Ultrahigh-Purity Valves
for Atomic Layer Processing

Atomic Layer Deposition (ALD) Valves

- Ultrahigh cycle life with high-speed actuation
- C_v range from 0.27 to 1.7
- Full immersion capability up to 392°F (200°C) with thermal actuators
- Electronic or optical actuator position-sensing option
- Suitable for ultrahigh-purity applications with 316L VIM-VAR stainless steel body
- Modular surface-mount, tube butt weld, and VCR® end connections

Contents

ALD3 and ALD6 Diaphragm Valve Features

- Normally closed and normally open pneumatic actuation
- Flow coefficients of 0.27 to 0.62 standard; custom flow coefficients available
- Two-port straight and elbow configurations
- Two-, three-, and four-port multiport valves and multivalve manifolds
- Two- and three-port modular surface-mount valves in 1.125 in. (ALD3 series only) and 1.5 in. platforms
  - C-seal design (all valves)
  - W-seal design (ALD3 series only)
- VCR, “H” Type VCR, and tube butt weld end connections in 1/4, 3/8, and 1/2 in. and 6, 10, and 12 mm sizes

Diaphragm

- Cobalt-based superalloy (UNS R30003) material for strength and corrosion resistance
- Optimized design for ultrahigh cycle life

Seat

- Fully contained seat design
- High-purity grade PFA, fully fluorinated
- Ultrahigh cycle life
- Broad range of chemical compatibility
- Excellent resistance to swelling and contamination
- High-integrity seat seal performance

Body

- Body seal provides ultrahigh cycle life
- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Fully swept flow path
  - minimizes entrapment areas
  - facilitates purging
  - maximizes flow capacity
- Optional body holes to accommodate heater cartridges

Actuators

Standard

- Pneumatic actuator for high-speed and repeatable actuation
- Capable of valve opening or closing time of less than 5 ms
- Factory-set flow adjusting mechanism ensures precise and consistent C_v from valve to valve
- Optional factory-set electronic actuator-position sensor verifies open position of pneumatically actuated valves
- Optional solenoid pilot valve for electronic control of high-speed actuation

Thermal

Same performance and options as standard actuator with the following additional features:

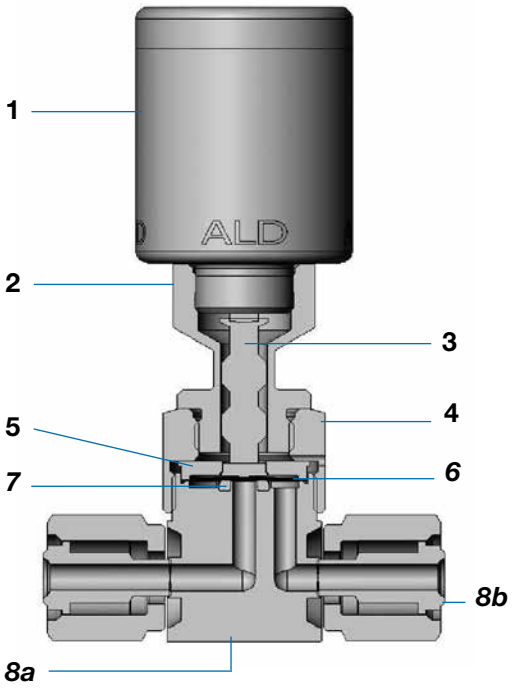
- Includes thermal isolation coupling for thermal applications
- Limits conductive heat transfer from the body to the actuator
- Provides a more uniform valve body temperature to reduce cold spots
- Significantly reduces electrical power required to heat the valve
- Extends the life of the actuator in applications where the body is heated

Materials of Construction (ALD3 and ALD6)

	Component	Material Grade/ASTM Specification
1	Pneumatic actuator assembly	—
	Cylinder, cap	Aluminum
	Pistons	Powdered metal 300 series SS—normally open; aluminum—normally open and normally closed
	Base	Powdered metal 300 series SS—normally open; none—normally closed
	Flow adjusting mechanism	316 SS/A479
	O-rings	Fluorocarbon FKM
	Springs	S17700
	Button	316 SS/A479
	Bushing	Carbon-filled PTFE
2	Thermal isolation coupling housing (thermal model only)	316 SS/A479
3	Thermal isolation coupling stem (thermal model only)	S17400
4	Bonnet nut	316 SS/A479
5	Bonnet	S17400
6	*Diaphragm*	*Cobalt-based superalloy (UNS R30003)/AMS 5876*
7	*Seat*	*High-purity PFA Type II/D3307*
8a	*Body*	*316L VIM-VAR SS/SEMI F20 Ultrahigh-Purity*①
8b	*Welded VCR end connections*	*316L VAR SS/SEMI F20 High-Purity*①
	Lubricant	PTFE-based

Wetted components listed in *italics*.

① 20 % minimum elongation allowed.



Normally Closed Actuator Shown

Process Specifications (ALD3 and ALD6)

See Swagelok® *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	Electropolished and finished to an average of 5 µin. (0.13 µm)	ALD3 normally closed: Inboard helium leak tested to a rate of 1×10^{-9} std cm³/s at the seat, envelope, and all seals. ALD3 and ALD6 normally open and ALD6 normally closed: Inboard helium leak tested to a rate of 1×10^{-8} std cm³/s at the seat and to a rate of 1×10^{-9} std cm³/s at the envelope and all other seals.

Technical Data (ALD3 and ALD6)

Valve Series	Working Pressure psig (bar)		Temperature Rating °F (°C)			Flow Coefficient (C_v)④	Orifice in. (mm)	Internal Volume⑤ in.³ (cm³)		Pneumatic Actuator⑤	
			Operating②③		Short-Term Bakeout			Tube Butt Weld Body	2-Port Surface-Mount	Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
	Operating①	Burst	Standard Actuator	Thermal Actuator②							
Normally Closed Actuation											
ALD3	Vacuum to 145 (10.0)	>3200 (220)	32 to 248 (0 to 120)	32 to 392 (0 to 200)	392 (200) (valve open)	0.27	0.16 (4.1)	0.086 (1.4)	0.048 (0.79)	50 to 90 (3.5 to 6.2)	0.042 (0.69)
ALD6						0.62	0.23 (5.8)	0.26 (4.3)	0.084 (1.4)		0.075 (1.2)
Normally Open Actuation											
ALD3	Vacuum to 145 (10.0)	>3200 (220)	32 to 248 (0 to 120)	32 to 392 (0 to 200)	392 (200) (valve open)	0.27	0.16 (4.1)	0.086 (1.4)	0.048 (0.79)	70 to 90 (4.9 to 6.2)	0.027 (0.44)
ALD6						0.62	0.23 (5.8)	0.26 (4.3)	0.084 (1.4)		0.046 (0.75)

① Recommended operating pressure of less than 35 psig (2.4 bar) for optimal cycle life.

② Actuator temperature is limited to 248°F (120°C); valve body temperature is rated to 392°F (200°C).

③ See pages 6 and 7 for maximum operating temperatures for products with an electronic actuator-position sensor, solenoid pilot valve, or both.

④ Custom flow coefficients available; contact your authorized Swagelok representative for more information.

⑤ ALD3 series 1.125 in. platform surface-mount valve:
- Internal volume for 2-port body: 0.078 in.³ (1.3 cm³)
- Actuation pressure: normally closed, 60 to 90 psig (4.2 to 6.2 bar); normally open, 70 to 90 psig (4.9 to 6.2 bar).
- Air displacement: 0.03 in.³ (0.49 cm³).

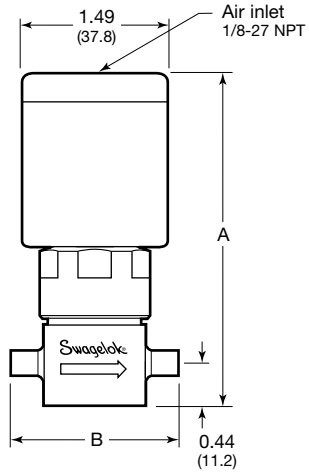
Ordering Information and Dimensions (ALD3 and ALD6)

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Two-Port Valves

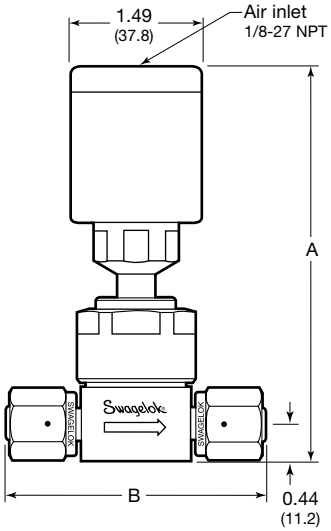
For a complete ordering number, add **C** for a normally closed actuator or **NO** for a normally open actuator.

Normally Closed Standard Actuator



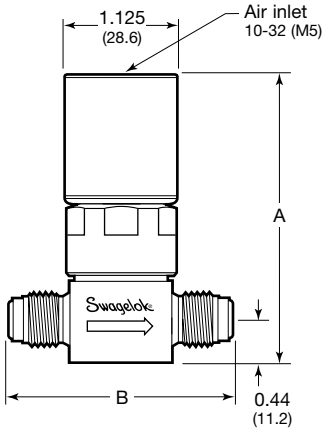
Butt Weld End Connections

Normally Closed Thermal Actuator



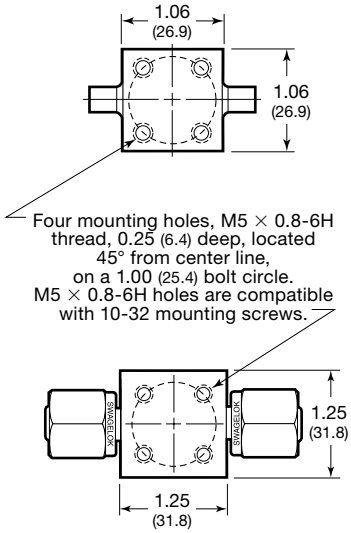
Female VCR Fitting End Connections

Normally Open Standard Actuator



Integral Male VCR Fitting End Connections

ALD3 Bottom



ALD6 Bottom

End Connections		Standard Actuator Ordering Number	Thermal Actuator Ordering Number	Dimensions, in. (mm)		
				A		
Inlet/Outlet	Size			Normally Closed	Normally Open	B
ALD3 Series						
Female VCR fitting	1/4 in.	6LVV-ALD3FR4-P-	6LVV-ALD3TFR4-P-	3.50 (88.9) (standard actuator)	3.22 (81.8) (standard actuator)	2.78 (70.6)
Integral male VCR fitting	1/4 in.	6LVV-ALD3VR4-P-	6LVV-ALD3TVR4-P-			2.30 (58.4)
Rotatable male VCR fitting	1/4 in.	6LVV-ALD3MR4-P-	6LVV-ALD3TMR4-P-			2.78 (70.6)
Tube butt weld, 0.30 in. long	1/4 × 0.035 in.	6LVV-ALD3BW4-P-	6LVV-ALD3TBW4-P-	4.50 (114) (thermal actuator)	4.22 (107) (thermal actuator)	1.74 (44.2)
Tube butt weld, 0.26 in. long	1/4 × 0.035 in.	6LVV-ALD3BW4S-P-	6LVV-ALD3TBW4S-P-			1.61 (40.9)
Tube butt weld, 7.6 mm long	6 × 1 mm	6LVV-ALD3BW6M-P-	6LVV-ALD3TBW6M-P-			1.74 (44.2)
ALD6 Series						
Female VCR fitting	1/2 in.	6LVV-ALD6FR8-P-	6LVV-ALD6TFR8-P-	3.76 (95.5) (standard actuator)	3.48 (88.4) (standard actuator)	4.16 (106)
Female “H” type VCR fitting	1/4 in.	6LVV-ALD6HFR4-P-	6LVV-ALD6THFR4-P-			2.78 (70.6)
Female/rotatable male “H” type VCR fitting	1/4 in.	6LVV-ALD6HFR4HMR4-P-	6LVV-ALD6THFR4HMR4-P-			2.96 (75.2)
Rotatable male VCR fitting	1/2 in.	6LVV-ALD6MR8-P-	6LVV-ALD6TMR8-P-			4.16 (106)
Rotatable male “H” type VCR fitting	1/4 in.	6LVV-ALD6HMR4-P-	6LVV-ALD6THMR4-P-	4.76 (121) (thermal actuator)	4.48 (114) (thermal actuator)	2.96 (75.2)
Tube butt weld, 0.50 in. long	3/8 × 0.035 in.	6LVV-ALD6BW6-P-	6LVV-ALD6TBW6-P-			2.25 (57.2)
	1/2 × 0.049 in.	6LVV-ALD6BW8-P-	6LVV-ALD6TBW8-P-			
Tube butt weld, 12.7 mm long	10 × 1 mm	6LVV-ALD6BW10M-P-	6LVV-ALD6TBW10M-P-			
	12 × 1 mm	6LVV-ALD6BW12M-P-	6LVV-ALD6TBW12M-P-			

Ordering Information and Dimensions (ALD3 and ALD6)

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Modular Surface-Mount Valves

Standard and High-Flow C-Seal Design

For a complete ordering number, add **C** for a normally closed actuator or **NO** for a normally open actuator.

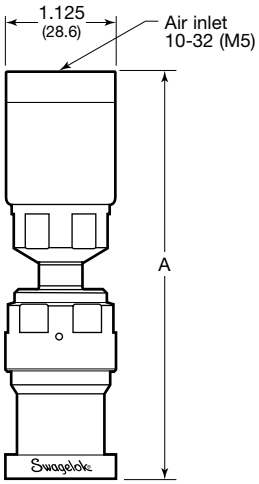
W-Seal Design

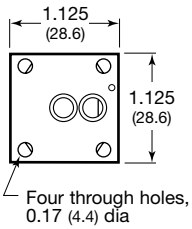
Insert **W** into an ALD3 series ordering number as shown.

Examples:

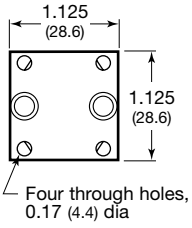
- 6LVV-MSM-ALD3E-**W**2-P-C for a 1.125 in. 2-port valve with standard actuator
- 6LVV-MSM-ALD3T-**W**3-P-C for a 1.5 in. 3-port valve with thermal actuator

Normally Closed Thermal Actuator, 1.125 in. Platform



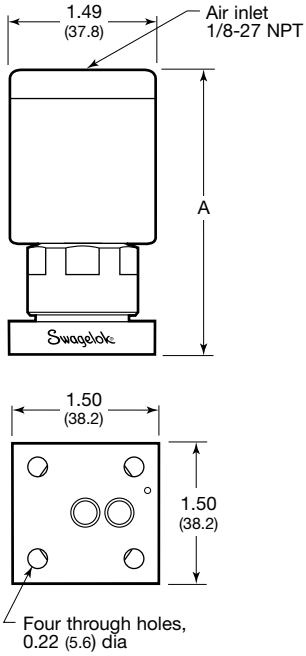


1.125 in. C-Seal Platform Bottom



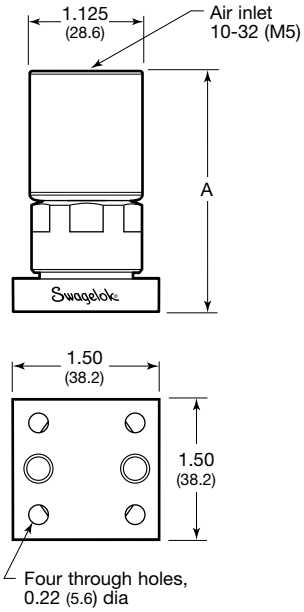
1.125 in. W-Seal Platform Bottom

Normally Closed Standard Actuator 1.5 in. Platform



1.5 in. C-Seal Platform Bottom

Normally Open Standard Actuator 1.5 in. Platform

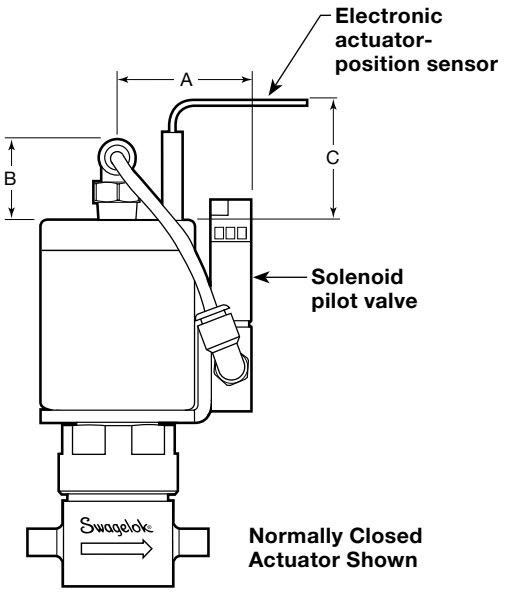


1.5 in. W-Seal Platform Bottom

Surface-Mount Platform	Ports	Standard Actuator Ordering Number	Thermal Actuator Ordering Number	**A,** in. (mm)			
				Normally Closed		Normally Open	
				C-Seal	W-Seal	C-Seal	W-Seal
ALD3 Series							
1.125 in.	2	6LVV-MSM-ALD3E-2-P-	6LVV-MSM-ALD3ET-2-P-	3.40 (86.4) (standard) 4.40 (112) (thermal)	3.40 (86.4) (standard) 4.40 (112) (thermal)	3.45 (87.6) (standard) 4.45 (113) (thermal)	3.45 (87.6) (standard) 4.45 (113) (thermal)
	3	6LVV-MSM-ALD3E-3-P-	6LVV-MSM-ALD3ET-3-P-				
1.5 in.	2	6LVV-MSM-ALD3-2-P-	6LVV-MSM-ALD3T-2-P-	3.02 (76.7) (standard) 4.02 (102) (thermal)	3.70 (94.0) (standard) 4.70 (119) (thermal)	2.74 (69.6) (standard) 3.74 (95.0) (thermal)	3.42 (86.9) (standard) 4.42 (112) (thermal)
	3	6LVV-MSM-ALD3-3-P-	6LVV-MSM-ALD3T-3-P-				
ALD6 Series							
1.5 in.	2	6LVV-MSM-ALD6-HF2-P-	6LVV-MSM-ALD6T-HF2-P-	3.15 (80.0) (standard) 4.15 (105) (thermal)	—	2.87 (72.9) (standard) 3.87 (98.3) (thermal)	—
	3	6LVV-MSM-ALD6-HF3-P-	6LVV-MSM-ALD6T-HF3-P-				

Options and Accessories (ALD3 and ALD6)

Valves with electronic actuator-position sensors (right), solenoid pilot valve assemblies, page 7, heater cartridge holes, page 7, and optical position sensors, page 12, are available.



Dimensions

Actuator	Dimensions, in. (mm)		
	A	B	C
Normally closed	1.32 (33.5)	0.70 (17.8)	1.18 (30.0)
Normally open	1.14 (29.0)	0.63 (16.0)	

Ordering Information

To order one option, add a designator to the valve ordering number. To order two or more options, add the designators in the sequence shown below.

6LVV – ALD3BW4-P-C **S V H**

- **S**: Electronic actuator-position sensor
- **V**: Solenoid pilot valve assembly
- **H**: Heater cartridge holes

Examples:

6LVV-ALD3BW4-P-C**H** for a valve with heater cartridge holes

6LVV-ALD3BW4-P-C**S** for a valve with electronic actuator-position sensor with short pigtail electrical connector

6LVV-ALD3BW4-P-C**SLH** for a valve with electronic actuator-position sensor with long cable with flying leads electrical connector and heater cartridge holes

6LVV-A3T1V333P-AA**V** for a multivalve manifold with solenoid pilot valve assembly on valve 2

6LVV-A31V333P-A**SV**A**SV** for a multivalve manifold with electronic actuator-position sensor with short pigtail electrical connector and solenoid pilot valve assembly on both valves

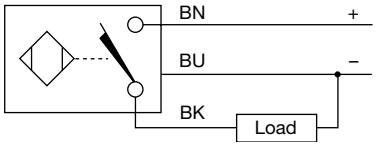
Electronic Actuator-Position Sensors

Transmit a signal to an electrical device indicating the open position of pneumatically actuated valves. Sensors and electrical connectors described below are third-party products.

Sensor Technical Information

Output	3-wire V (dc)—transistor (current-sourcing)
Output Function	Normally open
Voltage	10 to 30 V (dc) polarity protected—pulsed SCP
Operating Temperature	–23 to 70°C (–10 to 158°F)

Wiring Diagram



Factory-Assembled Electronic Actuator-Position Sensors

Factory-assembled position sensors are set for optimum performance and sealed with a tamper-evident paste that provides visible evidence of disassembly or adjustment.

To order an electronic actuator-position sensor factory assembled to a valve, add a designator to the valve ordering number.

Examples:

6LVV-ALD3BW4-P-C**S**
6LVV-MSM-ALD6-HF2-P-C**SL**

Sensor Electrical Connector	Designator
Short pigtail①	S
Long cable with flying leads	SL

① A mating direct-current M8 3-wire push-on straight female connector is available.
Ordering number: **MS-CS-BALF-1**

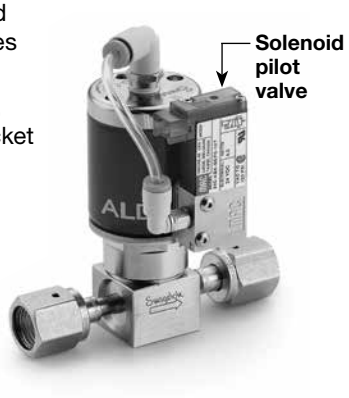
Note: optical sensors for ALD3 and ALD6 are available on page 12.

Options and Accessories (ALD3 and ALD6)

Solenoid Pilot Valve Assemblies

Fast-acting, high-flow solenoid pilot valve enhances ALD series valve response time.

- Includes tubing, connectors, and rotatable mounting bracket for installation versatility.
- See illustration on page 6 for assembly dimensions.
- See table below for technical information. For additional technical information, see MAC® valve part number 34C-ABA-GDFC-1KT.



Solenoid Pilot Valve Technical Information

Component	MAC valve 34C-ABA
Solenoid Pilot Valve	24 V, 4 W
	Temperature rating: 50°C (122°F) maximum, continuous use
	Porting: M5 × 0.8-6H thread, compatible with 10-32 screws
Push-to-Connect Fitting	Material: C3604 brass, 304 SS, polybutylene terephthalate (PBT), polypropylene (PP), polyoxymethylene (POM), Nitrile rubber (NBR) (Buna N)
Tubing	Material: polyurethane
Bracket	Material: 316 SS
O-Ring	Material: Fluorocarbon FKM
Washer	Material: Nylon

Factory-Assembled Solenoid Pilot Valves

To order a solenoid pilot valve factory assembled, add **V** to the ordering number.

Examples: 6LVV-ALD3BW4-P-C**V**
6LVV-MSM-ALD6-2-P-C**V**

In modular surface-mount systems, the solenoid pilot valve may interfere with adjacent components.

Solenoid Pilot Valves for Field Assembly

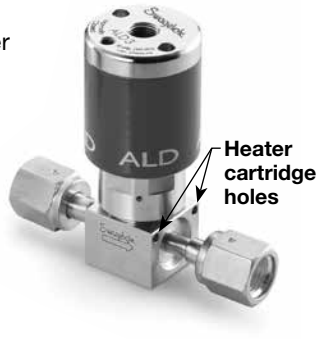
Ordering number for a solenoid pilot valve component only:

MS-PVK-ALD-MAC34CA

Heater Cartridge Holes

Valves are available with holes in the body to accommodate heater cartridges.

- Hole size: 1/8 in. through holes for two-port, three-port, and elbow bodies; 1/8 by 1 in. deep holes for monoblock bodies.
- Two-port and monoblock bodies feature two body holes; three-port and elbow bodies feature one body hole. For more information, contact your authorized Swagelok representative.



Ordering Information.

To order a valve with heater cartridge holes, add **H** to the ordering number.

Examples: 6LVV-ALD3BW4-P-C**H**
6LVV-MSM-ALD6-2-P-C**H**

ALD20 Valve Features

- Normally closed pneumatic actuation
- Flow coefficients of 1.2 to 1.7 standard; custom flow coefficients available
- Two-port straight and elbow configurations
- Two-, three- and four-port multiport valves
- 1.5 in. platforms with C-seal design
- 1/2 in. VCR and tube butt weld end connections
- Patent-pending design

Seat

- Fully contained seat design
- High-purity grade PFA, fully fluorinated
- Ultrahigh cycle life
- Broad range of chemical compatibility
- Excellent resistance to swelling and contamination
- High-integrity seat seal performance

Body

- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Alloy 22 available for enhanced corrosion resistance

Bellows

- Highly polished (5 µin. R_a) bellows designed for ultra-high purity applications
- Alloy 22 material for enhanced corrosion resistance
- Optimized design for ultrahigh cycle life

Actuators

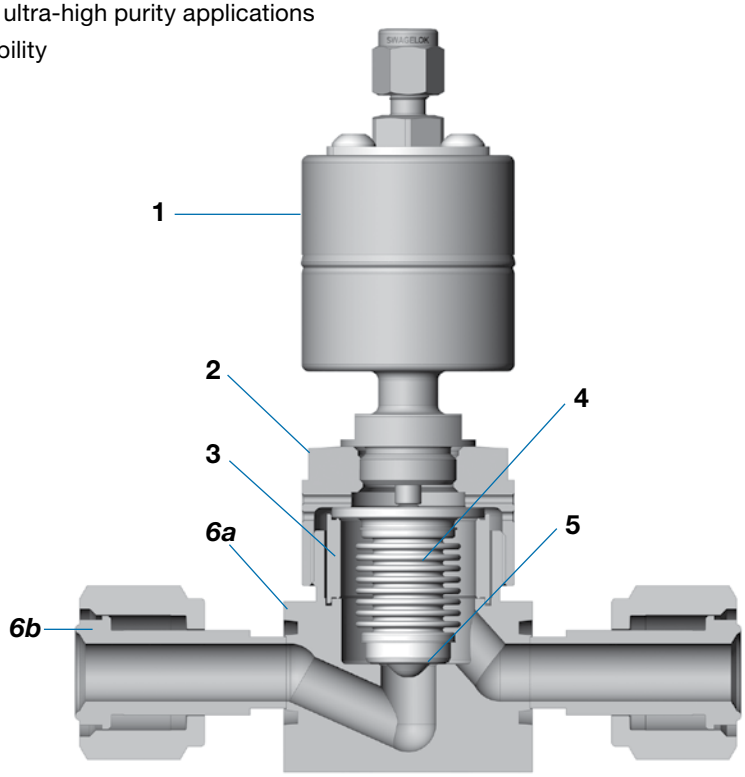
Thermal

- Pneumatic actuator for high-speed and repeatable actuation
- Fully temperature immersible
- Capable of valve opening or closing time of less than 10 ms
- Factory-set flow adjusting mechanism ensures precise and consistent C_v from valve to valve

ALD20 Valve for High Flow Applications

Features

- High flow capacity (up to 1.7 Cv) in a compact footprint
- Valve and actuator fully immersible at elevated temperatures
- Allows configurable flow path to optimize systems
- Highly polished (5 µin. R_a) alloy 22 bellows designed for ultra-high purity applications
- PFA seat for enhanced purity and improved thermal stability



Materials of Construction (ALD20)

Component	Material Grade/ ASTM Specification
1 Pneumatic actuator assembly	316 SS/A479
Lubricant	PTFE-based
2 Bonnet nut	316 SS/A479
3 *Spacer ring*	*Alloy 22/B574*
4 *Polished bellows assembly*	*Alloy 22/B575*
5 *Seat*	*High-purity PFA Type II/D3307*
6a *Body*	*316L VIM-VAR SS/ SEMI F20 Ultrahigh-Purity*①
	Alloy 22/B574
6b *Welded VCR end connections*	*316L VAR SS/ SEMI F20 High-Purity*① 316 SS/A479 VCR nut
	Alloy 22/B574 316 SS/A479 VCR nut

Wetted components listed in *italics*.
① 20 % minimum elongation allowed.

Process Specifications (ALD20)

See Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 for details on processes, process controls, and process verification. (For the alloy 22 option, reference the cleaning, assembly, and packaging sections in MS-06-61.)

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	316L VIM-VAR SS electropolished and finished to an average of 5 µin. (0.13 µm) Alloy 22 finished to an average of 5 µin. (0.13 µm)	*Inboard Helium Leak Test:* ALD20 normally closed valves inboard helium leak tested to a rate of 1×10^{-9} std cm^3/s at the envelope and all external seals.
			Internal Helium Leak Test: ALD20 normally closed valves internal helium leak tested to a rate of 1×10^{-7} std cm^3/s at the seat.
			Internal seat seal may change during valve life cycle, contact Swagelok technical service for additional information.

Technical Data (ALD20)

Body Style	Working Pressure psig (bar)		Temperature Rating °F (°C)	Flow Coefficient (C_v)	Orifice in. (mm)	Internal Volume in.³ (cm³)	Pneumatic Actuator	
	Operating	Burst	Operating (Immersion)				Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
Normally Closed Actuation								
1/2 in. Ported	Vacuum to 20 (1.4)	>3200 (220)	50 to 392 (10 to 200)	1.7	0.36 (9.1)	0.75 (12.3) Tube Butt Weld	70 to 90 (4.9 to 6.2)	0.10 (1.6)
MSM High Flow C-seal				1.2	0.29 (7.2)	0.50 (8.1) 2-Port		

Ordering Information and Dimensions (ALD20)

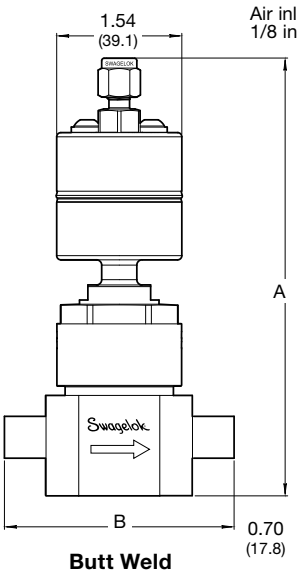
Dimensions, in inches (millimeters), are for reference only and are subject to change.

To order, add a body material designator to an ALD20 basic ordering number.

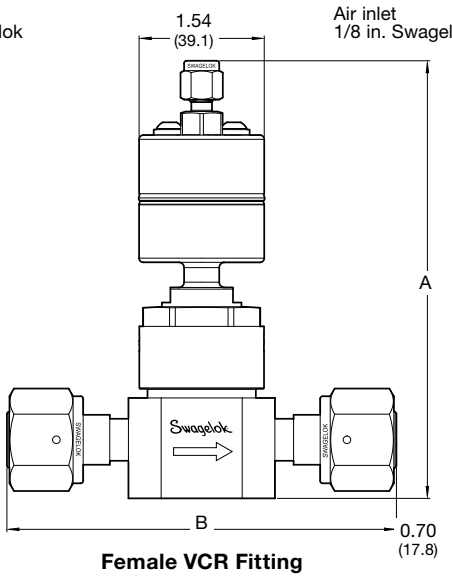
Material	Designator
316L VIM-VAR SS	6LVV
Alloy 22	HC22

Example: **6LVV**-ALD20FR8-P-C

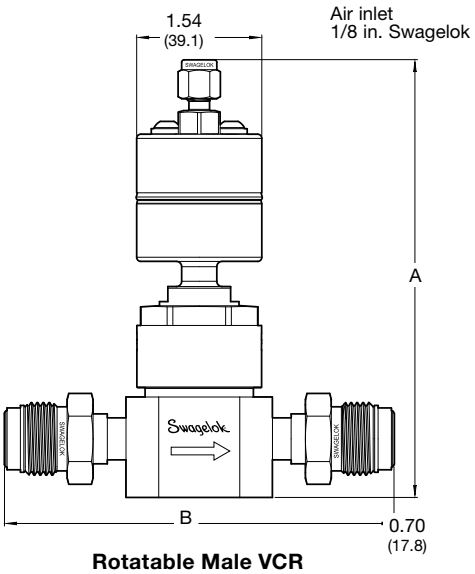
Two-Port Valves



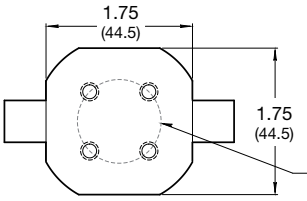
Butt Weld End Connections



Female VCR Fitting End Connections



Rotatable Male VCR Fitting End Connections



Two-Port Bottom

End Connections		Ordering Number	Dimensions, in. (mm)	
Inlet/Outlet	Size		A	B
Female VCR fitting	1/2 in.	-ALD20FR8-P-C	5.23 (133)	4.65 (118)
Rotatable male VCR fitting	1/2 in.	-ALD20MR8-P-C		
Female/Rotatable male VCR fitting	1/2 in.	-ALD20FR8MR8-P-C		
Tube butt weld, 0.50 in. long	1/2 × 0.049 in.	-ALD20BW8-P-C		2.74 (69.7)
Tube butt weld, 0.50 in. long/ Female VCR fitting	1/2 × 0.049 in./ 1/2 in.	-ALD20BW8FR8-P-C		3.70 (94.0)

Ordering Information and Dimensions (ALD20)

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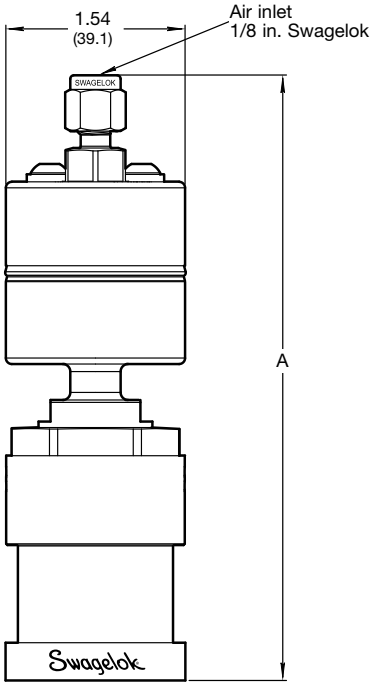
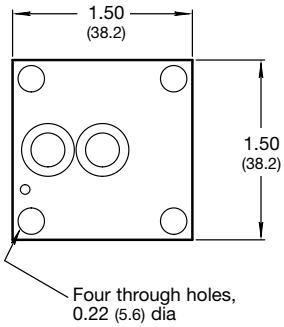
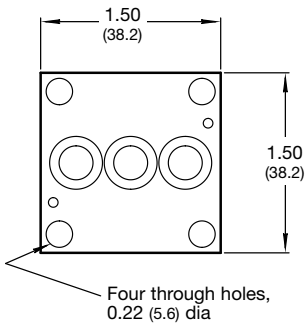
Modular Surface-Mount Valves

High-Flow C-Seal Design







Ports	Ordering Number	**A,** in. (mm)
2	-MSM-ALD20-HF2-P-C	5.05 (128)
3	-MSM-ALD20-HF3-P-C	

Options and Accessories (ALD3, ALD6, ALD20)

Optical Position Sensors

Features

- Fast response times
- Compatible with high temperatures
- Unaffected by Radio Frequency (RF) noise
- Transferable from one valve to another, without loss of factory settings

Optical Sensor Kits

Optical sensors detect the open position on normally closed pneumatically actuated valves. Optical sensor kits contain the hardware required to install the sensor onto an optical sensor ready valve and connect it to an amplifier.

Optical sensors kits are factory set to the correct depth and tested for proper functionality.

Sensor Kit Technical Information

Fiber Unit	FU-87
Temperature Rating	–76°F to 356°F (–60°C to 180°C)
Max Ambient Temperature	302°F (150°C)
Fiber Length①	6.56 ft. (2 m)

① Every optical sensor kit includes a single use fiber cutting tool

Ordering Information

Optical Sensor Kit Ordering number:

MS-SOK-ALD-FU87

To order an Optical Sensor Kit with an amplifier add, **-AMP** to the ordering number.

MS-SOK-ALD-FU87**-AMP**

Optical Sensor Ready ALD3 and ALD6 Valves*

Optical sensor ready valves are designed to allow an optical sensor kit to be easily installed onto the actuator. The modifications from standard ALD valves include the following:

- A sensor target is included in the actuator
- The actuator is 0.115 in. (2.9 mm) taller
- The 1/8-27 NPT air inlet is replaced with a 10-32 (M5) connection

Ordering Information (ALD3 and ALD6)*

To order an optical sensor ready valve, add **SO** to the ordering number.

Example: 6LVV-ALD3BW4-P-LI-C**SO**

Note: Optical sensor is only available on normally closed valves. LI indicates “less indicator” as sensor kits are sold separately for field assembly.

* All **ALD20** valves are optical sensor-ready. No special order information is required.

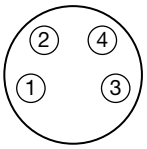
Caution: Do not mix or interchange parts with those of other manufacturers.

Optical Sensor Amplifiers

The optical sensor amplifiers work in conjunction with an Optical Sensor Kit and an Optical Sensor Ready Valve to transmit a signal to an electrical device. The signal indicates the open position of pneumatically actuated valves.

Amplifier Technical Information

Amplifier	FS-N11CP
Output	PNP, M8 Connector
Temperature Rating	–4° to 131°F (–20° to 55°C)
Power Requirement	12-24V DC ± 10% Ripple (P-P) 10 % or Less



M8 Connector Pin Layout

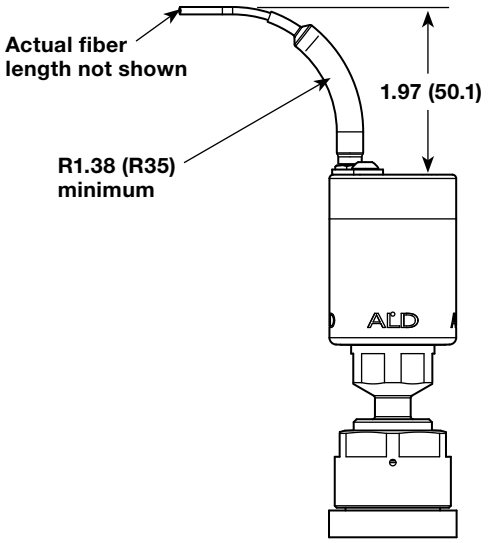
1	Power (12-24V DC)
2	Input
3	Ground (0V)
4	Digital Output

Factory Programmed Amplifiers

Factory programmed amplifiers are preset for optimum performance with Swagelok optical sensor ready valves and optical sensor kits. All factory programmed amplifiers are tested for proper functionality.

Optical Sensor Amplifier Ordering Number:

MS-SOK-ALD-AMP-M8



Multiport and Elbow Valves and Monoblock Manifolds

ALD series valves are available in multiport and elbow configurations and monoblock manifolds; refer to *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, MS-02-442.

Swagelok

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Warranty Information

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Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Diaphragm Valves

DL and DS Series

- Packless, all-metal containment
- Working pressures from vacuum to 3500 psig (241 bar)
- Temperatures from –100 to 250°F (–73 to 121°C)

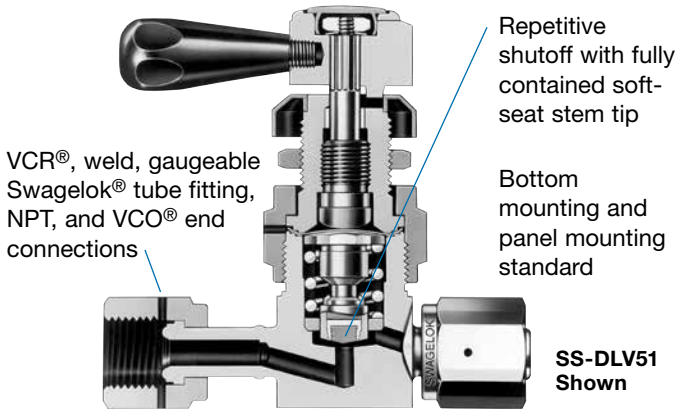
Features

DL Series

- DL series diaphragm valves require just one-quarter turn of the handle to actuate the valve from fully open to closed.
- Position indicator ring provides visual confirmation that the valve is fully open or closed.
- Splined handle and actuator prevent handle slippage and assure positive valve actuation.

DS Series

- DS series diaphragm valves require approximately one and one-half turns to operate from fully open to closed.
- Flow coefficient of 0.30 for high-flow requirements.



SS-DLV51 Shown

Technical Data

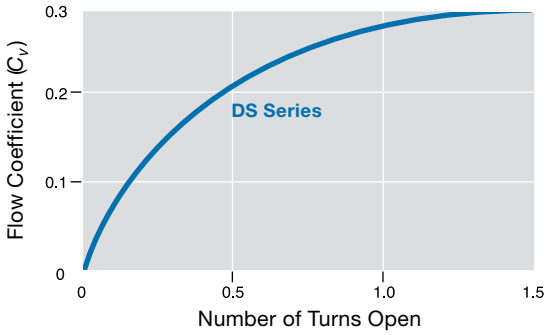
Series	Orifice in. (mm)	Flow Coefficient (C_v)	Pressure Rating at 70°F (20°C)	Differential Back Pressure① Max at 70°F (20°C)	Temperature Rating	Internal Volume②
DL	0.156 (4.0)	0.14	3500 psig (241 bar)	1500 psig (103 bar)	–100 to 250°F (–73 to 121°C)	0.18 in.^{3} max (2.9 cm^3)
DS		0.30③				

① A 17-7 PH® spring is available to increase the rating to 2500 psig (172 bar). To order, add **-PS** to the ordering number. Example: SS-DLS4-**PS**

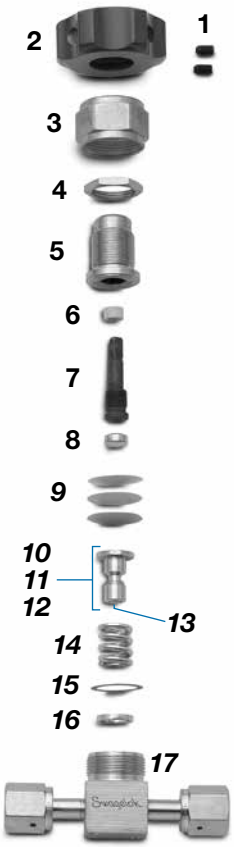
② Determined using valves with Swagelok tube fitting end connections.

③ C_v for 6LV-DSBW4 valve is 0.25.

Flow Coefficient at Turns Open



Materials of Construction



Component	Material Grade/ ASTM Specification
1 Set screw (DS series)	Alloy steel/ANSI 18.3
2 Rotary handle (DS series)	Aluminum 6061-T6①/B211
Lever handle (DL series)	Aluminum 2024-T4①/B211
Handle center (DL series)	Sintered 316 SS
Handle insert (DL series)	66 nylon/D4066
Nut (DL series)	18-8 SS
Indicator ring (DL Series)	316 SS/A240
3 Bonnet nut②	316 SS/A479
4 Panel mount nut	Sintered 316 SS
5 Bonnet	316 SS/A479
6 Wiper ring	Glass-filled PTFE
7 Actuator③④	416 SS/A582
8 Actuator button③	Brass 360/B16
9 *Diaphragms (3)*	*316 SS/A240*
10 *Stem*	*316L SS/A479*
11 *Stem plug*	
12 *Stem container*	
13 *Stem insert*	*PCTFE/D1430*
14 *Spring*	*316 SS/A313*
15 *Gasket*	*PTFE-coated 316L SS/A240*
16 *Guide*	*Electropolished 316 SS/A240*
17 *Body*	*316L SS/A479*
Swagelok tube fitting, integral tube butt weld, tube socket/tube butt weld, and VCO end connections	
VCR and NPT end connections	*316 SS or 316L SS/A479*

Pressure-Temperature Ratings

Temperature °F (°C)	Working Pressure psig (bar)
–100 (–73) to 100 (37)	3500 (241)
200 (93)	2950 (203)
250 (121)	2800 (192)

Wetted components listed in *italics*.

① Epoxy coated.

② Silver-plated threads.

③ Molybdenum disulfide-based lubricant.

④ Chrome-plated (DL series only).

Swagelok

Process Specifications

See Swagelok process specifications *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, and *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61, for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Process Designator	Process Specification	Wetted Surface Roughness (R_a)	Testing
Special cleaning with non–ozone-depleting chemicals	Performed in specially cleaned areas; valves are individually bagged	None	*Special Cleaning and Packaging (SC-11)*	20 µin. (0.51 µm) average, machine finished	Inboard helium leak tested to a rate of 4×10^{-9} std cm^3/s at the seat, envelope, and all seals
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags	P	*Ultrahigh-Purity Process Specification (SC-01)*	8 µin. (0.20 µm) average, machine finished and electropolished	

Ordering Information and Dimensions

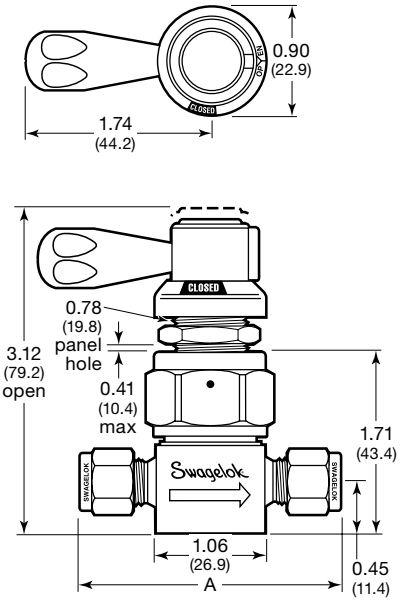
Select an ordering number.

Dimensions, in inches (millimeters), are for reference only and are subject to change.

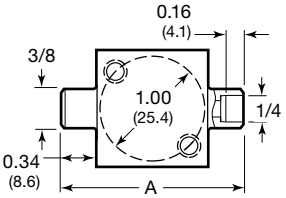
End Connections		DL Series Ordering Number	DS Series Ordering Number	A in. (mm)
Inlet/Outlet	Size			
Tube butt welds	1/4 in.	6LV-DLBW4	6LV-DSBW4	1.74 (44.2)
	3/8 in.	6LV-DLBW6	6LV-DSBW6	1.74 (44.2)
Tube socket and tube butt welds	1/4 and 3/8 in.	SS-DLTW4	SS-DSTW4	1.75 (44.4)
	3/8 and 1/2 in.	SS-DLTW6	SS-DSTW6	1.81 (46.0)
Swagelok tube fittings	1/4 in.	SS-DLS4	SS-DSS4	2.46 (62.5)
	3/8 in.	SS-DLS6	SS-DSS6	2.58 (65.5)
	6 mm	SS-DLS6MM	SS-DSS6MM	2.46 (62.5)
	8 mm	SS-DLS8MM	SS-DSS8MM	2.53 (64.3)
Female VCR fittings	1/4 in.	SS-DLV51	SS-DSV51	2.76 (70.1)
Female to male VCR fitting	1/4 in.	SS-DLV51-VCR4	SS-DSV51-VCR4	2.54 (64.5)
Male to female VCR fitting	1/4 in.	SS-DLVCR4V51	SS-DSVCR4V51	2.54 (64.5)
VCO O-ring fittings	1/4 in.	SS-DLVCO4	SS-DSVCO4	2.00 (50.8)
Male VCR fittings	1/4 in.	SS-DLVCR4	SS-DSVCR4	2.30 (58.4)

Dimensions shown with Swagelok tube fitting nuts finger-tight.

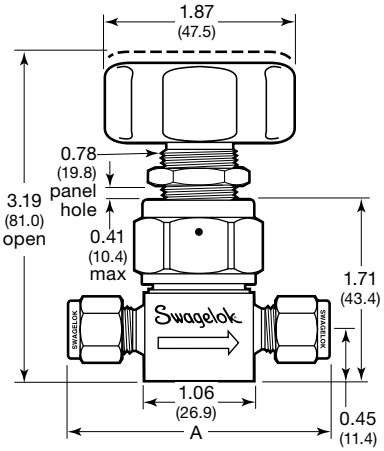
Straight Patterns

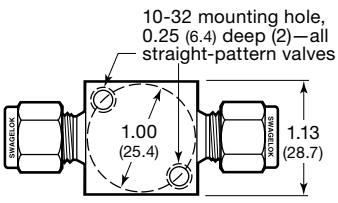


1/4 in. Tube Butt Welds



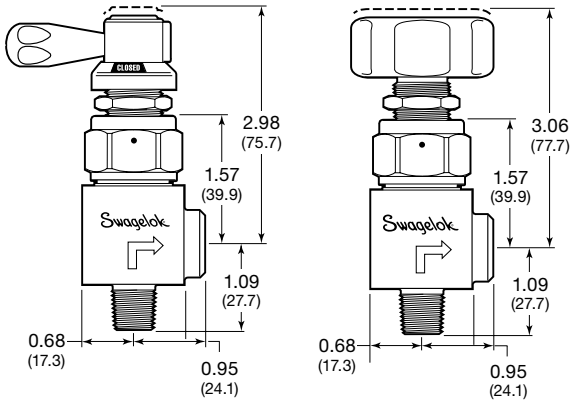
1/4 in. Tube Socket/ 3/8 in. Tube Butt Welds





Swagelok Tube Fittings

Angle Patterns



End Connections		DL Series Ordering Number	DS Series Ordering Number
Inlet/Outlet	Size		
Male/female NPT	1/4 in.	SS-DLM4F4A	SS-DSM4F4A

Options and Accessories

Optional Stem Tip Materials

To order a valve with an optional stem tip material, insert a stem tip material designator after the series designator in the ordering number.

Stem Tip Material	Designator
PTFE	T
Polyimide	V

Example: 6LV-DL**T**BW4

Stem Replacement Kit

A stem replacement kit includes a stem-tip assembly, spring, guide ring, and installation instructions.

Stem Tip Material	Stem Replacement Kit Ordering Number
PCTFE	6L-3AK-DS-KF
PTFE	6L-3AK-DS-T
Polyimide	6L-3AK-DS-VL

Diaphragm Seal Kits

A diaphragm seal kit includes three diaphragms (one set), one gasket, and installation instructions.

Ordering number: **SS-3DK-DS**

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, refer to *Oxygen System Safety* technical report, MS-06-13.

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff in DS series valves.**

Caution: Do not mix or interchange parts with those of other manufacturers.

Colored Handles

To order colored handles, add a color designator to the valve ordering number. Green is standard and requires no designator.

Handle Color	Designator
Black	-BK
Blue	-BL
Orange	-OR
Red	-RD
White	-WH
Yellow	-YW

Example: 6LV-DLBW4-**RD**

Ultrahigh-Purity Process Specification (SC-01)

Swagelok DL and DS series valves are processed in accordance with *Swagelok Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C.

To order a DL or DS series valve with special processing in accordance with *Swagelok Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61, and with a surface finish of 8 µin. (0.20 µm) R_a, add **-P** to the valve ordering number.

Example: 6LV-DLBW4-**P**

Multiport and Elbow Valves and Monoblock Manifolds

DL and DS series valves are available in multiport and elbow configurations and monoblock manifolds; see the Swagelok *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, MS-02-442.

Swagelok

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Ultrahigh-Purity Fluoropolymer Diaphragm Valves

DRP Series

- Pneumatic and quarter-turn manual 2-way and 3-way models; pneumatic and manual models with adjustable flow and bypass features
- Modified PTFE wetted parts and polypropylene actuator
- Meet SEMI Standard F57-0301 for ultrahigh-purity system components
- Fine thread flare and Nippon Pillar® Super 300 end connections standard; Flowell, space saver, and other end connections available
- Custom manifolds and subassemblies available

Swagelok

Contents

Ultrahigh-Purity Fluoropolymer Diaphragm Valves

The Swagelok® DRP series valve is manufactured to meet SEMI standard F57-0301 specifications for UHP chemical distribution systems and equipment and offers solutions for:

- Aggressive chemical mechanical planarization (CMP) slurry systems
- DI water systems
- Bulk chemical delivery systems
- Aggressive acids, bases, and other chemicals.

Features

Improved Patented Fluid Flow Path

- Hemispherical valve cavity and unique diaphragm shape minimize entrapment areas.
- All wetted surfaces clean rapidly and purge free of process fluids or contaminants.
- Flow path minimizes fluid shear for reduced slurry agglomeration.

Extended Diaphragm Life

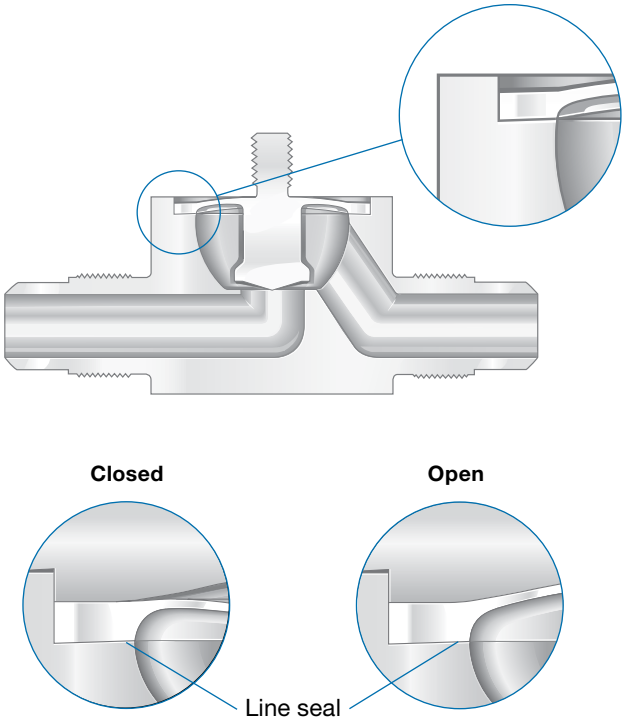
- Modified PTFE diaphragm promotes durability, seal integrity, and long cycle life.
- Patented modified PTFE diaphragm shape is optimized to minimize stress during cycling.

Enhanced Design

- Patented diaphragm rim seals off valve cavity.
- Uniformly distributed shutoff force minimizes valve seat strain.
- Web thickness of the diaphragm has been maximized to reduce the potential for acid permeation.
- Design minimizes opportunity for process fluid contamination.
- No exposed metals.
- Soft-acting spring closure helps prevent hydraulic shock, particle generation, and damage to the seat seal, as well as compensating for material creep.
- Open and closed valve status is indicated by handle position or position indicator.
- Ease of diaphragm replacement facilitates maintenance.

Reduced Entrapment

The geometry at the point of the seal between the diaphragm and the valve body creates a line seal and minimizes entrapment areas.



Line seal maintained during cycling of valve.
No entrapment areas created.

Diaphragm Containment

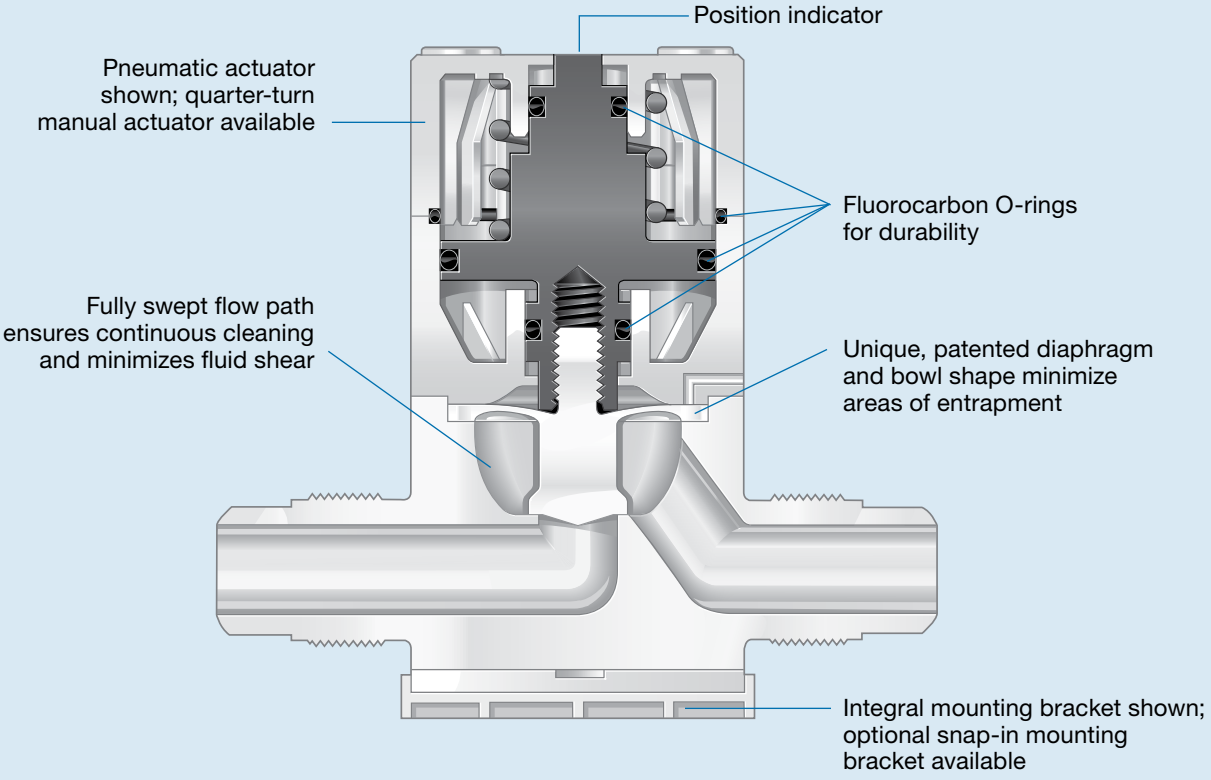
The outer diameter of the diaphragm is contained by a counterbore in the valve body. This design compensates for creep and sustains seal integrity during cycling.

Patented Bowl Geometry

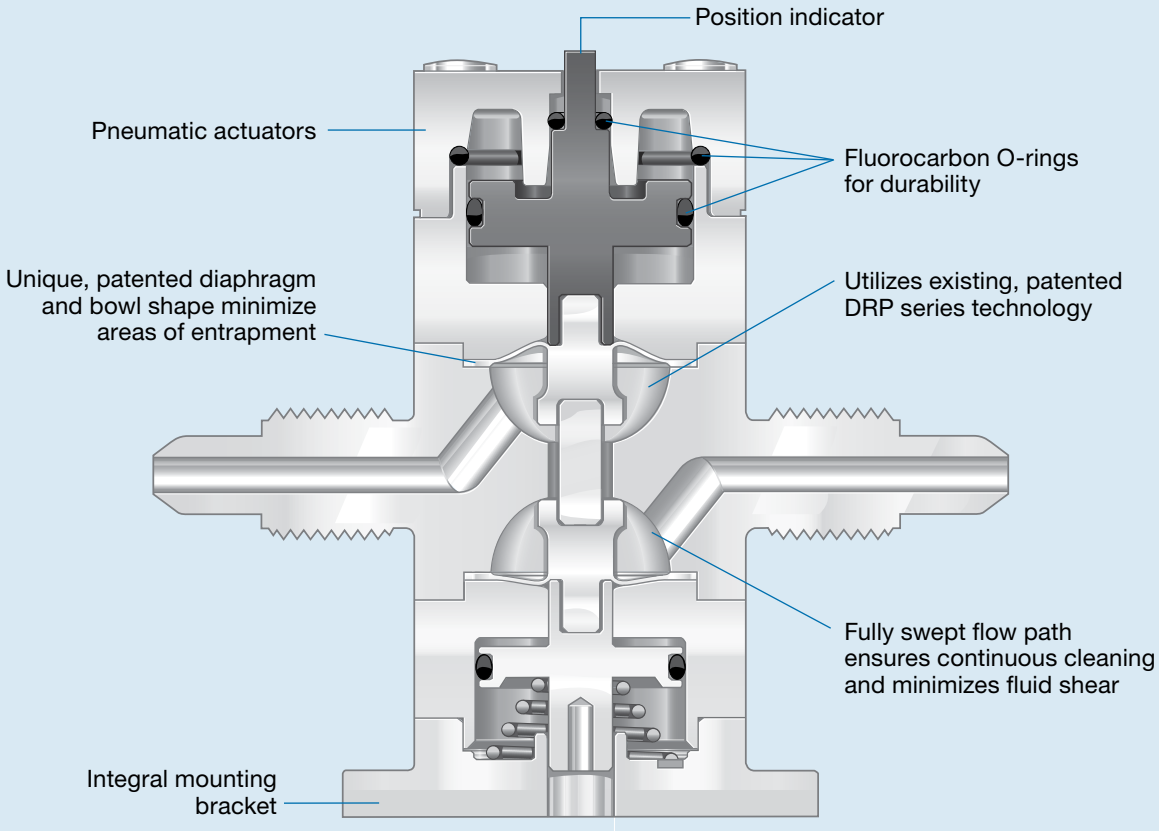
The rounded, open bowl enhances flow and cleaning.

Features

2-Way Valve

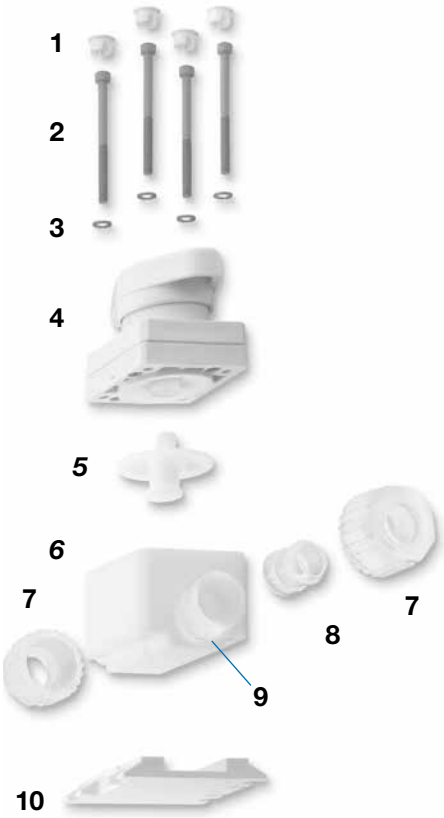


3-Way Valve

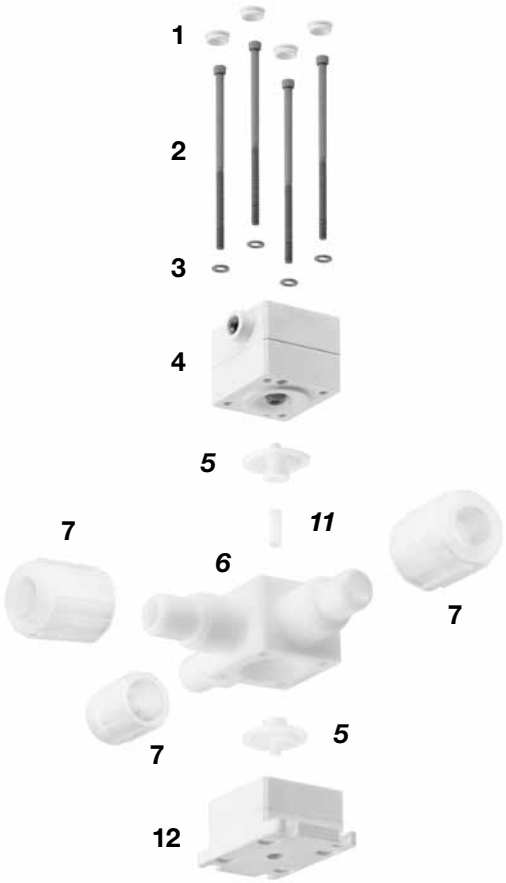


Materials of Construction

Pneumatic 2-Way Model Shown with Fine Thread Flare End Connections



Manual 2-Way Model Shown with Nippon Pillar Super 300 End Connections



Pneumatic 3-Way Model Shown with Fine Thread Flare End Connections

Component	End Connections	
	Fine Thread Flare	Nippon Pillar Super 300
	Material	
1 Hole plugs	Polypropylene	
2 Cap screws	PTFE-coated stainless steel	
3 Washers		
4 Actuator housing	20 % glass-filled polypropylene	
5 *Diaphragm*	*Modified PTFE*	
6 *Body*		
7 Nuts	PVDF	PFA
8 *Sleeve*	—	*PFA*
9 Gauge ring		ETFE
10 Mounting bracket	20 % glass-filled polypropylene	
11 *Connection rod*	*Modified PTFE*	
12 Actuator housing	Polypropylene	

Wetted components listed in *italics*.

Pressure-Temperature Ratings

Based on an ambient room temperature of 77 ± 9°F (25 ± 5°C).

Valve Body Size	End Connection Size	Media Temperature °F (°C)	2-Way Valves	3-Way Valves
			Pressure Rating① (forward and reverse) psig (bar)	
Small	6, 8, 10, and 12 mm; 1/4, 3/8, and 1/2 in.	73 to 149 (23 to 65)	80 (5.5)	80 (5.5)
		212 (100)	40 (2.7)	40 (2.7)
Medium	12, 19, and 25 mm; 1/2, 3/4, and 1 in.	73 to 149 (23 to 65)	100 (6.8)	80 (5.5)
		212 (100)	40 (2.7)	40 (2.7)
Large	19 and 25 mm; 3/4 and 1 in.	73 to 149 (23 to 65)	80 (5.5)	—
		212 (100)	40 (2.7)	—
	1 1/4 in.	73 (23)	80 (5.5)	—

① Minimum actuator pressure required at rated system pressures—60 psig (4.2 bar); maximum actuator pressure—100 psig (6.8 bar).

Flow Data

Flow Coefficients

For more information about flow coefficients, refer to *Valve Sizing* technical bulletin, MS-06-84.

Fine Thread Flare End Connections

Valve Body Size	Fine Thread Flare End Connection Size	2-Way Valves	3-Way Valves
		Flow Coefficient (C_v)	
Small	1/4 in.	0.4	0.32
	3/8 in.	0.8	0.48
	1/2 in.	0.8	0.65
Medium	1/2 in.	2.6	2.61
	3/4 in.	4.1	2.55
	1 in.	3.6	2.51
Large	3/4 in.	6.9	—
	1 and 1 1/4 in.	10.2	—

Nippon Pillar Super 300 End Connections

Valve Body Size	Nippon Pillar Super 300 End Connection Size	2-Way Valves	3-Way Valves
		Flow Coefficient (C_v)	
Small	1/4 in. / 6 mm	0.5	0.41
	8 mm	0.8	—
	3/8 in. / 10 mm	0.7	0.48
	1/2 in. / 12 mm	0.9	—
Medium	1/2 in. / 12 mm	2.9	—
	3/4 in. / 19 mm	4.5	—
	1 in. / 25 mm	3.6	—
Large	3/4 in. / 19 mm	7.2	—
	1 in. / 25 mm	10.0	—

Traceability and Material Certification

- Diaphragm and valve body are permanently laser marked for traceability.
- All wetted components are FDA compliant in accordance with 21CFR Part 177.
- The Swagelok DRP series valve meets the requirements of SEMI Standard F57-0301. Refer to *DRP Series Ultrahigh-Purity Fluoropolymer Diaphragm Valve Technical Report Abstracts,* MS-06-102, and the *Swagelok DRP Series Ultrahigh-Purity Fluoropolymer 3-Way Diaphragm Valve Technical Report Abstracts,* MS-06-107.

Testing

Every Swagelok DRP series valve is factory leak tested at the seat and shell.

Cleaning and Packaging

Every Swagelok DRP series valve is cleaned and packaged in accordance with SEMI Standard F57-0301 for ultrahigh-purity fluid system components.

Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

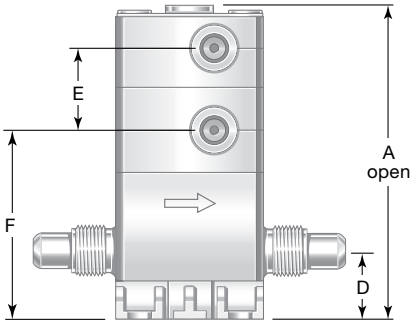
Pneumatic 2-Way Valves

To order, add an actuation mode designator to a basic ordering number.

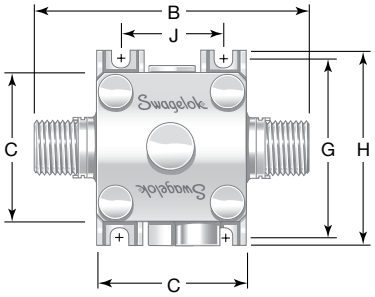
Actuator Thread	Actuation Mode	Designator
10-32 (small valve body); 1/8 in. NPT (medium and large valve body)	Normally closed	C
	Normally open	O
M5 × 0.8 (small valve body); JIS Rc-1/8 (ISO 7) (medium and large valve body)	Normally closed	EC
	Normally open	EO

Example: NXT-DRP41AFCFC-**C**

Side
Fine Thread Flare
End Connections Shown



Top
Nippon Pillar Super 300
End Connections Shown



Valve Body Size	End Connection Size	Basic Ordering Number	Dimensions A	B	C	D	E	F	G	H	J	Weight
Fine Thread Flare End Connections												
Dimensions, in. (mm)												lb (kg)
Small	1/4	NXT-DRP41AFCFC-	2.43 (61.7)	3.28 (83.3)	1.29 (32.8)	0.64 (16.3)	0.68 (17.3)	1.46 (37.1)	1.61 (40.9)	1.83 (46.5)	0.86 (21.8)	0.23 (0.10)
	3/8	NXT-DRP41AFDFD-		3.48 (88.4)		0.59 (15.0)						
	1/2	NXT-DRP41AFEFE-	2.68 (68.1)	3.78 (96.0)		0.77 (19.6)		1.71 (43.4)				0.28 (0.13)
Medium	1/2	NXT-DRP81AFEFE-	4.56 (116)	4.80 (122)	2.30 (58.4)	0.84 (21.3)	1.25 (31.8)	2.67 (67.8)	2.76 (70.1)	3.05 (77.5)	1.57 (39.9)	1.2 (0.54)
	3/4	NXT-DRP81AFGFG-		5.06 (129)								
	1	NXT-DRP81AFJFJ-	5.06 (129)	5.70 (145)		1.14 (29.0)		3.17 (80.5)				1.5 (0.68)
Large	3/4	NXT-DRP161AFGFG-	6.42 (163)	6.26 (159)	3.52 (89.4)	1.08 (27.4)	2.21 (56.1)	3.40 (86.4)	3.86 (98.0)	4.52 (115)	2.55 (64.8)	3.5 (1.6)
	1	NXT-DRP161AFJFJ-		6.90 (175)								
	1 1/4	NXT-DRP161AFKFK-	6.55 (166)	6.50 (165)		1.21 (30.7)		3.53 (89.7)				
Nippon Pillar Super 300 End Connections												
Dimensions, in. (mm)												lb (kg)
Small	1/4	NXT-DRP41ANCNC-	2.43 (61.7)	2.40 (61.0)	1.29 (32.8)	0.64 (16.3)	0.68 (17.3)	1.46 (37.1)	1.61 (40.9)	1.83 (46.5)	0.86 (21.8)	0.23 (0.10)
	3/8	NXT-DRP41ANDND-		2.71 (68.8)		0.83 (21.1)		1.71 (43.4)				
	1/2	NXT-DRP41ANENE-	2.68 (68.1)	3.29 (83.6)		0.77 (19.6)						0.28 (0.13)
Medium	1/2	NXT-DRP81ANENE-	4.56 (116)	3.93 (99.8)	2.30 (58.4)	0.84 (21.3)	1.25 (31.8)	2.67 (67.8)	2.76 (70.1)	3.05 (77.5)	1.57 (39.9)	1.2 (0.54)
	3/4	NXT-DRP81ANGNG-		4.28 (109)								
	1	NXT-DRP81ANJNJ-	5.06 (129)	4.68 (119)		1.21 (30.7)		3.17 (80.5)				1.5 (0.68)
Large	3/4	NXT-DRP161ANGNG-	6.42 (163)	5.48 (139)	3.52 (89.4)	1.08 (27.4)	2.21 (56.1)	3.40 (86.4)	3.86 (98.0)	4.52 (115)	2.55 (64.8)	3.5 (1.6)
	1	NXT-DRP161ANJNJ-		5.88 (149)								
Dimensions, mm (in.)												kg (lb)
Small	6	NXT-DRP41ANBNB-	61.7 (2.43)	61.0 (2.40)	32.8 (1.29)	16.3 (0.64)	17.3 (0.68)	37.1 (1.46)	40.9 (1.61)	46.5 (1.83)	21.8 (0.86)	0.10 (0.23)
	8	NXT-DRP41ANFNF-		63.8 (2.51)		15.0 (0.59)						
	10	NXT-DRP41ANHNH-	68.1 (2.68)	68.8 (2.71)		21.1 (0.83)		43.4 (1.71)				
	12	NXT-DRP41ANINI-		83.6 (3.29)		19.6 (0.77)						0.13 (0.28)
Medium	12	NXT-DRP81ANINI-	116 (4.56)	99.8 (3.93)	58.4 (2.30)	21.3 (0.84)	31.8 (1.25)	67.8 (2.67)	70.1 (2.76)	77.5 (3.05)	39.9 (1.57)	0.54 (1.2)
	19	NXT-DRP81ANONO-		109 (4.28)								
	25	NXT-DRP81ANQNQ-	129 (5.06)	119 (4.68)		30.7 (1.21)		80.5 (3.17)				0.68 (1.5)
Large	19	NXT-DRP161ANONO-	163 (6.42)	139 (5.48)	89.4 (3.52)	27.4 (1.08)	56.1 (2.21)	86.4 (3.40)	98.0 (3.86)	115 (4.52)	64.8 (2.55)	1.6 (3.5)
	25	NXT-DRP161ANQNQ-		149 (5.88)								

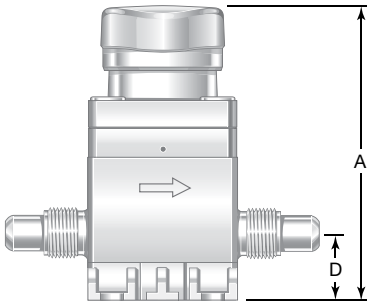
Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

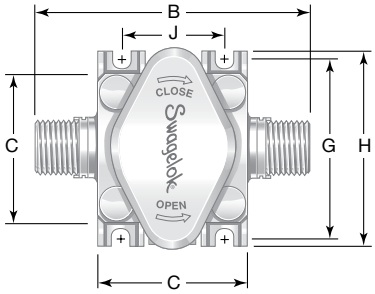
Quarter-Turn Manual 2-Way Valves

To order a DRP series valve assembled with a manual actuator, select an ordering number.

