

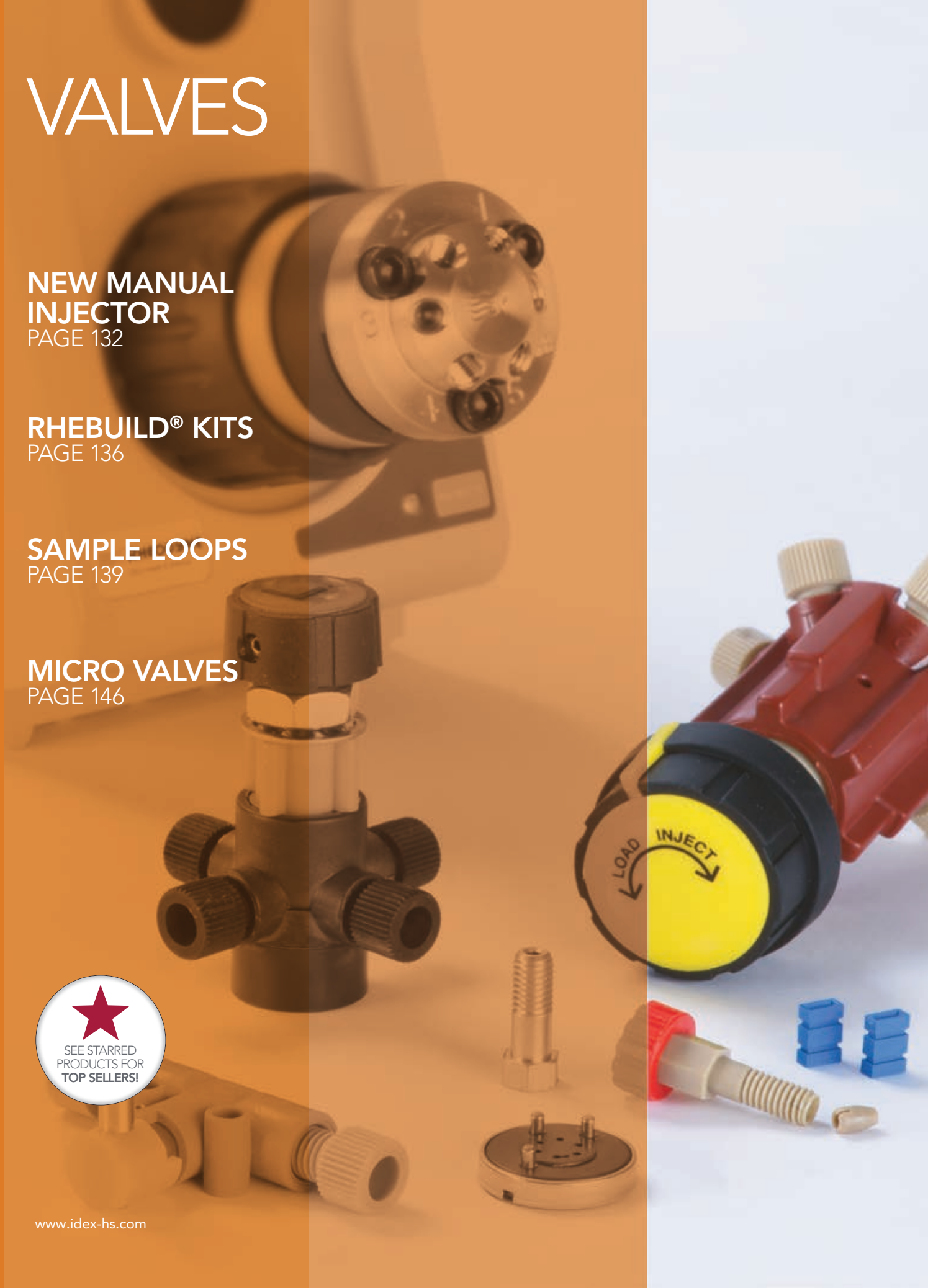
VALVES

**NEW MANUAL
INJECTOR**
PAGE 132

RHEBUILD® KITS
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SAMPLE LOOPS
PAGE 139

MICRO VALVES
PAGE 146



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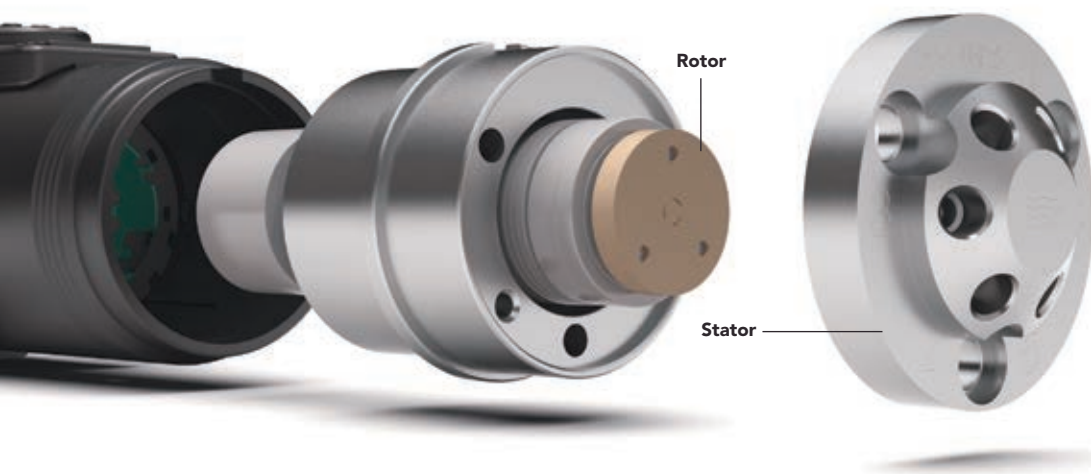
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Rotary Shear Valves

Rheodyne® Rotary Shear Valves were developed in tandem with the evolution of liquid chromatography, where combinations of elevated system pressures, aggressive chemicals, and ever-diminishing fluid volumes continually challenged system manufacturers who required highly precise fluid control and delivery. Today, many other disciplines utilize Rotary Shear Valves for their versatility, reliability, repeatability, long system uptime, and easy preventive maintenance.



Valve Overview

Valve Module	Flow Configurations	Page
ACTUATED VALVES		
UP TO 15,000 PSI		
Switching	<ul style="list-style-type: none"> • 2-Position, 6-Port • 2-Position, 10-Port 	130
Injection	<ul style="list-style-type: none"> • For Injection, add the appropriately sized Sample Loop to the Switching valves above 	130
Selection	<ul style="list-style-type: none"> • 6-Position, 7-Port 	130
UP TO 6,000 PSI		
Switching	<ul style="list-style-type: none"> • 2-Position, 6-Port (Analytical and Nano Scale) • 2-Position, 10-Port (Analytical and Nano Scale) 	130
Injection	<ul style="list-style-type: none"> • For Injection, add the appropriately sized Sample Loop to the Switching valves above • 2-Position, 6-Port (vertical port) 	130
Selection	<ul style="list-style-type: none"> • 6-Position, 7-Port 	130
UP TO 125 PSI		
Switching	<ul style="list-style-type: none"> • 2-Position, 6-Port • 2-Position, 6-Port (Double 3-Way) 	130
Selection	<ul style="list-style-type: none"> • 6-Position, 7-Port • 10-Position, 11-Port 	130

Valve Module	Flow Configurations	Page
MANUAL VALVES		
UP TO 15,000 PSI		
NEW! Injection	<ul style="list-style-type: none"> • 2-Position, 6-Port (Front-Loading, 9,000 psi) 	132
UP TO 6,000 PSI		
Switching	<ul style="list-style-type: none"> • 2-Position, 6-Port (Analytical and Micro Scale) 	132
Injection	<ul style="list-style-type: none"> • 2-Position, 6-Port 	132
Selection	<ul style="list-style-type: none"> • 6-Position, 7-Port 	
UP TO 1,000 PSI		
Switching	<ul style="list-style-type: none"> • 2-Way, Right Angle 4-Position, 4-Port • 3-Way, T-Shape 4-Position, 4-Port • 4-Way, Diagonal Flow 4-Position, 4-Port 	133
Injection	<ul style="list-style-type: none"> • 2-Position, 6-Port 	133
Selection	<ul style="list-style-type: none"> • 6-Position, 7-Port 	133

Choosing a Rotary Shear Valve

Evaluating some simple variables will assist you in choosing the best valve for your needs.

Identify the Operating Pressure of Your Instrument or Application

Valves are designed to repeatedly deliver specific fluids to different locations in a fluidic circuit. Achieving fluidic precision at 15,000 psi requires different valve-design features than what's required to achieve fluidic precision at 100 psi. A wide variety of variables such as valve architectures, metals, polymers, coatings, actuation speeds, and manufacturing techniques have been tested to achieve the fluidic accuracy and precision required for the full array of pressure conditions in life science applications. In this catalog, we define four separate pressure groupings:

Up to 15,000 psi (1,035 bar)	UHPLC/Fast Chromatography
Up to 6,000 psi (410 bar)	HPLC
Up to 1,000 psi (69 bar)	Upchurch Scientific®
Up to 125 psi (8.5 bar)	Low Pressure/Atmospheric Pressure

Identify the Range of Flow Rates in Your System

Because Rotary Shear Valves have been used most often in chromatography systems, certain flow rate ranges have evolved functionally. However, these ranges can apply to any system, not just chromatography:

- ▶ Micro/Nano Scale — flow rates less than 100 μ L per minute
- ▶ Analytical Scale — flow rates from 100 μ L to 10 mL per minute
- ▶ Prep (or Semi-Prep) Scale — flow rates greater than 10 mL per minute

Decide What You Want the Valve to Do

In this chapter Rotary Shear Valves perform three functions:

- ▶ Switching one or more flow paths to a different destination under pressure
- ▶ Injection into a flowing stream under pressure
- ▶ Selection/distribution of a variety of system liquids by means of a common port
- ▶ Read more about valve functions on pages 128–129

Identify Whether You Want Automated or Manual Control

An automated valve offers more sophisticated functionality. Choose an automated valve if the application requires fast, consistent flow-stream switching. Some other advantages of automated valves include control options (PC- or instrument-triggered), higher torque operation, valve-position feedback, or very small flow paths.

Choose a manual valve if your application involves low frequency of use, demands operator control, or involves injection of smaller sample volumes. (See page 129 for more on Single Mode vs. Dual Mode operation.)

Identify the Chemical Compatibility Requirements Related to Your Fluids

Consulting the chemical compatibility chart in the Technical Resources section at the back of The IDEX Health & Science Laboratory Products catalog helps identify what valve materials to use—and avoid—in your application. You can also find Chemical Compatibility information at www.idex-hs.com under Materials and Tools.

Identify Fluidic Connection Requirements in Your System

The rotary shear valves in this catalog accommodate one or more of the following tubing outer diameters: 1/8", 1/16", or 1/32".

