VALCO FITTINGS, CONT'D

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TUBING

VALVE SELECTION

VALCO INJECTORS AND VALVES

PRODUCTS FOR:

Products for HPLC

The products listed on these two pages are specifically oriented to applications in HPLC, SFE, SFC, and process analysis for pressure ranges up to 20,000 psi for HPLC, 40,000 for Nanovolume HPLC, and 5000-10,000 psi for SFE and SFC. For the complete listing of products in this catalog, refer to pages 1-3.

NEW

NANOVOLUME HPLC

VALCO FITTINGS

VALCO FITTINGS, CONT'D

Further reference

Description of:

HPLC ..... page 243
Nanovolume 244
SFC 244
SFE 244

PRODUCTS FOR:

GC ..... pp. 6-7
Liquid Handling 8

Table of contents 1-3
Index 247-249

VALCO INJECTORS AND VALVES, CONT'D

DIAPHRAGM VALVES

CHEMINERT INJECTORS AND VALVES

ACTUATORS AND ACCESSORIES

ACTUATORS AND ACCESSORIES, CONT'D

FLOW, PRESSURE, ON/OFF CONTROLLERS

INSTRUMENTATION

GENERAL REFERENCE

INDEX

ORDER INFORMATION

PRODUCTS FOR:

CONTENTS

NEW

INTRODUCTION TO VICI

NANOVOLUME HPLC PRODUCTS

GC COLUMNS

VALCO FITTINGS

PRODUCTS FOR:

HPLC ..... pp. 4-5
GC 6-7
Liquid Handling 8

Index 247-249

CHEMINERT FITTINGS

TUBING

VALVE SELECTION

VALCO INJECTORS AND VALVES

CHEMINERT INJECTORS AND VALVES

VALVE ACTUATORS AND ACCESSORIES

FLOW, PRESSURE, ON/OFF CONTROLLERS

PRODUCTS FOR:

GC ..... pp. 6-7
Liquid Handling 8

Table of contents 1-3
Index 247-249

Products for GC

Further reference

Description of:
GC ..... page 243

The products listed on these two pages are specifically oriented to applications in GC and process analysis for pressure ranges up to 1500 psi and temperatures up to 350°C. For the complete listing of products in this catalog, refer to pages 1-3.

PRODUCTS FOR:

HPLC ..... pp. 4-5

Liquid Handling 8

Table of contents 1-3
Index 247-249

TUBING

VALVE SELECTION

VALCO INJECTORS AND VALVES

DIAPHRAGM VALVES

ACTUATORS AND ACCESSORIES

FLOW, PRESSURE, ON/OFF CONTROLLERS

PRODUCTS FOR:

HPLC ..... pp. 4-5

Liquid Handling 8

Table of contents 1-3
Index 247-249

Products for Liquid Handling

The products listed on these two pages are specifically oriented to applications in LC, FIA, SPE, and process analysis for pressure ranges up to 1,000 psi. For the complete listing of products in this catalog, refer to pages 1-3.

Further reference

Description of:
FIA ..... page 243
LC 243

NEW

CHEMINERT FITTINGS

Low Pressure Fittings

FIA Fittings and Accessories

CHEMINERT FITTINGS, CONT'D

TUBING

VALVE SELECTION

VALCO INJECTORS AND VALVES

CHEMINERT INJECTORS AND VALVES

ACTUATORS AND ACCESSORIES

Actuators

PRODUCTS FOR:

HPLC 4-5
GC 6-7

Table of contents 1-3
Index 247-249

NEW!

No twist one-piece fittings ..... page 82

These new fittings offer the convenience of a one-piece fitting design while solving a problem inherent to such designs. Typical one piece fittings cause the ferrule to rotate against the fitting detail as the fitting is tightened, creating particulates. Also, once the ferrule contacts the tubing, the tubing is rotated as tightening continues.

The no twist design features 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 possiblities are endless.

NEW!

40,000 psi ultra-high pressure injector system

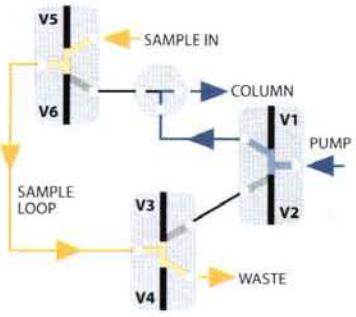
The VICI 40K injector is comprised of six miniature air actuated needle valves, plumbed to simulate the flow path of a conventional rotor/stator injector. An integral controller sends the on/off positioning signals to each valve, coordinating them to perform load, inject, and flush functions. *(See illustration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

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

1. Manual control with the pushbuttons on the controller
2. Laboratory computer via serial port communication
3. Contact closure inputs

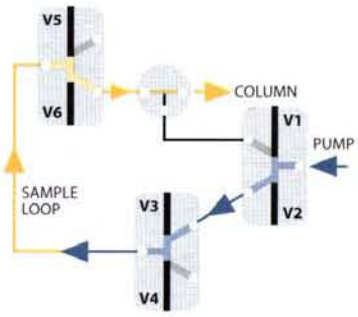
Prod No	*Price*
SPSS40	$4000

FOR MORE INFORMATION, CONTACT OUR TECHNICAL DEPARTMENT.



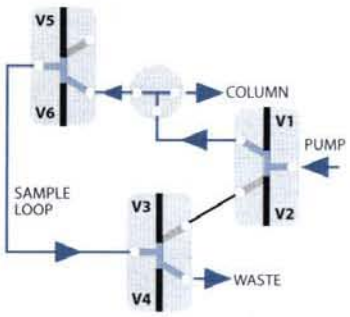
Load

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

Patents pending

NEW!

M Series Liquid Handling Pumps

The Cheminert® M Series liquid handling pump* is a syringe-free pump capable of delivering a bidirectional flow over six orders of magnitude. The M Series is a positive displacement pump, which means that it is self-priming and tolerant of any gas which may find its way into the fluid lines. There is no separate fill cycle, and the capacity is unlimited.

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

Operating principle

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

M6 pumps — *10 nl - 10 ml*

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

M50 pumps — *50 µl - 50 ml*

	Prod No
M50 pump with:	
Controller and stepper motor	CP3-8572-625M2
Stepper motor (no controller)	CP3-8572-625SM
M50 pump only	CP3-8572-625D

Accessories and replacement parts

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

* Patent No. 6,079,313

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

SPECS

	M6	M50
Continuous minimum dispense	10 nl	50 µl
Continuous maximum dispense	10 ml/min	50 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 ± 1 µl	625 ± 2 µl

NEW!

M Series Diluter/Dispensers

- Self-priming
- Easy to use
- Compact design
- Largest volume range available

Cheminert Diluter/Dispensers simplify the sample preparation process for dispensing and diluting liquids. The user-friendly Wizard format eliminates all the math calculations and external charts 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 multiple dispenses, simply enter the volume and 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, bidirectional, positive displacement pump. This design approach gives the largest volume range available, and eliminates the inconvenience of having to change and refill syringes. A multiposition stream selection valve can be easily integrated with the pump for multi-solvent applications.

Other features include a smart hand probe that signals the operator when an aspirate or dispense step is completed, enough memory to store 100 programs, and a small footprint that takes up a minimum of bench space.

For more information, visit vici.com or contact VICI technical support, liquid handling department.

M10 diluter/dispenser — *10 nl - 10 ml*

Prod No	*Price*
CD10-4841-M1A	$3200

M50 diluter/dispenser — *50 µl - 50 ml*

Prod No	*Price*
CD50-8572-M2A	$3275

Patent pending

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

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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.

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

VICI Valco Instruments

For over 35 years, Valco Instruments Co. Inc. (VICI) has been the leading designer and manufacturer of standard and custom components for precision analytical, biomedical, and biocompatible instrumentation. While Valco and Cheminert valves and fittings are the backbone of our product line, we also offer a wide range of related products such as pneumatic and electric actuators, tubing and sampling loops, heated enclosures, valve sequence and temperature controllers, gas purifiers, GC detectors, and digital interfaces.

Our international facility in Schenkon, Switzerland

VICI International AG

VICI 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. The popular Jour fingertight fittings and polymeric tubing are recent additions to our product line.

In 1996, VICI International became the first ISO-certified manufacturer of high pressure and low pressure valves for scientific equipment. Present certification is ISO 9001:2000.

VICI Valco Canada

VICI Valco Instruments Canada

VICI Valco Canada, located on the shores of the Saint Lawrence River in Brockville, Ontario, is our stocking and distribution center for ValcoBond® Capillary Columns. Products from all VICI companies are available in Canada directly from this location. We also supply and support our Canadian dealers and OEMs from our new facility.

VICI Gig Harbor Group

VICI Gig Harbor Group, in Gig Harbor, Washington, produces ValcoBond GC capillary columns. Extensive automation allows us to produce high quality columns at a fraction of the competitors' prices. Sales are direct in the US and Canada, and through a combination of private label, OEM, and distribution channels in other countries.

VICI Gig Harbor Group

VICI Metronics

VICI Metronics, Inc., located in Poulsbo, Washington, is the leading manufacturer of devices and instruments that are used in the generation of calibration gas standards. The Mat/Sen line includes contaminant traps and high performance gas specific purifiers suitable for use in GC/MS and LC/MS systems.

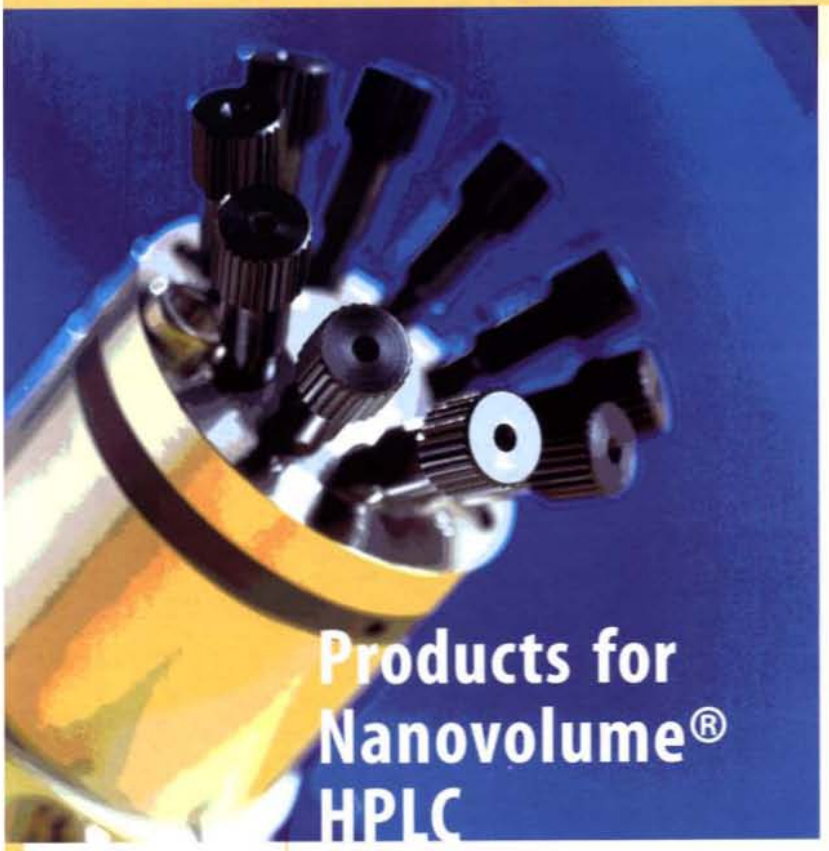
VICI Metronics
Move-in summer 2005

VICI Precision Sampling

VICI Precision Sampling produces syringes, Mininert® valves, probes, and tubing. Our extensive line of pre-cut stainless steel tubing is available in standard lengths or may be 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 Precision Sampling is located in Baton Rouge, Louisiana.

VICI Precision Sampling

VICI GIG HARBOR GROUP
VICI METRONICS
VICI PRECISION SAMPLING



Products for Nanovolume® HPLC

Nanovolume generally refers to components with bore sizes less than 250 µm (0.010"). 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.

Nanovolume® Fittings

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

Nanovolume® HPLC Sample Injectors and Switching Valves

20,000 psi Nanovolume®, 1/16" fittings *NEW*

- 1/16" Valco fittings
- 100 µm flowpath
- 4 port and 6 port versions

C2XU injectors achieve maximum pressure by employing our patented, award-winning feedback system. Available in 4 port, 6 port, and an internal sample configuration for injection of samples as small as 10 nanoliters.

Model C2XU
20,000 psi, page 20

10,000 and 20,000 psi Nanovolume®, 1/32" fittings

Ideal for applications in proteomics, C2NH and C2NX injectors achieve maximum pressure and lifetime by employing the patented, dynamic feedback system first introduced in our C2XH injectors (*page 168*). Available in 4 port, 6 port, and an internal sample configuration for injection of samples as small as 4 nanoliters.

Model C2NH
10,000 psi, page 22

5,000 psi Nanovolume®, 1/32" fittings

With a uniform 100 µm flowpath and port-to-port volume of less than 25 nl, the Cheminert nanovolume injectors and switching valves are ideal for high speed, high throughput techniques which demand a valve and fitting system that minimize internal volume and eliminate dead volume. Specially designed fingertight fittings accommodate fused silica capillary, 1/32" PEEK, or Valco electroformed nickel tubing.

Model CN2 is available in 4, 6, and 10 port versions; Model CN4 is an internal sample configuration for injection of samples as small as 4 nanoliters.

Model CN2
5,000 psi, page 23

WHICH NANOVOLUME® OR MICROBORE VALVE DO I NEED?

	4 and 6 port valves			Internal sample injectors		
Fitting size	**5,000 psi**	**10,000 psi**	**20,000 psi**	**5,000 psi**	**10,000 psi**	**20,000 psi**
Valco 1/16"	C2*	C2XH*	C2XU (new)	C4	C4XH	C4XU (new)
Valco 1/32"	—	C2NH	C2NX	—	C4NH	C4NX
Cheminert 1/32"	CN2	—	—	CN4	—	—

NANOVOLUME 0.10 mm ports (100 micron, .004")
MICROBORE 0.15-0.25 mm ports (150-250 micron, .006"-.010")

Fitting types

Valco 1/32"	Metal Valco nuts and ferrules	For 1/32" metal tubing
Valco 1/16"	Metal Valco nuts and ferrules	For 1/16" metal tubing
Cheminert 1/32"	PEEK fitting with integral ferrule	Accomodates fused silica, PEEK, and electroformed nickel tubing

* Models C2 and C2XH include 4, 6, and 10 port valves

Further reference

Nanovolume® Fittings

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 (available from VICI with standard or gold-plated ID). 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.

1/32" Nanovolume nuts and ferrules

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

		Prod No	*Price each:*
	**Internal nut** with collapsible ferrule *For use with:* *Nanovolume fittings* *6 port nanovolume valve CN2-4346*	C-NNFFPK	$7
	**Internal nut** with collapsible ferrule *For use with:* *10 port nanovolume valve CN2-4340*	C-NNFLFPK	8
	**External nut** *For use with:* *Nanovolume unions* *Nanovolume column end fittings* Note: Requires nanovolume ferrule	C-EN.5FPKB	4
	Nanovolume ferrule *For use with:* *Nanovolume external nut*	ZGF.5PK	4

Fill ports

for Nanovolume® valves

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

Description	*Prod No*	*Price*
For 1/32" CN2 series HPLC injectors	C-NVISF	$12

TECH TIP

Use these nuts with nanovolume fittings and CN2 valves. Use metal Valco nuts with C2NH, C4NH, C2XH, and C4XH valves.

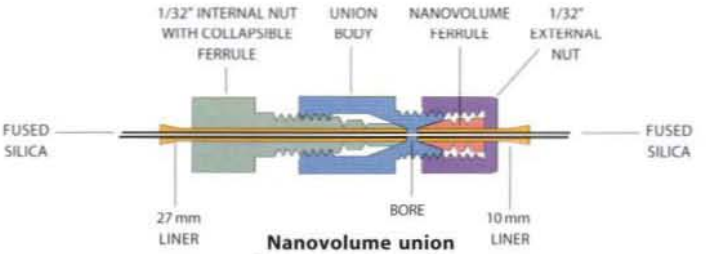
Injectors/ valves:
CN2 ..... page 23
C2NH 22
C4NH 22
C2NX 21
C4NX 21
Metal Valco nuts 36

TECH TIP

Liners adapt nanovolume fittings for use with fused silica tubing. Two lengths are available for use with two different types of nuts.

Further reference

Nanovolume
Liners ..... page 18
Column end fittings ... 19
Injectors 20-23
1/32" frits 18
Tubing
PEEK 107
Electroformed nickel 103



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

Nanovolume unions *for 1/32" tubing*

	100 µm bore		150 µm bore	
	Prod No	*Price*	*Prod No*	*Price*
For 1/32" PEEK or electroformed nickel tubing Does not require or include liners.	C-NEU.5XFPK	$39	C-NEU.5FPK	$32

Nanovolume unions *for fused silica tubing*

		100 µm bore		150 µm bore	
	FS tubing OD	*Prod No*	*Price*	*Prod No*	*Price*
For fused silica tubing Includes liners.	125 -175 µm	C-NEU.5XFPK.15	$45	C-NEU.5FPK.15	$38
	175 -225 µm	C-NEU.5XFPK.20	45	C-NEU.5FPK.20	38
	225 -275 µm	C-NEU.5XFPK.25	45	C-NEU.5FPK.25	38
	275 -325 µm	C-NEU.5XFPK.30	45	C-NEU.5FPK.30	38
	325 -375 µm	C-NEU.5XFPK.35	45	C-NEU.5FPK.35	38

Nanovolume reducing unions

	200 µm bore	
	Prod No	*Price*
1/32" to 1/16" tubing, natural PEEK	ZERU1.5FPK	$24

Nanovolume tees, y's, and crosses

		100 µm bore		150 µm bore	
		Prod No	*Price*	*Prod No*	*Price*
Tee	1/32" tubing or fused silica**	C-NTXFPK	$95	C-NTFPK	$75
Y	1/32" tubing or fused silica**	C-NYXFPK	95	C-NYFPK	75
Cross	1/32" tubing or fused silica**	C-NXXFPK	110	C-NXFPK	90

**A liner is needed for use with fused silica.
Order 27 mm length *without* screen, page 18.

TECH TIP

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

Liners ..... page 18

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

Liners for nanovolume connectors

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

The 27 mm liners are for internal nuts with collapsible ferrules:

- Liners *without* screens are for connecting fused silica.
- Liners *with* embedded screens are replacements for column end fittings.

10 mm liners are for use with external nuts.

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

For tubing OD	**Without screen** *Package/5:* *Prod No*	**With embedded 1 µm screen** *Sold individually:* *Prod No*
125 - 175 µm	C-NL.15L-5	C-NLS1.15
175 - 225 µm	C-NL.20L-5	C-NLS1.20
225 - 275 µm	C-NL.25L-5	C-NLS1.25
275 - 325 µm	C-NL.30L-5	C-NLS1.30
325 - 375 µm	C-NL.35L-5	C-NLS1.35

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

For tubing OD	**Without screen** *Package/5:* *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

Nanovolume frits

These frits are the answer to filtration of 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

TECH TIP

Use **27 mm liners** with internal nuts with collapsible ferrules.

Use **10 mm liners** with external nuts.

Liners *without* screens are for connecting fused silica.

Liners *with* embedded screens are replacements for column end fittings.

Further reference

Nanovolume® 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.

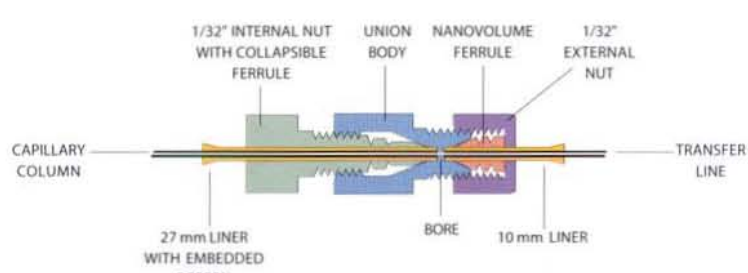
Like other nanovolume fittings, they include our one-piece 1/32" fingertight fittings, with a patented* collapsible ferrule. To avoid potential confusion, all fittings utilizing the Cheminert collapsible ferrule are made of black PEEK. The liners are natural PEEK.

Screen embedded in end of liner

Nanovolume column end fittings

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

Nanovolume column end fitting
For 360 µm fused silica columns
(C-NEF.5FPK.35S1)



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

*patents pending

Further reference

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

NEW

20,000 psi Nanovolume® valves, 1/16" Valco fittings, 0.10 mm ports (.004")

Model C2XU

SPECS

20,000 psi liq
50°C max
Metal stator
Valcon X rotor

OPTIONS

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

Includes stainless steel nuts and ferrules of the stator material.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 5 µl loop of the stator material.

	4 Port	6 Port
	Prod No	*Prod No*
N60 stainless stator		
Manual	C2XU-4904	C2XU-4906
With microelectric actuator	C2XU-4904EH	C2XU-4906EH
Replacement valve	C2XU-4904D	C2XU-4906D

Model C2XU 1/16" ZDV fittings

Sample loops *for C2XU valves*

Each metal loop includes two stainless steel nuts and ferrules.

Volume	**Stainless Steel** *Prod No*
1 µl	CSL1
2 µl	CSL2
5 µl	CSL5
10 µl	CSL10
15 µl	CSL15
20 µl	CSL20
50 µl	CSL50
100 µl	CSL100
250 µl	CSL250
500 µl	CSL500

NEW

20,000 psi Nanovolume® internal volume injector, 1/16" Valco fittings, 0.10 mm ports (.004")

Model C4XU

SPECS

20.000 psi liq
50°C max
Metal stator
Valcon X rotor

OPTIONS

- 50 nl and 100 nl sample volumes

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

Sample volume	**10 nanoliters** *Prod No*	**20 nanoliters** *Prod No*
N60 stainless stator		
Manual	C4XU-4904-.01	C4XU-4904-.02
With microelectric actuator	C4XU-4904.-01EH	C4XU-4904.-02EH
Replacement valve	C4XU-4904-.01D	C4XU-4904-.02D

Model C4XU 1/16" ZDV fittings

20,000 psi Nanovolume® valves, 1/32" Valco fittings, 0.10 mm ports (.004")

Model C2NX

Includes stainless steel nuts and ferrules of the stator material.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 1.5 µl loop of the stator material.

	4 Port	6 Port
	Prod No	*Prod No*
N60 stainless stator		
Manual	C2NX-4904	C2NX-4906
With microelectric actuator	C2NX-4904EH	C2NX-4906EH
Replacement valve	C2NX-4904D	C2NX-4906D

Model C2NX 1/32" ZDV fittings

SPECS

20,000 psi liq
50°C max
Metal stator
Valcon X rotor

Sample loops

for C2NX valves

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

	Stainless steel	
Volume	*Prod No*	*Price*
1 µl	CSLN1K	24
1.5 µl	CSLN1.5K	24
2 µl	CSLN2K	24
5 µl	CSLN5K	24

20,000 psi Nanovolume® internal volume injector, 1/32" Valco fittings, 0.10 mm ports (.004")

Model C4NX

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

Sample volume	**4 nanoliters**	**10 nanoliters**
	Prod No	*Prod No*
N60 stainless stator		
Manual	C4NX-4904-.004	C4NX-4904-.01
With microelectric actuator	C4NX-4904-.004EH	C4NX-4904.-01EH
Replacement valve	C4NX-4904-.004D	C4NX-4904-.01D

Model C4NX 1/32" ZDV fittings

SPECS

20.000 psi liq
50°C max
Metal stator
Valcon X rotor

Further reference

SPECS

10,000 psi liq
50°C max
Metal stator
Valcon X rotor

10,000 psi Nanovolume® valves, 1/32" Valco fittings, 0.10 mm ports (.004")

Model C2NH

Includes stainless steel nuts and ferrules of the stator material.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 1.5 µl loop of the stator material.

	4 Port	6 Port*
	Prod No	*Prod No*
N60 stainless stator		
Manual	C2NH-4904	C2NH-4906
With microelectric actuator	C2NH-4904EH	C2NH-4906EH
Replacement valve	C2NH-4904D	C2NH-4906D

Model C2NH 1/32" ZDV fittings

Sample loops

for C2NH valves

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

	Stainless steel
Volume	*Prod No*
1 µl	CSLN1K
1.5 µl	CSLN1.5K
2 µl	CSLN2K
5 µl	CSLN5K

SPECS

10.000 psi liq
50°C max
Metal stator
Valcon X rotor

10,000 psi Nanovolume® internal volume injector, 1/32" Valco fittings, 0.10 mm ports (.004")

Model C4NH

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

Sample volume	4 nanoliters	10 nanoliters
	Prod No	*Prod No*
N60 stainless stator		
Manual	C4NH-4904-.004	C4NH-4904-.01
With microelectric actuator	C4NH-4904-.004EH	C4NH-4904.-01EH
Replacement valve	C4NH-4904-.004D	C4NH-4904-.01D

Model C4NH 1/32" ZDV fittings

Further reference

Fill port adapters ..... p. 66
Nuts 36
Ferrules 38-39

5,000 psi Nanovolume® valves, 1/32"Cheminert fittings, 0.10 mm ports (.004")

Model CN2

Includes PEEK Cheminert nanovolume fittings.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 250 nl loop of the stator material.

	6 Port* Prod No	10 Port Prod No
PAEK stator		
Manual	CN2-4346	CN2-4340
With microelectric actuator	CN2-4346EH	CN2-4340EH
Replacement valve	CN2-4346D	CN2-4340D

Model CN2 1/32" Cheminert fittings

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

Sample loops

for CN2 valves

Each PEEK loop includes two PEEK Cheminert nanovolume fittings.

	PEEK	
Volume	*Prod No*	*Price*
250 nl	CNSL250PK	$30
500 nl	CNSL500PK	30
1 µl	CNSL1KPK	30
2 µl	CNSL2KPK	30
5 µl	CNSL5KPK	30

Model CN4 1/32" Cheminert fittings

5,000 psi Nanovolume® internal sample injector, 1/32"Cheminert fittings, 0.10 mm ports (.004")

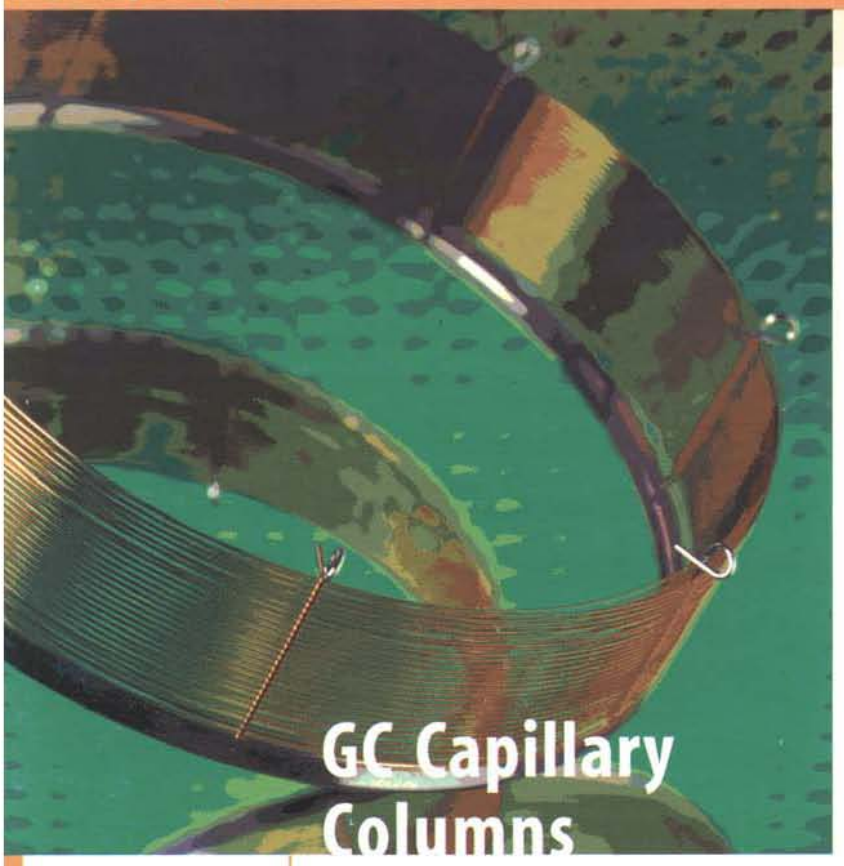
Model CN4

Includes PEEK Cheminert nanovolume fittings.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	4 nanoliters Prod No	10 nanoliters Prod No	20 nanoliters Prod No
PAEK stator			
Manual	CN4-4344-.004	CN4-4344-.01	CN4-4344-.02
With microelectric actuator	CN4-4344-.004EH	CN4-4344-.01EH	CN4-4344-.02EH
Replacement valve	CN4-4344-.004D	CN4-4344-.01D	CN4-4344-.02D

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

Further reference



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
- No risk guarantee

We use proprietary liquid phase processing to produce low bleed characteristics while maintaining identical retention characteristics to the phases you are used to. These processes combined with proprietary automated deactivation, coating, curing, bonding, and crosslinking produce MS-certified bleed characteristics equal to the best. Improved upper temperature limits enhance column "bake out", reducing sample carryover and cycle times.

VALCOBOND PHASES

VB-1U	*NEW!* 100% dimethylpolysiloxane, unimolecular
VB-1	100% dimethylpolysiloxane
VB-5	(5%-Phenyl)-methylpolysiloxane
VB-35	(35%-Phenyl)-methylpolysiloxane
VB-50/608	(50%-Phenyl)-methylpolysiloxane
VB-210	(50%-Trifluoropropyl)-methylpolysiloxane
VB-225	(50%-Cyanopropylphenyl)-methylpolysiloxane
VB-624	(6% Cyanopropyl-phenyl)-methylpolysiloxane
VB-1701	(14% Cyanopropyl-phenyl)-methylpolysiloxane
VB-Wax	Polyethylene glycol (PEG)
VB-FFAP	Nitroterephthalic acid modified PEG

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Contact us to discuss your specific application.

VICI Gig Harbor Group

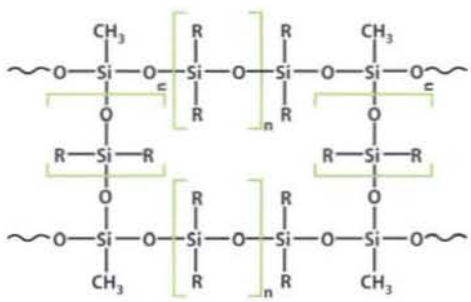
NEW!

Unimolecular™ Low Bleed VB-1 Columns

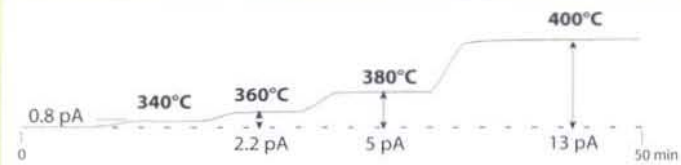
"Unimolecular phase" means that the entire column coating consists of a single molecule. This newest development in stationary phase polymer technology is available exclusively from VICI.

With the lowest bleed (5 pA at 380°C) and highest temperature specifications (370°/400°C for fused silica, 400°/450°C for stainless) available anywhere, VB-1 Unimolecular columns offer:

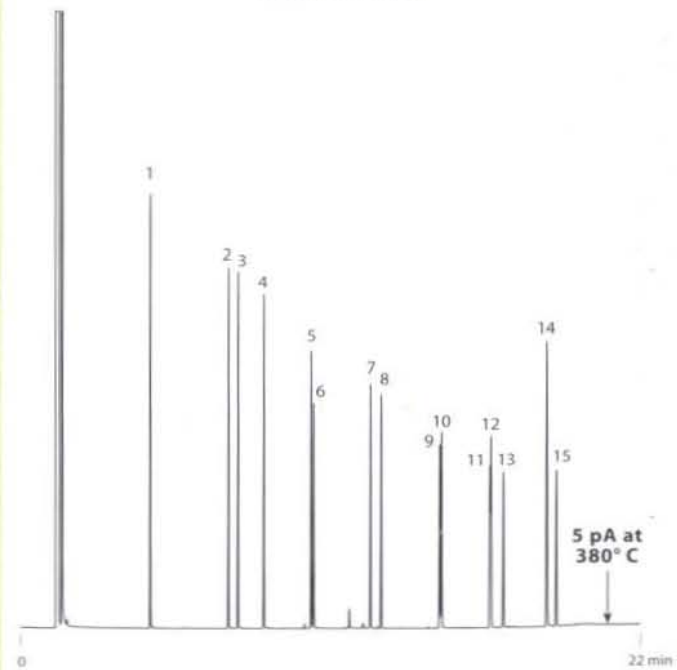
- faster stabilization
- reduced cycle times (by burning off high molecular weight compounds)
- Improved signal to noise ratio
- less detector contamination
- increased MS source lifetime
- improved integration/quantitation
- reduced instrument maintenance



The single molecular network is devoid of volatile components and terminal silanol groups



Bleed Profile



1	Naphthalene	6	Anthracene	12	Benzo(k)fluoranthene
2	Acenaphthalene	7	Fluoranthene	13	Benzo(a)pyrene
3	Acenaphthene	8	Pyrene	14	Indeno (1,2,3-c,d)pyrene/ 1,2:5,6-Dibenzanthracene
4	Fluorene	9	1,2 Benz(a)anthracene		
5	Phenanthrene	10	Chrysene	15	1,12-Benzoperylene
		11	Benzo(b)fluoranthene		

PAH ANALYSIS

Unimolecular VB-1, 30 m x 0.25 mm x 0.25 µm

Sample	Standard PAH sample
Column temp	100°C for 2 min, then programmed to 400°C @ 15°C/min.
Detector	400°C
Injector temp	280°C, split injection

VB-1 Unimolecular

100% dimethylpolysiloxane

PRIMARY APPLICATIONS

High temperature applications
Simulated distillation

Fused silica

0.25 mm ID

1 pA at 340°C	*df*	*Prod No*
15 meter	0.25	CFS-A01525-025U
30 meter	0.25	CFS-A03025-025U
60 meter	0.25	CFS-A06025-025U

0.32 mm ID

1 pA at 340°C		
30 meter	0.25	CFS-A03032-025U

Stainless steel

0.25 mm ID

1 pA at 340°C	*df*	*Prod No*
15 meter	0.25	CSS-A01525-025U
30 meter	0.25	CSS-A03025-025U
60 meter	0.25	CSS-A06025-025U

0.53 mm ID

2 pA at 340°C		
30 meter	0.50	CSS-A03053-050U

SimDis

<5 pA at 400°C		
5 meter	0.10	CSS-M00553-010A

SPECS

Fused silica columns
-40° to 370°/400°C)
Stainless steel columns
-40° to 400°/450°C)

FOR OUR COMPLETE LINE OF VALCOBOND COLUMNS

SPECS

Film thickness
Less than 1 µm
-60°C to 360/370°C
1 µm or more
-60°C to 340/360°C

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

MS-CERTIFIED

VB-1

100% dimethylpolysiloxane

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

0.25 mm ID	df	Prod No
15 meters	0.25	CFS-A01525-025B
30 meters	0.25	CFS-A03025-025B
60 meters	0.25	CFS-A06025-025B
	1.00	CFS-A06025-100B
0.32 mm ID		
30 meter	0.25	CFS-A03032-025B
	1.00	CFS-A03032-100B
	3.00	CFS-A03032-300B
60 meter	0.25	CFS-A06032-025B
	1.00	CFS-A06032-100B

0.53 mm ID	df	Prod No
30 meter	0.50	CFS-A03053-050B
	1.00	CFS-A03053-100B
	1.50	CFS-A03053-150B
	3.00	CFS-A03053-300B
	5.00	CFS-A03053-500B

SPECS

Film thickness
Less than 1 µm
-60°C to 360/370°C
1 µm or more
-60°C to 340/360°C

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

MS-CERTIFIED

VB-5

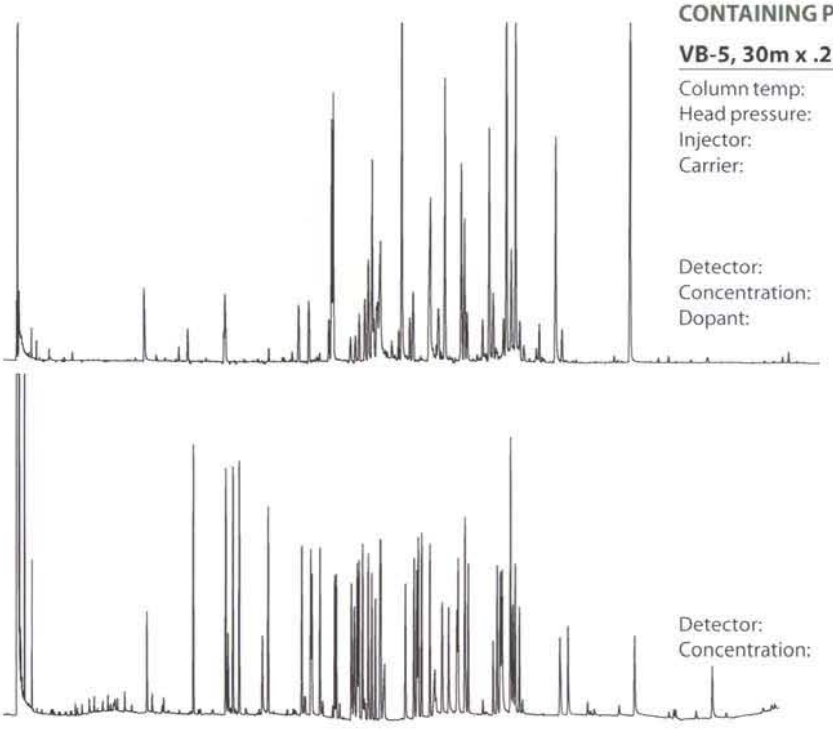
5% phenyl/95% dimethylpolysiloxane

PRIMARY APPLICATIONS

Drugs
Herbicides
Hydrocarbons
PCBs
Pesticides
Phenols
Semi-volatiles
Sulfur compounds

0.25 mm ID	df	Prod No
15 meters	0.10	CFS-B01525-010B
30 meters	0.25	CFS-B03025-025B
	0.50	CFS-B03025-050B
60 meters	0.25	CFS-B06025-025B

0.32 mm ID	df	Prod No
15 meters	0.25	CFS-B01532-025B
30 meter	0.25	CFS-B03032-025B
	0.50	CFS-B03032-050B
60 meter	0.25	CFS-B06032-025B
0.53 mm ID		
30 meter	3.00	CFS-B03053-300B
	5.00	CFS-B03053-500B



NITROGEN- AND PHOSPHORUS-CONTAINING PESTICIDES

VB-5, 30m x .25mm x 0.25µm

Column temp: 60°C to 320°C @10°C/min
Head pressure: 15 psi
Injector: 280°C, split 1:10
Carrier: Helium

Detector: **PDD Model D-5**, 280°C
Concentration: 0.8 mg/ml
Dopant: 3% Xenon in helium

Detector: **PDD Model D-3**, 280°C
Concentration: 2.5 mg/ml

Further reference

Pulsed discharge detectors
Model D-3 ..... page 230
Model D-5 230

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VICI Gig Harbor Group

VB-Wax

100% bonded polyethylene glycol

PRIMARY APPLICATIONS

Alcohols
Aldehydes
Aromatics
Flavors
Fragrances
Organic Acids
Solvents

0.25 mm ID	df	Prod No
30 meters	0.25	CFS-G03025-025A
60 meters	0.25	CFS-G06025-025A
0.32 mm ID		
30 meter	0.25	CFS-G03032-025A
	0.50	CFS-G03032-050A

0.53 mm ID	df	Prod No
30 meter	1.00	CFS-G03053-100A

SPECS

20°C to 250/260°C

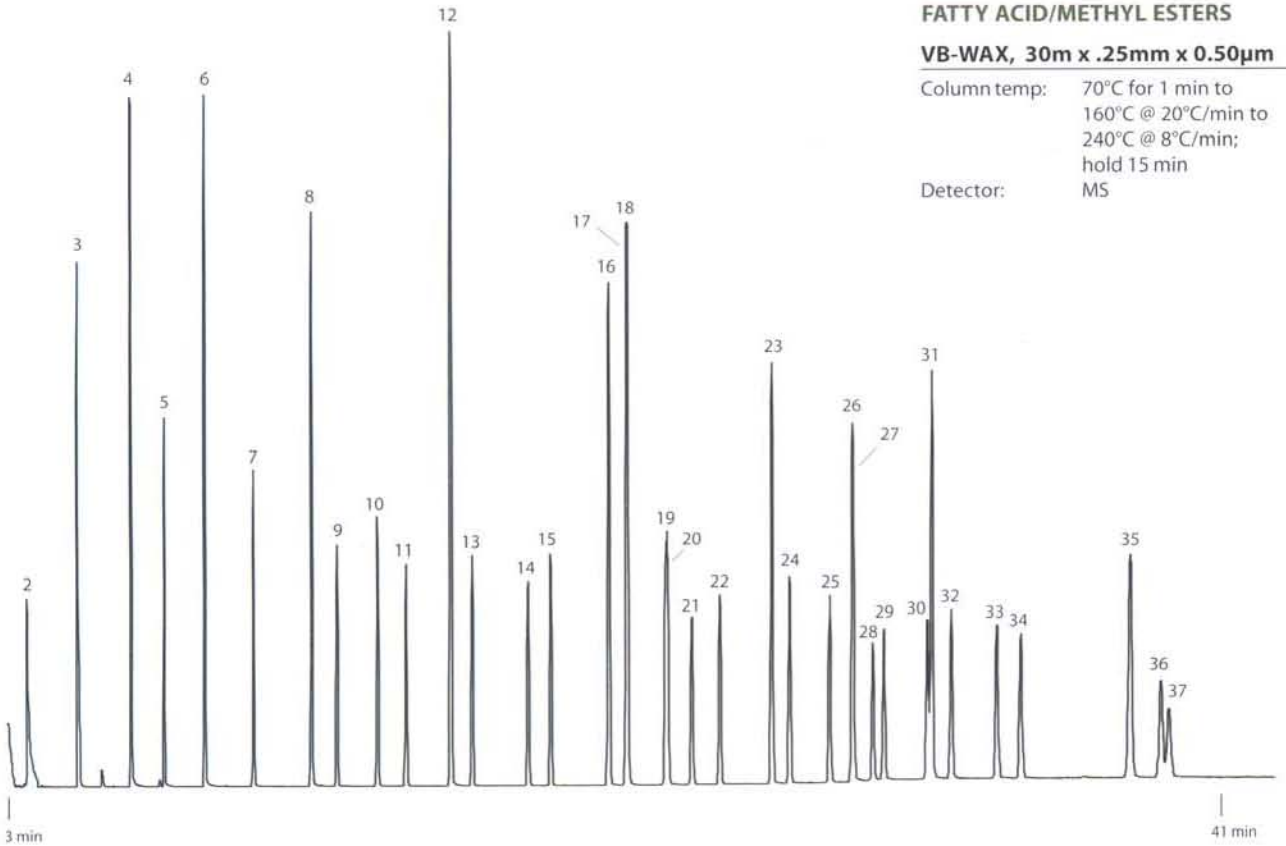
REPLACES

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

FATTY ACID/METHYL ESTERS

VB-WAX, 30m x .25mm x 0.50µm

Column temp: 70°C for 1 min to 160°C @ 20°C/min to 240°C @ 8°C/min; hold 15 min
Detector: MS



1 Butyric Acid Methyl Ester (C4:0)
2 Caproic Acid Methyl Ester (C6:0)
3 Caprylic Acid Methyl Ester (C8:0)
4 Capric Acid Methyl Ester (C10:0)
5 Undecanoic Acid Methyl Ester (C11:0)
6 Lauric Acid Methyl Ester (C12:0)
7 Tridecanoic Acid Methyl Ester (C13:0)
8 Myristic Acid Methyl Ester (C14:0)
9 Myristoleic Acid Methyl Ester (C14:1)
10 Pentadecanoic Acid Methyl Ester (C15:0)
11 cis-10-Pentadecenoic Acid Methyl Ester (C15:1)
12 Palmitic Acid Methyl Ester (C16:0)
13 Palmitoleic Acid Methyl Ester (C16:1)
14 Heptadecanoic Acid Methyl Ester (C17:0)
15 cis-10-Heptadecenoic Acid Methyl Ester (C17:1)
16 Stearic Acid Methyl Ester (C18:0)
17 Oleic Acid Methyl Ester (C18:1n9c)
18 Elaidic Acid Methyl Ester (C18:1n9t)
19 Linoleic Acid Methyl Ester (C18:2n6c)
20 Linolelaidic Acid Methyl Ester (C18:2n6t)
21 g-Linolenic Acid Methyl Ester (C18:3n6)
22 Linolenic Acid Methyl Ester (C18:3n3)
23 Arachidic Acid Methyl Ester (C20:0)
24 cis-11-Eicosenoic Acid Methyl Ester (C20:1)
25 cis-11,14-Eicosadienoic Acid Methyl Ester (C20:2)
26 cis-8,11,14-Eicosatrienoic Acid Methyl Ester (C20:3n6)
27 Heneicosanoic Acid Methyl Ester (C21:0)
28 cis-11,14,17-Eicosatrienoic Acid Methyl Ester (C20:3n3)
29 Arachidonic Acid Methyl Ester (C20:4n6)
30 cis-5,8,11,14,17-Eicosapentaenoic Acid Methyl Ester (C20:5n3)
31 Behenic Acid Methyl Ester (C22:0)
32 Erucic Acid Methyl Ester (C22:1n9)
33 cis-13,16-DocosadienoicAcid Methyl Ester (C22:2)
34 Tricosanoic Acid Methyl Ester (C23:0)
35 Lignoceric Acid Methyl Ester (C24:0)
36 cis-4,7,10,13,16,19-Docosahexaenoic Acid Methyl Ester (C22:6n3)
37 Nervonic Acid Methyl Ester (C24:1)

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VICI Gig Harbor Group

ValcoPLOT® HayeSep® Capillary PLOT Columns

- 100% bonded
- Widest polarity range
- Faster than micropacked
- Water tolerant

Now you can reduce run time by replacing your packed columns with ValcoPLOT HayeSep capillary PLOT columns, with phases available only from VICI. Our proprietary phase processing produces the first capillary PLOT columns with characteristics identical to HayeSep packed columns.

VALCOPLOT HAYESEP PHASES

HayeSep A	High purity Divinylbenzene/ ethyleneglycoldimethacrylate
HayeSep B	Divinylbenzene/polyethyleneimine
HayeSep C	Divinylbenzene/acrylonitrile
HayeSep D	High purity Divinylbenzene
HayeSep N	Divinylbenzene/ethyleneglycoldimethacrylate
HayeSep P	Divinylbenzene/styrene
HayeSep Q	Divinylbenzene
HayeSep QJ	Divinylbenzene (PVP modified)
HayeSep R	Divinylbenzene/N-vinyl-2-pyrollidinone
HayeSep S	Divinylbenzene/4-vinyl-pyridine
HayeSep T	Ethyleneglycoldimethacrylate

HayeSep A

High purity Divinylbenzene/ethyleneglycoldimethacrylate

SPECS

-60°C to 270/290°C

REPLACES

This phase is available exclusively from VICI.

PRIMARY APPLICATIONS

- Solvents
- Light gases
- Light hydrocarbons
- Residual solvents

Fused silica

0.32 mm ID	df (µm)	Prod No
15 meter	10	CFS-PA1532-010
30 meter	10	CFS-PA3032-010
0.53mm ID		
15 meter	20	CFS-PA1553-020
30 meter	20	CFS-PA3053-020

Stainless steel

0.53mm ID	df (µm)	Prod No
30 meter	20	CSS-PA3053-020

HayeSep D

High purity Divinylbenzene

SPECS

-60°C to 270/290°C

REPLACES

This phase is available exclusively from VICI.