Side
Fine Thread Flare
End Connections Shown



Top
Nippon Pillar Super 300
End Connections Shown



Valve Body Size	End Connection Size	Ordering Number	Dimensions A	B	C	D	G	H	J	Weight
Fine Thread Flare End Connections										
Dimensions, in. (mm)										lb (kg)
Small	1/4	NXT-DRP41AFCFC-WH	2.80 (71.1)	3.28 (83.3)	1.29 (32.8)	0.64 (16.3)	1.61 (40.9)	1.83 (46.5)	0.86 (21.8)	0.23 (0.10)
	3/8	NXT-DRP41AFDFD-WH		3.48 (88.4)		0.59 (15.0)				
	1/2	NXT-DRP41AFEFE-WH	3.06 (77.7)	3.78 (96.0)		0.77 (19.6)				0.28 (0.13)
Medium	1/2	NXT-DRP81AFEFE-WH	4.38 (111)	4.80 (122)	2.30 (58.4)	0.84 (21.3)	2.76 (70.1)	3.05 (77.5)	1.57 (39.9)	1.2 (0.54)
	3/4	NXT-DRP81AFGFG-WH		5.06 (129)						
	1	NXT-DRP81AFJFJ-WH	4.88 (124)	5.70 (145)		1.14 (29.0)				1.5 (0.68)
Large	3/4	NXT-DRP161AFGFG-WH	7.60 (193)	6.26 (159)	3.52 (89.4)	1.08 (27.4)	3.86 (98.0)	4.52 (115)	2.55 (64.8)	3.5 (1.6)
	1	NXT-DRP161AFJFJ-WH		6.90 (175)						
	1 1/4	NXT-DRP161AFKFK-WH	7.73 (196)	6.50 (165)		1.21 (30.7)				
Nippon Pillar Super 300 End Connections										
Dimensions, in. (mm)										lb (kg)
Small	1/4	NXT-DRP41ANCNC-WH	2.80 (71.1)	2.40 (61.0)	1.29 (32.8)	0.64 (16.3)	1.61 (40.9)	1.83 (46.5)	0.86 (21.8)	0.23 (0.10)
	3/8	NXT-DRP41ANDND-WH		2.71 (68.8)		0.83 (21.1)				
	1/2	NXT-DRP41ANENE-WH	3.06 (77.7)	3.29 (83.6)		0.77 (19.6)				0.28 (0.13)
Medium	1/2	NXT-DRP81ANENE-WH	4.38 (111)	3.93 (99.8)	2.30 (58.4)	0.84 (21.3)	2.76 (70.1)	3.05 (77.5)	1.57 (39.9)	1.2 (0.54)
	3/4	NXT-DRP81ANGNG-WH		4.28 (109)						
	1	NXT-DRP81ANJNJ-WH	4.88 (124)	4.68 (119)		1.21 (30.7)				1.5 (0.68)
Large	3/4	NXT-DRP161ANGNG-WH	7.60 (193)	5.48 (139)	3.52 (89.4)	1.08 (27.4)	3.86 (98.0)	4.52 (115)	2.55 (64.8)	3.5 (1.6)
	1	NXT-DRP161ANJNJ-WH		5.88 (149)						
Dimensions, mm (in.)										kg (lb)
Small	6	NXT-DRP41ANBNB-WH	71.1 (2.80)	61.0 (2.40)	32.8 (1.29)	16.3 (0.64)	40.9 (1.61)	46.5 (1.83)	21.8 (0.86)	0.10 (0.23)
	8	NXT-DRP41ANFNF-WH		63.8 (2.51)		15.0 (0.59)				
	10	NXT-DRP41ANHNH-WH	77.7 (3.06)	68.8 (2.71)		21.1 (0.83)				
	12	NXT-DRP41ANINI-WH		83.6 (3.29)		19.6 (0.77)				0.13 (0.28)
Medium	12	NXT-DRP81ANINI-WH	111 (4.38)	99.8 (3.93)	58.4 (2.30)	21.3 (0.84)	70.1 (2.76)	77.5 (3.05)	39.9 (1.57)	0.54 (1.2)
	19	NXT-DRP81ANONO-WH		109 (4.28)						
	25	NXT-DRP81ANQNQ-WH	124 (4.88)	119 (4.68)		30.7 (1.21)				0.68 (1.5)
Large	19	NXT-DRP161ANONO-WH	193 (7.60)	139 (5.48)	89.4 (3.52)	27.4 (1.08)	98.0 (3.86)	115 (4.52)	64.8 (2.55)	1.6 (3.5)
	25	NXT-DRP161ANQNQ-WH		149 (5.88)						

Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

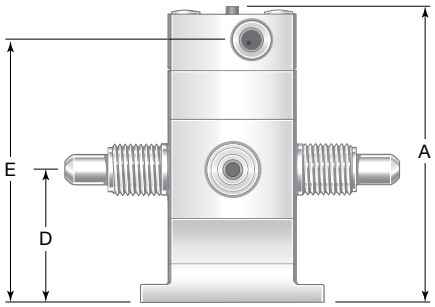
Pneumatic 3-Way Valves, Small Body Size

To order, add an actuator thread designator to the basic ordering number.

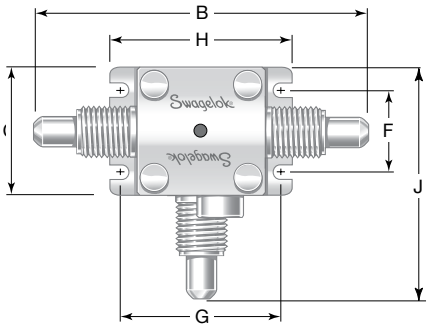
Actuator Thread	Designator
10-32	S
M5 × 0.8	ES

Example: NXT-DRP41YFCFCFC-**S**

Side
Fine Thread Flare
End Connections Shown



Top
Fine Thread Flare
End Connections Shown



End Connection Size	Basic Ordering Number	Dimensions									Weight
		A	B	C	D	E	F	G	H	J	
Fine Thread Flare End Fittings											
Dimensions, in. (mm)											lb (kg)
1/4	NXT-DRP41YFCFCFC-	2.97 (75.4)	3.28 (83.3)	1.29 (32.8)	1.23 (31.2)	2.56 (65.0)	0.86 (21.8)	1.61 (40.9)	1.83 (46.5)	2.28 (57.9)	0.27 (0.12)
3/8	NXT-DRP41YFDFDFD-		3.48 (88.4)							2.38 (60.5)	0.29 (0.13)
1/2	NXT-DRP41YFEFEFE-		3.78 (96.0)							2.63 (66.8)	0.31 (0.14)
Nippon Pillar Super 300 End Connections											
Dimensions, in. (mm)											lb (kg)
1/4	NXT-DRP41YNCNCNC-	2.97 (75.4)	2.40 (61.0)	1.29 (32.8)	1.23 (31.2)	2.56 (65.0)	0.86 (21.8)	1.61 (40.9)	1.83 (46.5)	1.84 (46.7)	0.27 (0.12)
3/8	NXT-DRP41YNDNDND-		2.72 (69.1)							2.00 (50.8)	0.29 (0.13)

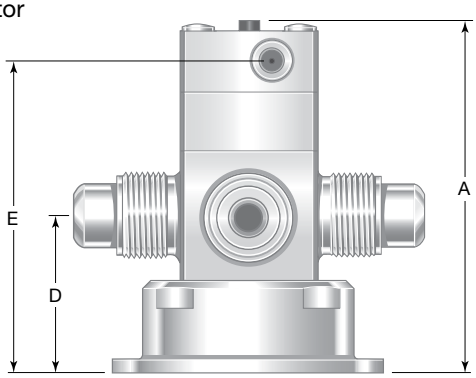
Pneumatic 3-Way Valves, Medium Body Size

To order, add an actuator thread designator to the basic ordering number.

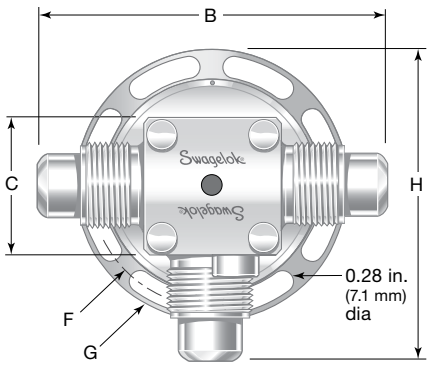
Actuator Thread	Designator
1/8 in. NPT	S
JIS Rc-1/8 (ISO7)	ES

Example: NXT-DRP81YFEFEFE-**S**

Side
Fine Thread Flare
End Connections Shown



Top
Fine Thread Flare
End Connections Shown



End Connection Size	Ordering Number	Dimensions								Weight
		A	B	C	D	E	F	G	H	
Fine Thread Flare End Connections										
Dimensions, in. (mm)										lb (kg)
1/2	NXT-DRP81YFEFEFE-	5.77 (147)	4.80 (122)	2.28 (57.9)	2.55 (64.8)	5.14 (131)	3.91 (99.3)	4.50 (114)	4.68 (119)	1.60 (0.73)
3/4	NXT-DRP81YFGFGFG-		5.06 (129)						4.81 (122)	1.78 (0.81)
1	NXT-DRP81YFJFJFJ-		5.70 (145)						5.13 (130)	1.80 (0.82)

Valves with Adjustable Flow and Bypass Features

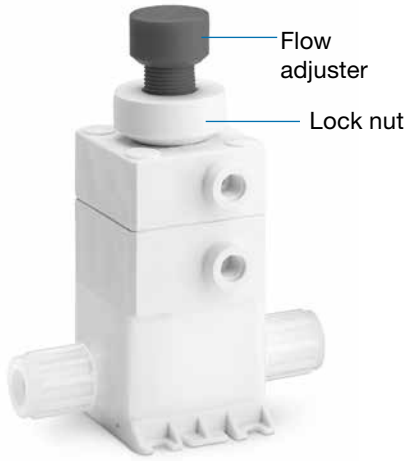
See page 2 through 5 for additional features, materials of construction, pressure-temperature ratings, traceability, testing, and cleaning and packaging information.

Models

Adjustable-Flow Manual Valves

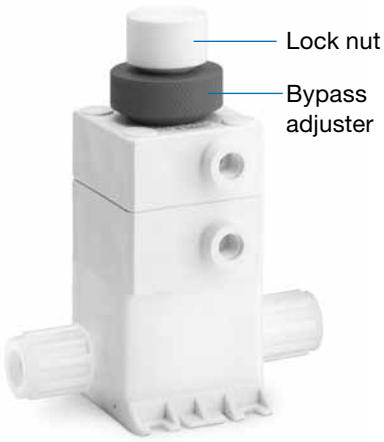
- Provide flow adjustment
- Open fully in about one turn
- Panel-mount option available for small and medium body size valves

Adjustable-Flow (Stroke-Limiter) Pneumatic Valves



- Normally closed valve
- Flow adjuster limits up stroke on actuation to provide flow control
- Open fully in about one and a half (small body), two (medium body), or four (large body) turns
- Lock nut ensures fixed and repeatable position

Adjustable-Bypass (Trickle-Flow) Pneumatic Valves

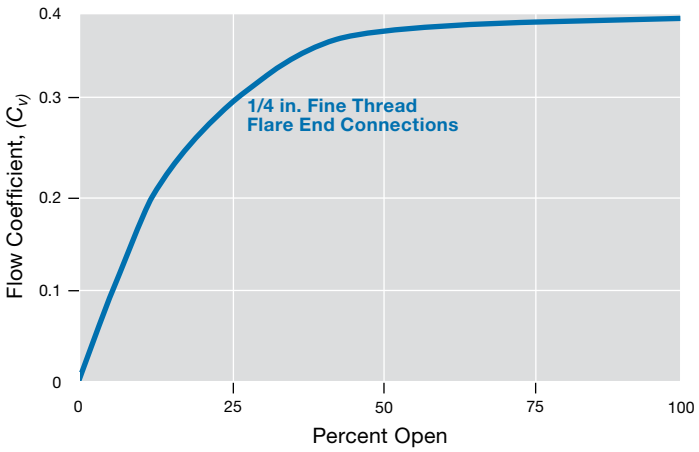


- Normally closed valve
- Bypass adjuster limits down stroke in closed position to provide flow control
- Close fully in about one and a half (small body), two (medium body), or four (large body) turns
- Can be used to switch between full open and a lower flow rate
- Lock nut ensures fixed and repeatable position

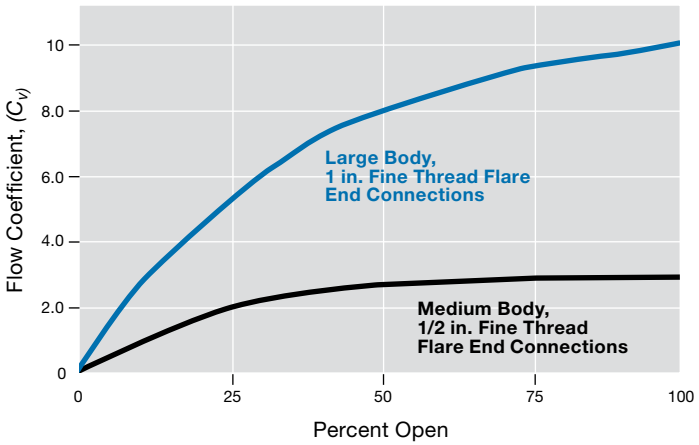
Flow Data at 70°F (20°C)

Flow Coefficient at Percent Open

Small Body Size



Medium and Large Body Sizes



Valves with Adjustable Flow and Bypass Features

Ordering Information and Dimensions

Dimensions are for reference only and are subject to change. For additional valve dimensions, see page 6 for pneumatic valves and page 7 for manual valves.

Adjustable-Flow Manual Valves

To order an adjustable-flow manual valve, add an actuator type designator to a basic ordering number.

Actuator Type	Designator
Standard	AWH
Panel mount	APM①

① Not available with large valve bodies.

Example: NXT-DRP41AFCFC-**AWH**

Normally Closed Pneumatic Valves

Adjustable-Flow

To order, add an *adjustable-flow designator* to a basic ordering number.

Example: NXT-DRP41AFCFC-**CL**

Adjustable-Bypass

To order, add an *adjustable-bypass* designator to a basic ordering number.

Example: NXT-DRP41AFCFC-**CB**

Pneumatic Actuator Thread	Adjustable-Flow Designator	Adjustable-Bypass Designator
10-32 (small valve body); 1/8 in. NPT (medium and large valve body)	CL	CB
M5 × 0.8 (small valve body); JIS Rc-1/8 (ISO 7) (medium and large valve body)	ECL	ECB

Valve Body Size	End Connection Size	Basic Ordering Number	Max C_v	Adjustable-Flow Manual Valve		Adjustable-Flow Pneumatic Valves		Adjustable-Bypass Pneumatic Valves	
				Height in. (mm)	Weight lb (kg)	Height in. (mm)	Weight lb (kg)	Height in. (mm)	Weight lb (kg)
Fine Thread Flare End Connections									
Small	1/4 in.	NXT-DRP41AFCFC-	0.4	3.38 (85.9)	0.20 (0.09)	3.27 (83.1)	0.30 (0.14)	3.39 (86.1)	0.30 (0.14)
	3/8 in.	NXT-DRP41AFDFD-	0.8						
	1/2 in.	NXT-DRP41AFEFE-		3.63 (92.2)	0.24 (0.11)	3.52 (89.4)	0.34 (0.15)	3.64 (92.5)	0.34 (0.15)
Medium	1/2 in.	NXT-DRP81AFEFE-	2.6	5.43 (138)	1.1 (0.50)	6.50 (165)	1.3 (0.59)	6.17 (157)	1.3 (0.59)
	3/4 in.	NXT-DRP81AFGFG-	4.1						
	1 in.	NXT-DRP81AFJFJ-	3.6	5.93 (151)		7.00 (178)		6.67 (169)	
Large	3/4 in.	NXT-DRP161AFGFG-	6.9	7.74 (197)	3.4 (1.5)	8.05 (204)	3.6 (1.6)	7.99 (203)	3.5 (1.6)
	1 in.	NXT-DRP161AFJFJ-	10.2						
	1 1/4 in.	NXT-DRP161AFKFK-		7.93 (201)		8.24 (209)		8.18 (208)	
Nippon Pillar Super 300 End Connections									
Small	1/4 in.	NXT-DRP41ANCNC-	0.5	3.38 (85.9)	0.20 (0.09)	3.27 (83.1)	0.30 (0.14)	3.39 (86.1)	0.30 (0.14)
	3/8 in.	NXT-DRP41ANDND-	0.7	3.63 (92.2)		3.52 (89.4)		3.64 (92.5)	
	1/2 in.	NXT-DRP41ANENE-	0.9		0.27 (0.12)		0.34 (0.15)		0.34 (0.15)
Medium	1/2 in.	NXT-DRP81ANENE-	2.9	5.43 (138)	1.1 (0.50)	6.50 (165)	1.3 (0.59)	6.17 (157)	1.3 (0.59)
	3/4 in.	NXT-DRP81ANGNG-	4.5						
	1 in.	NXT-DRP81ANJNJ-	3.6	5.93 (151)	1.4 (0.64)	7.00 (178)		6.67 (169)	
Large	3/4 in.	NXT-DRP161ANGNG-	7.2	7.74 (197)	3.4 (1.5)	8.05 (204)	3.6 (1.6)	7.99 (203)	3.5 (1.6)
	1 in.	NXT-DRP161ANJNJ-	10.0						
				mm (in.)	kg (lb)	mm (in.)	kg (lb)	mm (in.)	kg (lb)
Small	6 mm	NXT-DRP41ANBNB-	0.5	85.9 (3.38)	0.09 (0.20)	83.1 (3.27)	0.14 (0.30)	86.1 (3.39)	0.14 (0.30)
	8 mm	NXT-DRP41ANFNF-	0.8						
	10 mm	NXT-DRP41ANHNH-	0.7	92.2 (3.63)		89.4 (3.52)		92.5 (3.64)	
	12 mm	NXT-DRP41ANINI-	0.9		0.12 (0.27)		0.15 (0.34)		0.15 (0.34)
Medium	12 mm	NXT-DRP81ANINI-	2.9	138 (5.43)	0.50 (1.1)	165 (6.50)	0.59 (1.3)	157 (6.17)	0.59 (1.3)
	19 mm	NXT-DRP81ANONO-	4.5						
	25 mm	NXT-DRP81ANQNQ-	3.6	151 (5.93)	0.64 (1.4)	178 (7.00)		169 (6.67)	
Large	19 mm	NXT-DRP161ANONO-	7.2	197 (7.74)	1.5 (3.4)	204 (8.05)	1.6 (3.6)	203 (7.99)	1.6 (3.5)
	25 mm	NXT-DRP161ANQNQ-	10.0						

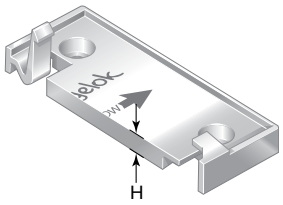
Options and Accessories

Dimensions are for reference only and are subject to change.

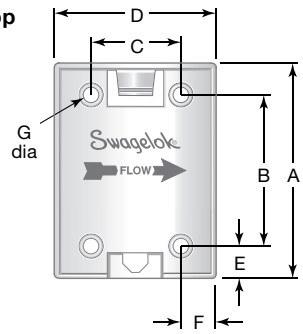
Snap-In Mounting Brackets (Two-Way and Adjustable Flow and Bypass Models)

- Facilitates installation
- Polarized to ensure proper valve orientation

Side



Top



Valve Body Size	Ordering Number	Dimensions								Weight
		A	B	C	D	E	F	G	H	
		Dimensions, in. (mm)								lb (kg)
Small	PP-MP2-DRP4	2.01 (51.1)	0.77 (19.6)	0.77 (19.6)	1.46 (37.1)	0.61 (15.5)	0.34 (8.6)	0.20 (5.1)	0.25 (6.4)	0.02 (0.01)
Medium	PP-MP2-DRP8	3.25 (82.6)	2.28 (57.9)	1.34 (34.0)	2.45 (62.2)	0.49 (12.4)	0.56 (14.2)	0.22 (5.6)	0.25 (6.4)	0.04 (0.02)
Large	PP-MP2-DRP16	4.77 (121)	3.30 (83.8)	2.20 (55.9)	3.78 (96.0)	0.73 (18.5)	0.79 (20.1)	0.22 (5.6)	0.37 (9.4)	0.11 (0.05)

Integral Lockout Handles

Valve Body Size	Maximum Padlock Shank Size
Small	0.12 in. (3.0 mm) dia, 1 in. (25.4 mm) long
Medium	0.28 in. dia (7.1 mm), 2 in. (50.8 mm) long
Large	0.31 in. (7.9 mm) dia, 2.5 in. (63.5 mm) long

- Standard padlock or lockout device secures handle in open or closed position.
- Handle orientation provides visual indication of open and closed positions.
- Assists compliance with with OSHA Lockout/Tagout, Standard 29 CFR Part 1910.147, *Control of Hazardous Energy.*

To order a valve with an integral handle that locks the valve in the *open* position, add **LO** to a quarter-turn manual valve ordering number.

Example: NXT-DRP41AFCFC-**LO**WH

To order a valve with an integral handle that locks the valve in the *closed* position, add **LC** to a quarter-turn manual valve ordering number.

Example: NXT-DRP41AFCFC-**LC**WH

PFA Fine Thread Flare Nuts

PFA fine thread flare nuts are available in place of standard PVDF nuts. To order, insert **P** into the valve ordering number.

Examples: NXT-DRP4**P**1AFCFC-C
NXT-DRP16**P**1AFKFK-O

Additional End Connections and Configurations

For Flowell, ISO, NPT, space saver or other end connections; custom manifolds; or configurations not shown, contact your authorized Swagelok representative.

Diaphragm Kits (Two-Way and Adjustable Flow and Bypass Models)

The design of the DRP series allows fast and easy maintenance with the valve inline.

Kit contains:

- hole plugs
- diaphragm
- cap screws
- washers
- instructions.

Valve Body Size	End Connections		Diaphragm Kit Basic Ordering Number
	Size	Style	
Small	1/4 and 3/8 in.	Flare	NXT-3DK-DRP4-
	1/4 in. 6 and 8 mm	Super 300	
	1/2 in.	Flare	NXT-3DK-DRP4-6
	3/8 and 1/2 in. 10 and 12 mm	Super 300	
Medium	1/2 and 3/4 in.	Flare	NXT-3DK-DRP8-
	1/2 and 3/4 in. 12 and 19 mm	Super 300	
Large	3/4 and 1 in.	Flare	NXT-3DK-DRP16-
	3/4 and 1 in. 19 and 25 mm	Super 300	
	1 1/4 in.	Flare	NXT-3DK-DRP16-20

To order, add **A** for pneumatic actuation or **H** for manual actuation to the basic kit ordering number.

Examples: NXT-3DK-DRP4-**A**
NXT-3DK-DRP4-6**H**

Ultrahigh-Purity Fluoropolymer Products

The Swagelok family of UHP fluoropolymer products includes O-ring–free check valves, fine thread flare and weld fittings, and tubing.

See these Swagelok catalogs for more information:

- *Ultrahigh-Purity Fluoropolymer O-Ring–Free Poppet Check Valves—CHP Series* catalog, MS-02-320
- *High-Purity PFA Fine Thread Flare Fittings* catalog, MS-02-195
- *Ultrahigh-Purity Fluoropolymer Tubing* catalog, MS-02-196.

Caution: Do not mix or interchange parts with those of other manufacturers.

Swagelok

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Diaphragm Valves

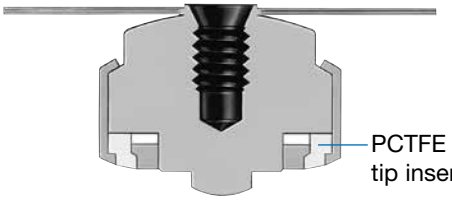
LD Series

- Working pressures up to 300 psig (20.6 bar)
- Shutoff, bulk-gas distribution, and isolation service
- Cast, forged, and bar stock stainless steel body material
- 1/4 to 1 in. and 12 to 25 mm end connections

Features

- No springs or threads in wetted areas enable cleaner operation.
- Contoured flow passages allow high flow.
- Tied diaphragm design provides positive stem retraction.

Replaceable Diaphragm/Stem Subassembly



Welded Diaphragm Construction

- Diaphragms are welded to stem to prevent leakage.
- Three diaphragms offer optimum combination of strength, flexibility, and cycle life.
- Design provides all-metal fluid containment.

Unique Stem Tip Design

- PCTFE stem tip insert promotes leak-tight shutoff.
- Compensating stem tip helps prevent damage from overtightening.

Body Construction

Cast (1/2 and 1 in. Sizes)

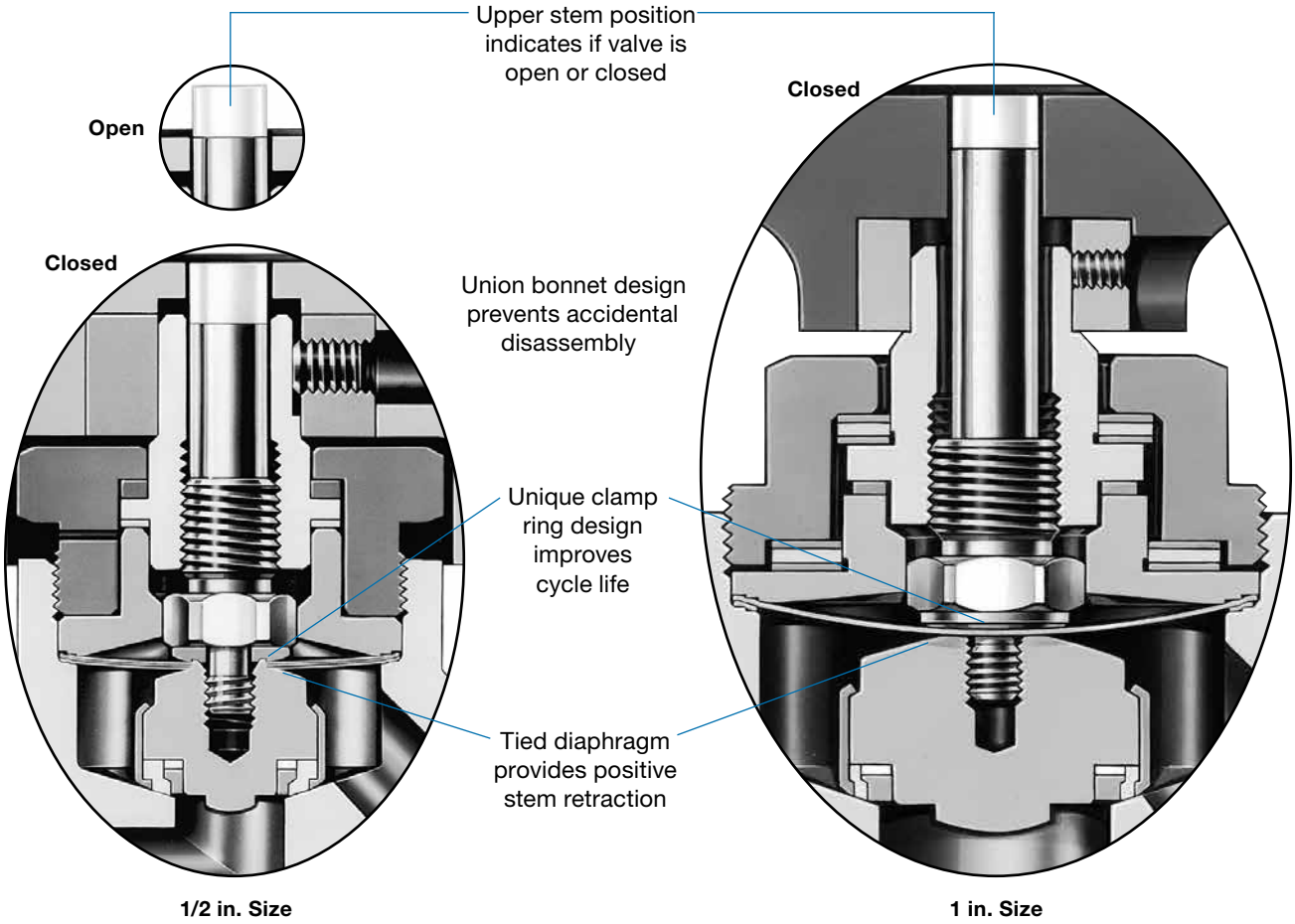
- Machined wetted surfaces in body are finished to an average of 20 µin. (0.51 µm) R_a.
- Optional electropolished body exteriors (ELD series) are available.
- Optional tube extension interiors electropolished to an average of 10 µin. (0.25 µm) R_a are available.

Forged (1/2 in. Size)

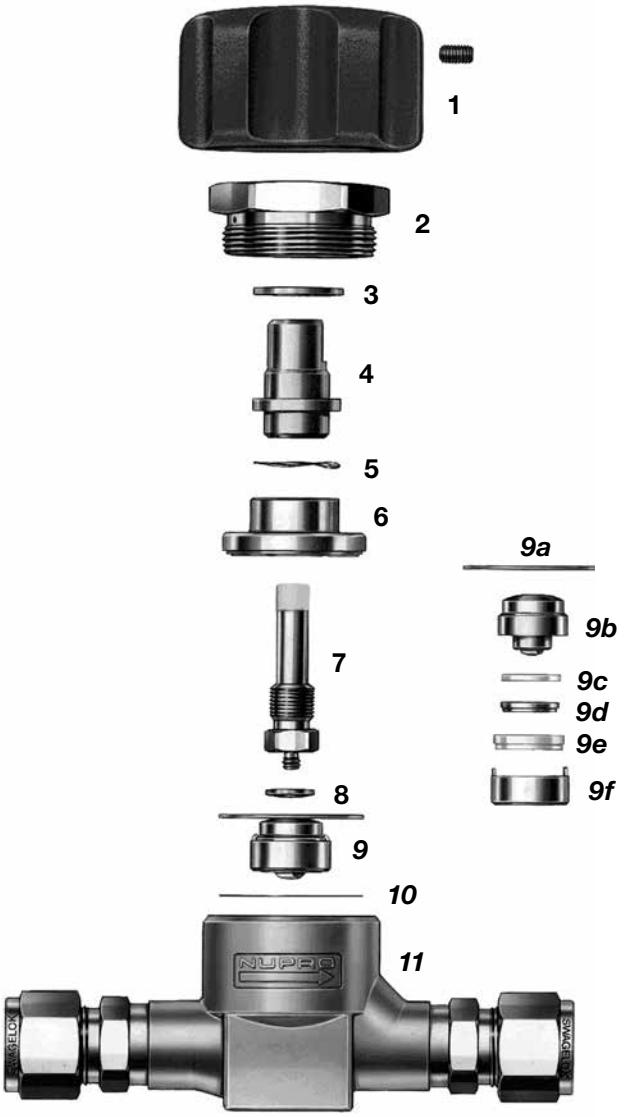
- Design results in compact size, lower internal volume.
- Wetted surfaces are electropolished to an average of 5 µin. (0.13 µm) R_a.

Bar Stock (1/2 and 1 in. Sizes)

- Valve and tubular shapes are combined into one integrated, compact component.
- Block bodies permit compact layout of bulk gas systems.
- Wetted surfaces are electropolished to an average of 5 µin. (0.13 µm) R_a.



Materials of Construction



Cast-body 1/2 in. size shown.

Component	Valve Body		
	Cast	Forged	Bar Stock
	Material Grade/ASTM Specification		
1 Handle	Polyester with 316 SS insert		
Handle set screw	Alloy steel		
2 Bonnet nut	Silver-plated 316 SS/A479		
3 Thrust washer	Bronze		
Actuator bearing (1 in. size)	High-carbon chrome steel	—	High-carbon chrome steel
4 Actuator	416 SS/A582		
5 Spring washer	Alloy steel		
6 Bonnet	316 SS/A479		
Thrust washer (1 in. size)	Bronze	—	Bronze
Bonnet bearing (1 in. size)	High-carbon chrome steel		High-carbon chrome steel
7 Upper stem	316 SS/A479		
8 Clamp ring	Brass/B16		
9 *Diaphragm/stem subassembly*	*See individual components below*		
***9a** Diaphragms (3)*	*316L SS/A240*		
***9b** Stem*	*316L SS/A479*		
***9c** Compression ring*	*Virgin PTFE*		
***9d** Inner ring*	*316L SS/A479*		
***9e** Stem tip insert*	*PCTFE/AMS 3650*		
***9f** Outer ring*	*316L SS/A479*		
***10** Gasket*	*PTFE-coated 316L SS/A240*		
***11** Body*	*CF3M/ A351*	*316L SS/ A182*	*316L SS/ A479*
Swagelok tube fitting and pipe end connections	*316 SS/ A479*	—	—
VCR® fitting end connections	*316 SS/A479*		
Tube extensions	*316 SS/A269*		
Lubricant	Molybdenum disulfide-base paste and dry film, petroleum lubricating grease		

Wetted components listed in *italics*.

Testing

SC-11 Process

Every LD series diaphragm valve processed in accordance with Swagelok® *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63 is helium leak tested to a maximum leak rate of 4×10^{-9} std cm^3/s.

SC-01 Process

Every LD series diaphragm valve processed in accordance with Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 is helium leak tested to a maximum leak rate of 1×10^{-9} std cm^3/s.

Cleaning and Packaging

Cast-Body Valves

All LD series cast-body diaphragm valves are cleaned and packaged in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63 to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C. Cleaning and packaging in accordance with Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 is available as an option for ELD series cast-body valves.

Forged-Body and Bar Stock Valves

All LD series forged-body and bar stock diaphragm valves are manufactured, cleaned, and packaged in accordance with Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61. Cleaning in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63 to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C is available as an option.

Pressure-Temperature Ratings

Valve Body	Cast	Forged and Bar Stock
Temperature, °F (°C)	**Working Pressure,** psig (bar)	
–20 (–28) to 100 (37)	300 (20.6)	300 (20.6)
200 (93)	265 (18.2)	255 (17.5)
300 (148)	240 (16.5)	230 (15.8)

Process Specifications

Series	Wetted Surface Roughness Average (R_a) µin. (µm) avg	Swagelok Process Specification
LD cast body	20 (0.51)—body machined surfaces	SC-11
ELD cast body	20 (0.51)—body machined surfaces; 10 (0.25)—tube extensions	SC-11
Forged body	5 (0.13)—P process	SC-01
Bar stock body	5 (0.13)—P process	SC-01

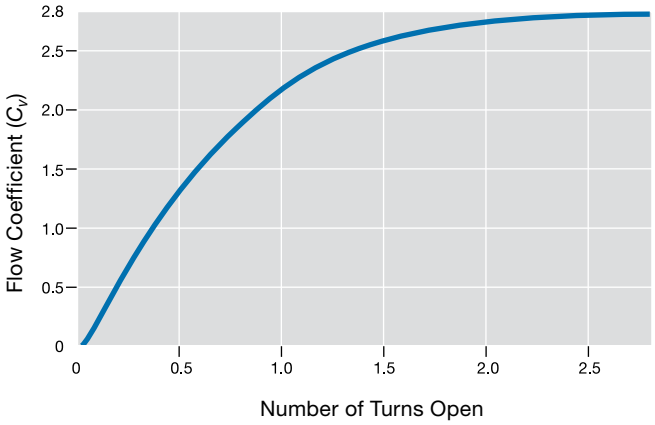
Flow Data at 70°F (20°C)

1/2 in. Size

0.500 in. (12.7 mm) orifice, 2.8 C_v

Pressure Drop to Atmosphere (Δp) psi (bar)	Air Flow std ft³/min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	31 (870)	9 (34)
50 (3.4)	84 (2300)	20 (75)
100 (6.8)	148 (4100)	28 (100)

Flow Coefficient at Turns Open

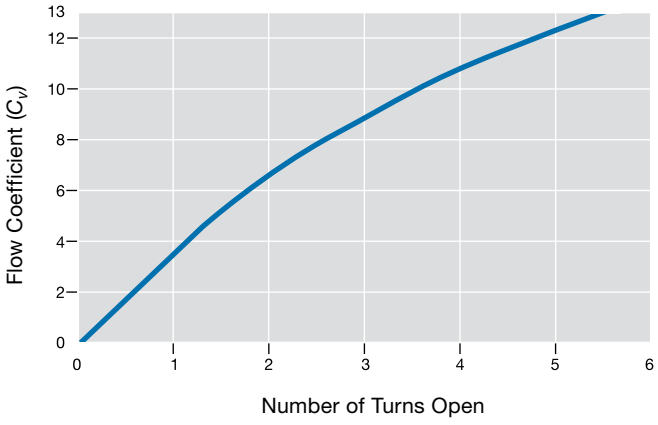


1 in. Size

1.125 in. (28.6 mm) orifice, 13 C_v

Pressure Drop to Atmosphere (Δp) psi (bar)	Air Flow std ft³/min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	140 (3900)	41 (150)
50 (3.4)	390 (11 000)	92 (340)
100 (6.8)	690 (19 500)	130 (490)

Flow Coefficient at Turns Open



Ordering Information and Dimensions

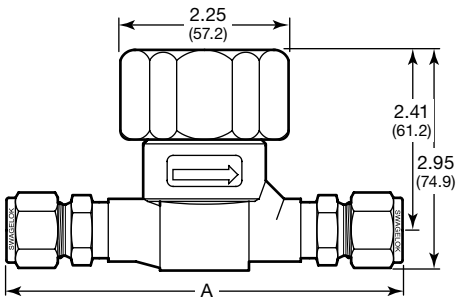
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Cast-Body Valves

Select an ordering number. To order optional cleaning and packaging in accordance with *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61, for ELD series valves, add **-DU** to the ordering number.

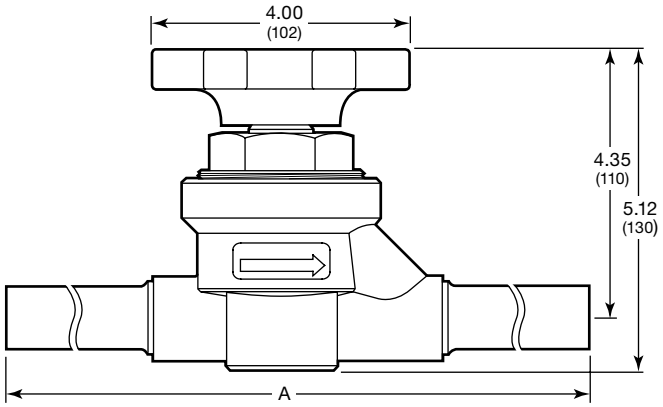
Example: 6L-ELD8-BBXX**-DU**

LD8 Series



End Connections		Ordering Number	A in. (mm)
Type	Size		
Swagelok tube fitting	1/2 in.	6L-LD8-BBXX	5.30 (135)
		6L-ELD8-BBXX	
	12 mm	6L-LD8-DDXX	
		6L-ELD8-DDXX	
Male VCR fitting	1/2 in.	6L-ELD8-CCXX	4.58 (116)
Female NPT	1/2 in.	6L-LD8-EEXX	5.61 (142)
Female ISO①	1/2 in.	6L-LD8-FFXX	
Tube extension, 3 in. (76.2 mm) long	1/2 × 0.049 in.	6L-ELD8-11XX	8.82 (224)
	3/4 × 0.065 in.	6L-ELD8-22XX	8.79 (223)
	12 × 1 mm	6L-ELD8-33XX	8.82 (224)
	18 × 1.5 mm	6L-ELD8-55XX	8.79 (223)

LD16 Series



End Connections		Ordering Number	A in. (mm)
Type	Size		
Swagelok tube fitting	3/4 in.	6L-LD16-AAXX	8.28 (210)
		6L-ELD16-AAXX	
	1 in.	6L-LD16-BBXX	8.46 (215)
		6L-ELD16-BBXX	
	25 mm	6L-LD16-EEXX	8.63 (219)
Tube extension, 3 in. (76.2 mm) long	1 × 0.065 in.	6L-LD16-55XX	10.9 (277)
		6L-ELD16-11XX	
	23 × 1.5 mm	6L-ELD16-33XX	

Dimensions shown with Swagelok tube fitting nuts finger-tight.

① See specifications ISO 7/1, BS EN 10226-1, DIN-2999, JIS B0203.

Cast-Body Valves with Purge Ports

Replace **XX** with **BB** for 1/4 in. integral male VCR fitting inlet and outlet purge ports.

Example: 6L-ELD8-BB**BB**

Replace **XX** with **BX** for 1/4 in. integral male VCR fiting inlet purge port and no outlet purge port.

Example: 6L-ELD8-BB**BX**

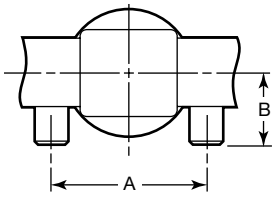
Replace **XX** with **XB** for no inlet purge port and 1/4 in. integral male VCR fiting outlet purge port.

Example: 6L-ELD8-BB**XB**

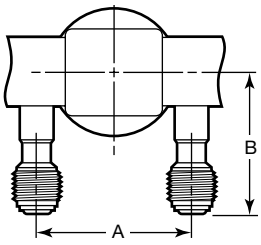
Purge Ports

Purge Port End Connections	Dimensions, in. (mm)	
	A	B
LD8 Series		
None	1.83 (46.5)	0.88 (22.4)
1/4 in. male VCR fittings		1.69 (42.9)
LD16 Series		
None	3.40 (86.4)	1.35 (34.3)
1/4 in. male VCR fittings		2.16 (54.9)

No purge ports



Integral male VCR fittings



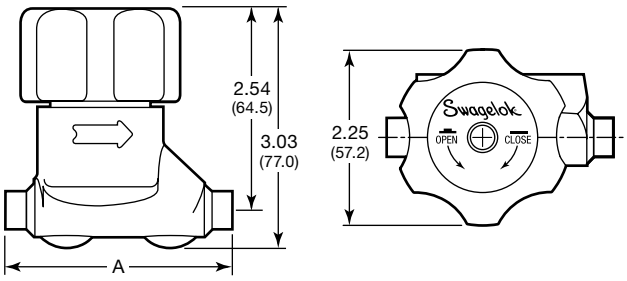
Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Forged-Body Valves

Select an ordering number. To order optional cleaning in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, remove **-P** from the ordering number.

Example: 6L-ELD8-VVX



End Connections		Ordering Number	A in. (mm)
Type	Size		
Tube butt weld	3/8 × 0.035 in.	6L-ELD8-VVX-P	2.88 (73.2)
	1/2 × 0.049 in.	6L-ELD8-WWX-P	
Tube extension, 3 in. (76.2 mm) long	3/8 × 0.035 in.	6L-ELD8-33X-P	8.86 (225)
	1/2 × 0.049 in.	6L-ELD8-11X-P	
	3/4 × 0.065 in.	6L-ELD8-22X-P	10.0 (254)
Rotatable male VCR fitting	1/2 in.	6L-ELD8-66X-P	5.43 (138)
Female VCR fitting	1/2 in.	6L-ELD8-77X-P	4.09 (104)

Forged-Body Valves with Purge Ports

Replace **X** with **M** for 1/4 in. rotatable male VCR fitting inlet and outlet purge ports.

Example: 6L-ELD8-11**M**-P

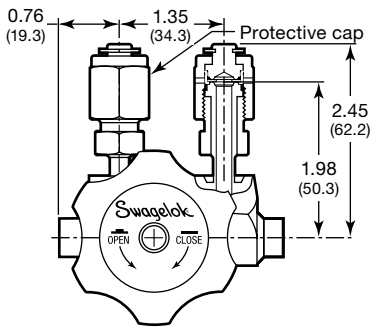
Replace **X** with **MX** for 1/4 in. integral male VCR fiting inlet purge port and no outlet purge port.

Example: 6L-ELD8-11**MX**-P

Replace **X** with **XM** for no inlet purge port and 1/4 in. integral male VCR fiting outlet purge port.

Example: 6L-ELD8-11**XM**-P

Rotatable male VCR fitting



Bar Stock-Body Distribution Valves

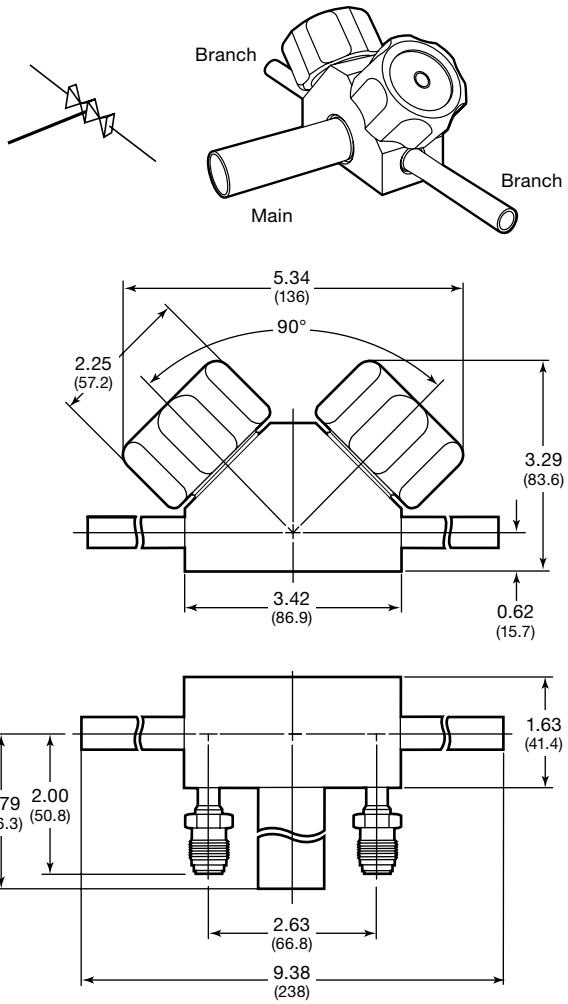
- Valves eliminate need for tee and cross fittings.
- Branches contain shutoff valves.
- Main line and branches are in same plane.
- Purge ports are 1/4 in. rotatable male VCR fittings.

Select an ordering number. To order optional cleaning in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, remove **P** from the ordering number.

Example: 6L-LDE-2B1-A

Double Horizontal Tee

Terminates main line in body.



Tubing Size		Series	Ordering Number
Main	Branch		
3/4 × 0.065 in.	1/2 × 0.049 in.	LD8	6L-LDE-2B1P-A
	1/2 in. rotatable male VCR fitting		6L-LDE-2H1P-A

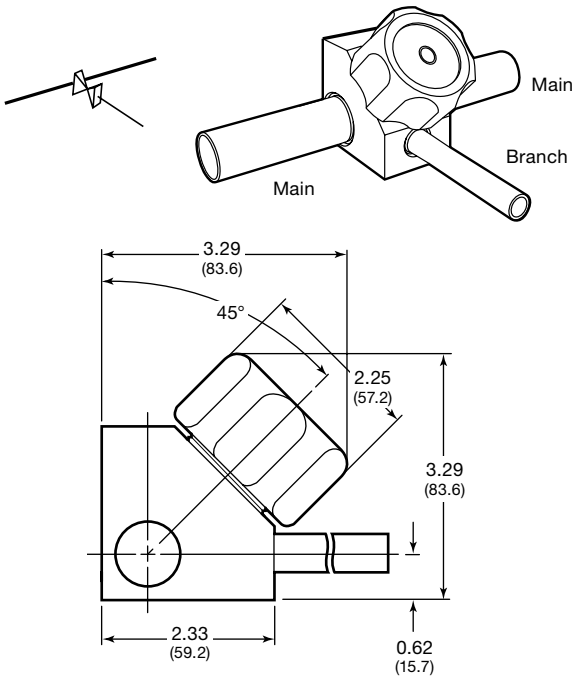
Length of main and branch line tubing is 3 in. (76.2 mm).

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

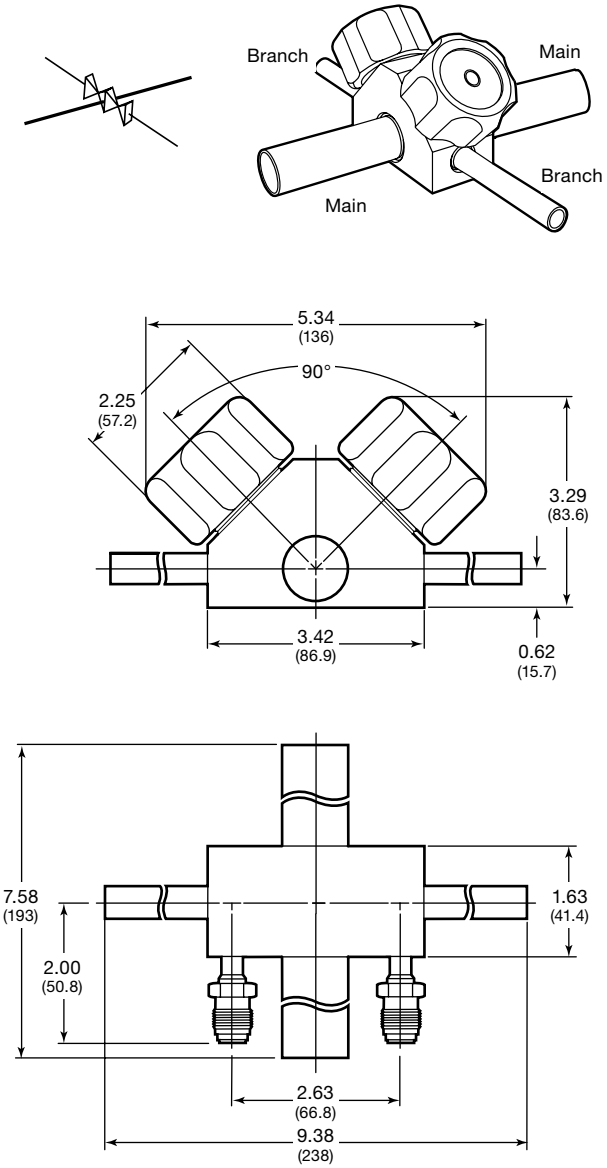
Single Horizontal Cross

Directs main line flow through body.



Double Horizontal Cross

Directs main line flow through body.



Tubing Size		Series	Ordering Number
Main	Branch		
1/2 × 0.049 in.	1/4 × 0.035 in.	LD8	6L-LDA-1A1P-A
	1/2 × 0.049 in.		6L-LDA-1B1P-A
	1/4 in. rotatable male VCR fitting		6L-LDA-1L1P-A
	1/2 in. rotatable male VCR fitting		6L-LDA-1H1P-A
3/4 × 0.065 in.	1/2 × 0.049 in.		6L-LDA-2B1P-A
	1/2 in. rotatable male VCR fitting		6L-LDA-2H1P-A
1 × 0.065 in.	1/2 × 0.049 in.		6L-LDA-3B1P-A
	1/2 in. rotatable male VCR fitting		6L-LDA-3H1P-A

Length of main and branch line tubing is 3 in. (76.2 mm).

Tubing Size		Series	Ordering Number
Main	Branch		
1/2 × 0.049 in.	1/2 × 0.049 in.	LD8	6L-LDC-1B1P-A
	1/2 in. rotatable male VCR fitting		6L-LDC-1H1P-A
3/4 × 0.065 in.	1/2 × 0.049 in.		6L-LDC-2B1P-A
	1/2 in. rotatable male VCR fitting		6L-LDC-2H1P-A
1 × 0.065 in.	1/2 × 0.049 in.		6L-LDC-3B1P-A
	1/2 in. rotatable male VCR fitting		6L-LDC-3H1P-A

Length of main and branch line tubing is 3 in. (76.2 mm).

Ordering Information and Dimensions

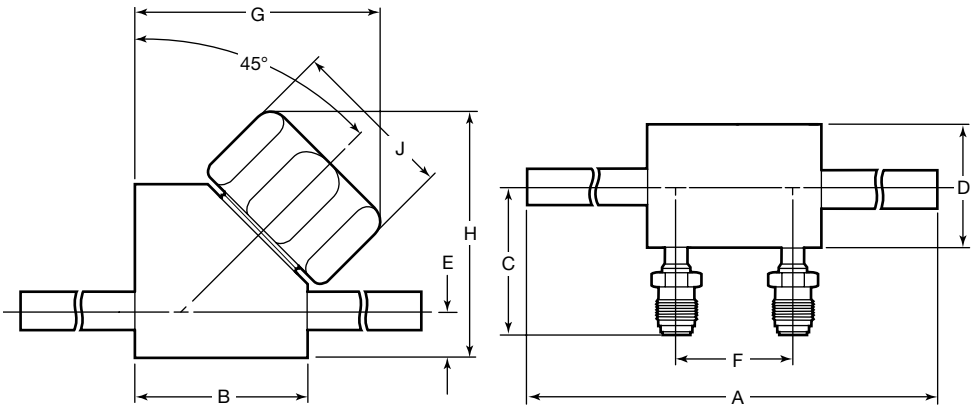
Dimensions are for reference only and are subject to change.

Bar Stock-Body Isolation Valves

- Valves provide shutoff service for bulk gas distribution systems.
- Purge ports are 1/4 in. rotatable male VCR fittings.

Select an ordering number. To order optional cleaning in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, remove **P** from the ordering number.

Example: 6L-LDF-1B1-A



Tubing Size		Ordering Number	Series	Dimensions, in. (mm)								
Inlet	Outlet			A	B	C	D	E	F	G	H	J
1/2 × 0.049 in.	1/2 × 0.049 in.	6L-LDF-1B1P-A	LD8	8.28 (210)	2.33 (59.2)	2.00 (50.8)	1.63 (41.4)	0.62 (15.7)	1.53 (38.9)	3.30 (83.8)		2.25 (57.2)
3/4 × 0.065 in.	3/4 × 0.065 in.	6L-LDF-2C1P-A		8.42 (214)	2.45 (62.2)					3.42 (86.9)		
3/4 × 0.065 in.	3/4 × 0.065 in.	6L-LDS-2C1P-Q	LD16	9.46 (240)	3.50 (88.9)	2.69 (68.3)	3.00 (76.2)	0.61 (15.5)	2.63 (66.8)	5.31 (135)		4.00 (102)
1 × 0.065 in.	1 × 0.065 in.	6L-LDS-3D1P-Q										

Length of main and branch line tubing is 3 in. (76.2 mm).

Accessories

Diaphragm/Stem Subassembly-Kit

Includes replacement diaphragm/stem subassembly, gasket, and instructions.

Ordering numbers:
6L-3K-LD8 for LD8 series;
6L-3K-LD16 for LD16 series.

Gasket Kit

Includes replacement gasket and instructions.

Ordering numbers:
6L-8K-LD8 for LD8 series;
6L-8K-LD16 for LD16 series.

Colored Handles

Green handles are standard.

Cast-Body Valves

For colored handles, add a dash and a handle color designator to the ordering number.

Example: 6L-LD8-BBXX-**BL**

Forged-Body Valves

For colored handles, insert a handle color designator in the ordering number.

Example: 6L-ELD8-VVX**BL**-P

Bar Stock-Body Valves

For colored handles, replace **A** or **Q** in the ordering number with a handle color designator.

Examples: 6L-LDE-2B1P-**C**
6L-LDS-2C1P-**S**

Handle Color	Designators		
	Cast and Forged Valves	Bar Stock Valves	
		LD8	LD16
Blue	BL	C	S
Black	BK	B	R
Brown	BW	J	Y
Gold	GD	G	W
Orange	OG	L	1
Pink	PN	K	Z
Purple	PR	F	V
Red	RD	D	T
Silver	IV	M	2
White	WH	H	X
Yellow	YW	E	U

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, refer to *Oxygen System Safety Technical Report,* MS-06-13.

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Caution: Do not mix or interchange parts with those of other manufacturers.

Swagelok

About this document

Thank you for downloading this electronic catalog, which is part of General Product catalog Swagelok published in print. This type of electronic catalog is updated as new information arises or revisions, which may be more current than the printed version.

Swagelok Company is a major developer and provider of fluid system solutions, including products, integration solutions and services for industry research, instrumentation, pharmaceutical, oil and gas, power, petrochemical, alternative fuels, and semiconductor. Our manufacturing facilities, research, service and distribution facilities support a global network of more than 200 authorized sales and service centers in 57 countries.

Visit www.swagelok.com to locate your Swagelok representative and obtain any information on features, technical information and product references, or to learn about the variety of services available only through authorized sales centers and service Swagelok.

Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit your Swagelok Web site or contact your authorized Swagelok representative.

Radial Diaphragm Valve

DR Series

- 316L stainless steel and modified PTFE wetted parts
- Variety of compact multivalve, multiport configurations
- Choice of sanitary clamp and butt weld end connections
- Choice of pneumatic or manual actuators in aluminum
- Five sizes from 1/2 to 2 in.

Swagelok

Contents

The Swagelok® DR series radial diaphragm valve offers a cleaner, more compact way to manage sterile flow streams. The DR series valve minimizes entrapment areas, drains easily, maximizes cleanability, and provides extended diaphragm life. It provides a clean solution for many applications including media preparation, fermentation, harvest, separation, refining, purification, CIP, and SIP systems.

The single-body design can be manufactured in a wide range of configurations to include multiple valves and multiple ports, and point-of-use valves. A single Swagelok radial diaphragm valve can replace complex weir-style valve assemblies, resulting in a more compact system.

The DR series valve is designed for system pressures up to 150 psig (10.3 bar) and operating temperatures up to 280°F (137°C).

Features

Multivalve and Multiport Configurations

- Reduce overall system size
- Provide instantaneous flow shifts, reducing the potential for cross contamination
- Require fewer fittings and piping and less welding, making the system easier to validate
- Reduce or eliminate dead legs.

Pneumatic Actuators

- Choice of normally closed, normally open, and double-acting modes of actuation
- Are offered in aluminum
- Are available with an optional position indicator switch assembly.

Manual Actuators

- Feature a knob handle for 1/2, 3/4, and 1 in. sizes
- Provide positive shutoff with minimal torque
- Open valve fully in 1 to 1 1/2 turns
- Are offered in aluminum.

Extended Diaphragm Life

- Optimized diaphragm shape minimizes stresses during cycling
- Uniformly distributed shutoff force minimizes diaphragm distortion
- Modified PTFE diaphragm material improves thermal cycling performance

Live-Loaded Diaphragm①

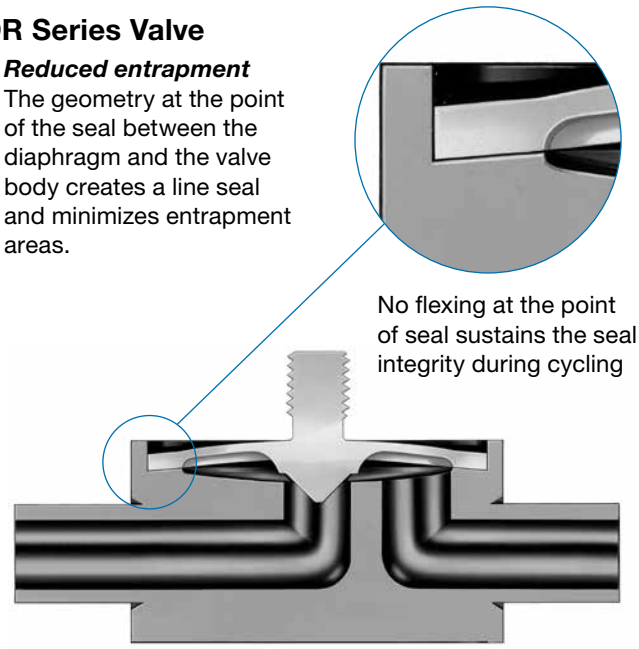
- Controls cold flow of the modified PTFE diaphragm
- Maintains seal to body during thermal cycling

① 1/2 in. model maintains a seal without a live-loaded diaphragm

DR Series versus Weir Style

DR Series Valve

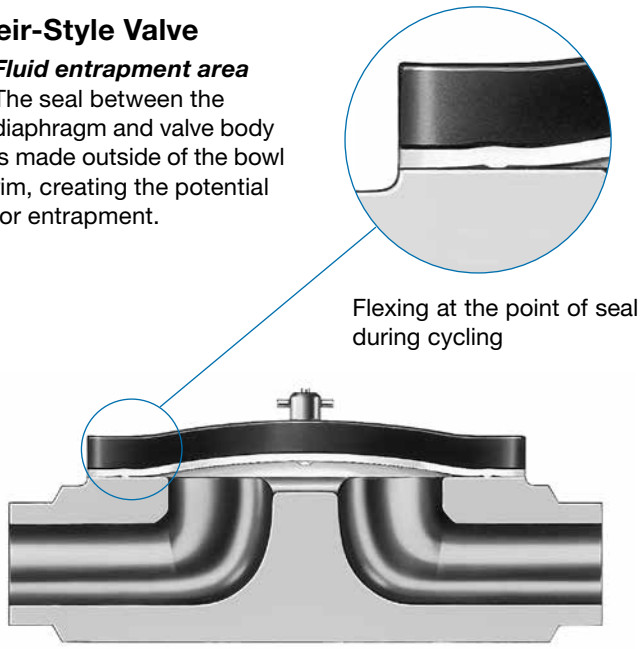
- ***Reduced entrapment***
  The geometry at the point of the seal between the diaphragm and the valve body creates a line seal and minimizes entrapment areas.



- ***Diaphragm containment***
  The outer diameter of the diaphragm is contained by a counterbore in the valve body. This design controls extrusion and sustains seal integrity during thermal cycling.
- ***Body bowl geometry***
  The rounded, open bowl enhances cleaning.

Weir-Style Valve

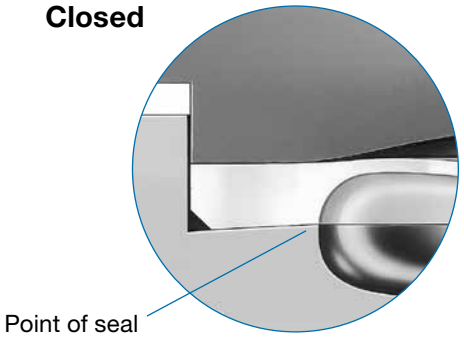
- ***Fluid entrapment area***
  The seal between the diaphragm and valve body is made outside of the bowl rim, creating the potential for entrapment.



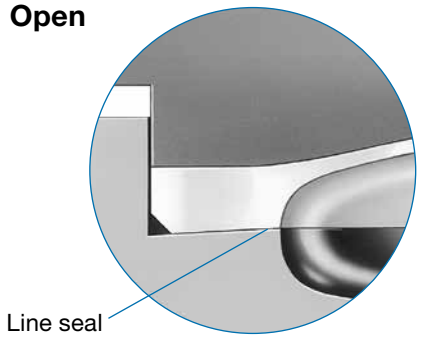
DR Series Valve

Line seal maintained during cycling of valve. No entrapment areas created.

Closed



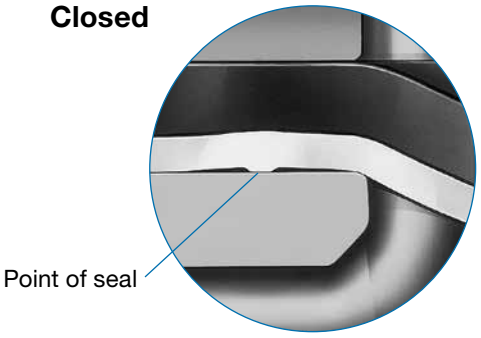
Open



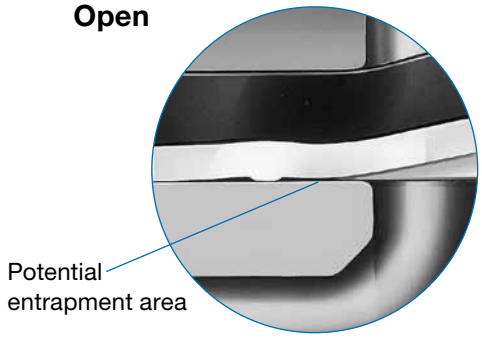
Weir-Style Valve

During cycling, flexing of the diaphragm at the point of seal creates a potential area of entrapment.

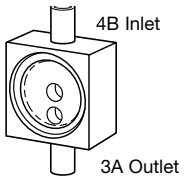
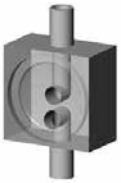
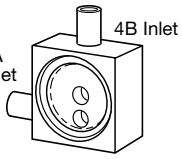
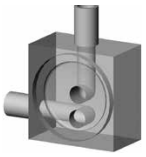
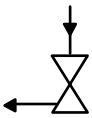
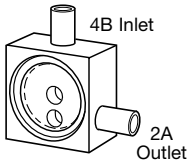
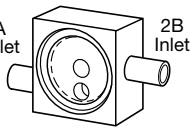
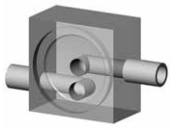
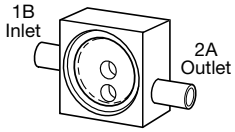
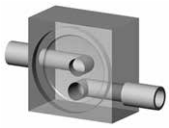
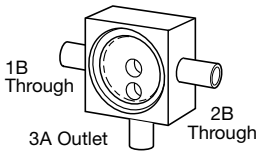
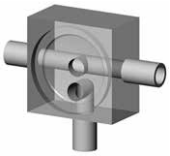
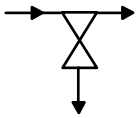
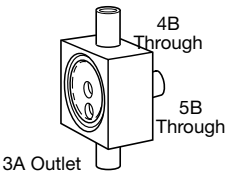
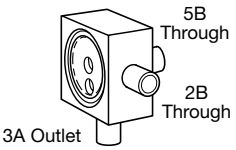
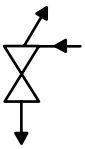
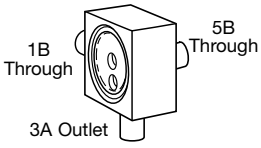
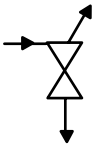
Closed



Open



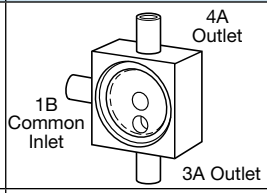
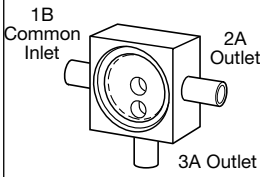
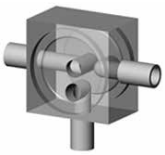
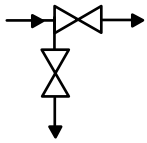
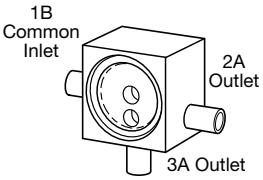
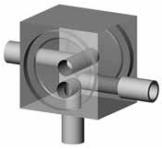
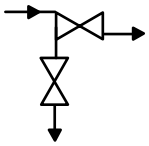
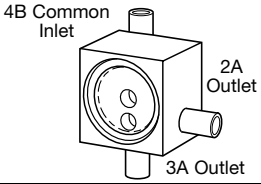
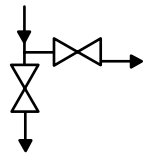
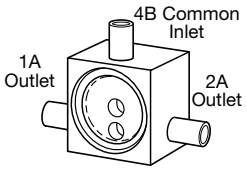
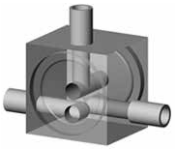
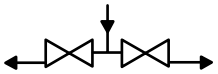
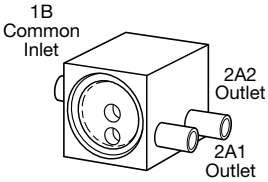
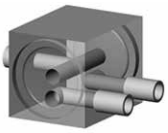
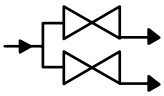
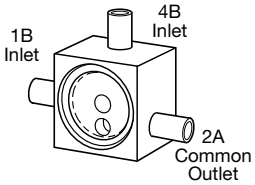
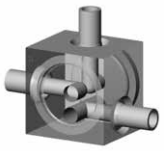
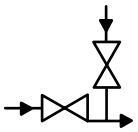
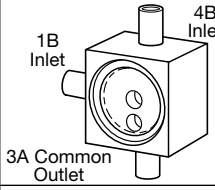
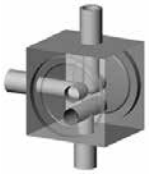
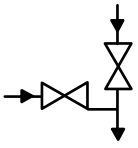
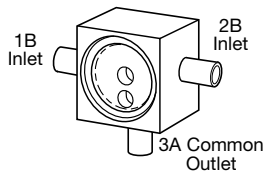
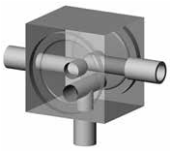
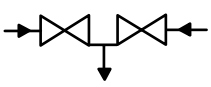
Standard One-Valve Configurations

Body Style Designator	External View	Internal View	Schematic Diagram	Description/ Application
1A straight				Shutoff two-way vertical
1B elbow to left				Shutoff two-way elbow with flow down and to left
1C elbow to right				Shutoff two-way elbow with flow down and to right
1E offset flow to left				Shutoff two-way horizontal with flow to left
1F offset flow to right				Shutoff two-way horizontal with flow to right
1G tee with outlet to bottom				■ Tee configuration ■ Ideal for use as point-of-use, drain or sample port
1K vertical elbow with outlet to bottom				
1N right elbow with outlet to bottom				
1R left elbow with outlet to bottom				

All body configurations are shown in the most drainable position.
Valves may be used in the reverse direction, but may not be fully drainable.

Connections are marked with a 1, 2, 3, 4, or 5, followed by an A or B. (See diagram on page 11 for more information.) The letter A indicates an outlet connection; B indicates an inlet connection.

Standard Two-Valve Configurations

Body Style Designator	External View	Internal View	Schematic Diagram	Description/ Application
2A common center				Ideal for diverting where drainability is not critical
2B common left				
2C offset 90°, common left				■ Ideal for diverting ■ Diaphragm closes on common port to control flow
2D offset 90°, common top				
2E offset side common top				
2F offset horizontal				
2K mixing 90° common side				■ Ideal for mixing ■ Common port is outlet port
2L mixing 90°, common bottom				
2M mixing side, common bottom				

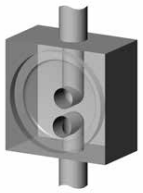
All body configurations are shown in the most drainable position.
Valves may be used in the reverse direction, but may not be fully drainable.

Connections are marked with a 1, 2, 3, or 4, followed by an A or B. (See diagram on page 11 for more information.) The letter A indicates an outlet connection; B indicates an inlet connection.

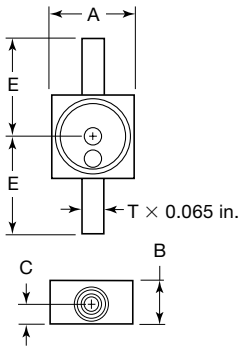
Typical Body Dimensions

Dimensions are for reference only and are subject to change.

1A Body



Typical 1-valve configuration with 2 ports

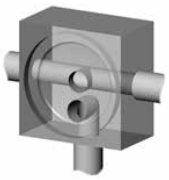


Shown with TB (tube butt weld) ends

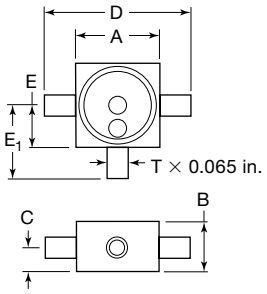
Body Style	Valve Size in.	Dimensions, in. (mm)						Body Weight lb (kg)
		A	B	C	E TB①	E SC①	T	
1A	1/2	2.00 (50.8)	1.13 (28.7)	0.50 (12.7)	2.50 (63.5)	1.75 (44.4)	0.50 (12.7)	1.1 (0.5)
	3/4	3.00 (76.2)	1.44 (36.6)	0.62 (15.7)	3.00 (76.2)	2.50 (63.5)	0.75 (19.1)	3.1 (1.4)
	1	4.00 (102)	2.00 (50.8)	0.81 (20.6)	3.50 (88.9)	3.25 (82.6)	1.00 (25.4)	7.5 (3.4)
	1 1/2	5.18 (132)	2.56 (65.0)	1.00 (25.4)	4.25 (108)	4.25 (108)	1.50 (38.1)	15.2 (6.9)
	2	6.00 (152)	3.19 (81.0)	1.32 (33.5)	4.75 (121)	4.75 (121)	2.00 (50.8)	24.9 (11.3)

① **TB** = tube butt weld ends; **SC** = TS series and Kwik-Clamp sanitary clamp end connections.