Effects of Valves and Tubing on Resolution

The effect of tubing on analytical and microscale analyses can be significant. Since dispersion caused by tubing is proportional to the fourth power of diameter, large bore tubing should be avoided when performing analytical scale or microscale analyses. Tubing ID size ≤ 0.25 mm (0.010") is recommended.

Consider a system with injection and column switching valves and analytical columns with small-bore connecting tubing. The chromatograms below, made using a typical analytical chromatograph, show these effects. Scheme A is the control (injection valve \rightarrow column \rightarrow detector) with no valve in the system. In Schemes B and C, two model 7060 Six-Position Switching Valves were placed side by side (injection valve \rightarrow valve #1 \rightarrow column \rightarrow valve #2 \rightarrow detector).

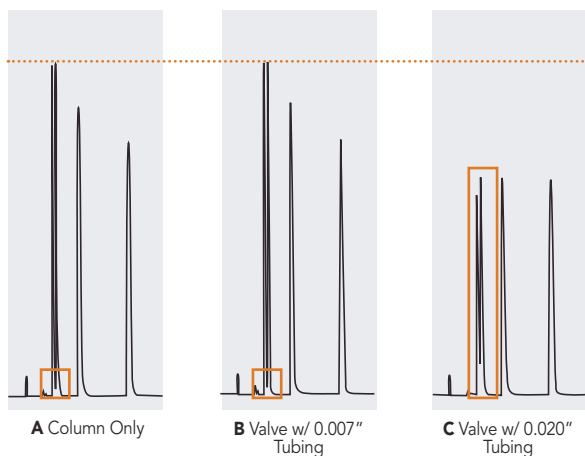
The injection valve and detector were connected to these valves by the same tubing used in the control. The extra tubing pieces required to connect the valves to the column were a 10 cm length for valve #1-to-column, and a 35 cm length for column-to-valve #2. The diameters of these tubes are indicated in the experimental details, below.

Comparison of Observed Column Plates of Rheodyne® Analytical and MicroScale Injection Valves

	7725	8125	Δ
$k' = 0.6$	2930	5054	72%
$k' = 1.5$	4653	6904	48%
$k' = 7.9$	7875	8305	5.0%

UV detector: 1 μ L volume, 4 mm path. Sample volume: 2 μ L, partial-filling method.
Column: 2 mm ID x 100 mm long, 4 μ m C-18. True plates of column = 11,570.

Effects of Valves and Tubing on Resolution



Conclusion: These sequential chromatograms show the effect of adding volume to the flow path through the addition of components.

(A) Establishes a baseline quality of separation with the minimum volume of liquid in the flow path.

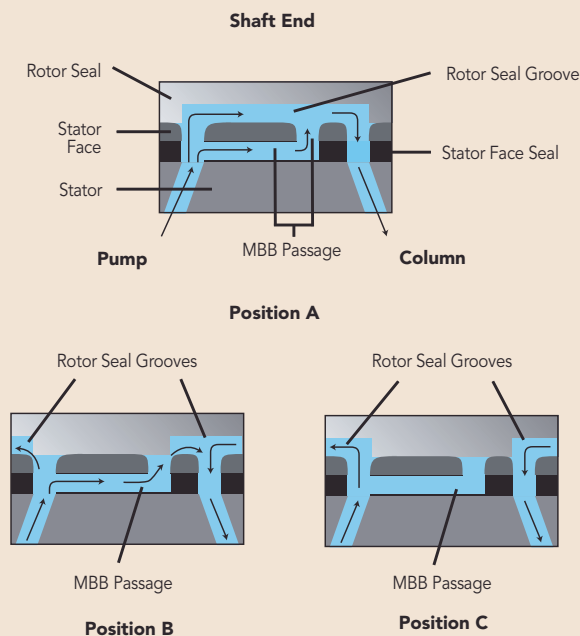
(B) Adding a valve plus smaller-ID tubing, and thereby increasing the liquid volume only marginally, barely affects the separation. However in

(C) Adding a valve plus larger-ID tubing, thereby increasing the liquid volume in the flow path to a greater degree, distinctly impairs the quality of the separation and the detectable sample.

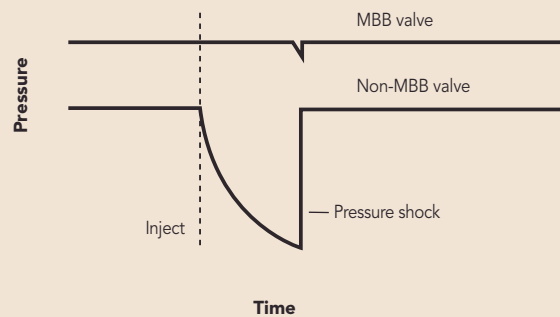
What is Make-Before-Break™, and When Does it Matter?

Make-Before-Break is a unique design feature of certain dual-mode manual injection valves.

Flow paths of model 7725(i) and 9725(i) with MBB design

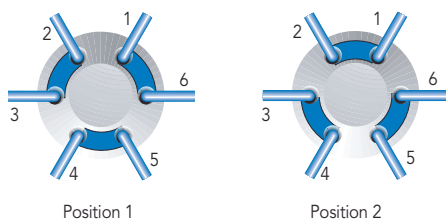


To maintain a constant, desired high-pressure flow, Rheodyne's Make-Before-Break (MBB®) design creates continuous flow between the LOAD and INJECT positions that virtually eliminates pressure transient shock to the system. A passage in the stator face makes a new connection before old connections break. The MBB design — an improvement over bypass-style injectors — does not dilute the sample and is easy to maintain and troubleshoot.

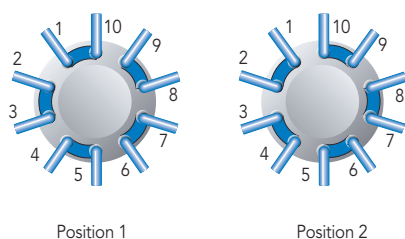


Switching Valves

Switching valves dynamically alternate between two fluid paths without manually disconnecting plumbing. In Chromatography, these valves can be used for column switching, backflushing, sample enrichment, and other techniques. In Diagnostic or Sequencing applications, the switching valve may alternate flow paths to enable back flushing or other fluidic tasks within the instrument.



Flow path of Two-Position, Six-Port Switching Valve

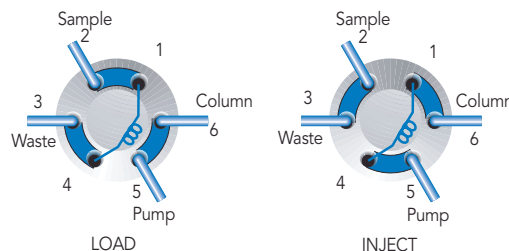


Flow path of Two-Position, Ten-Port Switching Valve

Rheodyne® switching valves operate between two positions, and may have 6 or 10 ports on the face of the stator (2/6 or 2/10). The flow paths connect ports around the circumference of the stator. The Upchurch Scientific® manual switching valves (to 1,000 psi) described on page 133 have different flow path geometry as noted.

Injection Valves

Rheodyne injection valves are a form of switching valve. Injection valves can be automated or manual, and they are generally utilized in the two-position, six-port (2/6) configuration and have a sample loop attached.



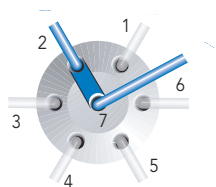
Flow path of Two-Position, Six-Port Injection Valve

The purpose of an Injection valve is to introduce a sample of a solution into a flowing stream of liquid. Some Switching valves become Injection valves by the addition of a Sample Loop (a defined length of tubing and fittings configured to match the angle of the valve ports). Sample is loaded and held in the loop until injection is triggered, either manually or mechanically.

Rheodyne injection valves are classified as either Single or Dual Mode, and either Front or Rear-loading, based on how the Sample Loop can be filled. A Single Mode Injection valve requires complete filling of the sample loop and is configured for Rear loading, generally in an auto-sample configuration. A Dual Mode Injection valve allows either partial or complete filling of the loop, and introduces sample by syringe through the needle port built into the valve shaft. Complete filling of the sample loop in both the Dual and Single Mode Injection valves provides greater repeatability injection to injection. (See the Application Note, page 129 for greater detail on partial vs. complete loop filling.)

Selection Valves

Selection valves enable discrete connections among multiple system liquids (mobile phase, reagents, buffers) by means of a common port (inlet or outlet) connected to a number of different reciprocal ports. In Diagnostic or Sequencing applications, the selection valve alternates between different reagents or sample streams. Selection valves also enable fractionation for multiple sample analyses.

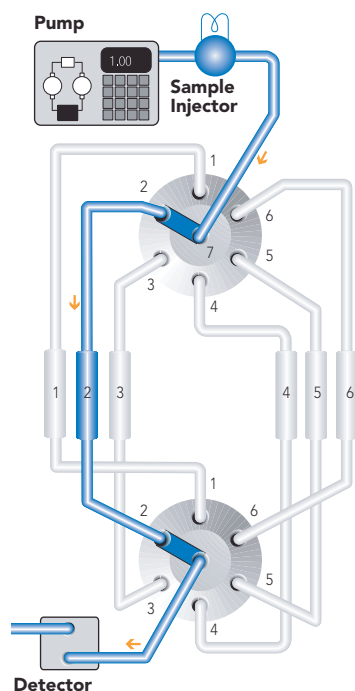


Flow path of Six-Position, Seven-Port Selector Valve

Numerous configurations exist among selection valves (e.g., 6-position 7-port, or 10-position 11-port), but these valves always operate between more than two positions. The ports are usually spaced radially, or outward in some manner around the center port of the stator.

APPLICATION NOTE

Six column selection using two selection valves.



APPLICATION NOTE

Dual Mode Sample Loop Loading: Partial-Filling vs. Complete-Filling

Partial-Filling

Use the partial-filling method if you need to conserve sample, or if you want to vary sample volume frequently.

In partial-filling, the syringe sets the volume injected onto the column. There is no sample waste, and the volume injected onto the column is equal to that dispensed from the syringe. Reproducibility is 1.0% relative standard deviation (RSD). The volume of the sample loaded is limited to half the sample loop volume. For example, the most you can load into a 200 μL sample loop is 100 μL .

Complete-Filling

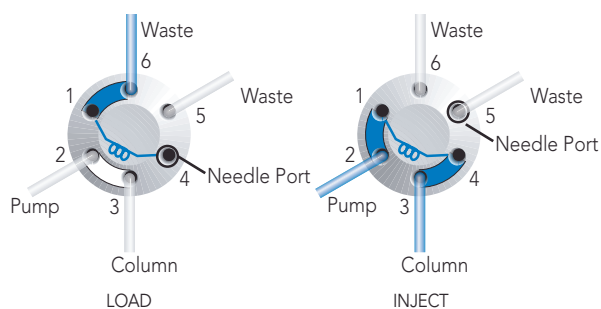
Use the complete-filling method if you have plenty of sample, if you do not vary sample volume, or if you need high reproducibility.

