Bellows-sealed Valves & Regulators

SM, SVH and FHR-1 Series

FITOK

Bellows-sealed Valves

SM Series Low Pressure Bellows-sealed Valves

Features

◎ Metal-to-metal gasket seal without external leakage
◎ Precision-formed metal bellows to ensure reliability
◎ Non-rotating stem tip to increase shutoff cycle life
◎ Handle and pneumatic actuator available
◎ Pneumatic actuator to rotate 360° for ease of installation
◎ Panel mounting and bottom mounting available

Technical Data

Type		SM4	SM8
Ports Size		1/4" to 3/8" or 6 mm to 8 mm	3/8" to 1/2" or 10 mm to 12 mm
Flow Coefficient (Cv)		0.30	0.80
Orifice Size		0.16 in. (4.1mm)	0.31 in. (8.0 mm)
Max. Working Pressure	Handle	500 psig (34.4 bar)	
	Pneumatic	145 psig (10 bar)	
Pneumatic Actuator Operating Pressure		60 to 90 psig (4.2 to 6.2 bar)	
Temperature		PCTFE: -10 ~ 150°F (-23 ~ 65℃) PFA: -10 ~ 302°F (-23 ~ 150℃)	
Leak rate (Helium)	Internal	≤ $4x10^{-9}$ mbar l/s	
	External	≤ $4x10^{-9}$ mbar l/s	

Flow Data

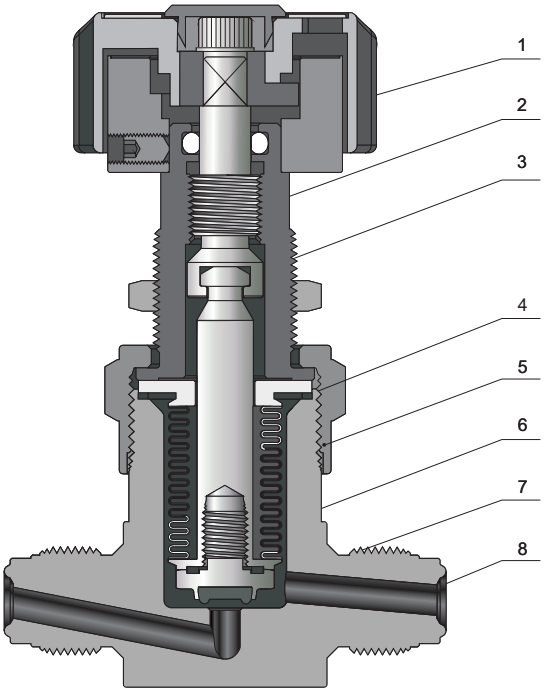
Air @ 70°F (21℃)
Water @ 60°F (16℃)

Pressure Drop to Atmosphere psig (bar)	Sm4: Cv 0.30		Sm8: Cv 0.80	
	Air (l/min)	Water (l/min)	Air (l/min)	Water (l/min)
10 (0.68)	96	3.6	270	9.6
50 (3.4)	250	7.9	730	21.6
100 (6.8)	450	11.0	1280	30.0

Product Technology Grade

Technology \ Product Grade	General Purpose	Special Cleaning and Packaging	Ultra High Purity
Material/Specification	316 SS/ASTM A479 316L SS/ASTM A479		316L SS/ASTM A479
Wetted Surface Roughness	Ra 20 µin. (0.51 µm)		Ra 8 µin. (0.20 µm)
Polishing Process	Machine finished		Electropolished
Cleaning and Packaging Specification	FC-01 Standard Cleaning and Packaging	FC-02 Special Cleaning and Packaging	FC-03 Ultra High Purity Cleaning and Packaging
Cleaning Process	Thrice degreasing ultrasonic cleaning	Special cleaning with non-ozone-depleting chemicals	Ultra high purity cleaning in continuously monitored ultrasonic cleaning system with deionized water
Assembly Environment	At atmosphere	In specially cleaned areas	In ISO Class 5/Federal Class 100 cleanroom
Packaging Process	Individually bagged	Double bagged	Double bagged and vacuum sealed in cleanroom

Major Materials of Construction



Round Handle Model

Item	Component	Material/Specification
1	Handle	ABS
2	Actuator	416 SS/ASTM A582
3	Bonnet	316 SS/ASTM A479
4	Bonnet Gasket	316L SS/ASTM A269
5	Bonnet nut	316 SS/ASTM A479
6	Bellows	316L SS/ASTM A269
7	Seat	PCTFE/ASTM D1430 or PFA/ASTM D3307
8	Body	316 SS/ASTM A479 or 316L SS/ASTM A479

Actuators

Manual - Round Handle

- ◎ Half turn to operate from fully open to closed
- ◎ Handle with window to visually indicate open and closed states

Pneumatic

- ◎ Normally open, "N.O." marked on the top of the cylinder
- ◎ Normally closed, "N.C." marked on the top of the cylinder