1G Body



Typical 1-valve configuration with 3 ports

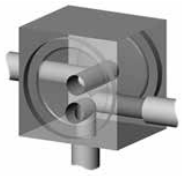


Shown with TB (tube butt weld) ends

Body Style	Valve Size in.	Dimensions, in. (mm)									Body Weight lb (kg)
		A	B	C	D TB①	D SC①	E	E1 TB①	E1 SC①	T	
1G	1/2	2.00 (50.8)	1.13 (28.7)	0.50 (12.7)	5.00 (127)	3.50 (88.9)	1.00 (25.4)	2.50 (63.5)	1.75 (44.4)	0.50 (12.7)	1.1 (0.5)
	3/4	3.00 (76.2)	1.44 (36.6)	0.62 (15.7)	6.00 (152)	5.00 (127)	1.50 (38.1)	3.00 (76.2)	2.50 (63.5)	0.75 (19.1)	3.1 (1.4)
	1	4.00 (102)	2.00 (50.8)	0.81 (20.6)	7.00 (178)	6.50 (165)	2.00 (50.8)	3.50 (88.9)	3.25 (82.6)	1.00 (25.4)	7.5 (3.4)
	1 1/2	5.18 (132)	2.56 (65.0)	1.00 (25.4)	8.50 (216)	8.50 (216)	2.59 (65.8)	4.25 (108)	4.25 (108)	1.50 (38.1)	15.2 (6.9)
	2	6.00 (152)	3.19 (81.0)	1.32 (33.5)	9.50 (241)	9.50 (241)	3.00 (76.2)	4.75 (121)	4.75 (121)	2.00 (50.8)	24.9 (11.3)

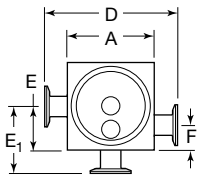
① **TB** = tube butt weld ends; **SC** = TS series and Kwik-Clamp sanitary clamp end connections.

2C Body

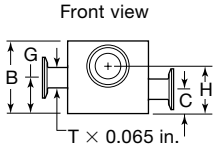


Typical 2-valve configuration with 3 ports

Top view



Front view



Shown with SC (sanitary clamp fitting) ends

Body Style	Valve Size in.	Dimensions, in. (mm)												Body Weight lb (kg)
		A	B	C	D TB①	D SC①	E	E_1 TB①	E_1 SC①	F	G	H	T	
2C	1/2	2.00 (50.8)	1.75 (44.4)	0.50 (12.7)	5.00 (127)	3.50 (88.9)	1.00 (25.4)	2.50 (63.5)	1.75 (44.4)	0.50 (12.7)	0.63 (16.0)	0.88 (22.4)	0.50 (12.7)	1.7 (0.8)
	3/4	3.00 (76.2)	2.50 (63.5)	0.62 (15.7)	6.00 (152)	5.00 (127)	1.50 (38.1)	3.00 (76.2)	2.50 (63.5)	0.69 (17.5)	1.25 (31.8)	1.68 (42.7)	0.75 (19.1)	5.2 (2.4)
	1	4.00 (102)	3.50 (88.9)	0.81 (20.6)	7.00 (178)	6.50 (165)	2.00 (50.8)	3.50 (88.9)	3.25 (82.6)	0.92 (23.4)	1.75 (44.4)	2.31 (58.7)	1.00 (25.4)	12.5 (5.7)
	1 1/2	5.18 (132)	4.63 (118)	1.00 (25.4)	8.50 (216)	8.50 (216)	2.59 (65.8)	4.25 (108)	4.25 (108)	1.08 (27.4)	2.31 (58.7)	3.07 (78.0)	1.50 (38.1)	25.7 (11.7)
	2	6.00 (152)	6.00 (152)	1.32 (33.5)	9.50 (241)	9.50 (241)	3.00 (76.2)	4.75 (121)	4.75 (121)	1.18 (30.0)	3.00 (76.2)	4.13 (105)	2.00 (50.8)	46.2 (21.0)

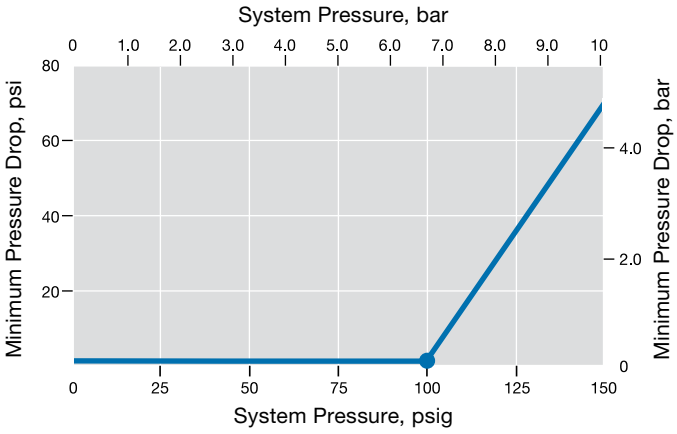
① **TB** = tube butt weld ends; **SC** = TS series and Kwik-Clamp sanitary clamp end connections.

Technical Data

Valve Pressure-Temperature Ratings

Temperature °F (°C)	Working Pressure psig (bar)
14 (–10) to 190 (87)	150 (10.3)
200 (93)	138 (9.5)
250 (121)	67 (4.6)
280 (137)	40 (2.7)

Required Pressure Drop for Valves with Normally Closed Pneumatic Actuators



Actuator Pressure-Temperature Ratings

Material	Temperature Rating, °F (°C)		Working Pressure psig (bar)
	Operating	Ambient	
Aluminum	14 to 280°F (–10 to 137°C)	Autoclavable to 300°F (148°C) max	70 to 120 psig (4.8 to 8.2 bar)

Design Specifications

The design and fabrication of Swagelok radial diaphragm valves are in compliance with **Part SD-4.6 Process (Hygienic) Valves of ASME BPE.**

Material Specifications

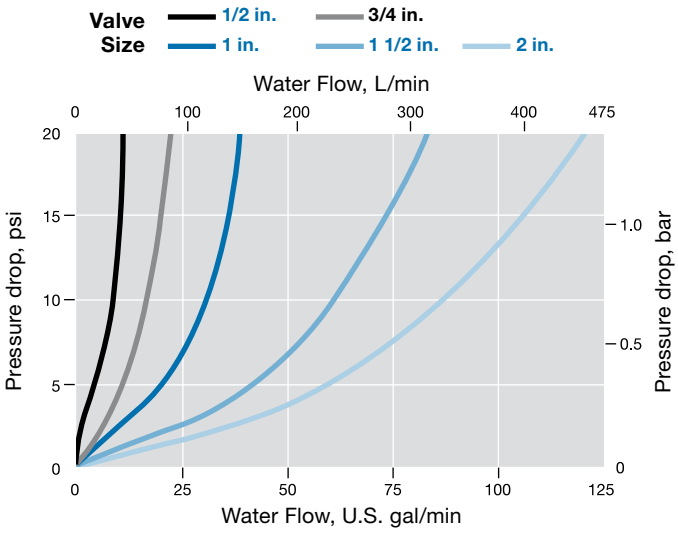
The wetted components of Swagelok radial diaphragm valves are traceable: valve bodies and fittings are heat traceable; diaphragm materials are lot traceable. All DR series valve bodies are machined from 316L stainless steel in accordance with ASTM A479 specifications, providing integrity, strength, and high levels of purity.

Surface Finish

- Interior body surfaces are electropolished and finished to 15 µin. (0.38 µm) R_a max. All accessible welds are ground flush on the inside diameter.
- Exterior body surfaces are passivated and finished to 63 µin. (1.60 µm) R_a avg.

Flow Data

Water



Flow Coefficient

Flow Coefficient C_v	Valve Size, in.				
	1/2	3/4	1	1 1/2	2
	1.6	4.6	8.7	18.7	27.2

Testing

Every Swagelok DR series radial diaphragm valve is inboard helium leak tested to a maximum allowable leak rate of 2.5×10^{-3} std cm^3/s, at the seat, envelope, and port welds, using FCI 70-2 as a guideline.

Cleaning and Packaging

All Swagelok DR series radial diaphragm valves are cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10),* MS-06-62.

Inspection

- The interior surfaces of Swagelok DR series valve bodies are 100 % visually inspected.
- All welds are performed by ASME Section IX certified welders and are 100 % visually inspected.
- All completed valve assemblies are 100 % visually inspected prior to shipment.

Validation Documentation

The following validation documentation can be provided upon request:

- Certified mill test report on the valve body
- Certification of compliance to specifications
- Certification of compliance to 21CFR Part 177
- Quality Assurance Manual
- ISO 9001 certification

Aluminum Actuators

Features

- Available for 1/2, 3/4, 1 in. valves
- Manual and pneumatic models
- Suitable for autoclave applications

Pneumatic Models

- Choice of actuation mode: normally closed, normally open, or double acting
- Reliable piston-driven actuation
- Optional Westlock position indicator assemblies are available.
- Available for all sizes

Belleville springs (not shown) are included on all sizes except 1/2 in.

Manual Models

- Open fully in 1 1/2 turns
- Provide positive shutoff with minimal torque
- Feature knob handle for 1/2 through 1 in. sizes

Materials of Construction

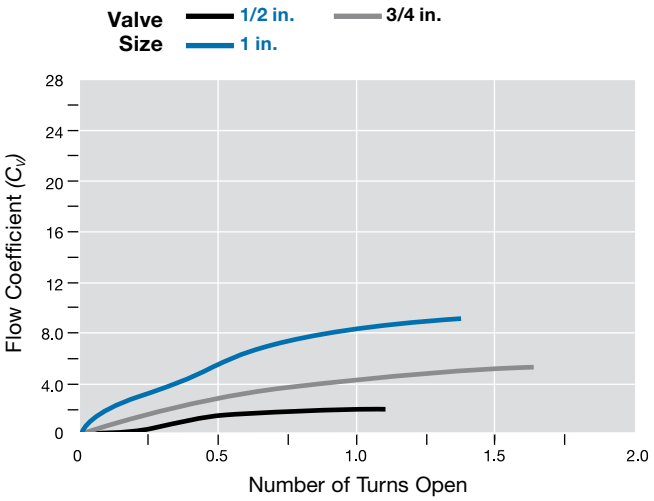
Item	Material Grade/ ASTM Specification
1 Cap screws	304 SS
2 Belleville springs	Inconel® 718/AMS 5596
3 Actuator assembly	Aluminum, hard anodized, PTFE impregnated housing with FDA-compliant fluorocarbon FKM O-rings
4 *Diaphragm*	*Modified PTFE/D4894*
5 Body gasket	FDA-compliant EPDM
6 *Body*	*316L SS/A479*

Wetted components listed in *italics.*

Aluminum Actuators

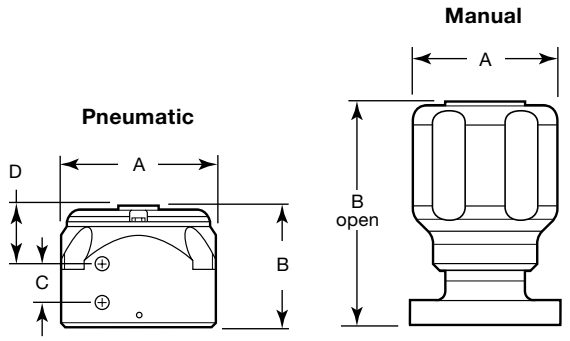
Manual Models

Flow Coefficient at Turns Open



Dimensions

Dimensions are for reference only and are subject to change.



Valve Size in.	Dimensions, in. (mm)							
	Pneumatic					Manual		
	A	B	C	D	Weight lb (kg)	A	B	Weight lb (kg)
1/2	2.00 (50.8)	2.91 (73.9)	0.75 (19.1)	1.10 (27.9)	0.8 (0.4)	2.00 (50.8)	3.08 (78.2)	0.8 (0.4)
3/4	3.00 (76.2)	3.82 (97.0)	1.00 (25.4)	1.43 (36.3)	2.7 (1.2)	2.75 (69.9)	3.59 (91.2)	2.0 (0.9)
1	4.00 (102)	3.78 (96.0)	1.04 (26.4)	1.45 (36.8)	4.8 (2.2)	5.00 (127)	4.32 (110)	3.9 (1.8)
1 1/2	5.18 (132)	5.15 (131)	1.30 (33.0)	2.37 (60.2)	8.6 (3.9)	5.00 (127)	6.60 (168)	7.9 (3.6)
2	6.00 (152)	5.24 (133)	1.15 (29.2)	2.49 (63.2)	13.8 (6.3)	6.00 (152)	6.57 (167)	9.9 (4.5)

Pneumatic Models

- Air inlet port is 1/8-27 NPT.
- Vent port is M5 × 0.8-6H thread for leak detection (accepts 10-32 UNF fitting).
- Mounting holes for an optional Westlock position indicator assembly include two M5 × 0.8-6H threaded holes in the top of the cap and one 10-24 UNC-2B threaded hole in the center of the piston.

Ordering Information

Valve with Aluminum Actuator

To order a complete valve with an aluminum actuator, see Ordering Information on page 11.

Aluminum Actuator Kit

The aluminum actuator kit includes a fully assembled actuator—manual or pneumatic, cap screws, Belleville springs (as required), body gasket, and service instructions. Diaphragm is not included.

To order an aluminum actuator kit, select the actuator kit basic ordering number, then add **BK** for manual actuation (not an option for 1, 1/2 and 2 in. sizes), **C** for normally closed, **O** for normally open, or **D** for double acting actuation.

Example: A-DR8-K1-**C**

Valve Size in.	Basic Ordering Number
1/2	A-DR8-K1-
3/4	A-DR12-K1-
1	A-DR16-K1-
1 1/2	A-DR24-K1-
2	A-DR32-K1-

Diaphragm-Body Gasket Kit

The diaphragm-body gasket kit includes a diaphragm, body gasket, and service instructions.

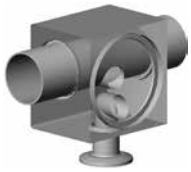
Valve Size in.	Ordering Number
1/2	NXT-3DK-DR8
3/4	NXT-3DK-DR12
1	NXT-3DK-DR16
1 1/2	NXT-3DK-DR24
2	NXT-3DK-DR32

Point-of-Use Valves

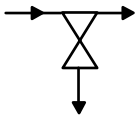
Description

Point-of-use radial diaphragm valves are multiport, tee configurations featuring a large flow-through header and a small drop-down isolation valve. These valves are ideal for:

- point-of-use drops
- sampling product from a process line
- draining, diverting, and controlling process fluids
- pure, clean steam takeoff.



Internal view



Schematic diagram

Technical Data

Same as standard DR series radial diaphragm valve. See page 7.

Testing

Same as standard DR series radial diaphragm valve. See page 7.

Features

- Reduced hold-up volume; improved cleaning efficiency
- Four valve sizes: 1/2, 3/4, 1, and 1 1/2 in.
- Four header sizes: 1 1/2, 2, 2 1/2, and 3 in.
- Straight tube extensions for header
- TS series sanitary clamp fitting for take-off port; available with optional butt weld end or Kwik-Clamp sanitary clamp fitting
- Choice of aluminum actuators
- Meets ASME BPE Bioprocessing Equipment Specification and FDA 6D guidelines.

Materials of Construction

Same as standard DR series radial diaphragm valve. See page 8 for valves with aluminum actuators.

Ordering Information

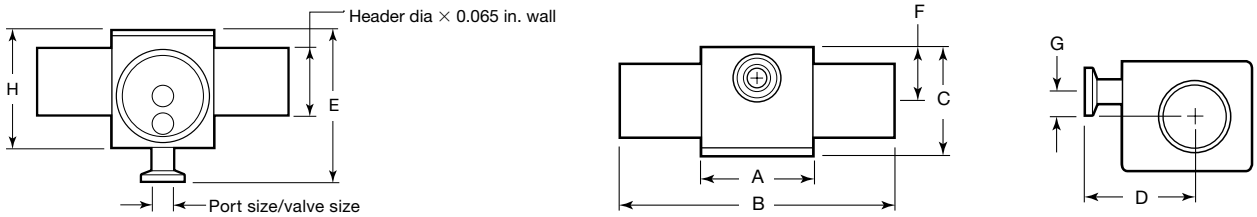
To order, select a basic ordering number from page 10, and add an actuator designator shown below.

Actuation Mode	Actuator Material	Actuator Designator
Manual	Aluminum	BK
Normally closed	Aluminum	C
Normally open	Aluminum	O
Double acting	Aluminum	D

Example: 6L-DR81PTLSETL-**BK**

Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.



Valve Size in.	Header Dia in.	Basic Ordering Number	Dimensions, in. (mm) A	B	C	D	E	F	G	H	Body Weight lb (kg)
1/2	1 1/2	6L-DR81PTLSETL-	2.25 (57.2)	5.57 (141)	2.13 (54.1)	2.25 (57.2)	3.25 (82.6)	1.13 (28.7)	0.50 (12.7)	2.50 (63.5)	2.6 (1.2)
	2	6L-DR81PTNSETN-		5.76 (146)	2.57 (65.3)	2.50 (63.5)	3.69 (93.7)	1.38 (35.1)	0.75 (19.1)	2.94 (74.7)	3.3 (1.5)
	2 1/2	6L-DR81PTPSETP-①		6.16 (156)	3.07 (78.0)	2.75 (69.9)	4.19 (106)	1.63 (41.4)	1.00 (25.4)	3.44 (87.4)	4.3 (2.0)
	3	6L-DR81PTRSETR-①			3.56 (90.4)	3.00 (76.2)	4.69 (119)	1.85 (47.0)	1.23 (31.2)	3.94 (100)	5.3 (2.4)
3/4	1 1/2	6L-DR121PTLSGTL-	3.25 (82.6)	6.56 (167)	2.19 (55.6)	2.87 (72.9)	3.75 (95.2)	1.19 (30.2)	0.37 (9.4)	3.00 (76.2)	4.5 (2.0)
	2	6L-DR121PTNSGTN-		6.75 (171)	2.82 (71.6)	3.12 (79.2)	4.07 (103)	1.63 (41.1)	0.81 (20.6)	3.32 (84.3)	6.0 (2.7)
	2 1/2	6L-DR121PTPSGTP-		7.15 (182)	3.44 (87.4)	3.37 (85.6)	4.57 (116)	1.98 (50.3)	1.16 (29.5)	3.82 (97.0)	8.1 (3.7)
	3	6L-DR121PTRSGTR-		7.18 (182)	3.81 (96.8)	3.62 (91.9)	5.07 (129)	2.08 (52.8)	1.26 (32.0)	4.32 (110)	9.4 (4.3)
1	1 1/2	6L-DR161PTLSJTL-	4.00 (102)	7.06 (179)	2.46 (62.5)	3.50 (88.9)	4.75 (121)	1.46 (37.1)	0.27 (6.9)	4.00 (102)	8.4 (3.8)
	2	6L-DR161PTNSJTN-		7.25 (184)	2.97 (75.4)	3.75 (95.2)		1.71 (43.4)	0.52 (13.2)		9.2 (4.2)
	2 1/2	6L-DR161PTPSJTP-		7.65 (194)	3.71 (94.2)	4.00 (102)	4.94 (125)	2.26 (57.4)	1.07 (27.2)	4.19 (106)	11.8 (5.4)
	3	6L-DR161PTRSJTR-			4.38 (111)	4.25 (108)	5.44 (138)	2.66 (67.6)	1.47 (37.3)	4.69 (119)	15.2 (6.9)
1 1/2	3	6L-DR241PTRSLTR-	5.18 (132)	9.09 (231)	4.00 (102)	5.03 (128)	6.87 (174)	2.25 (57.2)	0.94 (23.9)	5.18 (132)	23.1 (10.5)

① ASME BPE L/D is greater than 2.

Ordering Information

To order a DR series valve, select designators in the sequence shown.

6L – DR **16** **2E** **TJ** **TJ** **TJ** – **C**

Material

316L stainless steel

Series

DR series radial diaphragm valve

Valve Size

8 = 1/2 in.
12 = 3/4 in.
16 = 1 in.
24 = 1 1/2 in.
32 = 2 in.

Body Style

One valve, 2-port

1A = straight
1B = elbow to left
1C = elbow to right
1E = offset flow to left
1F = offset flow to right

One valve, 3-port

1G = tee with outlet to bottom
1K = vertical elbow with outlet to bottom
1N = right elbow with outlet to bottom
1R = left elbow with outlet to bottom

Two valve, 3-port

2A = common center
2B = common left
2C = offset 90°, common left
2D = offset 90°, common top
2E = offset side, common top
2F = offset horizontal
2K = mixing 90°, common side
2L = mixing 90°, common bottom
2M = mixing side, common bottom

Actuator Style

BK = Manual
C = Pneumatic, normally closed
O = Pneumatic, normally open
D = Pneumatic, double acting

One-valve models—select *one* designator.

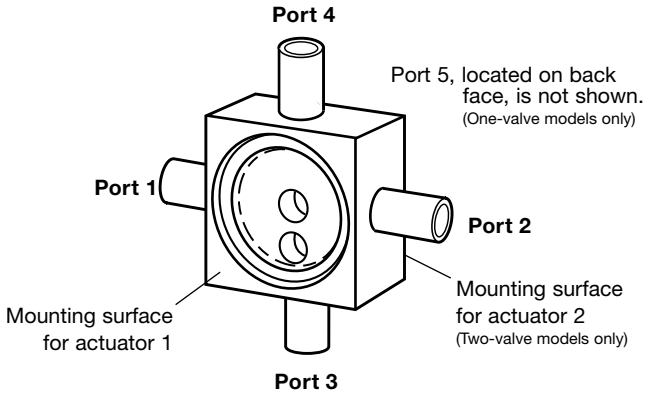
Two-valve models—select *one* designator if actuator styles are identical; select *two* designators if actuator styles are different. See sketch below to identify correct actuator sequence.

End Connection Size and Style

Size *in.*		*Tube Butt Weld*	*TS Series Sanitary Fitting*	*Kwik-Clamp Sanitary Fitting*
1/2	=	**TE**	**SE**	**IE**
3/4	=	**TG**	**SG**	**IG**
1	=	**TJ**	**SJ**	**IJ**
1 1/2	=	**TL**	**SL**	**IL**
2	=	**TN**	**SN**	**IN**

Select *two* designators for a 2-port valve; select *three* designators for a 3-port valve. Start with Port 1 and continue in numerical sequence, selecting designators for Ports 2, 3, 4, and 5. See sketch for port identification.

Example: 6L-DR122ETJTJTJ-**CBK**



⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Note: For Westlock position indicator switch options and ordering information, see page 12.

Position Indicator Switch Assemblies

- Provide electronic and visual indication of valve position
- Feature an internal proximity switch
- Include solenoid control capability

Technical Data

Position Indicator Switch Model	Westlock 99P2
Electronic Indication	Yes
Visual Indication	Yes
Temperature Rating	32 to 140°F (0 to 60°C)
Enclosure Material	Resin
NEMA Enclosure Rating	Class I, II, III, Division 2, Groups A, B, C, D, F, G
Solenoid Option	Contact your authorized Swagelok representative.
Maximum Current Rating	2 A at 24 V
Low Current Rating	1 mA at 5 V

Ordering Information

Valve with Position Indicator Switch Assembly

To order a valve with a position indicator switch assembly, add **M3** to the valve ordering number.

Example: 6L-DR81ATETE-C**M3**

Position Indicator Switch Kit

To order a position indicator switch kit for an existing valve, select a kit ordering number.

Valve Size in.	Kit Ordering Number
1/2	MS-ISK-DR8-M3
3/4	
1	MS-ISK-DR16-M3
1 1/2	
2	

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

October 2019, RevF
MS-02-186

Springless Diaphragm Valves
for High Performance

DP Series

- Suitable for ultrahigh-purity applications
- 316L VIM-VAR stainless steel body
- Low-pressure and high-pressure models
- VCR®, tube butt weld, and modular surface-mount end connections
- Manual or pneumatic actuation

Swagelok

Contents

Features

Seat

Fully contained PCTFE seat design provides:

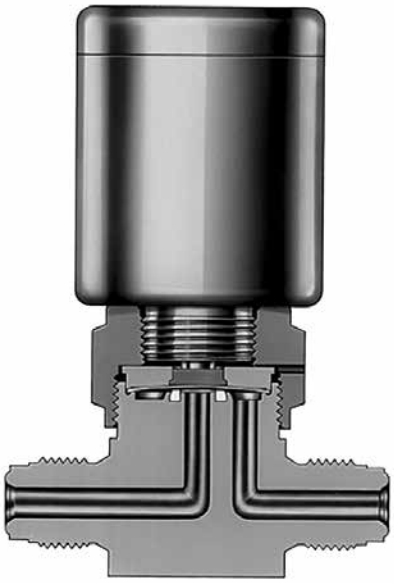
- excellent resistance to swelling and contamination
- improved helium leak test performance
- minimal particle generation
- long cycle life.

Diaphragm

- Cobalt-based superalloy (UNS R30003) material for strength and corrosion resistance
- Optimal design for long cycle life

Body

- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Fully swept flow path
  - minimizes entrapment areas
  - facilitates purging
  - maximizes flow capacity.



Models

Low-Pressure

- Pressure rating: 250 psig (17.2 bar)
- Temperature rating: –10 to 150°F (–23 to 65°C)
- Flow coefficient: 0.27

High-Pressure

- Pressure rating: 3045 psig (210 bar)
- Temperature rating: –10 to 150°F (–23 to 65°C)
- Flow coefficient: 0.20

Technical Data

Model	Working Pressure psig (bar)		Temperature Rating °F (°C)		Flow Coefficient (C_v)	Orifice in. (mm)	Internal Volume in.^{3} (cm^3)	Pneumatic Actuator	
	Operating	Burst	Operating	Short-Term Bakeout				Actuation Pressure psig (bar)	Air Displacement in.^{3} (cm^3)
Low-pressure	Vacuum to 250 (17.2)	3200 (220)	–10 to 150 (–23 to 65)	302 (150) (valve open)	0.27	0.16 (4.1)	0.086 (1.4) (body with BW4 ends)	60 to 120 (4.2 to 8.2)	0.09 (1.5)
High-pressure	Vacuum to 3045 (210)	12 200 (840)			0.20			70 to 120 (4.9 to 8.2)	0.47 (7.7)

See **Options and Accessories,** page 8, for high-temperature seat materials.

Materials of Construction

High-Pressure Pneumatic Actuator Shown

Component	Material Grade/ASTM Specification	
	Low-Pressure	High-Pressure
Body and integral end connections	*316L VIM-VAR SS/ SEMI F20 Ultrahigh-Purity*①	
Welded VCR end connections	*316L VAR SS/ SEMI F20 High-Purity*①	
Swagelok tube fittings	*316 SS/A276*	
Seat	*PCTFE/D1430*	
Diaphragm	*Cobalt-based superalloy (UNS R30003)/AMS 5876*	
Support diaphragm	Silver-plated cobalt-based superalloy (UNS R30003)/AMS 5876	
Washer	—	S17700
Bonnet	S17400 SS	
Bonnet nut	316 SS	
Pneumatic Actuator		
Cylinder, cap, pistons	Aluminum	
O-rings	Buna N	
Springs	S17700 SS	
Button	316 SS	
Manual Actuator		
Actuator	316 SS	
Button	—	316 SS
Directional handle	Nylon with stainless steel insert	
Integral lockout handle	Glass-filled nylon with stainless steel base	
Round handle	Polyester with stainless steel insert	
Toggle handle	316 SS with epoxy coating	—

Wetted components listed in *italics.*

O-rings are lubricated with PTFE-based lube; no lubricants on wetted components.

① 20 % minimum elongation allowed.

Process Specifications

See Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61; Swagelok *Photovoltaic Process Specification (SC-06)* catalog, MS-06-64; and Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Process Designator	Process Specification	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	P	*Ultrahigh-Purity Process Specification (SC-01)*	Electropolished and finished to an average of 5 µin. (0.13 µm)	Inboard helium leak tested to a rate of 1×10^{-9} std cm^3/s at the seat, envelope, and all seals. The DP series design has been helium leak tested to maximum leak rate of 1×10^{-10} std cm^3/s.
High-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in specially cleaned areas; valves are individually bagged.	P6	*Photovoltaic Process Specification (SC-06)*		
Special cleaning with non–ozone-depleting chemicals	Performed in specially cleaned areas; valves are individually bagged.	P1	*Special Cleaning and Packaging (SC-11)*		

Performance Specifications

Refer to *DP Series Diaphragm Valve Technical Report,* MS-06-15, for additional information on helium leak testing, particle counting, moisture analysis, hydrocarbon analysis, ionic cleanliness, and lab cycle testing data.

Flow Data

Pressure Drop to Atmosphere psig (bar)	Low-Pressure Models C_v = 0.27		High-Pressure Models C_v = 0.20	
	Water U.S. gal/min (L/min)	Air std ft^3/min (std L/min)	Water U.S. gal/min (L/min)	Air std ft^3/min (std L/min)
10 (0.68)	0.85 (3.2)	3.0 (86)	0.63 (2.4)	2.3 (64)
50 (3.4)	1.9 (7.2)	8.1 (230)	1.4 (5.4)	6.0 (170)
100 (6.8)	2.7 (10.2)	14.3 (410)	2.0 (7.6)	10.6 (300)

Actuation Options

Manual Actuators

- Low-pressure valves have blue handles as standard.
- High-pressure valves have white handles as standard.
- Seven handle colors are available; see **Options and Accessories—Handle Colors**, page 8.

Directional

- Quick, quarter-turn actuation
- Handle shape provides visual indication of OPEN and CLOSED position
- Available on high- and low-pressure models

Integral Lockout

- Quick, quarter-turn actuation
- Lockable in the CLOSED position for safety
- Handle shape and window indicator provides visual indication of OPEN and CLOSED position.
- Available on high- and low-pressure models

Round

- Quick, quarter-turn actuation
- Handle with window provides visual indication of OPEN and CLOSED positions
- Available on high- and low-pressure models

Toggle

- Spring-loaded toggle design for quick actuation
- Lockable in the CLOSED position for safety
- Handle position provides visual indication of OPEN and CLOSED positions
- Narrow handle profile allows close parallel mounting of valves
- Available on low-pressure models with PCTFE seats

Pneumatic Actuators

- Normally open pneumatic actuators are marked with a green ring on top of the cylinder.

High-Pressure Pneumatic Actuator

Low-Pressure Pneumatic Actuator

IGC II Modular Surface-Mount Valves

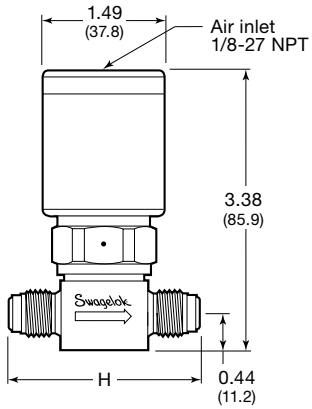
- 1.5 in. C-seal design
- Low-pressure valves: directional, integral lockout, round, toggle, and pneumatic actuators
- High-pressure valves: directional and integral lockout handles
- Available in two- or three-port configurations
- For more information on IGC II integrated gas components, see the *IGC II Integrated Gas Components—Substrates, Manifolds, Mounting Components, and Assembly Hardware* catalog, MS-02-134.

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

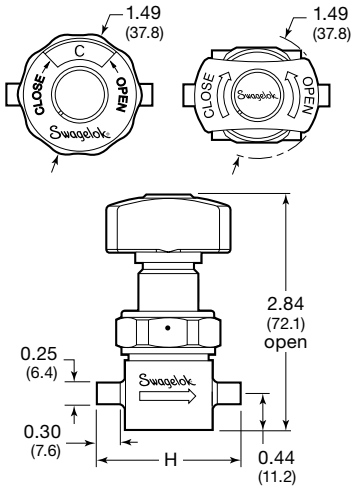
Low-Pressure Valves

Pneumatic Actuator



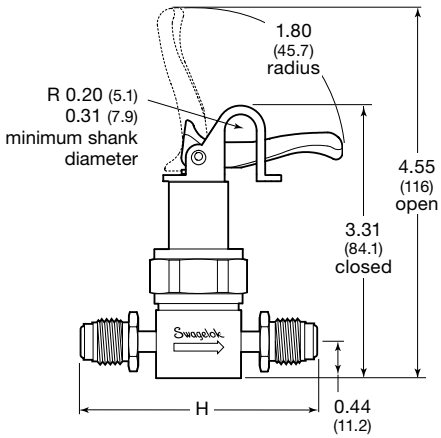
Integral Male VCR Fittings

Round Handle **Directional Handle**

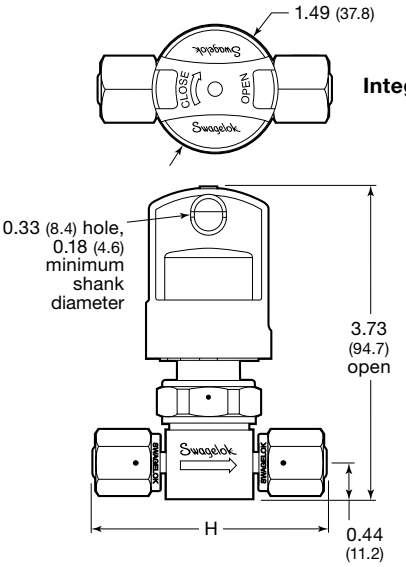


Tube Butt Weld Ends

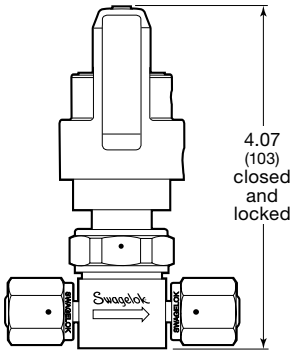
Toggle Handle



Rotatable Male VCR Fittings

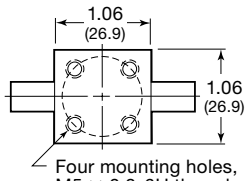


Integral Lockout Handle



Female VCR Fittings

Bottom



End Connection Inlet and Outlet	Basic Ordering Number①	H in. (mm)
1/4 in. tube butt weld 0.30 in. (7.6 mm) tube stub, 0.035 in. wall	6LVV-DPBW4-	1.74 (44.2)
1/4 in. tube butt weld 0.26 in. (6.6 mm) tube stub, 0.035 in. wall	6LVV-DPBW4S-	1.61 (40.9)
6 mm tube butt weld, 1 mm wall	6LVV-DPBW6M-	1.74 (44.2)
1/4 in. female VCR fitting	6LVV-DPFR4-	2.78 (70.6)
1/4 in. rotatable male VCR fitting	6LVV-DPMR4-	
1/4 in. integral male VCR fitting	6LVV-DPVR4-	2.30 (58.4)
1/4 in. Swagelok tube fitting	6LVV-DPS4-②	2.46 (62.5)
6 mm Swagelok tube fitting	6LVV-DPS6M-②	2.45 (62.2)

① Low-pressure valves have blue handles. For other colors, see **Options and Accessories—Handle Colors**, page 8.

② Not available with **P, P1,** or **P6** processing; omit process designator from ordering number.

To order, add a process designator, **P, P1,** or **P6** (see page 3), to the basic ordering number, then specify the actuator style as shown:

- For a **directional handle,** no additional designators are required.
- Example: 6LVV-DPBW4-P
- For an **integral lockout handle,** insert **L.**

  Example: 6LVV-DP**L**BW4-P
- For a **round handle,** insert **R.**

  Example: 6LVV-DP**R**BW4-P
- For a **toggle handle,** insert **T.**

  Example: 6LVV-DP**T**VR4-P
- For a **pneumatic actuator,** add **-C** for normally closed actuation or **-O** for normally open actuation.

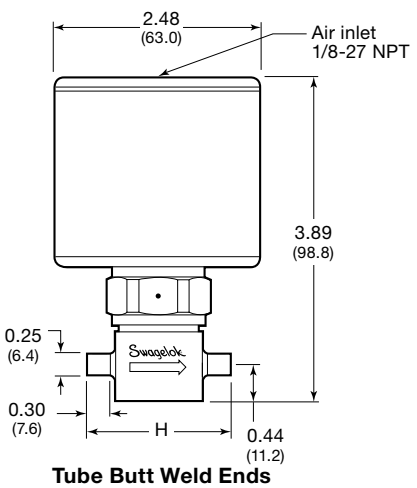
  Example: 6LVV-DPBW4-P**-C**

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

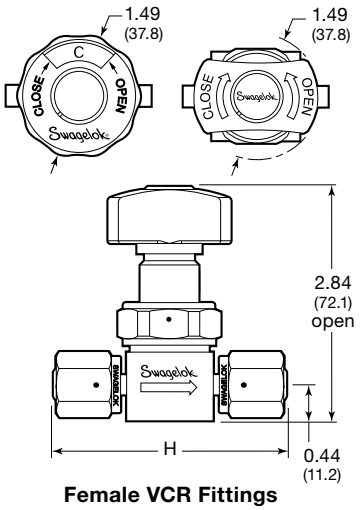
High-Pressure Valves

Pneumatic Actuator

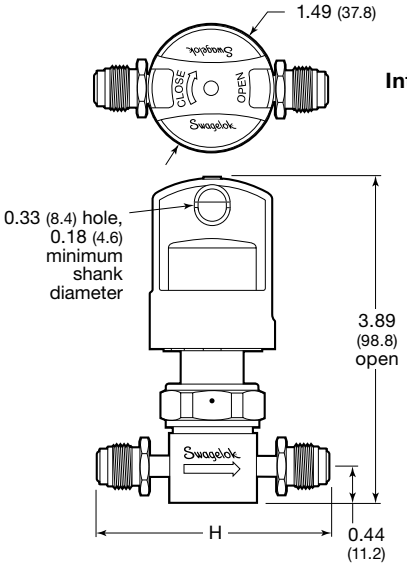


Tube Butt Weld Ends

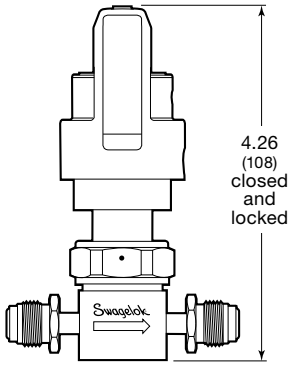
Round Handle **Directional Handle**



Female VCR Fittings

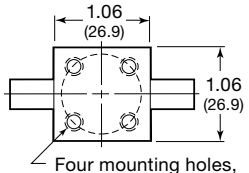


Integral Lockout Handle



Rotatable Male VCR Fittings

Bottom



Four mounting holes, M5 × 0.8-6H thread, 0.25 (6.4) deep, 45° from center line, on a 1.00 (25.4) bolt circle.

M5 × 0.8-6H holes are compatible with 10-32 mounting screws.

End Connection Inlet and Outlet	Basic Ordering Number①	H in. (mm)
1/4 in. tube butt weld 0.30 in. (7.6 mm) tube stub, 0.035 in. wall	6LVV-DPHBW4-	1.74 (44.2)
1/4 in. tube butt weld short 0.26 in. (6.6 mm) tube stub, 0.035 in. wall	6LVV-DPHBW4S-	1.61 (40.9)
6 mm tube butt weld, 1 mm wall	6LVV-DPHBW6M-	1.74 (44.2)
1/4 in. female VCR fitting	6LVV-DPHFR4-	2.78 (70.6)
1/4 in. rotatable male VCR fitting	6LVV-DPHMR4-	
1/4 in. integral male VCR fitting	6LVV-DPHVR4-	2.30 (58.4)
1/4 in. Swagelok tube fitting	6LVV-DPHS4-②	2.46 (62.5)
6 mm Swagelok tube fitting	6LVV-DPHS6M-②	2.45 (62.2)

① High-pressure valves have white handles. For other colors, see **Options and Accessories—Handle Colors,** page 8.

② Not available with **P, P1,** or **P6** processing; omit process designator from ordering number.

To order, add a process designator, **P, P1,** or **P6** (see page 3), to the basic ordering number, then specify the actuator style as shown:

- For a **directional handle,** no additional designators are required.

  Example: 6LVV-DPHBW4-P
- For an **integral lockout handle,** insert **L.**

  Example: 6LVV-DPH**L**BW4-P
- For a **round handle,** insert **R.**

  Example: 6LVV-DPH**R**BW4-P
- For a **pneumatic actuator,** add **-C** for normally closed actuation or **-O** for normally open actuation.

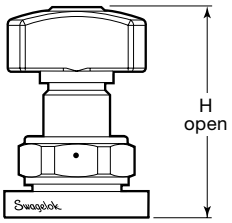
  Example: 6LVV-DPHBW4-P**-C**

Ordering Information and Dimensions

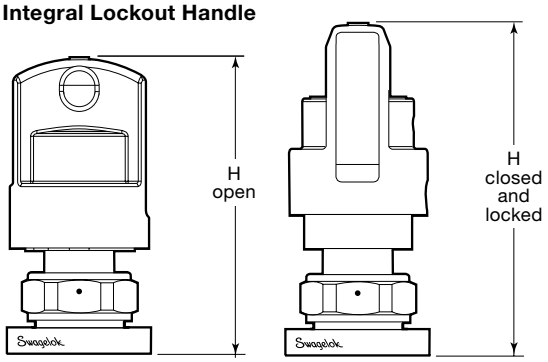
Dimensions, in inches (millimeters), are for reference only and are subject to change.

IGC II Modular Surface-Mount Valves

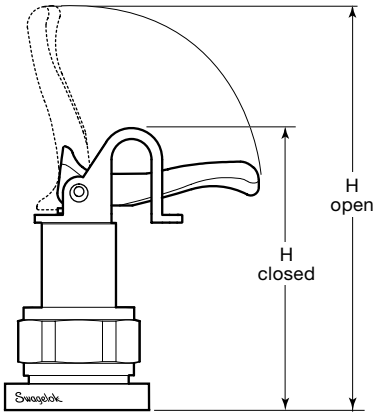
Directional and Round Handles



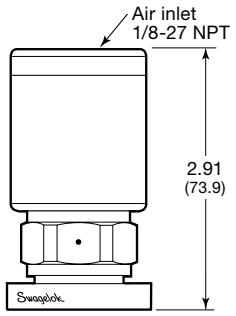
Integral Lockout Handle



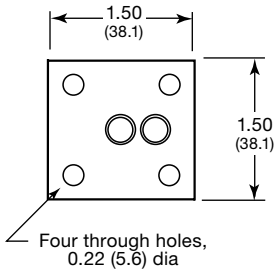
Toggle Handle



Pneumatic Actuator



Bottom



Dimensions

For other valve dimensions, see **Ordering Information and Dimensions** for low-pressure or high-pressure valves on pages 5 and 6.

Handle Type	Dimensions, in. (mm)			
	Low-Pressure		High-Pressure	
	H Open	H Closed	H Open	H Closed
Directional and round	2.36 (59.9)	2.34 (59.4)	2.36 (59.9)	2.34 (59.4)
Integral lockout	3.25 (82.6)	3.59① (91.2)	3.41 (86.6)	3.78① (96.0)
Toggle	2.83 (71.9)	4.04 (103)	—	

① Closed and locked position.

Low-Pressure Models

Actuation	Ordering Numbers	
	2 Port	3 Port
Directional handle	6LVV-MSM-DP-2-P	6LVV-MSM-DP-3-P
Integral lockout handle	6LVV-MSM-DPL-2-P	6LVV-MSM-DPL-3-P
Round handle	6LVV-MSM-DPR-2-P	6LVV-MSM-DPR-3-P
Toggle handle	6LVV-MSM-DPT-2-P	6LVV-MSM-DPT-3-P
Pneumatic, normally closed	6LVV-MSM-DP-2-P-C	6LVV-MSM-DP-3-P-C
Pneumatic, normally open	6LVV-MSM-DP-2-P-O	6LVV-MSM-DP-3-P-O

High-Pressure Models

Actuation	Ordering Numbers	
	2 Port	3 Port
Directional handle	6LVV-MSM-DPH-2-P	6LVV-MSM-DPH-3-P
Integral lockout handle	6LVV-MSM-DPHL-2-P	6LVV-MSM-DPHL-3-P
Round handle	6LVV-MSM-DPHR-2-P	6LVV-MSM-DPHR-3-P

Options and Accessories

Handle Colors (excluding multivalve manifolds)

Seven handle colors are available for color coding of process lines.

Select a basic kit ordering number and add a color designator.

Handle Kit	Basic Ordering Number
Directional	NY-5K-DP-
Integral lockout	NY-5K-DPL-
Round handle replacement	PY-5QK-DPR-
Round handle retrofit	PY-5K-DPR-

Color	Designator
Black	BK
Blue	BL
Green	GR
Orange	OR
Red	RD
White	WH
Yellow	YW

Example: **NY-5K-DP-RD** for a red directional handle kit.

Maintenance Kits

Diaphragm Replacement Kits

- Include two diaphragms and replacement instructions.
- Are available for high- or low-pressure valves.

Ordering number: **E-3DK-DP**

Actuator Replacement Kits

Include actuator and service instructions.

Select a kit ordering number:

Actuator Replacement Kit	Ordering Numbers	
	Low-Pressure	High-Pressure
Directional handle	NY-DP-K1-BL	NY-DPH-K1-WH
Integral lockout handle	NY-DPL-K1-BL	NY-DPHL-K1-WH
Round handle	PY-DPR-K1-BL	PY-DPHR-K1-WH
Toggle handle	SS-DPT-K1-BL	—
Pneumatic normally closed	A-DP-K1-C	A-DPH-K1-C①
Pneumatic normally open	A-DP-K1-O	A-DPH-K1-O①
High-temperature pneumatic normally closed	A-DPV-K1-C	A-DPHV-K1-C①
High-temperature pneumatic normally open	A-DPV-K1-O	A-DPHV-K1-O①

① For high-pressure 1V and 2V monoblock configurations, insert **M** into the ordering number as shown.
Examples: A-DPH**M**-K1-C
A-DPH**M**V-K1-C

⚠ **Do not interchange high- and low-pressure actuators.**

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, refer to *Oxygen System Safety* technical report, MS-06-13.

Caution: Do not mix or interchange parts with those of other manufacturers.

High-Temperature Seat Material—Polyimide

- Temperature rating is from 50 to 300°F (10 to 150°C).
- Fluorocarbon FKM O-rings in pneumatic actuator are included.
- All other materials and ratings remain the same.

To order, insert **V** in the valve ordering number.

Examples: 6LVV-DP**V**C111P-C
6LVV-DPH**V**BW4P-C

Indicator Switch

- Transmits a signal to an electrical device, indicating the open or closed position of the pneumatically actuated valve.
- Features a single-pole, single-throw switch rated at:
  - 1/2 A for 115 V (ac) for a normally open switch;
  - 1/4 A for 115 V (ac) for a normally closed switch;
  - –40 to 185°F (–40 to 85°C) temperature.
- Includes a 24 in. (61 cm) wire lead with an inline clip.
- Is available assembled on any normally closed and high-pressure, normally open, pneumatically actuated DP series valve, or as a kit for field assembly.

Factory-Assembled Indicator Switches

To order a valve with an indicator switch, add **M** for a normally open switch or **M-2** for a normally closed switch to the valve ordering number.

Examples: 6LVV-DPFR4-P-C**M**
6LVV-DPHBW4-P-C**M-2**

Indicator Switch Kits

Include actuator and switch. Select an ordering number.

Indicator Switch Kit	Ordering Numbers	
	Low-Pressure	High-Pressure
Normally open	MS-ISK-DP-CM	MS-ISK-DPH-CM①
Normally closed	MS-ISK-DP-CM-2	MS-ISK-DPH-CM-2①

① For high-pressure 1V and 2V monoblock configurations, insert **M** into the ordering number as shown.
Example: MS-ISK-DPH**M**-CM

Multiport and Elbow Valves and Monoblock Manifolds

DP series valves are available in multiport and elbow configurations and monoblock manifolds; refer to *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, MS-02-442.

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High-Flow, Springless Diaphragm Valves

DF Series

- 316L VAR stainless steel body
- Working pressures up to 300 psig (20.6 bar)
- 1/4, 3/8, and 1/2 in.; 10 and 12 mm end connections

Swagelok

Features

Valve

- Flow coefficient of 0.62 meets high-flow requirements.
- No springs or threads in wetted areas improves cleanliness.
- Fully swept flow path enhances purging and gas replacement.
- Minimal PCTFE volume minimizes gas adsorption and desorption.
- Fully contained seat insert increases cycle life.
- High-flow Swagelok® "H" Type VCR® fittings, Swagelok VCR fittings, and tube butt weld end connections are available.

Pneumatic Actuators

- Normally closed and normally open models are available for remote actuation.
- Actuators require low actuation pressure.
- Construction is lightweight aluminum.

Manual Actuators

- Three-quarter turn actuation
- Choice of seven handle colors

Round Handle

- Window handle provides visual indication of open and closed positions.

Integral Lockout Handle

- Standard padlock or lockout device secures handle in closed position.
- Handle orientation provides visual indication of open or closed position.

Technical Data

Model	Working Pressure psig (bar)		Temperature Rating °F (°C)		Flow Coefficient (C_v)	Orifice in. (mm)	Internal Volume in.³ (cm³)	Pneumatic Actuator	
	Operating	Burst	Operating①	Bakeout②				Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
Manual	Vacuum to 300 (20.6)	3200 (220)	–10 to 150 (–23 to 65)	302 (150) (valve open)	0.62	0.23 (5.8)	0.27 (4.4) body with HVCR fittings	—	—
Pneumatic	Vacuum to 125 (8.6)							70 to 100 (4.9 to 6.8)	0.13 (2.1)

① See **Polyimide Seat Material,** page 4, for operating temperatures up to 270°F (132°C).

② Contact your authorized Swagelok sales and service representative for more information.

Process Specifications

See Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61; Swagelok *Photovoltaic Process Specification (SC-06)* catalog, MS-06-64; and Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Process Designator	Process Specification	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	P	*Ultrahigh-Purity Process Specification (SC-01)*	Electropolished and finished to an average of 5 µin. (0.13 µm)	Inboard and internal helium leak tested to a maximum leak rate of 1×10^{-9} std cm³/s in accordance with SEMI F1
High-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in specially cleaned areas; valves are individually bagged.	P6	*Photovoltaic Process Specification (SC-06)*		
Special cleaning with non–ozone-depleting chemicals	Performed in specially cleaned areas; valves are individually bagged.	P1	*Special Cleaning and Packaging (SC-11)*		

Performance Specifications

Refer to *DF Series Diaphragm Valve Technical Report,* MS-06-14, for additional information on particle counting, moisture analysis, hydrocarbon analysis, ionic cleanliness, and lab cycle testing data.

Materials of Construction

Component	Material Grade/ ASTM Specification	Component	Material Grade/ ASTM Specification
Valve		**Round Handle**	
Body	*316L VAR SS/ SEMI F20 High-Purity*①	Handle	Polyester with SS insert
		Actuator, bonnet nut	316 SS
Seat	*PCTFE/AMS 3650*	Bonnet	S17400 SS
Diaphragms	*Cobalt-based superalloy (UNS R30003)/AMS 5876*	**Integral Lockout Handle**	
		Handle	Glass-filled nylon
Pneumatic Actuator		Set screws	Alloy steel/F912
Cylinder, cap, pistons	Aluminum	Retaining ring	PH 15-7 Mo® SS
O-rings	Buna N	O-rings	Fluorocarbon FKM
Springs	S17700 SS	Sleeve, base	Powdered metal SS

Wetted components listed in *italics.*

① 20 % minimum elongation allowed.

Flow Data at 70°F (20°C)

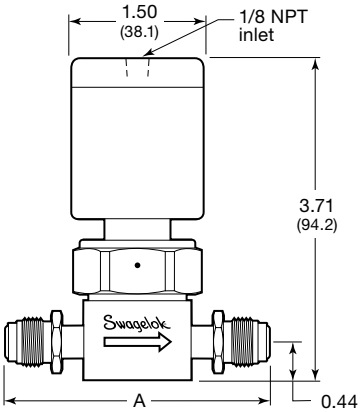
0.23 in. (5.8 mm) orifice, 0.62 C_v

Pressure Drop to Atmosphere psi (bar)	Water Flow U.S. gal/min (L/min)	Air Flow std ft³/min (std L/min)
10 (0.68)	2.0 (7.4)	7.0 (200)
50 (3.4)	4.4 (17)	19 (530)
100 (6.8)	6.2 (23)	33 (930)

Ordering Information and Dimensions

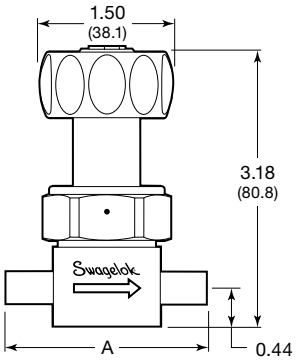
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Pneumatic Actuator



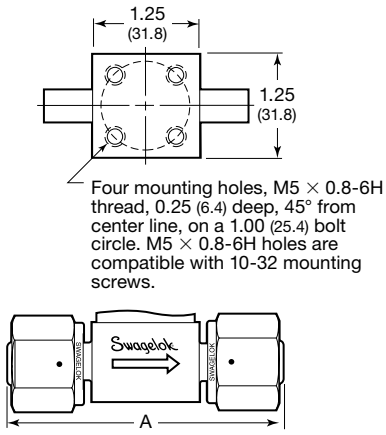
Rotatable Male "H" Type VCR Fittings

Round Handle



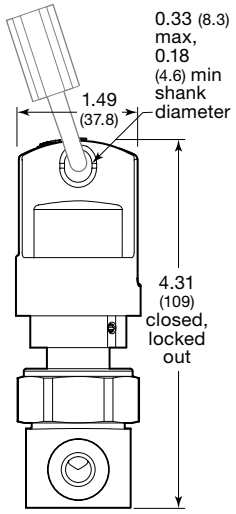
Tube Butt Welds

Bottom



Female VCR Fittings

Integral Lockout Handle



End Connections		Basic Ordering Number	A in. (mm)
Inlet/Outlet	Size		
Female "H" type VCR fittings	1/4 in.	6LV-DFHFR4-	2.78 (70.6)
Rotatable male "H" type VCR fittings	1/4 in.	6LV-DFHMR4-	2.96 (75.2)
Female/rotatable male "H" type VCR fitting	1/4 in.	6LV-DFHFR4HMR4-	2.96 (75.2)
Female VCR fittings	1/2 in.	6LV-DFFR8-	4.16 (106)
Rotatable male VCR fittings	1/2 in.	6LV-DFMR8-	4.16 (106)
Tube butt welds	3/8 × 0.035 in.	6LV-DFBW6-	2.25 (57.1)
	1/2 × 0.049 in.	6LV-DFBW8-	
	10 × 1 mm	6LV-DFBW10M-	
	12 × 1 mm	6LV-DFBW12M-	

Valves with Round Handles or Pneumatic Actuators

Select a basic ordering number, add a process designator (see page 2), then add a pneumatic actuator or handle color designator.

Examples: 6LV-DFHFR4-**P-BK** for P process, black handle
6LV-DFHMR4-**P1-C** for P1 process, normally closed pneumatic actuator

Pneumatic Actuator	Designator
Normally closed	-C
Normally open	-O
Normally closed with indicator switch	-CM

Handle Color	Designator
Black	-BK
Blue	-BL
Green	-GR
Orange	-OR
Red	-RD
White	-WH
Yellow	-YW

Valves with Integral Lockout Handles

Insert **L** into a basic ordering number, add a process designator (see page 2), then add a handle color designator.

Examples: 6LV-DF**L**HFR4-**P-BK** for P process, black handle
6LV-DF**L**HMR4-**P6-BL** for P6 process, blue handle

Options and Accessories

Polyimide Seat Material

- DF series valves with polyimide seats are rated for operating temperatures from 50 to 270°F (10 to 132°C).
- Pneumatic actuators contain fluorocarbon FKM O-rings.
- All other materials and ratings remain the same.

To order, insert **V** into the valve ordering number.

Example: 6LV-DFL**V**BW8-P-C

Indicator Switch

- Transmits a signal to an electrical device indicating either the open or closed position of a pneumatically actuated valve.
- Features a single-pole, single-throw switch rated at:
  - 1/2 A for 115 V (ac) for normally open switch;
  - 1/4 A for 115 V (ac) for a normally closed switch;
  - –40 to 185°F (–40 to 85°C) temperature.
- Includes a 24 in. (61 cm) wire lead with an inline clip.
- Is available assembled on any normally closed, pneumatically actuated DF series valve or for field assembly.

Factory-Assembled Indicator Switches

To order a valve with an indicator switch, add **M** for a normally open switch or **M-2** for a normally closed switch to the valve ordering number.

Examples: 6LV-DFHFR4-P-C**M**
6LV-DFBW8-P-C**M-2**

Indicator Switch Kits

To order a kit for an existing valve, use ordering number **MS-ISK-DF-CM** for a normally open switch or **MS-ISK-DF-CM-2** for a normally closed switch.

Kits include actuator and switch.

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, refer to *Oxygen System Safety* technical report, MS-06-13.

Panel Mounting

- Is available for round-handle valves.
- Includes threaded bonnet nut and 1 1/8 in. hex panel mount nut.
- Requires 0.96 in. (24.4 mm) diameter hole.

To order, add **-PM** to the valve ordering number.

Example: 6LV-DFHFR4-BK-**PM**

Maintenance Kits

Diaphragm Replacement Kits

Kits include two diaphragms and replacement instructions.

Ordering number: **E-3DK-DF**

Actuator Replacement Kits

Kits include all components except body, seat, and diaphragms.

Actuator Kit	Ordering Number
Green round handle	PY-DF-K1-GR
Green integral lockout handle	NY-DFL-K1-GR
Normally closed pneumatic with Buna N O-rings	A-DF-K1-C
Normally open pneumatic with Buna N O-rings	A-DF-K1-O
Normally closed pneumatic with fluorocarbon FKM O-rings, for use with polyimide seat option	A-DFV-K1-C
Normally open pneumatic with fluorocarbon FKM O-rings, for use with polyimide seat option	A-DFV-K1-O

Select a kit ordering number.

To order a kit with a round handle or integral lockout handle of another color, replace **GR** with a handle color designator.

Example: PY-DF-K1-**BK**

Color	Designator
Black	BK
Blue	BL
Orange	OR
Red	RD
White	WH
Yellow	YW

Multiport and Elbow Valves and Monoblock Manifolds

DF series valves are available in multiport and elbow configurations and monoblock manifolds; refer to *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, MS-02-442.

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Ultrahigh-Purity PFA Tubing

PFA4 and PFA9D

Features

- Available in ultrahigh-purity and advanced (fluorosurfactant resistant) ultrahigh-purity grades
- 100 % virgin material
- PFA has high thermal stability
- Meets SEMI F57-0301 specifications
- Flammability: UL 94 rated V-O (self-extinguishing)

Pressure-Temperature Ratings

Fractional Tubing

Tubing Size, in.	**1/8**	**1/4**	**3/8**	**1/2**	**3/4**	**1**	**1 1/4**
Temperature °F (°C)	**Working Pressure** psig (bar)						
75 (23)	300 (20.6)	275 (18.9)	235 (16.1)	170 (11.7)	110 (7.5)	80 (5.5)	
350 (176)	60 (4.1)	35 (2.4)	30 (2.0)	20 (1.3)	15 (1.0)	10 (0.6)	

Metric Tubing

Tubing Size, mm	**4**	**6**	**8**	**10**
Temperature °C (°F)	**Working Pressure** bar (psig)			
23 (75)	34.4 (500)	16.1 (235)	11.7 (170)	8.9 (130)
176 (350)	4.1 (60)	2.0 (30)	1.3 (20)	1.2 (18)

Marking

Tubing is laser etched with the tubing size, material designator, and lot traceability number.

Cleaning and Packaging

Ultrahigh-purity fluoropolymer tubing is packaged and shipped with the ends capped in accordance with SEMI F57-0301.

Tubing Sizes

Fractional Tubing

Tube OD in.	**Tube ID** in.	**Nominal Wall Thickness** in.
1/8	0.06	0.030
1/4	0.16	0.047
	0.12	0.063
3/8	0.25	
1/2	0.38	
3/4	0.63	
1	0.88	
1 1/4	1.10	0.075

Metric Tubing

Tube OD mm	**Tube ID** mm	**Nominal Wall Thickness** mm
4	2.0	1.0
6	4.0	
8	6.0	
10	8.0	

Ordering Information

Build an ultrahigh-purity fluoropolymer tubing ordering number by combining the designators as shown below.

PFA4 - T 2-030 - 100 - U

Material and Grade

PFA4 = Ultrahigh-purity perfluoroalkoxy (PFA)
PFA9D = PFA 950HP

Type

Standard tubing

Tubing Size

Fractional

2-030 = 1/8 in.
4-047 = 1/4 in. (0.047 in. wall)
4-063 = 1/4 in. (0.063 in. wall)
6-063 = 3/8 in.
8-063 = 1/2 in.
12-063 = 3/4 in.
16-063 = 1 in.
20-075 = 1 1/4 in.

Metric

4M-1.0M = 4 mm
6M-1.0M = 6 mm
8M-1.0M = 8 mm
10M-1.0M = 10 mm

Package Length

Fractional

50 = 50 ft coil
100 = 100 ft coil
500 = 500 ft spool①
1000 = 1000 ft spool①

Metric

15M = 15 m coil
30M = 30 m coil
150M = 150 m coil
300M = 300 m spool①

① Not available for 1 1/4 in. tubing.

Purity

Ultrahigh-purity with SEMI F57-0301 packaging

Accessories

Tube Cutter

A tube cutter for plastic tubing up to 1 in. outside diameter is available.

Ordering number: **MS-HC-SC-1A**

Replacement blade ordering number: **MS-HC-SC-1A-BLD**

Ultrahigh-Purity Fluoropolymer Products

The Swagelok family of UHP fluoropolymer products includes pneumatically actuated and quarter-turn manual radial diaphragm-sealed shutoff valves, O-ring–free poppet check valves, and fine thread flare fittings.

See these Swagelok catalogs for more information:

- *Ultrahigh-Purity Fluoropolymer Diaphragm Valves—DRP Series* catalog, MS-02-171
- *Ultrahigh-Purity Fluoropolymer O-Ring–Free Poppet Check Valves—CHP Series* catalog, MS-02-320
- *High-Purity PFA Fine Thread Flare Fittings* catalog, MS-02-195

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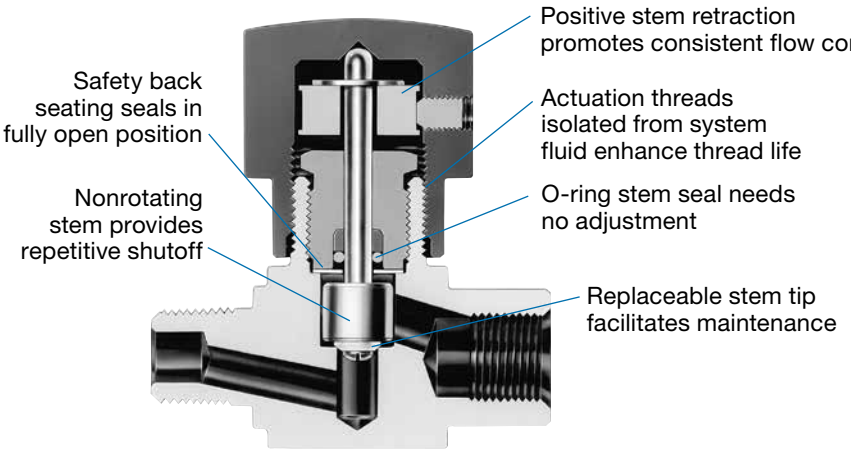
Nonrotating-Stem Needle Valves

D Series

- Pressures up to 3000 psig (206 bar)
- Temperatures up to 450°F (232°C) with PEEK stem tip
- Stainless steel, brass, and alloy 400 materials

Features

- Compact, rugged design is available in straight and angle flow patterns.
- Protective handle prevents contaminants from entering functional valve parts.
- Orifice sizes from 0.093 to 0.218 in. (2.4 to 5.6 mm) are available.
- Flow coefficients (C_v) from 0.12 to 0.53 are available.
- Female NPT, male NPT, Swagelok® tube fitting, and mixed end connections are available.



Materials of Construction

Component	Valve Body Materials		
	316 SS	Brass	Alloy 400
	Material Grade/ASTM Specification		
1 Handle	Anodized aluminum/B221		
Set screw	Nickel cadmium-plated steel		
2 Retaining ring	Zinc-plated steel		
3 Spool	Aluminum/B209, B211		
4 *Packing bolt*	*Molybdenum disulfide-coated 316 SS/A276*	*Molybdenum disulfide-coated brass 360/B16*	*Molybdenum disulfide-coated alloy 400/B164*
5 Backup ring	PTFE/D1710		
6 *O-ring*	*Fluorocarbon FKM*		
7 *Washer*	*Fluorocarbon-coated 316 SS/A167*	*Aluminum 5052/B209*	*Fluorocarbon-coated alloy 400/B127*
8 *Stem*	*316 SS/A276*		*Alloy 400/B164*
Stem tip	*PCTFE/D1430*		
Machine screw	*316 SS/A276*		*Alloy 400/B164*
9 *Body*	*316 SS/A182*	*Brass 377/B283*	*Alloy 400/B564*
Lubricants	*Molybdenum disulfide in hydrocarbon carrier; O-ring—silicone-based; machine screw—hydrocarbon thread lock*		

Wetted components listed in *italics*.

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Pressure-Temperature Ratings

Ratings are limited to:

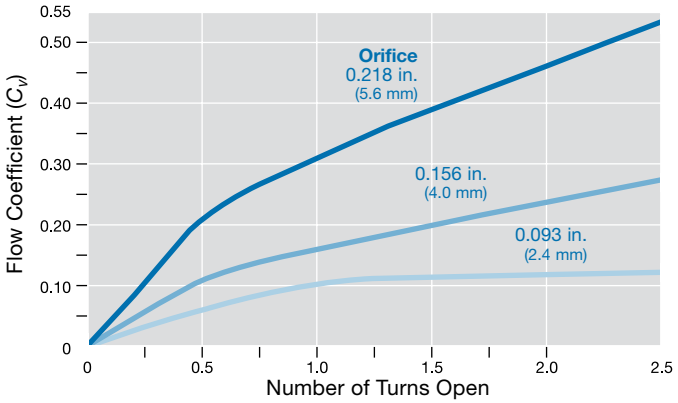
- 250°F (121°C) max with Buna N, silicone, and ethylene propylene O-rings.
- –65 to 250°F (–53 to 121°C) with Buna C O-rings.
- 30 to 100°F (–1 to 37°C) with Kalrez® O-rings to 3000 psi, 30 to 150°F (–1 to 65°C) with Kalrez® O-rings to 1000 psi.

ASME Class	1250		N/A		1500	
Material Group	2.2		N/A		3.4	
Material Name	316 SS		Brass		Alloy 400	
Stem Tip Material	PCTFE	PEEK	PCTFE	PEEK	PCTFE	PEEK
Temperature, °F (°C)	Working Pressure, psig (bar)					
–20 (–28) to 100 (37)	3000 (206)	3000 (206)	3000 (206)	3000 (206)	3000 (206)	3000 (206)
150 (65)	2790 (192)	2790 (192)	2675 (184)	2675 (184)	2820 (194)	2820 (194)
200 (93)	2580 (177)	2580 (177)	2350 (161)	2350 (161)	2640 (181)	2640 (181)
250 (121)	—	2455 (169)	—	2200 (151)	—	2555 (176)
300 (148)	—	2330 (160)	—	2050 (141)	—	2470 (170)
350 (176)	—	2235 (153)	—	1220 (84.0)	—	2430 (167)
400 (204)	—	2140 (147)	—	390 (26.8)	—	2390 (164)
450 (232)	—	2065 (142)	—	—	—	2380 (163)

For more information about pressure ratings of valves with tube fitting end connections, refer to *Tubing Data* catalog, MS-01-107.

Flow Data at 100°F (37°C)

Flow Coefficient at Turns Open



Testing

Every Swagelok nonrotating-stem needle valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min. Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

Cleaning and Packaging

Every Swagelok nonrotating-stem needle valve is cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)* catalog, MS-06-62.

Ordering Information and Dimensions

Stainless Steel Valve

Select an ordering number.

Alloy 400 or Brass Valves

Replace **SS** with **M** for alloy 400 or **B** for brass.

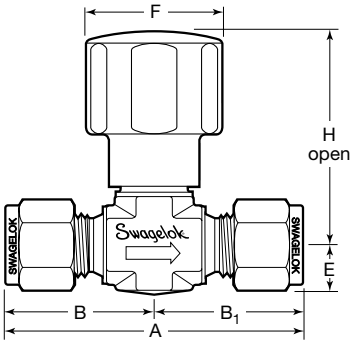
Example: **M**-ODKS2

PEEK Stem Tip

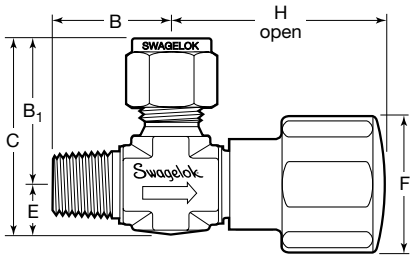
Replace **K** with **P.**

Example: SS-OD**P**S2

Straight Pattern



Angle Pattern



Angle-Pattern Valves

Select a valve with a C dimension listed and add **-A** to the ordering number.

Example: SS-ODKS2**-A**

End Connections		C_v	Orifice in. (mm)	Ordering Number	Dimensions, in. (mm)						
Inlet/Outlet	Size				A	B	B_1	C	E	F	H
Swagelok tube fittings	1/8 in.	0.12	0.093 (2.4)	SS-ODKS2	2.20 (55.9)	1.10 (27.9)		1.41 (35.8)	0.31 (7.9)	1.12 (28.4)	1.86 (47.2)
	1/4 in.	0.27	0.156 (4.0)	SS-14DKS4	2.27 (57.6)	1.13 (28.7)		1.51 (38.4)	0.38 (9.7)		
	3/8 in.	0.53	0.218 (5.6)	SS-16DKS6	2.58 (65.5)	1.29 (32.8)		1.79 (45.5)	0.50 (12.7)	1.25 (31.8)	2.02 (51.3)
	6 mm	0.27	0.156 (4.0)	SS-14DKS6MM	2.27 (57.6)	1.13 (28.7)		1.51 (38.4)	0.38 (9.7)	1.12 (28.4)	1.86 (47.2)
Female NPT	1/4 in.	0.53	0.218 (5.6)	SS-16DKF4	2.12 (53.8)	1.06 (26.9)		—	0.50 (12.7)	1.25 (31.8)	2.02 (51.3)
Male NPT	1/4 in.	0.27	0.156 (4.0)	SS-14DKM4	1.97 (50.0)	0.98 (24.9)		1.36 (34.5)	0.38 (9.7)	1.12 (28.4)	1.86 (47.2)
	1/4 in.	0.53	0.218 (5.6)	SS-16DKM4	2.25 (57.2)	1.12 (28.4)		—	0.50 (12.7)	1.25 (31.8)	2.02 (51.3)
	3/8 in.			SS-16DKM6					0.56 (14.2)		
Male NPT/ Swagelok tube fitting	1/8 to 1/4 in.	0.12	0.093 (2.4)	SS-ODKM2-S4	1.85 (47.0)	0.75 (19.0)	1.10 (27.9)	1.42 (36.1)	0.31 (7.9)	1.12 (28.4)	1.86 (47.2)
	1/4 in.	0.27	0.156 (4.0)	SS-14DKM4-S4	2.12 (53.8)	0.98 (24.9)	1.13 (28.7)	1.51 (38.4)	0.38 (9.7)	1.12 (28.4)	1.86 (47.2)
	1/4 to 3/8 in.	0.53	0.218 (5.6)	SS-16DKM4-S6	2.38 (60.5)	1.12 (28.4)	1.26 (32.0)	1.79 (45.5)	0.50 (12.7)	1.25 (31.8)	2.02 (51.3)
	1/4 in. to 6 mm	0.27	0.156 (4.0)	SS-14DKM4-S6MM	2.12 (53.8)	0.98 (24.9)	1.13 (28.7)	1.51 (38.4)	0.38 (9.7)	1.12 (28.4)	1.86 (47.2)
Male/female NPT	1/8 in.	0.12	0.093 (2.4)	SS-ODKM2-F2	1.69 (42.9)	0.75 (19.0)	0.94 (23.9)	1.25 (31.8)	0.31 (7.9)	1.12 (28.4)	1.86 (47.2)
	1/4 in.	0.53	0.218 (5.6)	SS-16DKM4-F4	2.19 (55.6)	1.12 (28.4)	1.06 (26.9)	1.56 (39.6)	0.50 (12.7)	1.25 (31.8)	2.02 (51.3)
	1/2 to 1/4 in.			SS-16DKM8-F4	2.50 (63.5)	1.25 (31.8)		1.81 (46.0)	0.56 (14.2)		

Dimensions are for reference only and are subject to change. Dimensions shown with Swagelok nuts finger-tight.