PRIMARY APPLICATIONS

- Solvents
- Hydrocarbons
- Alcohols
- Sulfur compounds
- Residual solvents
- Halogenated hydrocarbons

Fused silica

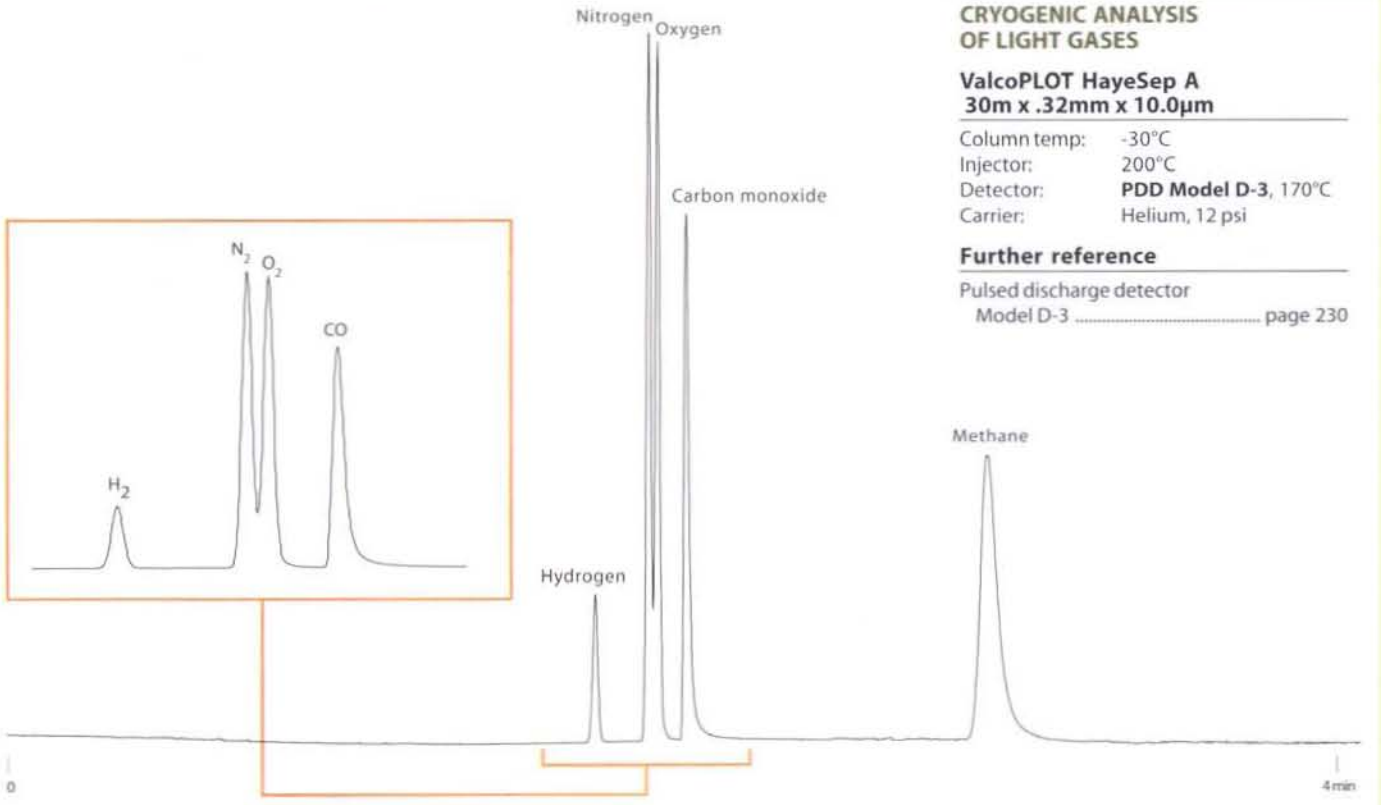
0.32 mm ID	df (µm)	Prod No
15 meter	10	CFS-PD1532-010
30 meter	10	CFS-PD3032-010
0.53mm ID		
15 meter	20	CFS-PD1553-020
30 meter	20	CFS-PD3053-020

Stainless steel

0.53mm ID	df (µm)	Prod No
30 meter	20	CSS-PD3053-020

Further reference

Pulsed discharge detector Model D-3 ..... page 230



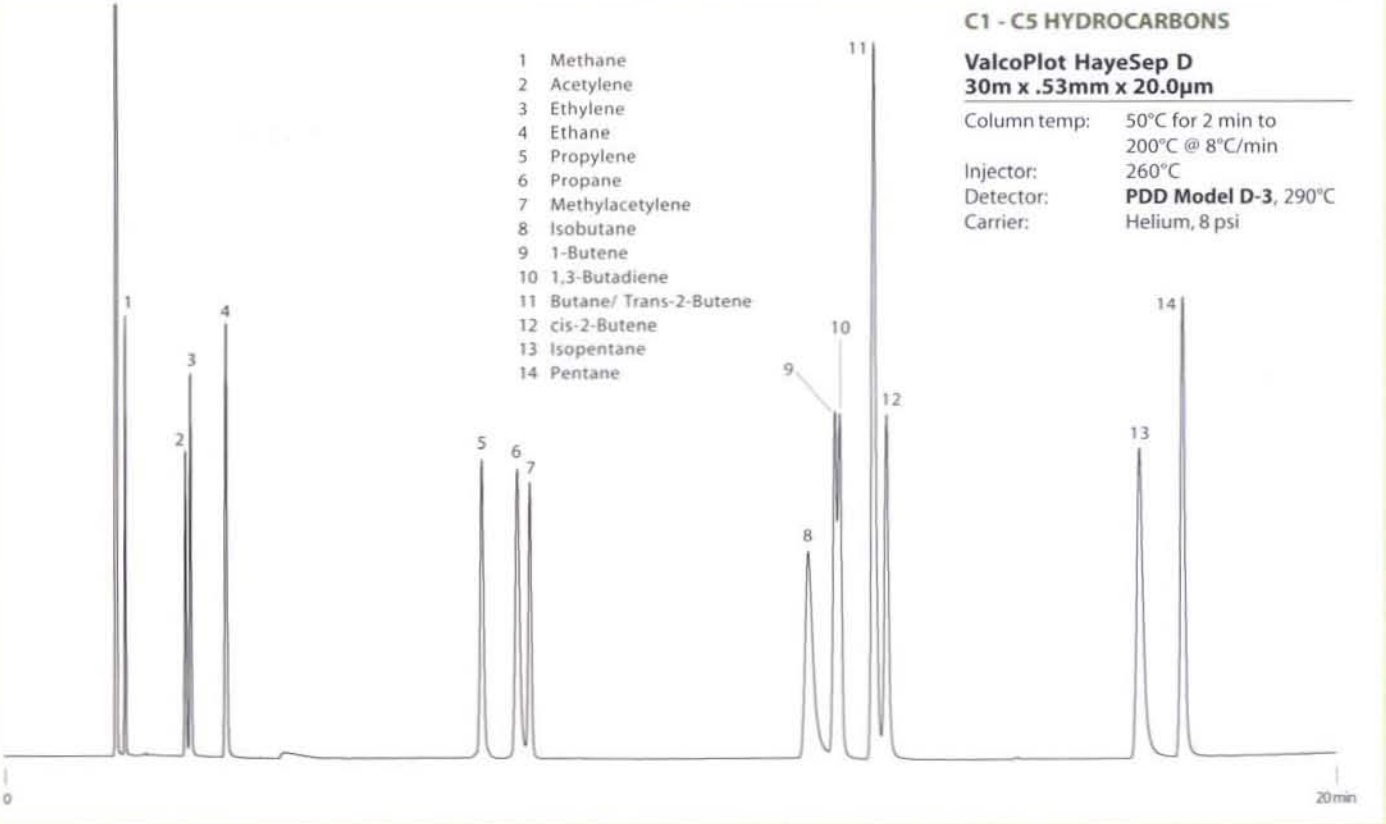
CRYOGENIC ANALYSIS OF LIGHT GASES

ValcoPLOT HayeSep A
30m x .32mm x 10.0µm

Column temp:	-30°C
Injector:	200°C
Detector:	**PDD Model D-3**, 170°C
Carrier:	Helium, 12 psi

Further reference

Pulsed discharge detector
Model D-3 ..... page 230



C1 - C5 HYDROCARBONS

ValcoPlot HayeSep D
30m x .53mm x 20.0µm

Column temp:	50°C for 2 min to 200°C @ 8°C/min
Injector:	260°C
Detector:	**PDD Model D-3**, 290°C
Carrier:	Helium, 8 psi

SPECS

350/350°C

REPLACES

GS-Molesieve 5A
HP-PLOT Molesieve
CP-Molesieve 5A
Rt-Msieve-5A
MXT-Msieve-51
PLT-5A

Molesieve 5Å

Molesieve 5Å

PRIMARY APPLICATIONS

Gases

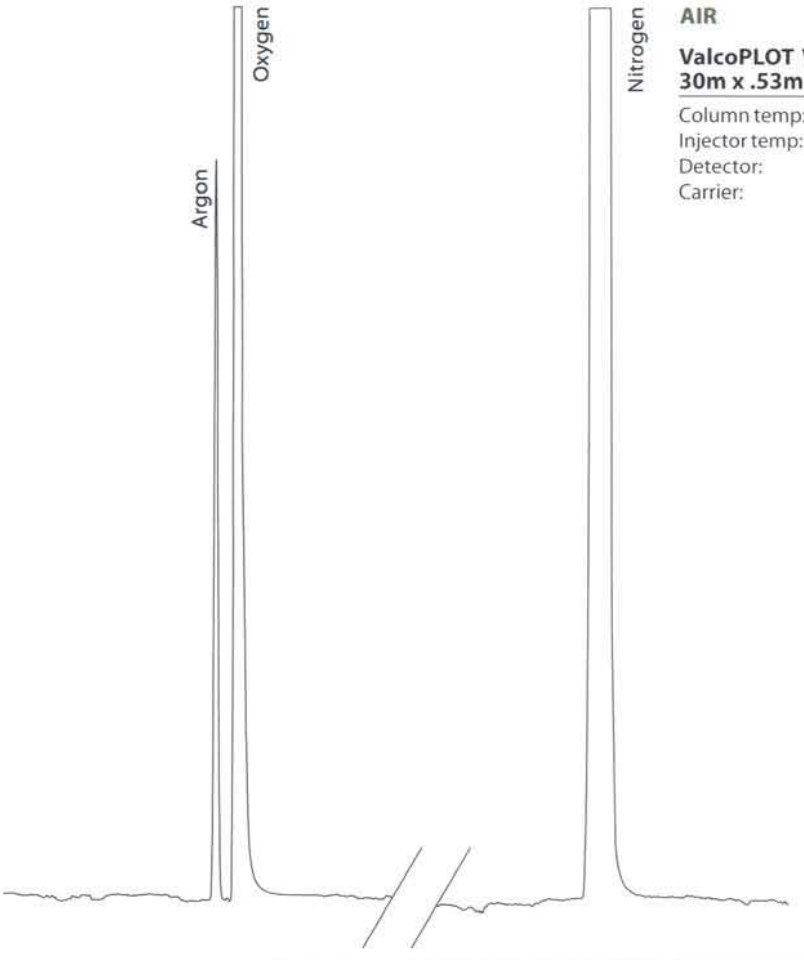
ValcoPLOT Molesieve 5Å PLOT columns offer greatly enhanced analytical efficiency at economical prices. No need for cryogenic equipment to analyze Ar/O_2 with our thick film columns. ValcoPLOT Molesieve 5Å PLOT thin film columns offer fast elution of carbon monoxide with near perfect peak symmetry. Our proprietary bonding technology insures that the particles stay put even when used with valves.

Fused silica

0.32 mm ID	*df(µm)*	*Prod No*
30 meter	10	CFS-X03032-100
0.53 mm ID		
30 meter	15	CFS-X03053-150
	50	CFS-X03053-500
50 meter	15	CFS-X05053-150
	50	CFS-X05053-500

Stainless steel

0.53 mm ID	*df(µm)*	*Prod No*
30 meter	15	CSS-X03053-150
	50	CSS-X03053-500



AIR

ValcoPLOT VP-Molesieve 5Å
30m x .53mm x 0.50µm

Column temp: Ambient
Injector temp: 250°C
Detector: **PDD Model D-3**, 300°C
Carrier: Helium

Further reference

Pulsed discharge detector Model D-3 ..... page 230

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VICI Gig Harbor Group

Alumina

Aluminum oxide

PRIMARY APPLICATIONS
C1 - C5 hydrocarbons

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.

VP-Alumina/KCl

Fused silica

0.53 mm ID	df(µm)	Prod No
30 meter	10	CFS-Y03053-100A
50 meter	10	CFS-Y05053-100A

Stainless steel

0.53 mm ID		
30 meter	10	CSS-Y03053-100A

VP-Alumina/Na_2SO_4

Fused silica

0.53 mm ID	df(µm)	Prod No
30 meter	10	CFS-Z03053-100A
50 meter	10	CFS-Z05053-100A

Stainless steel

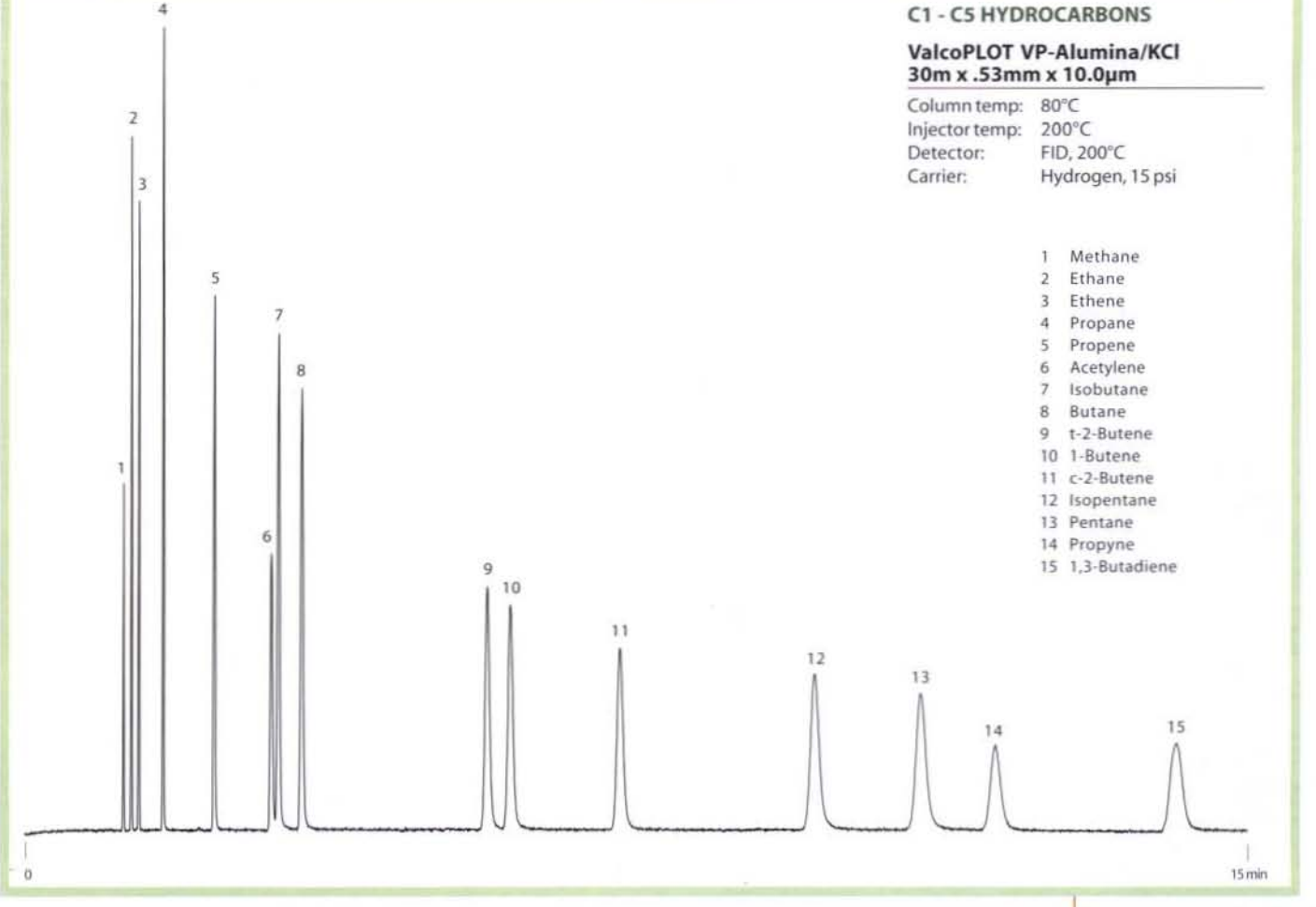
0.53 mm ID		
30 meter	10	CSS-Z03053-100A

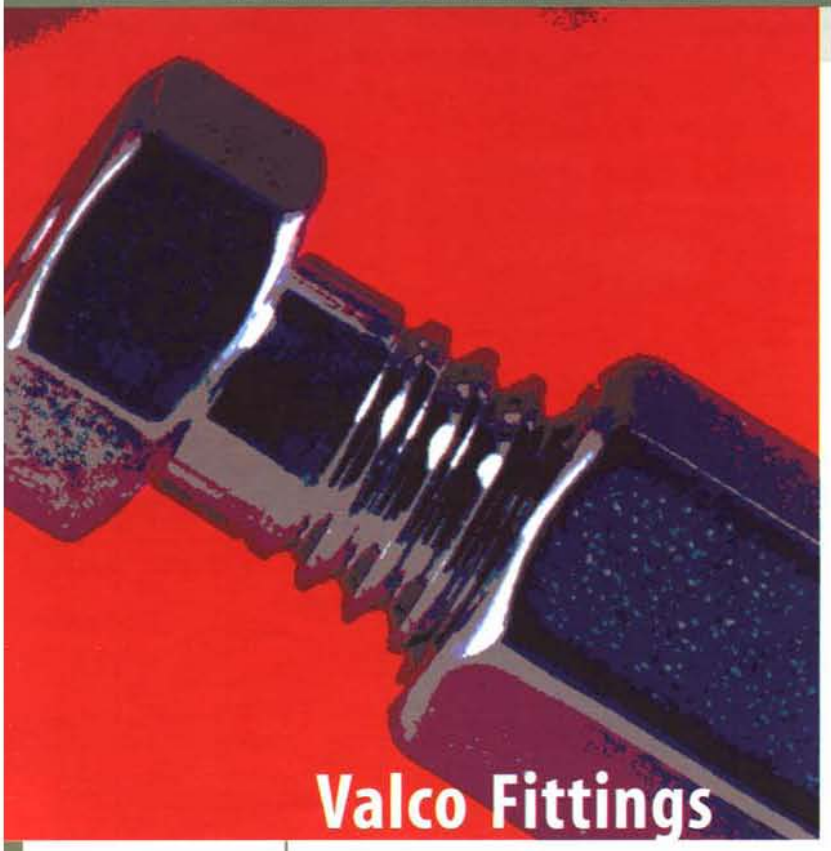
SPECS

-60°C to 200°C

REPLACES

GS-Alumina
HP-PLOT Al203
CP-Al203/KCl
CP-Al203/Na2SO4
Rt-alumina-PLOT
Al203/KCl
Al203/Na2SO4





The two piece compression fitting (**Figure 1**), in which a ferrule is compressed onto the tube as a nut is tightened, offers reliability in high pressure situations and in connecting metal tubing.

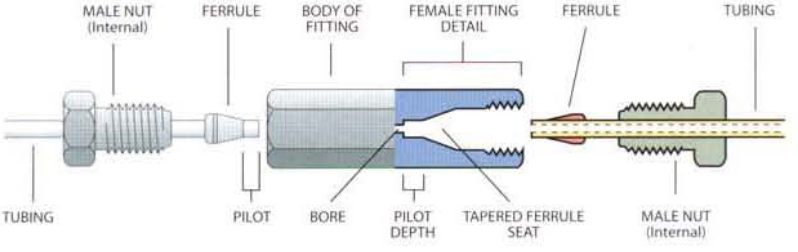


Figure 1
Valco compression fitting

Valco excels in all critical areas of the design and manufacture of 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 insuring 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 most instrument applications.

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

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.

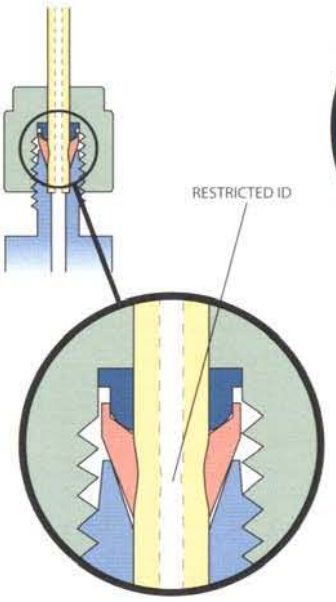


Figure 2:
ID restriction
in common compression fitting

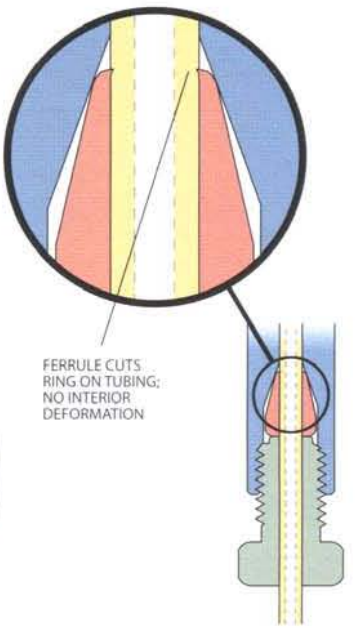
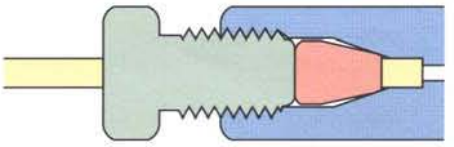


Figure 3:
No ID restriction
in Valco compression fitting

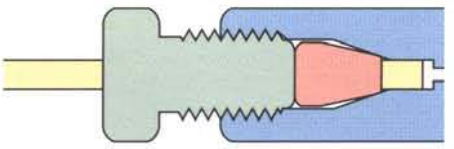
Interchangeability

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.

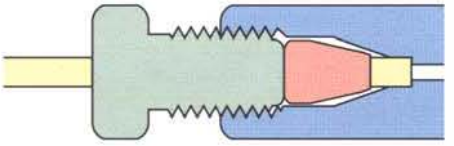
Because of variation in tubing OD and in pilot and taper designs from manufacturer to manufacturer, the amount of tubing extending beyond the made up ferrule can vary. (The most radical variation is in the fittings manufactured by Waters. Based on the old Swagelok design, they have a pilot depth considerably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



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

Reliably Clean

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. The practical result of the extra effort is this: you don't have to be concerned about solvent residues.

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.

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: 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 pre-cut tubing, which is manufactured to quality standards in excess of most commercial tubing, further assures the best fitting connection.

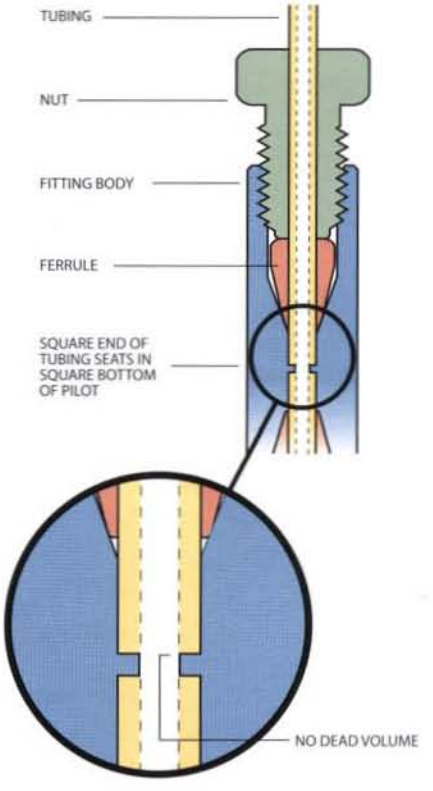


Figure 5:
Valco/Cheminert high pressure compression fitting

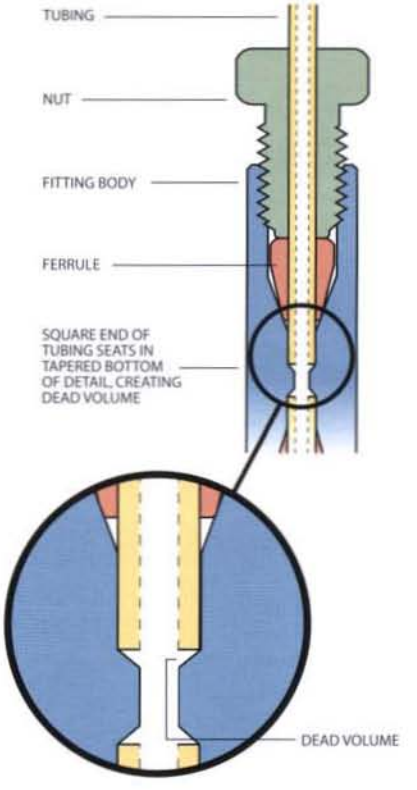


Figure 6:
Poor quality compression fitting

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.

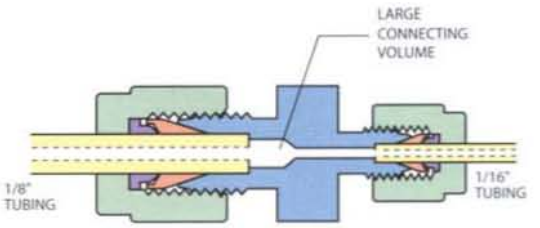


Figure 7:
Common commercial reducing union

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.

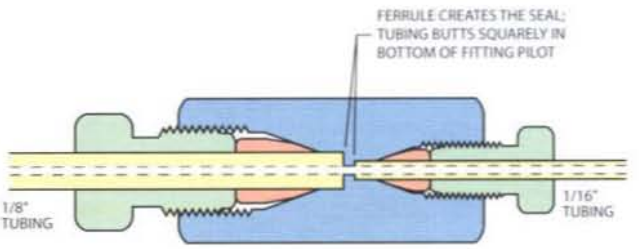


Figure 8:
Valco zero dead volume reducing union

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.

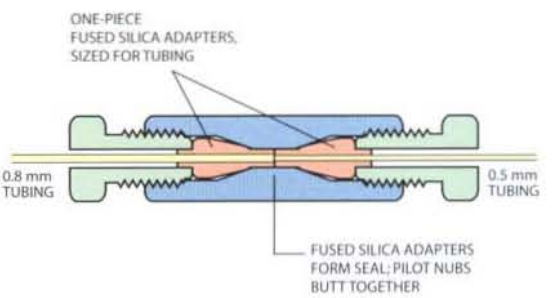


Figure 9:
Valco zero dead volume through-bore union

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.

Nuts, Plugs, and Caps

Most Valco fittings and valves are supplied with the appropriate quantity of nuts and ferrules. However, if additional nuts are required, they may be ordered separately. Use a plug to close off an unused port in a valve, manifold, or HPLC column. Use a cap to close off a tube with a ferrule and internal nut already made up.

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	.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

Further reference

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" external nut	EN.5
1/32" external nut, knurled	EN.5KN
1/16" external nut	EN1
1/8" external nut	EN2
1/4" external nut	EN4 *
3/8" external nut	EN6 *
1/2" external nut	EN8 *
1" external nut	EN1K *

Plugs – stainless steel and high pressure

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

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

Further reference

PEEK plugs ..... page 84
PEEK plugs for high pressure Cheminert valves 84
PEEK caps 84

Caps – stainless steel

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

		Stainless caps	
Description	*Length of nut**	*Prod No*	*Price*
1/32"	.30"	ZC.5	$9
1/16"	.43"	ZC1	8
1/8"	.57"	ZC2	8
1/4"	.70"	ZC4	10

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"
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

Ferrules

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

Valco zero volume ferrules may be used with all Valco fittings and with those of most other manufacturers. The maximum pressure limit is generally determined by the yield strength of the tubing. The exception is for very narrow bore Type 316 stainless steel tubing, where the maximum operational limit of Valco ferrules and fittings is 10,000 psi, regardless of the tubing strength. 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.

METALS AT A GLANCE

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

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

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

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

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

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

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

FERRULE IDENTIFICATION

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


316 STAINLESS


303 STAINLESS


HASTELLOY C


TITANIUM

Further reference

For more detailed information on metals, refer to the discussion on pages 238-239.

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

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

POLYMERS AT A GLANCE

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

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

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

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

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

Polyimide, Valcon V
High temp, graphite reinforced

Polyimide, Virgin V1
High temp, electrical insulator

Further reference

PEEK ferrules ..... page 83
Grooved PEEK ferrules 83

For more detailed information on polymers, refer to the discussion on pages 239-240.

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"

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

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

Reducing Ferrules

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

- **Internal** ZDV (zero dead volume) reducing ferrules are designed for use with all standard Valco internal style fittings – that is, those with a male nut and female fitting detail. The ferrule features an integral pilot which fills the pilot cavity (the space between the end of the ferrule and the bottom of the detail), yielding a zero dead volume fitting.
- **External** ZDV reducing ferrules are designed for use with all standard external style fittings – that is, those with a female nut and a male fitting detail. This ferrule has a slightly longer pilot than the internal version, to accommodate the longer external detail. The result is a zero dead volume fitting. A single groove indicates that the ferrule has the longer pilot and is for use in an external detail.
- **Standard** reducing ferrules can be used where mixing is not a problem, such as with liquid or gas delivery. A 1/16" to 1/32" ferrule of this style is simply a 1/16" ferrule with a 1/32" hole.

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	

Internal reducing ferrule
(ZRF)

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

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®.

Further reference

Internal reducers (IZR) ..... page 60
External reducers (EZR) 61
Ferrule removal kits 80

For 1/16" and 1/32" reducing ferrules with smaller ODs for use with fused silica, see the FS and FSR adapters on pages 42-43.

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.)

External reducing ferrule
(EZRF)

OPTION
Available in Virgin Polyimide.

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	Price	Prod No PEEK	Price	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

Standard reducing ferrule
(RF)

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

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

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

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

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

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

Fused Silica Adapters

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

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**, right, can be used to remove ferrules from all types of fittings.

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®.

One piece fused silica adapter (FS)

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

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

Ferrule removal kit

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

Prod No
FRK1

WHICH ADAPTER FOR WHICH COLUMN?

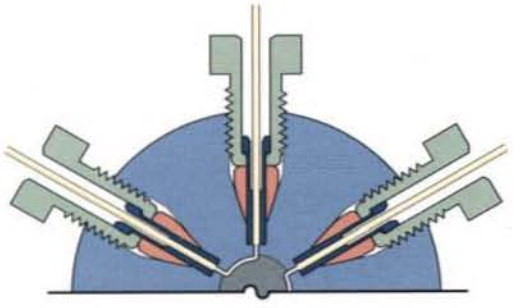
Column ID	Typical column OD	1/32" adapter	1/16" adapter
< 0.20 mm	0.25 mm	FS.25	FS1.25
0.25 mm	0.4 mm	FS.4	FS1.4
0.32 mm	0.5 mm	FS.5	FS1.5
0.53 mm	0.8 mm	ZF.5V	FS1.8

Removable fused silica adapters (FSR)

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

Package of 5:		**Polyimide, Valcon** *Prod No*
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

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

Further reference

Fused silica
unions ..... pp 44, 45, 48
fittings 44-49

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

Pin vise and
drill index 81

0.10 mm = .004"
0.15 mm = .006"

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

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

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

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

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

Fused Silica Fittings

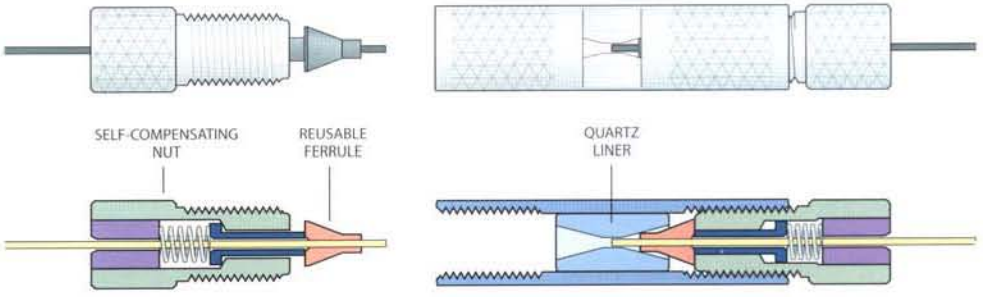
The patented design of our fused silica fittings insures stable, leak-free connections at temperatures up to 400°C, and undistorted ferrules that are easily removed and reused. Columns may be changed without the risk of the leaks which can devastate systems such as mass spectrometers or atomic emission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

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

Fused silica unions

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

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



Fused silica union
with self-compensating nut

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

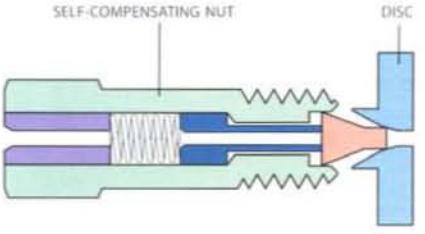
These reusable ferrules seal at the tip, and are different from standard ferrules. Order for use with FSKZU1 fused silica unions and FSZNA-HP nuts on these two pages.

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

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

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

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



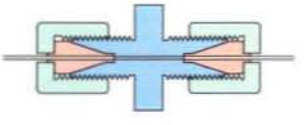
Self-compensating nut
for the HP 6890/5890 GC

Further reference
1/32" fused silica adapter ferrules ..... page 42

1/32" Ultra low mass external unions

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

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" FUSED SILICA FERRULES
(package of 5)

Tubing OD:

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

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"

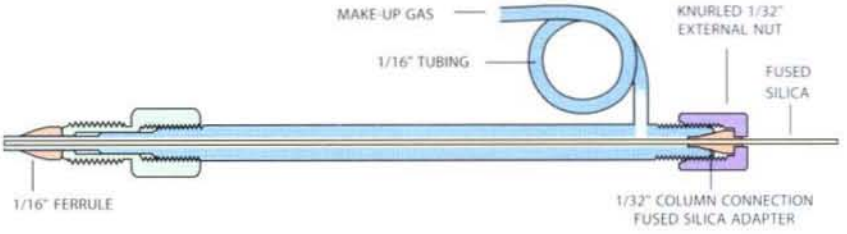
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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

Fused silica 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

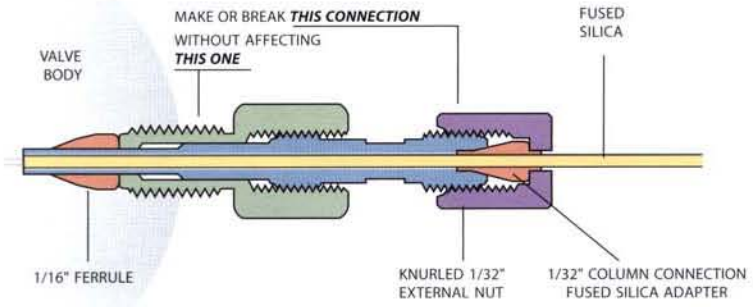


Fused silica make-up adapter
(FSMUA1.5)

Internal to external reducer/adapters

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

Description	*Bore*	*Prod No*
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. Use of metal ferrules may distort the fitting.

Further reference

1/32" fused silica adapter ferrules ..... page 42

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

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"

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

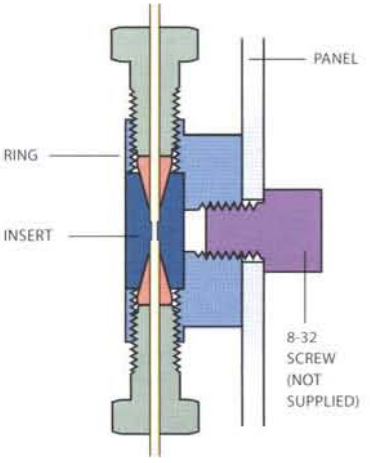
Microvolume Connectors

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

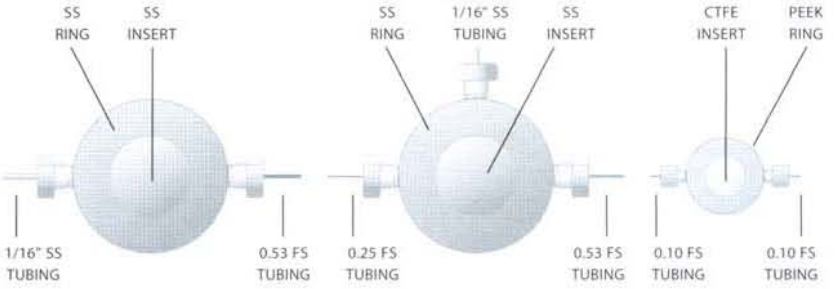
Valco microvolume fittings make it possible to couple 100 micron ID capillary GC, HPLC, or CZE columns without special nuts and ferrules. A stainless ring with one of the plastic inserts provides electrical insulation within the insert, while the PEEK ring achieves total isolation.

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

All standard Valco zero dead volume reducing ferrules (ZRF, FS, and FSR) will work in these fittings. They are uniquely designed to fill the void between the fitting pilot and the smaller tubing OD, eliminating any dead volume in the fitting. (Standard 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

Further reference

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, and deduct $5 from the connector price.
For example, to order an insert for a 1/16" microvolume union MU1CS6, order part number MIU1CS6.

0.10 mm = .004"
0.15 mm = .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"
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1/8" = 3.2 mm
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

OPTIONS

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

NANOVOLUME CONNECTIONS

For 0.10 mm (100 µm) bore fittings, see pages 16-17.

Unions

Unions join two pieces of tubing of the same OD. Select the union with the bore that matches the ID of the tubing. If the IDs are different, choose the union with a bore which matches the smaller tube bore.

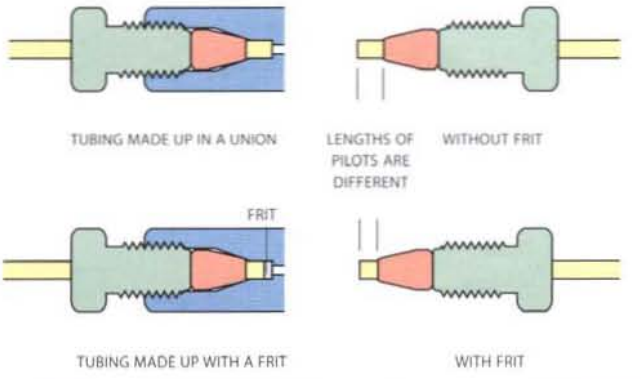
- **Internal** unions have female threads and a fitting detail for zero volume fittings. The nuts have male (external) threads.
- **External** unions have male threads, requiring a nut with internal threads.
- **External/internal** unions have male threads on one end and female threads on the other, 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.

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 74-78
Frits and screens 79



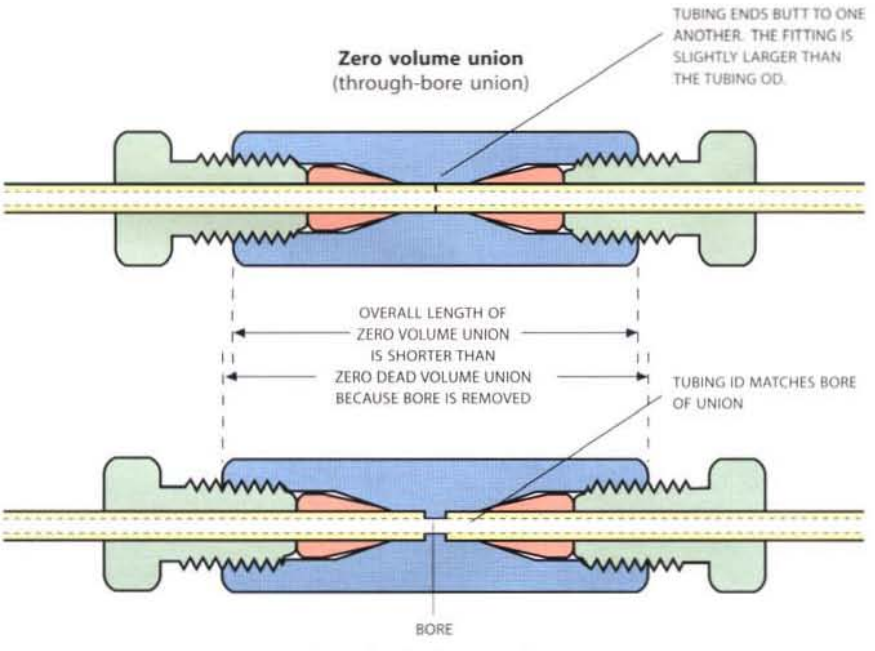
Bulkhead versions can be mounted through an instrument panel or on a bracket. The fitting body is undercut so that it bites into the panel when the mounting nut is tightened, eliminating the need for a lock washer. An O-ring can be installed between the body and the panel to allow operation in purged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

Standard material is 300 series stainless steel.

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.

Further reference

Reducing unions to connect two tubes with different ODs 54-57

Unions with 1/4-28 fittings 92

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"

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

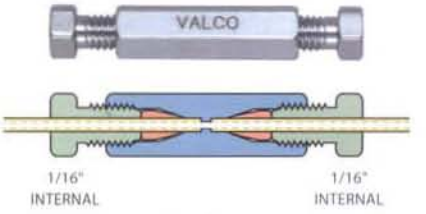
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Internal 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)

Further reference

Internal unions,
high pressure PEEK 85

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 48-49.

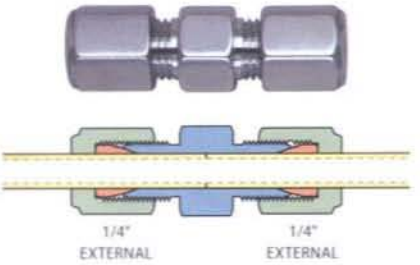
5/16" = .312" = 7.9 mm	1/32" = 0.8 mm	0.25 mm = .010"	1.5 mm = .060"	6.4 mm = .253"
3/8" = .375" = 9.5 mm	1/16" = 1.6 mm	0.50 mm = .020"	2.0 mm = .080"	7.0 mm = .275"
7/16" = .437" = 11.1 mm	1/8" = 3.2 mm	0.75 mm = .030"	4.6 mm = .180"	10.0 mm = .400"
	1/4" = 6.4 mm	1.0 mm = .040"	6.0 mm = .236"	

External unions

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

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

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



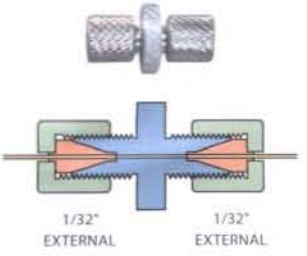
External union
Through-bore version
(EU4T)
Ends of tubing butt together

Bulkhead external union
(EBU2L)

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 42)*. Standard material is 300 series stainless.

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

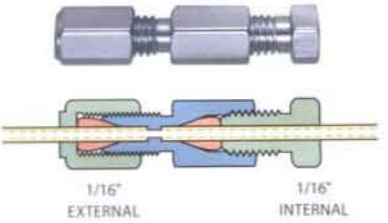


1/32" external union
(EU.5)
For use with GC capillary columns

External/internal unions

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

Tubing OD	*Bore*	**Standard** *Prod No*	*Price*	**Bulkhead** *Prod No*	*Price*	**Bulkhead panel hole diameter**
1/32"	0.25 mm	EZU.5	$26	–	–	–
	0.50 mm	EZU.5L	26	–	–	–
1/16"	0.25 mm	EZU1C	24	EZBU1C	$29	5/16"
	0.50 mm	EZU1M	24	EZBU1M	29	5/16"
	0.75 mm	EZU1	18	EZBU1	23	5/16"
	1/16"	EZU1T	18	EZBU1T	23	5/16"
1/8"	1.0 mm	EZU2	14	EZBU2	19	7/16"
	2.0 mm	EZU2L	14	EZBU2L	19	7/16"
	1/8"	EZU2T	14	EZBU2T	19	7/16"



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

Bulkhead external/internal union
(EZBU1)

Reducing Unions

Reducing unions join two tubes of different outside diameters.

- **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.

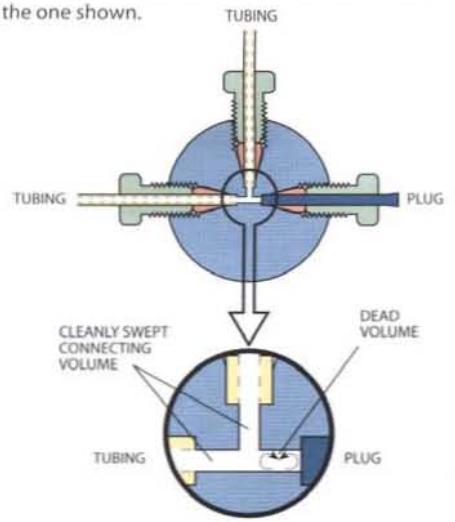
Internal fittings are almost always the best with tubing of 1/8" OD or smaller. They make a stronger connection and offer the lower volume necessary for high performance instrumentation. Also, because 1/16" external fittings have very thin, easily distorted walls, they are not as durable as 1/16" internal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

Standard material is 300 series stainless.

DEAD VOLUME

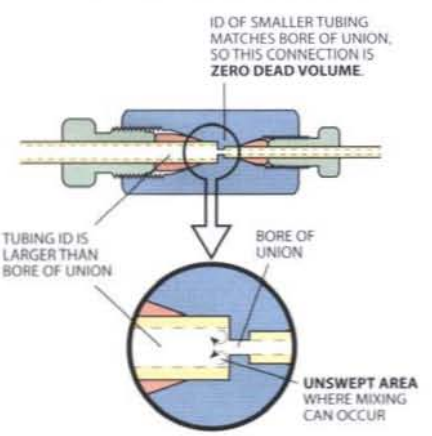
"Dead volume" is created in obvious situations such as the one shown.



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)

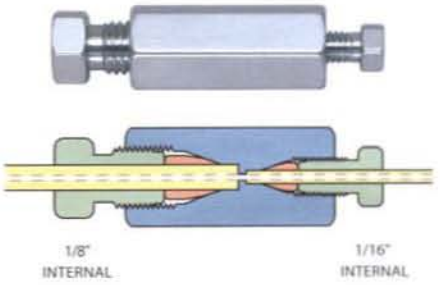
Internal reducing unions – stainless steel

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"	1.0 mm	ZRU42
	2.0 mm	ZRU42L
	1/8"	ZRU42T



Internal reducing union – metal
Standard bore
(ZRU21)

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"	1.0 mm	ZBRU42	7/16"
	2.0 mm	ZBRU42L	7/16"
	1/8"	ZBRU42T	7/16"

Bulkhead internal reducing union – metal
(ZBRU21)

Further reference

Internal reducing unions, high pressure PEEK ..... page 85
External/internal reducing unions 57
Internal/external reducing unions 57
Standard unions 52
Unions with 1/4-28 fittings 92

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"

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

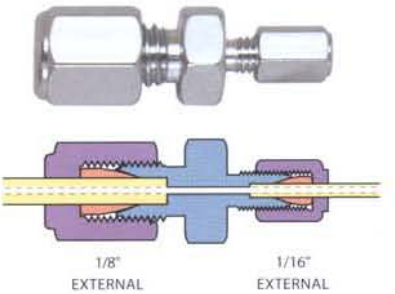
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

External 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"	1.0 mm	ERU42
	2.0 mm	ERU42L
	1/8"	ERU42T



External reducing union
Standard bore
(ERU21)

Bulkhead external reducing unions

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

Bulkhead external reducing union
(EBRU12L)

TECH TIP

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

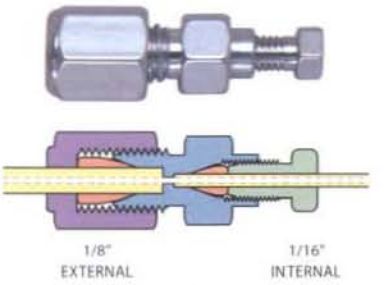
5/16" = .312" = 7.9 mm	1/32" = 0.8 mm	0.25 mm = .010"	1.5 mm = .060"	6.4 mm = .253"
3/8" = .375" = 9.5 mm	1/16" = 1.6 mm	0.50 mm = .020"	2.0 mm = .080"	7.0 mm = .275"
7/16" = .437" = 11.1 mm	1/8" = 3.2 mm	0.75 mm = .030"	4.6 mm = .180"	10.0 mm = .400"
	1/4" = 6.4 mm	1.0 mm = .040"	6.0 mm = .236"	

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"



External/internal reducing union
Standard bore
(EZRU21)

Bulkhead external/internal reducing union
(EZBRU21)

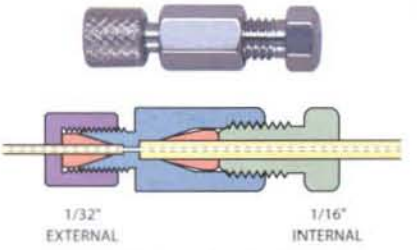
Internal/external reducing unions

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

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

Only polymeric ferrules should be used with 1/32" external details – metal ferrules will distort them. These unions include a stainless steel ferrule for the 1/16" SS tube, but because of the variety of fused silica ODs and corresponding ferrules, a 1/32" fused silica adapter must be ordered separately.
(See page 42.)

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



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

Bulkhead internal/external reducing union
(EZBRU.51)

Further reference

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

SPECIAL METALS AND/OR SMALLER BORES

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

Microvolume connectors ..... pp 48-49
High pressure PEEK connectors 84

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 60

Further reference

PEEK tees 84
PEEK crosses 84

1/16" Manifolds

1/16" manifolds connect 4 to 14 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 300 series stainless steel or PEEK.

	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	0.40 mm	0.75 mm	PEEK	Z16M1PK

1/8" Manifolds

1/8" manifolds connect 4 to 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. 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

TECH TIP

A manifold used with an SD flowpath multiposition valve allows HPLC column selection with a single valve. See page 159 for an illustration.

Further reference

HPLC column selector
SD UW valves ..... pg 152
ST UW valves 153
Manifold
pipe adapters 63

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"

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

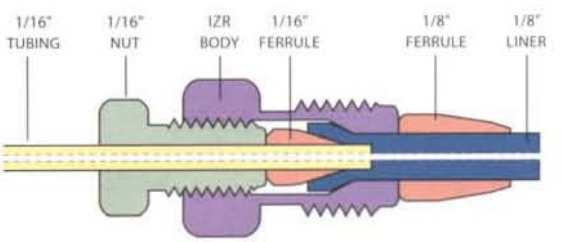
Internal reducers

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

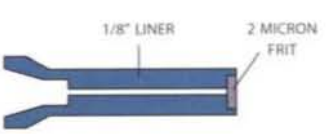
A second version has a 2 micron stainless steel frit pressed into the end of the liner, adding filtering capability. However, we suggest using these only as a final or backup filter, with a standard filter (*see page 78*) as the primary filter. Because IZRs have a much smaller surface area than the standard filter, they tend to plug too often if used in a stand-alone capacity.

Patent No. 4,173,363. An HPLC precolumn design based on this patent is currently licensed to Optimize Technologies.

		Without frit		With 2µ frit	
Tubing OD	*Bore*	*Prod No*	*Price*	*Prod No*	*Price*
1/16" to 1/32"	0.25 mm	IZR1.5	$19	IZR1.5F	$24
	0.50 mm	IZR1.5L	17	IZR1.5LF	22
	1/32"	IZR1.5T	17	–	–
1/8" to 1/16"	0.25 mm	IZR21C	13	IZR21CF	18
	0.50 mm	IZR21	11	IZR21F	16
	1.00 mm	IZR21L	11	IZR21LF	16
	1/16"	IZR21T	11	–	–
1/4" to 1/16"	1.00 mm	IZR41	12	IZR41F	17
1/4" to 1/8"	1.00 mm	IZR42	12	IZR42F	17
1/4" to 1/8"	2.00 mm	IZR42L	12	IZR42LF	17



Valco's unique internal reducer
(IZR21)



IZR liner with pressed-in frit

External to internal adapters (injector/detector adapters)

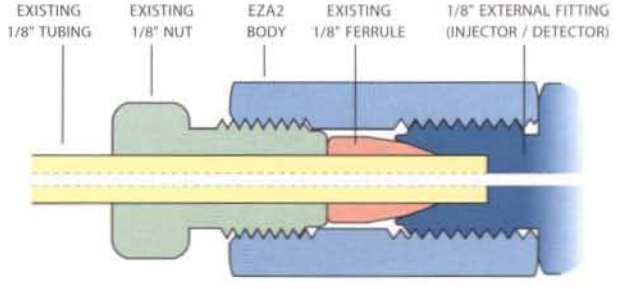
EZAs (external adapters) and EZRs (external reducers) adapt an external tee or union or the external type fittings common on injectors and detectors to Valco zero dead volume connections. Since EZAs are commonly used to connect an external fitting to an existing tube already made up with a Valco internal 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.

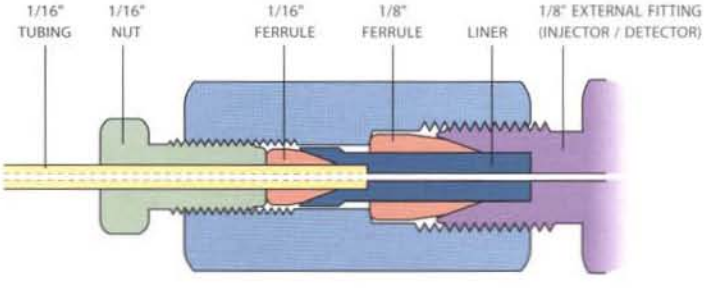
Standard material is 300 series stainless. The EZA does not include nut or ferrule; the EZR includes a liner, one nut, and two ferrules.

Patent No. 4,173,363

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)

Further reference

Ferrules ..... page 38
Nuts 36

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"

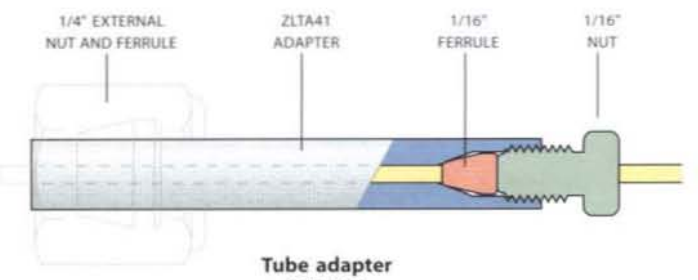
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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



Tube adapter
(ZLTA41)

Aerosol adapter bulkhead union

It is becoming a common practice to bottle gaseous standards and samples in convenient aerosol cans. 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.

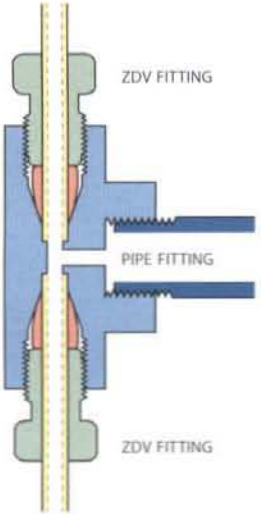
Description	*Prod No*
Aerosol adapter bulkhead union	ZBAA1

Aerosol adapter bulkhead union
(ZBAA1)

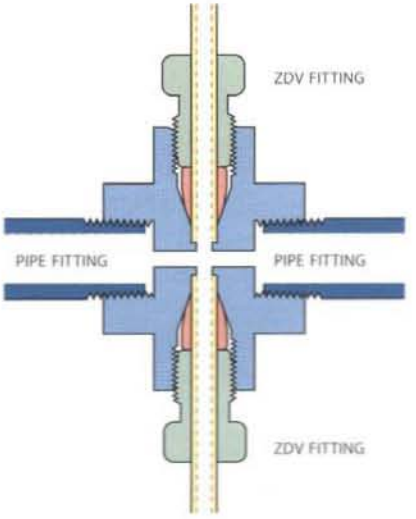
Manifold pipe adapters

These manifolds, which go from 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. Available in Hastelloy C and titanium on special order.