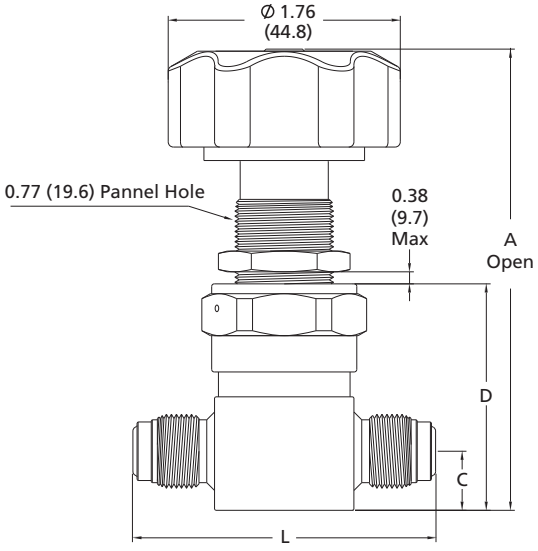
Dimensions and Ordering Information

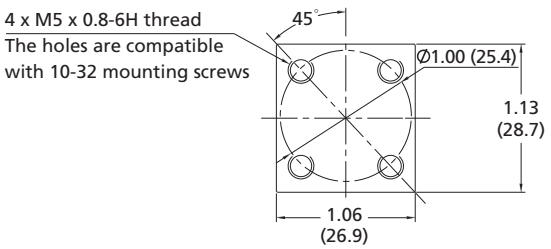
Straight Type

Dimensions

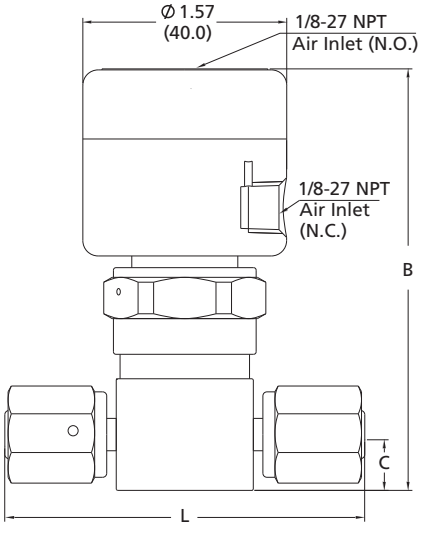
Dimensions, in inches (millimeters), are for reference only.

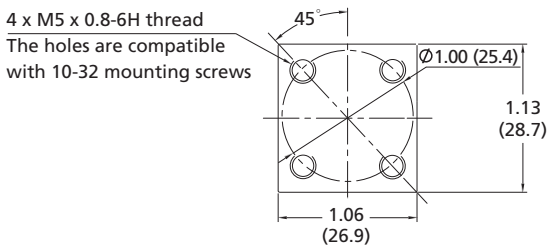
Manual - Handle





Pneumatic





Basic Ordering Number	Connection Type and Size	Dimensions, in. (mm)				
		A	B	C	D	L
	SM4 Series					
SM4□□-FL4-	1/4" FITOK Tube Fitting	3.51 (89.4)	3.31 (84.0)	0.45 (11.4)	1.78 (45.2)	2.46(62.5)
SM4□□-FL6-	3/8" FITOK Tube Fitting					2.58(65.5)
SM4□□-ML6-	6 mm FITOK Tube Fitting					2.46(62.5)
SM4□□-ML8-	8 mm FITOK Tube Fitting					2.53(64.3)
SM4□□-TB4-	1/4" Tube Butt Weld					1.74(44.2)
SM4□□-TB6-	3/8" Tube Butt Weld					
SM4□□-MTB6-	6 mm Tube Butt Weld					
SM4□□-TS4-	1/4" Tube Socket Weld					1.75(44.4)
SM4□□-FR4-	1/4" Integral Male FR					2.30(58.4)
SM4□□-FFR4-	1/4" Female FR					2.76(70.1)
SM4□□-FO4-	1/4" Male FO					2.00(50.8)
	SM8 Series					
SM8□□-FL6-	3/8"FITOK Tube Fitting	3.77 (95.7)	3.76 (95.5)	0.53 (13.5)	2.02 (51.3)	2.58(65.5)
SM8□□-FL8-	1/2" FITOK Tube Fitting					2.80(71.1)
SM8□□-ML10-	10 mm FITOK Tube Fitting					2.60(66.0)
SM8□□-ML12-	12 mm FITOK Tube Fitting					2.80(71.1)
SM8□□-TB6-	3/8" Tube Butt Weld					1.74(44.2)
SM8□□-TB8-	1/2" Tube Butt Weld					
SM8□□-FR8-	1/2" Integral Male FR	3.87 (98.2)	3.86 (98.0)	0.63 (16.0)	2.12 (53.8)	2.58(65.5)
SM8□□-FFR8-	1/2" Female FR					3.15(80.0)

Ordering Number Description

SM4SS – FL4 – ML6 – RAF2

Body Material	
6L	316L SS
SS	316 SS

Type
4
8

Inlet Type	
TB	Fractional Tube Butt Weld
MTB	Metric Tube Butt Weld
TS	Fractional Tube Socket Weld
FR	Integral Male FR Fitting
FFR	Female FR Fitting
FL	Fractional Tube Fitting
ML	Metric Tube Fitting
FO	Male FO Fitting

Inlet Size	
4	1/4"
6	6 mm or 3/8"
8	8 mm or 1/2"
10	10 mm
12	12 mm

Outlet Type	Outlet Size
	Same as Inlet
Specified in the same way as Inlet type and size	

Actuator Type	
R	Handle
C	Pneumatic Normally Closed
O	Pneumatic Normally Open

Seat	
	PCTFE
A	PFA

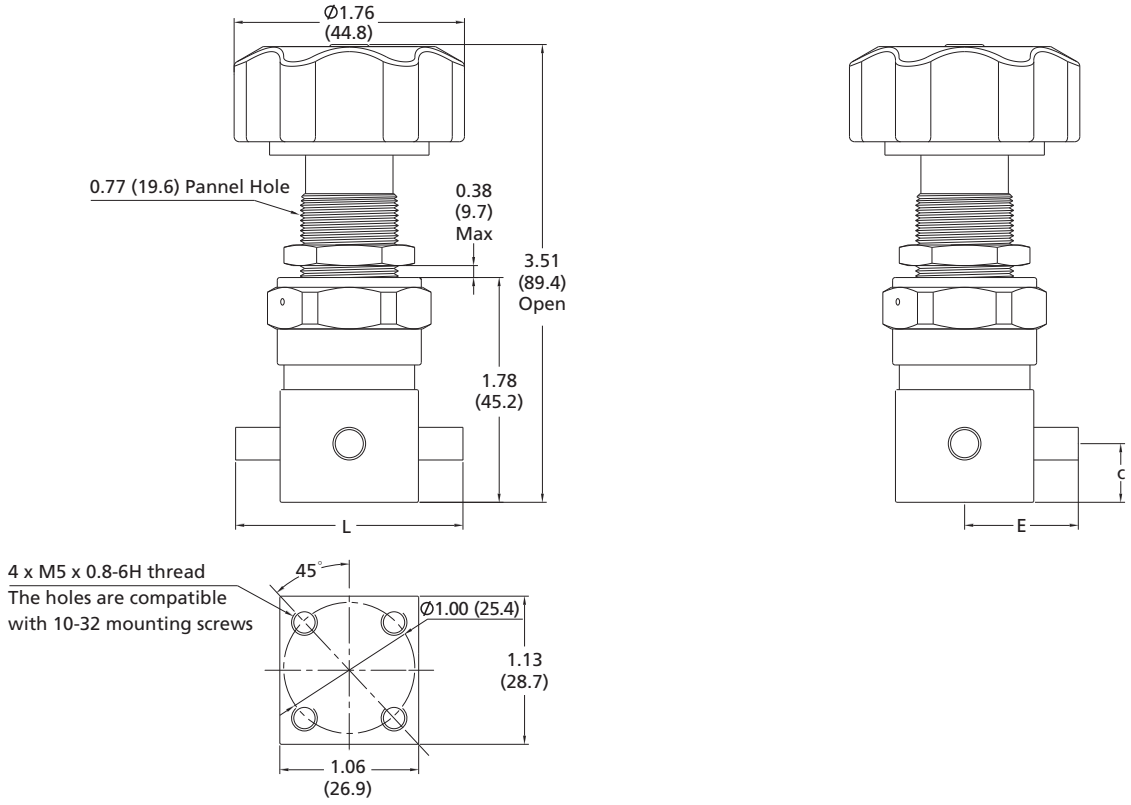
Technology Grade	
	General Purpose
F2	Special Cleaning and Packaging
F3	Ultra High Purity