In complete-filling, the loop sets the volume loaded onto the column. Use excess sample (two to five loop volumes) to replace all the mobile phase in the loop. See Figure 2. Change the loop to vary the sample volume. Reproducibility is typically 0.1% RSD for loop sizes $\geq 5 \mu\text{L}$. Accuracy is limited as loop volumes are nominal.

Q: "Which method should I use and which Rheodyne® sample injection valves use this method?"

A: There are two types of injection valves available: dual mode and single mode. Dual mode injection valves allow both partial- and complete-filling whereas single mode injection valves allow only complete-filling. See manual injection valves, page 132.

If you are collecting experimental data, sample is scarce, and/or you want to use different sample volumes, a dual mode injector with a large volume sample loop is appropriate. Only dual mode injection valves allow the partial-filling method for easily varying your volumes (up to half your sample loop volume) by setting the syringe volume. Once you begin routine analysis, and/or you have an abundance of sample, either a dual mode or single mode injector is appropriate. Both types of injection valves allow the complete-filling method in which you overfill the sample loop. Complete-filling maximizes the reproducibility of your results.



Flow path for the typical dual mode injector

Actuated Valves

An automated valve offers more sophisticated functionality. Choose an automated valve if the application requires fast, consistent flow-stream switching. Some other advantages of automated valves include control options (PC- or instrument-triggered), higher torque operation, valve-position feedback, or very small flow paths.

Actuated Valves up to 15,000 psi

Part No.	Description	Ports, Connections	Wetted Material	Rapid Replacement Pod
UP TO 15,000 PSI (1,035 BAR)				
SWITCHING				
MXT715-000	2-Position, 6-Port	10-32 Ports for 1/16" OD Tubing	UltraLife	PD715-000
MXT715-102	2-Position, 10-Port	10-32 Ports for 1/16" OD Tubing	UltraLife	PD715-102
INJECTION For Injection, add the appropriately sized Sample Loop to the Switching valves above				
SELECTION				
MXT715-105	6-Position, 7-Port	10-32 Ports for 1/16" OD Tubing	UltraLife	PD715-105

All of these MXX valves include a set of 1/16" and 1/8" ferrules. Replacement Fittings for MXX valves can be located on page 144.

Actuated Valves up to 6,000 psi

Part No.	Description	Ports, Connections	Wetted Material	Rapid Replacement Pod
UP TO 6,000 PSI (410 BAR)				
SWITCHING				
MXP7900-000	2-Position, 6-Port	10-32 Ports for 1/16" OD Tubing	DuraLife®*	PD7900
MXP7960-000	2-Position, 10-Port	10-32 Ports for 1/16" OD Tubing	DuraLife	PD7960
MXP7980-000	2-Position, 6-Port, Nano, 5,000 psi (345 bar)	M4 Ports for 1/32" OD Tubing	DuraLife II	PD7980
MXP7986-000	2-Position, 10-Port, Nano, 5,000 psi (345 bar)	M4 Ports for 1/32" OD Tubing	DuraLife II	PD7986
MXP9900-000	2-Position, 6-Port, Biocompatible, 5,000 psi (345 bar)	10-32 Ports for 1/16" OD Tubing	PEEK	PD9900
MXP9960-000	2-Position, 10-Port, Biocompatible, 5,000 psi (345 bar)	10-32 Ports for 1/16" OD Tubing	PEEK	PD9960
INJECTION For Injection, add the appropriately sized Sample Loop to the Switching valves above				
MXP7920-000	2-Position, 6-Port, Vertical Port	10-32 Ports for 1/16" OD Tubing	DuraLife	PD7920
SELECTION				
MXP7970-000	6-Position, 7-Port	10-32 Ports for 1/16" OD Tubing	DuraLife II**	PD7970

* DuraLife is a proprietary material combination of SST and an advanced polymer.

** DuraLife II is a proprietary material combination consisting of Titanium and an advanced polymer.

All of these MXX valves include a set of 1/16" and 1/8" ferrules. Replacement Fittings for MXX valves can be located on page 144.

Actuated Valves to 125 psi

Part No.	Description	Ports, Connections	Wetted Material	Ferrule Size
UP TO 125 PSI (8.5 BAR)				
SWITCHING				
MXX777-601	2-Position, 6-Port	Accepts Either 1/16" or 1/8" Tubing	RPC-7*	1/16" and 1/8"
MXX777-603	2-Position, Double Three Way	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
MXX777-612	2-Position, 6-Port, Large Bore	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
SELECTION				
MXX777-605	6-Position, 7-Port	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
MXX777-616	6-Position, 7-Port, Large Bore	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"
MXX778-605	10-Position, 11-Port	Accepts Either 1/16" or 1/8" Tubing	RPC-7	1/16" and 1/8"

* RPC-7 Proprietary Polymer Combination.

All of these MXX valves include a set of 1/16" and 1/8" ferrules. Replacement Fittings for MXX valves can be located on page 144.

MX Series II

Actuated Valves

- ▶ **MXT** to 15,000 psi (1,035 bar)
- ▶ **MXP** to 6,000 psi (410 bar)
- ▶ **MXX** to 125 psi (8.5 bar)

Add Rheodyne® MX Series II™ actuated valves to your existing instrument or use in stand-alone lab configurations. MX valves can be controlled remotely or operated manually using the push-button front panel with LED position indicator. MX valves connect to your instrument or PC through contact closure, BCD, serial port, or USB. Commands can be sent to the MX valves using your chromatography software or the included proprietary software for timed-events programmability.

Available flow rates include options for Analytical, Micro/Nano, or Semi-Prep in a range of pressure capabilities. Valve liquid ends are available in materials chosen to be chemically inert and biocompatible. Routine maintenance using authorized RheBuild® kits (page 136) or — for the higher-pressure MXP and MXP valves — the Rapid Replacement Pods™ (page 135) assures optimal performance.

 Biocompatible



MXX
Up to 125 psi
(9 bar)



MXT
Up to 15,000 psi
(1,034 bar)



MXP
Up to 6,000 psi
(414 bar)

Manual Valves

Choose a manual valve if your application involves low frequency of use, demands operator control, or involves injection of smaller sample volumes.



NEW!

7725i-188
Manual Injection Valve
Up to 9,000 psi (600 bar)



7060
Manual Switching Valve
Up to 7,000 psi (483 bar)

SPECIFICATIONS & DETAILS

Part No.	Stator Passage Diameter	Factory Set Pressure	Maximum Field Set Pressure	Maximum Temperature (°C)
3000, 3030 (PEEK)	1.0 mm (0.040")	3,000 psi (207 bar)	4,000 psi (276 bar)	50°
3000-038 (SST)	1.0 mm (0.040")	4,000 psi (276 bar)	5,000 psi (340 bar)	50°
7000, 7010 (SST)	0.6 mm (0.024")	5,000 psi (340 bar)	7,000 psi (483 bar)	150°
7000L (SST)	1.0 mm (0.040")	3,000 psi (207 bar)	5,000 psi (340 bar)	150°
7030 (SST)	0.6 mm (0.024")	5,000 psi (340 bar)	7,000 psi (483 bar)	150°
7030L (SST)	1.0 mm (0.040")	3,000 psi (207 bar)	5,000 psi (340 bar)	150°
7060 (SST)	0.4 mm (0.016")	5,000 psi (340 bar)	7,000 psi (483 bar)	80°
7060L (SST)	1.0 mm (0.040")	3,000 psi (207 bar)	5,000 psi (340 bar)	80°

SST = Stainless Steel

Manual Valves up to 15,000 psi

Part No.	Description	Tubing/Fitting Size	Wetted Material	Configuration
UP TO 15,000 PSI (1,035 BAR)				
INJECTION				
NEW! 7725i-188	2-Position, 6-Port, 9,000 psi (600 bar)	10-32 Ports for 1/16" OD Tubing	Stainless Steel, PEEK, Ceramic	Front loading

Manual Valves up to 6,000 psi

Part No.	Description	Tubing/Fitting Size	Wetted Material	Configuration
UP TO 6,000 PSI (410 BAR)				
SWITCHING				
3000	2-Position, 6-Port, Prep Scale	5/16-24 Ports for 1/16" Tubing	PEEK	—
3000-038	2-Position, 6-Port, Prep Scale	5/16-24 Ports for 1/8" Tubing	Stainless Steel & PEEK	—
3030	2-Position, 6-Port, Prep Scale	5/16-24 Ports for 1/8" OD Tubing	PEEK	Double 3-Way
7000	2-Position, 6-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel®	—
7000L	2-Position, 6-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	—
7030	2-Position, 6-Port, Prep Scale Dual Mode with Switch	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	Double 3-Way
7030L	2-Position, 6-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	Double 3-Way
INJECTION*				
Part No.	Description	Tubing/Fitting Size	Wetted Material	Sample Loop Volume
7010	2-Position, 6-Port Single Mode	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	20 µL*
9010	2-Position, 6-Port Single Mode (Switching, Injection)	10-32 Ports for 1/16" OD Tubing	PEEK, ETFE, Ceramic	20 µL*
3725-038	2-Position, 6-Port, Prep Scale Dual Mode	5/16-24 Ports for 1/8" Tubing	Stainless Steel & PEEK	10 mL*
3725i	2-Position, 6-Port, Prep Scale Dual Mode with Switch	5/16-24 Ports for 1/8" Tubing	PEEK	10 mL*
3725i-038	2-Position, 6-Port, Prep Scale Dual Mode with Switch	5/16-24 Ports for 1/8" Tubing	Stainless Steel & PEEK	10 mL*
★ 7725	2-Position, 6-Port, Analytical Scale Dual Mode	10-32 Ports for 1/16" OD Tubing	Stainless Steel, Ceramic, Vespel	20 µL*
★ 7725i	2-Position, 6-Port, Analytical Scale Dual Mode with Switch	10-32 Ports for 1/16" OD Tubing	Stainless Steel, Ceramic, Vespel	20 µL*
8125**	2-Position, 6-Port, Micro Scale Dual Mode with Switch	10-32 Ports for 0.020" (0.5 mm) or 1/16" Tubing	Stainless Steel, Ceramic, Vespel	5 µL*
9725	2-Position, 6-Port, Analytical Scale Dual Mode	10-32 Ports for 1/16" OD Tubing	PEEK, ETFE, Ceramic	20 µL*
★ 9725i	2-Position, 6-Port, Analytical Scale Dual Mode with Switch	10-32 Ports for 1/16" OD Tubing	PEEK, ETFE, Ceramic	20 µL*
SELECTION				
7060	6-Position, 7-Port	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	6-Way
7060L	6-Position, 7-Port, Large Bore	10-32 Ports for 1/16" OD Tubing	Stainless Steel & Vespel	6-Way

* Ships with a sample loop attached to ports 1 and 4.