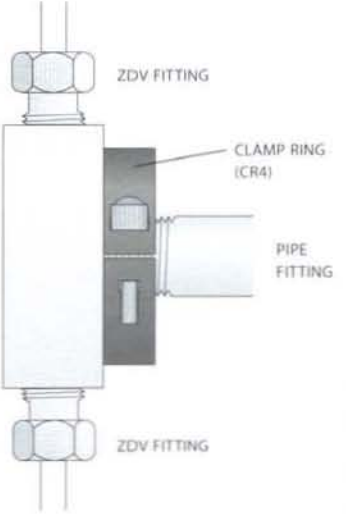
Description	*Bore*	*Prod No*
One 1/8" female pipe to:		
three 1/16" ZDV fittings	1.0 mm	FP1Z3M21
three 1/8" ZDV fittings	2.0 mm	FP1Z3M22
three 1/4" ZDV fittings	4.6 mm	FP1Z3M24
One 1/4" female pipe to:		
three 1/16" ZDV fittings	1.0 mm	FP1Z3M41
three 1/8" ZDV fittings	2.0 mm	FP1Z3M42
three 1/4" ZDV fittings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

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"

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

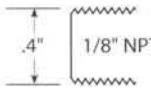
Female pipe to Valco internal adapters

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.

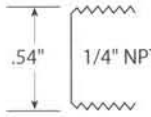
Description	*Bore*	*Prod No*
1/8" NPT female to:		
1/16" ZDV fitting	1.0 mm	FPZA21
1/8" ZDV fitting	1.0 mm	FPZA22
1/8" ZDV fitting	2.0 mm	FPZA22L
1/4" NPT female to:		
1/16" ZDV fitting	1.0 mm	FPZA41
1/8" ZDV fitting	1.0 mm	FPZA42
1/8" ZDV fitting	2.0 mm	FPZA42L
1/4" ZDV fitting	4.6 mm	FPZA44L
1/2" NPT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

TECH TIP

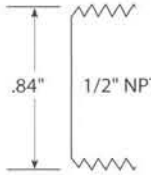
NPT, National Pipe Thread, is a standard developed a long time ago by people without rulers. 1/8" NPT is nowhere close to 1/8"! Measure the diameter of the fitting across the narrow end. You can also count the number of threads in a 1" section. Then look at the diagrams below to determine the correct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



27 threads per inch



18 threads per inch



14 threads per inch

Further reference

Our manifold pipe adapters on page 63 allow you to connect one or two pipe fittings to three Valco zero dead volume fittings.

Male pipe to Valco external adapters

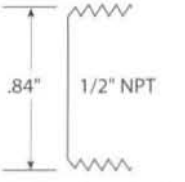
Male pipe adapters make a minimum volume connection from the female pipe fittings typically found on pressure gauges and regulators to Valco external fittings. Standard material is 300 series stainless.

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 facing 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

27 threads per inch

18 threads per inch



14 threads per inch

Female pipe to Valco external adapters

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

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

Description	*Bore*	*Prod No*
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 page 38.)*

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"

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

Fill ports *for Valco and Cheminert metal 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 3/4" or longer blunt tip needle	
For 1/16" fittings and injectors - 22 ga	VISF-1
For 1/32" fittings and injectors - 26 ga	VISF.5FPK
For use with 2" 22 gauge blunt tip needle	
For 1/16" fittings and injectors	VISF-2
For 1/8" fittings and injectors	VISF-A
Replacement liners and ferrules	
Liner for VISF-1	VISL-1
Liner for VISF-2 or VISF-A	VISL-2
Ferrule for VISF-1 or VISF-2	ZF1VISF

Fill ports *for 1/16" Cheminert polymeric 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.

Description	*Prod No*
For use with 3/4" or longer 22 gauge blunt tip needle	
For fittings and low pressure injectors (C22Z series injectors)	C-VISF-1
For high pressure injectors (C2, C3, C4 series injectors)	C-VISF-1H
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

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

TECH TIP

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

Nanovolume fill ports ..... page 16

Loop fill port assembly

for Cheminert C2 and C4 valves

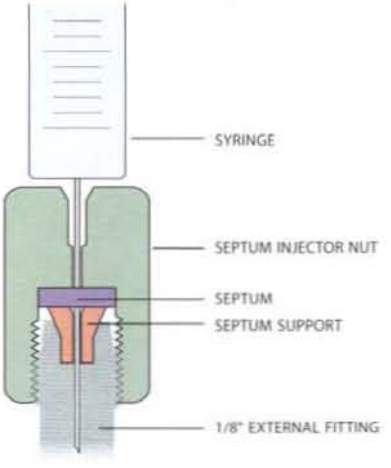
The loop fill port assembly, for use with Cheminert high pressure valves (C2 and C4 series), permits sample loading and manual injection from the front of the valve. It includes an aluminum bracket, two syringe fill ports (for 3/4" or 2" needles), a bulkhead union, and two pieces of stainless tubing: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

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)

Further reference

External/internal reducing unions ... pg 57
External/internal unions 53

Cheminert valves

Model C2 ..... 170, 174
Model C4 ..... 171, 175

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"

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

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

HPLC Column End Fittings

Although our column end fittings look like ordinary reducing unions, they are machined with a conical recess to match a specific column ID so that there are no abrupt or irregular diameter changes which can cause loss of theoretical plates. (See illustrations, facing page.) 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. 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. *(See page 19.)*

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

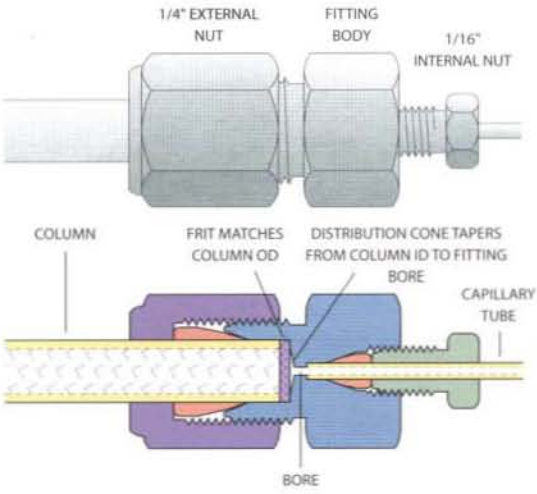
When packing columns, use Valco "through-type" unions to couple the column to the packing reservoir.

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

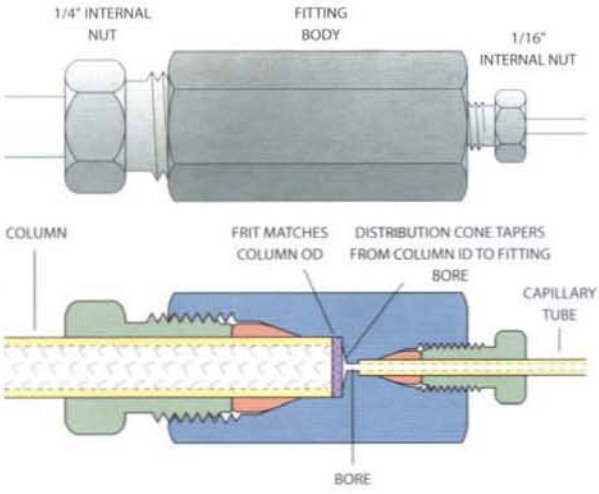
Through-type unions for packing columns ..... page 52

Further reference

Frits ..... page 71



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

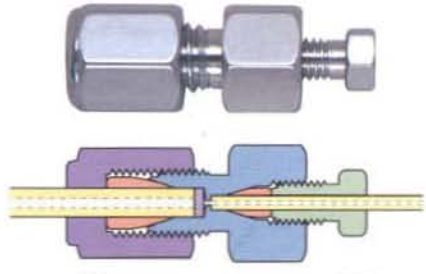


Internal column end fitting
1/4" to 1/16", 4.6 mm column ID, with removable frit
(CEF414.6F)

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

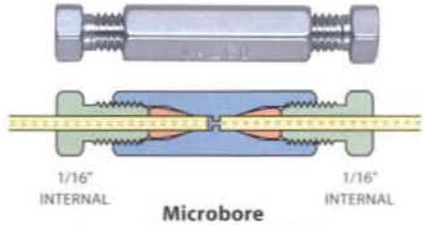
Standard material is Type 316 stainless.

	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 19.

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"

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

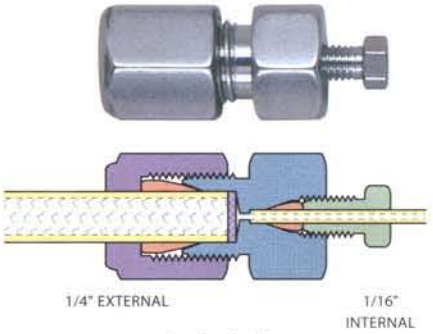
NANOBORE COLUMN END FITTINGS

See our complete line of 100 µm and 150 µm bore fittings on page 19.

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

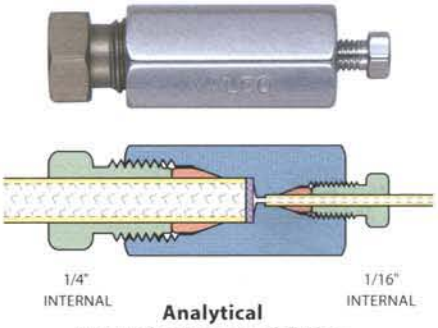
Standard material is Type 316 stainless.

	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

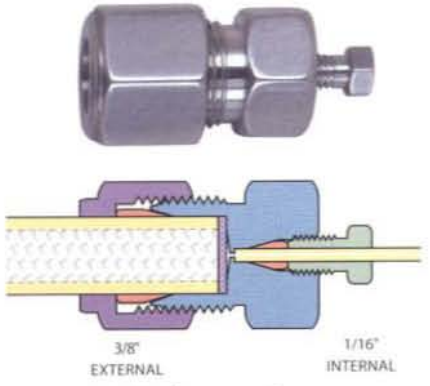


Analytical internal column end fitting with removable frit (CEF414.6F)

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.

	Pore Size	Frit thickness	Stainless steel Prod No		Hastelloy C Prod No	Titanium Prod No
Package of 10:						
1/16" frits	0.5µ	0.75 mm	.5FR1-10		.5FR1HC-10	–
	2µ	0.75 mm	2FR1-10		2FR1HC-10	2FR1TI-10
	10µ	0.75 mm	10FR1-10		–	–
1/8" frits	0.5µ	1.00 mm	.5FR2-10		–	–
	2µ	1.00 mm	2FR2-10		2FR2HC-10	2FR2TI-10
	10µ	1.00 mm	10FR2-10		–	–
1/4" frits	0.5µ	1.00 mm	.5FR4-10		–	–
	2µ	1.00 mm	2FR4-10		2FR4HC-10	2FR4TI-10
	10µ	1.00 mm	10FR4-10		10FR4HC-10	–
Each:						
3/8" frits	2µ	1.00 mm	2FR6	$1.00	2FR6HC	2FR6TI
1/2" frits	2µ	1.00 mm	2FR8	1.50	2FR8HC	2FR8TI
1" frits	2µ	1.50 mm	2FR1K	2.00	2FR1KHC	2FR1KTI

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"

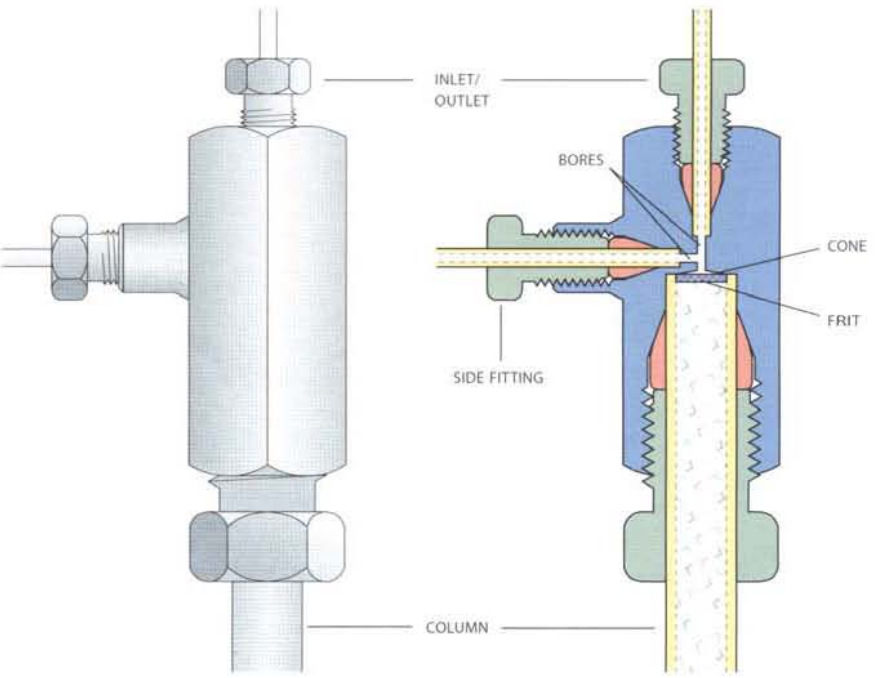
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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

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"	0.50 mm	1/16"	0.50 mm	TCEF211
1/8"	1.0 mm	1/16"	1.65 mm	1/16"	0.40 mm	TCEF211T
1/4"	4.6 mm	1/16"	0.25 mm	1/16"	0.25 mm	TCEF411C
1/4"	4.6 mm	1/16"	0.75 mm	1/16"	0.75 mm	TCEF411
1/4"	4.6 mm	1/16"	1.65 mm	1/16"	0.75 mm	TCEF411T
1/4"	4.6 mm	1/8"	0.75 mm	1/16"	0.75 mm	TCEF421
3/8"	6.0 mm	1/16"	0.75 mm	1/16"	0.75 mm	TCEF611
3/8"	6.0 mm	1/16"	1.65 mm	1/16"	0.75 mm	TCEF611T
1/2"	9.0 mm	1/16"	0.75 mm	1/16"	0.75 mm	TCEF811
1/2"	9.0 mm	1/16"	1.65 mm	1/16"	0.75 mm	TCEF811T



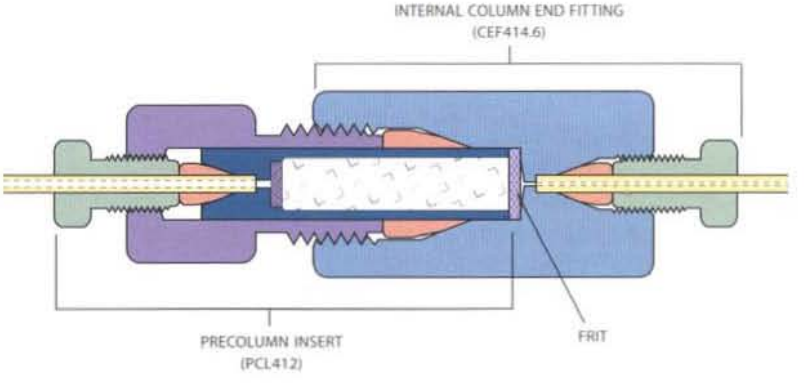
Post-column reaction fitting
(TCEF411)

Precolumns (guard columns)

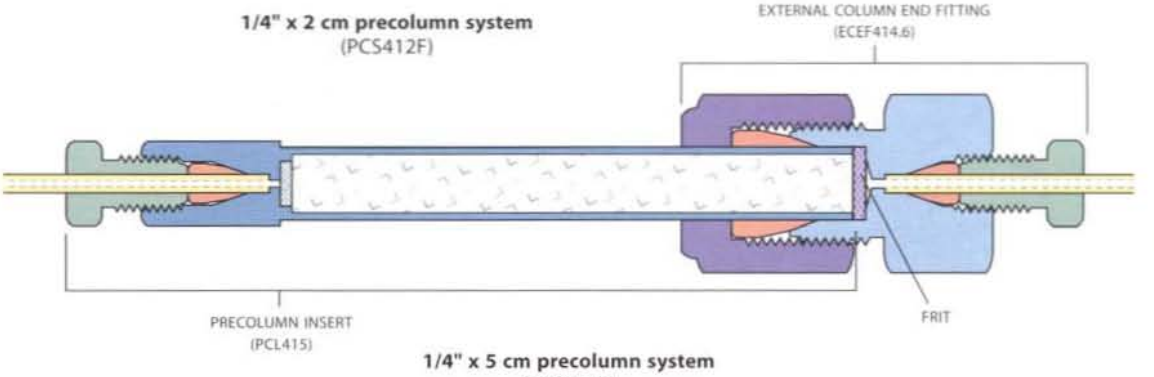
Precolumns are available in 2 cm and 5 cm lengths, and can be filled with either 5µ packing or 37 - 44µ pellicular packing. Both lengths are used in conjunction with a column end fitting. When packed for high efficiency they can be used as analytical columns, but a more typical use is as a guard column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

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

Description	*Prod No*
1/4" x 2 cm precolumn system Includes: One precolumn insert One internal column end fitting One 2µ frit	PCS412F
1/4" x 5 cm precolumn system Includes: One precolumn insert One external column end fitting One 2µ frit	PCS415F
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)



1/4" x 5 cm precolumn system
(PCS415F)

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"
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

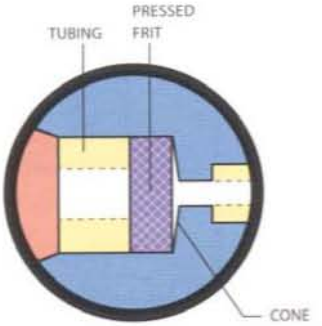
Filters

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

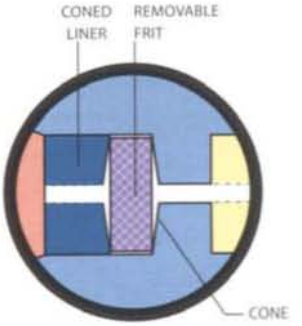
Valco's unique patented* filter design results in extremely low internal volume and simplifies filter element replacement. Filter bodies are "coned" for uniform flow and maximum filter surface area. The filters are made entirely of metal, so they can be used at any instrumentation temperature. While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

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

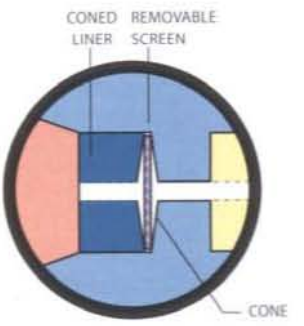
- **Pressed frits**, permanently installed in the filter, are recommended where contaminants are the exception and not the rule. The frits are 2µ stainless.
- **Removable frits** are the best choice for maximum filtration, or if the application requires Hastelloy C or titanium. However, they allow more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



Pressed frit



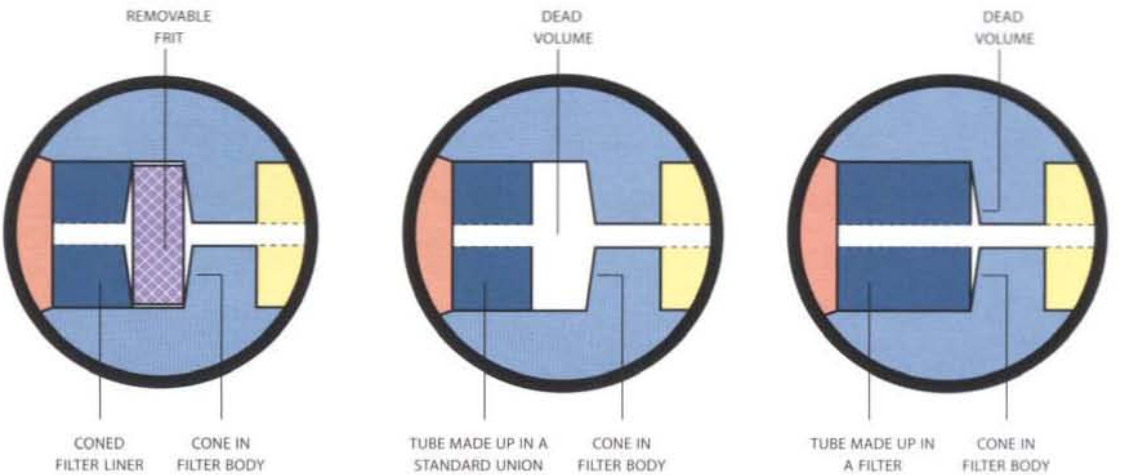
Removable frit



Removable screen

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

Further reference



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

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, nonstandard pilot length.

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

Arrow imprinted on filter body showing recommended direction of flow

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"

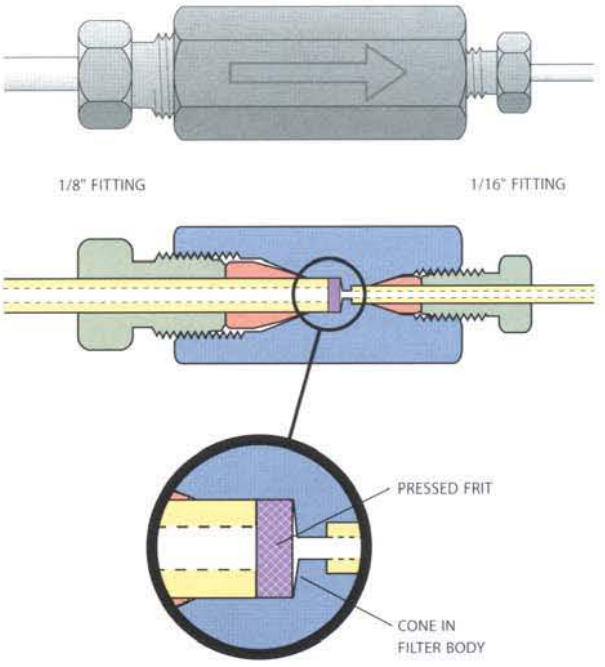
1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm

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

Filters with a pressed frit

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

		Standard	Bulkhead
Description	*Bore*	*Prod No*	*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



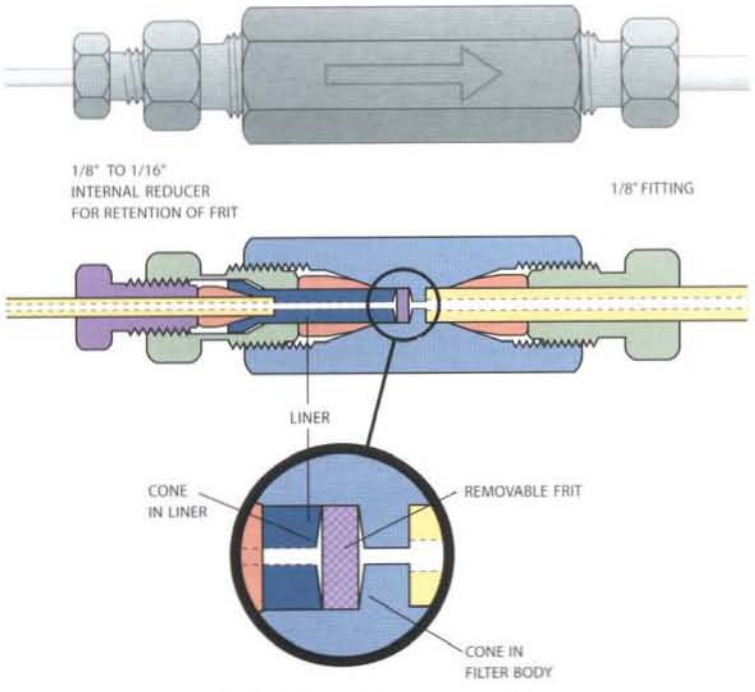
Reducing filter with a pressed frit
1/8" to 1/16"
(ZRUF21)

Filters with a removable frit

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

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

		Standard	Bulkhead
Description	*Bore*	*Prod No*	*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 79

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"

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

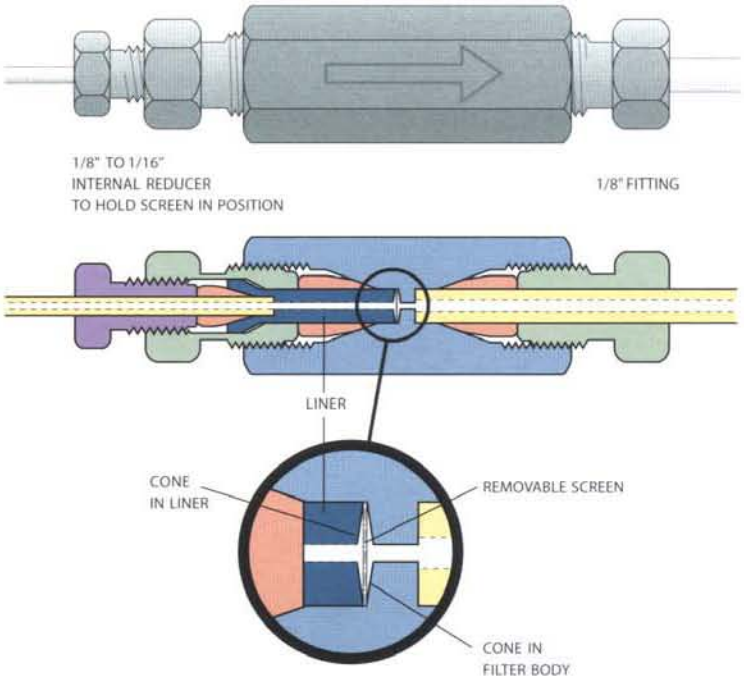
1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

Filters with a removable 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.

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

		Standard	Bulkhead
Description	*Bore*	*Prod No*	*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 screen or one with a frit?

Screens plug less rapidly, allow much more flow, and provide lower pressure drop. We recommend their use downstream from pumps and upstream from valves.

Since screens are thinner, there is less mixing and dispersion than might occur with a frit. Use a frit where maximum filtration is the main requirement or where the stainless screen may be chemically attacked.

And remember:

A frit must always be replaced with a frit.

A screen must always be replaced with a screen.

Replacement screens ..... page 79

Replacement frits

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

			Stainless Steel		Hastelloy C		Titanium	
Package of 10:	*Pore Size*	*Frit Thickness*	*Prod No*	*Price*	*Prod No*	*Price*	*Prod No*	*Price*
1/16" frits	0.5µ	0.75 mm	.5FR1-10	$10	.5FR1HC-10	$20	–	–
	2µ	0.75 mm	2FR1-10	10	2FR1HC-10	20	2FR1TI-10	$30
	10µ	0.75 mm	10FR1-10	10	–	–	–	–
1/8" frits	0.5µ	1.00 mm	.5FR2-10	10	–	–		
	2µ	1.00 mm	2FR2-10	10	2FR2HC-10	20	2FR2TI-10	40
	10µ	1.00 mm	10FR2-10	10	–	–	–	–
1/4" frits	0.5µ	1.00 mm	.5FR4-10	10	–	–	–	–
	2µ	1.00 mm	2FR4-10	10	2FR4HC-10	25	2FR4TI-10	50
	10µ	1.00 mm	10FR4-10	10	10FR4HC-10	25	–	–

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

Replacement screens

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

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

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

5/16" = .312" = 7.9 mm	1/32" = 0.8 mm	0.25 mm = .010"	1.5 mm = .060"	6.4 mm = .253"
3/8" = .375" = 9.5 mm	1/16" = 1.6 mm	0.50 mm = .020"	2.0 mm = .080"	7.0 mm = .275"
7/16" = .437" = 11.1 mm	1/8" = 3.2 mm	0.75 mm = .030"	4.6 mm = .180"	10.0 mm = .400"
	1/4" = 6.4 mm	1.0 mm = .040"	6.0 mm = .236"	

Tools

As a convenience to our customers, we stock several standard tools that are useful for working with valves, fittings, and other products from VICI. In addition, we offer custom tools which are designed and machined in our factory to facilitate use of specific VICI products.

Custom socket wrench

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

Prod No

SWH4

Ferrule removal kit

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

Prod No

FRK1

Hex key set

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

Prod No

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

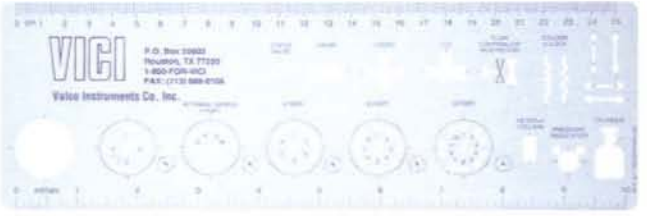
The drill index has drills sized from 0.0135" to 0.039" (0.34 to 1 mm). These are useful tools when a fused silica tube breaks in a union (see Tech Tip on the facing page) and for enlarging the inner diameter of fused silica adapters.

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



Further reference

Tools for valves
Pencil magnet 218
Valve spanner handle 219

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

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

4.6 mm = .180"
6.0 mm = .236"
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7.0 mm = .275"
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1/32" = 0.8 mm
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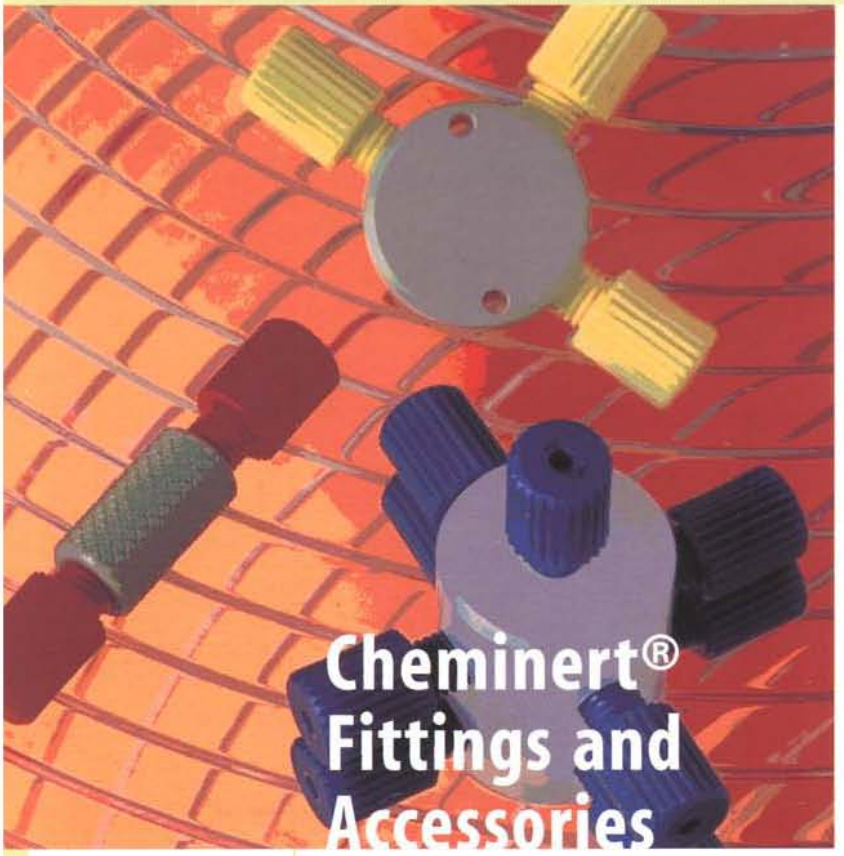


Cheminert® Fittings and Accessories

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

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. Our new Nanovolume™ fittings, with 100 or 150 µm bore, are ideal for high resolution capillary chromatography. *(See pages 16-19.)*

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

Further reference

NEW!

No twist one-piece fittings

10-32 for 1/16" tubing

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

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

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

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

Internal nuts – high pressure PEEK

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

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

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

Ferrules – high pressure PEEK

PEEK ferrules seal by the increased friction from compression.

Package of 10:	*Prod No*
1/32"	ZF.5PK-10
1/16"	ZF1PK-10
1/8"	ZF2PK-10
1/4"	ZF4PK-10
3/8"	ZF6PK-10
1/2"	ZF8PK-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 generally recommended if the tubing is the same material as the ferrule.

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

* Patent No. 6,57[illegible]

POLYMERS AT A GLANCE

PEEK ..... PK
Chemical resistance; up to 175°C

TECH TIP

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

PFA ferrules ..... page 39

Further reference

For more detailed information on PEEK, refer to the discussion on page 240.

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"

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

Plugs and caps – high pressure PEEK

Polymeric 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 the previous page. PEEK caps include a PEEK nut and ferrule. For high pressure polymeric valve plugs, see below. For low pressure valve plugs, see page 91.

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

PEEK plugs for high pressure polymeric valves

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

Description	*Length of nut**	*Prod No*
1/16" hex	.62"	C-MZP1PK
1/16" long hex	.87"	C-LZP1PK
1/16" fingertight	.88"	C-ZP1FPKL

Tees and crosses – high pressure PEEK

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

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

POLYMERS AT A GLANCE

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

TECH TIP

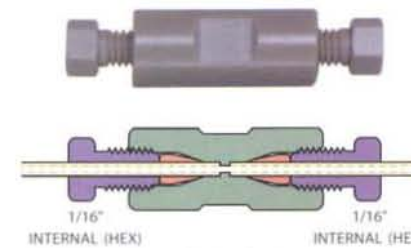
Ferrules for high pressure PEEK fittings are available in PEEK and PFA.

PEEK ferrules ..... page 83
PFA ferrules 39

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	3/8"
	0.50 mm	ZU.5LFPK	ZBU.5LFPK	3/8"
	1/32"	ZU.5TFPK	ZBU.5TFPK	3/8"
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 union – PEEK
Standard bore version
(ZU1PK)

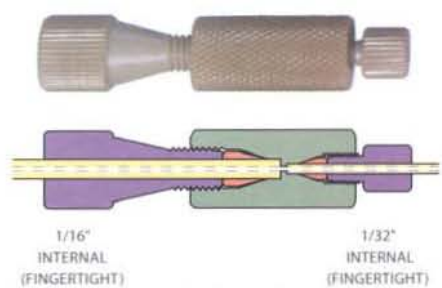
Bulkhead fingertight internal union – PEEK
(ZBU1FPK)

Bulkhead hex internal union – PEEK
(ZBU1PK)

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"



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

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

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

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm
1/4" = 6.4 mm

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"

Low Pressure Fittings

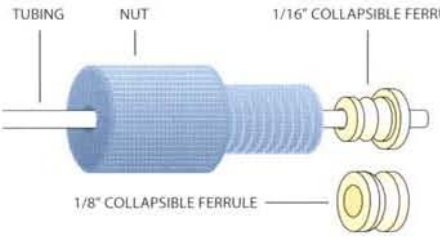
Cheminert low pressure fittings are ideally suited for flow injection analysis, low pressure liquid chromatography, and stream sampling devices. They may be safely used at pressures up to 500 psi and temperatures to 50°C. Two designs of low pressure tube end fittings are available. *Flangeless* tube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

Flangeless tube end fittings

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

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



Flangeless tube end fitting

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	CFL-1L	CFL-2L
Natural	CFL-1N	CFL-2N
Orange	CFL-1E	CFL-2E
Purple	CFL-1P	CFL-2P
Red	CFL-1R	CFL-2R
White	CFL-1W	CFL-2W
Yellow	CFL-1Y	CFL-2Y
Assorted *(pkg/12, one of each color)* with ferrule:		
CTFE	CFL-1A	CFL-2A
PEEK	CFL-1A-PK	CFL-2A-PK
Replacements		
PEEK ferrules *(pkg/10)*	CFL-CB1PK	CFL-CB2PK
CTFE ferrules *(pkg/10)*	CFL-CB1KF	CFL-CB2KF
PEEK nuts *(pkg/5)*	CFL-1PK	CFL-2PK
Setting tool	CST	CST

POLYMERS AT A GLANCE

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

ETFE ..... TZ
Resistant to most chemical attack. Some chlorinated chemicals cause physical swelling. Produced as Tefzel ®

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

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

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

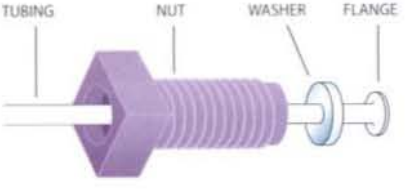
Standard flanged tube end fittings

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 88)*. This is an excellent method for connecting fluorocarbon tubing, as there is no reduction of the inside diameter and no binding or twisting of the tubing when the fitting is tightened. A mating of the parts is achieved with zero dead volume, making this an ideal fitting for biological systems.

Cheminert tube end fittings come in twelve different colors for system color coding, and are available for 1/16" or 1/8" OD fluorocarbon tubing. (While in theory other polymers could be molded to form a flange, only fluorocarbons such as PTFE or FEP have low-temperature malleability and good form retention at operating temperatures.) Tube end fittings attach directly to Cheminert valves and fittings, and are easily joined to each other with a union. Finger-tightness 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 fittings		**1/16" OD**	**1/8" OD**
	(pkg/10)	*Prod No*	*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	CF-1L	CF-2L
	Natural	CF-1N	CF-2N
	Orange	CF-1E	CF-2E
	Purple	CF-1P	CF-2P
	Red	CF-1R	CF-2R
	White	CF-1W	CF-2W
	Yellow	CF-1Y	CF-2Y
	Assorted *(pkg/12, one of each color)*	CF-1A	CF-2A
Washers	*(pkg/10)*	CF-W1	CF-W2



Flanged tube end fitting

TECH TIP

To make up standard flanged tube end fittings, use the flanging tool on page 88.

A flanging starter kit, complete with flanging tool, flanging tips, and an array of tubing and fittings, is also available. See page 88.

Further reference

High pressure fittings ..... pp 83-85
PTFE and FEP tubing 106-107

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"

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

Flanging tools

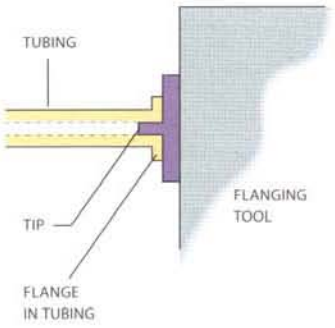
The flanging tool makes the flange which retains the standard tube end fitting and washer on PTFE or FEP tubing. With this tool lengths of tubing may be easily assembled to any required dimension. The time required is only 5 to 10 seconds per flange.

Flanging tools are available for 110 VAC or 230 VAC, and come complete with tips for 0.75 mm 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.

		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
for tubing ID ⊠ 0.75 mm	CFT-TC
for tubing ID ⊠ 1.00 mm	CFT-TM
for tubing ID ⊠ 1.50 mm	CFT-TL
for tubing ID ⊠ 2.00 mm	CFT-TXL
Razor blades *(pkg /10)*	CFT-R
Tubing holder	CFT-H



Flange being made on tubing

Starter kits

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

The starter kit includes:

- 1 flanging tool with 2 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

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

PEEK starter kit

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

		Prod No
PEEK starter kit		JR-35P
Includes:		
1	Plastic box	
10	PEEK one-piece fittings, 10-32	
5	PEEK handtight fittings	
5	PEEK nuts, hex-head long	
20	PEEK ferrules, double-ended 1/16"	
1	PEEK union, HP body only, 10-32	
2	Tubing elbows 90°	
2	Tubing elbows 180°	
1	PEEK filter, in-line, incl. PAT frit 5 µm	
1	Clean-cut tubing cutter	
1	Last Drop PTFE filter 5 µm	
3m	PEEK tubing, 1/16" x 0.25 mm ID, blue stripe	
3m	PEEK tubing, 1/16" x 0.50 mm ID, orange stripe	
1	Tweezers	

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	
PTFE tubing, 1/16" x 0.75 mm ID, 6 ft.	

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

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

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

7.0 mm = .275"
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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

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.

Further reference

Color-coded PEEK tubing ..... page 108

Plugs *1/4-28*

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

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

Low pressure PEEK plugs *10-32*

These all-PEEK plugs are for use in Cheminert PEEK fittings and low pressure polymeric valves (C20Z and C30Z series). For high pressure polymeric valves (C1-C5 series), use plugs on page 84.

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

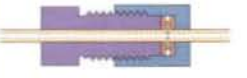
External nuts for flanged tube ends *1/4-28*

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

TECH TIP

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



0.25 mm = .010"
0.50 mm = .020"
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1/4" = 6.4 mm
3/8" = 9.5 mm
1/2" = 12.7 mm

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

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*	**Polypropylene** *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	–
1/8"	Butt connection	CUTPK	CUTKF	CUTPP *(pkg/5 w/o fittings)*

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

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

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

Includes 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, Delrin	CFL-4D
CTFE ferrule	CFL-CB4KF-S

Further reference

Flangeless tube end fittings 86
Nanovolume unions 17

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

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

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

Includes 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

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"

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

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

Low Pressure Tees, Crosses, and Manifolds

Tees *1/4-28*

Includes 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*

Includes 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*

Includes 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

Mixing tees

1/4-28

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

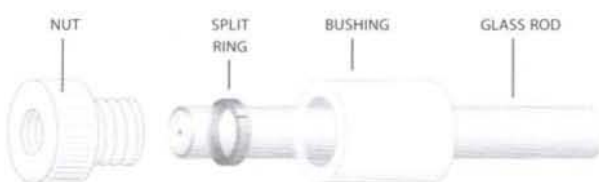
Tubing OD	*Bore*	PEEK *Prod No*	CTFE *Prod No*
1/16"	0.75 mm	CM1XPK	CM1XKF
1/8"	1.50 mm	CM2XPK	CM2XKF

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. They are available as individual components or as complete assemblies. Assemblies include a bushing and nut, a polypropylene or CTFE split ring, and a 1/4" OD x 3-1/4" long piece of 1 mm or 2 mm ID glass tube.

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 rod, 3-1/4" long		
1 mm ID	CGCG41	–
2 mm ID	CGCG42	–
Split rings *(package of 5)*	CGCR	CGCRKF



Glass connector

Further reference

Flangeless tube end fittings ..... page 86

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"

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

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	1.50 mm	CFLAPK	CFLAKF	CFLAPFA
to 10-32	0.75 mm	ZUFLPK	ZUFLKF	–
Male luer				
to 1/4-28	1.50 mm	CMLAPK	CMLAKF	CMLAPFA

Luer adapter bulkhead unions

Luer to 1/4-28 or 10-32

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

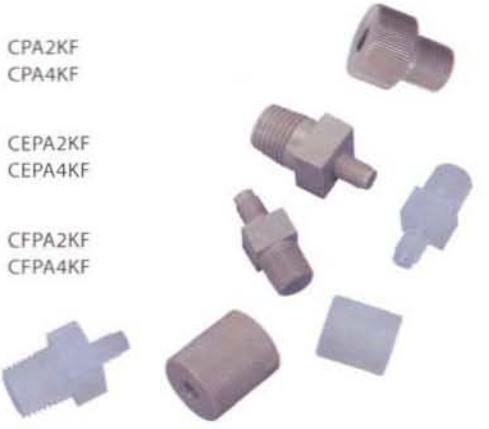
Description	*Bore*	PEEK *Prod No*	CTFE *Prod No*
Female luer			
to 1/4-28	0.75 mm	CBUFLPK	CBUFLKF
to 10-32	0.75 mm	ZBUFLPK	ZBUFLKF
Male luer			
to 10-32	1.00 mm	ZBUMLPK	ZBUMLKF

Pipe adapters

1/4-28 to NPT

Female versions include flangeless fittings for 1/8" OD tubing.

		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

This adapter permits Valco 10-32 fittings to be installed into any 1/4-28 fitting detail.

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 also reflects the color-coding of our PEEK tubing). 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

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"

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

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

Pore size	*Prod No*
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 fittings are hand tightened.

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

Last Drop mobile phase filter

The Last Drop mobile phase filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. Its flat filter element sits parallel to the bottom of the reservoir, and allows 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 mobile phase filters that begin to draw air into the system when less than 10% of the solvent remains in the reservoir.

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

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

	Filter element	*Prod No*
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

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"

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

No-Met biocompatible mobile phase filter

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

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

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

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

Stainless steel mobile phase filters and helium spargers

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

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

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

Mobile phase filters *Direct connect*

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

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

No-Met biocompatible mobile phase filter

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

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

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

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

Stainless steel mobile phase filters and helium spargers

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

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

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

Mobile phase filters *Direct connect*

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

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

Last Drop mobile phase filter

The Last Drop mobile phase filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. Its flat filter element sits parallel to the bottom of the reservoir, and allows 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 mobile phase filters that begin to draw air into the system when less than 10% of the solvent remains in the reservoir.

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

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

	Filter element	*Prod No*
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

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"

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

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

Pore size	*Prod No*
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 fittings are hand tightened.

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

Replacement elements (PEEK-encapsulated titanium)

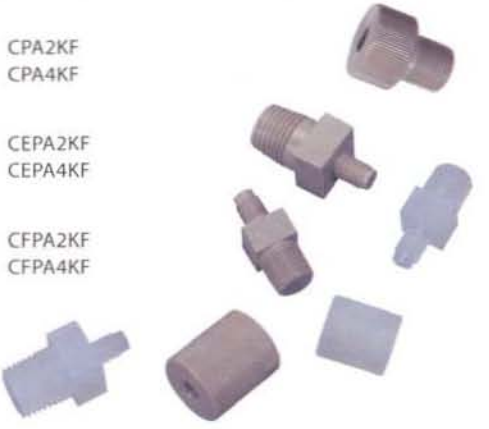
Pore size	*Prod No*
0.5 micron	C-F1.5TI

Pipe adapters

1/4-28 to NPT

Female versions include flangeless fittings for 1/8" OD tubing.

		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

This adapter permits Valco 10-32 fittings to be installed into any 1/4-28 fitting detail.

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 also reflects the color-coding of our PEEK tubing). 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

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"

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

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	1.50 mm	CFLAPK	CFLAKF	CFLAPFA
to 10-32	0.75 mm	ZUFLPK	ZUFLKF	–
Male luer				
to 1/4-28	1.50 mm	CMLAPK	CMLAKF	CMLAPFA

Luer adapter bulkhead unions

Luer to 1/4-28 or 10-32

Our luer adapter bulkhead union connects a male or female luer to 1/4-28 or 10-32 fittings. These are the ideal fittings for through-the-panel syringe injections. The 1/4-28 versions include flangeless fittings for 1/16" OD tubing. Versions with 10-32 connections (for 1/16" OD tubing) include a finger-tight 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	0.75 mm	CBUFLPK	CBUFLKF
to 10-32	0.75 mm	ZBUFLPK	ZBUFLKF
Male luer			
to 10-32	1.00 mm	ZBUMLPK	ZBUMLKF

Mixing tees

1/4-28

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

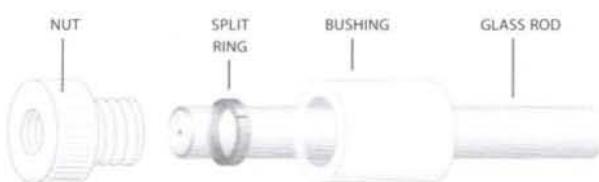
Tubing OD	*Bore*	PEEK *Prod No*	CTFE *Prod No*
1/16"	0.75 mm	CM1XPK	CM1XKF
1/8"	1.50 mm	CM2XPK	CM2XKF

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. They are available as individual components or as complete assemblies. Assemblies include a bushing and nut, a polypropylene or CTFE split ring, and a 1/4" OD x 3-1/4" long piece of 1 mm or 2 mm ID glass tube.

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 rod, 3-1/4" long		
1 mm ID	CGCG41	–
2 mm ID	CGCG42	–
Split rings *(package of 5)*	CGCR	CGCRKF



Glass connector

Further reference

Flangeless tube end fittings ..... page 86

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"

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

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

Low Pressure Tees, Crosses, and Manifolds

Tees *1/4-28*

Includes 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*

Includes 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*

Includes 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

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

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

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

Includes 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

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"

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

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

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

Tubing OD	*Bore*	**PEEK** *Prod No*	**CTFE** *Prod No*	**Polypropylene** *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	–
1/8"	Butt connection	CUTPK	CUTKF	CUTPP *(pkg/5 w/o fittings)*

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

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

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

Includes 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, Delrin	CFL-4D
CTFE ferrule	CFL-CB4KF-S

Further reference

Flangeless tube end fittings 86
Nanovolume unions 17

Plugs *1/4-28*

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

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

Low pressure PEEK plugs *10-32*

These all-PEEK plugs are for use in Cheminert PEEK fittings and low pressure polymeric valves (C20Z and C30Z series). For high pressure polymeric valves (C1-C5 series), use plugs on page 84.

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

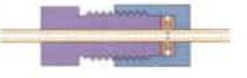
External nuts for flanged tube ends *1/4-28*

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

TECH TIP

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



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

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

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.

Further reference

Color-coded PEEK tubing ..... page 108

PEEK starter kit

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

		Prod No
PEEK starter kit		JR-35P
Includes:		
1	Plastic box	
10	PEEK one-piece fittings, 10-32	
5	PEEK handtight fittings	
5	PEEK nuts, hex-head long	
20	PEEK ferrules, double-ended 1/16"	
1	PEEK union, HP body only, 10-32	
2	Tubing elbows 90°	
2	Tubing elbows 180°	
1	PEEK filter, in-line, incl. PAT frit 5 µm	
1	Clean-cut tubing cutter	
1	Last Drop PTFE filter 5 µm	
3m	PEEK tubing, 1/16" x 0.25 mm ID, blue stripe	
3m	PEEK tubing, 1/16" x 0.50 mm ID, orange stripe	
1	Tweezers	

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	
PTFE tubing, 1/16" x 0.75 mm ID, 6 ft.	

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

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

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

Flanging tools

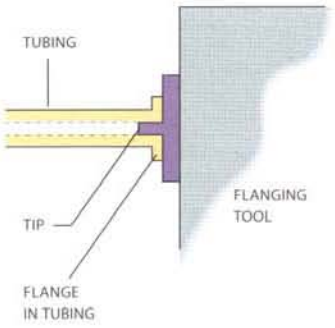
The flanging tool makes the flange which retains the standard tube end fitting and washer on PTFE or FEP tubing. With this tool lengths of tubing may be easily assembled to any required dimension. The time required is only 5 to 10 seconds per flange.

Flanging tools are available for 110 VAC or 230 VAC, and come complete with tips for 0.75 mm 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.

		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
for tubing ID ⊠ 0.75 mm	CFT-TC
for tubing ID ⊠ 1.00 mm	CFT-TM
for tubing ID ⊠ 1.50 mm	CFT-TL
for tubing ID ⊠ 2.00 mm	CFT-TXL
Razor blades *(pkg /10)*	CFT-R
Tubing holder	CFT-H



Flange being made on tubing

Starter kits

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

The starter kit includes:

- 1 flanging tool with 2 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

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

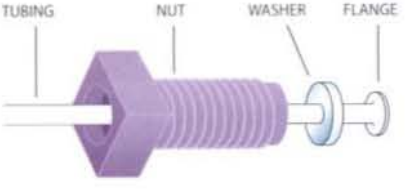
Standard flanged tube end fittings

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 88)*. This is an excellent method for connecting fluorocarbon tubing, as there is no reduction of the inside diameter and no binding or twisting of the tubing when the fitting is tightened. A mating of the parts is achieved with zero dead volume, making this an ideal fitting for biological systems.

Cheminert tube end fittings come in twelve different colors for system color coding, and are available for 1/16" or 1/8" OD fluorocarbon tubing. (While in theory other polymers could be molded to form a flange, only fluorocarbons such as PTFE or FEP have low-temperature malleability and good form retention at operating temperatures.) Tube end fittings attach directly to Cheminert valves and fittings, and are easily joined to each other with a union. Finger-tightness 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 fittings		**1/16" OD**	**1/8" OD**
	(pkg/10)	*Prod No*	*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	CF-1L	CF-2L
	Natural	CF-1N	CF-2N
	Orange	CF-1E	CF-2E
	Purple	CF-1P	CF-2P
	Red	CF-1R	CF-2R
	White	CF-1W	CF-2W
	Yellow	CF-1Y	CF-2Y
	Assorted *(pkg/12, one of each color)*	CF-1A	CF-2A
Washers	*(pkg/10)*	CF-W1	CF-W2



Flanged tube end fitting

TECH TIP

To make up standard flanged tube end fittings, use the flanging tool on page 88.

A flanging starter kit, complete with flanging tool, flanging tips, and an array of tubing and fittings, is also available. See page 88.