Branch Type

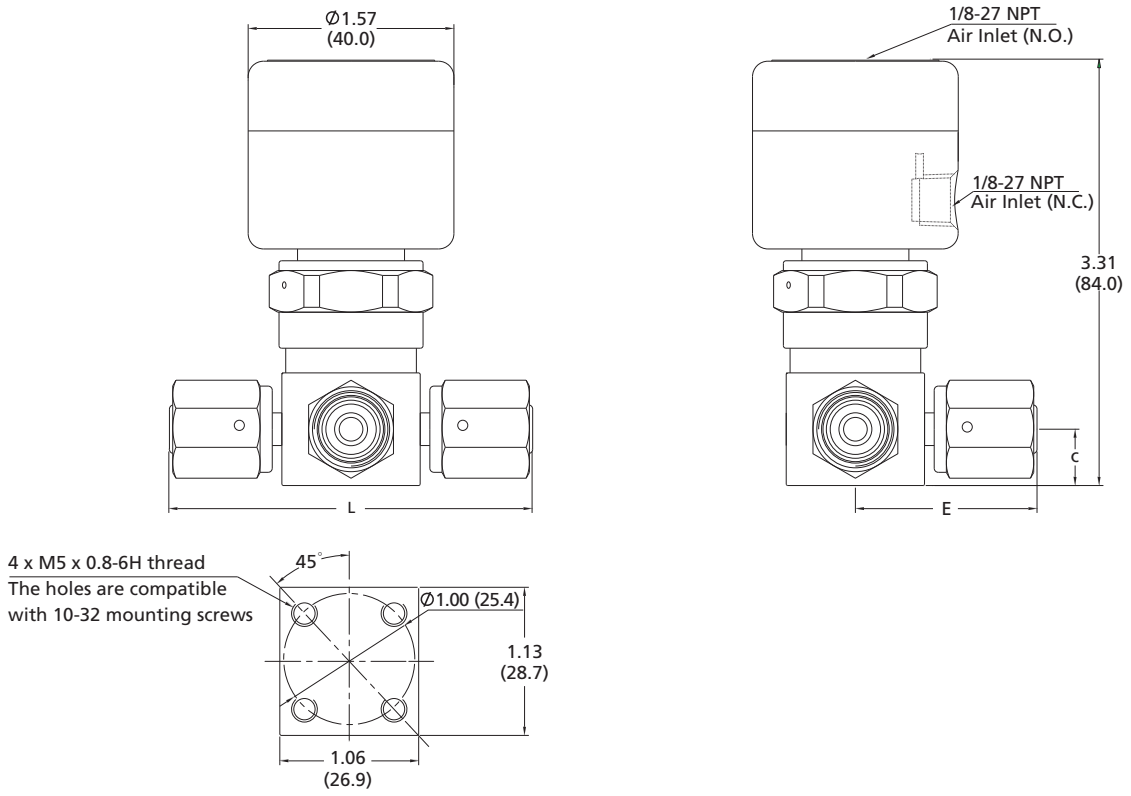
Dimensions

Dimensions, in inches (millimeters), are for reference only.

Manual - Handle



Pneumatic

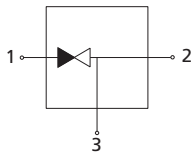


Basic Ordering Number	Connection Type and Size	Dimensions, in. (mm)		
		C	E	L
SM4□□-TB4-	1/4" Tube Butt Weld	0.45 (11.4)	0.87 (22.1)	1.74 (44.2)
SM4□□-MTB6-	6 mm Tube Butt Weld			
SM4□□-FFR4-	1/4" Female FR		1.38 (35.1)	2.76 (70.1)
SM4□□-RFR4-	1/4" Rotatable Male FR		1.74 (44.2)	3.48 (88.4)

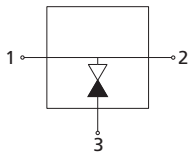
Flow Paths

◎ Flow paths as viewed from the top

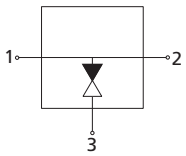
3D Flow



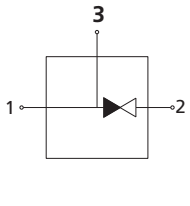
3E Flow



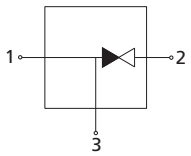
3F Flow



3G Flow



3K Flow



Ordering Number Description

SM4SS – TB4 – FR4 – FFR4 – 3G – RAF2

Type

4	

Body Material

6L	316L SS
SS	316 SS

Port 1 Type

TB	Fractional Tube Butt Weld
MTB	Metric Tube Butt Weld
TS	Fractional Tube Socket Weld
FR	Integral Male FR Fitting
FFR	Female FR Fitting
FL	Fractional Tube Fitting
ML	Metric Tube Fitting
FO	Male FO Fitting

