW2
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



UW Type
1/16" fittings

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

OPTIONS
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see pages 254-5)*
- 1/32" fittings with 0.25 mm bore (.010") also available. Consult factory for product number and pricing.

NOTE
These valves are not available in manual closemount version.

Injectors and switching valves, 1/16" fittings, 0.40 mm ports (.016")

W Type

SPECS

5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

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 254-5)*

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**

	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual	C4W	C6W	C8W	C10W
With air actuator	AC4W	AC6W	AC8W	AC10W
With microelectric actuator	EPC4W	EPC6W	EPC8W	EPC10W
Replacement valve	DC4W	DC6W	DC8W	DC10W
Replacement rotor	SSAC4W	SSAC6W	SSAC8W	SSAC10W



W Type
1/16" fittings

OPTIONAL FLOWPATH

Model C6W 6 port valves can also be ordered with a dual 3-way rotor, as described in EPA Method 555.

To specify this flowpath, substitute "2X3" for "6" in the valve or rotor product number.



MORE INFORMATION

Actuators
Air ..... page 197
Manual 204
Microelectric 190-1
Universal 193
Materials
Metals 254-255
Polymers 256
Valve rotors 257
Standoff assemblies 205

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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*	*Volume*	*Prod No*
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

VALCO VALVES

Injectors and switching valves, 1/16" fittings, 0.75 mm ports (.030")

UW Type

5,000 psi
Semi-prep
1/16" **0.75 mm**

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately.

	 4 Ports *Prod No*	 6 Ports *Prod No*	 8 Ports *Prod No*	 10 Ports *Prod No*
Manual with 2" standoff	2C4UW	2C6UW	2C8UW	2C10UW
With air actuator	AC4UW	AC6UW	AC8UW	AC10UW
With microelectric actuator	EDC4UW	EDC6UW	EDC8UW	EDC10UW
Replacement valve	DC4UW	DC6UW	DC8UW	DC10UW
Replacement rotor	SSAC4UW	SSAC6UW	SSAC8UW	SSAC10UW



UW Type
1/16" fittings

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

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 254-5)*
- Larger bore available.

NOTE
These valves are not available in manual closemount version.

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*	*Volume*	*Prod No*
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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

Injectors and switching valves, 1/8" fittings, 0.75 mm (.030")

UW Type

SPECS

5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

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 254-5)*
- Larger bore available. *(see page 118)*

NOTE

These valves are not available in manual closemount version.

Manual 10 port includes 2" standoff.
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**

	 **4 Ports** *Prod No*	 **6 Ports** *Prod No*	 **8 Ports** *Prod No*	 **10 Ports** *Prod No*
Manual with 2" standoff	24UW	26UW	28UW	210UW
With air actuator	A4UW	A6UW	A8UW	A10UW
With microelectric actuator	ED4UW	ED6UW	ED8UW	ED10UW
Replacement valve	D4UW	D6UW	D8UW	D10UW
Replacement rotor	SSA4UW	SSA6UW	SSA8UW	SSA10UW



UW Type
1/8" fittings

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Actuators
Air ..... page 197
Manual 204
Microelectric 190-1
Universal 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*	*Volume*	*Prod No*
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

VALCO VALVES

Injectors and switching valves, 1/8" fittings, large bore

UW Type

5,000 psi
Prep
1/8" **Large bore**

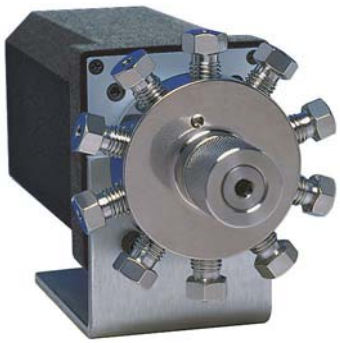
Manual 10 port includes 2" standoff.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
Sample loops are not included with valves. Order separately.

	 **4 Ports 1.7 mm (.067")** *Prod No*	 **6 Ports 1.7 mm (.067")** *Prod No*	 **8 Ports 1.3 mm (.050")** *Prod No*	 **10 Ports 1.0 mm (.040")** *Prod No*
Manual with 2" standoff	2L4UW	2L6UW	2L8UW	2L10UW
With air actuator	AL4UW	AL6UW	AL8UW	AL10UW
With microelectric actuator	EDL4UW	EDL6UW	EDL8UW	EDL10UW
Replacement valve	DL4UW	DL6UW	DL8UW	DL10UW
Replacement rotor	SSAL4UW	SSAL6UW	SSAL8UW	SSAL10UW

SPECS
5000 psi liq
75°C max
Nitronic 60 valve body
Valcon H rotor

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 254-5)*
- Smaller bore available. *(see page 117)*

NOTE
These valves are not available in manual closemount version.



UW Type
1/8" fittings

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..
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

1/8" Stainless steel loops

for UW Type valves

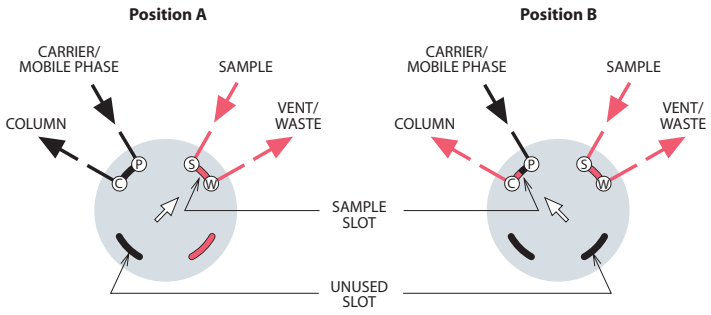
Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.

Volume	*Prod No*	*Volume*	*Prod No*
100 µl	SL100UW	2 ml	SL2KUW
250 µl	SL250UW	5 ml	SL5KUW
500 µl	SL500UW	10 ml	SL10KUW
1 ml	SL1KUW	20 ml	SL20KUW



MORE INFORMATION
Actuators
Air ..... page 197
Manual.....204
Microelectric 190-1
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

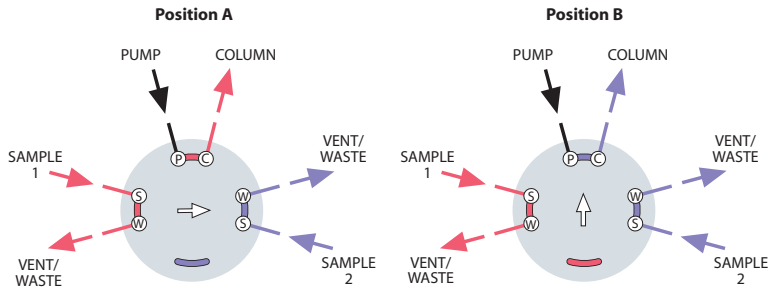
4 port internal sample injector



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

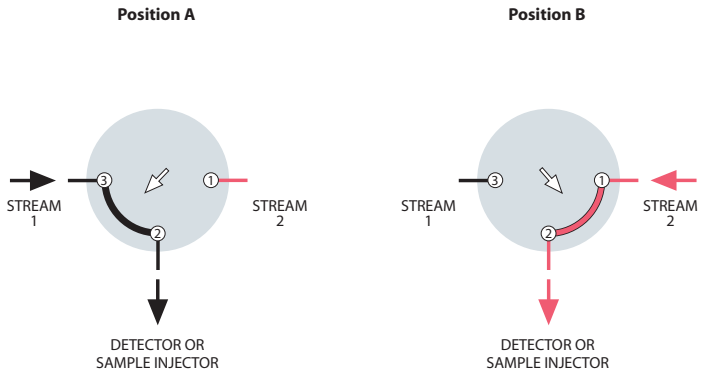


DUAL MICROVOLUME SAMPLE INJECTION

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.

3 port switching valve



STREAM SELECTION WITHOUT MAINTAINED FLOW

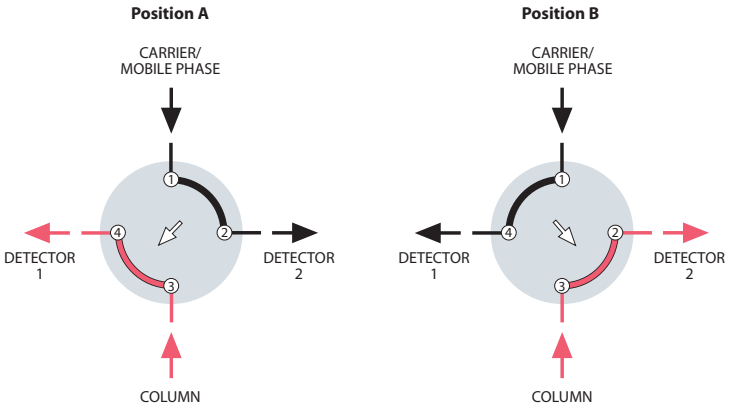
This arrangement allows one of two sample points to flow to a sample injector or detector while blocking the other sample point's flow.

VALCO VALVES

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.

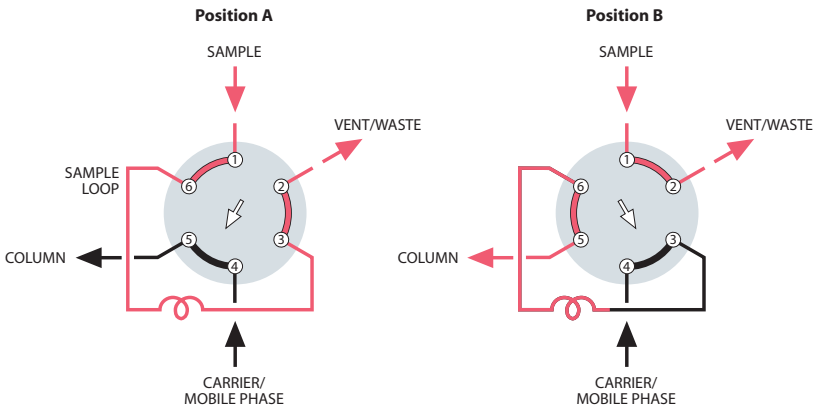


6 port external sample injector

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.

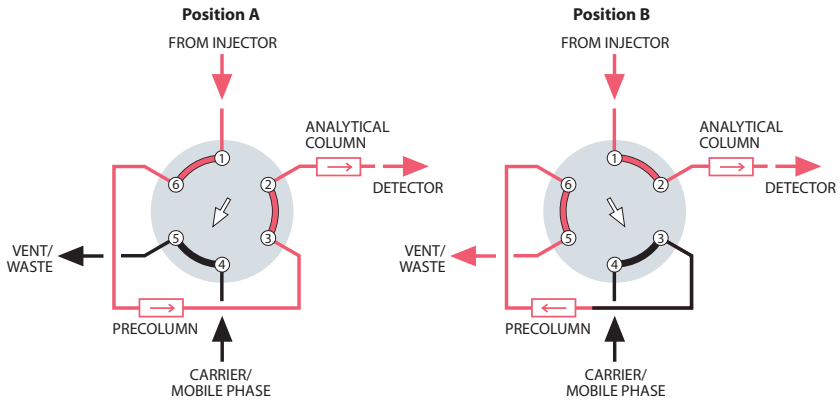


6 port column switching

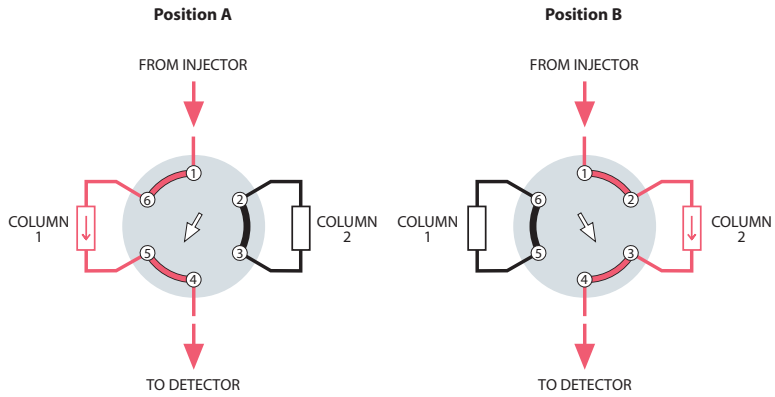
BACKFLUSH OF PRECOLUMN TO VENT

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

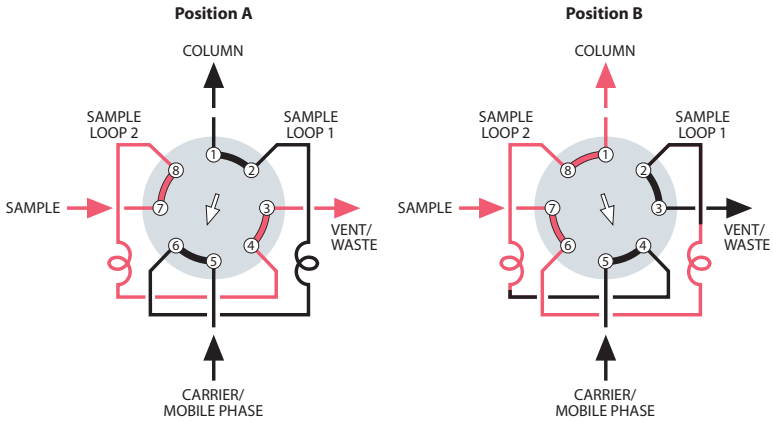


TWO COLUMN SELECTION

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.

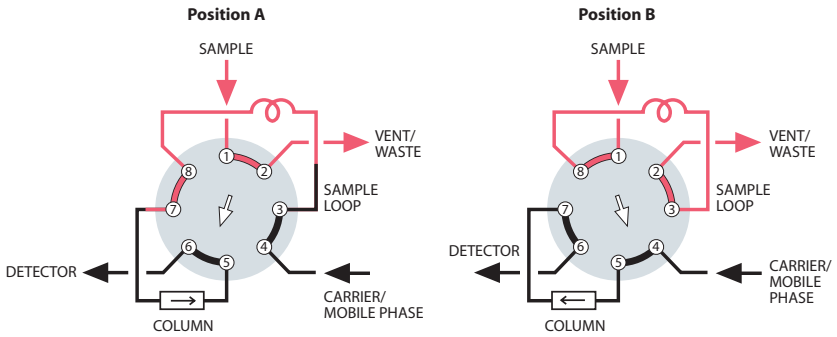
8 port dual external sample injector



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.

VALCO VALVES

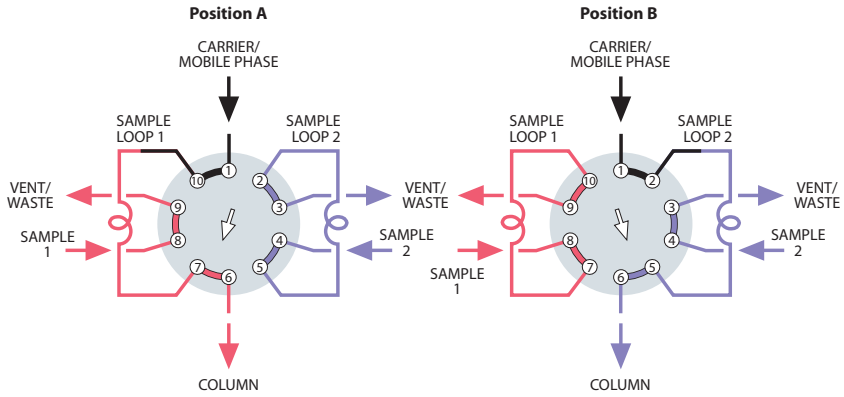
10 port dual external sampling

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.

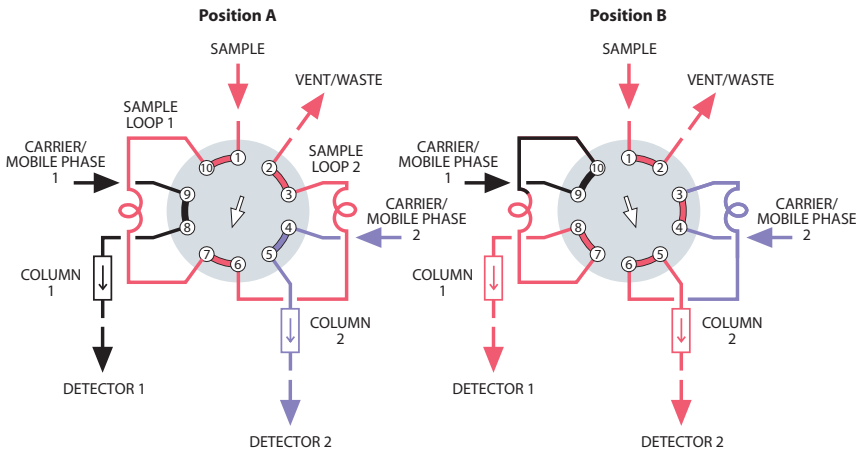


10 port dual external sampling

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.

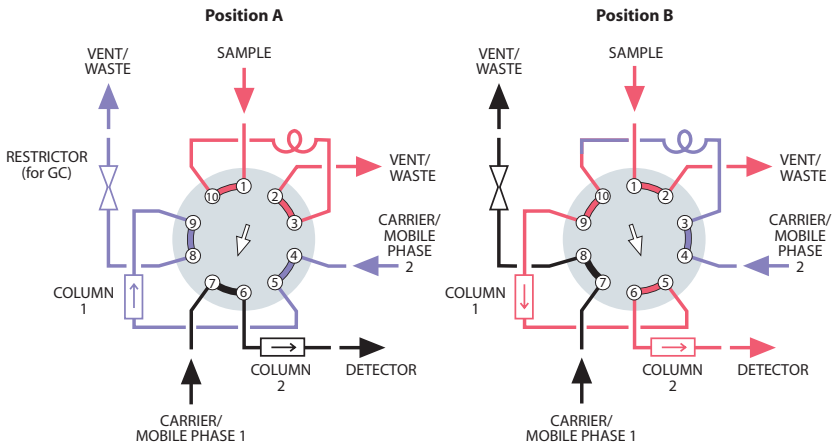
In an important non-chromatographic application, the roles of carrier and sample are reversed, permitting two different quantities of two different materials to be dispensed together, as in automatic dilution.



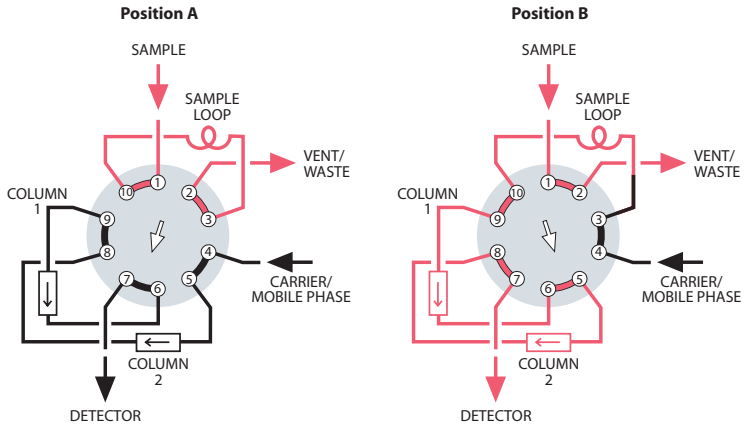
10 port sampling/switching

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.



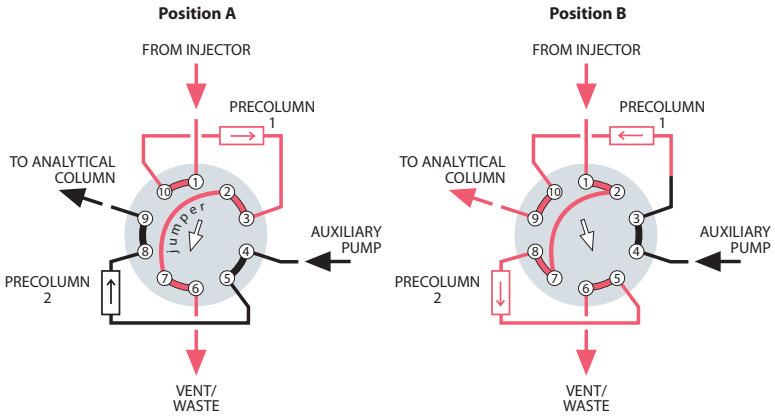
10 port sampling/switching



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

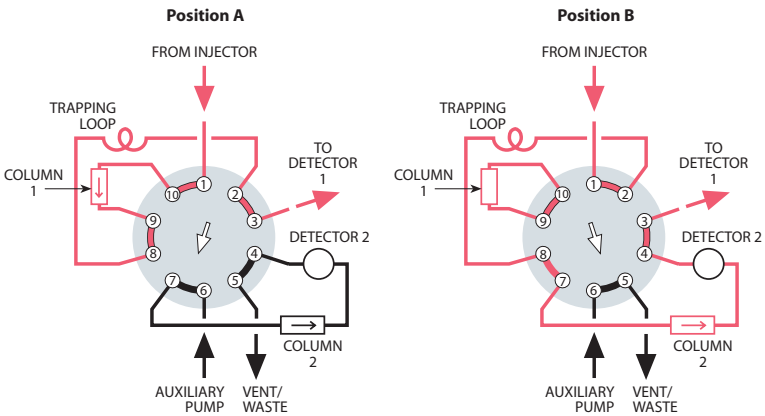


SAMPLE ENRICHMENT (CLEANUP) USING DUAL PRECOLUMNS

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



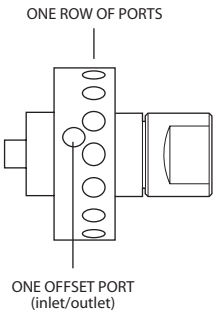
HEART CUT TRAPPED IN A LOOP AND INJECTED ONTO A SECOND COLUMN

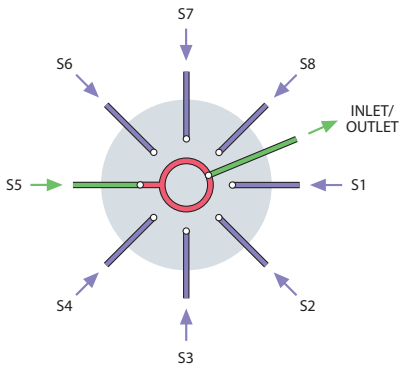
Sample is injected (using a separate injector) onto an analytical column. Early eluting components (front cut) pass through a trapping loop and are detected (at port 3). The valve is then switched, and the center (or heartcut) which was retained in the trapping loop is injected onto the second column 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.

VALCO VALVES

Dead-end flowpath – SD configuration

SD valves select one of 4 to 12 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 136.





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.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

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

SPECS

400 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2CSD6MWE	2CSD10MWE	2CSD12MWE	2CSD16MWE
W ith air actuator	A2CSD6MWE	A2CSD10MWE	A2CSD12MWE	A2CSD16MWE
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

Application..... page 136
Actuators
Air 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Mounting hardware
Closemount 208
Standoff.....205

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.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

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

Low pressure | SD Dead-end | 1/8" | 1.0 mm

	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2SD6MWE	2SD10MWE	2SD12MWE	2SD16MWE
With air actuator	A2SD6MWE	A2SD10MWE	A2SD12MWE	A2SD16MWE
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

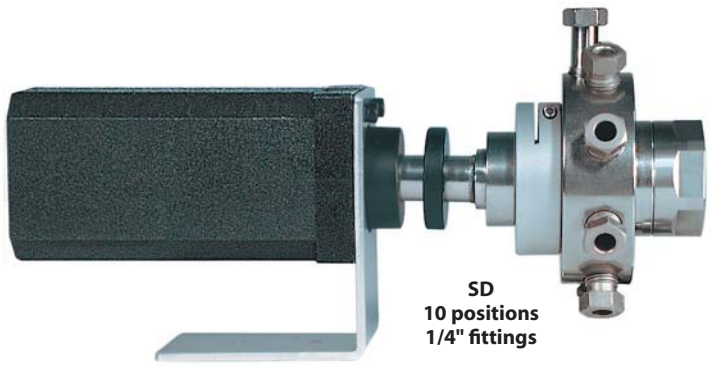
SPECS
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.
Manual version not available.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

OPTIONS
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium *(see pages 254-255)*

Low pressure | SD Dead-end | 1/4" | 4.0 mm

	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
With air actuator	AH2VLSD4MWE2	AH2VLSD6MWE2	AH2VLSD8MWE2	AH2VLSD10MWE2
With microelectric actuator	EMT2VLSD4MWE2	EMT2VLSD6MWE2	EMT2VLSD8MWE2	EMT2VLSD10MWE2
Replacement valve	DVLSD4MWE2	DVLSD6MWE2	DVLSD8MWE2	DVLSD10MWE2
Replacement rotor	SSAVLSD4MWE2	SSAVLSD6MWE2	SSAVLSD8MWE2	SSAVLSD10MWE2

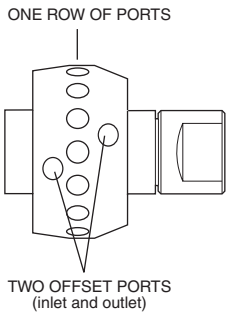


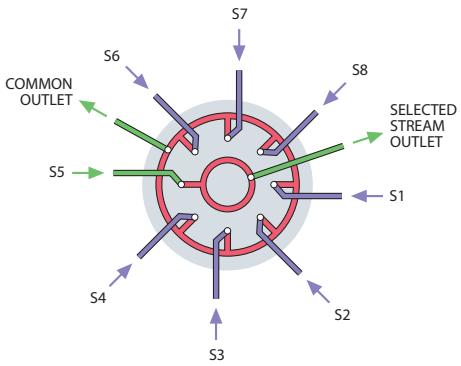
SD
10 positions
1/4" fittings

VALCO VALVES

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 137.





1/16" fittings, 1.0 mm ports (.040")

MW Type

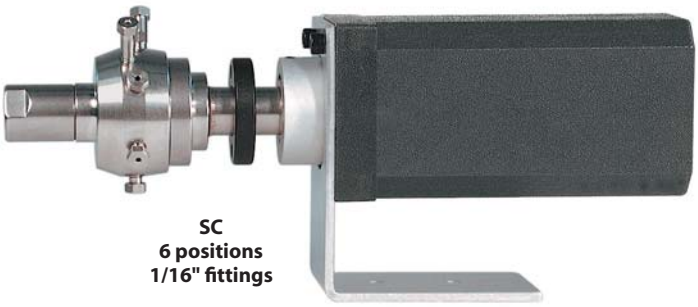
Low pressure
SC Common outlet
1/16" 1.0 mm

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

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)*

SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2CSC6MWE	2CSC10MWE	2CSC12MWE	2CSC16MWE
With air actuator	AH2CSC6MWE	A2CSC10MWE	A2CSC12MWE	A2CSC16MWE
With microelectric actuator	EMT2CSC6MWE	EMT2CSC10MWE	EMT2CSC12MWE	EMT2CSC16MWE
Replacement valve	DCSC6MWE	DCSC10MWE	DCSC12MWE	DCSC16MWE
Replacement rotor	SSACSC6MWE	SSACSC10MWE	SSACSC12MWE	SSACSC16MWE



SC
6 positions
1/16" fittings

MORE INFORMATION
Application..... page 137
Actuators
Air 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Mounting hardware
Closemount 208
Standoff.....205

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.
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 *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2SC6MWE	2SC10MWE	2SC12MWE	2SC16MWE
With air actuator	AH2SC6MWE	A2SC10MWE	A2SC12MWE	A2SC16MWE
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

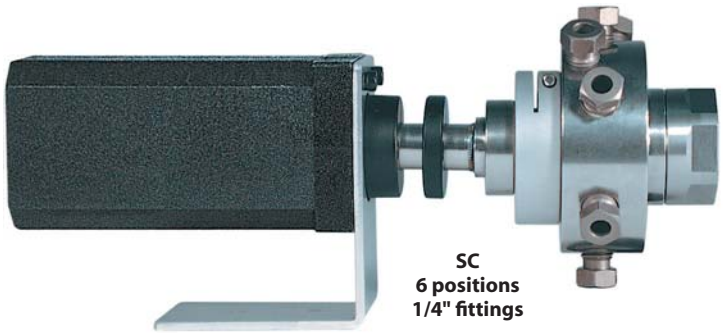
SPECS
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.
Manual version not available.
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 *Prod No*	6 Position *Prod No*	8 Position *Prod No*
With air actuator	AH2VLSC4MWE2	AH2VLSC6MWE2	AH2VLSC8MWE2
With microelectric actuator	EMT2VLSC4MWE2	EMT2VLSC6MWE2	EMT2VLSC8MWE2
Replacement valve	DVLSC4MWE2	DVLSC6MWE2	DVLSC8MWE2
Replacement rotor	SSAVLSC4MWE2	SSAVLSC6MWE2	SSAVLSC8MWE2

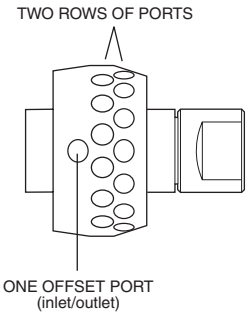


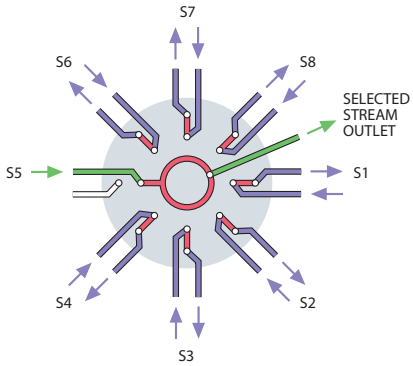
SC
6 positions
1/4" fittings

VALCO VALVES

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 138.





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.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

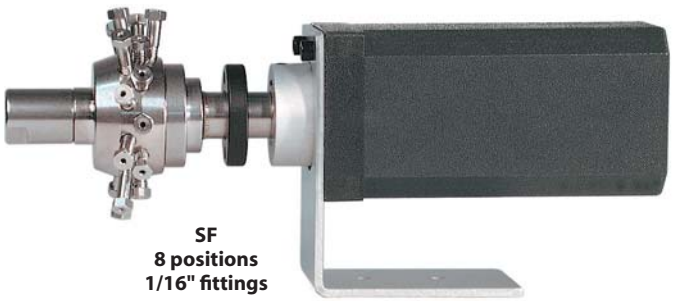
OPTIONS

- 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)*

SPECS

200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2CSF6MWE	2CSF10MWE	2CSF12MWE	2CSF16MWE
With air actuator	AH2CSF6MWE	A2CSF10MWE	A2CSF12MWE	A2CSF16MWE
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

Application..... page 138
Actuators
Air 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Mounting hardware
Closemount 208
Standoff.....205

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.
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 *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2SF6MWE	2SF10MWE	2SF12MWE	2SF16MWE
With air actuator	AH2SF6MWE	A2SF10MWE	A2SF12MWE	A2SF16MWE
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

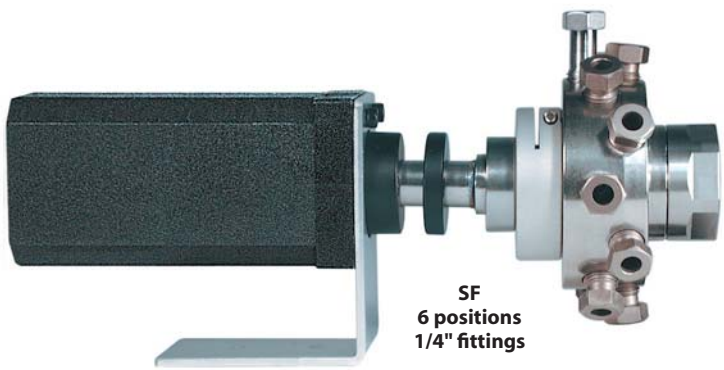
SPECS
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.
Manual version is not available.
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 *Prod No*	6 Position *Prod No*	8 Position *Prod No*
With air actuator	AH2VLSF4MWE2	AH2VLSF6MWE2	AH2VLSF8MWE2
With microelectric actuator	EMT2VLSF4MWE2	EMT2VLSF6MWE2	EMT2VLSF8MWE2
Replacement valve	DVLSF4MWE2	DVLSF6MWE2	DVLSF8MWE2
Replacement rotor	SSAVLSF4MWE2	SSAVLSF6MWE2	SSAVLSF8MWE2

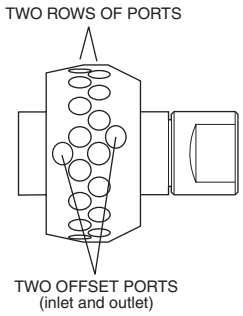


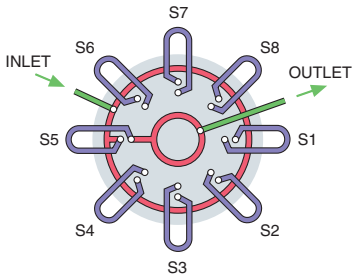
SF
6 positions
1/4" fittings

VALCO VALVES

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 139.





1/16" fittings, 0.75 mm ports (.030")

MW Type

Low pressure

ST Trapping

1/16" 0.75 mm

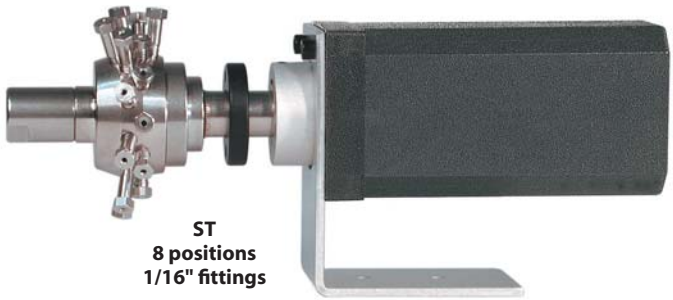
Includes 2" standoff. Ask about closemount assembly if valve will not be heated.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

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 *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2CST6MWE	2CST10MWE	2CST12MWE	2CST16MWE
With air actuator	AH2CST6MWE	A2CST10MWE	A2CST12MWE	A2CST16MWE
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. **Request matched loops when loops will be installed on a single valve.**

Volume	*Prod No*	*Volume*	*Prod No*
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

Application..... page 139
Actuators
Air 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Mounting hardware
Closemount 208
Standoff.....205

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.
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 *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2ST6MWE	2ST10MWE	2ST12MWE	2ST16MWE
With air actuator	AH2ST6MWE	A2ST10MWE	A2ST12MWE	A2ST16MWE
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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.



1/8" Stainless steel loops

for MW Type valves

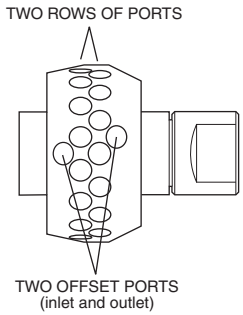
Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately. **Request matched loops when loops will be installed on a single valve.**

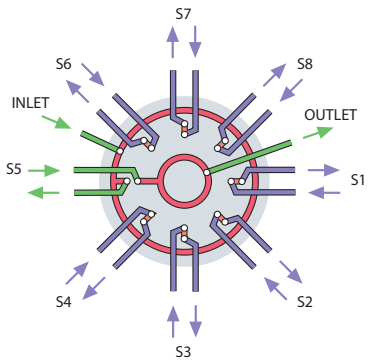
Volume	*Prod No*	*Volume*	*Prod No*
100 µl	SL100STP	1 ml	SL1KSTP
250 µl	SL250STP	2 ml	SL2KSTP
500 µl	SL500STP	5 ml	SL5KSTP
		10 ml	SL10KSTP

VALCO VALVES

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 140.





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.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

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)*

SPECS

200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2CSTF6MWE	2CSTF10MWE	2CSTF12MWE	2CSTF16MWE
With air actuator	AH2CSTF6MWE	A2CSTF10MWE	A2CSTF12MWE	A2CSTF16MWE
With microelectric actuator	EMT2CSTF6MWE	EMT2CSTF10MWE	EMT2CSTF12MWE	EMT2CSTF16MWE
Replacement valve	DCSTF6MWE	DCSTF10MWE	DCSTF12MWE	DCSTF16MWE
Replacement rotor	SSACSTF6MWE	SSACSTF10MWE	SSACSTF12MWE	SSACSTF16MWE

MORE INFORMATION

Application..... page 140
Actuators
Air 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Mounting hardware
Closemount 208
Standoff.....205

1/8" fittings, 1.0 mm ports (.040")

MW Type

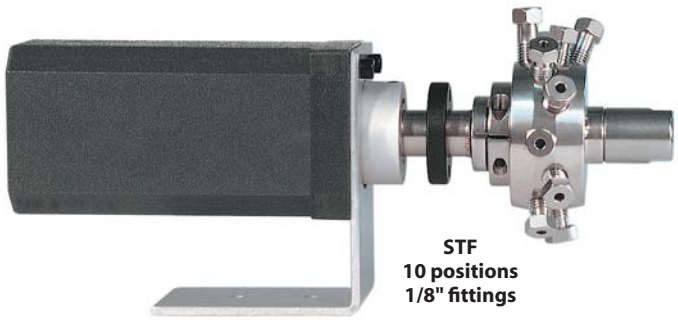
SPECS
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

Includes 2" standoff. Ask about closemount assembly if valve will not be heated.
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

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

Low pressure
STF Trap/ flow-throw
1/8" **1.0 mm**

	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2STF6MWE	2STF10MWE	2STF12MWE	2STF16MWE
With air actuator	AH2STF6MWE	A2STF10MWE	A2STF12MWE	A2STF16MWE
With microelectric actuator	EMT2STF6MWE	EMT2STF10MWE	EMT2STF12MWE	EMT2STF16MWE
Replacement valve	DSTF6MWE	DSTF10MWE	DSTF12MWE	DSTF16MWE
Replacement rotor	SSASTF6MWE	SSASTF10MWE	SSASTF12MWE	SSASTF16MWE

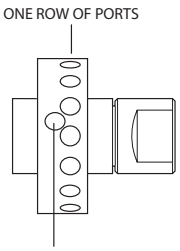


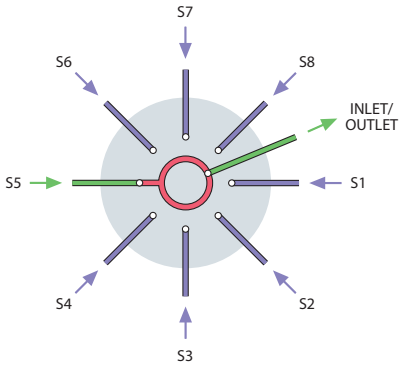
STF
10 positions
1/8" fittings

VALCO VALVES

Dead-end flowpath – SD configuration

SD valves select one of 4 to 12 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 141.





1/16" fittings, 0.4 mm ports (.016")

UW Type

5,000 psi
SD Dead-end
1/16" 0.40 mm

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 p. 254-255)*
- Low pressure, high temperature versions available
- Larger bore available except 10 and 12 positions

SPECS
5000 psi liq
75°C max
Nitronic 60 body
Valcon E rotor

	4 Position *Prod No*	6 Position *Prod No*	10 Position *Prod No*
Manual (not recommended)	CSD4UW	CSD6UW	CSD10UW
With air actuator	ACSD4UW	ACSD6UW	ACSD10UW
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

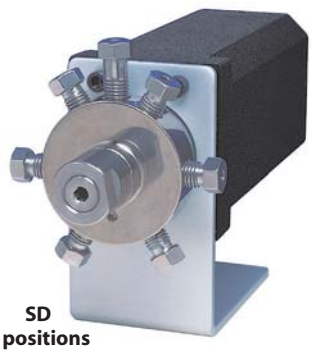
5,000 psi
SD Dead-end
1/8" 0.75 mm

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 p. 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

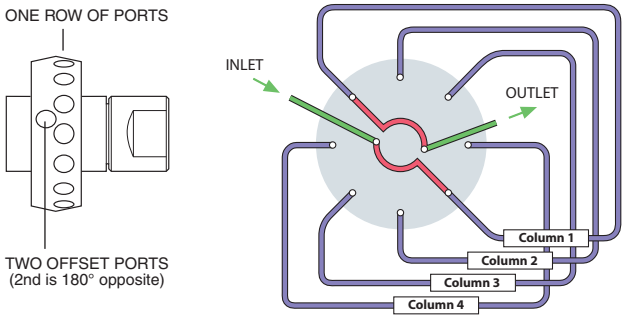
	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*
Manual (not recommended)	SD4UW	SD6UW	SD8UW
With air actuator	ASD4UW	ASD6UW	ASD8UW
With microelectric actuator	EMTSD4UW	EMTSD6UW	EMTSD8UW
Replacement valve	DSD4UW	DSD6UW	DSD8UW
Replacement rotor	SSASD4UW	SSASD6UW	SSASD8UW



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 141.



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.
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 p. 254-255)*
- Low pressure, high temperature versions available. (Consult factory.)

	4 Columns or Loops *Prod No*	6 Columns or Loops *Prod No*
With air actuator	ACST4UW	ACST6UW
With microelectric actuator	EMTCST4UW	EMTCST6UW
Replacement valve	DCST4UW	DCST6UW
Replacement rotor	SSACST4UW	SSACST6UW



ST
4 position
1/16" fittings

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.



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. **Request matched loops when loops will be installed on a single valve.**

Volume	*Prod No*	*Volume*	*Prod No*
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

SD flowpath — low pressure

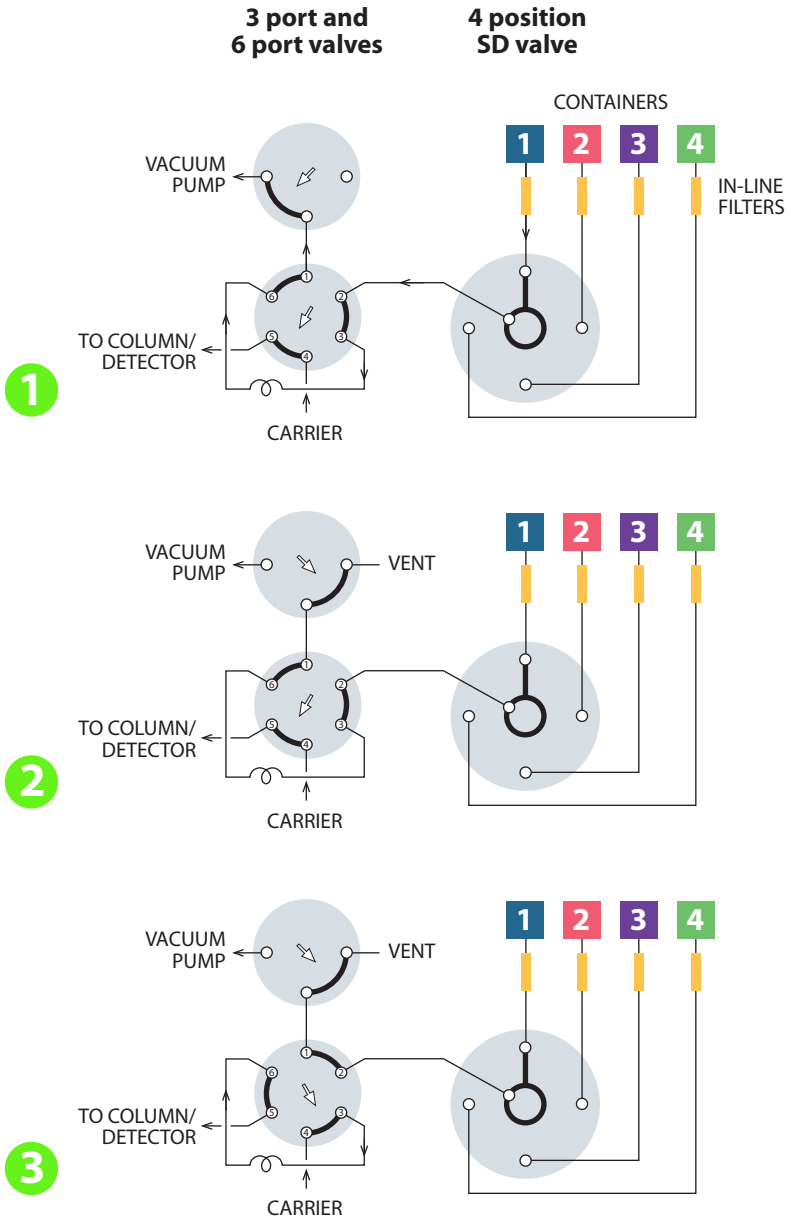
STREAM SELECTION WITH DEAD-ENDED STREAMS

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.

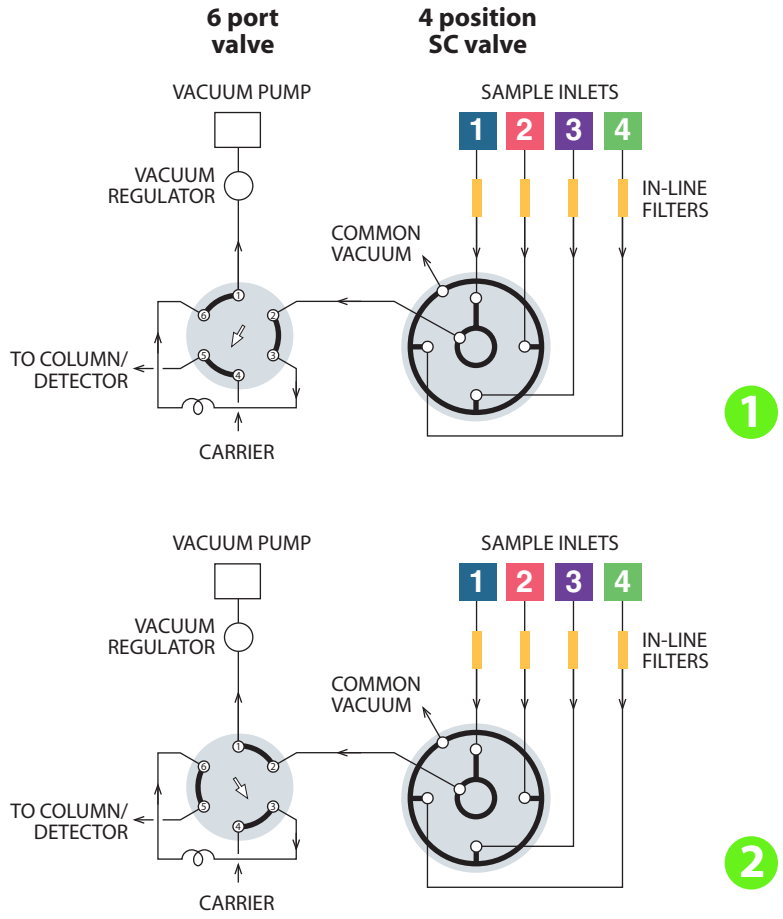
1 A vacuum pump is used to move sample from the containers to a 6 port sampling valve. 2 The 3 port valve is used to block the vacuum flow through the sampling valve to allow the sample within the loop to equilibrate at atmospheric pressure. 3 The 6 port valve is then switched, injecting the sample. 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
SD prices
Low pressure . . 124-125
High pressure 134
Application
High pressure SD . . . 141

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 50-52

MORE INFORMATION

Actuators
Air ..... page 196
Mod. universal 194
Universal 193

SC prices 126-127

VALCO VALVES

SF flowpath

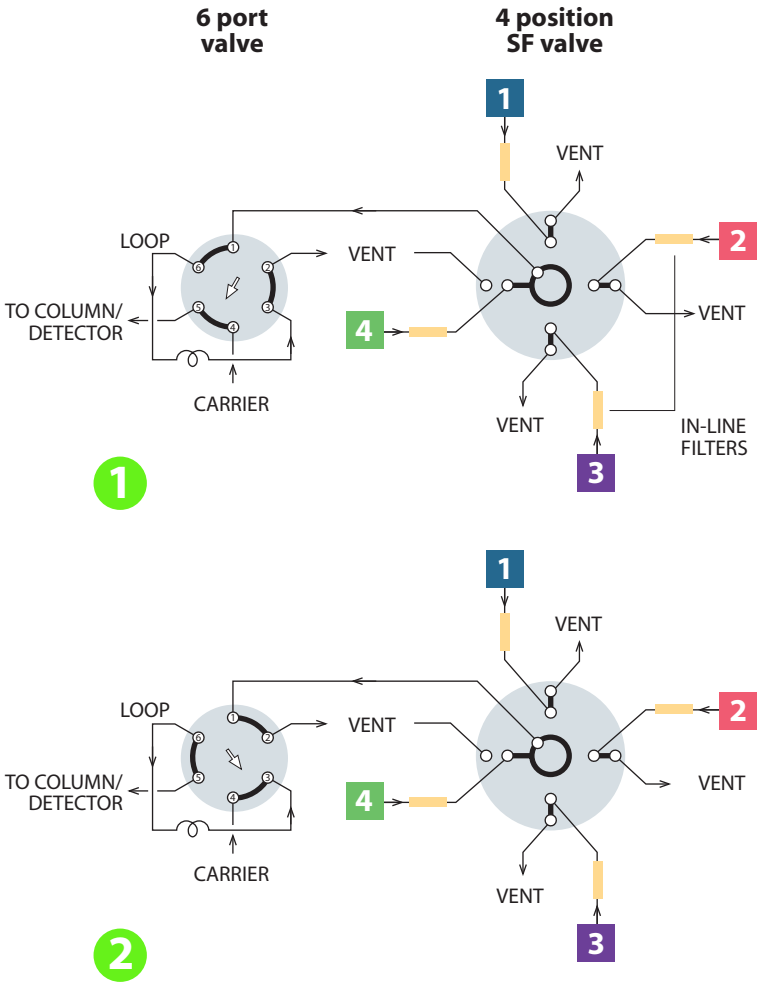
STREAM SELECTION WITH CONTINUOUS FLOW TO INDIVIDUAL OUTLETS

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.

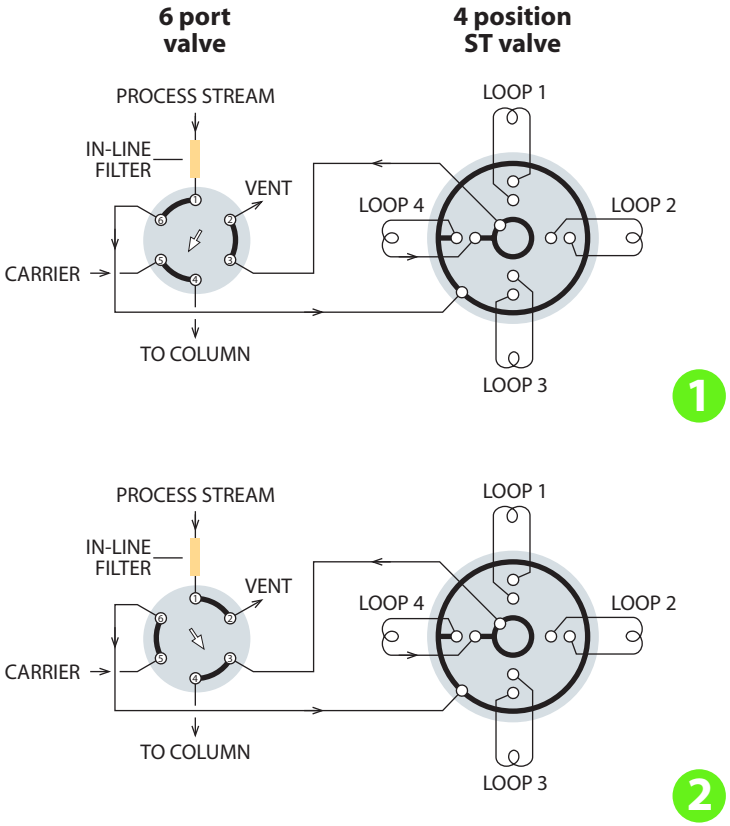


MORE INFORMATION

Actuators
- Air ..... page 196
- Mod. universal 194
- Universal 193

SF prices 128-129

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.