Further reference

High pressure fittings ..... pp 83-85
PTFE and FEP tubing 106-107

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

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

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

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

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

Low Pressure Fittings

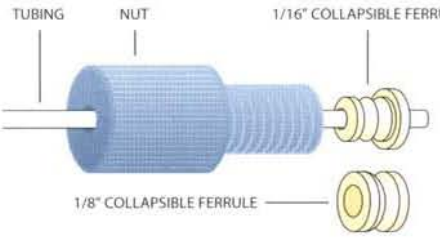
Cheminert low pressure fittings are ideally suited for flow injection analysis, low pressure liquid chromatography, and stream sampling devices. They may be safely used at pressures up to 500 psi and temperatures to 50°C. Two designs of low pressure tube end fittings are available. *Flangeless* tube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

Flangeless tube end fittings

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

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



Flangeless tube end fitting

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	CFL-1L	CFL-2L
Natural	CFL-1N	CFL-2N
Orange	CFL-1E	CFL-2E
Purple	CFL-1P	CFL-2P
Red	CFL-1R	CFL-2R
White	CFL-1W	CFL-2W
Yellow	CFL-1Y	CFL-2Y
Assorted *(pkg/12, one of each color)* with ferrule:		
CTFE	CFL-1A	CFL-2A
PEEK	CFL-1A-PK	CFL-2A-PK
Replacements		
PEEK ferrules *(pkg/10)*	CFL-CB1PK	CFL-CB2PK
CTFE ferrules *(pkg/10)*	CFL-CB1KF	CFL-CB2KF
PEEK nuts *(pkg/5)*	CFL-1PK	CFL-2PK
Setting tool	CST	CST

POLYMERS AT A GLANCE

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

ETFE ..... TZ
Resistant to most chemical attack. Some chlorinated chemicals cause physical swelling. Produced as Tefzel ®

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

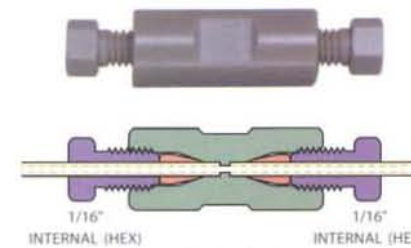
PEEK ..... PK
Chemical resistance; up to 225°C

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

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	3/8"
	0.50 mm	ZU.5LFPK	ZBU.5LFPK	3/8"
	1/32"	ZU.5TFPK	ZBU.5TFPK	3/8"
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 union – PEEK
Standard bore version
(ZU1PK)

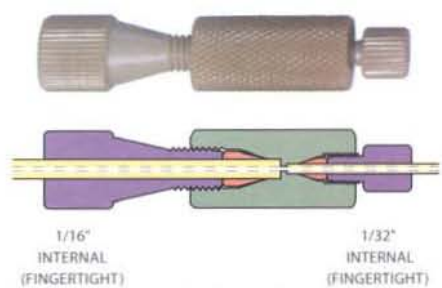
Bulkhead fingertight internal union – PEEK
(ZBU1FPK)

Bulkhead hex internal union – PEEK
(ZBU1PK)

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"



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

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

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

1/32" = 0.8 mm
1/16" = 1.6 mm
1/8" = 3.2 mm
1/4" = 6.4 mm

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"

Plugs and caps – high pressure PEEK

Polymeric 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 the previous page. PEEK caps include a PEEK nut and ferrule. For high pressure polymeric valve plugs, see below. For low pressure valve plugs, see page 91.

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

PEEK plugs for high pressure polymeric valves

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

Description	*Length of nut**	*Prod No*
1/16" hex	.62"	C-MZP1PK
1/16" long hex	.87"	C-LZP1PK
1/16" fingertight	.88"	C-ZP1FPKL

Tees and crosses – high pressure PEEK

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

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

POLYMERS AT A GLANCE

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

TECH TIP

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

PEEK ferrules ..... page 83
PFA ferrules 39

Internal nuts – high pressure PEEK

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

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

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

Ferrules – high pressure PEEK

PEEK ferrules seal by the increased friction from compression.

Package of 10:	*Prod No*
1/32"	ZF.5PK-10
1/16"	ZF1PK-10
1/8"	ZF2PK-10
1/4"	ZF4PK-10
3/8"	ZF6PK-10
1/2"	ZF8PK-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 generally recommended if the tubing is the same material as the ferrule.

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

* Patent No. 6,57[illegible]

POLYMERS AT A GLANCE

PEEK ..... PK
Chemical resistance; up to 175°C

TECH TIP

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

PFA ferrules ..... page 39

Further reference

For more detailed information on PEEK, refer to the discussion on page 240.

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

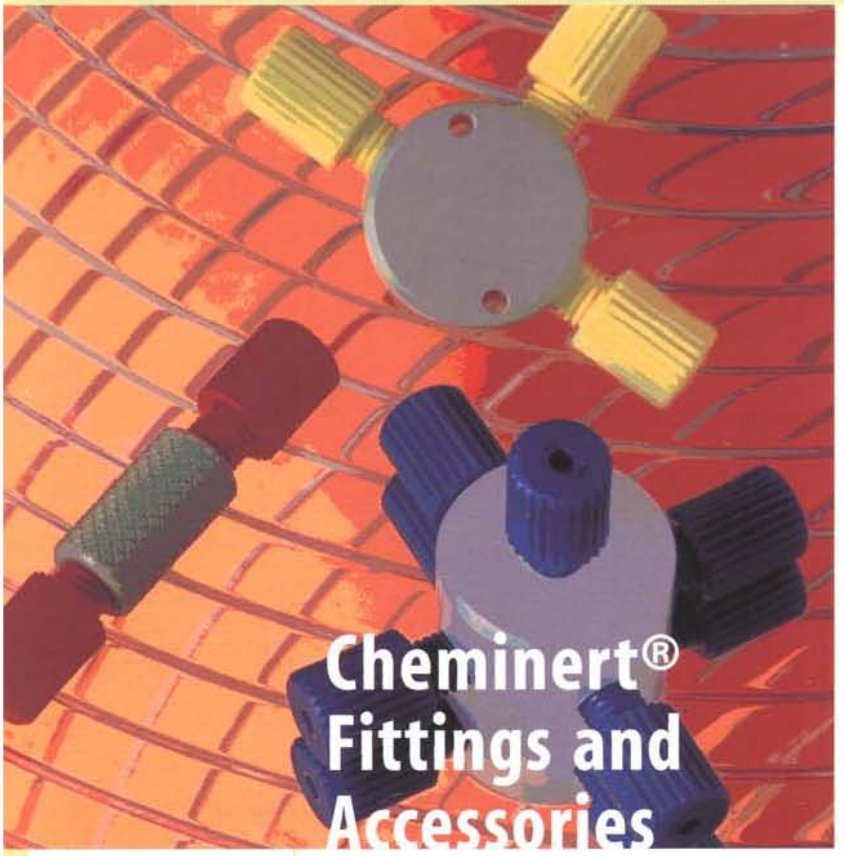
1.0 mm = .040"
1.5 mm = .060"
2.0 mm = .080"

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

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

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 and Accessories

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

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. Our new Nanovolume™ fittings, with 100 or 150 µm bore, are ideal for high resolution capillary chromatography. *(See pages 16-19.)*

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

Further reference

NEW!

No twist one-piece fittings

10-32 for 1/16" tubing

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

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

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

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

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

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

Capacity	*Cap*	*Prod No*
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

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

VICI-cap

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

The VICI-cap is available for either GL45 or S40 threaded bottles. It has a 1/4-28 female port and three ports for tubing insertion: two 1/8" tubing ports and a 1/16" tubing port. The tubing ports are made so that you push the tubing through the hole, while 1/4-28 fittings provide the best connection. If required, just plug the port that you do not need.

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

*Ethylene Propylene Diene Monomer

TECH TIP

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

Further reference

Bulkhead connectors ..... page 93
Flangeless fittings 86
Plugs 91
Polymeric tubing 106-107

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"

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 sample injectors, 1/32" fittings, 0.25 mm ports (.010")

W 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 page 238)

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

Sample volume	.06 µl	.1 µl	.2 µl	.5 µl
	Prod No	*Prod No*	*Prod No*	*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 standard electric actuator	E2NI4WE.06	E2NI4WE.1	E2NI4WE.2	E2NI4WE.5
With microelectric actuator	EP2NI4WE.06	EP2NI4WE.1	EP2NI4WE.2	EP2NI4WE.5
Replacement valve	DNI4WE.06	DNI4WE.1	DNI4WE.2	DNI4WE.5
Replacement rotor	SSANI4WE.06	SSANI4WE.1	SSANI4WE.2	SSANI4WE.5

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

W Type

SPECS

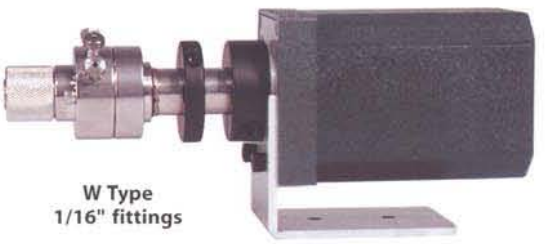
1000 psi liq
175°C max
Nitronic 60 valve body
Valcon E rotor

OPTIONS

- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium
(see page 238)

Includes 2" standoff. Manual version has no standoff.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply

Sample volume	.06 µl	.1 µl	.2 µl	.5 µl
	Prod No	*Prod No*	*Prod No*	*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 standard electric actuator	E2CI4WE.06	E2CI4WE.1	E2CI4WE.2	E2CI4WE.5
With microelectric actuator	EP2CI4WE.06	EP2CI4WE.1	EP2CI4WE.2	EP2CI4WE.5
Replacement valve	DCI4WE.06	DCI4WE.1	DCI4WE.2	DCI4WE.5
Replacement rotor	SSACI4WE.06	SSACI4WE.1	SSACI4WE.2	SSACI4WE.5



W Type
1/16" fittings

Further reference

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

UW Type

Includes 2" standoff. Manual version has no standoff.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply

Sample volume	.2 µl	.5 µl	1 µl	2 µl
	Prod No	*Prod No*	*Prod No*	*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 std electric actuator	E2CI4UWE.2	E2CI4UWE.5	E2CI4UWE1	E2CI4UWE2
With microelectric actuator	ED2CI4UWE.2	ED2CI4UWE.5	ED2CI4UWE1	ED2CI4UWE2
Replacement valve	DCI4UWE.2	DCI4UWE.5	DCI4UWE1	DCI4UWE2
Replacement rotor	SSACI4UWE.2	SSACI4UWE.5	SSACI4UWE1	SSACI4UWE2

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 page 238)

Internal sample injectors, 1/8" fittings, 0.75 mm ports (.030")

UW Type

Includes 2" standoff. Manual version has no standoff.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply

Sample volume	.2 µl	.5 µl	1 µl	2 µl
	Prod No	*Prod No*	*Prod No*	*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 std electric actuator	E2I4UWE.2	E2I4UWE.5	E2I4UWE1	E2I4UWE2
With microelectric actuator	ED2I4UWE.2	ED2I4UWE.5	ED2I4WUE1	ED2I4UWE2
Replacement valve	DI4UWE.2	DI4UWE.5	DI4UWE1	DI4UWE2
Replacement rotor	SSAI4UWE.2	SSAI4UWE.5	SSAI4UWE1	SSAI4UWE2

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 page 238)

UW Type
1/8" 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

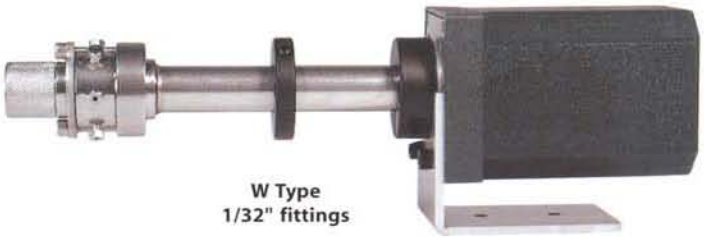
- 3 and 12 port valves available
- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

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

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




	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 standard electric actuator	E4N4WE	E4N6WE	E4N8WE	E4N10WE
With microelectric actuator	EH4N4WE	EH4N6WE	EH4N8WE	EH4N10WE
Replacement valve	DN4WE	DN6WE	DN8WE	DN10WE
Replacement rotor	SSAN4WE	SSAN6WE	SSAN8WE	SSAN10WE



W Type
1/32" fittings

1/32" Stainless steel loops *for W Type valves*

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

Volume	*Prod No*	*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

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Nickel 200, PEEK, and PTFE

Further reference

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

W Type

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

	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 standard electric actuator	E4N4WT	E4N6WT	E4N8WT	E4N10WT
With microelectric actuator	EH4N4WT	EH4N6WT	EH4N8WT	EH4N10WT
Replacement valve	DN4WT	DN6WT	DN8WT	DN10WT
Replacement rotor	SSAN4WT	SSAN6WT	SSAN8WT	SSAN10WT

W Type
1/32" fittings

1/32" Stainless steel loops

for W Type valves

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

Volume	*Prod No*	*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

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Nickel 200, PEEK, and PTFE

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 page 238)

SPECS

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

For 300 psi, 350°C max, see page 126.

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 page 238)*

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

W Type

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




	4 Ports	6 Ports	8 Ports	10 Ports
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C4WE	C6WE	C8WE	C10WE
Manual with standoff	4C4WE	4C6WE	4C8WE	4C10WE
With air actuator	A4C4WE	A4C6WE	A4C8WE	A4C10WE
With standard electric actuator	E4C4WE	E4C6WE	E4C8WE	E4C10WE
With microelectric actuator	EH4C4WE	EH4C6WE	EH4C8WE	EH4C10WE
Replacement valve	DC4WE	DC6WE	DC8WE	DC10WE
Replacement rotor	SSAC4WE	SSAC6WE	SSAC8WE	SSAC10WE

W Type
1/16" fittings

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

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.

Further reference

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

UW Type

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




	4 Ports	6 Ports	8 Ports	10 Ports
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C4UWE	C6UWE	C8UWE	C10UWE
Manual with standoff	4C4UWE	4C6UWE	4C8UWE	4C10UWE
With air actuator	A4C4UWE	A4C6UWE	A4C8UWE	A4C10UWE
With standard electric actuator	E4C4UWE	E4C6UWE	E4C8UWE	E4C10UWE
With microelectric actuator	ED4C4UWE	ED4C6UWE	ED4C8UWE	ED4C10UWE
Replacement valve	DC4UWE	DC6UWE	DC8UWE	DC10UWE
Replacement rotor	SSAC4UWE	SSAC6UWE	SSAC8UWE	SSAC10UWE

UW Type
1/16" fittings

1/16" Stainless steel loops

for UW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrule
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

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.

SPECS

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

For 300 psi, 330°C max, see page 127.

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 page 238)*
- Larger bore available

SPECS

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

For 400 psi, 225°C max, see page 124.

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 page 238)

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

W Type

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




	4 Ports *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 standard electric actuator	E4C4WT	E4C6WT	E4C8WT	E4C10WT
With microelectric actuator	EH4C4WT	EH4C6WT	EH4C8WT	EH4C10WT
Replacement valve	DC4WT	DC6WT	DC8WT	DC10WT
Replacement rotor	SSAC4WT	SSAC6WT	SSAC8WT	SSAC10WT

W Type
1/16" fittings

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

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.

Further reference

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

UW Type

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




	4 Ports *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 standard electric actuator	E4C4UWT	E4C6UWT	E4C8UWT	E4C10UWT
With microelectric actuator	ED4C4UWT	ED4C6UWT	ED4C8UWT	ED4C10UWT
Replacement valve	DC4UWT	DC6UWT	DC8UWT	DC10UWT
Replacement rotor	SSAC4UWT	SSAC6UWT	SSAC8UWT	SSAC10UWT

UW Type
1/16" fittings

1/16" Stainless steel loops

for UW Type valves

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

Volume	*Prod No*	*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

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.

SPECS

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

For 400 psi, 225°C max, see page 125.

OPTIONS

- 2", 3", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Larger bore available

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 page 238)*
- Larger bore available

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

Includes 4" standoff. Manual version has no standoff.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately (*see facing page*).




	4 Ports *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 standard electric actuator	E44UWE	E46UWE	E48UWE	E410UWE
With microelectric actuator	ED44UWE	ED46UWE	ED48UWE	ED410UWE
Replacement valve	D4UWE	D6UWE	D8UWE	D10UWE
Replacement rotor	SSA4UWE	SSA6UWE	SSA8UWE	SSA10UWE

SPECS

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 page 238)*

Sampling and switching valves, 1/4" fittings, 4.0 mm ports (.156") *MW Type*

Includes 4" standoff. Manual version not available without standoff.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not available.



	4 Ports *Prod No*	*Price*	6 Ports *Prod No*	8 Ports *Prod No*
Manual with standoff	4VL4MWE2	$875	4VL6MWE2	4VL8MWE2
With air actuator	A4VL4MWE2	1060	A4VL6MWE2	A4VL8MWE2
With std electric actuator	E4VL4MWE2	1325	E4VL6MWE2	E4VL8MWE2
With microelectric actuator	ET4VL4MWE2	1535	ET4VL6MWE2	ET4VL8MWE2
Replacement valve	DVL4MWE2	825	DVL6MWE2	DVL8MWE2
Replacement rotor	SSAVL4MWE2	150	SSAVL6MWE2	SSAVL8MWE2

MW Type
1/4" fittings

Further reference

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

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

	4 Ports	6 Ports	8 Ports	10 Ports
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual with standoff	44UWT	46UWT	48UWT	410UWT
With air actuator	A44UWT	A46UWT	A48UWT	A410UWT
With standard electric actuator	E44UWT	E46UWT	E48UWT	E410UWT
With microelectric actuator	ED44UWT	ED46UWT	ED48UWT	ED410UWT
Replacement valve	D4UWT	D6UWT	D8UWT	D10UWT
Replacement rotor	SSA4UWT	SSA6UWT	SSA8UWT	SSA10UWT

UW Type
1/8" fittings

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

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.

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 page 238)*
- Larger bore available

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

W Type

Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

SPECS

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

OPTIONS

- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- 1/32" fittings with 0.25 mm bore (.010") also available. Consult factory for product number and pricing.

Sample volume	.06 µl	.1 µl	.2 µl	.5 µl
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	CI4W.06	CI4W.1	CI4W.2	CI4W.5
With air actuator	ACI4W.06	ACI4W.1	ACI4W.2	ACI4W.5
With standard electric actuator	ECI4W.06	ECI4W.1	ECI4W.2	ECI4W.5
With microelectric actuator	EPCI4W.06	EPCI4W.1	EPCI4W.2	EPCI4W.5
Replacement valve	DCI4W.06	DCI4W.1	DCI4W.2	DCI4W.5
Replacement rotor	SSACI4W.06	SSACI4W.1	SSACI4W.2	SSACI4W.5

W Type 1/16" fittings

UW Type 1/16" fittings

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

UW Type

Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

SPECS

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

OPTIONS

- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- 1/32" fittings with 0.25 mm bore (.010") also available. Consult factory for product number and pricing.

Sample volume	.2 µl	.5 µl	1 µl	2 µl
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	CI4UW.2	CI4UW.5	CI4UW1	CI4UW2
With air actuator	ACI4UW.2	ACI4UW.5	ACI4UW1	ACI4UW2
With standard electric actuator	ECI4UW.2	ECI4UW.5	ECI4UW1	ECI4UW2
With microelectric actuator	EDCI4UW.2	EDCI4UW.5	EDCI4UW1	EDCI4UW2
Replacement valve	DCI4UW.2	DCI4UW.5	DCI4UW1	DCI4UW2
Replacement rotor	SSACI4UW.2	SSACI4UW.5	SSACI4UW1	SSACI4UW2

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

W Type

Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately.

	 **4 Ports** *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 standard electric actuator	EC4W	EC6W	EC8W	EC10W
With microelectric actuator	EPC4W	EPC6W	EPC8W	EPC10W
Replacement valve	DC4W	DC6W	DC8W	DC10W
Replacement rotor	SSAC4W	SSAC6W	SSAC8W	SSAC10W

W Type 1/16" fittings

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

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.

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 page 238)

Further reference

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 page 238)*
- Larger bore available.

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

Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply
Sample loops are not included with valves. Order separately.

	4 Ports	6 Ports	8 Ports	10 Ports
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C4UW	C6UW	C8UW	C10UW
With air actuator	AC4UW	AC6UW	AC8UW	AC10UW
With standard electric actuator	EC4UW	EC6UW	EC8UW	EC10UW
With microelectric actuator	EDC4UW	EDC6UW	EDC8UW	EDC10UW
Replacement valve	DC4UW	DC6UW	DC8UW	DC10UW
Replacement rotor	SSAC4UW	SSAC6UW	SSAC8UW	SSAC10UW

UW Type
1/16" fittings

1/16" Stainless steel loops *for UW Type valves*

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

Volume	*Prod No*	*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.

Further reference

SPECS

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

OPTIONS

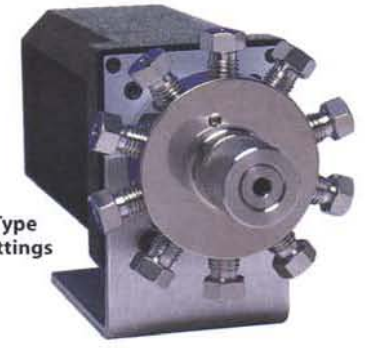
- 3 port valve available
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Smaller bore available. *(see page 133)*

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

UW Type

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

				
	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	L4UW	L6UW	L8UW	2L10UW
With air actuator	AL4UW	AL6UW	AL8UW	AL10UW
With standard electric actuator	EL4UW	EL6UW	EL8UW	EL10UW
With microelectric actuator	EDL4UW	EDL6UW	EDL8UW	EDL10UW
Replacement valve	DL4UW	DL6UW	DL8UW	DL10UW
Replacement rotor	SSAL4UW	SSAL6UW	SSAL8UW	SSAL10UW



UW Type
1/8" fittings

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

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.

Further reference

Applications

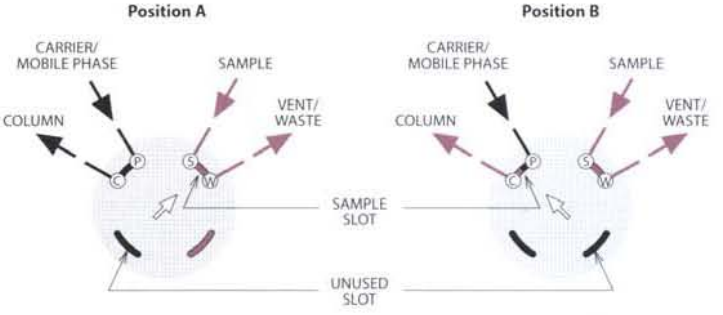
These illustrations show basic sample injection techniques using Valco two position valves. With rare exceptions, there is no difference between switching valves and external volume sampling valves, so the same valve can be used for either function.

The unique advantage of 8 and 10 port valves is that they reduce extra column volume by combining sampling and switching functions in a single valve. This minimizes expense, maintenance, service, and risk of leaks as compared to multiple 6 port valve systems.

4 PORT INTERNAL SAMPLE INJECTOR

Microvolume Sample Injection

The internal sample (fixed volume) flowpath is used when very small sample volumes are required. The sample size is determined by a passage engraved on the valve rotor, allowing precise, repeatable injections. In Position A, the sample flows through the sample passage while the mobile phase flows through to the column. The third passage is inactive. In Position B, the sample passage is in line with the column and the mobile phase injects the contents of the sample passage onto the column. The passage which was inactive in Position A allows the sample to continue flowing without interruption.

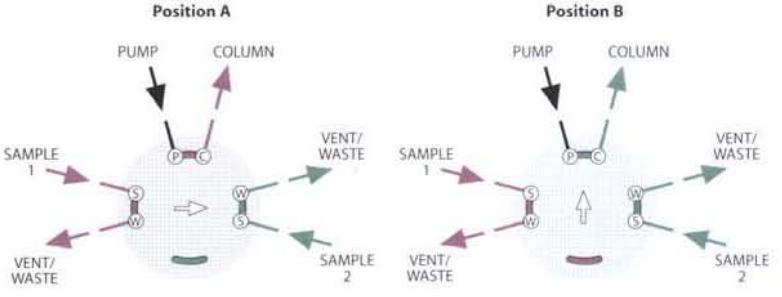


6 PORT INTERNAL SAMPLE INJECTOR

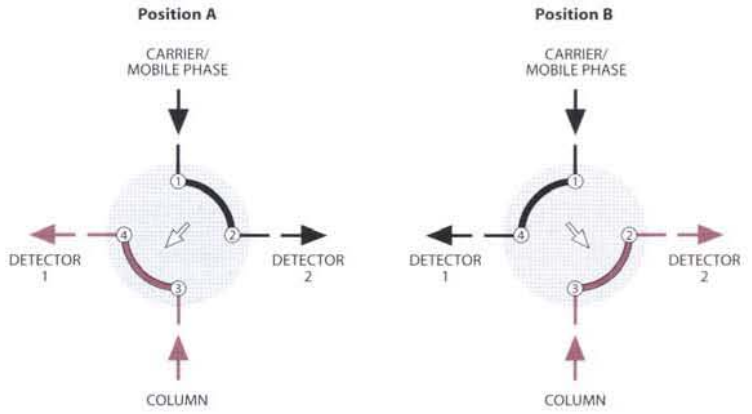
Dual Microvolume Sample Injection

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 inject alternately the same sample onto two different columns by swapping sample/waste and pump/column connections.

Note: This C16 valve is not shown in this catalog. Call for details.



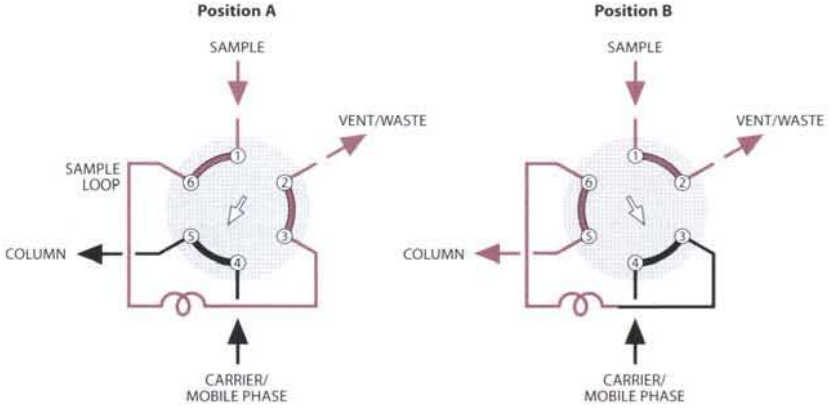
Two Position Applications



4 PORT SWITCHING VALVE

Detector Selection from Two Columns or One Column and Auxiliary Carrier

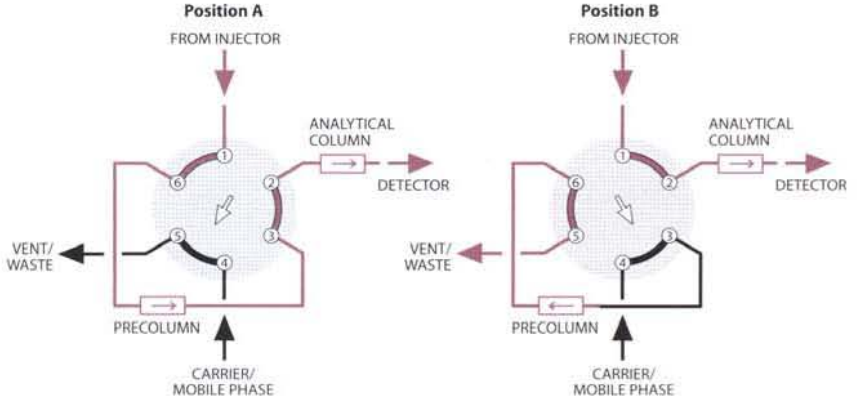
This unique configuration allows analysis of different parts of one analysis with two different detectors, without splitting or multiple injections. For example, fixed gases can be analyzed with a thermal conductivity detector, followed by the analysis of a hydrocarbon fraction with a flame ionization 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

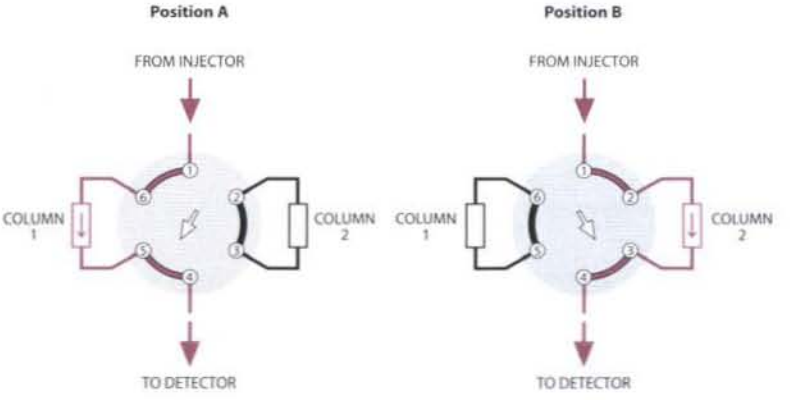
This plumbing scheme allows slower eluting components (end cut) which are not of interest to be backflushed to vent. Often a shorter version of the analytical column is used as the precolumn. Once all the components of interest have entered the main column (at port 2), the valve switches, backflushing the precolumn to vent and reducing analysis time. 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.

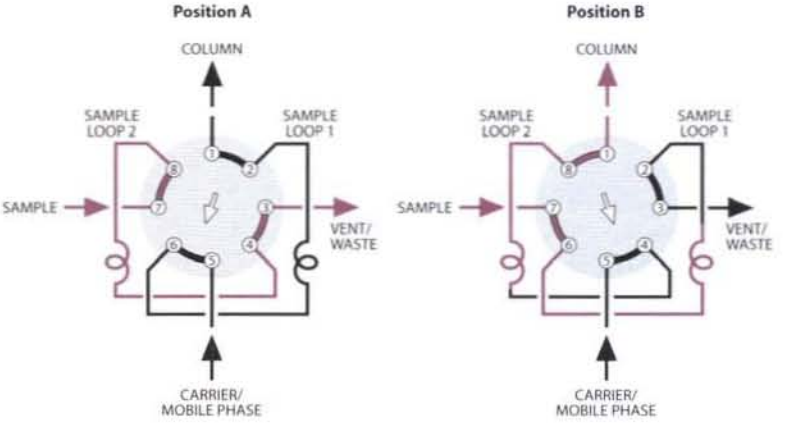
(If flow must be maintained to the non-selected column, an 8 or 10 port valve is required.)



8 PORT DUAL EXTERNAL SAMPLE INJECTOR

Same Sample to Different Loops

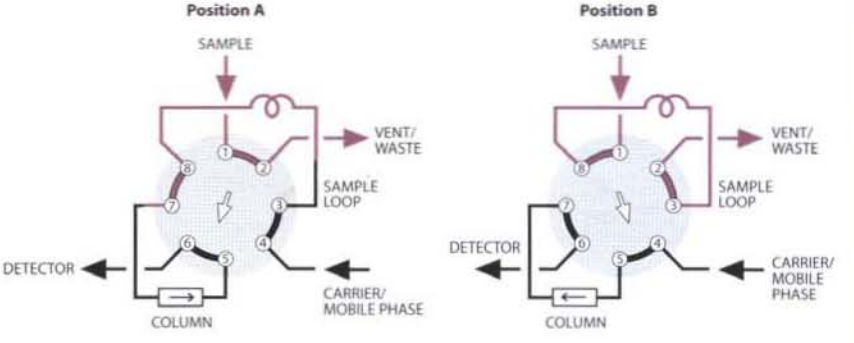
In a dual external sample loop configuration, sample is injected in both positions. In Position A, Loop 2 is loaded while the mobile phase flows through Loop 1 and onto the column. In Position B, the Loop 2 sample is injected into the column and another sample is loaded into Loop 1. When the valve is returned to Position A, the Loop 1 sample is injected onto the column and Loop 2 is reloaded.



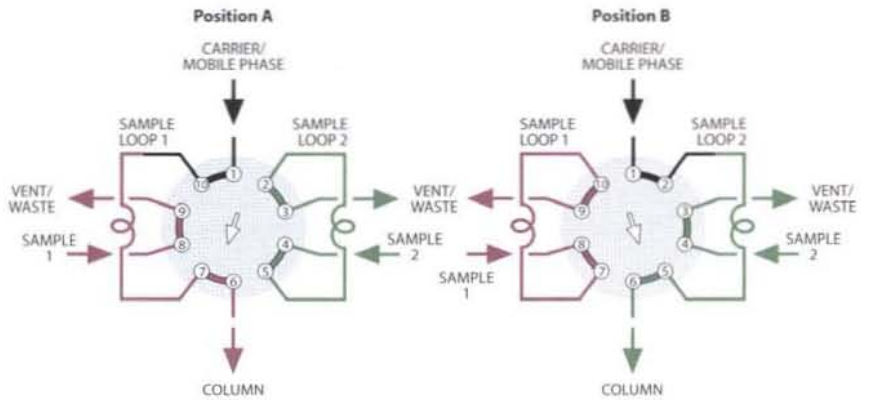
8 PORT SAMPLING/SWITCHING

Loop Sampling with Backflush to Detector

One valve functions as sampling and backflush valve, simplifying operation and reducing cost. When components of interest are detected, the strongly retained components are backflushed and removed from the column without temperature programming.



Two Position Applications



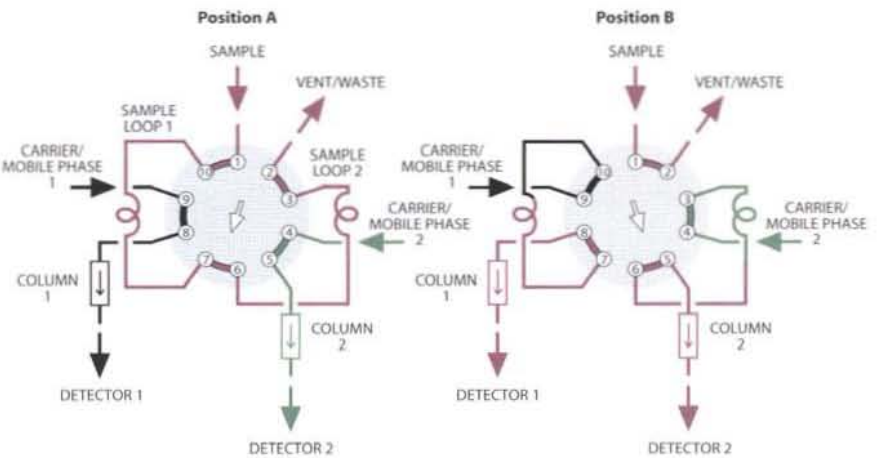
10 PORT DUAL EXTERNAL SAMPLING

Two Different Samples to Same Column

A 10 port valve permits alternate injections from the two loops, which may be identical or of different sizes. This technique replaces a 4 port switching valve, used as a 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.

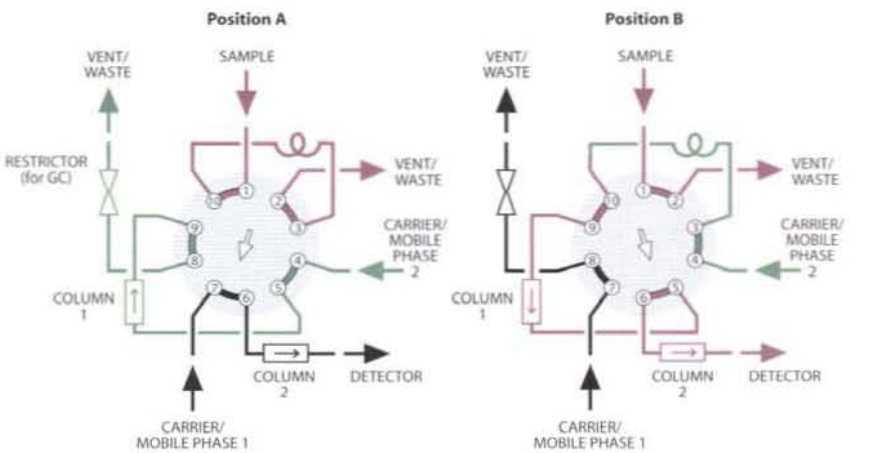


10 PORT DUAL EXTERNAL SAMPLING

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

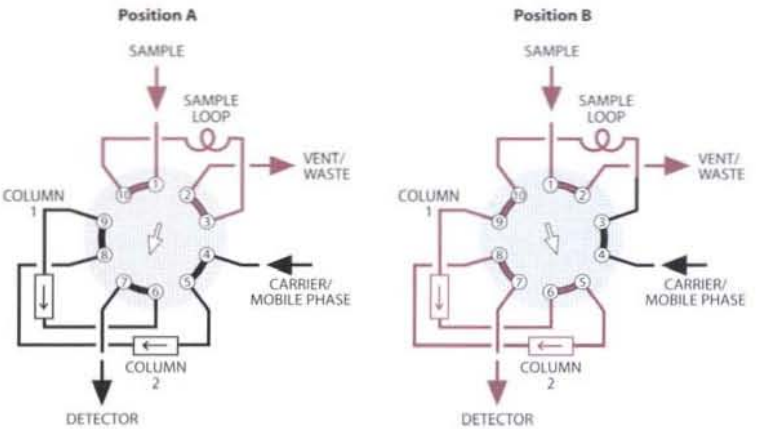
Loop Sampling with Backflush of Pre-column to Vent

When components of interest 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 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

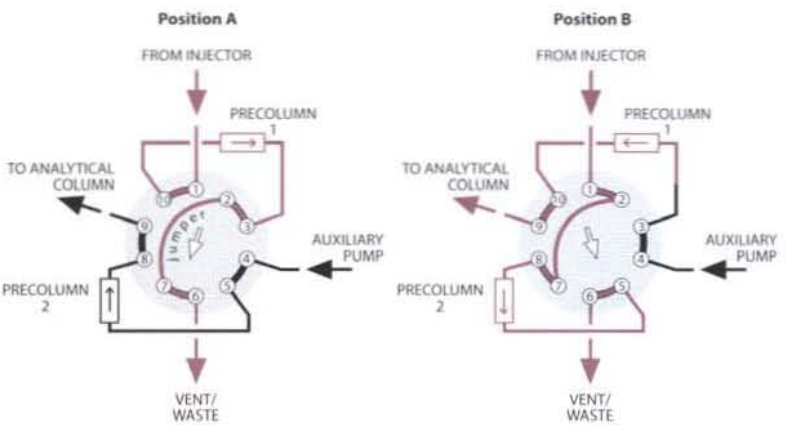
This is ideal for fixed gas-from-CO_2 analysis where no "high boilers" are present. Column 1 is packed with a porous polymer and Column 2 with molecular sieve. The sample loop is loaded in Position A. When the valve is switched, the loop contents are sent onto Column 1. As the inorganic gases and methane 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 mole sieve and pass through the porous polymer column to the detector.



10 PORT COLUMN SWITCHING

Sample Enrichment (Cleanup) Using Dual Precolumns

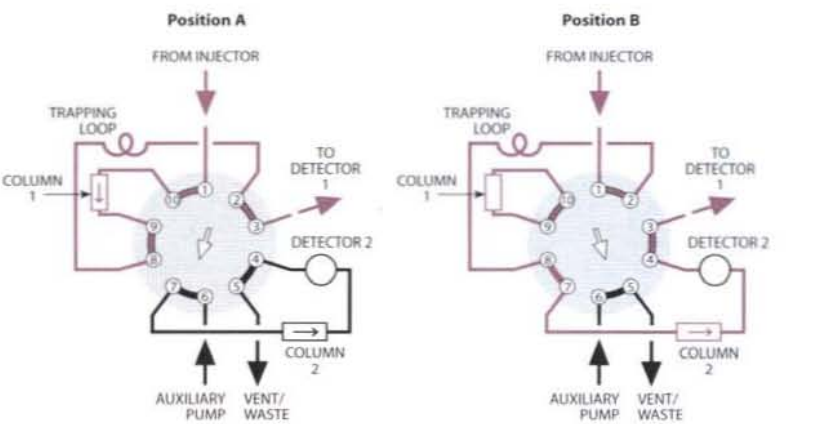
Sample is injected by a separate injector onto one of two precolumns (stripper). Early eluting components vent at port 6 while components of interest are retained on the stripper. When the valve is switched, a new injection is made onto the second stripper while components retained on the first stripper are backflushed onto the analytical column at port 9. An auxiliary pump at port 4 is required.



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 Multiposition Valves

Instead of the back and forth switching of two position valves, multiposition valves step incrementally through continuous revolutions (bi-directionally with the microelectric actuator). While we can supply older models, all the valves in this catalog have a preload assembly. This design allows the rotor to be inspected or replaced without taking the valve off the actuator, and valves ordered with a microelectric actuator are permanently aligned.

Flowpath Configurations

SD (dead-ended) valves select one of 4 to 16 dead-ended streams, directing it through the valve outlet to a sample valve, pressure sensor, detector, column, etc. The same configuration can also direct one stream to a number of outlets for fraction collection.

SC (common outlet) valves are similar to SDs, except that instead of being dead-ended the non-selected streams flow to a common outlet.

SF (flow-through) valves 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) valves are used for multi-column, multi-sample, or multi-trap operations.

STF (trapping/flow-through) valves are similar to STs, with the single difference that the non-selected streams are returned to their own vents or sources rather that being dead-ended or trapped as they are in the standard ST configuration.

PORT DIAMETERS—
LOW PRESSURE (MW)

Fitting size	No. of Positions	Standard port diameter
SD		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 10	4.0 mm (.156")
SC		
1/16"	4 - 16	1.0 mm (.040")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 8	4.0 mm (.156")
SF		
1/16"	4 - 16	1.0 mm (.040")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 8	4.0 mm (.156")
ST		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")
STF		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")

PORT DIAMETERS—
HIGH PRESSURE (UW)

Fitting size	No. of Positions	Standard port diameter
SD		
1/16"	4 - 12	0.40 mm (.016")
1/8"	4, 6, 8	0.75 mm (.030")
ST		
1/16"	4,6	0.40 mm (.016")

Further reference

Actuation .. pp 190-205

Applications .. 154-159

Materials
Metals 238
Polymers 239
Valve rotors 240

Specifying a special body material 117

Multiposition valve prices
Low pressure
SD 142-143
SC 144-145
SF 146-147
ST 148-149
STF 150-151
High pressure
SD 152
ST 153

Loops, if required, are found on corresponding valve pages.

For special port diameters, please consult the factory.

Valco Multiposition Valves

Instead of the back and forth switching of two position valves, multiposition valves step incrementally through continuous revolutions (bi-directionally with the microelectric actuator). While we can supply older models, all the valves in this catalog have a preload assembly. This design allows the rotor to be inspected or replaced without taking the valve off the actuator, and valves ordered with a microelectric actuator are permanently aligned.

Flowpath Configurations

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SC (common outlet) valves are similar to SDs, except that instead of being dead-ended the non-selected streams flow to a common outlet.

SF (flow-through) valves 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) valves are used for multi-column, multi-sample, or multi-trap operations.

STF (trapping/flow-through) valves are similar to STs, with the single difference that the non-selected streams are returned to their own vents or sources rather that being dead-ended or trapped as they are in the standard ST configuration.

PORT DIAMETERS—
LOW PRESSURE (MW)

Fitting size	No. of Positions	Standard port diameter
SD		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 10	4.0 mm (.156")
SC		
1/16"	4 - 16	1.0 mm (.040")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 8	4.0 mm (.156")
SF		
1/16"	4 - 16	1.0 mm (.040")
1/8"	4 - 16	1.0 mm (.040")
1/4"	4 - 8	4.0 mm (.156")
ST		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")
STF		
1/16"	4 - 16	0.75 mm (.030")
1/8"	4 - 16	1.0 mm (.040")

PORT DIAMETERS—
HIGH PRESSURE (UW)

Fitting size	No. of Positions	Standard port diameter
SD		
1/16"	4 - 12	0.40 mm (.016")
1/8"	4, 6, 8	0.75 mm (.030")
ST		
1/16"	4,6	0.40 mm (.016")

Further reference

Actuation .. pp 190-205

Applications .. 154-159

Materials
Metals 238
Polymers 239
Valve rotors 240

Specifying a special body material 117

Multiposition valve prices
Low pressure
SD 142-143
SC 144-145
SF 146-147
ST 148-149
STF 150-151
High pressure
SD 152
ST 153

Loops, if required, are found on corresponding valve pages.

For special port diameters, please consult the factory.

Low Pressure Multiposition Valves

Valco **MW Type** low pressure valves are available with 1/16", 1/8" or 1/4" fittings. (Refer to the chart opposite for port diameters.) The 1/16" and 1/8" valves can be ordered with 4, 6, 8, 10, 12, or 16 positions, in any of the five flowpath configurations. Valves 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 valves 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 MULTIPOSITION VALVES – 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 Multiposition Valves

Valco **UW Type** high pressure valves are available in SD and ST flowpaths. SD valves with 1/16" fittings are available in 4, 6, 8, 10, or 12 positions, while 1/8" valves can be ordered with 4, 6, 8, or 10 positions. ST flowpath UW valves have 1/16" fittings, with either 4 or 6 positions. (Refer to the chart opposite for port diameters.)

SPECIFICATIONS

VALCO MULTIPOSITION VALVES – 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	–	–

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

MW Type

SPECS

4-8 Positions:
400 psi gas
200°C max
10-16 Positions:
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Larger bore available

	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 standard electric actuator	E2SD6MWE	E2SD10MWE	E2SD12MWE	E2SD16MWE
With microelectric actuator	EMT2SD6MWE	EMT2SD10MWE	EMT2SD12MWE	EMT2SD16MWE
Replacement valve	DSD6MWE	DSD10MWE	DSD12MWE	DSD16MWE
Replacement rotor	SSASD6MWE	SSASD10MWE	SSASD12MWE	SSASD16MWE

1/4" fittings, 4.0 mm ports (.156")

MW Type

SPECS

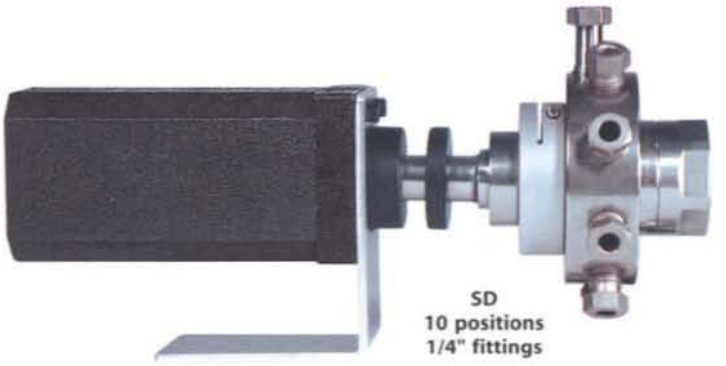
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

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

OPTIONS

- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

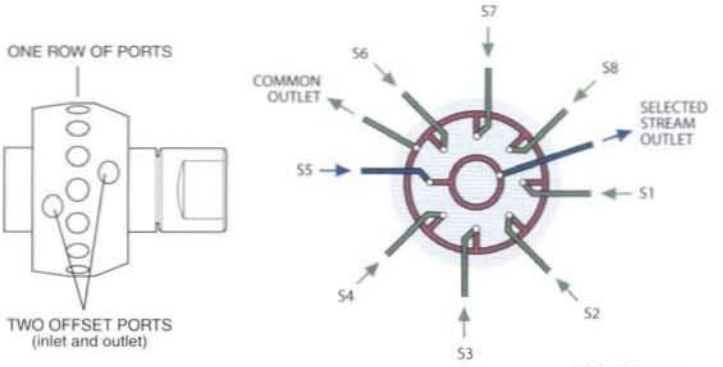
	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*	10 Position *Prod No*
With air actuator	AH2VLSD4MWE2	AH2VLSD6MWE2	AH2VLSD8MWE2	AH2VLSD10MWE2
With std electric actuator	E2VLSD4MWE2	E2VLSD6MWE2	E2VLSD8MWE2	E2VLSD10MWE2
With microelectric actuator	EMT2VLSD4MWE2	EMT2VLSD6MWE2	EMT2VLSD8MWE2	MT2VLSD10MWE2
Replacement valve	DVLSD4MWE2	DVLSD6MWE2	DVLSD8MWE2	DVLSD10MWE2
Replacement rotor	SSAVLSD4MWE2	SSAVLSD6MWE2	SSAVLSD8MWE2	SSAVLSD10MWE2



SD
10 positions
1/4" fittings

Common outlet flowpath – SC configuration

SC valves 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 155.



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

MW Type

SPECS

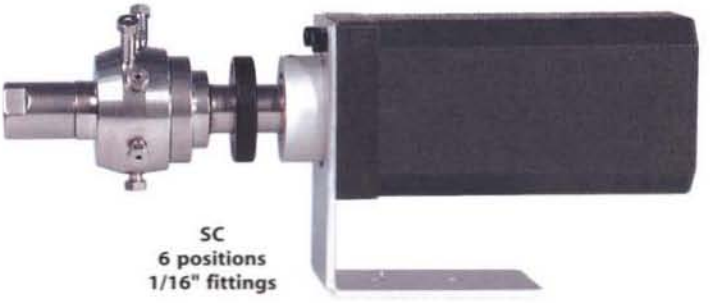
200 psi gas
200°C max
Nitronic 60 body
Valcon E rotor

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

	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	A2CSC6MWE	A2CSC10MWE	A2CSC12MWE	A2CSC16MWE
With standard electric actuator	E2CSC6MWE	E2CSC10MWE	E2CSC12MWE	E2CSC16MWE
With microelectric actuator	EMT2CSC6MWE	EMT2CSC10MWE	EMT2CSC12MWE	EMT2CSC16MWE
Replacement valve	DCSC6MWE	DCSC10MWE	DCSC12MWE	DCSC16MWE
Replacement rotor	SSACSC6MWE	SSACSC10MWE	SSACSC12MWE	SSACSC16MWE



SC
6 positions
1/16" fittings

Further reference

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

MW Type

SPECS

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

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Larger bore available except 16 position

	6 Position		10 Position	12 Position	16 Position
	Prod No	*Price*	*Prod No*	*Prod No*	*Prod No*
Manual (not recommended)	2SC6MWE	$725	2SC10MWE	2SC12MWE	2SC16MWE
With air actuator	A2SC6MWE	990	A2SC10MWE	A2SC12MWE	A2SC16MWE
With standard electric actuator	E2SC6MWE	1320	E2SC10MWE	E2SC12MWE	E2SC16MWE
With microelectric actuator	EMT2SC6MWE	1520	EMT2SC10MWE	EMT2SC12MWE	EMT2SC16MWE
Replacement valve	DSC6MWE	600	DSC10MWE	DSC12MWE	DSC16MWE
Replacement rotor	SSASC6MWE	90	SSASC10MWE	SSASC12MWE	SSASC16MWE

1/4" fittings, 4.0 mm ports (.156")

MW Type

SPECS

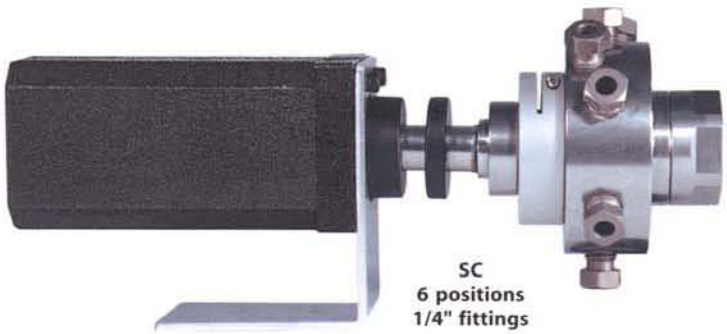
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

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

OPTIONS

- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

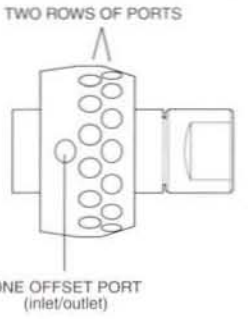
	4 Position	6 Position	8 Position
	Prod No	*Prod No*	*Prod No*
With air actuator	AH2VLSC4MWE2	AH2VLSC6MWE2	A2VLSC8MWE2
With std electric actuator	E2VLSC4MWE2	E2VLSC6MWE2	E2VLSC8MWE2
With microelectric actuator	EMT2VLSC4MWE2	EMT2VLSC6MWE2	EMT2VLSC8MWE2
Replacement valve	DVLSC4MWE2	DVLSC6MWE2	DVLSC8MWE2
Replacement rotor	SSAVLSC4MWE2	SSAVLSC6MWE2	SSAVLSC8MWE2

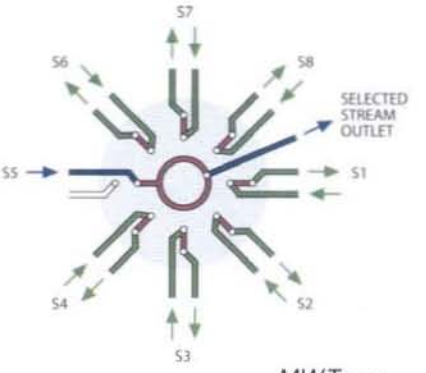


SC
6 positions
1/4" fittings

Flow-through flowpath – SF configuration

SD and SC valves select and isolate one of 4 to 16 streams, with the remainder dead-ended in the SD and flowing to a common outlet in the SC. The SF is similar, but carries the evolution a step further with the non-selected streams flowing through individual outlets. For an application suggestion, see page 156.