Port 1 Size

4	1/4"
6	6 mm or 3/8"
8	8 mm

Port 2/3 Type / Port 2/3 Size

	Same as Port 1
Specified in the same way as Port 1 type and size	

Flow Path

3D
3E
3F
3G
3K

Actuator Type

R	Handle
C	Pneumatic Normally Closed
O	Pneumatic Normally Open

Seat

	PCTFE
A	PFA

Technology Grade

	General Purpose
F2	Special Cleaning and Packaging
F3	Ultra High Purity

Bellows-sealed Valves

SVH Series High Pressure Bellows-sealed Valves

Features

◎ Packless valves with all-metal seal to atmosphere
◎ Compact designed body with minimal dead space
◎ 316L SS precision-formed bellows for long cycle life
◎ PCTFE stem tip material with remarkable chemical and thermal resistance
◎ Normally closed and normally open pneumatic actuator optional
◎ Bottom mounting

Technical Data

Ports Size		1/4" to 3/8" or 6 mm to 8 mm
Flow Coefficient (Cv)		0.30
Orifice Size		0.15 in. (3.8 mm)
Max. Working Pressure		3500 psig (241 bar)
Pneumatic Actuator Operating Pressure		60 to 90 psig (4.2 to 6.2 bar)
Temperature		PCTFE: -40~150°F (-40~65°C) Vespel: -40~400°F (-40~204°C)
Leak Rate (Helium)	**Internal**	$\leqslant 4x10^{-9}$ mbar l/s
	External	$\leqslant 4x10^{-9}$ mbar l/s

Flow Data

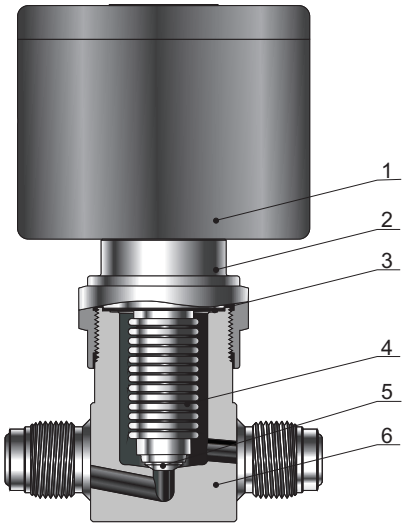
Air @ 70°F (21°C)
Water @ 60°F (16°C)

Pressure Drop to Atmosphere psig (bar)	Air (l/min)	Water (l/min)
10 (0.68)	96	3.6
50 (3.4)	250	7.9
100 (6.8)	450	11.0

Product Technology Grade

Technology \ Product Grade	General Purpose	Special Cleaning and Packaging	Ultra High Purity
Material/Specification	316 SS/ASTM A479 316L SS/ASTM A479		316L SS/ASTM A479
Wetted Surface Roughness	Ra 20 µin. (0.51 µm)		Ra 10 µin. (0.25 µm)
Polishing Process	Machine finished		Electropolished
Cleaning and Packaging Specification	FC-01 Standard Cleaning and Packaging	FC-02 Special Cleaning and Packaging	FC-03 Ultra High Purity Cleaning and Packaging
Cleaning Process	Thrice degreasing ultrasonic cleaning	Special cleaning with non-ozone-depleting chemicals	Ultra high purity cleaning in continuously monitored ultrasonic cleaning system with deionized water
Assembly Environment	At atmosphere	In specially cleaned areas	In ISO Class 5/Federal Class 100 cleanroom
Packaging Process	Individually bagged	Double bagged	Double bagged and vacuum sealed in cleanroom

Major Materials of Construction



Normally Closed Model

Item	Component	Material/Specification
1	Pneumatic Actuator	Aluminum
2	Bonnet Nut	304 SS/ASTM A479
3	Gasket	PTFE-coated 316L SS/A240
4	Bellows	316L SS/ASTM A269
5	Seat	PCTFE/ASTM D1430 or Vsepel
6	Body	316 SS/ASTM A479 or 316L SS/ASTM A479

Pneumatic Actuators

◎ Normally open, "N.O." marked on the top of the cylinder
◎ Normally closed, "N.C." marked on the top of the cylinder

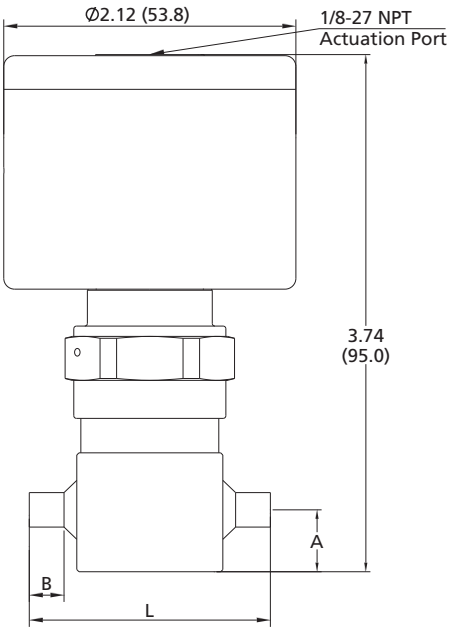
Dimensions and Ordering Information

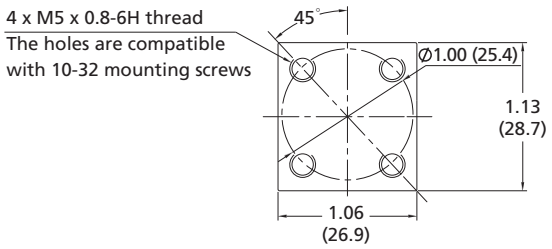
Straight Type

Dimensions

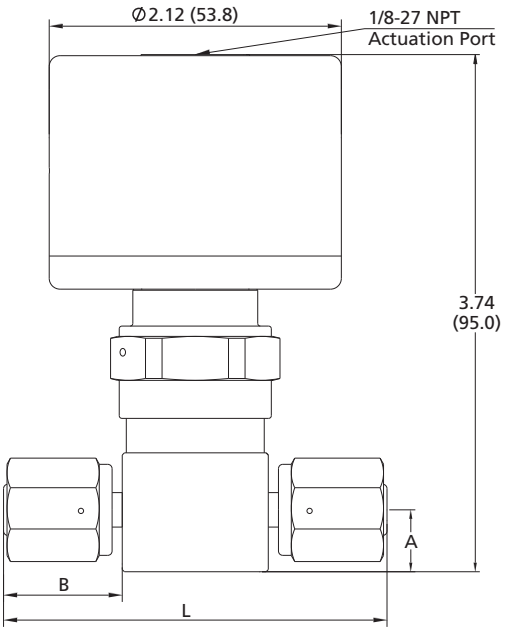
Dimensions, in inches (millimeters), are for reference only.