** The 8125 requires special ferrules for 0.020" (0.5 mm) tubing; 8125-084–0.5 mm ferrule for 8125; 8125-086–0.5 mm ferrule for 8125 — 4-pk.

SPECIFICATIONS & DETAILS

Characteristics of Rheodyne® Manual Sample Injection Valves

Type & Capabilities	Scale	Partial Filling Volumes (Range)	Sample Loop Sizes (Range)	Wetted Materials	Max. psi (bar) ¹	Max. T (°C)	MBB ²	Model ³
Dual Mode Can load the loop by two methods: 1) Partial filling—syringe determines volume without wasting sample 2) Complete filling—loop determines volume by over filling loop	Analytical	1 µL–2.5 mL 1 µL–5.0 mL	2 µL–5.0 mL 2 µL–10 mL	316 SST, Vespel® PEEK, ETFE, ceramic	7,000 (483) 5,000 (340)	80° 50°	Yes Yes	7725, 7725i 9725, 9725i
	Micro	0.1 µL–500 µL	5 µL–1.0 mL	316 SST, PEEK, Vespel, ceramic	7,000 (483)	80°	No	8125
	Preparative	100 µL–10 mL	2.0 mL–20 mL	316 SST, PEEK PEEK	5,000 (340) 4,000 (276)	50° 50°	Yes Yes	3725(i)-038, 3725i
Single Mode Can load the loop by one method: Complete filling—loop determines volume by over filling loop	Analytical	Not Applicable	5 µL–5.0 mL 5 µL–10 mL	316 SST, Vespel PEEK, ETFE, Ceramic	7,000 (483) 5,000 (340)	150° 50°	No No	7010 9010

SST = Stainless Steel

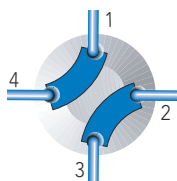
¹ This is the maximum pressure to which the valve can be adjusted. Some models are shipped from the factory set for lower pressures.

² MBB (Make-Before-Break™) is a design that provides uninterrupted flow when switching between LOAD and INJECT. MBB also greatly reduces transient pressure shocks.

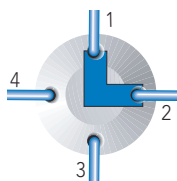
³ Models with an "i" suffix have a built-in position sensing switch. Models 8125 and 9010 also have a built-in switch.

NOTE

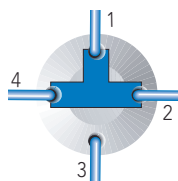
Upchurch Scientific® Switching Valve Options



4-Way Diagonal Flow Switching Valves (V-100D, V-101D)



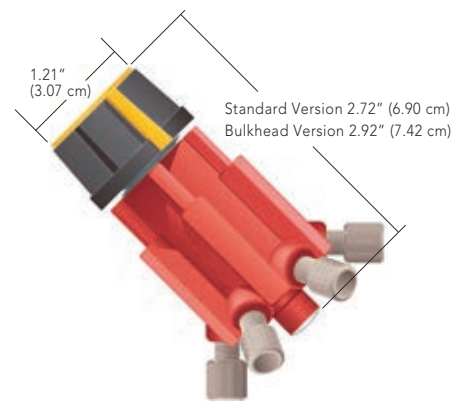
Right Angle Flow Switching Valves (V-100L, V-101L)



3-Way Flow Switching Valves (V-100T, V-101T)



V-101L
Manual Switching Valve
Up to 1,000 psi (69 bar)



V-540
Manual Injection Valve
Up to 1,000 psi (69 bar)

Manual Valves up to 1,000 psi

Part No.	Description	Tubing/Fitting Size	Wetted Material	Configuration	Includes
UP TO 1,000 PSI (69 BAR) UPCHURCH SCIENTIFIC					
SWITCHING					
V-100D	4-Position, 4-Port, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Double Diagonal	*
★ V-101D	4-Position, 4-Port, Bulkhead, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Double Diagonal	*
★ V-100L	4-Position, 4-Port, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Right-Angle "L"	**
★ V-101L	4-Position, 4-Port, Bulkhead, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Right-Angle "L"	**
V-100T	4-Position, 4-Port, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Single "T"	***
V-101T	4-Position, 4-Port, Bulkhead, 500 psi (34 bar)	1/4-28 Ports for 1/16" OD Tubing	PEEK, PTFE	Single "T"	***
INJECTION For Injection, add the appropriately sized Sample Loop to the Switching valves above					
V-450	2-Position, 6-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Injection	(6) XP-235
★ V-451	2-Position, 6-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Injection	(6) XP-235
V-540	2-Position, 6-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Injection	(6) XP-335
★ V-541	2-Position, 6-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Injection	(6) XP-335
SELECTION					
V-240	6-Position, 7-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-235
★ V-241	6-Position, 7-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/16" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-235
V-340	6-Position, 7-Port, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-335
★ V-341	6-Position, 7-Port, Bulkhead Version, 1,000 psi (69 bar)	1/4-28 Ports for 1/8" OD Tubing	Polyimide, PTFE	Multi-port Selection	(6) XP-335

* (4) P-218BLK, (4) P-240.

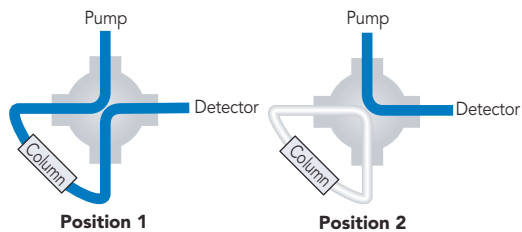
** (4) P-218BLK, (4) P-240, (1) P-309.

*** (4) P-218BLK, (4) P-240, (1) P-309.

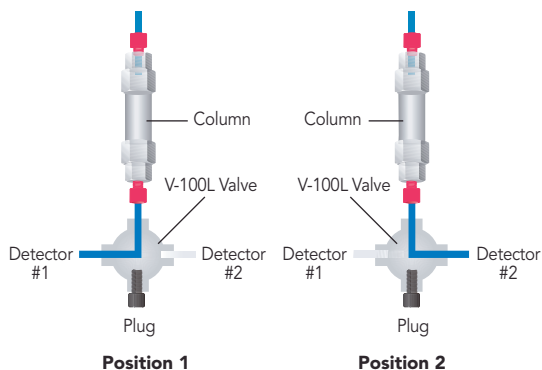
APPLICATION NOTE

Upchurch Scientific® Switching Valve Applications

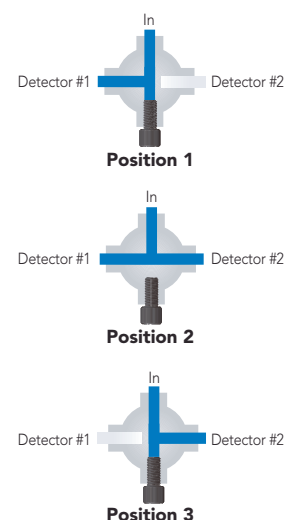
Protect sensitive system components (such as a column) during a cleaning cycle with our Diagonal Flow Switching Valve ("D"). This valve eliminates the need to remove, plug and reconnect a low pressure column (see below).



- ▶ A typical application for a Right Angle Flow Switching Valve ("L") is column switching, allowing two columns to use one detector. Detector switching is another common application for this valve (see below). Plug off the extra port with the included plug.



- ▶ Your detector switching application may require the flexibility of routing the column effluent to both detectors simultaneously while retaining the ability to isolate each detector. Use our 3-Way Flow Switching Valve ("T"), plugging off the fourth port with the included plug (see right).



Rapid Replacement Pods™

For Rheodyne® Valves

- ▶ Zero downtime maintenance
- ▶ Improves lab throughput

To help keep your instrument online and performing at maximum precision, select the exact Rapid Replacement Pod for your higher pressure MX Series II valves. Replacement pods are easily exchanged as part of scheduled preventive maintenance, or in an emergency, a pod can be substituted quickly while the original is examined and cleaned at your convenience. The pod kit contains complete instructions for removal and replacement.



Part No.	Description	For Valve Part No.
TO 15,000 PSI (1,035 BAR)		
SWITCHING		
PD715-000	Rapid Replacement Pod	MXT715-000
PD715-102	Rapid Replacement Pod	MXT715-102
SELECTION		
PD715-105	Rapid Replacement Pod	MXT715-105
UP TO 6,000 PSI (410 BAR)		
SWITCHING		
PD7900	Rapid Replacement Pod	MXP7900-000
PD7960	Rapid Replacement Pod	MXP7960-000
PD7980	Rapid Replacement Pod	MXP7980-000
PD7986	Rapid Replacement Pod	MXP7986-000
PD9900	Rapid Replacement Pod	MXP9900-000
PD9960	Rapid Replacement Pod	MXP9960-000
INJECTION		
PD7920	Rapid Replacement Pod	MXP7920-000
SELECTION		
PD7970	Rapid Replacement Pod	MXP7970-000

RheBuild® Kits

RheBuild Kits are available for all Rheodyne® brand products. Included in each individualized RheBuild Kit are all parts, tools, and instructions to maintain precision performance of your particular product. RheBuild Kits eliminate individual part ordering.



APPLICATION NOTE

How to Avoid Pressure Transients

Air in the sample loop can cause an instantaneous system pressure drop that eventually returns to a normal level. Air causes the pressure to drop when the injector moves from the LOAD to the INJECT position. When large sample loops ($\geq 100 \mu\text{L}$) are partially loaded, air present in the needle port tube is pushed into the sample loop (see Figure 1). Air can also enter the sample loop from siphoning which occurs when the vent line is higher than the injection port. In either case, upon injection, the system pressure collapses the air bubble, causing pressure to drop momentarily.

A pressure drop in the system caused by air results in changes in retention time, artifact peaks, and affects column performance.

Avoid pressure drops by removing the air in the needle port tube. Do this by flushing about 1 mL of mobile phase with a luer syringe with needle port cleaner. Keep the needle port tube filled with mobile phase by occasional flushing. Adjust the vent line(s) so the outlet is at the same horizontal level as the needle port (see Figure 2). For additional injection troubleshooting, refer to the Rheodyne Troubleshooting Guide for HPLC Injection Problems. You may download the Guide from the IDEX Health & Science web site: www.idex-hs.com under Support.