Options and Accessories

Optional O-Ring Materials

Fluorocarbon FKM O-rings are standard. For an optional O-ring material, add an O-ring designator to the valve ordering number.

Example: SS-ODKS2-**BC**

O-Ring Kits

O-ring kits contain O-ring, backup ring, washer, retaining ring, lubricant, and instructions. To order, add a kit designator to a kit basic ordering number.

Example: **BC70-9K-OD**

O-ring Material	O-ring Designator	Kit Designator	Kit Basic Ordering Number
Buna C	-BC	BC70	-9K-OD (OD, 14D series) -9K-16D (16D series)
Buna N	-B	BN70	
Ethylene propylene	-E	EP70	
Fluorocarbon FKM	—	VA70	
Kalrez®	-KZ	KZ70	
Silicone	-SI	SI70	

Stem Tip Kits

Kits contain stem tip, machine screw, and instructions.

To order, select a kit basic ordering number and add **SS** for a 316 SS or brass valve, or **M** for an alloy 400 valve.

Examples: **SS**-3BK-14DK
M-3BK-14DP

Valve Series	Kit Basic Ordering Number	
	PCTFE Tip	PEEK Tip
OD, 14D	-3BK-14DK	-3BK-14DP
16D	-3BK-16DK	-3BK-16DP

Seal Maintenance Kits

Kits contain stem tip, machine screw, retaining ring, washer, fluorocarbon FKM O-ring, backup ring, lubricants, and instructions.

To order, select a kit basic ordering number and add **SS** for a 316 SS or brass valve, or **M** for an alloy 400 valve.

Examples: **SS**-91K-14DK
M-91K-14DP

Valve Series	Kit Basic Ordering Number	
	PCTFE Tip	PEEK Tip
OD, 14D	-91K-14DK	-91K-14DP
16D	-91K-16DK	-91K-16DP

Handles

Black aluminum knob handles are standard. For handles of other colors, add a handle color designator to the valve ordering number.

Example: SS-ODKS2-**BL**

Handle Color	Designator
Blue	-BL
Green	-GR
Orange	-OG
Red	-RD
Yellow	-YW

Handle Kits

Select a handle kit ordering number. For kits with handles of colors other than black, replace **-BK** with a handle color designator.

Example: A-5K-14D-**BL**

Valve Series	Kit Ordering Number
OD, 14D	A-5K-14D-BK
16D	A-5K-16D-BK

Sour Gas Service

Nonrotating-stem 316 SS needle valves with NPT end connections are available for sour gas service. Packing bolt, washer, stem, and stem tip screw are alloy 400. Materials are selected in accordance with NACE MR0175/ISO 15156. See the NACE specification for information on stainless steel tube fitting requirements.

To order, add **-SG** to the ordering number.

Example: SS-16DKF4-**SG**

Valves with Rupture Discs or Outage Tubes

⚠ **Be sure to use the correct pressure relief device for the gas being used.**

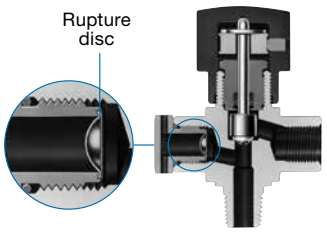
16D Series

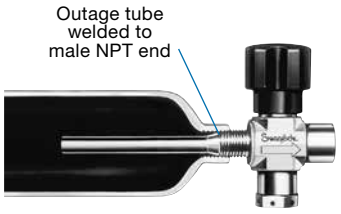
Certain 16D series valves can be configured as valves with rupture discs.

14D and 16D Series

Certain 14D and 16D series valves can be configured as valves with outage tubes.

For more information about valves with rupture discs or outage tubes, refer to *Sample Cylinders, Accessories, and Outage Tubes* catalog, MS-01-177.





Caution: Do not mix or interchange parts with those of other manufacturers.

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page the individual catalog; for example, the Swagelok *Gaugeable Tube Fittings and Tube Adapters* catalog is MS-01-140, RevW. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

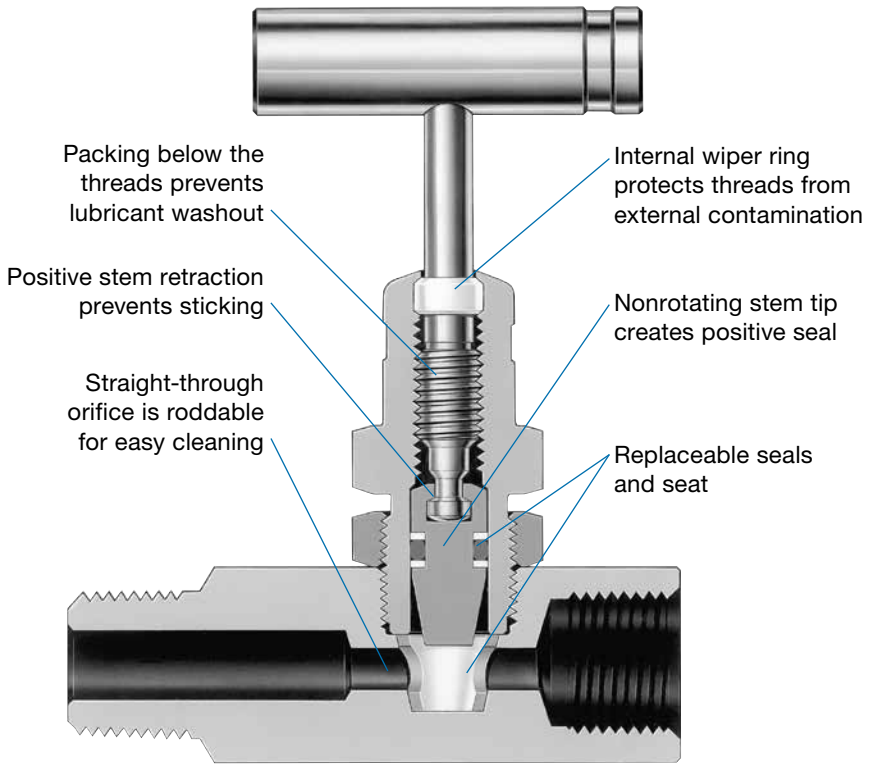
Rising Plug Valves

4P and 5P Series

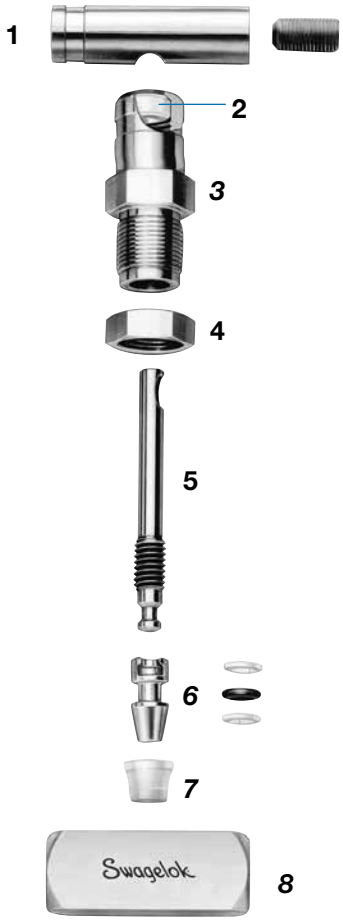
- Roddable, straight-through orifice for maximum flow
- Working pressures up to 6000 psig (413 bar)
- Packing below the threads
- Replaceable seat and stem tip design
- Low Emissions certification per API 624 available

Swagelok

Features



Materials of Construction



Pressure-Temperature Ratings

Valves are standard with acetal seats, fluorocarbon FKM O-rings, and PTFE backup rings. Ratings are limited to:

- 250°F (121°C) max for fluids compatible with acetal seat material, except for water and steam, which are not recommended for temperatures greater than 200°F (93°C).

Ratings extend to:

- –65°F (–53°C) with Buna C O-rings.
- 400°F (204°C) with PEEK or PFA seat material and fluorocarbon FKM or Kalrez® O-rings.

To order PEEK or PFA seats, see **Ordering Information and Dimensions**.

To order optional O-ring materials, **see Options and Accessories**, page 4.

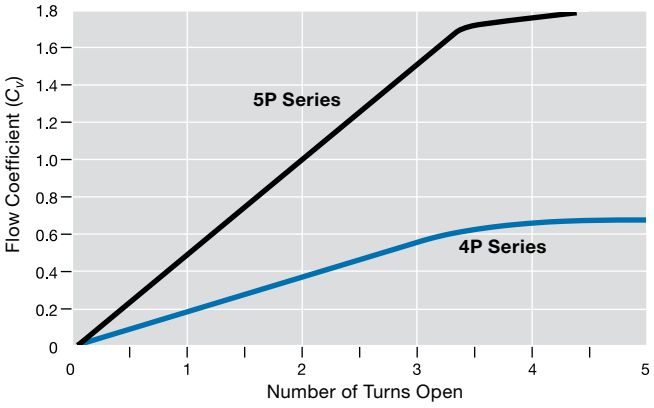
Material	316 SS			Alloy 400		
Seat Material	**Acetal**	**PEEK**	**PFA**	**Acetal**	**PEEK**	**PFA**
Temperature, °F (°C)	**Working Pressure,** psig (bar)					
–20 (–28) to 100 (37)	6000 (413)	6000 (413)	750 (51.6)	5000 (344)	5000 (344)	750 (51.6)
200 (93)	2650 (182)	3000 (206)	625 (43.0)	2650 (182)	3000 (206)	625 (43.0)
250 (121)	1000 (68.9)	1600 (110)	450 (31.0)	1000 (68.9)	1600 (110)	450 (31.0)
300 (148)	—	1300 (89.5)	300 (20.6)	—	1300 (89.5)	300 (20.6)
350 (176)	—	1200 (82.6)	200 (13.7)	—	1200 (82.6)	200 (13.7)
400 (204)	—	1000 (68.9)	100 (6.8)	—	1000 (68.9)	100 (6.8)

Component	Valve Body Materials	
	316 SS	Alloy 400
	Material Grade/ ASTM Specification	
1 Handle	316 SS/A276, A479	
Set screw	S17400/A564	
2 Wiper ring	Glass-reinforced PTFE	
3 *Bonnet*	*316 SS/ A276, A479*	*Alloy 400/ B164*
4 Lock nut	316 SS powdered metal	
5 Stem shank	S17400/A564	
6 *Stem tip*	*316 SS/ A276, A479*	*Alloy 400/ B164*
Backup rings	*PTFE/D1710*	
O-ring	*Fluorocarbon FKM*	
7 *Seat*	*Acetal/D6778, PEEK, or PFA/D3307*	
8 *Body*	*316 SS/ A276, A479*	*Alloy 400/ B164*
Wetted lubricant	*Silicone-based*	
Nonwetted lubricants	Tungsten disulfide- and fluorocarbon-based	

Wetted components listed in *italics.*

Flow Data at 100°F (37°C)

Flow Coefficient at Turns Open



Testing

Every 4P and 5P series rising plug valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min. Stem and body seals are tested to a requirement of no detectable leakage using a liquid leak detector.

Cleaning and Packaging

All Swagelok® 4P and 5P series rising plug valves are cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10),* MS-06-62.

Low Fugitive Emissions

The American Petroleum Institute's API 624 tests for fugitive emissions to atmosphere for rising stem valves. The tests are conducted at a third party lab and certify that at no point in the test did the valve leak in excess of 100 ppm of methane. Certificates stating that the valve is certified for Low Emissions service are available for valves with standard Fluorocarbon FKM o-ring. For more information, contact your authorized Swagelok sales and service representative.

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Stainless Steel Valves

Select an ordering number.

Alloy 400 Valves (5P Series)

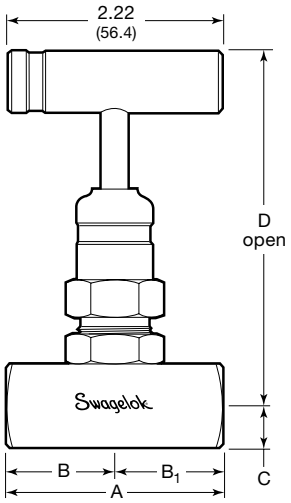
Replace **SS** with **M.**

Example: **M**-5PDF8

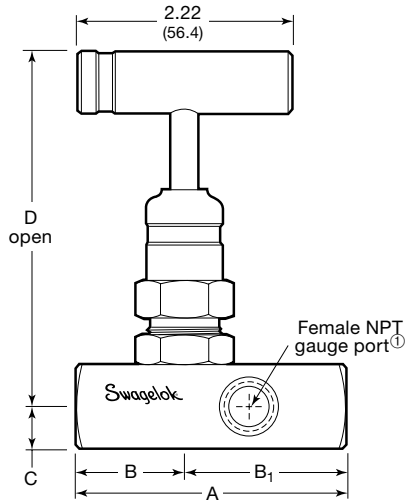
Optional Seat Materials

Acetal seats are standard. For optional seat materials, replace **D** in the ordering number with **P** for PEEK or **T** for PFA.

Example: SS-4P**P**F4



Standard model



Gauge port model

End Connections		C_v	Orifice in. (mm)	Ordering Number	Series	Model	Dimensions, in. (mm)				
Inlet/Outlet	Size						A	B	B_1	C	D
Female NPT	1/4 in.	0.63	0.187 (4.8)	SS-4PDF4	4P	Standard	2.25 (57.2)	1.13 (28.7)	1.13 (28.7)	0.44 (11.2)	3.78 (96.0)
				SS-4PDGF4	4P	Gauge port①	2.88 (73.2)		1.75 (44.4)	0.50 (12.7)	
	1/2 in.	1.80	0.250 (6.4)	SS-5PDF8	5P	Standard	2.66 (67.6)	1.33 (33.8)	1.33 (33.8)	0.56 (14.2)②	3.86 (98.0)
				SS-5PDGF8	5P	Gauge port①	3.58 (90.9)		2.25 (57.2)		
Male/ female NPT	1/4 in.	0.63	0.187 (4.8)	SS-4PDM4-F4	4P	Standard	2.91 (73.9)	1.78 (45.2)	1.13 (28.7)	0.44 (11.2)	3.78 (96.0)
	1/2 to 1/4 in.			SS-4PDM8-F4	4P	Standard	3.02 (76.7)	1.89 (48.0)			
				SS-4PDGM8-F4③	4P	Gauge port①	4.88 (124)	3.13 (79.5)	1.75 (44.4)	0.50 (12.7)	
	1/2 in.	1.80	0.250 (6.4)	SS-5PDM8-F8	5P	Standard	3.48 (88.4)	2.16 (54.9)	1.33 (33.8)	0.56 (14.2)②	3.86 (98.0)
				SS-5PDGM8-F8③	5P	Gauge port①	5.58 (142)	3.33 (84.6)	2.25 (57.2)		
	3/4 to 1/2 in.			SS-5PDM12-F8	5P	Standard	3.49 (88.6)	2.16 (54.9)	1.33 (33.8)		
				SS-5PDGM12-F8③	5P	Gauge port①	5.58 (142)	3.33 (84.6)	2.25 (57.2)		

① Gauge ports on 316 SS bodies match outlet size; alloy 400 bodies have 1/4 in. gauge ports.

② Alloy 400 valve dimension *C* is 0.63 in. (16.0 mm).

③ Has 2 in. (50.8 mm) lagging extension body for insertion through pipe insulation.

Options and Accessories

Optional O-Ring Materials

Fluorocarbon FKM O-rings are standard. For other O-ring materials, add a designator to the valve ordering number.

O-Ring Material	Designator	Temperature Rating °F (°C)
Buna C	-BC	–65 to 250 (–53 to 121)
Buna N	-B	–20 to 250 (–28 to 121)
Ethylene propylene	-E	
Kalrez	-KZ	–20 to 400 (–28 to 204)
Silicone	-SI	–20 to 250 (–28 to 121)

Example: SS-4PDF4-**BC**

Seal Maintenance Kits

Maintenance kits contain stem tip, fluorocarbon FKM O-ring, PTFE backup rings, seat, lubricants, and instructions. Select a kit ordering number.

Seat Material	Kit Ordering Number
Acetal	SS-9K-5PD
PFA	SS-9K-5PT
PEEK	SS-9K-5PP

To order kits for alloy 400 valves (5P series only), replace **SS** with **M.**

Example: **M**-9K-5PD

Special Cleaning and Packaging (SC-11)

To order 4P and 5P series rising plug valves cleaned and packaged in accordance with Swagelok *Special Cleaning and Packaging (SC-11),* MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, add **-SC11** to the valve ordering number.

Example: SS-4PDF4-**SC11**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Panel Mounting

Panel mounting is available. A stainless steel panel nut is assembled onto a threaded bonnet. The maximum panel thickness is 1/2 in. (12.7 mm), and the panel hole size is 25/32 in. (19.8 mm).

To order, add **-PM** to the valve ordering number.

Example: SS-4PDF4-**PM**

Sour Gas Service

Both 4P and 5P series rising plug valves are available for sour gas service. Materials are selected in accordance with NACE MR0175/ISO 15156.

Materials

Body, bonnet: annealed 316 SS

O-ring: ethylene propylene, silicone-based lubricant

Stem shank: strain-hardened 316 SS/ASTM A176 with tungsten disulfide and fluorinated-based lubricant on threads

Stem tip: alloy 400/ASTM B164

All other components are the same as standard product.

Pressure-Temperature Ratings

Ratings are the same as standard 316 SS valves with acetal or PEEK seats and ethylene propylene O-rings.

Ordering Information

To order, add **-SG** to the valve ordering number.

Example: SS-4PDF4-**SG**

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, see the Swagelok *Oxygen System Safety* technical report, MS-06-13.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

MS-01-49, November 2019, RevN

Compact Gauge Valves

For Gauge Isolation and Venting

Features

The Swagelok® compact gauge valve provides fast, convenient installation and gauge maintenance in a lightweight package and smaller footprint than conventional assemblies.

- Designed for use with Swagelok pressure gauges with tube adapter end connections, the compact gauge valve enables easy dial alignment and reduces gauge installation time and cost.
- Swagelok tube fitting end connections reduce valve installation time and cost and provide robust tube grip and vibration resistance.
- An integral purge valve eliminates a threaded connection, reducing potential leak points. The purge cap is crimped permanently to the valve body for operator safety and to prevent accidental disassembly.
- 316 stainless steel construction offers durability and corrosion resistance.

Shown with Swagelok B model pressure gauge, available separately.

Materials of Construction

The compact gauge valve is composed of a stainless steel Swagelok 1 series needle valve (without panel nut) and integral stainless steel Swagelok purge valve. For complete materials of construction, see the Swagelok *Integral Bonnet Needle Valves—O, 1, 18, 20, and 26 Series* catalog, MS-01-164, and the Swagelok *Bleed Valves and Purge Valves* catalog, MS-01-62.

Testing

Every Swagelok compact gauge valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min. Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

Cleaning and Packaging

Every Swagelok compact gauge valve is cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10),* MS-06-62.

⚠ **Always open purge valves slowly. The vent hole rotates with the cap, changing the direction of discharge as the cap is turned. These valves contain no packing, so some fluid weepage will occur when the valves are opened. Operating personnel must protect themselves from exposure to system fluids.**

Pressure-Temperature Ratings

Ratings are limited to:

- 200°F (93°C) max with soft-seat stem with PCTFE stem tip.
- 250°F (121°C) max with UHMWPE packing.
- 450°F (232°C) max with PFA packing.
- 600°F (315°C max with PEEK packing.

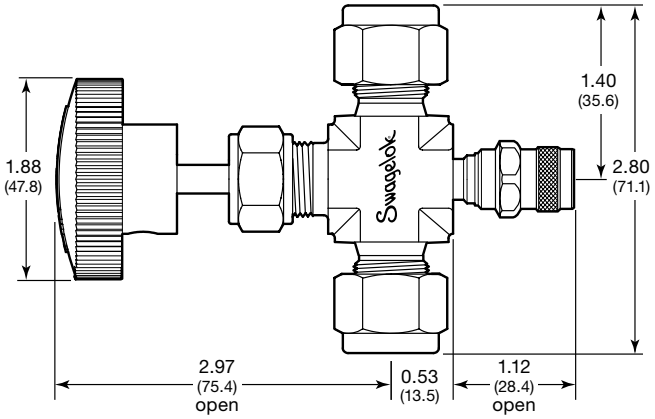
Material	316 SS
Temperature °F (°C)	**Working Pressure** psig (bar)
–65 (–53) to 100 (37)	4000 (275)
150 (65)	3720 (256)
200 (93)	3440 (237)
250 (121)	3265 (224)
300 (148)	3105 (213)
350 (176)	2975 (204)
400 (204)	2850 (196)
450 (232)	2750 (189)
500 (260)	2650 (182)
600 (315)	2500 (172)

Valves with O-ring stem seals are also available. See **Valves with O-Ring Stem Seals,** page 2, for materials and temperature ratings.

Swagelok

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.



Select an ordering number.

End Connection		Ordering Number
Type	Size	
Swagelok tube fitting	1/2 in.	SS-1RPS8
	12 mm	SS-1RPS12MM

Two-piece chevron-style PFA packing is standard. For an optional stem packing, see **Options,** at right.

Vee and Soft-Seat Stems

A regulating stem is standard. For an optional stem, replace **R** in the ordering number with **V** for a vee stem or **K** for a soft-seat stem with PCTFE stem tip**.**

Examples: SS-1**V**PS8
SS-1**K**PS12MM

Additional Products

Swagelok pressure gauges monitor vacuum and positive system pressures up to 15 000 psi, 1000 bar, or 100 MPa, and are available with Swagelok tube adapter end connections.

For more information, see the Swagelok *Pressure Gauges, Industrial and Process—PGI Series* catalog, MS-02-170.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Options

Stem Packing Materials

To order an optional stem packing material, add **-P** for UHMWPE or **-PK** for PEEK to the ordering number. See **Pressure-Temperature Ratings,** page 1, for ratings of valves with optional stem packing materials.

Examples: SS-1RPS8**-P**
SS-1RPS12MM**-PK**

O-Ring Stem Seals

For an optional O-ring stem seal, Add an O-ring designator to the valve ordering number.

Examples:
SS-1RPS8**-BC**
SS-1RPS12MM**-B**

O-Ring Material	Temperature Rating °F (°C)	Designator
Buna C	–65 to 250 (–53 to 121)	-BC
Buna N	–20 to 250 (–28 to 121)	-B
Ethylene propylene		-E
Fluorocarbon FKM	–20 to 450 (–28 to 232)	-V
Kalrez®		-KZ
Silicone	–20 to 250 (–28 to 121)	-SI

Handles

Black phenolic round handles are standard; colored phenolic, 316 SS bar, and anodized black aluminum bar handles are optional.

Add a handle designator to the ordering number.

Examples:
SS-1RPS8**-BL**
SS-1RPS12MM**-SH**

Handle	Designator
Blue phenolic	-BL
Green phenolic	-GR
Orange phenolic	-OG
Red phenolic	-RD
Yellow phenolic	-YW
316 SS bar	-SH
Anodized black aluminum bar	-BKB

Multiple Options

Add designators in *alphabetical* order.

Examples: SS-1RPS8**-BL-V**
SS-1RPS12MM**-B-SH**

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

Printed in U.S.A., AGS
MS-02-355, R3

General Utility Service Needle Valves

GU Series

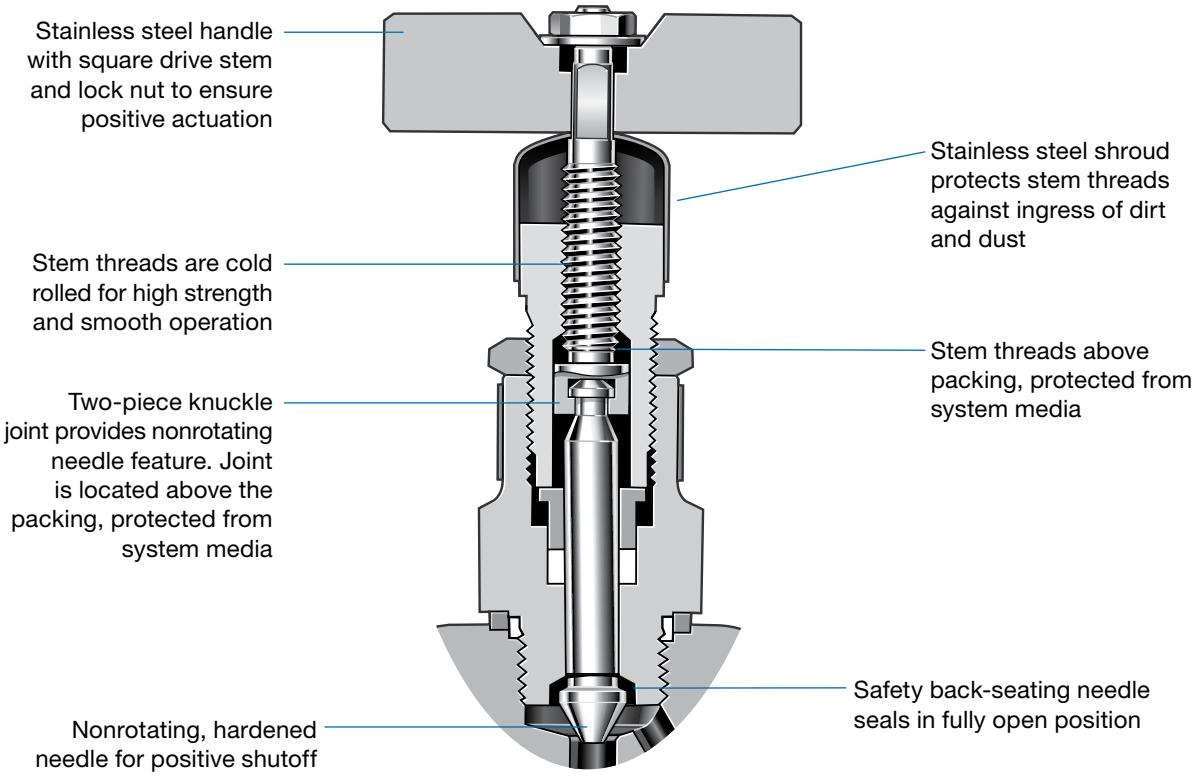
- Straight and angle patterns
- Stainless steel and carbon steel body material
- Pressures up to 6000 psig (413 bar)
- Temperatures up to 450°F (232°C) with PTFE packing; up to 650°F (343°C) with optional graphite packing

Swagelok

Features

GU series needle valves are for use in general-purpose applications to isolate or vent system media. The hardened stainless steel, nonrotating needle promotes leak-tight shutoff and long service life. The valve stem threads are isolated from the media.

- Compact design
- Stainless steel stop pin
- High-temperature packing and bonnet seal option available
- Antitamper and lockable handle features available
- Suitable for sour gas service; materials are selected in accordance with NACE MR0175/ISO 15156.
- Low Emissions certification per API 624 available



Materials of Construction

Component	Valve Body Material	
	Stainless Steel	Carbon Steel
	Material Grade/ASTM Specification	
Body	*316 SS/ A479*	*Zinc plated① carbon steel/ AISI 1018*
Bonnet		*316 SS/A479*
Needle	*S17400 SS/A564 Condition H1150D*	
Packing, bonnet seals	*Carbon/glass-filled PTFE or graphite*	
Lubricant	*Fluorinated base with PTFE and tungsten disulfide*	
Bonnet seal ring, gland nut, shroud, stem, gland, handle, handle lock nut, handle washer, locking pin	316 SS	
Gland lock nut	Powdered metal 300 series SS	

Wetted components listed in *italics.*

① Bodies with weld end connections receive a rust-preventive coating instead of zinc plating.

Pressure-Temperature Ratings

Temperature, °F (°C)	Packing Material	
	PTFE	Graphite
	Working Pressure, psig (bar)	
–20 (–28) to 0 (–17)	—	6000 (413)
0 (–17) to 100 (37)	6000 (413)	6000 (413)
200 (93)	5160 (355)	5160 (355)
300 (148)	4680 (322)	4680 (322)
400 (204)	4260 (293)	4260 (293)
450 (232)	4110 (283)	4110 (283)
500 (260)	—	3960 (272)
600 (315)	—	3780 (260)
650 (343)	—	3660 (252)

Testing

Every Swagelok GU series needle valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min. Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

Cleaning and Packaging

Every Swagelok GU series needle valve is cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10),* MS-06-62.

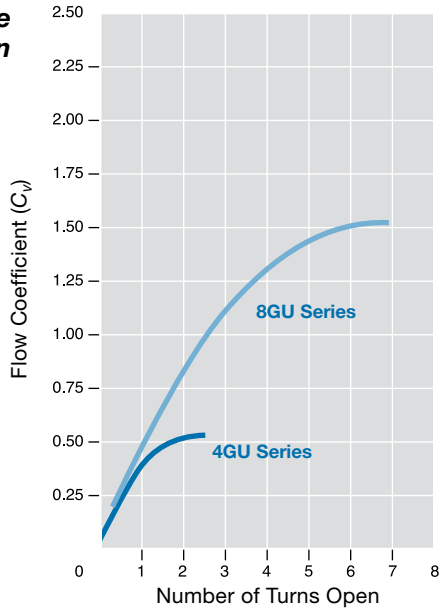
Low Fugitive Emissions

The American Petroleum Institute's API 624 tests for fugitive emissions to atmosphere for rising stem valves. The tests are conducted at a third party lab and certify that at no point in the test did the valve leak in excess of 100 ppm of methane. Certificates stating that the valve is certified for Low Emissions service are available for valves with PTFE packing. For more information, contact your authorized Swagelok sales and service representative.

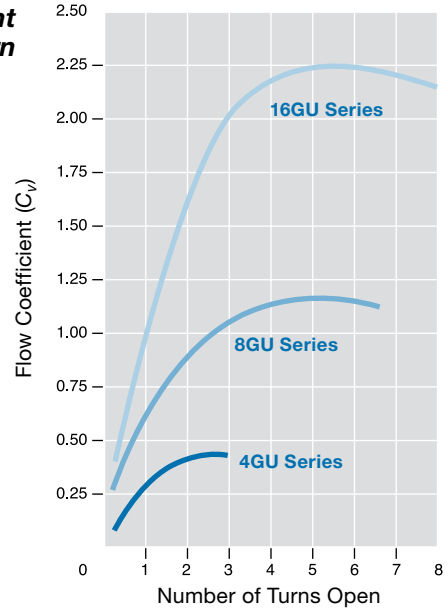
Flow Data

Flow Coefficient at Turns Open

Angle Pattern



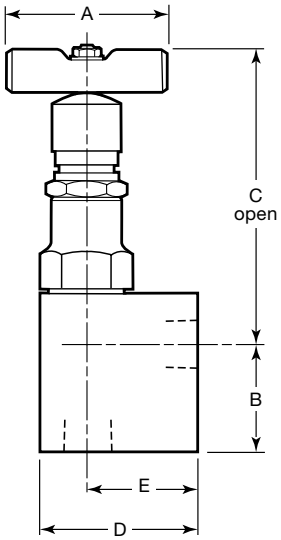
Straight Pattern



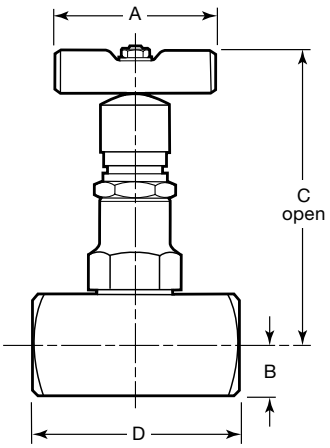
Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

Angle Pattern



Straight Pattern



Angle Pattern

End Connections		C_v	Orifice in. (mm)	Ordering Number		Dimensions, in. (mm)				
Type	Size			Stainless Steel	Carbon Steel	A	B	C	D	E
Female NPT	1/4 in.	0.55	0.20 (5.0)	SS-4GUF4-A	S-4GUF4-A	1.75 (44.5)	0.85 (21.6)	3.20 (81.2)	1.50 (38.1)	1.00 (25.4)
	3/8 in.			SS-4GUF6-A	S-4GUF6-A		1.10 (27.9)		1.75 (44.5)	1.25 (31.8)
	1/2 in.			SS-4GUF8-A	S-4GUF8-A		1.23 (31.2)	3.33 (84.6)	2.00 (51.0)	1.31 (33.3)
	1/2 in.	1.60	0.31 (8.0)	SS-8GUF8-A	S-8GUF8-A	2.00 (51.0)	1.23 (31.2)	3.87 (98.3)	2.00 (51.0)	1.38 (35.1)
	3/4 in.			SS-8GUF12-A	S-8GUF12-A		1.60 (40.6)	3.98 (101)	2.50 (63.5)	1.50 (38.1)
	1 in.			SS-8GUF16-A	S-8GUF16-A			4.25 (108)	2.76 (70.0)	1.75 (44.5)

Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

Straight Pattern

End Connections		C_v	Orifice in. (mm)	Ordering Number		Dimensions, in. (mm)			
Type	Size			Stainless Steel	Carbon Steel	A	B	C	D
Female NPT	1/4 in.	0.45	0.20 (5.0)	SS-4GUF4	S-4GUF4	1.75 (44.5)	0.50 (12.7)	3.20 (81.2)	2.13 (54.1)
	3/8 in.			SS-4GUF6	S-4GUF6				2.25 (57.2)
	1/2 in.	0.45	0.20 (5.0)	SS-4GUF8	S-4GUF8	1.75 (44.5)	0.63 (16.0)	3.33 (84.6)	2.63 (66.8)
		1.20	0.31 (8.0)	SS-8GUF8	S-8GUF8	2.00 (51.0)		3.87 (98.3)	2.76 (70.0)
	3/4 in.	1.20	0.31 (8.0)	SS-8GUF12	S-8GUF12	2.00 (51.0)	0.75 (19.1)	3.98 (101)	3.00 (76.2)
		2.25	0.43 (11.0)	SS-16GUF12	S-16GUF12	3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.25 (82.6)
	1 in.	1.20	0.31 (8.0)	SS-8GUF16	S-8GUF16	2.00 (51.0)	1.00 (25.4)	4.25 (108)	3.50 (88.9)
		2.25	0.43 (11.0)	SS-16GUF16	S-16GUF16	3.00 (76.2)		5.35 (136)	4.02 (102)
Male NPT/ female NPT	1/4 in.	0.45	0.20 (5.0)	SS-4GUM4-F4	S-4GUM4-F4	1.75 (44.5)	0.50 (12.7)	3.20 (81.2)	2.38 (60.5)
	3/8 in.			SS-4GUM6-F6	S-4GUM6-F6				
	1/2 in.	0.45	0.20 (5.0)	SS-4GUM8-F8	S-4GUM8-F8	1.75 (44.5)	0.63 (16.0)	3.33 (84.6)	2.76 (70.0)
		1.20	0.31 (8.0)	SS-8GUM8-F8	S-8GUM8-F8	2.00 (51.0)		3.87 (98.3)	3.00 (76.2)
	3/4 in.	1.20	0.31 (8.0)	SS-8GUM12-F12	S-8GUM12-F12	2.00 (51.0)	0.75 (19.1)	3.98 (101)	3.13 (79.6)
		2.25	0.43 (11.0)	SS-16GUM12-F12	S-16GUM12-F12	3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.50 (88.9)
	1 in.	1.20	0.31 (8.0)	SS-8GUM16-F16	S-8GUM16-F16	2.00 (51.0)	1.00 (25.4)	4.25 (108)	3.50 (88.9)
		2.25	0.43 (11.0)	SS-16GUM16-F16	S-16GUM16-F16	3.00 (76.2)		5.35 (136)	4.02 (102)
Fractional tube socket weld	1/4 in.	0.45	0.20 (5.0)	SS-4GUSW4T	S-4GUSW4T	1.75 (44.5)	0.50 (12.7)	3.20 (81.3)	2.00 (50.8)
	3/8 in.			SS-4GUSW6T	S-4GUSW6T				
	1/2 in.	0.45	0.20 (5.0)	SS-4GUSW8T	S-4GUSW8T	1.75 (44.5)	0.50 (12.7)	3.20 (81.3)	2.25 (57.2)
		1.20	0.31 (8.0)	SS-8GUSW8T	S-8GUSW8T	2.00 (51.0)	0.63 (16.0)	3.87 (98.3)	2.63 (66.8)
	3/4 in.	1.20	0.31 (8.0)	SS-8GUSW12T	S-8GUSW12T	2.00 (51.0)	0.63 (16.0)	3.87 (98.3)	2.63 (66.8)
		2.25	0.43 (11.0)	SS-16GUSW12T	S-16GUSW12T	3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.25 (82.6)
	1 in.	1.20	0.31 (8.0)	SS-8GUSW16T	S-8GUSW16T	2.00 (51.0)	0.75 (19.1)	3.98 (101)	2.63 (66.8)
		2.25	0.43 (11.0)	SS-16GUSW16T	S-16GUSW16T	3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.25 (82.6)
Fractional pipe socket weld	1/4 in.	0.45	0.20 (5.0)	—	S-4GUSW4P	1.75 (44.5)	0.50 (12.7)	3.20 (81.2)	2.25 (57.2)
	3/8 in.				S-4GUSW6P		0.63 (16.0)	3.33 (84.6)	
	1/2 in.	0.45	0.20 (5.0)		S-4GUSW8P	1.75 (44.5)	0.75 (19.1)	3.45 (87.6)	2.50 (63.5)
		1.20	0.31 (8.0)		S-8GUSW8P	2.00 (51.0)		3.98 (101)	2.63 (66.8)
	3/4 in.	1.20	0.31 (8.0)		S-8GUSW12P	2.00 (51.0)	0.88 (22.4)	4.13 (105)	3.25 (82.6)
		2.25	0.43 (11.0)		S-16GUSW12P	3.00 (76.2)		5.24 (133)	3.50 (88.9)
	1 in.	1.20	0.31 (8.0)		S-8GUSW16P	2.00 (51.0)	1.00 (25.4)	4.25 (108)	3.50 (88.9)
		2.25	0.43 (11.0)		S-16GUSW16P	3.00 (76.2)		5.35 (136)	
Metric tube socket weld	6 mm	0.45	0.20 (5.0)	SS-4GUSW6MMT	—	1.75 (44.5)	0.50 (12.7)	3.20 (81.2)	2.38 (60.5)
	8 mm			SS-4GUSW8MMT					2.00 (51.0)
	10 mm			SS-4GUSW10MMT					
	12 mm	0.45	0.20 (5.0)	SS-4GUSW12MMT		1.75 (44.5)	0.50 (12.7)	3.20 (81.2)	2.25 (57.2)
		1.20	0.31 (8.0)	SS-8GUSW12MMT		2.00 (51.0)	0.63 (16.0)	3.87 (98.2)	2.63 (66.8)
	14 mm	1.20	0.31 (8.0)	SS-8GUSW14MMT		2.00 (51.0)	0.63 (16.0)	3.87 (98.2)	2.63 (66.8)
		2.25	0.43 (11.0)	SS-16GUSW14MMT		3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.75 (95.3)
	16 mm	1.20	0.31 (8.0)	SS-8GUSW16MMT		2.00 (51.0)	0.63 (16.0)	3.87 (98.2)	2.63 (66.8)
		2.25	0.43 (11.0)	SS-16GUSW16MMT		3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.50 (88.9)
	18 mm	2.25	0.43 (11.0)	SS-16GUSW18MMT		3.00 (76.2)	0.88 (22.4)	5.24 (133)	3.25 (82.6)
	25 mm			SS-16GUSW25MMT					

Options

To order valves with multiple options, add the appropriate designator in *alphabetical* order.

High-Temperature Stem Packing, Bonnet Seal

Graphite stem packing and bonnet seal material is available for temperatures up to 650°F (343°C).

To order valves with graphite material, add **-G** to the valve ordering number:

Example: SS-4GUF4**-G**

Antitamper Handle

The antitamper handle reduces the risk of human error and deliberate tampering. The valve can be operated with the antitamper key, sold separately.

To order valves with antitamper handles, add **-AT** to the valve ordering number.

Example: SS-4GUF4**-AT**

Round Lockable Handles

The lockable handles can lock the valve in any position. These round handles accommodate shackle diameters smaller than 0.22 in. (5.7 mm) for 4GU and 8GU series valves and 0.28 in. (7.0 mm) for 16GU series valves.

Nylon

A nylon lockable handle is available for ambient temperatures up to 250°F (121°C) and process temperatures up to 450°F (232°C).

To order, add **-NLH** to the valve ordering number.

Example: SS-4GUF8**-NLH**

Stainless Steel

A stainless steel lockable handle is available for marine service.

To order, add **-SLH** to the valve ordering number.

Example: SS-4GUF8**-SLH**

Accessories

Antitamper Key

- Fits all vent valves within the system
- Order separately

Valve Series	Ordering Number
4GU	S004468
8GU	
16GU	S007240

Handle Kits

Standard stainless steel bar handle kits contain a handle, washer, lock nut, and instructions.

Optional round lockable nylon or stainless steel handle kits contains a handle, lock shield, retaining ring, label, washer, lock nut, and instructions.

Handle Style	Valve Series	Kit Ordering Number
Stainless steel bar	4GU	SS-5K-4GU
	8GU	SS-5K-8GU
	16GU	SS-5K-16GU
Round lockable nylon	4GU	SS-5K-4GU-NLH
	8GU	SS-5K-8GU-NLH
	16GU	SS-5K-16GU-NLH
Round lockable stainless steel	4GU	SS-5K-4GU-SLH
	8GU	SS-5K-8GU-SLH
	16GU	SS-5K-16GU-SLH

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

MS-02-312, RevH, November 2019

Severe-Service Union-Bonnet Needle Valves

N Series and HN Series

- Working pressures up to 10 000 psig (689 bar)
- Temperatures from –65 to 450°F (–53 to 232°C) with PTFE packing; up to 1200°F (648°C) with Grafoil® packing
- 316 stainless steel; 316/316L dual certified stainless steel (SSD), alloys 400, 20, 600, and C-276; and titanium materials
- Low Emissions certification per API 624 available

Swagelok

Features

Stem Designs

- Ball tip (NB)—3N, 6N, 12N, and 6HN
- Regulating (NR)—all models
- PCTFE soft-seat regulating (NKR)—all models
- PTFE soft-seat regulating (NTR)—3N, 6N, 3HN, and 6HN

Orifice Sizes

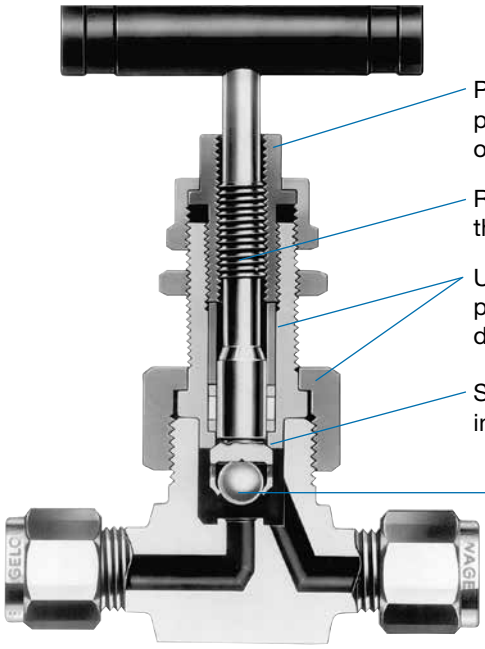
- 0.156 in. (4.0 mm)—3N and 3HN
- 0.250 in. (6.4 mm)—6N and 6HN
- 0.437 in. (11.1 mm)—12N

Flow Coefficients (C_v)

- From 0.35 to 2.4

Flow Patterns

- Straight—all models
- Angle—3N, 6N, and 12N



Pressure-Temperature Ratings

Ratings are based on manual valves with optional Grafoil® packing. Ratings are limited to:

- 200°F (93°C) max with PCTFE stem tip (NKR).
- 250°F (121°C) max with UHMWPE stem packing.
- 450°F (232°C) max with PTFE stem tip (NTR) or stem packing.
- 600°F (315°C) max with PEEK stem packing and 316 SS, 316/316L SSD, alloy 600, alloy C-276, or titanium; 500°F (260°C) max with PEEK stem packing and alloy 400 (alloy 400 available in N series only).
- 1000°F (537°C) max with 316/316L SSD body, bonnet and stem components.

See **Stem Packing Materials,** page 10, for more information about packing materials.

N Series

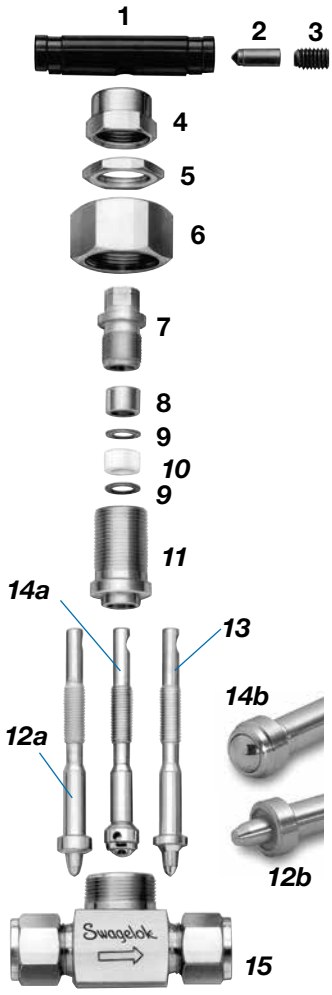
ASME Class	2500				N/A	
Material Group	2.2	N/A	3.4	3.5	N/A	N/A
Material Name	316 SS	316/316L SSD	Alloy 400	Alloy 600	Alloy C-276	Titanium
Temperature, °F (°C)	Working Pressure, psig (bar)					
–65 (–53) to 100 (37)	6000 (413)	6000 (413)	5000 (344)	6000 (413)	6000 (413)	3570 (245)
200 (93)	5160 (355)	5160 (355)	4400 (303)	5600 (385)	6000 (413)	3110 (214)
250 (121)	4910 (338)	4910 (338)	4260 (293)	5460 (376)	6000 (413)	2840 (195)
300 (148)	4660 (321)	4660 (321)	4120 (283)	5320 (366)	6000 (413)	2570 (177)
350 (176)	4470 (307)	4470 (307)	4050 (279)	5220 (359)	5975 (411)	2385 (164)
400 (204)	4280 (294)	4280 (294)	3980 (274)	5120 (352)	5880 (405)	2200 (151)
450 (232)	4130 (284)	4130 (284)	3970 (273)	5030 (346)	5710 (393)	2055 (141)
500 (260)	3980 (274)	3980 (274)	3960 (272)	4940 (340)	5540 (381)	1885 (129)
600 (315)	3760 (259)	3760 (259)	—	4780 (329)	5040 (347)	1625 (111)
650 (343)	3700 (254)	3700 (254)	—	4700 (323)	4905 (337)	—
700 (371)	3600 (248)	3600 (248)	—	4640 (319)	4730 (325)	—
750 (398)	3520 (242)	3520 (242)	—	4430 (305)	4430 (305)	—
800 (426)	3460 (238)	3460 (238)	—	4230 (291)	4230 (291)	—
850 (454)	3380 (232)	3380 (232)	—	4060 (279)	4060 (279)	—
900 (482)	3280 (225)	3280 (225)	—	3745 (258)	3745 (258)	—
950 (510)	3220 (221)	3220 (221)	—	2725 (187)	3220 (221)	—
1000 (537)	3030 (208)	3030 (208)	—	1800 (124)	3030 (208)	—
1050 (565)	3000 (206)	—	—	1155 (79.5)	3000 (206)	—
1100 (593)	2685 (184)	—	—	770 (53.0)	2685 (184)	—
1150 (621)	2285 (157)	—	—	565 (38.9)	2285 (157)	—
1200 (648)	1715 (118)	—	—	515 (35.4)	1545 (106)	—

HN Series (High Pressure)

ASME Class	N/A	N/A
Material Group	N/A	N/A
Material Name	316 SS	316/316L SSD
Temperature °F (°C)	Working Pressure psig (bar)	
–65 (–53) to 100 (37)	10 000 (689)	10 000 (689)
200 (93)	9 290 (640)	9 290 (640)
250 (121)	8 840 (609)	8 840 (609)
300 (148)	8 390 (578)	8 390 (578)
350 (176)	8 045 (554)	8 045 (554)
400 (204)	7 705 (530)	7 705 (530)
450 (232)	7 435 (512)	7 435 (512)
500 (260)	7 165 (493)	7 165 (493)
600 (315)	6 770 (466)	6 770 (466)
650 (343)	6 660 (458)	6 660 (458)
700 (371)	6 480 (446)	6 480 (446)
750 (398)	6 335 (436)	6 335 (436)
800 (426)	6 230 (429)	6 230 (429)
850 (454)	6 085 (419)	6 085 (419)
900 (482)	5 905 (406)	5 905 (406)
950 (510)	5 795 (399)	5 795 (399)
1000 (537)	5 450 (375)	5 450 (375)
1050 (565)	5 400 (372)	—
1100 (593)	4 835 (333)	—
1150 (621)	4 115 (283)	—
1200 (648)	3 085 (212)	—

For more information about pressure ratings of valves with tube fitting end connections, refer to Swagelok® *Tubing Data* catalog, MS-01-107. Pressure ratings of valves with VCR® or VCO® fitting end connections are based on the ratings of the mating fitting; refer to Swagelok *VCR Metal Gasket Face Seal Fittings* catalog, MS-01-24, and Swagelok *VCO O-Ring Face Seal Fittings* catalog, MS-01-28, (VCR and VCO fittings available in N series only).

Materials of Construction



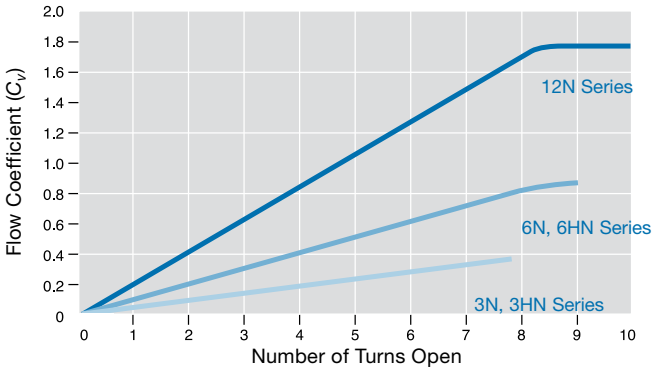
Component		Valve Body Material					
		316 SS	316/316L SSD	Alloy 400	Alloy 600	Alloy C-276	Titanium
		Material Grade/ASTM Specification					
1	Handle	Anodized aluminum 2024T4/B211					
2	Handle pin	Nickel cadmium-plated steel/A108					
3	Set screw	Nickel cadmium-plated steel					
4	Lock nut	316 SS/A276 or A479					
5	Panel nut	316 SS/B783					
6	Union nut	316 SS/A276					
7	Packing bolt						
8	Gland	316 SS/ A276	316 SS/A479 or B895	Silver-plated alloy 400/ B164	Silver-plated alloy 600/B166	Silver-plated alloy C-276/B574	Ti grade 4/ B348
9	*Packing supports*	*Glass-filled PTFE*					
10	*Packing*	*PTFE/D1710*					
11	*Bonnet*	*316 SS/ A479*	*316/316L SSD/A479*	*Alloy 400/ B164*	*Alloy 600/ B166*	*Alloy C-276/ B574*	*Ti grade 4/ B348*
12a	*NTR or NKR soft-seat regulating stem shank*	*Silver-plated 316 SS/A276*	*Silver-plated 316/316L SSD/A276*	*Silver-plated alloy 400/ B164*	*Silver-plated alloy 600/B166*	*Silver-plated alloy C-276/B574*	*Ti grade 4/ B348*
12b	*Soft-seat tip*	*NTR stem—PTFE/D1710; NKR stem—PCTFE*					
13	*NR regulating stem*	*Silver-plated 316 SS/A276*	*Silver-plated 316/316L SSD/A276*	*Silver-plated alloy 400/B164*	*Silver-plated alloy 600/B166*	*Silver-plated alloy C-276/B574*	*Ti grade 4/ B348*
14a	*NB ball tip stem shank*						
14b	*NB ball stem tip*	*Cobalt-based alloy*	*Cobalt-based alloy*	*Material must be selected; see* **Ball Stem Tip Materials**, *page 6.*			
15	*Body*	*316 SS/ A479*	*316/316L SSD/ A479*	*Alloy 400/ B164, B127, or B564*	*Alloy 600/ B166 or B564*	*Alloy C-276/ B564*	*Ti grade 4/ B348 or Ti grade F4/B381*
	Lubricant	*Nickel antiseize with hydrocarbon carrier (all valves);hydrocarbon-based (NB ball tip)*					

Wetted components listed in *italics.*

Flow Data at 100°F (37°C)

NR, NTR, and NKR Regulating Stems

Flow Coefficient at Turns Open



NB Ball Stem Tip

The NB stem is designed to be used in a fully open or fully closed position. See **Dimensions** for flow coefficients.

Testing

Every N series and HN series needle valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min. Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

Cleaning and Packaging

All N series and HN series needle valves are cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)* catalog, MS-06-62. Cleaning and packaging in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C are available as an option.

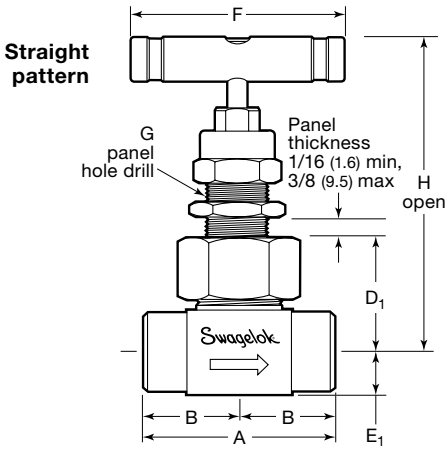
Low Fugitive Emissions

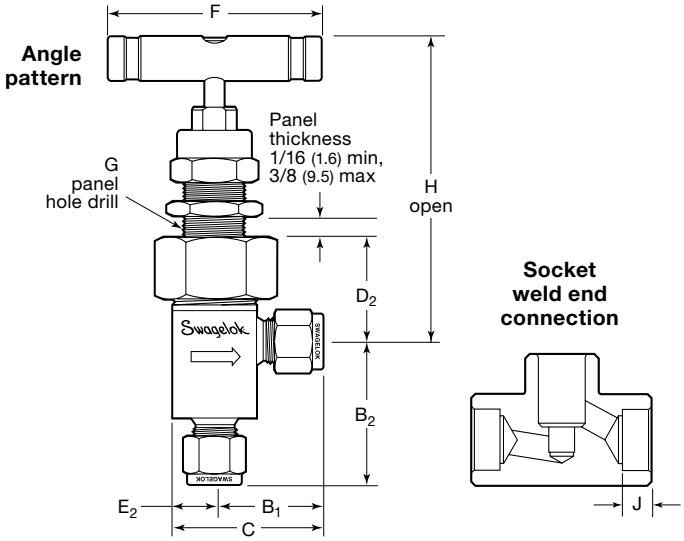
The American Petroleum Institute's API 624 tests for fugitive emissions to atmosphere for rising stem valves. The tests are conducted at a third party lab and certify that at no point in the test did the valve leak in excess of 100 ppm of methane. Certificates stating that the valve is certified for Low Emissions service are available for valves with PTFE packing. For more information, contact your authorized Swagelok sales and service representative.

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

N Series





End Connections		C_v	Ordering Number	Dimensions, in. (mm)													
Inlet/Outlet	Size			A	B	B_1	B_2	C	D_1	D_2	E_1	E_2	F	G	H Straight	H Angle	J
3N Series: 0.156 in. (4.0 mm) Orifice																	
Female NPT	1/8 in.	0.35	SS-3NBF2	2.00 (50.8)	1.00 (25.4)	0.89 (22.6)	1.00 (25.4)	1.27 (32.3)	1.09 (27.7)	1.28 (32.5)	0.38 (9.7)	0.38 (9.7)	1.75 (44.4)	19/32 (15.1)	3.05 (77.5)	3.23 (82.0)	—
	1/4 in.		SS-3NBF4	2.06 (52.3)	1.03 (26.2)						0.39 (9.9)						
Male NPT	1/4 in.		SS-3NBM4	2.00 (50.8)	1.00 (25.4)	1.00 (25.4)		1.38 (35.1)		1.09 (27.7)	0.38 (9.7)					3.05 (77.5)	
Male/ female NPT	1/4 in.		SS-3NBM4-F4	2.03 (51.6)	1.03 (26.2)	0.89 (22.6)		1.27 (32.3)		1.28 (32.5)	0.39 (9.9)					3.23 (82.0)	
Swagelok tube fittings	1/4 in.		SS-3NBS4	2.40 (61.0)	1.20 (30.5)	1.16 (29.5)	1.48 (37.6)	1.54 (39.1)		1.09 (27.7)						3.05 (77.5)	
	6 mm		SS-3NBS6MM														
	8 mm		SS-3NBS8MM			—	—	—		—		—				—	
Tube socket welds	1/4 in.		SS-3NBSW4T	1.82 (46.2)	0.91 (23.1)	0.88 (22.4)	1.19 (30.2)	1.25 (31.8)		1.09 (27.7)	0.38 (9.7)	0.38 (9.7)				3.05 (77.5)	0.28 (7.1)
Male VCO fittings	1/4 in.		SS-3NBVCO4	2.06 (52.3)	1.03 (26.2)												—
Male VCR fittings	1/4 in.		SS-3NBVCR4			—	—	—		—		—				—	
6N Series: 0.250 in. (6.4 mm) Orifice																	
Female NPT	1/4 in.	0.86	SS-6NBF4	2.25 (57.2)	1.12 (28.4)	1.00 (25.4)	1.12 (28.4)	1.50 (38.1)	1.34 (34.0)	1.47 (37.3)	0.50 (12.7)	0.50 (12.7)	2.50 (63.5)	25/32 (19.8)	3.70 (94.0)	3.82 (97.0)	—
	3/8 in.		SS-6NBF6														
Swagelok tube fittings	3/8 in.		SS-6NBS6	2.83 (71.9)	1.41 (35.8)	1.29 (32.8)	1.66 (42.2)	1.79 (45.5)		1.22 (31.0)						3.57 (90.7)	
	1/2 in.		SS-6NBS8	3.04 (77.2)	1.52 (38.6)	1.40 (35.6)	1.65 (41.9)	1.90 (48.3)		1.34 (34.0)						3.70 (94.0)	
	10 mm		SS-6NBS10MM	2.85 (72.4)	1.42 (36.1)	1.30 (33.0)	1.55 (39.4)	1.80 (45.7)		1.34 (34.0)						3.70 (94.0)	
	12 mm		SS-6NBS12MM	3.04 (77.2)	1.52 (38.6)	1.40 (35.6)	1.65 (41.9)	1.90 (48.3)		1.34 (34.0)						3.70 (94.0)	
Tube socket welds	3/8 in.		SS-6NBSW6T	2.25 (57.2)	1.12 (28.4)	1.00 (25.4)	1.25 (31.8)	1.50 (38.1)									0.31 (7.9)
	1/2 in.		SS-6NBSW8T				1.00 (25.4)			1.40 (35.6)						3.76 (95.5)	0.38 (9.7)
Pipe socket welds	1/4 in.		SS-6NBSW4P				1.12 (28.4)			1.47 (37.3)						3.82 (97.0)	
Male VCO fittings	1/2 in.		SS-6NBVCO8			—	—	—		—		—				—	—
Male VCR fittings	1/2 in.		SS-6NBVCR8	3.12 (79.2)	1.56 (39.6)				1.53 (38.9)		0.62 (15.7)				3.89 (98.8)		

Dimensions shown with Swagelok tube fitting nuts finger-tight.

Ordering Information and Dimensions

N Series

Select an ordering number.

To order other valve body materials, replace **SS** in the ordering number with a material designator.

Example: **M**-3NBF2

Material	Designator
Alloy 400	M
Alloy 600	INC
Alloy C-276	HC
Titanium	TI
316/316L	SSD

Ball Stem Tip Materials

Ordering numbers specify a cobalt-based alloy ball stem tip. N series valves of 316 SS are standard with this stem tip and require no designator.

To specify ball stem tip material for valves of other materials, add a designator to the ordering number.

Example: INC-6NBF4-**HC**

Ball Stem Tip Material/ ASTM Specification	Designator
Cobalt-based alloy	-STE
440C SS/A276	-440C
Alloy 400/B127 or B164	-M
Alloy C-276/B574 or B575	-HC
Titanium/B348 or B265	-TI

Angle-Pattern Valves

Ordering numbers that list *C* dimensions are available in angle patterns. To order, add **-A** to the ordering number.

Example: SS-12NBF8-**A**

Options and Accessories

See page 10 for information about optional stem packings, stem designs, handles, and sour gas valves.

End Connections		C_v	Ordering Number	Dimensions, in. (mm)													
Inlet/Outlet	Size			A	B	B_1	B_2	C	D_1	D_2	E_1	E_2	F	G	H Straight	H Angle	J
12N Series: 0.437 in. (11.1 mm) Orifice																	
Female NPT	1/2 in.	2.4	SS-12NBF8	3.12 (79.2)	1.56 (39.6)	1.31 (33.3)	1.56 (39.6)	2.00 (50.8)	1.82 (46.2)	2.00 (50.8)	0.62 (15.7)	0.69 (17.5)	3.50 (88.9)	1 1/32 (26.2)	4.78 (121)	4.97 (126)	—
	3/4 in.		SS-12NBF12	3.25 (82.6)	1.62 (41.1)	—	—	—	1.91 (48.5)	—	0.78 (19.8)	—			4.88 (124)	—	
	1 in.		SS-12NBF16	3.62 (91.9)	1.81 (46.0)				2.13 (54.1)		1.00 (25.4)				5.10 (129)		
Male/ female NPT	1/2 in.	1.9	SS-12NBM8-F8	3.12 (79.2)	1.56 (39.6)	1.31 (33.3)	1.56 (39.6)	2.00 (50.8)	1.82 (46.2)	2.00 (50.8)	0.62 (15.7)	0.69 (17.5)			4.78 (121)	4.97 (126)	
	3/4 in.		SS-12NBM12-F12	3.25 (82.6)	1.62 (41.1)	—	—	—	1.91 (48.5)	—	0.78 (19.8)	—			4.88 (124)	—	
	1 in.		SS-12NBM16-F16	3.62 (91.9)	1.81 (46.0)				2.13 (54.1)		1.00 (25.4)				5.10 (129)		
Swagelok tube fittings	1/2 in .	2.1	SS-12NBS8	3.92 (99.6)	1.96 (49.8)	1.68 (42.7)	2.08 (52.8)	2.37 (60.2)	1.82 (46.2)	1.88 (47.8)	0.62 (15.7)	0.69 (17.5)			4.78 (121)	4.85 (123)	
	3/4 in.	2.4	SS-12NBS12														
	1 in.		SS-12NBS16	4.09 (104)	2.04 (51.8)	—	—	—	1.88 (47.8)	—	0.69 (17.5)	—					
	12 mm	1.9	SS-12NBS12MM	3.92 (99.6)	1.96 (49.8)	1.68 (42.7)	2.08 (52.8)	2.37 (60.2)	1.82 (46.2)	1.88 (47.8)	0.62 (15.7)	0.69 (17.5)					
Tube socket welds	1/2 in.	2.2	SS-12NBSW8T	3.12 (79.2)	1.56 (39.6)	1.31 (33.3)	1.69 (42.9)	2.00 (50.8)									0.38 (9.7)
	3/4 in.		SS-12NBSW12T			—	—	—		—		—				—	0.44 (11.2)
Pipe socket welds	1/2 in.	2.4	SS-12NBSW8P			1.31 (33.3)	1.56 (39.6)	2.00 (50.8)	1.88 (47.8)	2.00 (50.8)	0.69 (17.5)	0.69 (17.5)			4.85 (123)	4.97 (126)	0.38 (9.7)
Male VCO fittings	3/4 in.	2.2	SS-12NBVCO12			—	—	—	1.82 (46.2)	—	0.62 (15.7)	—			4.78 (121)	—	—
Male VCR fittings	1/2 in.	1.9	SS-12NBVCR8														

Ordering Information and Dimensions

HN Series (High Pressure)

Select an ordering number.

Ordering numbers specify a regulating stem tip. Cobalt-based alloy ball stem tips are available for 6HN series valves. To order, replace **NR** in the ordering number with **NB.**

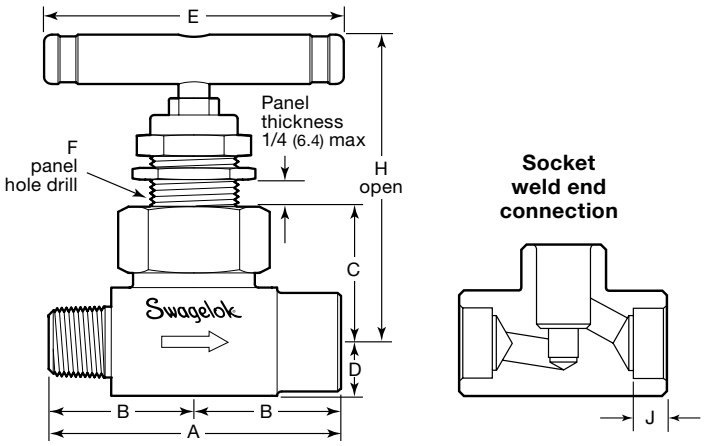
Example: 6H**NB**F4

Options and Accessories

See page 10 for information about optional stem designs, stem packings, and sour gas valves.

Dimensions, in inches (millimeters), are for reference only and are subject to change.

HN Series



End Connections		Ordering Number	Dimensions, in. (mm)							
Inlet/Outlet	Size		A	B	C	D	E	F	H	J
3HN Series: 0.156 in. (4.0 mm) Orifice; 0.35 C_v										
Female NPT	1/8 in.	SS-3HNRF2	2.25 (57.2)	1.13 (28.7)	1.34 (34.0)	0.50 (12.7)	2.50 (63.5)	0.81 (20.6)	3.43 (87.1)	—
	1/4 in.	SS-3HNRF4								
Male NPT	1/4 in.	SS-3HNRM4								
Male/ female NPT	1/4 in.	SS-3HNRM4-F4								
Swagelok tube fittings	1/4 in.	SS-3HNRS4	2.82 (71.6)	1.41 (35.8)						
Tube socket welds	1/4 in.	SS-3HNRSW4T	2.25 (57.2)	1.13 (28.7)						0.28 (7.1)
6HN Series: 0.250 in. (6.4 mm) Orifice; 0.86 C_v										
Female NPT	1/4 in.	SS-6HNRF4	3.13 (79.5)	1.56 (39.6)	1.81 (46.0)	0.63 (16.0)	3.50 (88.9)	1.06 (26.9)	4.27 (108)	—
	1/2 in.	SS-6HNRF8	3.25 (82.6)	1.63 (41.4)	1.90 (48.2)	0.78 (19.8)			4.36 (111)	
Male NPT	1/2 in.	SS-6HNRM8	3.13 (79.5)	1.56 (39.6)	1.81 (46.0)	0.63 (16.0)			4.27 (108)	
Male/ female NPT	1/2 in.	SS-6HNRM8-F8	3.25 (82.6)	1.63 (41.4)	1.90 (48.2)	0.78 (19.8)			4.36 (111)	

Dimensions shown with Swagelok tube fitting nuts finger-tight.

Pneumatic Actuators

Swagelok 3N and 6N series valves can be equipped with pneumatic actuators in normally closed, normally open, and double-acting models.

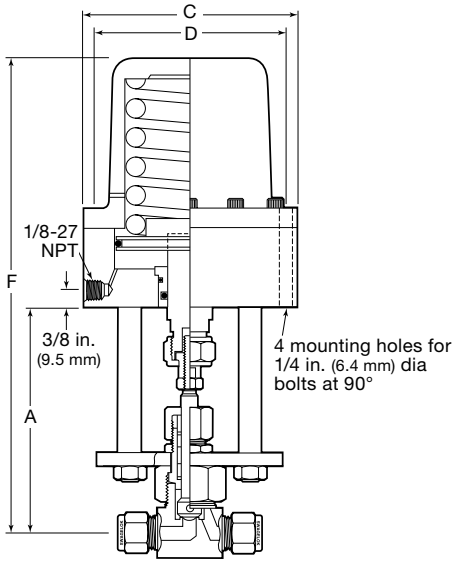
Actuator Technical Data

Pressure-Temperature Ratings

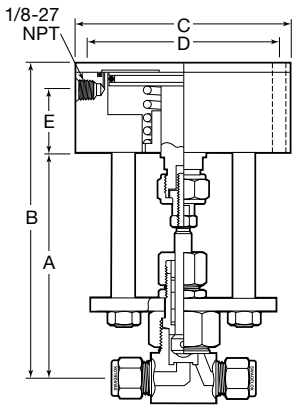
Normally closed:
150 psig at –20 to 300°F
(10.3 bar at –28 to 148°C)

Normally open and double acting:
150 psig at –20 to 400°F
(10.3 bar at –28 to 204°C)

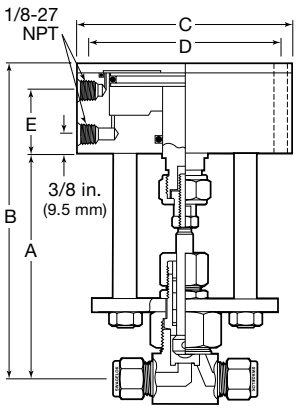
Dimensions



Normally Closed



Normally Open



Double Acting

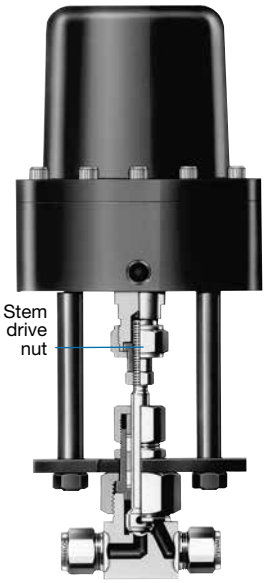
Valve Series	Dimensions, in. (mm)					
	A	B	C	D	E	F
3N	4.22 (107)	5.91 (150)	3.75 (95.3)	3.25 (82.6)	1.12 (28.4)	8.47 (215)
6N	4.47 (114)	6.22 (158)	4.25 (108)	3.81 (96.8)	1.19 (30.2)	9.41 (239)

Dimensions are for reference only and are subject to change.

Pneumatic Actuator Performance

Minimum actuator pressures and maximum system pressures shown in the graphs below are based on factory adjustment of packing and stems lubricated with a silicone-based lubricant.

Packing nut adjustment may affect actuator performance. If the load is too low, the packing may leak. **If the load is too high, the actuator may stall and the valve will not cycle.**



Normally Closed

Normally Closed Actuators

Adjustment of the actuator stem drive nut affects actuator spring force, which in turn affects:

- the maximum system pressure that can be shut off by the valve
- the minimum actuator pressure required to open the valve.

Figures 1 and 2 show the minimum actuator pressure required to open a normally closed actuator at system pressure.

Maximum system pressure for a 3N valve with normally closed actuator:

- NR, NTR, or NKR stem—3000 psig (206 bar).
- NB stem—4400 psig (303 bar).

Maximum system pressure for a 6N valve with normally closed actuator:

- NR, NTR, or NKR stem—3600 psig (248 bar).
- NB stem—4600 psig (316 bar).

Fig. 1—3N Series with Normally Closed Actuator

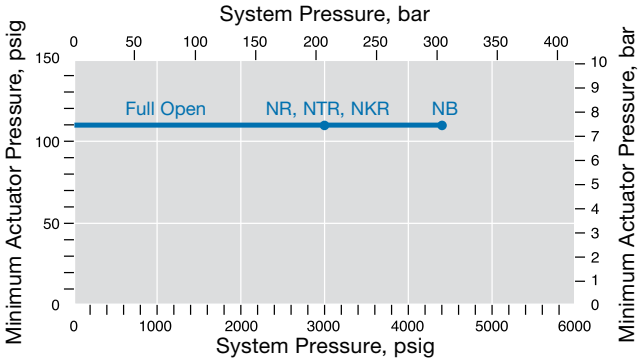
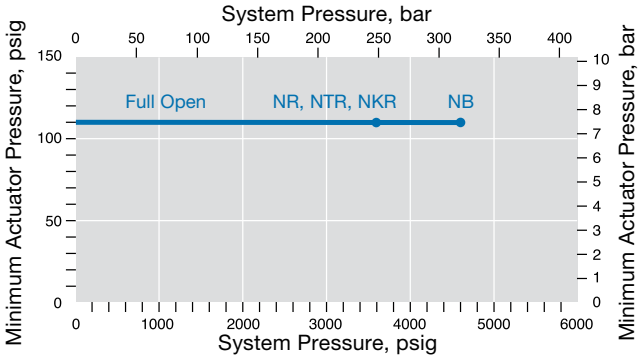


Fig. 2—6N Series with Normally Closed Actuator



Pneumatic Actuators

Ordering Information

To order a 3N or 6N series valve equipped with a pneumatic actuator, add a designator to the valve ordering number.