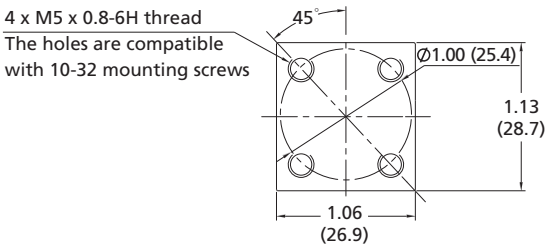
Normally Closed





Normally Open





Basic Ordering Number	Connection Type and Size	Dimensions in. (mm)		
		A	B	L
SVH□□-TB4-	1/4" Tube Butt Weld	0.44 (11.2)	0.25 (6.4)	1.75 (44.4)
SVH□□-FFR4-	1/4" Female FR	0.44 (11.2)	0.85 (21.6)	2.76 (70.1)
SVH□□-FR4-	1/4" Integral Male FR	0.44 (11.2)	0.62 (15.7)	2.30 (58.4)
SVH□□-FL4-	1/4" FITOK Tube Fitting	0.44 (11.2)	0.70 (17.8)	2.46 (62.5)
SVH□□-FL6-	3/8" FITOK Tube Fitting	0.44 (11.2)	0.76 (19.3)	2.58 (65.5)
SVH□□-ML6-	6 mm FITOK Tube Fitting	0.44 (11.2)	0.70 (17.8)	2.46 (62.5)

Ordering Number Description

SVHSS – FL4 – ML6 – CVF2

Body Material	
6L	316L SS
SS	316 SS

Inlet Type	
TB	Fractional Tube Butt Weld
MTB	Metric Tube Butt Weld
FR	Integral Male FR Fitting
FFR	Female FR Fitting
FL	Fractional Tube Fitting
ML	Metric Tube Fitting

Inlet Size	
4	1/4"
6	6 mm or 3/8"
8	8 mm

Outlet Type	
	Same as Inlet

Specified in the sameway as Inlet type and size

Outlet Size

Actuator Type	
C	Pneumatic Normally Closed
O	Pneumatic Normally Open

Technology Grade	
	General Purpose
F2	Special Cleaning and Packaging
F3	Ultra High Purity