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

MW Type

SPECS

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

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

	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	A2CSF6MWE	A2CSF10MWE	A2CSF12MWE	A2CSF16MWE
With standard electric actuator	E2CSF6MWE	E2CSF10MWE	E2CSF12MWE	E2CSF16MWE
With microelectric actuator	EMT2CSF6MWE	EMT2CSF10MWE	EMT2CSF12MWE	EMT2CSF16MWE
Replacement valve	DCSF6MWE	DCSF10MWE	DCSF12MWE	DCSF16MWE
Replacement rotor	SSACSF6MWE	SSACSF10MWE	SSACSF12MWE	SSACSF16MWE

SF
8 positions
1/16" fittings

Further reference

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

MW Type

SPECS

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

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- 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	A2SF6MWE	A2SF10MWE	A2SF12MWE	A2SF16MWE
With standard electric actuator	E2SF6MWE	E2SF10MWE	E2SF12MWE	E2SF16MWE
With microelectric actuator	EMT2SF6MWE	EMT2SF10MWE	EMT2SF12MWE	EMT2SF16MWE
Replacement valve	DSF6MWE	DSF10MWE	DSF12MWE	DSF16MWE
Replacement rotor	SSASF6MWE	SSASF10MWE	SSASF12MWE	SSASF16MWE

1/4" fittings, 4.0 mm ports (.156")

MW Type

SPECS

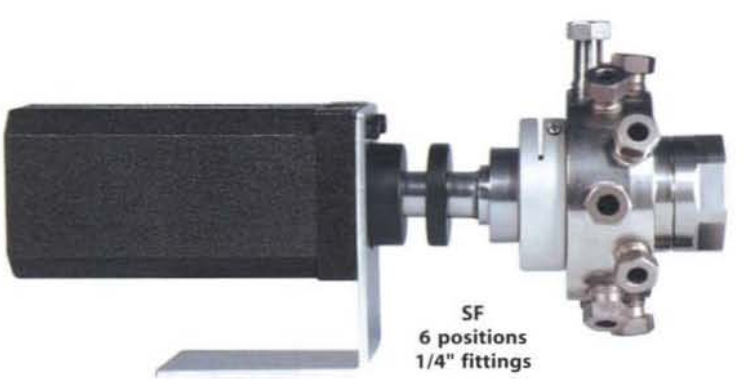
100 psi gas
75°C max
Nitronic 60 body
Valcon E2 rotor

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

OPTIONS

- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

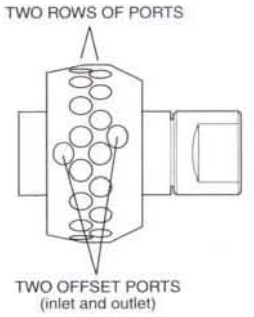
	4 Position *Prod No*	6 Position *Prod No*	8 Position *Prod No*
With air actuator	AH2VLSF4MWE2	AH2VLSF6MWE2	AH2VLSF8MWE2
With std electric actuator	E2VLSF4MWE2	E2VLSF6MWE2	E2VLSF8MWE2
With microelectric actuator	EMT2VLSF4MWE2	EMT2VLSF6MWE2	EMT2VLSF8MWE2
Replacement valve	DVLSF4MWE2	DVLSF6MWE2	DVLSF8MWE2
Replacement rotor	SSAVLSF4MWE2	SSAVLSF6MWE2	SSAVLSF8MWE2

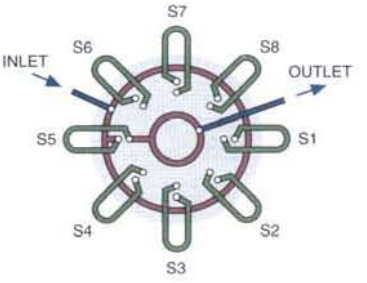


SF
6 positions
1/4" fittings

Trapping flowpath – ST configuration

ST valves 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 157.





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

MW Type

SPECS

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

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

	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	A2CST6MWE	A2CST10MWE	A2CST12MWE	A2CST16MWE
With standard electric actuator	E2CST6MWE	E2CST10MWE	E2CST12MWE	E2CST16MWE
With microelectric actuator	EMT2CST6MWE	EMT2CST10MWE	EMT2CST12MWE	EMT2CST16MWE
Replacement valve	DCST6MWE	DCST10MWE	DCST12MWE	DCST16MWE
Replacement rotor	SSACST6MWE	SSACST10MWE	SSACST12MWE	SSACST16MWE

ST
8 positions
1/16" fittings

Further reference

1/16" Stainless steel loops

for MW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately. When a set of loops is ordered, loops will be supplied from the same lot.

Volume	*Prod No*	*Volume*	*Prod No*
50 µl	SL50CSTP	1 ml	SL1KCSTP
100 µl	SL100CSTP	2 ml	SL2KCSTP
250 µl	SL250CSTP	5 ml	SL5KCSTP
500 ul	SL500CSTP	10 ml	SL10KCSTP

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

MW Type

SPECS

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

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Larger bore available except 16 position

	6 Position	10 Position	12 Position	16 Position
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual (not recommended)	2ST6MWE	2ST10MWE	2ST12MWE	2ST16MWE
With air actuator	A2ST6MWE	A2ST10MWE	A2ST12MWE	A2ST16MWE
With standard electric actuator	E2ST6MWE	E2ST10MWE	E2ST12MWE	E2ST16MWE
With microelectric actuator	EMT2ST6MWE	EMT2ST10MWE	EMT2ST12MWE	EMT2ST16MWE
Replacement valve	DST6MWE	DST10MWE	DST12MWE	DST16MWE
Replacement rotor	SSAST6MWE	SSAST10MWE	SSAST12MWE	SSAST16MWE

1/8" Stainless steel loops

for MW Type valves

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately. When a set of loops is ordered, loops will be supplied from the same lot.

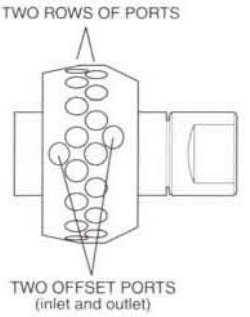
Volume	*Prod No*	*Volume*	*Prod No*
100 µl	SL100STP	1 ml	SL1KSTP
250 µl	SL250STP	2 ml	SL2KSTP
500 µl	SL500STP	5 ml	SL5KSTP
		10 ml	SL10KSTP

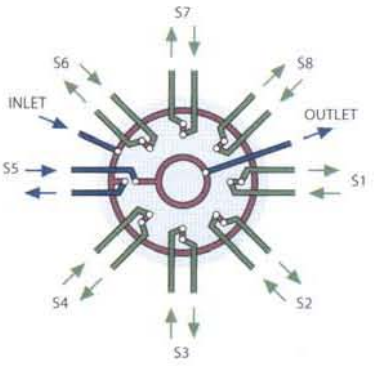
ABOUT LOOPS

- Other materials 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.

Trapping/flow-through flowpath – STF configuration

The STF valve 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 158.





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

MW Type

SPECS

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

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

OPTIONS

- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*

	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	A2CSTF6MWE	A2CSTF10MWE	A2CSTF12MWE	A2CSTF16MWE
With standard elec actuator	E2CSTF6MWE	E2CSTF10MWE	E2CSTF12MWE	E2CSTF16MWE
With microelectric actuator	EMT2CSTF6MWE	EMT2CSTF10MWE	EMT2CSTF12MWE	EMT2CSTF16MWE
Replacement valve	DCSTF6MWE	DCSTF10MWE	DCSTF12MWE	DCSTF16MWE
Replacement rotor	SSACSTF6MWE	SSACSTF10MWE	SSACSTF12MWE	SSACSTF16MWE

Further reference

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

MW Type

SPECS

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

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

OPTIONS

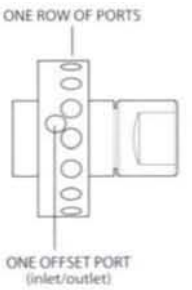
- 4 and 8 positions available
- 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Larger bore available except 16 position

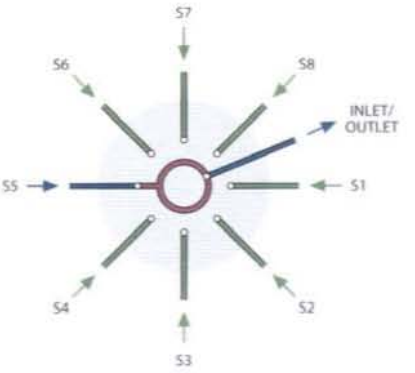
	6 Position *Prod No*	10 Position *Prod No*	12 Position *Prod No*	16 Position *Prod No*
Manual (not recommended)	2STF6MWE	2STF10MWE	2STF12MWE	2STF16MWE
With air actuator	A2STF6MWE	A2STF10MWE	A2STF12MWE	A2STF16MWE
With standard elec actuator	E2STF6MWE	E2STF10MWE	E2STF12MWE	E2STF16MWE
With microelectric actuator	EMT2STF6MWE	EMT2STF10MWE	EMT2STF12MWE	EMT2STF16MWE
Replacement valve	DSTF6MWE	DSTF10MWE	DSTF12MWE	DSTF16MWE
Replacement rotor	SSASTF6MWE	SSASTF10MWE	SSASTF12MWE	SSASTF16MWE

STF
10 positions
1/8" fittings

Dead-end flowpath – SD configuration

SD valves select one of 4 to 16 dead-ended streams. The selected stream flows from the valve outlet to a sample valve, pressure sensor, detector, column, etc. This configuration may also be used to direct one stream to a number of outlets for applications such as fraction collection. For an application suggestion, see page 159.





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

UW Type

SPECS

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

Standard electric actuators: 110 VAC for USA;
110/230 VAC to 24 VDC power supply for international
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

OPTIONS

- **8 and 12 positions available**
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Low pressure, high temperature versions available
- Larger bore available except 10 and 12 positions

	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 standard electric actuator	ECSD4UW	ECSD6UW	ECSD10UW
With microelectric actuator	EMTCSD4UW	EMTCSD6UW	EMTCSD10UW
Replacement valve	DCSD4UW	DCSD6UW	DCSD10UW
Replacement rotor	SSACSD4UW	SSACSD6UW	SSACSD10UW

1/8" fittings, 0.75 mm ports (.030")

UW Type

SPECS

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

Standard electric actuators: 110 VAC for USA;
110/230 VAC to 24 VDC power supply for international
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply)

OPTIONS

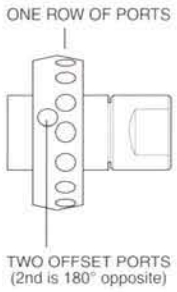
- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Low pressure, high temperature versions available
- Larger bore available except 8 position

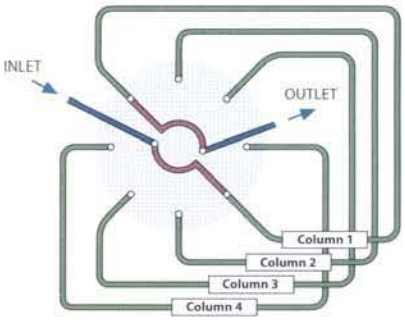
SD
6 positions
1/8" fittings

	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 standard electric actuator	ESD4UW	ESD6UW	ESD8UW
With microelectric actuator	EMTSD4UW	EMTSD6UW	EMTSD8UW
Replacement valve	DSD4UW	DSD6UW	DSD8UW
Replacement rotor	SSASD4UW	SSASD6UW	SSASD8UW

Both column ends selected – ST configuration

ST valves 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 159.





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

SPECS

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

Standard electric actuators: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international
Microelectric actuators: 24 VDC (includes a 110/230 VAC to 24 VDC power supply). Manual versions are not available.

OPTIONS

- 2", 3", 4", and 6" standoffs
- Materials: Hastelloy C, Inconel 600, Monel 400, Nickel 200, Nitronic 50, Titanium, Zirconium *(see page 238)*
- Low pressure, high temperature versions available

	4 Columns or Loops *Prod No*	6 Columns or Loops *Prod No*
With air actuator	ACST4UW	ACST6UW
With standard electric actuator	ECST4UW	ECST6UW
With microelectric actuator	EMTCST4UW	EMTCST6UW
Replacement valve	DCST4UW	DCST6UW
Replacement rotor	SSACST4UW	SSACST6UW

ST
4 position
1/16" fittings

1/16" Stainless steel loops *for UW Type valves*

Each stainless steel loop includes two stainless nuts and two stainless ferrules. Order special fittings separately.
When a set of loops is ordered, loops will be supplied from the same lot.

Volume	*Prod No*	*Price*	*Volume*	*Prod No*	*Price*
10 µl	SL10CSTUW	$19	250 µl	SL250CSTUW	$23
15 µl	SL15CSTUW	19	500 µl	SL500CSTUW	26
20 µl	SL20CSTUW	19	1 ml	SL1KCSTUW	29
25 µl	SL25CSTUW	19	2 ml	SL2KCSTUW	37
50 µl	SL50CSTUW	19	5 ml	SL5KCSTUW	43
100 µl	SL100CSTUW	19	10 ml	SL10KCSTUW	56

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.

Further reference

Actuators
Air ..... pages 198, 200
Microelectric 194-195
Standard elec ... 196-197
Materials
Metals 238
Polymers 239
Valve rotors 240
Mounting hardware
Closemount 216
Standoff 212-215

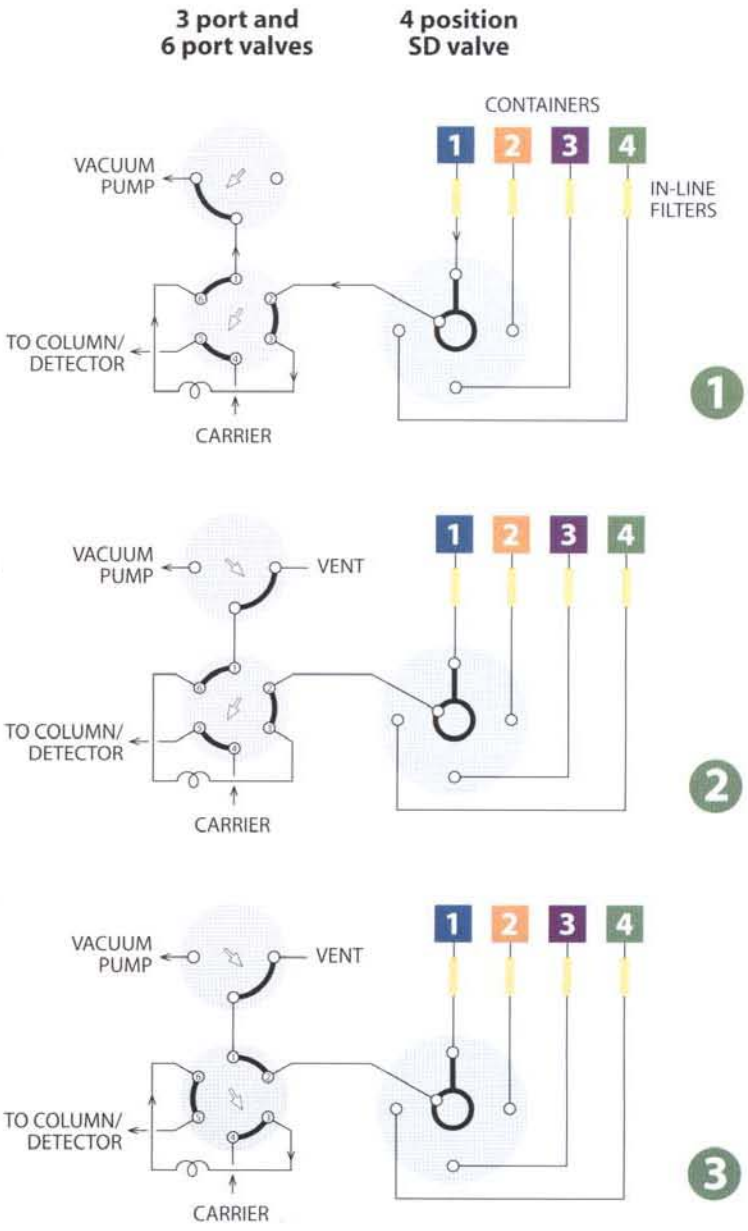
SD Flowpath Configuration – MW

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.

❶ A vacuum pump is used to move sample from the containers to a 6 port sampling valve. ❷ 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. ❸ The six 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.



Further reference

Cheminert multiposition valves .... pages 184-189

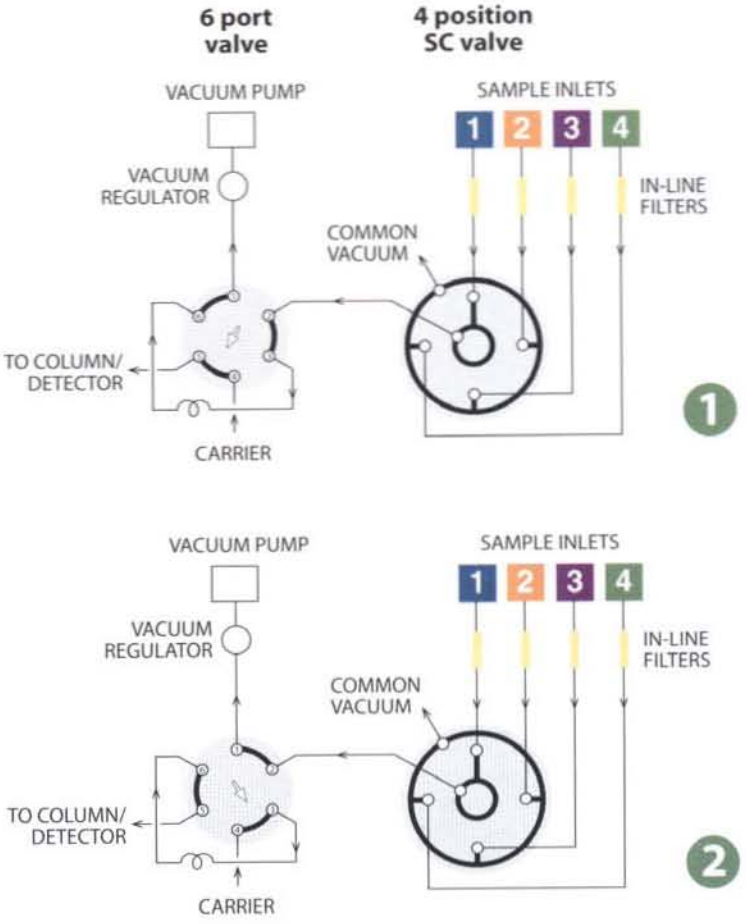
SD prices
low pressure 142
high pressure 152
Application
High pressure SD 159

SC Flowpath Configuration – MW

SC valves 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 valves 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. ❶ The sample loop on the 6 port valve is loaded from Stream 1. ❷ The six 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 74-79

Further reference

Actuators
Air ..... pages 198, 200
Microelectric 194-195
Standard elec ... 196-197

SC prices 144-145

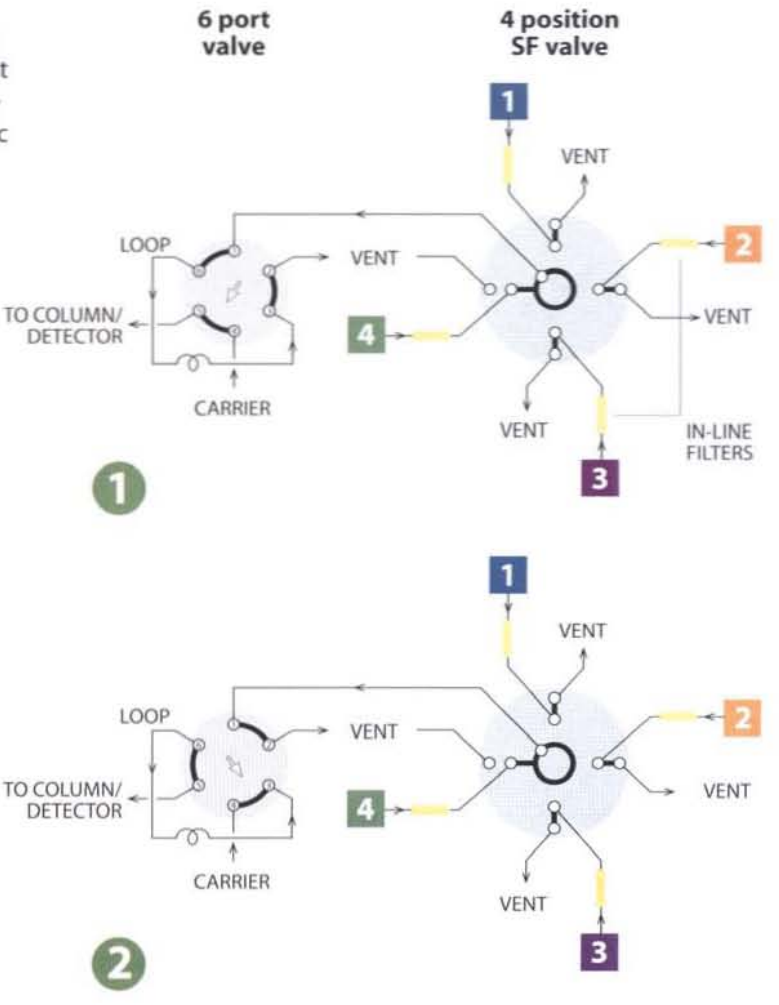
SF Flowpath Configuration – MW

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 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 valve 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 ❶ shows sample loading from stream 4, while mode ❷ shows sample injected onto the analytical column.



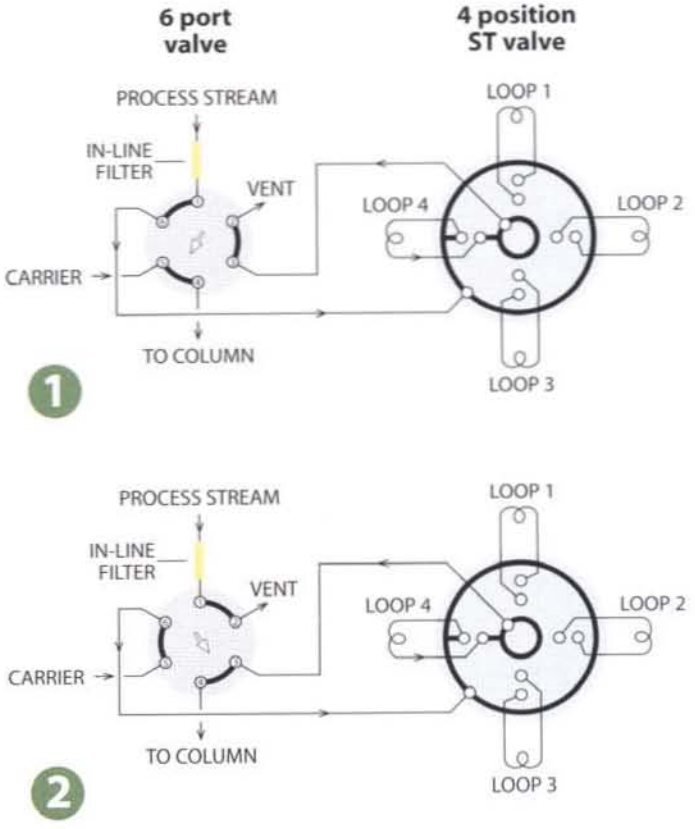
Further reference

ST Flowpath Configuration – MW

ST valves 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 ❶ collection/trapping and ❷ 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 74-79

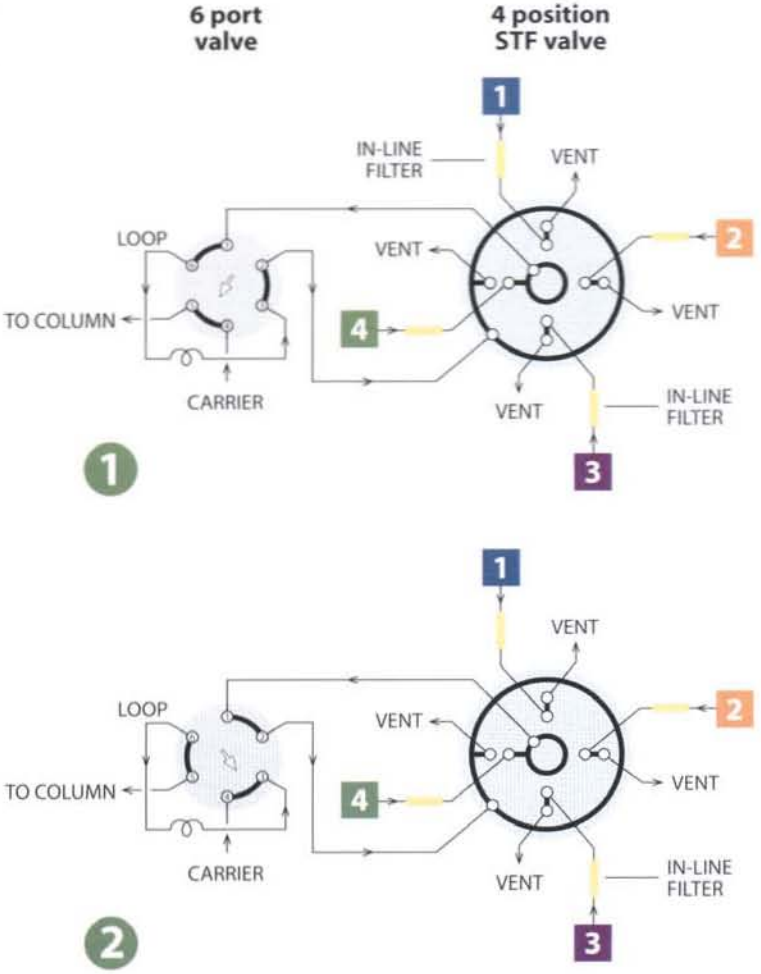
Further reference

ST prices
low pressure 148-149
high pressure 153
Application
High pressure ST 159

STF Flowpath Configuration – MW

The STF valve 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 valve on an air or electric actuator along with a similarly equipped 6 port valve comprise a complete sampling system for the automated analysis of up to 16 sampling points.



TECH TIP

Because the most common cause of valve failure is stray particulates entering the valve, we strongly recommend the use of in-line filters at sample entry points.

Our ZUFR filters feature inexpensive and easily replaceable low pressure drop filter screens (2 or 10 micron). The filters are available in 1/16", 1/8", and 1/4" standard, reducing, and bulkhead versions.

Filters ..... page 77

Further reference

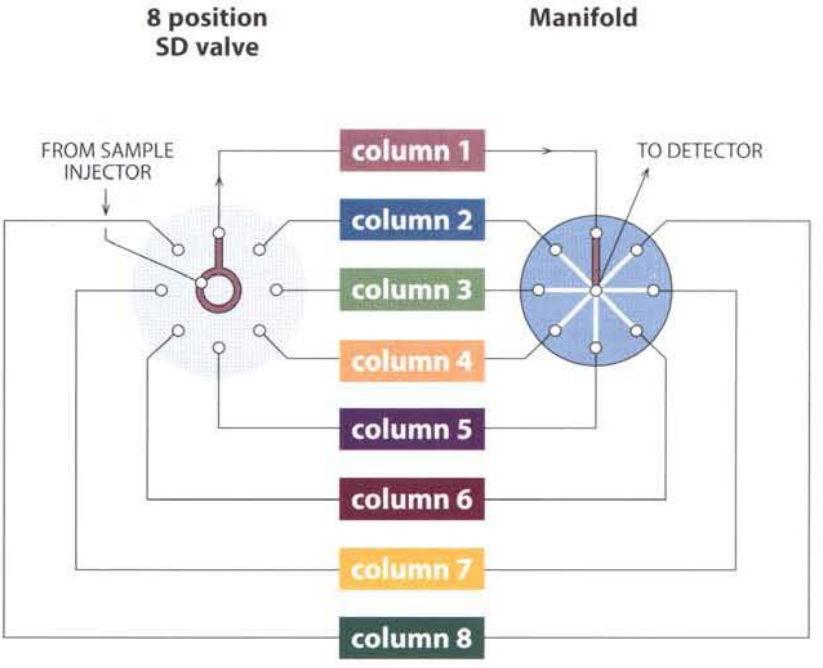
Actuators
Air ..... pages 198, 200
Microelectric 194-195
Standard elec ... 196-197

Cheminert multiposition valves 184-189

STF prices 150-151

SD Flowpath Configuration – UW

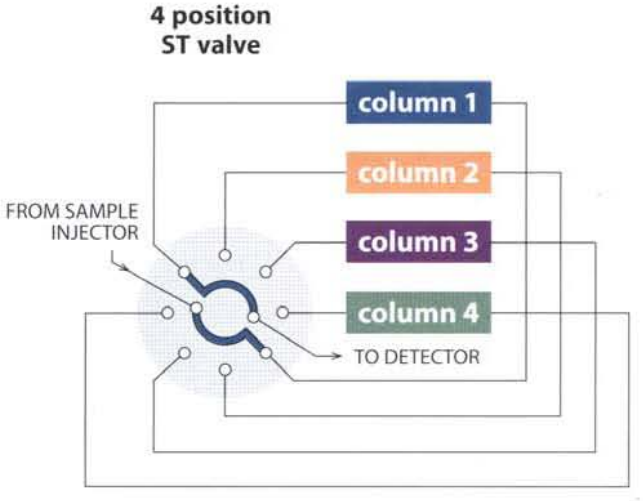
This example illustrates an SD (UW type) valve used for HPLC column selection. This allows multiple columns to be installed permanently in the system, eliminating instrument downtime and leakage potential resulting from having to change columns repeatedly. The SDUW valve selects only column inlets – the column outlets are connected to the detector via a low-volume manifold. The manifold is sold separately.



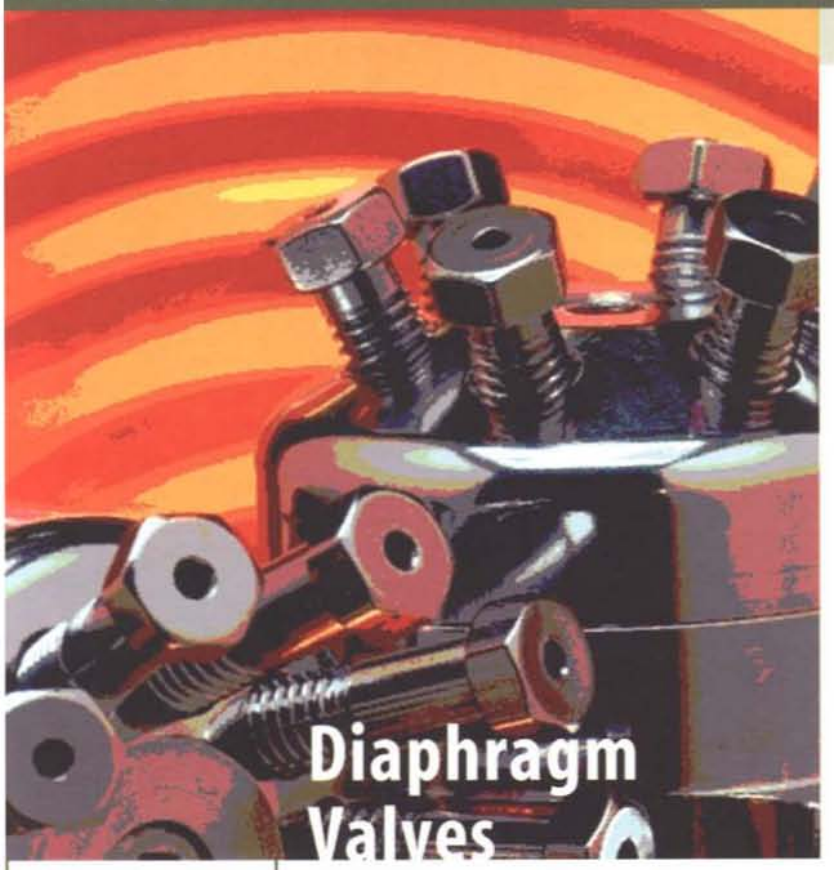
ST Flowpath Configuration – UW

Column Selection with UW Type Valves

Up to 6 HPLC columns can be rapidly accessed by column selection valves, eliminating instrument downtime involved in exchanging columns, and 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.



Further reference

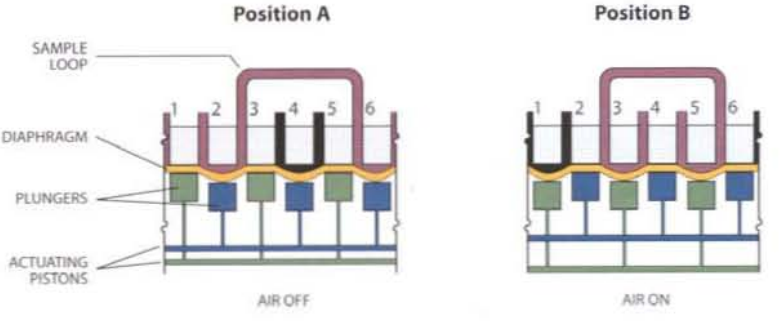


- Only 35 mm (1.375") in diameter
- >1,000,000 cycle lifetime
- Three configurations – 6 port, 10 port, and 4 port internal sample
- Built in actuator
- 1/16" or 1/32" Valco zero dead volume fittings

The VICI mini diaphragm valve has been 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 insure 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 200°C.

Temperature/Pressure Specifications

The standard valve can be operated at temperatures up to 200°C, at 300 psi. The specially-formed diaphragm also permits sampling at subambient pressures.

Materials of Construction

The cap is Nitronic 60 stainless (optional Hastelloy C or Type 316 stainless), with remaining metal parts of 300 series stainless. The diaphragm is formed from a specialized polyimide.

Actuation

Actuator air (50-60 psi) is supplied to a side port with 10-32 female threads, permitting use of a variety of compression or barbed fittings. A 3-way solenoid is required for actuation.

Further reference

Glossary ..... page 242

Materials
Metals 238

Valve descriptions
Cheminert injectors and valves 164
Cheminert multiposition 182
Valco GC and HPLC 116
Valco injectors and valves 116
Valco multiposition 140

Valve prices
Cheminert HPLC . 168-175
Cheminert low pressure 176-179
Cheminert multiposition 184-189
Valco GC 120-129
Valco HPLC 130-134
Valco multiposition 142-153

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 200°C.

Temperature/Pressure Specifications

The standard valve can be operated at temperatures up to 200°C, at 300 psi. The specially-formed diaphragm also permits sampling at subambient pressures.

Materials of Construction

The cap is Nitronic 60 stainless (optional Hastelloy C or Type 316 stainless), with remaining metal parts of 300 series stainless. The diaphragm is formed from a specialized polyimide.

Actuation

Actuator air (50-60 psi) is supplied to a side port with 10-32 female threads, permitting use of a variety of compression or barbed fittings. A 3-way solenoid is required for actuation.

Further reference

Glossary ..... page 242

Materials
Metals 238

Valve descriptions
Cheminert injectors and valves 164
Cheminert multiposition 182
Valco GC and HPLC 116
Valco injectors and valves 116
Valco multiposition 140

Valve prices
Cheminert HPLC . 168-175
Cheminert low pressure 176-179
Cheminert multiposition 184-189
Valco GC 120-129
Valco HPLC 130-134
Valco multiposition 142-153

SPECS

Internal sample:
750 psi liq
50°C max
Sampling/switching:
300 psi liq
200°C max
Nitronic 60 valve body
Polyimide diaphragm

Diaphragm valves, 1/32" fittings, 0.25 mm ports (.010")

Includes stainless steel nuts and ferrules.
A 3-way solenoid is required for actuation. Order separately.

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 liq
200°C max
Nitronic 60 valve body
Polyimide diaphragm

Diaphragm valves, 1/16" fittings, 0.40 mm ports (.016")

Includes stainless steel nuts and ferrules.
A 3-way solenoid is required for actuation. Order separately.

4 port .5 µl internal sample *Prod No*	4 port 1 µl internal sample *Prod No*	6 port sampling/switching *Prod No*	10 port multifunctional *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 liq
200°C max
Nitronic 60 valve body
Polyimide diaphragm

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

Includes stainless steel nuts and ferrules.
A 3-way solenoid is required for actuation. Order separately.

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

6 port
1/16" fittings

Replacement diaphragms *for DV valves*

Description	*Prod No*
Polyimide diaphragm	
for .010" or .016"	DV22-21D
for .030"	DV22-31D
PTFE diaphragm	DV22-22D

1/16" Stainless steel loops *for DV valves*

Each loop includes two stainless steel nuts and ferrules.
Order special fittings separately.
For 1/32" loops, use NW loops *(page 122)*.

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

OPTIONS

- Clamp ring
  Use this ring to attach diaphragm valves to a surface.

Prod No	*Price*
CR4	$10

- Materials:
  Hastelloy C
  Type 316 stainless

For more information, refer to the metals discussion on page 238.

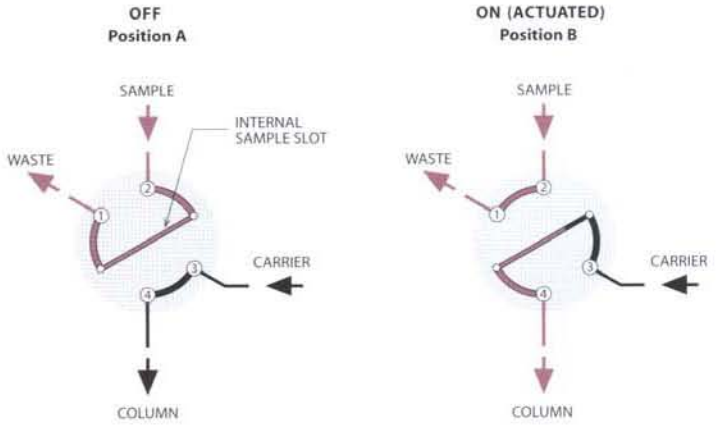
Further reference

More applications ... pp 135-139

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.



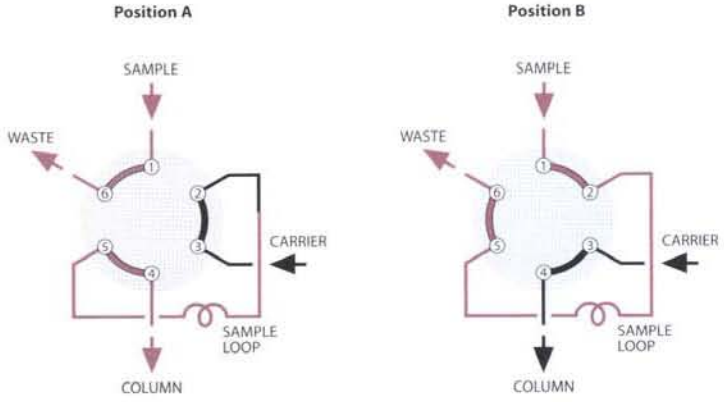
6 PORT SAMPLE INJECTOR

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.

Further reference

More applications ..... pages 136-137



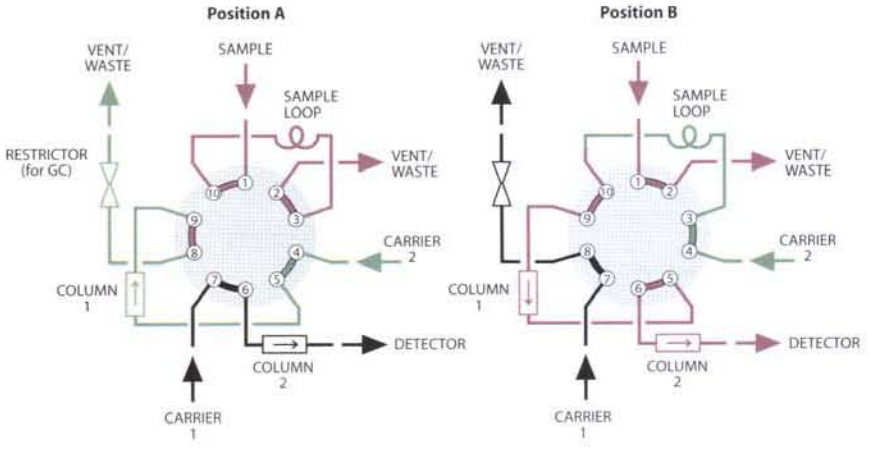
10 PORT SAMPLE INJECTOR

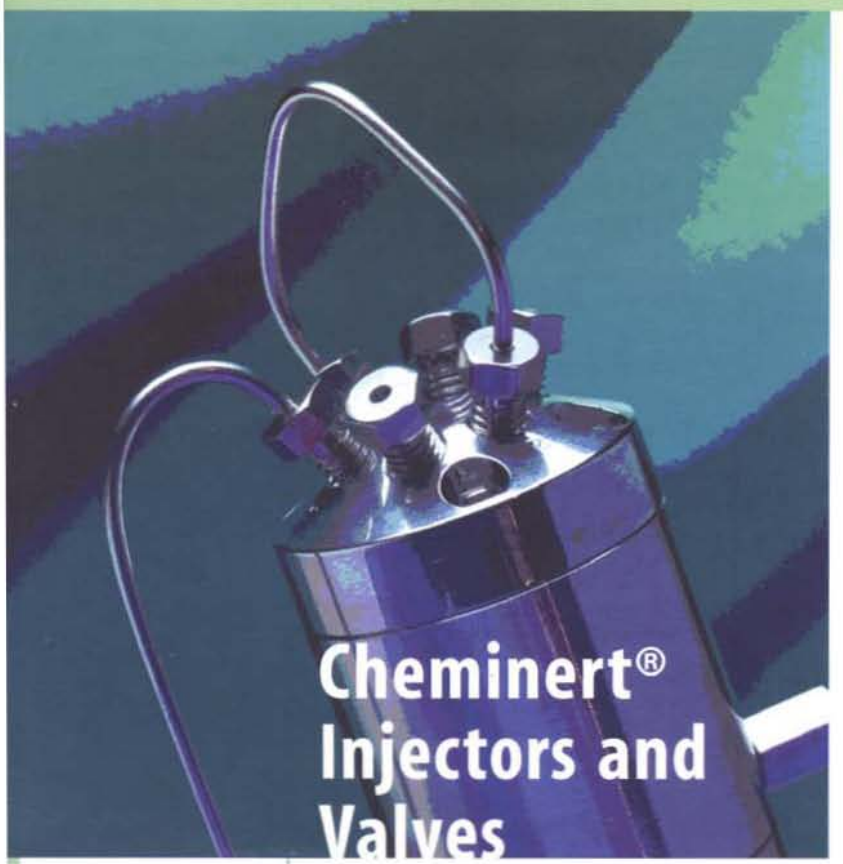
Loop Sampling with Backflush of Pre-Column to Vent

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.

Further reference

More applications ..... pages 138-139





Cheminert® Injectors and Valves

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

The basic Cheminert design involves a flat rotor which is engraved with slots which connect the ports. A stator is held at a constant, preset force against the rotor. When repairs are required, all that is necessary for rotor access is the removal of two or three screws. Remove the old rotor and replace it, put the screws back in and tighten them, and the valve is ready for use at the factory-set pressure specification. No adjustments are possible, much less required. Other advantages of the design include easy panel mounting, low actuating torque, and compact size. The flat plate design offers flow paths for basic flow switching, sample injection, and stream selection up to 10 positions (26 positions in some models).

Two position valve descriptions, product numbers, and prices begin on the next page. For information on **multiposition** valves, refer to pages 182-189.

Materials of Construction

HPLC models have stators of Nitronic 60 stainless steel, PAEK, Hastelloy C, or titanium, all of which are compatible with common HPLC solvents. 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

Two Position Injectors and Switching Valves

The applications sections beginning on page 135 and 180 give an overview of the many functions which can be performed by two position valves. Since the most common method of sample injection utilizes a 6 port valve with an external sample loop, 6 port valves are often referred to as "injectors". However, as the Applications section demonstrates, 6 port valves can do more than inject sample, and 8 and 10 port valves can be sample injectors at the same time they're also used for backflushing or column switching.

One more variation is the 4 port internal sample injector, which is used when the sample size must be smaller than the smallest available loop. The internal sample "loop" is actually an engraved connecting slot on the rotor which is sized to contain a specified amount of sample.

See NANOVOLUME® INJECTORS AND VALVES ..... p. 20-23

Port sizes are 0.10 mm (.004").
Pressure ratings of 5,000, 10,000, and 20,000.

HPLC Sample Injectors and Switching Valves

10,000 psi Microbore

Cheminert's Model C2XH is uniquely suited for applications up to 10,000 psi liquid. The R&D 100 award-winning design incorporates a dynamic sealing system that provides the force necessary to seal up to the maximum pressure limit. Seal force decreases proportionately as system pressure decreases, extending valve lifetime.

Model C2XH
Microbore, page 168

Model C2XH is available in 4, 6, and 10 port versions;
Model C4XH is an internal sample configuration for injection of samples as small as 10 nanoliters.

Microbore and Analytical HPLC

Model C2 valves can be used as injectors or switching valves. Choose from 4, 6, 8, or 10 port versions. (6 port valves include a sample loop).

Model C4 is an equivalent internal volume sample injector, with sample sizes ranging from .01 to .5 µl. C2 and C4 valves are compatible with all VICI actuation options, with position feedback available for manual valves.

Model C2
Microbore, page170
Analytical, page 174

Model C4
Microbore, page 171
Analytical, page 175

R&D 100 AWARD WINNER

The C2XH injector was named one of the 100 premier new products of 1999.

Further reference

Model C1
Microbore, page 172
Analytical, page 173

Model C2V
Microbore, page 172
Analytical, page 173

Model C3
Microbore, page 172
Analytical, page 173

HPLC Sample Injectors and Switching Valves

Microbore and Analytical HPLC, *continued*

Model C1 is a through-the-handle (front-loading) injector designed for direct replacement of existing competitive models. Because the handle is integral to the design, all Model C1 injectors are manual, with position feedback standard.

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

Model 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.

Direct syringe loading with a C1, C3, or C2V injector allows a choice between the partial-filling method, in which the injection volume is determined by a syringe, and full-loop injection, in which the volume is determined by the size of the loop. A sample loop is supplied with the injector.

Semi-Preparative HPLC

Model C2 valves are also available with flow passages optimized for semi-preparative HPLC. Choose from 4, 6, 8, or 10 port versions. (6 port valves include a sample loop). 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.

Further reference

Actuation .. pp 190-205

Applications .. 180-181

Loop fill port kit 67
Position feedback 203
Syringe adapter (fill port) 66
Valco injectors and switching valves 116

Materials
Metals 238
Polymers 239
Valve rotors 240

Cheminert valve prices
HPLC 168-175
Low pressure 176-179
Nanovolume® 20-23
Multiposition 184-189

Sample loop product numbers and prices are on the same page(s) as the valves they fit.

Low Pressure Sample Injectors and Switching Valves

With Valco Zero Dead Volume Fittings

C20Z valves with zero dead volume fittings (10-32 thread) include 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.

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.

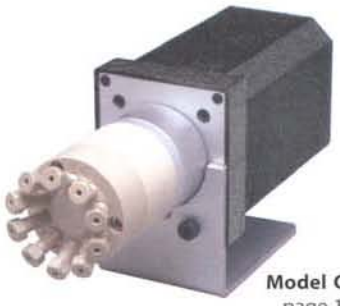
Multicolored Cheminert 1/4-28 flangeless fittings for 1/16" or 1/8" OD tubing (depending on the valve model) are included.

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 0.2, 0.5, or 1 µl sample size.

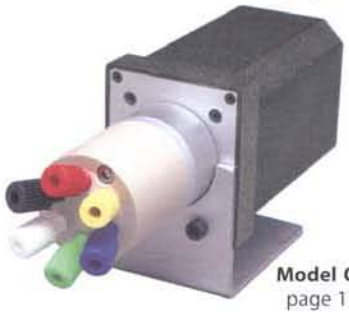
With Cheminert 1/2-20 Fittings

With a bore of .180" (4.6mm) and connections for ¼" OD tubing, the Cheminert **Model C42** is perfect for viscous liquid sampling and switching and for applications where low pressure-drop is essential. The multiposition C45 selector valves have proven to be an excellent product line, so the addition of the two position C42 should make easy work of low pressure, high flow applications.



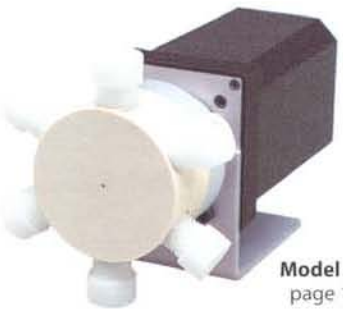
Model C22Z
page 176

Model C24Z
page 178



Model C22
page 177

Model C24
page 178



Model C42
page 179

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.

SPECS

10,000 psi liq
50°C max
Metal stator
Valcon X rotor

OPTIONS

- Hastelloy C stators
- 0.4 mm ports (.016")
- 6,000 psi rating available
- 0.15 mm (0.006") bore

R&D 100 AWARD WINNER

This design was named one of the 100 premier new products of 1999.

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

Model C2XH

Includes inlet filter, stainless steel nuts, and ferrules of the stator material.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 5 µl loop of the stator material.

	 4 Port	 6 Port*	 10 Port
	Prod No	*Prod No*	*Prod No*
N60 stainless stator			
Manual	C2XH-1904	C2XH-1906	C2XH-1900
With microelectric actuator	C2XH-1904EH	C2XH-1906EH	C2XH-1900EH
Replacement valve	C2XH-1904D	C2XH-1906D	C2XH-1900D
Replacement rotor	C2-19R4	C2-19R6	C2-19R0H
Replacement stator	C-1C04	C-1C06	C-1C00H
Replacement inlet filter assy	CEAZ	CEAZ	CEAZ
Replacement filter	CXLF-S2	CXLF-S2	CXLF-S2

Sample loops

for C2XH valves

Each metal loop includes two stainless steel nuts and ferrules.

	Stainless Steel
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

Model C2XH 1/16" ZDV fittings

10,000 psi Submicroliter injector, 1/16" Valco fittings, 0.25 mm ports (.010")

Model C4XH

Includes stainless steel nuts and ferrules.
Standard electric actuator: 110 VAC for USA;
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	**.05 µl**	**.1 µl**
	Prod No	*Prod No*
N60 stainless stator		
Manual	C4XH-1904-.05	C4XH-1904-.1
With microelectric actuator	C4XH-1904-.05EH	C4XH-1904.-1EH
Replacement valve	C4XH-1904-.05D	C4XH-1904-.1D
Replacement rotor	C4-19R-.05	C4-19R-.1
Replacement stator	C4-1C0	C4-1C0
Replacement inlet filter assy	CEAZ	CEAZ
Replacement filter	CXLF-S2	CXLF-S2

Model C4XH 1/16" ZDV fittings

SPECS

10,000 psi liq
50°C max
Metal stator
Valcon X rotor

OPTIONS

- Hastelloy C stators
- .01 and .02 µl sample volumes
- 0.15 mm (0.006") bore

SPECS

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

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

OPTIONS

- Hastelloy C stators
- Loop fill port assembly for injection from front of the valve. *See page 67.*
- 0.15 mm (0.006") bore

Order loops from facing page.