Example: SS-3NBS4-**95C**

Valve Series	Actuator Designator		
	Normally Closed	Normally Open	Double Acting
3N	-95C	-95O	-95D
6N	-96C	-96O	-96D

Normally Open Actuators

The amount the stem orifice opens beyond the cracked-open position depends on system pressure, flow characteristics, and valve packing nut adjustment.

Figures 3 and 4 show the minimum actuator pressure required to close a normally open actuator at system pressure.

Normally Open

Minimum system pressure required to assist the spring in opening the valve:

- 3N series with normally open actuator—1000 psig (69.0 bar).
- 6N series with normally open actuator—500 psig (34.5 bar).

Double-Acting Actuators

Figures 5 and 6 show the minimum actuator pressure required to open or close a 3N or 6N series valve with a double-acting actuator at system pressure.

Double Acting

Fig. 3—3N Series with Normally Open Actuator

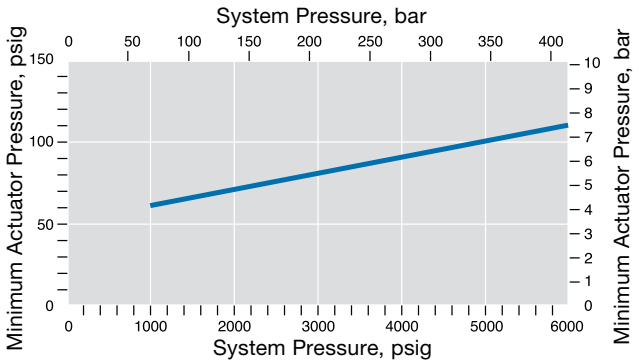


Fig. 4—6N Series with Normally Open Actuator

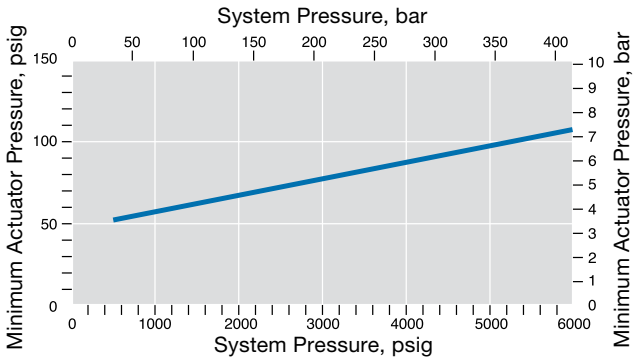


Fig. 5—3N Series with Double-Acting Actuator

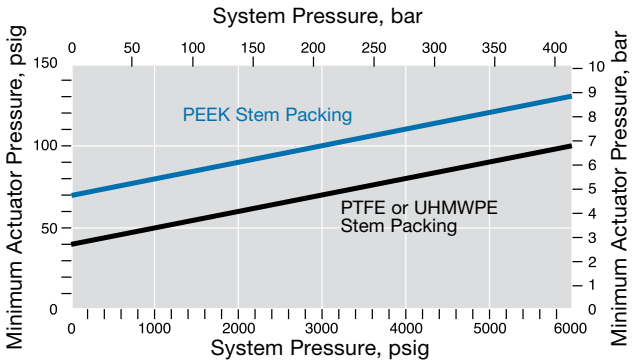
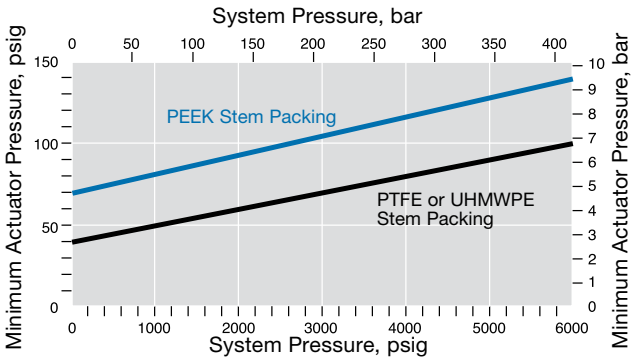


Fig. 6—6N Series with Double-Acting Actuator



Options and Accessories

N Series and HN Series

Stem Packing Materials

PTFE packing is standard. To order an optional stem packing material, add a stem packing material designator to the valve ordering number. See page 2 for pressure-temperature ratings of valves with optional stem packing materials.

Stem Packing Material	Designator
UHMWPE	-P
PEEK	-PK
Grafoil	-G

UHMWPE (ultrahigh-molecular weight polyethylene) is intended for service where fluorocarbons are not acceptable. UHMWPE packing is lubricated with nickel antiseize with hydrocarbon carrier; it does not require packing supports.

PEEK (polyetheretherketone) packing material is a 2-piece chevron design including PEEK packing supports and molybdenum disulfide, fluorinated tungsten disulfide-based lubricant; stem packing replacement kits also contain nickel antiseize with hydrocarbon carrier. PEEK packing is not available in normally open or normally closed pneumatically actuated N series valves.

Grafoil is a high-temperature packing material that does not require packing supports. Factory assemblies contain fluorinated tungsten disulfide-based lubricant and nickel antiseize with hydrocarbon carrier; stem packing replacement kits contain only nickel antiseize with hydrocarbon carrier. Grafoil is not available in pneumatically actuated N series valves or 12N series valves with colored phenolic knobs.

Examples: SS-3HNRF4-**P**
SS-6NBS8-**PK**
SS-12NBF8-**G**

Stem Packing Kits

PTFE, UHMWPE, PEEK, and Grafoil stem packing kits are available. Kits contain stem packing(s), lubricant(s), and instructions.

Valve Series	Seal Material and Kit Ordering Number			
	PTFE	UHMWPE	Grafoil	PEEK
3N, 3HN	T-9K-3N	PE-9K-3N	G-9K-3N	PK-9K-3N
6N, 6HN	T-9K-6N	PE-9K-6N	G-9K-6N	PK-9K-6N
12N	T-9K-12N	PE-9K-12N	G-9K-12N	PK-9K-12N
Lubricant	Nickel antiseize with hydrocarbon carrier			Nickel antiseize with hydrocarbon carrier and fluorinated tungsten disulfide-based; molybdenum disulfide-based coating

Stem Designs

N series valve ordering numbers specify NB ball stem tips. HN series valve ordering numbers specify NR regulating stem tips. To order valves with other stem designs, replace **NB** or **NR** in the ordering number with the desired stem design designator.

Stem Design	Designator
Regulating①	NR
PCTFE soft-seat regulating	NKR
PTFE soft-seat regulating②	NTR

① Not intended for repetitive shutoff in gas applications.
② Not available in 12N series.

Examples: SS-3**NR**F2
SS-3H**NKR**F2

Sour Gas Valves

Valves with female pipe ends are available for sour gas service. Materials are selected in accordance with NACE MR0175/ISO 15156. The body and bonnet are annealed 316 stainless steel; the stem is alloy 400. To order, add **-SG** to the valve ordering number.

Examples: SS-3NBF2-**SG**
SS-3HNRF2-**SG**

Special Cleaning and Packaging (SC-11)

To order N series and HN series valves with optional cleaning and packaging to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, add **-SC11** to the valve ordering number.

Example: SS-3NBF2-**SC11**

Options and Accessories

N Series Handles

Anodized black aluminum bar handles are standard. Colored phenolic (with brass insert) and 316 stainless steel bar handles are available.

Exception: 12N series valves with Grafoil packing are not available with colored phenolic knobs.

To order, add a handle designator to the valve ordering number.

Examples: SS-3NBS4-**BKP**
SS-12NBF8-**SH**

Handle	Designator
Black phenolic knob	-BKP
Blue phenolic knob	-BLP
Green phenolic knob	-GRP
Orange phenolic knob	-OGP
Red phenolic knob	-RDP
Yellow phenolic knob	-YWP
Stainless steel bar	-SH

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, refer to *Oxygen System Safety* technical report, MS-06-13.

HN Series Ball Stem Tip Materials

Cobalt-based alloy is standard. To specify other ball tip materials, add a ball stem tip material designator to the valve ordering number:

Example: SS-6HNBF4-**M**

Ball Tip Material/ ASTM Specification	Designator
440C SS/A276	-440C
Alloy 400/B127 or B164	-M
Alloy C-276/B574 or B575	-HC

Additional Valve Materials

Alloy 625, alloy 825, Alloy 2507 super duplex stainless steel, and 6-moly materials are available for N and HN series valves. Refer to *Severe-Service Union-Bonnet Needle Valves—Special Alloy Materials* catalog, MS-02-365.

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Caution: Do not mix or interchange parts with those of other manufacturers.

Swagelok

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Integral-Bonnet Needle Valves

O, 1, 18, 20, and 26 Series

- Live-loaded packing system
- Compact design
- Working pressures up to 6000 psig (413 bar)
- Temperatures up to 600°F (315°C)

Swagelok

Features

Stem Designs

- Vee—all series
- Soft-seat—all series
- Regulating—O, 1, and 18 series

Orifice Sizes

- From 0.080 to 0.375 in. (2.0 to 9.5 mm)

Flow Coefficients (C_v)

- From 0.09 to 1.80

Flow Patterns

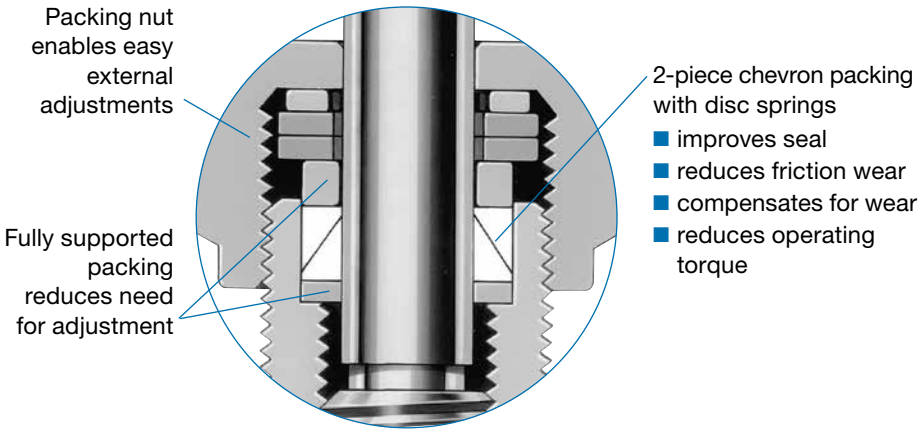
- Straight, angle, and cross patterns

Panel Mounting

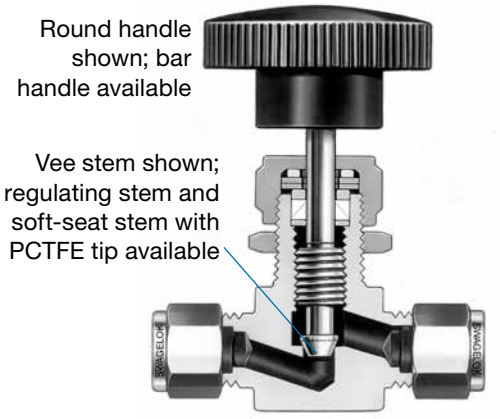
- O, 1, and 18 series

Live-Loaded Packing System

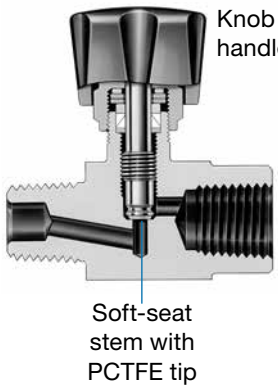
Low Emissions certification per API 624 available



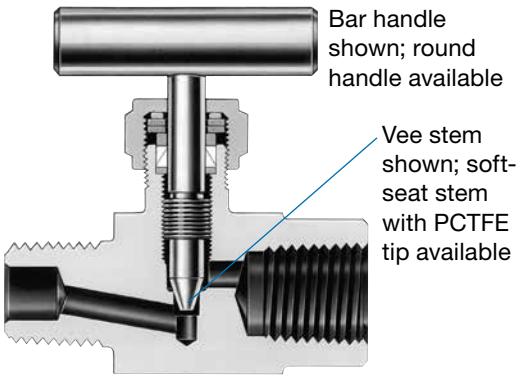
O, 1, and 18 Series



20K Series



20V and 26 Series



Pressure-Temperature Ratings

Ratings are limited to:

- 200°F (93°C) max with soft-seat stem with PCTFE stem tip.
- 250°F (121°C) max with UHMWPE packing.
- 450°F (232°C) max with PFA packing.
- 600°F (315°C) max with PEEK packing.

To order a valve with soft-seat stem and PCTFE stem tip, see **Ordering Information and Dimensions,** page 4 and 6.

To order a valve with UHMWPE or PEEK packing, see **Options and Accessories,** page 7.

O, 1, and 18 Series

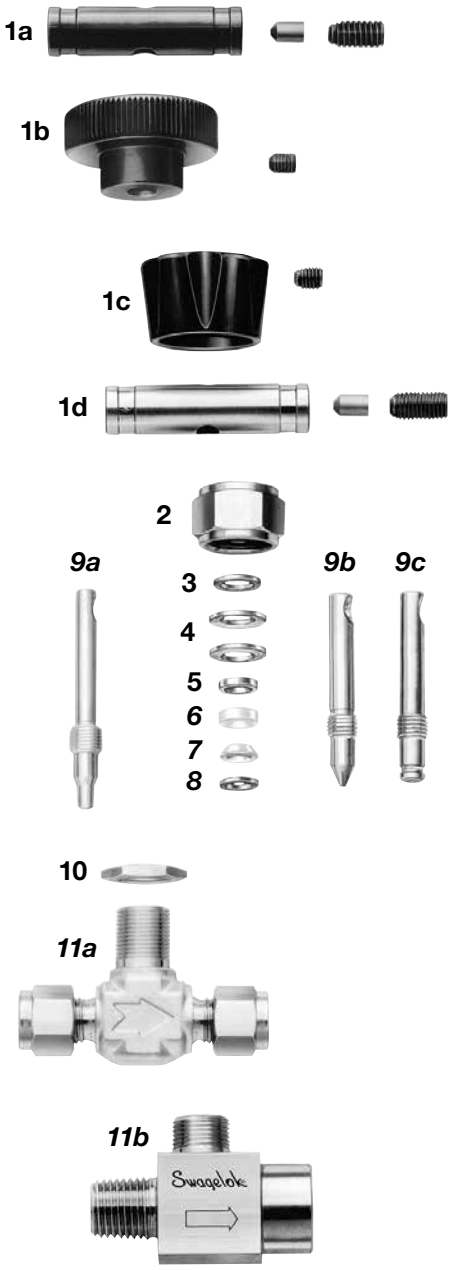
ASME Class	2080	N/A		1500
Material Group	2.2	N/A		3.4
Material Name	316 SS	Brass	Steel	Alloy 400
Temperature, °F (°C)	Working Pressure, psig (bar)			
–65 (–53) to –20 (–28)	5000 (344)	3000 (206)	—	3000 (206)
–20 (–28) to 100 (37)	5000 (344)	3000 (206)	3000 (206)	3000 (206)
200 (93)	4295 (295)	2350 (161)	2730 (188)	2640 (181)
250 (121)	4085 (281)	2200 (151)	2695 (185)	2555 (176)
300 (148)	3875 (266)	2050 (141)	2660 (183)	2470 (170)
350 (176)	3715 (255)	1470 (101)	2615 (180)	2430 (167)
400 (204)	3560 (245)	390 (26)	—	2390 (164)
450 (232)	3435 (236)	—	—	2380 (163)
500 (260)	3310 (228)	—	—	2375 (163)
600 (315)	3130 (215)	—	—	—

20 and 26 Series

ASME Class	2500
Material Group	2.2
Material Name	316 SS
Temperature °F (°C)	Working Pressure psig (bar)
–65 (–53) to 100 (37)	6000 (413)
200 (93)	5160 (355)
250 (121)	4910 (338)
300 (148)	4660 (321)
350 (176)	4470 (307)
400 (204)	4280 (294)
450 (232)	4130 (284)
500 (260)	3980 (274)
600 (315)	3760 (259)

For more information about pressure ratings of valves with tube fitting end connections, refer to *Tubing Data* catalog, MS-01-107.

Materials of Construction



Component		Series	Valve Body Materials			
			Material Grade/ASTM Specification			
			316 SS	Brass	Steel	Alloy 400
1a	Bar handle	18	Anodized aluminum 2024/B221 or A209			
	Handle pin		Steel/A108			
	Set screw		Nickel cadmium-plated steel			
1b	Round handle	O and 1	Phenolic with brass insert			
	Set screw		Nickel cadmium-plated steel			
1c	Knob handle	20K	Anodized aluminum 7129/B221	—		
	Set screw		Nickel cadmium-plated steel			
1d	Bar handle	20V and 26	316 SS/A276	—		
	Handle pin, set screw		S17400/A564			
2	Packing nut	All	316 SS/A276	Brass 360/ B16	12L14/ A108	Alloy 400/ B164
3	Gland	O, 1,① and 20	304 SS/A240, A167			
4	Packing springs	All②	S17700/A693			
5	Packing gland	All	316 SS/A240, A276, B783			
6	*Upper packing*	All	*PFA/D3307*			
7	*Lower packing*					
8	*Lower gland*	All	*316 SS/A240*			*Alloy 400/ B127*
9a	*Regulating stem*	O, 1, and 18	*Chrome-plated③ 316 SS/A276*	*316 SS/A276*		*Alloy 400/ B164*
9b	*Vee stem*	All				
9c	*Soft-seat stem*	All				
	Stem tip		*PCTFE/D1430*			
10	Panel nut	O, 1, and 18	316 SS	Brass 360/ B16	316 SS	
11a	*Body*	O, 1, and 18	*316 SS/A182*	*Brass 377/ B283*	*Cadmium-plated 11L17/ A108*	*Alloy 400/ B564*
11b	*Body*	20 and 26	*316 SS/A479*	—		
	Lubricant	All	*Tungsten disulfide- and fluorocarbon-based*			

Wetted components listed in *italics.*

Valve series listed with standard handles. For handle options, see **Handles,** page 8.

① 1 series valves with orifice of 0.172 in. (4.4 mm).

② O, 20 and 1 series with orifice of 0.172 (4.4 mm)—2 springs;
18, 26, and 1 series with orifice of 0.250 (6.4 mm)—3 springs.

③ Regulating and vee stem tip and threads; soft-seat stem threads.

Testing

Every integral-bonnet needle valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min. Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

Cleaning and Packaging

All integral-bonnet needle valves are cleaned and packaged in accordance with Swagelok Standard C*leaning and Packaging (SC-10)* catalog, MS-06-62. Cleaning and packaging in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C are available as an option.

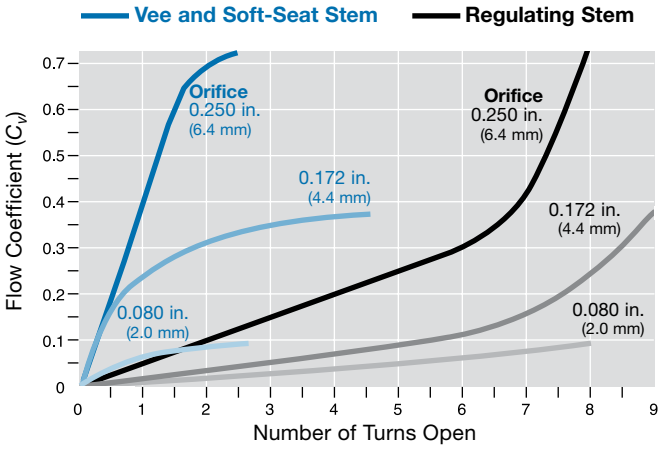
Low Fugitive Emissions

The American Petroleum Institute's API 624 tests for fugitive emissions to atmosphere for rising stem valves. The tests are conducted at a third party lab and certify that at no point in the test did the valve leak in excess of 100 ppm of methane. Certificates stating that the valve is certified for Low Emissions service are available for valves with PFA and PEEK packing. For more information, contact your authorized Swagelok sales and service representative.

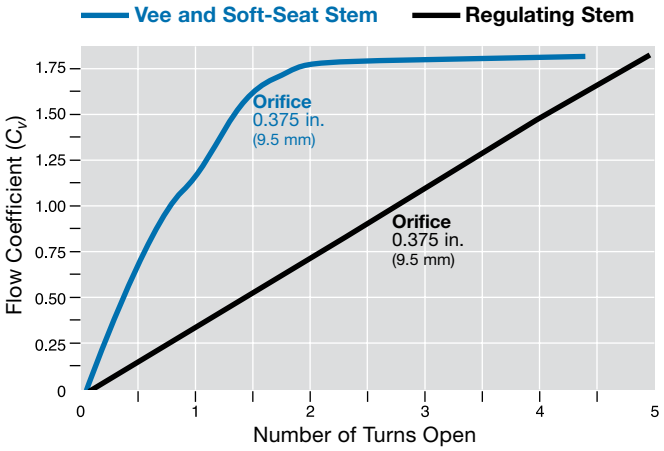
Flow Data at 100°F (37°C)

Flow Coefficient at Turns Open

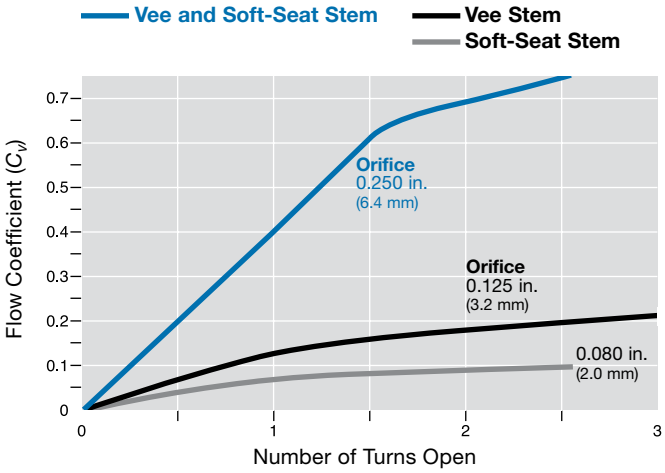
O and 1 Series



18 Series



20 and 26 Series

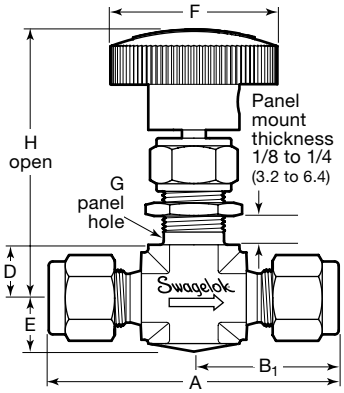


Ordering Information and Dimensions

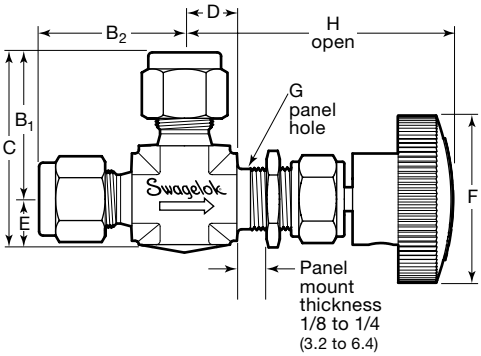
O, 1, and 18 Series

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Straight pattern



Angle pattern



Stainless Steel Valves with Regulating Stems

Select an ordering number.

Alloy 400, Brass, and Steel Valves with Regulating Stems

Replace **SS** in the ordering number with a material designator.

Example: **M**-ORS2

Material	Designator
Alloy 400	M
Brass	B
Steel	S

Vee and Soft-Seat Stems

Replace **R** in the ordering number with **V** for a vee stem or **K** for a soft-seat stem with PCTFE stem tip**.**

Examples: SS-O**V**S2
SS-O**K**S2

Angle-Pattern Valves

Add **-A** to the ordering number.

Example: SS-ORS2**-A**

Cross-Pattern Valves

Certain 1 series valves are available with cross-pattern bodies, which provide continuous flow between the side ports and on-off or regulating flow through the bottom port. Shown at right: **SS-1RS4-X**

Contact your authorized Swagelok sales and service representative for more information and additional ordering numbers.

Ordering Information and Dimensions

End Connections		C_v	Orifice in. (mm)	Ordering Number	Dimensions, in. (mm)								
Inlet/Outlet	Size				A	B_1	B_2	C	D	E	F	G	H
Fractional Swagelok tube fittings	1/8 in.	0.09	0.080 (2.0)	SS-ORS2	1.94 (49.3)	0.98 (24.9)		1.29 (32.8)	0.44 (11.2)	0.31 (7.9)	1.00 (25.4)	0.47 (11.9)	2.28 (57.9)
	1/4 in.	0.37	0.172 (4.4)	SS-1RS4	2.27 (57.6)	1.13 (28.7)		1.51 (38.4)		0.38 (9.7)	1.38 (35.1)	0.53 (13.5)	2.50 (63.5)
	3/8 in.	0.73	0.250 (6.4)	SS-1RS6	2.58 (65.5)	1.29 (32.8)		1.79 (45.5)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	1/2 in.			SS-1RS8	2.80 (71.1)	1.40 (35.6)		1.90 (48.3)					
	1/2 in.	1.80	0.375 (9.5)	SS-18RS8	3.80 (96.5)	1.90 (48.3)		2.65 (67.3)	0.75 (19.1)		3.00 (76.2)	1.03 (26.2)	3.91 (99.3)
	3/4 in.			SS-18RS12									
Metric Swagelok tube fittings	3 mm	0.09	0.080 (2.0)	SS-ORS3MM	1.94 (49.3)	0.98 (24.9)		1.29 (32.8)	0.44 (11.2)	0.31 (7.9)	1.00 (25.4)	0.48 (12.2)	2.28 (57.9)
	6 mm	0.37	0.172 (4.4)	SS-1RS6MM	2.27 (57.6)	1.13 (28.7)		1.51 (38.4)		0.38 (9.7)	1.38 (35.1)	0.53 (13.5)	2.50 (63.5)
	8 mm			SS-1RS8MM	2.34 (59.4)	1.17 (29.7)		1.54 (39.1)					
	10 mm	0.73	0.250 (6.4)	SS-1RS10MM	2.60 (66.0)	1.30 (33.0)		1.80 (45.7)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	12 mm			SS-1RS12MM	2.80 (71.1)	1.40 (35.6)		1.90 (48.3)					
	12 mm	1.80	0.375 (9.5)	SS-18RS12MM	3.80 (96.5)	1.90 (48.3)		2.65 (67.3)	0.75 (19.1)		3.00 (76.2)	1.03 (26.2)	3.91 (99.3)
	18 mm			SS-18RS18MM									
Female NPT	1/8 in.	0.09	0.080 (2.0)	SS-ORF2	1.88 (47.8)	0.94 (23.9)		1.25 (31.8)	0.44 (11.2)	0.31 (7.9)	1.00 (25.4)	0.47 (11.9)	2.28 (57.9)
	1/8 in.	0.37	0.172 (4.4)	SS-1RF2	1.62 (41.1)	0.81 (20.6)		1.19 (30.2)		0.38 (9.7)	1.38 (35.1)	0.53 (13.5)	2.50 (63.5)
	1/4 in.	0.73	0.250 (6.4)	SS-1RF4	2.12 (53.8)	1.06 (26.9)		1.56 (39.6)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	3/8 in.	1.80	0.375 (9.5)	SS-18RF6	3.00 (76.2)	1.50 (38.1)		2.25 (57.2)	0.75 (19.1)		3.00 (76.2)	1.03 (26.2)	3.88 (98.6)
	1/2 in.			SS-18RF8									
Male NPT	1/8 in.	0.09	0.080 (2.0)	SS-ORM2	1.50 (38.1)	0.75 (19.1)		1.06 (26.9)	0.44 (11.2)	0.31 (7.9)	1.00 (25.4)	0.47 (11.9)	2.28 (57.9)
	1/8 in.	0.37	0.172 (4.4)	SS-1RM2	1.62 (41.1)	0.81 (20.6)		1.19 (30.2)		0.38 (9.7)	1.38 (35.1)	0.53 (13.5)	2.50 (63.5)
	1/4 in.			SS-1RM4	1.97 (50.0)	0.98 (24.9)		1.36 (34.5)					
	3/8 in.	0.73	0.250 (6.4)	SS-1RM6	2.25 (62.5)	1.12 (28.4)		1.62 (41.1)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	1/2 in.	1.80	0.375 (9.5)	SS-18RM8	3.00 (76.2)	1.50 (38.1)		2.25 (57.2)	0.75 (19.1)		3.00 (76.2)	1.03 (26.2)	3.88 (98.6)
Male NPT/ Swagelok tube fitting	1/8 in.	0.09	0.080 (2.0)	SS-ORM2-S2	1.73 (43.9)	0.98 (24.9)	0.75 (19.1)	1.29 (32.8)	0.44 (11.2)	0.31 (7.9)	1.00 (25.4)	0.47 (11.9)	2.28 (57.9)
	1/4 in.	0.37	0.172 (4.4)	SS-1RM4-S4	1.95 (49.5)	1.13 (28.7)	0.98 (24.9)	1.51 (38.4)		0.38 (9.7)	1.38 (35.1)	0.53 (13.5)	2.50 (63.5)
	1/4/ 3/8 in.	0.73	0.250 (6.4)	SS-1RM4-S6	2.42 (61.5)	1.29 (32.8)	1.12 (28.4)	1.79 (45.5)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	3/8 in.			SS-1RM6-S6									
	3/8/ 1/2 in.			SS-1RM6-S8	2.52 (64.0)	1.40 (35.6)		1.90 (48.3)					
Male/ female NPT	1/4 in.	0.73	0.250 (6.4)	SS-1RM4-F4	2.19 (55.6)	1.06 (26.9)	1.12 (28.4)	1.56 (39.6)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	1/2 in.	1.80	0.375 (9.5)	SS-18RM8-F8	3.00 (76.2)	1.50 (38.1)		2.25 (57.2)	0.75 (19.1)		3.00 (76.2)	1.03 (26.2)	3.88 (98.6)
Female ISO①	1/4 in.	0.73	0.250 (6.4)	SS-1RF4RT	2.12 (53.8)	1.06 (26.9)		1.56 (39.6)	0.55 (14.0)	0.50 (12.7)	1.88 (47.8)	0.78 (19.8)	2.97 (75.4)
	3/8 in.	1.80	0.375 (9.5)	SS-18RF6RT	3.00 (76.2)	1.50 (38.1)		2.25 (57.2)	0.75 (19.1)		3.00 (76.2)	1.03 (26.2)	3.88 (98.6)
	1/2 in.			SS-18RF8RT									

Dimensions determined using valves with regulating stems and standard handles. Dimensions are shown with Swagelok nuts finger-tight.

① See specifications ISO 7/1, BS EN 10226-1, DIN-2999, JIS B0203.

Ordering Information and Dimensions

20 and 26 Series

Dimensions are for reference only and are subject to change.

Select an ordering number.

For soft-seat stems and PCTFE stem-tips in valves that are standard with vee stems, replace **V** with **K.**

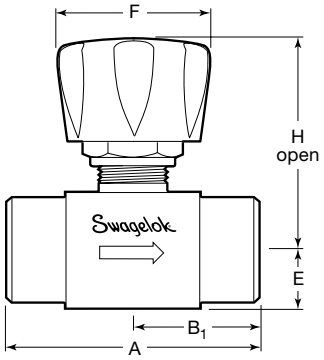
Example: SS-20**K**S4

Angle-Pattern Valves

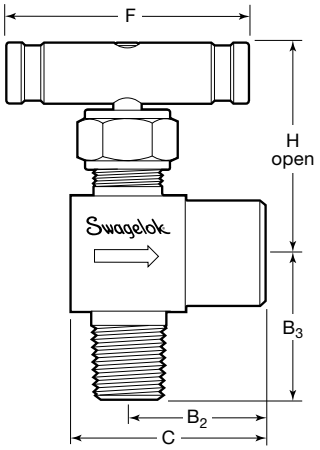
Angle-pattern bodies are available for valves with *C* dimensions listed. To order, add **-A** to the ordering number.

Example: SS-20KM4-F4**-A**

Straight pattern



Angle pattern



End Connections		C_v	Orifice in. (mm)	Ordering Number	Dimensions, in. (mm)							
Inlet/Outlet	Size				A	B_1	B_2	B_3	C	E	F	H
20 series with soft-seat stem and PCTFE stem tip												
Female NPT	1/4 in.	0.09	0.080 (2.0)	SS-20KF4	1.88 (47.8)	0.94 (23.9)	—	—	—	0.42 (10.7)	1.12 (28.4)	1.66 (42.2)
Male NPT	1/4 in.			SS-20KM4	1.94 (49.3)	0.97 (24.6)						
Male/ female NPT	1/4 in.			SS-20KM4-F4	1.91 (48.5)	0.94 (23.9)	1.00 (25.4)	1.03 (26.2)	1.44 (36.6)			
20 and 26 series with vee stem												
Swagelok tube fittings	1/4 in.	0.21	0.125 (3.2)	SS-20VS4	2.46 (62.5)	1.23 (31.2)	1.13 (28.7)	1.16 (29.5)	1.57 (39.9)	0.42 (10.7)	1.75 (44.4)	1.66 (42.2)
	3/8 in.	0.73	0.250 (6.4)	SS-26VS6	3.08 (78.2)	1.54 (39.1)	—	—	—	0.66 (16.8)	2.50 (63.5)	2.31 (58.7)
	1/2 in.			SS-26VS8	3.30 (83.8)	1.65 (41.9)						
Female NPT	1/4 in.	0.21	0.125 (3.2)	SS-20VF4	1.88 (47.8)	0.94 (23.9)	1.00 (25.4)		1.44 (36.6)	0.42 (10.7)	1.75 (44.4)	1.66 (42.2)
	3/8 in.	0.73	0.250 (6.4)	SS-26VF6	2.50 (63.5)	1.25 (31.8)	—	—	—	0.66 (16.8)	2.50 (63.5)	2.31 (58.7)
	1/2 in.			SS-26VF8			1.41 (35.8)		2.06 (52.3)			
Male NPT	1/4 in.	0.21	0.125 (3.2)	SS-20VM4	1.94 (49.3)	0.97 (24.6)	—	—	—	0.42 (10.7)	1.75 (44.4)	1.66 (42.2)
Male NPT/ Swagelok tube fittings	1/4 in.			SS-20VM4-S4	—	—	1.13 (28.7)	1.00 (25.4)	1.57 (39.9)	—		
Male/ female NPT	1/4 in.			SS-20VM4-F4	1.91 (48.5)	0.94 (23.9)	1.00 (25.4)	1.03 (26.2)	1.44 (36.6)	0.42 (10.7)	1.75 (44.4)	
	3/8 in.	0.73	0.250 (6.4)	SS-26VM6-F6	2.50 (63.5)	1.25 (31.8)	1.41 (35.8)	1.22 (31.0)	2.06 (52.3)	0.66 (16.8)	2.50 (63.5)	2.31 (58.7)
	1/2 in.			SS-26VM8-F8	2.55 (64.8)	1.25 (31.8)	1.41 (35.8)					
	3/4 to 1/2 in.			SS-26VM12-F8	2.50 (63.5)	1.25 (31.8)	—	—	—			
Female ISO①	1/4 in.	0.21	0.125 (3.2)	SS-20VF4RT	1.88 (47.8)	0.94 (23.9)	—	—	—	0.42 (10.7)	1.75 (44.4)	1.66 (42.2)
	1/2 in.	0.73	0.250 (6.4)	SS-26VF8RT	2.50 (63.5)	1.25 (31.8)	—	—	—	0.66 (16.8)	2.50 (63.5)	2.31 (58.7)

Dimensions are shown with Swagelok nuts finger-tight.

① See specifications ISO 7/1, BS EN 10226-1, DIN-2999, JIS B0203.

Options and Accessories

Stem Packing Materials

Two-piece chevron-style PFA packing is standard. For an optional stem packing, add **-P** for UHMWPE or **-PK** for PEEK to the ordering number. See **Pressure-Temperature Ratings,** page 2, for ratings of valves with optional stem packings. See the table at right for lubricants used with optional stem packing materials.

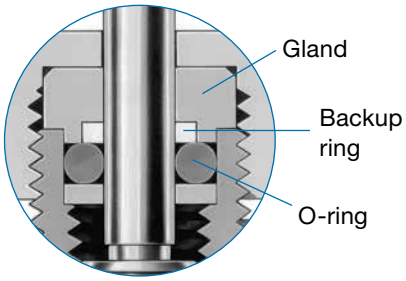
Examples: SS-ORS2**-P**
SS-20KF4**-PK**

Stem Packing Kits

PFA, UHMWPE, and PEEK packing kits are available. Kits contain stem packings, springs, lubricant, and instructions.

Valve Series	Orifice in. (mm)	Stem Packing Material, Kit Ordering Number		
		PFA	UHMWPE	PEEK
O	All	PFA-91K-O	PE-91K-O	PK-91K-O
1	0.172 (4.4)	PFA-91K-14	PE-91K-14	PK-91K-14
	0.250 (6.4)	PFA-91K-16	PE-91K-16	PK-91K-16
18	All	PFA-91K-18	PE-91K-18	PK-91K-18
20	All	PFA-91K-20	PE-91K-20	PK-91K-20
26	All	PFA-91K-16	PE-91K-16	PK-91K-16
Lubricant		Tungsten disulfide and fluorocarbon based	Molybdenum disulfide and hydrocarbon based	Molybdenum disulfide, tungsten disulfide, and fluorocarbon based

O-Ring Stem Seals



O-ring stem seals include:

- 316 SS/ASTM A276 gland for 316 SS, steel, and alloy 400 valves, or brass 360 gland for brass valves
- PTFE/ASTM D1710 backup ring and silicone-based lubricant for all O-rings except ethylene propylene, which requires a polyethylene/ASTM D4020 backup ring, and molybdenum disulfide with hydrocarbon-based lubricant
- O-ring.

O-Ring Material	Temperature Rating °F (°C)	O-Ring Designator	Kit Designator	Kit Basic Ordering Number
Buna C	–65 to 250 (–53 to 121)	-BC	BC70	-9K-O (O and 20 series)
Buna N	–20 to 250 (–28 to 121)	-B	BN70	-9K-14 (1 series, 0.172 in. orifice)
Ethylene propylene		-E	EP70	
Fluorocarbon FKM	–20 to 450 (–28 to 232)	-V	VA70	-9K-16 (1 series, 0.250 in. orifice)
Kalrez®	10 to 350 (–12 to 176)	-KZ	KZ00	
Silicone	–20 to 250 (–28 to 121)	-SI	SI70	-9K-18 (18 series)

Valves with O-Ring Stem Seals

Add an O-ring designator to the ordering number.

Examples: SS-ORS2**-BC**
SS-20KF4**-B**

O-Ring Maintenance Kits

Maintenance kits contain O-ring, backup ring, lubricant, and instructions.

To order, add a kit designator to a kit basic ordering number.

Example: **BC70-9K-O**

Options and Accessories

Handles

- O and 1 series valves—black phenolic round handles are standard; colored phenolic, 316 SS bar, and anodized black aluminum bar handles are optional.
- 18 series valves—anodized black aluminum bar handles are standard; phenolic round and 316 SS bar handles are optional.
- 20K series valves—anodized black aluminum knob handles are standard; phenolic round, 316 SS bar, and anodized black aluminum bar handles are optional.
- 20V and 26 series valves—316 SS bar handles are standard; phenolic round and anodized black aluminum bar handles are optional.

Valves with Optional Handles

Add a handle designator to the ordering number.

Handle	Designator (O and 1 Series)	Designator (18, 20, and 26 Series)	Kit Color Designator
Black phenolic	-BK	-BKP	-BK
Blue phenolic	-BL	-BLP	-BL
Green phenolic	-GR	-GRP	-GR
Orange phenolic	-OG	-OGP	-OG
Red phenolic	-RD	-RDP	-RD
Yellow phenolic	-YW	-YWP	-YW
316 SS bar	-SH	-SH	—
Anodized black aluminum bar	-BKB	-BKB	—

Examples:
SS-ORS2-**BL**
SS-20KF4-**SH**

Handle Kits

Handle kits contain handle and instructions. Select a handle kit ordering number.

For colored phenolic handles, replace **BK** in the ordering number with a kit color designator.

Valve Series	Orifice in. (mm)	Handle Kit Ordering Numbers		
		Black Phenolic	Black Aluminum Bar	316 SS Bar
O	All	PH-5K-OK-BK	A-5K-14B-BK	SS-5K-14B
1	0.172 (4.4)	PH-5K-14K-BK		
	0.250 (6.4)	PH-5K-4K-BK	A-5K-6NB-BK	SS-5K-6NB
18	All	PH-5K-7K-BK	A-5K-18B-BK	SS-5K-7B
20	All	PH-5K-14K-BK	A-5K-14B-BK	SS-5K-14B
26	All	PH-5K-4K-BK	A-5K-6NB-BK	SS-5K-6NB

Example: PH-5K-OK-**BL**

To order an anodized black aluminum knob handle kit for the 20K series valve, use ordering number **A-5K-20K-BK.**

Sour Gas Service

Integral-bonnet needle valves with female NPT, female ISO, and male NPT end connections are available for sour gas service. Stem and lower gland are alloy 400. Materials are selected in accordance with NACE MR0175/ISO 15156. See the NACE specification for information on stainless steel tube fitting requirements.

To order, add **-SG** to the ordering number.

Example: SS-ORF2-**SG**

Special Cleaning and Packaging (SC-11)

To order integral-bonnet needle valves cleaned and packaged in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* catalog, MS-06-63, to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, add **-SC11** to the valve ordering number.

Example: SS-ORS2-**SC11**

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, refer to *Oxygen System Safety* technical report, MS-06-13.

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Caution: Do not mix or interchange parts with those of other manufacturers.

Swagelok

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Instrument Manifold Systems

Instrument, Direct, and Remote-Mount Manifolds and Modular Systems

- V, VB, and VL series 2-, 3-, and 5-valve instrument manifolds
- VE series 2-, 3-, and 5-valve direct-mount manifolds
- 2-valve remote-mount manifolds
- Mod 85 modular instrumentation systems
- Low Emissions certification per API 624 available for direct- and remote-mount manifolds and Mod 85 systems

Swagelok

Contents

V, VB, and VL Series Instrument Manifolds

Manifold Features

Swagelok offers a variety of 2-, 3-, and 5-valve instrument manifolds. The 2-valve manifolds are designed for static pressure and liquid level applications; the 3- and 5-valve manifolds are designed for differential pressure applications.

These manifolds are available in traditional and compact body designs. Manifold connections include female Swagelok® tube fittings, pipe ends (NPT and ISO 228/1), and flanges (MSS SP-99) in 1/2 and 3/4 in. and 12 mm sizes.

Body Design

- All 316 stainless steel.
- One-piece construction provides strength.
- Designed with 4:1 design factor.

Bonnet-to-Body Seal

- Metal-to-metal seal eliminates the need for O-ring seals.

Traditional Body

Compact Body

Safety Stop Pin

- 316 stainless steel pin prevents detachment of the bonnet from the body due to vibration.
- Design is vibration tested to MIL-STD 167-1, Sections 5.1.2.4.2 through 5.1.2.4.6.

Mounting Options

- 2 1/8 in. (54 mm) port center lines for direct instrument mounting with flange connections.
- Remote mounting with female Swagelok tube fitting and NPT connections.

Internal Finish

- Burr-free threads and internal surfaces reduce leaks, promoting accurate transmitter readings.

Flange Connections

- Flange design meets the requirements of MSS SP-99.
- Standard flange seal is a fluorocarbon FKM O-ring.
- Flange seals and flange bolts are included with manifold.

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

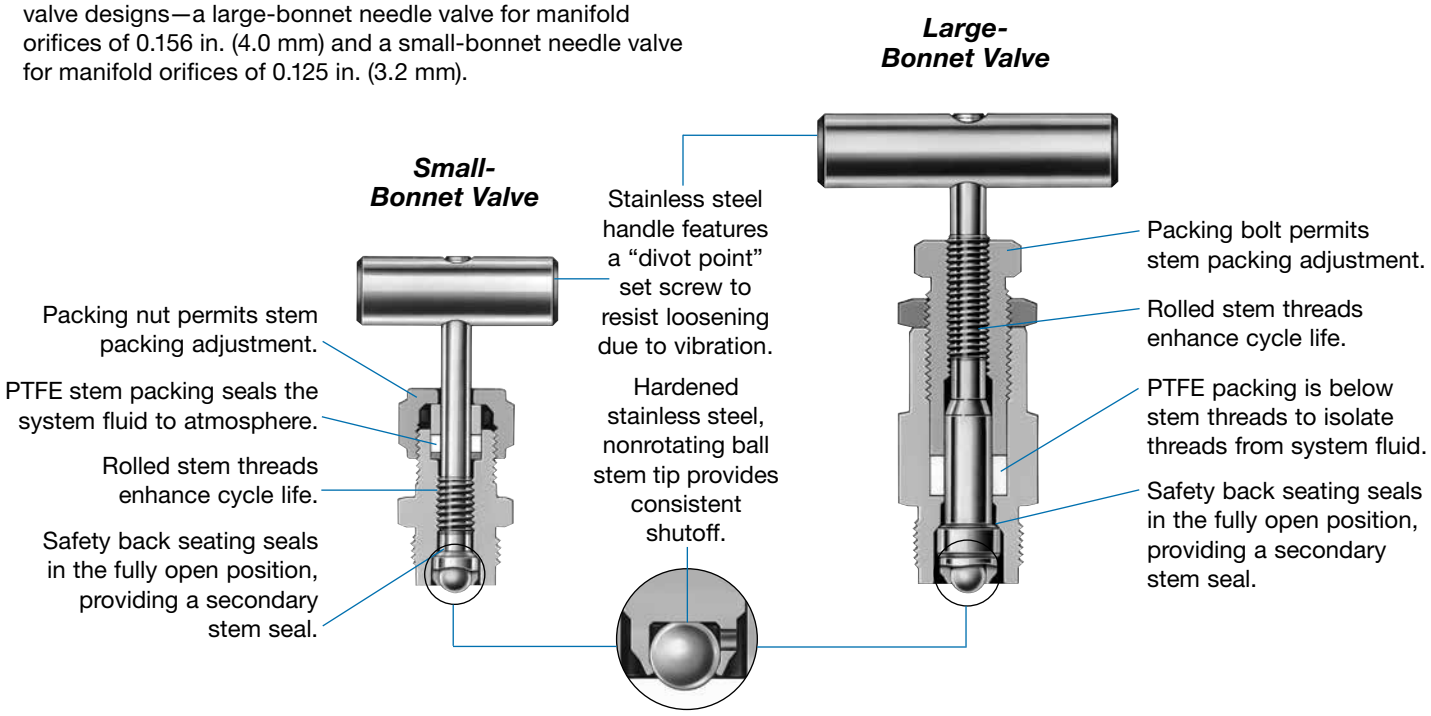
⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

Valve Features

The flow through a Swagelok manifold is controlled by a series of stainless steel needle valves. Each valve has a specific function—to block pressure, to bleed off pressure, or to equalize pressure—depending on its location on the manifold.

The control of all these functions is shared by two needle valve designs—a large-bonnet needle valve for manifold orifices of 0.156 in. (4.0 mm) and a small-bonnet needle valve for manifold orifices of 0.125 in. (3.2 mm).

On both designs, the stem packing is externally adjustable in the open position. PTFE is the standard packing material; optional Grafoil packing is available for high-temperature applications.



Technical Data

Traditional Body Manifolds

Orifice Size (isolation valve)	0.125 in. (3.2 mm) for all 2-valve V series
	0.156 in. (4.0 mm) for all others
Weight	2-valve: 2.0 to 3.5 lb (0.9 to 1.6 kg)
	3-valve: 3.2 to 6.4 lb (1.5 to 2.9 kg)
	5-valve: 6.0 to 8.0 lb (2.7 to 3.6 kg)

Compact Body Manifolds

Orifice Size	Vent valves—0.125 in. (3.2 mm)
	Isolation valves—0.156 in. (4.0 mm)
Weight	Block and bleed valves—2.75 to 3.00 lb (1.25 to 1.36 kg)
	Double block and bleed valves—3.10 to 3.35 lb (1.41 to 1.52 kg)

Pressure-Temperature Ratings①

ASME Class	**2500**
Material Group	**2.2**
Material Name	**316 SS**
Temperature °F (°C)	**Working Pressure** psig (bar)
–65 (–53) to 100 (37)	6000 (413)
200 (93)	5160 (355)
250 (121)	4910 (338)
300 (148)	4660 (321)
350 (176)	4470 (307)
400 (204)	4280 (294)
450 (232)	4130 (284)
500 (260)	3980 (274)
550 (287)	3870 (266)
600 (315)	3760 (259)
650 (343)	3700 (254)
700 (371)	3600 (248)
750 (398)	3520 (242)
800 (426)	3460 (238)
850 (454)	3380 (232)
900 (482)	3280 (225)
950 (510)	3220 (221)
1000 (537)	3030 (208)
1050 (565)	3000 (206)
1100 (593)	2685 (184)
1150 (621)	2285 (157)
1200 (648)	1715 (118)

① Ratings based on optional Grafoil packing. Ratings limited to:
- –20 to 450°F (–28 to 232°C) with standard fluorocarbon FKM flange seals.
- 450°F (232°C) with standard PTFE packing.
- 1000°F (537°C) with Grafoil packing and MSS flange end connection.

V and VL Series 2-Valve Manifolds

Materials of Construction

Materials for pressure-containing wetted parts are in compliance with ASME B31.1.

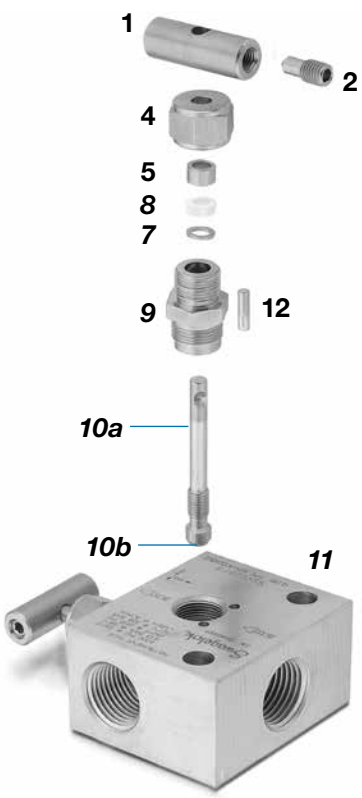
Component		Material Grade/ ASTM Specification
1	Handle①	316 SS/A479
2	Set screw	
3	Packing bolt	
4	Packing nut	
5	Upper gland	
6	Jam nut	316 SS/A276
7	*Lower gland*	*316 SS/A240 or A167*
8	*Packing*	*PTFE/D1710*
9	*Bonnet*	*316 SS/A479*
10a	*Stem*	*316 SS/A276*
10b	*Ball tip*	*316 SS/A479*
11	*Body*	
12	Stop pin	316 SS/A479
	Flange seals (not shown)	*Fluorocarbon FKM*
	Flange bolts (not shown)	B8M CL.2B/A193
	Lubricants	*Fluorinated base with PTFE and tungsten disulfide*
		Hydrocarbon-based

Wetted components listed in *italics.*

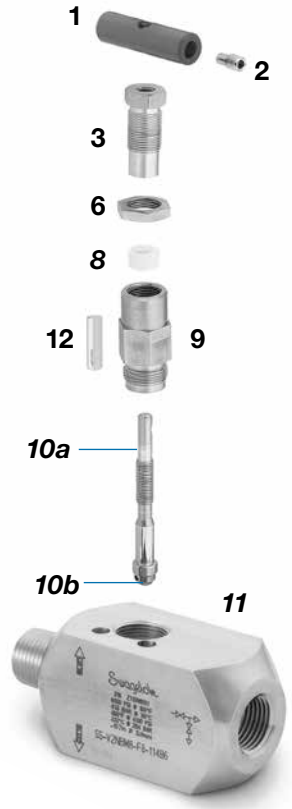
① Isolation valve handles of compact models are blue enamel coated.

V Series

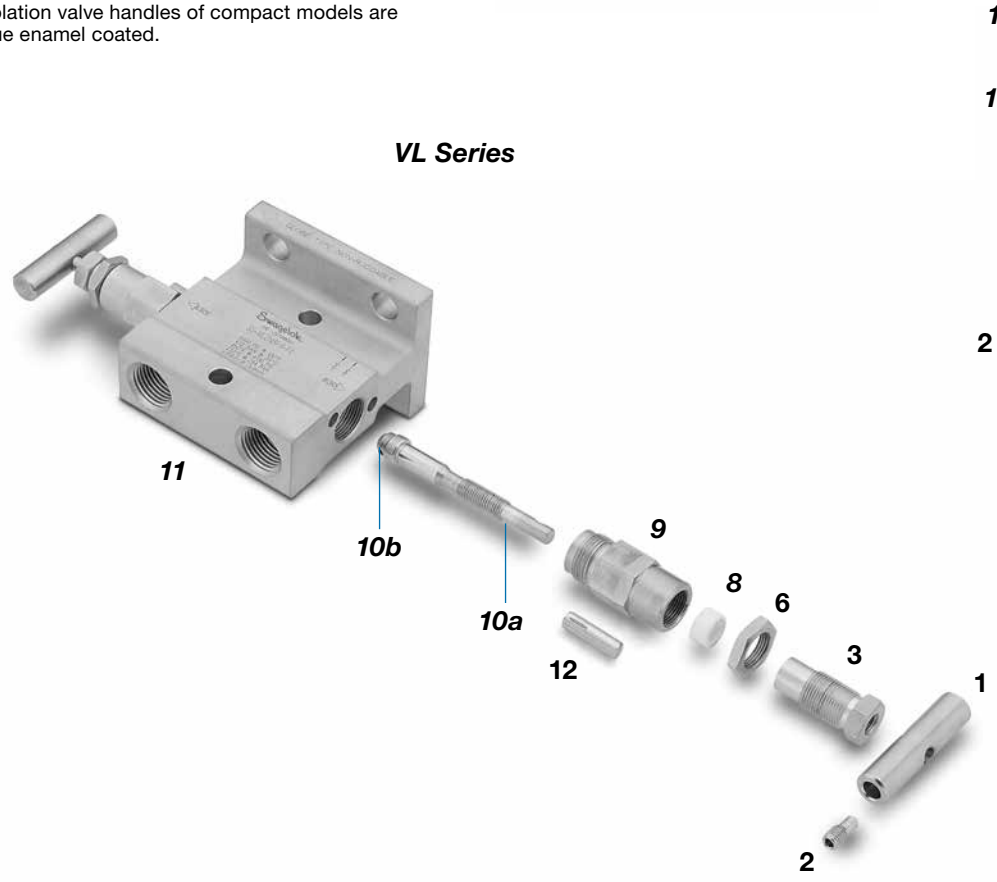
Traditional Body



Compact Body

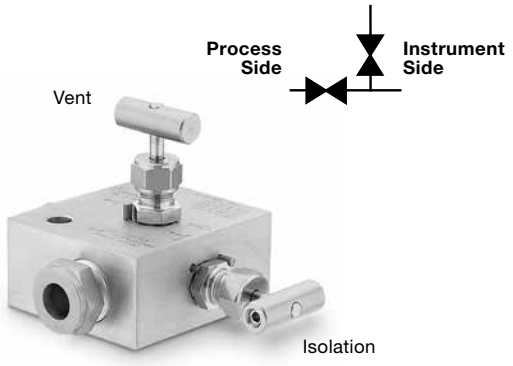


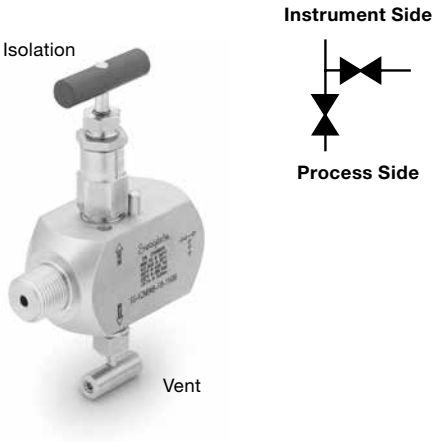
VL Series



V and VL Series 2-Valve Manifolds

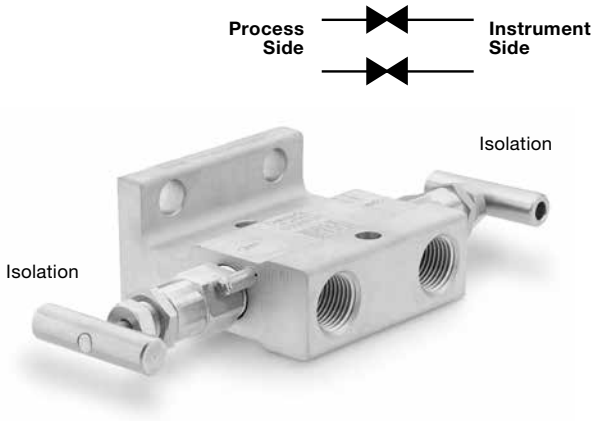
V Series





- Allows for block and bleed (or calibration) of a gauge- or absolute-pressure transmitter or gauge
- Consists of one isolation valve and one vent valve
- End connections—1/2 in. and 12 mm female Swagelok® tube fitting; 1/2 in. female pipe (NPT); flange (MSS)
- Direct instrument mount and remote mount

VL Series



- Designed for liquid level applications
- Consists of two isolation valves operating in parallel to shut off either one of the two process lines through the manifold
- No equalizing passage through the manifold
- End connections—1/2 in. female pipe (NPT) to flange
- Direct instrument mount

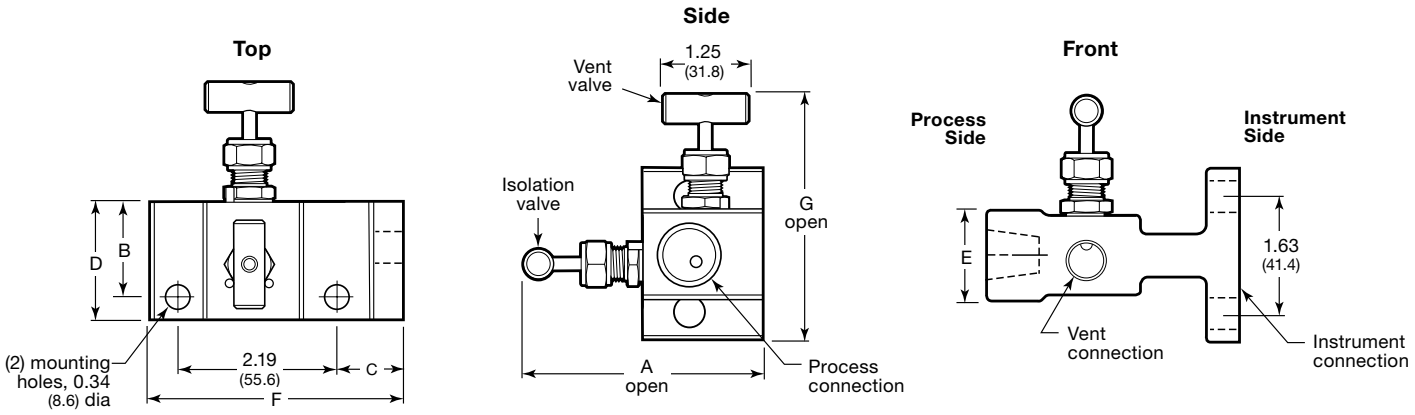
V and VL Series 2-Valve Manifolds

Ordering Information and Dimensions

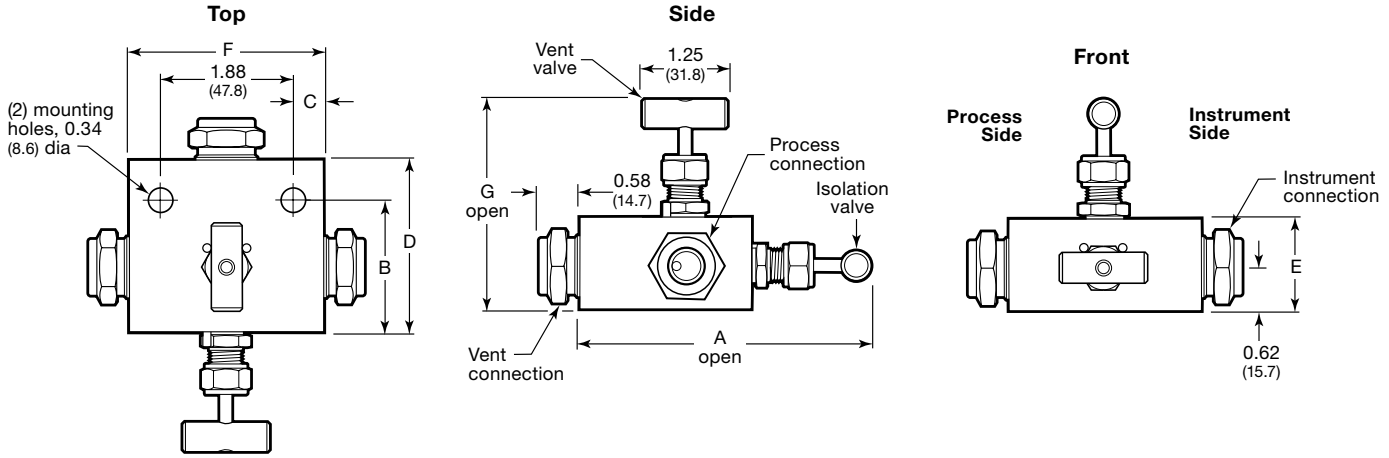
Dimensions, in inches (millimeters), are for reference only and are subject to change.

V Series

Instrument Manifolds with Flange Connections



Manifolds with Female Swagelok Tube Fitting and Pipe Connections



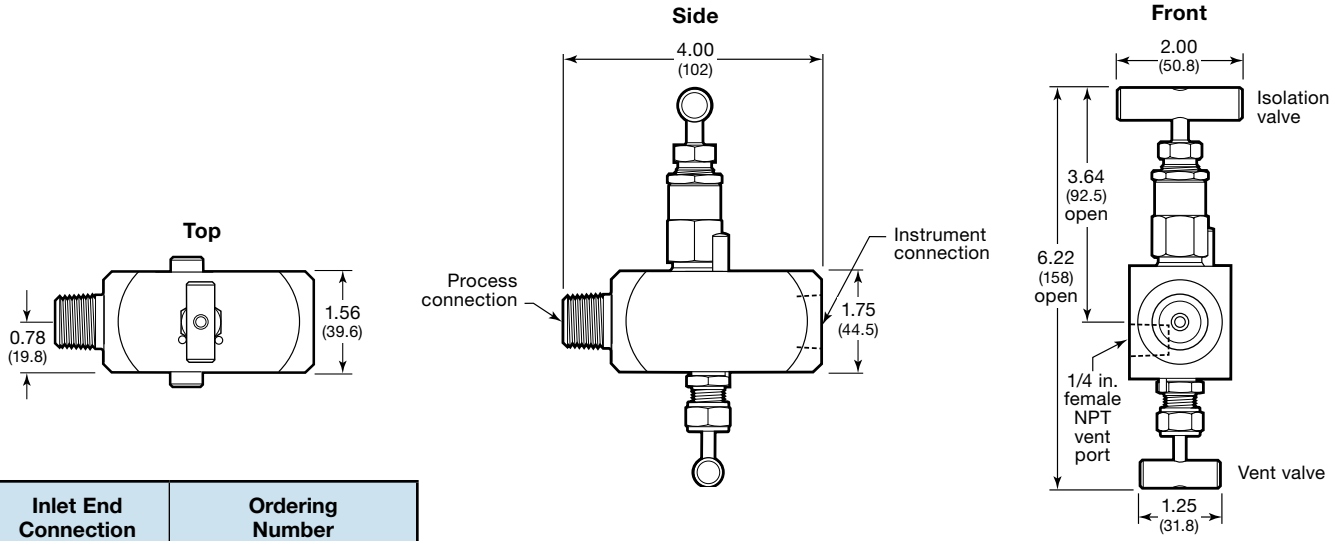
End Connections			Ordering Number	Dimensions, in. (mm)						
Process	Instrument	Vent		A	B	C	D	E	F	G
1/2 in. female Swagelok tube fitting			SS-V2BFS8	4.19 (106)	1.89 (48.0)	0.44 (11.2)	2.48 (63.0)	1.31 (33.3)	2.75 (69.9)	3.05 (77.5)
1/2 in. female Swagelok tube fitting	Flange (MSS)	1/4 in. female NPT	SS-V2BFS8-FL	3.36 (85.3)	1.31 (33.3)	0.90 (22.9)	1.63 (41.4)	1.25 (31.8)	3.46 (87.9)	3.48 (88.4)
12 mm female Swagelok tube fitting			SS-V2BFS12MM	4.19 (106)	1.89 (48.0)	0.44 (11.2)	2.48 (63.0)	1.31 (33.3)	2.75 (69.9)	3.05 (77.5)
12 mm female Swagelok tube fitting	Flange (MSS)	1/4 in. female NPT	SS-V2BFS12MM-FL	3.36 (85.3)	1.31 (33.3)	0.90 (22.9)	1.63 (41.4)	1.25 (31.8)	3.46 (87.9)	3.48 (88.4)
1/2 in. female NPT			SS-V2BF8	3.82 (97.0)	1.62 (41.1)	0.31 (7.9)	2.12 (53.8)	1.31 (33.3)	2.50 (63.5)	3.05 (77.5)
1/2 in. female NPT	Flange (MSS)	1/4 in. female NPT	SS-V2BF8-FL	3.36 (85.3)	1.31 (33.3)	0.90 (22.9)	1.63 (41.4)	1.25 (31.8)	3.48 (88.4)	3.48 (88.4)

V and VL Series 2-Valve Manifolds

Ordering Information and Dimensions

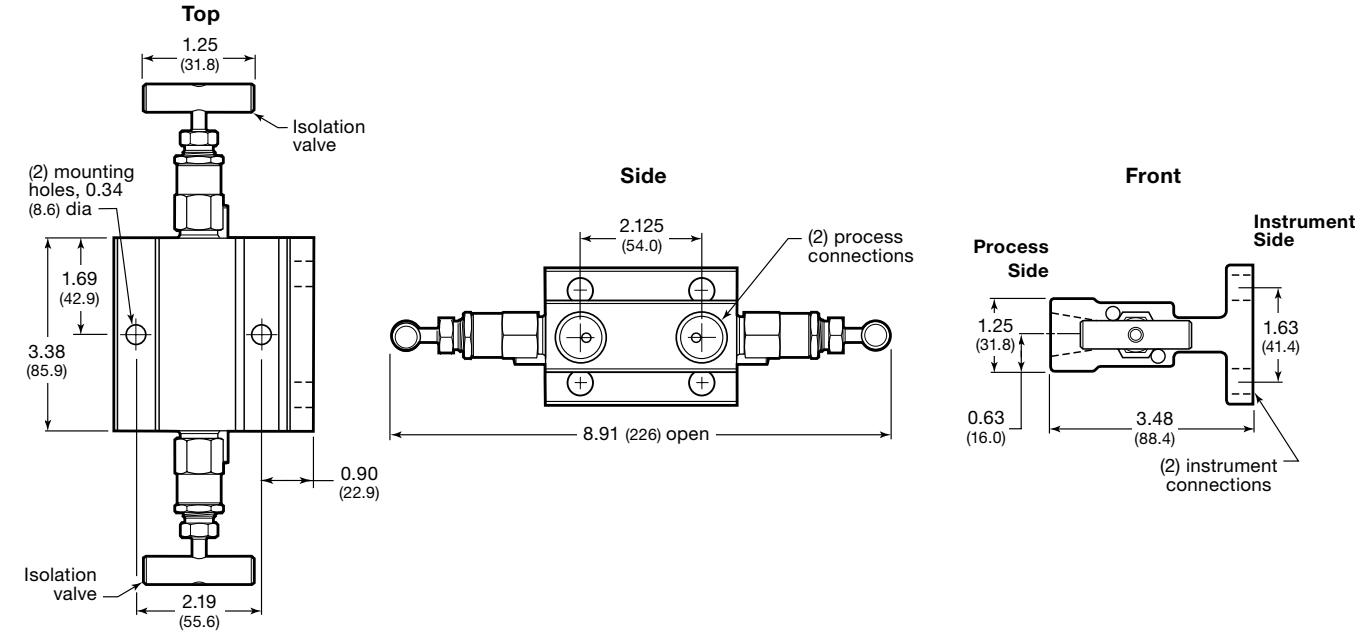
Dimensions, in inches (millimeters), are for reference only and are subject to change.

V Series



Inlet End Connection	Ordering Number
1/2 in. male NPT	SS-V2NBM8-F8-11486
3/4 in. male NPT	SS-V2NBM12-F8-11486

VL Series



End Connections		Ordering Number
Process	Instrument	
1/2 in. female NPT	Flange (MSS)	SS-VL2NBF8-FL

V Series 3-Valve Manifolds

Materials of Construction

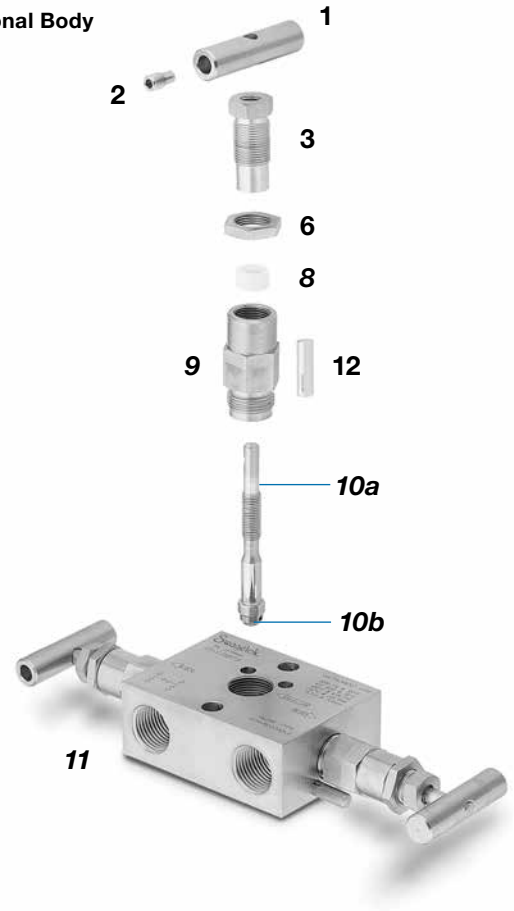
Materials for pressure-containing wetted parts are in compliance with ASME B31.1.

	Component	Material Grade/ ASTM Specification
1	Handle①	316 SS/A479
2	Set screw	
3	Packing bolt	
4	Packing nut	
5	Upper gland	
6	Jam nut	316 SS/A276
7	*Lower gland*	*316 SS/A240 or A167*
8	*Packing*	*PTFE/D1710*
9	*Bonnet*	*316 SS/A479*
10a	*Stem*	*316 SS/A276*
10b	*Ball tip*	*316 SS/A479*
11	*Body*	
12	Stop pin	316 SS/A479
	Flange seals (not shown)	*Fluorocarbon FKM*
	Flange bolts (not shown)	B8M CL.2B/A193
	Lubricants	*Fluorinated base with PTFE and tungsten disulfide*
		Hydrocarbon-based

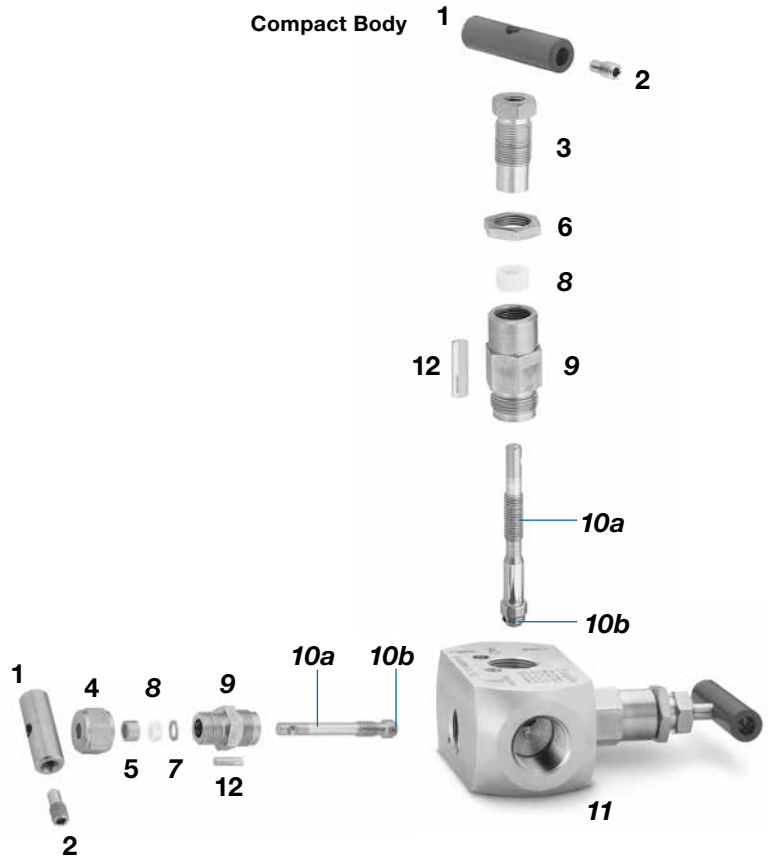
Wetted components listed in *italics.*

① Isolation valve handles of compact models are blue enamel coated.