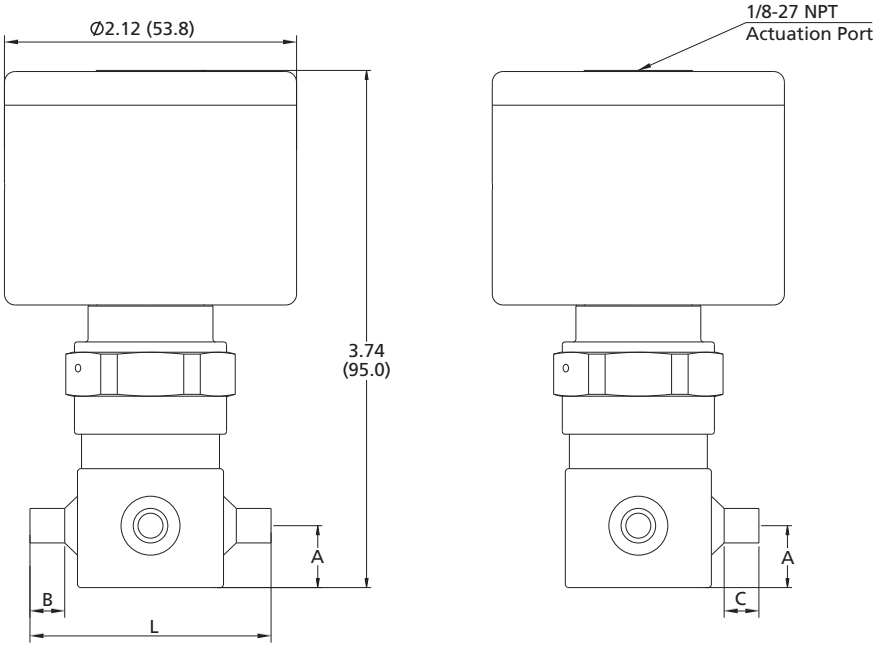
Seat	
	PCTFE
V	Vespel

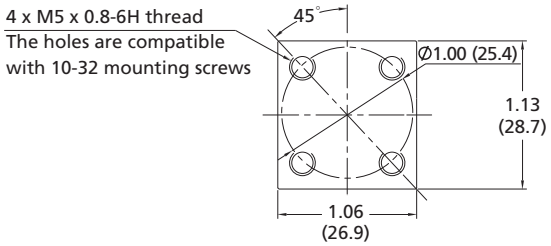
Branch Type

Dimensions

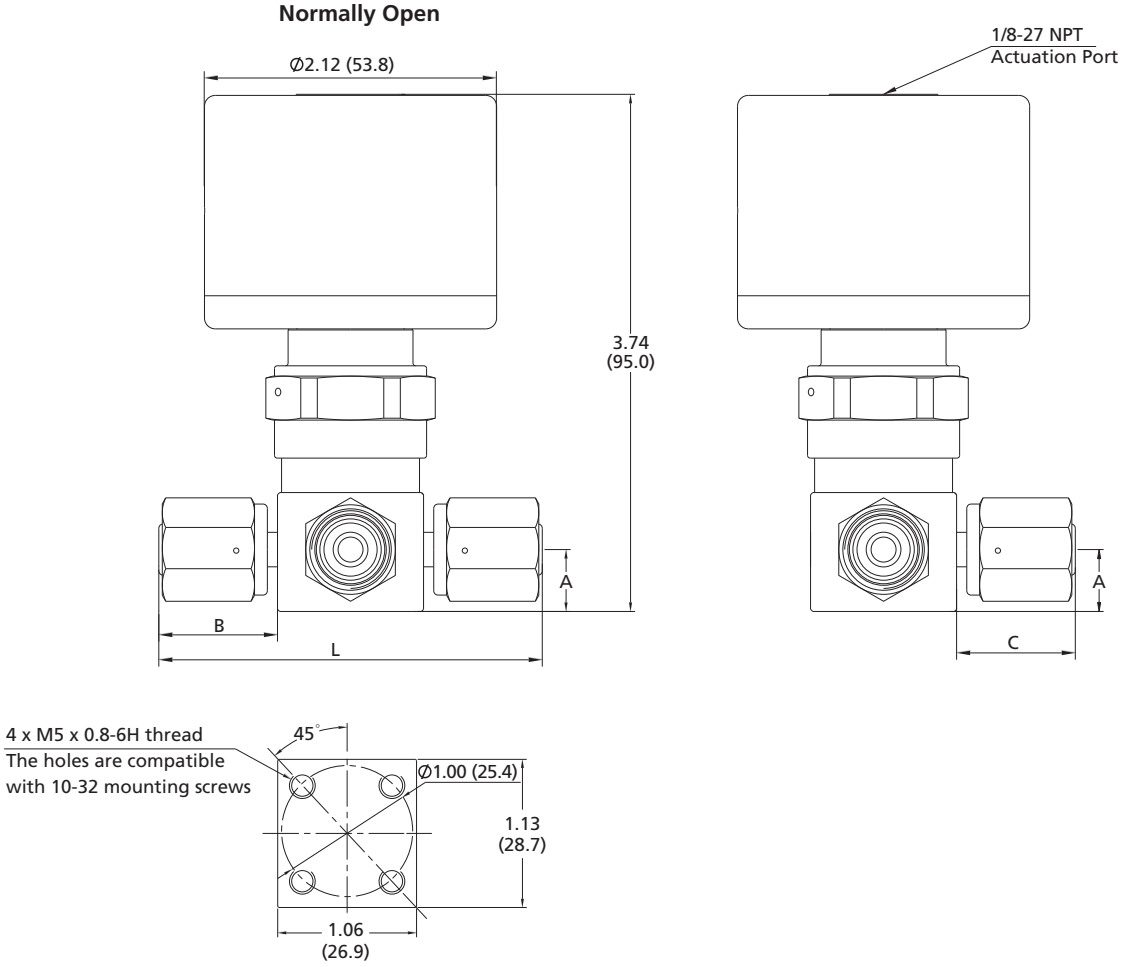
Dimensions, in inches (millimeters), are for reference only.

Normally Closed





Normally Open

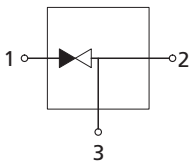


Basic Ordering Number	Connection Type and Size	Dimensions in. (mm)			
		A	B	C	L
SVH□□-TB4-	1/4" Tube Butt Weld	0.44 (11.2)	0.25 (6.4)	0.25 (6.4)	1.75 (44.4)
SVH□□-FFR4-	1/4" Female FR	0.44 (11.2)	0.85 (21.6)	0.85 (21.6)	2.76 (70.1)
SVH□□-FR4-	1/4" Integral Male FR	0.44 (11.2)	0.62 (15.7)	0.62 (15.7)	2.30 (58.4)
SVH□□-FL4-	1/4" FITOK Tube Fitting	0.44 (11.2)	0.70 (17.8)	0.70 (17.8)	2.46 (62.5)
SVH□□-FL6-	3/8" FITOK Tube Fitting	0.44 (11.2)	0.76 (19.3)	0.76 (19.3)	2.58 (65.5)
SVH□□-ML6-	6 mm FITOK Tube Fitting	0.44 (11.2)	0.70 (17.8)	0.70 (17.8)	2.46 (62.5)

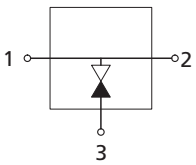
Flow Paths

◎ Flow paths as viewed from the top

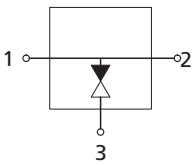
3D Flow



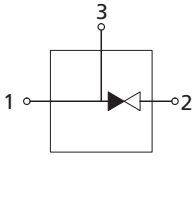
3E Flow



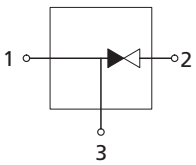
3F Flow



3G Flow



3K Flow



Ordering Number Description

SVHSS – TB4 – FR4 – FFR4 – 3G – CVF2

Body Material	
6L	316L SS
SS	316 SS

Port 1 Type	
TB	Fractional Tube Butt Weld
MTB	Metric Tube Butt Weld
FR	Integral Male FR Fitting
FFR	Female FR Fitting
FL	Fractional Tube Fitting
ML	Metric Tube Fitting

Port 1 Size	
4	1/4"
6	6 mm or 3/8"
8	8 mm

Port 2/3 Type	Port 2/3 Size
Same as Port 1	
Specified in the same way as port 2/3 type and size	

Flow Path
3D
3E
3F
3G
3K

Actuator Type	
C	Pneumatic Normally Closed
O	Pneumatic Normally Open

Technology Grade	
	General Purpose
F2	Special Cleaning and Packaging
F3	Ultra High Purity