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

Model C2

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 5 µl loop of the stator material.




	4 Port	6 Port*	8 Port	10 Port
	Prod No	*Prod No*	*Prod No*	*Prod No*
N60 stainless stator				
Manual	C2-1004	C2-1006	C2H-1008	C2H-1000
With pneumatic actuator	C2-1004A	C2-1006A	C2H-1008A	C2H-1000A
With standard electric actuator	C2-1004E	C2-1006E	C2H-1008E	C2H-1000E
With microelectric actuator	C2-1004EH	C2-1006EH	C2H-1008EH	C2H-1000EH
Replacement valve	C2-1004D	C2-1006D	C2H-1008D	C2H-1000D
Replacement rotor	C2-10R4	C2-10R6	C2-10R8H	C2-10R0H
Replacement stator	C-1C04	C-1C06	C-1C08H	C-1C00H
PAEK stator				
Manual	C2-1344	C2-1346	C2H-1348	C2H-1340
With pneumatic actuator	C2-1344A	C2-1346A	C2H-1348A	C2H-1340A
With standard electric actuator	C2-1344E	C2-1346E	C2H-1348E	C2H-1340E
With microelectric actuator	C2-1344EH	C2-1346EH	C2H-1348EH	C2H-1340EH
Replacement valve	C2-1344D	C2-1346D	C2H-1348D	C2H-1340D
Replacement rotor	C2-13R4	C2-13R6	C2-13R8H	C2-13R0H
Replacement stator	C-1C44	C-1C46	C-1C48H	C-1C40H
Titanium stator				
Manual	C2-1034	C2-1036	C2H-1038	C2H-1030
With pneumatic actuator	C2-1034A	C2-1036A	C2H-1038A	C2H-1030A
With standard electric actuator	C2-1034E	C2-1036E	C2H-1038E	C2H-1030E
With microelectric actuator	C2-1034EH	C2-1036EH	C2H-1038EH	C2H-1030EH
Replacement valve	C2-1034D	C2-1036D	C2H-1038D	C2H-1030D
Replacement rotor	C2-10R4	C2-10R6	C2-10R8H	C2-10R0H
Replacement stator	C-1C34	C-1C36	C-1C38H	C-1C30H

Model C2
1/16" ZDV fittings

Further reference

Sample loops

for C1, C2, C2V, and C3 valves

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

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

ABOUT LOOPS

- Other materials available in many sizes: Electroformed Nickel, Hastelloy C, Nickel 200, and PTFE *(see page 238)*.
- Metal oops > 2 ml are made from 1/8" OD tubing with brazed or welded 1/16" tube ends or reducing unions.

Model C4
1/16" ZDV
fittings

Microbore internal sample injector, 1/16" Valco fittings, 0.15 mm ports (.006")

Model C4

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

Sample volume	0.01 µl	0.02 µl	0.05 µl
	Prod No	*Prod No*	*Prod No*
N60 stainless stator			
Manual	C4-0004-.01	C4-0004-.02	C4-0004-.05
With pneumatic actuator	C4-0004-.01A	C4-0004-.02A	C4-0004-.05A
With standard electric actuator	C4-0004-.01E	C4-0004-.02E	C4-0004-.05E
With microelectric actuator	C4-0004-.01EH	C4-0004-.02EH	C4-0004-.05EH
Replacement valve	C4-0004-.01D	C4-0004-.02D	C4-0004-.05D
Replacement rotor	C4-00R-.01	C4-00R-.02	C4-00R-.05
Replacement stator	C4-0C0	C4-0C0	C4-0C0
PAEK stator			
Manual	C4-0344-.01	C4-0344-.02	C4-0344-.05
With pneumatic actuator	C4-0344-.01A	C4-0344-.02A	C4-0344-.05A
With standard electric actuator	C4-0344-.01E	C4-0344-.02E	C4-0344-.05E
With microelectric actuator	C4-0344-.01EH	C4-0344-.02EH	C4-0344-.05EH
Replacement valve	C4-0344-.01D	C4-0344-.02D	C4-0344-.05D
Replacement rotor	C4-03R-.01	C4-03R-.02	C4-03R-.05
Replacement stator	C4-0C4	C4-0C4	C4-0C4

SPECS

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

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

OPTIONS

- .1 µl sample volumes are also available.
- Loop fill port assembly for injection from front of the valve. *See page 67.*

Further reference

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 stator available

Order sample loops from page 171.

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.
Includes one 5 µl loop of the stator material. Includes syringe fill port for 22 gauge 3/4" and 2" needle.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C3-1006	C3-1346
With pneumatic actuator	C3-1006A	C3-1346A
With standard electric actuator	C3-1006E	C3-1346E
With microelectric actuator	C3-1006EH	C3-1346EH
Replacement valve	C3-1006D	C3-1346D
Replacement rotor	C2-10R6	C2-13R6
Replacement stator	C3-1C06	C3-1C46

Model 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

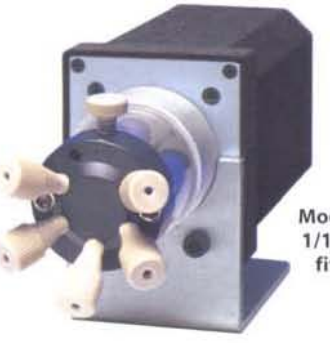
OPTIONS

- Titanium stator available

Order sample loops from page 171.

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

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C2V-1006	C2V-1346
With pneumatic actuator	C2V-1006A	C2V-1346A
With standard electric actuator	C2V-1006E	C2V-1346E
With microelectric actuator	C2V-1006EH	C2V-1346EH
Replacement valve	C2V-1006DK	C2V-1346DK
Replacement rotor	C2-10R6	C2-13R6
Replacement stator	C2V-1C06	C2V-1C46



Model C2V 1/16" ZDV fittings

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

Model C1

SPECS

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

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

OPTIONS

- Titanium stator available

Order sample loops from page 171.

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

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
6 port injector	C1-1006	C1-1346
Replacement rotor	C1-10R6	C1-13R6
Replacement stator	C-1C06	C-1C46

REPLACEMENT INJECTOR FITTING

Prod No
C-261

Model C1 1/16" ZDV fittings

Analytical centered port injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C3

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.
Includes one 20 µl loop of the stator material. Includes syringe fill port for 22 gauge 3/4" and 2" needle.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C3-2006	C3-2346
With pneumatic actuator	C3-2006A	C3-2346A
With standard electric actuator	C3-2006E	C3-2346E
With microelectric actuator	C3-2006EH	C3-2346EH
Replacement valve	C3-2006D	C3-2346D
Replacement rotor	C2-20R6	C2-23R6
Replacement stator	C3-2C06	C3-2C46

Model C3 1/16" ZDV fittings

SPECS

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

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

OPTIONS

- Titanium stator available

Order sample loops from page 171.

Analytical vertical port injector, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C2V

Includes stainless steel nuts and ferrules. Valves with PAEK stators have PEEK nuts and ferrules.
Includes one 20 µl loop of the stator material.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual	C2V-2006	C2V-2346
With pneumatic actuator	C2V-2006A	C2V-2346A
With standard electric actuator	C2V-2006E	C2V-2346E
With microelectric actuator	C2V-2006EH	C2V-2346EH
Replacement valve	C2V-2006DK	C2V-2346DK
Replacement rotor	C2-20R6	C2-23R6
Replacement stator	C2V-2C06	C2V-2C46

Model C2V 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

- Titanium stator available

Order sample loops from page 171.

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

Model C1

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

	N60 stainless stator *Prod No*	PAEK stator *Prod No*
Manual valve	C1-2006	C1-2346
Replacement rotor	C1-20R6	C1-23R6
Replacement stator	C-2C06	C-2C46

REPLACEMENT INJECTOR FITTING

Prod No	*Price*
C-261	$35

Model C1 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

- Titanium stator available

Order sample loops from page 171.

SPECS

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

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

OPTIONS

- 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 67.*

Order loops from page 171.

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.

Analytical valves, 1/16" Valco fittings, 0.40 mm ports (.016")

Model C2

Includes stainless steel nuts and ferrules of the stator material. Valves with PAEK stators have PEEK nuts and ferrules.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
* The 6 port valve includes a 20 µl loop of the stator material.




	4 Port		6 Port*	8 Port	10 Port
	Prod No	*Price*	*Prod No*	*Prod No*	*Prod No*
N60 stainless stator					
Manual	C2-2004	$350	C2-2006	C2H-2008	C2H-2000
With pneumatic actuator	C2-2004A	585	C2-2006A	C2H-2008A	C2H-2000A
With standard electric actuator	C2-2004E	850	C2-2006E	C2H-2008E	C2H-2000E
With microelectric actuator	C2-2004EH	1010	C2-2006EH	C2H-2008EH	C2H-2000EH
Replacement valve	C2-2004D	350	C2-2006D	C2H-2008D	C2H-2000D
Replacement rotor	C2-20R4	65	C2-20R6	C2-20R8H	C2-20R0H
Replacement stator	C-2C04	200	C-2C06	C-2C08H	C-2C00H
PAEK stator					
Manual	C2-2344	450	C2-2346	C2H-2348	C2H-2340
With pneumatic actuator	C2-2344A	685	C2-2346A	C2H-2348A	C2H-2340A
With standard electric actuator	C2-2344E		C2-2346E	C2H-2348E	C2H-2340E
With microelectric actuator	C2-2344EH		C2-2346EH	C2H-2348EH	C2H-2340EH
Replacement valve	C2-2344D		C2-2346D	C2H-2348D	C2H-2340D
Replacement rotor	C2-23R4		C2-23R6	C2-23R8H	C2-23R0H
Replacement stator	C-2C44		C-2C46	C-2C48H	C-2C40H
Titanium stator					
Manual	C2-2034		C2-2036	C2H-2038	C2H -2030
With pneumatic actuator	C2-2034A		C2-2036A	C2H-2038A	C2H-2030A
With standard electric actuator	C2-2034E		C2-2036E	C2H-2038E	C2H-2030E
With microelectric actuator	C2-2034EH		C2-2036EH	C2H-2038EH	C2H-2030EH
Replacement valve	C2-2034D		C2-2036D	C2H-2038D	C2H-2030D
Replacement rotor	C2-20R4		C2-20R6	C2-20R8H	C2-20R0H
Replacement stator	C-2C34		C-2C36	C-2C38H	C-2C30H

Model C2 1/16" ZDV fittings

AUTOSAMPLER REPLACEMENT VALVES

The Cheminert Model C2 6 port valve is an excellent replacement for the valve originally supplied in many autosamplers, including autosamplers manufactured by Beckman, Gilson, Spark-Holland, SpectraPhysics, Thermo Separations, and Varian.

Call technical support to determine which replacement is best for your application.

Further reference

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

Model C4

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

Sample volume	0.1 µl	0.2 µl	0.5 µl
	Prod No	*Prod No*	*Prod No*
N60 stainless stator			
Manual	C4-1004-.1	C4-1004-.2	C4-1004-.5
With pneumatic actuator	C4-1004-.1A	C4-1004-.2A	C4-1004-.5A
With standard electric actuator	C4-1004-.1E	C4-1004-.2E	C4-1004-.5E
With microelectric actuator	C4-1004-.1EH	C4-1004-.2EH	C4-1004-.5EH
Replacement valve	C4-1004-.1D	C4-1004-.2D	C4-1004-.5D
Replacement rotor	C4-10R-.1	C4-10R-.2	C4-10R-.5
Replacement stator	C4-1C0	C4-1C0	C4-1C0
PAEK stator			
Manual	C4-1344-.1	C4-1344-.2	C4-1344-.5
With pneumatic actuator	C4-1344-.1A	C4-1344-.2A	C4-1344-.5A
With standard electric actuator	C4-1344-.1E	C4-1344-.2E	C4-1344-.5E
With microelectric actuator	C4-1344-.1EH	C4-1344-.2EH	C4-1344-.5EH
Replacement valve	C4-1344-.1D	C4-1344-.2D	C4-1344-.5D
Replacement rotor	C4-13R-.1	C4-13R-.2	C4-13R-.5
Replacement stator	C4-1C4	C4-1C4	C4-1C4
Titanium stator			
Manual	C4-1034-.1	C4-1034-.2	C4-1034-.5
With pneumatic actuator	C4-1034-.1A	C4-1034-.2A	C4-1034-.5A
With standard electric actuator	C4-1034-.1E	C4-1034-.2E	C4-1034-.5E
With microelectric actuator	C4-1034-.1EH	C4-1034-.2EH	C4-1034-.5EH
Replacement valve	C4-1034-.1D	C4-1034-.2D	C4-1034-.5D
Replacement rotor	C4-10R-.1	C4-10R-.2	C4-10R-.5
Replacement stator	C4-1C3	C4-1C3	C4-1C3

SPECS

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

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

OPTIONS

- .05 µl sample volumes are also available.
- Loop fill port assembly for injection from front of the valve. *See page 67.*

Model C4
1/16" ZDV
fittings

Further reference

SPECS

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

OPTIONS

- Purge option
- Other polymeric rotors and stators are available.

  Consult the factory for prices and information.

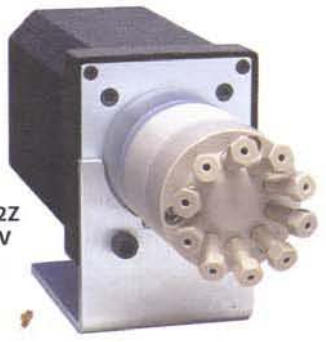
Valves with 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Model C22Z

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




	4 Port	6 Port	8 Port	10 Port
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C22Z-3184	C22Z-3186	C22Z-3188	C22Z-3180
With pneumatic actuator	C22Z-3184A	C22Z-3186A	C22Z-3188A	C22Z-3180A
With standard electric actuator	C22Z-3184E	C22Z-3186E	C22Z-3188E	C22Z-3180E
With microelectric actuator	C22Z-3184EH	C22Z-3186EH	C22Z-3188EH	C22Z-3180EH
Replacement valve	C22Z-3184D	C22Z-3186D	C22Z-3188D	C22Z-3180D
Replacement rotor	C12-314	C12-316	C12-318	C12-310
Replacement stator	C22Z-384	C22Z-386	C22Z-388	C22Z-380



Model C22Z 1/16" ZDV fittings

TECH TIP

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 that could damage the metal parts of the valve.

Consult our technical staff for details.

Further reference

Sample loops

for Model C22Z

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.

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

Valves with 1/4-28 fitting details for 1/16" tubing, 0.75 mm ports (.030") *Model C22*

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/16" tubing.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
Sample loops are not included with valves. Order separately.




	4 Port	6 Port	8 Port	10 Port
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C22-3184	C22-3186	C22-3188	C22-3180
With pneumatic actuator	C22-3184A	C22-3186A	C22-3188A	C22-3180A
With standard electric actuator	C22-3184E	C22-3186E	C22-3188E	C22-3180E
With microelectric actuator	C22-3184EH	C22-3186EH	C22-3188EH	C22-3180EH
Replacement valve	C22-3184D	C22-3186D	C22-3188D	C22-3180D
Replacement rotor	C22-314	C22-316	C22-318	C22-310
Replacement stator	C22-384	C22-386	C22-388	C22-380

SPECS

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

Valves with 1/4-28 fitting details for 1/8" tubing, 1.50 mm ports (.060") *Model C22*

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/8" tubing.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.
Sample loops are not included with valves. Order separately.

	4 Port	6 Port	8 Port	10 Port
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C22-6184	C22-6186	C22-6188	C22-6180
With pneumatic actuator	C22-6184A	C22-6186A	C22-6188A	C22-6180A
With standard electric actuator	C22-6184E	C22-6186E	C22-6188E	C22-6180E
With microelectric actuator	C22-6184EH	C22-6186EH	C22-6188EH	C22-6180EH
Replacement valve	C22-6184D	C22-6186D	C22-6188D	C22-6180D
Replacement rotor	C22-614	C22-616	C22-618	C22-610
Replacement stator	C22-684	C22-686	C22-688	C22-680

SPECS

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

Sample loops *for Model C22*

Loops include flangeless fittings with natural color nuts. Loops less than 500 µl are made from 1/16" OD tubing; loops 500 µl or greater are made from 1/8" OD tubing.

	FEP	PTFE	PEEK
Volume	*Prod No*	*Prod No*	*Prod No*
20 µl	CFSL20FEP	CFSL20TF	CFSL20PK
50 µl	CFSL50FEP	CFSL50TF	CFSL50PK
100 µl	CFSL100FEP	CFSL100TF	CFSL100PK
250 µl	CFSL250FEP	CFSL250TF	CFSL250PK
500 µl	CFSL500FEP	CFSL500TF	CFSL500PK
1 ml	CFSL1KFEP	CFSL1KTF	CFSL1KPK
2 ml	CFSL2KFEP	CFSL2KTF	CFSL2KPK

Model C22
1/4-28 fittings

Further reference

Internal sample injectors, 1/16" Valco ZDV fittings, 0.40 mm ports (.016") *Model C24Z*

SPECS

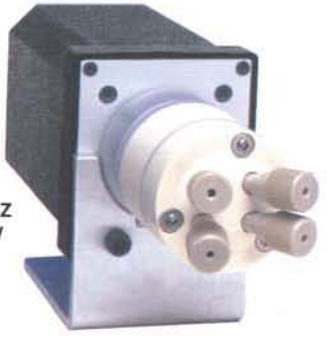
100 psi gas/ 250 psi liq
75°C max
PPS stator
Valcon E2 rotor

OPTIONS

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

Includes Valco ZDV PEEK nuts and ferrules.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	0.2 µl	0.5 µl	1 µl
	Prod No	*Prod No*	*Prod No*
Manual	C24Z-2184-.2	C24Z-2184-.5	C24Z-2184-1
With pneumatic actuator	C24Z-2184-.2A	C24Z-2184-.5A	C24Z-2184-1A
With standard electric actuator	C24Z-2184-.2E	C24Z-2184-.5E	C24Z-2184-1E
With microelectric actuator	C24Z-2184-.2EH	C24Z-2184-.5EH	C24Z-2184-1EH
Replacement valve	C24Z-2184-.2D	C24Z-2184-.5D	C24Z-2184-1D
Replacement rotor	C24-10R-.2	C24-10R-.5	C24-10R-1
Replacement stator	C24Z-1C8	C24Z-1C8	C24Z-1C8



Model C24Z 1/16" ZDV fittings

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.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

Sample volume	0.5 µl	1 µl	2 µl
	Prod No	*Prod No*	*Prod No*
Manual	C24-2184-.5	C24-2184-1	C24-2184-2
With pneumatic actuator	C24-2184-.5A	C24-2184-1A	C24-2184-2A
With standard electric actuator	C24-2184-.5E	C24-2184-1E	C24-2184-2E
With microelectric actuator	C24-2184-.5EH	C24-2184-1EH	C24-2184-2EH
Replacement valve	C24-2184-.5D	C24-2184-1D	C24-2184-2D
Replacement rotor	C24-10R-.5	C24-10R-1	C24-10R-2
Replacement stator	C24-1C8	C24-1C8	C24-1C8

Model C24 1/4-28 fittings

TECH TIP

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 that could damage the metal parts of the valve. Consult our technical staff for details.

NEW

Valves with 1/2-20 fittings for 1/4" tubing, 4.6 mm ports (.180")

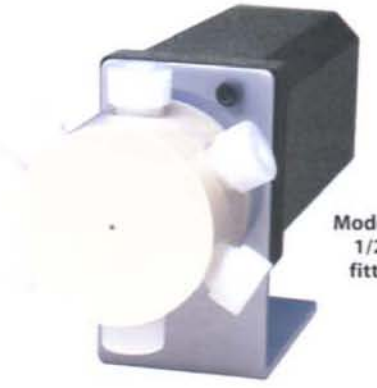
Model C42

Manual and microelectric versions not available.
Includes Cheminert 1/2-20 flangeless fittings for 1/4" tubing. (Delrin nuts and CTFE bushings.)
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.

SPECS

50 psi liq
50°C max
PPS stator/body
Valcon TF rotor

	4 Port *Prod No*	6 Port *Prod No*
With pneumatic actuator	C42-9784A	C42-9786A
With standard electric actuator	C42-9784E	C42-9786E
Replacement valve	C42-9784D	C42-9786D
Replacement rotor	C42-97R4	C42-97R6



Model C42 1/2-20 fittings

Fittings for C42 valves

For additional 1/2-20 fittings and adapters, see page 66.

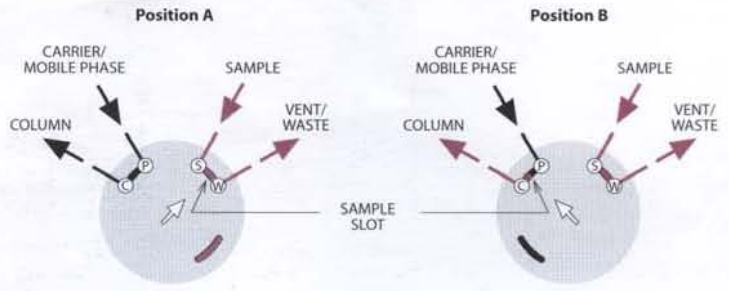
	Prod No
Delrin nut	CFL-4D
CTFE nut	CFL-4KF
PPS nut	CFL-4PPS
CTFE bushing	CFL-CB4KF-S

Further reference

Applications

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.

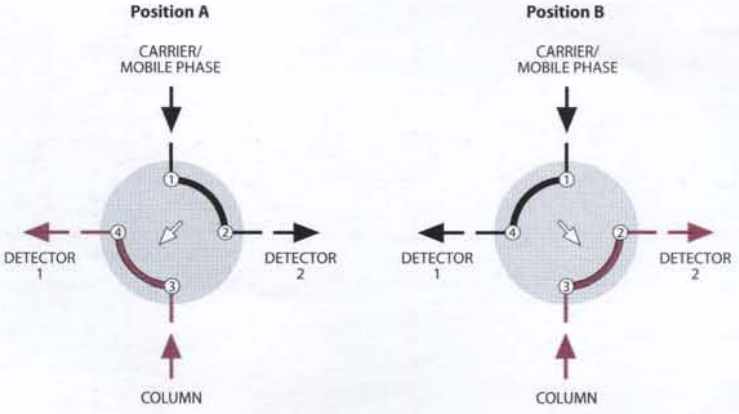
The unique advantage of 8 and 10 port valves is that they reduce extra column volume by combining sampling and switching functions in a single valve. This minimizes expense, maintenance, service, and risk of leaks as compared to multiple 6 port valve systems.



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 analysis 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.

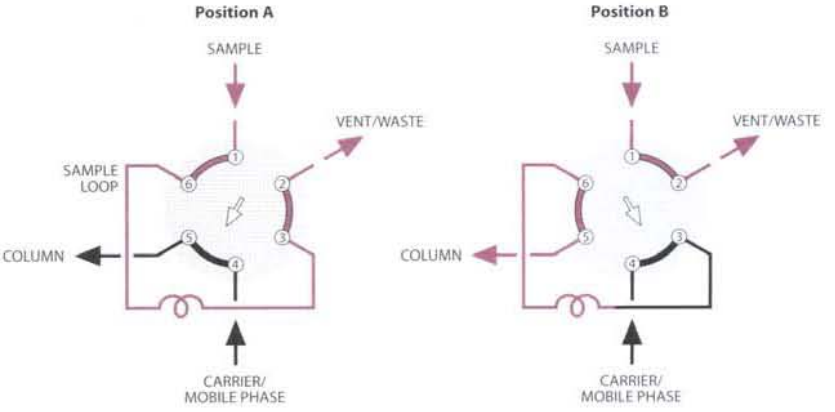
6 PORT EXTERNAL SAMPLE INJECTOR

Sample Injection

With the valve in Position A, sample flows through the external loop while the mobile phase flows directly through to the 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.

Further reference

More applications ..... pages 136-137



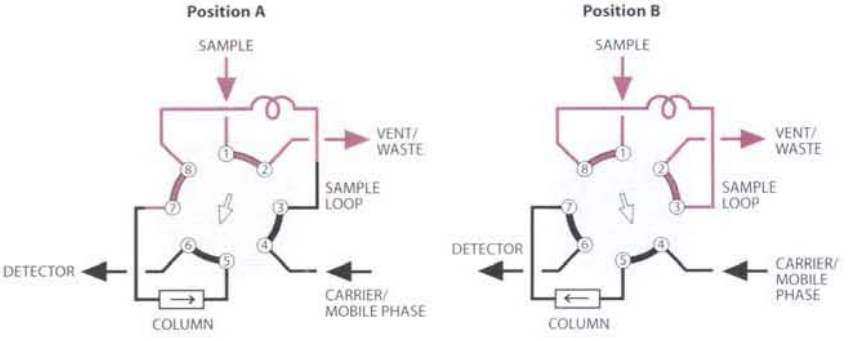
8 PORT SAMPLING/SWITCHING

Loop Sampling with Backflush to Detector

One valve functions as sampling and 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.

Further reference

More applications ..... page 137



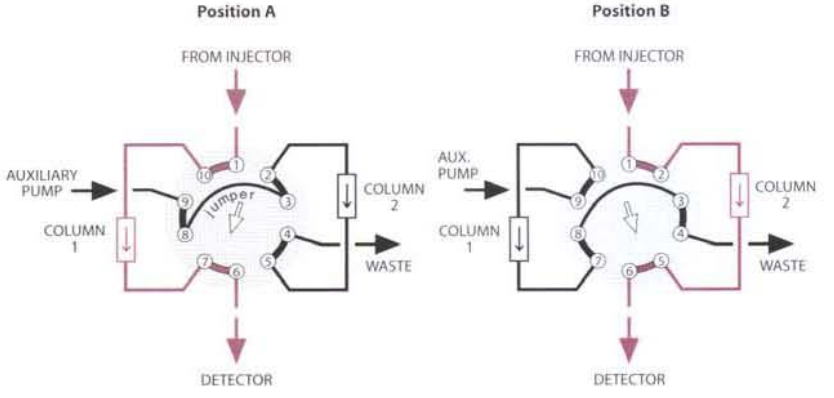
10 PORT SAMPLING/SWITCHING

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 by use of an auxiliary pump. Once the first analysis is complete, the valve is switched and the regenerated column is now ready for analytical use.

Further reference

More applications ..... pages 138-139



Cheminert Multiposition Valves

Multiposition valves move in continuous revolutions by incremental steps, unlike the back and forth switching of two position valves. Each step selects one of 4 to 26 streams, directing it through the valve outlet to a sample valve, pressure sensor, detector, column, etc. The same valve can also direct one stream to a number of outlets for fraction collection.

Model C5
page 184

In the standard models, the non-selected streams are dead-ended. However, some valves can be ordered with an optional rotor that returns each stream to its source. Consult the factory for more information.

High Pressure Multiposition Valves

The **Model C5**, with Valco ZDV fitting details, is available with 4, 6, 8, or 10 positions. Stators are available in Nitronic 60 stainless, titanium, and Hastelloy C-22, with rotors of Valcon H, all of which are compatible with common HPLC solvents. PAEK stators are used in combination with Valcon E rotors.

The C5 valve is the backbone of the Cheminert **HPLC column selector system**, which includes two stream selection valves mounted on a single microelectric actuator. Columns not included.

HPLC column selector system
page 185

Further reference

Sample loop product numbers and prices are on the same page(s) as the valves they fit.

SPECIFICATIONS

CHEMINERT MULTIPOSITION VALVES

Model	Stator material	Std rotor material	Max pressure	Max temp	Number of positions
High Pressure					
C5	Metal	Valcon H	5000 psi liq	75°C	4, 6, 8, 10
	PAEK	Valcon E	5000 psi liq	50°C	4, 6, 8, 10
Low Pressure					
C25Z	PPS	Valcon E2	100 psi gas/ 250 psi liq	75°C	4, 6, 8, 10, 14
C25	PPS	Valcon E2	100 psi gas/ 250 psi liq	75°C	4, 6, 8, 10
C35Z	PPS	Valcon E2	100 psi liq	50°C	20, 24, 26
C45	PPS	Valcon TF	100 psi liq	50°C	4, 6

Low Pressure Multiposition Valves

With Valco Zero Dead Volume Fittings

Model C25Z valves have Valco ZDV fitting details, and are available in 4, 6, 8, 10, and 14 position models.

Model C35Z valves have 1/16" Valco ZDV details, and are available in 20, 24, and 26 position models. This is a tapered rotor valve limited to 100 psi liquid. Rotors are made from Valcon E2, with valve body made from PPS.

Model C25Z
page 186

With Cheminert 1/4-28 Fittings

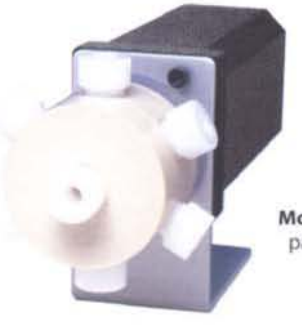
The **Model C25** has female 1/4-28 threaded fitting details for direct connection of lines – no couplings are required. The C25 is available in 4, 6, 8, and 10 position models. Multicolored Cheminert 1/16" or 1/8" flangeless fittings are included. Order other fittings separately as required. Rotors are made of Valcon E2, a proprietary reinforced PTFE composite, with stators of PPS.

Model C35Z
page 188

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 TF, with valve body made from PPS.

Model C25
page 187



Model C45
page 189

PORT DIAMETERS

Model	Fitting size	Standard port diameter
High Pressure		
C5	1/16" ZDV	0.25 mm (.010") 0.40 mm (.016") 0.75 mm (.030")
Low Pressure		
C25Z	1/16" ZDV	0.75 mm (.030")
C25	1/4-28 for 1/16" tubing	0.75 mm (.030")
	1/4-28 for 1/8" tubing	1.50 mm (.060")
C35Z	1/16" ZDV	0.75 mm (.030")
C45	1/2-20 for 1/4" tubing	4.6 mm (.180")

TECH TIP

Caution:

Metal fittings will damage the threads and details of C25Z and C35Z series valves.

Use of metal fittings in these valves voids the warranty.

SPECS

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

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

OPTIONS

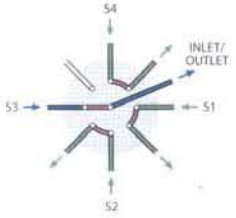
- 2", 3", 4", and 6" standoffs
- Hastelloy C
- Optional 0.15 mm (.006") and 0.25 mm (.010") bores available
- Optional 0.75 mm (.030") bore for Prep HPLC available

OPTIONAL FLOWPATH

Model C5 valves select and isolate one of 4 to 10 streams, with the remainder dead-ended.

Model C5F, the flow-through version, is similar to the C5 but its non-selected streams continue flowing through individual outlets. 3, 4, and 5 positions are available.

Consult the factory for C5F prices and information.

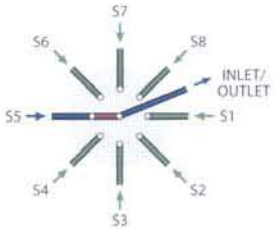


Model C5F schematic diagram

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

Model C5

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



	4 Position *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 pneumatic actuator	C5-2004A	C5-2006A	C5H-2008A	C5H-2000A
With standard electric actuator	C5-2004E	C5-2006E	C5H-2008E	C5H-2000E
With microelectric actuator	C5-2004EMH	C5-2006EMH	C5H-2008EMT	C5H-2000EMT
Replacement valve	C5-2004D	C5-2006D	C5H-2008D	C5H-2000D
Replacement rotor	C5-20R4	C5-20R6	C5-20R8H	C5-20R0H
Replacement stator	C5-2C04	C5-2C06	C5-2C08H	C5-2C00H
PAEK stator				
Manual	C5-2344	C5-2346	C5H-2348	C5H-2340
With pneumatic actuator	C5-2344A	C5-2346A	C5H-2348A	C5H-2340A
With standard electric actuator	C5-2344E	C5-2346E	C5H-2348E	C5H-2340E
With microelectric actuator	C5-2344EMH	C5-2346EMH	C5H-2348EMT	C5H-2340EMT
Replacement valve	C5-2344D	C5-2346D	C5H-2348D	C5H-2340D
Replacement rotor	C5-23R4	C5-23R6	C5-23R8H	C5-23R0H
Replacement stator	C5-2C44	C5-2C46	C5-2C48H	C5-2C40H
Titanium stator				
Manual	C5-2034	C5-2036	C5H-2038	C5H-2030
With pneumatic actuator	C5-2034A	C5-2036A	C5H-2038A	C5H-2030A
With standard electric actuator	C5-2034E	C5-2036E	C5H-2038E	C5H-2030E
With microelectric actuator	C5-2034EMH	C5-2036EMH	C5H-2038EMT	C5H-2030EMT
Replacement valve	C5-2034D	C5-2036D	C5H-2038D	C5H-2030D
Replacement rotor	C5-20R4	C5-20R6	C5-20R8H	C5-20R0H
Replacement stator	C5-2C34	C5-2C36	C5-2C38H	C5-2C30H

Model C5 6 positions 1/16" ZDV fittings

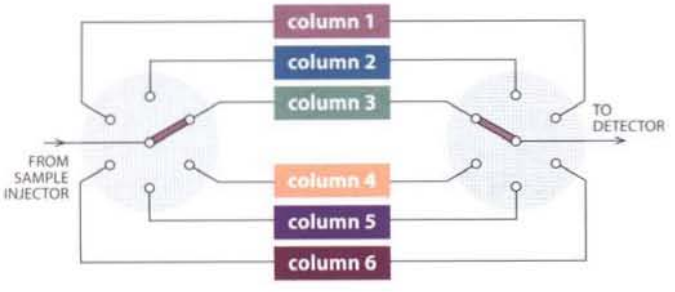
HPLC column selector system with 1/16" Valco ZDV fittings, 0.40 mm ports

Model C5

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

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

	6 Column	8 Column	10 Column
	Prod No	*Prod No*	*Prod No*
N60 stainless stator			
System	C5-2006EMHD	C5H-2008EMTD	C5H-2000EMTD
Replacement valve	C5-2006D	C5H-2008D	C5H-2000D
Replacement rotor	C5-20R6	C5-20R8H	C5-20R0H
Replacement stator	C5-2C06	C5-2C08H	C5-2C00H
PAEK stator			
System	C5-2346EMHD	C5H-2348EMTD	C5H-2340EMTD
Replacement valve	C5-2346D	C5H-2348D	C5H-2340D
Replacement rotor	C5-23R6	C5-23R8H	C5-23R0H
Replacement stator	C5-2C46	C5-2C48H	C5-2C40H



RS-232 interface cable

Prod No
I-22697

Model C5 system
Columns not included

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
- Optional 0.25 mm (.010") bore available
- Optional 0.75 mm (.030") bore for Prep HPLC available

Further reference

SPECS

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

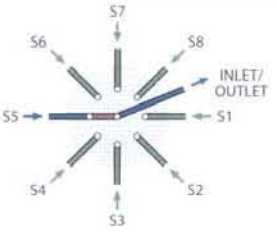
OPTIONS

- C25Z valves: 4 positions are also available.
- 2", 3", 4", and 6" standoffs
- Other polymeric materials are available. Consult the factory.

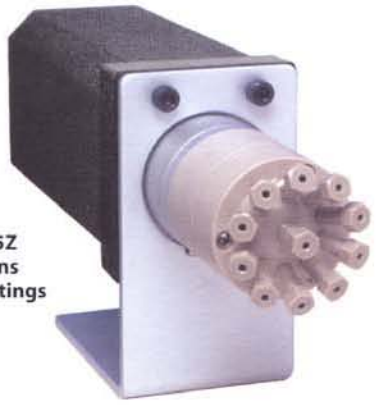
Stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030")

Model C25Z

Includes Valco ZDV PEEK nuts and ferrules.
Standard electric actuator: 110 VAC for USA;
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



	6 Position	8 Position	10 Position	14 Position
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C25Z-3186	C25Z-3188	C25Z-3180	C25Z-31814
With pneumatic act.	C25Z-3186A	C25Z-3188A	C25Z-3180A	C25Z-31814A
With std electric act.	C25Z-3186E	C25Z-3188E	C25Z-3180E	C25Z-31814E
With microelectric act.	C25Z-3186EMH	C25Z-3188EMH	C25Z-3180EMH	C25Z-31814EMH
Replacement valve	C25Z-3186D	C25Z-3188D	C25Z-3180D	C25Z-31814D
Replacement rotor	C15-310	C15-310	C15-310	C15-310
Replacement stator	C25Z-386	C25Z-388	C25Z-380	C25Z-3814

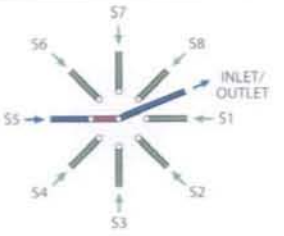


Model C25Z
10 positions
1/16" ZDV fittings

Further reference

Stream selector, 1/4-28 fittings for 1/16" tubing, 0.75 mm ports (.030") *Model C25*

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/16" tubing.
Standard electric actuator: 110 VAC for USA;
110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



	4 Position	6 Position	8 Position	10 Position	
	Prod No	*Prod No*	*Prod No*	*Prod No*	*Price*
Manual	C25-3184	C25-3186	C25-3188	C25-3180	$385
With pneumatic act.	C25-3184A	C25-3186A	C25-3188A	C25-3180A	775
With std electric act.	C25-3184E	C25-3186E	C25-3188E	C25-3180E	1105
With microelec act.	C25-3184EMH	C25-3186EMH	C25-3188EMH	C25-3180EMH	1255
Replacement valve	C25-3184D	C25-3186D	C25-3188D	C25-3180D	385
Replacement rotor	C25-314	C25-316	C25-318	C25-310	55
Replacement stator	C25-384	C25-386	C25-388	C25-380	275

SPECS

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

OPTIONS

- 2", 3", 4", and 6" standoffs

Stream selector, 1/4-28 fittings for 1/8" tubing, 1.50 mm ports (.060") *Model C25*

Includes multicolored Cheminert 1/4-28 flangeless fittings for 1/8" tubing.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.

	4 Position	6 Position	8 Position	10 Position
	Prod No	*Prod No*	*Prod No*	*Prod No*
Manual	C25-6184	C25-6186	C25-6188	C25-6180
With pneumatic act.	C25-6184A	C25-6186A	C25-6188A	C25-6180A
With std electric act.	C25-6184E	C25-6186E	C25-6188E	C25-6180E
With microelec act.	C25-6184EMH	C25-6186EMH	C25-6188EMH	C25-6180EMH
Replacement valve	C25-6184D	C25-6186D	C25-6188D	C25-6180D
Replacement rotor	C25-614	C25-616	C25-618	C25-610
Replacement stator	C25-684	C25-686	C25-688	C25-680

SPECS

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

OPTIONS

- 2", 3", 4", and 6" standoffs

Model C25
10 position
1/4-28 fittings

Further reference

SPECS

100 psi liq
50°C max
PPS stator
Valcon E2 rotor

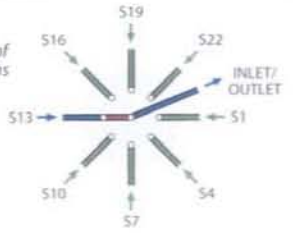
OPTIONS

- Optional bore:
  0.5 mm (.020")
  1.0 mm (.040")
- 2", 3", 4", and 6" standoffs
- Consult the factory for optional materials.

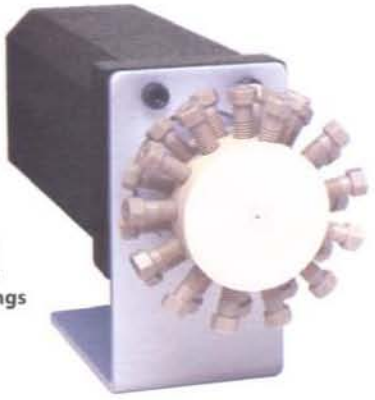
Stream selector, 1/16" Valco ZDV fittings, 0.75 mm ports (.030") *Model C35Z*

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

(For clarity, only eight of the twenty-four streams are illustrated.)



	20 Position	24 Position	26 Position
	Prod No	*Prod No*	*Prod No*
With microelectric actuator	C35Z-31820EMH	C35Z-31824EMH	C35Z-31826EMH
Replacement valve	C35Z-31820D	C35Z-31824D	C35Z-31826D
Replacement rotor	C35Z-31R20	C35Z-31R24	C35Z-31R26



Model C35Z
26 positions
1/16" ZDV fittings

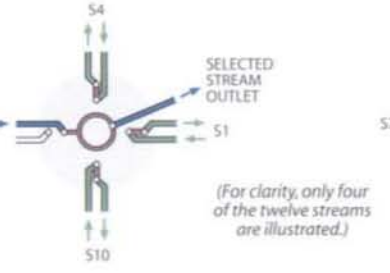
OPTIONAL FLOWPATHS

Model C35Z valves select and isolate one of 20-26 streams, with the remainder dead-ended.

Model C35ZF, the flow-through version, is similar to the C35Z but its non-selected streams continue flowing through individual outlets. 10, 12, and 13 positions are available.

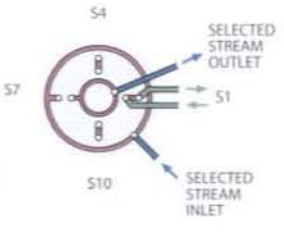
Model C35ZT, the trapping version, is similar to the C35ZF but has a second selected port. Non-selected streams continue flowing. 12 and 14 positions are available.

Call for pricing and information.



(For clarity, only four of the twelve streams are illustrated.)

Model C35ZF schematic



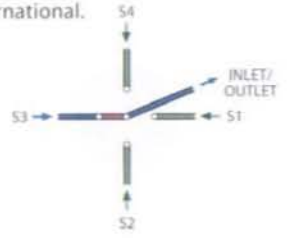
Model C35ZT schematic

Further reference

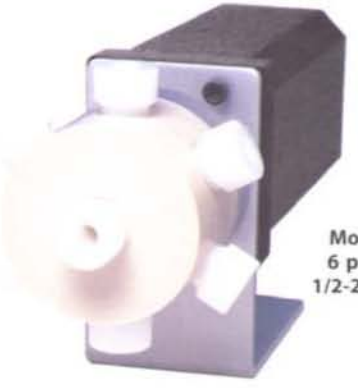
Stream selector, 1/2-20 fittings for 1/4" tubing, 4.6 mm ports (.180")

Model C45

Manual version not available.
Includes Cheminert 1/2-20 flangeless fittings for 1/4" tubing, Delrin nuts and CTFE bushings.
Standard electric actuator: 110 VAC for USA; 110/230 VAC to 24 VDC power supply for international.
Microelectric actuator: 24 VDC, with 110/230 VAC to 24 VDC power supply.



	4 Position	6 Position
	Prod No	*Prod No*
With pneumatic actuator	C45-9784A	C45-9786A
With std electric actuator	C45-9784E	C45-9786E
With microelectric actuator	C45-9784EMT	C45-9786EMT
Replacement valve	C45-9784D	C45-9786D
Replacement rotor	C45-97R4	C45-97R6



Model C45
6 positions
1/2-20 fittings

Fittings for C45 valves

For additional 1/2-20 fittings and adapters, see page 92.

	Prod No
Delrin nut	CFL-4D
CTFE nut	CFL-4KF
PPS nut	CFL-4PPS
CTFE bushing	CFL-CB4KF-S

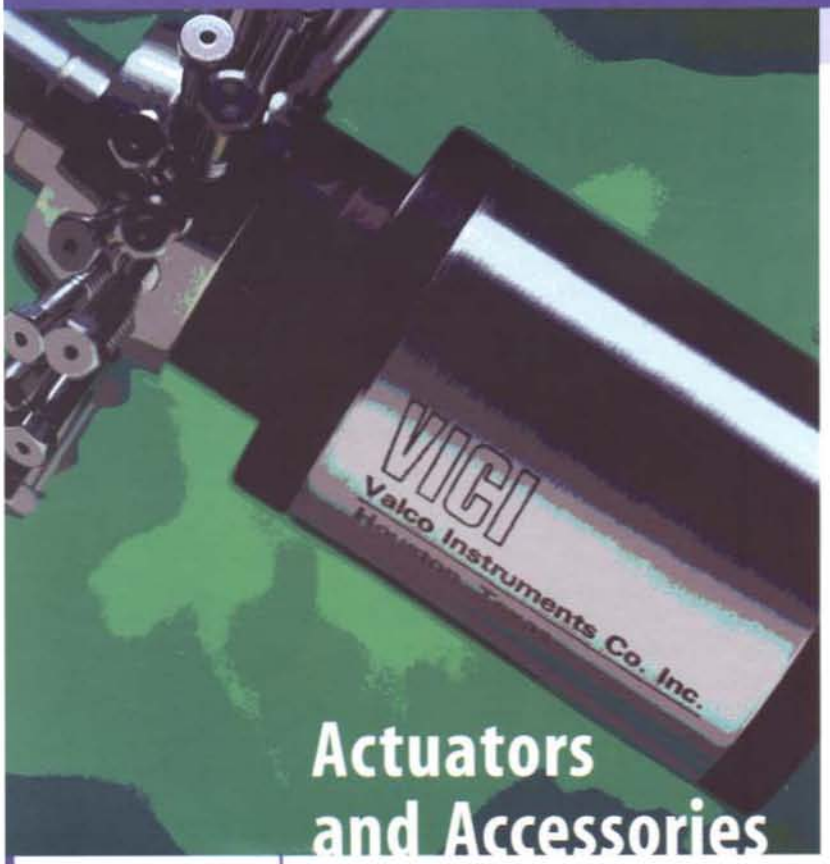
SPECS

100 psi liq
50°C max
PPS stator
Valcon E2 rotor

OPTIONS

- Optional bore: 3.0 mm (.120")
- 2", 3", 4", and 6" standoffs
- Consult the factory for optional materials.

Further reference



Actuators and Accessories

Two position valves switch back and forth between Load and Inject, or Position A and Position B. Multiposition valves 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 multiposition valves, we recommend that multiposition valves be purchased with air or electric actuators. While a manual detent assembly is available, the higher turning torque of our other multiposition valve 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.

Air Actuation

Air actuators are useful in situations where any spark could be disastrous or where there is no electricity available. They are small, relatively inexpensive, very rugged and dependable, and field-serviceable. Low gas consumption and lightweight, compact construction make the air actuator suitable for aerospace flight hardware applications as well as laboratory or process applications.

With the addition of a DVI (digital valve interface) to translate the timed event signals into the necessary air pulses, air actuators can be automatically switched by a data system, integrator, or controller such as our DVSP (digital valve sequence programmer) or SVI (serial valve interface).

Electric Actuation

The **microelectric actuator** features automatic valve alignment, high-speed switching, compact size, 24 VDC power input, and reversible direction (in the multiposition model).

If lower cost outranks those factors in your consideration, our **standard electric actuator** (110/230 VAC) offers a dependable, economical solution.

Both types of electric actuators can be operated manually with a controller assembly that features position-indicating LEDs and a toggle switch, but one of the biggest advantages of electric actuators over air is the ease with which they can be connected to an external data system for fully automated control. The microelectric actuator has built-in multidrop RS-232 (RS-485 optional) for bidirectional communications. The SVI (serial valve interface) was designed specifically to interface our standard electric actuators with RS-232 compatible systems, allowing control of up to six actuators via modem, BASIC program, or Valco-supplied PC software.

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.

Further reference

Actuators

Controllers and Accessories

Mounting Hardware

Microelectric Actuators

- CE certified
- Automatic alignment
- Manual control with position indication
- Remote control by contact closures or TTL logic level signals
- RS-232 bidirectional communication (optional RS-485)
- Two position and multiposition versions
- Universal power supply, 110/230 VAC to 24 VDC

The microelectric actuator offers Valco dependability in a unit which is less than half the size of our standard model. The actuator consists of a control module, a stepper motor/gearbox assembly, a manual remote control, interconnecting cables, and a 110/230 VAC to 24 VDC power supply. The composite version combines the stepper motor/gearbox assembly with the control module. The RS-232 interface cable, if required, must be ordered separately.

Since different valve models have varying actuation torque requirements, there are five microelectric actuator models for two position valves – EQ, EH, EP, ER, and ET – and two versions for multiposition – EMH and EMT. Consult the chart on the respective ordering information page to determine which model meets your requirements. When a valve and actuator are ordered at the same time, the proper actuator is supplied automatically.

An actuator can be specified with closemount hardware, with a standoff, or with just the standoff mounting hardware, if your valve already has a standoff. The microelectric actuator is designed for room temperature use. Valves which will be mounted in ovens require a standoff assembly, which locates the actuator out of the heated zone.

ORDER TIP

To purchase a ***valve with a microelectric actuator installed***, see valve ordering information.

Valco

Cheminert

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.

Further reference

Mounting Hardware

Two Position Microelectric Actuators

- CE certified
- Stall-sensing circuitry – no mechanical microswitches
- High speed switching – <100 ms in EQ model
- A model for every valve we sell

The two position microelectric actuator features exclusive stall-sensing circuitry which eliminates problems associated with valve/actuator misalignment. Power to the actuator motor is switched off when the driver pin goes against the stop of the valve cutout – no sooner, no later – and it's all done without any mechanical microswitches. Not only does this mean that alignment problems are a thing of the past, it means that you can stock one actuator for valves that turn 30°, 36°, 45°, 60°, 90°, or anything in between.

During initialization, the valve rotates at moderate speed while the actuator waits to sense the stall. Once the rotation angle has been measured and confirmed by repetition, the angle is memorized and actuation takes place at maximum speed. Valve position memory is maintained even in the event of a power failure. There is nothing more to do unless you wish to install a valve with a different angle of rotation. In that event, cycling the actuator with no valve mounted sets up reinitialization.

Microelectric actuators

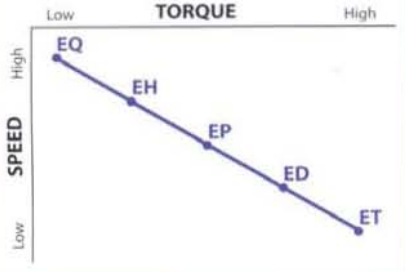
for two position valves

Standard voltage 24 VDC. Includes autosensing 24 VDC power supply.
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.
Consult the chart below to determine which actuator model is best suited for your valve.

Description	With closemount assembly Prod No	With 2" standoff assembly Prod No	For use with existing standoff Prod No
Highest speed actuator	EQ	EQ2	EQS
High speed actuator	EH	EH2	EHS
Medium torque actuator	EP	EP2	EPS
High torque actuator	ED	ED2	EDS
Highest torque actuator	ET	ET2	ETS

Description	Prod No
RS-232 interface cable	I-22697

SPEED AND TORQUE:
Inversely proportional



WHICH MODEL FOR WHICH TWO POSITION VALVE?

Fitting size	Valve type	Actuator model	Valve type	Actuator model
	Valco GC		**Valco HPLC**	
1/32"	W	EH	W	EP
1/16"	W	EH	W	EP
1/16"	UW	ED	UW	ED
1/8"	UW	ED	UW	ED
1/4"	MW	ET	—	—

Cheminert HPLC & Low Pressure

All valves	EH

Multi-drop cables

for multiple microelectric actuators

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric two position and multiposition actuators. Cables have one female DB9 and 2 to 8 male DB9 connectors – approximately 6" long. Note: the RS-232 interface cable (I-22697) is required for ***each*** actuator controlled serially.

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

TECH TIP

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric two position and multiposition actuators.

Multiposition Microelectric Actuators

- 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
- Composite model

One actuator can be used on any multiposition valve, 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.)

A new addition to this line is a composite version, which combines the control module and stepper motor/gearbox assembly into one unit, eliminating the need for a cable connecting the motor to the controller.

ORDER TIP

To purchase a ***valve with a microelectric actuator installed***, see valve ordering information.

Valco

Injectors and valves ..... pp 119-139
Multiposition valves 140-159

Cheminert

Injectors and valves 164-181
Multiposition valves 182-189

Further reference

Mounting Hardware

Closemount hardware ..... page 216
Right angle drive 211
Standoff assembly 212
Standoff mounting hardware 212

Microelectric actuators

for multiposition valves

Standard voltage 24 VDC. Includes autosensing 24 VDC power supply.
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.
Consult the chart below to determine which actuator model is best suited for your valve.