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 50-52

MORE INFORMATION

ST prices
Low pressure . . 130-131
High pressure 135
Application
High pressure ST . . . 141

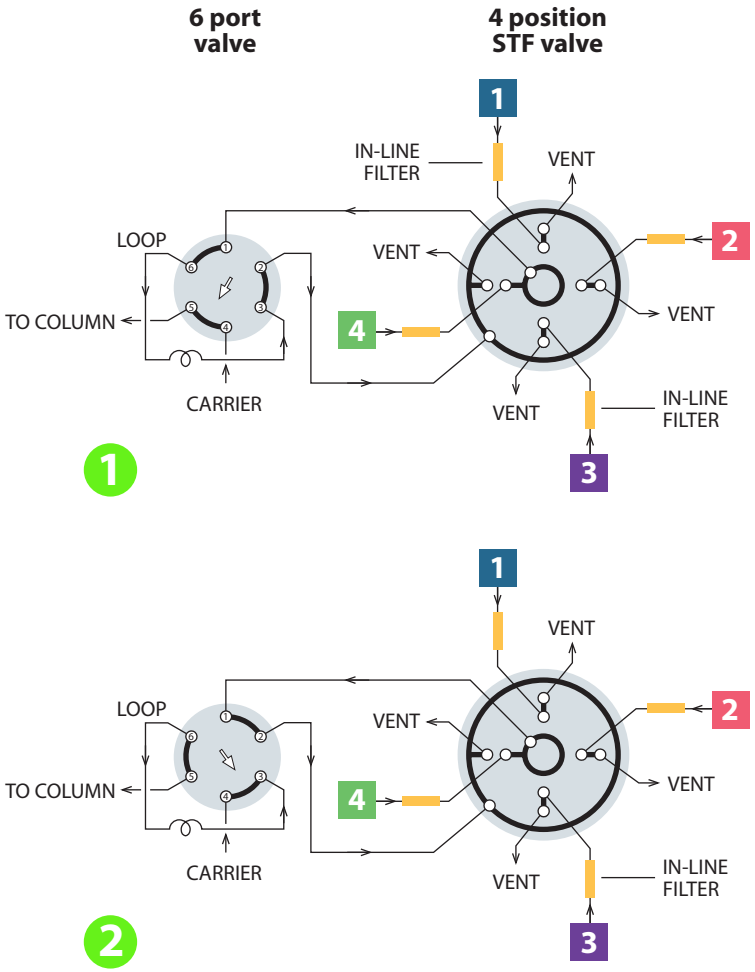
VALCO VALVES

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 ..... pages 50-52

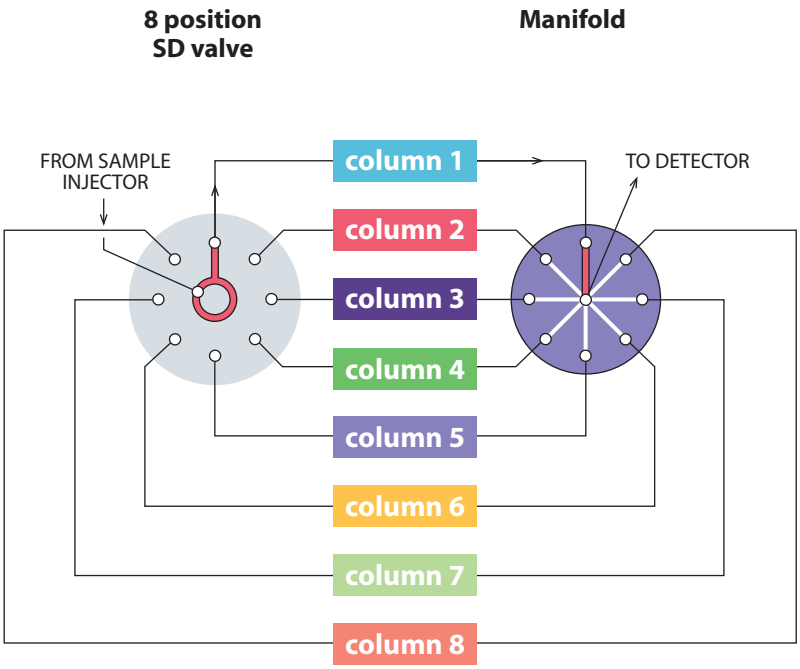
MORE INFORMATION

Actuators

Air ..... page 196
Mod. universal 194
Universal 193

STF prices 132-133

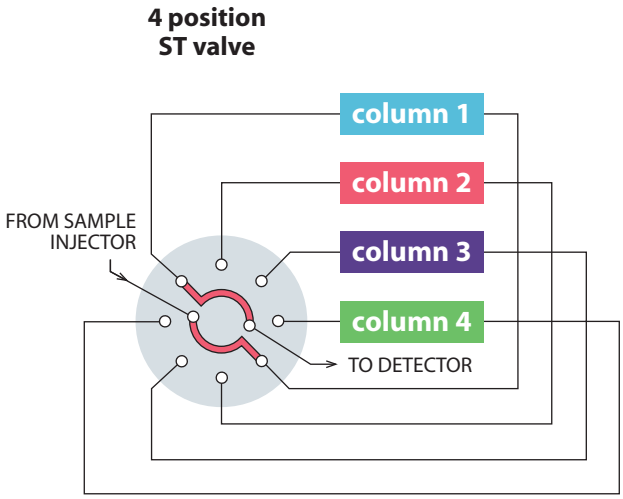
SD flowpath — high pressure



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

Prices
SD high pressure . . . 134
ST high pressure 135
Application
Low pressure SD . . . 136
Low pressure ST . . . 139
Manifolds 33

Diaphragm valves

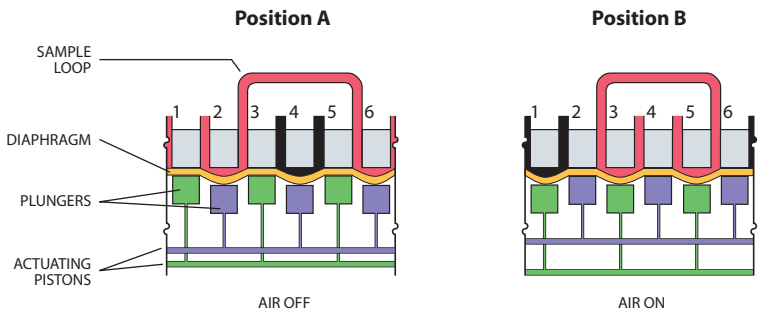
FOR CONTINUOUS AUTOMATED OPERATION

- 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.

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 page 198.)*

Optional Mounting Kit

The mounting kit consists of a ring which is mounted on a flat surface. A slot allows the ring to be tightened around the collar of the valve.

Temperature/Pressure Specifications

Diaphragm valves can be operated at temperatures up to 200°C, at 300 psi. The standard valve is for applications in which the sample is above ambient pressure. An optional version works with subambient pressures, such as when the sample is "pulled" through the valve by a vacuum pump.

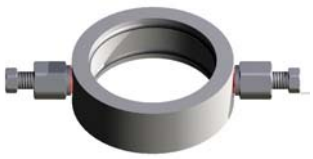
Materials of Construction

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.

Purge Option

Purging improves sensitivity when a diaphragm valve is used in conjunction with a VICI Pulsed Discharge Detector, for example, since air cannot diffuse into the flow path.

The optional purge ring, easy to install on any VICI diaphragm valve, is equipped with two 1/16" ports for the purge gas inlet and outlet.



Purge ring
Page 144

ACTUATION
A 3-way solenoid is required for actuation.
3-way solenoid . . . p 198

MORE INFORMATION
Materials
Metals. 254-255

Valve descriptions
Cheminert injectors and valves 146-151
Cheminert selectors . . 146, 152-153
Valco injectors and valves 98-101
Valco selectors . . 102-103

Valve prices
Cheminert
HPLC 154-165
Low pressure . . 166-169
Selectors 172-179
Valco
GC 104-113
HPLC 114-118
Selectors 124-135

DIAPHRAGM VALVES

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 on page 198.



4 port
.5 µl internal sample
Prod No
DV12-1114-.5



4 port
1 µl internal sample
Prod No
DV12-1114-1



6 port
sampling/switching
Prod No
DV12-1116



10 port
multifunctional
Prod No
DV12-1110

SPECS
Internal sample:
750 psi liq
50°C max
Sampling/switching:
300 psi gas
175°C max
Sample:
Above ambient pressure*
Nitronic 60 valve body
Polyimide diaphragm
* For vacuum applications, contact the factory.

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 on page 198.

4 port .5 µl internal sample	4 port 1 µl internal sample	6 port sampling/switching	10 port multifunctional
Prod No	*Prod No*	*Prod No*	*Prod No*
DV22-2114-.5	DV22-2114-1	DV22-2116	DV22-2110

SPECS
Internal sample:
750 psi liq
50°C max
Sampling/switching:
300 psi gas
175°C max
Sample:
Above ambient pressure*
Nitronic 60 valve body
Polyimide diaphragm
* For vacuum applications, contact the factory.

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 on page 198.

4 port .5 µl internal sample	4 port 1 µl internal sample	6 port sampling/switching	10 port multifunctional
Prod No	*Prod No*	*Prod No*	*Prod No*
DV22-3114-.5	DV22-3114-1	DV22-3116	DV22-3110

SPECS
Internal sample:
750 psi liq
50°C max
Sampling/switching:
300 psi gas
175°C max
Sample:
Above ambient pressure*
Nitronic 60 valve body
Polyimide diaphragm
* For vacuum applications, contact the factory.

1/16" sample loops

Each stainless steel loop includes two 1/16" stainless nuts and ferrules.



Volume	*Prod No*
2 µl	CSL2
5 µl	CSL5
10 µl	CSL10
20 µl	CSL20
50 µl	CSL50
100 µl	CSL100
250 µl	CSL250
500 µl	CSL500
1 ml	CSL1K
2 ml	CSL2K
5 ml	CSL5K
10 ml	CSL10K

1/32" sample loops

Each stainless steel loop includes two 1/32" stainless steel nuts and ferrules.



Volume	*Prod No*
1 µl	CSLN1K
2 µl	CSLN2K
5 µl	CSLN5K
10 µl	CSLN10K

Replacement diaphragms

	Prod No
Polyimide diaphragm	
.010" bore	DV22-21D
.016" bore	DV22-21D
.030" bore	DV22-31D
PTFE diaphragm	DV22-22D



6 port
1/16" fittings

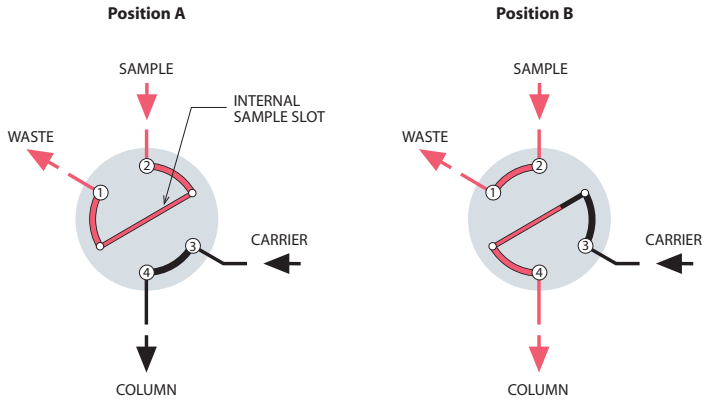
Accessories

	Prod No
Purge ring	DV22-PURGE
Mounting kit	DVBRKIT

OPTIONS
■ Materials:
Hastelloy C
Type 316 stainless
For more information, refer to the metals discussion on page 254-5.

MORE INFORMATION
More applications . . pp 119-123
3-way solenoid 198

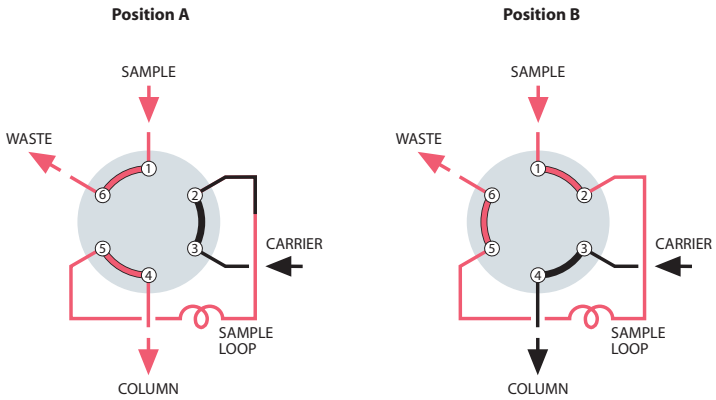
4 port sample injector



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



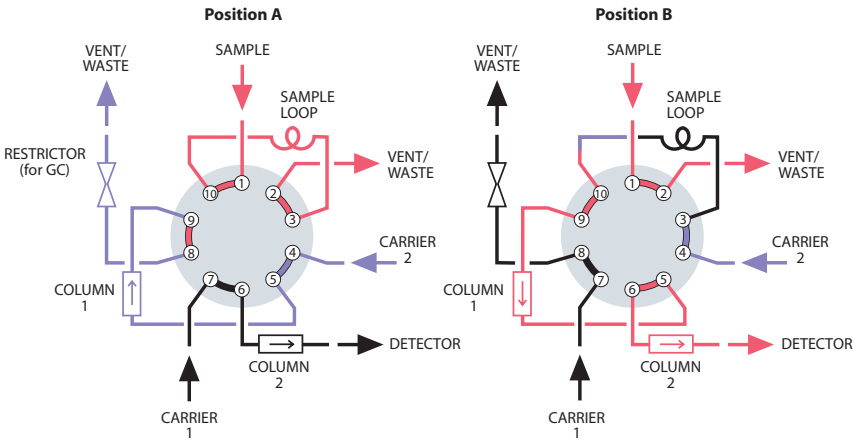
SAMPLE INJECTION

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 120-121

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 122-123

Cheminert® valves

FOR INJECTION, SWITCHING, AND STREAM SELECTION

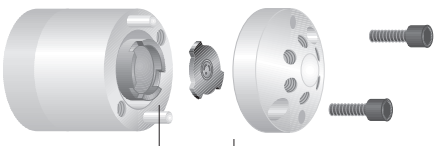
- Pressure ratings from 100 psi to 20,000 psi liq
- Inert, biocompatible construction
- Easy field service
- Automated operation – pneumatic or electric
- 4, 6, 8, and 10 port and internal sample two position models
- Stream selection versions with up to 26 positions

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 (28 positions in some models).



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

MORE INFORMATION

Decoding product no's for Cheminert valves . . . pages 264-265

Actuation 188-209

Applications . 170-171

Materials
Metals 254-255
Polymers 256
Valve rotors 257

Valve descriptions
Cheminert
HPLC 149,152
Low pressure . . . 150,153
Nanovolume® 147
UHPLC 147-148
Diaphragm 142-143
Valco
Injectors 101
Selectors 102-103

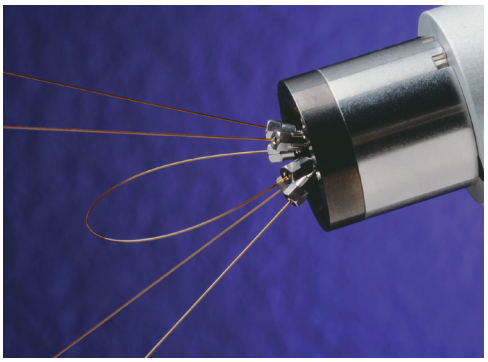
Cheminert valve prices
HPLC 158-165
Low pressure 166-169
Nanovolume® valves . . 154-155, 158-159
OEM 180-187
Selectors 172-179
UHPLC 154-157



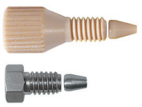
Nanovolume®

Cheminert Nanovolume® injectors, switching valves, and selectors are ideal for high speed, high throughput techniques which demand a valve and fitting system that minimize internal volume and eliminate dead volume.

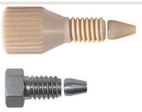
A proprietary rotor material and stator coating achieve pressures to 20,000 psi, suitable for the most demanding analytical techniques. All models are compatible with any VICI actuation option.



Nanovolume® **Injectors and switching valves**

Application	Fittings		Bore size	Model	Pressure rating	More info
UHPLC 20,000 psi 15,000 psi 10,000 psi	360 micron		100 or 150 µm	C72MU	20,000 psi	p. 154
				C72MX	15,000 psi	p. 154
				C72MH	10,000 psi	vici.com
	1/32" stainless		100 or 150 µm	C72NU	20,000 psi	vici.com
				C72NX	15,000 psi	p. 155
				C72NH	10,000 psi	vici.com
	1/16" stainless		150 µm	C72X	15,000 psi	vici.com
				C72H	10,000 psi	vici.com
HPLC 5,000 psi	1/32" PEEK or stainless		100 or 150 µm	C2N	5,000 psi	p. 158

Nanovolume® **Internal sample injectors**

Application	Fittings		Bore size	Sample sizes available	Model	Pressure rating	More info
UHPLC 20,000 psi 15,000 psi 10,000 psi	1/32" stainless		100 µm	4, 10, or 20 nl	C74NU	20,000 psi	vici.com
					C74NX	15,000 psi	vici.com
					C74NH	10,000 psi	vici.com
			150 µm	10, 20, or 30 nl	C74NU	20,000 psi	vici.com
					C74NX	15,000 psi	p. 155
					C74NH	10,000 psi	vici.com
	1/16" stainless		150 µm	10, 20, or 50 nl	C74U	20,000 psi	vici.com
					C74X	15,000 psi	vici.com
					C74H	10,000 psi	vici.com
HPLC 5,000 psi	1/32" PEEK or stainless		100 or 150 µm	4, 10, or 20 nl	C4N	5,000 psi	p. 159

Nanovolume® **Selectors**

Application	Fittings		Bore size	Model	Pressure rating	More info
UHPLC 20,000 psi 15,000 psi 10,000 psi	1/32" stainless		100 or 150 µm	C75NU	20,000 psi	vici.com
				C75NX	15,000 psi	p. 172
				C75NH	10,000 psi	vici.com
	1/16" stainless		150 µm	C75U	20,000 psi	vici.com
				C75X	15,000 psi	vici.com
				C75H	10,000 psi	vici.com

NANOVOLUME® VALVES AT VICI.COM

For more information on all valve options listed here, go to:

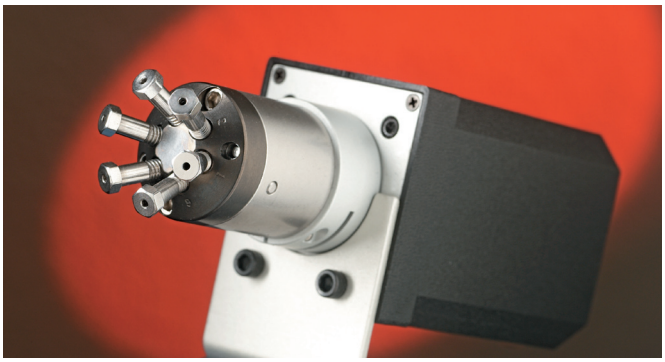
www.vici.com/cval/cval_nano.php

CHEMINERT VALVES

UHPLC

Cheminert UHPLC injectors, switching valves, and selectors are ideal for high speed, high throughput techniques which demand a valve and fitting system that minimize internal volume and eliminate dead volume.

VICI offers UHPLC versions for nanobore and microbore applications.



Nanovolume® UHPLC valves

See previous page for information about Nanovolume® UHPLC injectors, switching valves, and selectors.

Microbore **UHPLC injectors and switching valves**

Application	Fittings		Bore size	Model	Pressure rating	More info
UHPLC 20,000 psi	1/32" stainless		250 µm	C72NU	20,000 psi	vici.com
				C72NX	15,000 psi	vici.com
15,000 psi				C72NH	10,000 psi	vici.com
10,000 psi	1/16" stainless		250 µm	C72U	20,000 psi	vici.com
				C72X	15,000 psi	p. 156
				C72H	10,000 psi	p. 156

Microbore **UHPLC internal sample injectors**

Application	Fittings		Bore size	Sample sizes available	Model	Pressure rating	More info
UHPLC 20,000 psi	1/32" stainless		250 µm	20, 50, or 100 nl	C74NU	20,000 psi	vici.com
					C74NX	15,000 psi	vici.com
15,000 psi					C74NH	10,000 psi	vici.com
10,000 psi	1/16" stainless		250 µm	20, 50, or 100 nl	C74U	20,000 psi	vici.com
					C74X	15,000 psi	p. 157
					C74H	10,000 psi	p. 157

Microbore **UHPLC selectors**

Application	Fittings		Bore size	Model	Pressure rating	More info
UHPLC 20,000 psi	1/32" stainless		250 µm	C75NU	20,000 psi	vici.com
				C75NX	15,000 psi	p. 172
15,000 psi				C75NH	10,000 psi	vici.com
10,000 psi	1/16" stainless		250 µm	C75U	20,000 psi	vici.com
				C75X	15,000 psi	vici.com
				C75H	10,000 psi	p. 173

UHPLC VALVES AT VICI.COM

For more information on all valve options listed here, go to:

www.vici.com/cval/cval_uhplc.php

MORE INFORMATION

Nanovolume® injectors and selectors 147

HPLC injectors

Nanobore

Nanovolume® HPLC injectors and internal sample injectors include 1/32" PEEK nuts and ferrules. See page 147 for an overview of these valves.

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 C1CFI is a 6 port through-the-handle continuous flow injector. An engraving on the stator maintains pump flow between ports 2 and 3 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

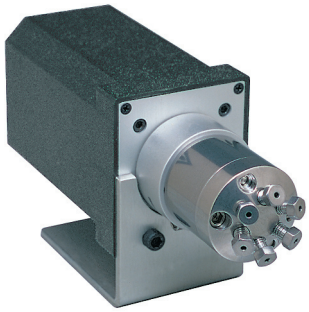
Models C2, C6, and **C1CFI** are also available for analytical injection and switching, with port sizes of 0.40 mm (.016"). **Model C4** offers internal volume sample sizes ranging from 0.1 to 0.5 µl.

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.

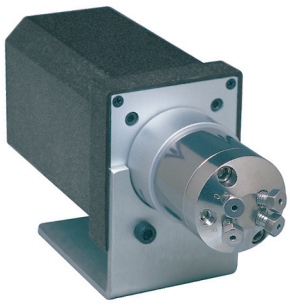
Autosampler Replacements

We supply direct replacements for injectors in many popular autosamplers. Call technical support to determine which replacement is best for your application.



Model C2
Microbore, page 160
Analytical, page 163

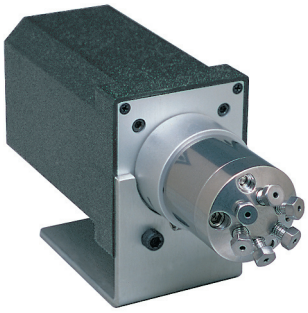
5,000 psi



Model C4
Microbore, page 161
Analytical, page 164

5,000 psi

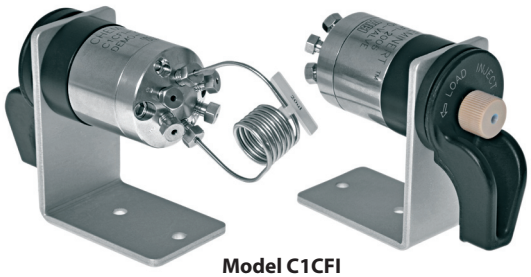
Internal sample



Model C6
Microbore, page 162
Analytical, page 165

5,000 psi

Continuous flow



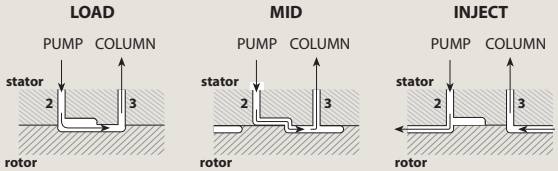
Model C1CFI
Microbore, page 162
Analytical, page 165

5,000 psi

Through-handle

Continuous flow

MODEL C1CFI FLOWPATH



For schematic diagrams of continuous flow Model C6, see pages 162 and 165.

MORE INFORMATION

HPLC selectors 152
Injectors and selectors for OEMs 151,153

CHEMINERT VALVES

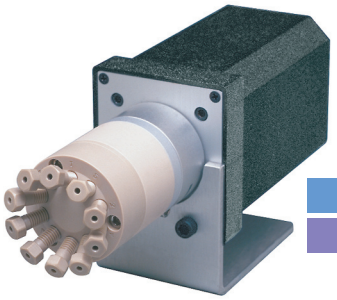
Low pressure injectors

With Valco Zero Dead Volume (ZDV) Fittings

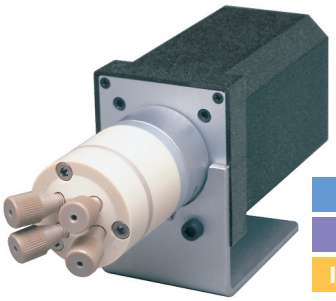
C20Z Series valves with zero dead volume fittings (10-32 thread) are shipped with standard PEEK nuts and ferrules. Zero dead volume fingertight fittings and nuts and ferrules of other materials may be ordered separately. Standard specifications are 100 psi gas/250 psi liquid at 75°C. On request, the 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 166
Low pressure
10-32 ZDV



Model C24Z
page 168
Low pressure
10-32 ZDV
Internal sample

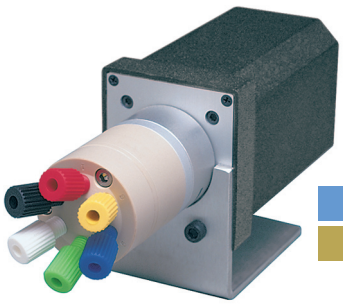
With Cheminert 1/4-28 Fittings

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.

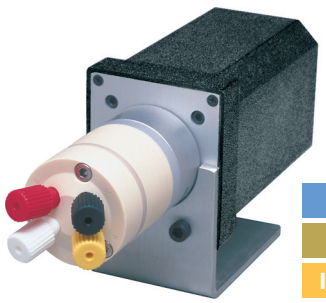
Multicolored Cheminert 1/4-28 flangeless fittings for 1/16" or 1/8" OD tubing (depending on the valve model) are included.

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 167
Low pressure
1/4-28 Int.



Model C24
page 169
Low pressure
1/4-28 Int.
Internal sample

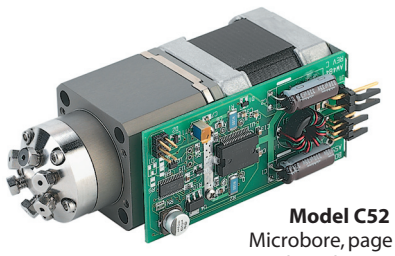
CAUTION
Metal fittings will damage the threads and details of C20Z series valves (models C22Z, C24Z, C25Z). Use of metal fittings in a C20Z valve voids the warranty.

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.

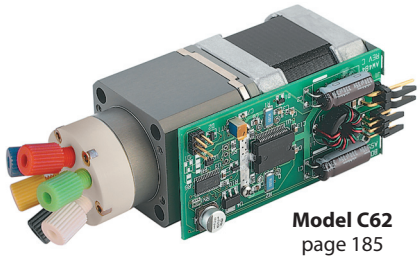
MORE INFORMATION

Decoding product no's for Cheminert valves . . . pages 264-265
Actuation 188-209
Applications . 170-171
Materials
Metals 254-255
Polymers 256
Valve rotors 257
Valve descriptions
Cheminert
Injectors. 147-151
Selectors 152-153
Nanovolume® 147
Diaphragm 142-143
Valco
Injectors. 101
Selectors 102-103
Cheminert valve prices
HPLC. 158-165
Low pressure 166-169
Nanovolume® valves..154-155, 158-159
Selectors 172-179
OEM 180-187
UHPLC 154-157

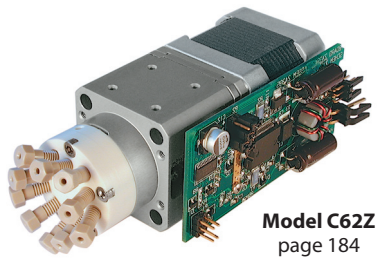
For OEMs



Model C52
Microbore, page 180
Analytical, page 182
5,000 psi



Model C62
page 185
Low pressure



Model C62Z
page 184
Low pressure

Integrated Motor/Injector Assemblies

Cheminert's **Model C52** (HPLC) and **Model C62(Z)** (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, one contact closure shifts the injector to inject and a second is required to shift it back to load. A simple jumper change shifts the mode to single contact closure, in which 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. 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 light-weight package and are available in 4, 6, 8, and 10 port configurations. Serial communication via RS-232 is optional.

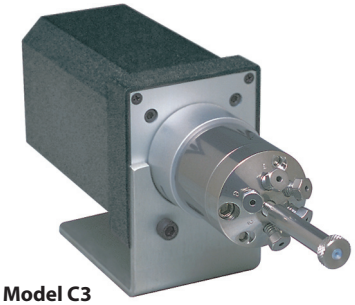
Autosampler and Other OEM Injectors

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.

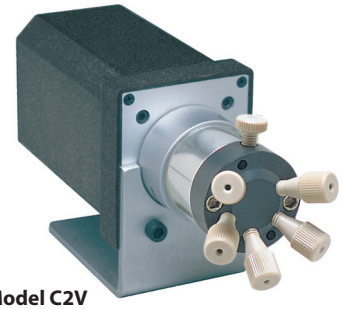
Model C2V is designed specifically for use in an autosampler. It is like the standard C2 except that the sample port is perpendicular to the valve axis. This permits the valve and actuator to be installed horizontally, while the syringe loads the injector vertically.

UNIVERSAL ACTUATOR
The new universal actuator operates virtually any Valco or Cheminert rotary valve – two position and selector alike – greatly simplifying the electronic aspect of instrument design. 193

OEM SELECTOR VALVES
See pages 153 and 186-187 for selector (multiposition) valves for OEMs.



Model C3
Microbore, page 181
Analytical, page 183
5,000 psi
Centered port



Model C2V
Microbore, page 181
Analytical, page 183
5,000 psi
Vertical port

CHEMINERT VALVES

UHPLC and high pressure selectors

UHPLC **Model C75** selectors offer pressure ratings of 20,000 psi, 15,000 psi and 10,000 psi with 1/32" and 1/16" fittings for nanobore and microbore applications. See charts on pages 147 and 148 for all options.



Model C75
See chart on page 147

20,000 psi

15,000 psi

10,000 psi



Model C5
page 174

5,000 psi

HPLC **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.



HPLC column selector system
page 175

5,000 psi

Column selector system

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.

Consult the factory for information about a **UHPLC column selector system**.

PORT DIAMETERS

Model	*Fitting size*	*Standard port diameter*	
High Pressure			
C5	1/16" ZDV	0.15 mm	(.006")
		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")
C25G	1/16" ZDV	0.67 mm	(.026")
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")

SPECIFICATIONS

CHEMINERT SELECTORS

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
C25G	PEEK	Valcon M	100 psi liq	50°C	20, 24, 28
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

UNIVERSAL ACTUATOR
The new universal actuator operates virtually any Valco or Cheminert rotary valve – two position and selector alike – greatly simplifying the electronic aspect of instrument design. . . .193

CAUTION
Metal fittings will damage the threads and details of C25Z, C25G, and C65Z series valves.

Use of metal fittings in these valves voids the warranty.

MORE INFORMATION
Actuation . . . pp 188-209

Materials
Metals 254-255
Polymers 256
Valve rotors 257

Valve descriptions
Cheminert
Injectors. 147-151
Selectors 152-153
Nanovolume® 147
Diaphragm 142-143
Valco
Injectors. 101
Selectors 102-103

Cheminert valve prices
HPLC. 158-165
Low pressure 166-169
Nanovolume®
valves..154-155, 158-159
Selectors 172-179
OEM 180-187
UHPLC 154-157



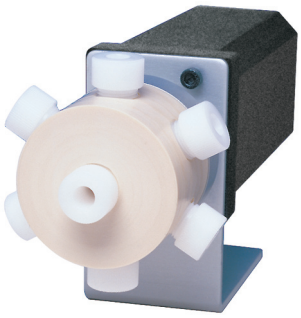
Model C25Z
page 176
Low pressure
10-32 ZDV



Model C25
page 177
Low pressure
1/4-28 Internal



Model C25G
page 178
Low pressure
6-40 flat bottom



Model C45
page 179
Low pressure
1/2-20 Int.

Low pressure selectors

With Valco Zero Dead Volume Fittings

Model C25Z valves feature the popular 1/16" Valco ZDV details for 1/16" OD tubing. Available in 4, 6, 8, 10, 12, and 14 positions, with a variety of actuator options. Standard materials are PPS stator and Valcon E2 rotor, with other materials optional.

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. Rotors are made of Valcon E2 with stators of PPS.

With 6-40 Fittings for 1/16" or 1/32" tubing

Model C25G valves feature 6-40 flat bottom details that can accommodate 1/16" (standard) or 1/32" (optional) tubing. The fitting is one piece PEEK with a stainless steel retainer. available with 20, 24, or 28 positions. Universal actuator is required.

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 position configurations only.

For OEMs

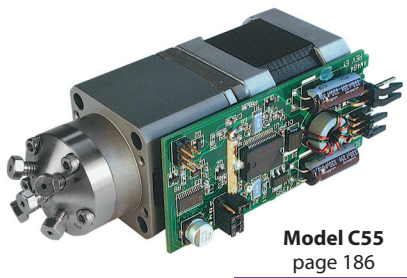
Integrated Motor/Stream Selectors

Cheminert's new **Model C55** (HPLC) and **Model C65(Z)** (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.

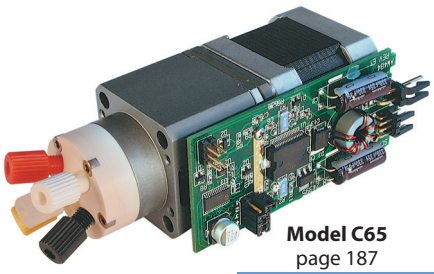
Using the well-proven Cheminert stream selector design and the 24 volt motor from our microelectric actuators, the Models C55, C65, and C65Z need only to be connected to an instrument's power supply. A single momentary contact closure steps the valve to the next position; a separate contact closure moves 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.

Serial communication via RS-232 is optional.



Model C55
page 186
5,000 psi



Model C65
page 187
Low pressure

OEM INJECTORS
See pages 151, 180-185 for injectors for OEMs.

CHEMINERT VALVES

20,000 psi UHPLC Nanovolume® valves
360 micron fittings, 100 micron bore (.004")

Model C72MU

20,000 psi
Nanobore
360 µm 100 µm

Includes stainless 360 micron fittings.
Valves for use with fused silica tubing have gold-plated ferrules.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



4 Port
Prod No



6 Port
Prod No

Coated stainless stator for use with stainless tubing

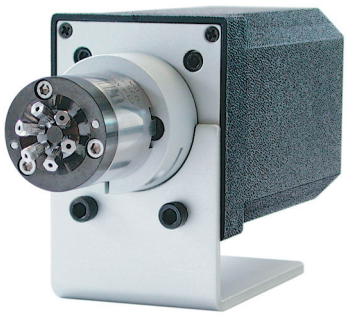
Manual	C72MU-4674	C72MU-4676
With air actuator	C72MU-4674A	C72MU-4676A
With microelectric actuator	C72MU-4674EH	C72MU-4676EH
Replacement valve	C72MU-4674D	C72MU-4676D
Replacement rotor	C72M-46R4	C72M-46R6
Replacement stator	C72M-4C74	C72M-4C76

For use with fused silica tubing

Manual	C72MFSU-4674	C72MFSU-4676
With air actuator	C72MFSU-4674A	C72MFSU-4676A
With microelectric actuator	C72MFSU-4674EH	C72MFSU-4676EH
Replacement valve	C72MFSU-4674D	C72MFSU-4676D
Replacement rotor	C72M-46R4	C72M-46R6
Replacement stator	C72M-4C74	C72M-4C76

SPECS
20,000 psi liq
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)

15,000 psi UHPLC Nanovolume® valves
360 micron fittings, 150 micron bore (.006")

Model C72MX

15,000 psi
Nanobore
360 µm 150 µm

Includes stainless 360 micron fittings.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



6 Port
Prod No



10 Port
Prod No

Coated stainless stator

Manual	C72MX-6676	C72MX-6670
With air actuator	C72MX-6676A	C72MX-6670A
With microelectric actuator	C72MX-6676EH	C72MX-6670ED
Replacement valve	C72MX-6676D	C72MX-6670D
Replacement rotor	C72M-66R6	C72M-66R0
Replacement stator	C72M-6C76	C72M-6C70

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

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

OPTIONS
- 100 micron (.004") bore
- 250 micron (.010") bore
- 10,000 psi version available
- 4 and 8 port versions available

Includes stainless nuts and ferrules.
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 | Nanobore | 1/32" | 150 µm



6 Port *
Prod No



10 Port
Prod No

Coated stainless stator		
Manual	C72NX-6676	C72NX-6670
With air actuator	C72NX-6676A	C72NX-6670A
With microelectric actuator	C72NX-6676EH	C72NX-6670ED
Replacement valve	C72NX-6676D	C72NX-6670D
Replacement rotor	C72N-66R6	C72N-66R0
Replacement stator	C72N-6C76	C72N-6C70



Model C72NX
1/32" Valco stainless fittings

Sample loops *for C72NX valves*

Each stainless loop includes two stainless 1/32" Valco fittings.

Volume	**Stainless** *Prod No*
1 µl	CSLN1K5
2 µl	CSLN2K
5 µl	CSLN5K
10 µl	CSLN10K





Model C74NX
1/32" Valco stainless fittings

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

OPTIONS
- 100 micron (.004") bore
- 250 micron (.010") bore
- 10,000 and 20,000 psi versions available

Includes stainless nuts and ferrules.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



15,000 psi | Nanobore | Internal sample | 1/32" | 150 µm

	10 nanoliters *Prod No*	**20 nanoliters** *Prod No*	**30 nanoliters** *Prod No*
Coated stainless stator			
Manual	C74NX-6674-.01	C74NX-6674-.02	C74NX-6674-.03
With air actuator	C74NX-6674-.01A	C74NX-6674-.02A	C74NX-6674-.03A
With microelectric actuator	C74NX-6674-.01EH	C74NX-6674-.02EH	C74NX-6674-.03EH
Replacement valve	C74NX-6674-.01D	C74NX-6674-.02D	C74NX-6674-.03D
Replacement rotor	C74N-66R-.01	C74N-66R-.02	C74N-66R-.03
Replacement stator	C74N-6C7	C74N-6C7	C74N-6C7

MORE INFORMATION
1/32" Valco fittings .....pages 10,12
1/16" Nanovolume® injectors
C72X ..... vici.com
C74X ..... vici.com

CHEMINERT VALVES

15,000 psi UHPLC microbore valves, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C72X

15,000 psi | Microbore | 1/16" | 0.25 mm

Includes stainless steel nuts and ferrules.
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.

	 **4 Port** *Prod No*	 **6 Port*** *Prod No*	 **8 Port** *Prod No*	 **10 Port** *Prod No*
Manual	C72X-1674	C72X-1676	C72X-1678	C72X-1670
With air actuator	C72X-1674A	C72X-1676A	C72X-1678A	C72X-1670A
With microelectric actuator	C72X-1674EH	C72X-1676EH	C72X-1678ED	C72X-1670ED
Replacement valve	C72X-1674D	C72X-1676D	C72X-1678D	C72X-1670D
Replacement rotor	C72-16R4	C72-16R6	C72-16R8	C72-16R0
Replacement stator	C72-1C74	C72-1C76	C72-1C78	C72-1C70

SPECS
15,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

OPTIONS
■ 0.15 mm ports (.006")

10,000 psi UHPLC microbore valves, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C72H

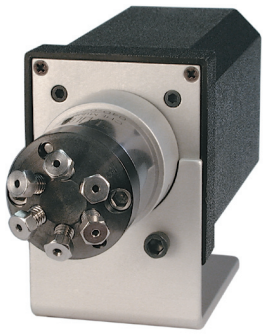
10,000 psi | Microbore | 1/16" | 0.25 mm

Includes stainless steel nuts and ferrules.
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.

	 **4 Port** *Prod No*	 **6 Port*** *Prod No*	 **8 Port** *Prod No*	 **10 Port** *Prod No*
Manual	C72H-1674	C72H-1676	C72H-1678	C72H-1670
With air actuator	C72H-1674A	C72H-1676A	C72H-1678A	C72H-1670A
With microelectric actuator	C72H-1674EH	C72H-1676EH	C72H-1678ED	C72H-1670ED
Replacement valve	C72H-1674D	C72H-1676D	C72H-1678D	C72H-1670D
Replacement rotor	C72-16R4	C72-16R6	C72-16R8	C72-16R0
Replacement stator	C72-1C74	C72-1C76	C72-1C78	C72-1C70

SPECS
10,000 psi liq
50°C max
Stainless stator with inert coating
Valcon E3 rotor

OPTIONS
■ 0.15 mm ports (.006")



Model C72H
(C72X similar)
1/16" ZDV fittings

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*	*Volume*	*Prod No*	*Volume*	*Prod No*
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



ABOUT LOOPS
■ Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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

OPTIONS
■ 0.15 mm ports (.006")

Includes stainless steel nuts and ferrules.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



15,000 psi
Microbore
Internal sample
1/16" 0.25 mm

Sample volume	20 nanoliters *Prod No*	50 nanoliters *Prod No*	100 nanoliters *Prod No*
Manual	C74X-1674-.02	C74X-1674-.05	C74X-1674-.1
With air actuator	C74X-1674-.02A	C74X-1674-.05A	C74X-1674-.1A
With microelectric actuator	C74X-1674-.02EH	C74X-1674-.05EH	C74X-1674-.1EH
Replacement valve	C74X-1674-.02D	C74X-1674-.05D	C74X-1674-.1D
Replacement rotor	C74-16R-.02	C74-16R-.05	C74-16R-.1
Replacement stator	C74-1C7	C74-1C7	C74-1C7

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

OPTIONS
■ 0.15 mm ports (.006")

Includes stainless steel nuts and ferrules.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



10,000 psi
Microbore
Internal sample
1/16" 0.25 mm

Sample volume	20 nanoliters *Prod No*	50 nanoliters *Prod No*	100 nanoliters *Prod No*
Manual	C74H-1674-.02	C74H-1674-.05	C74H-1674-.1
With air actuator	C74H-1674-.02A	C74H-1674-.05A	C74H-1674-.1A
With microelectric actuator	C74H-1674-.02EH	C74H-1674-.05EH	C74H-1674-.1EH
Replacement valve	C74H-1674-.02D	C74H-1674-.05D	C74H-1674-.1D
Replacement rotor	C74-16R-.02	C74-16R-.05	C74-16R-.1
Replacement stator	C74-1C7	C74-1C7	C74-1C7



Model C74H
(C74X similar)
1/16" ZDV fittings

MORE INFORMATION
Actuators
Air ..... page 197
Microelectric 190
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

CHEMINERT VALVES

5,000 psi Nanovolume® valves, 1/32" fittings, 100 micron ports (.004")

Model C2N

5,000 psi
Nanobore
1/32" 100 µm

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK 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* Prod No	10 Port Prod No
N60 stainless stator		
Manual	C2N-4006	C2N-4000
With microelectric actuator	C2N-4006EH	C2N-4000EH
Replacement valve	C2N-4006D	C2N-4000D
Replacement rotor	C2N-40R6	C2N-40R0
Replacement stator	C2N-4C06	C2N-4C00
PAEK stator		
Manual	C2N-4346	C2N-4340
With microelectric actuator	C2N-4346EH	C2N-4340EH
Replacement valve	C2N-4346D	C2N-4340D
Replacement rotor	C2N-43R6	C2N-43R0
Replacement stator	C2N-4C46	C2N-4C40

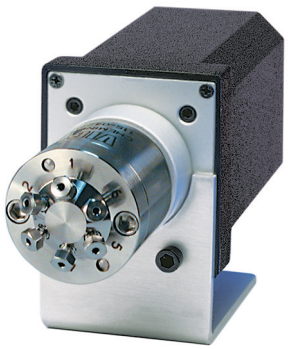
SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

- 150 micron (.006") and 250 micron (.010") bores



Model C2N
1/32" ZDV fittings

Sample loops

for C2N valves

Each stainless loop includes two stainless steel nuts and ferrules.
Each PEEK loop includes two PEEK nuts and ferrules.

Volume	Stainless steel Prod No	PEEK Prod No
1 µl	CSLN1K	CSLN1KPK
2 µl	CSLN2K	CSLN2KPK
5 µl	CSLN5K	CSLN5KPK
10 µl	CSLN10K	CSLN10KPK



ABOUT LOOPS

- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

5,000 psi Nanovolume® internal sample injector, 1/32"fittings, 100 micron ports (.004")

Model C4N

SPECS

5000 psi liq
75°C max
Metal stator
Valcon H rotor

5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

■ 150 micron (.006") bore

Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



5,000 psi
Nanobore
Internal sample
1/32" 100 µm

Sample volume	4 nanoliters *Prod No*	10 nanoliters *Prod No*	20 nanoliters *Prod No*
N60 stainless stator			
Manual	C4N-4004-.004	C4N-4004-.01	C4N-4004-.02
With microelectric actuator	C4N-4004-.004EH	C4N-4004-.01EH	C4N-4004-.02EH
Replacement valve	C4N-4004-.004D	C4N-4004-.01D	C4N-4004-.02D
Replacement rotor	C4N-40R-.004	C4N-40R-.01	C4N-40R-.02
Replacement stator	C4N-4C0	C4N-4C0	C4N-4C0
PAEK stator			
Manual	C4N-4344-.004	C4N-4344-.01	C4N-4344-.02
With microelectric actuator	C4N-4344-.004EH	C4N-4344-.01EH	C4N-4344-.02EH
Replacement valve	C4N-4344-.004D	C4N-4344-.01D	C4N-4344-.02D
Replacement rotor	C4N-43R-.004	C4N-43R-.01	C4N-43R-.02
Replacement stator	C4N-4C4	C4N-4C4	C4N-4C4



Model C4N
1/32" ZDV fittings

CHEMINERT VALVES

Microbore valves, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C2

5,000 psi
Microbore
1/16" **0.25 mm**

Includes nuts and ferrules.
Valves with metal stators have stainless steel nuts and ferrules of the stator material.
Valves with PAEK stators have PEEK nuts and ferrules.
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** *Prod No*	 **6 Port*** *Prod No*	 **8 Port** *Prod No*	 **10 Port** *Prod No*
N60 stainless stator				
Manual	C2-1004	C2-1006	C2H-1008	C2H-1000
With air actuator	C2-1004A	C2-1006A	C2H- 1008A	C2H-1000A
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 air actuator	C2-1344A	C2-1346A	C2H-1348A	C2H-1340A
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 air actuator	C2-1034A	C2-1036A	C2H-1038A	C2H-1030A
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



Model C2
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

- Continuous flow version is available as Model C6. *See page 162.*
- Hastelloy C stators
- Loop fill port assembly for injection from front of the valve. *See page 41.*
- 0.15 mm (0.006") bore

NOTE

Cheminert high pressure valves with polymeric stators have a longer pilot depth.



Order loops from page 161.

MORE INFORMATION

Actuators
Air ..... page 197
Microelectric 190
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Nuts
Metal..... 10
PEEK 63
Ferrules
Metal..... 12
PEEK 63
Standoff
assemblies 205

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

OPTIONS

- 100, 200, and 500 nl sample volumes are also available in 0.25 mm bore. *See page 164.*
- Loop fill port assembly for injection from front of the valve. *See page 41.*
- 0.25 mm (0.010") bore

NOTE

Cheminert high pressure valves with polymeric stators have a longer pilot depth.

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



5,000 psi
Microbore
Internal sample
1/16" 0.15 mm

Sample volume	10 nanoliters *Prod No*	20 nanoliters *Prod No*	50 nanoliters *Prod No*
N60 stainless stator			
Manual	C4-0004-.01	C4-0004-.02	C4-0004-.05
With air actuator	C4-0004-.01A	C4-0004-.02A	C4-0004-.05A
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 air actuator	C4-0344-.01A	C4-0344-.02A	C4-0344-.05A
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

ABOUT LOOPS

- Other materials are 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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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.



Volume	Stainless Steel *Prod No*	PEEK (for PAEK stators) *Prod No*	Titanium *Prod No*
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	—	—

CHEMINERT VALVES

Microbore continuous flow through-the-handle injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C1CFI

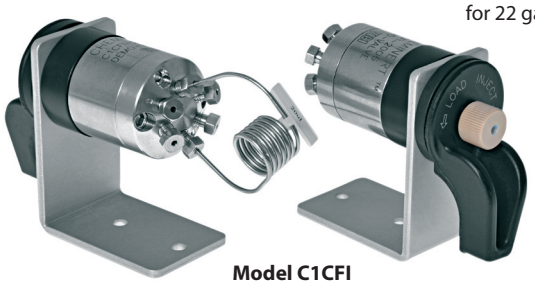
5,000 psi
Microbore
Continuous flow
Through-handle
1/16" 0.25 mm



Available only in manual version.
Position feedback included.
Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes one 5 µl loop of the stator material.

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
6 port injector	C1CFI-1006	C1CFI-1346
Replacement rotor	C1-10R6	C1-13R6
Replacement stator	C1CF-1C06	C1CF-1C46
Replacement injector fitting for 22 gauge x 2" long needle	C-261	





Model C1CFI
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
■ 0.40 mm bore (.016") on page 165.

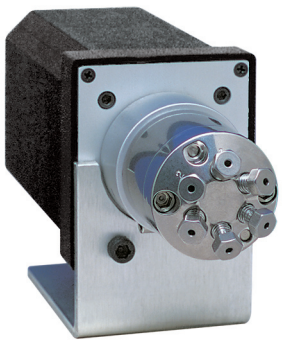
MORE INFORMATION
Syringes. . . . . page 250

NOTE
Cheminert high pressure valves with polymeric stators have a longer pilot depth.

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



Model C6
1/16" ZDV fittings

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
Includes one 5 µl loop of the stator material.

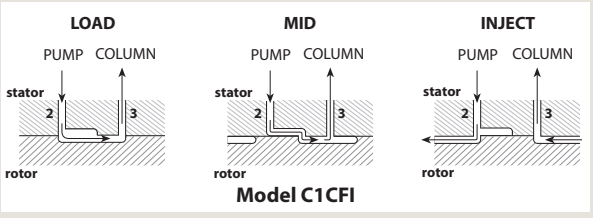
	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C6-1006	C6-1346
With pneumatic actuator	C6-1006A	C6-1346A
With standard electric actuator	C6-1006E	C6-1346E
With microelectric actuator	C6-1006EH	C6-1346EH
Replacement valve	C6-1006D	C6-1346D
Replacement rotor	C2-10R6	C2-13R6
Replacement stator	C6-1C06	C6-1C46

SPECS
5000 psi liq
75°C max
Metal stator
Valcon H rotor

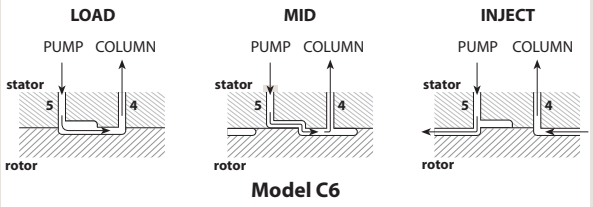
5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Order loops from page 161.

CONTINUOUS FLOWPATHS
An engraving on the stator maintains pump flow between the pump connection port and the column connection port during most of the switching cycle, virtually eliminating pressure spikes.



Model C1CFI



Model C6

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

OPTIONS

- Continuous flow version is available as Model C6. *See page 162.*
- 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.*

NOTE

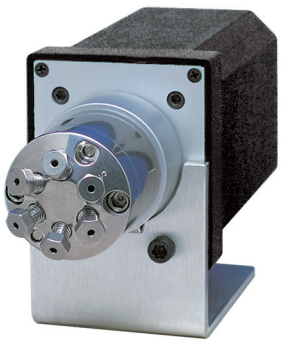
Cheminert high pressure valves with polymeric stators have a longer pilot depth.