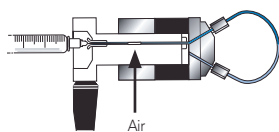


Figure 1 Air present in the needle port tube is pushed by the syringe during loading into the sample loop

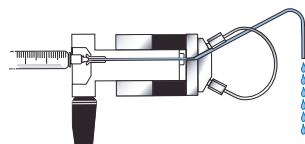


Figure 2 Pathway of the flushing mobile phase using the Needle Port Cleaner, Part # 7125-054 (see page 143) when the injector is in INJECT

Part No. Description

RHEBUILD KITS FOR MX SERIES II™ VALVES

7150-999	RheBuild Kit for MXT715-000 (includes 2 rotor seals)
7152-999	RheBuild Kit for MXT715-102 (includes 2 rotor seals)
7155-999	RheBuild Kit for MXT715-105 (includes 2 rotor seals)
7920-999	RheBuild Kit for MXP7920-000 and MXP7900-000
7960-999	RheBuild Kit for MXP9960-000 (includes rotor seal and stator face seal)
7961-999	RheBuild Kit for MXP7960-000
7970-999	RheBuild Kit for MXP7970-000
79801-999	RheBuild Kit for MXP7980-000
79861-999	RheBuild Kit for MXP7986-000
7900-999	RheBuild Kit for MXP9900-000 (includes rotor seal and stator face seal)

RHEBUILD KITS FOR MANUAL VALVES

3725-999	RheBuild Kit for models 3725, 3725i, 3725-038, 3735i-038
7010-996	Conversion Kit including Stator Face Assembly for model 7010
7010-997	RheBuild Kit including Stator for model 7010
7010-998	RheBuild Kit, pH Upgrade Kit for model 7000
7010-999	RheBuild Kit for model 7010 and 7010-type Valves
7125-999	RheBuild Kit for models 7125 and 7126
7125Ti-999	RheBuild Kit for model 7125-081
7410-999	RheBuild Kit for model 7410
7520-999	RheBuild Kit for models 7520 and 7526 (includes inlet stator and seal)
7725-999	RheBuild Kit for models 7725 and 7725i
7788-999	RheBuild Kit for model 7725i-188
8125-999	RheBuild Kit for models 8125 and 8126
9010-999	RheBuild Kit for model 9010
9125-999	RheBuild Kit for models 9125 and 9126
9725-999	RheBuild Kit for models 9725 and 9725i; 7725(i) pH upgrade kit

RHEBUILD KITS FOR MX SERIES I™ VALVES

7900-999	RheBuild Kit for models MX7900-000, MX7925-000, MX9900-000, MX9925-000
7960-999	RheBuild Kit for model MX7960-000
7980-999	RheBuild Kit for model MX7980-000
7984-999	RheBuild Kit for model MX7984-000
7986-999	RheBuild Kit for model MX7986-000

RHEBUILD KITS FOR LABPRO™ & EV AUTOMATED FLUIDIC INSTRUMENTS

1006-999	RheBuild Kit for model PR/EV100-106
5001-999	RheBuild Kit for models PR/EV500-101 and PR/EV550-101
5100-999	RheBuild Kit for models PR/EV500-100 and PR/EV550-100
5104-999	RheBuild Kit for models PR/EV500-104 and PR/EV550-104
7004-999	RheBuild Kit for models PR/EV700-104 and PR/EV750-104
7112-999	RheBuild Kit for models PR/EV700-112 and PR/EV750-112
7501-999	RheBuild Kit for models PR/EV700-100 and PR/EV750-100
7502-999	RheBuild Kit for models PR/EV700-102 and PR/EV750-102
7507-999	RheBuild Kit for models PR/EV700-107 and PR/EV750-107
7531-999	RheBuild Kit for models PR703-100 and PR753-100

Rotor Seals & Stators

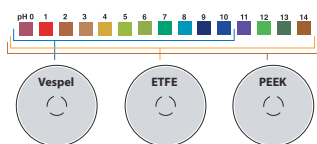
The rotor seal is the polymeric disc that makes a high pressure seal against the stator or stator face seal. The seal wears with use and is one of the only parts that may need routine replacement.



Stators are available in 316 stainless steel, PEEK and proprietary materials. Stators need replacement only if the ports or sealing surfaces become damaged. Avoid damage from use of improper injection needles by referring to the "Using Proper Syringe Needles" Application Note on page 142.

Please Note: Rotor seals for MX Series II™ Modules are available in RheBuild® Kits on page 136. Stators for MX Series II Modules are available on this page. MX (Series I) Module rotor seals are available in RheBuild Kits on page 136.

APPLICATION NOTE



How to Select the Right Rotor Seal

The standard rotor seal in many Rheodyne® manual valves is made from a Vespel® blend. This polyimide has low wear and high chemical

resistance. Vespel tolerates a pH range of 0 to 10. Solutions more basic than pH 10 dissolve Vespel which damages the rotor seal. If you use any solutions above pH 10, Rheodyne recommends a PEEK blend rotor seal. PEEK offers a high chemical resistance and versatility, and will tolerate the entire pH range from 0 to 14. ETFE blend rotor seals are appropriate for use in applications where PEEK is not generally acceptable, such as when methylene chloride or DMSO in higher concentrations is being used.

Part No.	For Valve Model No.	Description
VESPEL BLEND ROTOR SEALS		
7000-016	7000L, 7040L	Vespel Rotor Seal
7010-039	7010, 7000, 7040	Vespel Rotor Seal
★ 7030-003	7030, 9030	Vespel Rotor Seal
7030-014	7030L	Vespel Rotor Seal
7060-070	7060, 7066	Vespel Rotor Seal
7060-064	7060L	Vespel Rotor Seal
7125-047	7125, 7725, 9725	Vespel Rotor Seal
7410-038	7410	Vespel Rotor Seal
7413-013	7413	Vespel Rotor Seal
8125-038	8125	Vespel Rotor Seal

Part No.	For Valve Model No.	Description
ETFE BLEND ROTOR SEALS		
7000-017	7000L, 7040L	ETFE Rotor Seal
7010-071	7010, 7010-087, 7000, 7040	ETFE Rotor Seal
7030-015	7030, 9030	ETFE Rotor Seal
7060-074	7060, 7066, 9060	ETFE Rotor Seal
7060-067	7060L	ETFE Rotor Seal
7125-079	7125, 7125-081, 7725	ETFE Rotor Seal
7410-075	7410	ETFE Rotor Seal
8125-097	8125	ETFE Rotor Seal
9010-051	9010	ETFE Rotor Seal
9125-082	9125, 9725	ETFE Rotor Seal
PEEK BLEND ROTOR SEALS		
3030-005	3030, 3030-038	PEEK Rotor Seal
3710-008	3000, 3000-038, 3710, 3710-038	PEEK Rotor Seal
3725-018	3725, 3725-038	PEEK Rotor Seal
9010-065	7000, 7010, 9010	PEEK Rotor Seal
8125-119	8125	PEEK Rotor Seal
9125-095	7125, 7725, 9125, 9725	PEEK Rotor Seal
STATORS FOR MX SERIES II MODULES		
7123-548	MXT715-000	Stator
7123-550	MXT715-105	Stator
7123-568	MXT715-102	Stator
7770-229	MXP7920-000	Stator
7980-004	MXP7980-000	Stator
7986-004	MXP7986-000	Stator
7900-146	MXP9900-000	Stator
7900-179	MXP7900-000	Stator
7900-183	MXP7970-000	Stator
7960-014	MXP7960-000	Stator
9960-002	MXP9960-000	Stator
STATORS FOR OTHER RHEODYNE VALVES		
3725-006	3725, 3710-038, 3000-038 and 3030-038	Stator
3725-085	3725-038, 3710-038, 3000-038 and 3030-038	Stator
7010-069	7000L, 7030L, 7040L	Stator
7010-040	7010, 7125, 7000, 7030 and 7040	Stator
7010-066	7125-081 and 7010-087	Stator
7060-039	7060 and 7066	Stator
7060-065	7060L, EV501-100	Stator
7123-047	PR/EV500-100	Stator
7123-127	PR/EV750-107	Stator
7123-128	PR/EV700-107	Stator
7123-142	PR/EV500-104, EV501-104	Stator
7123-145	PR/EV550-104, EV551-104	Stator
7123-147	PR/EV550-100	Stator
7123-148	PR/EV500-101	Stator
7123-149	PR/EV550-101	Stator
7123-180	PR703-100 and EV700-105	Stator
7123-221	PR753-100 and EV750-105	Stator
7123-223	PR/EV700-112	Stator
7123-390	EV200-102	Stator
7410-041	7410 and 7413	Stator
7520-030 (inlet)	7520	Stator
7520-035 (outlet)	7520	Stator
7650-002	PR/EV700-102	Stator
7725-010	7725(i)	Stator
7750-070	7750	Stator
7750-038	PR/EV700-100	Stator
8125-098	8125	Stator
9060-016	9060	Stator
9125-043	9125, 9010, 9030 and 9725(i)	Stator
9650-009	PR/EV750-102	Stator
9750-021	PR/EV750-100	Stator

Stainless Steel Sample Loops

These high quality stainless steel sample loops have burr-free, square-cut ends to ensure a flush connection to valve ports. The size designations of loops are nominal. The actual volumes can differ from the theoretical designations because of the 0.001" (± 0.025 mm) tolerance of the metal tubing bore.

Accuracy of large metal loops (1.0 mm, 0.040" bore) is about $\pm 5\%$, intermediate loops (0.5 mm, 0.020" bore) $\pm 10\%$, and small loops (0.2 mm, 0.007" bore) $\pm 30\%$.

Since both standards and unknowns are usually analyzed using the same sample loop, knowledge of the actual, accurate volume is rarely needed. If the sample loop volume must be known, it is best to calibrate the loop in place on the valve so the flow passages in the valve are also taken into account. An alternative to calibration is to use a dual mode injector and partial-filling method of loading. See the "Sample Loop Loading" Application Note on page 129.

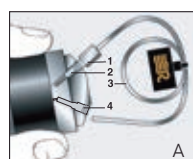
Model 7725 Injector loops are not interchangeable with loops for the model 7125. The port angle for the 7725 is 30° whereas the port angle for the 7125 is 20° requiring the loops to have a different shape.

Model 8125 Micro-Scale Sample Injector requires special loops in the 5.0 μ L to 50 μ L range. The 8125 sample loops are made with 0.5 mm (0.020") OD tubing.

APPLICATION NOTE

How to Properly Install Sample Loops: Stainless Steel

Stainless steel sample loops are supplied with fittings that are not swaged onto the tube. It is important that the loop be completely bottomed in the injector port before the ferrule is swaged onto the tube. The depth of the tubing holes may vary slightly from port to port and from valve to valve. A fitting made up in one port may leave a small cavity in another port. The cavity causes high dispersion and peak distortion such as fronting, tailing, or broadening. It is good practice to label loop ends so they will be replaced in the same, respective ports that were used in swaging the ferrules. Hint: swaging ferrules separately on each side, into each respective valve port makes loop installation easier.



To install the sample loop:

- Take one end of the loop and place the nut (1) and ferrule (2) onto the tubing (3) with the threaded portion of the nut and tapered portion of the ferrule toward the end. See Figure A.
- Insert the tubing into port (4). Confirm that the tubing is bottomed in the valve port as shown in Figure A.
- While firmly pressing down on the tubing, hand-tighten the nut as tight as possible.
- With the IDEX Wrench (see pages 33 and 144), designed especially for fittings, tighten one quarter turn past finger tight. Remove the loop to confirm the ferrule is swaged onto the tube.
- Repeat steps a-d with the other end of the loop while the swaged end remains outside the valve port. See Figure B.
- Reinstall each end of the loop to their respective ports. See Figure C.