Seat	
	PCTFE
V	Vespel

Regulators

FHR-1 Series High Performance High Purity Regulators

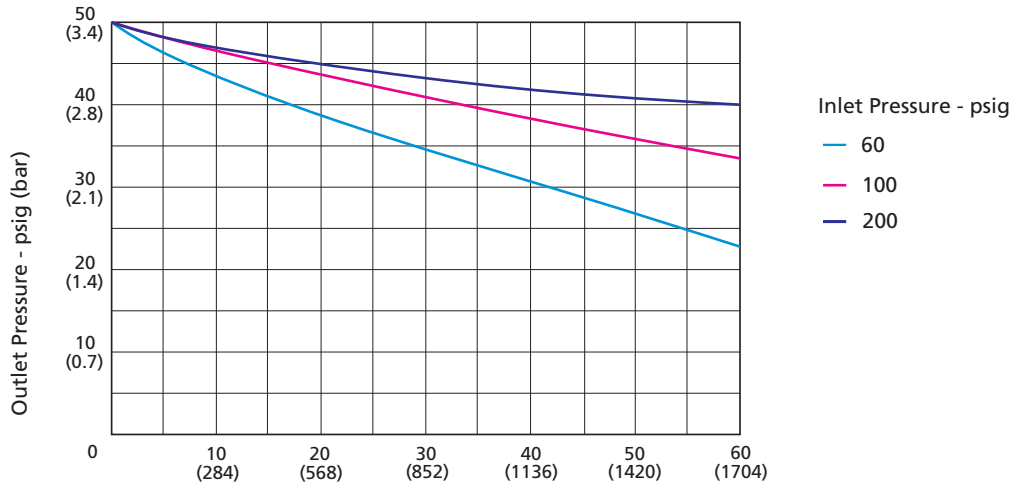
Features

- ◎ 316L stainless steel body for corrosive gases and toxic gases
- ◎ Standard Hastelloy poppet and diaphragm
- ◎ Tied diaphragm for added safety
- ◎ Metal to metal diaphragm to body seal
- ◎ No springs or threads are exposed to the wetted area
- ◎ Internal surfaces are finished with Ra 10 µin. (0.25 µm) or Ra 5 µin. (0.13 µm) to ensure minimal particle generation
- ◎ Every step of assembly, welding, testing, final cleaning and packaging is conducted in Class 100 cleanroom
- ◎ Ultra High Purity applications

Technical Data

Port Size		1/4" , 3/8" or 1/2"
Max. Working Pressure		3500 psig
Outlet Pressure Range		0~30, 0~60, 0~100, 0 ~150 psig
Flow Coefficient (Cv)		3500 psig Inltet: 0.06 600,1000 psig Inlet: 0.15
Temperature		PCTFE: -40~149°F (-40~65°C) Vespel: -15~302°F (-26~150°C)
Leak Rate (Helium)	**Internal**	≤5x10^{-8}mbar l/s
	External	≤1x10^{-9}mbar l/s
Weight (regulator only)		≈1.5 lbs (0.7 kg)

Flow Data



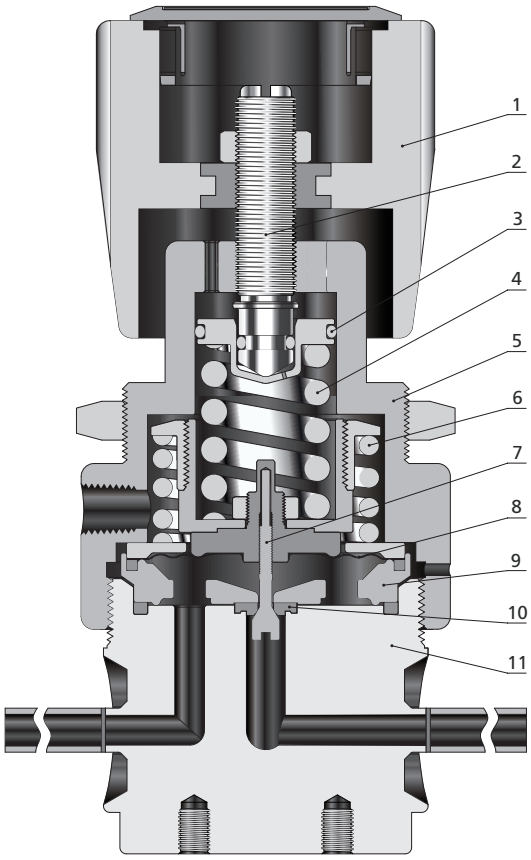
Flow Rate - SCFM (SLPM) Nitrogen

Product Technology Grade

Technology \ Product Grade	General Purpose	Special Cleaning and Packaging	Ultra High Purity
Material/Specification	316L SS/ASTM A479		316 VAR/SEMI F20 316 VIM-VAR/SEMI F20
Wetted Surface Roughness	Ra 10 μin. (0.25 μm)①		Ra 5 μin. (0.13 μm)
Polishing Process	Machine finished		Electropolished
Cleaning and Packaging Specification	FC-01 Standard Cleaning and Packaging	FC-02 Special Cleaning and Packaging	FC-03 Ultra High Purity Cleaning and Packaging
Cleaning Process	Thrice degreasing ultrasonic cleaning	Special cleaning with non-ozone-depleting chemicals	Ultra high purity cleaning in continuously monitored ultrasonic cleaning system with deionized water
Assembly Environment	At atmosphere	In specially cleaned areas	In ISO Class 5/Federal Class 100 cleanroom
Packaging Process	Individually bagged	Double bagged	Double bagged and vacuum sealed in cleanroom

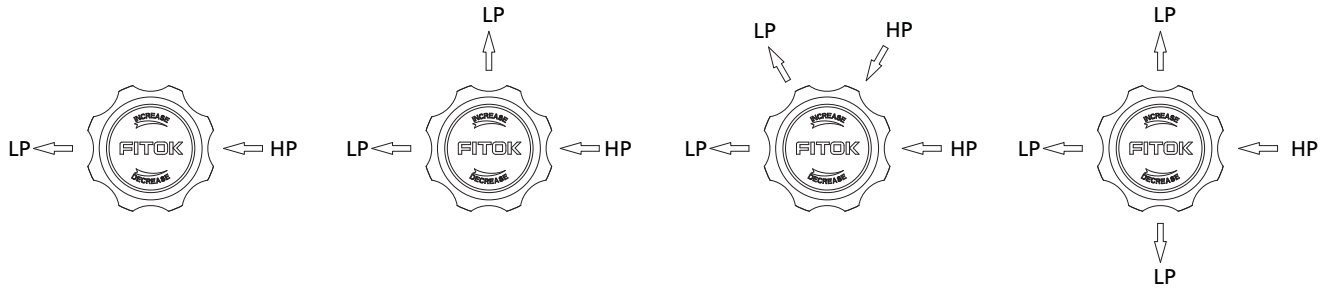
① For FR connections and tube butt connections, standard internal surface roughness is finished to an average of Ra 5 μin. (0.13 μm)