Traditional Body



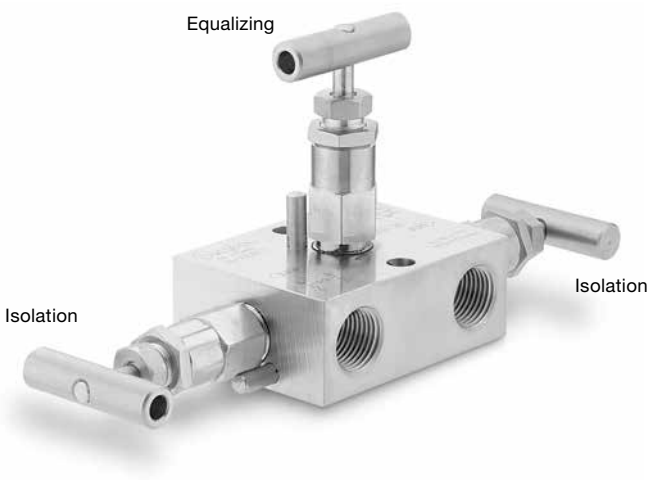
Compact Body



V Series 3-Valve Manifolds

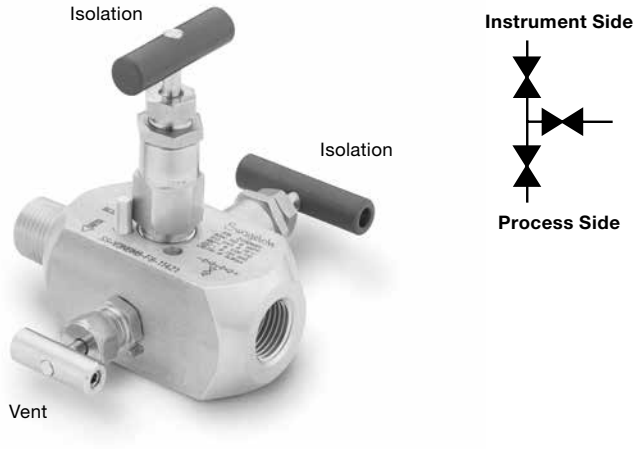
Traditional Body

- Designed for mounting on differential pressure transmitters with 2 1/8 in. (54 mm) center-to-center connections
- Consists of two isolation valves and one equalizing valve
- End connections—1/2 in. and 12 mm female Swagelok tube fitting, 1/2 in. female pipe (NPT), and flange (MSS)
- Instrument flange mount and remote mount



Compact Body

- Allows for block and bleed (or calibration) of a gauge or absolute pressure transmitter or gauge
- Consists of two isolation valves and one vent valve
- End connections—1/2 in. female pipe (NPT)
- Direct instrument mount and remote mount

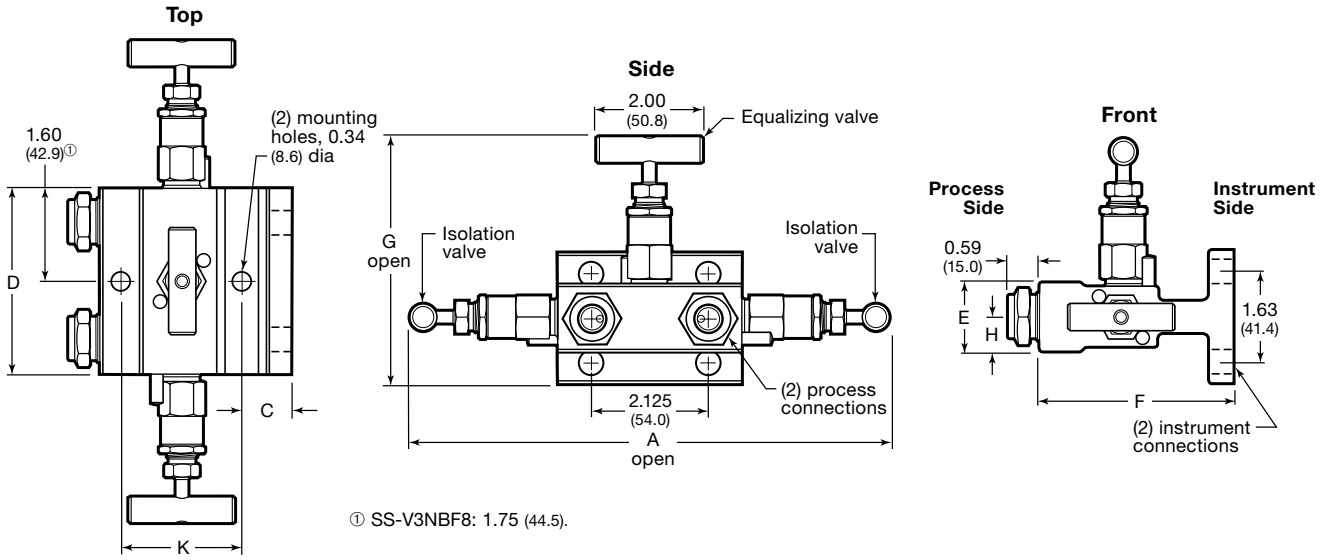


V Series 3-Valve Manifolds

Ordering Information and Dimensions

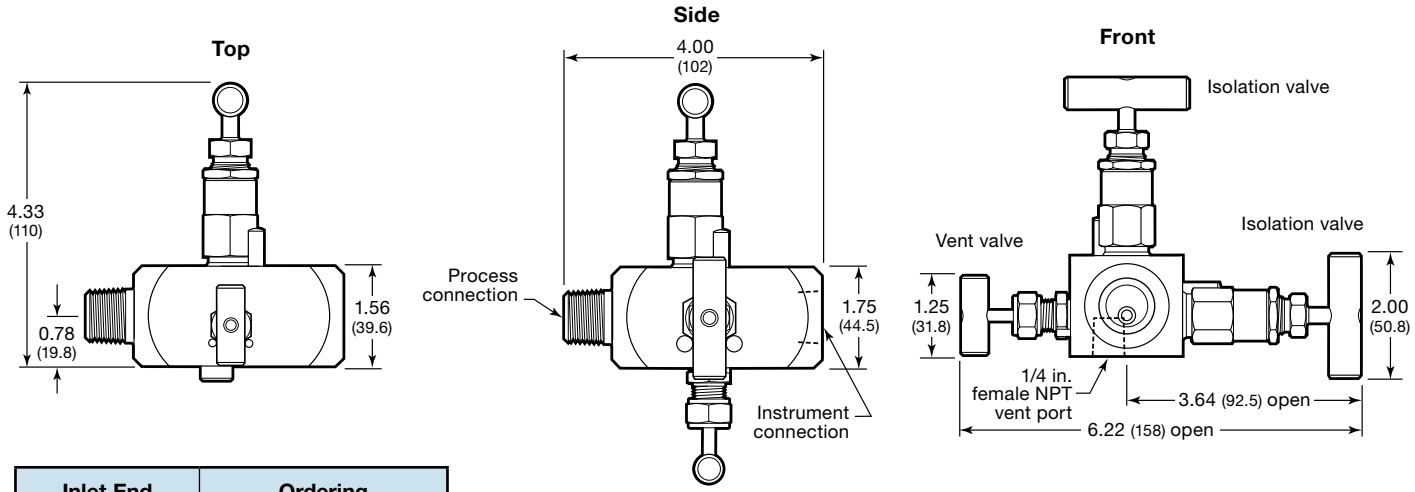
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Manifold with Female Swagelok Tube Fitting-To-Flange Connections



① SS-V3NBF8: 1.75 (44.5).

End Connections		Ordering Number	Dimensions, in. (mm)							
Process	Instrument		A	C	D	E	F	G	H	K
1/2 in. female NPT		SS-V3NBF8	9.03 (229)	0.31 (7.9)	3.50 (88.9)	1.31 (33.3)	2.50 (63.5)	4.08 (104)	0.66 (16.8)	1.88 (47.8)
1/2 in. female NPT	Flange (MSS)	SS-V3NBF8-FL	8.91 (226)	0.90 (22.9)	3.38 (85.9)	1.25 (31.8)	3.48 (88.4)	4.51 (115)	0.63 (16.0)	2.19 (55.6)
1/2 in. female Swagelok tube fitting		SS-V3NBFS8		0.46 (11.7)		1.31 (33.3)	3.04 (77.2)	4.08 (104)	0.66 (16.8)	1.88 (47.8)
1/2 in. female Swagelok tube fitting	Flange (MSS)	SS-V3NBFS8-FL		0.90 (22.9)		1.25 (31.8)	3.48 (88.4)	4.51 (115)	0.63 (16.0)	2.19 (55.6)
12 mm female Swagelok tube fitting		SS-V3NBFS12MM		0.46 (11.7)		1.31 (33.3)	3.04 (77.2)	4.08 (104)	0.66 (16.8)	1.88 (47.8)
12 mm female Swagelok tube fitting	Flange (MSS)	SS-V3NBFS12MM-FL		0.90 (22.9)		1.25 (31.8)	3.48 (88.4)	4.51 (115)	0.63 (16.0)	2.19 (55.6)
Flange (MSS)		SS-V3NBFL				2.40 (61.0)	4.07 (103)	4.55 (116)	1.20 (30.5)	1.88 (47.8)



Inlet End Connection	Ordering Number
1/2 in. male NPT	SS-V3NBM8-F8-11421
3/4 in. male NPT	SS-V3NBM12-F8-11421

V and VB Series 5-Valve Manifolds

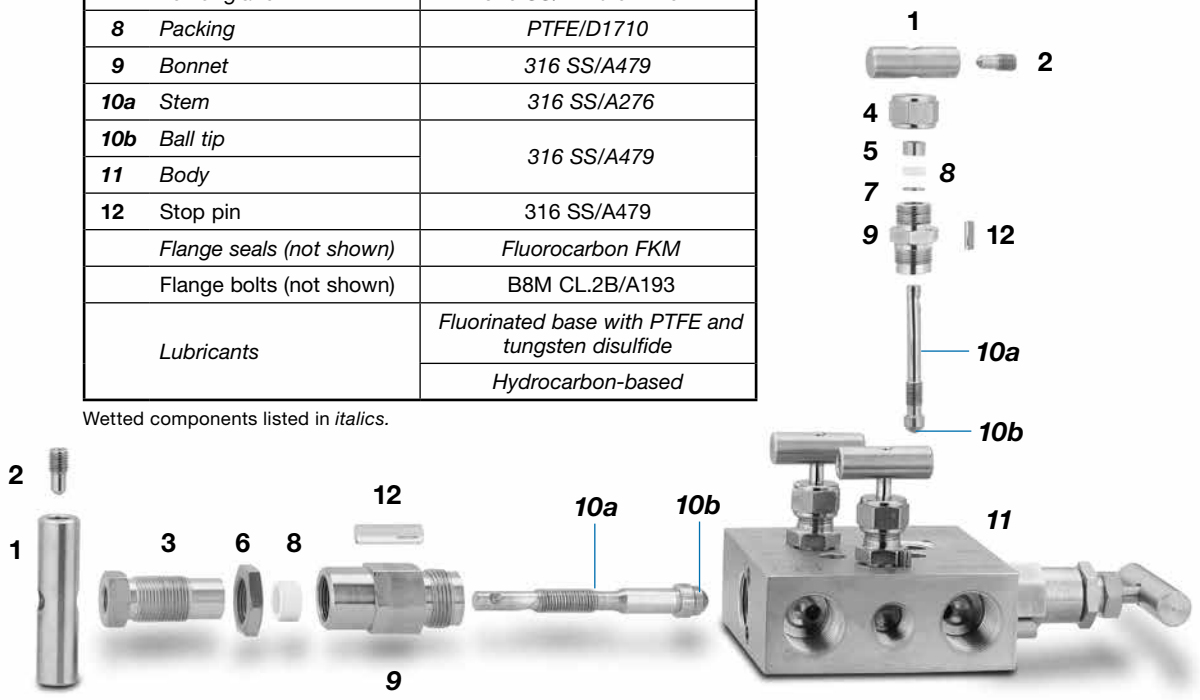
- 1/2 in. and 12 mm female Swagelok tube fittings, 1/2 in. female pipe (NPT), and flange (MSS) end connections
- Instrument flange mount and remote mount

Materials of Construction

Materials for pressure-containing wetted parts are in compliance with ASME B31.1.

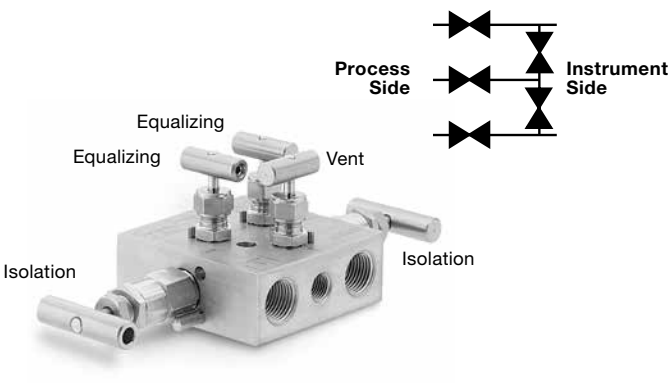
Component		Material Grade/ ASTM Specification
1	Handle	316 SS/A479
2	Set screw	
3	Packing bolt	
4	Packing nut	
5	Upper gland	
6	Jam nut	316 SS/A276
7	*Lower gland*	*316 SS/A240 or A167*
8	*Packing*	*PTFE/D1710*
9	*Bonnet*	*316 SS/A479*
10a	*Stem*	*316 SS/A276*
10b	*Ball tip*	*316 SS/A479*
11	*Body*	
12	Stop pin	316 SS/A479
	Flange seals (not shown)	*Fluorocarbon FKM*
	Flange bolts (not shown)	B8M CL.2B/A193
	Lubricants	*Fluorinated base with PTFE and tungsten disulfide*
		Hydrocarbon-based

Wetted components listed in *italics*.



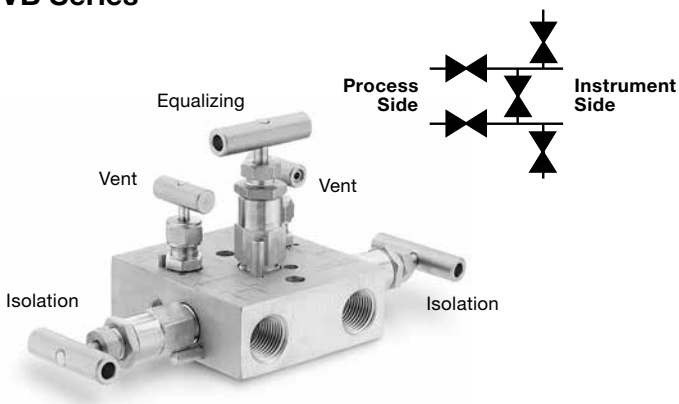
V series body shown.

V Series



- Designed for mounting on differential pressure transmitters where a double-equalize function is required
- Consists of two isolation valves, two equalizing valves, and one vent valve

VB Series



- Designed for mounting on differential pressure transmitters where a double-bleed function is required.
- Consists of two isolation valves, two vent valves, and one equalizing valve

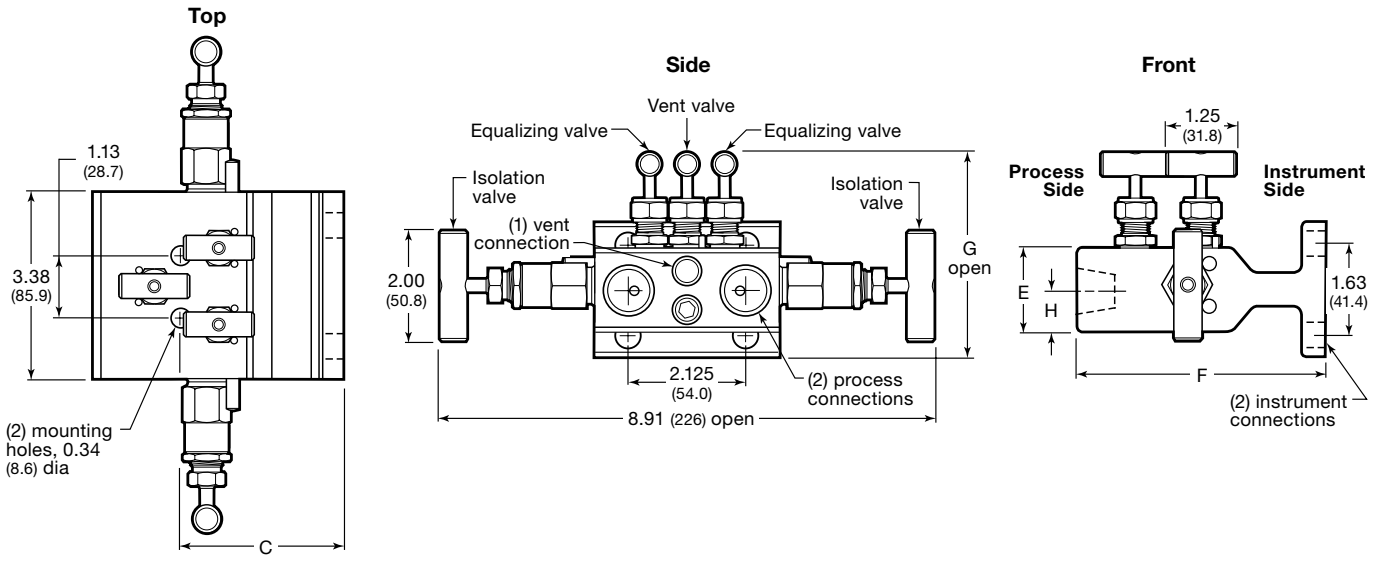
V and VB Series 5-Valve Manifolds

Ordering Information and Dimensions

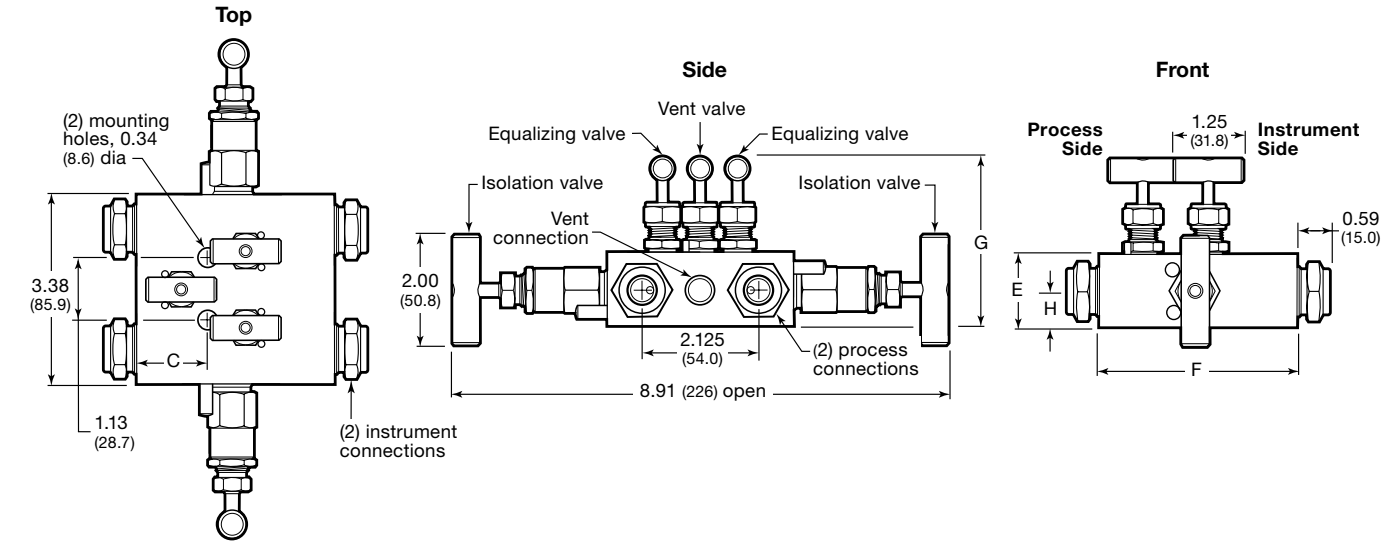
Dimensions, in inches (millimeters), are for reference only and are subject to change.

V Series

Direct Instrument Mount Manifolds with Flange Connections



Manifolds with Female Swagelok Tube Fitting and Pipe Connections



End Connections			Ordering Number	Dimensions, in. (mm)				
Process	Instrument	Vent		C	E	F	G	H
1/2 in. female Swagelok tube fitting		1/4 in. female NPT	SS-V5NBFS8	1.28 (32.5)	1.31 (33.3)	3.55 (90.2)	3.05 (77.5)	0.63 (16.0)
1/2 in. female Swagelok tube fitting	Flange (MSS)		SS-V5NBFS8-FL	2.88 (73.2)	1.49 (37.8)	4.43 (114)	3.64 (92.5)	0.75 (19.1)
12 mm female Swagelok tube fitting			SS-V5NBFS12MM	1.28 (32.5)	1.31 (33.3)	3.55 (90.2)	3.05 (77.5)	0.63 (16.0)
12 mm female Swagelok tube fitting	Flange (MSS)		SS-V5NBFS12MM-FL	2.88 (73.2)	1.49 (37.8)	4.43 (114)	3.64 (92.5)	0.75 (19.1)
1/2 in. female NPT			SS-V5NBF8	1.42 (36.0)	1.31 (33.3)	3.62 (91.9)	3.05 (77.5)	0.63 (16.0)
1/2 in. female NPT	Flange (MSS)		SS-V5NBF8-FL	2.88 (73.2)	1.49 (37.8)	4.47 (114)	3.66 (93.0)	0.75 (19.1)
Flange (MSS)		1/8 in. female NPT	SS-V5NBFL	2.98 (75.7)	1.50 (38.1)	5.00 (127)		—

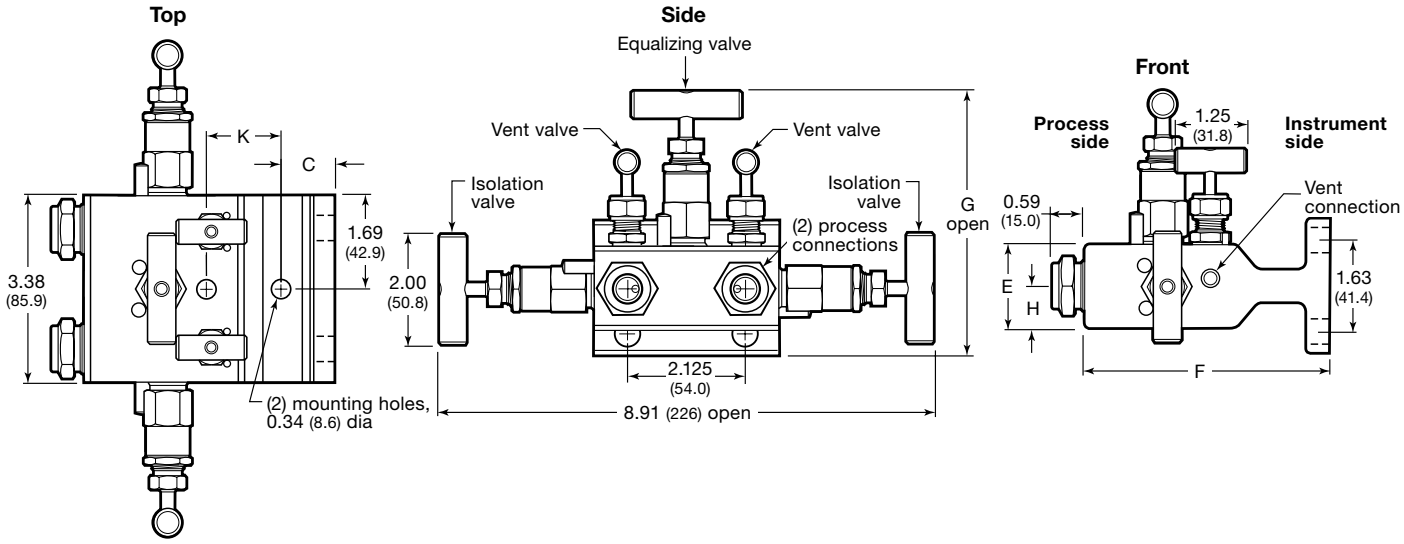
V and VB Series 5-Valve Manifolds

Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

VB Series

Manifold With Female Swagelok Tube Fitting-To-Flange Connections



End Connections			Ordering Number	Dimensions, in. (mm)					
Process	Instrument	Vent		C	E	F	G	H	K
1/2 in. female NPT		1/8 in. female NPT	SS-VB5NBF8	1.22 (31.0)	1.31 (33.3)	3.62 (91.9)	4.10 (104)	0.61 (15.5)	1.88 (47.8)
1/2 in. female NPT	Flange (MSS)		SS-VB5NBF8-FL	0.94 (23.9)	1.49 (37.8)	4.47 (114)	4.76 (121)	0.75 (19.1)	1.35 (34.3)
1/2 in. female Swagelok tube fitting			SS-VB5NBFS8	1.22 (31.0)	1.31 (33.3)	3.65 (92.7)	4.10 (104)	0.61 (15.5)	1.88 (47.8)
1/2 in. female Swagelok tube fitting	Flange (MSS)		SS-VB5NBFS8-FL	0.94 (23.9)	1.49 (37.8)	4.43 (113)	4.76 (121)	0.75 (19.1)	1.35 (34.3)

Testing

Every Swagelok V, VB, and VL series instrument manifold is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min.

Shell testing is performed with a liquid leak detector to a requirement of no detectable leakage.

Cleaning and Packaging

Every Swagelok V, VB, and VL series instrument manifold is cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)* catalog, MS-06-62.

Options

High-Temperature Packing

- Grafoil valve packing material for high-temperature service. See **Pressure-Temperature Ratings,** page 3.
- Includes Grafoil flange seals on MSS flanges.

To order a manifold with optional Grafoil packing, add **-G** to the manifold ordering number.

Example: SS-V3NBF8-FL-**G**

Flange Seal Materials

- MSS flange seals are available in Grafoil, virgin PTFE, and reinforced PTFE for system compatibility.
- Temperature ratings are included in the table below.

To order a manifold with an optional MSS flange seal material, add a material designator to the manifold ordering number.

Example: SS-V3NBF8-FL-**T**

MSS Flange Seal Material	Material Designator	Lubricant/ Sealant	Temperature Rating °F (°C)	Packing Material
Fluorocarbon FKM	—	Silicone base	–20 to 450 (–28 to 232)	PTFE
Grafoil	-G	Fluorinated base	–65 to 1000 (–53 to 537)	Grafoil
Virgin PTFE	-T	Silicone base	–65 to 250 (–53 to 121)	PTFE
Reinforced PTFE	-TRL			PTFE

Mounting Kits

Mounting Bracket Kit

Kit contains stainless steel bracket, U-bolts, cap screws, nuts, lock washers, spacer, and instructions. Kit does not fit 3-valve manifolds with flange-to-flange end connections.

Ordering number: **SS-MB-VBK**

Steam-Trace Block Kits

Kit contains plated steel trace block with two 1/4 in. female NPT ports, cap screws, nuts, lock washers, block retainer plate, heat transfer gasket, and instructions.

Manifold Styles	Kit Ordering Number
3-valve, flange	S-MB-M3SK
3-valve, pipe-to-pipe	S-MB-M5SK
3-valve, tube-to-tube	
5-valve, all styles	

MSS Flange Fasteners

- Optional long studs or short bolts are available for special flange mounting applications. See table below for flange fastener length comparison.
- All fasteners are stainless steel with 7/16-20 threads.
- Optional fasteners are available for all V, VB, and VL series manifolds with MSS flanges.

To order a manifold with optional flange fasteners, add a fastener designator to the manifold ordering number.

MSS Flange Fasteners	Length in. (mm)	Hex Size in.	Fastener Designator
Standard hex head bolt	1.0 (25.4)	5/8	—
Long stud with hex nut	2.6 (66.0)	11/16	-LGB
Short hex head bolt	0.875 (22.2)	5/8	-SHB

Example: SS-V3NBF8-FL-**LGB**

Mounting Hole Center Line

- Elongated mounting holes on the instrument flange allow for center line installations between 2 1/8 and 2 1/4 in. (54.0 and 57.2 mm).
- Available on 3- and 5-valve V and VB series manifolds with MSS flanges.
- Pressure rating is 3600 psig at 100°F (248 bar at 37°C) and 2480 psig at 450°F (170 bar at 232°C).

To order, add **-EH** to the manifold ordering number.

Example: SS-V5NBF8-FL-**EH**

Hydrostatic Testing

Hydrostatic testing is available as an option.

To order, add **-W20** to the manifold ordering number.

Example: SS-V2BF8-**W20**

Maintenance Kits

Flange Seal and Bolt Kits

- Kit contains flange seals, flange bolts, lubricant, and instructions.
- Select a kit ordering number from the tables below based on the manifold series, flange style, and seal material.

V, VB, and VL Series with MSS Flanges

Flange Seal Material	Kit Ordering Number	
	2-Valve	3- and 5-Valve
Fluorocarbon FKM	SS-MK-V2V	SS-MK-V3V
Grafoil	SS-MK-V2G	SS-MK-V3G
Virgin PTFE	SS-MK-V2T	SS-MK-V3T
Reinforced PTFE	SS-MK-V2R	SS-MK-V3R

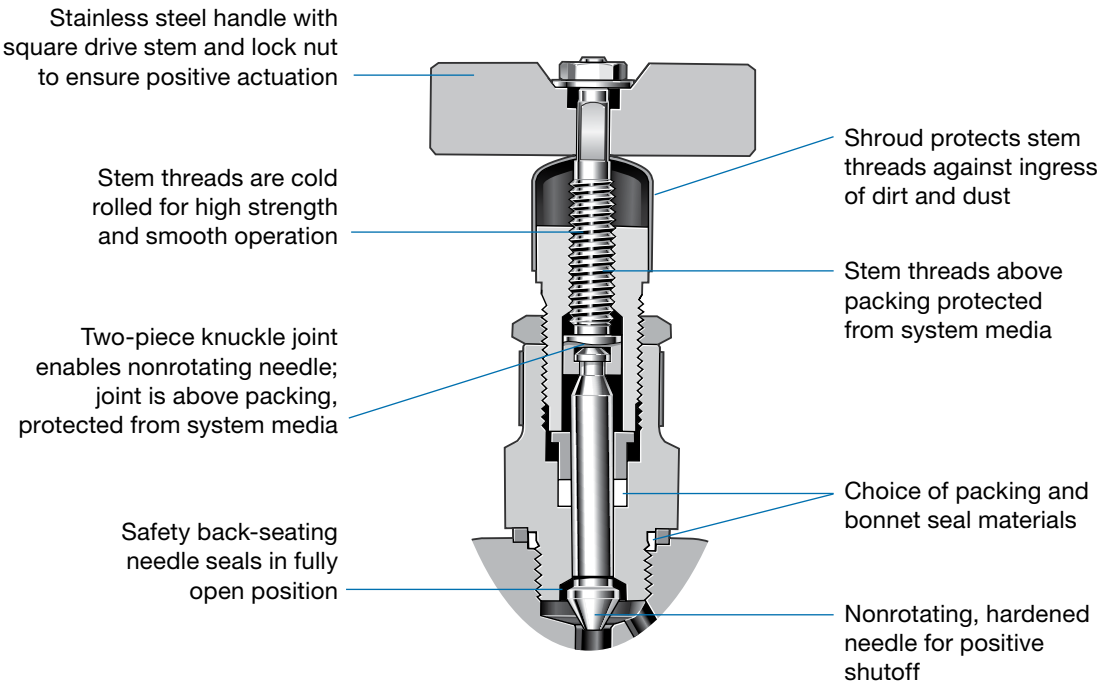
Direct- and Remote-Mount Manifolds

VE and MSBG Series Manifolds

Features

- Compact design
- Stainless steel stop pin
- Color-coded valve label rings
- Graphite packing and seals available
- Material traceability available; contact your authorized Swagelok sales and service representative.
- Low Emissions certification per API 624 available

Valve



Materials of Construction

Component	Grade/ASTM Specification
Body, bonnets	*316/316L SS/A479*
Needles	*S17400 SS/A564 Condition H1150D*
Packing, bonnet seals	*PTFE① or graphite*
Lubricant	*Molybdenum disulfide in hydrocarbon carrier*
Gland lock nuts	300 series powdered metal SS
All other components	316 SS

Wetted components listed in *italics*.

① Optional Low Emissions configuration supplied with Carbon/glass-filled PTFE.

Pressure-Temperature Ratings

Orifice Size in. (mm)	PTFE Seals		Graphite Seals	
	Temperature °F (°C)	Working Pressure psig (bar)	Temperature °F (°C)	Working Pressure psig (bar)
0.197 (5)	–58 (–50) to 200 (93)	6000 (413)	–58 (–50) to 200 (93)	6000 (413)
	201 (94) to 400 (204)	4000 (275)	201 (94) to 850 (454)	3000 (206)

Low Fugitive Emissions

The American Petroleum Institute's API 624 tests for fugitive emissions to atmosphere for direct- and remote-mount manifolds, see page 19 and 20 for ordering information. The tests are conducted at a third party lab and certify that at no point in the test did the valve leak in excess of 100 ppm of methane. Certificates stating that the manifold is certified for Low Emissions service are available. For more information, contact your authorized Swagelok sales and service representative.

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

VE Series Direct-Mount Manifolds

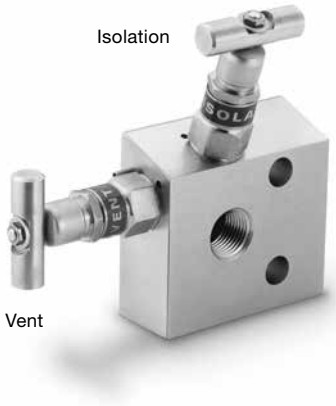
Features

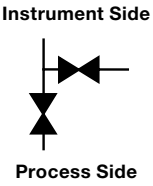
VE series manifolds mount directly to pressure and differential pressure transmitters

- MSS SP-99 and DIN EN 61518 flange connections are available
- High-tensile steel instrument bolt and PTFE seal kit are included with each manifold
- Mounting bracket kits are available

2-Valve Manifold

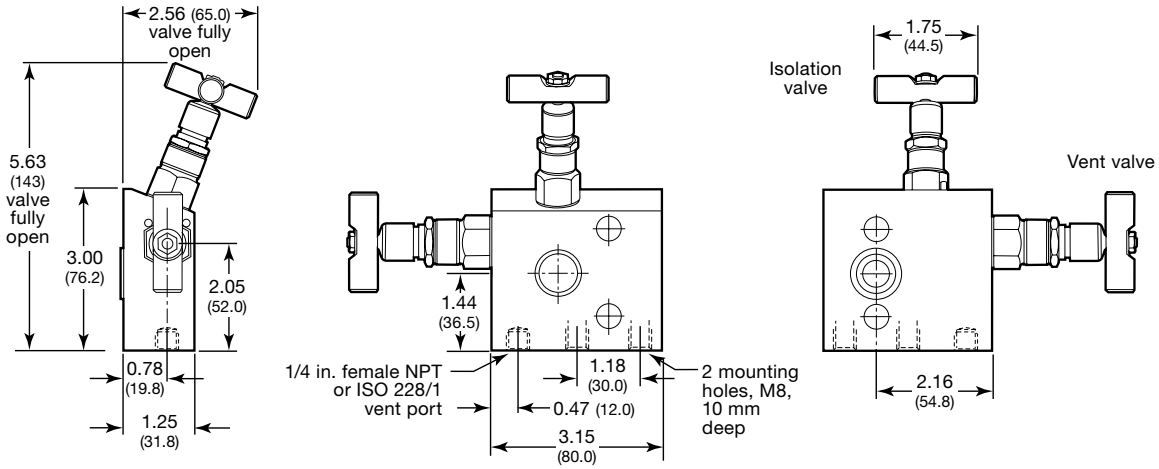
- Direct mounting to gauges, pressure switches, or absolute pressure transmitters
- Vent port
  - female NPT with NPT process connection
  - female ISO 228/1 with ISO 228/1 process connection





Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.



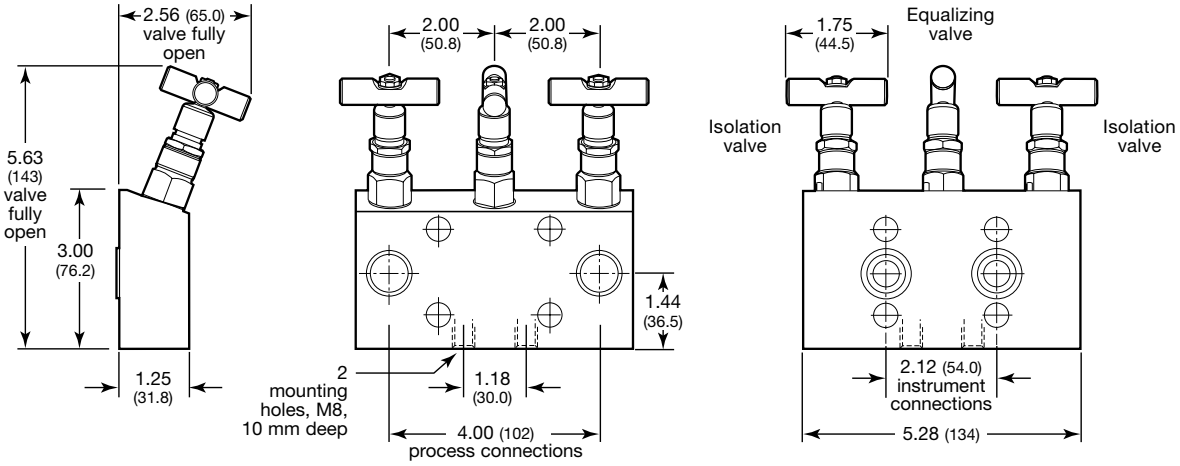
VE Series Direct-Mount Manifolds

3-Valve Manifold

- Direct mounting to instrument on 2.12 in. (54.0 mm) centers

Dimensions

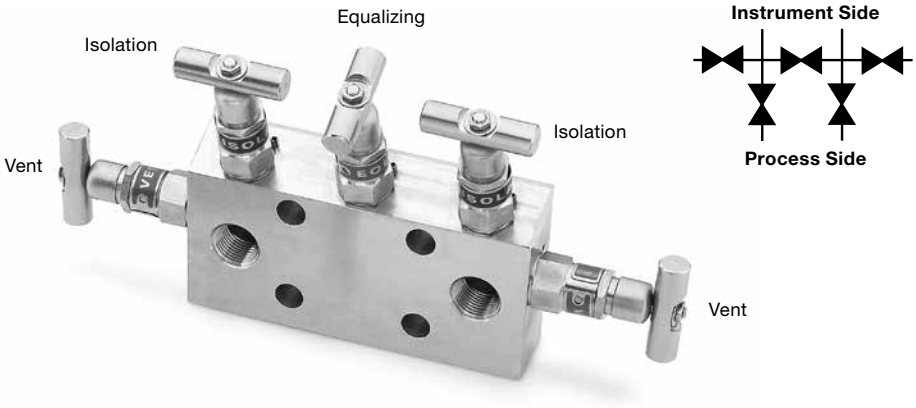
Dimensions, in inches (millimeters), are for reference only and are subject to change.



VE Series Direct-Mount Manifolds

5-Valve Manifold

- Direct mounting to instrument on 2.12 in. (54.0 mm) centers
- Two vent ports
  - female NPT with NPT process connections
  - female ISO 228/1 with ISO 228/1 process connections



Dimensions

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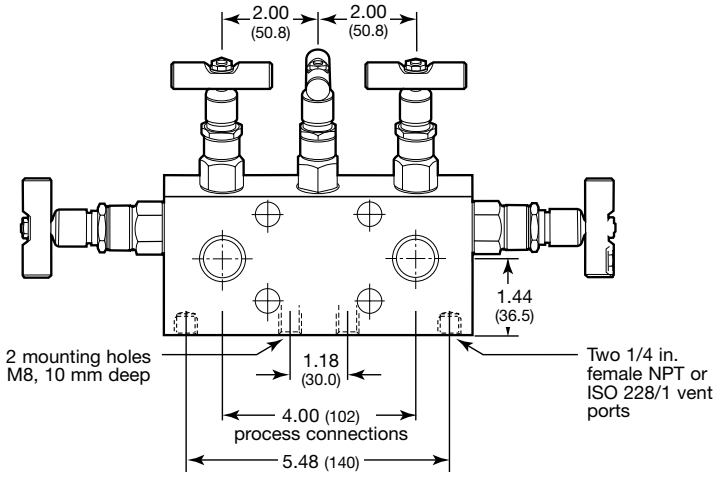
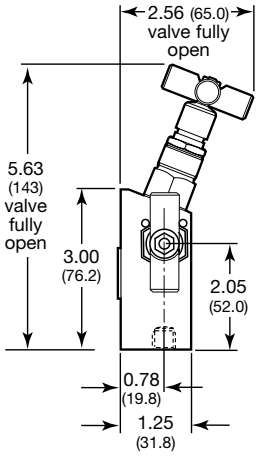
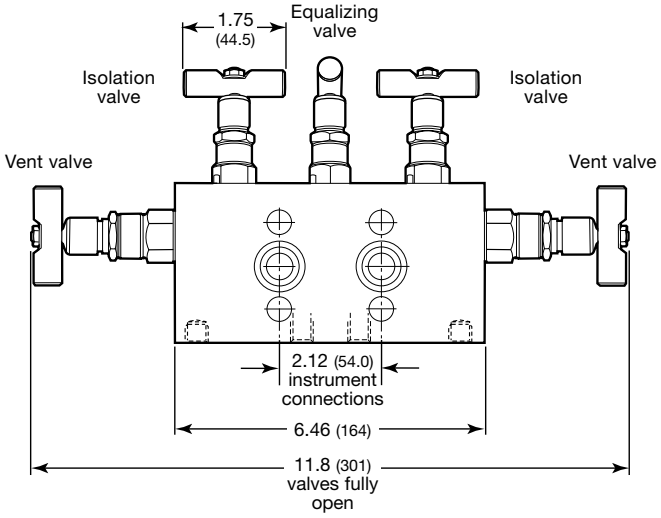






VE Series Direct-Mount Manifolds

Ordering Information

Build a direct-mount manifold ordering number by combining the designators in the sequence shown below.

A		B	C	D	E		F		G
SS	–	VE	5	V	F8	–	FD	–	AG

A Material
SS = 316 stainless steel

B Series
VE = Direct-mount manifold

C Manifold
2 = Two-valve
3 = Three-valve
5 = Five-valve

D Valve Stem
V = Nonrotating vee tip

E Process connections
F8 = 1/2 in. female NPT
F8RP = 1/2 in. female ISO 228/1 pipe

F Flange
FD = DIN/IEC 61518 Type A flange
FL = MSS flange

G Options
A = Antitamper equalizing valve①
B = Antitamper vent valve①
C = Antitamper equalizing and vent valves①
G = Graphite packing, bonnet seals, and flange seals
L = Carbon/glass-filled PTFE packing and bonnet seal (Low Emissions option)
S = Stainless steel instrument flange bolts

① Antitamper key sold separately; see page 25.

Accessories

Flange Seal and Bolt Kits

A high-tensile steel instrument bolt and PTFE seal kit is included with each VE manifold. Additional instrument bolt and seal kits may be ordered.

- Kit contains flange seals and flange bolts.
- For additional or alternative bolt and seal kits, select an ordering number from the table based on the manifold, flange, bolt material, and flange seal material.

Mounting Bracket Kit

Kit contains stainless steel bracket, U-bolts, cap screws, nuts, lock washers, spacer, and instructions.

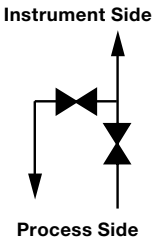
Ordering number: **SS-MB-VCBK**

Manifold	Flange	Bolt Material	Flange Seal Material	Ordering Number
2-valve	DIN	Stainless steel/ A193 B8M	PTFE	K100934-FD-S
			Graphite	K100934-FD-GS
		High-tensile steel grade S	PTFE	K100934-FD-H
			Graphite	K100934-FD-GH
	MSS	Stainless steel/ A193 B8M	PTFE	K100934-S
			Graphite	K100934-GS
		High-tensile steel grade S	PTFE	K100934-H
			Graphite	K100934-GH
3-valve, 5-valve	DIN	Stainless steel/ A193 B8M	PTFE	K100935-FD-S
			Graphite	K100935-FD-GS
		High-tensile steel grade S	PTFE	K100935-FD-H
			Graphite	K100935-FD-GH
	MSS	Stainless steel/ A193 B8M	PTFE	K100935-S
			Graphite	K100935-GS
		High-tensile steel grade S	PTFE	K100935-H
			Graphite	K100935-GH

2-Valve Remote-Mount Manifold

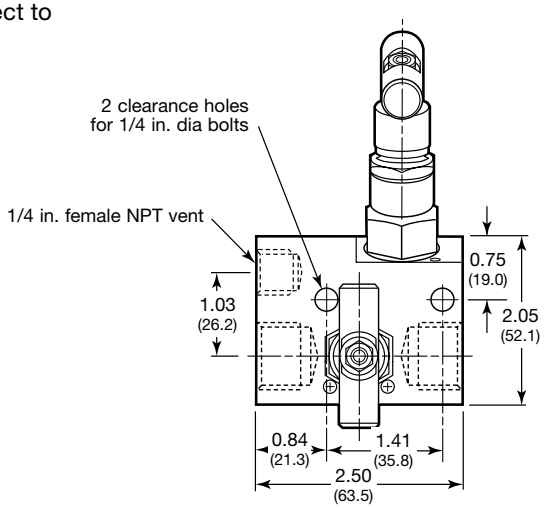
Features

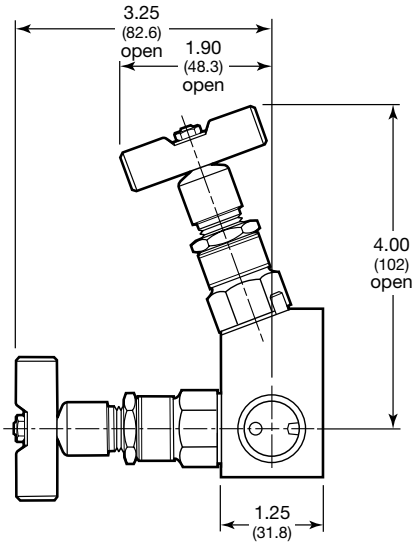
- Angled vent valve for panel mounting
- Color-coded valve label rings for easy valve identification
- Available graphite packing and seals for high-temperature service



Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.





Ordering Information

Build a remote-mount manifold ordering number by combining the designators in the sequence shown below.

A		B	C
M	**S**	B G	**4N** **A** T

A Material
S = Stainless steel
C = Carbon steel

B End Connections
2N = 1/4 in. female NPT
4N = 1/2 in. female NPT

C Packing, Bonnet Seal Material
A = PTFE
C = Graphite
L = Carbon/glass-filled PTFE (Low Emissions option)

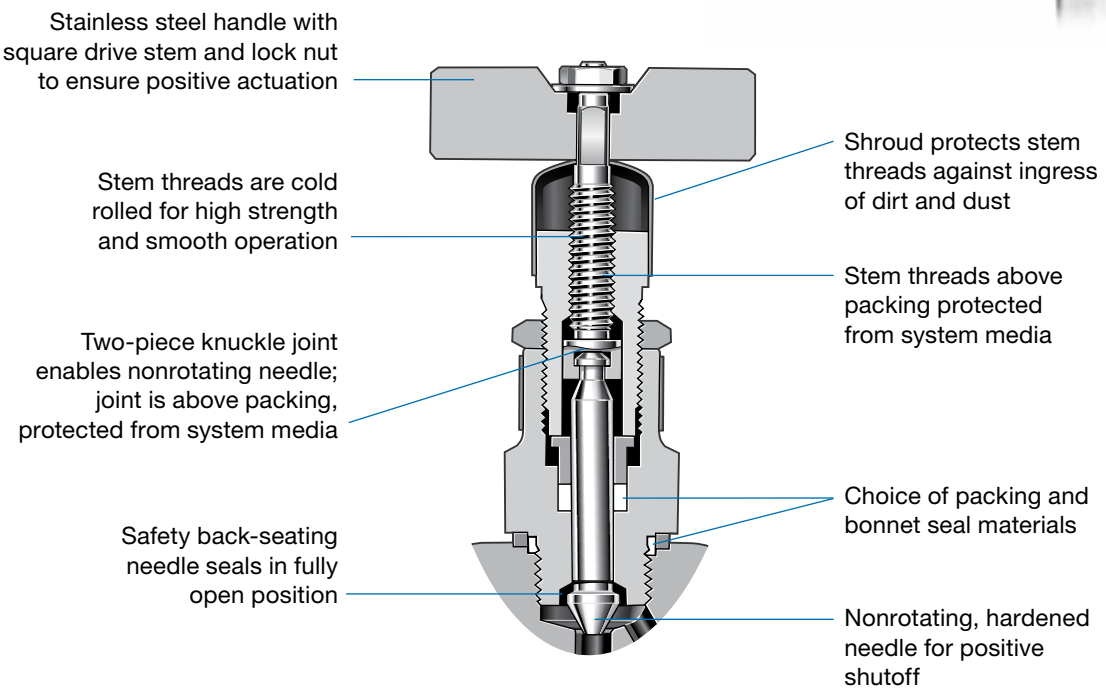
Testing

Every direct- and remote-mount manifold is factory tested hydrostatically. A shell test is performed at 1.5 times maximum rated working pressure, and a seat test is performed at 1.1 times maximum rated working pressure, in accordance with BS EN 12266-1 (formerly BS 6755 part 1).

Modular 85 System

Features

- A standard series of 2- and 4- valve manifolds for pressure and differential pressure measurement
- Instrument monoflanges provide isolation and vent functions for local instrument or indicator mounting
- Metal-to-metal seals and parallel threads in accordance with BS 2779 (ISO 228/1)
- Allows pre-assembly that can reduce field installation time and cost
- Hydrostatic test certificates complete with full chemical and physical material certifications available
- Low Emissions certification per API 624 available



Materials of Construction

Component	Grade/ASTM Specification
Body	*CF8M/ASTM A351*
Bonnets	*316/316L SS/A479*
Needles	*S17400 SS/A564 Condition H1150D*
Packing, bonnet seals	*PTFE*①
Lubricant	*Molybdenum disulfide in hydrocarbon carrier*
Gland lock nuts	300 series powdered metal SS
All other components	316 SS

Wetted components listed in *italics*.

① Optional Low Emissions configuration supplied with Carbon/glass-filled PTFE.

Pressure-Temperature Ratings

Orifice Size in. (mm)	PTFE Seals		Graphite Seals	
	Temperature °F (°C)	Working Pressure psig (bar)	Temperature °F (°C)	Working Pressure psig (bar)
0.197 (5)	–58 (–50) to 200 (93)	6000 (413)	–58 (–50) to 200 (93)	6000 (413)
	201 (94) to 400 (204)	4000 (275)	201 (94) to 850 (454)	3000 (206)

Low Fugitive Emissions

The American Petroleum Institute's API 624 tests for fugitive emissions to atmosphere for modular 85 system. The tests are conducted at a third party lab and certify that at no point in the test did the valve leak in excess of 100 ppm of methane. Certificates stating that the modular 85 system is certified for Low Emissions service are available. For more information, contact your authorized Swagelok sales and service representative.

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **Valves that have not been cycled for a period of time may have a higher initial actuation torque.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff.**

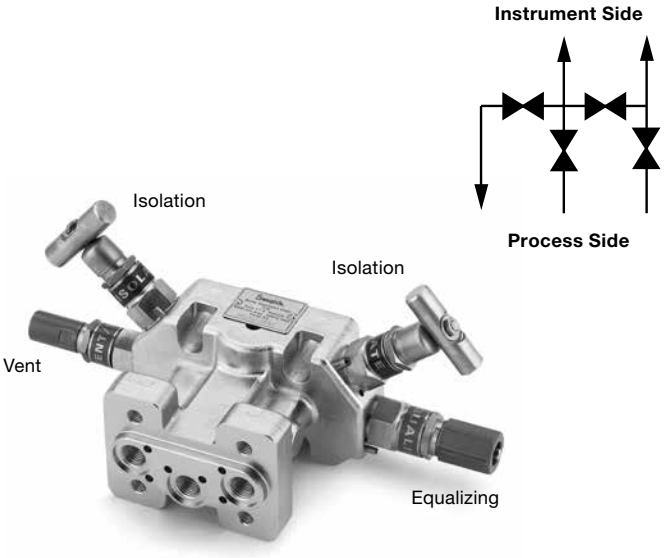
Instrument Manifolds

Features

- Bar handle on isolation valves
- Equalizing and vent valves fitted with antitamper feature
- All valves color coded and labeled
- Process and vent connection: 1/4 in. ISO parallel thread (G1/4) with locking pin feature
- Supplied complete with locking pins, gaskets, and four M8 mounting plate screws
- Factory installed and tested Swagelok® tube fittings with locking pin and gasket available
- Instrument mounting face in accordance with DIN 19213

Four-Valve Differential-Pressure Manifold

- Two isolation, one equalizing, and one vent valves
- Direct mounting to instrument on 2 1/8 in. (54 mm) centers and mounting plate
- Installation allows vent port to be higher than the process ports for liquid service, and below for gas service; manifolds marked for liquid and gas service
- Bolt and seal kit **K7179** included with each manifold purchased

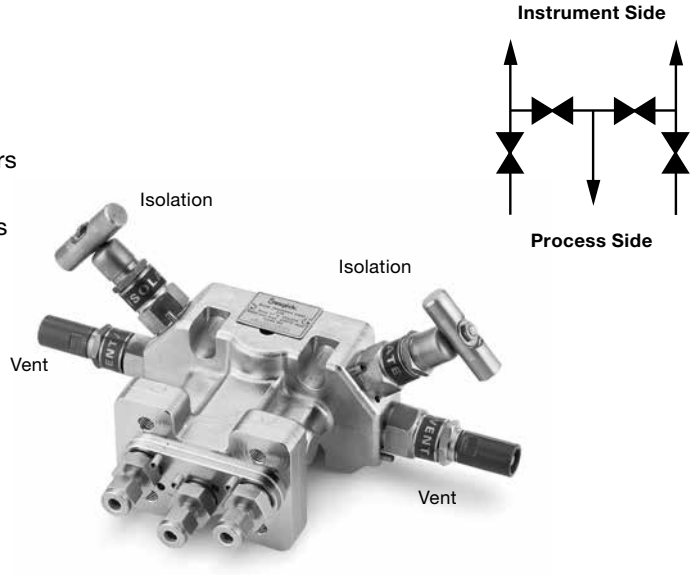


Ordering Information

Description	Ordering Number
G1/4 (as shown)	M5156S0001
G1/4 with 3/8 in. Swagelok tube fittings installed	M5156S0003
G1/4 with 10 mm Swagelok tube fittings installed	M5156S0005

Four-Valve Differential-Pressure Manifold

- For applications where cross-contamination of process fluids is not permitted
- Two isolation and two vent valves
- Direct mounting to instrument on 2 1/8 in. (54 mm) centers and mounting plate
- Installation allows vent port to be higher than the process ports for liquid service, and below for gas service; manifolds marked for liquid and gas service
- Bolt and seal kit **K7179** included with each manifold purchased



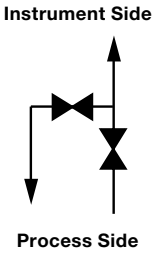
Ordering Information

Description	Ordering Number
G1/4	M5705S0001
G1/4 with 3/8 in. Swagelok tube fittings installed	M5705S0003
G1/4 with 10 mm Swagelok tube fittings installed (as shown)	M5705S0005

Instrument Manifolds

Two-Valve Pressure Manifold

- For absolute and gauge pressure transmitters
- One isolation and one vent valve
- Bolt and seal kit **K7180** included with each manifold purchased

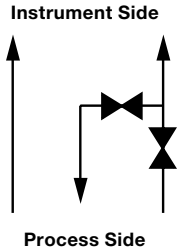


Ordering Information

Description	Ordering Number
G1/4 (as shown)	M6006S0001
G1/4 with 3/8 in. Swagelok tube fittings installed	M6006S0003
G1/4 with 10 mm Swagelok tube fittings installed	M6006S0005

Two-Valve Differential Pressure Manifold

- For low-pressure applications and level measure on atmospheric tanks with differential pressure cell
- One isolation and one vent valve
- Direct mounting to instrument on 2 1/8 in. (54 mm) centers, and mounting plate
- Bolt and seal kit **K7179** included with each manifold purchased

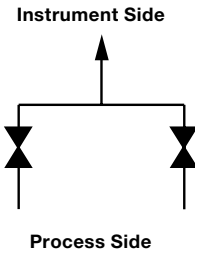


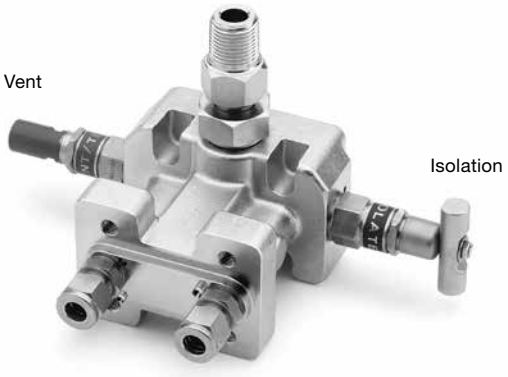
Ordering Information

Description	Ordering Number
G1/4 (as shown)	M5706S0001
G1/4 with 3/8 in. Swagelok tube fittings installed	M5706S0003
G1/4 with 10 mm Swagelok tube fittings installed	M5706S0005

Pressure Manifold

- For direct connecting to pressure transmitters or pressure gauges and mounting plates
- One isolation and one vent valve
- Integral gauge adapter, 1/2 in. NPT for 360° positioning, 1/2 in. ISO parallel thread (G1/2) option





Ordering Information

Description	Ordering Number
G1/4 (process), 1/2 in. positionable male NPT (instrument)	M5713S1001
G1/4 (process), 1/2 in. positionable female NPT (instrument)	M5713S2001
G1/4 with 3/8 in. Swagelok tube fitting installed (1/2 in. male NPT) (as shown)	M5713S1003
G1/4 with 10 mm Swagelok tube fitting installed (1/2 in. female NPT)	M5713S2005

Purge Blocks

Features

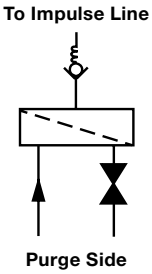
- Complete with one vent valve, one integral filter, one or two soft-seated check valves
- Suitable for connecting to instrument impulse lines on 2 1/8 in. (54 mm) centers
- Brackets and fixing bolts supplied for mounting to 2 in. pipe stand
- Vent valve fitted with antitamper feature
- Integral filter screen: 750 µm
- Check valve spring: nickel alloy
- Process connections: 10 mm or 3/8 in. Swagelok tube fitting
- Purge supply and vent connection: 1/4 in. ISO parallel thread (G1/4) or 1/4 in. NPT option with locking pin and gasket
- Pressure-temperature ratings:
  6000 psig (413 bar) at 100°F (37°C)
  4000 psig (275 bar) at 400°F (204°C)
- Factory installed and tested Swagelok tube fittings with locking pin and gasket

Self-Venting Single Purge Block

- For pressure measurement and differential pressure measurement.

Ordering Information

Description	Ordering Number
G1/4 inlet and vent G1/4 with 3/8 in. Swagelok tube fitting installed outlet	M5709S3001
G1/4 with 3/8 in. Swagelok tube fittings installed	M5709S3003
G1/4 inlet and vent G1/4 with 10 mm Swagelok tube fittings installed outlet	M5709S5001
G1/4 with 10 mm Swagelok tube fittings installed	M5709S5005

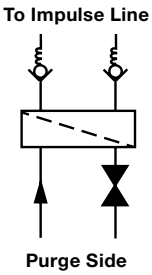


Self-Venting Double Purge Block

- Suitable for differential pressure measurement and for connecting to instrument impulse lines on 2 1/8 in. (54 mm) centers

Ordering Information

Description	Ordering Number
G1/4 with 3/8 in. Swagelok tube fittings installed	M5708S3003
G1/4 with 10 mm Swagelok tube fittings installed	M5708S5005



Accessories

Electric Heater Block

- For use where heating of manifolds and instrument bodies is required for winterization purposes
- Power: 250 W max
- Area classification: Zone 1 Gas Group IIA, IIB, and IIC
- Type of Protection: Explosion proof ATEX certified II 2 G EExd IIC T3 and T4

Ordering number, 110/240 V (ac) nominal voltage: **S900001**

Ordering number, 12/36 V (dc) nominal voltage: **S900001-CS2S**

Steam Tracing Block

- For use where heating of transmitter bodies and manifold is required.
- Bolts directly to manifold body
- 10 mm or 3/8 in. Swagelok tube fitting
- Pressure-temperature ratings: 290 psig (19.9 bar) at 410°F (210°C)
- Factory-installed and tested Swagelok tube fittings with locking pin and gasket available

Ordering Information

Description	Ordering Number
G1/4 ISO parallel thread	K5829S1001
G1/4 with 3/8 in. Swagelok tube fittings installed	K5829S1003
G1/4 with 10 mm Swagelok tube fittings installed	K5829S1005

Port Protector

- 1/4 in. ISO parallel thread (G1/4) plug with integral 750 µm filter screen

Ordering number: **K5840S**

Purge Orifice Nipple

- Restricted orifice nipple and data tag plate supplied for 6 and 10 mm; 1/4 and 3/8 in. tubing
- Specify orifice size requirements when ordering

Ordering Information

Tube Size	Ordering Number
6 mm	K5981S-1M
10 mm	K5981S-3M
3/8 in.	K5981S-3D
1/4 in.	K5981S-2D

Mounting Plate Assembly (Type A)

- Allows mounting of manifold, electrical connection box, or air filter/regulator, nameplate, and protection shade to a 2 in. pipe stand
- Supplied complete with fasteners, clamps, and brackets
- Drilled to suit all components as indicated in the modular system, process connections, and steam tracer tubing, etc.

Ordering number, Type A1 assembly, *with* capacity for mounting electrical connection box: **K5839S**

Ordering number, Type A2 assembly, *without* capacity for mounting electrical connection box: **K100222-4**

Mounting Plate Assembly (Type B)

- Allows mounting of manifold, electrical connection box, or air filter/regulator, and nameplate to a 2 in. pipe stand
- Supplied complete with fasteners, clamps, and brackets
- Drilled to suit all components as indicated in the modular system, process connections, and steam tracer tubing, etc.

Ordering number, Type B1 assembly, *with* capacity for mounting electrical connection box: **K6261S**

Ordering number, Type B2 assembly, *without* capacity for mounting electrical connection box: **K100222-5**

Antitamper Key

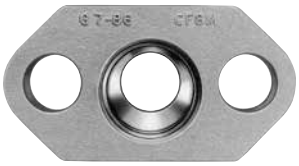
- Fits all vent and equalizing valves within the system
- Order separately

Ordering number: **S004468**

Instrument Manifold Systems Accessories

Eccentric Flanges

- Used with flange-to-flange manifolds to allow the connection of process flange taps or process root valves.
- Offered with Swagelok tube fitting, female NPT, or pipe butt weld connections.
- Provide an offset connection of 1/16 in. (1.6 mm) from the bolt hole center line.



Eccentric View

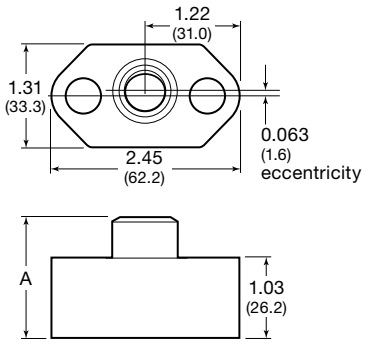
Swagelok Tube Fitting

Female NPT

Pipe Butt Weld

Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.



End Connection	**A,** in. (mm)
Swagelok tube fitting	2.25 (57.2)
Female NPT	1.03 (26.2)
Pipe butt weld	1.55 (39.4)

Ordering Information

- Kit includes two (2) flanges, two (2) flange seals, four (4) 7/16-20 hex bolts, lubricant, and instructions.
- Flange seal material is fluorocarbon FKM with a temperature rating of –20 to 450°F (–28 to 232°C).

Eccentric Flange Seal Kits

Material Grade/ASTM Specification	End Connection		Kit Ordering Number	Bolt Material
	Size	Type		
CF8M SS/ ASTM A351	1/4 in.	Female NPT	SS-MKV-V3F4	316 SS
	1/2 in.	Swagelok tube fitting	SS-MKV-V3S8	
		Female NPT	SS-MKV-V3F8	
CF3M SS/ ASTM A351	1/2 in.	Pipe butt weld	SS-MKV-V3W8P	

Optional Eccentric Flange Seal Materials

To order an eccentric flange seal kit with an optional seal material, replace **MKV** in the kit ordering number with a seal designator.

Flange Seal Material	Seal Designator	Temperature Rating °F (°C)
Virgin PTFE	-MKT	–65 to 250 (–53 to 121)
Reinforced PTFE	-MKR	
Grafoil	-MKG	–65 to 1000 (–53 to 537)

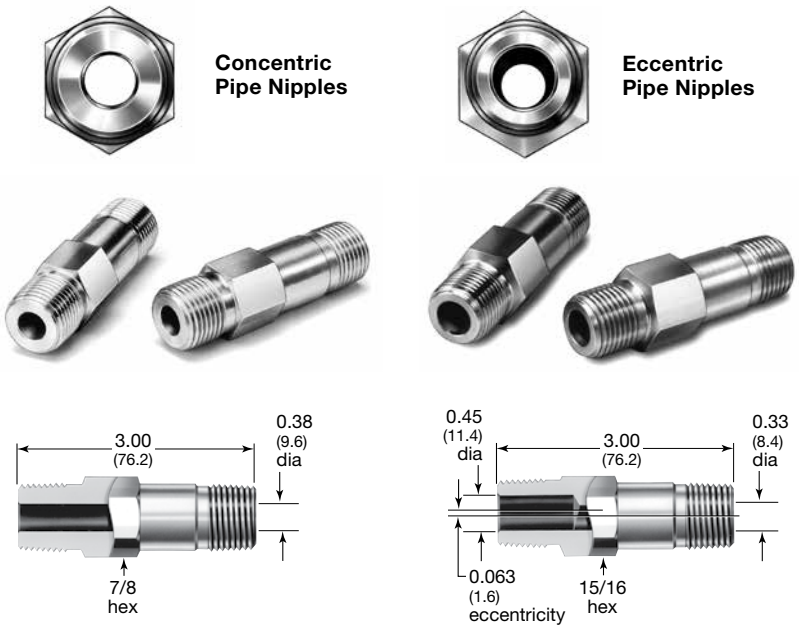
Example: SS-**MKT**-V3F4

Concentric and Eccentric Pipe Nipples

- Used with eccentric flanges to adapt to different flange tap spacings.
- Provide an offset of 1/16 in. (1.6 mm) from center line.
- Offered with 1/2 in. male NPT end connections.
- Available in 316 stainless steel and carbon steel.

Ordering Information

- Order pipe nipples as individual components.
- See ordering number in the **Pipe Nipple Selection** table below.



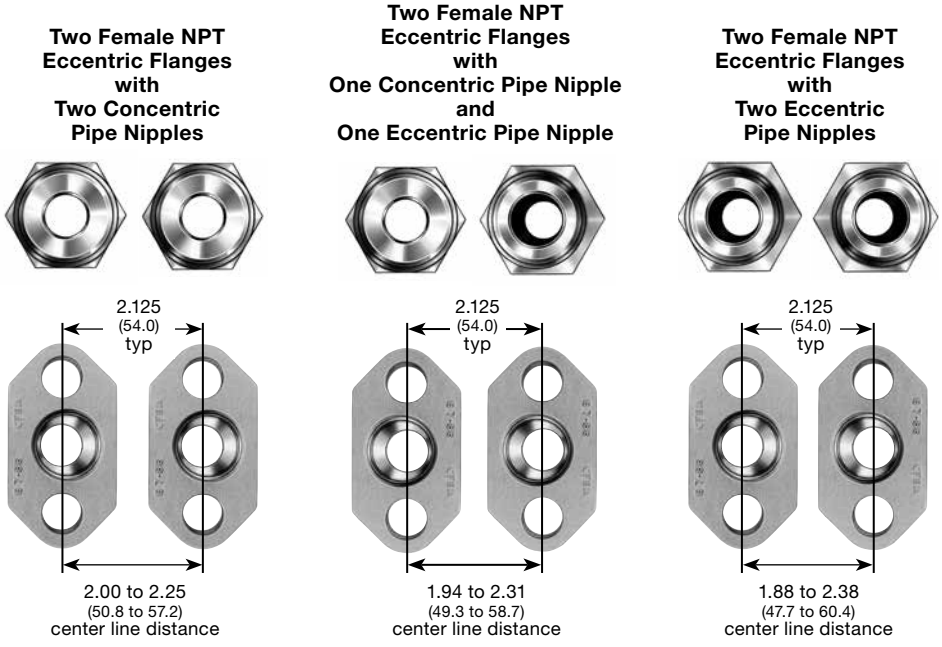
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Pipe Nipple Selection

Type	Material Grade/ASTM Specification	Ordering Number	Pressure Rating at 70°F (20°C) psig (bar)	Temperature Rating °F (°C)	Pressure Rating at Maximum Temperature
Concentric	316 SS/A276	SS-CLNM8	10 000 (689)	–65 to 1200 (–53 to 648)	2850 psig at 1200°F (196 bar at 648°C)
	Carbon steel/A108	S-CLNM8	8 000 (551)	–20 to 350 (–28 to 176)	6970 psig at 350°F (480 bar at 176°C)
Eccentric	316 SS/A276	SS-ELNM8	7 500 (516)	–65 to 1200 (–53 to 648)	2140 psig at 1200°F (147 bar at 648°C)
	Carbon steel/A108	S-ELNM8	6 000 (413)	–20 to 350 (–28 to 176)	5230 psig at 350°F (360 bar at 176°C)

Optional Center Line Distances

- A variety of center line distances can be obtained by using various combinations of eccentric flanges and pipe nipples.
- The illustrations at the right show these combinations using female NPT eccentric flanges.



Dimensions, in inches (millimeters), are for reference only and are subject to change.

DP Transmitter Calibration Fittings

- Speed transmitter calibration by reducing the number of steps in the traditional calibration.
- Allow rapid access to the cell for calibration—only the vent port tap requires removal to access transmitter ports.
- Prevent possible galling of transmitter NPT body threads—straight threads on the calibration tube fitting screw directly into plug/vent port fittings.
- Choice of fitting with 5/16-24 in. thread and 1/4 in. tubing or 1/4-28 in. thread and 1/4 in. tubing, depending on the vent port size of the transmitter plug.
- Are available in 316 stainless steel material.

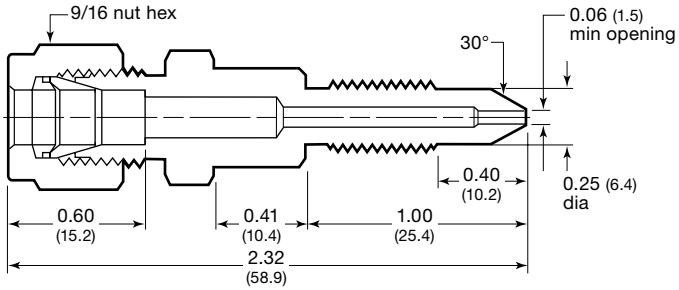
Ordering number for fitting with 5/16-24 thread:
SS-400-1-0253

Ordering number for fitting with 1/4-28 thread:
SS-400-1-0257

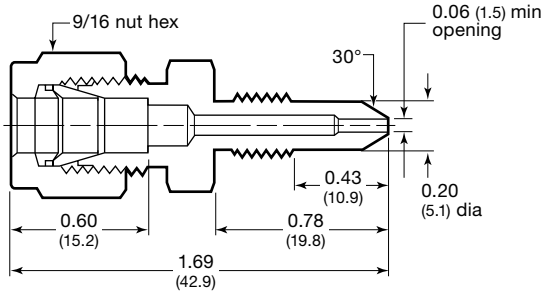
Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Calibration Fitting with 5/16-24 in. Thread



Calibration Fitting with 1/4-28 in. Thread



Gauge Adapters

- Adapt female ISO/BSP parallel thread to male NPT threads.
- Are offered in 1/4, 3/8, and 1/2 in. male NPT sizes.
- Are available in 316 stainless steel material.