Order loops from page 161.

Includes nuts and ferrules.
Valves with metal stators have stainless steel nuts and ferrules of the stator material.
Valves with PAEK stators have PEEK nuts and ferrules.
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.

	 4 Port *Prod No*	 6 Port* *Prod No*	 8 Port *Prod No*	 10 Port *Prod No*
N60 stainless stator				
Manual	C2-2004	C2-2006	C2H-2008	C2H-2000
With air actuator	C2-2004A	C2-2006A	C2H-2008A	C2H-2000A
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 air actuator	C2-2344A	C2-2346A	C2H-2348A	C2H-2340A
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 air actuator	C2-2034A	C2-2036A	C2H-2038A	C2H-2030A
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

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.



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.

CHEMINERT VALVES

Analytical internal sample injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C4

5,000 psi
Analytical
Internal sample
1/16" 0.25 mm



Includes nuts and ferrules.
Valves with metal stators have stainless steel nuts and ferrules of the stator material.
Valves with PAEK stators have PEEK nuts and ferrules.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	0.1 µl *Prod No*	0.2 µl *Prod Noe*	0.5 µl *Prod No*
N60 stainless stator			
Manual	C4-1004-.1	C4-1004-.2	C4-1004-.5
With air actuator	C4-1004-.1A	C4-1004-.2A	C4-1004-.5A
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 air actuator	C4-1344-.1A	C4-1344-.2A	C4-1344-.5A
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 air actuator	C4-1034-.1A	C4-1034-.2A	C4-1034-.5A
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

NOTE

Cheminert high pressure valves with polymeric stators have a longer pilot depth.

MORE INFORMATION

Actuators
Air ..... page 197
Microelectric 190
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

Analytical continuous flow through-the-handle injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C1CFI

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 162.

MORE INFORMATION

Syringes. . . . . page 250

NOTE

Cheminert high pressure valves with polymeric stators have a longer pilot depth.

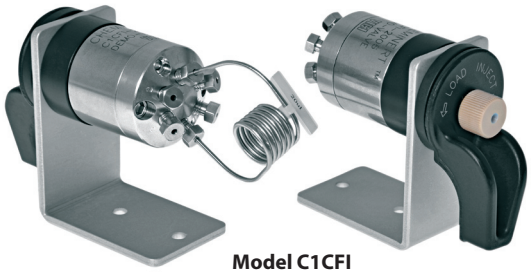
Available only in manual version.
Position feedback included.
Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes one 20 µl loop of the stator material.



5,000 psi
Analytical
Continuous flow
Through-handle
1/16" 0.40 mm

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
6 port injector	C1CFI-2006	C1CFI-2346
Replacement rotor	C1-20R6	C1-23R6
Replacement stator	C1CF-2C06	C1CF-2C46
Replacement injector fitting for 22 gauge x 2" long needle	C-261	





Model C1CFI
1/16" ZDV fittings

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

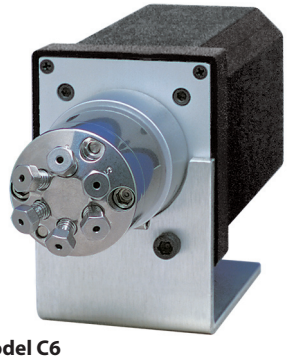
5000 psi liq
50°C max
PAEK stator
Valcon E rotor

Order loops from page 161.

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
Includes a 20 µl loop of the stator material.

5,000 psi
Analytical
Continuous flow
1/16"

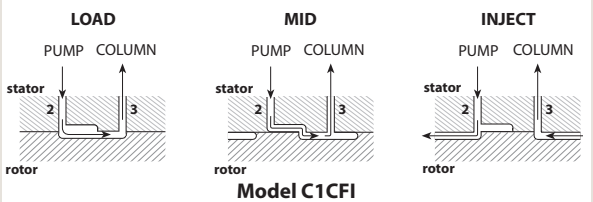
Prod No	N60 stainless stator *Prod No* *Price*	PAEK stator *Price*
Manual	C6-2006	C6-2346
With pneumatic actuator	C6-2006A	C6-2346A
With microelectric actuator	C6-2006EH	C6-2346EH
Replacement valve	C6-2006D	C6-2346D
Replacement rotor	C2-20R6	C2-23R6
Replacement stator	C6-2C06	C6-2C46



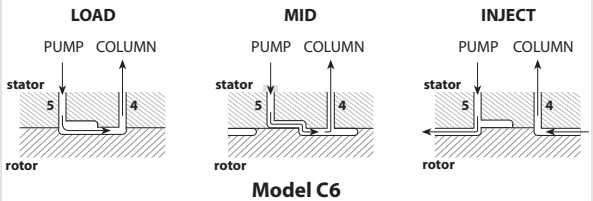
Model C6
1/16" ZDV fittings

CONTINUOUS FLOWPATHS

An engraving on the stator maintains pump flow between the pump connection port and the column connection port during most of the switching cycle, virtually eliminating pressure spikes.



Model C1CFI



Model C6

CHEMINERT VALVES

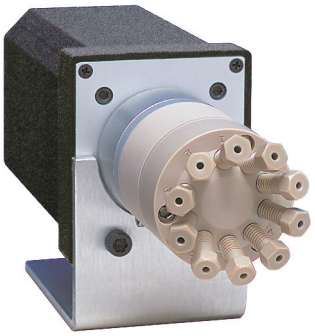
Valves with 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Model C22Z

Low pressure
10-32 ZDV
1/16" 0.75 mm

Includes Valco ZDV PEEK nuts and ferrules.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
Sample loops are not included with valves. Order separately.

	4 Port *Prod No*	6 Port *Prod No*	8 Port *Prod No*	10 Port *Prod No*
Manual	C22Z-3184	C22Z-3186	C22Z-3188	C22Z-3180
With air actuator	C22Z-3184A	C22Z-3186A	C22Z-3188A	C22Z-3180A
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/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

OPTIONS

- 12 and 14 port versions available.
- Purge option
- Other polymeric rotors and stators are available.

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.

Volume	FEP *Prod No*	PTFE *Prod No*	PEEK *Prod No*
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

ABOUT LOOPS

- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Actuators
Air ..... page 197
Microelectric 190
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

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.
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 *Prod No*	 6 Port *Prod No*	 8 Port *Prod No*	 10 Port *Prod No*
Manual	C22-3184	C22-3186	C22-3188	C22-3180
With air actuator	C22-3184A	C22-3186A	C22-3188A	C22-3180A
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 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 1/8" tubing.
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 *Prod No*	6 Port *Prod No*	8 Port *Prod No*	10 Port *Prod No*
Manual	C22-6184	C22-6186	C22-6188	C22-6180
With air actuator	C22-6184A	C22-6186A	C22-6188A	C22-6180A
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.



Volume	FEP *Prod No*	PTFE *Prod No*	PEEK *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

ABOUT LOOPS
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.



Model C22
1/4-28 fittings

CHEMINERT VALVES

Internal sample injectors, 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

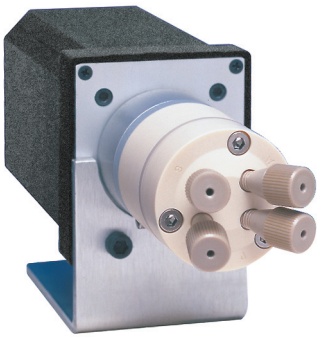
Model C24Z

Low pressure
Internal sample
10-32 ZDV
1/16" 0.40 mm

Includes Valco ZDV PEEK nuts and ferrules.
Microelectric actuator:24 VDC, with 110/230 VAC to 24 VDC power supply.



Sample volume	0.2 µl *Prod No*	0.5 µl *Prod No*	1 µl *Prod No*
Manual	C24Z-2184-.2	C24Z-2184-.5	C24Z-2184-1
With air actuator	C24Z-2184-.2A	C24Z-2184-.5A	C24Z-2184-1A
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/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

OPTIONS

- 2.0 µl sample volumes are also available.
- Purge option.
- Other polymeric rotors and stators are available.

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

Actuators
Air . . . . . page 197
Microelectric 190
Universal 193
Materials
Metals. 254-255
Polymers 256
Valve rotors. 257
Standoff
assemblies 205

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

OPTIONS

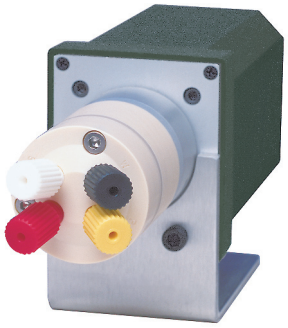
- 0.2 µl sample volumes are also available.
- Purge option
- Other polymeric rotors and stators are available. Consult the factory for prices and information.

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/16" tubing.
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

Sample volume	**0.5 µl** *Prod No*	**1 µl** *Prod No*	**2 µl** *Prod No*
Manual	C24-2184-.5	C24-2184-1	C24-2184-2
With air actuator	C24-2184-.5A	C24-2184-1A	C24-2184-2A
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

CHEMINERT VALVES

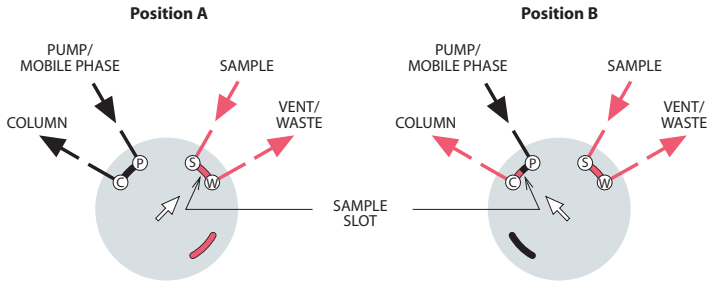
These illustrations show basic sample injection techniques using Cheminert two position valves. With rare exceptions, there is no difference between switching valves and external volume sampling valves, so the same valve can be used for either function.

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

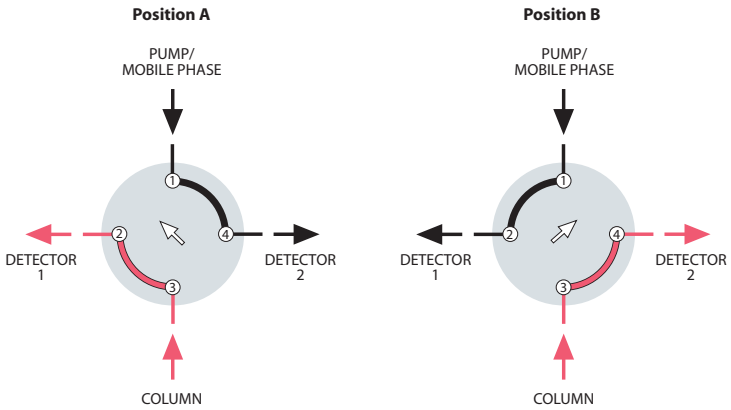
The internal sample (fixed volume) flowpath is used when very small sample volumes are required. The sample size is determined by a passage engraved on the valve rotor, allowing precise, repeatable injections. In Position A, the sample flows through the sample passage while the mobile phase flows through 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.



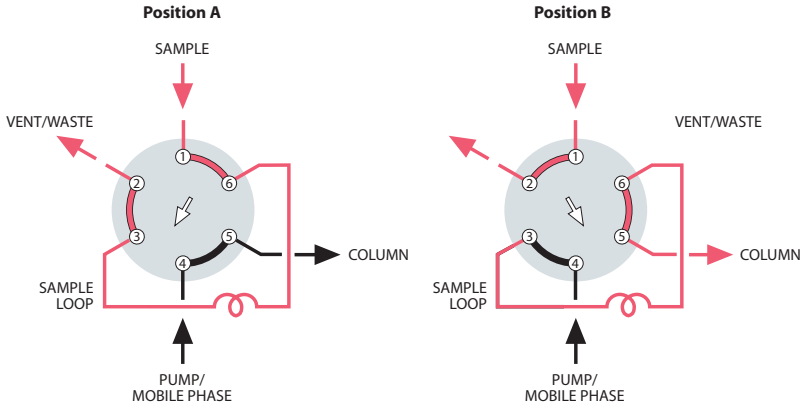
4 port switching valve

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



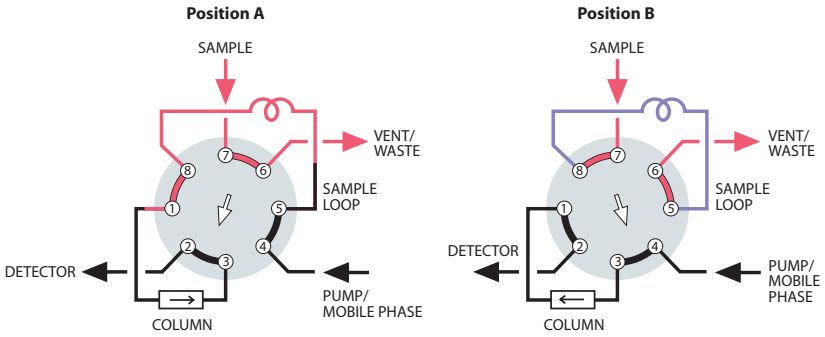
SAMPLE INJECTION

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 120-121

8 port sampling/switching

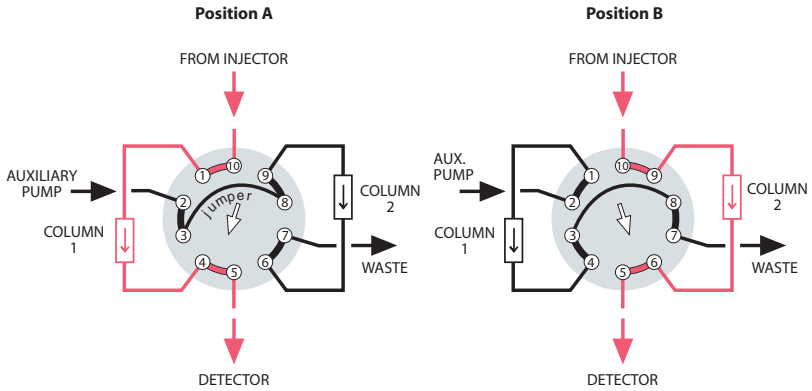


LOOP SAMPLING WITH BACKFLUSH TO DETECTOR

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 121

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 122-123

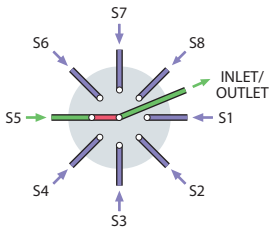
CHEMINERT VALVES

15,000 psi UHPLC Nanovolume® selectors, 1/32" Valco fittings, 150 micron ports (.006")

Model C75NX

15,000 psi
Nanobore
Stream selector
1/32" 150 µm

Includes Valco stainless steel fittings.
Manual version not available.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



SPECS
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 *Prod No*	8 Position *Prod No*	10 Position *Prod No*
Coated stainless stator			
With air actuator	C75NX-6676A	C75NX-6678A	C75NX-6670A
With microelectric actuator	C75NX-6676EMH	C75NX-6678EMT	C75NX-6670EMT
Replacement valve	C75NX-6676D	C75NX-6678D	C75NX-6670D
Replacement rotor	C75N-66R6	C75N-66R8	C75N-66R0
Replacement stator	C75N-6C76	C75N-6C78	C75N-6C70



Model C75NX
1/32" Valco stainless fittings

10,000 psi UHPLC microbore selectors, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C75H

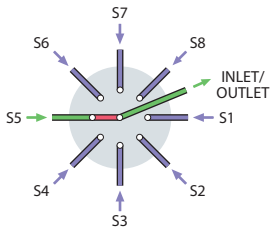
SPECS

10,000 psi liq
50°C max
Stainless stator
with inert coating
Valcon E3 rotor

OPTIONS

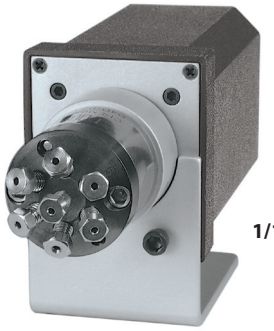
- 150 micron (.006") bore
- 15,000 psi version available
- 4 positions

Includes Valco stainless steel fittings.
Manual version not available.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



10,000 psi
Microbore
Stream selector
1/16" 0.25 mm

	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
Coated stainless stator			
With air actuator	C75H-1676A	C75H-1678A	C75H-1670A
With microelectric actuator	C75H-1676EMH	C75H-1678EMT	C75H-1670EMT
Replacement valve	C75H-1676D	C75H-1678D	C75H-1670D
Replacement rotor	C75-16R6	C75-16R8	C75-16R0
Replacement stator	C75-1C76	C75-1C78	C75-1C70



Model C75H
1/16" Valco stainless fittings

MORE INFORMATION

Actuators
Air ..... page 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

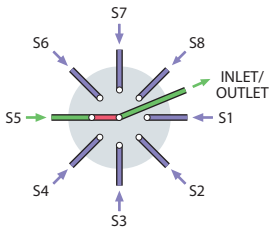
CHEMINERT VALVES

HPLC stream selector, 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

Model C5

5,000 psi
Stream selector
10-32 ZDV
1/16" **0.40 mm**

Includes nuts and ferrules.
Valves with metal stators have stainless steel nuts and ferrules of the stator material.
Valves with PAEK stators have PEEK nuts and ferrules.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
N60 stainless stator				
Manual	C5-2004	C5-2006	C5H-2008	C5H-2000
With air actuator	C5-2004A	C5-2006A	C5H-2008A	C5H-2000A
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 air actuator	C5-2344A	C5-2346A	C5H-2348A	C5H-2340A
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 air actuator	C5-2034A	C5-2036A	C5H-2038A	C5H-2030A
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

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

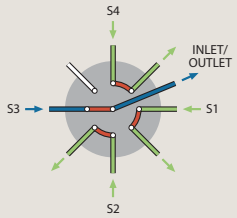


Model C5
6 positions
1/16" ZDV fittings

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

MORE INFORMATION

Manifolds ..... page 33

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

OPTIONS

- 2", 3", 4", and 6" standoffs
- Hastelloy C stator
- Optional 0.25 mm (.010") and 0.15 mm (.006") bores available
- Optional 0.75 mm (.030") bore for Prep HPLC available

The system comprises two stream selection valves mounted on a single modular universal actuator, which can be controlled manually, via remote logic level signal, or by RS-232 interface (RS-485 optional). *(See plumbing diagram below.)*

5,000 psi
Column selector system
10-32 ZDV
1/16" 0.40 mm

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

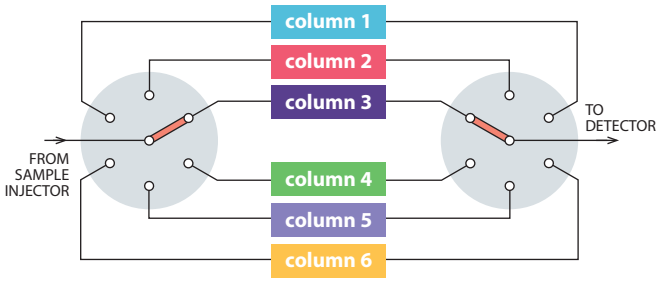
	6 Column *Prod No*	8 Column *Prod No*	10 Column *Prod No*
N60 stainless stator			
System	C5-2006EMTD	C5H-2008EMTD	C5H-2000EMTD
Replacement rotor	C5-20R6	C5-20R8H	C5-20R0H
PAEK stator			
System	C5-2346EMTD	C5H-2348EMTD	C5H-2340EMTD
Replacement rotor	C5-23R6	C5-23R8H	C5-23R0H

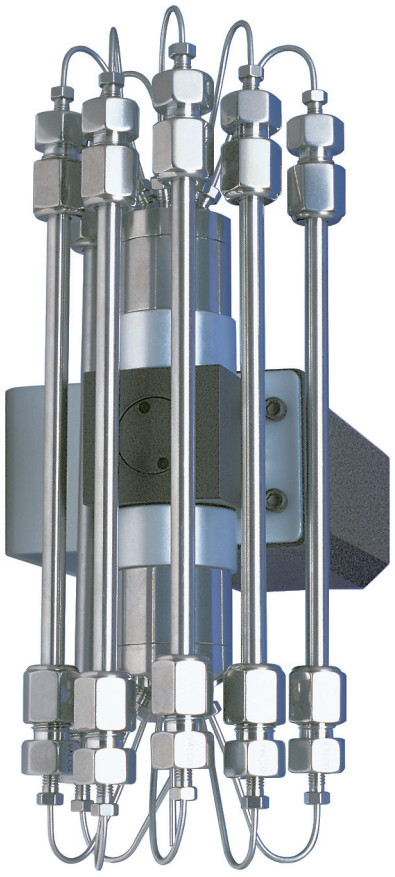
Contact factory for replacement valves and stators, as valves for dual drive assemblies have mirror image stators.

RS-232 interface cable

Prod No

I-22697





Model C5 system
Columns not included

UHPLC COLUMN SELECTOR SYSTEMS

Consult the factory for more information on UHPLC systems.

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.

MORE INFORMATION

Actuators
Air ..... page 197
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff assemblies 205

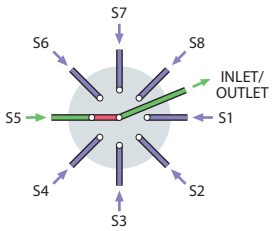
CHEMINERT VALVES

Stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Model C25Z

Low pressure
Stream selector
10-32 ZDV
1/16" 0.75 mm

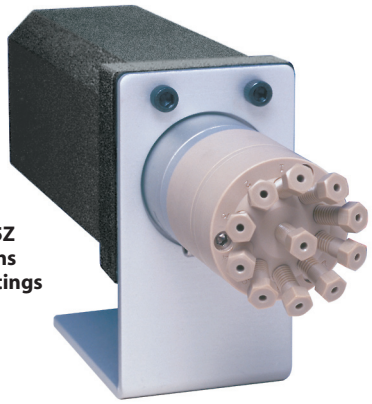
Includes Valco ZDV PEEK nuts and ferrules.
Microelectric actuator:
24 VDC, with 110/230 VAC to 24 VDC power supply.



	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*	14 Position *Prod No*
Manual	C25Z-3186	C25Z-3188	C25Z-3180	C25Z-31814
With air actuator	C25Z-3186A	C25Z-3188A	C25Z-3180A	C25Z-31814A
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

SPECS
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

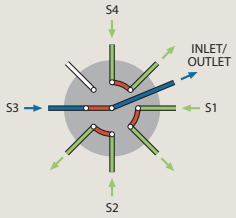
OPTIONS
- 4 and 12 positions available
- 2", 3", 4", and 6" standoffs
- Other polymeric materials are available. Consult the factory.



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.



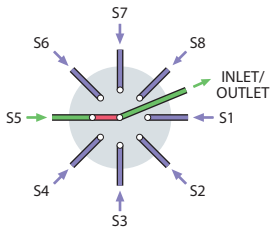
Stream selector, 1/4-28 fittings for 1/16" tubing, 0.75 mm ports (.030")

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.
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 *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
Manual	C25-3184	C25-3186	C25-3188	C25-3180
With air actuator	C25-3184A	C25-3186A	C25-3188A0	C25-3180A
With microelectric act.	C25-3184EMH	C25-3186EMH	C25-3188EMH	C25-3180EMH
Replacement valve	C25-3184D	C25-3186D0	C25-3188D	C25-3180D
Replacement rotor	C25-314	C25-316	C15-310	C25-310
Replacement stator	C25-384	C25-386	C25-388	C25-380

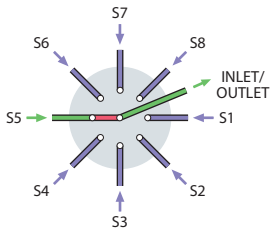
Stream selector, 1/4-28 fittings for 1/8" tubing, 1.50 mm ports (.060")

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.
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 *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
Manual	C25-6184	C25-6186	C25-6188	C25-6180
With air actuator	C25-6184A	C25-6186A	C25-6188A	C25-6180A
With microelectric 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

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.

MORE INFORMATION
Actuators
Air ..... page 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205



Model C25
10 position
1/4-28 fittings

CHEMINERT VALVES

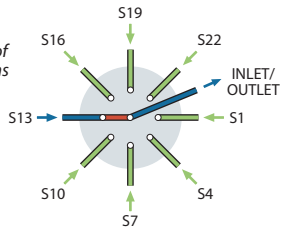
Stream selector, 1/16" Cheminert fittings

Model C25G

Low pressure
Stream selector
6-40 flat bottom
1/16"

Includes 6-40 PEEK nut/bushings for 1/16" OD tubing.
Available only with
microelectric actuator:
24 VDC,
with 110/230 VAC power supply.

(For clarity, only eight of the twenty-four streams are illustrated.)



SPECS
100 psi liq
50°C max
PEEK stator
Valcon M rotor

OPTIONS
- 2", 3", 4", and 6" standoffs
- Consult the factory for optional materials.

Bore:	**20 Position 0.67 mm (.026")** *Prod No*	**24 Position 0.61 mm (.024")** *Prod No*	**28 Position 0.56 mm (.022")** *Prod No*
With microelectric actuator	C25G-24520EMT	C25G-24524EMT	C25G-24528EMT
Replacement valve	C25G-24520D	C25G-24524D	C25G-24528D
Replacement rotor	C25G-24R20	C25G-24R24	C25G-24R28
Replacement stator	C25G-2C520	C25G-2C524	C25G-2C528



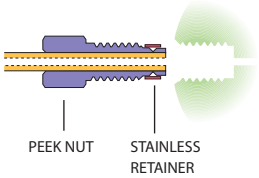
Model C25G
24 positions
1/16" fittings

Fittings for C25G valves

The C25G selector uses unique 6-40 fittings for flat-bottomed fitting details. As the fitting is tightened, the grooved area (supported by the stainless retainer) compresses enough to grip the tube for a low pressure connection.

	Prod No
6-40 one piece nut/bushing, natural PEEK, stainless retainer	CNNF1PK
Tightening tool	CGFT



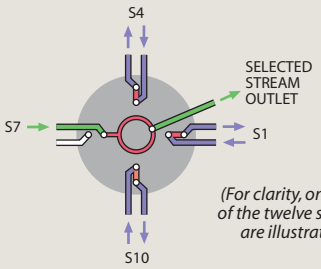


OPTIONAL FLOWPATHS

Model C25G valves select and isolate one of 20-28 streams, with the remainder dead-ended.

Model C25GF, the flow-through version, is similar to the C25G but its non-selected streams continue flowing through individual outlets. 10, 12, and 14 positions are available.

Call for pricing and information.



(For clarity, only four of the twelve streams are illustrated.)

Model C35ZF schematic

Stream selector, 1/2-20 fittings for 1/4" tubing, 4.6 mm ports (.180")

Model C45

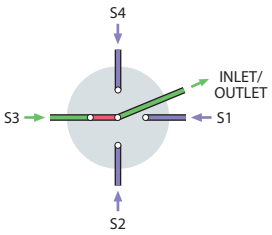
SPECS

100 psi liq
50°C max
PPS stator
Valcon TF rotor

OPTIONS

- 2", 3", 4", and 6" standoffs
- Consult the factory for optional materials.
- 8 position selectors are available with 3 mm (.120") ports

Manual version not available.
Includes Cheminert 1/2-20 flangeless fittings for 1/4" tubing, Delrin nuts, and CTFE ferrules.
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

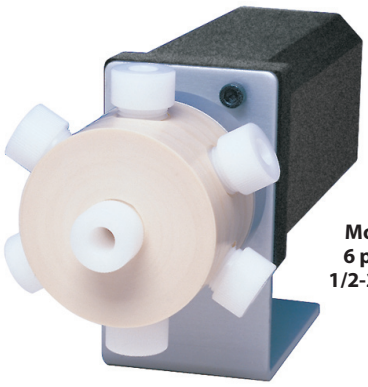
	4 Position *Prod No*	6 Position *Prod No*
With air actuator	C45-9784A	C45-9786A
With microelectric actuator	C45-9784EMT	C45-9786EMT
Replacement valve	C45-9784D	C45-9786D
Replacement rotor	C45-97R4	C45-97R6

Fittings for C45 valves

For additional 1/2-20 fittings and adapters, see page 72.



		Prod No
Nuts	CTFE	CFL-4KF
	Delrin	CFL-4D
	PPS	CFL-4PPS
Ferrules	CTFE	CFL-CB4KF-S
Plugs	CTFE	CP-4K
	Delrin	CP-4D



Model C45
6 positions
1/2-20 fittings

MORE INFORMATION

Actuators
Air ..... page 196
Microelectric 192
Universal 193
Materials
Metals..... 254-255
Polymers 256
Valve rotors.....257
Standoff
assemblies 205

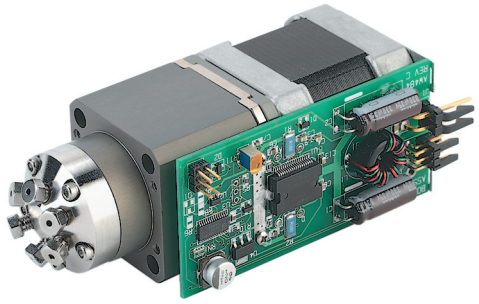
Integrated motor/valve, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C52

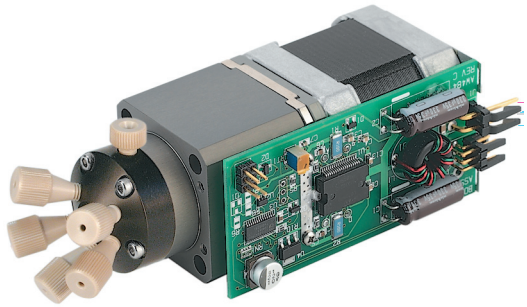
5,000 psi
Microbore
Integrated
1/16" 0.25 mm
CE ready*

See page 151 for more information on Model C52 valves.
Also available in vertical port version. Contact the factory.
Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.

	4 Port *Prod No*	6 Port* *Prod No*	8 Port *Prod No*	10 Port *Prod No*
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



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.



Volume	Stainless Steel *Prod No*	PEEK (for PAEK stators) *Prod No*
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	—

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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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
- Serial communication via RS-232 is available.

* CE READY

Since these integrated VICI motor/valves are designed as components to be embedded into other systems, they do not include a power supply. They have been tested according to the following EMC Standards:
EN61326-1: 2006
Conducted emissions
Radiated emissions
However, these results do not substitute for, preclude, or guarantee passage of any or all relevant compliance testing as required for a final product that includes these components.

NOTE

Cheminert high pressure valves with polymeric stators have a longer pilot depth.

MORE INFORMATION

Materials
Metals. . . . . page 254-5
Polymers 256
Valve rotors. 257

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

OPTIONS
- Titanium and Hastelloy stators available



Order loops from page 161.

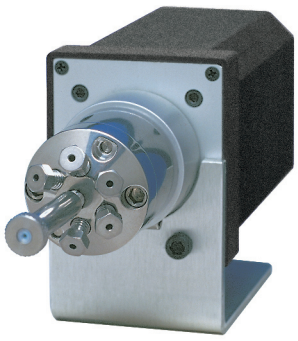
NOTE
Cheminert high pressure valves with polymeric stators have a longer pilot depth.

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes one 5 µl loop of the stator material.
Includes syringe fill port for 22 gauge 3/4" and 2" needle.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



5,000 psi
Microbore
Centered port
1/16" 0.25 mm

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C3-1006	C3-1346
With air actuator	C3-1006A	C3-1346A
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 C3
1/16" ZDV fittings

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

OPTIONS
- Titanium and Hastelloy stators available



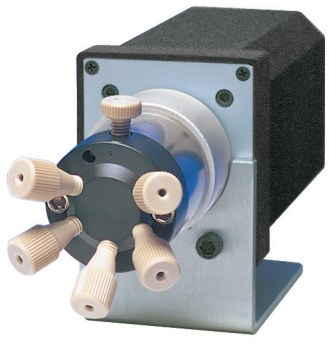
Order loops from page 161.

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes one 5 µl loop of the stator material.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



5,000 psi
Microbore
Vertical port
1/16" 0.25 mm

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C2V-1006	C2V-1346
With air actuator	C2V-1006A	C2V-1346A
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 C2V
1/16" ZDV fittings

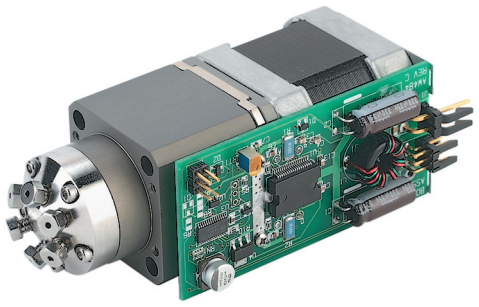
Integrated motor/valve, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C52

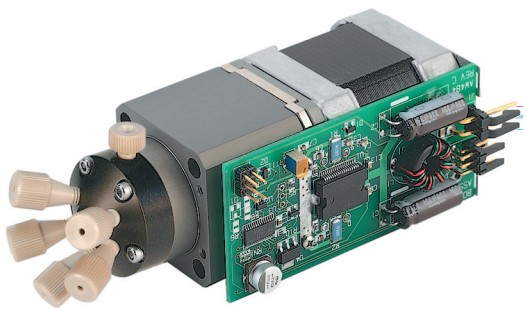
5,000 psi
Analytical
Integrated
1/16" 0.40 mm
CE ready*

See page 151 for more information on Model C52 valves.
Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.nuts and ferrules.

	4 Port *Prod No*	6 Port* *Prod No*	8 Port *Prod No*	10 Port *Prod No*
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



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.

Volume	Stainless Steel *Prod No*	PEEK (for PAEK stators) *Prod No*
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	—



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.
- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

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
- Serial communication via RS-232 is available.

* CE READY

Since these integrated VICI motor/valves are designed as components to be embedded into other systems, they do not include a power supply. They have been tested according to the following EMC Standards:
EN61326-1: 2006
Conducted emissions
Radiated emissions
However, these results do not substitute for, preclude, or guarantee passage of any or all relevant compliance testing as required for a final product that includes these components.

NOTE

Cheminert high pressure valves with polymeric stators have a longer pilot depth.

MORE INFORMATION

Materials
Metals. . . . . page 254-5
Polymers 256
Valve rotors. 257

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

OPTIONS
- Titanium and Hastelloy stators available



Order loops from page 161.

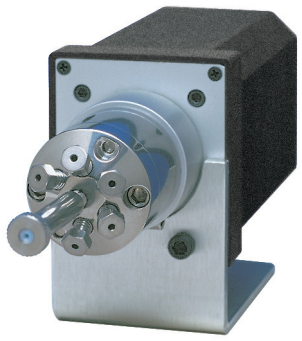
NOTE
Cheminert high pressure valves with polymeric stators have a longer pilot depth.

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes one 20 µl loop of the stator material.
Includes syringe fill port for 22 gauge 3/4" and 2" needle.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



5,000 psi
Analytical
Centered port
1/16" 0.40 mm

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C3-2006	C3-2346
With air actuator	C3-2006A	C3-2346A
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

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

OPTIONS
- Titanium and Hastelloy stators available



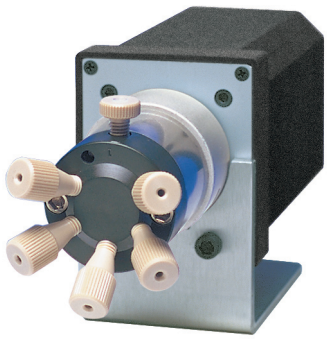
Order loops from page 161.

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.
Includes one 20 µl loop of the stator material.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



5,000 psi
Analytical
Vertical port
1/16" 0.40 mm

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C2V-2006	C2V-2346
With air actuator	C2V-2006A	C2V-2346A
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

Integrated motor/valve, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Model C62Z

Low pressure
Integrated
10-32 ZDV
1/16" 0.75 mm
CE ready*

Includes Valco ZDV PEEK nuts and ferrules.
Sample loops are not included with valves. Order separately.

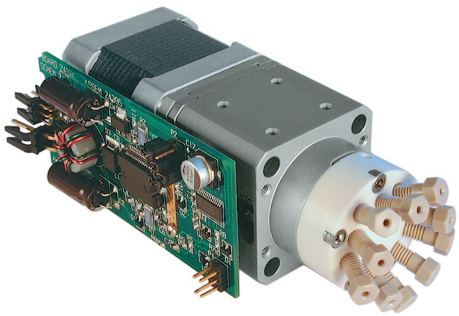








	4 Port *Prod No*	6 Port *Prod No*	8 Port *Prod No*	10 Port *Prod No*
With motor, sensor, & controller	C62Z-3184I	C62Z-3186I	C62Z-3188I	C62Z-3180I
With motor and sensor only	C62Z-3184I-S	C62Z-3186I-S	C62Z-3188I-S	C62Z-3180I-S



Model C62Z
1/16" ZDV fittings

SPECS

100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

OPTIONS

- Other polymeric rotors and stators are available

  Consult the factory for prices and information.
- Serial communication via RS-232 is available.

* CE READY

Since these integrated VICI motor/valves are designed as components to be embedded into other systems, they do not include a power supply. They have been tested according to the following EMC Standards:

EN61326-1: 2006
Conducted emissions
Radiated emissions

However, these results do not substitute for, preclude, or guarantee passage of any or all relevant compliance testing as required for a final product that includes these components.

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*	PTFE *Prod No*	PEEK *Prod No*
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

ABOUT LOOPS

- Sample loop shape and dimensions may vary from batch to batch due to fluctuations in tubing ID. Loop volume is controlled as closely as possible, but is not calibrated.

MORE INFORMATION

Materials
Metals. . . . page 254-255
Polymers 256
Valve rotors. 257

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

OPTIONS
■ Serial communication via RS-232 is available.

*** CE READY**
See note on facing page.

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 ready*

	 **4 Port** *Prod No*	 **6 Port** *Prod No*	 **8 Port** *Prod No*	 **10 Port** *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

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

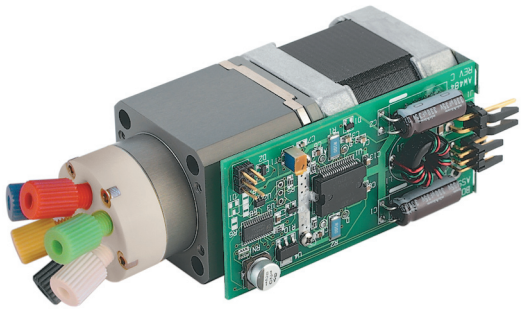
OPTIONS
■ Serial communication via RS-232 is available.

*** CE READY**
See note on facing page.

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 ready*

	4 Port *Prod No*	**6 Port** *Prod No*	**8 Port** *Prod No*	**10 Port** *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.



Volume	FEP *Prod No*	PTFE *Prod No*	PEEK *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

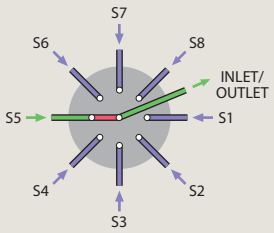
Integrated motor/stream selector, 1/16" Valco ZDV fittings, 0.40 mm ports (.016")

Model C55

5,000 psi
Integrated
Stream selector
10-32 ZDV
1/16" 0.40 mm
CE ready*

Includes nuts and ferrules.
Valves with stainless stators have stainless fittings.
Valves with PAEK stators have PEEK fittings.

See Tech Tip, below.



	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
Including RS-232 interface	C55-2004IA	C55-2006IA	C55-2008IA	C55-2000IA
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
Including RS-232 interface	C55-2344IA	C55-2346IA	C55-2348IA	C55-2340IA
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

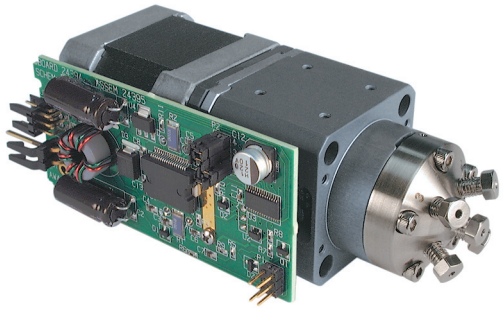
5000 psi liq
50°C max
PAEK stator
Valcon E rotor

OPTIONS

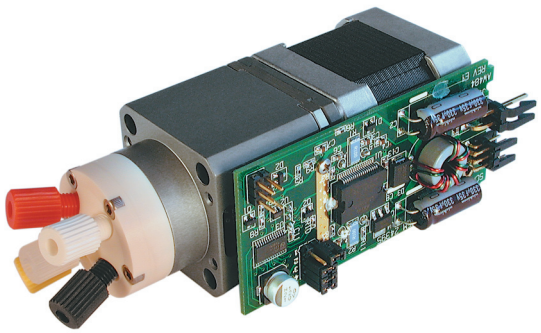
- Optional bore:
  0.25 mm (.010")
  0.75 mm (.030")
- 4 and 8 positions available

* CE READY

Since these integrated VICI motor/valves are designed as components to be embedded into other systems, they do not include a power supply. They have been tested according to the following EMC Standards:
EN61326-1: 2006
Conducted emissions
Radiated emissions
However, these results do not substitute for, preclude, or guarantee passage of any or all relevant compliance testing as required for a final product that includes these components.



Model C55
1/16" ZDV fittings



Model C65
1/4-28 fittings

TECH TIP

For accurate port alignment, these integrated motor/stream selectors must be turned in one direction only.
Factory setting is clockwise rotation, but it can be changed by a jumper setting. (See Technical Note TN-821 on vici.com)

Integrated motor/stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

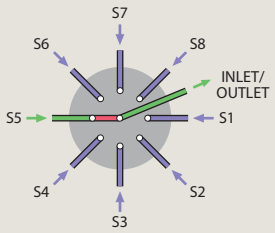
Model C65Z

SPECS
100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

*** CE READY**
See note on facing page.

Includes Valco ZDV PEEK nuts and ferrules.

See Tech Tip on facing page.



Low pressure
Integrated
Stream selector
10-32 ZDV
1/16" 0.75 mm
CE ready*

	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
Including RS-232 interface	C65Z-3184IA	C65Z-3186IA	C65Z-3188IA	C65Z-3180IA
With motor and sensor only	C65Z-3184I-S	C65Z-3186I-S	C65Z-3188I-S	C65Z-3180I-S

Integrated motor/stream stream selector, 1/4-28 fittings for 1/16" tubing, 0.75 mm ports (.030")

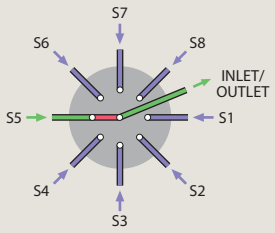
Model C65

SPECS
100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

*** CE READY**
See note on facing page.

Includes multicolored Cheminert flangeless fittings for 1/16" tubing. See photo on facing page.

See Tech Tip on facing page.



Low pressure
Integrated
Stream selector
1/4-28 Internal
1/16" 0.75 mm
CE ready*

	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod Noe*	10 Position *Prod No*
With integrated actuator	C65-3184I	C65-3186I	C65-3188I	C65-3180I
Including RS-232 interface	C65-3184IA	C65-3186IA	C65-3188IA	C65-3180IA
With motor and sensor only	C65-3184I-S	C65-3186I-S	C65-3188I-S	C65-3180I-S

Integrated motor/stream stream selector, 1/4-28 fittings for 1/8" tubing, 1.50 mm ports (.060")

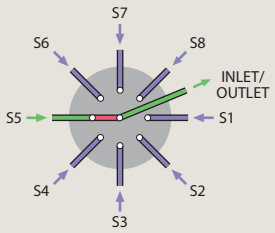
Model C65

SPECS
100 psi gas/ 250 psi liq
50°C max
PPS stator
Valcon E2 rotor

*** CE READY**
See note on facing page.

Includes multicolored Cheminert flangeless fittings for 1/8" tubing. See photo on facing page.

See Tech Tip on facing page.



Low pressure
Integrated
Stream selector
1/4-28 Internal
1/8" 1.50 mm
CE ready*

	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
Including RS-232 interface	C65-6184IA	C65-6186IA	C65-6188IA	C65-6180IA
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.



Manual
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.



Air actuator
Two position, page 197
Selector, page 196

MORE INFORMATION

Actuators
Air . . . . . pages 196-197
Microelectric . . 190-192
Modular universal . . 194
Universal electric . . . 193

Mounting Hardware
Closemount assembly 208
Standoff assembly 205

Controllers and Accessories
DVI 199
Digital valve interface
HSSA. 198
High speed switching accessory
MSVA2 198
Manifold 3-way solenoid valve assembly
PFAF 199
Position feedback for air actuators
RAD. 204
Right angle drive
Solenoid air valves. . . . 198



Electric Actuation



Microelectric actuator
For two position valves, page 190

The **microelectric actuator** features automatic valve alignment, high-speed switching, compact size, 24 VDC power input, and reversible direction (in the selector model).

Microelectric actuators can be operated manually with a controller assembly that features position-indicating LEDs and a toggle switch, or can be easily connected to an external data system for fully automated control. Built-in multidrop RS-232 (RS-485 optional) facilitates bidirectional communications.

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. A manual controller is included; current interface options include RS232/485, USB, and BCD.

A **modular universal actuator**, also available, is fully backward-compatible with multiposition microelectric actuator models EMH and EMT. Like the universal actuator, it can also be used for two position valves.



Microelectric actuator
For selectors, page 192



Universal actuator
Two position and selectors, page 193



Modular universal actuator
Two position and selectors, page 194



Standoff assemblies
page 205

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.

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.



Right angle drive
page 204

Microelectric actuators for two position valves



- CE certified
- Automatic alignment via stall-sensing circuitry – no mechanical microswitches
- Manual remote control with position indication
- High speed switching – <100 ms in EQ model
- RS-232 bidirectional communication (switchable RS-485)
- Universal power supply, 110/230 VAC to 24 VDC

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.

Since different valve models have varying actuation torque requirements, there are five microelectric actuator models – EQ, EH, EP, ED, and ET. Consult the chart on the facing 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, so valves which will be mounted in ovens require a standoff assembly to locate the actuator out of the heated zone.

The microelectric 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 RS-232 interface cable, if required, must be ordered separately. *(See facing page.)*

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 left 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

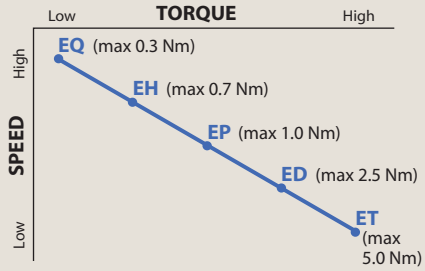
WHICH MODEL FOR WHICH TWO POSITION VALVE?

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

Model C72X	
8 and 10 ports	ED
All other valves	EH

SPEED AND TORQUE: Inversely proportional



MORE INFORMATION

Closemount hardware . . page 208
Microelectric actuators for selectors 192
Right angle drive . 204
Standoff assembly 205
Standoff mounting hardware 205

ORDER TIP

To purchase a ***two position valve with a microelectric actuator installed***, see valve ordering information.

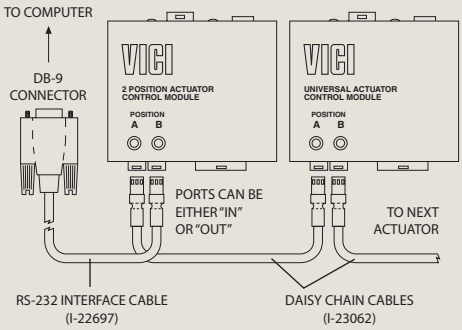
Valco injectors and valves . . . 98-117
Cheminert injectors and valves . 146-169, 181, 183

RS-232 interface cable

Description	*Prod No*
RS-232 interface cable	I-22697

DAISY CHAIN CABLES
Daisy chain cables permit a single serial port (RS-232) to control multiple actuators – newer two position microelectric and universal.

See Technical Note 421 for further information..



NEW *for newer two position microelectric actuators and universal actuators*

Daisy chain cables

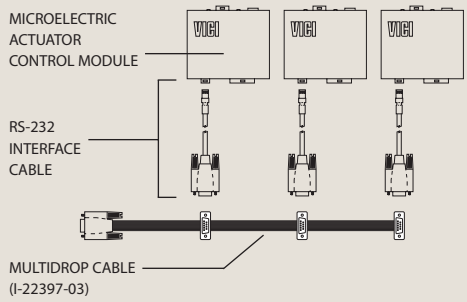
- More layout flexibility
- More economical than multi-drop configuration

The newly redesigned two position microelectric actuator controller on the facing page (differentiated by a plastic housing instead of a metal one) allows multiple units to be daisy-chained for control from a single serial port. Universal actuators with the RS232/485 option (page 193) can be included in the series, if desired. A chain of actuators requires only one RS-232 interface cable, plus a 3-pin daisy chain cable for each actuator – a more flexible and economical solution than the multi-drop cable application described below.

For lengths other than the 55 cm cable listed, please contact our technical support department. Note that cable lengths should be shorter than one meter for reliable RS-232 communication; longer lengths can affect the signal integrity.

Length	*Prod No*
55 cm	I-23062

MULTI-DROP CABLES
Multi-drop cables permit a single serial port (RS-232) to control multiple actuators – microelectric and universal.



Multi-drop cables

for microelectric and universal actuators

- Work with all VICI microelectric and universal actuators (RS232/485 option)

Multi-drop cables permit a single serial port (RS-232) to control any combination of microelectric actuators (two position and multiposition, any vintage) and universal actuators with the RS232/485 option (page 193). These ribbon cables have one female DB9 and 2 to 8 male DB9 connectors, spaced at approximately 6".
Note: An 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

Plug-and-play cables

for two position microelectric actuators

Plug-and-play cables will allow a direct connection and control between a specific instrument and the microeletric two position actuator. Contact technical support for other instruments.

Relay assembly	*Prod No*
Two position microelectric actuator to	
Agilent 6890 GC	V-RA-24VDC-HP6890
Agilent 7890 GC	V-RA-24VDC-HP6890
Varian 3800 GC	V-RA-24VDC-VA3800
Agilent 1100 LC	V-RA-5VDC-HP1100
Waters Alliance LC	V-RA-5VDC-WA2690

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.

MORE INFORMATION
Universal actuators . . . 193

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
- Universal power supply, 110/230 VAC to 24 VDC



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. *See below.*)

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.

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

TECH TIP
Multi-drop cables permit a single serial port to control multiple actuators. In addition, we offer plug-and-play cables for direct connection of the actuator to a specific instrument.
Multi-drop cables . . . 191
Plug-and-play cables 195

ORDER TIP
To purchase a ***selector (multiposition valve) with a microelectric actuator installed***, see valve ordering information.

Valco selectors . . . pp 124-135
Cheminert selectors 172-179

MORE INFORMATION
Closemount hardware . . . . . page 208
Microelectric actuators for two position 190
Right angle drive 204
Standoff assembly 205
Standoff mounting hardware 205

WHICH MODEL FOR WHICH INJECTOR / TWO POSITION VALVE?

Valco

Fitting size	*Valve type*	*Actuator model* **GC**	*Actuator model* **HPLC**
1/32"	W	EUH	EUH
1/16"	W	EUH	EUH
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.

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 C25G	EUD	
Model C45	EUT	

* 20,000 psi versions use EUD.

ABOUT STANDOFFS

Keyed standoff assemblies are used with selectors on universal 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 universal actuator. To install a universal 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 modular universal actuators.

Universal actuators

- CE certified
- One actuator works with two position valves *and* selectors
- Simplified, universal communication protocol
- Variety of interfaces
- Three versions for various valve torque requirements



Our universal actuators are truly universal – a single actuator can be used to operate a selector and later to operate a two position valve and back again, simply by changing simple settings.

Three universal actuator models – high speed, medium speed/medium torque, and high torque – cover our entire line of Valco and Cheminert valves and selectors, with their wide range of turning torques.