Description	**With 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
Composite version			
High speed actuator	ECMH	ECMH2	ECMHS
High torque actuator	ECMT	ECMT2	ECMTS

Description	*Prod No*
RS-232 interface cable	I-22697

Multi-drop cables

for multiple microelectric actuators

Multi-drop cables permit a single serial port (RS-232) to control multiple microelectric two position and multiposition actuators. Cables have one female DB9 and 2 to 8 male DB9 connectors – approximately 6" long. Note: the RS-232 interface cable (I-22697) is required for ***each*** actuator controlled serially.

No. of actuators to be controlled	*Prod No*
2	I-22897-02
3	I-22897-03
4	I-22897-04
5	I-22897-05
6	I-22897-06
8	I-22897-08

WHICH MODEL FOR WHICH MULTIPOSITION VALVE?

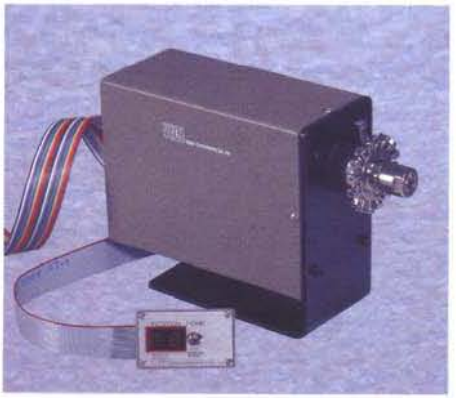
Valve model		Actuator model
Valco		
All valves		EMT
Cheminert high pressure		
C5	4, 6 positions	EMH
	8, 10 positions	EMT
Cheminert low pressure		
C25Z		EMH
C25		EMH
C35Z		EMH
C45		EMT

ABOUT STANDOFFS

Keyed standoff assemblies are used with multiposition microelectric actuators, to key the valve body to the actuator and standoff so that the actuators can self-align and operate valves with any number of positions.

Valco multiposition valves are not keyed unless ordered with a microelectric actuator. To install a microelectric actuator on an existing Valco multiposition valve, the key (pin) must be removed from the actuator clamp ring assembly. This can be done easily with a pair of pliers.

See page 215, top and bottom illustrations, for drawings of keyed standoff assemblies with multiposition microelectric actuators.



Standard Electric Actuators

- Position indication
- Manual control
- 110 VAC (230 VAC optional)
- No power demand on the chromatograph
- Two position and multiposition models

Two position standard electric actuators may be operated manually by a toggle switch or automatically by any data system with momentary contact closures or 5 VDC negative true logic outputs. The actuator is a complete system, including interface cable, power cord, and manual controller assembly with position indication.

Multiposition models can be used with any of our multiposition valves, including the old P type with external spring hardware. The manual controller has an LED display to indicate the current valve position, and allows the user to step sequentially from one position to the next or to return to Position 1 (Home) from any position. A data system with momentary contact closures can direct the step and home functions; 5 VDC negative true logic outputs provide direct position access. A 20-conductor interface cable permits the system to step the actuator sequentially, move the actuator directly to any position, and read the actual valve position.

A standard electric actuator can be ordered with closemount hardware, with a standoff, or with just the standoff mounting hardware, if your valve already has a standoff. Since the actuator is designed for room temperature use, valves which will be mounted in ovens require a standoff assembly so that the actuator is located out of the heated zone.

The actuator's rotation (two position) or number of positions (multiposition) must be properly matched to the valve's. If you are converting a manual valve to electric actuation and have any doubts about which actuator and hardware you need, call our sales or technical staff for assistance.

ORDER TIP

To purchase a ***valve with a standard electric actuator installed***, see valve ordering information.

Valco

Injectors and valves ..... pp 119-139
Multiposition valves 140-159

Cheminert

Injectors and valves 164-181
Multiposition valves 182-189

Further reference

Controllers

DVSP ..... page 204
Digital valve sequence programmer
SVI 205
Serial valve interface

Mounting Hardware

Closemount hardware 216
Right angle drive 211
Standoff assembly 212
Standoff mounting hardware 212

Standard electric actuators *for two position valves*

Standard voltage: 110 VAC. (230 VAC and 24 volt CE versions optional. Consult factory for product numbers and pricing.)
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

		With closemount assembly	With 2" standoff assembly	For use with existing standoff
No. of ports in valve	*Description*	*Prod No*	*Prod No*	*Prod No*
3, 4	90° rotation	E90	E902	E90S
6	60° rotation	E60	E602	E60S
8	45° rotation	E45	E452	E45S
10	36° rotation	E36	E362	E36S
12	30° rotation	E30	E302	E30S

Standard electric actuators *for multiposition valves*

Standard voltage: 110 VAC. (230 VAC optional. Consult factory for product numbers and pricing.)
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

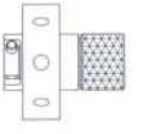
	With closemount assembly	With 2" standoff assembly	For use with existing standoff
Description	*Prod No*	*Prod No*	*Prod No*
4 position	E4	E42	E4S
4 x 2*	E4X2	E4X22	E4X2S
6 position	E6	E62	E6S
6 x 2**	E6X2	E6X22	E6X2S
8 position	E8	E82	E8S
10 position	E10	E102	E10S
12 position	E12	E122	E12S
16 position	E16	E162	E16S

* The 4 column selection valve, CST4UW, is an 8 position valve and needs a 4 x 2 actuator.
** The 6 column selection valve, CST6UW, is a 12 position valve and needs a 6 x 2 actuator.

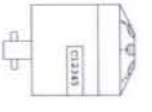
TECH TIP

Valco two position W and UW type valves and Cheminert valves have the following angles of rotation:

3 port	90°
4 port	90°
6 port	60°
8 port	45°
10 port	36°
12 port	30°
14 port	26°



Valco



Cheminert

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.

Air Actuators

Valco air actuators offer reliable, long-term performance under the most stringent conditions. Its low gas consumption and lightweight, compact construction make the air actuator suitable for aerospace flight hardware applications as well as laboratory or process applications.

Bottled instrument air or nitrogen is recommended. Up to 80 psig may be used without damaging the actuator or valve. The standard air actuator is rated for use at temperatures up to 70°C. Generally speaking, valves which will be in ovens or heated zones 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.

When an actuator is ordered by itself it can be specified with close-mount hardware, with a standoff, or with just the standoff mounting hardware, if your valve already has a standoff. In addition, 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***, see valve ordering information.

Valco

Injectors and valves ..... pp 119-139
Multiposition valves 140-159

Cheminert

Injectors and valves 164-181
Multiposition valves 182-189

Further reference

PFAF ..... page 203
Position feedback

Mounting Hardware

Closemount hardware 216
Right angle drive 211
Standoff assembly 212
Standoff mounting hardware 212

Two Position Air Actuators

The recommended method for implementing a two position air actuator is with a manifold solenoid valve assembly (MSVA), a block-mounted pair of 3-way solenoids that sends a pulse of air to switch the actuator from position to position. This is preferable to implementations which continue to supply air to the actuator after it is switched, since continuous air translates to a continuous rotational force applied to the valve. Such force can cause sideloading, leaking, and additional wear.

Typical actuation pressure is 40-50 psig, but up to 80 psig may be used without damaging the valve or actuator. 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.

When high speed switching is required, a high speed switching accessory (HSSA) can upgrade valve switching times to less than 30 ms with air or 8 ms with helium. A position feedback (PFAF), with contact closures in both positions, is also available as an option.

Standard air actuators

for two position valves

Temperature range 0-70°C
Standoff version includes a 4" standoff. 2", 3", and 6" standoffs are also available.

No. of ports in valve	*Description*	**With closemount assembly** *Prod No*	**With 4" standoff assembly** *Prod No*	**For use with existing standoff** *Prod No*
3, 4	90° rotation	A90	A904	A90S
6	60° rotation	A60	A604	A60S
8	45° rotation	A45	A454	A45S
10	36° rotation	A36	A364	A36S
12	30° rotation	A30	A304	A30S

High temperature air actuators

for two position valves

Temperature range 50-175°C
Standoff version includes a 2" standoff. 3", 4", and 6" standoffs are also available.

No. of ports in valve	*Description*	**With closemount assembly** *Prod No*	**With 2" standoff assembly** *Prod No*	**For use with existing standoff** *Prod No*
3, 4	90° rotation	AT90	AT902	AT90S
6	60° rotation	AT60	AT602	AT60S
8	45° rotation	AT45	AT452	AT45S
10	36° rotation	AT36	AT362	AT36S
12	30° rotation	AT30	AT302	AT30S

Replacement O-rings

Includes a complete set of O-rings for a two position air actuator.

Description	*Prod No*
Standard	OR
High temp	ORT

Actuator compression fittings

Includes 1/8" compression to 10-32 male thread, plus 1/8" brass ferrule and hex nut.

Description	*Prod No*
3 piece fitting assembly	F-TCF

TECH TIP

Air actuator with a **closemount assembly:**

Air actuator with a **4" standoff assembly:**

Air actuator **for use with an existing standoff:**

Further reference

HSSA ..... page 202
High speed switching accessory
PFAF 203
Position feedback

Multiposition Air Actuators

The recommended method for implementing a multiposition air actuator requires only a single 4-way solenoid. Up to 80 psig may be used without damaging the valve or actuator.

Multiposition air actuators include a rotary switch which may be connected to a digital readout.

Standard air actuators

for multiposition valves

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 multiposition valves

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

ORDER TIP

To purchase a ***valve with an air actuator installed***, see valve ordering information.

Valco

Injectors and valves ..... pp 119-139
Multiposition valves 140-159

Cheminert

Injectors and valves 164-181
Multiposition valves 182-189

Further reference

Closemount hardware ..... page 216
Right angle drive 211
Standoff assembly 212
Standoff mounting hardware 212

Actuator Controllers and Interfaces

Valco supports the actuation of valves with the controllers and interfaces listed below. Since our electric actuators are designed with more control and automation capabilities built in, most of the products in this section are for expanding the capabilities of our two position and multiposition air actuators.

CONTROLLERS AND INTERFACES

Name		*2 pos*	*Multi*	*Actuator*	*What it does*	*Page*
Controllers						
SVI	Serial valve interface	■	■	Microelectric Std electric Air	Controls actuators from a computer. Can control up to 6 valves. Air actuators require DVI interface.	205
DVSP	Digital valve sequence programmer	■	■	Microelectric Std electric Air	Programs valve switching for remote operation. For air actuators, provides pulsed and continuous control of solenoid air valves.	204
Solenoids						
MSVA	Manifold solenoid valve assembly (3-way solenoids)	■		Air	Recommended for 2 position air actuators. Sends pulse of air to switch actuator from position to position.	202
41E1	4-way solenoid air valve		■	Air	Simplest way to step multiposition air actuators.	202
Interfaces and Accessories						
DVI	Digital valve interface	■		Air	Translates timed events from data system, integrator, or controllers such as DVSP or SVI into air pulses. Includes LED position indicator.	203
HSSA	High speed switching accessory	■		Air	For high speed switching.	202
PFAF	Position feedback	■		Air	Provides a contact closure for TTL logic level signals.	203
PFW PFC	Position feedback	■		Manual	For manual Valco W type and Cheminert C1, C2, and C4 series valves. Continuous contact closure remote starts a chromatograph or data system.	203

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 application also requires the DVI discussed on page 179.

	Prod No
	HSSA

41E1 4-Way solenoid air valve *for multiposition air actuators*

This 4-way solenoid air valve with 1/8" tube fittings is the simplest method of stepping a multiposition air actuator. Energizing the solenoid steps the valve to its next position, and de-energizing the solenoid resets the mechanical ratchet in the actuator. This implementation, not recommended for two position actuators, can be useful when only a limited number of external events is available on the data system.

	Prod No
110 VAC	41E1-120VAC
230 VAC	41E1-220VAC
24 VAC	41E1-24VAC
12 VDC	41E1-12VDC
24 VDC	41E1-24VDC

MSVA Manifold 3-way solenoid valve assembly *for two position air actuators*

The recommended way to switch two position air actuated valves is to "pulse" a pair of 3-way solenoid valves. This method applies air to the actuator only during switching, and alleviates problems associated with continuous air pressure. The MSVA is a block-mounted pair of 3-way solenoid air valves with 1/8" tube connections, available in 12 VDC, 24 VDC, 24 VAC, 110 VAC, and 230 VAC models.

	Prod No
110 VAC	MSVA-110VAC
230 VAC	MSVA-220VAC
24 VAC	MSVA-24VAC
12 VDC	MSVA-12VDC
24 VDC	MSVA-24VDC

Further reference

Actuators

Controllers and Interfaces

Mounting Hardware

DVI Digital valve interface

for two position air actuators

We highly recommend the DVI for use with two position air actuators. It sends a two second pulse of air to switch the valve and then vents the air, simulating switching by hand and eliminating the potential for damaging the valve or actuator with continuously-applied pressure. It also features LED position indication, provides manual and remote operation, and outputs a contact closure when it goes to the INJECT position, a feature which can be used to start a run or integration. The DVI is available for 110 or 230 VAC.

	Prod No
110 VAC	DVI
230 VAC	DVI-220

PFAF Position feedback

for two position air actuators

The optional position feedback (PFAF) can be field installed on any two position standard air actuator. Each position provides a contact closure for TTL logic level signals.

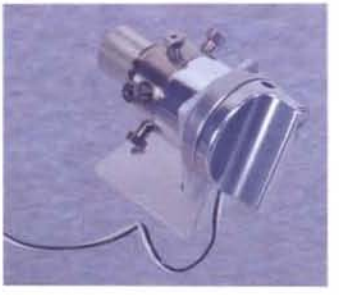
Prod No
PFAF

Position feedback

for manual valves

An optional position feedback is available for manual Valco W type and Cheminert C2 and C4 series valves (standard on Cheminert C1 valves). The continuous contact closure, provided only while the valve is in the inject position, can remote start a chromatograph or data system.

Description	*Prod No*
For Valco W type valves	
6 port	PFW60
4, 8, and 10 port	PFW90
For Cheminert valves	
C2 and C4 series	PFC2



DVSP
Digital valve sequence programmer

for all air and electric actuators

The digital valve sequence programmer (DVSP) is an add-on or stand-alone timer/programmer with 4 intervals, settable in ranges of 0-99 seconds, 0-9.9 minutes, or 0-99 minutes. The DVSP is most commonly used for remote operation of electrical devices such as solenoid valves, Valco two position or multiposition electric actuators, and the Valco DVI (digital valve interface), which converts contact closures into pneumatic pulses for switching Valco two position air actuators.

The DVSP has two operational modes: in the AUTO mode, the DVSP will return to the first interval and begin another sequence after the last interval is completed, and in the SINGLE CYCLE mode it stops after completing one sequence. During a cycle or sequence, simple controls allow the user to stop the cycle, reset it to Interval 1, switch to the AUTO mode, or advance to the next interval. The DVSP can also be wired for remote operation by contact closure from a data system or other control device.

Each interval has one DPDT (double pole, double throw) relay, rated at 5 amps, which provides two sets of contacts with no connection from one side to the other. This means that a single interval can be used to perform two separate functions requiring differing voltage requirements. For example, one side of relay A (Interval 1) can be used to switch an electric actuator (contact closure) while the other side is connected to 110/230 VAC and switches a 110/230 VAC solenoid valve at the same time as the electric actuator. In addition, Relay E supplies a two second contact. When solenoid valves are wired in series with this relay the result is "pulsed operation" of the air actuator, which avoids the potential valve and actuator problems associated with continuously-applied air pressure.

Both 12 VDC and 110/230 VAC power supplies are included within the DVSP, but the relays may be supplied with power from an external power source. For example, 24 VDC solenoid valves can be switched by the DVSP relays if the 24 volts is supplied to the relays from an external 24 VDC power supply.

	Prod No
110 VAC	DVSP4
230 VAC	DVSP4-220

Further reference

Actuators
Air ..... pages 198-200
Microelectric 192-195
Standard elec 196-197

Controllers and Interfaces
HSSA 202
High speed switching accessory
PFAF 203
Position feedback for air actuators
PFW/PFC 203
Position feedback for manual valves

Mounting Hardware
Closemount hardware 216
Right angle drive 211
Standoff assembly 212
Standoff mounting hardware 212

SVI
Serial valve interface

for all air and standard electric actuators

The serial valve interface (SVI) is a device that converts commands from a computer, via a serial port, into positional control for two position and multiposition valves. Each SVI can control up to four air actuated (via a DVI, page 179) or electrically actuated two position valves and two electrically actuated multiposition valves. The timing program can be run in the background, freeing the computer for other applications. Two serial ports (one male, one female) allow up to eight SVIs to be daisy-chained and run from a single serial communication port. In addition to controlling valves, the SVI can be used to control other devices which require logic level, BCD, or single line inputs.

The SVI is a self-contained unit, with its own 110 VAC (or 230 VAC Eurostandard) power supply. There is no need to open the computer to connect the SVI, because its DB-9 to DB-9 RS-232 cable connects to any available serial port. It also includes an interface cable for Valco two position actuators, and two Ansley 20-wire connectors for installation on the interface cable which comes as part of the multiposition electric actuator. For air actuated valves, optional interface cables are available for the DVI, which converts electrical signals to pneumatic pulses.

Software is supplied on a Windows-compatible CD-ROM. If different program functionality is needed, information is given in the manual which will assist in writing the necessary software.

	Prod No
110 VAC	SVI
230 VAC	SVI-220
DVI/SVI interface cable	I-22239

Purge Housings

Purge housings for Valco valves eliminate any possible diffusion from the atmosphere *into* the valve, or safely vent fugitive emissions *from* the valve. They are typically used in trace level analyses to isolate the valve from ambient air, but can also be used as a safety measure to isolate a valve against leaks into the atmosphere, such as when pyrophoric, toxic, or carcinogenic materials are present in the sample stream.

Two screws secure each half of the purge housing to the valve, so that the rear chamber of the housing (the preload assembly/spring side of the valve) can be removed for rotor inspection or replacement without affecting the actuator side of the housing.

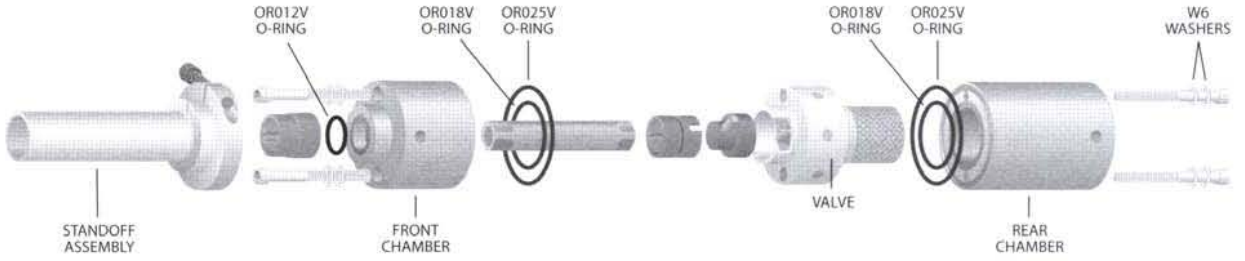
Ideally, the purge housing should be ordered when a new valve is ordered, so that it can be factory-installed. Field installation of purge housings is generally not recommended. To order a new valve with a purge housing, add the suffix "PH" to the product number for the valve/actuator assembly, and add $165 to the price. The purge housing requires a standoff assembly, which can be 2, 3, 4, or 6" long. Multiposition valves require an actuator – no manual version is available.

All Valco two position valves with two threaded mounting holes will accommodate a purge housing without modification, but most multiposition and 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 and multiposition valves*

Description	*Prod No*	*Price*	*Notes*
On a new valve	Add suffix PH to valve prod no	Add $165 to valve price	Requires standoff assembly. Multiposition valve requires an actuator.
On existing valve, factory installation	Contact factory	$215	
On existing valve, for field installation	Not recommended		

PURGE HOUSING WITH VALVE



Heated Valve Enclosures

These insulated enclosures allow valves to be operated at temperatures independent of other controlled zones of analytical instruments. The compact construction and minimum power dissipation enable mounting within larger, lower temperature zones without significantly raising the larger oven's minimum temperature or impairing its programmability.

All enclosures include a heater block and a heater cartridge with line cord. The product number chart lists the heater size typically required to heat the valve(s) to the indicated temperature. Holes are provided in the heater block for Perkin Elmer, Agilent, and Varian temperature sensors, with an additional thermocouple hole permitting temperature readout. Since 1/32" W type valves are smaller, they require a special heater block; enclosures for 1/32" valves are denoted by asterisk (*) in the price chart below.

Note: Heated valve enclosures provide a way to heat valves. A GC's auxiliary temperature zone controller or a device such as our ITC (instrumentation temperature controller) is required to maintain the valves at a set temperature.

Includes insulated enclosure and heater assembly (standard heater block, heater cartridge, line cord). Standard voltage: 110 VAC. For a 230 VAC model, add -220 to the product number. Insulation is 1/2" thick, so internal dimensions are 1" smaller than the exterior size given below.

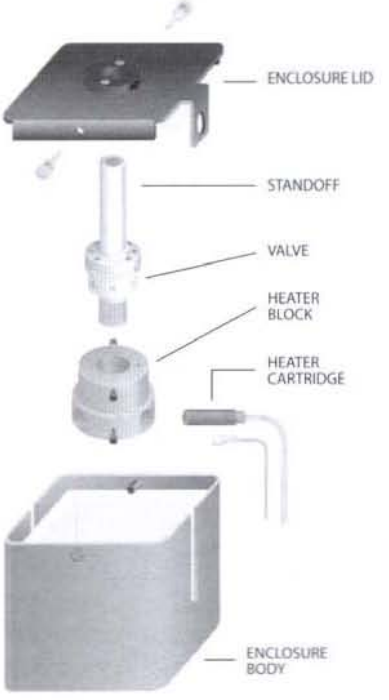
Heated valve enclosures *for two position and multiposition valves*

Capacity	*Exterior dimensions (Interior approx 1" smaller)*	*Rating*	*Prod No*
1 valve	4" x 4-1/4" x 3-5/8"d	65W/350°C	HVEA
		* 65W/350°C	HVEAN
	4-1/4" x 5-1/8" x 3-5/8"d	65W/350°C	HVEB
		* 65W/350°C	HVEBN
	8" x 8" x 6"d	100W/350°C	HVEC
2 valves	8" x 5-1/4" x 4"d	125W/350°C	HVE2
3 valves	13-1/2" x 5-3/4" x 4"d	150W/350°C	HVE3
6 valves	13-3/4" x 8" x 6"d	300W/350°C	HVE6

** for use with 1/32" valves*

HEATED VALVE ENCLOSURE

For one valve (HVEA)



Further reference

ITC ..... page 209
Instrumentation temperature controller

Heated column enclosures 209
Heater assemblies 208
Heater blocks 208

Heater assemblies

A heater assembly includes a standard heater block, heater cartridge, and line cord. Heater cartridges are also available individually. Consult 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. Cartridges for larger heater blocks may also be purchased. Consult the factory.

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

Further reference

Heated valve enclosures ..... page 207

Heated column enclosures

Heated column enclosures allow a column to be operated at temperatures independent of other controlled zones in the instrument. They are similar in construction to our heated valve enclosures *(page 207)*, except instead of a valve heater block they contain a column mandrel which will accept 1/8" columns up to 10' long. The HCE2 can have a heated valve installed adjacent to the heated column, with a valve heater block ordered separately.

Includes one column mandrel, insulated enclosure, and heater assembly (standard heater block, heater cartridge, line cord). Standard voltage: 110 VAC. For a 230 VAC model, add -220 to the product number. Insulation is 1/2" thick, so internal dimensions are 1" smaller than the exterior size given below.

Capacity	*Exterior dimensions (Interior approx 1" smaller)*	*Rating*	*Prod No*
Heated column enclosure			
1 column	4" x 4-1/4" x 3-5/8"d	65W/350°C	HCE1
	4-1/4" x 5-1/8" x 3-5/8"d	65W/350°C	HCEB
	8" x 8" x 6"d	65W/350°C	HCEC
2 columns	8" x 5-1/4" x 4"d	65W/350°C	HCE2
Column mandrel (heater assembly not included with column mandrel)			CM

ITC Instrumentation temperature controller

The ITC is an isothermal proportional controller for use in the thermal systems common to analytical instrumentation, and is often used with heated valve enclosures. The desired temperature is set in 1°C increments on the front panel. A thermocouple sensor provides quick recognition of temperature changes. The power to the heater can be attenuated from 0-90% in 10% increments, an easy-to-use feature which improves temperature stability at the set point to 0.5°C. Maximum output current is 10 amps.

The ITC is available with a range of 0°C to 399°C, in 110 VAC or 230 VAC.

		Prod No
0°C to 399°C	110 VAC	ITC10399
	230 VAC	ITC10399-220
Replacement thermocouple		I-21014-01

Further reference

Heated valve enclosures ..... page 207

Valve Mounting Hardware

Valves are supplied with all the necessary hardware for their configuration as ordered, and are shipped installed on the proper actuator, aligned and ready to use. Usually the configuration can be changed in the field – from closemount to standoff, or from manual to air or electrically actuated. If you need to change the actuation mounting, you will find the necessary parts in this section.

WHAT HARDWARE DO I NEED?

I want:	I have:	I need to order:	Page
A valve on an actuator with a standoff assembly	No valve or actuator	■ The entire assembly from the valve section. (Don't order each part separately)	
	A valve	■ Actuator with standoff assembly already installed. (See actuator sections)	
	A valve on an actuator with closemount hardware	■ Standoff assembly ■ Clamp ring ■ Screws	212 212 212
	A valve, an actuator, and a standoff assembly but no way to attach them	■ Clamp ring ■ Screws	212 212
A valve on an actuator with closemount hardware	A manual valve	■ Actuator with closemount hardware already installed. (See actuator sections)	
	A valve on an actuator with a standoff assembly	■ Actuator closemount hardware	216
A valve that I can turn by hand, on a standoff	A valve, a standoff assembly, but no knob or retainer	■ Manual knob for use with a standoff	213
A valve that I can turn by hand, with closemount hardware	A valve with no hardware	■ Manual closemount hardware	216
A valve and standoff to turn in a 90° angle from the actuator, so it will all fit	A valve and an actuator that won't fit where I need to install it	■ RAD (right angle drive)	211

Further reference

Actuators

GLOSSARY AT A GLANCE
MOUNTING HARDWARE

Clamp ring
Adjustable ring for clamping the valve or standoff assembly onto an actuator, knob, or instrument panel.

Closemount hardware
All the hardware required to mount a valve directly onto the face of an air, standard electric, or microelectric actuator.

Keyed
The design which enables multiposition microelectric actuators to self-align. A specially designed clamp ring and standoff assembly key together with the microelectric actuator and the valve to locate position 1.

Position feedback
Hardware which provides a contact closure for the remote start of a chromatograph or data system.

Standoff assembly
All the hardware required to allow a valve to be mounted in an oven or heated zone while the actuator or knob remains outside the heated zone. Standard lengths are 2", 3", 4", and 6".

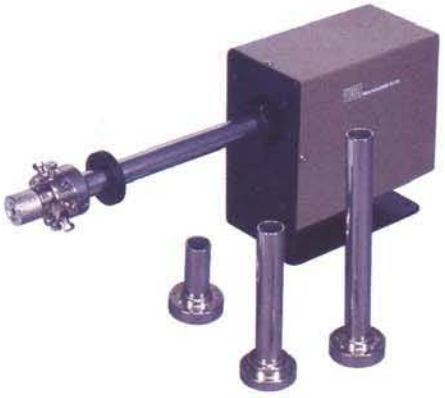
Standoff mounting hardware
The clamp ring and screws necessary to mount a valve and standoff assembly onto an actuator.

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 also available.

With closemount hardware		With 2" standoff assembly
Prod No	*Price*	*Prod No*
RAD	$200	2RAD



Standoff Assemblies

Valves which will be installed in ovens or heated zones require a standoff assembly, which locates the actuator out of the heated zone and supports both the valve and the handle or actuator. The 5/8" outside diameter standoff tube extends through the oven wall and is secured by means of a clamp ring supplied with the assembly.

If you are converting an actuated valve from a closemount to a standoff application, order the appropriate clamp ring and two screws in addition to the standoff assembly. Consult the factory for availability of nonstandard lengths.

The multiposition microelectric actuator 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 to a 6 in the product number.

Standoff assemblies and mounting hardware

for actuators

Description	**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 multiposition valves	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 multiposition valves	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 multiposition valves	2SOAMP	CR3	HWSC-SC8-8B
For Cheminert valves	2SOAMP	CR3	HWSC-SC8-8B

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.

Further reference

For illustrations of standoffs on valves and actuators, see pages 214-215.

Standoff assemblies

for manual valves

Includes knob, standoff assembly, retainer, and adapter.
For illustration, see page 214, top.

Description	*Prod No*
For Valco W Type two position valves	
with 1 or 2 mounting holes	4SOWK
with no mounting holes	4SOWKMP
For Valco UW Type two position valves	
with 1 or 2 mounting holes	4SOUTH
with no mounting holes	4SOUTHMP
For Cheminert valves	4SOWKMP

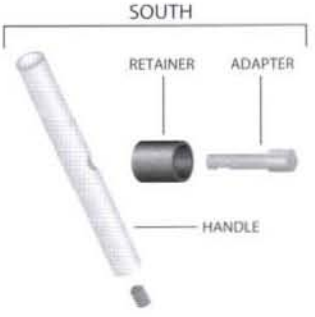
Knobs and handles

for use with a standoff

If you already have a spare standoff assembly but lack the knob or retainer, or have an actuated valve on a standoff which you'd like to convert to manual use, here's what you'll need. Includes knob or handle, retainer, and adapter.

Description	*Prod No*
Knob for a W type valve	WMMASO
T-handle for a UW type valve	SOUTH

Knob
for Valco W type valves



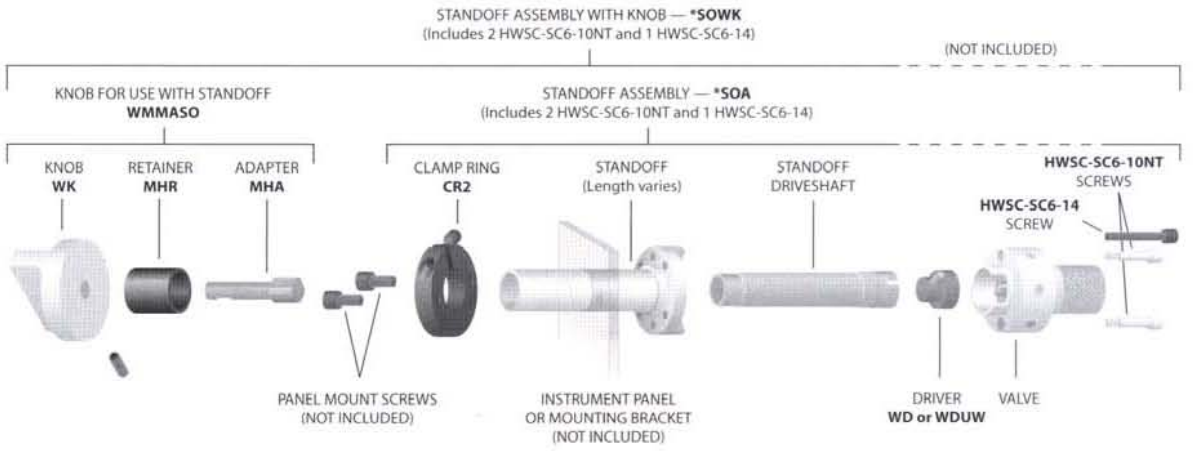
T-handle
for Valco UW type valves

TECH TIP

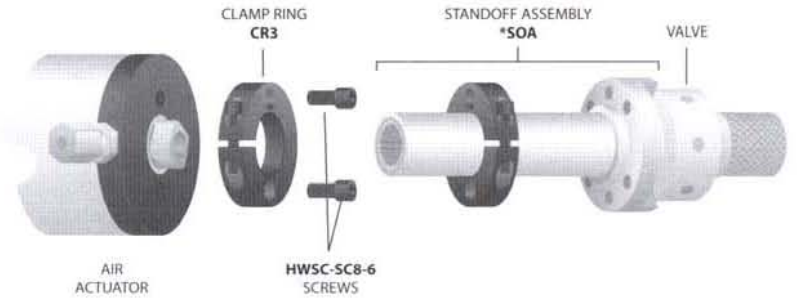
If you need the ***actuator as well as the hardware***, you can order it complete with the appropriate hardware or with the required standoff already installed.

Actuators

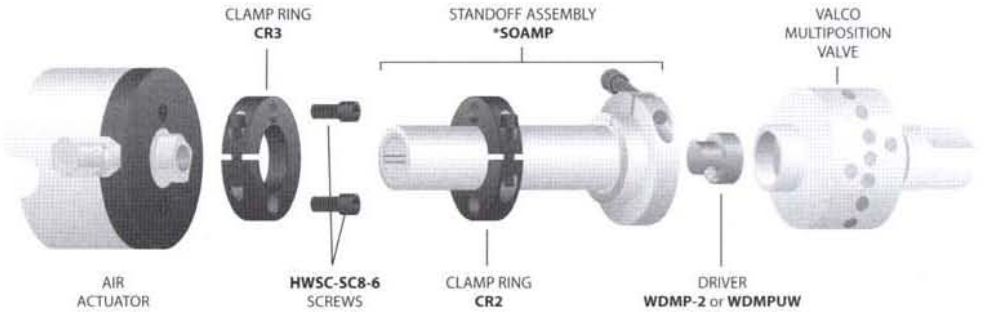
STANDOFF WITH
VALCO TWO POSITION VALVE – MANUAL



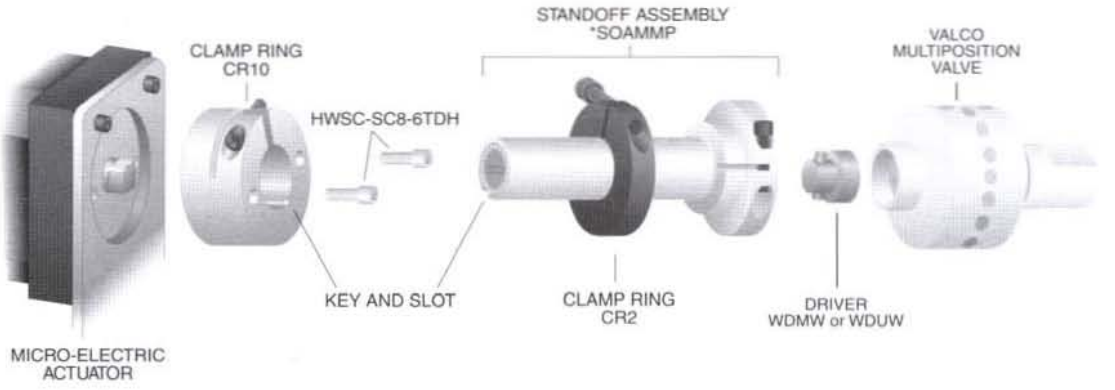
STANDOFF WITH
VALCO TWO POSITION VALVE – AIR ACTUATOR



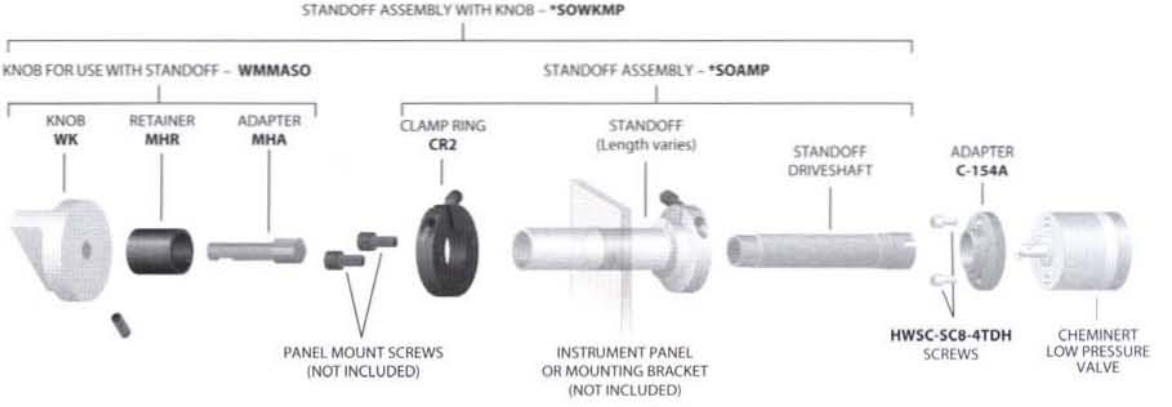
STANDOFF WITH
VALCO MULTIPOSITION VALVE – AIR ACTUATOR



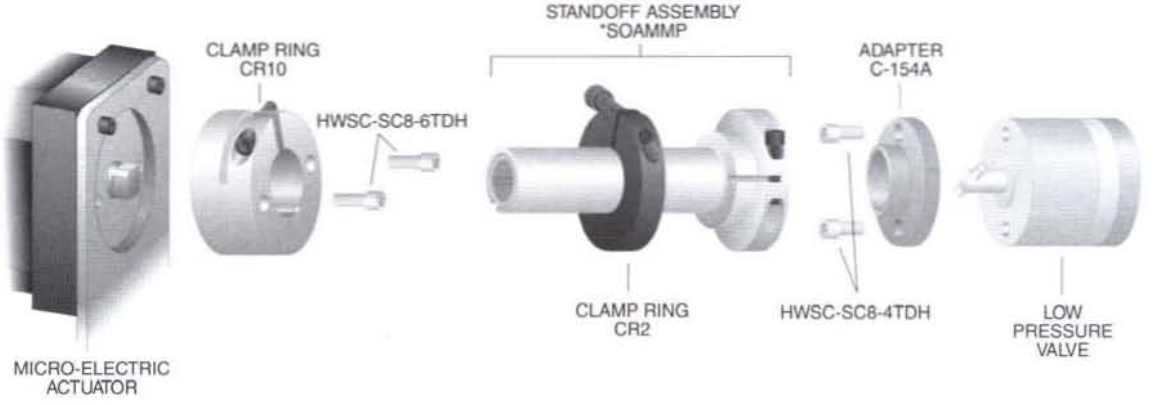
KEYED STANDOFF WITH
VALCO MULTIPOSITION VALVE – MICROELECTRIC ACTUATOR



STANDOFF WITH
CHEMINERT TWO POSITION VALVE – MANUAL



KEYED STANDOFF WITH
CHEMINERT MULTIPOSITION VALVE – MICROELECTRIC ACTUATOR



Closemount Hardware

If a valve is not going to be heated beyond the temperature range of the actuator, closemount hardware often makes the cleanest installation.

Closemount hardware *for manual valves*

If you have a Valco W Type valve with no hardware and want a knob on it, or if you are converting an air or electrically actuated two position valve to manual use, this is what you need. There are two versions: one for valves with threaded mounting holes and one for valves with unthreaded mounting holes. (If your valve has no mounting holes, you will have to use it with a standoff.)

Description	*Prod No*
For valves with	
threaded mounting holes	WMMA
unthreaded mounting holes	WMMA10

Closemount hardware *for actuators*

Order the appropriate closemount hardware if you want to change your valve and actuator from a standoff to a closemount connection. Two mounting screws are included. If air and standard electric actuators require different mounting screws, two of each screw are included with the closemount hardware.

Description	*Prod No*
Air or standard electric actuators	
For Valco two position valves	
with 1 or 2 mounting holes	CMH
with no mounting holes	CMHMP
For Valco multiposition valves	CMHMP
For Cheminert valves	
high pressure design	CMH11H
low pressure design	CMH11L
(low pressure design includes required adapter)	
Microelectric actuators	
For Valco two position valves	
with 1 or 2 mounting holes	CMH12H
with no mounting holes	CMH12H
For Valco multiposition valves	
(UW and MW Types only)	CMH13
For Cheminert two position valves	
high pressure design	CMH12H
low pressure design	CMH12L
(low pressure design includes required adapter)	
For Cheminert multiposition valves	
high pressure design	CMH13H
low pressure design	CMH13L
(low pressure design includes required adapter)	

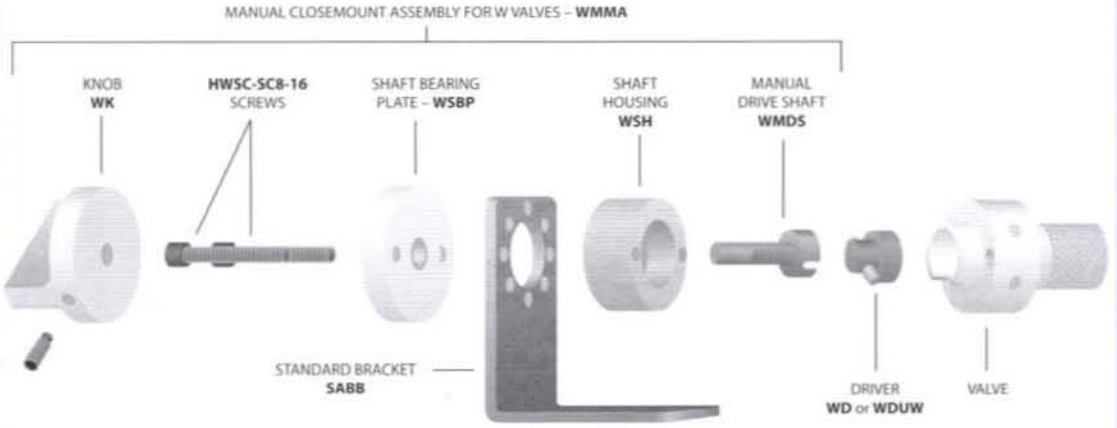
TECH TIP

If you need the ***actuator as well as the hardware***, you can order it complete with the appropriate hardware or with the required standoff already installed.

Actuators

Air ..... pages 198-200
Microelectric 192-195
Standard elec 196-197

CLOSEMOUNT WITH
VALCO VALVE – MANUAL



CLOSEMOUNT WITH
CHEMINERT VALVE (Low pressure two position) – MICROELECTRIC

CLOSEMOUNT WITH
VALCO VALVE (1 or 2 mounting holes) – AIR ACTUATOR

Tools

As a convenience to our customers, we stock several standard tools that are useful for working with valves, fittings, and other products from VICI. In addition, we offer custom tools which are designed and machined in our factory to facilitate use of specific VICI products.

Custom socket wrench

This 1/4" socket wrench with a slot to slip over 1/16" tubing is the perfect tool for installing fittings in some of our multiposition valves, in which the proximity of the ports makes it difficult to get a normal open end wrench in position.

Prod No

SWH4

Hex key set

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

Prod No

HKS

Open end wrenches

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

Pencil magnet

A pencil-type magnet is useful for removing the rotor from Valco valves when the rotor must be replaced or rotated. The process of disassembly and assembly is described in Technical Note 201, which may be requested by phoning or faxing. It may also be found in the support section at www.vici.com.

Prod No

PM

Further reference

Ferrule removal kit 80

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 and for enlarging the inner diameter of fused silica adapters.

Prod No

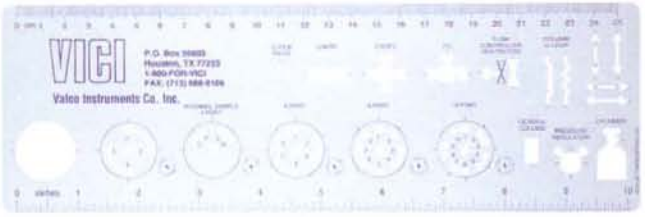
PV

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



Valve spanner handle

A special tool for gripping a multiposition valve body. It is especially useful during valve alignment procedures.

Prod No

VSH

SPECS

Inlet pressure:
100 psi
Maximum temperature:
100°C

Combo Valves

A new generation of needle and shut-off valve provides screwdriver-adjustable control and positive shut-off without damage to the needle. It is ideal for providing hydrogen and air to an FID, since the flow setting is not changed by turning the valve on and off. It can also be used to supply make-up or combustion gas in a wide variety of applications.

The valve body materials are anodized aluminum or stainless steel, with Viton O-ring seals. Maximum temperature is 100°C, and maximum inlet pressure is 100 psig. The valve can be panel-mounted in an 11/16" or 3/4" hole, using hardware supplied. Comes 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	Stainless body
	Prod No	*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

Optional colored knobs	Standard (.62")	Long (1.25")
	Prod No	*Prod No*
Green	CNVEKG	CNVEKLG
Red	CNVEKR	CNVEKLR
Blue	CNVEKU	CNVEKLU
Silver	CNVEKS	CNVEKLS
Black	CNVEKB	CNVEKLB

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.

Gas Flow Controllers

Flow controllers provide a stable flow rate under varying pressure.

VICI flow controllers are precision machined from aluminum or stainless bar stock to eliminate the contamination often found in die-cast parts. Positive flow shut-off is provided by an integral Viton-sealed adjustment valve. In all our flow controllers, the inlet pressure must exceed the outlet pressure by 10 psi.

Model 100 gas flow controller

Fixed span upstream referenced flow controller

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N_2 at 40 psi). This series of flow controller can be equipped 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

Standard fittings:
- 1/8" external tube fittings (EAOR22)

Other fittings are available. Contact the factory for further information.

	Aluminum body Viton diaphragm		Aluminum body SS diaphragm	SS body Viton diaphragm	SS body SS diaphragm
Flow rate /min	*Prod No*	*Price*	*Prod No*	*Prod No*	*Prod No*
With standard control knob					
0 - 150 mL	FC10AV1K	$195	FC10AS1K	FC10SV1K	FC10SS1K
0 - 250 mL	FC10AV2K	195	FC10AS2K	FC10SV2K	FC10SS2K
0 - 850 mL	FC10AV3K	195	FC10AS3K	FC10SV3K	FC10SS3K
0 - 1.2 L	FC10AV4K	195	FC10AS4K	FC10SV4K	FC10SS4K
0 - 4.5 L	FC10AV5K	195	FC10AS5K	FC10SV5K	FC10SS5K
0 - 10.0 L	FC10AV6K	195	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

ALTERNATE FITTING TYPES

Models 100 and 300
The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are listed below. Order separately.

Internal fitting with O-ring seal	*Prod No*
1/8" to 5/16-24	ZAOR22
1/16" to 5/16-24	ZAOR12

Model 202
The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. Another adapter is listed below. Order separately.

1/8" NPT male pipe to Valco internal 1/8"	*Prod No*
	PZA22

Condyne Combo Valves

Very similar in function to the Valco combo valves, these are the original, hex-bodied combo valves made by the Condyne division of VICI Metronics for nearly 30 years. Condyne products have been transferred to the Valco Houston location, where a number of improvements have been made.

SPECS

Maximum inlet pressure: 100 psi
Maximum temperature: 100°C

Standard construction features an anodized aluminum body with Viton O-ring seals. Maximum inlet pressure is 100 psi, with a maximum temperature of 100°C. The valve can be panel mounted through an 11/16" or 3/4" diameter hole. Valco 1/16" fittings are standard, but 1/8" fittings are also available. Nuts and ferrules are included.

Typically, the knob color is used as an indicator of the rated flow, but the standard knob can be changed if desired. A longer version of the knob is also available, as is an all brass valve (in OEM quantities). Consult the factory regarding these options.

Condyne combo valves

Maximu m flow @ 40psi He or N2		**1/16" Valco fittings**	**1/8" Valco fittings**
	Knob color	*Prod No*	*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

Combo Pressure Regulators

The VICI combo regulator is a combination regulator and shut-off valve. The pressure is set using the screwdriver adjustment in the center of the on/off knob. Turning the knob counterclockwise provides positive shutoff, while clockwise rotation restores gas pressure to within 0.05 psi of the setpoint.

The regulator is machined from aluminum bar stock and then hard-anodized to provide contamination-free service. It features a stainless steel diaphragm and Viton-sealed stainless poppet. The compact size (3" x 1.125" diameter) saves panel space and permits installation anywhere that an 11/16" hole can be located (mounting hardware is supplied).

Available with outlet pressure ranges of 0-15 psi, 0-30 psi, or 0-60 psi. 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.

	Valco internal fittings 1/16"	**Valco internal fittings 1/8"**	**External fittings 1/8"**
Pressure range:	*Prod No*	*Prod No*	*Prod No*
0-15 psi	PR50A15Z1	PR50A15Z2	PR50A15E2
0-30 psi	PR50A30Z1	PR50A30Z2	PR50A30E2
0-60 psi	PR50A60Z1	PR50A60Z2	PR50A60E2

ADAPTERS USED FOR VALCO AND CONDYNE CONTROL DEVICES

Prod No	*Used for*	*Description*
ZAOR11	Diaphragm valve; optional on on/off valves	Valco 1/16" internal to 10-32 female
ZAOR12	Optional for Model 100 and 300 flow controllers	Valco 1/16" internal to 5/16-24 O-ring seal
ZAOR22	Optional for Model 100 and 300 flow controllers	Valco 1/8" internal to 5/16-24 O-ring seal
EAOR21	Air actuated prime/purge and on/off valves	External 1/8" to 10-32 O-ring seal
EAOR22	Standard on Model 100 and 300 flow controllers	External 1/8" to 5/16-24 O-ring seal

Micrometering Valves

Micrometering (needle) valves combine the ease of connection associated with Valco zero dead volume fittings with convenient bulkhead mounting. The very low internal volume and precision design make this valve ideal for use as a gas control valve in chromatographic systems.

The Viton® model is rated at 225°C, while a version with Kalrez™ seals is capable of continuous operation at 315°C. This allows a needle valve to be mounted directly within a heated oven, facilitating control of flow switching in multidimensional systems while keeping the gases at oven temperature.

Valves are rated for maximum of 1000 psi gas. They are individually tested on a mass spectrometer leak detector to a helium leak rate specification of $< 1 \times 10^{-8}$ 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 psi N_2 inlet		
Viton	Lubricated	ZBNV1
Viton	Non-lubricated	ZBNV1-D
Kalrez	Non-lubricated	ZBNV1-KZ
Fine control: 2–175 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	ZBNV1F
Viton	Non-lubricated	ZBNV1F-D
Kalrez	Non-lubricated	ZBNV1F-KZ
Low flow: 2–90 ml/min@ 40 psi N_2 inlet		
Viton	Lubricated	ZBNV1LF
Viton	Non-lubricated	ZBNV1LF-D
Kalrez	Non-lubricated	ZBNV1LF-KZ

1/16" micrometering valves *with 18" tubes*

Seal	*Lubrication*	*Prod No*
Standard: 2–225 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	BNV1
Viton	Non-lubricated	BNV1-D
Kalrez	Non-lubricated	BNV1-KZ
Low flow: 2–90 ml/min@ 40 psi N_2 inlet		
Viton	Lubricated	BNV1LF
Viton	Non-lubricated	BNV1LF-D
Kalrez	Non-lubricated	BNV1LF-KZ

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.

Gas Flow Controllers

Flow controllers provide a stable flow rate under varying pressure.

VICI flow controllers are precision machined from aluminum or stainless bar stock to eliminate the contamination often found in die-cast parts. Positive flow shut-off is provided by an integral Viton-sealed adjustment valve. In all our flow controllers, the inlet pressure must exceed the outlet pressure by 10 psi.

Model 100 gas flow controller

Fixed span upstream referenced flow controller

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N_2 at 40 psi). This series of flow controller can be equipped 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

Standard fittings:
- 1/8" external tube fittings (EAOR22)

Other fittings are available. Contact the factory for further information.

	Aluminum body Viton diaphragm		Aluminum body SS diaphragm	SS body Viton diaphragm	SS body SS diaphragm
Flow rate /min	*Prod No*	*Price*	*Prod No*	*Prod No*	*Prod No*
With standard control knob					
0 - 150 mL	FC10AV1K	$195	FC10AS1K	FC10SV1K	FC10SS1K
0 - 250 mL	FC10AV2K	195	FC10AS2K	FC10SV2K	FC10SS2K
0 - 850 mL	FC10AV3K	195	FC10AS3K	FC10SV3K	FC10SS3K
0 - 1.2 L	FC10AV4K	195	FC10AS4K	FC10SV4K	FC10SS4K
0 - 4.5 L	FC10AV5K	195	FC10AS5K	FC10SV5K	FC10SS5K
0 - 10.0 L	FC10AV6K	195	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

ALTERNATE FITTING TYPES

Models 100 and 300
The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are listed below. Order separately.