Figure 1 Cut-away view of stainless steel sample loop installation



Part No.	Volume	Tubing
RHEODYNE® STAINLESS STEEL LOOPS FOR MXT715-000		
7755-300	5 μ L Sample Loop	0.18 mm (0.007") ID x 1/16" OD
7755-301	10 μ L Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-302	20 μ L Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-303	50 μ L Sample Loop	0.51 mm (0.021") ID x 1/16" OD
7755-304	100 μ L Sample Loop	0.51 mm (0.021") ID x 1/16" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 7125, 7010 INJECTION VALVES (DO NOT USE FOR 7725)		
7020	5 μ L Sample Loop	0.18 mm (0.007") ID x 1/16" OD
7021	10 μ L Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7022	20 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7023	50 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7024	100 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7025	200 μ L Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7026	500 μ L Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7027	1.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7028	2.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
7029	5.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
1876	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
1877	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 3725-038, 3725I-038 INJECTION VALVES		
3065-018	2.0 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
3065-019	5.0 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
3065-023	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
3065-025	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 7725, 7725I, PR/EV700-100, PR/EV703-100, MX MODULE INJECTION VALVES (DO NOT USE FOR 7125)		
7755-020	5 μ L Sample Loop	0.18 mm (0.007") ID x 1/16" OD
7755-021	10 μ L Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-022	20 μ L Sample Loop	0.30 mm (0.012") ID x 1/16" OD
7755-023	50 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7755-024	100 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD
7755-025	200 μ L Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7755-026	500 μ L Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7755-027	1.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD
7755-028	2.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
7755-029	5.0 mL Sample Loop	1.0 mm (0.040") ID x 1/16" OD
1876	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
1877	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD
RHEODYNE STAINLESS STEEL LOOPS FOR 8125 INJECTOR (USE 7755-024 TO 7755-029 FOR VOLUMES > 50 μL)		
8020	5 μ L Sample Loop	0.20 mm (0.008") ID x 0.020" OD
8021	10 μ L Sample Loop	0.20 mm (0.008") ID x 0.020" OD
8022	20 μ L Sample Loop	0.25 mm (0.010") ID x 0.020" OD
8023	50 μ L Sample Loop	0.30 mm (0.012") ID x 0.020" OD
8125-084	Ferrules for 0.020" (0.5 mm) Tubing	
8125-086	Ferrules for 0.020" (0.5 mm) Tubing, 4-pk	

See page 140 for Valco-compatible stainless steel sample loops.

PEEK Sample Loops

Flexible PEEK sample loops are alternatives to stainless steel loops. PEEK loop ends are provided with clean, straight cuts for easy valve installation.

PEEK polymer is inert to almost all organic solvents and is biocompatible, giving PEEK loops added versatility. Natural PEEK is used for these sample loops. Like metal loops, the size designations of PEEK loops are nominal. The actual volumes can differ from the theoretical designations because of the ± 0.05 mm (0.002") tolerance of the tubing bore. Accuracy of large PEEK loops (0.8 mm, 0.030" bore) is about $\pm 14\%$, intermediate loops (0.5 mm, 0.020") $\pm 21\%$, and small loops (0.2 mm, 0.007") $\pm 65\%$.

PEEK loops are also supplied with unswaged RheFlex® fittings but do not require the same swaging precaution. The fittings can reposition along the loop tubing when the fitting reinserts in the ports for correct loop installation.

Please Note: Several of our PEEK Sample Loops can also be used with Valco/VICI® sample injection valves. Please refer to the product listing on this page to aid selection.



APPLICATION NOTE

PEEK Physical Strength Characteristics

Although PEEK material is compatible with virtually all solvents, there are many factors that affect burst pressure of PEEK tubing. Factors such as increases in inner diameter, temperature, exposure time, and concentration of organic solvents affect the degradation of PEEK. Other solvents such as THF, methylene chloride and DMSO cause PEEK tubing to swell while concentrated nitric acid and sulfuric acid weaken the tubing.

Part No.	Volume	Tubing	Valco No.
PEEK LOOPS FOR 3725, 3725I INJECTION VALVES			
3055-018	2.0 mL Sample Loop	1.6 mm (0.062") ID x 1/8" OD	N/A
3055-019	5.0 mL Sample Loop	1.6 mm (0.062") ID x 1/8" OD	N/A
3055-023	10 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD	N/A
3055-025	20 mL Sample Loop	2.0 mm (0.080") ID x 1/8" OD	N/A
PEEK LOOPS FOR 9725, 9010, PR/EV750-100, PR/EV753-100 INJECTION VALVES			
Part No.	Volume	Bore / Tubing	Valco No.
9055-020	5.0 μ L Sample Loop	0.18 mm (0.007") ID x 1/16" OD	SL5CWPK
9055-021	10 μ L Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL10WPK
9055-022	20 μ L Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL20WPK
9055-023	50 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL50WPK
9055-024	100 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL100WPK
9055-025	200 μ L Sample Loop	0.51 mm (0.020") ID x 1/16" OD	N/A
9055-026	500 μ L Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL500WPK
9055-027	1.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL1KCWPK
9055-028	2.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL2KCWPK
9055-029	5.0 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	N/A
9055-033	10 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	N/A
PEEK LOOPS FOR 7725, 7725i, PR/EV700-100			
7123-227	1 μ L Sample Loop (models PR/EV700-100 and EV750-100 only)	Internal groove	N/A
7755-015	2 μ L Sample Loop (models 7725, 7725i, and 9725(i) only)	Internal groove	N/A
REPLACEMENT RHEFLEX FITTINGS FOR PEEK LOOPS			
Part No.	Description		Qty.
6000-078	Nut/Ferrule Set, Natural PEEK, 5/16-24, for 1/8" OD loops		ea.
6000-079	Ferrules, Natural PEEK, for 1/8" OD loops		5-pk
6000-251	Ferrules, Natural PEEK, for 1/16" OD loops		10-pk
6000-254	Nut/Ferrule Sets, Natural PEEK, 10-32, for 1/16" OD loops		10-pk

Valco/VICI-Compatible Stainless Steel Sample Loops

Valco-Compatible Stainless Steel Loops are manufactured by IDEX Health & Science. These loops are designed for use with Valco valve models CW6 and EC6W. Each loop has burr-free, polished ends and is passivated and flushed with reagent-grade methanol to ensure cleanliness.

Loops made with 1/16" OD tubing come complete with F-287 SealTight™ Fittings, which are pressure rated to 9,000 psi (620 bar)¹. The fittings and adapters that accompany the 1/8" OD sample loops are rated to 1,000 psi (69 bar)¹. Volumes are stated at ±10%.

¹ These pressure ratings reflect the performance of the fittings, not the port or valve in which they are used. IDEX Health & Science manufactures many products designed as direct replacements for OEM components. Reference to these manufacturers does not imply their endorsement of our products.



Part No.	Volume	Tubing	Valco No.
VALCO/VICI-COMPATIBLE STAINLESS STEEL LOOPS FOR C6W, EC6W INJECTION VALVES			
1750	5 µL Sample Loop	0.18 mm (0.007") ID x 1/16" OD	SL5CW
1751	10 µL Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL10CW
1752	15 µL Sample Loop	0.25 mm (0.010") ID x 1/16" OD	SL15CW
1755	20 µL Sample Loop	0.51 mm (0.010") ID x 1/16" OD	SL20CW
1758	25 µL Sample Loop	0.51 mm (0.010") ID x 1/16" OD	SL25CW
1759	50 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL50CW
1762	100 µL Sample Loop	0.51 mm (0.020") ID x 1/16" OD	SL100CW
1778	200 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	N/A
1763	250 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL250CW
1764	500 µL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL500CW
1770	1 mL Sample Loop	0.76 mm (0.030") ID x 1/16" OD	SL1KCW
1772	2 mL Sample Loop	1.02 mm (0.040") ID x 1/16" OD	SL2KCW
1775	5 mL Sample Loop	2.03 mm (0.080") ID x 1/8" OD	SL5KCW
1776	10 mL Sample Loop	2.03 mm (0.080") ID x 1/8" OD	SL10KCW

APPLICATION NOTE

Fluidic Movement in Tubes

Q: "Why can I load only up to half of the volume of the loop in partial-filling method?"

A: Sample occupies 2 μL of loop for every 1 μL loaded from the syringe. For example, 10 μL of sample spreads out over the entire length of a 20 μL loop. Any additional sample loaded will overflow the end of the loop and exit out to waste. Reproducibility is poor because the volume of sample in the loop is different from the known volume originally loaded by your syringe.

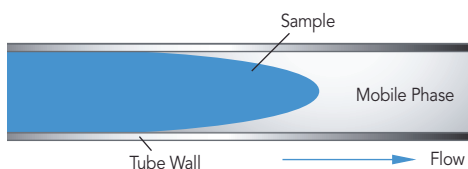


Figure 1 Schematic of sample flow through mobile phase between tubing walls

Fluid spreads in a parabolic shape through a tube instead of moving in one plug because the velocity is different at the center of the tube than at the walls. The velocity at the center of the tube is twice the average velocity, and near the wall the velocity is almost zero, creating a parabolic shape. This fluidic movement is called laminar flow. See Figure 1.

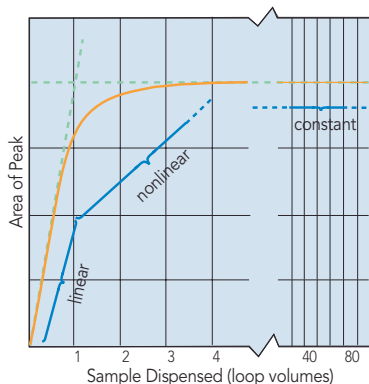


Figure 2 Sample mass (observed peak area) vs. volume of sample dispensed from the syringe, in units of loop volumes, injected onto the column from a Rheodyne® dual mode injector such as model 7725

In dual mode injection valves (see "Sample Loop Loading" Application Note on page 129) the sample from the syringe needle loads directly into the sample loop. The sample volume is known since there is no sample waste. The laminar flow phenomenon accounts for the shape of the plot as shown in Figure 2. Note that the plot has three regions:

a) Partial-Filling Region. When the volume dispensed is less than half the loop volume, the curve is linear. Sample has not reached the end of the loop. Within this region, performance depends on the syringe and operator.

b) Nonlinear Region. When the volume dispensed is between

half the loop volume and about two loop volumes, the curve is nonlinear. Sample is lost from the loop, so reproducibility is poor. If you dispense a volume equal to the loop size, you are in this region of poor performance.

c) Complete-Filling Region. When the volume of sample dispensed is several loop volumes, the loop contains only pure sample, undiluted by residual mobile phase. Within this region, reproducibility is highest.