Actuators include a universal 24 VDC power supply and a manual controller. An OEM version that excludes these items is also available. The standard interface allows simple positioning commands – Step and Home for selectors, A and B for two position – via direct input signals from switch closures, relay contacts, or TTL-compatible interfaces. A more extensive command set is available with the optional RS232/485, USB, or BCD interfaces.

Note: while the actuators listed below are universal, the valve mounting hardware is not. The product numbers shown 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.

Universal actuators

Standard voltage 24 VDC. Includes autosensing 24 VDC power supply. Does not include mounting hardware. Order separately.

	High speed (EUH)	**Medium torque (EUD)**	**High torque (EUT)**
Interface	*Prod no*	*Prod no*	*Prod no*
Standard	EUH	EUD	EUT
RS-232/485	EUHA	EUDA	EUTA
USB	EUHB	EUDB	EUTB
BCD	EUHC	EUDC	EUTC

MORE INFORMATION

Cables . . . . pages 191, 195
Closemount hardware 208
Right angle drive 204
Standoff assembly 205
Standoff mounting hardware 205

NOTE

Modular universal actuators, with the motor separated from the controller, offer the same features and functionality as the universal actuator. The modular configuration is often easier to incorporate into an instrument design.

Modular universal actuators for OEMs 194-5



Modular universal actuators

- CE certified
- Bidirectional
- Optional position indication
  LCD display BCD
  RS-232/485 USB
- Compact stepper motor design
- Automatic self-alignment with keyed selector valves
- Variety of control modes with optional interfaces
  Step and home functions with contact closure *(standard)*
  Direct position access via BCD interface
  Position access/confirmation via serial interface



The modular universal actuator allows instrument manufacturers to use a single motor and control software to operate virtually any Valco or Cheminert rotary valve. This actuator is a drop-in replacement for the previous microelectric multiposition actuator (part numbers EMH, EMT, etc.); the motor is identical, and the controller is the same size, with the same cable connections. And while the modular universal actuator perfectly mimics the microelectric's functionality, it packs even more features into the same small package.

This new version of the popular universal actuator makes it easier for the instrument manufacturer to work in the limited space frequently encountered in today's modern instruments. Plus, the modular design makes it possible to mount the more sensitive electronics module away from the liquid end of the valve.

Like the microelectric actuator, the modular universal actuator is bidirectional, and can be easily programmed to take the shortest path during actuation. Position feedback is available via RS232/485 (switchable) or USB interfaces.

All Valco and Cheminert valves and selectors can be actuated by one of the three available versions: high speed, medium speed/torque, or high torque. The actuator includes a universal input 24 volt DC power supply and a manual controller with LCD display. An OEM version that excludes these and the motor mounting bracket is available at additional savings.

While the actuators listed here are universal, the valve mounting hardware is not. The product numbers shown do *not* include the hardware required to mount a valve, since the parts required depend on the valve type. If you are ordering a universal actuator with a *new* valve, the proper hardware is, of course, included. If you are ordering an actuator for use with an *existing* valve, call our technical support staff for help in acquiring the correct mounting hardware.

NEW Modular universal actuators *for selectors and two position valves*

Standard voltage 24 VDC. Includes autosensing 24 VDC power supply.
Consult the charts at left to determine which actuator model is best suited for your valve.

Interface	**High speed** *Prod no*	**Medium torque** *Prod no*	**High torque** *Prod no*
Standard	UMH	UMD	UMT
RS-232/485	UMHA	UMDA	UMTA
USB	UMHB	UMDB	UMTB
BCD	UMHC	UMDC	UMTC

WHICH MODEL FOR WHICH INJECTOR / TWO POSITION VALVE?

Valco

Fitting size	*Valve type*	*Actuator model* **GC**	*Actuator model* **HPLC**
1/32"	W	UMH	UMH
1/16"	W	UMH	UMH
1/16"	UW	UMD	UMD
1/8"	UW	UMD	UMD
1/4"	MW	UMT	—

Cheminert

	Actuator model **HPLC**	*Actuator model* **UHPLC**
4 and 6 ports *	UMH	UMH
8 and 10 ports	UMH	UMD
	Low pressure	
All valves	UMH	

*20,000 psi versions use UMD.

WHICH MODEL FOR WHICH SELECTOR?

Valco

	Actuator model
All valves	UMT

Cheminert

	Actuator model **HPLC**	*Actuator model* **UHPLC**
4 and 6 position *	UMH	UMH
8 and 10 position	UMD	UMD
	Low pressure	
Model C25 and C25Z	UMH	
Model C25G	UMD	
Model C45	UMT	

* 20,000 psi versions use UMD.

MOUNTING HARDWARE

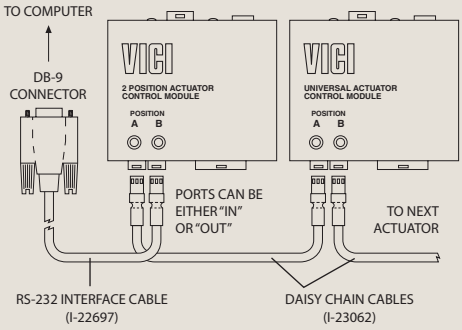
Closemount hardware..... page 208
Right angle drive 204
Standoff assembly....205
Standoff mounting hardware.....205

RS-232 interface cable

Description	*Prod No*
RS-232 interface cable	I-22697

DAISY CHAIN CABLES
Daisy chain cables permit a single serial port (RS-232) to control multiple actuators – newer two position microelectric and universal.

See Technical Note 421 for further information..



NEW

Daisy chain cables

for universal actuators and newer two position microelectric actuators

- More layout flexibility
- Economical

Universal actuators with the RS232/485 interface option can be daisy-chained for control from a single serial port. The series can also include the redesigned two position microelectric actuator (page 191) if desired. A chain of actuators requires only one RS-232 interface cable, plus a 3-pin daisy chain cable for each actuator – a more flexible and economical solution than the multi-drop cable application described in the shaded box below.

For lengths other than the 55 cm cable listed, please contact our technical support department. Note that cable lengths should be shorter than one meter for reliable RS-232 communication; longer lengths can affect the signal integrity.

Length	*Prod No*
55 cm	I-23062

Plug-and-play cables

for microelectric selector and universal actuators

Plug-and-play cables will allow a direct connection and control betweeen a specific instrument and a microelectic or universal actuator. Contact technical support for other instruments.

BCD cable	*Prod No*
Modular universal actuator to	
Agilent 6890 GC	V-EMPMCR-HP6890
Agilent 6890 Network GC	V-EMPMCR-HP6890N
Agilent 7890 GC	V-EMPMCR-HP6890N

For 4 and 6 column selector * (page 175)

Remote cable	
Modular universal actuator to	
Agilent 1100 LC	V-EMPMCR-HP1100
Waters Alliance LC	V-EMPMCR-WA2690

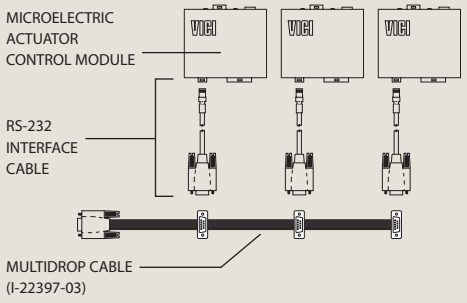
For 8 and 10 column selector * (page 175)

Remote cable	
Modular universal actuator to	
Agilent 1100 LC	V-EMPMCR-HP1100-10
Waters Alliance LC	V-EMPMCR-WA2690-10

* Requires a specific software setting in the actuator control module

MULTI-DROP CABLES
Multi-drop cables permit a single serial port (RS-232) to control multiple actuators. These ribbon cables work with all VICI microelectric and universal (RS232 option) actuators. Requires one RS-232 interface cable per actuator.

See page 191.



MORE INFORMATION

Microelectric actuators
for two position 190
for selectors 192
Universal actuators ...193

ACTUATORS AND ACCESSORIES

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.

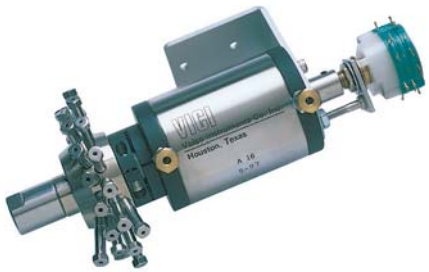


Air actuators for selectors

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 of 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*
Standard	ORMP
High temp	ORTMP



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.

ORDER TIP
To purchase a ***valve with an air actuator installed***, go directly to valve ordering information.

MORE INFORMATION
PFAF . . . . . page 199
Position feedback

Mounting Hardware
Closemount hardware. 208
Right angle drive 204
Standoff assembly. . . . 205
Standoff mounting hardware. 205

Air actuators for two position valves

The recommended method for implementing a two position air actuator is a manifold solenoid valve assembly (5-way three position solenoid air valve, *page 198*) 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.

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**

MORE INFORMATION

HSSA . . . . . page 199
High speed switching accessory
5-way three position solenoid air valve . . . 198
PFAF 199
Position feedback

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.

	Prod No
3 piece fitting assembly	F-TCF



ACTUATORS AND ACCESSORIES

4-Way solenoid air valve CE *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	V-SV-S52-110VAC
240 VAC	V-SV-S52-220VAC
24 VAC	V-SV-S52-24VAC
24 VDC	V-SV-S52-24VDC



3-Way solenoid air valve CE *for diaphragm valves*

This 3-way solenoid with 1/8" tube connections is perfect for switching spring-return valves such as our on/off or prime/purge valves (pages 212-213) or the DV22 diaphragm valves on pages 142-144. Energizing the solenoid provides air to the actuator, while removing power from the solenoid allows the valve to return to its original state. Use of this solenoid is not recommended for rotary valves.

	Prod No
110 VAC	V-SV-S32-110VAC
240 VAC	V-SV-S32-220VAC
24 VAC	V-SV-S32-24VAC
24 VDC	V-SV-S32-24VDC



5-Way three position solenoid air valve CE *for two position air actuators*

This 5-way solenoid air valves with 1/8" tube connections is recommended to switch two position air actuators. It applies air to the actuator only during switching and alleviates problems associated with continuous air pressure.

	Prod No
110 VAC	V-SV-S53-110VAC
240 VAC	V-SV-S53-220VAC
24 VAC	V-SV-S53-24VAC
24 VDC	V-SV-S53-24VDC



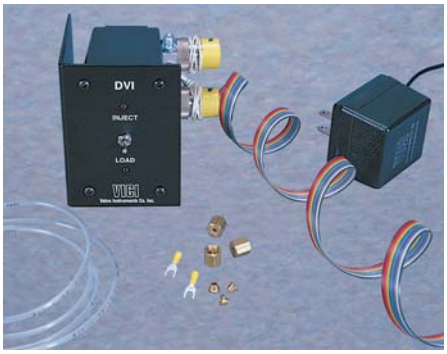
MORE INFORMATION

Actuators

Air .....pages 196-197
Microelectric 190-192
Universal electric 193

Mounting Hardware

Closemount hardware..... page 208
Right angle drive 204
Standoff assembly....205
Standoff mounting hardware.....205



DVI Digital valve interface (Non-CE) *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



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 above.

Prod No
HSSA



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 be used to 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 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. 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

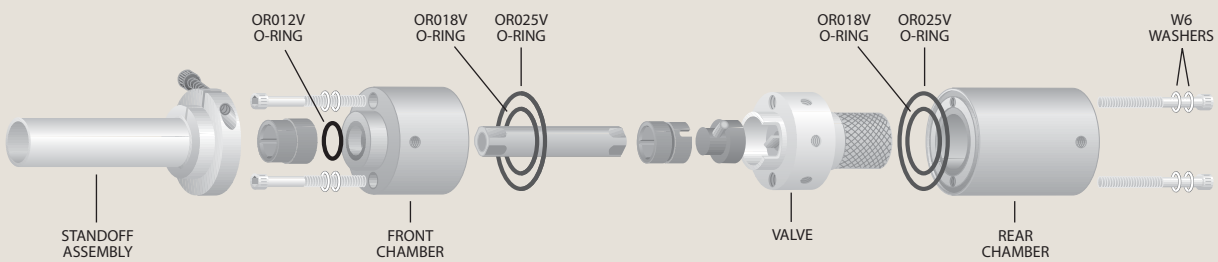
Description	*Prod No*	*Notes*
On a new valve	Add suffix PH to valve prod no	Requires standoff assembly. Multiposition valve requires an actuator.
On existing valve, factory installation	Contact factory	
On existing valve, for field installation	Not recommended	

SPECS

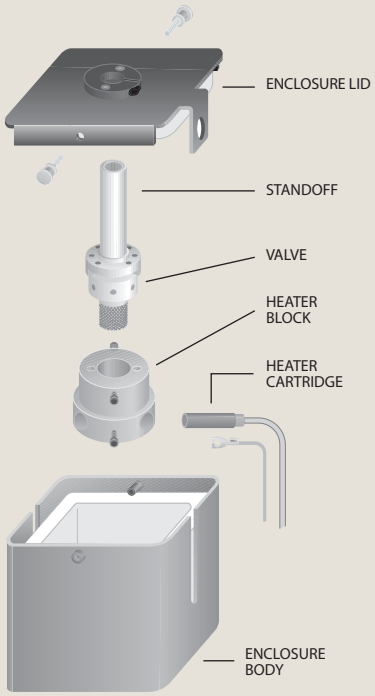
Maximum temperature:
175°C

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 ENCLOSURE
For one valve (HVEA)



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.

An insulated enclosure and a standard heater block are included. The product number chart lists the heater cartridge size typically required to heat the valve(s) to the indicated temperature. Holes are provided in the heater block for Perkin Elmer, Agilent, and other 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.

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 (Non-CE) *for two position valves and selectors*

Capacity	*Exterior dimensions (Interior approx 1" smaller)*	*Rating*	**With heater cartridge** *Prod No*	**Without heater cartridge** *Prod No*
1 valve	4" x 4-1/4" x 3-5/8"d	65W/350°C	HVEA	HVEAX
		* 65W/350°C	HVEAN	HVEANX
	4-1/4" x 5-1/8" x 3-5/8"d	65W/350°C	HVEB	HVEBX
		* 65W/350°C	HVEBN	HVEBNX
	8" x 8" x 6"d	100W/350°C	HVEC	HVECX
2 valves	8" x 5-1/4" x 4"d	125W/350°C	HVE2	HVE2X
3 valves	13-1/2" x 5-3/4" x 4"d	150W/350°C	HVE3	HVE3X
6 valves	13-3/4" x 8" x 6"d	300W/350°C	HVE6	HVE6X

** for use with 1/32" valves*



MORE INFORMATION

ITC ..... page 203
Instrumentation temperature controller

Heated column enclosures 203
Heater assemblies 202
Heater blocks.....202

Heater assemblies (Non-CE)

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 (Non-CE)

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 a column mandrel, an insulated enclosure, and a standard heater block, with or without the heater cartridge and 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*	**With heater cartridge** *Prod No*	**Without heater cartridge** *Prod No*
Heated column enclosure				
1 column	4" x 4-1/4" x 3-5/8"d	65W/350°C	HCE1	HCE1X
	4-1/4" x 5-1/8" x 3-5/8"d	65W/350°C	HCEB	HCEBX
	8" x 8" x 6"d	65W/350°C	HCEC	HCECX
2 columns	8" x 5-1/4" x 4"d	65W/350°C	HCE2	HCE2X

	Prod No
Column mandrel (heater assembly not included with column mandrel)	CM



ITC Instrumentation temperature controller (Non-CE)

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.

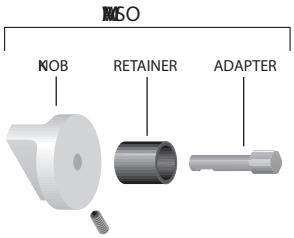
		Prod No
0°C to 399°C	110 VAC	ITC10399
	230 VAC	ITC10399-220
Replacement thermocouple		I-21014-01

ACTUATORS AND ACCESSORIES

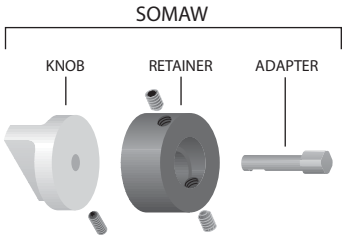
Knobs and handles *for use with a standoff*

Choose from theselection below 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. Includes parts shown.

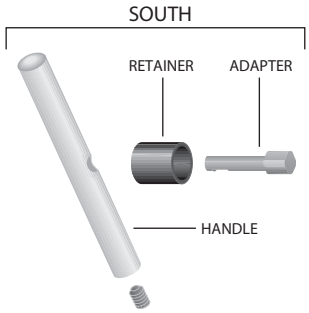
Description	*Prod No*
Knob for a W type valve	WMMASO
Knob for W/UW type valve	SOMAW
T-handle for a UW type valve	SOUTH
Handle for UW type valve	SOMAP
Handle with position feedback for W/UW type valve	SOMAPPF



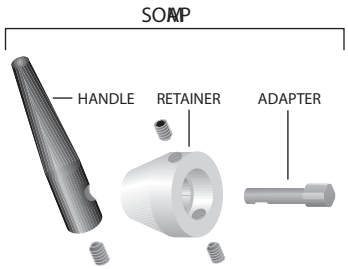
Knob
for Valco W type valves



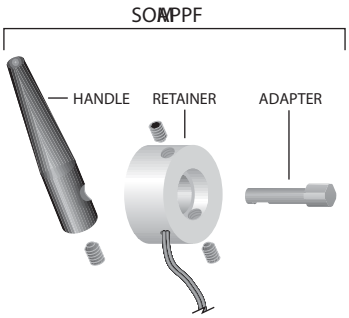
Knob
for Valco W/UW valves



T-handle
for Valco UW type valves



Handle
for Valco W/UW type valves



Handle
with position feedback
for Valco W/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 *Prod No*	**With 2" standoff assembly** *Prod No*
RAD	2RAD



TECH TIP
RADs add a slight amount of backlash and load. The backlash is not an issue with two position valves on microelectric or universal actuators, since the actuators locate and remember the stopping point. However, for two position valves on other actuators and for all selectors, we recommend that the valves have ports no smaller than .016".

The additional load may mean that a valve that ordinarily requires an ED actuator might require an ET when used with a right angle drive.

If you have any questions, please consult our technical support.



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 at the beginning of 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

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 196-7
Microelectric 190-192
Universal 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.

MORE INFORMATION
For illustrations of standoffs on valves and actuators, see pages 206 and 207.

Standoff assemblies

for manual valves

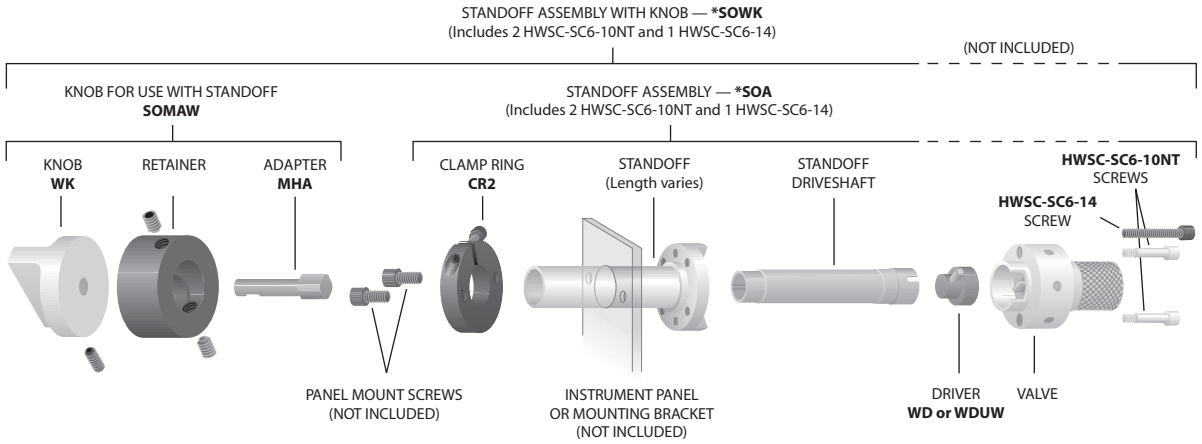
Includes knob, standoff assembly, retainer, and adapter. For illustration, see page 206, top.

	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



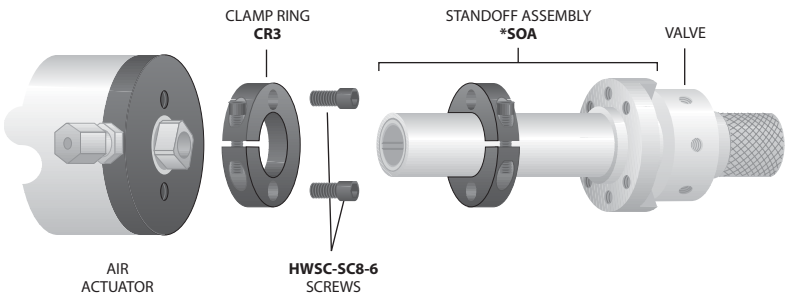
Standoff with

VALCO TWO POSITION VALVE – MANUAL



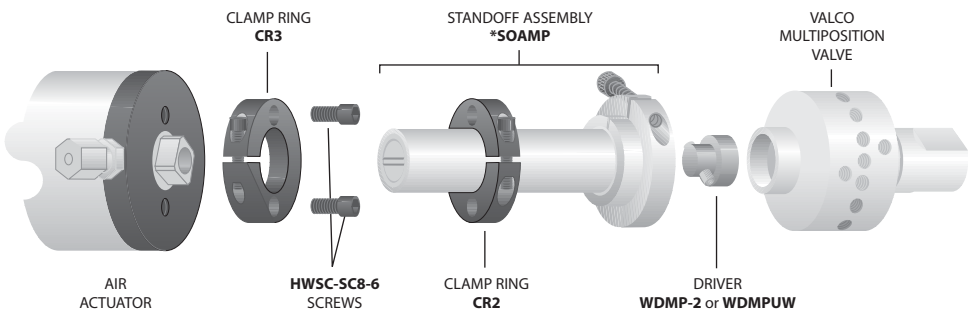
Standoff with

VALCO TWO POSITION VALVE – AIR ACTUATOR



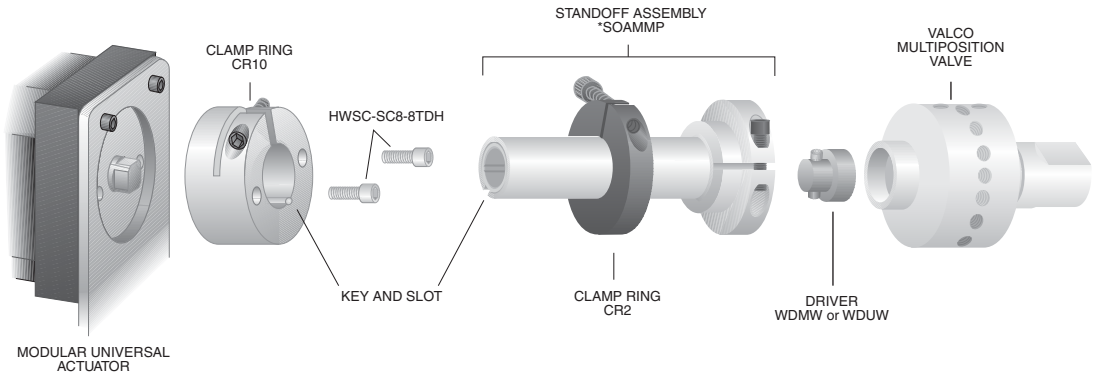
Standoff with

VALCO SELECTOR – AIR ACTUATOR



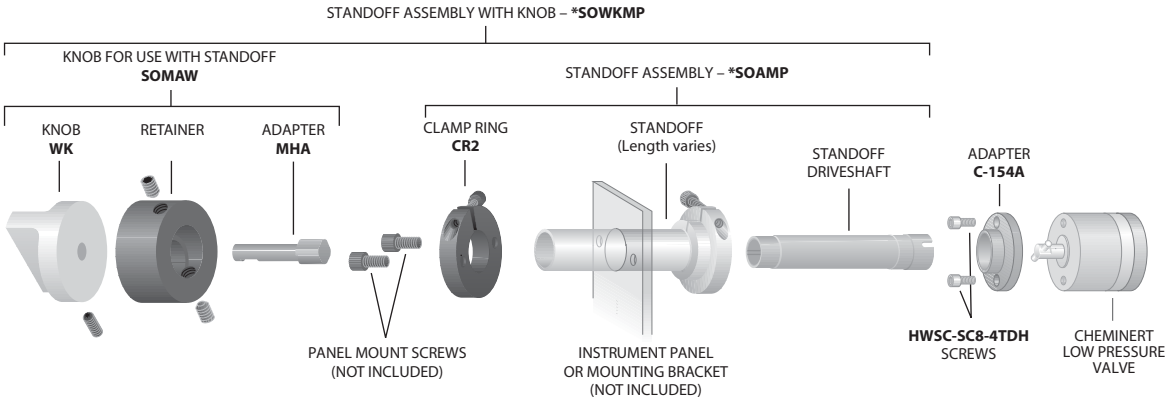
Keyed standoff with

VALCO SELECTOR – MICROELECTRIC, UNIVERSAL, OR MODULAR UNIVERSAL ACTUATOR



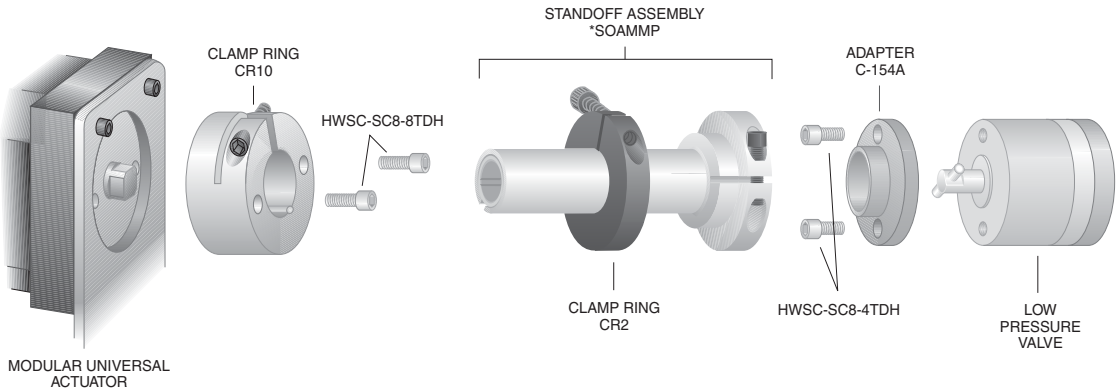
Standoff with

CHEMINERT TWO POSITION VALVE – MANUAL



Keyed standoff with

CHEMINERT SELECTOR – MICROELECTRIC, UNIVERSAL, OR MODULAR UNIVERSAL ACTUATOR



ACTUATORS AND ACCESSORIES

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)	
Two position microelectric actuators	
For Valco two position valves	
with 1 or 2 mounting holes	CMH12H
with no mounting holes	CMH12H
For Cheminert two position valves	
high pressure design	CMH12H
low pressure design	CMH12L
(low pressure design includes required adapter)	
Universal and modular universal actuators	
For Valco multiposition valves	
(UW and MW Types only)	CMH13
For Cheminert multiposition valves	
high pressure design	CMH13H
low pressure design	CMH13L
(low pressure design includes required adapter)	

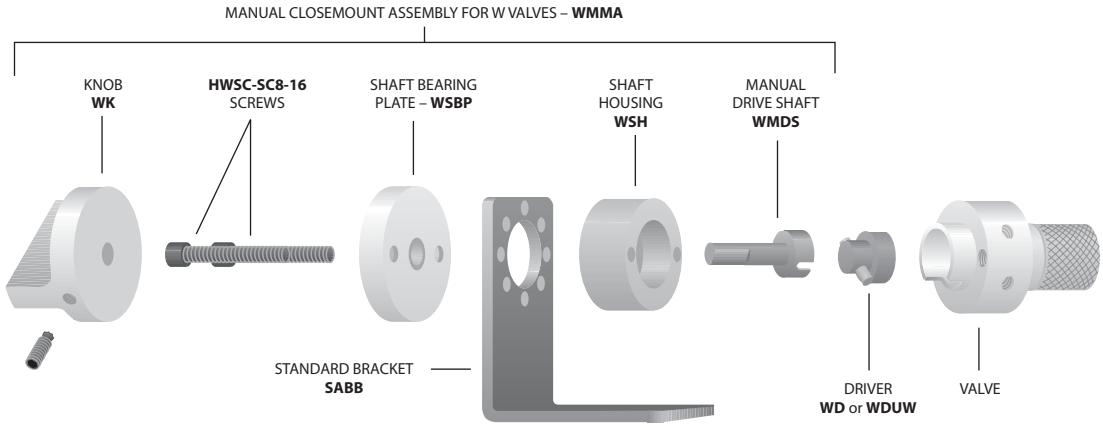
TECH TIP
If you need the ***actuator as well as the hardware***, you can order it complete with the appropriate hardware or with the required standoff already installed.

Actuators

Air .....pages 196-197
Microelectric 190-192
Modular universal 194
Universal.....193

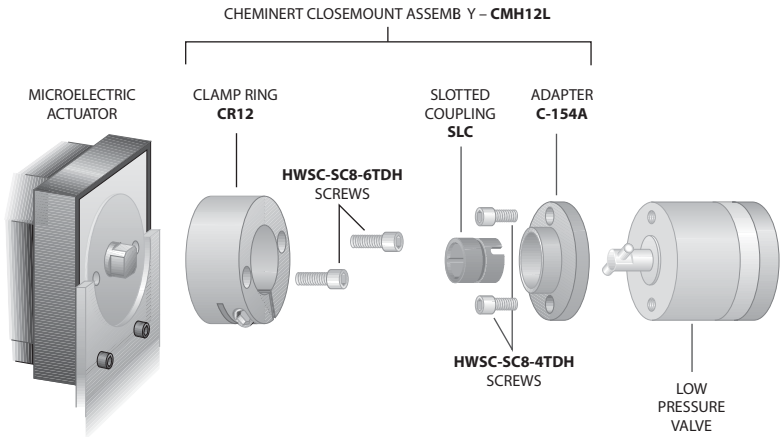
Closemount with

VALCO VALVE – MANUAL



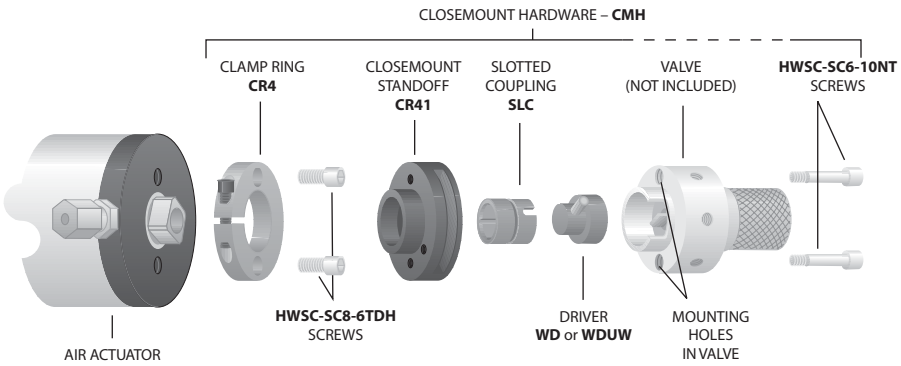
Closemount with

CHEMINERT VALVE (Low pressure two position) – MICROELECTRIC



Closemount with

VALCO VALVE (1 or 2 mounting holes) – AIR ACTUATOR



ACTUATORS AND ACCESSORIES

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

These socket wrenches with a slot to slip over the tubing are the perfect tool for installing fittings when proximity of the ports makes it difficult to get a normal open end wrench in position. The SWH3 fits the 3/16" hex head on our 1/32" ZDV fittings; the SWH4 works with the 1/4" hex nuts for 1/16" fittings.

Size	*Prod No*
3/16"	SWH3
1/4"	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 found in the support section at www.vici.com.

Prod No
PM



MORE INFORMATION
Ferrule removal kit. . . p 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

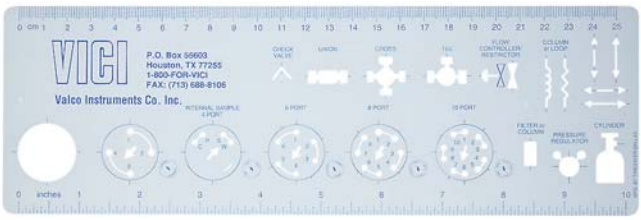


Template

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

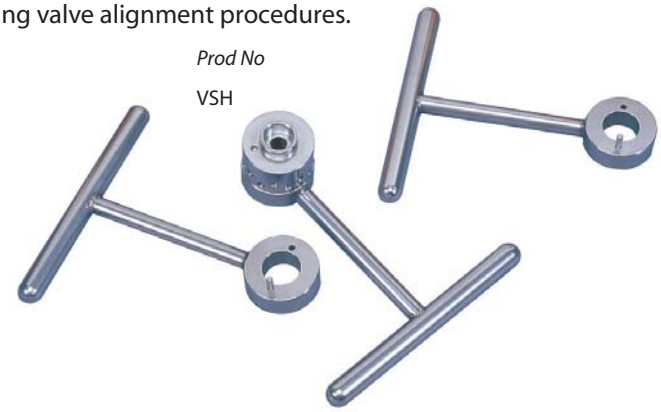


Valve spanner handle

A special tool for gripping a multiposition valve body. It is especially useful during valve alignment procedures.

Prod No

VSH



Mirror

Helpful to get access to valve serial numbers and to check discharge on pulsed discharge detectors (PDD).

Prod No

MR



Control devices

FLOW, PRESSURE, AND ON/OFF

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 40K ON/OFF AND PRIME/ PURGE VALVES

40,000 psi valves .... p 85



MORE INFORMATION

3-way solenoid .... p 198



On/off valves

for liquids

SPECS

	Temp	*Pressure*
Standard temperature / high pressure		
1/16"	100°C	10,000 psi liq
High temperature / medium pressure		
1/16"	300°C	6,000 psi liq
1/8"	300°C	2,000 psi liq

Standard temperature/ high pressure

Fitting size	*Bore*	Manual with 1" knob *Prod No*	Air actuated with 1" standoff *Prod No*
1/16"	0.50 mm	SFVO	ASFVO
	0.75 mm	SFVOL	ASFVOL

High temperature/ medium pressure

Fitting size	*Bore*	Manual with 2" knob *Prod No*	Manual with 4" knob *Prod No*	Air actuated with 2" standoff *Prod No*	Air actuated with 4" standoff *Prod No*
1/16"	0.50 mm	SFVOHT	SFVOHT4	ASFVOHT	ASFVOHT4
	0.75 mm	SFVOLHT	SFVOLHT4	ASFVOLHT	ASFVOLHT4
1/8"	1.50 mm	–	–	ASFVO2HT	ASFVO2HT4

Prime/purge valves

for liquids

SPECS

	Temp	*Pressure*
Standard temperature / high pressure		
1/16"	100°C	10,000 psi liq
High temperature / medium pressure		
1/16"	300°C	6,000 psi liq
1/8"	300°C	2,000 psi liq

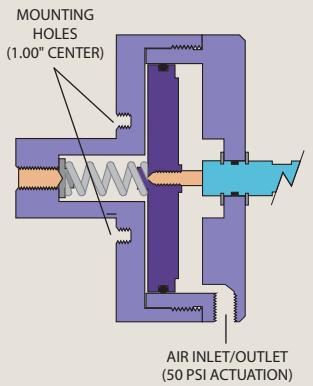
Standard temperature/ high pressure

Fitting size	*Bore*	Manual with 1" knob *Prod No*	Air actuated with 1" standoff *Prod No*
1/16"	0.50 mm	SFV	ASFV
	0.75 mm	SFVL	ASFVL

High temperature/ medium pressure

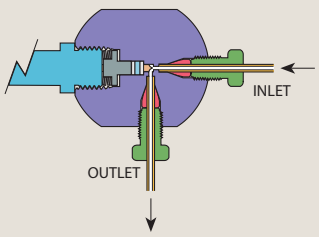
Fitting size	*Bore*	Manual with 2" knob *Prod No*	Manual with 4" knob *Prod No*	Air actuated with 2" standoff *Prod No*	Air actuated with 4" standoff *Prod No*
1/16"	0.50 mm	SFVHT	SFVHT4	ASFVHT	ASFVHT4
	0.75 mm	SFVLHT	SFVLHT4	ASFVLHT	ASFVLHT4
1/8"	1.50 mm	–	–	ASFV2HT	ASFV2HT4

Air actuator option

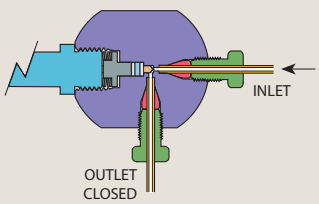


AN EAOR21 FITTING FOR 1/8" AIR SUPPLY TUBING IS INCLUDED.
(SEE PAGE 216)

On/off valve

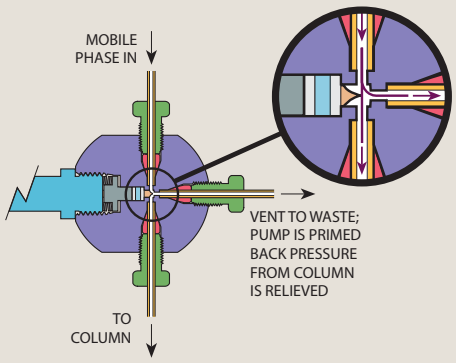


OPEN POSITION

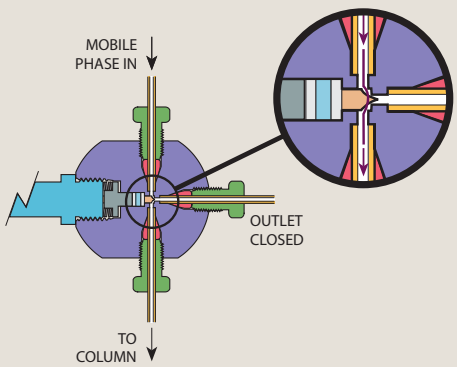


CLOSED POSITION

Prime/purge valve



OPEN POSITION



CLOSED POSITION

CONTROL DEVICES

A new generation needle and shut-off valve combines flow control and positive shut-off without damage to the needle. Since the flow setting is not changed by turning the valve on and off, the valve is ideal for providing hydrogen and air to an FID. It can also be used to supply make-up or combustion gas in a wide variety of applications.

Flow is set using the screwdriver adjustment in the center of the on/off knob.

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.

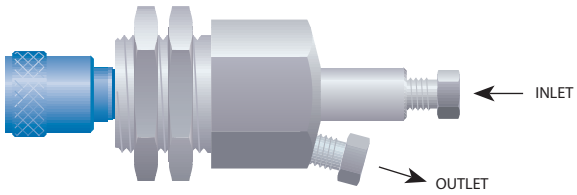
The standard knob is silver-colored and .62" long. Colored knobs for gas identification are available separately, in two lengths.

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 more recent design on the opposite page, 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 a nickel-plated 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



CONTROL DEVICES

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 a minimum of 10 psi.

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 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.



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. *(See below.)* Contact the factory for further information.

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

ADAPTERS USED FOR VALCO AND CONDYNE CONTROL DEVICES

Description			*Prod No*	*Used for*
Valco 1/16 internal to	10-32 O-ring seal		ZAOR11	Diaphragm valve On/off valves (optional)
	5/16-24 O-ring seal		ZAOR12	Model 100 controller (optional) Model 300 controller (optional)
Valco 1/8" internal to	5/16-24 O-ring seal		ZAOR22	Model 100 controller (optional) Model 300 controller (optional)
External 1/8" to	10-32 O-ring seal		EAOR21	Air actuated prime/purge and on/off valves
	5/16-24 O-ring seal		EAOR22	Model 100 controller (standard) Model 300 controller (standard)

ALTERNATE FITTING TYPES

Models 100 and 300
The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are ZAOR22 and ZAOR12, listed at left. Order separately.

Model 202
The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. To use 1/8" OD tubing, order PZA22 on page 35.

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 35
External 36

Micrometering (needle) valves combine the ease of connection associated with Valco zero dead volume fittings with convenient bulkhead mounting. Very low internal volume and precision design make this valve ideal for use as a gas control valve in chromatographic systems.

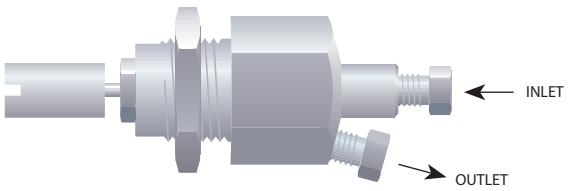
The Viton® model is rated at 225°C, while a version with Kalrez™ seals is capable of continuous operation at 315°C. This allows a needle valve to be mounted directly within a heated oven, facilitating control of flow switching in multidimensional systems while keeping the gases at oven temperature.

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 $< 1 \times 10^{-8}$ 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 psig N_2 inlet		
Viton	Lubricated	ZBNV1
Viton	Non-lubricated	ZBNV1-D
Kalrez	Non-lubricated	ZBNV1-KZ
Fine control: 2–175 ml/min@ 15 psig N_2 inlet		
Viton	Lubricated	ZBNV1F
Viton	Non-lubricated	ZBNV1F-D
Kalrez	Non-lubricated	ZBNV1F-KZ
Low flow: 2–90 ml/min@ 40 psig 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*
Fine control: 2–175 ml/min@ 15 psig N_2 inlet		
Viton	Lubricated	BNV1
Viton	Non-lubricated	BNV1-D
Kalrez	Non-lubricated	BNV1-KZ
Low flow: 2–90 ml/min@ 40 psig N_2 inlet		
Viton	Lubricated	BNV1LF
Viton	Non-lubricated	BNV1LF-D
Kalrez	Non-lubricated	BNV1LF-KZ



VICI regulators are machined from aluminum bar stock and then hard-anodized to provide contamination-free service. They feature a stainless steel diaphragm and Viton®-sealed stainless poppet. The compact size (1.125" diameter by 2" long for regulator, 3" long for combo version) saves panel space and permits installation anywhere that an 11/16" hole can be located. Mounting hardware is supplied.

While the outward appearance is unchanged, a recent redesign has enhanced thermal stability, linearity, and shock resistance.

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.

Available with outlet pressure ranges of 0-15 psi, 0-30 psi, or 0-60 psi, VICI 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.

Pressure regulators

NEW *No knob and shut-off feature*



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	PR51A15Z1	PR51A15Z2	PR51A15E2
0-30 psi	PR51A30Z1	PR51A30Z2	PR51A30E2
0-60 psi	PR51A60Z1	PR51A60Z2	PR51A60E2

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

Instrumentation

DETECTORS, ANALYZERS, AND PURIFIERS

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

TRACE GAS ANALYZERS AT VICI.COM

For more information about trace gas analyers, go to:

www.vici.com/instr/itga.php

MORE INFORMATION

Pulsed discharge detectors
- Model D-2 .... page 221
- Model D2-IM 222
- Model D-3 223
- Model D-4 223

Plug-and-play detectors
- for Agilent 6890 223
- for Agilent 7890 223
- 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, HP2 helium purifier *(see page 226)*, and power supply.

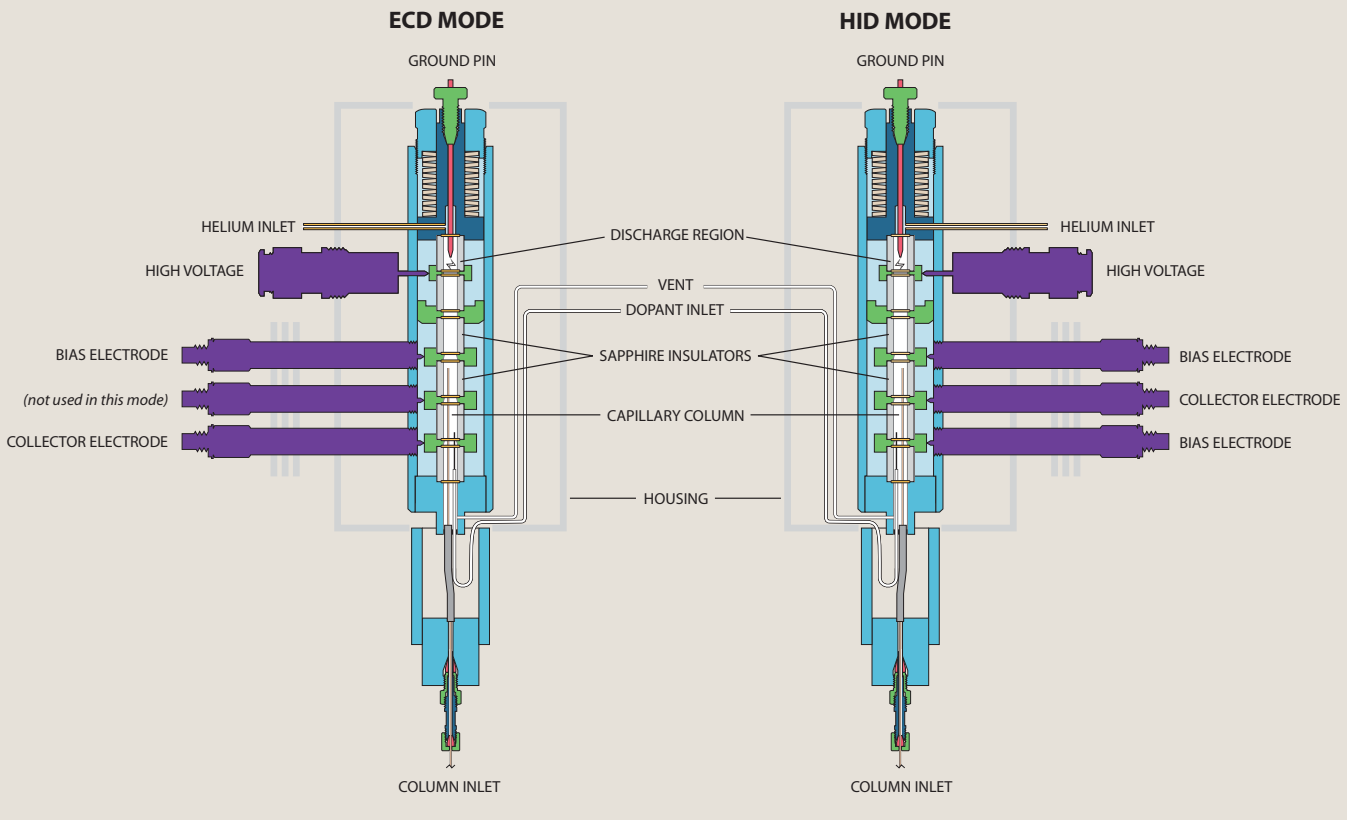


PDD Model D-2 CE *Stand-alone system*

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



INSTRUMENTATION

miniPDD helium ionization detectors

The newest member of the PDD family is also the smallest and thriftiest. The miniPDD uses about one fifth (20%) the amount of helium as the D-3 and D-4 versions, giving up only a bit of sensitivity and dynamic range in return. It is approximately one half the size of the D-4, but has nearly the same sensitivity – about 100 ppb for fixed gases. With its reduced size, weight, and helium consumption, it is particularly well suited to portable applications, or to any situation in which the high cost of helium becomes a consideration.

It can be paired with other Valco components (controller, pulse module, helium purifiers, etc.) or can be purchased alone for use with existing components. Call today to discuss the endless possibilities.



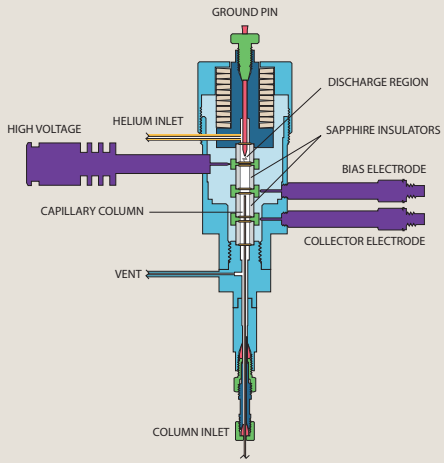
Shown actual size.

NEW PDD Model D2-IM CE *Helium photoionization*

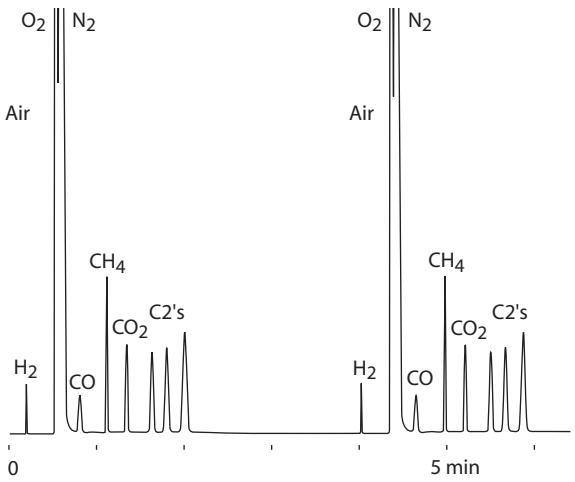
Detector cell only optimized for helium photoionization mode

Description	*Prod No*
miniPDD cell only	PD-D2-IM
miniPDD system Includes controller and purifier	D-2-IM

Model D-2-IM schematic



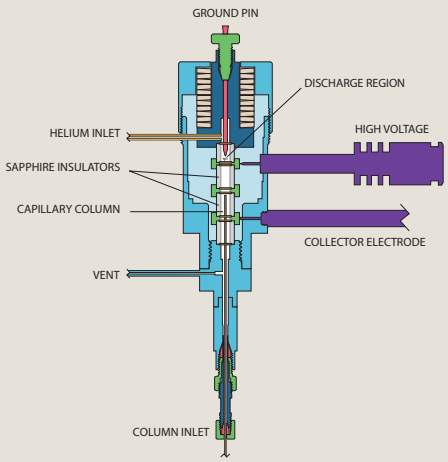
miniPDD Model D-2-IM



TWO CONSECUTIVE RUNS OF LIGHT HYDROCARBONS IN AIR

Detector:	miniPDD Model PD-2-IM
Detector temp:	150°C
Column:	100/120 ShinCarbon 1.4 m x 0.53 mm Silcosteel
Resistive heat:	30°C (0.9 min) to 230°C at 100°C/min (hold 1 min)
Sample:	2000 ppm in air, 2 µL size
Carrier:	Helium
Discharge gas:	Helium

Model D-3 schematic



Plug-and-play detectors for Agilent 7890 and 6890

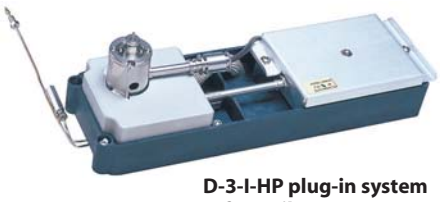
Model D-3 is designed for plug-and-play installation on the popular Agilent 6890 and 7890, and is optimized for trace level work in the helium photoionization mode.

Both versions utilize the electonics and power supply of the host GC.