Refer to Swagelok *Pipe Fittings* catalog, MS-01-147, for additional information.

Positionable Gauge Adapters

- Allow 360° orientation of pressure gauges.
- Are offered with 1/2 in. male NPT inlet connection.
- Are available with 1/2 in. NPT and ISO parallel gauge connections.
- Are all 316 stainless steel material.

Refer to Swagelok *Pressure Gauges, Industrial and Process—PGI Series* catalog, MS-02-170, for additional information.

Protective Shade

- For extra protection of electronic instruments against environmental conditions
- Mounts directly to mounting plate assembly
- Fire-retardant fiberglass construction with stainless steel fasteners

Ordering number: **K5983-06**

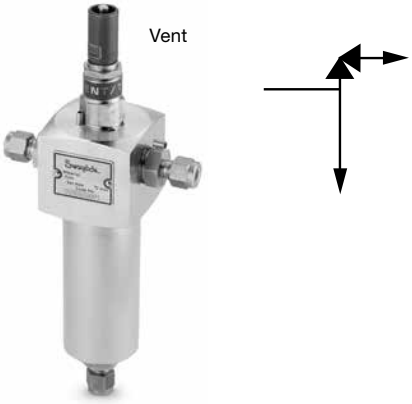
Manifold Kidney Flange Blank

- For protecting process lines when removing the differential pressure instrument.

Ordering number: **K5982S**

Seal Pot with Integral Vent valve

- Liquid chamber of 50 cm^3
- Valve fitted with high-temperature graphite packing and seals
- Process and vent connections: 1/4 in. ISO parallel thread (G1/4) with locking pins and gasket
- Pressure-temperature ratings:
  6000 psig (413 bar) at 100°F (37°C)
  3000 psig (206 bar) at 842°F (450°C)
- Factory-installed and tested Swagelok tube fittings with locking pin and gasket available



Ordering Information

Description	Ordering Number
G1/4 ISO parallel thread	S5986S0001
G1/4 with 3/8 in. Swagelok tube fittings installed	S5986S0003
G1/4 with 10 mm with Swagelok tube fittings installed	S5986S0005

Filling Connector

- With integral, soft-seated nonreturn valve
- Suitable for direct bolting to the flange face of pressure transmitters
- 6 mm or 1/4 in. tube fitting with retained cap
- Supplied complete with 2 × 7/16-20 bolts, PTFE flange seal, plug, and retaining chain
- Pressure-temperature ratings:
  6000 psig (413 bar) at 100°F (37°C)
  4000 psig (275 bar) at 400°F (204°C)

Ordering Information

Description	Ordering Number
G1/4 with 1/4 in. Swagelok tube fitting installed	K5837S0003
G1/4 with 6 mm Swagelok tube fitting installed	K5837S0005

Additional Manifold Products

For bellows-sealed 3-valve manifolds, refer to Swagelok *Bellows-Sealed 3-Valve Manifolds—V3 Series* catalog, MS-02-07. The manifolds use B or U series bellows-sealed valves for systems with difficult fluid containment requirements.

Caution: Do not mix or interchange parts with those of other manufacturers.

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.

Metering Valves

S, M, L, and 31 Series

- Straight-pattern flow coefficients (C_v) from 0.004 to 0.16
- Low- and high-pressure service
- Repeatable vernier handles available
- Brass and 316 stainless steel materials

Features

Low-Pressure Valves (S, M, and L Series)

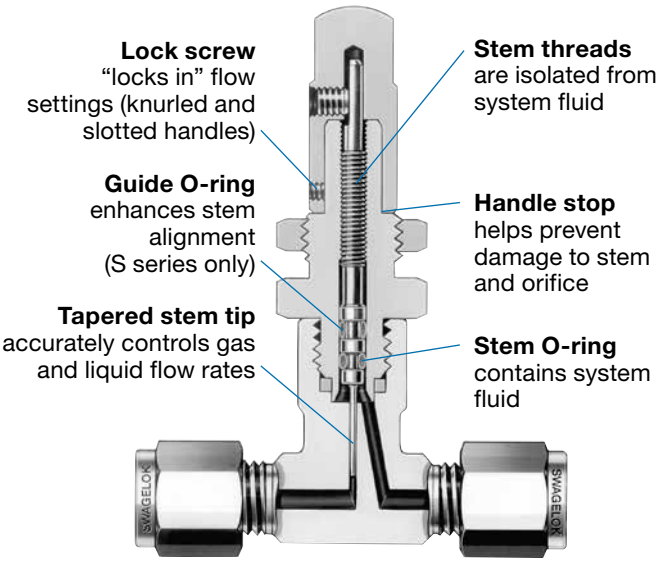
- Straight-pattern flow coefficients (C_V) from 0.004 to 0.16
- Forged-body 316 SS or brass construction
- Straight, angle, cross, and double patterns
- Panel mounting
- Knurled, round, vernier, slotted, and adjustable-torque handles
- Swagelok® tube fitting, male NPT, and integral VCR® fitting end connections

Technical Data

Series	Pressure-Temperature Ratings		Orifice in. (mm)	Shutoff Service	Stem Taper (Included Angle)
	Temperature °F (°C)	Working Pressure psig (bar)			
S	–10 to 400 (–23 to 204) —fluorocarbon FKM O-rings; –10 to 300 (–23 to 148) —Buna N O-rings	2000 (137)	0.032 (0.81)	No	1°
M		1000 (68.9)①	0.056 (1.42)	No	3°
L			0.128 (3.25)	Yes②	6°

① Downstream pressure 500 psig (34.4 bar) max when valve requires adjustment at pressure due to strength limitations of the fine-pitch threads and high operating torque.

② Stainless steel L series valves are not recommended for shutoff in vacuum or gas service, or for repetitive shutoff in liquid service.



S, M, and L Series

S series valve shown.

High-Pressure Valves (31 Series)

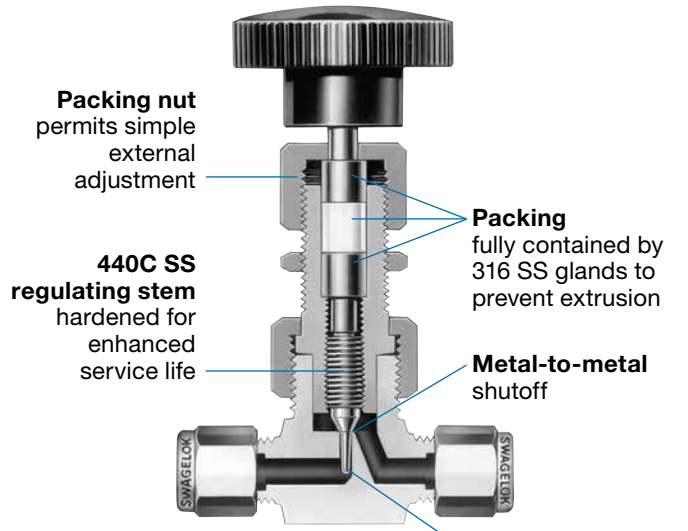
- Flow coefficient of 0.04; orifice of 0.062 in. (1.6 mm)
- 316 SS bar stock body
- Straight and angle patterns
- Metal-to-metal shutoff
- 2° stem taper (included angle)
- Panel mounting
- Round phenolic handle
- Swagelok tube fitting and female NPT end connections

Pressure-Temperature Ratings

Ratings based on optional Grafoil® packing.

Ratings limited to 450°F (232°C) at 3435 psig (236 bar) with standard PTFE packing.

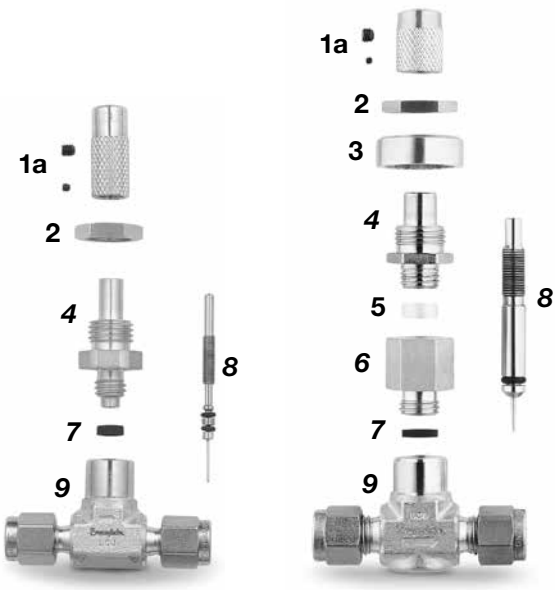
ASME Class	2080
Material Group	2.2
Material Name	316 SS
Temperature, °F (°C)	Working Pressure, psig (bar)
–65 (–53) to 100 (37)	5000 (344)
200 (93)	4295 (295)
300 (148)	3875 (266)
400 (204)	3560 (245)
450 (232)	3435 (236)
500 (260)	3310 (228)
600 (315)	3130 (215)
650 (343)	3080 (212)
700 (371)	3000 (206)
750 (398)	2930 (201)
800 (426)	2880 (198)
850 (454)	2815 (193)



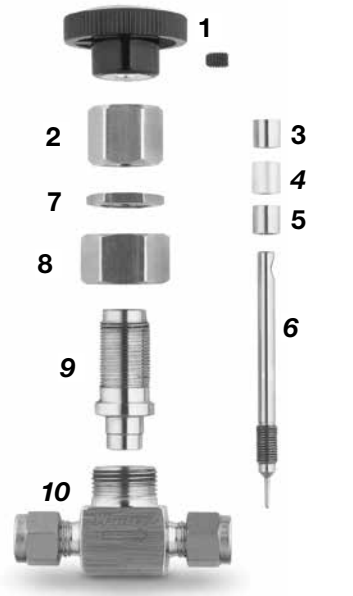
31 Series

Materials of Construction

Low-Pressure Valves (S, M, and L Series)



High-Pressure Valves (31 Series)



Component		Valve Body Materials	
		Brass	316 SS
		Material Grade/ASTM Specification	
1a	Handle	Silver-mist chrome-plated brass 360/B16	300 SS/A276
	Handle screw Lock screw①	Black oxide and light oil-coated alloy steel/ANSI 18.3	
1b	Handle	Green anodized aluminum 6061-T651/B211	
	Handle screw	Black oxide and light oil-coated alloy steel/ANSI 18.3	
2	Panel mount nut	Silver-mist chrome-plated brass 360/B16	316 SS/A479—S, M; 316 SS/B783—L
3	Bonnet sleeve	Sintered 316 SS	
4	*Bonnet*	*Silver-mist chrome-plated brass 345/B453*	*316 SS/A479*
5	Stem guide ring	Glass-filled PTFE	
6	*Body extension*②	*Silver-mist chrome-plated brass 345/B453*	*316 SS/A479*
7	*Body seal*③	*Buna N*	*Fluorocarbon FKM*
8	*Stem*	*S17400 SS/A564—S;* *316 SS/A479—M, L*	*Hard chrome-plated S17400 SS/A564—S;* *Hard chrome-plated 316 SS/A479—M, L*
	O-rings	*Buna N*	*Fluorocarbon FKM*
9	*Body*	*Silver-mist chrome-plated brass 377/B283*	*316 SS/A182*
Lubricants		*Molybdenum disulfide-based; silicone-based*	

Component		Material Grade/ ASTM Specification
1	Handle	Phenolic/D4617
	Set screw	Nickel-cadmium plated steel
2	Packing nut	316 SS/A276
3	Upper gland	
4	*Packing*	*PTFE/D1710*
5	*Lower gland*	*316 SS/A276*
6	*Stem*	*440C SS/A276*
7	Panel nut	316 SS/B783
8	Union nut	316 SS/A276
9	*Bonnet*	*316 SS/A479*
10	*Body*	
	Lubricant	*Nickel antiseize with hydrocarbon carrier*

Wetted components listed in *italics*.

① Anaerobic-type adhesive.

② Straight and double-pattern M series valves.

③ Angle and cross-pattern M series valves do not contain a body seal.

Testing

Every Swagelok S, M, and L series metering valve is factory tested with nitrogen at 1000 psig (69 bar). Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

Every Swagelok L series metering valve is tested for bubble-tight seat shutoff at 100 psig (6.8 bar) differential pressure.

Every Swagelok 31 series needle valve is factory tested with nitrogen at 1000 psig (69 bar). Seats have a maximum allowable leak rate of 0.1 std cm^3/min.

Cleaning and Packaging

Swagelok metering valves with VCR end connections are processed in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* (MS-06-63), to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C.

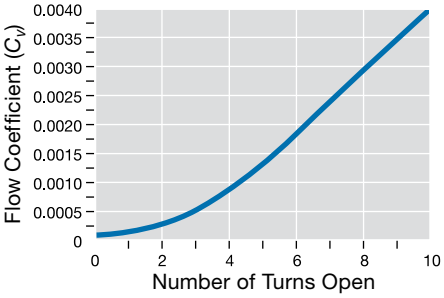
Swagelok metering valves with other end connections are processed in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)* (MS-06-62),; special cleaning and packaging are available as an option.

Swagelok

Flow Data at 70°F (20°C)

S Series

Flow Coefficient at Turns Open



Maximum Flow—0.004 C_v

Pressure Drop to Atmosphere psi (bar)	Air Flow std ft³/min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	0.04 (1.1)	0.01 (0.03)
50 (3.4)	0.10 (2.8)	0.02 (0.07)
100 (6.8)	0.20 (5.6)	0.04 (0.15)

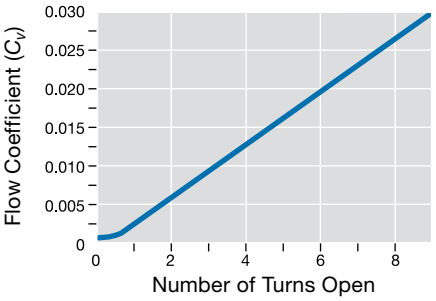
Factory Flow Setting

The handle stop is set at 4 to 10 std cm³/min with 15 psig (1.0 bar) inlet pressure.

Adjusting stop to lower flow setting can damage valve and stem tip.

M Series

Flow Coefficient at Turns Open

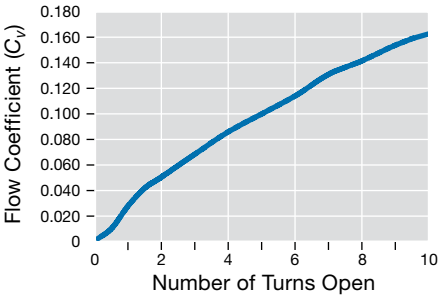


Maximum Flow—0.03 C_v

Pressure Drop to Atmosphere psi (bar)	Air Flow std ft³/min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	0.33 (9.3)	0.09 (0.34)
50 (3.4)	0.90 (25.4)	0.21 (0.79)
100 (6.8)	1.5 (42.4)	0.30 (1.1)

L Series

Flow Coefficient at Turns Open

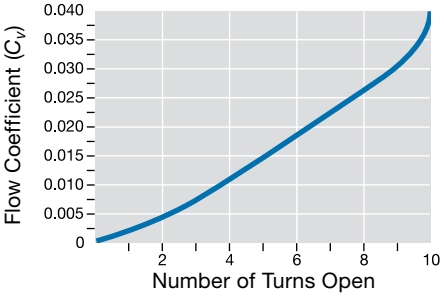


Maximum Flow—0.16 C_v

Pressure Drop to Atmosphere psi (bar)	Air Flow std ft³/min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	2.0 (56.6)	0.51 (1.9)
50 (3.4)	6.4 (181)	1.2 (4.5)
100 (6.8)	11.4 (323)	1.7 (6.4)

31 Series

Flow Coefficient at Turns Open



Maximum Flow—0.04 C_v

Pressure Drop to Atmosphere psi (bar)	Air Flow std ft³/min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	0.45 (12.7)	0.12 (0.45)
50 (3.4)	1.2 (33.9)	0.28 (1.0)
100 (6.8)	2.1 (59.4)	0.40 (1.5)

Ordering Information

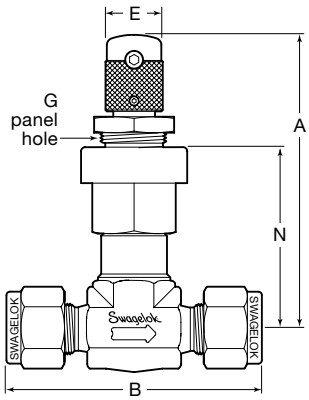
Select an ordering number.

S, M, and L Series

For brass S, M, and L series valves, replace **SS** with **B**.

Example: **B**-SS1

Straight Pattern



M series valve shown.

S series—0.16 in. (4.1 mm) maximum panel thickness.

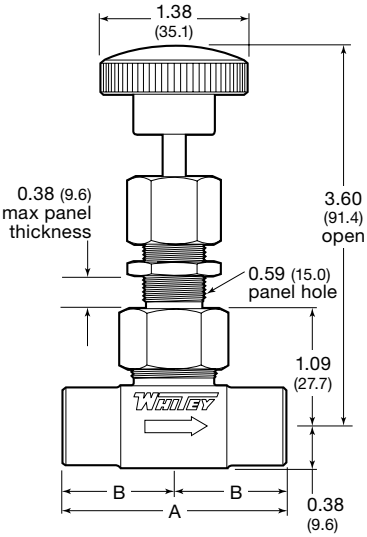
M and L series—0.13 in. (3.3 mm) maximum panel thickness.

31 Series

For angle-pattern 31 series valves, add **-A** to the ordering number.

Example: SS-31RS4-**A**

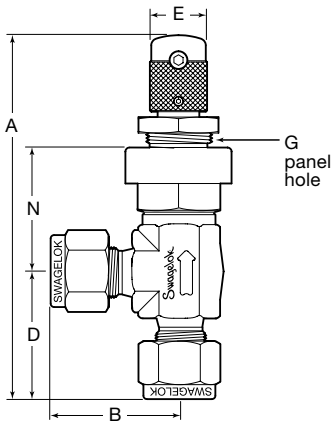
Straight Pattern



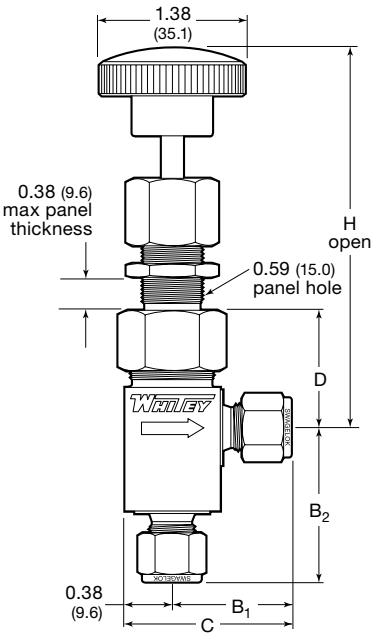
Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Angle Pattern



Angle Pattern



End Connections		Ordering Number	Dimensions, in. (mm)					
Inlet/Outlet	Size		A	B	D	E	G	N
S series straight pattern								
Swagelok tube fittings	1/16 in.	SS-SS1	2.34 (59.4)	1.56 (39.6)	—	0.38 (9.6)	0.45 (11.4)	0.92 (23.4)
	1/8 in.	SS-SS2		1.90 (48.3)				
	1/4 in.	SS-SS4		2.04 (51.8)				
	3 mm	SS-SS3MM		1.90 (48.3)				
	6 mm	SS-SS6MM		2.04 (51.8)				
Male VCR fittings	1/4 in.	SS-SVR4		2.06 (52.3)				
S series angle pattern								
Swagelok tube fittings	1/16 in.	SS-SS1-A	3.22 (81.8)	0.81 (20.6)	0.88 (22.4)	0.38 (9.6)	0.45 (11.4)	0.92 (23.4)
	1/8 in.	SS-SS2-A	3.32 (84.3)	0.98 (24.9)				
	1/4 in.	SS-SS4-A	3.36 (85.3)	1.02 (25.9)				
	3 mm	SS-SS3MM-A	3.32 (84.3)	0.98 (24.9)	0.99 (25.1)			
Male NPT/ Swagelok tube fitting	1/8 in.	SS-SM2-S2-A	3.07 (78.0)	0.98 (24.9)				
M series straight pattern								
Swagelok tube fittings	1/8 in.	SS-2MG	2.78 (70.6)	2.02 (51.3)	—	0.50 (12.7)	0.58 (14.7)	1.56 (39.6)
	1/4 in.	SS-4MG		2.20 (55.9)				
	3 mm	SS-3MG-MM		2.02 (51.3)				
	6 mm	SS-6MG-MM		2.20 (55.9)				
Male NPT	1/8 in.	SS-2MG2		1.50 (38.1)				
	1/4 in.	SS-4MG2		1.96 (49.8)				
Female NPT	1/8 in.	SS-2MG4		1.94 (49.3)				
Male VCR fittings	1/4 in.	SS-MGVR4		2.06 (52.3)				
M series angle pattern								
Swagelok tube fittings	1/8 in.	SS-2MA	3.30 (83.8)	1.01 (25.7)		0.50 (12.7)	0.58 (14.7)	1.07 (27.2)
	1/4 in.	SS-4MA	3.39 (86.1)	1.10 (27.9)				
	3 mm	SS-3MA-MM	3.30 (83.8)	1.01 (25.7)				
	6 mm	SS-6MA-MM	3.39 (86.1)	1.10 (27.9)				
Male NPT	1/8 in.	SS-2MA2	3.04 (77.2)	0.75 (19.1)				
	1/4 in.	SS-4MA2	3.27 (83.1)	0.98 (24.9)	1.02 (25.9)			
Male NPT/ Swagelok tube fitting	1/8 in.	SS-2MA1	3.04 (77.2)	1.01 (25.7)	0.75 (19.1)			
Female NPT	1/8 in.	SS-2MA4	3.26 (82.8)	0.97 (24.6)				
L series straight pattern								
Swagelok tube fittings	1/4 in.	SS-4L	2.82 (71.6)	2.34 (59.4)	—	1.13 (28.7)	0.58 (14.7)	1.26 (32.0)
	3/8 in.	SS-6L		2.46 (62.5)				
	6 mm	SS-6L-MM		2.34 (59.4)				
Male NPT	1/4 in.	SS-4L2		2.00 (50.8)				
L series angle pattern								
Swagelok tube fittings	1/4 in.	SS-4LA	3.77 (95.8)	1.17 (29.7)		1.13 (28.7)	0.58 (14.7)	1.04 (26.4)
	6 mm	SS-6LA-MM						

End Connections		Ordering Number	Dimensions, in. (mm)						
Type	Size		A	B	B_1	B_2	C	D	H
31 series									
Swagelok tube fitting	1/4 in.	SS-31RS4	2.40 (61.0)	1.20 (30.5)	1.16 (29.5)	1.48 (37.6)	1.54 (39.1)	1.09 (27.7)	3.60 (91.4)
	6 mm	SS-31RS6MM							
Female NPT	1/8 in.	SS-31RF2	2.00 (50.8)	1.00 (25.4)	0.91 (23.1)	1.00 (25.4)	1.28 (32.5)		3.80 (96.5)
	1/4 in.	SS-31RF4	2.06 (52.3)	1.03 (26.2)					

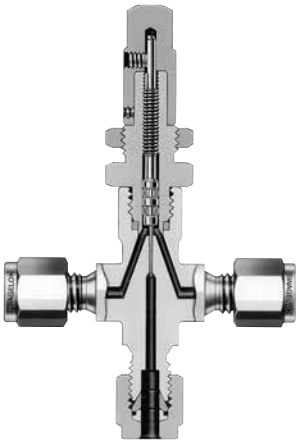
Dimensions shown with Swagelok tube fitting nuts finger-tight.

Options and Accessories

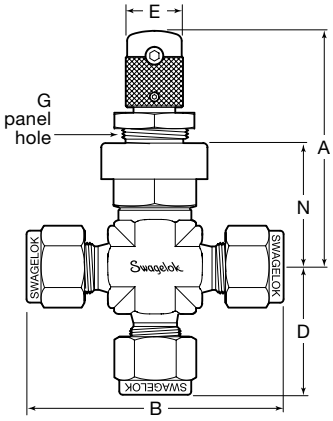
Cross Pattern

S and M Series

- Fluid flows between side ports around stem in any stem position.
- Flow through branch port can be metered in both directions.



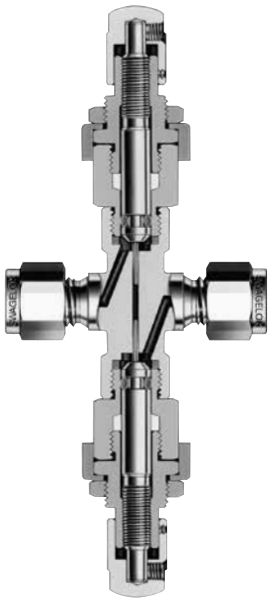
S series valve shown.



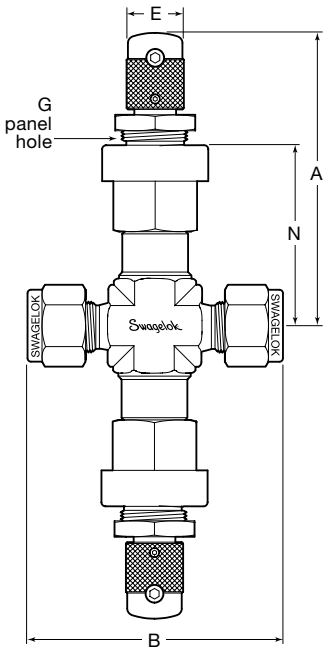
Double Pattern

S and M Series

- Inlet valve handle can be set and locked at desired maximum flow.
- Outlet valve handle can be used for fine flow control up to the preset maximum of the inlet valve.



M series valve shown.



Ordering Information and Dimensions

Select an ordering number. For brass valves, replace **SS** with **B**.

Example: **B**-SS2-X

Dimensions are for reference only and are subject to change.

Valve Pattern	End Connections		C_v	Ordering Number	Dimensions, in. (mm)					
	Type	Size			A	B	D	E	G	N
S series										
Cross	Swagelok tube fitting	1/8 in.	0.004	SS-SS2-X	3.32 (84.3)	1.96 (49.8)	0.98 (24.9)	0.38 (9.6)	0.45 (11.4)	0.92 (23.4)
Double		1/8 in.	0.003	SS-SS2-D	2.34 (59.4)	1.90 (48.3)	—			
M series										
Cross	Swagelok tube fitting	1/4 in.	0.03	SS-4MX	3.39 (86.1)	1.10 (27.9)		0.50 (12.7)	0.58 (14.7)	1.07 (27.2)
Double		1/4 in.	0.026	SS-4MGD	2.78 (70.6)	2.20 (55.9)	—			1.56 (39.6)

Dimensions shown with Swagelok tube fitting nuts finger-tight.

Options and Accessories

Vernier Handle

S, M, and L Series

- Helps ensure repeatable flow adjustments.
- Provides readings accurate to 1/25 turn.

To order, add **-VH** to an S series ordering number or **-MH** to an M or L series ordering number.

Examples: SS-SS1**-VH**
SS-2MG**-MH**

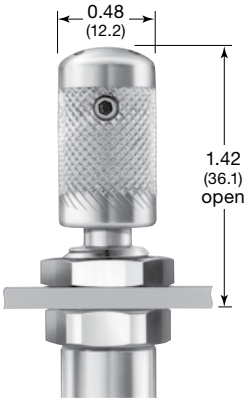
Vernier Handle Kits

Kits contain all parts necessary to add a vernier handle to an existing valve.

Series	Kit Ordering Number
S	NY-5K-S
M	NY-2M-K6
L	

Adjustable-Torque Handle

S Series



- Enhances control for setting flows.
- Features PTFE packing and two top-mounted torque adjustment screws.
- Is available in stainless steel material on stainless steel valves and in chrome-plated brass on brass valves, as standard.

To order, add **-OH** to the ordering number.

Example: SS-SS1**-OH**

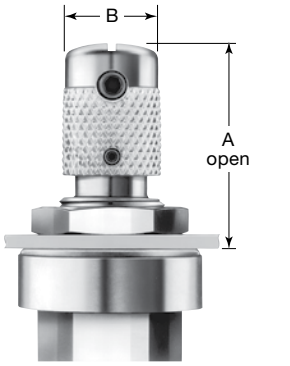
Adjustable-Torque Handle Kits

Kits contain all parts necessary to add an adjustable-torque handle to an existing valve.

Valve Material	Kit Ordering Number
Stainless steel	SS-5K-S-OH
Brass	B-5K-S-OH

Slotted Handle

S and M Series



M series valve shown.

- Allows flow setting adjustment with a screwdriver.
- Is for use in installations where handle is not easily accessible.
- Is available in stainless steel material on stainless steel valves and in chrome-plated brass on brass valves, as standard.
- Allows valve to be panel mounted without removing handle.

To order, add **-SL** to the ordering number.

Example: SS-SS1**-SL**

Series	Dimensions, in. (mm)	
	A	B
S	1.42 (36.1)	0.38 (9.6)
M	1.22 (31.0)	0.50 (12.7)

Slotted Handle Kits

Kits contain all parts necessary to add a slotted handle to an existing valve.

Series	Kit Ordering Number
S	SS-5K-S-SL
M	SS-2M-K5-SL

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Colored Handles

31 Series

Black phenolic handles are standard. To order colored phenolic handles, add a handle color designator to the ordering number.

Example: SS-31RS4**-BL**

Handle Color	Designator
Blue	-BL
Green	-GR
Orange	-OG
Red	-RD
Yellow	-YW

Handle Kits

Handle kits contain handle, brass insert, and instructions.

To order a black phenolic handle, use kit ordering number PH-5K-14K-BK.

For colored phenolic handles, replace **-BK** in the kit ordering number with a handle color designator.

Example: PH-5K-14K**-BL**

Options and Accessories

Stem O-Ring Materials

S, M, and L Series

Buna N O-rings are standard for brass valves; fluorocarbon FKM O-rings are standard for stainless steel valves. When ordering optional stem O-ring materials:

- S series—stem and guide O-rings are replaced with the optional material, *except for* the Kalrez® option; for Kalrez material, the stem O-ring is replaced and the guide O-ring remains the standard material.
- S series and M series—body seal material may change, as shown in the table below.

O-Ring Material	Designator	Temperature Rating °F (°C)	Body Seal Material
Buna N	-BU	–10 to 300 (–23 to 148)	Standard
Ethylene propylene	-EP	–10 to 300 (–23 to 148)	S series—PTFE
Fluorocarbon FKM	-VI	–10 to 400 (–23 to 204)	Standard
Kalrez	-KZ	0 to 300 (–17 to 148)	S series and M series—PTFE
Neoprene	-NE	–10 to 250 (–23 to 121)	S series—PTFE

To order optional O-ring materials, add the desired O-ring material designator to the ordering number.

Example: SS-SS1-**BU**

High-Temperature Stem Packing Material

31 Series

Grafoil packing extends the temperature rating to 850°F (454°C) and requires fluorinated tungsten disulfide-based lubricant. To order, add **-G** to the ordering number.

Example: SS-31RS4-**G**

Stem Packing Kits

PTFE and Grafoil packing kits are available. Kits include packing, lubricant, and instructions. Select a kit ordering number.

Stem Packing Material and Kit Ordering Number	
PTFE	**Grafoil**
T-9K-2	G-9K-2
Lubricant: nickel antiseize, hydrocarbon carrier	Lubricant: fluorinated tungsten disulfide-based

Caution: Do not mix or interchange parts with those of other manufacturers.

Special Cleaning and Packaging (SC-11)

All Series

Swagelok metering valves with VCR end connections are processed in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* (MS-06-63), to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C.

To order special cleaning and packaging for metering valves with other end connections, add **-SC11** to the valve ordering number.

Example: SS-SS1-**SC11**

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, see the Swagelok *Oxygen System Safety* technical report (MS-06-13).

⚠ **A packing adjustment may be required periodically to increase service life and to prevent leakage.**

⚠ **To increase service life, ensure proper valve performance, and prevent leakage, apply only as much torque as is required to achieve positive shutoff in L and 31 series valves that are rated for shutoff service.**

Swagelok

About this document

Thank you for downloading this electronic catalog, which is part of General Product catalog Swagelok published in print. This type of electronic catalog is updated as new information arises or revisions, which may be more current than the printed version.

Swagelok Company is a major developer and provider of fluid system solutions, including products, integration solutions and services for industry research, instrumentation, pharmaceutical, oil and gas, power, petrochemical, alternative fuels, and semiconductor. Our manufacturing facilities, research, service and distribution facilities support a global network of more than 200 authorized sales and service centers in 57 countries.

Visit www.swagelok.com to locate your Swagelok representative and obtain any information on features, technical information and product references, or to learn about the variety of services available only through authorized sales centers and service Swagelok.

Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

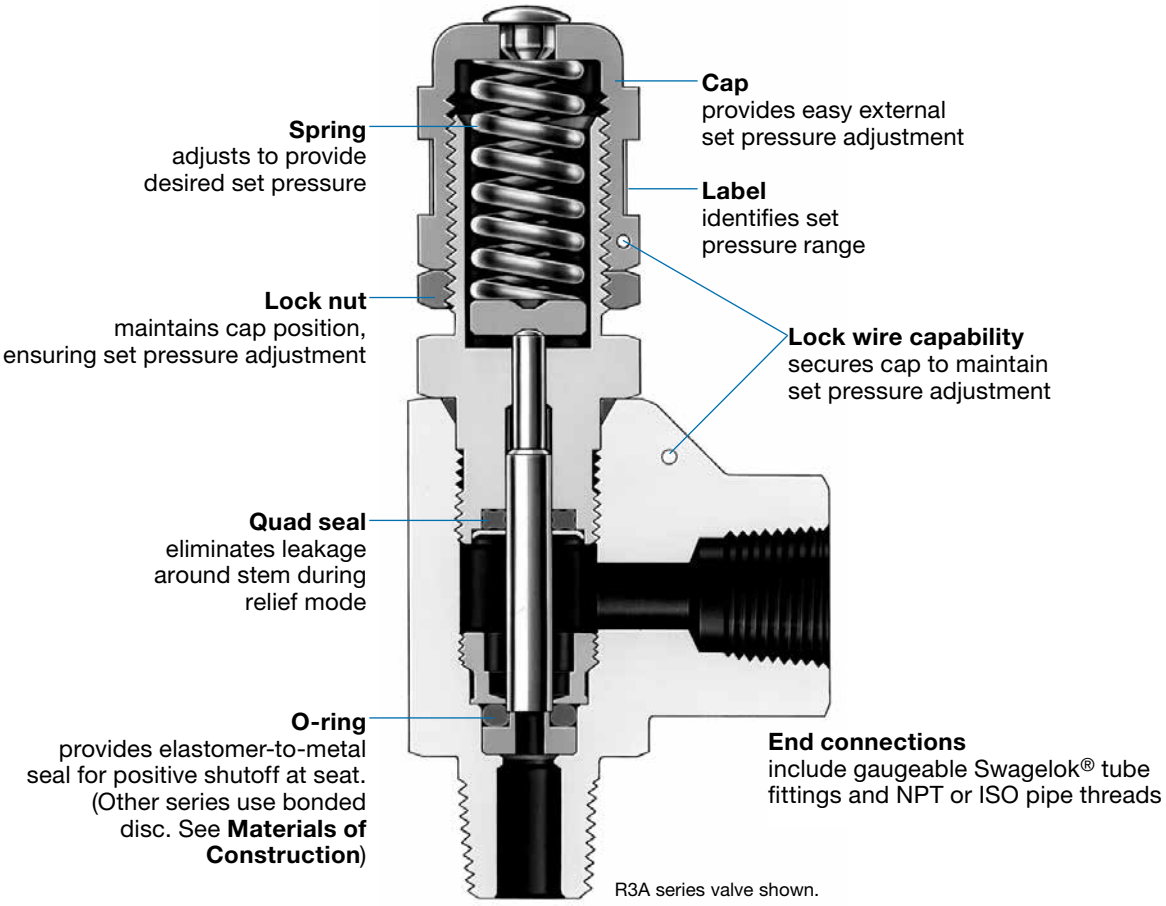
Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit your Swagelok Web site or contact your authorized Swagelok representative.

Proportional Relief Valves

R Series

- Liquid or gas service
- Set pressures from 10 to 6000 psig (0.7 to 413 bar)
- 1/4 and 1/2 in. and 6 to 12 mm end connections



R3A series valve shown.

Features

High-Pressure Valves

- Service up to 6000 psig (413 bar)
- Multiple springs for a selection of set pressure ranges
- Valves available factory-set to a specified set pressure
- 1/4 in. and 6 and 8 mm end connections—R3A series
- 1/2 in. and 12 mm end connections—R4 series

Low-Pressure Valves

- Service up to 300 psig (20.6 bar)
- One spring for the full set pressure range
- Valves available factory-set to a specified set pressure
- 1/4 in. and 6 and 8 mm end connections—RL3 series
- 1/2 in. and 12 mm end connections—RL4 series

Applications

R series relief valves are proportional relief valves that open gradually as the pressure increases. Consequently, they do not have a capacity rating at a given pressure rise (accumulation), and they are not certified to ASME or any other codes.

⚠ **Some system applications require relief valves to meet specific safety codes. The system designer and user must determine when such codes apply and whether these relief valves conform to them.**

⚠ **Swagelok proportional relief valves should never be used as ASME Boiler and Pressure Vessel Code safety relief devices.**

⚠ **Swagelok proportional relief valves are not "Safety Accessories" as defined in the Pressure Equipment Directive 2014/68/EU.**

Operation

R series relief valves OPEN when system pressure reaches the set pressure and CLOSE when system pressure falls below the set pressure.

- High-pressure R3A and R4 series—select and install the spring that covers the required set pressure; apply the matching label to the cap.
- Low-pressure RL3 and RL4 series—the spring is already installed.

⚠ **For valves not actuated for a period of time, initial relief pressure may be higher than the set pressure.**

Technical Data

Pressure-Temperature Ratings

Series	R3A					R4				RL3 and RL4			
Inlet Working Pressure①	6000 psig (413 bar); up to 8000 psig (551 bar) during relief					6000 psig (413 bar)				300 psig (20.6 bar)			
Outlet Working Pressure①	1500 psig (103 bar)					2500 psig (172 bar)				225 psig (15.5 bar)			
Set Pressure	50 to 6000 psig (3.4 to 413 bar)					50 to 1500 psig (3.4 to 103 bar)				10 to 225 psig (0.7 to 15.5 bar)			
Seal Material	Fluoro-carbon FKM	Buna N	Neo-prene	Ethylene pro-pylene	Perfluoro-carbon FFKM	Fluoro-carbon FKM	Buna N	Neo-prene	Ethylene pro-pylene	Fluoro-carbon FKM	Buna N	Neo-prene	Ethylene pro-pylene
Temperature, °F (°C)	**Maximum Set Pressure,** psig (bar)												
–40 (–40)	—	—	—	—	—	—	—	—	—	—	—	—	225 (15.5)
–30 (–34)												225 (15.5)	
–10 (–23)			6000 (413)								225 (15.5)		
0 (–17)		6000 (413)		6000 (413)						225 (15.5)			
10 (–12)													
25 (–4)	6000 (413)				2500 (172)	1500 (103)	1500 (103)	1500 (103)	1500 (103)				
30 (–1)													
40 (4)				6000 (413)	6000 (413)								
50 (10)													
70 (20)													
150 (65)	5580 (384)	5580 (384)	5580 (384)	5580 (384)	3000 (207)								
200 (93)	5160 (355)	5160 (355)	5160 (355)	5160 (355)	1500 (103)								
250 (121)	4910 (338)	4910 (338)	4910 (338)	4910 (338)	—								
275 (135)	—	—	4660 (321)	—				—	—				
300 (148)										—			

① Outlet pressure should not exceed inlet pressure.

Set Pressure and Resealing Pressure

- Set pressure is the upstream pressure at which the first indication of flow occurs. Set pressure of each valve **after initial relief** is repeatable within
  - ± 3.0 psig (0.20 bar) or ± 5 % (whichever is greater) of the initial set pressure at 60 to 80°F (15 to 26°C)
  - ± 6.0 psig (0.40 bar) or ± 20 % (whichever is greater) of the initial set pressure below 60°F (15°C) and above 80°F (26°C).
- Resealing pressure is the upstream pressure at which there is no indication of flow. Resealing pressure is always lower than set pressure.

Testing

Every R series proportional relief valve is tested for set and resealing performance.

Series	Test Set Pressure psig (bar)	Minimum Resealing Pressure as a Percentage of Set Pressure, %
RL3, RL4	10 to 20 (0.7 to 1.3)	50
	175 to 225 (12.0 to 15.5)	91
R3A, R4	100 to 200 (6.8 to 13.7)	50
	850 to 1000 (58.5 to 68.9)	84

Back Pressure

High-Pressure Valves (R3A and R4 Series)

The effect of system back pressure is minimized by the design of these high-pressure valves.

Low-Pressure Valves (RL3 and RL4 Series)

System back pressure increases the set pressure of the valve. To compensate, multiply the back pressure by 0.8 and subtract the result from the desired set pressure. Use the result to pre-set the valve while back pressure is equal to atmospheric pressure.

Example:

Desired set pressure is 120 psig. System back pressure is 40 psig.

Step 1. Multiply back pressure by 0.8.
40 psig × 0.8 = 32 psig.

Step 2. Subtract result from desired set pressure.
120 psig – 32 psig = 88 psig.

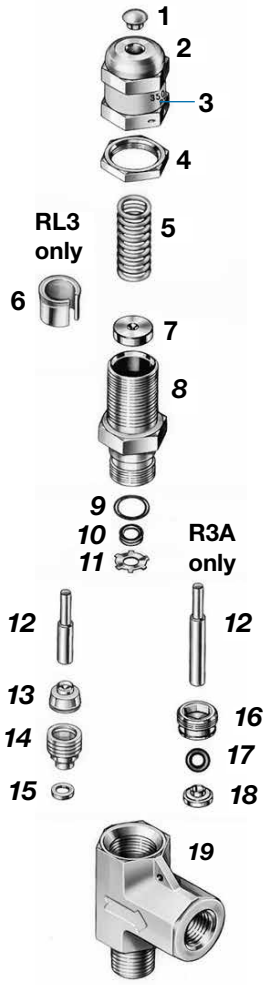
Step 3. Pre-set proportional relief valve to 88 psig.

Cleaning and Packaging

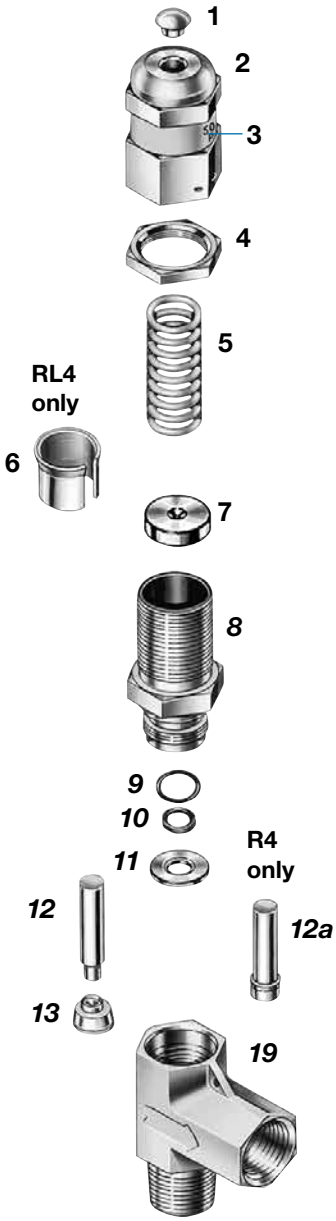
All Swagelok R series relief valves are cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)* (MS-06-62) .

Materials of Construction

RL3 and R3A



RL4 and R4

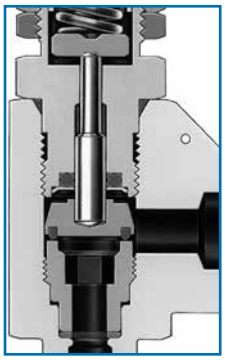


Component		Material Grade/ASTM Specification
1	Plug	302 SS/ASTM 240
2	Cap	316 SS/A479
3	Label	Polyester
4	Lock nut	RL3, R3A—powdered metal 300 series SS/B783; RL4, R4—316 SS/A276
5	Spring	S17700 SS/AMS 5678
6	Sleeve	304 SS/A240
7	Spring support	RL3, R3A—powdered metal 300 series SS/B783; RL4, R4—316 SS/A276
8	*Bonnet*	*316 SS/A479*
9	*O-ring*	*Fluorocarbon FKM*
10	*Quad seal*	*PTFE-coated fluorocarbon FKM*
11	*Retainer*	*RL3, R3A—316 SS/A666; RL4, R4—316 SS/A479*
12	*Stem*	*316 SS/A479*
12a	*Bonded stem*	*Fluorocarbon FKM-bonded*① *316 SS/A479*
13	*Bonded disc*	
14	*Seat*	*316 SS/A479*
15	*Gasket*	*PTFE-coated 316 SS/A240*
16	*Seat retainer*	*316 SS/A479*
17	*O-ring*	*Fluorocarbon FKM*
18	*Insert*	*316 SS/A479*
19	*Body*	*316 SS/A182*
	Lubricants	*Molybdenum disulfide-based dry film and paste; silicone-based*

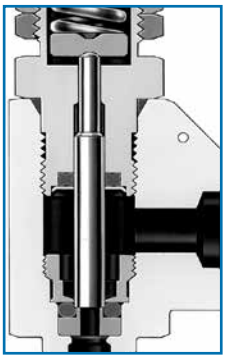
Wetted components listed in *italics*.

① Material Safety Data Sheet for bonding agents available on request.

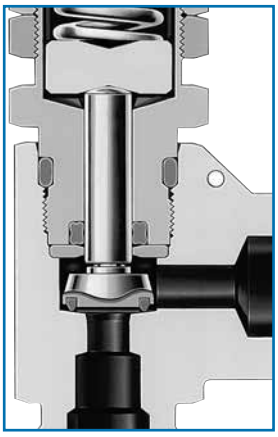
RL3



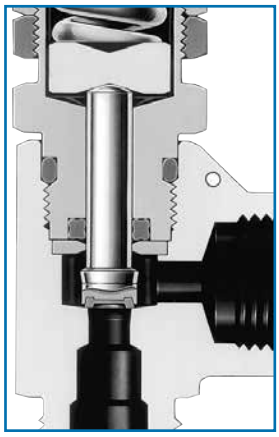
R3A



RL4



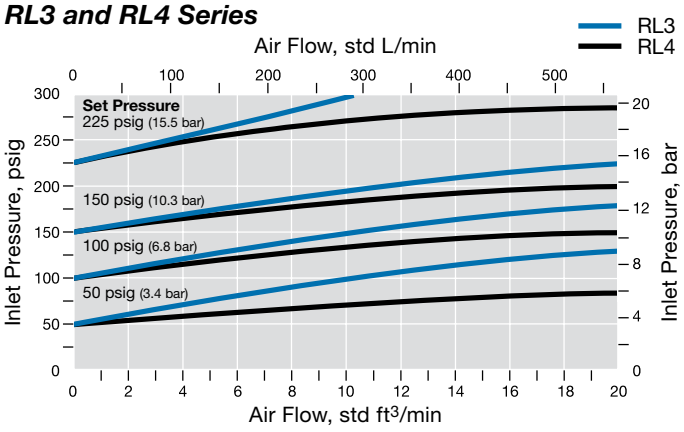
R4



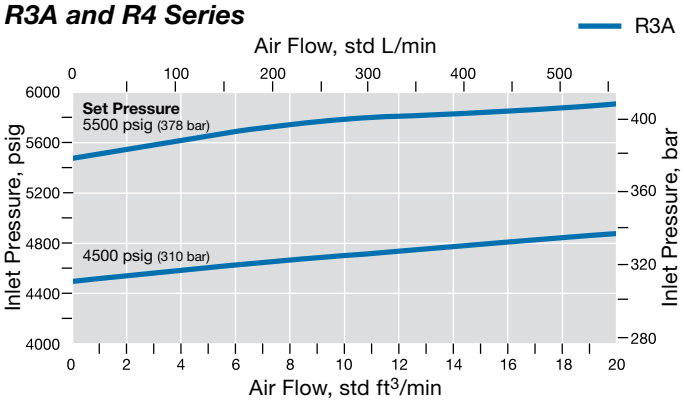
Flow Data at 70°F (20°C)

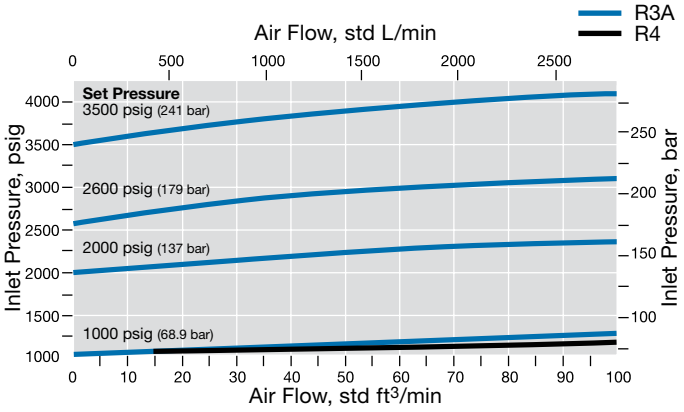
Air

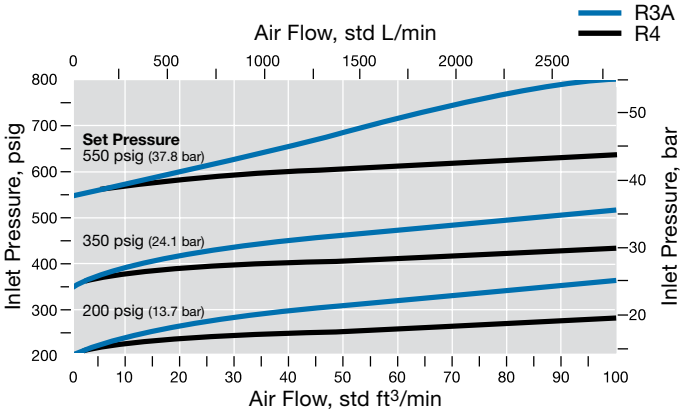
RL3 and RL4 Series



R3A and R4 Series

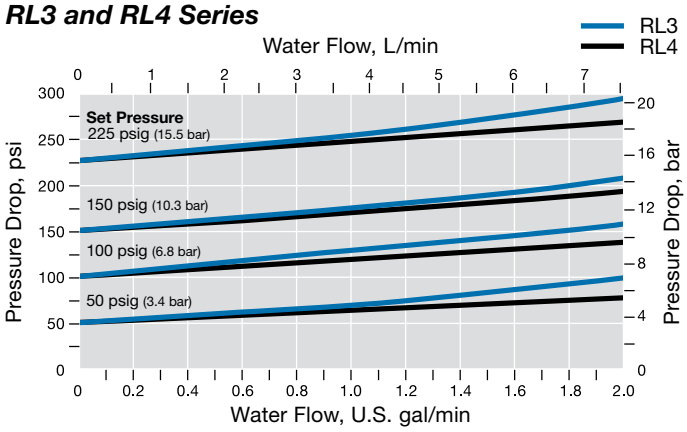




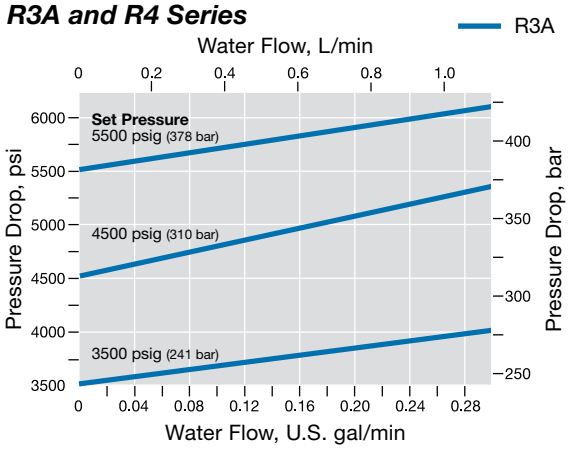


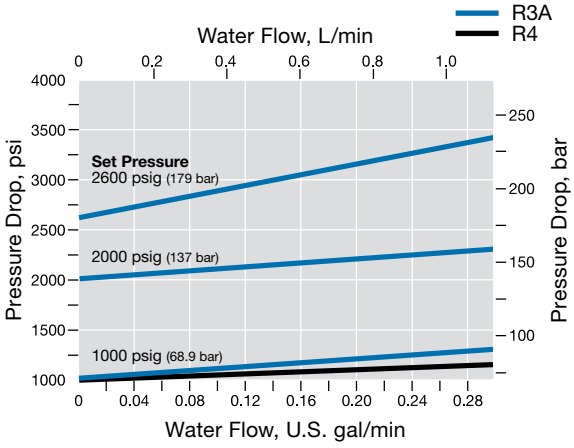
Water

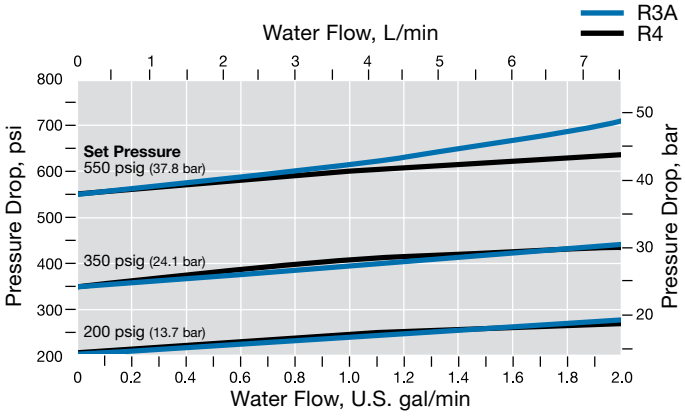
RL3 and RL4 Series



R3A and R4 Series

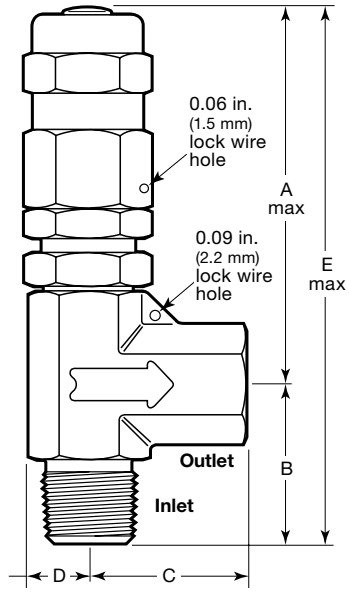


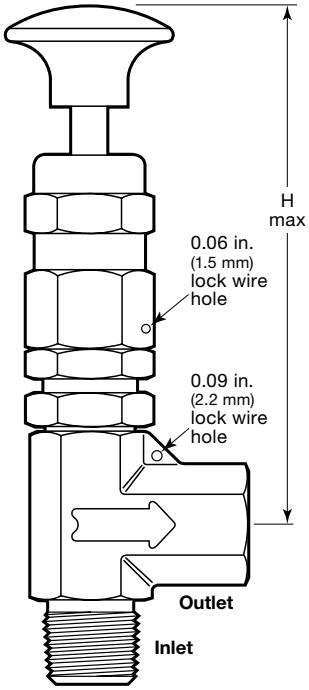




Dimensions

Dimensions are for reference only and are subject to change.





Valve with Manual Override Handle

Low-Pressure Valves (RL3 and RL4 Series)

End Connections		Ordering Number	Dimensions, in. (mm)					
Inlet/Outlet	Size		A	B	C	D	E	H
RL3 series: 0.19 in. (4.8 mm) fully open orifice								
Swagelok tube fittings	1/4 in.	SS-RL3S4	2.70 (68.6)	1.44 (36.6)	1.60 (40.6)	0.43 (10.9)	4.14 (105)	4.09 (104)
	6 mm	SS-RL3S6MM						
	8 mm	SS-RL3S8MM						
Male NPT/ Swagelok tube fitting	1/4 in.	SS-RL3M4-S4		1.19 (30.2)	1.60 (40.6)		3.89 (98.8)	
Male NPT/ female NPT	1/4 in.	SS-RL3M4-F4		1.19 (30.2)	1.17 (29.7)		3.89 (98.8)	
Male ISO/ female ISO①	1/4 in.	SS-RL3M4F4-RT		1.19 (30.2)	1.17 (29.7)		3.89 (98.8)	
RL4 series: 0.25 in. (6.4 mm) fully open orifice								
Swagelok tube fittings	1/2 in.	SS-RL4S8	4.09 (104)	1.83 (46.5)		0.50 (12.7)	5.92 (150)	5.37 (136)
	12 mm	SS-RL4S12MM						
Male NPT/ Swagelok tube fitting	1/2 in.	SS-RL4M8S8		1.43 (36.3)	1.83 (46.5)		5.52 (140)	
Male NPT/ female NPT	1/2 in.	SS-RL4M8F8		1.43 (36.3)	1.43 (36.3)		5.52 (140)	

High-Pressure Valves (R3A and R4 Series)

End Connections		Ordering Number	Dimensions, in. (mm)					
Inlet/Outlet	Size		A	B	C	D	E	H
R3A series: 0.14 in. (3.6 mm) fully open orifice								
Swagelok tube fittings	1/4 in.	SS-4R3A	2.70 (68.6)	1.44 (36.6)	1.60 (40.6)	0.43 (10.9)	4.14 (105)	4.09 (104)
	6 mm	SS-6R3A-MM						
	8 mm	SS-8R3A-MM						
Male NPT/ Swagelok tube fitting	1/4 in.	SS-4R3A1		1.19 (30.2)	1.60 (40.6)		3.89 (98.8)	
Male NPT/ female NPT	1/4 in.	SS-4R3A5		1.19 (30.2)	1.17 (29.7)		3.89 (98.8)	
Male ISO/ female ISO①	1/4 in.	SS-4R3A5-RT		1.19 (30.2)	1.17 (29.7)		3.89 (98.8)	
R4 series: 0.25 in. (6.4 mm) fully open orifice								
Swagelok tube fittings	1/2 in.	SS-R4S8	4.09 (104)	1.83 (46.5)		0.50 (12.7)	5.92 (150)	5.37 (136)
	12 mm	SS-R4S12MM						
Male NPT/ Swagelok tube fitting	1/2 in.	SS-R4M8S8		1.43 (36.3)	1.83 (46.5)		5.52 (140)	
Male NPT/ female NPT	1/2 in.	SS-R4M8F8		1.43 (36.3)	1.43 (36.3)		5.52 (140)	

Dimensions shown with Swagelok tube fitting nuts finger-tight.

① See specifications ISO 7/1, BS EN 10226-1, DIN-2999, and JIS B0203.

Ordering Information

Low-Pressure Valves (RL3 and RL4 Series)

Valve contains spring; set pressure must be adjusted. Select a valve ordering number.

Factory-Set Valves

RL3 and RL4 series valves are available with springs factory-set to a specified set pressure. Valves are set, tested, locked, and tagged with the set pressure; certificates of test are included.

To order, add **-SET** to the valve ordering number and specify the desired set pressure.

Example: SS-RL3S4-**SET**

Replacement Spring Kits

Spring kits include spring and installation instructions. Select a spring kit ordering number.

Series	Spring Kit Ordering Number	Set Pressure Range psig (bar)
RL3	177-13K-RL3	10 to 225 (0.7 to 15.5)
RL4	177-13K-RL4	

High-Pressure Valves (R3A and R4 Series)

Valve does not contain spring. Select a valve ordering number and a spring kit ordering number.

Spring Kits

Spring kits include spring, label, 302 SS lock wire with seal, spring support, and installation instructions.

Select a spring kit basic ordering number and add the spring designator for the desired set pressure range.

Examples: **177-R3A-K1-F**
177-13K-R4-C

Set Pressure Range psig (bar)	Spring Designator	Spring Color
R3A series spring kit: basic ordering number 177-R3A-K1-		
50 to 350 (3.4 to 24.1)	A	Blue
350 to 750 (24.1 to 51.7)	B	Yellow
750 to 1500 (51.7 to 103)	C	Purple
1500 to 2250 (103 to 155)	D	Orange
2250 to 3000 (155 to 206)	E	Brown
3000 to 4000 (206 to 275)	F	White
4000 to 5000 (275 to 344)	G	Red
5000 to 6000 (344 to 413)	H	Green
R4 series spring kit: basic ordering number 177-13K-R4-		
50 to 350 (3.4 to 24.1)	A	Blue
350 to 750 (24.1 to 51.7)	B	Yellow
750 to 1500 (51.7 to 103)	C	Purple

Factory-Set Valves

R3A and R4 series valves are available with springs factory-set to a specified set pressure. Valves are set, tested, locked, and tagged with the set pressure; certificates of test are included.

To order, add **-SET** and a spring designator whose range includes the desired set pressure to the valve ordering number; specify the desired set pressure.

Example: SS-4R3A-**SETB**

Options and Accessories

Seal Materials

Fluorocarbon FKM is the standard seal material. Buna N, ethylene propylene, and neoprene and perfluorocarbon FFKM are available. Quad seal elastomers are PTFE-coated.

To order a *valve* with an optional seal material, add a valve seal material designator to the valve ordering number.

Examples: SS-4R3A-**BU**
SS-RL3S4-**BU**

Seal Material	Designator	
	Valves	Seal Kits
Buna N	-BU	BN①
Ethylene propylene	-EP	EP
Neoprene	-NE	NE
Perfluorocarbon FFKM②	-KZ	KZ
Fluorocarbon FKM	—	VI

① Use **BU** for R3A series seal kits.
② Only available for R3A series.

To order a *replacement seal kit,* insert a seal kit material designator as a prefix (R3A series) or suffix (all others) to the seal kit basic ordering number.

Examples: **BU**-R3A-K2
SS-3K-RL3-**BN**

RL3 Series	R3A Series	RL4 Series	R4 Series
Seal kit basic ordering number			
SS-3K-RL3-	-R3A-K2	SS-3K-RL4-	SS-3K-R4-
Seal kit contents			
O-ring, quad seal, bonded disc, retainer, instructions	O-rings (2), quad seal, retainer, instructions	O-ring, quad seal, bonded disc, retainer, instructions	O-ring, quad seal, bonded stem, instructions

Special Cleaning and Packaging (SC-11)

To order R series relief valves processed in accordance with Swagelok *Special Cleaning and Packaging (SC-11)* (MS-06-63) to ensure compliance with product cleanliness requirements stated in ASTM G93 Level C, add **-SC11** to the valve ordering number.

Example: SS-RL3S4-**SC11**

Oxygen Service Hazards

For more information about hazards and risks of oxygen-enriched systems, see the Swagelok *Oxygen System Safety* technical report (MS-06-13).

Options and Accessories

Manual Override Handles

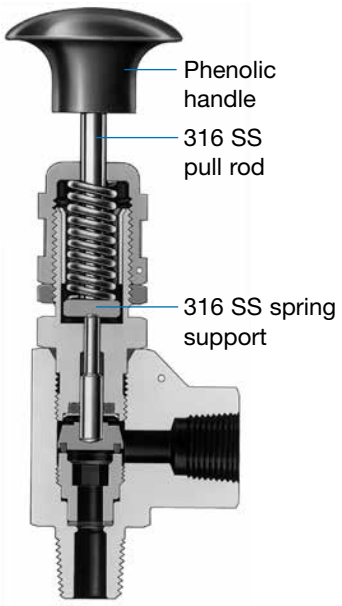
A manual override handle opens the valve without changing the set pressure.

For use with:

- RL3 and RL4 series—standard spring
- R3A series—A, B, and C springs only
- R4 series—A spring only.

Handle diameter is 1.50 in. (38.1 mm). Maximum overall height of valve with handle in closed position:

- 5.16 in. (131 mm) for R3A and RL3 series
- 6.78 in. (172 mm) for R4 and RL4 series.



To order, add **-MO** to the valve ordering number.

Example: SS-RL3S4**-MO**

Manual Override Handle Kits

Kits contain handle, pull rod, spring support, and instructions. To order, select the desired kit ordering number.

Series	Manual Override Kit Ordering Number
RL3, R3A	SS-R3A-K5
RL4, R4	SS-R4-K5

Proportional Safety Relief Valves

Swagelok PRV series proportional safety relief valves are certified to PED 2014/68/EU. For more information, see the Swagelok *Proportional Safety Relief Valves* catalog, MS-02-432.

Caution: Do not mix or interchange parts with those of other manufacturers.

Swagelok

About this document

Thank you for downloading this electronic catalog, which is part of General Product catalog Swagelok published in print. This type of electronic catalog is updated as new information arises or revisions, which may be more current than the printed version.

Swagelok Company is a major developer and provider of fluid system solutions, including products, integration solutions and services for industry research, instrumentation, pharmaceutical, oil and gas, power, petrochemical, alternative fuels, and semiconductor. Our manufacturing facilities, research, service and distribution facilities support a global network of more than 200 authorized sales and service centers in 57 countries.

Visit www.swagelok.com to locate your Swagelok representative and obtain any information on features, technical information and product references, or to learn about the variety of services available only through authorized sales centers and service Swagelok.

Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit your Swagelok Web site or contact your authorized Swagelok representative.

Stream Selector System

For Process Analyzer Applications

SSV Series

- Provides double-block-and-bleed (DBB) operation in a single compact module
- Conventional NPT and ANSI/ISA 76.00.02 compatible designs
- System pressures to 250 psig (17.2 bar) with 40 psig (2.8 bar) actuation pressure
- Integrated flow loop to provide consistent outlet flow
- Large colored visual indicator ring for open position

Swagelok

Contents

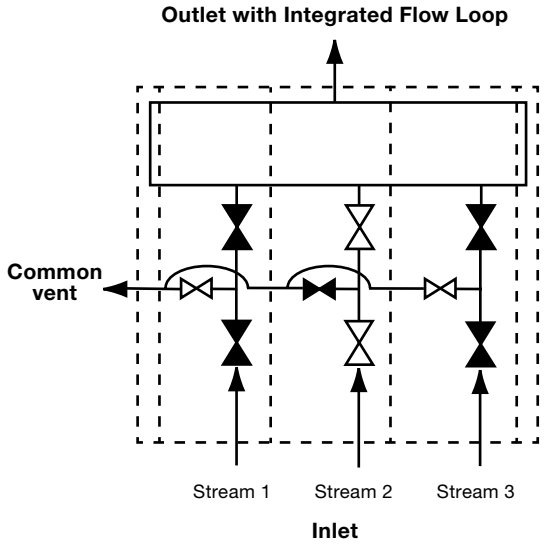
Stream Selector System For Process Analyzer Applications

The Swagelok® stream selector system (SSV series) is a modular assembly designed for process analyzer sampling systems. The SSV series system can accommodate multiple process streams with each stream controlled by a DBB module. Each DBB module features a double block-and-bleed design to eliminate cross-contamination of sample streams. The SSV series system also features an integrated flow loop that provides consistent outlet flow and ensures fast and efficient purging.

Features

- Modular design offers ease of installation and maintenance.
- Built-in pneumatic actuator provides repetitive shutoff with fewer potential leak points than conventional systems.
- Distinctive vented air gap prevents mixing of pneumatic actuator supply and system fluid under pressure.
- Compact design saves cabinet space and reduces internal volume.
- Stainless steel construction provides enhanced corrosion resistance.
- Inlet and outlet connections are 1/8 in. female NPT or MPC compatible (ANSI/ISA 76.00.02)
- Optional integrated atmospheric reference vent (ARV) is available.

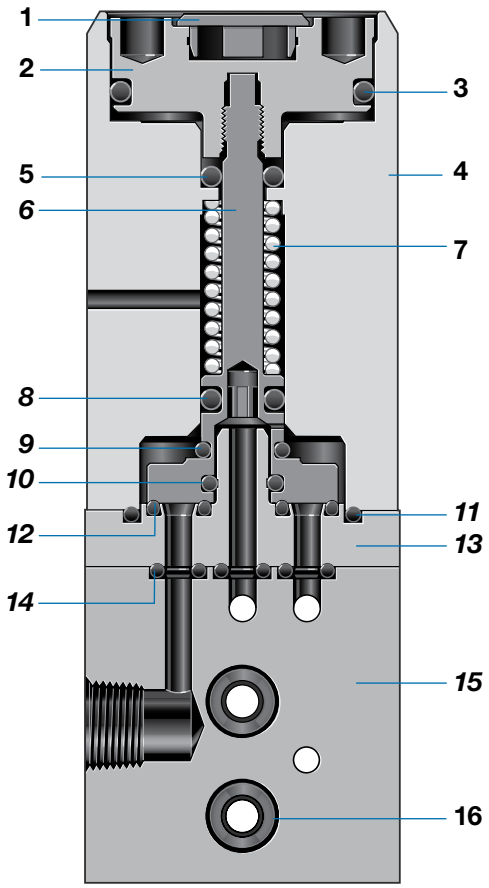
Flow Schematic



Materials of Construction

Component	Material Grade / ASTM Specification
1 Cap	Nylon
2 Piston	316 SS / A479
3 Piston seal	Fluorocarbon FKM
4 *Body*	*CF3M / A351*
5 Upper stem seal	Fluorocarbon FKM
6 *Stem*	*316 SS / A479*
7 Spring	S17700 stainless steel
8 *Lower stem seal*	*Fluorocarbon FKM*
9 *Vent seal*	
10 *Boss seal*	
11 *Body seal*	
12 *Double block seal*	
13 *Flange*	*316 SS / A479*
14 *Base block seal*	*Fluorocarbon FKM*
15 *Base block*	*316 SS / A479*
16 Insert	316 SS / A479
All port plugs (not shown)	*316 SS / A479 with PTFE tape*
All cap screws (not shown)	18-8 SS
Actuation air seals (not shown)	Fluorocarbon FKM
Wetted lubricant	*PTFE-based*

Wetted components listed in *italics*.



Technical Data

Bore Size in. (mm)	Flow Coefficient (C_v) (Standard system with three streams)		
	Stream 1	**Stream 2**	**Stream 3**
0.125 (3.2)	0.20	0.20	0.20

Testing

Every Swagelok SSV system is factory tested at room temperature with nitrogen at 250 psig (17.2 bar). Each double block-and-bleed seat has a maximum allowable leak rate of 0.1 std cm^3/min. Shell testing is performed to a requirement of no detectable leakage with a liquid leak detector.

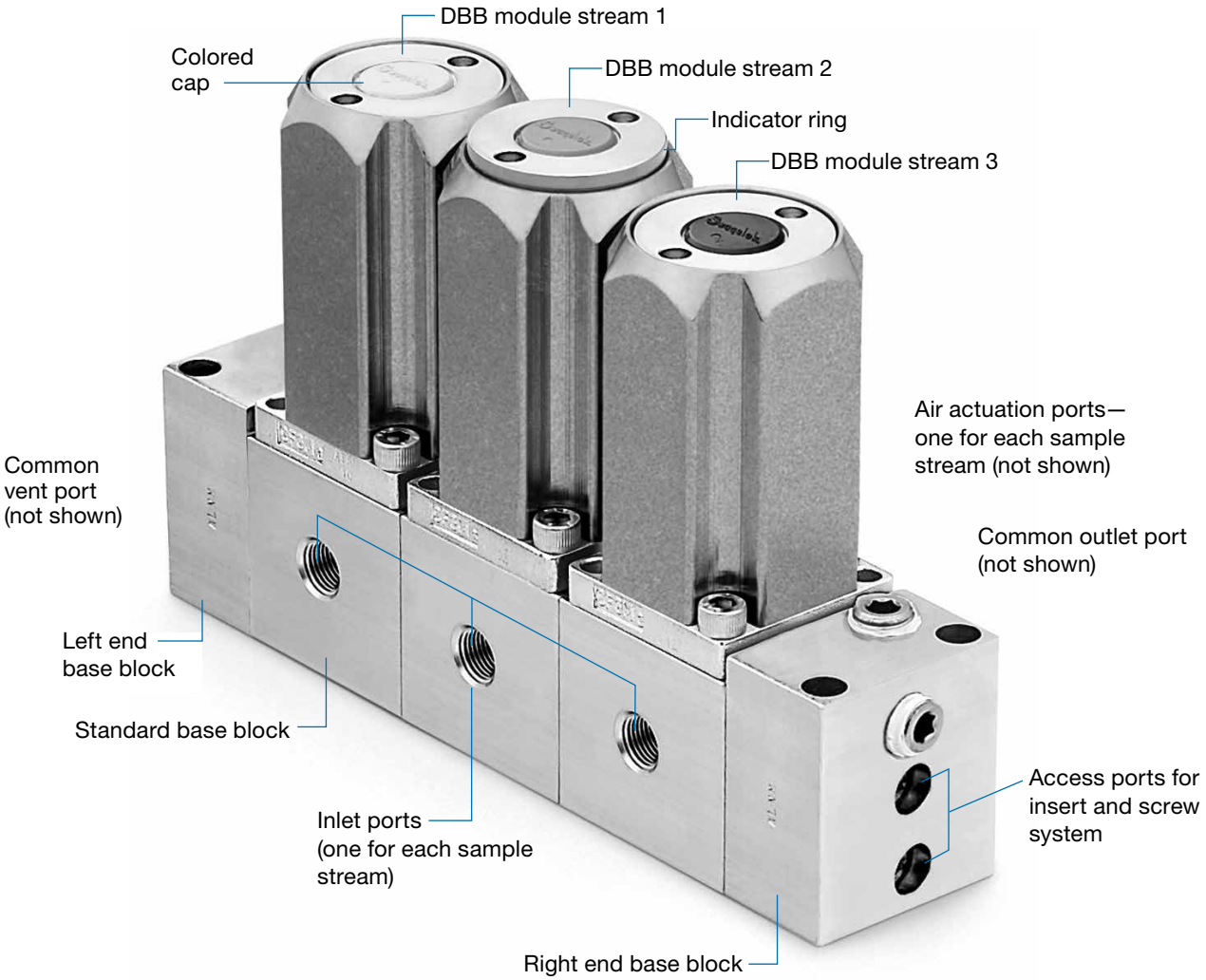
Pressure-Temperature Ratings

Temperature °F (°C)	Working Pressure psig (bar)	Actuator Pressure Rating psig (bar)	Minimum Actuation Pressure psig (bar)
20 (–6)	200 (13.7)	40 to 150 (2.8 to 10.3)	45 (3.2)
30 (–1)	250 (17.2)		40 (2.8)
100 (37)			
300 (148)			

Cleaning and Packaging

All Swagelok SSV systems are cleaned and packaged in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)* (MS-06-62).