In the single mode injection valves the sample must pass through a connecting passage before it reaches the sample loop. Since some of the sample dispensed from the syringe remains in the connecting passageway, an unknown amount enters the sample loop. Therefore, single mode injection valves achieve high reproducibility only by using the complete-filling method.

APPLICATION NOTE

How to Find and Fix Common Sample Injector Leaks

Leaks cause valuable sample loss. Nobody wants that. The key to the valve holding pressure is the integrity of the sealing surfaces. If there is a scratch on the sealing surface, or the needle seal in the rotor seal is damaged, a leak may appear. It is also important to realize what appears to be a leak can instead be a result of siphoning. The following are the three most common situations in which fluid leaks occur.

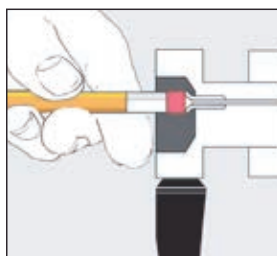


Figure 1 To reform the needle seal, push the eraser end of a pencil against the needle port

1. If fluid leaks out of the needle port only while loading the loop (i.e., while pushing down on the plunger of the syringe), the problem is most likely that the needle seal or the needle port fitting in the loop filler port is not gripping the syringe needle tightly enough. Tighten the needle seal grip by pushing with the eraser end of the pencil on the needle port (See Figure 1). The tightening reduces the hole diameter of the needle seal and port fitting.

2. If fluid leaks continuously from the needle port or vent lines and/or from the stator-to-stator ring interface, replace the rotor seal and/or stator face assembly. Scratches on the rotor seal or cracks in the stator face assembly allow mobile phase to escape and cause cross port leakage. Genuine Rheodyne replacement rotor seals are listed on page 137.

3. If fluid leaks from the needle port and/or vent lines but eventually stops, the cause is most likely siphoning and not a leak. Siphoning occurs if the vent lines are lower or higher than the needle port. Adjust the vent line(s) so that the outlet is at the same horizontal level as the needle port to prevent siphoning. (See Figure 2).

For other leakage or injection troubleshooting, refer to the Rheodyne Troubleshooting Guide for HPLC Injection Problems. You may download the Guide from the Rheodyne web site: www.idex-hs.com under Support.

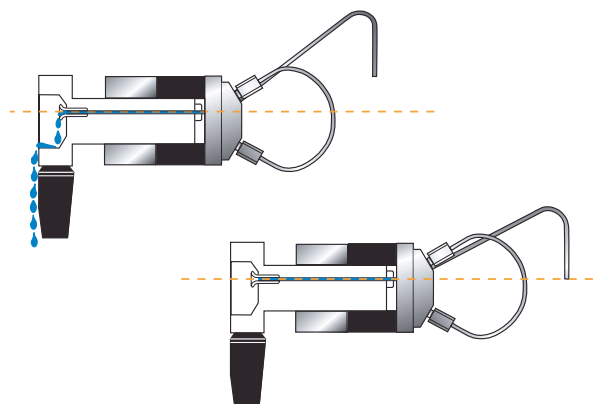


Figure 2 Needle port level compared to the level of vent line outlet: (A) siphoning occurs when the vent line outlet is above the needle port level (B) siphoning does not occur if the vent line outlet is the same horizontal level as the needle port

APPLICATION NOTE

Using Proper Syringe Needles

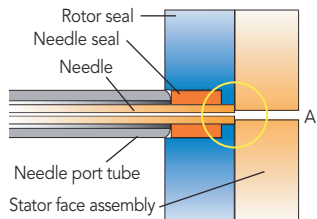
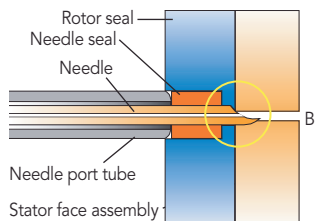


Figure 1 A square cut needle: (A) stops against the stator face assembly; The tip of a pointed needle (B) slips into the stator face and the tip breaks off as the valve rotates



With front-loading injection valves it is important to use the correct needle when loading the sample loop. An incorrect needle will damage the valve and can cause poor reproducibility. When the needle is too short the tip will not reach the needle seal. When the needle is too small in diameter the seal will not grip tightly enough. Needles with a beveled tip can damage the rotor seal and stator face assembly (see Figure 1). The needle should be #22 gauge (0.028"–0.0285" / 0.72 mm), and 90° point style (square cut end). Model 3725 requires a #16 gauge (0.0645"–0.0655" / 1.65 mm) needle. Never use a beveled, pointed, or tapered needle.

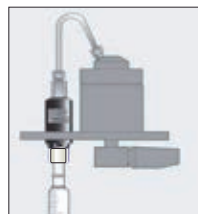
Needle specifications are not critical when using a Loop Filler Port to load the sample loop. However, it is important to tighten the needle port fitting around the needle if using a syringe needle with a slightly smaller diameter than 0.7 mm (0.028").

If the loading method used is complete-filling, a syringe without a needle can be used. A syringe fitted with a Needle Port Cleaner can be used with a front-loading valve (Figure 2A) or with a Loop Filler Port (Figure 2B).

Needle port accessories are listed on this page.



A



B

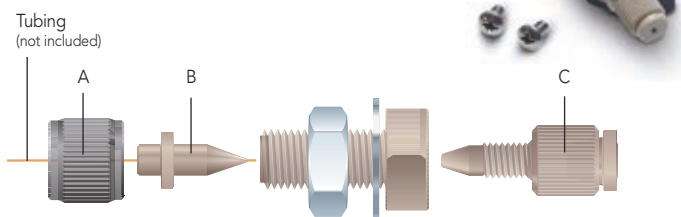
Figure 2
(A) Syringe fitted with Needle Port Cleaner (Part # 7125-054) loading a front-loading valve (model 7725); (B) loading a Loop Filler Port (Part # 7012)

Injection Port Adapters

- ▶ For 360 µm OD tubing
- ▶ Mount on bracket or bulkhead

To introduce sample, connect 360 µm OD capillary tubing to an Upchurch Scientific® Injection Port Adapter Assembly. This adapter accepts standard 22 gauge Hamilton-style injection syringe needles. No additional swept volume is added to the fluid pathway by this adapter, as the needle butts directly against the connecting tubing during injections. The adapter can be bulkhead mounted or mounted with the V-447 Kits.

To introduce a sample directly into a 10-32 port, purchase a M-432-03 separately.



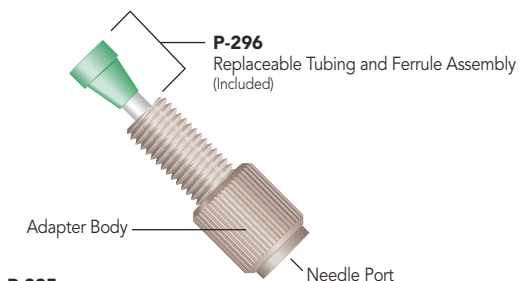
M-432
Micro Injection Port Adapter Assembly

RELATED PRODUCTS

	A	B	C
For 360 µm OD Tubing			
M-432 and V-447	P-416BLK	F-152	M-432-03

- ▶ For use with Upchurch Scientific Injection Valves on page 133

This simple, biocompatible adapter is designed specifically for the Upchurch Scientific Injection Valves on page 133 and can also convert any 1/4-28 flat-bottom port into a port that can accept a standard 22 gauge HPLC injection needle. This injection port adapter is adjustable, so you can create a snug fit around the needle to prevent any leaking of the analyte. In addition, this product features an internal stop that prevents you from inserting the needle too far, eliminating the possibility of damaging the valve with the needle tip.



P-295
1/4-28 Flat-Bottom Injection Port Adapter

Needle Port Accessories

The Rheodyne® adaptable Loop Filler Ports (Part #7012 and 9012) are used to load sample from syringe needles or luer tips. The Needle Port (Part #9013) conserves sample by minimizing the volume between the needle and the valve.



Part No.	Description
MICRO INJECTION PORT ADAPTER	
For 360 µm OD Tubing	
F-152	Replacement MicroFerrule for M-432, Natural PEEK
M-432	Micro Injection Port Adapter Assembly
M-432-03	Replacement Tubing/Fitting Assembly for M-432 & M-433
P-416BLK	Replacement Female Nut for M-432, Black PEEK
V-447	Micro Injection Port Adapter Assembly Actuator Mounting Kit Includes (1) M-432 with mini-actuator bracket and (2) mounting screws
1/4-28 FLAT-BOTTOM INJECTION PORT ADAPTER	
P-295	Adjustable Injection Port Adapter
P-296	Replacement Tubing/Ferrule Assembly
NEEDLE PORT ACCESSORIES	
7012	Stainless Steel Loop Filler Port
7125-054	Needle Port Cleaner
9012	PEEK Loop Filler Port
9013	PEEK Needle Port
9125-076	Suction Needle Adapter (for Model 9725)

Valve Wrenches

- ▶ For convenient wrench-tightening of fittings on high pressure rotary shear valves
- ▶ For removal of knobs on Upchurch Scientific® Manual Valves

The smartly designed IDEX Wrench is a double-ended slotted socket wrench that fits over 1/16" and 1/8" OD tubing. It easily loosens and tightens 1/4" and 5/16" hex head stainless steel or PEEK fittings. The "Z" shape of the IDEX Wrench provides ideal leverage for changing sample loops and fittings, and keeps one end from restricting the use of the other.

The V-103 is an Allen (hex-key) wrench designed to remove the knob from Upchurch Scientific V-101 valves (page 133). The V-104 is an Allen wrench that can be used to remove the knob from Upchurch Scientific Medium Pressure Selection and Injection Valves (also found on page 133).



MXX Replacement Fittings

Use these replacement Ferrules and O-rings for 1/8" and 1/16" tubing with the MXX Series II valves shown on page 133. Please see the part number chart below for a list of individual part numbers.



Mounting Brackets

Rheodyne® mounting brackets and panels of different shapes and sizes organize and provide a sturdy support for Rheodyne valves. The Ring Stand Mounting Bracket now allows the valves to mount onto common laboratory equipment.