PDD Model D-3 *Helium photoionization*

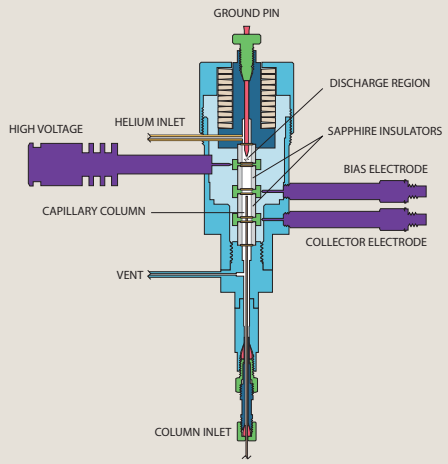
Detector optimized for trace level work in helium photoionization mode

Description	**110 VAC** *Prod No*	**230 VAC** *Prod No*
Plug-in system for Agilent 7890	D-3-I-7890	D-3-I-7890-220
Plug-in system for Agilent 6890	D-3-I-HP	D-3-I-HP-220



D-3-I-HP plug-in system for Agilent 6890 GC

Model D-4 schematic



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, 17, 2010, and 2014; 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

Description	**110 VAC** *Prod No*	**230 VAC** *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, 2010, 2014 *	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 CE

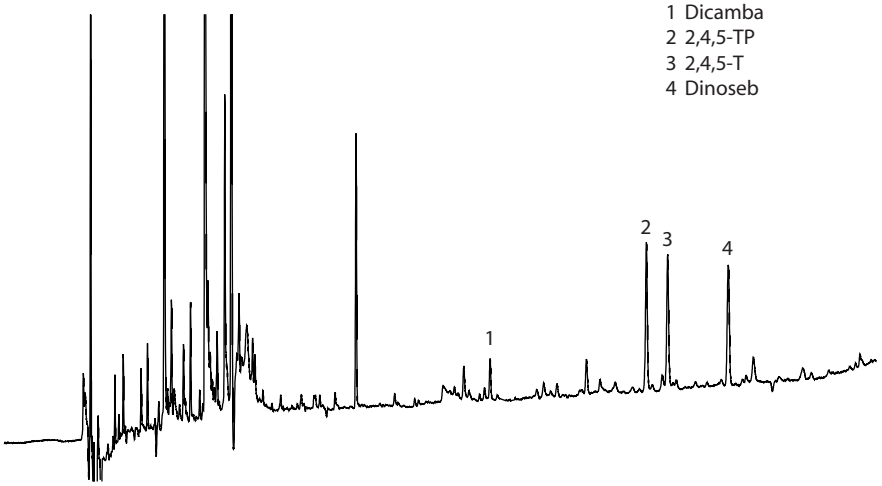
NOTE
PDD Model D-4-I-220 has been designed to meet CE regulations.

INSTRUMENTATION

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

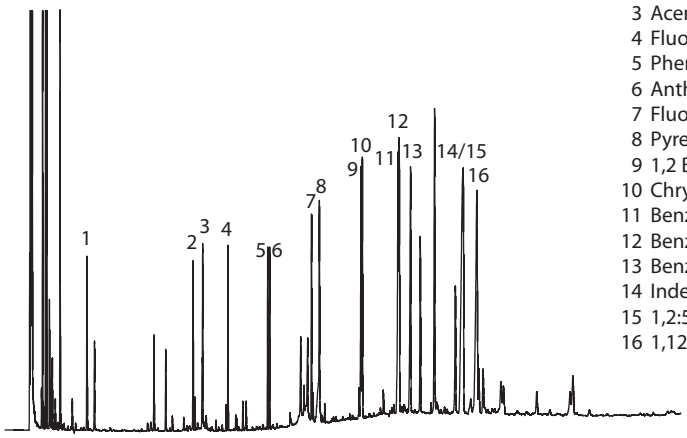


1 Dicamba
2 2,4,5-TP
3 2,4,5-T
4 Dinoseb

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

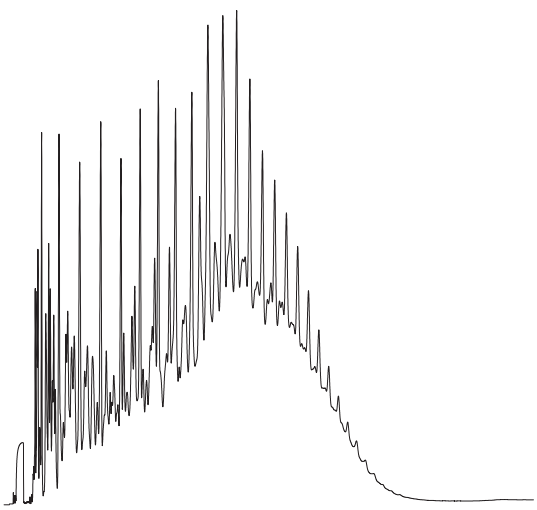


1 Naphthalene
2 Acenaphthalene
3 Acenaphthene
4 Fluorene
5 Phenanthrene
6 Anthracene
7 Fluoranthene
8 Pyrene
9 1,2 Benzanthracene
10 Chrysene
11 Benzo(b)fluoranthene
12 Benzo(k)fluoranthene
13 Benzo(a)pyrene
14 Indeno (1,2,3-C.d)pyrene
15 1,2:5,6-Dibenzanthracene
16 1,12-Benzoperylene

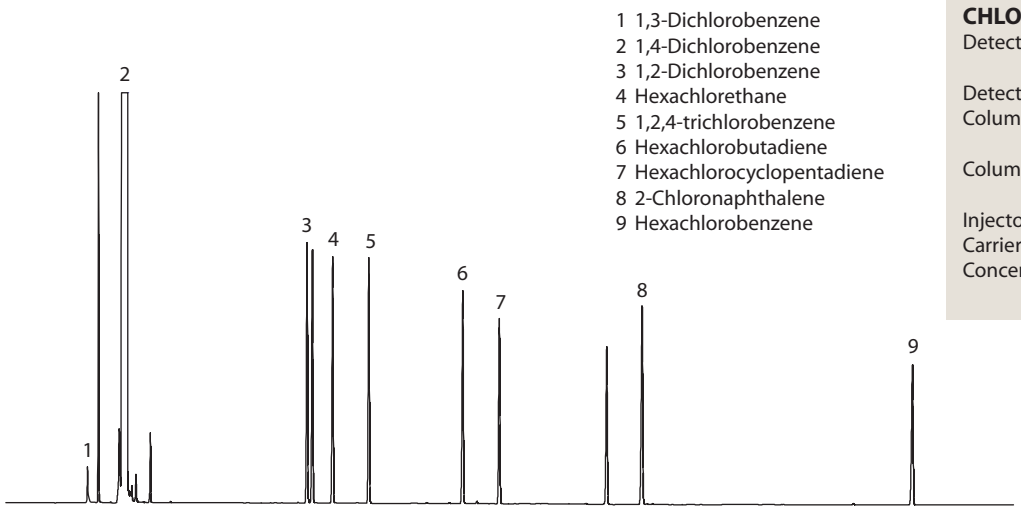
miniPDD Model D-2-IM

SIMULATED DISTILLATION IN TWO MINUTES

Detector:	miniPDD
Detector temp:	320°C
Column:	ValcoBond® VB-1 5 m x 0.25 mm x 0.20 µm
Column temp:	40°C initial for 0.1 min to 320°C at 150°C/min
Injector temp:	Cold on-column injection
Carrier gas:	Helium
Reference gas:	Helium
Sample:	Reference Gas Oil (RGO) provided by Separation Systems, Inc.



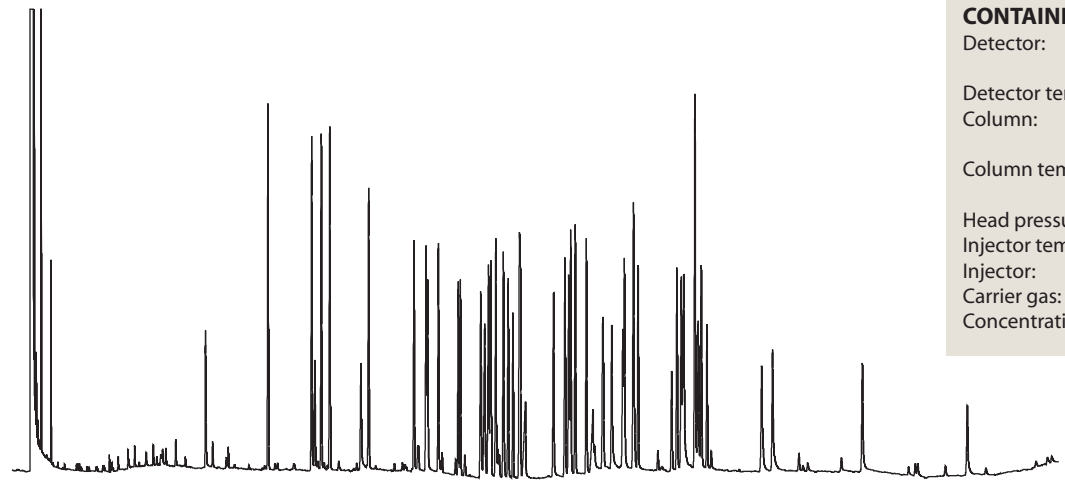
PDD Model D-3



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

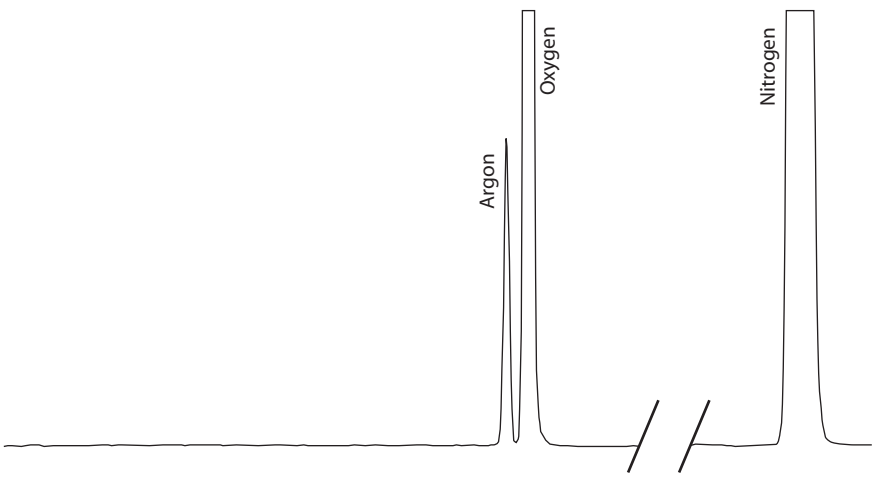
PDD Model D-3



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

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

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

CE

Includes universal power supply.

Description	**Helium purifier** *Prod No*	**Nitrogen purifier** *Prod No*
110 VAC	HP2-110	NP2-110
230 VAC	HP2-220	NP2-220

Replacement getter assembly

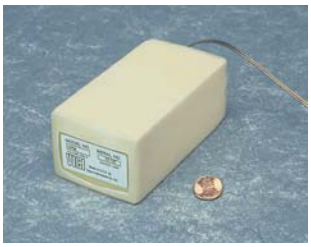
Helium	I-23572HP2
Nitrogen	I-23572NP2

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

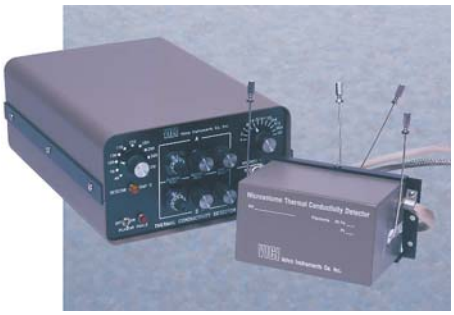
The Valco Miniature Helium Purifier (HPM) and Miniature Nitrogen Purifier (NPM) are designed to be installed in a gas chromatograph's flow path immediately upstream of the injector. The HPM/NPM will remove any contaminants introduced by flow controllers, elastomeric tube seals, pressure regulators, crude traps, or other system components that are not completely clean and leak-tight.

Mini helium and nitrogen purifiers

CE

Includes universal power supply.

Description	**Helium purifier** *Prod No*	**Nitrogen purifier** *Prod No*
110 VAC	HPM-110	NPM-110
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

CE

Description	**110 VAC** *Prod No*	**230 VAC** *Prod No*
Entire unit (cell and electronics)	TCD2-NIFE-110	TCD2-NIFE-220
Cell/oven assembly only, dual filament	TCD2-NIFED-110	TCD2-NIFED-220
TCD controller only	TCD2-C-110	TCD2-C-220

Calibration gas standards

PERMEATION DEVICES 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. In addition, Metronics is 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. The product line also includes gas purifiers, contaminant traps, and GC Industries oxygen and toxic gas monitors.

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. This 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 the dilution flow rate.

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. 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.

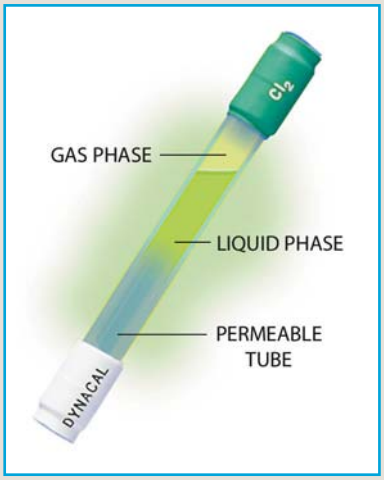
TO ORDER

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





- 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.

Tubular device



The tubular device, or "perm tube", is a sealed permeable cylinder containing the desired permeant reference material. Release of the chemical occurs by permeation through the walls of the PTFE tube for the entire length between the impermeable plugs. A wide range of rates – typically from 5 ng/min to 50,000 ng/min – can be achieved by varying the length and thickness of the tube. These are the most widely used of the various permeation devices.

Extended life tubular device



Our unique extended life tubular (XLT) device is essentially a standard perm tube 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.

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

MORE INFORMATION

G-Cal perm tubes. . .p. 232

CALIBRATION GAS STANDARDS

- 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 ±0.01°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 (Non-CE) 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 PTFE 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.

Non-CE, use restricted within the EU.



Model 120

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 Model 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.



Model 150

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 230

Model 340 Dynacalibrators®

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 340

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 450

Model 500 Dynacalibrators®

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.



Model 500

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

CALIBRATION GAS STANDARDS

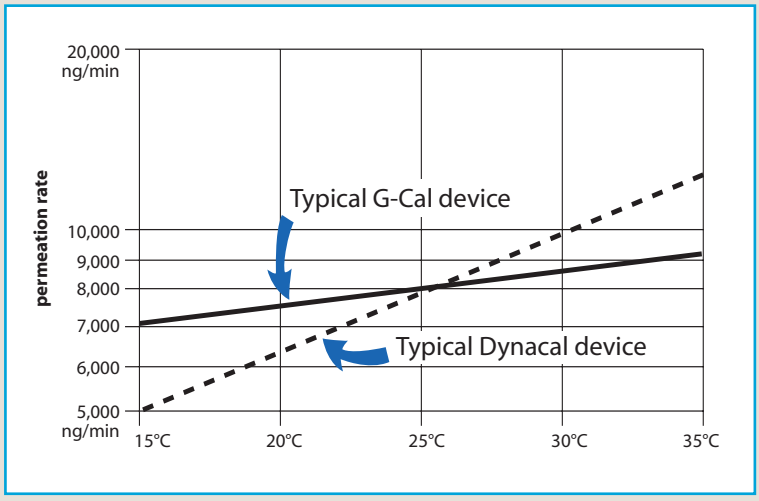
- Excellent for use in the field
- Can be operated at room temperature
- Can handle Arsine and Phosphine
- Longer lifetime than Dynacal® devices

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

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
Freons
Hydrogen Fluoride
Hydrogen Sulfide
Methane *
Methanol
Methyl Mercaptan
Nitric Oxide *
Nitrogen Dioxide
Nitrous Oxide *
Phosphine *
Propylene Oxide
Sulfur Dioxide
Sulfur Hexafluoride
Thiophene
Toluene
Vinyl Chloride
Water
Xylenes

** Available only in G-Cal permeation devices.*

MORE INFORMATION

Dynacal perm tubes.....p. 229



- 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 unique 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 tubing throughout.

G-Calibrators

Non CE. Use restricted in EU

Non-CE, use restricted within the EU.

Flow range	*Oven*	*Battery*	*Prod No.*
100-1000 cc/min	no	1.5 VDC	2301
	no	12 VDC NiCad	2310-10
	yes	12 VDC NiCad	2330-10
200-4000 cc/min	no	12 VDC NiCad	2310-20
	yes	12 VDC NiCad	2330-20

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

GC capillary columns

VALCOBOND® AND VALCOPLOT®

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 retention characteristics identical to the phases you are used to.

ValcoPLOT® capillary columns

- Widest polarity range
- Faster than micropacked
- Water tolerant

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 236-238*

VB-FLUORO	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:

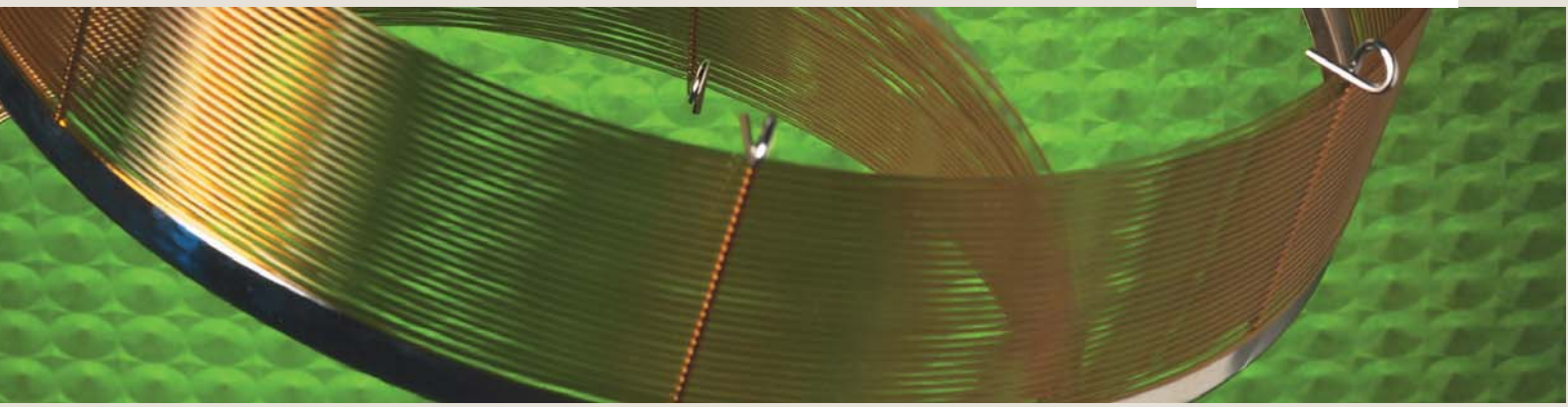
1/32" ultra low mass external unions . . . p 19
FS adapter ferrules . 16-17
GC
Detectors 221-223, 227
Injection valves 104-113
Stream selectors. 124-135
Gas purifiers. 246-247
Helium and nitrogen purifiers 226-227
Inlet discs (injector nuts for HP 6890 and 5890 . . 18
Reduced breakdown injection port liners 245

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

- 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

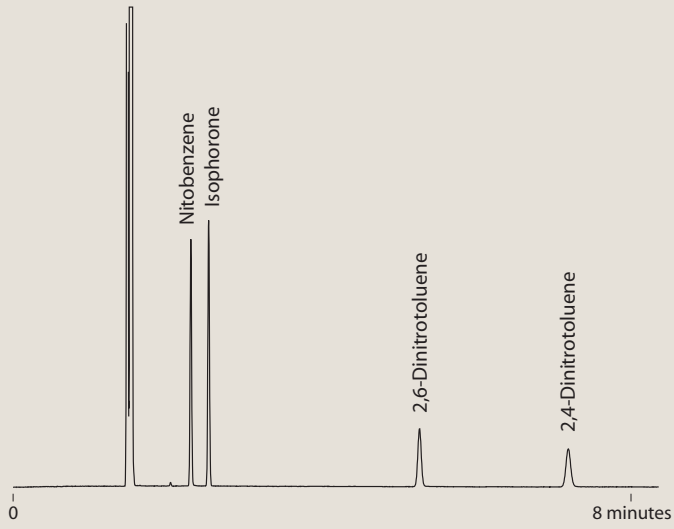
VB-Fluoro



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

GC CAPILLARY 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 APPLICATIONS
- Amines
- Flavors
- Fragrances
- Hydrocarbons
- Pesticides
- PCBs
- Phenols
- Sulfur compounds
- EPA Methods 504, 551, 1618
- NIOSH Methods 1300-1301, 1400-1403, 1450, 1501, 2005

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)

TO ORDER
Toll-free 877–737–1887
Tel 360–697–9199
Fax.....360–697–6682

columns@vici.com

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

GC CAPILLARY 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 APPLICATIONS
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		*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
Toll-free 877–737–1887
Tel 360–697–9199
Fax.....360–697–6682

columns@vici.com

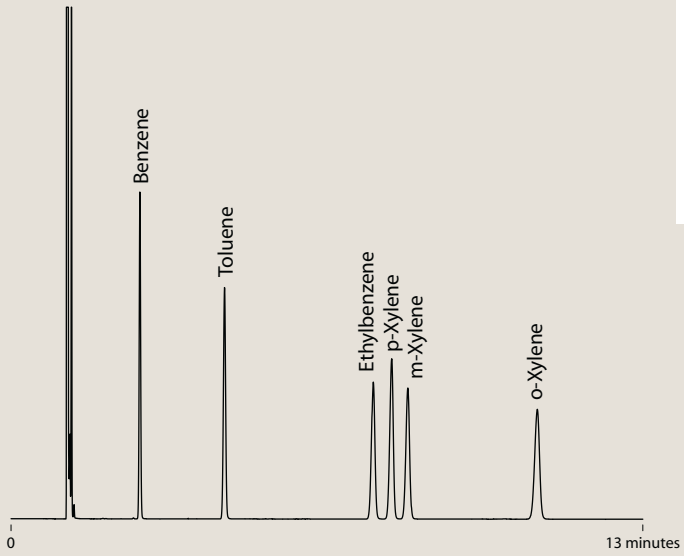
VB-Wax



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

GC CAPILLARY COLUMNS

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 proprietary bonding technology ensures that the particles stay put even when columns are used with valves. Our thick film columns separate Ar/O_2 without the need for cryogenic equipment. The thin film columns offer fast elution of carbon monoxide with near perfect peak symmetry.

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

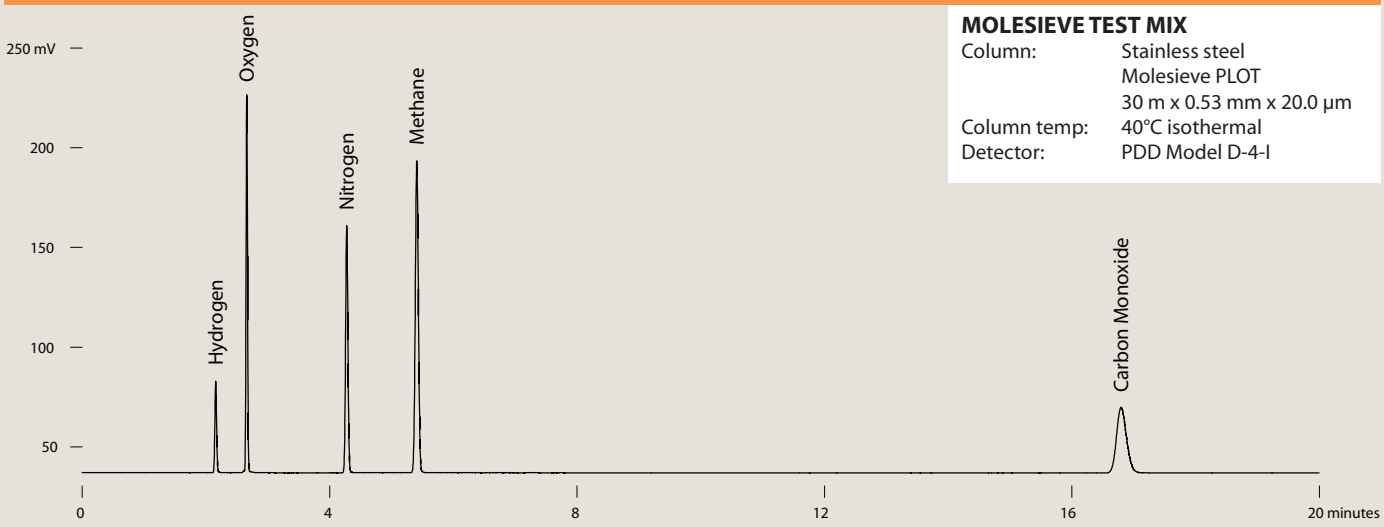
0.53 mm ID	*df (µm)*	*Prod No*
15 meters	20	CSS-X1553-200
30 meters	20	CSS-X3053-200
30 meters	50	CSS-X3053-500

TO ORDER
For prices or more information about your specific application, contact VICI Metronics:

Toll-free 877–737–1887
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

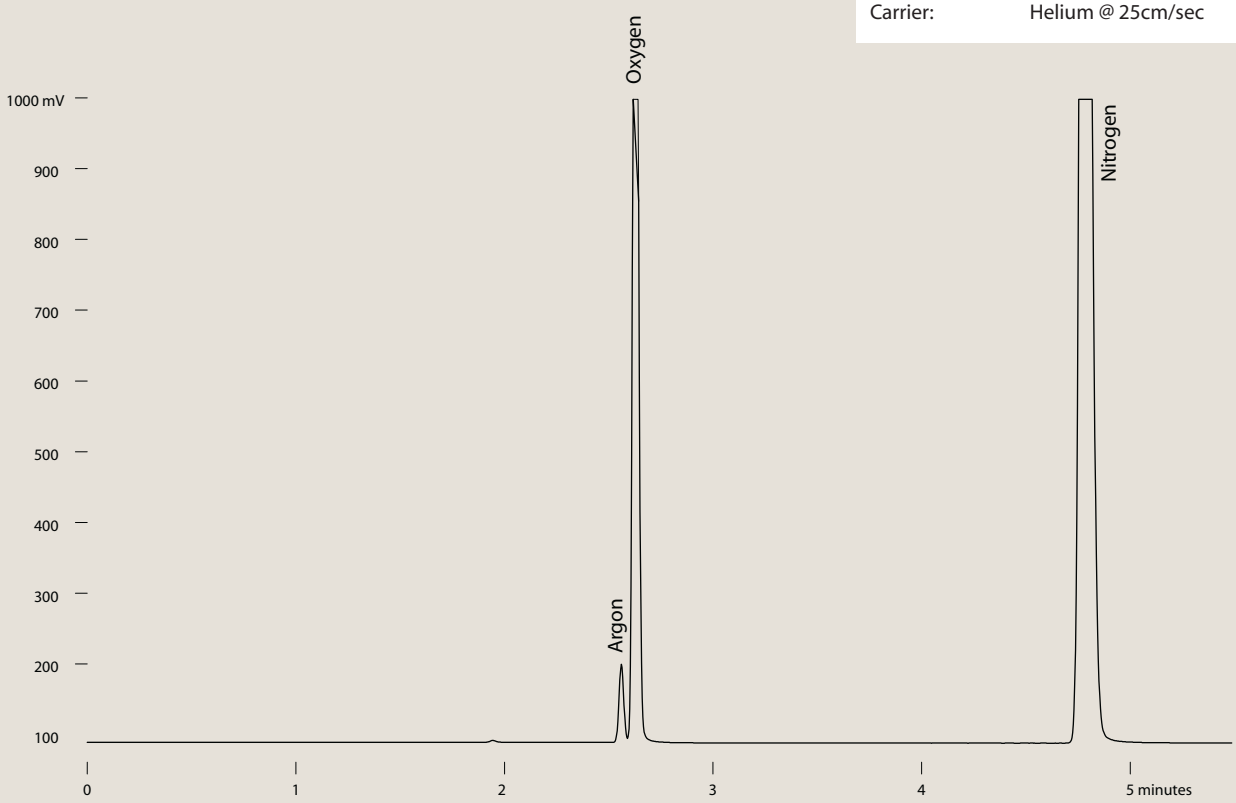


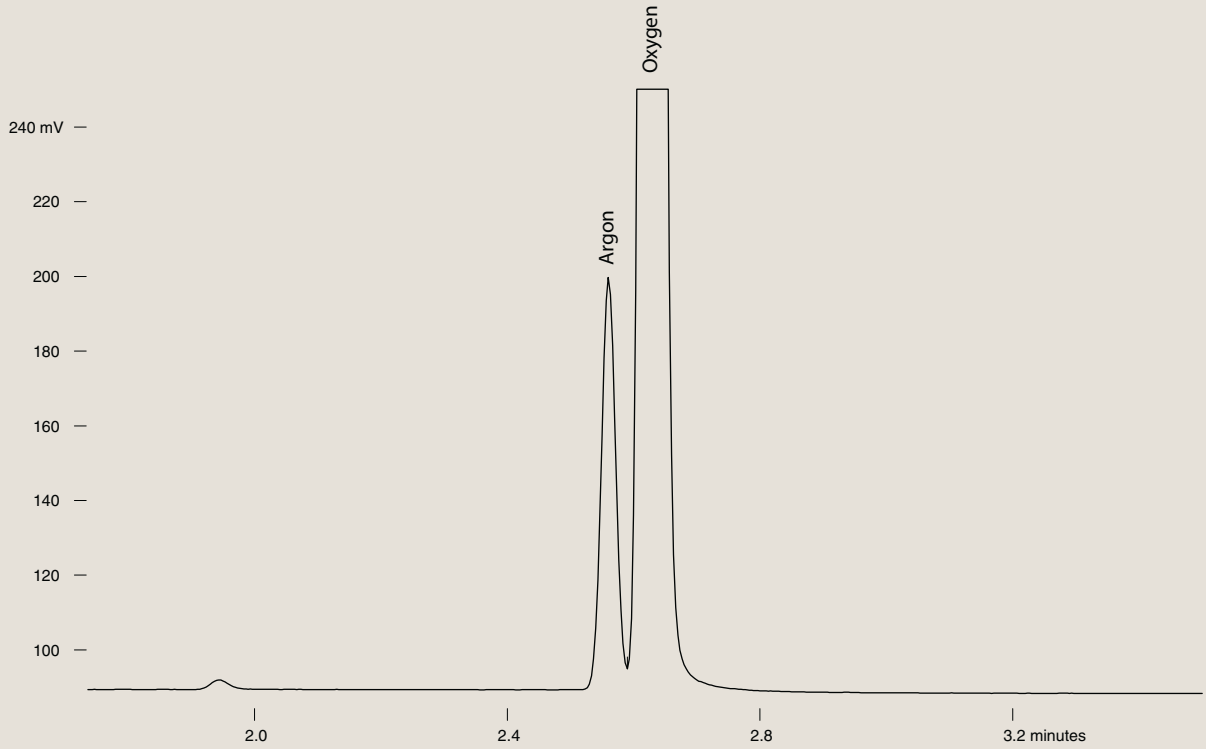
MOLESIEVE TEST MIX
Column: Fused silica Molesieve PLOT 30 m x 0.53 mm x 20.0 µm
Column temp: 40°C isothermal
Detector: PDD Model D-4-I

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





GC CAPILLARY 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

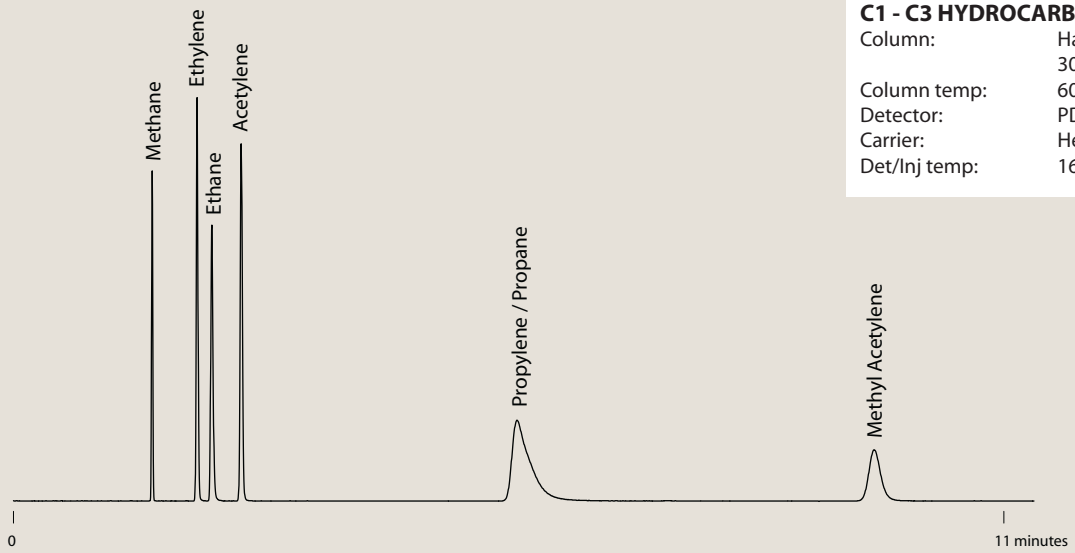
0.53 mm ID	*df*	*Prod No*
15 meters	20	CFS-PQ1553-200
30 meters	20	CFS-PQ3053-200

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
Tel 360–697–9199
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

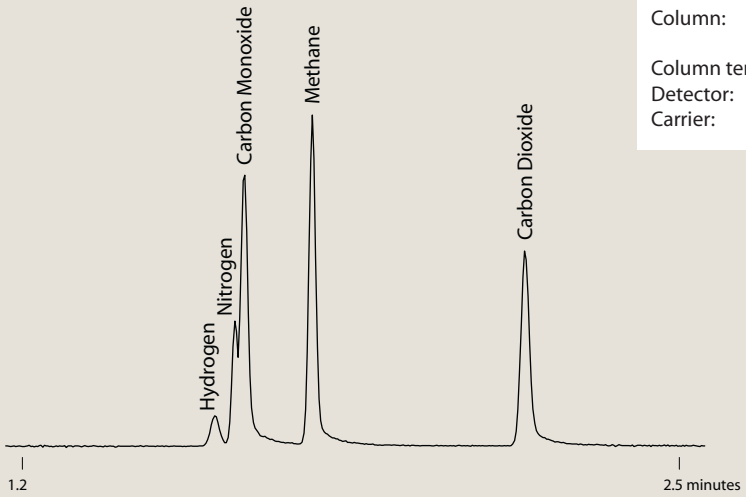
ValcoPLOT D



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

GC CAPILLARY 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

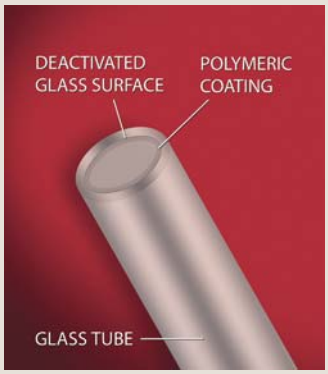
0.32 mm ID	df	Prod No	0.53 mm ID	df	Prod No
15 meters	10	CFS-PS1532-100	15 meters	20	CFS-PS1553-200
30 meters	10	CFS-PS3032-100	30 meters	20	CFS-PS3053-200

TO ORDER
For prices or more information about your specific application, contact VICI Metronics:

Toll-free 877–737–1887
Tel 360–697–9199
Fax. 360–697–6682

columns@vici.com





- Reduce breakdown of Endrin and DDT
- Increase the interval between liner changes

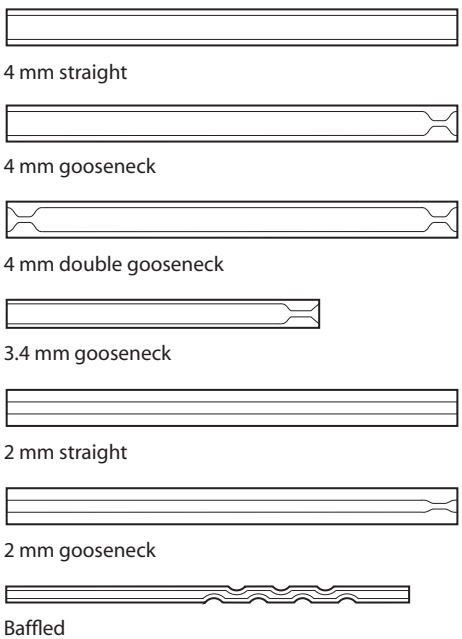
DDT and Endrin are easily degraded in the injection port; with non-deactivated liners and those filled with non-deactivated glass wool, Endrin breakdown can be as high as 98%. EPA method 8081A states, "If degradation of either DDT or Endrin exceeds 15%, take corrective action before proceeding with calibration."

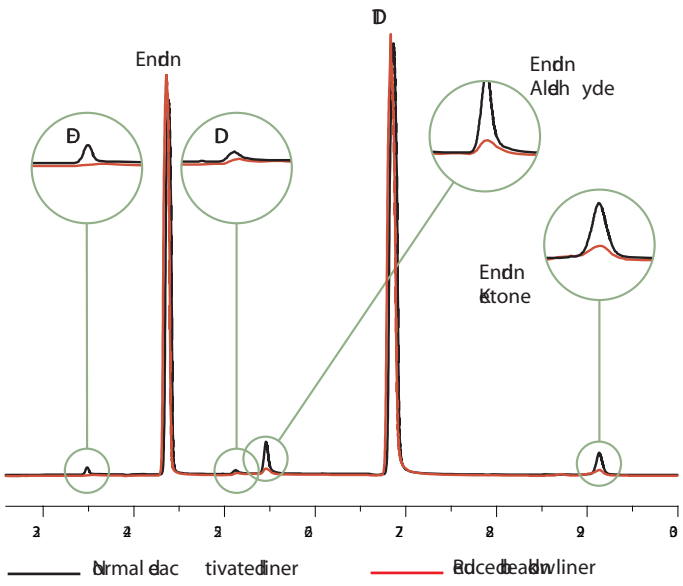
VICI reduced breakdown liners are produced by applying a highly-crosslinked siloxane over a conventionally deactivated liner. The resulting liner contributes less to breakdown than any other component of the injection system.

Reduced breakdown injection port liners

Package of 5 liners.

For injector	*Description*	*Prod No*
Agilent/Thermo	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-GS2-5
	4 mm gooseneck	LNR-GS4-5
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 purification

GAS-SPECIFIC PURIFIERS AND CONTAMINANT TRAPS

from VICI Metronics

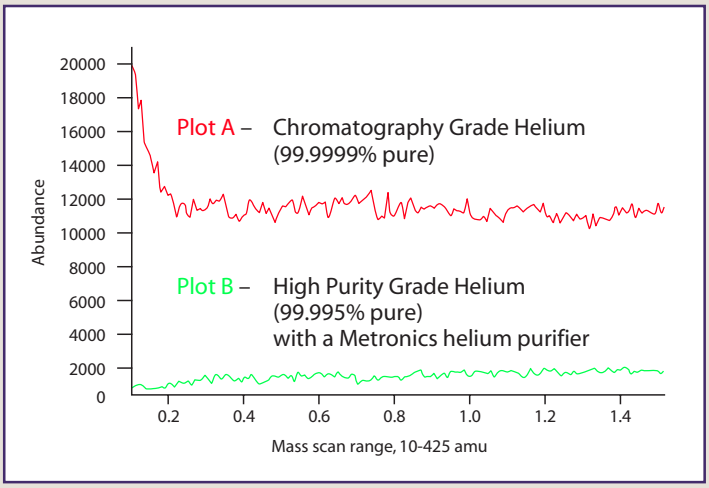
Gas Specific Purifiers and Contaminant Traps

- 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 optimum 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 entry into the GC.

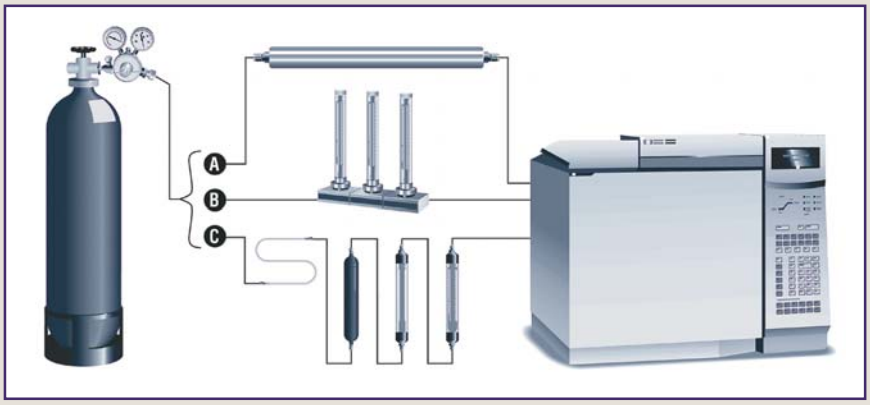
Gas purification is optimized by a multiple bed format. Each bed functions at a lower contaminant concentration, resulting in a series of contaminant concentration gradients across the length of the gas purifier.

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.





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	

TO ORDER
For prices or more information about our gas purifiers, contact VICI Metronics:

Toll-free 877–737–1887
Tel 360–697–9199
Fax. 360–697–6682

vicimetronics.com

Analytical syringes

PLUS MININERT VALVES AND MICRO VALVES

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 pages 68-69.)

Micro valves for GC and LC

1/4-28

	Prod No				
		3 PORT	4 PORT		
"T" flow path					
3 ports	PS-660100				
4 ports	PS-660110			"T"	
		2 PORT	4 PORT		
180° flow path					
2 ports	PS-660200				
4 ports	PS-660210			180°	
		2 PORT	3 PORT	4 PORT	
90° flow path					
2 ports	PS-660300				
3 ports	PS-660310				
4 ports	PS-660320				90°

SPECS
200 psi gas [1]
500 psi liquid [2]
.060" bore
1/4-28 fitting detail
All polymer-based materials

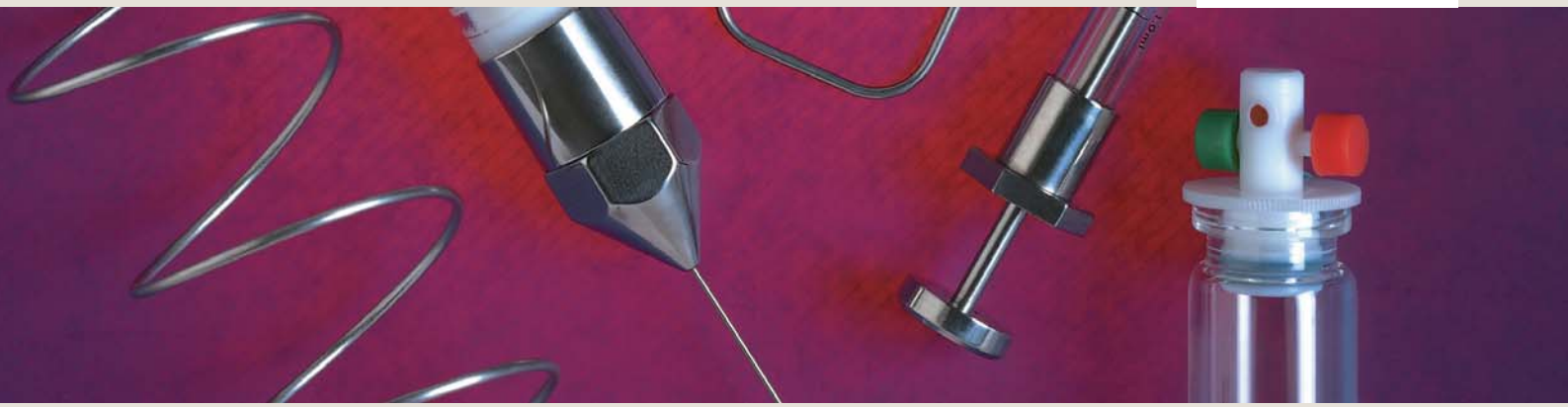
[1] Tested with Helium using 1/16" OD x 0.84 mm ID PTFE tubing with PEEK collapsible ferrules

[2] Tested with Isopropanol using 1/8" OD x 0.75 mm ID PTFE tubing with CTFE collapsible ferrules

MORE INFORMATION
1/4-28 fittings . . . . . p. 68-9

TO ORDER
Toll-free 800–828–1653
Tel 225–927–1128
Fax. 225–923–1331

FOR OUR COMPLETE LINE OF PRODUCTS
Visit our website at **viciprecisionsampling.com** or call us for a catalog:



VICI Precision Sampling's patented Pressure-Lok® syringes feature a PTFE plunger tip, stress-formed by a special process to ensure 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 and prevents 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.

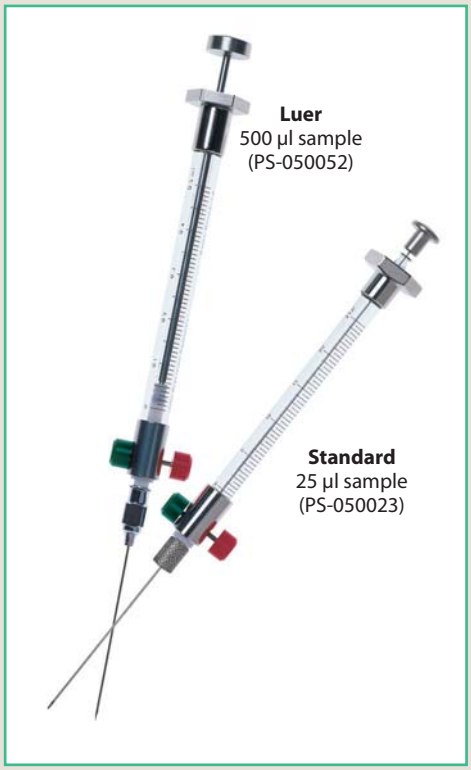
The positive rear stop (in 250 µl and larger sizes) prevents plunger blowout at elevated pressures. The Series A-2 syringe has all the standard Pressure-Lok features such as a PTFE plunger tip, PTFE-sealed needle, and ultrasmooth bore. Replacement components are available for easy repairs.

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

	Standard	Luer
Sample size	*Prod No*	*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

ANALYTICAL SYRINGES

Series C-160 *for GC*

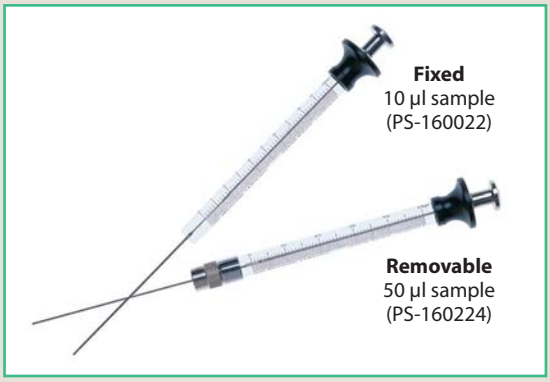
The C-160 offers day-in, day-out dependability at an economical price. A plunger tip of stress-formed virgin PTFE is self-lubricating and durable, and the PTFE needle seat at the rear of the needle prevents possible dissolution of the needle cement or contamination of the sample.

Choose between a fixed or removable needle version. Replacement needles are open end bevel type, .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



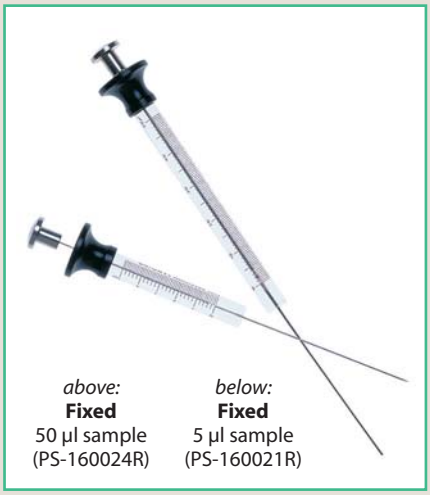
Syringes for Valco, Cheminert, and Rheodyne HPLC injectors

Syringes used to fill a loop on a sample injection valve have needles with 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

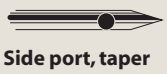


MORE INFORMATION
Fill ports. . . . . page 40
Luer adapters 41

NEEDLE TIPS


Blunt, open end


Bevel, open end


Side port, taper

TO ORDER
Toll-free 800–828–1653
Tel 225–927–1128
Fax. 225–923–1331

FOR OUR COMPLETE LINE OF PRODUCTS
Visit our website at **viciprecisionsampling.com** or call us for a catalog:

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



Valves with threaded fittings

Our threaded designs offer positive on/off fluid control as an in-line valve or syringe access as a termination valve at a sample point. In-line valves are 1/4-28 male 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

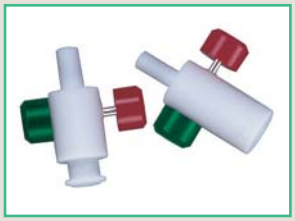
Termination valves	
1/4-28 male	PS-631201
1/4-28 female	PS-631203
1/8" NPT male	PS-631202
1/8" NPT female	PS-631204



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

SPECS

TEMPERATURES

Mininert valves can be used at temperature up to 40°C. However, after 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.

General reference

HELPFUL PRODUCT INFORMATION

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

1. 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.



Contact us

EUROPE, MIDDLE EAST, ASIA, and AFRICA

VICI AG International

SALES
- Phone: Int + 41· 41· 925·6200
- Fax: Int + 41· 41· 925·6201
- Email: order@vici.ch

TECHNICAL
- Phone: Int + 41· 41· 925·6200
- Fax: Int + 41· 41· 925·6201
- Email: support@vici.ch

SERVICE
- Phone: Int + 41· 41· 925·6200
- Fax: Int + 41· 41· 925·6201

Parkstrasse 2
CH-6214 Schenkon
Switzerland

info@vici.ch

NORTH, CENTRAL, AND SOUTH AMERICA (except CANADA); AUSTRALIA and NEW ZEALAND

Valco Instruments Co. Inc.

SALES
- Phone: 713–688–9345
  800–367–8424 *
  * USA and Canada only
- Fax: 713–688–8106
- Email: sales_usa@vici.com

TECHNICAL
- Phone: 713–688–9345
- Fax: 713–956–1649
- Email: tech_usa@vici.com

SERVICE
- Phone: 713–688–9345
- Fax: 713–688–7618
- Email: service@vici.com

P.O. Box 55603
Houston, TX 77255
USA

valco@vici.com

CANADA

VICI Valco Instruments Canada Corporation
- Tollfree: 866–297–2626
- Phone: 613–342–2600
- Fax: 613–342–0111
- Email: canada@vici.com

26 Water Street East
Brockville
Canada K6V 1A1

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. (herein-after 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.

SPECIFIC TERMS AND CONDITIONS OF SALE
Download specific terms and conditions of sales of VICI AG, Switzerland, from www.vici.ch.

GENERAL REFERENCE

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.

GENERAL REFERENCE

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.*

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

An engineered polyaryletherketone, this high-strength composite resists 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%).

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.

Valcon X

This designation indicates a proprietary polyimide blend with chemical properties similar to Valcon T, but with higher compressive strength.

NOTES

The specifications in the discussions on this page 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.

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.

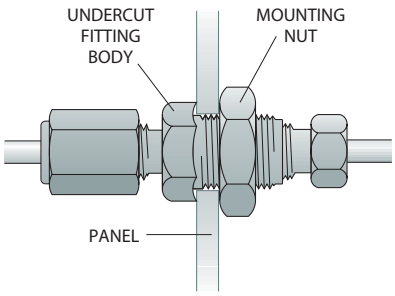
B

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.



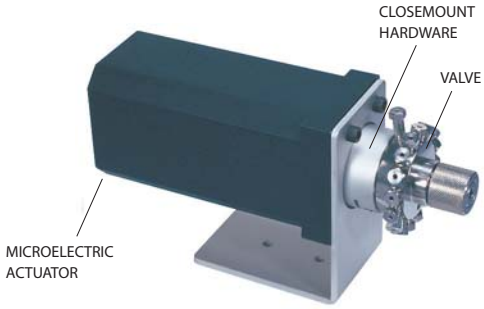
Butt connection: a type of connection in which the two tube ends are directly and squarely in contact, usually effected with a through-type union. Typically used with fused silica connections, or small bore metal tubing.

C

Cap: a cap is used to dead-end a piece of tubing which has a nut and ferrule installed.

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.