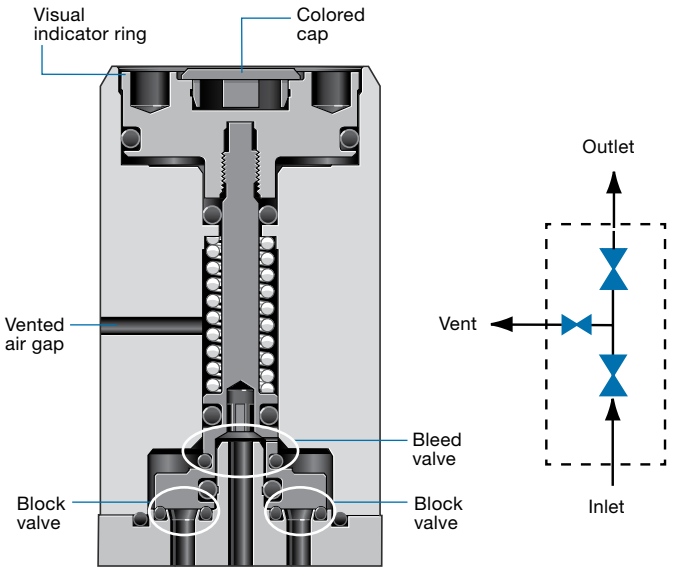
Typical SSV Three-Stream System



DBB Module

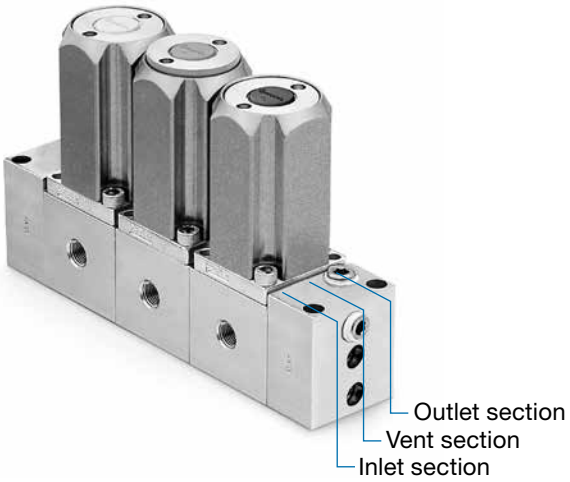
Each individual DBB module consists of a pneumatic actuator and a flange. Multiple DBB modules are connected with base blocks to create the stream selector system.

- One-piece, integrated DBB module allows for easy removal without the need to disconnect process lines.
- Normally closed, double block-and-bleed design consists of:
  - Double-block valves that control system fluid and eliminate cross-contamination of sample streams
  - Bleed valve that is tied to a common vent for all DBB modules.
- Distinctive vented air gap and double seal between pneumatic actuator air and system fluids to prevent mixing of air and fluid under pressure.
- Visual indicator provides easy visual and tactile indication of open position with large, raised green ring.
- Interchangeable colored caps provide stream identification. (Standard color is blue.)



Base Blocks

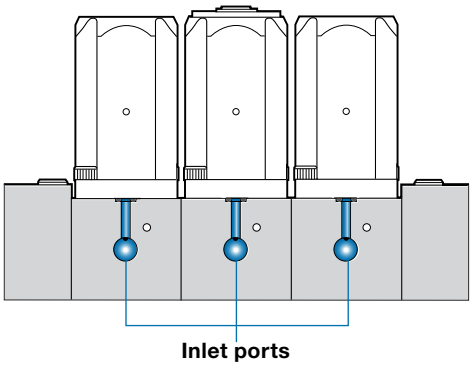
- Types of base blocks include standard, outlet, end (left and right), and ARV (optional).
- Blocks are attached together with a patent-pending insert and screw system to create a fluid path.
- Blocks contain all the fluid connections in one location.

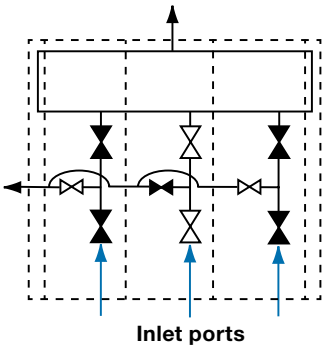


Internal Porting

Inlet Section (Sample Stream Inlet Ports)

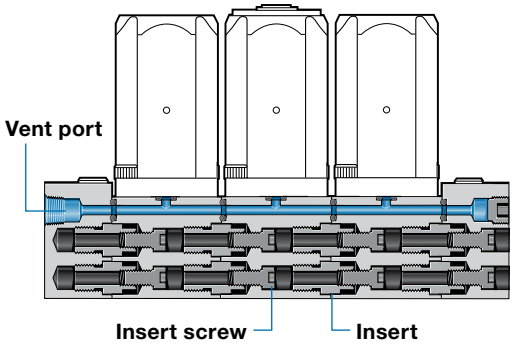
- 1/8 in. female NPT is standard inlet port connector.
- MPC-compatible (ANSI/ISA 76.00.02) connections are available.

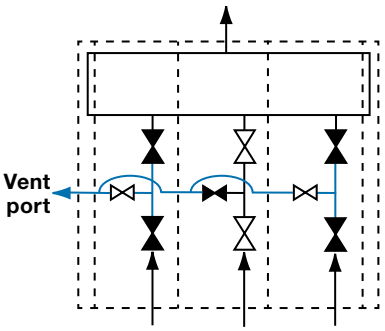




Vent Section (Common Vent and Block Connectors)

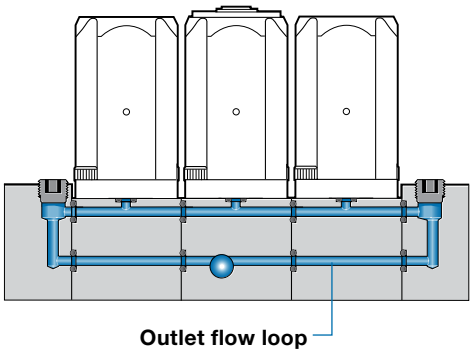
- Vent port has 1/8 in. female NPT for both conventional and MPC configurations.
- All DBB modules bleed to a common vent line.
- Insert screws between blocks are tightened separately to ensure proper assembly and disassembly.
- Recessed insert screws are captive within each block for ease of assembly and to eliminate misplacing.

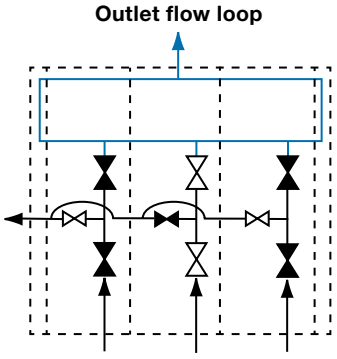




Outlet Section (Integrated Outlet Flow Loop)

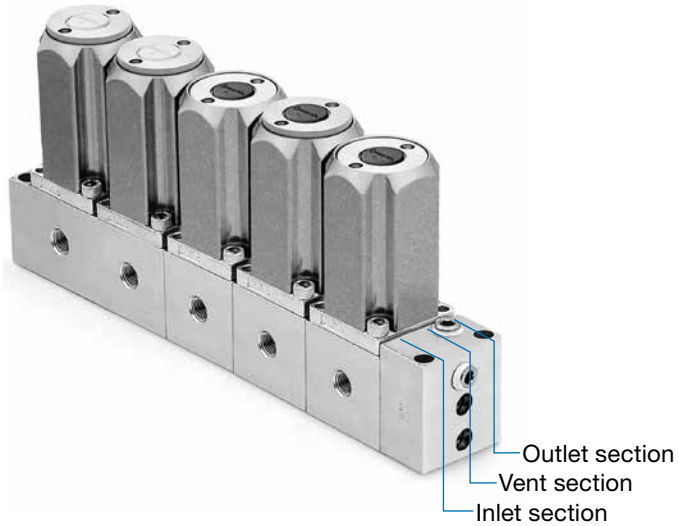
- Integrated outlet flow loop allows for fast and efficient purging.
- Provides consistent C_v from one module to another regardless of the addition of multiple modules.



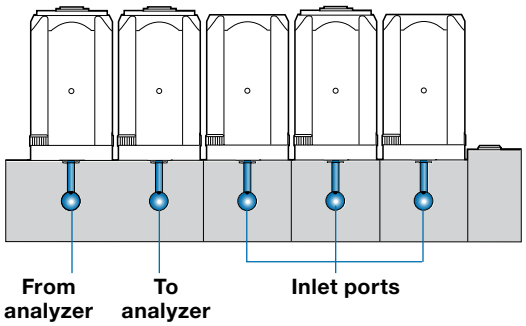


Atmospheric Reference Vent Option

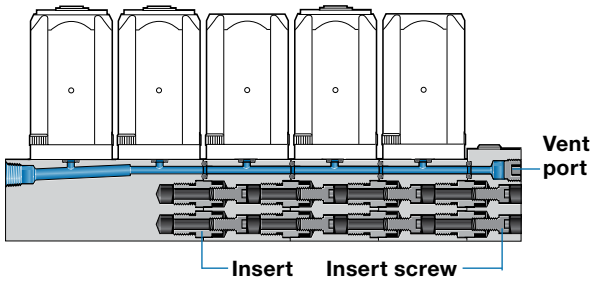
The integrated atmospheric reference vent (ARV) is positioned prior to the analyzer and attached to the outlet of the stream selector system. It is designed to equalize the sample loop pressure to atmospheric pressure just prior to the sample injection. This ensures a constant sample pressure in repetitive analyses.



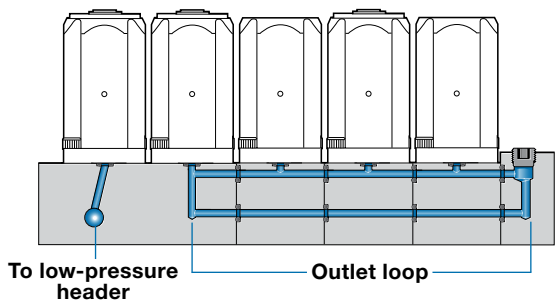
Inlet Section



Vent Section



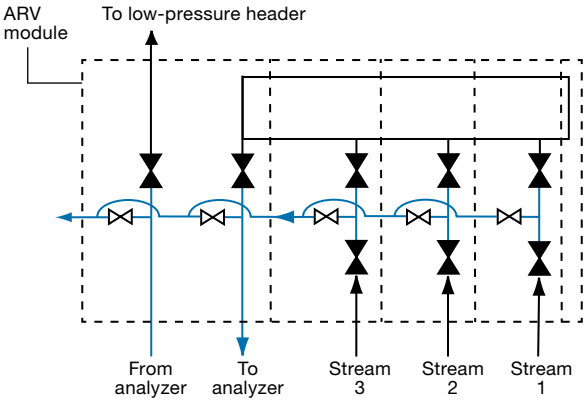
Outlet Section



Operation

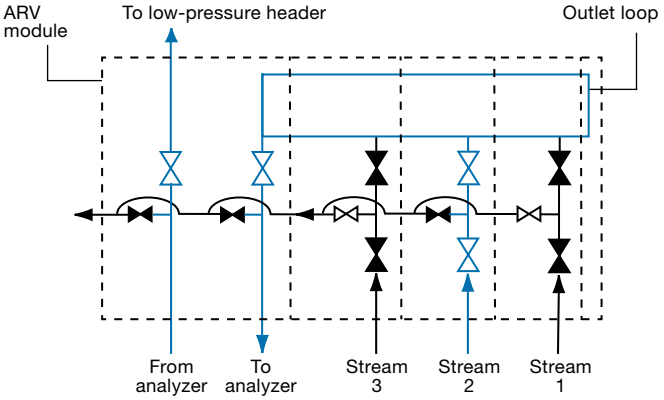
Vent

All valves are in the *off* position. The analyzer is *open* to vent.



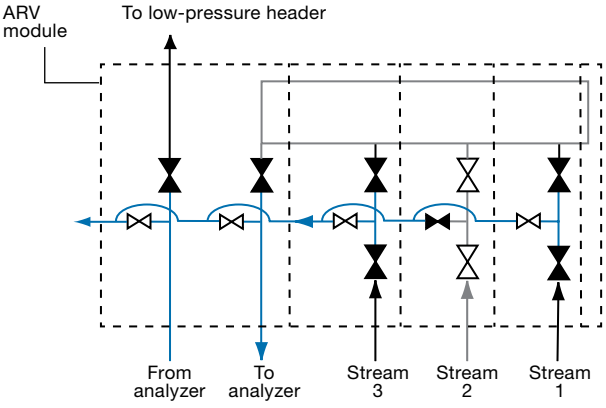
Sample

Stream 2 and the ARV module are in the *on* position, flowing the outlet loop to the low pressure header.



Vent

Stream 2 is in the *on* position and the ARV module is in the *off* position, equalizing the analyzer to the vent pressure.



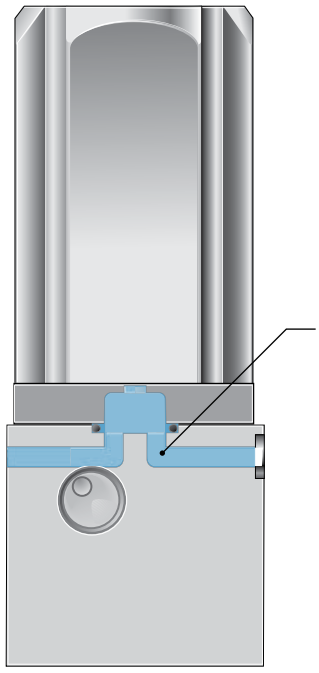
High-Purge Option

The high-purge flow loop option provides increased purgeability and cleanliness for applications requiring a high degree of sample purity.

A unique base block and valve flange divert the outlet flow up into the outlet port of each closed stream, providing a fully swept flow path to the analyzer.

The result is rapid delivery of a high-purity sample to the analyzer. In tests using water at a flow rate of 100 std cm^3/min flow for three sample streams, impurity levels dropped below 1 % percent within 12 seconds, as shown in the graph below.

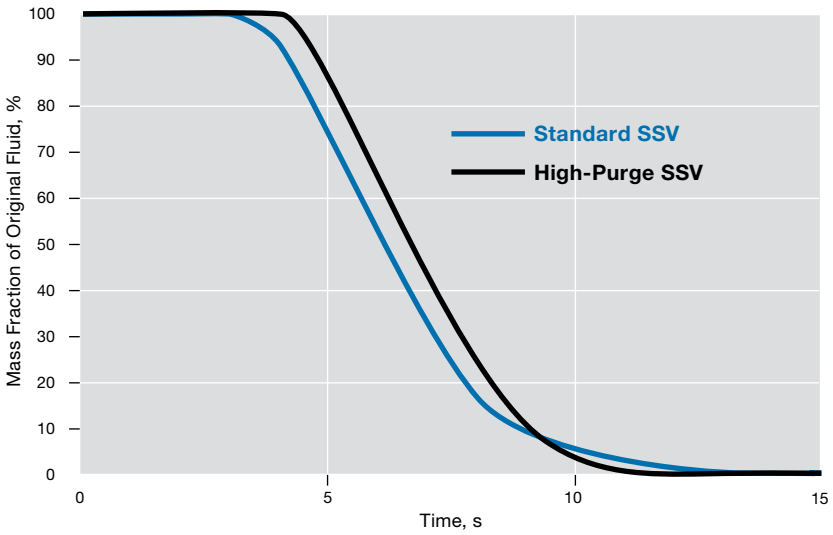
The high-purge option is available on standard and outlet SSV and MPC models; the high-purge SSV components employ a different interface design from standard SSV components and cannot be interchanged with other SSV models.



Flow path to the analyzer is fully swept, enhancing the rate of system purging.

Impurity Level After Stream Switching

Liquid test flow rate: 100 std cm^3/min

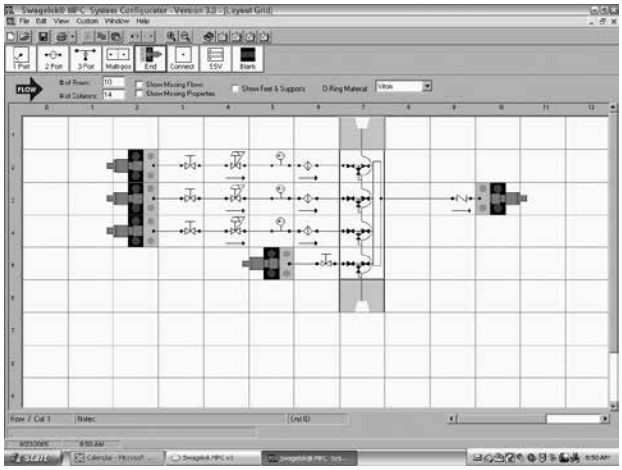


MPC-Compatible Interface Option

- The Swagelok stream selector system with a special bottom porting can be mounted on an MPC substrate.
- Interface is compatible with ANSI/ISA 76.00.02 MPC platform.
- MPC option for the SSV system is included in the *MPC Configurator* for design assistance.

Note: The DBB module cannot be mounted to MPC substrate without base block.

MPC Configurator Screen with SSV Layout



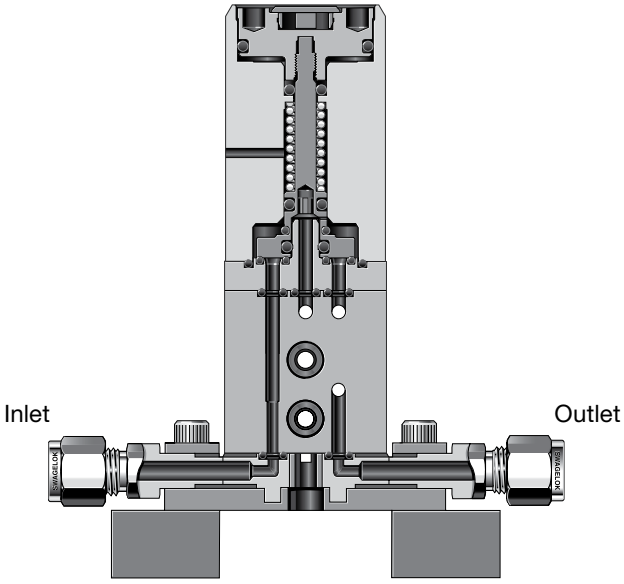
The *MPC Configurator* is available to download from your Swagelok website.

Materials of Construction

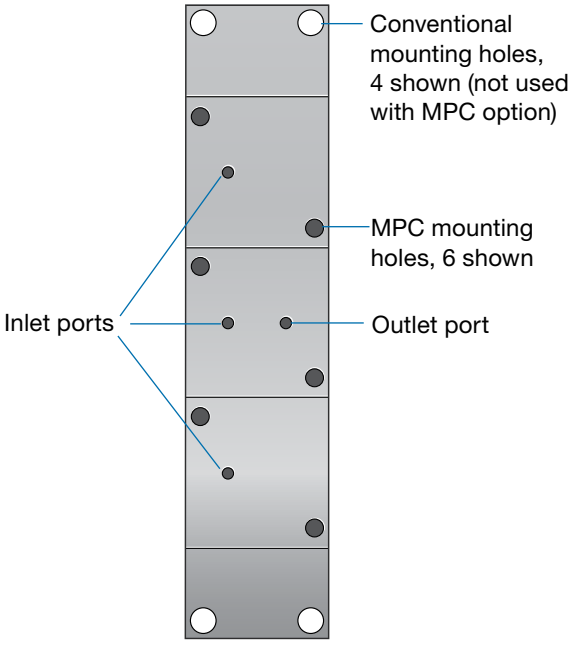
For SSV system components, see **Materials of Construction,** page 3.

For MPC components, see the Swagelok *Modular Platform Components (MPC)* catalog (MS-02-185), page 754.

Cutaway of MPC-Compatible SSV System



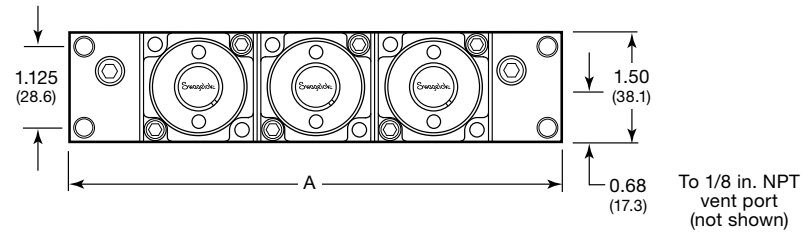
Bottom View of MPC-Compatible SSV System



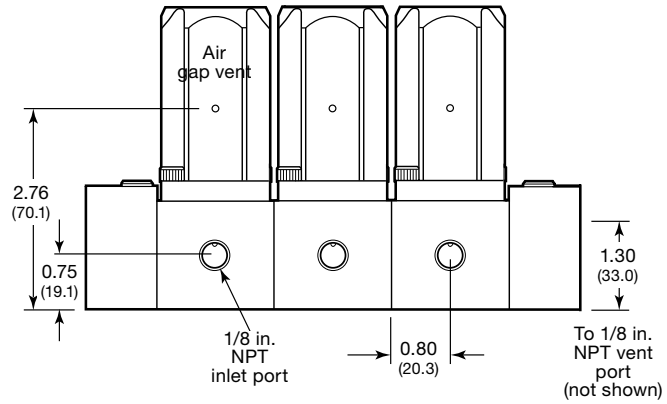
Ordering Information and Dimensions

Dimensions are for reference only and are subject to change.

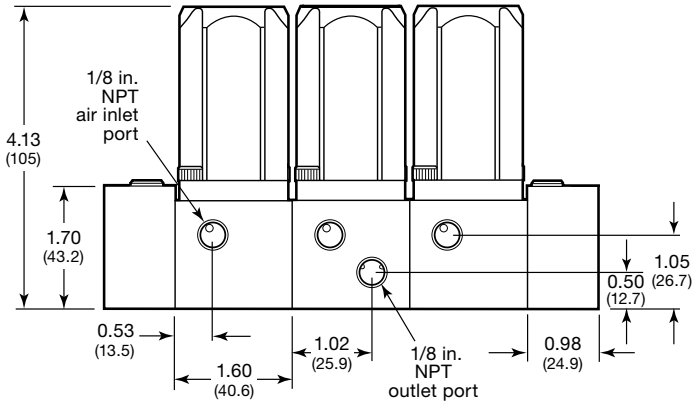
Top



Front
(Inlet Side)



Back
(Outlet Side)



Stream Selector System Assembly

Select an ordering number.

To order a Swagelok SSV system with more than 12 streams, contact your authorized Swagelok representative.

Number of Streams	SSV System			With Atmospheric Reference Vent	
	Standard SSV Ordering Number	High-Purge SSV Ordering Number	A in. (mm)	Ordering Number	A in. (mm)
2	SS-SSV-V-2-F2	SS-SSVP-V-2-F2	5.15 (131)	SS-SSV-V-2-F2-ARV	7.77 (197)
3	SS-SSV-V-3-F2	SS-SSVP-V-3-F2	6.75 (171)	SS-SSV-V-3-F2-ARV	9.37 (238)
4	SS-SSV-V-4-F2	SS-SSVP-V-4-F2	8.35 (212)	SS-SSV-V-4-F2-ARV	10.97 (279)
5	SS-SSV-V-5-F2	SS-SSVP-V-5-F2	9.95 (253)	SS-SSV-V-5-F2-ARV	12.57 (319)
6	SS-SSV-V-6-F2	SS-SSVP-V-6-F2	11.55 (293)	SS-SSV-V-6-F2-ARV	14.17 (360)
7	SS-SSV-V-7-F2	SS-SSVP-V-7-F2	13.15 (334)	SS-SSV-V-7-F2-ARV	15.77 (401)
8	SS-SSV-V-8-F2	SS-SSVP-V-8-F2	14.75 (375)	SS-SSV-V-8-F2-ARV	17.37 (441)
9	SS-SSV-V-9-F2	SS-SSVP-V-9-F2	16.35 (415)	SS-SSV-V-9-F2-ARV	18.97 (482)
10	SS-SSV-V-10-F2	SS-SSVP-V-10-F2	17.95 (456)	SS-SSV-V-10-F2-ARV	20.57 (522)
11	SS-SSV-V-11-F2	SS-SSVP-V-11-F2	19.55 (497)	SS-SSV-V-11-F2-ARV	22.17 (563)
12	SS-SSV-V-12-F2	SS-SSVP-V-12-F2	21.15 (537)	SS-SSV-V-12-F2-ARV	23.77 (604)

Options

MPC-Compatible Interface

The Swagelok SSV system is offered with an optional MPC-compatible interface (ANSI/ISA 76.00.02) for up to ten streams.

To order the MPC interface option, replace **F2** in the valve ordering number with **MPC.**

Example: SS-SSV-V-2-**MPC**

Vented Air Gap Threaded Test Port

An optional 1/8 in. female NPT threaded test port is available for the vented air gap.

To order a Swagelok SSV system with threaded test ports, insert **T** into the valve ordering number as shown.

Example: SS-SSV-V**T**-2-F2

Kalrez® Seals

Optional Kalrez seals are available in place of the *wetted* fluorocarbon FKM seals. For pressure-temperature ratings, see table at right. To order a Swagelok SSV system with Kalrez seals, replace **V** in the valve ordering number with **K.**

Example: SS-SSV-**K**-2-F2

Temperature °F (°C)	**Working Pressure** psig (bar)
Kalrez Seals	
30 (–1)	100 (6.8)
40 (4)	250 (17.2)
70 (20)	250 (17.2)
300 (148)	250 (17.2)
Simriz Seals	
30 (–1)	200 (13.7)
40 (4)	250 (17.2)
70 (20)	250 (17.2)
250 (121)	250 (17.2)

Simriz® Seals

Optional Simriz seals are available in place of the *wetted* fluorocarbon FKM seals. For pressure-temperature ratings, see table above right. To order a Swagelok SSV system with Simriz seals, replace **V** in the valve ordering number with **Z.**

Example: SS-SSV-**Z**-2-F2

Electronic Position Sensors

SSV system modules are available with electronic position sensors, which transmit a signal to an electrical device indicating the *closed* position of SSV series stream selector valves.

Features

Standard industrial and intrinsically safe sensor models are available. Both models:

- offer instant, remote confirmation of valve actuator position
- validate valve response

The industrial model aids troubleshooting with a local LED indicator.

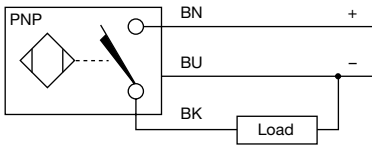
The intrinsically safe model is designed for use in applications where intrinsically safe ratings are required, such as hazardous environments or media.

Standard Industrial Sensor

Electrical Specifications

Turck Part Number	Bi 1-EH04-AP6X-V1131/ S1164
Connection	Turck picofast® snap lock, 3-pin (PKG 3Z cable)
Output	3-wire V (dc)—transistor (PNP current-sourcing)
Voltage	10 to 30 V (dc) polarity protected—pulsed SCP
Output Function	Normally open
Operating Temperature	–23 to 70°C (–10 to 158°F)

Wiring Diagram

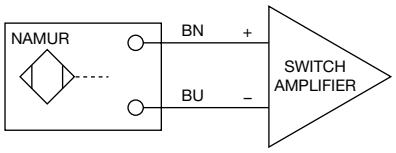


Intrinsically Safe Sensor

Electrical Specifications

Turck Part Number	Bi 1-EH04-Y1-V1130/S1164
Connection	Turck picofast snap lock, 3-pin (PKG 3Z cable)
Output	2-wire NAMUR-style (IEC60947-5-6 [EN60947-5-6])
Voltage	NAMUR switch amplifier required
Output Function	Normally open
Operating Temperature	–23 to 70°C (–10 to 158°F)

Wiring Diagram



Ordering Information

To order an electronic position sensor factory assembled, add:

- **-PS** for a standard industrial sensor
- **-PS-IS** for an intrinsically safe sensor

to the valve ordering number.

Examples: SS-SSV-V-2-F2-**PS**
SS-SSV-V-3-MPC-**PS-IS**

Replacement Part Kits

Kits With Seals

Replacement part kits that include seals contain all fluorocarbon FKM seals. Kalrez seals and Simriz seals are available in place of the *wetted* fluorocarbon FKM seals. For pressure-temperature ratings, see the table on page 10.

To order *wetted* Kalrez or Simriz seals, replace **V** in the kit ordering number with **K** for Kalrez or **Z** for Simriz.

Examples: SS-1K-SSVM-**K**-F2-STD
SS-1K-1B-SSVM-**Z**

Stream Assembly Kit

Each kit includes a DBB module assembled to a base block.

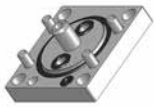
Stream Assembly Type	Ordering Number
Standard SSV	
Standard	SS-1K-SSVM-V-F2-STD
Outlet	SS-1K-SSVM-V-F2-OUT
MPC standard	SS-1K-SSVM-V-MPC-STD
MPC outlet	SS-1K-SSVM-V-MPC-OUT
ARV	SS-1K-SSVM-V-F2-ARV
High-Purge SSV	
Standard	SS-1K-SSVPM-V-F2-STD
Outlet	SS-1K-SSVPM-F2-OUT
MPC standard	SS-1K-SSVPM-V-MPC-STD
MPC outlet	SS-1K-SSVPM-V-MPC-OUT

Base Block Kit

Each kit includes one base block assembled with inserts and insert screws.

Block Type	Ordering Number
Standard SSV	
Standard	SS-1K-SSVB-V-STD
Outlet	SS-1K-SSVB-V-OUT
Left end	SS-1K-SSVB-LEF
Right end	SS-1K-SSVB-V-RIT
MPC standard	SS-1K-SSVB-V-MPC-STD
MPC outlet	SS-1K-SSVB-V-MPC-OUT
ARV	SS-1K-SSVB-V-ARV
High-Purge SSV	
Standard	SS-1K-SSVPB-V-STD
Outlet	SS-1K-SSVPB-V-OUT
MPC standard	SS-1K-SSVPB-V-MPC-STD
MPC outlet	SS-1K-SSVPB-V-MPC-OUT

Flange Kit



Each kit includes a flange assembled with O-ring seals.

Standard SSV kit ordering number: **SS-1K-1B-SSVM-V**

High-purge SSV kit ordering number: **SS-1K-1B-SSVPM-V**

Module Kit

Each kit includes a completely assembled module including the pneumatic actuator and flange.

Module Type	Ordering Number
DBB	SS-1K-SSVM-V
ARV	SS-1K-SSVM-V-ARV
High-purge DBB	SS-1K-SSVPM-V

O-Ring Seal Kit

Each kit includes the seals for one DBB module.

Ordering number: **SS-1K-9-SSVM-V**

Kits Without Seals

Cap Kit

This kit includes ten caps of the same color. To order, add the cap color designator to the basic kit ordering number: **MS-5K-SSVM**

Example: MS-5K-SSVM-**BL**

Cap Color	Designator
Black	-BK
Blue	-BL
Green	-GR
Orange	-OG
Red	-RD
Yellow	-YW
White	-WH

Screw Kit

This kit includes all cap screws for one stream assembly.
Ordering number: **SS-6K-SSVM**

Caution: Do not mix or interchange parts with those of other manufacturers.

Swagelok

About this document

Thank you for downloading this electronic catalog, which is part of General Product catalog Swagelok published in print. This type of electronic catalog is updated as new information arises or revisions, which may be more current than the printed version.

Swagelok Company is a major developer and provider of fluid system solutions, including products, integration solutions and services for industry research, instrumentation, pharmaceutical, oil and gas, power, petrochemical, alternative fuels, and semiconductor. Our manufacturing facilities, research, service and distribution facilities support a global network of more than 200 authorized sales and service centers in 57 countries.

Visit www.swagelok.com to locate your Swagelok representative and obtain any information on features, technical information and product references, or to learn about the variety of services available only through authorized sales centers and service Swagelok.

Safe Product Selection

When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit your Swagelok Web site or contact your authorized Swagelok representative.

Ultrahigh-Purity Valves
for Atomic Layer Processing

Atomic Layer Deposition (ALD) Valves

- Ultrahigh cycle life with high-speed actuation
- C_v range from 0.27 to 1.7
- Full immersion capability up to 392°F (200°C) with thermal actuators
- Electronic or optical actuator position-sensing option
- Suitable for ultrahigh-purity applications with 316L VIM-VAR stainless steel body
- Modular surface-mount, tube butt weld, and VCR® end connections

Contents

ALD3 and ALD6 Diaphragm Valve Features

- Normally closed and normally open pneumatic actuation
- Flow coefficients of 0.27 to 0.62 standard; custom flow coefficients available
- Two-port straight and elbow configurations
- Two-, three-, and four-port multiport valves and multivalve manifolds
- Two- and three-port modular surface-mount valves in 1.125 in. (ALD3 series only) and 1.5 in. platforms
  - C-seal design (all valves)
  - W-seal design (ALD3 series only)
- VCR, “H” Type VCR, and tube butt weld end connections in 1/4, 3/8, and 1/2 in. and 6, 10, and 12 mm sizes

Diaphragm

- Cobalt-based superalloy (UNS R30003) material for strength and corrosion resistance
- Optimized design for ultrahigh cycle life

Seat

- Fully contained seat design
- High-purity grade PFA, fully fluorinated
- Ultrahigh cycle life
- Broad range of chemical compatibility
- Excellent resistance to swelling and contamination
- High-integrity seat seal performance

Body

- Body seal provides ultrahigh cycle life
- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Fully swept flow path
  - minimizes entrapment areas
  - facilitates purging
  - maximizes flow capacity
- Optional body holes to accommodate heater cartridges

Actuators

Standard

- Pneumatic actuator for high-speed and repeatable actuation
- Capable of valve opening or closing time of less than 5 ms
- Factory-set flow adjusting mechanism ensures precise and consistent C_v from valve to valve
- Optional factory-set electronic actuator-position sensor verifies open position of pneumatically actuated valves
- Optional solenoid pilot valve for electronic control of high-speed actuation

Thermal

Same performance and options as standard actuator with the following additional features:

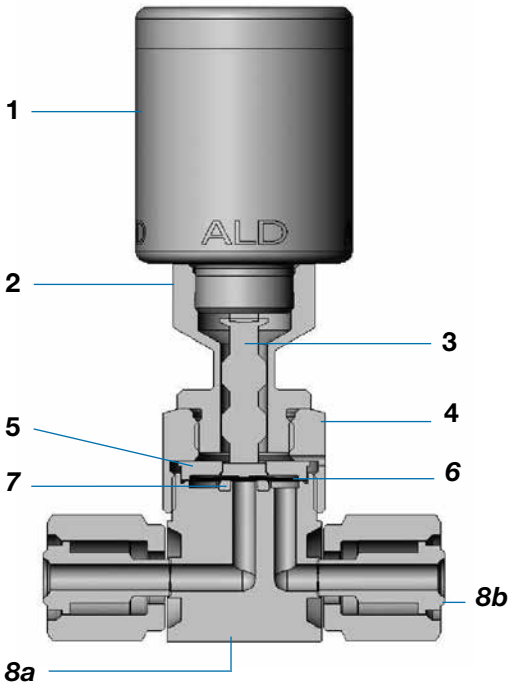
- Includes thermal isolation coupling for thermal applications
- Limits conductive heat transfer from the body to the actuator
- Provides a more uniform valve body temperature to reduce cold spots
- Significantly reduces electrical power required to heat the valve
- Extends the life of the actuator in applications where the body is heated

Materials of Construction (ALD3 and ALD6)

	Component	Material Grade/ASTM Specification
1	Pneumatic actuator assembly	—
	Cylinder, cap	Aluminum
	Pistons	Powdered metal 300 series SS—normally open; aluminum—normally open and normally closed
	Base	Powdered metal 300 series SS—normally open; none—normally closed
	Flow adjusting mechanism	316 SS/A479
	O-rings	Fluorocarbon FKM
	Springs	S17700
	Button	316 SS/A479
	Bushing	Carbon-filled PTFE
2	Thermal isolation coupling housing (thermal model only)	316 SS/A479
3	Thermal isolation coupling stem (thermal model only)	S17400
4	Bonnet nut	316 SS/A479
5	Bonnet	S17400
6	*Diaphragm*	*Cobalt-based superalloy (UNS R30003)/AMS 5876*
7	*Seat*	*High-purity PFA Type II/D3307*
8a	*Body*	*316L VIM-VAR SS/SEMI F20 Ultrahigh-Purity*①
8b	*Welded VCR end connections*	*316L VAR SS/SEMI F20 High-Purity*①
	Lubricant	PTFE-based

Wetted components listed in *italics*.

① 20 % minimum elongation allowed.



Normally Closed Actuator Shown

Process Specifications (ALD3 and ALD6)

See Swagelok® *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	Electropolished and finished to an average of 5 µin. (0.13 µm)	ALD3 normally closed: Inboard helium leak tested to a rate of 1×10^{-9} std cm³/s at the seat, envelope, and all seals. ALD3 and ALD6 normally open and ALD6 normally closed: Inboard helium leak tested to a rate of 1×10^{-8} std cm³/s at the seat and to a rate of 1×10^{-9} std cm³/s at the envelope and all other seals.

Technical Data (ALD3 and ALD6)

Valve Series	Working Pressure psig (bar)		Temperature Rating °F (°C)			Flow Coefficient (C_v)④	Orifice in. (mm)	Internal Volume⑤ in.³ (cm³)		Pneumatic Actuator⑤	
			Operating②③		Short-Term Bakeout			Tube Butt Weld Body	2-Port Surface-Mount	Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
	Operating①	Burst	Standard Actuator	Thermal Actuator②							
Normally Closed Actuation											
ALD3	Vacuum to 145 (10.0)	>3200 (220)	32 to 248 (0 to 120)	32 to 392 (0 to 200)	392 (200) (valve open)	0.27	0.16 (4.1)	0.086 (1.4)	0.048 (0.79)	50 to 90 (3.5 to 6.2)	0.042 (0.69)
ALD6						0.62	0.23 (5.8)	0.26 (4.3)	0.084 (1.4)		0.075 (1.2)
Normally Open Actuation											
ALD3	Vacuum to 145 (10.0)	>3200 (220)	32 to 248 (0 to 120)	32 to 392 (0 to 200)	392 (200) (valve open)	0.27	0.16 (4.1)	0.086 (1.4)	0.048 (0.79)	70 to 90 (4.9 to 6.2)	0.027 (0.44)
ALD6						0.62	0.23 (5.8)	0.26 (4.3)	0.084 (1.4)		0.046 (0.75)

① Recommended operating pressure of less than 35 psig (2.4 bar) for optimal cycle life.

② Actuator temperature is limited to 248°F (120°C); valve body temperature is rated to 392°F (200°C).

③ See pages 6 and 7 for maximum operating temperatures for products with an electronic actuator-position sensor, solenoid pilot valve, or both.

④ Custom flow coefficients available; contact your authorized Swagelok representative for more information.

⑤ ALD3 series 1.125 in. platform surface-mount valve:
- Internal volume for 2-port body: 0.078 in.³ (1.3 cm³)
- Actuation pressure: normally closed, 60 to 90 psig (4.2 to 6.2 bar); normally open, 70 to 90 psig (4.9 to 6.2 bar).
- Air displacement: 0.03 in.³ (0.49 cm³).

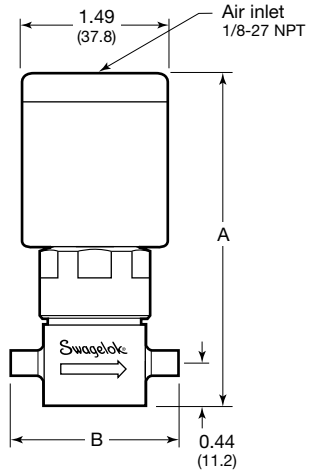
Ordering Information and Dimensions (ALD3 and ALD6)

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Two-Port Valves

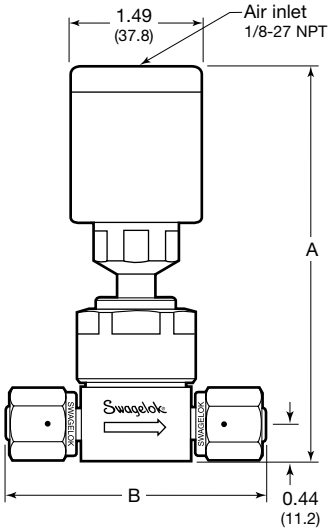
For a complete ordering number, add **C** for a normally closed actuator or **NO** for a normally open actuator.

Normally Closed Standard Actuator



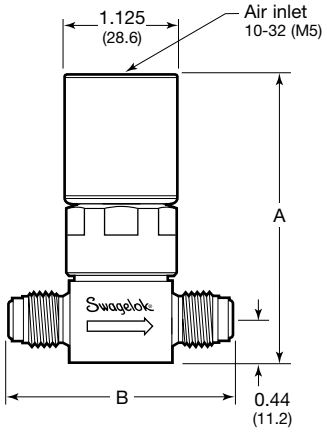
Butt Weld End Connections

Normally Closed Thermal Actuator



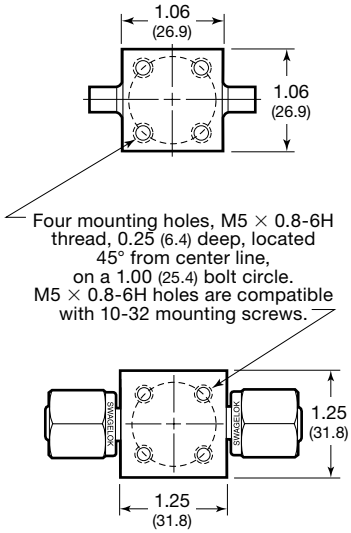
Female VCR Fitting End Connections

Normally Open Standard Actuator



Integral Male VCR Fitting End Connections

ALD3 Bottom



ALD6 Bottom

End Connections		Standard Actuator Ordering Number	Thermal Actuator Ordering Number	Dimensions, in. (mm)		
				A		
Inlet/Outlet	Size			Normally Closed	Normally Open	B
ALD3 Series						
Female VCR fitting	1/4 in.	6LVV-ALD3FR4-P-	6LVV-ALD3TFR4-P-	3.50 (88.9) (standard actuator)	3.22 (81.8) (standard actuator)	2.78 (70.6)
Integral male VCR fitting	1/4 in.	6LVV-ALD3VR4-P-	6LVV-ALD3TVR4-P-			2.30 (58.4)
Rotatable male VCR fitting	1/4 in.	6LVV-ALD3MR4-P-	6LVV-ALD3TMR4-P-			2.78 (70.6)
Tube butt weld, 0.30 in. long	1/4 × 0.035 in.	6LVV-ALD3BW4-P-	6LVV-ALD3TBW4-P-	4.50 (114) (thermal actuator)	4.22 (107) (thermal actuator)	1.74 (44.2)
Tube butt weld, 0.26 in. long	1/4 × 0.035 in.	6LVV-ALD3BW4S-P-	6LVV-ALD3TBW4S-P-			1.61 (40.9)
Tube butt weld, 7.6 mm long	6 × 1 mm	6LVV-ALD3BW6M-P-	6LVV-ALD3TBW6M-P-			1.74 (44.2)
ALD6 Series						
Female VCR fitting	1/2 in.	6LVV-ALD6FR8-P-	6LVV-ALD6TFR8-P-	3.76 (95.5) (standard actuator)	3.48 (88.4) (standard actuator)	4.16 (106)
Female “H” type VCR fitting	1/4 in.	6LVV-ALD6HFR4-P-	6LVV-ALD6THFR4-P-			2.78 (70.6)
Female/rotatable male “H” type VCR fitting	1/4 in.	6LVV-ALD6HFR4HMR4-P-	6LVV-ALD6THFR4HMR4-P-			2.96 (75.2)
Rotatable male VCR fitting	1/2 in.	6LVV-ALD6MR8-P-	6LVV-ALD6TMR8-P-			4.16 (106)
Rotatable male “H” type VCR fitting	1/4 in.	6LVV-ALD6HMR4-P-	6LVV-ALD6THMR4-P-	4.76 (121) (thermal actuator)	4.48 (114) (thermal actuator)	2.96 (75.2)
Tube butt weld, 0.50 in. long	3/8 × 0.035 in.	6LVV-ALD6BW6-P-	6LVV-ALD6TBW6-P-			2.25 (57.2)
	1/2 × 0.049 in.	6LVV-ALD6BW8-P-	6LVV-ALD6TBW8-P-			
Tube butt weld, 12.7 mm long	10 × 1 mm	6LVV-ALD6BW10M-P-	6LVV-ALD6TBW10M-P-			
	12 × 1 mm	6LVV-ALD6BW12M-P-	6LVV-ALD6TBW12M-P-			

Ordering Information and Dimensions (ALD3 and ALD6)

Dimensions, in inches (millimeters), are for reference only and are subject to change.

Modular Surface-Mount Valves

Standard and High-Flow C-Seal Design

For a complete ordering number, add **C** for a normally closed actuator or **NO** for a normally open actuator.

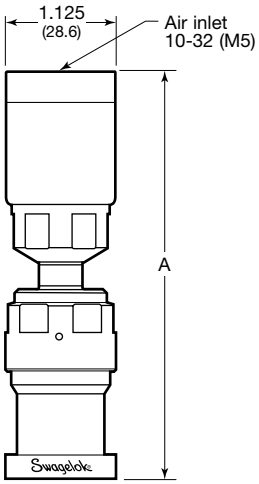
W-Seal Design

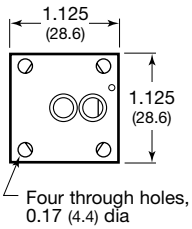
Insert **W** into an ALD3 series ordering number as shown.

Examples:

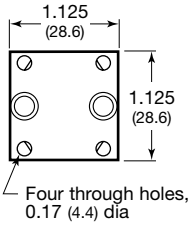
- 6LVV-MSM-ALD3E-**W**2-P-C for a 1.125 in. 2-port valve with standard actuator
- 6LVV-MSM-ALD3T-**W**3-P-C for a 1.5 in. 3-port valve with thermal actuator

Normally Closed Thermal Actuator, 1.125 in. Platform



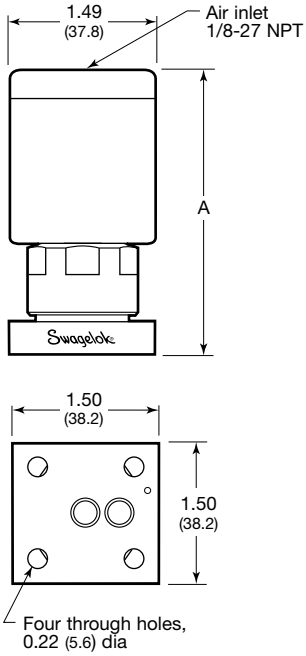


1.125 in. C-Seal Platform Bottom



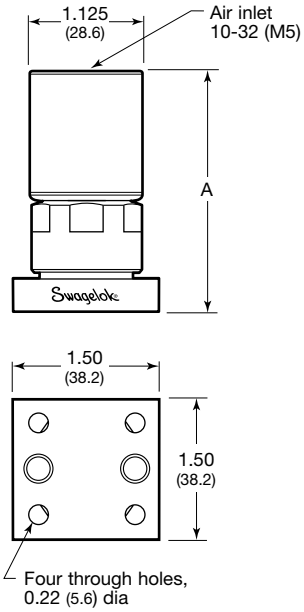
1.125 in. W-Seal Platform Bottom

Normally Closed Standard Actuator 1.5 in. Platform



1.5 in. C-Seal Platform Bottom

Normally Open Standard Actuator 1.5 in. Platform

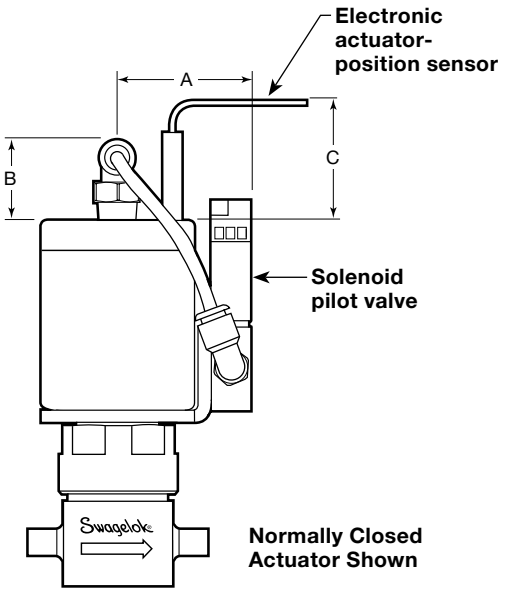


1.5 in. W-Seal Platform Bottom

Surface-Mount Platform	Ports	Standard Actuator Ordering Number	Thermal Actuator Ordering Number	**A,** in. (mm)			
				Normally Closed		Normally Open	
				C-Seal	W-Seal	C-Seal	W-Seal
ALD3 Series							
1.125 in.	2	6LVV-MSM-ALD3E-2-P-	6LVV-MSM-ALD3ET-2-P-	3.40 (86.4) (standard) 4.40 (112) (thermal)	3.40 (86.4) (standard) 4.40 (112) (thermal)	3.45 (87.6) (standard) 4.45 (113) (thermal)	3.45 (87.6) (standard) 4.45 (113) (thermal)
	3	6LVV-MSM-ALD3E-3-P-	6LVV-MSM-ALD3ET-3-P-				
1.5 in.	2	6LVV-MSM-ALD3-2-P-	6LVV-MSM-ALD3T-2-P-	3.02 (76.7) (standard) 4.02 (102) (thermal)	3.70 (94.0) (standard) 4.70 (119) (thermal)	2.74 (69.6) (standard) 3.74 (95.0) (thermal)	3.42 (86.9) (standard) 4.42 (112) (thermal)
	3	6LVV-MSM-ALD3-3-P-	6LVV-MSM-ALD3T-3-P-				
ALD6 Series							
1.5 in.	2	6LVV-MSM-ALD6-HF2-P-	6LVV-MSM-ALD6T-HF2-P-	3.15 (80.0) (standard) 4.15 (105) (thermal)	—	2.87 (72.9) (standard) 3.87 (98.3) (thermal)	—
	3	6LVV-MSM-ALD6-HF3-P-	6LVV-MSM-ALD6T-HF3-P-				

Options and Accessories (ALD3 and ALD6)

Valves with electronic actuator-position sensors (right), solenoid pilot valve assemblies, page 7, heater cartridge holes, page 7, and optical position sensors, page 12, are available.



Dimensions

Actuator	Dimensions, in. (mm)		
	A	B	C
Normally closed	1.32 (33.5)	0.70 (17.8)	1.18 (30.0)
Normally open	1.14 (29.0)	0.63 (16.0)	

Ordering Information

To order one option, add a designator to the valve ordering number. To order two or more options, add the designators in the sequence shown below.

6LVV – ALD3BW4-P-C **S V H**

- **S**: Electronic actuator-position sensor
- **V**: Solenoid pilot valve assembly
- **H**: Heater cartridge holes

Examples:

6LVV-ALD3BW4-P-C**H** for a valve with heater cartridge holes

6LVV-ALD3BW4-P-C**S** for a valve with electronic actuator-position sensor with short pigtail electrical connector

6LVV-ALD3BW4-P-C**SLH** for a valve with electronic actuator-position sensor with long cable with flying leads electrical connector and heater cartridge holes

6LVV-A3T1V333P-AA**V** for a multivalve manifold with solenoid pilot valve assembly on valve 2

6LVV-A31V333P-A**SV**A**SV** for a multivalve manifold with electronic actuator-position sensor with short pigtail electrical connector and solenoid pilot valve assembly on both valves

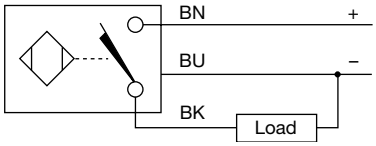
Electronic Actuator-Position Sensors

Transmit a signal to an electrical device indicating the open position of pneumatically actuated valves. Sensors and electrical connectors described below are third-party products.

Sensor Technical Information

Output	3-wire V (dc)—transistor (current-sourcing)
Output Function	Normally open
Voltage	10 to 30 V (dc) polarity protected—pulsed SCP
Operating Temperature	–23 to 70°C (–10 to 158°F)

Wiring Diagram



Factory-Assembled Electronic Actuator-Position Sensors

Factory-assembled position sensors are set for optimum performance and sealed with a tamper-evident paste that provides visible evidence of disassembly or adjustment.

To order an electronic actuator-position sensor factory assembled to a valve, add a designator to the valve ordering number.

Examples:

6LVV-ALD3BW4-P-C**S**
6LVV-MSM-ALD6-HF2-P-C**SL**

Sensor Electrical Connector	Designator
Short pigtail①	S
Long cable with flying leads	SL

① A mating direct-current M8 3-wire push-on straight female connector is available.
Ordering number: **MS-CS-BALF-1**

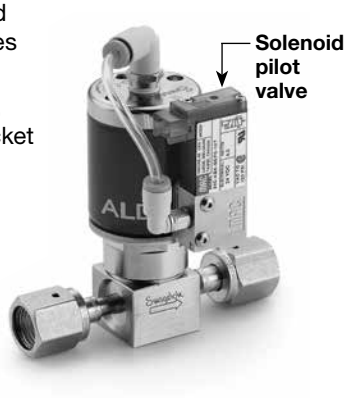
Note: optical sensors for ALD3 and ALD6 are available on page 12.

Options and Accessories (ALD3 and ALD6)

Solenoid Pilot Valve Assemblies

Fast-acting, high-flow solenoid pilot valve enhances ALD series valve response time.

- Includes tubing, connectors, and rotatable mounting bracket for installation versatility.
- See illustration on page 6 for assembly dimensions.
- See table below for technical information. For additional technical information, see MAC® valve part number 34C-ABA-GDFC-1KT.



Solenoid Pilot Valve Technical Information

Component	MAC valve 34C-ABA
Solenoid Pilot Valve	24 V, 4 W
	Temperature rating: 50°C (122°F) maximum, continuous use
	Porting: M5 × 0.8-6H thread, compatible with 10-32 screws
Push-to-Connect Fitting	Material: C3604 brass, 304 SS, polybutylene terephthalate (PBT), polypropylene (PP), polyoxymethylene (POM), Nitrile rubber (NBR) (Buna N)
Tubing	Material: polyurethane
Bracket	Material: 316 SS
O-Ring	Material: Fluorocarbon FKM
Washer	Material: Nylon

Factory-Assembled Solenoid Pilot Valves

To order a solenoid pilot valve factory assembled, add **V** to the ordering number.

Examples: 6LVV-ALD3BW4-P-C**V**
6LVV-MSM-ALD6-2-P-C**V**

In modular surface-mount systems, the solenoid pilot valve may interfere with adjacent components.

Solenoid Pilot Valves for Field Assembly

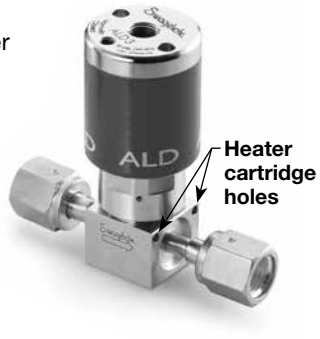
Ordering number for a solenoid pilot valve component only:

MS-PVK-ALD-MAC34CA

Heater Cartridge Holes

Valves are available with holes in the body to accommodate heater cartridges.

- Hole size: 1/8 in. through holes for two-port, three-port, and elbow bodies; 1/8 by 1 in. deep holes for monoblock bodies.
- Two-port and monoblock bodies feature two body holes; three-port and elbow bodies feature one body hole. For more information, contact your authorized Swagelok representative.



Ordering Information.

To order a valve with heater cartridge holes, add **H** to the ordering number.

Examples: 6LVV-ALD3BW4-P-C**H**
6LVV-MSM-ALD6-2-P-C**H**

ALD20 Valve Features

- Normally closed pneumatic actuation
- Flow coefficients of 1.2 to 1.7 standard; custom flow coefficients available
- Two-port straight and elbow configurations
- Two-, three- and four-port multiport valves
- 1.5 in. platforms with C-seal design
- 1/2 in. VCR and tube butt weld end connections
- Patent-pending design

Seat

- Fully contained seat design
- High-purity grade PFA, fully fluorinated
- Ultrahigh cycle life
- Broad range of chemical compatibility
- Excellent resistance to swelling and contamination
- High-integrity seat seal performance

Body

- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Alloy 22 available for enhanced corrosion resistance

Bellows

- Highly polished (5 µin. R_a) bellows designed for ultra-high purity applications
- Alloy 22 material for enhanced corrosion resistance
- Optimized design for ultrahigh cycle life

Actuators

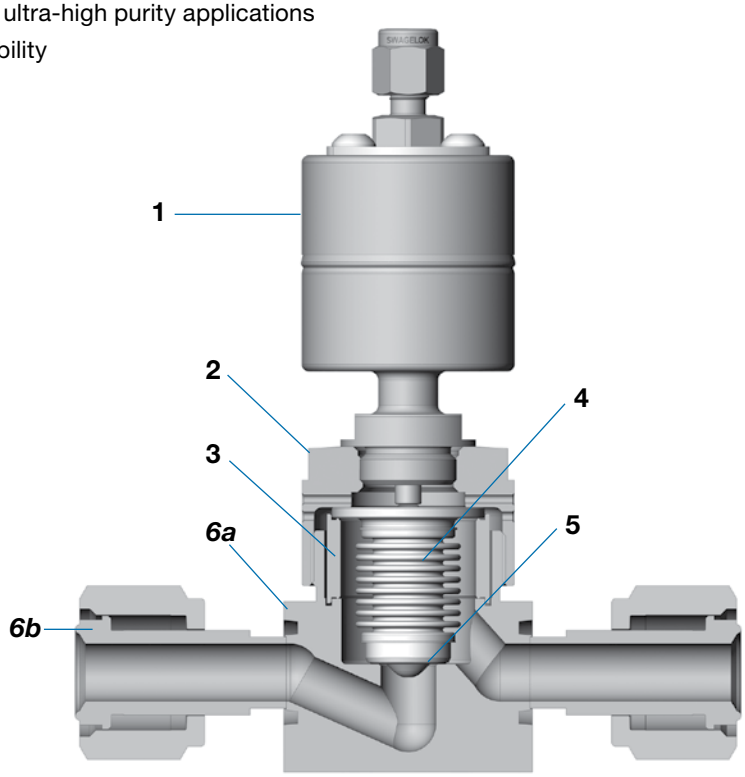
Thermal

- Pneumatic actuator for high-speed and repeatable actuation
- Fully temperature immersible
- Capable of valve opening or closing time of less than 10 ms
- Factory-set flow adjusting mechanism ensures precise and consistent C_v from valve to valve

ALD20 Valve for High Flow Applications

Features

- High flow capacity (up to 1.7 Cv) in a compact footprint
- Valve and actuator fully immersible at elevated temperatures
- Allows configurable flow path to optimize systems
- Highly polished (5 µin. R_a) alloy 22 bellows designed for ultra-high purity applications
- PFA seat for enhanced purity and improved thermal stability



Materials of Construction (ALD20)

Component	Material Grade/ ASTM Specification
1 Pneumatic actuator assembly	316 SS/A479
Lubricant	PTFE-based
2 Bonnet nut	316 SS/A479
3 *Spacer ring*	*Alloy 22/B574*
4 *Polished bellows assembly*	*Alloy 22/B575*
5 *Seat*	*High-purity PFA Type II/D3307*
6a *Body*	*316L VIM-VAR SS/ SEMI F20 Ultrahigh-Purity*①
	Alloy 22/B574
6b *Welded VCR end connections*	*316L VAR SS/ SEMI F20 High-Purity*① 316 SS/A479 VCR nut
	Alloy 22/B574 316 SS/A479 VCR nut

Wetted components listed in *italics*.
① 20 % minimum elongation allowed.

Process Specifications (ALD20)

See Swagelok *Ultrahigh-Purity Process Specification (SC-01)* catalog, MS-06-61 for details on processes, process controls, and process verification. (For the alloy 22 option, reference the cleaning, assembly, and packaging sections in MS-06-61.)

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.	316L VIM-VAR SS electropolished and finished to an average of 5 µin. (0.13 µm) Alloy 22 finished to an average of 5 µin. (0.13 µm)	*Inboard Helium Leak Test:* ALD20 normally closed valves inboard helium leak tested to a rate of 1×10^{-9} std cm^3/s at the envelope and all external seals.
			Internal Helium Leak Test: ALD20 normally closed valves internal helium leak tested to a rate of 1×10^{-7} std cm^3/s at the seat.
			Internal seat seal may change during valve life cycle, contact Swagelok technical service for additional information.

Technical Data (ALD20)

Body Style	Working Pressure psig (bar)		Temperature Rating °F (°C)	Flow Coefficient (C_v)	Orifice in. (mm)	Internal Volume in.³ (cm³)	Pneumatic Actuator	
	Operating	Burst	Operating (Immersion)				Actuation Pressure psig (bar)	Air Displacement in.³ (cm³)
Normally Closed Actuation								
1/2 in. Ported	Vacuum to 20 (1.4)	>3200 (220)	50 to 392 (10 to 200)	1.7	0.36 (9.1)	0.75 (12.3) Tube Butt Weld	70 to 90 (4.9 to 6.2)	0.10 (1.6)
MSM High Flow C-seal				1.2	0.29 (7.2)	0.50 (8.1) 2-Port		

Ordering Information and Dimensions (ALD20)

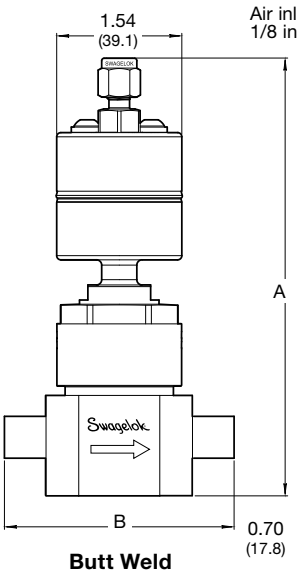
Dimensions, in inches (millimeters), are for reference only and are subject to change.

To order, add a body material designator to an ALD20 basic ordering number.

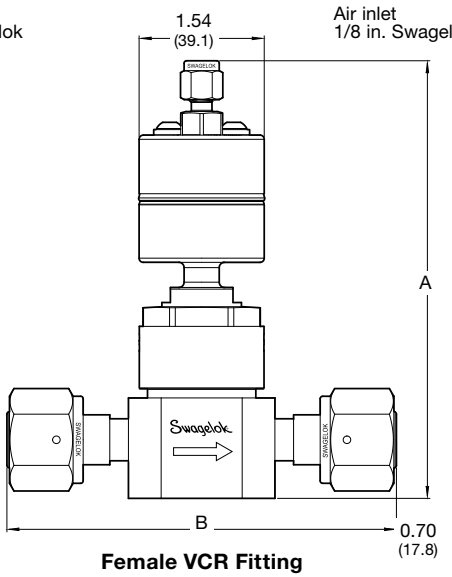
Material	Designator
316L VIM-VAR SS	6LVV
Alloy 22	HC22

Example: **6LVV**-ALD20FR8-P-C

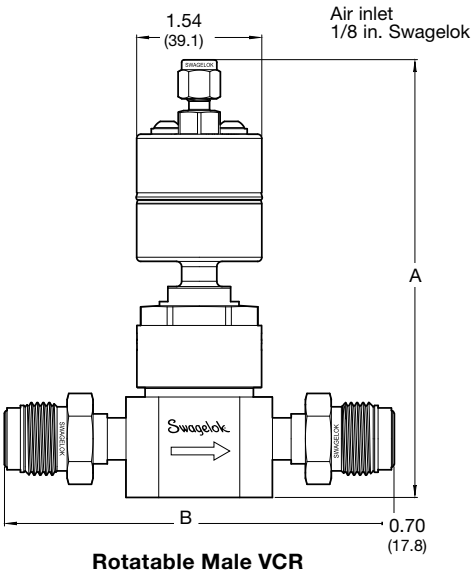
Two-Port Valves



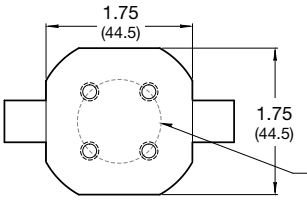
Butt Weld End Connections



Female VCR Fitting End Connections



Rotatable Male VCR Fitting End Connections



Two-Port Bottom

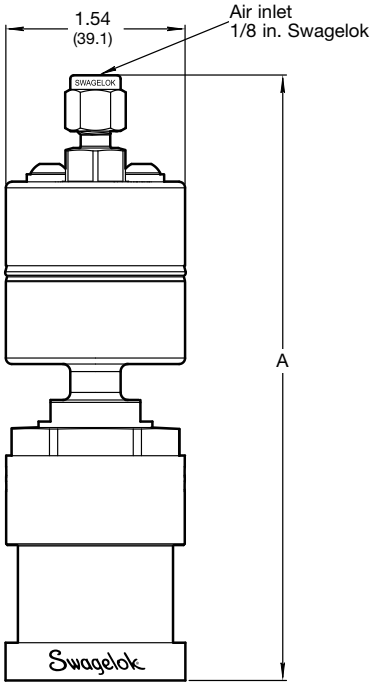
End Connections		Ordering Number	Dimensions, in. (mm)	
Inlet/Outlet	Size		A	B
Female VCR fitting	1/2 in.	-ALD20FR8-P-C	5.23 (133)	4.65 (118)
Rotatable male VCR fitting	1/2 in.	-ALD20MR8-P-C		
Female/Rotatable male VCR fitting	1/2 in.	-ALD20FR8MR8-P-C		
Tube butt weld, 0.50 in. long	1/2 × 0.049 in.	-ALD20BW8-P-C		2.74 (69.7)
Tube butt weld, 0.50 in. long/ Female VCR fitting	1/2 × 0.049 in./ 1/2 in.	-ALD20BW8FR8-P-C		3.70 (94.0)

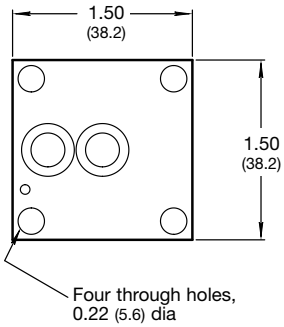
Ordering Information and Dimensions (ALD20)

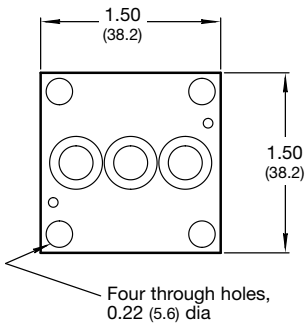
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Modular Surface-Mount Valves

High-Flow C-Seal Design







Ports	Ordering Number	**A,** in. (mm)
2	-MSM-ALD20-HF2-P-C	5.05 (128)
3	-MSM-ALD20-HF3-P-C	

Options and Accessories (ALD3, ALD6, ALD20)

Optical Position Sensors

Features

- Fast response times
- Compatible with high temperatures
- Unaffected by Radio Frequency (RF) noise
- Transferable from one valve to another, without loss of factory settings

Optical Sensor Kits

Optical sensors detect the open position on normally closed pneumatically actuated valves. Optical sensor kits contain the hardware required to install the sensor onto an optical sensor ready valve and connect it to an amplifier.

Optical sensors kits are factory set to the correct depth and tested for proper functionality.

Sensor Kit Technical Information

Fiber Unit	FU-87
Temperature Rating	–76°F to 356°F (–60°C to 180°C)
Max Ambient Temperature	302°F (150°C)
Fiber Length①	6.56 ft. (2 m)

① Every optical sensor kit includes a single use fiber cutting tool

Ordering Information

Optical Sensor Kit Ordering number:

MS-SOK-ALD-FU87

To order an Optical Sensor Kit with an amplifier add, **-AMP** to the ordering number.

MS-SOK-ALD-FU87**-AMP**

Optical Sensor Ready ALD3 and ALD6 Valves*

Optical sensor ready valves are designed to allow an optical sensor kit to be easily installed onto the actuator. The modifications from standard ALD valves include the following:

- A sensor target is included in the actuator
- The actuator is 0.115 in. (2.9 mm) taller
- The 1/8-27 NPT air inlet is replaced with a 10-32 (M5) connection

Ordering Information (ALD3 and ALD6)*

To order an optical sensor ready valve, add **SO** to the ordering number.

Example: 6LVV-ALD3BW4-P-LI-C**SO**

Note: Optical sensor is only available on normally closed valves. LI indicates “less indicator” as sensor kits are sold separately for field assembly.

* All **ALD20** valves are optical sensor-ready. No special order information is required.

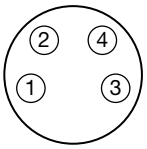
Caution: Do not mix or interchange parts with those of other manufacturers.

Optical Sensor Amplifiers

The optical sensor amplifiers work in conjunction with an Optical Sensor Kit and an Optical Sensor Ready Valve to transmit a signal to an electrical device. The signal indicates the open position of pneumatically actuated valves.

Amplifier Technical Information

Amplifier	FS-N11CP
Output	PNP, M8 Connector
Temperature Rating	–4° to 131°F (–20° to 55°C)
Power Requirement	12-24V DC ± 10% Ripple (P-P) 10 % or Less



M8 Connector Pin Layout

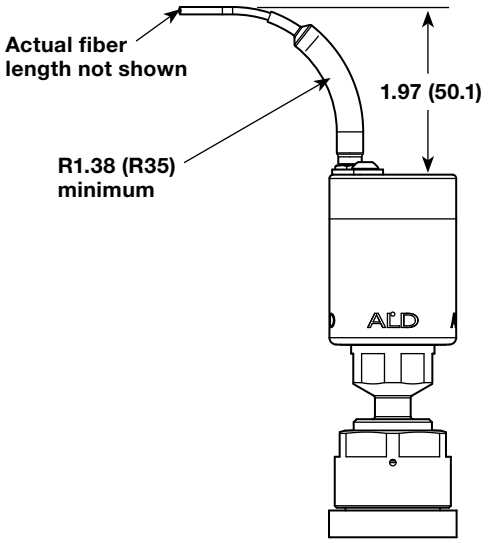
1	Power (12-24V DC)
2	Input
3	Ground (0V)
4	Digital Output

Factory Programmed Amplifiers

Factory programmed amplifiers are preset for optimum performance with Swagelok optical sensor ready valves and optical sensor kits. All factory programmed amplifiers are tested for proper functionality.

Optical Sensor Amplifier Ordering Number:

MS-SOK-ALD-AMP-M8



Multiport and Elbow Valves and Monoblock Manifolds

ALD series valves are available in multiport and elbow configurations and monoblock manifolds; refer to *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, MS-02-442.

Swagelok

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page of the individual catalog. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

Warranty Information

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit swagelok.com or contact your authorized Swagelok representative.

Safe Product Selection
When selecting a product, the total system design must be considered to ensure safe, trouble-free performance. Function, material compatibility, adequate ratings, proper installation, operation, and maintenance are the responsibilities of the system designer and user.

Caution: Do not mix or interchange parts with those of other manufacturers.