Part No. Description

VALVE WRENCHES

6810	IDEX Wrench
V-103	0.050" Allen Wrench (replacement)
V-104	5/64" Allen Wrench (replacement)

MOUNTING BRACKET ACCESSORIES

7160	Mounting Panel
7160-010	Valve Angle Bracket
7160-029	Ring Stand Mounting Bracket

VALVE BRACKET

M-615-1	Mounting Bracket for Upchurch Scientific® Switching Valves
M-615-2	Mounting Bracket for Upchurch Scientific Injection and Selection Valves

REPLACEMENT FITTINGS

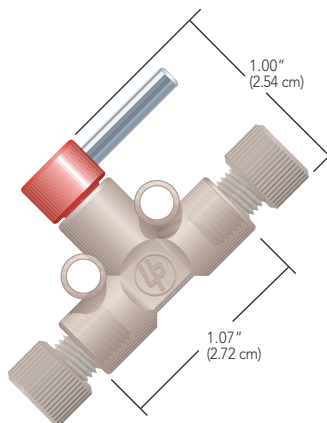
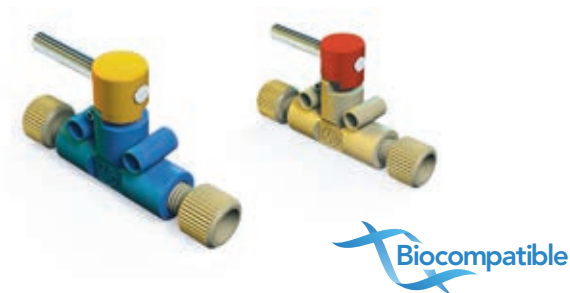
Part No.	Description	Qty.
7770-039	Ferrules for 1/8" OD Tubing	25-pk
7770-040	Ferrules for 1/8" Tubing	50-pk
7770-041	Ferrules for 1/8" Tubing	100-pk
7770-044	Ferrules for 1/16" OD Tubing	25-pk
7770-045	Ferrules for 1/16" Tubing	50-pk
7770-046	Ferrules for 1/16" Tubing	100-pk
7770-124	O-rings for 1/16" OD Tubing	25-pk

Shut-Off Valves

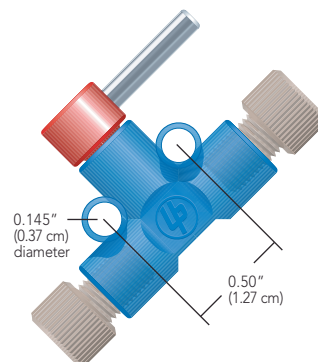
- ▶ Biocompatible, all-polymer flow path
- ▶ Available for 1/16" and 1/8" OD tubing
- ▶ Pressure rated to 500 psi (34 bar)

Stop a flow stream quickly with Upchurch Scientific® biocompatible Shut-Off Valves. The bodies are manufactured from either PEEK or ETFE, and both versions feature a PCTFE rotor, making them highly resistant to chemical attack. The blue colorant used in some valve configurations has proven not to leach out with common HPLC solvents.

Connect semi-rigid or rigid tubing, such as PEEK, stainless steel or fluoropolymer, with the 1/4-28 Flangeless Fittings provided. Soft tubing, such as PharMed® or Tygon® (see pages 75–89), may be connected to these valves using our 1/4-28 barbed adapters, found on page 58.



P-733
PEEK Shut-Off Valve



P-783
ETFE Shut-Off Valve

Part No.	Material	OD Tubing	Thru-hole	Internal Volume*	Includes
SHUT-OFF VALVES					
P-721	ETFE, Natural	1/8"	0.040" (1.0 mm)	10.0 µL	(2) P-335, (2) P-300N
★ P-732	PEEK, Natural	1/16"	0.020" (0.5 mm)	2.5 µL	(2) XP-235
★ P-733	PEEK, Natural	1/8"	0.040" (1.0 mm)	10.0 µL	(2) XP-335
★ P-782	ETFE, Blue	1/16"	0.020" (0.5 mm)	2.5 µL	(2) XP-235
★ P-783	ETFE, Blue	1/8"	0.040" (1.0 mm)	10.0 µL	(2) XP-335

* Maximum internal volume, with valve fully open.

Micro-Splitter Valves

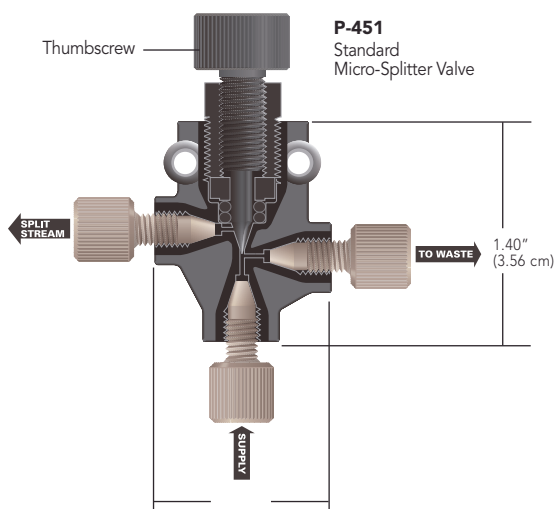
- ▶ For interfacing LC-MS systems
- ▶ Adjustable split stream flow rates
- ▶ Versions for up to 800 psi (55 bar) and up to 4,000 psi (276 bar)

The Upchurch Scientific® line of Micro-Splitter Valves is designed to accurately split and control a low-flow stream off a single incoming supply.

Choose between 1/4-28 flat-bottom and 10-32 coned threaded versions.

The High Pressure Micro-Splitter Valves are designed to operate successfully up to 4,000 psi (276 bar) and the standard Micro-Splitter valves are pressure rated to 800 psi (55 bar).

The Graduated Valve offers many of the benefits and features of Micro-Splitter Valves, plus the ability to adjust and set the split flow to repeatable settings. This allows documentation of settings and the resulting flow rates for easier method development. The graduations also make it easier to employ the valve in a system used to run multiple analyses that require different split flow rates.



P-470



P-450

APPLICATION NOTE

- ▶ With an incoming flow rate of 1 mL/min using room temperature water and equal pressures on both outlet lines, the minimum split flow rate is 2 μ L/min for the standard micro-splitter valves and 4.8 μ L/min for the high pressure micro-splitter valves.
- ▶ All Micro-Splitter Valves have been tested at flow rates to 100 mL/min, with a maximum resulting pressure drop of only 45 psi (3.1 bar) when the valve is fully opened.

SPECIFICATIONS & DETAILS

Part No.	Valve Type	Threads	Internal Volume ¹ (closed/fully open)	Max. Operating Pressure
P-450	Standard	1/4-28	2.1 / 4.1 μ L	800 psi (55 bar)
P-451	Standard	10-32	1.2 / 2.8 μ L	800 psi (55 bar)
P-460S, T	High Pressure	10-32	1.2 / 2.8 μ L	4,000 psi (276 bar)
P-470	High Pres. Graduated	10-32	1.2 / 2.8 μ L	4,000 psi (276 bar)

¹ The supply and waste port thru-holes have IDs of 0.020" (0.50 mm). The ID for the split-stream port thru-hole is 0.020" (0.50 mm) in standard versions; in capillary versions it is 0.010" (0.25 mm).

Part No.	Description	Includes
MICRO-SPLITTER VALVES		
P-450	Standard, 1/4-28, Biocompatible	(3) XP-235
P-451	Standard, 10-32, Biocompatible	(3) F-120
P-460S	High Pressure, 10-32, with Stainless Steel Needle	(3) F-120
P-460T	High Pressure, 10-32, with Titanium Needle	(3) F-120
GRADUATED MICRO-SPLITTER VALVES		
P-470	High Pressure Graduated, 10-32, with Stainless Steel Needle	(3) F-120

* Use with the MicroTight Tubing Sleeves, found on page 19.

Micro-Metering Valves

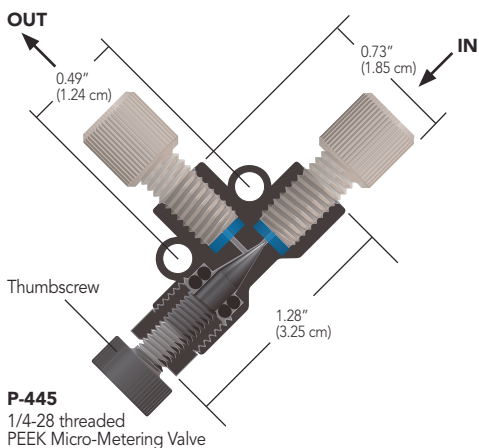
- ▶ Flow rates as low as 3.5 $\mu\text{L}/\text{min}^*$
- ▶ 1/4-28 flat-bottom and 10-32 coned designs available
- ▶ Materials of construction: PEEK, PTFE

For fine control of fluid flow rates, Micro-Metering Valves can reduce outgoing flow to as low as 3.5 $\mu\text{L}/\text{min}^*$. These needle valves are perfect for use with peristaltic pump fluid-transfer applications, mass spectrometry, and fraction collection.

Upchurch Scientific® Micro-Metering Valves can also be used to regulate gas flow in helium sparging lines and as a flow-dependent variable back pressure regulator. For flow independent regulation of back pressure, please see pages 152–153.

Flow path materials are PEEK polymer and PTFE. All versions of this valve have 0.020" (0.50 mm) thru-holes.

**At 1.0 mL/min incoming flow rate with room temperature water.*



APPLICATION NOTE

Back Pressure Considerations

The Micro-Splitter Valves are designed to work when both effluent flow path pressures are nearly identical. However, the split flow path will often have higher back pressure than the waste flow path, making it hard to achieve any split flow at all. There are two possible solutions. Place a back pressure regulator (see pages 152–153) on the waste flow path that is equal to or slightly greater than the pressure on the split flow path. Or, switch the two effluent pathways such that the split flow pathway is attached to the “waste” port on the valve and the waste flow pathway is attached to the “split” port on the valve. *(Please Note: This second method may result in a loss of adjustment sensitivity.)*

Prime/Purge Valve

Air within the pump head can cause noisy pump operation and flow instability. Solve this problem by placing a High Pressure Micro-Splitter Valve (page 146) inline between the pump and the injector valve. You can then safely divert pump flow to a waste container at a sufficient rate to dislodge the air. Remove air from the solvent line leading to the pump with a Prime/Purge Valve (page 155).

Multi-Column and Detector Systems

Does your work require analyses with multiple columns and detectors that use the same mobile phase? If so, install one of our High Pressure Micro-Splitter Valves after your injector. A single injection can then be split to two separate columns and detector systems, at two different flow rates. This economical set-up eliminates the need for an additional pump and injector valve, while allowing data to be obtained simultaneously.

Post-Detector Interfacing

Use a Standard Micro-Splitter Valve to route fluid exiting an initial detector to other devices, such as a mass spectrometer and a fraction collector. The valve will split and reduce the flow rate to that required for MS interfacing, while diverting the remainder of the flow to the collector (a back pressure regulator may also be required for this set up, available on pages 152–153).

Other Applications

These valves are also suited for other applications, such as adapting a standard HPLC system to handle microbore analyses. For more information and plumbing diagrams for this application and those listed above, please contact your local distributor or IDEX Health & Science directly.

Part No.	Material	OD Tubing	Thru-hole	Internal Volume*	Includes
MICRO-METERING VALVES					
P-445	PEEK, Black	1/16"	0.020" (0.50 mm)	7.7 μL	(2) XP-230
★ P-446	PEEK, Black	1/16"	0.020" (0.50 mm)	7.2 μL	(2) F-120
P-447	PEEK, Black	1/8"	0.020" (0.50 mm)	7.7 μL	(2) XP-330

** Maximum internal volume, with valve fully open.*