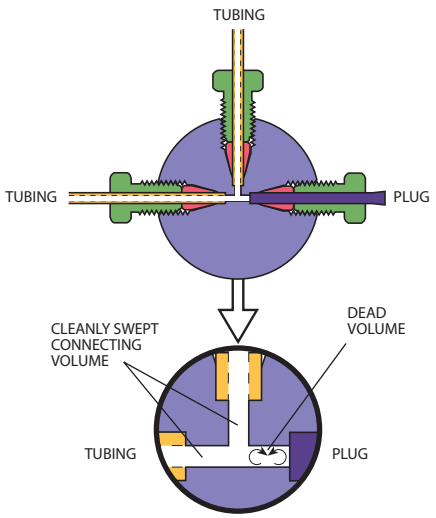
Compression fitting: a style of fitting in which a threaded nut compresses a tapered ferrule onto tubing as the nut is tightened. Valco metal ferrules cut a ring into the tubing wall while polymer types rely on surface compression to form a seal.

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, which 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.

L



INTERNAL UNION



INTERNAL REDUCING UNION

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.

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®: a trademark registered to Valco Instruments Co. Inc, applied to our nanobore components with bore sizes less than 250 µm (0.010").

NPT: National Pipe Thread; a standardized tapered pipe fitting. See **pipe thread**.

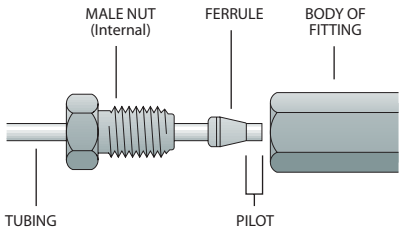
Nut: the tensioning component of a compression fitting. As the threaded nut is tightened into the fitting detail, it pushes the ferrule forward into the tapered ferrule seat, causing it to make up on the tube.

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. The one exception is Cheminert high pressure valves with polymeric stators which have a longer pilot depth.

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.

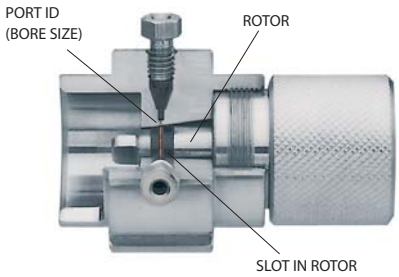
Port: the connection, orifice, seal, or septum, etc., through which sample may be added (injected) or withdrawn.

R

Reducing ferrule: a ferrule which allows a smaller tube to be 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

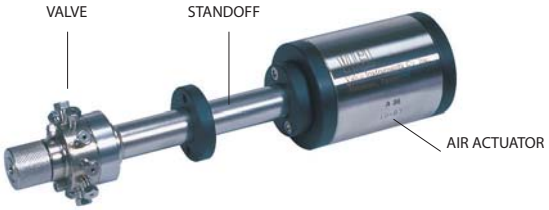
SFE: Supercritical Fluid Extraction. An extraction technique using a fluid in its supercritical state as the extraction medium. Some liquids and mixtures maintained above a critical temperature and pressure exhibit properties of both the liquid and gas phases of the element. These are defined as supercritical. 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 than 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

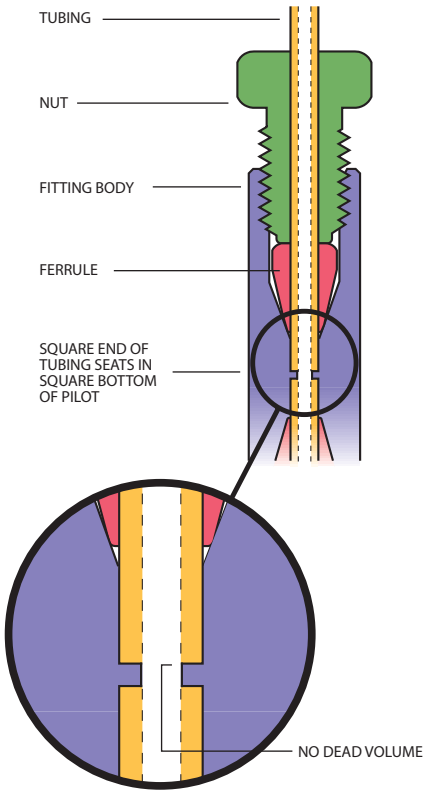
Wetted surfaces: the surfaces which are contacted by the sample stream.

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.

GENERAL REFERENCE

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
1	6.8948	0.06895	0.06805
10	68.948	0.6895	0.6805
20	137.896	1.379	1.361
30	206.844	2.0685	2.0415
40	275.792	2.758	2.722
50	344.74	3.4475	3.4025
60	413.688	4.137	4.083
70	482.636	4.8265	4.7635
80	551.584	5.516	5.444
90	620.532	6.2055	6.1245
100	689.48	6.895	6.805
125	861.85	8.61875	8.50625
150	1034.22	10.3425	10.2075
175	1206.59	12.06625	11.90875
200	1378.96	13.79	13.61
225	1551.33	15.51375	15.31125
250	1723.7	17.2375	17.0125
275	1896.07	18.96125	18.71375
300	2068.44	20.685	20.415
325	2240.81	22.40875	22.11625
350	2413.18	24.1325	23.8175
375	2585.55	25.85625	25.51875
400	2757.92	27.58	27.22
425	2930.29	29.30375	28.92125
450	3102.66	31.0275	30.6225
475	3275.03	32.75125	32.32375
500	3447.4	34.475	34.025
525	3619.77	36.19875	35.72625
550	3792.14	37.9225	37.4275
575	3964.51	39.64625	39.12875
600	4136.88	41.37	40.83
625	4309.25	43.09375	42.53125
650	4481.62	44.8175	44.2325
675	4653.99	46.54125	45.93375
700	4826.36	48.265	47.635
725	4998.73	49.98875	49.33625
750	5171.1	51.7125	51.0375
775	5343.47	53.43625	52.73875

psi	KPa	BAR	Atm
800	5515.84	55.16	54.44
825	5688.21	56.88375	56.14125
850	5860.58	58.6075	57.8425
875	6032.95	60.33125	59.54375
900	6205.32	62.055	61.245
925	6377.69	63.77875	62.94625
950	6550.06	65.5025	64.6475
975	6722.43	67.22625	66.34875
1000	6894.8	68.95	68.05
1100	7584.28	75.845	74.855
1200	8273.76	82.74	81.66
1300	8963.24	89.635	88.465
1400	9652.72	96.53	95.27
1500	10342.2	103.425	102.075
1600	11031.68	110.32	108.88
1700	11721.16	117.215	115.685
1800	12410.64	124.11	122.49
1900	13100.12	131.005	129.295
2000	13789.6	137.9	136.1
2500	17237	172.375	170.125
3000	20684.4	206.85	204.15
3500	24131.8	241.325	238.175
4000	27579.2	275.8	272.2
4500	31026.6	310.275	306.225
5000	34474	344.75	340.25
5500	37921.4	379.225	374.275
6000	41368.8	413.7	408.3
6500	44816.2	448.175	442.325
7000	48263.6	482.65	476.35
7500	51711	517.125	510.375
8000	55158.4	551.6	544.4
8500	58605.8	586.075	578.425
9000	62053.2	620.55	612.45
9500	65500.6	655.025	646.475
10,000	68947.6	689.48	680.46
15,000	103,421.4	1,034.21	1,020.69
20,000	137,895.1	1,378.95	1,360.9
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

REGULATIONS



As a worldwide supplier of products for the analytical instrument market, we work hard to make sure those products comply with regulatory requirements around the world. All machined products (valves, fittings, etc.) are *fully* RoHS/REACH/WEEE* compliant. Most of the electrical products we manufacture are also CE tested and certified. Only a few legacy products are not CE certified.

Following is a list of items in this catalog which are ***not*** CE and/or RoHS compliant:

Cheminert® flanging tools . . . . . page 70
Cheminert starter kits 70
Digital valve interface
DVI 199
DVI-220 199
Diluter/dispenser, M series 82
Dynacalibrator® Model 120 230
G-calibrators (all) 233
Heated valve enclosures (all) 201
Heated column enclosures (all) 203
Heater assemblies and cartridges (all) 202
Instrumentation temperature controller
ITC10399 203
ITC10399-200 203

* CE Conformité Européene (European Conformity)
REACH Registration, Evaluation, Authorization, and Restriction of Chemical Substances
RoHS Restriction of Hazardous Substances Directive
WEEE Waste Electrical and Electronic Equipment Directive

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	Tube sealing bushing (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 7,507,586 7,601,543	Pulsed discharge detectors
5,329,966	Calibrated flow controllers
4,064,908	Combo valves
7,316,777	No-twist one-piece fitting
7,442,902	Adaptive temperature controller

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	Fortron Industries Corp.
Hamilton	Hamilton Company
Hastelloy C	Haynes International Inc.
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	Inco Alloys Intl Inc.
Nanovolume	Valco Instruments Co. Inc.
Nickel 200	Inco Alloys Intl Inc
Nitronic	AK Steel Corporation
Parker	Parker Hannifin Co.
PEEK	Victrex Manufacturing Ltd.
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	Saint-Gobain Performance Plastics
Valco	Valco Instruments Co. Inc. and VICI AG International
ValcoBond	Valco Instruments Co. Inc.
ValcoPLOT	Valco Instruments Co. Inc.
Vespel	E.I. duPont de Nemours
Viton	DuPont Performance Elastomers
VICI	Valco Instruments Co. Inc. and VICI AG International
VICI Jour	Valco Instruments Co. Inc. and VICI AG International
Waters	Waters Associates

GENERAL REFERENCE

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 actuation. Internal sample injectors also include the sample size. (Keep in mind that 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.**

UHPLC injectors

C72MH	10k psi	Nanovolume® injector, 360 µm fittings
C72MX	15k psi	Nanovolume® injector, 360 µm fittings
C72MU	20k psi	Nanovolume® injector, 360 µm fittings
C72NH	10k psi	Nanovolume® injector, 1/32" fittings
C72NX	15k psi	Nanovolume® injector, 1/32" fittings
C72NU	20k psi	Nanovolume® injector, 1/32" fittings
C74NX	15 psi	Nanovolume® internal sample injector, 1/32" fittings
C72H	10k psi	Microbore injector
C72X	15k psi	Microbore injector
C72U	20k psi	Microbore injector
C74H	10k psi	Internal sample injector
C74X	15k psi	Internal sample injector

HPLC injectors

C2N	5k psi	Nanovolume® injector, 1/32" fittings
C4N	5k psi	Nanovolume® internal sample injector, 1/32" fittings
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

UHPLC selectors

C75NH	10k psi	Nanovolume® selector, 1/32" fittings
C75NX	15k psi	Nanovolume® selector, 1/32" fittings
C75NU	20k psi	Nanovolume® selector, 1/32" fittings
C75H	10k psi	Microbore selector
C75X	15k psi	Microbore selector
C75U	20k psi	Microbore selector

HPLC selectors

C5	5k psi	Stream selector

Low pressure selectors

C25Z	Stream selector, Valco ZDV fittings
C25	Stream selector, 1/4-28 fittings
C25G	Stream selector, Cheminert fittings
C45	Stream selector, 1/2-20 fittings

Note: All valves have 1/16" Valco ZDV fittings unless otherwise noted.

OEM injectors

C2V	5k psi	Vertical port injector
C3	5k psi	Centered port injector
C52	5k psi	HPLC integrated motor/valve
C52V	5k psi	HPLC integrated motor/valve with vertical port injector
C62Z		Low pressure integrated motor/valve, Valco ZDV fittings
C62		Low pressure integrated motor/valve, 1/4-28 fittings

OEM selectors

C55	5k psi	HPLC integrated motor/valve selector
C65Z		Low pressure integrated motor/valve selector, Valco ZDV fittings
C65		Low pressure integrated motor/valve selector, 1/4-28 fittings

- (HYPHEN)

2. **Required.**

Place a hyphen after the Cheminert valve type.

Examples:

C1 - 1 3 4 6

C1-1346:
C1 through-the-handle injector, 0.25 mm ports,
Valcon E rotor, PAEK stator, 6 ports, manual (blank = manual)

C5 - 2 0 0 6 EMH

C5-2006EMH:
C5 stream selector, 0.40 mm ports, Valcon H rotor,
Nitronic 60 stator, 6 positions, microelectric actuator

C22Z - 3 1 8 0 EUHA

C22Z-3180EUHA:
C22Z low pressure injector with ZDV fittings, 0.75 mm ports,
Valcon E2 rotor, PPS stator, 10 ports, universal actuator with
RS-232 interface

C74NX - 6 6 7 4 -.01 EH

C74NX-6674-.01EH:
C74NX UHPLC nanovolume internal sample injector rated at 15,000 psi,
150 micron ports (.006"), Valcon E3 rotor, coated stainless stator, 4 ports,
10 nl internal sample size, microelectric actuator

PORT SIZE

3. **Required.**

0	0.15 mm	(.006")
1	0.25 mm	(.010")
2	50 µm or 0.40 mm	(.002")* (.016")
3	0.75 mm	(.030")
4	100 µm or 1.00 mm	(.004")* (.040")
5	1.25 mm	(.050")
6	150 µm or 1.50 mm	(.006")* (.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
9	Valcon X

STATOR MATERIAL

5. **Required.**

0	Nitronic 60
1	CTFE
2	Hastelloy C **
3	Titanium **
4	PAEK
5	Valcon E4
6	[not used]
7	PVDF (low pressure) Coated stainless ***
8	PPS
9	Coated stainless

** These stator materials are coated when in a C72 / C74 / C75 series valve

*** Stator code "7" indicates coated stainless for C72 / C74 / C75 series valves

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
28	28

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.**

Air
A 0-70°C

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

Universal
See chart below.

Manual
[blank] (no code letter; shipped with knob)

Driver only
D (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!

UNIVERSAL ACTUATORS

	High speed	Medium speed/ medium torque	High torque
Without interface	EUH	EUD	EUT
With RS-232/485	EUHA	EUDA	EUTA
With USB	EUHB	EUDB	EUTB
With BCD	EUHC	EUDC	EUTC

GENERAL REFERENCE

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

1. **Required.**

Valve is shipped with manual knob unless specified otherwise.

Air
A 0-70°C
AT 50-150°C

Microelectric
EH • high speed
EP • medium torque
ED • high torque
ET • highest torque

Universal
See chart below.

Manual
[blank] (no code letter; wshipped with knob)

Driver only
D (for use with existing actuator)

STANDOFF ASSEMBLY LENGTH

2. Optional.

Specify if required.

2 2" standoff
3 3" standoff
4 4" standoff
6 6" standoff

BORE SIZE

3. Optional.

For standard bore, leave blank.

[blank] Standard bore
L Large bore

FITTINGS SIZE

4. **Required.**

For 1/8" fittings, leave blank.

N 1/32"
C 1/16"
[blank] 1/8"
VL 1/4"

INTERNAL SAMPLE INJECTOR

5. Optional.

Requires 4 ports. Also specify sample size (9).

I

UNIVERSAL ACTUATORS

	High speed	Medium speed/ medium torque	High torque
Without interface	EUH	EUD	EUT
With RS-232/485	EUHA	EUDA	EUTA
With USB	EUHB	EUDB	EUTB
With BCD	EUHC	EUDC	EUTC

Note: Valco valve product numbers require "-" (hyphen) after the universal actuator code.

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 E HC

A36UWEHC:
Air actuator, 3" standoff, standard bore, 1/8" (blank = 1/8"), 6 ports, UW type, Valcon E rotor, Hastelloy C body material

EUDC- 2 L 6 UW E

EUDC-2L6UWE:
Universal actuator with BCD interface, 2" standoff, large bore (.067" instead of .030"), 1/8" (blank = 1/8"), 6 ports, UW type, Valcon E 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	.06 0.06 µl
4	UW	E Valcon E	HC Hastelloy C	.1 0.1 µl
6	MW	E2 Valcon E2	IN Inconel 600	.2 0.2 µl
8		M Valcon M	M4 Monel 400	.5 0.5 µl
10		P Valcon P	NI Nickel 200	1 1.0 µl
12		R Valcon R	N5 Nitronic 50	2 2.0 µl
14		T Valcon T	TI Titanium	Put a hyphen (-) before the sample size in the product number.
		TF Valcon TF		

TECH TIP
The letter "C" after number of ports specifies smaller bore than standard.
Example:
DC6**C**W,
bore size 0.25 mm

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!

GENERAL REFERENCE

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 features you must specify for a selector. (Keep in mind that some combinations are 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

1. **Required.**

Valve is shipped with manual knob unless specified otherwise.

Air
A 0-70°C
AH high torque
AT 50-150°C

Microelectric
EMH • high speed
EMT • high torque

Universal
See chart below.

Manual
[blank] (not recommended)

Driver only
D (for use with existing actuator)

STANDOFF ASSEMBLY LENGTH

2. Optional.

Specify if required.

2 2" standoff
3 3" standoff
4 4" standoff
6 6" standoff

BORE SIZE

3. Optional.

For standard bore, leave blank.

[blank] Standard bore
L Large bore

FITTINGS SIZE

4. **Required.**

For 1/8" fittings, leave blank.

C 1/16"
[blank] 1/8"
VL 1/4"

FLOWPATH

5. **Required.**

SD
SC
SF
ST
STF

UNIVERSAL ACTUATORS

	High speed	Medium speed/ medium torque	High torque
Without interface	EUH	EUD	EUT
With RS-232/485	EUHA	EUDA	EUTA
With USB	EUHB	EUDB	EUTB
With BCD	EUHC	EUDC	EUTC

Note: Valco valve product numbers require "-" (hyphen) after the universal actuator code.

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

UMT 4 C SD 4 UW

UMT4CSD4UW:
Modular universal actuator, 4" standoff, 1/16" valve, SD flowpath, 4 positions, UW type, Valcon H (blank = H) rotor, standard N60 body

EUT- 3 ST 10 MW T HC

EUT3ST10MWTHC:
Universal actuator with no interface, 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 Nitronic 60 SS unless specified otherwise.
4	MW Low pressure	[blank] Valcon H	S6 Type 316 SS
6	UW high pressure	E Valcon E	HC Hastelloy C
8		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	

TECH TIP
The letter "C" after number of ports specifies smaller bore than standard.
Example:
DCSD6**C**MWE,
bore size 0.25 mm

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!

GENERAL REFERENCE

.2FR.5-5 53,60
.5FR.5-5 53,60
.5FR1-10 ..... .53
.5FR1HC-10 45,53
.5FR2-10 45,53
.5FR2HC-10 ..... .53
.5FR4-10 45,53
.5SR.5-10 ..... .53
.5SR1-10 ..... .53
.5SR2-10 ..... .53
.5SR4-10 ..... .53
10FR1-10 45,53
10FR2-10 45,53
10FR4-10 45,53
10FR4HC-10 45,53
10SR.5-10 ..... .53
10SR1-10 ..... .53
10SR2-10 ..... .53
10SR4-10 ..... .53
1FR2-10 ..... .53
1FR2HC-10 ..... .53
1SR.5-10 ..... .53
1SR1-10 ..... .53
1SR2-10 ..... .53
1SR4-10 ..... .53
210UW 117
2301 233
2310-10 233
2310-20 233
2330-10 233
2330-20 233
2CI4UWE.2 105
2CI4UWE.5 105
2CI4UWE1 105
2CI4UWE2 105
2CI4WE.06 104
2CI4WE.1 104
2CI4WE.2 104
2CI4WE.5 104
2CSC10MWE 126
2CSC12MWE 126
2CSC16MWE 126
2CSC6MWE 126
2CSD10MWE 124
2CSD12MWE 124
2CSD16MWE 124
2CSD6MWE 124
2CSF10MWE 128
2CSF12MWE 128
2CSF16MWE 128
2CSF6MWE 128
2CST10MWE 130
2CST12MWE 130
2CST16MWE 130
2CST6MWE 130
2CSTF10MWE 132
2CSTF12MWE 132
2CSTF16MWE 132
2CSTF6MWE 132
2FR.5-5 53,60
2FR1-10 45,53
2FR1HC-10 45,53
2FR1K ..... .45
2FR1KHC ..... .45
2FR1KTI ..... .45
2FR1TI-10 45,53
2FR2-10 45,53
2FR2HC-10 45,53
2FR2TI-10 45,53
2FR4-10 45,53
2FR4HC-10 45,53
2FR4TI-10 45,53
2FR6 ..... .45
2FR6HC ..... .45
2FR6TI ..... .45
2FR8 ..... .45
2I4UWE.2 105
2I4UWE.5 105
2I4UWE1 105
2I4UWE2 105
2L10UW 118
2NI4WE.06 104
2NI4WE.1 104
2NI4WE.2 104
2NI4WE.5 104
2RAD 204
2SC10MWE 127
2SC12MWE 127
2SC16MWE 127
2SC6MWE 127
2SD10MWE 125
2SD12MWE 125
2SD16MWE 125
2SD6MWE 125
2SF10MWE 129
2SF12MWE 129
2SF16MWE 129
2SF6MWE 129
2SOA 205
2SOA 205
2SOAMMP 205
2SOAMMP 205
2SOAMP 205
2SOAMP 205
2SOAMP 205
2SOAMP 205
2SOAMP 205
2SOAMPCP ..... .83
2SR.5-10 ..... .53
2SR1-10 ..... .53
2SR2-10 ..... .53
2SR4-10 ..... .53
2ST10MWE 131
2ST12MWE 131
2ST16MWE 131
2ST6MWE 131
2STF10MWE 133
2STF12MWE 133
2STF16MWE 133
2STF6MWE 133
3SOAMPCP ..... .83
410UWE 112
410UWT 113
44UWE 112
44UWT 113
46UWE 112
46UWT 113
48UWE 112
48UWT 113
4C10UWE 109
4C10UWT 111
4C10WE 108
4C10WT 110
4C4UWE 109
4C4UWT 111
4C4WE 108
4C4WT 110
4C6UWE 109
4C6UWT 111
4C6WE 108
4C6WT 110
4C8UWE 109
4C8UWT 111
4C8WE 108
4C8WT 110
4N10WE 106
4N10WT 107
4N4WE 106
4N4WT 107
4N6WE 106
4N6WT 107
4N8WE 106
4N8WT 107
4SOA 205
4SOAMP 205
4SOAMPCP ..... .83
4SOUTH 205
4SOUTHMP 205
4SOWK 205
4SOWKMP 205
4SOWKMP 205
4UW 117
4UWE 112
4VL4MWE2 112
4VL6MWE2 112
4VL8MWE2 112
6SOAMPCP ..... .83
6UW 117
6UWE 112
8UW 117
8UWE 112
A10 196
A102 196
A10S 196
A10UW 117
A12 196
A122 196
A12S 196
A16 196
A162 196
A16S 196
A2CI4UWE.2 105
A2CI4UWE.5 105
A2CI4UWE1 105
A2CI4UWE2 105
A2CI4WE.06 104
A2CI4WE.1 104
A2CI4WE.2 104
A2CI4WE.5 104
A2CSC10MWE 126
A2CSC12MWE 126
A2CSC16MWE 126
A2CSD10MWE 124
A2CSD12MWE 124
A2CSD16MWE 124
A2CSD6MWE 124
A2CSF10MWE 128
A2CSF12MWE 128
A2CSF16MWE 128
A2CST10MWE 130
A2CST12MWE 130
A2CST16MWE 130
A2CSTF10MWE 132
A2CSTF12MWE 132
A2CSTF16MWE 132
A2I4UWE.2 105
A2I4UWE.5 105
A2I4UWE1 105
A2I4UWE2 105
A2NI4WE.06 104
A2NI4WE.1 104
A2NI4WE.2 104
A2NI4WE.5 104
A2SC10MWE 127
A2SC12MWE 127
A2SC16MWE 127
A2SD10MWE 125
A2SD12MWE 125
A2SD16MWE 125
A2SD6MWE 125
A2SF10MWE 129
A2SF12MWE 129
A2SF16MWE 129
A2ST10MWE 131
A2ST12MWE 131
A2ST16MWE 131
A2STF10MWE 133
A2STF12MWE 133
A2STF16MWE 133
A30 197
A304 197
A30S 197
A36 197
A364 197
A36S 197
A4 196
A410UWE 112
A410UWT 113
A42 196
A44UWE 112
A44UWT 113
A45 197
A454 197
A45S 197
A46UWE 112
A46UWT 113
A48UWE 112
A48UWT 113
A4C10UWE 109
A4C10UWT 111
A4C10WE 108
A4C10WT 110
A4C4UWE 109
A4C4UWT 111
A4C4WE 108
A4C4WT 110
A4C6UWE 109
A4C6UWT 111
A4C6WE 108
A4C6WT 110
A4C8UWE 109
A4C8UWT 111
A4C8WE 108
A4C8WT 110
A4N10WE 106
A4N10WT 107
A4N4WE 106
A4N4WT 107
A4N6WE 106
A4N6WT 107
A4N8WE 106
A4N8WT 107
A4S 196
A4UW 117
A4VL4MWE2 112
A4VL6MWE2 112
A4VL8MWE2 112
A6 196
A60 197
A604 197

A60S 197
A62 196
A6S 196
A6UW 117
A8 196
A82 196
A8S 196
A8UW 117
A90 197
A904 197
A90S 197
AC10UW 116
AC10W 115
AC4UW 116
AC4W 115
AC6UW 116
AC6W 115
AC8UW 116
AC8W 115
ACI4UW.2 114
ACI4UW.5 114
ACI4UW1 114
ACI4UW2 114
ACI4W.06 114
ACI4W.1 114
ACI4W.2 114
ACI4W.5 114
ACSD10UW 134
ACSD4UW 134
ACSD6UW 134
ACST4UW 135
ACST6UW 135
AH2CSC6MWE 126
AH2CSF6MWE 128
AH2CST6MWE 130
AH2CSTF6MWE 132
AH2SC6MWE 127
AH2SF6MWE 129
AH2ST6MWE 131
AH2STF6MWE 133
AH2VLSC4MWE2 127
AH2VLSC6MWE2 127
AH2VLSC8MWE2 127
AH2VLSD10MWE2 125
AH2VLSD4MWE2 125
AH2VLSD6MWE2 125
AH2VLSD8MWE2 125
AH2VLSF4MWE2 129
AH2VLSF6MWE2 129
AH2VLSF8MWE2 129
AL10UW 118
AL4UW 118
AL6UW 118
AL8UW 118
ASD4UW 134
ASD6UW 134
ASD8UW 134
ASFV 213
ASFV2HT 213
ASFV2HT4 213
ASFV40K.5 ..... .85
ASFV40K1 ..... .85
ASFV40K360 ..... .85
ASFVHT 213
ASFVHT4 213
ASFVL 213
ASFVLHT 213
ASFVLHT4 213
ASFVO 213
ASFVO2HT 213
ASFVO2HT4 213
ASFVO40K.5 ..... .85
ASFVO40K1 ..... .85
ASFVO40K360 ..... .85
ASFVOD40K.5 ..... .85
ASFVOD40K1 ..... .85
ASFVOD40K360 ..... .85
ASFVOHT 213
ASFVOHT4 213
ASFVOL 213
ASFVOLHT 213
ASFVOLHT4 213
AT10 196
AT104 196
AT10S 196
AT12 196
AT124 196
AT12S 196
AT16 196
AT164 196
AT16S 196
AT30 197
AT302 197
AT30S 197
AT36 197
AT362 197
AT36S 197
AT4 196
AT44 196
AT45 197
AT452 197
AT45S 197
AT4S 196
AT6 196
AT60 197
AT602 197
AT60S 197
AT64 196
AT6S 196
AT8 196
AT84 196
AT8S 196
AT90 197
AT902 197
AT90S 197
BNV1 218
BNV1-D 218
BNV1-KZ 218
BNV1LF 218
BNV1LF-D 218
BNV1LF-KZ 218
C-1C00H 160
C-1C04 160
C-1C06 160
C-1C08H 160
C-1C30H 160
C-1C34 160
C-1C36 160
C-1C38H 160
C-1C40H 160
C-1C44 160
C-1C46 160
C-1C48H 160
C-2C00H 163
C-2C04 163
C-2C06 163
C-2C08H 163
C-2C30H 163
C-2C34 163
C-2C36 163
C-2C38H 163
C-2C40H 163
C-2C44 163
C-2C46 163
C-2C48H 163
C-BOT16 ..... .81
C-BOT32 ..... .81
C-EN.5FPKB ..... .59
C-F1.5TI ..... .78
C-LFP ..... .41
C-LZP1PK ..... .64
C-MPFTI10 ..... .79
C-MPFTI2 ..... .79
C-MPR2 ..... .81
C-MPR3 ..... .81
C-MZP1PK ..... .64
C-NEF.5FPK.15S1 ..... .61
C-NEF.5FPK.20S1 ..... .61
C-NEF.5FPK.25S1 ..... .61
C-NEF.5FPK.30S1 ..... .61
C-NEF.5FPK.35S1 ..... .61
C-NEF.5XFPK.15S1 ..... .61
C-NEF.5XFPK.20S1 ..... .61
C-NEF.5XFPK.25S1 ..... .61
C-NEF.5XFPK.30S1 ..... .61
C-NEF.5XFPK.35S1 ..... .61
C-NERU1FPK ..... .59
C-NEU.5FPK ..... .59
C-NEU.5FPK.15 ..... .60
C-NEU.5FPK.20 ..... .60
C-NEU.5FPK.25 ..... .60
C-NEU.5FPK.30 ..... .60
C-NEU.5FPK.35 ..... .60
C-NEU.5XFPK ..... .59
C-NEU.5XFPK.15 ..... .60
C-NEU.5XFPK.20 ..... .60
C-NEU.5XFPK.25 ..... .60
C-NEU.5XFPK.30 ..... .60
C-NEU.5XFPK.35 ..... .60
C-NL S1.15 ..... .61
C-NL.15L-5 ..... .60
C-NL.15S-5 ..... .60
C-NL.20L-5 ..... .60
C-NL.20S-5 ..... .60
C-NL.25L-5 ..... .60
C-NL.25S-5 ..... .60
C-NL.30L-5 ..... .60
C-NL.30S-5 ..... .60
C-NL.35L-5 ..... .60
C-NL.35S-5 ..... .60
C-NLS1.20 ..... .61
C-NLS1.25 ..... .61
C-NLS1.30 ..... .61
C-NLS1.35 ..... .61
C-NNFFPK ..... .59
C-NPFPK ..... .59
C-NTFPK ..... .59
C-NTXFPK ..... .59
C-NXFPK ..... .59
C-NXXFPK ..... .59
C-NYFPK ..... .59
C-NYXFPK ..... .59
C-PF ..... .78
C-PFL ..... .78
C-PFM ..... .78
C-PFS ..... .78
C-VISF-1 ..... .40
C-VISF-1H ..... .40
C-ZP1FPK ..... .64
C1-10R6 162
C1-13R6 162
C1-20R6 165
C1-23R6 165
C10UW 116
C10UWE 109
C10W 115
C10WE 108
C12-310 166
C12-314 166
C12-316 166
C12-318 166
C15-310 ..... 176, 177
C1CF-1C06 162
C1CF-1C46 162
C1CF-2C06 165
C1CF-2C46 165
C1CFI-1006 162
C1CFI-1346 162
C1CFI-2006 165
C1CFI-2346 165
C2-1004 160
C2-1004A 160
C2-1004D 160
C2-1004EH 160
C2-1006 160
C2-1006A 160
C2-1006D 160
C2-1006EH 160
C2-1034 160
C2-1034A 160
C2-1034D 160
C2-1034EH 160
C2-1036 160
C2-1036A 160
C2-1036D 160
C2-1036EH 160
C2-10R0H 160, 180
C2-10R4 ..... 160, 180
C2-10R6 ..... 160, 180, 181
C2-10R8H 160, 180
C2-1344 160
C2-1344A 160
C2-1344D 160
C2-1344EH 160
C2-1346 160
C2-1346A 160
C2-1346D 160
C2-1346EH 160
C2-13R0H 160, 180
C2-13R4 ..... 160, 180
C2-13R6 ..... 160, 162, 180, 181
C2-13R8H 160, 180
C2-2004 163
C2-2004A 163
C2-2004D 163
C2-2004EH 163
C2-2006 163
C2-2006A 163
C2-2006D 163
C2-2006EH 163
C2-2034 163
C2-2034A 163
C2-2034D 163
C2-2034EH 163
C2-2036 163
C2-2036A 163
C2-2036D 163
C2-2036EH 163
C2-20R0H 163, 182
C2-20R4 ..... 163, 182

GENERAL REFERENCE

C2-20R6 .....163, 165, 182, 183
C2-20R8H.....163, 182
C2-23R0H.....163, 182
C2-23R4 .....163, 182
C2-23R6 163
C2-23R6 ..... 165, 182, 183
C2-23R8H.....163, 182
C2-2344 163
C2-2344A..... 163
C2-2344D..... 163
C2-2344EH..... 163
C2-2346 163
C2-2346A..... 163
C2-2346D..... 163
C2-2346EH..... 163
C22-310 167
C22-314 167
C22-316 167
C22-318 167
C22-3180 167
C22-3180A..... 167
C22-3180D 167
C22-3180EH 167
C22-3184 167
C22-3184A..... 167
C22-3184D 167
C22-3184EH 167
C22-3186 167
C22-3186A..... 167
C22-3186D 167
C22-3186EH 167
C22-3188 167
C22-3188A..... 167
C22-3188D 167
C22-3188EH 167
C22-380 167
C22-384 167
C22-386 167
C22-388 167
C22-610 167
C22-614 167
C22-616 167
C22-618 167
C22-6180 167
C22-6180A..... 167
C22-6180D 167
C22-6180EH 167
C22-6184 167
C22-6184A..... 167
C22-6184D 167
C22-6184EH 167
C22-6186 167
C22-6186A..... 167
C22-6186D 167
C22-6186EH 167
C22-6188 167
C22-6188A..... 167
C22-6188D 167
C22-6188EH 167
C22-680 167
C22-684 167
C22-686 167
C22-688 167
C22Z-3180..... 166
C22Z-3180A 166
C22Z-3180D 166
C22Z-3180EH 166
C22Z-3184..... 166
C22Z-3184A 166
C22Z-3184D 166
C22Z-3184EH 166
C22Z-3186..... 166
C22Z-3186A 166
C22Z-3186D 166
C22Z-3186EH 166
C22Z-3188..... 166
C22Z-3188A 166
C22Z-3188D 166
C22Z-3188EH 166
C22Z-380..... 166
C22Z-384..... 166
C22Z-386..... 166
C22Z-388..... 166
C24-10R-.2..... 168
C24-10R-.5.....168, 169
C24-10R-1 .....168, 169
C24-10R-2 169
C24-1C8 169
C24-2184-.5..... 169
C24-2184-.5A 169
C24-2184-.5D 169
C24-2184-.5EH..... 169
C24-2184-1 169
C24-2184-1A..... 169
C24-2184-1D..... 169
C24-2184-1EH 169
C24-2184-2 169
C24-2184-2A..... 169
C24-2184-2D..... 169
C24-2184-2EH 169
C24Z-1C8..... 168
C24Z-21 2184-.5D..... 168
C24Z-2184-.2 168
C24Z-2184-.2D..... 168
C24Z-2184-.5D..... 168
C24Z-2184-1D 168
C24Z-2184-1D 168
C25-310 177
C25-314 177
C25-316 177
C25-3180 177
C25-3180A..... 177
C25-3180D 177
C25-3180EMH 177
C25-3184A..... 177
C25-3184D 177
C25-3184EMH 177
C25-3186 177
C25-3186A..... 177
C25-3186D0 177
C25-3186EMH 177
C25-3188 177
C25-3188A0 177
C25-3188D 177
C25-3188EMH 177
C25-380 177
C25-384 177
C25-386 177
C25-388 177
C25-610 177
C25-614 177
C25-616 177
C25-618 177
C25-6180 177
C25-6180A..... 177
C25-6180D 177
C25-6180EMH 177
C25-6184 177
C25-6184A..... 177
C25-6184D 177
C25-6184EMH 177
C25-6186 177
C25-6186A..... 177
C25-6186D 177
C25-6186EMH 177
C25-6188 177
C25-6188A..... 177
C25-6188D 177
C25-6188EMH 177
C25-680 177
C25-684 177
C25-686 177
C25-688 177
C25G-24520D..... 178
C25G-24520EMT 178
C25G-24524D..... 178
C25G-24524EMT 178
C25G-24528D..... 178
C25G-24528EMT 178
C25G-24R20 178
C25G-24R24 178
C25G-24R28 178
C25G-2C520 178
C25G-2C524 178
C25G-2C528 178
C25Z-3180..... 176
C25Z-3180A 176
C25Z-3180D 176
C25Z-3180EMH 176
C25Z-31814..... 176
C25Z-31814A 176
C25Z-31814D 176
C25Z-31814EMH..... 176
C25Z-3186..... 176
C25Z-3186A 176
C25Z-3186D 176
C25Z-3186EMH 176
C25Z-3188..... 176
C25Z-3188A 176
C25Z-3188D 176
C25Z-3188EMH 176
C25Z-325..... 176
C25Z-380..... 176
C25Z-38-14 176
C25Z-386..... 176
C25Z-388..... 176
C2H-1008A 160
C2H-1000..... 160
C2H-1000A 160
C2H-1000D 160
C2H-1000EH..... 160
C2H-1008..... 160
C2H-1008D 160
C2H-1008EH..... 160
C2H-1030..... 160
C2H-1030A 160
C2H-1030D 160
C2H-1030EH..... 160
C2H-1038..... 160
C2H-1038A 160
C2H-1038D 160
C2H-1038EH..... 160
C2H-1340..... 160
C2H-1340A 160
C2H-1340D 160
C2H-1340EH..... 160
C2H-1348..... 160
C2H-1348A 160
C2H-1348D 160
C2H-1348EH..... 160
C2H-2000..... 163
C2H-2000A 163
C2H-2000D 163
C2H-2000EH..... 163
C2H-2008..... 163
C2H-2008A 163
C2H-2008D 163
C2H-2008EH..... 163
C2H-2030..... 163
C2H-2030A 163
C2H-2030D 163
C2H-2030EH..... 163
C2H-2038..... 163
C2H-2038A 163
C2H-2038D 163
C2H-2038EH..... 163
C2H-2340..... 163
C2H-2340A 163
C2H-2340D 163
C2H-2340EH..... 163
C2H-2348..... 163
C2H-2348A 163
C2H-2348D 163
C2H-2348EH..... 163
C2N-4000..... 158
C2N-4000D 158
C2N-4000EH..... 158
C2N-4006..... 158
C2N-4006D 158
C2N-4006EH..... 158
C2N-40R0..... 158
C2N-40R6..... 158
C2N-4340..... 158
C2N-4340D 158
C2N-4340EH..... 158
C2N-4346..... 158
C2N-4346D 158
C2N-4346EH..... 158
C2N-43R0..... 158
C2N-43R6..... 158
C2N-4C00..... 158
C2N-4C06..... 158
C2N-4C40..... 158
C2N-4C46..... 158
C2V-1006 181
C2V-1006A 181
C2V-1006D 181
C2V-1006EH 181
C2V-1346 181
C2V-1346A 181
C2V-1346D 181
C2V-1346EH 181
C2V-1C06..... 181
C2V-1C46..... 181
C2V-2006 183
C2V-2006A 183
C2V-2006D 183
C2V-2006EH 183
C2V-2346 183
C2V-2346A 183
C2V-2346D 183
C2V-2346EH 183
C2V-2C06..... 183
C2V-2C46..... 183
C3-1006 181
C3-1006A..... 181
C3-1006D..... 181
C3-1006EH..... 181
C3-1346 181
C3-1346A..... 181

C3-1346D. 181
C3-1346EH. 181
C3-1C06 181
C3-1C46 181
C3-2006 183
C3-2006A. 183
C3-2006D. 183
C3-2006EH. 183
C3-2346 183
C3-2346A. 183
C3-2346D. 183
C3-2346EH. 183
C3-2C06 183
C3-2C46 183
C360C 58
C360CFS. 58
C360CPK. 57
C360ET 57, 67
C360EZR.5XC 39
C360IZR.5TS6 38
C360IZR.5TS6FS. 38
C360IZR.5TS6PK 38
C360IZR1S6. 38
C360IZR1S6AL 38
C360IZR1S6FS 38
C360IZR1S6PK 38
C360NFFS 58
C360NFPK 57
C360NFS6 58
C360PPK. 57
C360QTPK2 57
C360QTPK4 57
C360QTPK6 57
C360QUPK2 57
C360QUPK4 57
C360QUPK6 57
C360QXPK2. 57
C360QXPK4. 57
C360QXPK6. 57
C360RU.5FS2 58
C360RU.5FS4 58
C360RU.5FS6 58
C360RU.5S62 58
C360RU.5S64 58
C360RU.5S66 58
C360RU1FS6. 58
C360RU1PK6. 57
C360RU1S66. 58
C360UFS2 58
C360UFS4 58
C360UFS6 58
C360UPK2 57
C360UPK4 57
C360UPK64. 57
C360US62 58
C360US64 58
C360US66 58
C4-0004-.01. 161
C4-0004-.01A 161
C4-0004-.01D 161
C4-0004-.01EH. 161
C4-0004-.02. 161
C4-0004-.02A 161
C4-0004-.02D 161
C4-0004-.02EH. 161
C4-0004-.05. 161
C4-0004-.05A 161
C4-0004-.05D 161
C4-0004-.05EH. 161
C4-00R-.01. 161
C4-00R-.02. 161
C4-00R-.05. 161
C4-0344-.01. 161
C4-0344-.01A 161
C4-0344-.01D 161
C4-0344-.01EH. 161
C4-0344-.02. 161
C4-0344-.02A 161
C4-0344-.02D 161
C4-0344-.02EH. 161
C4-0344-.05. 161
C4-0344-.05A 161
C4-0344-.05D 161
C4-0344-.05EH. 161
C4-03R-.01. 161
C4-03R-.02. 161
C4-03R-.05. 161
C4-0C0 161
C4-0C4 161
C4-1004-.1. 164
C4-1004-.1A 164
C4-1004-.1D 164
C4-1004-.1EH 164
C4-1004-.2. 164
C4-1004-.2A 164
C4-1004-.2D 164
C4-1004-.2EH 164
C4-1004-.5. 164
C4-1004-.5A 164
C4-1004-.5D 164
C4-1004-.5EH 164
C4-1034-.1. 164
C4-1034-.1A 164
C4-1034-.1D 164
C4-1034-.1EH 164
C4-1034-.2. 164
C4-1034-.2A 164
C4-1034-.2D 164
C4-1034-.2EH 164
C4-1034-.5. 164
C4-1034-.5A 164
C4-1034-.5D 164
C4-1034-.5EH 164
C4-10R-.1 164
C4-10R-.2 164
C4-10R-.5 164
C4-1344-.1. 164
C4-1344-.1A 164
C4-1344-.1D 164
C4-1344-.1EH 164
C4-1344-.2. 164
C4-1344-.2A 164
C4-1344-.2D 164
C4-1344-.2EH 164
C4-1344-.5. 164
C4-1344-.5A 164
C4-1344-.5D 164
C4-1344-.5EH 164
C4-13R-.1 164
C4-13R-.2 164
C4-13R-.5 164
C4-1C0 164
C4-1C3 164
C4-1C4 164
C45-9784A. 179
C45-9784D 179
C45-9784EMT. 179
C45-9786A. 179
C45-9786D0 179
C45-9786EMT. 179
C45-97R4 179
C45-97R6 179
C4N-4004-.004. 159
C4N-4004-.004D 159
C4N-4004-.004EH 159
C4N-4004-.01 159
C4N-4004-.01D 159
C4N-4004-.01EH 159
C4N-4004-.02 159
C4N-4004-.02D 159
C4N-4004-.02EH 159
C4N-40R-.004 159
C4N-40R-.01 159
C4N-40R-.02 159
C4N-4344-.004. 159
C4N-4344-.004D 159
C4N-4344-.004EH 159
C4N-4344-.01 159
C4N-4344-.01D 159
C4N-4344-.01EH 159
C4N-4344-.02 159
C4N-4344-.02D 159
C4N-4344-.02EH 159
C4N-43R-.004 159
C4N-43R-.01 159
C4N-43R-.02 159
C4N-4C0. 159
C4N-4C4. 159
C4UW 116
C4UWE 109
C4W. 115
C4WE. 108
C5-2004 174
C5-2004A. 174
C5-2004D. 174
C5-2004EMH. 174
C5-2006 174
C5-2006A. 174
C5-2006D. 174
C5-2006EMH. 174
C5-2006EMTD 175
C5-2034 174
C5-2034A. 174
C5-2034D. 174
C5-2034EMH. 174
C5-2036 174
C5-2036A. 174
C5-2036D. 174
C5-2036EMH. 174
C5-20R0H. 174, 175, 186
C5-20R4 . . . . . 174, 186
C5-20R6 . . . . . 174, 175, 186
C5-20R8H. 174, 175, 186
C5-2344 174
C5-2344A. 174
C5-2344D. 174
C5-2344EMH. 174
C5-2346 174
C5-2346A. 174
C5-2346D. 174
C5-2346EMH. 174
C5-2346EMTD 175
C5-23R0H. 174, 175, 186
C5-23R4 . . . . . 174, 186
C5-23R6 . . . . . 174, 175, 186
C5-23R8H. 174, 175, 186
C5-2C00H. 174
C5-2C04 174
C5-2C06 174
C5-2C08H. 174
C5-2C30H. 174
C5-2C34 174
C5-2C36 174
C5-2C38H. 174
C5-2C40H. 174
C5-2C44 174
C5-2C46 174
C5-2C48H. 174
C52-1000I 180
C52-1000I-S. 180
C52-1000IX 180
C52-1004I 180
C52-1004I-S. 180
C52-1004IX 180
C52-1006I 180
C52-1006I-S. 180
C52-1006IX 180
C52-1008I 180
C52-1008I-S. 180
C52-1008IX 180
C52-1340I 180
C52-1340I-S. 180
C52-1340IX 180
C52-1344I 180
C52-1344I-S. 180
C52-1344IX 180
C52-1346I 180
C52-1346I-S. 180
C52-1346IX 180
C52-1348I 180
C52-1348I-S. 180
C52-1348IX 180
C52-1C00 180
C52-1C04 180
C52-1C06 180
C52-1C08 180
C52-1C40 180
C52-1C44 180
C52-1C46 180
C52-1C48 180
C52-2000I 182
C52-2000I-S. 182
C52-2000IX 182
C52-2004I 182
C52-2004I-S. 182
C52-2004IX 182
C52-2006I 182
C52-2006I-S. 182
C52-2006IX 182
C52-2008I 182
C52-2008I-S. 182
C52-2008IX 182
C52-2340I 182
C52-2340I-S. 182
C52-2340IX 182
C52-2344I 182
C52-2344I-S. 182
C52-2344IX 182
C52-2346I 182
C52-2346I-S. 182
C52-2346IX 182
C52-2348I 182
C52-2348I-S. 182
C52-2348IX 182
C52-2C00 182
C52-2C04 182
C52-2C06 182
C52-2C08 182
C52-2C40 182
C52-2C44 182

GENERAL REFERENCE

C52-2C46 182
C52-2C48 182
C55-2000I 186
C55-2000IA 186
C55-2000I-S 186
C55-2000IX 186
C55-2004I 186
C55-2004IA 186
C55-2004I-S 186
C55-2004IX 186
C55-2006I 186
C55-2006IA 186
C55-2006I-S 186
C55-2006IX 186
C55-2008I 186
C55-2008IA 186
C55-2008I-S 186
C55-2008IX 186
C55-2340I 186
C55-2340IA 186
C55-2340I-S5 186
C55-2340IX 186
C55-2344I 186
C55-2344IA 186
C55-2344I-S 186
C55-2344IX 186
C55-2346I 186
C55-2346IA 186
C55-2346I-S 186
C55-2346IX 186
C55-2348I 186
C55-2348IA5 186
C55-2348I-S 186
C55-2348IX 186
C55-2C00 186
C55-2C04 186
C55-2C06 186
C55-2C08 186
C55-2C40 186
C55-2C44 186
C55-2C46 186
C55-2C48 186
C5H-2000 174
C5H-2000A 174
C5H-2000D 174
C5H-2000EMT 174
C5H-2000EMTD 175
C5H-2008 174
C5H-2008A 174
C5H-2008D 174
C5H-2008EMT 174
C5H-2008EMTD 175
C5H-2030 174
C5H-2030A 174
C5H-2030D 174
C5H-2030EMT 174
C5H-2038 174
C5H-2038A 174
C5H-2038D 174
C5H-2038EMT 174
C5H-2340 174
C5H-2340A 174
C5H-2340D 174
C5H-2340EMT 174
C5H-2340EMTD 175
C5H-2348 174
C5H-2348A 174
C5H-2348D 174
C5H-2348EMT 174
C5H-2348EMTD 175
C5M1KF 74
C5M1PK 74
C5M2KF 74
C5M2PK 74
C6-1006 162
C6-1006A 162
C6-1006D 162
C6-1006E 162
C6-1006EH 162
C6-1346 162
C6-1346A 162
C6-1346D 162
C6-1346E 162
C6-1346EH 162
C6-1C06 162
C6-1C46 162
C6-2006 165
C6-2006A 165
C6-2006D 165
C6-2006EH 165
C6-2346 165
C6-2346A 165
C6-2346D 165
C6-2346EH 165
C6-2C06 165
C6-2C46 165
C62-3180I 185
C62-3180I-S 185
C62-3184I 185
C62-3184I-S 185
C62-3186I 185
C62-3186I-S 185
C62-3188I 185
C62-3188I-S 185
C62-6180I 185
C62-6180I-S 185
C62-6184I 185
C62-6184I-S 185
C62-6186I 185
C62-6186I-S 185
C62-6188I 185
C62-6188I-S 185
C62Z-3180I 184
C62Z-3180I-S 184
C62Z-3184I 184
C62Z-3184I-S 184
C62Z-3186I 184
C62Z-3186I-S 184
C62Z-3188I 184
C62Z-3188I-S 184
C65-3180I 187
C65-3180IA 187
C65-3180I-S 187
C65-3184I 187
C65-3184IA 187
C65-3184I-S 187
C65-3186I 187
C65-3186IA 187
C65-3186I-S 187
C65-3188I 187
C65-3188IA 187
C65-3188I-S 187
C65-6180I 187
C65-6180IA 187
C65-6180I-S 187
C65-6184I 187
C65-6184IA 187
C65-6184I-S 187
C65-6186I 187
C65-6186IA 187
C65-6186I-S 187
C65-6188I 187
C65-6188IA 187
C65-6188I-S 187
C65Z-3180I 187
C65Z-3180IA 187
C65Z-3180I-S 187
C65Z-3184I 187
C65Z-3184IA 187
C65Z-3184I-S 187
C65Z-3186I 187
C65Z-3186IA 187
C65Z-3186I-S 187
C65Z-3188I 187
C65Z-3188IA 187
C65Z-3188I-S 187
C6UW 116
C6UWE 109
C6W 115
C6WE 108
C72-16R0 156
C72-16R0 156
C72-16R4 156
C72-16R4 156
C72-16R6 156
C72-16R6 156
C72-16R8 156
C72-16R8 156
C72-1C70 156
C72-1C70 156
C72-1C74 156
C72-1C74 156
C72-1C76 156
C72-1C76 156
C72-1C78 156
C72-1C78 156
C72H-1670 156
C72H-1670A 156
C72H-1670D 156
C72H-1670ED 156
C72H-1674 156
C72H-1674A 156
C72H-1674D 156
C72H-1674EH 156
C72H-1676 156
C72H-1676A 156
C72H-1676D 156
C72H-1676EH 156
C72H-1678 156
C72H-1678A 156
C72H-1678D 156
C72H-1678ED 156
C72M-46R4 154
C72M-46R4 154
C72M-46R6 154
C72M-46R6 154
C72M-4C74 154
C72M-4C74 154
C72M-4C76 154
C72M-4C76 154
C72M-66R0 154
C72M-66R6 154
C72M-6C70 154
C72M-6C76 154
C72MFSU-4674 154
C72MFSU-4674A 154
C72MFSU-4674D 154
C72MFSU-4674EH 154
C72MFSU-4676 154
C72MFSU-4676A 154
C72MFSU-4676D 154
C72MFSU-4676EH 154
C72MU-4674 154
C72MU-4674A 154
C72MU-4674D 154
C72MU-4674EH 154
C72MU-4676 154
C72MU-4676A 154
C72MU-4676D 154
C72MU-4676EH 154
C72MX-6670 154
C72MX-6670A 154
C72MX-6670D 154
C72MX-6670ED 154
C72MX-6676 154
C72MX-6676A 154
C72MX-6676D 154
C72MX-6676EH 154
C72N-66R0 155
C72N-66R6 155
C72N-6C70 155
C72N-6C76 155
C72NX-6670 155
C72NX-6670A 155
C72NX-6670D 155
C72NX-6670ED 155
C72NX-6676 155
C72NX-6676A 155
C72NX-6676D 155
C72NX-6676EH 155
C72X-1670 156
C72X-1670A 156
C72X-1670D 156
C72X-1670ED 156
C72X-1674 156
C72X-1674A 156
C72X-1674D 156
C72X-1674EH 156
C72X-1676 156
C72X-1676A 156
C72X-1676D 156
C72X-1676EH 156
C72X-1678 156
C72X-1678A 156
C72X-1678D 156
C72X-1678ED 156
C74-16R-.02 157
C74-16R-.02 157
C74-16R-.05 157
C74-16R-.05 157
C74-16R-.1 157
C74-16R-.1 157
C74-1C7 157
C74H-1674-.02 157
C74H-1674-.02A 157
C74H-1674-.02D 157
C74H-1674-.02EH 157
C74H-1674-.05 157
C74H-1674-.05A 157
C74H-1674-.05D 157
C74H-1674-.05EH 157
C74H-1674-.1 157
C74H-1674-.1A 157
C74H-1674-.1D 157
C74H-1674-.1EH 157
C74N-66R-.01 155
C74N-66R-.02 155
C74N-66R-.03 155
C74N-6C7 155
C74NX-6674-.01 155