Internal fitting with O-ring seal	*Prod No*
1/8" to 5/16-24	ZAOR22
1/16" to 5/16-24	ZAOR12

Model 202
The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. Another adapter is listed below. Order separately.

1/8" NPT male pipe to Valco internal 1/8"	*Prod No*
	PZA22

SPECS

Inlet pressure:
100 psi
Maximum temperature:
100°C

Combo Valves

A new generation of needle and shut-off valve provides screwdriver-adjustable control and positive shut-off without damage to the needle. It is ideal for providing hydrogen and air to an FID, since the flow setting is not changed by turning the valve on and off. It can also be used to supply make-up or combustion gas in a wide variety of applications.

The valve body materials are anodized aluminum or stainless steel, with Viton O-ring seals. Maximum temperature is 100°C, and maximum inlet pressure is 100 psig. The valve can be panel-mounted in an 11/16" or 3/4" hole, using hardware supplied. Comes 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	Stainless body
	Prod No	*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

Optional colored knobs	Standard (.62")	Long (1.25")
	Prod No	*Prod No*
Green	CNVEKG	CNVEKLG
Red	CNVEKR	CNVEKLR
Blue	CNVEKU	CNVEKLU
Silver	CNVEKS	CNVEKLS
Black	CNVEKB	CNVEKLB

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.

Gas Flow Controllers

Flow controllers provide a stable flow rate under varying pressure.

VICI flow controllers are precision machined from aluminum or stainless bar stock to eliminate the contamination often found in die-cast parts. Positive flow shut-off is provided by an integral Viton-sealed adjustment valve. In all our flow controllers, the inlet pressure must exceed the outlet pressure by 10 psi.

Model 100 gas flow controller

Fixed span upstream referenced flow controller

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N_2 at 40 psi). This series of flow controller can be equipped 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

Standard fittings:
- 1/8" external tube fittings (EAOR22)

Other fittings are available. Contact the factory for further information.

	Aluminum body Viton diaphragm		Aluminum body SS diaphragm	SS body Viton diaphragm	SS body SS diaphragm
Flow rate /min	*Prod No*	*Price*	*Prod No*	*Prod No*	*Prod No*
With standard control knob					
0 - 150 mL	FC10AV1K	$195	FC10AS1K	FC10SV1K	FC10SS1K
0 - 250 mL	FC10AV2K	195	FC10AS2K	FC10SV2K	FC10SS2K
0 - 850 mL	FC10AV3K	195	FC10AS3K	FC10SV3K	FC10SS3K
0 - 1.2 L	FC10AV4K	195	FC10AS4K	FC10SV4K	FC10SS4K
0 - 4.5 L	FC10AV5K	195	FC10AS5K	FC10SV5K	FC10SS5K
0 - 10.0 L	FC10AV6K	195	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

ALTERNATE FITTING TYPES

Models 100 and 300
The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are listed below. Order separately.

Internal fitting with O-ring seal	*Prod No*
1/8" to 5/16-24	ZAOR22
1/16" to 5/16-24	ZAOR12

Model 202
The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. Another adapter is listed below. Order separately.

1/8" NPT male pipe to Valco internal 1/8"	*Prod No*
	PZA22

Condyne Combo Valves

Very similar in function to the Valco combo valves, these are the original, hex-bodied combo valves made by the Condyne division of VICI Metronics for nearly 30 years. Condyne products have been transferred to the Valco Houston location, where a number of improvements have been made.

SPECS

Maximum inlet pressure: 100 psi
Maximum temperature: 100°C

Standard construction features an anodized aluminum body with Viton O-ring seals. Maximum inlet pressure is 100 psi, with a maximum temperature of 100°C. The valve can be panel mounted through an 11/16" or 3/4" diameter hole. Valco 1/16" fittings are standard, but 1/8" fittings are also available. Nuts and ferrules are included.

Typically, the knob color is used as an indicator of the rated flow, but the standard knob can be changed if desired. A longer version of the knob is also available, as is an all brass valve (in OEM quantities). Consult the factory regarding these options.

Condyne combo valves

Maximu m flow @ 40psi He or N2		**1/16" Valco fittings**	**1/8" Valco fittings**
	Knob color	*Prod No*	*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

Combo Pressure Regulators

The VICI combo regulator is a combination regulator and shut-off valve. The pressure is set using the screwdriver adjustment in the center of the on/off knob. Turning the knob counterclockwise provides positive shutoff, while clockwise rotation restores gas pressure to within 0.05 psi of the setpoint.

The regulator is machined from aluminum bar stock and then hard-anodized to provide contamination-free service. It features a stainless steel diaphragm and Viton-sealed stainless poppet. The compact size (3" x 1.125" diameter) saves panel space and permits installation anywhere that an 11/16" hole can be located (mounting hardware is supplied).

Available with outlet pressure ranges of 0-15 psi, 0-30 psi, or 0-60 psi. 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.

	Valco internal fittings 1/16"	**Valco internal fittings 1/8"**	**External fittings 1/8"**
Pressure range:	*Prod No*	*Prod No*	*Prod No*
0-15 psi	PR50A15Z1	PR50A15Z2	PR50A15E2
0-30 psi	PR50A30Z1	PR50A30Z2	PR50A30E2
0-60 psi	PR50A60Z1	PR50A60Z2	PR50A60E2

ADAPTERS USED FOR VALCO AND CONDYNE CONTROL DEVICES

Prod No	*Used for*	*Description*
ZAOR11	Diaphragm valve; optional on on/off valves	Valco 1/16" internal to 10-32 female
ZAOR12	Optional for Model 100 and 300 flow controllers	Valco 1/16" internal to 5/16-24 O-ring seal
ZAOR22	Optional for Model 100 and 300 flow controllers	Valco 1/8" internal to 5/16-24 O-ring seal
EAOR21	Air actuated prime/purge and on/off valves	External 1/8" to 10-32 O-ring seal
EAOR22	Standard on Model 100 and 300 flow controllers	External 1/8" to 5/16-24 O-ring seal

Micrometering Valves

Micrometering (needle) valves combine the ease of connection associated with Valco zero dead volume fittings with convenient bulkhead mounting. The very low internal volume and precision design make this valve ideal for use as a gas control valve in chromatographic systems.

The Viton® model is rated at 225°C, while a version with Kalrez™ seals is capable of continuous operation at 315°C. This allows a needle valve to be mounted directly within a heated oven, facilitating control of flow switching in multidimensional systems while keeping the gases at oven temperature.

Valves are rated for maximum of 1000 psi gas. They are individually tested on a mass spectrometer leak detector to a helium leak rate specification of $< 1 \times 10^{-8}$ 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 psi N_2 inlet		
Viton	Lubricated	ZBNV1
Viton	Non-lubricated	ZBNV1-D
Kalrez	Non-lubricated	ZBNV1-KZ
Fine control: 2–175 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	ZBNV1F
Viton	Non-lubricated	ZBNV1F-D
Kalrez	Non-lubricated	ZBNV1F-KZ
Low flow: 2–90 ml/min@ 40 psi N_2 inlet		
Viton	Lubricated	ZBNV1LF
Viton	Non-lubricated	ZBNV1LF-D
Kalrez	Non-lubricated	ZBNV1LF-KZ

1/16" micrometering valves *with 18" tubes*

Seal	*Lubrication*	*Prod No*
Standard: 2–225 ml/min@ 15 psi N_2 inlet		
Viton	Lubricated	BNV1
Viton	Non-lubricated	BNV1-D
Kalrez	Non-lubricated	BNV1-KZ
Low flow: 2–90 ml/min@ 40 psi N_2 inlet		
Viton	Lubricated	BNV1LF
Viton	Non-lubricated	BNV1LF-D
Kalrez	Non-lubricated	BNV1LF-KZ

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.

Gas Flow Controllers

Flow controllers provide a stable flow rate under varying pressure.

VICI flow controllers are precision machined from aluminum or stainless bar stock to eliminate the contamination often found in die-cast parts. Positive flow shut-off is provided by an integral Viton-sealed adjustment valve. In all our flow controllers, the inlet pressure must exceed the outlet pressure by 10 psi.

Model 100 gas flow controller

Fixed span upstream referenced flow controller

The Model 100 is available in a variety of preset maximum flow rates, from 150 mL/min to 10 liters/min (N_2 at 40 psi). This series of flow controller can be equipped 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

Standard fittings:
- 1/8" external tube fittings (EAOR22)

Other fittings are available. Contact the factory for further information.

	Aluminum body Viton diaphragm		Aluminum body SS diaphragm	SS body Viton diaphragm	SS body SS diaphragm
Flow rate /min	*Prod No*	*Price*	*Prod No*	*Prod No*	*Prod No*
With standard control knob					
0 - 150 mL	FC10AV1K	$195	FC10AS1K	FC10SV1K	FC10SS1K
0 - 250 mL	FC10AV2K	195	FC10AS2K	FC10SV2K	FC10SS2K
0 - 850 mL	FC10AV3K	195	FC10AS3K	FC10SV3K	FC10SS3K
0 - 1.2 L	FC10AV4K	195	FC10AS4K	FC10SV4K	FC10SS4K
0 - 4.5 L	FC10AV5K	195	FC10AS5K	FC10SV5K	FC10SS5K
0 - 10.0 L	FC10AV6K	195	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

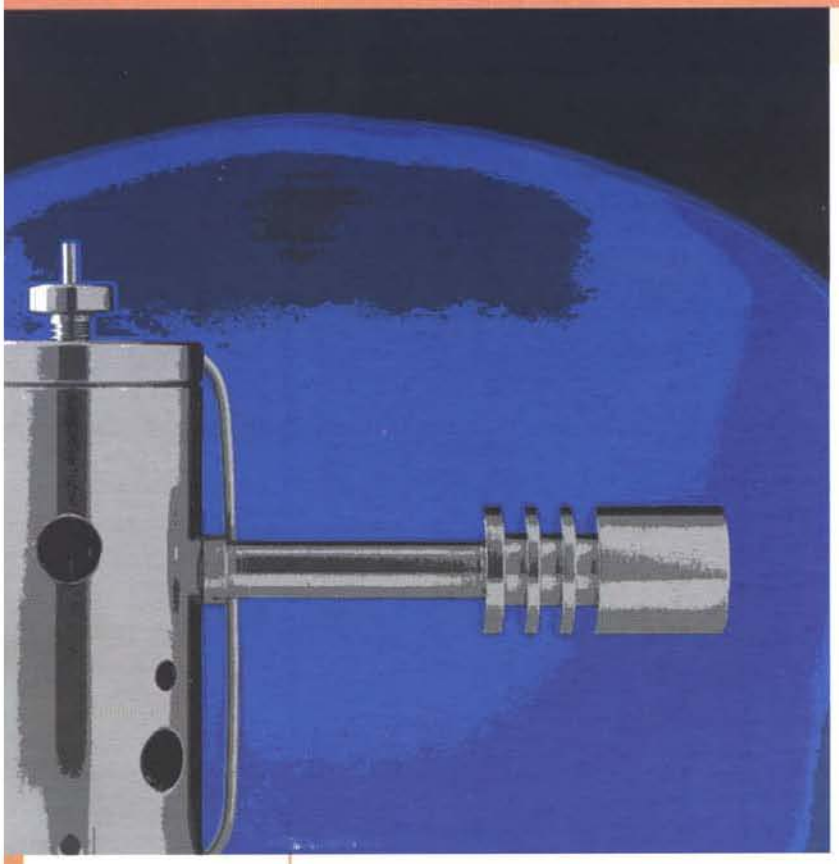
ALTERNATE FITTING TYPES

Models 100 and 300
The standard is the EAOR22 1/8" external tube fitting. Alternative fitting types are listed below. Order separately.

Internal fitting with O-ring seal	*Prod No*
1/8" to 5/16-24	ZAOR22
1/16" to 5/16-24	ZAOR12

Model 202
The standard 1/8" NPT female pipe thread with pipe adapters to 1/16" OD tubing included. Another adapter is listed below. Order separately.

1/8" NPT male pipe to Valco internal 1/8"	*Prod No*
	PZA22



Instrumentation

Most of the components we supply to the instrumentation industry are from our valve and fitting lines. The rest, from our R&D 100 Award-winning pulsed discharge detectors to our application-dedicated trace gas analyzers, are primarily for gas detection and purification.

Pulsed Discharge Detectors

Non-Radioactive, Multiple Mode Electron Capture / Helium Photoionization

VICI PDDs (pulsed discharge detectors) utilize a stable, low powered, pulsed DC discharge in helium as an ionization source. Eluants from the column, flowing counter to the flow of helium from the discharge zone, are ionized by photons from the helium discharge. The bias electrode(s) focus the resulting electrons toward the collector electrode, where they cause changes in the standing current which are quantified as the detector output. Performance is equal to or better than detectors with conventional radioactive sources.

In the electron capture mode, the PDD is a selective detector for monitoring high electron affinity compounds such as freons, chlorinated pesticides, and other halogen compounds. For this type of compound, the minimum detectable quantity (MDQ) is at the femtogram (10^{-15}) or picogram (10^{-12}) level.

In the helium photoionization mode, the PDD is a universal, non-destructive, high sensitivity detector. The response to both inorganic and organic compounds is linear over a wide range. Response to fixed gases is positive (increase in standing current), with an MDQ in the low ppb range.

The PDD in helium photoionization mode is an ideal replacement for FIDs in petrochemical or refinery environments, where the hydrogen and flame can be problematic. In addition, when the discharge gas is doped with argon, krypton, or xenon (depending on the desired cutoff point), the PDD functions as a specific photoionization detector for selective determination of aliphatics, aromatics, amines, and other species.

R&D 100 AWARD WINNER

The VICI pulsed discharge detector was named one of the 100 premier new products of 1996.

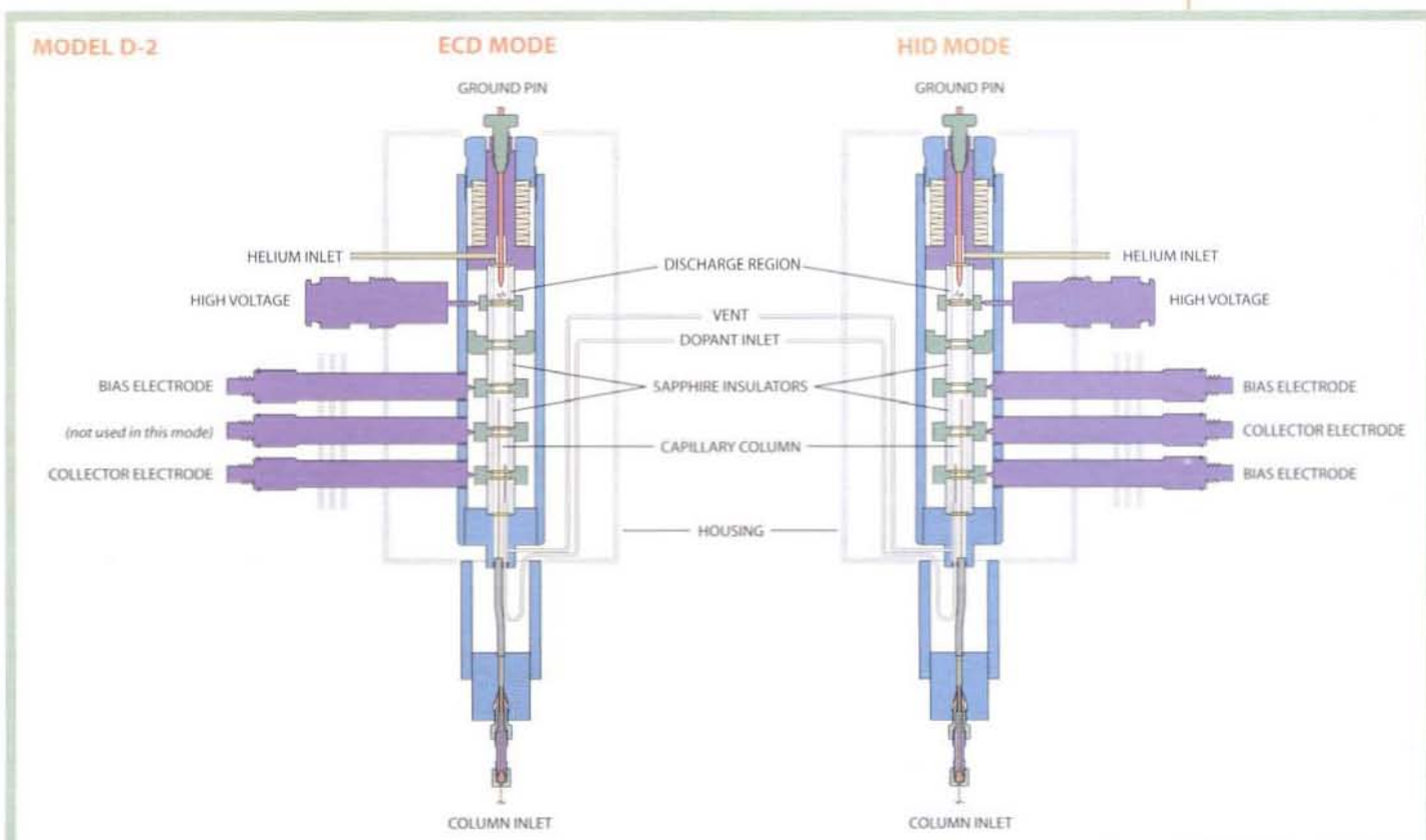
Model D-2

The D-2 is a dual mode, universal detector system which can be retrofitted to your older GC. The D-2-I is optimized for trace level work in the helium photoionization mode. The stand-alone systems include detector, controller, electrometer, helium purifier, and power supply.

PDD Model D-2 *Stand-alone system*

Detector system includes detector cell, pulser, controller, electrometer, and helium purifier.

	110 VAC	230 VAC
Description	*Prod No*	*Prod No*
Mode-selectable universal 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



Plug-and-play detectors for Agilent 6890

Models D-3 and D-5 are designed for plug- and-play installation on the Agilent 6890. The D-3 is optimized for trace level work in the helium photoionization mode, and the newer D-5 is optimized for electron capture detection. Both versions utilize the electonics and power supply of the host 6890.

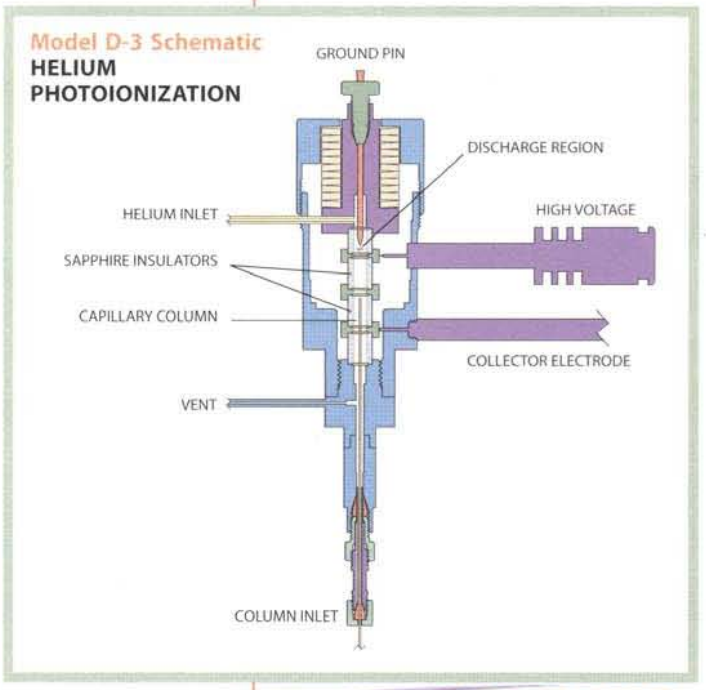
D-3-I-HP plug-in system for Agilent 6890 GC

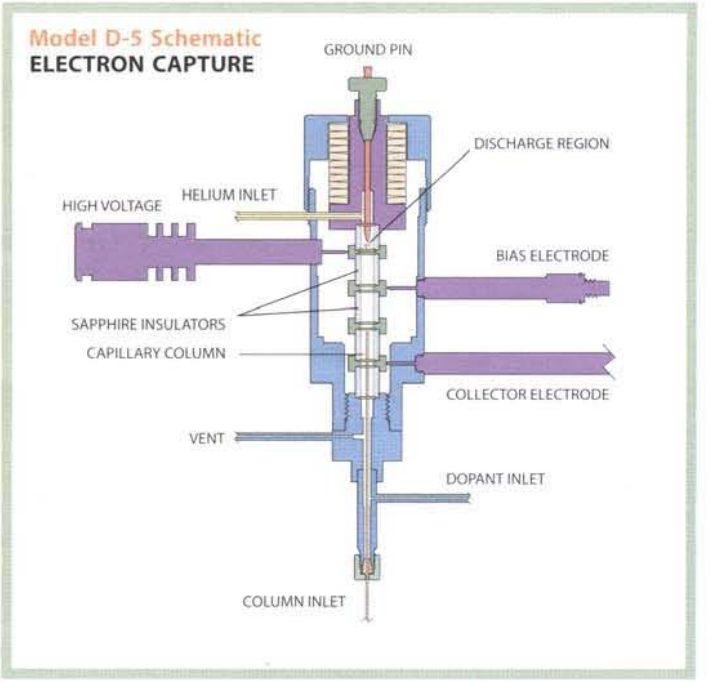
PDD Model D-3 — *Helium photoionization*

			110 VAC		230 VAC
Description		*Prod No*	*Price*	*Prod No*	*Price*
Detector optimized for trace level work in helium photoionization mode					
	Plug-in system for Agilent 6890	D-3-I-HP	$5400	D-3-I-HP-220	$5400

PDD Model D-5 — *Electron capture*

		110 VAC	230 VAC
Description		*Prod No*	*Prod No*
Detector optimized for electron capture detection			
	Plug-in system for Agilent 6890	D-5-6890	D-5-6890-220





Plug-and-play detectors for other GCs

Pulsed Discharge Detector Models D-4 and D-6 are available in versions for easy installation on most of the GCs in current use, including the Varian 3800, Shimadzu 14 and 17, ThermoFinnigan Trace, Mega, and Top, and Hewlett Packard 5890. The D-4 is single mode, optimized for trace level work in the helium photoionization mode, and the D-6 is an electron capture detector.

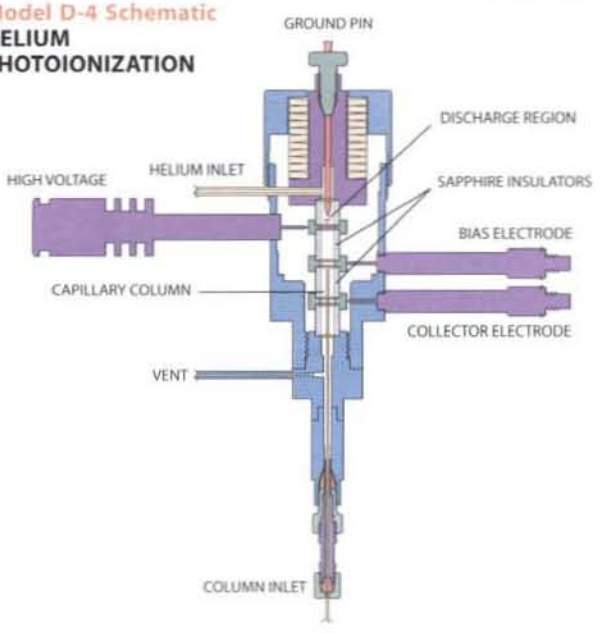
PDD Model D-4 — *Helium photoionization*

Description	110 VAC *Prod No*	230 VAC *Prod No*
Detectors optimized for trace level work in helium photoionization mode		
Specialized detector for		
HP 5890	D-4-I-HP58	D-4-I-HP58-220
Shimadzu GC 14 *	D-4-I-SH14-R	D-4-I-SH14-R-220
Shimadzu GC 17 *	D-4-I-SH17-R	D-4-I-SH17-R-220
Thermo Trace GC *	D-4-I-TQ-R	D-4-I-TQ-R-220
Varian 3800 *	D-4-I-VA38-R	D-4-I-VA38-R-220
* Uses existing GC FID electrometer.		
For all other GCs	D-4-I	D-4-I-220

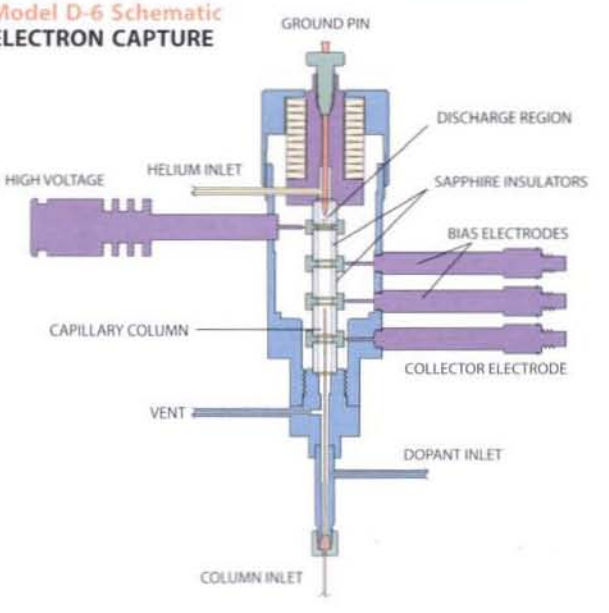
PDD Model D-6 — *Electron capture*

Description	110 VAC *Prod No*	230 VAC *Prod No*
Detectors optimized for electron capture detection		
Specialized detector for		
HP 5890	D-6-HP58	D-6-HP58-220
Shimadzu GC 17 *	D-6-SH17-R	D-6-SH17-R-220
Thermo Trace GC *	D-6-TT-R	D-6-TT-R-220
Varian 3800 *	D-6-VA38-R	D-6-VA38-R-220
* Uses existing GC FID electrometer.		

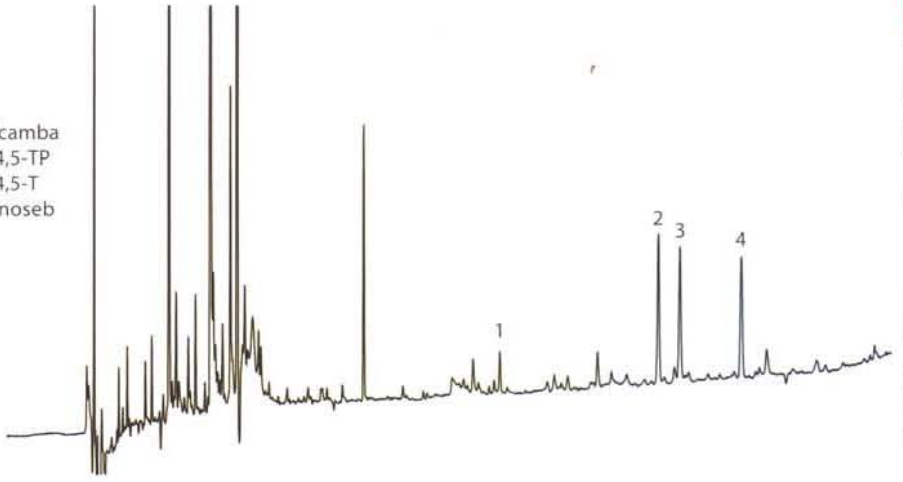
Model D-4 Schematic
HELIUM PHOTOIONIZATION



Model D-6 Schematic
ELECTRON CAPTURE

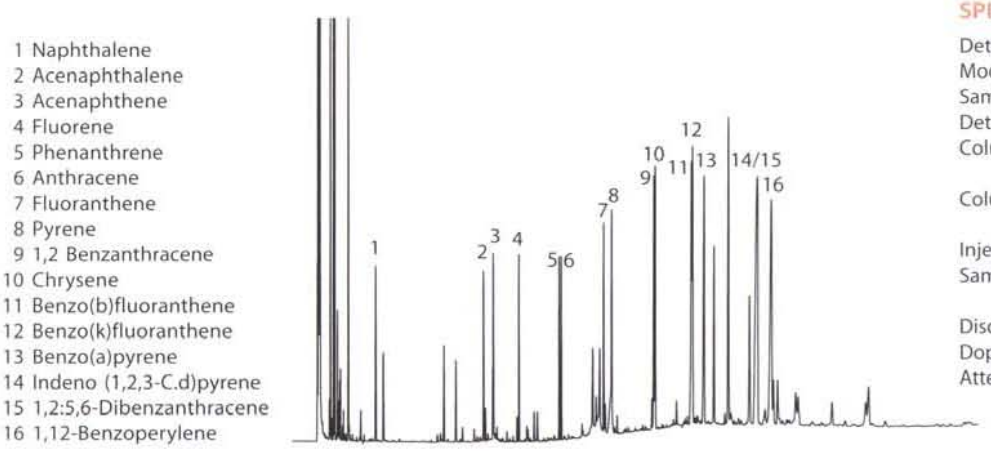


Pulsed Discharge Detector Applications



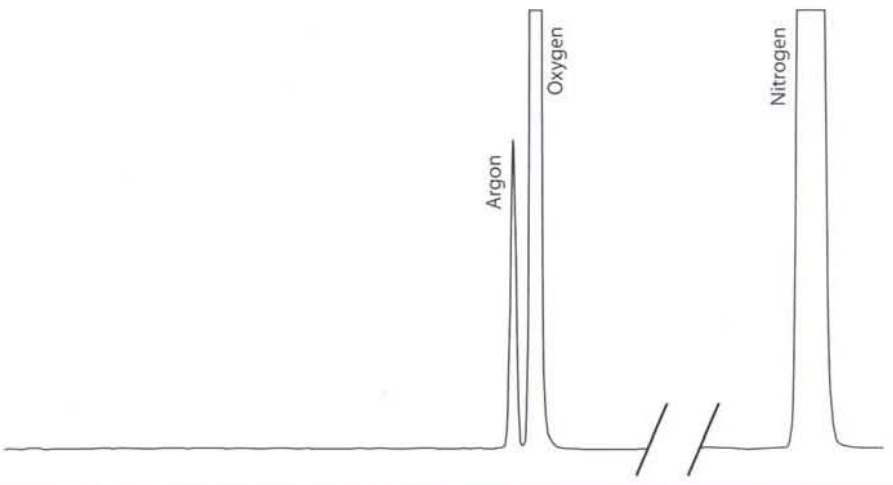
HERBICIDES IN SOIL SAMPLES USING EPA METHOD 8151

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



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



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 (helium purifier) 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 (nitrogen purifier) is similar, purifying nitrogen to sub-ppm levels of gaseous impurities.

The purification substrate in Valco gas purifiers is a non-evaporable gettering alloy. This stable alloy is contained in a welded assembly, so the purifiers can be used safely in industrial applications with minimal precautions. The getter is activated by heating, which eliminates the oxide film on the particle surface and allows helium to diffuse into the bulk of the getter particles. The HP2 and NP2 feature a self-regulating design which eliminates the possibility of thermal runaway and maintains the getter material at the optimum temperature.

Standard helium and nitrogen purifiers

Includes universal power supply.

	Helium purifier	Nitrogen purifier
Description	*Prod No*	*Prod No*
110 VAC	HP2	NP2
230 VAC	HP2-220	NP2-220

Replacement getter assembly

Helium	I-23572HP2
Nitrogen	I-23572NP2

HELIUM PURIFIER

- CE certified
- Gases purified: He, Ne, Ar, Kr, Xe, Rn
- Maximum operating pressure: 1000 psig
- Impurities removed: Outlet impurities less than 10ppb H_2O, H_2, O_2, N_2, NO, NH_3, CO, CO_2, and CH_4, based on 10ppm total inlet impurities. Other impurities removed include CF_4, CCl_4, SiH_4 and light hydrocarbons.
- Impurities ***not*** removed: He, Ne, Ar, Kr, Xe, Rn

NITROGEN PURIFIER

- CE certified
- Gases purified: N_2 only
- Impurities removed: Outlet impurities less than 10ppb H_2O, H_2, O_2, NO, NH_3, CO, CO_2, and CH_4, based on 10ppm total inlet impurities. Other impurities removed include CF_4, CCl_4, SiH_4 and light hydrocarbons.
- Impurities ***not*** removed: He, Ne, Ar, Kr, Xe, Rn, N_2

Miniature Gas Purifiers

The Valco Miniature Helium Purifier (HPM) and Miniature Nitrogen Purifier (NPM) are designed to be installed in a gas chromatograph's flow path immediately upstream of the injector. The HPM/NPM will remove any contaminants introduced by flow controllers, elastomeric tube seals, pressure regulators, crude traps, or other system components that are not completely clean and leak-tight.

Mini helium and nitrogen purifiers

Includes universal power supply.

	Helium purifier	Nitrogen purifier
Description	*Prod No*	*Prod No*
110 VAC	HPM	NPM
230 VAC	HPM-220	NPM-220

Microvolume Thermal Conductivity Detector

Our dual filament TCD is a stand-alone unit consisting of the detector housing and a controller with electrometer and temperature controls. The detector cell includes two separate nickel/iron filaments, capable of independent or referenced (differential) operation. Cell volume and geometry are optimized for capillary chromatography and enhanced sensitivity at low flow rates. (Recommended total flow rate: 2-10 mL/min.) Thermal stability is maintained to ±0.02°C, resulting in a stable, noise-free signal. A single 0-1 millivolt attenuated output for a strip chart recorder is provided through the signal cable at the rear of the controller, with 0-1 volt and 0-10 volt unattenuated signals available through the remote signal cable.

TCD Thermal conductivity detectors

	110 VAC	230 VAC
Description	*Prod No*	*Prod No*
Entire unit (cell and electronics)	TCD2-NIFE	TCD2-NIFE-220
Cell/oven assembly only Dual filament	TCD2-NIFED	TCD2-NIFED-220
TCD controller only	TCD2-C	TCD2-C-220
NIFE filament assembly (set of 2)	TCD2-NIFE-FA	TCD2-NIFE-FA

General Reference

This section contains background information to supplement the product discussions on the preceding pages. You will find a glossary of terms, safety and trademark information, and discussions of the mechanical and chemical properties of the materials used in the manufacturing of our products. Additional information, including a complete library of technical notes and manuals, can be found in the support section of our website at www.vici.com.

Safety

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 insuring 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.

Warranty

This Limited Warranty gives the Buyer specific legal rights, and a Buyer may also have other rights that vary from state to state.

For a period of 365 calendar days from the date of shipment, Valco Instruments Company, Inc. (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace defective and/or nonconforming goods or parts without charge for material or labor OR at Seller's option demand return of the goods and tender repayment of the price. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods OR at Seller's option return of the goods and repayment of the price.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resulting from, or relating in any manner to these goods.

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items, such as but not limited to valve seals or ferrules. This warranty is VOID when repairs are performed by a non-authorized service center or representative.

If you have any problem locating an authorized service center or representative, please call, fax, or write the Service Department, listed at right.

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.

NORTH, SOUTH, AND CENTRAL AMERICA (except Canada);

VALCO INSTRUMENTS CO. INC.

SALES

TECHNICAL

SERVICE

EUROPE, MIDDLE EAST, ASIA, AND OTHER COUNTRIES

VICI INTERNATIONAL (VICI AG)

SALES

TECHNICAL

SERVICE

CANADA

VICI VALCO INSTRUMENTS CANADA CORPORATION

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

CTFE
Valcon E
Valcon E2
Valcon H
Valcon M
Valcon T
Valcon TF
Valcon X

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

Properties of Metals

Stainless steel, Type 316

This is the standard tubing material for chromatography, suitable for a wide variety of applications. It is cold drawn seamless, not welded, with close tolerances held on both ID and OD. We neither recommend nor offer Type 304 stainless steel for analytical applications.

Austenitic stainless steels may be used for most chromatographic applications. Type 316 is most commonly used for HPLC because of its superior chloride ion resistance.

Stainless steel, Type 303

Recommended for GC use and general purpose connections, combining excellent machining characteristics with good resistance to corrosion and high temperature oxidation. Susceptible to attach by chlorides, iodides, and bromides.

Stainless steel, gold-plated

Improved inertness and high-integrity sealing for applications such as ultra pure gas analysis.

Electroformed nickel (EFNI)

We electroplate pure nickel over a diamond drawn mandrel in a continuous process, then carefully separate and remove the mandrel from the tubing. The result is an extremely inert and smooth (1–2 microinch finish) interior surface. 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.

Tantalum

Superior resistance to all acids except hydrofluoric and hot sulfuric. Good for most aqueous salt solutions, but attacked by alkalis. Oxidizes in air at temperatures above 150°C. *Note:* Current availability of tantalum is very limited, making it extremely expensive.

Titanium

Although it is more difficult to machine than common alloys containing aluminum and vanadium, Valco uses Grade 2 pure titanium in order to avoid possible contamination of the sample stream with these metals. Good for organic and inorganic salts except aluminum and calcium chlorides, and all alkalis except boiling concentrated potassium hydroxide. Good with dilute, low temperature formic, lactic, sulfuric, hydrochloric, and phosphoric acids, but rapidly attacked by hydrofluoric acid. Good with dilute nitric acid at low temperatures; corrodes at high concentrations and temperatures. Can ignite with fuming nitric acid. Attacked by oxalic acid, concentrated phosphoric acid, hot trichloroacetic acid, and zinc chloride.

Due to the nature of this metal, valves made of titanium typically have a shorter lifetime than HPLC grade stainless steel or Hastelloy C-22.

Zirconium

Excellent resistance to hydrochloric acid, good with hot sulfuric acid at concentrations up to 70% and boiling nitric acid at up to 90%. Attacked by hydrofluoric acid.

Brass

Used where a soft metal ferrule is desirable but no corrosive materials are present. Although Valco brass ferrules work as replacements in inexpensive commercial brass fittings, they are generally not recommended for chromatography applications.

Properties of Polymers

CTFE

Chlorotrifluoroethylene, is the generic name for the material produced as Kel-F® and as Aclar®. It is very resistant to all chemicals except THF and some halogenated solvents, and is resistant to all inorganic corrosive liquids, including oxidizing acids. CTFE can be used at temperatures up to 100°C. Swells in ketones.

ETFE

Ethyltrifluoroethylene is the generic name for the material such as Tefzel®. A fluoropolymer used for sealing surfaces, it is resistant to most chemical attack; however, some chlorinated chemicals will cause a physical swelling of ETFE tubing.

FEP

Fluorinated ethylene propylene is another member of the fluorocarbon family with similar chemical properties. It is generally more rigid than PTFE, with somewhat increased tensile strength. It is typically more transparent than PTFE, slightly less porous, and less permeable to oxygen. FEP is not as subject to compressive creep at room temperature as PTFE, and because of its slightly higher coefficient of friction is easier to retain in a compression fitting.

PAEK

Polyaryletherketone is the generic name for the family of polyketone compounds. (See PEEK.) PAEK includes PEK, PEEK, PEKK, and PEKEKK, which differ in physical properties and, to a lesser degree, in inertness.

PAEK (cont'd)

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, poly-etheretherketone 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 will be substantially reduced at elevated temperatures and in contact with some solvents or acids.

Its mechanical properties allow PEEK to be used instead of 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. This tubing is highly prone to "kinking", or sealing off, if held in a sharp bend over time.

We do not recommend PEEK tubing for critical, hazardous, or long term use, particularly at high pressures.

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®.

About Rotor Materials

A variety of polymeric composites have been developed to meet a variety of customer requirements for rotors, since no single material will perform satisfactorily in all situations. This brief summary of each polymer's particular features and potential drawbacks is provided to allow the user to make a more informed valve selection. Consult our technical specialists for any additional questions. *VICI polymer composites are proprietary formulations: only the generic compound class can be discussed.*

The specifications in the following discussions are for two position valves. Multiposition valves 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.

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 can be used at temperatures up to 100°C. Swells in ketones.

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 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.

Glossary

Adapter: a type of fitting which provides a method of joining two components of differing thread types or systems.

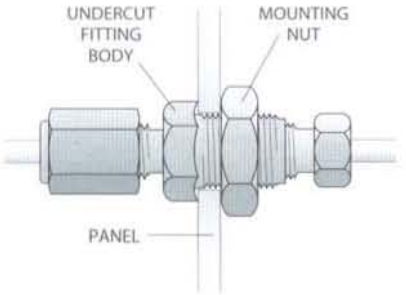
Analytical column: a long narrow tube packed or coated with one of many available chemically diverse compounds that can separate the components in a sample according to their boiling point, polarity, molecular size, or combination thereof. A column of some kind is used with most chromatographic techniques.

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.

Cap: A cap is used to dead-end a piece of tubing with a nut and ferrule attached.

Capillary bore: the smallest available standard orifice in a given fitting design (usually 0.25 mm). Typically denoted by suffix "C" in the product number.

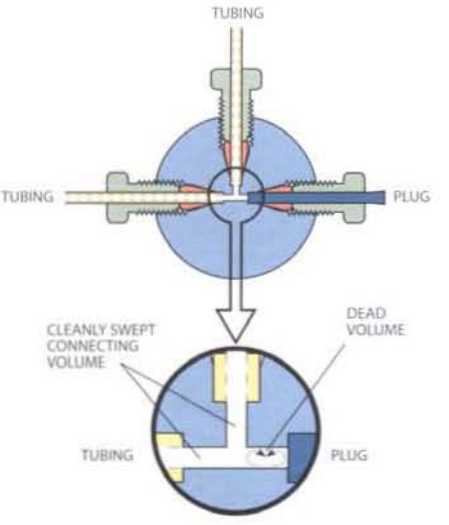
Closemount hardware: the mounting components providing the most direct, shortest attachment of valve to actuator.

Compression fitting: a style of fitting in which a threaded nut compresses a tapered ferrule onto tubing as the nut is tightened. Valco metal ferrules cut a ring into the tubing wall while polymer types rely on surface compression to form a seal.

Connecting volume: the volume between two or more connections. This may be cleanly swept, thus not contributing to peak distortion, or may be "dead volume" such as that found in fittings with larger bores than the connecting tubing.

Cross: a type of distribution fitting which connects four pieces of tubing, arranging them in the pattern of a cross.

Dead volume: any volume which a component introduces to a system that is not cleanly swept and relies on diffusion to clear the space. See **connecting volume**.



Detail: see **fitting detail**.

Distribution fitting: a generic term for tees, crosses, and manifolds, used to provide multiple access points to "distribute" a gas or liquid through a system. *CAUTION!* Using a distribution fitting in reverse to coalesce multiple streams may create dead volume. Special manifolds are available for this application.

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

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.

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.

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.

ID: internal diameter.

Inert: technically, unreactive with other substances; however, in the instrumentation field, "inert" is a relative term. Often polymers are termed inert but are soluble in some fluids and can react with some compounds.

Internal fitting: a type of compression fitting in which the fitting body has female threads; an internal *nut* has male threads.

INTERNAL UNION

INTERNAL REDUCING UNION

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.

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.

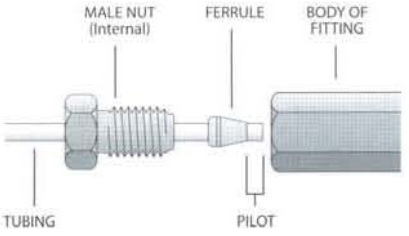
Nanovolume: Nanovolume generally refers to components with bore sizes less than 250 µm (0.010").

NPT: National Pipe Thread; a standardized tapered pipe fitting. See **pipe thread**.

Nut: the tensioning component of a compression fitting. As the threaded nut is tightened into the fitting detail, it pushes the ferrule forward into the tapered ferrule seat, causing it to make up on the tube.

OD: outside diameter.

Pilot: the tubing which extends beyond the ferrule in a made-up fitting, or the integral portion of a ZRF internal reducing ferrule which extends beyond the ferrule. See also **pilot depth**.



Pilot depth: the length of the tubing diameter cavity beyond the tapered ferrule seat within a fitting detail. Valco fitting pilot depths are tightly controlled to facilitate the interchangeability of components without the risk of leaks or dead volume.

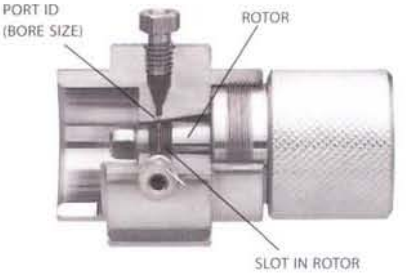
Pipe thread: the external or internal threads of a fitting designed to effect a metal-to-metal seal on the conical thread faces. This type of fitting does not "bottom out" in the detail. Typically used with PTFE tape or other compound to lubricate the threads; however, since the diffusion rate of air components through the PTFE tape is considerable, pipe fittings should not be used in systems where leakage rates are critical.

Port: the connection, orifice, seal, or septum, etc., through which sample may be added (injected) or withdrawn.

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

SFE: Supercritical Fluid Extraction. An extraction technique using a fluid in its supercritical state as the extraction medium. Some liquids and mixtures maintained above a critical temperature and pressure exhibit properties of both the liquid and gas phases of the element. These are defined as supercritical. CO_2 is a common supercritical fluid. Extreme caution must be used with supercritical CO_2, since uncontrolled expansion (leaks) can be very hazardous due to the substantial stored energy.

SFC: Supercritical Fluid Chromatography. An analytical technique using a supercritical fluid (see SFE) as the mobile phase/carrier.

Screen: a replaceable filter element generally made of Type 316 stainless steel, usually 0.003" thick. Screens clog less frequently than frits, and because they are thinner there is less mixing; however, they are less effective filters.

Sideloading: any force on the valve rotor other than the proper rotational force along the axis of the rotor, often resulting in leakage or increased wear. It is typically caused by actuation misalignment, over-rotation, or improper mounting of the valve.

Standard bore: a bore which was chosen as the standard for a particular fitting, typically based on the most common tubing ID used with that fitting.

Standoff: an extension between a valve and actuator which allows the valve to be installed in a different temperature zone from the actuator. Standoffs come in several different lengths.

Stator: the stationary component of a valve. Typically, it contains the fittings as well as one of the fluid sealing surfaces. In Valco valves, the stator is called the valve body.

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.

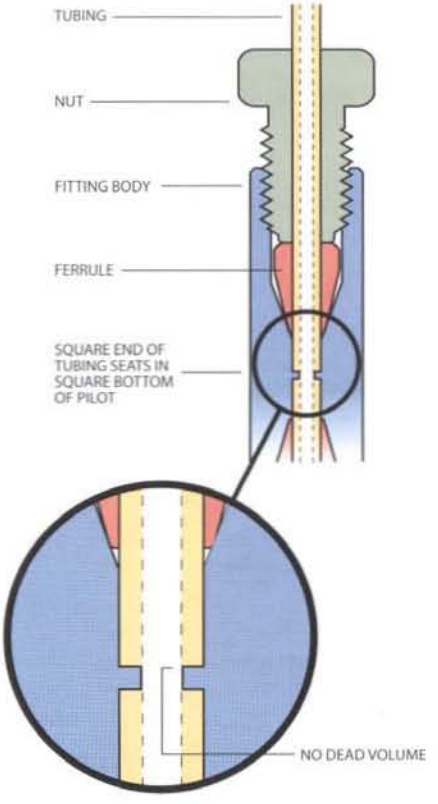
Union: a fitting for connecting two pieces of tubing of the same OD.

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.

Wetted surfaces: the surfaces which are contacted by the sample stream.

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".

Zero dead volume (ZDV): describes a connection which does not add volume to the system beyond what an extension of tubing would in its place.



Zero volume: while often used interchangeably with zero dead volume, it ideally describes a fitting design in which there is no internal volume, such as a through-type union designed to butt-fit two pieces of tubing.

Length, Pressure, and Temperature Conversions

LENGTH CONVERSIONS

mm	inches
0.12	.005"
0.15	.006"
0.25	.010"
0.40	.016"
0.50	.020"
0.75	.030"
1.0	.040"
1.5	.060"
2.0	.080"
4.6	.180"
6.0	.236"
6.4	.253"
7.0	.276"
10.0	.400"

inches	mm
1/32"	0.8
1/16"	1.6
1/8"	3.2
1/4"	6.4
3/8"	9.5
1/2"	12.7
1"	25.4

PRESSURE CONVERSIONS

psi	KPa	BAR	Atm
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

psi	KPa	BAR	Atm
750	5171.1	51.7125	51.0375
775	5343.47	53.43625	52.73875
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
10000	68948	689.5	680.5

TEMPERATURE CONVERSIONS

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-40	-40	35	95	110	230	185	365	260	500	335	635	650	1202
-35	-31	40	104	115	239	190	374	265	509	340	644	675	1247
-30	-22	45	113	120	248	195	383	270	518	345	653	700	1292
-25	-13	50	122	125	257	200	392	275	527	350	662	725	1337
-20	-4	55	131	130	266	205	401	280	536	375	707	750	1382
-15	5	60	140	135	275	210	410	285	545	400	752	775	1427
-10	14	65	149	140	284	215	419	290	554	425	797	800	1472
-5	23	70	158	145	293	220	428	295	563	450	842	825	1517
0	32	75	167	150	302	225	437	300	572	475	887	850	1562
5	41	80	176	155	311	230	446	305	581	500	932	875	1607
10	50	85	185	160	320	235	455	310	590	525	977	900	1652
15	59	90	194	165	329	240	464	315	599	550	1022	925	1697
20	68	95	203	170	338	245	473	320	608	575	1067	950	1742
25	77	100	212	175	347	250	482	325	617	600	1112	975	1787
30	86	105	221	180	356	255	491	330	626	625	1157	1000	1832

PATENTS

Among important US patents held by VICI are the following. Others are pending and may have been granted by the time of publication.

6,575,501	Collapsible bushing
6,247,731	Nut w/ controlled radius
6,511,528 6,099,619 5,858,068	Purification of CO_2
6,074,459	Ultra pure gas process
6,193,213	XL valves
6,030,436	Permeation tube
6,202,698	Diaphragm valve
5,153,519 5,317,271 5,394,090 5,394,091 5,394,092 5,541,519 5,532,599 5,528,150 5,594,346 5,767,683 5,858,068 6,133,740 6,842,008	Pulsed discharge detectors
5,234,235 4,991,883	Fused silica unions
5,329,966	Calibrated flow controllers
4,064,908	Combo valves
4,173,363 4,281,679	Internal reducers, filters, external reducers, and precolumns
4,196,654	Air actuators
4,022,065	HPLC injectors
5,741,126	Pump

TRADEMARKS

Cheminert	Valco Instruments Co. Inc. and VICI International
Condyne	VICI Metronics Inc.
Delrin	E.I. duPont de Nemours
Dynacal	VICI Metronics Inc.
Dynacalibrator	VICI Metronics Inc.
Fortron	Celanese
Hamilton	Hamilton
Hastelloy C	Haynes International
HayeSep	Hayes Separations, Inc.
IBM	International Business Machines
Inconel 600	Huntington Alloys, Inc.
Kalrez	DuPont Dow Elastomers
Kel-F	3M Company
Kynar	Elf Atochem North America Inc.
Mat/Sen	Valco Instruments Co. Inc.
Metronics	VICI Metronics Inc.
Micro-Flo	Valco Instruments Co. Inc.
Mininert	Valco Instruments Co. Inc.
Monel 400	Huntington Alloys, Inc.
Nanovolume	Valco Instruments Co. Inc.
Nickel 200	Huntington Alloys, Inc.
Nitronic 50	Crucible Specialty Metals
Nitronic 60	Crucible Specialty Metals
Parker	Parker Hannifin co.
Perifit	Valco Instruments Co. Inc.
Pressure-Flo	Valco Instruments Co. Inc.
Pressure-Lok	Valco Instruments Co. Inc.
Ryton	Phillips Petroleum Co.
Swagelok	Crawford Fitting Company
Teflon	E.I. duPont de Nemours
Tefzel	E.I. duPont de Nemours
Tygon	Norton Performance Plastics
ValcoBond	Valco Instruments Co. Inc.
ValcoPLOT	Valco Instruments Co. Inc.
Vespel	E.I. duPont de Nemours
Viton	DuPont Dow Elastomers
VICI	Valco Instruments Co. Inc. and VICI International
Waters	Waters Associates