Major Materials of Construction



Item	Component	Material/Specification
1	Handle	ABS
2	Stem	C36000/ASTM B16
3	O-ring	Viton
4	Range Spring	S17700/ASTM A313
5	Bonnet	304 SS/ASTM A479
6	Back Move Spring	302 SS/ASTM A313
7	Lift Poppet	N06022/ASTM B574
8	Diaphragm	Hastelloy
9	Support	316L SS/ASTM A479
10	Seat	PCTFE/ASTM D1430 or Vespel
11	Body	316L SS/ASTM A479 or 316L VAR /SEMI F20 or 316L VIM-VAR /SEMI F20

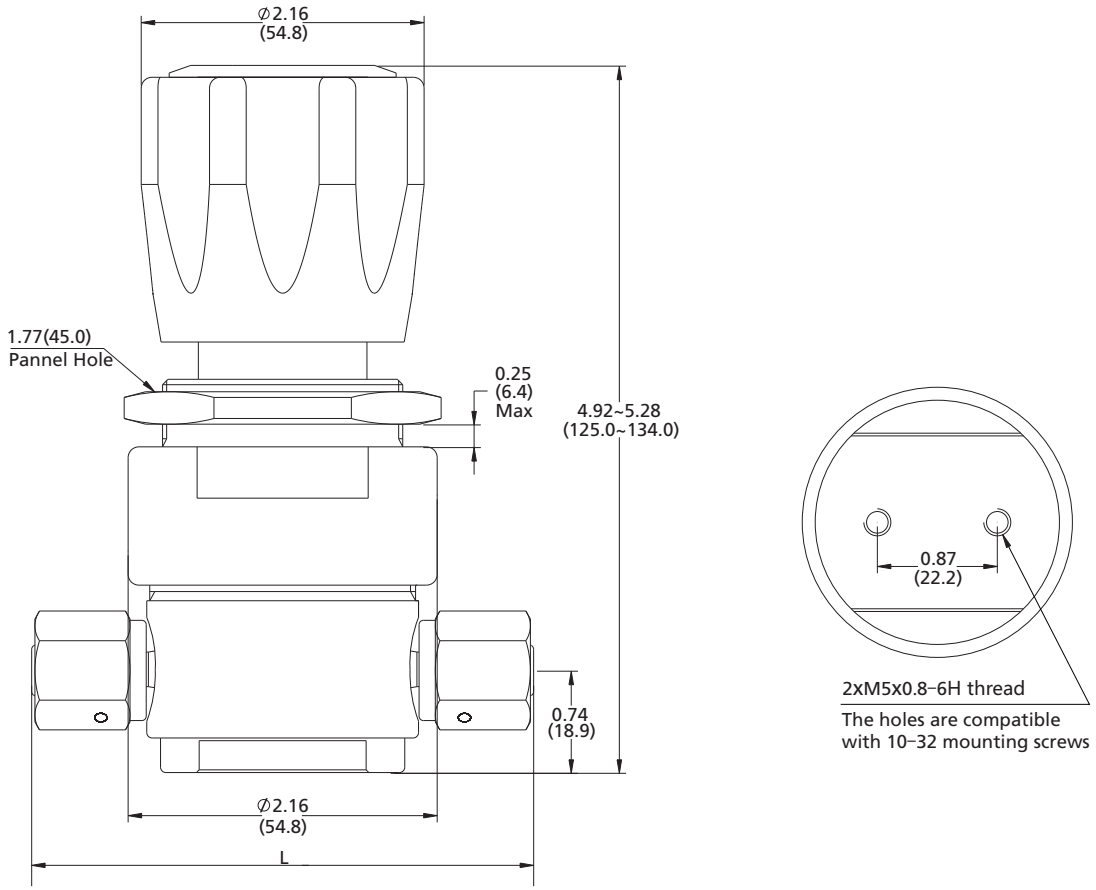
Porting Configurations



2 Ports (2P) | **3 Ports (3P)** | **4 Ports (4P)** | **4 Ports (4C)**

Dimensions

Dimensions, in inches (millimeters), are for reference only.



Connection Code	Connection Type and Size	L
C4	1/4" Fractional Tube Fitting	4.97"(126.2)
C6	3/8" Fractional Tube Fitting	5.99"(152.1)
T4	1/4" Fractional Tube Butt Weld	3.70 (94.0)
T6	3/8" Fractional Tube Butt Weld	
F4	1/4" Female Face Seal	
F8	1/2" Female Face Seal	4.75"(120.6)
M4	1/4" Rotatable Male Face Seal	3.70 (94.0)
M8	1/2" Rotatable Male Face Seal	4.75"(120.6)
IF4	1/4" Internal Female Face Seal	1.09"(27.7)

Ordering Number Description

FHR – 16L – 35 – 100 – 4P – B – M4M4M4M4 – ZV – F2

Body Material	
6L	316L SS
6LV	316L VAR
6LW	316L VIM-VAR

Inlet Pressure P1	
06	600 psig
10	1000 psig
35	3500 psig

Outlet Pressure Range P2	
30	0~30 psig
60	0~60 psig
100	0~100 psig
150	0~150 psig

Porting	
2P	2 ports (no gauge port)
3P	3 ports (gauge port at outlet)
4P	4 ports (gauge ports at inlet and outlet)
4C	4 ports (gauge port at outlet)

Gauge	
	Without gauge
B	With gauge (psi/bar)
M	With gauge (psi/MPa)

Connection Type and Size	
C4	1/4" Fractional Tube Fitting
C6	3/8" Fractional Tube Fitting
T4	1/4" Fractional Tube Butt Weld
T6	3/8" Fractional Tube Butt Weld
F4	1/4" Female Face Seal
F8	1/2" Female Face Seal
M4	1/4" Rotatable Male Face Seal
M8	1/2" Rotatable Male Face Seal
IF4	1/4" Internal Female Face Seal
Other connections are available upon request	

Optional Feature	
Z	Panel nut
N	Bolts for assembly
V	Vespel seat

Technology Grade	
	General Purpose
F2	Special Cleaning and Packaging
F3	Ultra High Purity

Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.