C74NX-6674-.01A 155
C74NX-6674-.01D 155
C74NX-6674-.01EH 155
C74NX-6674-.02 155
C74NX-6674-.02A 155
C74NX-6674-.02D 155
C74NX-6674-.02EH 155
C74NX-6674-.03 155
C74NX-6674-.03A 155
C74NX-6674-.03D 155
C74NX-6674-.03EH 155
C74X-1674-.02 157
C74X-1674-.02A 157
C74X-1674-.02D 157
C74X-1674-.02EH 157
C74X-1674-.05 157
C74X-1674-.05A 157
C74X-1674-.05D 157
C74X-1674-.05EH 157
C74X-1674-.1 157
C74X-1674-.1A 157
C74X-1674-.1D 157
C74X-1674-.1EH 157
C75-16R0 173
C75-16R6 173
C75-16R8 173
C75-1C70 173
C75-1C76 173
C75-1C78 173
C75H-1670A 173
C75H-1670D 173
C75H-1670EMT 173
C75H-1676A 173
C75H-1676D 173
C75H-1676EMH 173
C75H-1678A 173
C75H-1678D 173
C75H-1678EMT 173
C75N-66R0 172
C75N-66R6 172
C75N-66R8 172
C75N-6C70 172
C75N-6C76 172
C75N-6C78 172
C75NX-6670A 172
C75NX-6670D 172
C75NX-6670EMT 172
C75NX-6676A 172
C75NX-6676D 172
C75NX-6676EMH 172
C75NX-6678A 172
C75NX-6678D 172
C75NX-6678EMT 172
C8UW 116
C8UWE 109
C8W 115
C8WE 108
C9M1KF 74
C9M1PK 74
C9M2KF 74
C9M2PK 74
CBUCKF 73
CBUCPK 73
CBUCS6 73
CBUFLKF 76
CBUFLPK 76
CBUKF 73
CBULKF 73
CBULPK 73
CBULS6 73
CBUMKF 73
CBUMPK 73
CBUMS6 73
CBUPK 73
CBUS6 73
CCKF-5 71
CCPK-5 71
CD10-4841-M1A 82
CD50-8182-M2A 82
CEF1 43
CEF1.5 43
CEF1.5F 43
CEF1F 43
CEF2.51.0 43
CEF2.51.0F 43
CEF211.0 43
CEF211.0F 43
CEF212.0 43
CEF212.0F 43
CEF412.1 44
CEF412.1F 44
CEF413.0 44
CEF413.0F 44
CEF414.0 44
CEF414.0F 44
CEF414.6 44
CEF414.6F 44
CEN1KF 69
CEN1PK 69
CEN2KF 69
CEN2PK 69
CEPA2KF 77
CEPA2PK 77
CEPA4KF 77
CEPA4PK 77
CF-1A 69
CF-1BE 69
CF-1BK 69
CF-1BR 69
CF-1DG 69
CF-1E 69
CF-1G 69
CF-1L 69
CF-1N 69
CF-1P 69
CF-1R 69
CF-1W 69
CF-1Y 69
CF-2A 69
CF-2BE 69
CF-2BK 69
CF-2BR 69
CF-2DG 69
CF-2E 69
CF-2G 69
CF-2L 69
CF-2N 69
CF-2P 69
CF-2R 69
CF-2W 69
CF-2Y 69
CF-W1 69
CF-W2 69
CFE-S10 78
CFE-S2 78
CFE-S75 78
CFL-1A 68
CFL-1A-PK 68
CFL-1BE 68
CFL-1BK 68
CFL-1BR 68
CFL-1DG 68
CFL-1E 68
CFL-1G 68
CFL-1L 68
CFL-1N 68
CFL-1P 68
CFL-1PK 68
CFL-1R 68
CFL-1W 68
CFL-1Y 68
CFL-2A 68
CFL-2A-PK 68
CFL-2BE 68
CFL-2BK 68
CFL-2BR 68
CFL-2DG 68
CFL-2E 68
CFL-2G 68
CFL-2L 68
CFL-2N 68
CFL-2P 68
CFL-2PK 68
CFL-2R 68
CFL-2W 68
CFL-2Y 68
CFL-4D 72, 179
CFL-4KF 72, 179
CFL-4PPS 179
CFLAKF 76
CFLAPFA 76
CFLAPK 76
CFL-CB1KF 68
CFL-CB1PK 68
CFL-CB2KF 68
CFL-CB2PK 68
CFL-CB4KF-S 72, 179
CFPA2KF 77
CFPA2PK 77
CFPA4KF 77
CFPA4PK 77
CFS-A01010-010B 236
CFS-A01010-020B 236
CFS-A01010-040B 236
CFS-A01018-010B 236
CFS-A01018-018B 236
CFS-A01018-040B 236
CFS-A01525-010B 236
CFS-A01525-025B 236
CFS-A01525-050B 236
CFS-A01525-100B 236
CFS-A01525-150B 236
CFS-A01532-010B 236
CFS-A01532-025B 236
CFS-A01532-032B 236
CFS-A01532-050B 236
CFS-A01532-100B 236
CFS-A01532-200B 236
CFS-A01532-300B 236
CFS-A01532-400B 236
CFS-A01532-500B 236
CFS-A01553-015B 236
CFS-A01553-050B 236
CFS-A01553-100B 236
CFS-A01553-150B 236
CFS-A01553-300B 236
CFS-A01553-500B 236
CFS-A02010-010B 236
CFS-A02010-020B 236
CFS-A02010-04 0B 236
CFS-A03018-010B 236
CFS-A03018-018B 236
CFS-A03018-040B 236
CFS-A03018-100B 236
CFS-A03025-010B 236
CFS-A03025-025B 236
CFS-A03025-050B 236
CFS-A03025-100B 236
CFS-A03025-150B 236
CFS-A03032-010B 236
CFS-A03032-025B 236
CFS-A03032-032B 236
CFS-A03032-050B 236
CFS-A03032-100B 236
CFS-A03032-200B 236
CFS-A03032-300B 236
CFS-A03032-400B 236
CFS-A03032-500B 236
CFS-A03053-015B 236
CFS-A03053-050B 236
CFS-A03053-100B 236
CFS-A03053-150B 236
CFS-A03053-300B 236
CFS-A03053-500B 236
CFS-A04018-018B 236
CFS-A04018-040B 236
CFS-A06025-010B 236
CFS-A06025-025B 236
CFS-A06025-050B 236
CFS-A06025-100B 236
CFS-A06025-150B 236
CFS-A06032-010B 236
CFS-A06032-025B 236
CFS-A06032-032B 236
CFS-A06032-050B 236
CFS-A06032-100B 236
CFS-A06032-200B 236
CFS-A06032-300B 236
CFS-A06032-400B 236
CFS-A06032-500B 236
CFS-A06053-100B 236
CFS-A06053-150B 236
CFS-A06053-300B 236
CFS-A06053-500B 236
CFS-B01010-010B 237
CFS-B01010-020B 237
CFS-B01018-018B 237
CFS-B01018-040B 237
CFS-B01525-010B 237
CFS-B01525-025B 237
CFS-B01525-050B 237
CFS-B01525-100B 237
CFS-B01532-010B 237
CFS-B01532-025B 237
CFS-B01532-050B 237
CFS-B01532-100B 237
CFS-B01532-200B 237
CFS-B01532-300B 237
CFS-B01532-500B 237
CFS-B01553-050B 237
CFS-B01553-100B 237
CFS-B01553-150B 237
CFS-B01553-200B 237
CFS-B01553-265B 237
CFS-B01553-300B 237
CFS-B01553-500B 237
CFS-B02010-010B 237
CFS-B02010-020B 237
CFS-B02018-018B 237
CFS-B02018-040B 237

GENERAL REFERENCE

CFS-B03018-018B 237
CFS-B03018-040B 237
CFS-B03025-010B 237
CFS-B03025-025B 237
CFS-B03025-050B 237
CFS-B03025-100B 237
CFS-B03032-010B 237
CFS-B03032-025B 237
CFS-B03032-050B 237
CFS-B03032-100B 237
CFS-B03032-200B 237
CFS-B03032-300B 237
CFS-B03032-500B 237
CFS-B03053-050B 237
CFS-B03053-100B 237
CFS-B03053-150B 237
CFS-B03053-265B 237
CFS-B03053-300B 237
CFS-B03053-500B 237
CFS-B04018-018B 237
CFS-B04018-040B 237
CFS-B06025-010B 237
CFS-B06025-025B 237
CFS-B06025-050B 237
CFS-B06025-100B 237
CFS-B06032-010B 237
CFS-B06032-025B 237
CFS-B06032-050B 237
CFS-B06032-100B 237
CFS-B06032-200B 237
CFS-B06032-300B 237
CFS-B06032-500B 237
CFS-B06053-100B 237
CFS-B06053-150B 237
CFS-B06053-200B 237
CFS-B06053-265B 237
CFS-B06053-300B 237
CFS-B06053-500B 237
CFS-C01525-025B 236
CFS-C01525-050B 236
CFS-C01532-025B 236
CFS-C01532-050B 236
CFS-C01553-050B 236
CFS-C01553-100B 236
CFS-C03025-025B 236
CFS-C03025-050B 236
CFS-C03032-025B 236
CFS-C03032-050B 236
CFS-C03053-050B 236
CFS-C03053-100B 236
CFS-C06025-025B 236
CFS-C06025-050B 236
CFS-C06032-025B 236
CFS-C06032-050B 236
CFS-C06053-050B 236
CFS-C06053-100B 236
CFS-D01525-025B 237
CFS-D01525-050B 237
CFS-D01532-025B 237
CFS-D01532-050B 237
CFS-D01532-100B 237
CFS-D01553-050B 237
CFS-D01553-083B 237
CFS-D01553-100B 237
CFS-D03025-015B 237
CFS-D03025-025B 237
CFS-D03025-050B 237
CFS-D03032-025B 237
CFS-D03032-050B 237
CFS-D03032-100B 237
CFS-D03053-050B 237
CFS-D03053-083B 237
CFS-D03053-100B 237
CFS-D06025-025B 237
CFS-D06025-050B 237
CFS-D06032-025B 237
CFS-D06032-050B 237
CFS-D06032-100B 237
CFS-D06053-050B 237
CFS-E01018-100A 238
CFS-E01525-140A 238
CFS-E01532-180A 238
CFS-E01553-300A 238
CFS-E02018-100A 238
CFS-E02520-112A 238
CFS-E03018-100A 238
CFS-E03025-140A 238
CFS-E03032-180A 238
CFS-E03053-300A 238
CFS-E04018-100A 238
CFS-E06025-140A 238
CFS-E06032-180A 238
CFS-E06053-300A 238
CFS-E07553-300A 238
CFS-F01525-025A 238
CFS-F01525-050A 238
CFS-F01532-025A 238
CFS-F01532-050A 238
CFS-F01532-100A 238
CFS-F01553-050A 238
CFS-F01553-100A 238
CFS-F03025-025A 238
CFS-F03025-050A 238
CFS-F03032-025A 238
CFS-F03032-050A 238
CFS-F03032-100A 238
CFS-F03053-050A 238
CFS-F03053-100A 238
CFS-F06025-025A 238
CFS-F06025-050A 238
CFS-F06032-025A 238
CFS-F06032-050A 238
CFS-F06032-100A 238
CFS-F06053-050A 238
CFS-F06053-100A 238
CFS-G01010-010A 238
CFS-G01018-018A 238
CFS-G01525-025A 238
CFS-G01532-025A 238
CFS-G01532-050A 238
CFS-G01532-100A 238
CFS-G01553-050A 238
CFS-G01553-100A 238
CFS-G02010-010A 238
CFS-G02018-018A 238
CFS-G03025-025A 238
CFS-G03032-025A 238
CFS-G03032-050A 238
CFS-G03032-100A 238
CFS-G03053-050A 238
CFS-G03053-100A 238
CFS-G06025-025A 238
CFS-G06032-025A 238
CFS-G06032-050A 238
CFS-G06053-100A 238
CFS-N03025-025 235
CFS-N03053-100 235
CFS-PA1532-100 242
CFS-PA1553-200 242
CFS-PA3032-100 242
CFS-PA3053-200 242
CFS-PB1532-100 244
CFS-PB1553-200 244
CFS-PB3032-100 244
CFS-PB3053-200 244
CFS-PC1532-100 244
CFS-PC1553-200 244
CFS-PC3032-100 244
CFS-PC3053-200 244
CFS-PD1532-100 242
CFS-PD1553-200 242
CFS-PD3032-100 242
CFS-PD3053-200 242
CFS-PN1532-100 244
CFS-PN1553-200 244
CFS-PN3032-100 244
CFS-PN3053-200 244
CFS-PP1532-100 244
CFS-PP1553-200 244
CFS-PP3032-100 244
CFS-PP3053-200 244
CFS-PQ1532-100 242
CFS-PQ1553-200 242
CFS-PQ3032-100 242
CFS-PQ3053-200 242
CFS-PR1532-100 244
CFS-PR1553-200 244
CFS-PR3032-100 244
CFS-PR3053-200 244
CFS-PS1532-100 244
CFS-PS1553-200 244
CFS-PS3032-100 244
CFS-PS3053-200 244
CFS-X1553-200 240
CFS-X1553-500 240
CFS-X3053-200 240
CFS-X3053-500 240
CFS-Y1553-100 242
CFS-Y3053-100 242
CFS-Y5053-100 242
CFS-Z1553-100 242
CFS-Z3053-100 242
CFS-Z5053-100 242
CFSL100FEP 167, 185
CFSL100PK 167, 185
CFSL100TF 167, 185
CFSL1KFEP 167, 185
CFSL1KPK 167, 185
CFSL1KTF 167, 185
CFSL20FEP 167, 185
CFSL20PK 167, 185
CFSL20TF 167, 185
CFSL250FEP 167, 185
CFSL250PK 167, 185
CFSL250TF 167, 185
CFSL2KFEP 167, 185
CFSL2KPK 167, 185
CFSL2KTF 167, 185
CFSL500FEP 167, 185
CFSL500PK 167, 185
CFSL500TF 167, 185
CFSL50FEP 167, 185
CFSL50PK 167, 185
CFSL50TF 167, 185
CFT-110 70
CFT-220 70
CFT-H 70
CFT-R 70
CFT-TC 70
CFT-TL 70
CFT-TM 70
CFT-TXC 70
CFT-TXL 70
CFT1K-110 70
CFT1K-220 70
CFT2K-110 70
CFT2K-220 70
CGC41 75
CGC41KF 75
CGC42 75
CGC42KF 75
CGCB 75
CGCBKF 75
CGCG41 75
CGCG42 75
CGCN 75
CGCNKF 75
CGCR 75
CGCRKF 75
CGFT 67
CGFT 178
CI4UW.2 114
CI4UW.5 114
CI4UW1 114
CI4UW2 114
CI4UWE.2 105
CI4UWE.5 105
CI4UWE1 105
CI4UWE2 105
CI4W.06 114
CI4W.1 114
CI4W.2 114
CI4W.5 114
CI4WE.06 104
CI4WE.1 104
CI4WE.2 104
CI4WE.5 104
CM 203
CM1XKF 75
CM1XPK 75
CM2XKF 75
CM2XPK 75
CMH 208
CMH11H 208
CMH11L 208
CMH12H 208
CMH12L 208
CMH13 208
CMH13H 208
CMH13L 208
CMHMP 208
CMLAKF 76
CMLAPFA 76
CMLAPK 76
CNFT 67
CNNF1PK 178
CNV1A10S1 214
CNV1A150S1 214
CNV1A250S1 214
CNV1A500S1 214
CNV1A50S1 214
CNV1S10S1 214
CNV1S150S1 214
CNV1S250S1 214
CNV1S500S1 214
CNV1S50S1 214
CNVEKB 214
CNVEKG 214
CNVEKLB 214
CNVEKLG 214

CNVEKLR 214
CNVEKLS 214
CNVEKLU 214
CNVEKR 214
CNVEKS..... 214
CNVEKU 214
CP-4D 71
CP-4D 179
CP-4K.....71
CP-4K..... 179
CP-CM1-P.....83
CP-DSM 83
CP-DSM2 83
CP2-4841-100D 83
CP2-4841-100M1 83
CP2-4841-100SM.....83
CP3-8182-625D 83
CP3-8182-625M2 83
CP3-8182-625SM2 83
CPA2KF.....77
CPA2PK.....77
CPA4KF.....77
CPA4PK.....77
CPKF 71
CPPK 71
CR10 205
CR10 205
CR3..... 205
CR3..... 205
CR3..... 205
CR3..... 205
CR3..... 205
CR8..... 205
CR8..... 205
CSD10UW 134
CSD4UW..... 134
CSD6UW..... 134
CSL10 ..... 144, 156, 161, 180, 182
CSL100 .... 144, 156, 161, 180, 182
CSL100TI 161
CSL10K 144, 156, 161, 180, 182
CSL10TI..... 161
CSL1K 144, 156, 161, 180, 182
CSL1KTI..... 161
CSL2..... 144, 156, 161, 180, 182
CSL20 ..... 144, 156, 161, 180, 182
CSL20TI..... 161
CSL250 .... 144, 156, 161, 180, 182
CSL250TI 161
CSL2K 144, 156, 161, 180, 182
CSL5..... 144, 156, 161, 180, 182
CSL50 ..... 144, 156, 161, 180, 182
CSL500 .... 144, 156, 161, 180, 182
CSL500TI 161
CSL50TI..... 161
CSL5K 144, 156, 161, 180, 182
CSLN10K..... 144, 155, 158
CSLN10KPK..... 158
CSLN1K.....144, 158
CSLN1K5..... 155
CSLN1KPK 158
CSLN2K..... 144, 155, 158
CSLN2KPK 158
CSLN5K..... 144, 155, 158
CSLN5KPK 158
CSS-X1553-200 240
CSS-X3053-200 240
CSS-X3053-500 240
CST.....68
CST.....68
CTA2KF 76
CTA2PK.....76
CTA2S6 76
CTA4KF 76
CTA4PK.....76
CTA4S6 76
CTCKF 74
CTCPK 74
CTKF.....74
CTLKF 74
CTLPK 74
CTMKF.....74
CTMPK 74
CTPK 74
CU4LKF.....72
CU4LPK.....72
CUCKF.....72
CUCPK.....72
CUKF 72
CULKF 72
CULPK.....72
CUMKF 72
CUMPK 72
CUPK 72
CUTPP.....72
CVA10GS1 215
CVA10GS2 215
CVA150US1..... 215
CVA150US2..... 215
CVA1KYS1 215
CVA1KYS2 215
CVA500BS1 215
CVA500BS2 215
CVA50RS1 215
CVA50RS2 215
CXCKF 74
CXCPK.....74
CXKF 74
CXLKF 74
CXLPK.....74
CXMKF 74
CXMPK 74
CXPK 74
CZBUCKF 73
CZBUCPK.....73
CZBUCS6 73
CZBUKF.....73
CZBUMKF.....73
CZBUMPK.....73
CZBUMS6.....73
CZBUPK 73
CZBUS6.....73
CZSL100FEP 166, 184
CZSL100PK 161, 166, 180, 182, 184
CZSL100TF.....166, 184
CZSL10FEP 166, 184
CZSL10PK.. 161, 166, 180, 182, 184
CZSL10TF.....166, 184
CZSL1KFEP 166, 184
CZSL1KPK . 161, 166, 180, 182, 184
CZSL1KTF.....166, 184
CZSL20FEP 166, 184
CZSL20PK.. 161, 166, 180, 182, 184
CZSL20TF.....166, 184
CZSL250FEP 166, 184
CZSL250PK 161, 166, 180, 182, 184
CZSL250TF.....166, 184
CZSL2KFEP 166, 184
CZSL2KPK . 161, 166, 180, 182, 184
CZSL2KTF.....166, 184
CZSL2PK..... 161, 180, 182
CZSL500FEP 166, 184
CZSL500PK 161, 166, 180, 182, 184
CZSL500TF.....166, 184
CZSL50FEP 166, 184
CZSL50PK.. 161, 166, 180, 182, 184
CZSL50TF.....166, 184
CZSL5FEP.....166, 184
CZSL5KPK 161, 180, 182
CZSL5PK.....161, 166
CZSL5PK..... 180, 182, 184
CZSL5TF.....166, 184
CZUCKF 72
CZUCPK.....72
CZUCS6 72
CZUKF.....72
CZUMKF.....72
CZUMPK.....72
CZUMS6.....72
CZUPK.....72
CZUS6.....72
D-2 221
D-2-220..... 221
D-2-I..... 221
D-2-I-220 221
D-3-I-7890 223
D-3-I-7890-220..... 223
D-3-I-HP 223
D-3-I-HP-220..... 223
D-4-I..... 223
D-4-I-220 223
D-4-I-HP58..... 223
D-4-I-HP58-220 223
D-4-I-SH14-R..... 223
D-4-I-SH14-R-220 223
D-4-I-SH17-R..... 223
D-4-I-SH17-R-220 223
D-4-I-TQ-R 223
D-4-I-TQ-R-220..... 223
D-4-I-VA38-R..... 223
D-4-I-VA38-R-220 223
D10UW..... 117
D10UWE..... 112
D10UWT..... 113
D4UW 117
D4UWE..... 112
D4UWT..... 113
D6UW 117
D6UWE..... 112
D6UWT..... 113
D8UW 117
D8UWE..... 112
D8UWT..... 113
DC10UW..... 116
DC10UWE 109
DC10UWT 111
DC10W 115
DC10WE..... 108
DC10WT..... 110
DC4UW..... 116
DC4UWE..... 109
DC4UWT..... 111
DC4W 115
DC4WE 108
DC4WT 110
DC6UW..... 116
DC6UWE..... 109
DC6UWT..... 111
DC6W 115
DC6WE 108
DC6WT 110
DC8UW..... 116
DC8UWE..... 109
DC8UWT..... 111
DC8W 115
DC8WE 108
DC8WT 110
DCI4UW.2..... 114
DCI4UW.5..... 114
DCI4UW1 114
DCI4UW2 114
DCI4UWE.2 105
DCI4UWE.5 105
DCI4UWE1..... 105
DCI4UWE2..... 105
DCI4W.06..... 114
DCI4W.1 114
DCI4W.2 114
DCI4W.5 114
DCI4WE.06..... 104
DCI4WE.1..... 104
DCI4WE.2..... 104
DCI4WE.5..... 104
DCSC10MWE 126
DCSC12MWE 126
DCSC16MWE 126
DCSC6MWE..... 126
DCSD10MWE 124
DCSD10UW..... 134
DCSD12MWE 124
DCSD16MWE 124
DCSD4UW 134
DCSD6MWE 124
DCSD6UW 134
DCSF10MWE..... 128
DCSF12MWE..... 128
DCSF16MWE..... 128
DCSF6MWE..... 128
DCST10MWE..... 130
DCST12MWE..... 130
DCST16MWE..... 130
DCST4UW 135
DCST6MWE..... 130
DCST6UW 135
DCSTF10MWE 132
DCSTF12MWE 132
DCSTF16MWE 132
DCSTF6MWE..... 132
DI4UWE.2..... 105
DI4UWE.5..... 105
DI4UWE1 105
DI4UWE2 105
DL10UW..... 118
DL4UW 118
DL6UW 118
DL8UW 118
DN10WE..... 106
DN10WT..... 107
DN4WE 106
DN4WT..... 107
DN6WE 106
DN6WT..... 107
DN8WE..... 106
DN8WT..... 107
DNI4WE.06 104
DNI4WE.1..... 104
DNI4WE.2..... 104
DNI4WE.5..... 104
DSC10MWE..... 127
DSC12MWE..... 127

GENERAL REFERENCE

DSC16MWE ... 127
DSC6MWE ... 127
DSD10MWE ... 125
DSD12MWE ... 125
DSD16MWE ... 125
DSD4UW ... 134
DSD6MWE ... 125
DSD6UW ... 134
DSD8UW ... 134
DSF10MWE ... 129
DSF12MWE ... 129
DSF16MWE ... 129
DSF6MWE ... 129
DST10MWE ... 131
DST12MWE ... 131
DST16MWE ... 131
DST6MWE ... 131
DSTF10MWE ... 133
DSTF12MWE ... 133
DSTF16MWE ... 133
DSTF6MWE ... 133
DV12-1110 ... 144
DV12-1114-.5 ... 144
DV12-1114-1 ... 144
DV12-1116 ... 144
DV22-2110 ... 144
DV22-2114-.5 ... 144
DV22-2114-1 ... 144
DV22-2116 ... 144
DV22-21D ... 144
DV22-21D ... 144
DV22-22D ... 144
DV22-3110 ... 144
DV22-3114-.5 ... 144
DV22-3114-1 ... 144
DV22-3116 ... 144
DV22-31D ... 144
DVBRKIT ... 32, 33, 144
DVI ... 199
DVI-220 ... 199
DVL4MWE2 ... 112
DVL6MWE2 ... 112
DVL8MWE2 ... 112
DVLSC4MWE2 ... 127
DVLSC6MWE2 ... 127
DVLSC8MWE2 ... 127
DVLSD10MWE2 ... 125
DVLSD4MWE2 ... 125
DVLSD6MWE2 ... 125
DVLSD8MWE2 ... 125
DVLSF4MWE2 ... 129
DVLSF6MWE2 ... 129
DVLSF8MWE2 ... 129
EAOR21 ... 216
EAOR22 ... 216
EBRU12L6 ... 30
EBRU12T ... 30
EBRU14L ... 30
EBRU14T ... 30
EBRU24L ... 30
EBU2L ... 27
EBU2T ... 27
EBU4 ... 27
EBU4L ... 27
EBU4T ... 27
ECEF111.0 ... 43
ECEF111.0F ... 43
ECEF1K1 ... 45
ECEF1K1F ... 45
ECEF211.0 ... 43
ECEF211.0F ... 43
ECEF412.1 ... 44
ECEF412.1F ... 44
ECEF413.0 ... 44
ECEF413.0F ... 44
ECEF414.0 ... 44
ECEF414.0F ... 44
ECEF414.6 ... 44
ECEF414.6F ... 44
ECEF616.0 ... 45
ECEF616.0F ... 45
ECEF617.0 ... 45
ECEF617.0F ... 45
ECEF8110.0 ... 45
ECEF8110.0F ... 45
ECEF819.0 ... 45
ECEF819.0F ... 45
ED ... 190
ED10UW ... 117
ED2 ... 190
ED2CI4UWE.2 ... 105
ED2CI4UWE.5 ... 105
ED2CI4UWE1 ... 105
ED2CI4UWE2 ... 105
ED2I4UWE.2 ... 105
ED2I4UWE.5 ... 105
ED2I4UWE1 ... 105
ED2I4UWE2 ... 105
ED410UWE ... 112
ED410UWT ... 113
ED44UWE ... 112
ED44UWT ... 113
ED46UWE ... 112
ED46UWT ... 113
ED48UWE ... 112
ED48UWT ... 113
ED4C10UWE ... 109
ED4C10UWT ... 111
ED4C4UWE ... 109
ED4C4UWT ... 111
ED4C6UWE ... 109
ED4C6UWT ... 111
ED4C8UWE ... 109
ED4C8UWT ... 111
ED4UW ... 117
ED6UW ... 117
ED8UW ... 117
EDC10UW ... 116
EDC4UW ... 116
EDC6UW ... 116
EDC8UW ... 116
EDCI4UW.2 ... 114
EDCI4UW.5 ... 114
EDCI4UW1 ... 114
EDCI4UW2 ... 114
EDL10UW ... 118
EDL4UW ... 118
EDL6UW ... 118
EDL8UW ... 118
EDS ... 190
EH ... 190
EH2 ... 190
EH4C10WE ... 108
EH4C10WT ... 110
EH4C4WE ... 108
EH4C4WT ... 110
EH4C6WE ... 108
EH4C6WT ... 110
EH4C8WE ... 108
EH4C8WT ... 110
EH4N10WE ... 106
EH4N10WT ... 107
EH4N4WE ... 106
EH4N4WT ... 107
EH4N6WE ... 106
EH4N6WT ... 107
EH4N8WE ... 106
EH4N8WT ... 107
EHS ... 190
EMH ... 192
EMH2 ... 192
EMHS ... 192
EMT ... 192
EMT2 ... 192
EMT2CSC10MWE ... 126
EMT2CSC12MWE ... 126
EMT2CSC16MWE ... 126
EMT2CSC6MWE ... 126
EMT2CSD10MWE ... 124
EMT2CSD12MWE ... 124
EMT2CSD16MWE ... 124
EMT2CSD6MWE ... 124
EMT2CSF10MWE ... 128
EMT2CSF12MWE ... 128
EMT2CSF16MWE ... 128
EMT2CSF6MWE ... 128
EMT2CST10MWE ... 130
EMT2CST12MWE ... 130
EMT2CST16MWE ... 130
EMT2CST6MWE ... 130
EMT2CSTF10MWE ... 132
EMT2CSTF12MWE ... 132
EMT2CSTF16MWE ... 132
EMT2CSTF6MWE ... 132
EMT2SC10MWE ... 127
EMT2SC12MWE ... 127
EMT2SC16MWE ... 127
EMT2SC6MWE ... 127
EMT2SD10MWE ... 125
EMT2SD12MWE ... 125
EMT2SD16MWE ... 125
EMT2SD6MWE ... 125
EMT2SF10MWE ... 129
EMT2SF12MWE ... 129
EMT2SF16MWE ... 129
EMT2SF6MWE ... 129
EMT2ST10MWE ... 131
EMT2ST12MWE ... 131
EMT2ST16MWE ... 131
EMT2ST6MWE ... 131
EMT2STF10MWE ... 133
EMT2STF12MWE ... 133
EMT2STF16MWE ... 133
EMT2STF6MWE ... 133
EMT2VLSC4MWE2 ... 127
EMT2VLSC6MWE2 ... 127
EMT2VLSC8MWE2 ... 127
EMT2VLSD10MWE2 ... 125
EMT2VLSD4MWE2 ... 125
EMT2VLSD6MWE2 ... 125
EMT2VLSD8MWE2 ... 125
EMT2VLSF4MWE2 ... 129
EMT2VLSF6MWE2 ... 129
EMT2VLSF8MWE2 ... 129
EMTCSD10UW ... 134
EMTCSD4UW ... 134
EMTCSD6UW ... 134
EMTCST4UW ... 135
EMTCST6UW ... 135
EMTS ... 192
EMTSD4UW ... 134
EMTSD6UW ... 134
EMTSD8UW ... 134
EN.5 ... 11
EN.5KN ... 11
EN1 ... 11
EN1K ... 11
EN2 ... 11
EN2SI ... 41
EN4 ... 11
EN6 ... 11
EN8 ... 11
EP ... 190
EP2 ... 190
EP2CI4WE.06 ... 104
EP2CI4WE.1 ... 104
EP2CI4WE.2 ... 104
EP2CI4WE.5 ... 104
EP2NI4WE.06 ... 104
EP2NI4WE.1 ... 104
EP2NI4WE.2 ... 104
EP2NI4WE.5 ... 104
EPC10W ... 115
EPC4W ... 115
EPC6W ... 115
EPC8W ... 115
EPCI4W.06 ... 114
EPCI4W.1 ... 114
EPCI4W.2 ... 114
EPCI4W.5 ... 114
EPS ... 190
EQ ... 190
EQ2 ... 190
EQS ... 190
ERU21 ... 30
ERU21L ... 30
ERU21T ... 30
ERU41 ... 30
ERU41T ... 30
ERU42 ... 30
ERU42L ... 30
ERU42T ... 30
ET ... 190
ET2 ... 190
ET4VL4MWE2 ... 112
ET4VL6MWE2 ... 112
ET4VL8MWE2 ... 112
ETS ... 190
EU.5 ... 19
EU.5 ... 27
EU.5L ... 19
EU.5L ... 27
EU.5T ... 27
EU.5TFS.25-5 ... 19
EU2 ... 27
EU2L ... 27
EU2T ... 27
EU4 ... 27
EU4L ... 27
EU4T ... 27
EUD ... 193
EUDA ... 193
EUDB ... 193
EUDC ... 193
EUH ... 193
EUHA ... 193
EUHB ... 193
EUHC ... 193
EUT ... 193
EUTA ... 193

EUTB 193
EUTC 193
EZA1 39
EZA2 39
EZBRU.51 31
EZBRU.51L 31
EZBRU.51T 31
EZBRU1.5L 31
EZBRU1.5T 31
EZBRU2.5L 31
EZBRU2.5T 31
EZBRU21 31
EZBRU21T 31
EZBRU41 31
EZBRU41T 31
EZBRU42 31
EZBRU42L 31
EZBRU42T 31
EZBU1 27
EZBU1C 27
EZBU1M 27
EZBU1T 27
EZBU2 27
EZBU2L 27
EZBU2T 27
EZR1.5 39
EZR1.5T 39
EZR2.5 39
EZR21 39
EZR21T 39
EZR41 39
EZR41T 39
EZR42 39
EZR42T 39
EZRF1.5KF-5 15
EZRF1.5PK-5 15
EZRF1.5TFG-5 15
EZRF1.5V-5 15
EZRF2.5KF-5 15
EZRF2.5PK-5 15
EZRF2.5TFG-5 15
EZRF2.5V-5 15
EZRF21KF-5 15
EZRF21PK-5 15
EZRF21TFG-5 15
EZRF21V-5 15
EZRF41KF-5 15
EZRF41PK-5 15
EZRF41TFG-5 15
EZRF41V-5 15
EZRF42KF-5 15
EZRF42PK-5 15
EZRF42TFG-5 15
EZRF42V-5 15
EZRU.51 31
EZRU.51L 31
EZRU.51T 31
EZRU1.5 31
EZRU1.5L 31
EZRU1.5T 31
EZRU2.5 31
EZRU2.5L 31
EZRU2.5T 31
EZRU21 31
EZRU21C 31
EZRU21T 31
EZRU41 31
EZRU41C 31
EZRU41T 31
EZRU42 31
EZRU42L 31
EZRU42T 31
EZU.5 27
EZU.5L 27
EZU1 27
EZU1C 27
EZU1M 27
EZU1T 27
EZU2 27
EZU2L 27
EZU2T 27
F-TCF 197
FC10AS1K 216
FC10AS1S3 216
FC10AS1S4 216
FC10AS2K 216
FC10AS2S3 216
FC10AS2S4 216
FC10AS3K 216
FC10AS3S3 216
FC10AS3S4 216
FC10AS4K 216
FC10AS4S3 216
FC10AS4S4 216
FC10AS5K 216
FC10AS5S3 216
FC10AS5S4 216
FC10AS6K 216
FC10AS6S3 216
FC10AS6S4 216
FC10AV1K 216
FC10AV1S3 216
FC10AV1S4 216
FC10AV2K 216
FC10AV2S3 216
FC10AV2S4 216
FC10AV3K 216
FC10AV3S3 216
FC10AV3S4 216
FC10AV4K 216
FC10AV4S3 216
FC10AV4S4 216
FC10AV5K 216
FC10AV5S3 216
FC10AV5S4 216
FC10AV6K 216
FC10AV6S3 216
FC10AV6S4 216
FC10SS1K 216
FC10SS1S3 216
FC10SS1S4 216
FC10SS2K 216
FC10SS2S3 216
FC10SS2S4 216
FC10SS3K 216
FC10SS3S3 216
FC10SS3S4 216
FC10SS4K 216
FC10SS4S3 216
FC10SS4S4 216
FC10SS5K 216
FC10SS5S3 216
FC10SS5S4 216
FC10SS6K 216
FC10SS6S3 216
FC10SS6S4 216
FC10SV1K 216
FC10SV1S3 216
FC10SV1S4 216
FC10SV2K 216
FC10SV2S3 216
FC10SV2S4 216
FC10SV3K 216
FC10SV3S3 216
FC10SV3S4 216
FC10SV4K 216
FC10SV4S3 216
FC10SV4S4 216
FC10SV5K 216
FC10SV5S3 216
FC10SV5S4 216
FC10SV6K 216
FC10SV6S3 216
FC10SV6S4 216
FC22AS1K 217
FC22AS1S3 217
FC22AS1S4 217
FC22AV1K 217
FC22AV1S3 217
FC22AV1S4 217
FC22SS1K 217
FC22SS1S3 217
FC22SS1S4 217
FC22SV1K 217
FC22SV1S3 217
FC22SV1S4 217
FC30AS1K 217
FC30AS1S3 217
FC30AS1S4 217
FC30AS2K 217
FC30AS2S3 217
FC30AS2S4 217
FC30AS3K 217
FC30AS3S3 217
FC30AS3S4 217
FC30AS4K 217
FC30AS4S3 217
FC30AS4S4 217
FC30AV1K 217
FC30AV1S3 217
FC30AV1S4 217
FC30AV2K 217
FC30AV2S3 217
FC30AV2S4 217
FC30AV3K 217
FC30AV3S3 217
FC30AV3S4 217
FC30AV4K 217
FC30AV4S3 217
FC30AV4S4 217
FC30SS1K 217
FC30SS1S3 217
FC30SS1S4 217
FC30SS2K 217
FC30SS2S3 217
FC30SS2S4 217
FC30SS3K 217
FC30SS3S3 217
FC30SS3S4 217
FC30SS4K 217
FC30SS4S3 217
FC30SS4S4 217
FC30SV1K 217
FC30SV1S3 217
FC30SV1S4 217
FC30SV2K 217
FC30SV2S3 217
FC30SV2S4 217
FC30SV3K 217
FC30SV3S3 217
FC30SV3S4 217
FC30SV4K 217
FC30SV4S3 217
FC30SV4S4 217
FC31AV1 217
FP1Z3M21 34
FP1Z3M22 34
FP1Z3M24 34
FP1Z3M41 34
FP1Z3M42 34
FP1Z3M44 34
FP2Z3M21 34
FP2Z3M22 34
FP2Z3M24 34
FP2Z3M41 34
FP2Z3M42 34
FP2Z3M44 34
FPEA22 36
FPEA24 36
FPEA42 36
FPEA44 36
FPEA82 36
FPEA84 36
FPZA21 35
FPZA22 35
FPZA22L 35
FPZA41 35
FPZA42 35
FPZA42L 35
FPZA44L 35
FPZA81 35
FPZA82 35
FPZA82L 35
FPZA84L 35
FRK1 ..... 16, 54
FRK2 ..... 16, 54
FS.2-5 16
FS.25-5 16
FS.25PK-5 16
FS.25V1-5 16
FS.36-5 16
FS.4-5 16
FS.4PK-5 16
FS.4V1-5 16
FS.5-5 16
FS.5PK-5 16
FS.5PK-5 16
FS.5V1-5 16
FS1.2-5 16
FS1.25-5 16
FS1.25PK-5 16
FS1.25V1-5 16
FS1.2PK-5 16
FS1.2V1-5 16
FS1.3-5 16
FS1.35-R10 18
FS1.35-R10 18
FS1.3PK-5 16
FS1.3V1-5 16
FS1.4-5 16
FS1.45-R10 18
FS1.45-R10 18
FS1.4PK-5 16
FS1.4V1-5 16
FS1.5-5 16
FS1.5PK-5 16
FS1.5V1-5 16
FS1.75-R10 18
FS1.75-R10 18
FS1.8-5 16

GENERAL REFERENCE

FS1.8PK-5....16
FS1.8V1-5....16
FS1.9-5....16
FS1.9PK-5....16
FS1.9V1-5....16
FS11.0-5....16
FS11.0PK-5....16
FS11.0V1-5....16
FS1L.15PK-5....17
FS1L.2-5....17
FS1L.2PK-5....17
FS1L.4-5....17
FS1L.4PK-5....17
FS1L.5-5....17
FS1L.5PK-5....17
FS1L.8-5....17
FS1L.8PK-5....17
FS1L1.0-5....17
FS1L1.0PK-5....17
FS1R.15PK-5....17
FS1R.2-5....17
FS1R.2PK-5....17
FS1R.4-5....17
FS1R.4PK-5....17
FS1R.5-5....17
FS1R.5PK-5....17
FS1R.8-5....17
FS1R.8PK-5....17
FS1R1.0-5....17
FS1R1.0PK-5....17
FSL.25-5....17
FSL.4-5....17
FSL.5-5....17
FSMUA1.5....20
FSMUAS1.5....20
FSMUAS1.5L....20
FSMUAS1.5M....20
FSR.25-5....17
FSR.3-5....17
FSR.4-5....17
FSR.5-5....17
FSZA-HP....18
FSZNA-HP....18
HA1....202
HA1T....202
HA2....202
HA3....202
HA6....202
HB....202
HB1N....202
HBS....202
HCE1....203
HCE1X....203
HCE2....203
HCE2X....203
HCEB....203
HCEBX....203
HCEC....203
HCECX....203
HKS....54
HKS....210
HP2-110....226
HP2-220....226
HPM-110....227
HPM-220....227
HSSA....199
HVE2....201
HVE2X....201
HVE3....201
HVE3X....201
HVE6....201
HVE6X....201
HVEA....201
HVEAN....201
HVEANX....201
HVEAX....201
HVEB....201
HVEBN....201
HVEBNX....201
HVEBX....201
HVEC....201
HVECX....201
HWSC-SC8-6....205
HWSC-SC8-8B....205
HWSC-SC8-8B....205
HWSC-SC8-8B....205
HWSC-SC8-8B....205
HWSC-SC8-8B....205
HWSC-SC8-8B....205
HWSC-SC8-8TDH....205
HWSC-SC8-8TDH....205
I-21014-01....203
I-21208-05....202
I-21208-06....202
I-21208-33....202
I-22697....175, 191, 192, 195
I-22897-02....191, 195
I-22897-03....191, 195
I-22897-04....191, 195
I-22897-05....191, 195
I-22897-06....191, 195
I-22897-08....191, 195
I-23572HP2....226
I-23572NP2....226
I4UWE.2....105
I4UWE.5....105
I4UWE1....105
I4UWE2....105
ITC10399....203
ITC10399-220....203
IZERA1.5....21
IZERA1.5C....21
IZERA1.5M....21
IZN1-10....10
IZR1.5....38
IZR1.5F....38
IZR1.5L....38
IZR1.5LF....38
IZR1.5T....38
IZR21....38
IZR21C....38
IZR21CF....38
IZR21F....38
IZR21L....38
IZR21LF....38
IZR21T....38
IZR41....38
IZR41F....38
IZR42....38
IZR42F....38
IZR42L....38
IZR42LF....38
JR-201540....71
JR-26501....77
JR-26502....77
JR-26503....77
JR-26504....77
JR-32178....80
JR-32179....80
JR-357090-5....90
JR-357180-5....90
JR-35P....67
JR-367008-10....80
JR-367008-2....80
JR-367008-20....80
JR-367016-10....80
JR-367016-2....80
JR-367016-20....80
JR-55010-5....66
JR-55011-5....66
JR-55012-5....66
JR-55013-5....66
JR-55014-5....66
JR-55015-5....66
JR-55016-12....66
JR-55020-5....66
JR-55021-5....66
JR-55022-5....66
JR-55023-5....66
JR-55024-5....66
JR-55025-5....66
JR-5508-5....66
JR-797....92
JR-798....92
JR-9000-0520....79
JR-9000-0530....79
JR-9000-0602....79
JR-9000-0640....79
JR-9001-5....92
JR-S-11001....81
JR-S-11002....81
JR-S-11003....81
JR-T-5804....91
JR-T-5999....91
JR-T-6000....91
JR-T-6001....91
JR-T-6002....91
JR-T-6003....91
JR-T-60031....91
JR-T-98013....91
JR-T-98017....91
JR-T-98025....91
JR-T-98050....91
JR-T-98075....91
JR-T-98200....91
JR-TD-5804....91
JR-TD-6007....91
JR-TD-6008....91
JR-TD-6009....91
JR-TD-6010....91
JR-TD-6011....91
L4UW....118
L6UW....118
L8UW....118
LNR-CIS4-B-5....245
LNR-DGS4-5....245
LNR-GS2-5....245
LNR-GS4-5....245
LNR-HP2-5....245
LNR-HP4-5....245
LNR-VAR3.4-5....245
LNR-VARGS2-5....245
LZN.5-10....10
LZN.5FPK-10....63
LZN1-10....10
LZN1PK-10....63
LZN2-10....10
LZN4-10....10
LZNF1KF-5....62
LZNF1PK-5....62
LZNF1PKG-5....62
LZP.5FPK....64
LZP1....11
LZP1H....11
LZP1PK....64
LZP1PK....71
LZP2....11
LZP2H....11
MR....55, 211
MRX.5PK....23
MRX.5S6....23
MRX1PK....23
MRX1S6....23
MRY.5PK....23
MRY.5S6....23
MRY1PK....23
MRY1S6....23
MT.5CHC....23
MT.5CKF....23
MT.5CPK....23
MT.5CS6....23
MT.5CTI....23
MT.5XCHC....23
MT.5XCKF....23
MT.5XCPK....23
MT.5XCS6....23
MT.5XCTI....23
MT1CHC....23
MT1CKF....23
MT1CPK....23
MT1CS6....23
MT1CTI....23
MT1XCHC....23
MT1XCKF....23
MT1XCPK....23
MT1XCS6....23
MT1XCTI....23
MU.5CHC....23
MU.5CKF....23
MU.5CPK....23
MU.5CS6....23
MU.5CTI....23
MU.5XCHC....23
MU.5XCKF....23
MU.5XCPK....23
MU.5XCS6....23
MU.5XCTI....23
MU1CHC....23
MU1CKF....23
MU1CPK....23
MU1CS6....23
MU1CTI....23
MU1XCHC....23
MU1XCKF....23
MU1XCPK....23
MU1XCS6....23
MU1XCTI....23
MX.5CHC....23
MX.5CKF....23
MX.5CPK....23
MX.5CS6....23
MX.5CTI....23
MX.5XCHC....23
MX.5XCKF....23
MX.5XCPK....23
MX.5XCS6....23
MX.5XCTI....23
MX1CHC....23
MX1CKF....23
MX1CPK....23

MX1CS6 23
MX1CTI 23
MX1XCHC 23
MX1XCKF 23
MX1XCPK 23
MX1XCS6 23
MX1XCTI 23
MY.5CHC 23
MY.5CKF 23
MY.5CPK 23
MY.5CS6 23
MY.5CTI 23
MY.5XCHC 23
MY.5XCKF 23
MY.5XCPK 23
MY.5XCS6 23
MY.5XCTI 23
MY1CHC 23
MY1CKF 23
MY1CPK 23
MY1CS6 23
MY1CTI 23
MY1XCHC 23
MY1XCKF 23
MY1XCPK 23
MY1XCS6 23
MY1XCTI 23
MZN1-10 10
MZN1PK-10 63
MZNF1KF-5 62
MZNF1PK-5 62
MZNF1PKG-5 62
MZP1PK 64, 71
NP2-110 226
NP2-220 226
NPM-110 227
NPM-220 227
OEW 55, 210
OEW-2 ..... 55, 210
OEW-3 ..... 55, 210
OR 197
ORMP 196
ORT 197
ORTMP 196
P100-1 247
P100-2 247
P200-1 247
P200-2 247
P300-1 247
P300-2 247
P310-1 247
P310-2 247
P350-1 247
P350-2 247
P400-1 247
P400-2 247
P500-1 247
P500-2 247
P600-1 247
P600-2 247
P700-1 247
P700-2 247
PCL412 47
PCL415 47
PCS412F 47
PCS415F 47
PD-D2-IM 222
PEA22 36
PEA24 36
PEA42 36
PEA44 36
PEA82 36
PEA84 36
PFAF 199
PFC2 199
PFC4 199
PFC4 199
PFW36 199
PFW60 199
PFW90 199
PM 210
PR50A15E2 219
PR50A15Z1 219
PR50A15Z2 219
PR50A30E2 219
PR50A30Z1 219
PR50A30Z2 219
PR50A60E2 219
PR50A60Z1 219
PR50A60Z2 219
PR51A15E2 219
PR51A15Z1 219
PR51A15Z2 219
PR51A30E2 219
PR51A30Z1 219
PR51A30Z2 219
PR51A60E2 219
PR51A60Z1 219
PR51A60Z2 219
PS-050023 249
PS-050024 249
PS-050025 249
PS-050031 249
PS-050032 249
PS-050033 249
PS-050034 249
PS-050035 249
PS-050036 249
PS-050043 249
PS-050044 249
PS-050045 249
PS-050051 249
PS-050052 249
PS-050053 249
PS-050054 249
PS-050055 249
PS-050056 249
PS-123050R 250
PS-160021 250
PS-160021R 250
PS-160022 250
PS-160022R 250
PS-160023 250
PS-160023R 250
PS-160024 250
PS-160024R 250
PS-160025 250
PS-160025R 250
PS-160221 250
PS-160221R 250
PS-160222 250
PS-160222R 250
PS-160223 250
PS-160223R 250
PS-160224 250
PS-160224R 250
PS-160225 250
PS-160225R 250
PS-614158 ..... 81, 251
PS-614160 ..... 81, 251
PS-614161 81
PS-614163 ..... 81, 251
PS-614170 ..... 81, 251
PS-614250 ..... 81, 251
PS-631201 251
PS-631202 251
PS-631203 251
PS-631204 251
PS-631205 251
PS-631206 251
PS-644350 251
PS-644850 251
PS-654050 251
PS-654051 251
PS-660100 248
PS-660110 248
PS-660200 248
PS-660210 248
PS-660300 248
PS-660310 248
PS-660320 248
PS-943050 249
PS-943051 249
PS-943052 249
PS-943060 249
PS-943061 249
PS-943062 249
PV 55, 211
PZA21 35
PZA21T 35
PZA22 35
PZA41 35
PZA42 35
PZA42L 35
PZA44L 35
PZA81 35
PZA82 35
PZA82L 35
PZA84L 35
RAD 204
RF1.5KF-5 15
RF1.5PK-5 15
RF1.5TFG-5 15
RF1.5V-5 15
RF2.5KF-5 15
RF2.5PK-5 15
RF2.5TFG-5 15
RF2.5V-5 15
RF21KF-5 15
RF21PK-5 15
RF21TFG-5 15
RF21V-5 15
RF41KF-5 15
RF41PK-5 15
RF41TFG-5 15
RF41V-5 15
RF42KF-5 15
RF42PK-5 15
RF42TFG-5 15
RF42V-5 15
SD4UW 134
SD6UW 134
SD8UW 134
SEAL1-HP 18
SFEC42 47
SFECH412 47
SFV 213
SFVHT 213
SFVHT4 213
SFVL 213
SFVLHT 213
SFVLHT4 213
SFVO 213
SFVOHT 213
SFVOHT4 213
SFVOL 213
SFVOLHT 213
SFVOLHT4 213
SI4G 41
SL100CSTP 130
SL100CSTUW 135
SL100CUW 109, 111, 116
SL100CW 108, 110, 115
SL100NW 106, 107
SL100STP 131
SL100UW 113, 117, 118
SL10CSTUW 135
SL10CUW 109, 111, 116
SL10CW 108, 110, 115
SL10KCSTP 130
SL10KCSTUW 135
SL10KCUW 109, 111, 116
SL10KCW 108, 110, 115
SL10KSTP 131
SL10KUW 113, 117, 118
SL10NW 107
SL10UW 113, 117
SL15CSTUW 135
SL15CUW 109, 111, 116
SL15CW 108, 110, 115
SL15NW 107, 113
SL15UW 117
SL1KCSTP 130
SL1KCSTUW 135
SL1KCUW 109, 111, 116
SL1KCW 108, 110, 115
SL1KSTP 131
SL1KUW 113, 117, 118
SL20CSTUW 135
SL20CUW 109, 111, 116
SL20CW 108, 110, 115
SL20KUW 113, 117, 118
SL20NW 107
SL20UW 113, 117
SL250CSTP 130
SL250CSTUW 135
SL250CUW 109, 111, 116
SL250CW 108, 110, 115
SL250NW 106, 107
SL250STP 131
SL250UW 113, 117, 118
SL25CSTUW 135
SL25CUW 109, 111, 116
SL25CW 108, 110, 115
SL25NW 106, 107
SL25UW 113, 117
SL2CW 108, 110, 115
SL2KCSTP 130
SL2KCSTUW 135
SL2KCUW 109, 111, 116
SL2KCW 108, 110, 115
SL2KSTP 131
SL2KUW 113, 117, 118
SL3CUW 116
SL500CSTP 130
SL500CSTUW 135
SL500CUW 109
SL500CUW 111, 116
SL500CW 108, 110, 115
SL500NW 106, 107

GENERAL REFERENCE

SL500STP 131
SL500UW 113, 117, 118
SL50CSTP 130
SL50CSTUW 135
SL50CUW 109, 111, 116
SL50CW 108, 110, 115
SL50NW 106, 107
SL50UW 113, 117
SL5CUW 109, 111
SL5CUW 116
SL5CW 108, 110, 115
SL5KCSTP 130
SL5KCSTUW 135
SL5KCUW 109
SL5KCUW 111, 116
SL5KCW 108, 110
SL5KSTP 131
SL5KUW 113, 117, 118
SL5NW 107
SOMAP 204
SOMAPPF 204
SOMAW 204
SOUTH 204
SPSS40 84
SSA10UW 117
SSA10UWE 112
SSA10UWT 113
SSA4UW 117
SSA4UWE 112
SSA4UWT 113
SSA6UW 117
SSA6UWE 112
SSA6UWT 113
SSA8UW 117
SSA8UWE 112
SSA8UWT 113
SSAC10UW 116
SSAC10UWE 109
SSAC10UWT 111
SSAC10W 115
SSAC10WE 108
SSAC10WT 110
SSAC4UW 116
SSAC4UWE 109
SSAC4UWT 111
SSAC4W 115
SSAC4WE 108
SSAC4WT 110
SSAC6UW 116
SSAC6UWE 109
SSAC6UWT 111
SSAC6W 115
SSAC6WE 108
SSAC6WT 110
SSAC8UW 116
SSAC8UWE 109
SSAC8UWT 111
SSAC8W 115
SSAC8WE 108
SSAC8WT 110
SSACI4UW.2 114
SSACI4UW.5 114
SSACI4UW1 114
SSACI4UW2 114
SSACI4UWE.2 105
SSACI4UWE.5 105
SSACI4UWE1 105
SSACI4UWE2 105
SSACI4W.06 114
SSACI4W.1 114
SSACI4W.2 114
SSACI4W.5 114
SSACI4WE.06 104
SSACI4WE.1 104
SSACI4WE.2 104
SSACI4WE.5 104
SSACSC10MWE 126
SSACSC12MWE 126
SSACSC16MWE 126
SSACSC6MWE 126
SSACSD10MWE 124
SSACSD10UW 134
SSACSD12MWE 124
SSACSD16MWE 124
SSACSD4UW 134
SSACSD6MWE 124
SSACSD6UW 134
SSACSF10MWE 128
SSACSF12MWE 128
SSACSF16MWE 128
SSACSF6MWE 128
SSACST10MWE 130
SSACST12MWE 130
SSACST16MWE 130
SSACST4UW 135
SSACST6MWE 130
SSACST6UW 135
SSACSTF10MWE 132
SSACSTF12MWE 132
SSACSTF16MWE 132
SSACSTF6MWE 132
SSAI4UWE.2 105
SSAI4UWE.5 105
SSAI4UWE1 105
SSAI4UWE2 105
SSAL10UW 118
SSAL4UW 118
SSAL6UW 118
SSAL8UW 118
SSAN10WE 106
SSAN10WT 107
SSAN4WE 106
SSAN4WT 107
SSAN6WE 106
SSAN6WT 107
SSAN8WE 106
SSAN8WT 107
SSANI4WE.06 104
SSANI4WE.1 104
SSANI4WE.2 104
SSANI4WE.5 104
SSASC10MWE 127
SSASC12MWE 127
SSASC16MWE 127
SSASC6MWE 127
SSASD10MWE 125
SSASD12MWE 125
SSASD16MWE 125
SSASD4UW 134
SSASD6MWE 125
SSASD6UW 134
SSASD8UW 134
SSASF10MWE 129
SSASF12MWE 129
SSASF16MWE 129
SSASF6MWE 129
SSAST10MWE 131
SSAST12MWE 131
SSAST16MWE 131
SSAST6MWE 131
SSASTF10MWE 133
SSASTF12MWE 133
SSASTF16MWE 133
SSASTF6MWE 133
SSAVL4MWE2 112
SSAVL6MWE2 112
SSAVL8MWE2 112
SSAVLSC4MWE2 127
SSAVLSC6MWE2 127
SSAVLSC8MWE2 127
SSAVLSD10MWE2 125
SSAVLSD4MWE2 125
SSAVLSD6MWE2 125
SSAVLSD8MWE2 125
SSAVLSF4MWE2 129
SSAVLSF6MWE2 129
SSAVLSF8MWE2 129
SWH3 ..... 54, 210
SWH4 ..... 54, 210
T100-1 247
T100-2 247
T100C10-10 95
T100C10-100 95
T100C10-50 95
T100C10D 95
T100C20-10 95
T100C20-100 95
T100C20-50 95
T100C20D 95
T100C30-10 95
T100C30-100 95
T100C30-50 95
T100C30D 95
T100C40-10 95
T100C40-100 95
T100C40-50 95
T100C40D 95
T100N10-10 94
T100N10-100 94
T100N10-50 94
T100N10D 94
T100N20-10 94
T100N20-100 94
T100N20-50 94
T100N20D 94
T10C10-10 95
T10C10-100 95
T10C10-50 95
T10C10D 95
T10C20-10 95
T10C20-100 95
T10C20-50 95
T10C20D 95
T10C30-10 95
T10C30-100 95
T10C30-50 95
T10C30D 95
T10C40-10 95
T10C40-100 95
T10C40-50 95
T10C40D 95
T10C5-10 95
T10C5-100 95
T10C5-50 95
T10C5D 95
T10N10-10 94
T10N10-100 94
T10N10-50 94
T10N10D 94
T10N20-10 94
T10N20-100 94
T10N20-50 94
T10N20D 94
T10N5-10 94
T10N5-100 94
T10N5-50 94
T10N5D 94
T200-1 247
T200-2 247
T20C10-10 95
T20C10-100 95
T20C10-50 95
T20C10D 95
T20C20-10 95
T20C20-100 95
T20C20-50 95
T20C20D 95
T20C30-10 95
T20C30-100 95
T20C30-50 95
T20C30D 95
T20C40-10 95
T20C40-100 95
T20C40-50 95
T20C40D 95
T20C5-10 95
T20C5-100 95
T20C5-50 95
T20C5D 95
T20N10-10 94
T20N10-100 94
T20N10-50 94
T20N10D 94
T20N20-10 94
T20N20-100 94
T20N20-50 94
T20N20D 94
T20N5-10 94
T20N5-100 94
T20N5-50 94
T20N5D 94
T300-1 247
T300-2 247
T30C10-10 95
T30C10-100 95
T30C10-50 95
T30C10D 95
T30C20-10 95
T30C20-100 95
T30C20-50 95
T30C20D 95
T30C30-10 95
T30C30-100 95
T30C30-50 95
T30C30D 95
T30C40-10 95
T30C40-100 95
T30C40-50 95
T30C40D 95
T30C5-10 95
T30C5-100 95
T30C5-50 95
T30C5D 95
T30N10-10 94
T30N10-100 94
T30N10-50 94
T30N10D 94
T30N20-10 94
T30N20-100 94
T30N20-50 94

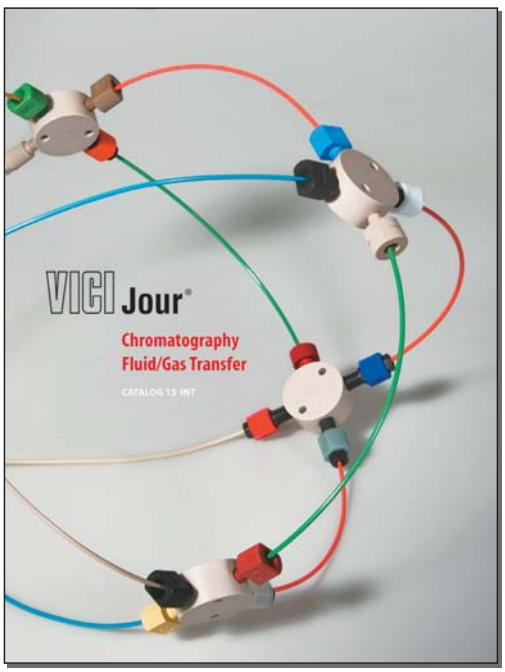
T30N20D 94
T30N5-10 94
T30N5-100 94
T30N5-50 94
T30N5D 94
T400-1 247
T400-2 247
T401-1 247
T401-2 247
T50C1 0D 95
T50C10-10 95
T50C10-100 95
T50C10-50 95
T50C20-10 95
T50C20-100 95
T50C20-50 95
T50C20D 95
T50C30-10 95
T50C30-100 95
T50C30-50 95
T50C30D 95
T50C40-10 95
T50C40-100 95
T50C40-50 95
T50C40D 95
T50C5-10 95
T50C5-100 95
T50C5-50 95
T50C5D 95
T50N10-10 94
T50N10-100 94
T50N10-50 94
T50N10D 94
T50N20-10 94
T50N20-100 94
T50N20-50 94
T50N20D 94
T50N5-10 94
T50N5-100 94
T50N5-50 94
T50N5D 94
T5C10-10 95
T5C10-100 95
T5C10-50 95
T5C10D 95
T5C20-10 95
T5C20-100 95
T5C20-50 95
T5C20D 95
T5C30-10 95
T5C30-100 95
T5C30-50 95
T5C30D 95
T5C40-10 95
T5C40-100 95
T5C40-50 95
T5C40D 95
T5C5-10 95
T5C5-100 95
T5C5-50 95
T5C5D 95
T5N10-10 94
T5N10-100 94
T5N10-50 94
T5N10D 94
T5N20-10 94
T5N20-100 94
T5N20-50 94
T5N20D 94
T5N5-10 94
T5N5-100 94
T5N5-50 94
T5N5D 94
T700-1 247
T700-2 247
TCD2-C-110 227
TCD2-C-220 227
TCD2-NIFE-110 227
TCD2-NIFE-220 227
TCD2-NIFED-110 227
TCD2-NIFED-220 227
TCEF1.5.5C 46
TCEF1.5.5T 46
TCEF111 46
TCEF211 46
TCEF211T 46
TCEF411 46
TCEF411C 46
TCEF411T 46
TCEF421 46
TCEF611 46
TCEF611T 46
TCEF811 46
TCEF811T 46
TEFNI.101 87
TEFNI.102 87
TEFNI.104 87
TEFNI.105 87
TEFNI.110 87
TEFNI.502 87
TEFNI.504 87
TEFNI.505 87
TEFNI.507 87
TEFNI.510 87
TEFNI.512 87
TEFNI.515 87
TEFNI.520 87
TEFNI120 87
TEFNI130 87
TEFNI140 87
TEMPLATE1 ....55, 211
TFEP110-10M 92
TFEP110-25M 92
TFEP110-5M 92
TFEP120-10M 92
TFEP120-25M 92
TFEP120-5M 92
TFEP130-10M 92
TFEP130-25M 92
TFEP130-5M 92
TFEP260-10M 92
TFEP260-25M 92
TFEP260-5M 92
THC110 93
THC120 93
THC130 93
THC140 93
THC270 93
THC285 93
TINCO261 93
TINCO282 93
TNFS800360010 88
TNFS800360015 88
TNFS800360020 88
TNFS800360025 88
TNFS800360050 88
TNFS800360100 88
TNFS800360180 88
TNFS800360250 88
TNI.510 93
TNI.520 93
TNI105 93
TNI120 93
TNI130 93
TNI140 93
TNI285 93
TNPK16001140050 89
TNPK16001140075 89
TNPK16001140100 89
TNPK160011401015 89
TNPK16001140125 89
TNPK16001140180 89
TNPK16001140250 89
TNPK16001140305 89
TNPK16001140510 89
TNPK16001140760 89
TNPK800360050 89
TNPK800360075 89
TNPK800360100 89
TNPK800360125 89
TNPK800360180 89
TNPK800360205 89
TNPK800404250 89
TNPK800510305 89
TNPK800535380 89
TNPK800660510 89
TPK.102 90
TPK.104 90
TPK.105 90
TPK.106 90
TPK.502-10M 90
TPK.502-25M 90
TPK.502-5M 90
TPK.505-10M 90
TPK.505-25M 90
TPK.505-5M 90
TPK.510-10M 90
TPK.510-25M 90
TPK.510-5M 90
TPK.515-10M 90
TPK.515-25M 90
TPK.515-5M 90
TPK106-10M 90
TPK106-25M 90
TPK106-5M 90
TPK110-10M 90
TPK110-25M 90
TPK110-5M 90
TPK120-10M 90
TPK120-25M 90
TPK120-5M 90
TPK130-10M 90
TPK130-25M 90
TPK130-5M 90
TPK260-10M 90
TPK260-25M 90
TPK260-5M 90
TSS.505 93
TSS.507 93
TSS.510 93
TSS.520 93
TSS105 93
TSS110 93
TSS115 93
TSS120 93
TSS126 93
TSS130 93
TSS140 93
TSS230 93
TSS240 93
TSS260 93
TSS267 93
TSS285 93
TTF106-10M 92
TTF106-25M 92
TTF106-5M 92
TTF110-10M 92
TTF110-25M 92
TTF110-5M 92
TTF115-10M 92
TTF115-25M 92
TTF115-5M 92
TTF120-10M 92
TTF120-25M 92
TTF120-5M 92
TTF130-10M 92
TTF130-25M 92
TTF130-5M 92
TTF230-10M 92
TTF230-25M 92
TTF230-5M 92
TTF260-10M 92
TTF260-25M 92
TTF260-5M 92
TTF285-10M 92
TTF285-25M 92
TTF285-5M 92
TTZ110-10M 92
TTZ110-25M 92
TTZ110-5M 92
TTZ120-10M 92
TTZ120-25M 92
TTZ120-5M 92
TTZ130-10M 92
TTZ130-25M 92
TTZ130-5M 92
TTZ260-10M 92
TTZ260-25M 92
TTZ260-5M 92
UMD 194
UMDA 194
UMDB 194
UMDC 194
UMH 194
UMHA 194
UMHB 194
UMHC 194
UMT 194
UMTA 194
UMTB 194
UMTC 194
V-EMPMCR-HP1100 195
V-EMPMCR-HP1100-10 195
V-EMPMCR-HP6890 195
V-EMPMCR-HP6890N 195
V-EMPMCR-HP6890N 195
V-EMPMCR-WA2690 195
V-EMPMCR-WA2690-10 195
V-RA-24VDC-HP6890 191
V-RA-24VDC-HP6890 191
V-RA-24VDC-VA3800 191
V-RA-5VDC-HP1100 191
V-RA-5VDC-WA2690 191
V-SV-S32-110VAC 198
V-SV-S32-220VAC 198
V-SV-S32-24VAC 198
V-SV-S32-24VDC 198
V-SV-S52-110VAC 198
V-SV-S52-220VAC 198
V-SV-S52-24VAC 198

GENERAL REFERENCE

V-SV-S52-24VDC 198
V-SV-S53-110VAC 198
V-SV-S53-220VAC 198
V-SV-S53-24VAC 198
V-SV-S53-24VDC 198
VISF.5FPK 40
VISF-1 40
VISF-2 40
VISF-A 40
VISL-1 40
VISL-1 40
VISL-1H 40
VISL-2 40
VSH 211
WMMA 208
WMMA10 208
WMMASO 204
XLZN1-10 10
XLZN2-10 10
Z10M1 33
Z10M1PK 33
Z10M2 33
Z12M1 33
Z12M1PK 33
Z12M2 33
Z14M1 33
Z14M1PK 33
Z16M1PK 33
Z4M1 33
Z4M1PK 33
Z4M2 33
Z6M1 33
Z6M1PK 33
Z6M2 33
Z8M1 33
Z8M1PK 33
Z8M2 33
ZAOR11 216
ZAOR12 216
ZAOR22 216
ZBAA1 37
ZBNV1 218
ZBNV1-D 218
ZBNV1F 218
ZBNV1F-D 218
ZBNV1F-KZ 218
ZBNV1-KZ 218
ZBNV1LF 218
ZBNV1LF-D 218
ZBNV1LF-KZ 218
ZBRU1.5 29
ZBRU1.5FPK 65
ZBRU1.5L 29
ZBRU1.5LFPK 65
ZBRU1.5T 29
ZBRU1.5TFPK 65
ZBRU2.5 29
ZBRU2.5FPK 65
ZBRU2.5L 29
ZBRU2.5LFPK 65
ZBRU2.5T 29
ZBRU2.5TFPK 65
ZBRU21 29
ZBRU21C 29
ZBRU21CFPK 65
ZBRU21FPK 65
ZBRU21LFPK 65
ZBRU21T 29
ZBRU21TFPK 65
ZBRU41 29
ZBRU41C 29
ZBRU41T 29
ZBRU42 29
ZBRU42L 29
ZBRU42T 29
ZBRUF1.5 50
ZBRUF21 50
ZBRUF42 50
ZBRUFR1.5 52
ZBRUFR1.5F 51
ZBRUFR21 52
ZBRUFR21F 51
ZBRUFR41 52
ZBRUFR41F 51
ZBRUFR42 52
ZBRUFR42F 51
ZBU.5 26
ZBU.5FPK 65
ZBU.5L 26
ZBU.5LFPK 65
ZBU.5T 26
ZBU.5TFPK 65
ZBU.5XC 26
ZBU1 26
ZBU1C 26
ZBU1CFPK 65
ZBU1CPK 65
ZBU1FPK 65
ZBU1L 26
ZBU1M 26
ZBU1MFPK 65
ZBU1MPK 65
ZBU1PK 65
ZBU1T 26
ZBU1TFPK 65
ZBU1TPK 65
ZBU1XC 26
ZBU2 26
ZBU2L 26
ZBU2LPK 65
ZBU2PK 65
ZBU2T 26
ZBU2TPK 65
ZBU4 26
ZBU4L 26
ZBU4T 26
ZBUF1 50
ZBUF2 50
ZBUF4 50
ZBUFLKF 76
ZBUFLPK 76
ZBUFR.5 52
ZBUFR.5F 51
ZBUFR1 52
ZBUFR1C 52
ZBUFR1CF 51
ZBUFR1F 51
ZBUFR2 52
ZBUFR2F 51
ZBUMLKF 76
ZBUMLPK 76
ZC.5 11
ZC.5FPK 64
ZC1 11
ZC1FPK 64
ZC1PK 64
ZC2 11
ZC2PK 64
ZC4 11
ZERU1.5FPK 65
ZF.5-10 12
ZF.5B-10 12
ZF.5FEP-10 13
ZF.5GP-10 12
ZF.5GV-5 13
ZF.5HC 12
ZF.5KF-10 13
ZF.5NI 12
ZF.5PFA-10 13
ZF.5PK-10 13
ZF.5PK-10 63
ZF.5PK-5 16
ZF.5PKG-10 63
ZF.5S6-10 12
ZF.5TF-10 13
ZF.5TFG-10 13
ZF.5TI 12
ZF.5V1-5 ..... 13, 16
ZF.5V-5 13,16
ZF1-10 12
ZF1B-10 12
ZF1FEP-10 13
ZF1GP-10 12
ZF1GV-5 13
ZF1HC 12
ZF1KF-10 13
ZF1NI 12
ZF1PFA-10 13
ZF1PK-10 13,63
ZF1PKG-10 63
ZF1S6-10 12
ZF1TF-10 13
ZF1TFG-10 13
ZF1TI 12
ZF1V1-5 13
ZF1V-5 13
ZF1VISF 40
ZF1VISF 40
ZF2-10 12
ZF2B-10 12
ZF2FEP-10 13
ZF2GP-10 12
ZF2GV-5 13
ZF2HC 12
ZF2KF-10 13
ZF2NI 12
ZF2PFA-10 13
ZF2PK-10 ..... 13, 63
ZF2PKG-10 63
ZF2S6-10 12
ZF2SI 41
ZF2TF-10 13
ZF2TFG-10 13
ZF2TI 12
ZF2V1-5 13
ZF2V-5 13
ZF4B-10 12
ZF4FEP-10 13
ZF4GP-10 12
ZF4GV-5 13
ZF4HC 12
ZF4KF-10 13
ZF4NI 12
ZF4PFA-10 13
ZF4PK-10 13
ZF4PK-10 63
ZF4PKG-10 63
ZF4S6-10 12
ZF4TF-10 13
ZF4TFG-10 13
ZF4TI 12
ZF4V1-5 13
ZF4V-5 13
ZF6FEP-10 13
ZF6GV-5 13
ZF6KF-10 13
ZF6PFA-10 13
ZF6PK-10 13,63
ZF6PKG-10 63
ZF6TF-10 13
ZF6TFG-10 13
ZF6V1-5 13
ZF6V-5 13
ZF8FEP-10 13
ZF8GV-5 13
ZF8KF-10 13
ZF8PFA-10 13
ZF8PK-10 13,63
ZF8PKG-10 63
ZF8TF-10 13
ZF8TFG-10 13
ZF8V1-5 13
ZF8V-5 13
ZGF.5PK 59
ZGF.5PK-10 63
ZGF1PK-10 63
ZLA-.5 41
ZLA-1 41
ZLA-2 41
ZLCA1PK 77
ZLTA41 37
ZN.5-10 10
ZN.5FPK-10 63
ZN1-10 10
ZN1FPK-10 63
ZN1PK-10 63
ZN1R 10
ZN1RFPK 10
ZN1RPK 10
ZN2-10 10
ZN2PK-10 63
ZN2R 10
ZN4-10 10
ZNF.5PK-5 62
ZNF.5PKG-5 62
ZNF1FKF-5 62
ZNF1FPK-5 62
ZNF1FPKG-5 62
ZNF1KF-5 62
ZNF1PK-5 62
ZNF1PKG-5 62
ZNFT 67
ZP.5 11
ZP.5FPK 64
ZP.5H 11
ZP1 11
ZP1FPK 64
ZP1FPK 71
ZP1H 11
ZP2 11
ZP2H 11
ZP2PK 64
ZP4 11
ZRF1.5KF-5 14
ZRF1.5PK-5 14
ZRF1.5TFG-5 14
ZRF1.5V1-5 14
ZRF1.5V-5 14
ZRF2.5KF-5 14
ZRF2.5PK-5 14

ZRF2.5TFG-5 14
ZRF2.5V1-5 14
ZRF2.5V-5 14
ZRF21KF-5 14
ZRF21PK-5 14
ZRF21TFG-5 14
ZRF21V1-5 14
ZRF21V-5 14
ZRF41KF-5 14
ZRF41PK-5 14
ZRF41TFG-5 14
ZRF41V1-5 14
ZRF41V-5 14
ZRF42KF-5 14
ZRF42PK-5 14
ZRF42TFG-5 14
ZRF42V1-5 14
ZRF42V-5 14
ZRU1.5 29
ZRU1.5FPK 65
ZRU1.5L 29
ZRU1.5LFPK 65
ZRU1.5T 29
ZRU1.5TFPK 65
ZRU1.5XC 29
ZRU2.5 29
ZRU2.5FPK 65
ZRU2.5L 29
ZRU2.5LFPK 65
ZRU2.5T 29
ZRU2.5TFPK 65
ZRU21 29
ZRU21C 29
ZRU21CFPK 65
ZRU21FPK 65
ZRU21LFPK 65
ZRU21T 29
ZRU21TFPK 65
ZRU41 29
ZRU41C 29
ZRU41T 29
ZRU42 29
ZRU42L 29
ZRU42T 29
ZRUF1.5 50
ZRUF21 50
ZRUF42 50
ZRUFR1.5 52
ZRUFR1.5F 51
ZRUFR21 52
ZRUFR21F 51
ZRUFR41 52
ZRUFR41F 51
ZRUFR42 52
ZRUFR42F 51
ZSN1R 10
ZT.5 32
ZT.5FPK 64
ZT.5L 32
ZT.5LFPK 64
ZT1 32
ZT1C 32
ZT1CFPK 64
ZT1FPK 64
ZT1L 32
ZT1LFPK 64
ZT1M 32
ZT1MFPK 64
ZT2 32
ZT2L 32
ZT2LPK 64
ZT2PK 64
ZT4 32
ZT4L 32
ZTA41 37
ZU.5 26
ZU.5FPK 65
ZU.5L 26
ZU.5LFPK 65
ZU.5T 26
ZU.5TFPK 65
ZU.5XC 26
ZU1 26
ZU1C 26
ZU1CFPK 65
ZU1CPK 65
ZU1FPK 65
ZU1FPK.5 78
ZU1L 26
ZU1M 26
ZU1MFPK 65
ZU1MPK 65
ZU1PK 65
ZU1T 26
ZU1TFPK 65
ZU1TPK 65
ZU1XC 26
ZU2 26
ZU2L 26
ZU2LPK 65
ZU2PK 65
ZU2T 26
ZU2TPK 65
ZU4 26
ZU4L 26
ZU4T 26
ZUF1 50
ZUF2 50
ZUF4 50
ZUFLKF 76
ZUFLPK 76
ZUFR.5 52
ZUFR.5F 51
ZUFR1 52
ZUFR1C 52
ZUFR1CF 51
ZUFR1F 51
ZUFR2 52
ZUFR2F 51
ZVISF-1PE 40
ZVISF-1PFA 40
ZVISF-1PFAH 40
ZX.5 32
ZX.5FPK 64
ZX.5L 32
ZX.5LFPK 64
ZX1 32
ZX1C 32
ZX1CFPK 64
ZX1FPK 64
ZX1L 32
ZX1LFPK 64
ZX1M 32
ZX1MFPK 64
ZX2 32
ZX2L 32
ZX2LPK 64
ZX2PK 64
ZX4 32
ZX4L 32
ZXLTA41 37

Contact us to receive your copy of these VICI catalogs.

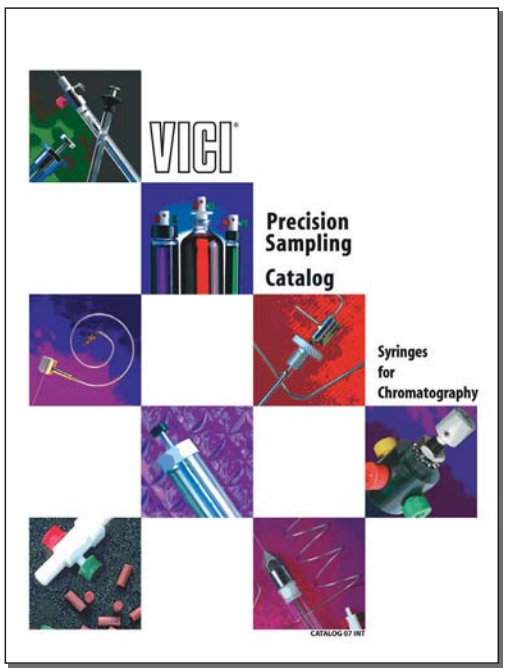


VICI JOUR

- High pressure polymeric and stainless steel fittings
- Nanovolume® HPLC fittings
- Low pressure fittings
- Filters and mobile phase filters
- Safety products
- Frits
- Columns and guard columns
- Sample loops

VICI PRECISION SAMPLING

- Gas tight syringes
- HPLC injection syringes
- Magnum syringes up to 500 mL
- Syringes for sampling from gas cylinders
- Mininert™ – Valves for vials
- Customized probes and shaped tubing



1/32" external union 19
3-way solenoid air valves 198
4-way solenoid air valves 198
5-way solenoid air valves 198
360 µm fittings 57-58
4-way solenoid air valve 198
10,000 psi injectors 156-157
15,000 psi injectors 154-157
40,000 psi injector system 84
40,000 psi valves 85

A

Actuator hardware
- Closemount 208
- Right angle drive 204
- Standoff 205

ACTUATORS 188-197
Air 196-197
Microelectric. 190-192
Modular universal 194
Universal 193

Adapters
- 1/16" internal to 1/32" external 21
- Aerosol to Valco 37
- Cheminert (See Cheminert Fittings)
- External to internal 39
- Fused silica 16-17
- Fused silica makeup 20
- Injector/detector 39
- Internal reducers 38
- Pipe adapters
  - Cheminert 77
  - Female to
    - Valco external 36
    - Valco internal 35
  - Male to
    - Valco external 36
    - Valco internal 35
  - Manifold pipe adapters .34
- Syringe adapters
  - Female luer to Valco. 41
  - Female luer to 1/4-28 ...76
  - Fill ports 40
- Tube adapters 37,76

Aerosol adapter bulkhead union 37
Air actuators for valves ... 196-197
Air actuator repair kits (O-rings)
- Selector 196
- Two position 197

Applications
- Cheminert 170-171
- Diaphragm 145
- Selector 136-141
- Two position ...119-23, 170-71

B

Biocompatible filters 78,80
Bulkhead reducing unions
- Cheminert
  - High pressure PEEK 65
- Low pressure 73

Bulkhead reducing unions, cont'd
- Valco
  - External 30
  - External/internal 31
  - Internal. 29
  - Internal/external 31

Bulkhead unions
- Aerosol adapter bulkhead union. 37
- Cheminert 65,73
- External 27
- External/internal 27
- Internal 26
- Luer adapter 76

C

Calibration gas generators 230-31, 233
Calibration gas standards 229, 232
Capillary columns 234-245
Caps
- Cheminert 57-58, 64, 71
- Valco 11

CHEMINERT FITTINGS 56-81
1/4-28 to ZDV adapter 77
360 µm fittings 57-58
Bulkhead unions
- Cheminert to Cheminert ...73
- Cheminert to Valco 73
- Cheminert to Luer 76

Caps
- High pressure 64
- Low pressure 71

Crosses
- High pressure 64
- Low pressure (1/4-28). 74
- Nanovolume 57,59

External nuts. 69
Ferrules 63
Glass connectors. 75
High pressure
- PEEK caps 64
- PEEK crosses 64
- PEEK ferrules 63
- PEEK internal nuts 63
- PEEK internal unions. 65
- PEEK internal reducing unions. 65
- PEEK plugs 64
- PEEK tees 64

Luer adapters
- Cheminert (1/4-28) 76
- Luer adapter bulkhead union. 76

Manifolds 74
Mixing tees 75
Nanovolume® fittings 57-61
Nuts, PEEK high pressure 63
(Also see *Tube end fittings*)
Pipe adapters
- Female 1/4-28 to:
  - female NPT 77
  - male NPT 77
- Male 1/4-28 to male NPT. ...77

Plugs High pressure. 64
Low pressure 71

CHEMINERT FITTINGS, cont'd
Reducing unions. 65
Tees
- High pressure 64
- Low pressure (1/4-28)... 74-75

Tube adapters
- Male 1/4-28 to tube 76

Tube end fittings
- External nuts for flanged tubing. 69
- Flanged 69
- Flangeless 1/4-28. 68

Unions
- High pressure 65
- Low pressure
  - Cheminert to:
    - 1/4" tubing. 72
    - Cheminert 72
    - Valco 72
- Nanovolume 57-59

CHEMINERT INJECTORS/ SELECTORS 146-187
HPLC 154-165
Low pressure 166-169
Nanovolume. 154-55, 158-59
OEM. 180-187
Selectors 172-179

Clean Cut tubing cutter 92
Closemount hardware 208
Color-It fingertight adapters. ...66
Column coupler. 77
Column end fittings
- Analytical 44
- Microbore. 43
- Nanovolume 61
- Post-column reaction. 46
- Semi-preparative 45
- Preparative. 45

Columns
- HPLC columns. 47
- ValcoBond columns ..234-245

Combo valves. 214-215
Combo pressure regulators... 219
Controlled radius nuts. 10
Crosses
- Cheminert 64,74
- Microvolume 22-23
- Nanovolume 57,59
- Valco 32

D

DVI (Digital valve interface)... 199
Detectors
- Pulsed discharge (PDD). 220-225
- Thermal conductivity (TCD). 227

DIAPHRAGM VALVES 142-145
Digital valve interface (DVI)... 199
Diluter/dispenser 82
Drill index 55
Dynacalibrators. 230-231

E

Easy-Flange kit. 71
Electric valve actuators
- Microelectric, Selector 192
- Two position. 190
- Modular universal 194
- Universal. 193

Electroformed nickel tubing. ...87

F

Ferrules
- For fused silica 16
- For fused silica unions 19
- Grooved PEEK. 63
- High pressure PEEK. 63
- Nanovolume 59
- Reducing. 14-15
- Standard
  - Metal. 12
  - Polymeric. 13

Ferrule removal kit 16, 54

FIA PRODUCTS
Cheminert fittings 56-81
Cheminert valves ..166-69, 172-79
M series pump 83
Mobile phase/ solvent reservoirs 81
Mobile phase filters 78-80
Perifit fittings 78
VICI-cap 81

Fill ports
- Metal and polymeric. 40
- Zero dead volume 40

Fill port assembly for Cheminert C2 and C4 valves 41

Filters
- Biocompatible 78-80
- In-line 78
- Mobile phase. 78-80
- Valco 48-53
  - Pressed frit 50
  - Removable frit 51
  - Removable screen 52

Fingertight fittings
- High pressure PEEK. 63-66
- Nanovolume 59-61
- No twist. 62
- One-piece color-coded PEEK. 66
- One-piece column coupler. 77

FITTINGS
Cheminert. 56-81
HPLC column end. 42-46
Nanovolume. 57-61
Valco 6-55

Flanged tube end fittings 69
Flangeless tube end fittings 68
Flanging tools and starter kits 70-71

FLOW, PRESSURE, AND ON/OFF CONTROL DEVICES 214-219
Combo valves....214-215
Combo pressure regulators... 219
Flow controllers....216-217
Micrometering valves 218
Needle valves..... 218
On/off valves 85, 212-213
Prime/purge valves ...85, 212-213

Flow controllers....216-217
Frits
- for HPLC column end fittings....45
- for Valco filters 53
- Nanovolume 60

Fused silica adapters
- One-piece....16
- Removable....17

Fused silica fittings..... 16-21
- 1/32" external union....19
- 1/16" internal to 1/32" external 21
- Injector nut for HP 6890 and 5890 18
- Injector/detector adapter...39
- Make-up adapter.....20
- Unions 19, 57-58

G

GC columns....234-245
GC valves 104-113
Gas flow controllers 216-217
Gas purifiers 226-27, 246-47
Glass connectors....75
Glossary 258-261

H

HPLC column end fittings
- Analytical 44
- Microbore....43
- Nanovolume 61
- Post-column reaction....46
- Semi-preparative 45
- Preparative....45

HPLC injectors
- Analytical 163-165
- Integrated 180, 182
- Microbore....160-162
- Nanobore 154-55, 158-59
- Valco 114-118

HPLC precolumns (guard columns)....47
HPLC integrated selectors ... 186
HSSA (High speed switching accessory)..... 199
Heated column enclosures ... 203
Heated valve enclosures..... 201
Heater cartridges 202
Helium photoionization detector 221-223
Helium purifier....226-27, 246-47
Hex key set 54
High speed switching accessory (HSSA) 199
High temperature air actuators
- Selector..... 196
- Two position 197

I

IZR (Internal reducer)....38
Injection port liner 245
Injector nut for HP-6890 and HP-5890 18
Injectors (See: *Cheminert valves*
Diaphragm valves
Valco valves)

INSTRUMENTATION 220-227
Helium purifiers....226-27, 247
Nitrogen purifiers 226-27, 247
Pulsed discharge detectors (PDD) 220-225
Thermal conductivity detectors (TCD) 227

Instrumentation temperature controller (ITC) 203
Integrated motor/valves for LC 180, 182, 184-186
Internal reducers (IZR)....38
Internal reducers for 360 µm tubing 38

L

Length conversions 262
Liquid handling pump 83
Loop fill port assembly for Cheminert C2, C4 valves 41
Loop installation wrench (custom socket wrench) .. 210
Loops *for each valve type are found on the price list page with their corresponding valves*
Luer adapters
- Cheminert 76
- Luer adapter bulkhead union....76
- Valco 41

M

M Series
- Pump 83
- Diluter/dispenser....82

Manifold pipe adapters 34
Manifolds
- Cheminert 74
- Valco 33

Manual valve hardware
- Closemount..... 208
- Knobs and handles 204
- Standoff 205

Materials discussions
- Metals 254-255
- Polymers..... 256
- Valve rotors 257

Metronics....1
Micro valves for GC and LC ... 248
Microelectric actuator,
- Selector..... 192
- Two position 190

Micrometering valves 218
Microvolume connectors... 22-23
Mininert valves 251
Mirror 55, 211
Mobile phase filters 78-80
Modular universal actuator... 194

N

Nanovolume®
- 360 µm fittings 57-58
- Caps 57-58
- Column end fittings 61
- Cross..... 57, 59
- Ferrules 57-59
- Frits....60
- Injectors 154-55, 158-59
- Nuts 57-59
- Plugs..... 57-58
- Reducing unions 57-59
- Selectors..... 172
- Tees..... 57, 59
- Unions..... 57-60

Needle valves..... 218
Nitrogen purifiers 226-27, 247
No twist one-piece fittings 62
Non-radioactive pulsed discharge detectors ... 220-23
Nuts
- Cheminert high pressure .62-3
- Cheminert low pressure ..68-9
- Nanovolume 57-59
- Valco
  - Controlled radius 10
  - External 11
  - Internal....10
- Septum injector nuts 41

O

OEM
- Injectors 151, 180-85
- Selectors.....153, 186-87
- Universal actuator..... 193-94

O-ring kits for air actuators
- Selector..... 196
- Two position 197

On/off valves 212-13
On/off valve, 40K psi 85
Open end wrenches..... 210
One-piece fingertight fittings..... 62-3, 66

P

PDD (Pulsed discharge detector)..... 220-23
PEEK fittings, high pressure...62-6
PEEK tubing 90-91
- Dual layer 91

Pencil magnet 210
Perifit fittings 78
Permeation devices 228-29
Pin vise 55
Pipe adapters
- Cheminert 77
- Female 1/4-28 to female NPT 77
- male NPT 77
- Female NPT to Valco external 36
- Valco internal.....35
- Male 1/4-28 to male NPT....77
- Male NPT to Valco external 36
- Valco internal.....35

Manifold pipe adapters.....34

Plugs
- Cheminert
  - High pressure.....64
  - Low pressure 71
- Valco 11

Polymeric ferrules..... 13-15, 63
Position feedback for
- Manual valves..... 199
- Air actuated valves 199

Post-column reaction fittings...46
Precision Sampling.....1
Precolumns (guard columns) ...47
Pressure conversions..... 262
Pressure regulators..... 219
Prime/purge valves 212-13
Pulsed discharge detectors (PDD) 220-23
Pump (M Series) 83
Purge housings for valves 200
Purifiers, gas 226-27, 246-47

R

RAD (Right angle drive) 204
Reduced breakdown injection liner 245
Reducing ferrules
- External....15
- Internal 14
- Standard....15

Reducing unions
- Bulkhead (See *Bulkhead reducing unions*)
- Cheminert
  - High pressure.....65
- Nanovolume 57-59
- Valco
  - External 30
  - External/internal.....31
  - Internal.....29
  - Internal/external.....31

Regulators, flow..... 216-17
Regulators, pressure..... 219
Right angle drive (RAD) 204
Rotor materials 257

S

Safety issues 252
Sample loops *for each valve type are found on the price list page with their corresponding valves*
Screens....53
Selectors
- Cheminert 172-79
- Nanovolume 172
- OEM 186-87
- Valco..... 124-35

Septum injector nut.....41
Solenoid air valves
- 3-way 198
- 4-way 198
- 5-way 198

Solvent reservoirs.....81
Standoff assemblies..... 205

Syringe adapters
Loop fill port assembly for C2 and C4 valves 41
Luer adapters
Cheminert.....76
Luer adapter bulkhead union.....76
Valco.....41
Fill ports
For metal valves 40
For polymeric valves 40
Nanovolume.....59
Zero dead volume 40
Septum injector nuts 41
Zero dead volume fill ports 40
Syringes 249-50

T

TCD (Thermal conductivity detector)..... 227
Tees
Cheminert high pressure ...64
Cheminert low pressure 74-75
Mixing.....75
Microvolume..... 22-23
Nanovolume 57-59
Valco 32
Temperature controllers
ITC (Instrumentation temperature controller)..... 203
Temperature conversions 262
Template for valve schematics.....55
Thermal conductivity detector (TCD) 227

TOOLS

Drill index 55
Ferrule removal kit 54
Hex key set 54
Loop installation wrench (custom socket wrench).. 210
Open end wrenches..... 210
Mirror 55, 211
Pencil magnet 210
Pin vise 55
Template 55
Tightening tools for PEEK fittings.....67
Valve spanner handle 211

Trademarks 263
Tube adapters 37, 76
Tube end fittings (Cheminert)
External 69
Flanged 69
Flangeless.....68

TUBING 86-95

Color coded PEEK
Dual-layer PEEK 91
Striped PEEK 91
Custom lengths
Metal 93
PEEK 90
Pre-cut lengths
Stainless 94-95
Polymeric 90, 92
316 Stainless..... 93-95
Electroformed nickel 87

TUBING, CONT'D

ETFE.....92
FEP.....92
Hastelloy C 93
Inconel 600 93
Nickel 200 93
Nickel-clad..... 88-89
PEEK..... 90-91
PTFE.....92

Tubing clip.....92
Tubing cutter 92

U

UHPLC injectors and selectors
Nanovolume® 154-55
Microbore 156-57
On/off 85
Prime/purge 85
Selectors 172-73
Unions
Bulkhead
(See *Bulkhead unions*)
Cheminert
High pressure.....65
Low pressure 72
Nanovolume..... 57-79
Reducing
(See *Reducing unions*)
Valco
1/32" external 19
External 27
Fused silica 19
Internal.....26
Microvolume 22-23
Reducing 28-31
Universal actuator 193-94

V

Valco Canada 1
Valco Instruments.....1

VALCO FITTINGS 6-55

1/32" external union 19
Adapters
1/16" internal to 1/32" external reducer 21
Aerosol to Valco 37
External to internal 39
Fused silica..... 16-17
Fused silica makeup 20
Injector/detector 39
Internal reducers 38
Manifold pipe adapters 34
Pipe adapters 35-36
Syringe adapters
Female luer to Valco 41
Fill ports.....40
Tube adapters.....37
Bulkhead reducing unions
External.....30
External/internal 31
Internal 29
Internal/external 31
Bulkhead unions
Aerosol adapter 37
External.....27
External/internal 27
Internal 26
Caps.....11

VALCO FITTINGS, CONT'D

Column end fittings
Analytical 44
Microbore.....43
Post-column reaction.....46
Semi-preparative and preparative 45
Crosses 32
Microvolume..... 22-23
Ferrules
For fused silica 16
Reducing..... 14-15
Standard
Metal.....12
Polymeric.....13
Ferrule removal kit 54
Fill ports 40
Filters..... 48-53
Pressed frit 50
Removable frit 51
Removable screen.....52
Frits
For HPLC column end fittings 45
For filters.....53
Fused silica adapters
One-piece.....16
Removable.....17
Fused silica fittings
1/32" external union.....19
1/16" internal to 1/32" external.....21
Injector nut for HP-6890 and HP-5890.....18
Inj/detector adapter.....39
Make-up adapter.....20
Microvolume unions.... 22-23
HPLC precolumns (guard columns) 47
Injector nut for HP-6890 and HP-5890 18
Internal reducers.....38
Loop fill port assembly for C2 and C4 valves 41
Luer adapters.....41
Manifold pipe adapters 34
Manifolds.....33
Microvolume connectors... 22-23
Nuts
Controlled radius.....10
External.....11
Internal 10
Septum injector nuts 41
Pipe adapters
Female NPT to
Valco external 36
Valco internal.....35
Male NPT to
Valco external 36
Valco internal.....35
Manifold pipe adapters 34
Plugs 11
Polymeric ferrules.....13
Post-column reaction fittings...46
Precolumns (guard columns) ...47
Reducing ferrules 14-15
Reducing unions..... 29-31
Screens.....53
Septum injector nut.....41

VALCO FITTINGS, CONT'D

Syringe adapters
Loop fill port assembly for C2, C4 valves 41
Luer adapters 41
Fill ports
For metal valves 40
For polymeric valves 40
Zero dead volume 40
Septum injector nuts 41
Tees 32
Microvolume..... 22-23
Tube adapters 37
Unions
1/32" external 19
Bulkhead..... 26-27
External.....27
External/internal reducing ..31
Fused silica 19
Internal 26
Internal/external reducing .31
Microvolume..... 22-23
Reducing..... 29-31

VALCO INJECTORS/VALVES

GC 104-13
HPLC 114-18
Selectors 124-35
Low pressure..... 124-33
High pressure 134-35

ValcoBond columns..... 234-245
ValcoPLOT columns 242-244
Valve actuators
Air 196-97
Microelectric 190-92
Universal (OEM) 193-94
Valve spanner handle 211
Valves
Cheminert 146-187
Combo valves 214-15
Diaphragm valves 142-45
Nanovolume® ..154-55, 158-59
Needle..... 218
On-off
Standard 212-13
UHPLC.....85
Prime/purge
Standard 212-13
UHPLC.....85
Valco..... 98-141
VICI-cap 81
VICI AG 1
VICI AG International.....1
VICI Metronics 1
VICI Precision Sampling 1
VICI Valco Canada.....1
VICI Valco Instruments 1

W

Warranty 253
Wrenches 54-55

To order

EUROPE, MIDDLE EAST, ASIA, and AFRICA

VICI AG International

SALES
- Phone: Int + 41 · 41 · 925·6200
- Fax: Int + 41 · 41 · 925·6201
- Email: order@vici.ch

TECHNICAL
- Phone: Int + 41 · 41 · 925·6200
- Fax: Int + 41 · 41 · 925·6201
- Email: support@vici.ch

SERVICE
- Phone: Int + 41 · 41 · 925·6200
- Fax: Int + 41 · 41 · 925·6201

Parkstrasse 2
CH-6214 Schenkon
Switzerland

info@vici.ch

Ex works, Schenkon, Switzerland.

We accept:

CANADA

VICI Valco Instruments Canada Corporation

- Toll-free: 866–297–2626
- Phone: 613–342–2600
- Fax: 613–342–0111
- Email: canada@vici.com

26 Water Street East
Brockville, Ontario
Canada K6V 1A1

canada@vici.com

F.O.B. shipping point, our factory, Brockville, Canada.

We accept:

NORTH AMERICA (except Canada), SOUTH and CENTRAL AMERICA, AUSTRALIA and NEW ZEALAND

VICI Valco Instruments Co. Inc.

SALES
- Phone: 800–367–8424*
  * USA and Canada only
- Fax: 713–688–8106
- Email: sales_usa@vici.com

TECHNICAL
- Phone: 713–688–9345
- Fax: 713–956–1649
- Email: tech_usa@vici.com

SERVICE
- Phone: 713–688–9345
- Fax: 713–688–7618
- Email: service@vici.com

P.O. Box 55603
Houston, TX 77255
USA

valco@vici.com

F.O.B. shipping point, our factory, Houston, Texas.

We accept:

Conditions of Sale

Terms and Conditions of Sale for VICI AG International can be downloaded from www.vici.ch.

Returns

No returns will be accepted more than 90 days after shipment for any reason. Before 90 days, no returns will be accepted without prior authorization. If it is necessary to return material to us, please contact our Sales Department for a return authorization number and forwarding instructions. Inspect shipments upon receipt and report shortages and incorrect or damaged material to us immediately.

Important! Damaged shipments must remain with the original packaging for freight company inspection.

Returned material will be subject to a restocking charge of 20% for catalog items. Special orders cannot be returned unless defective.

Repairs

For repair return authorization or information about factory refurbishments, contact our Service Department.

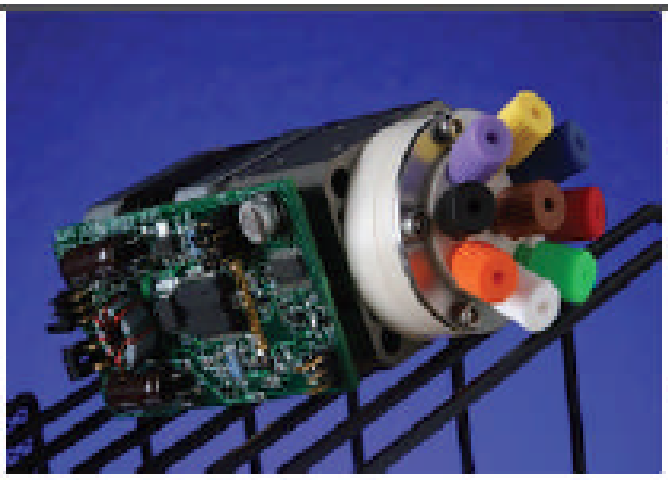
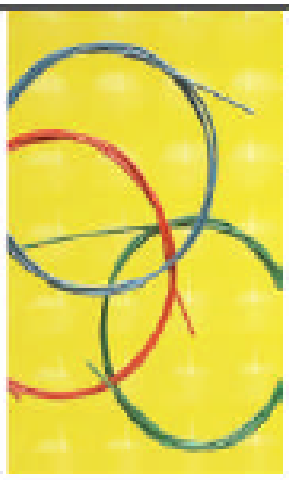
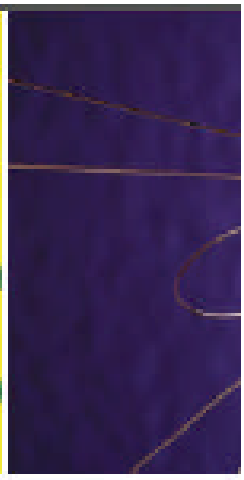
Technical Service

Our capable staff is waiting to assist you with your technical questions and application needs.

Notice

VICI reserves the right to correct errors and change prices, designs, or specifications without notice or liability. The information in this catalog is correct to the best of our knowledge but is not guaranteed to be so. VICI assumes no responsibility with respect thereto.

© 2012
Printed in Switzerland

VICI Valco Instruments
VICI AG International
VICI Valco Instruments Canada
VICI Metronics
VICI Precision Sampling