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 and closed

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	Operating①	Bakeout②				Actuation Pressure psig (bar)	Air Displacement in.^{3} (cm^3)
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 8, 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),* MS-06-61, and Swagelok *Special Cleaning and Packaging,* 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 doubled 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 cm^3/s in accordance with SEMI F1
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

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

Materials of Construction

Component	Material Grade/ ASTM Specification
Valve	
Body	*316L VAR SS/A479*
Seat	*PCTFE/AMS 3650*
Diaphragms	*Elgiloy®/AMS 5876*
Pneumatic Actuator	
Cylinder, cap, pistons	Aluminum
O-rings	Buna N
Springs	S17700 SS
Round Handle	
Handle	Polyester with stainless steel insert
Actuator, bonnet nut	316 SS
Bonnet	S17400 SS
Integral Lockout Handle	
Handle	Glass-filled nylon
Set screws	Alloy steel/F912
Retaining ring	PH 15-7 Mo® SS
O-rings	Fluorocarbon FKM
Sleeve	Powdered metal stainless steel/B783
Base	

Wetted components listed in *italics.*

Flow Data at 70°F (20°C)

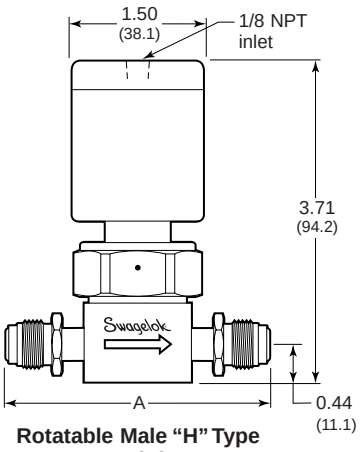
0.23 in. (5.8 mm) orifice, 0.62 C_v

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

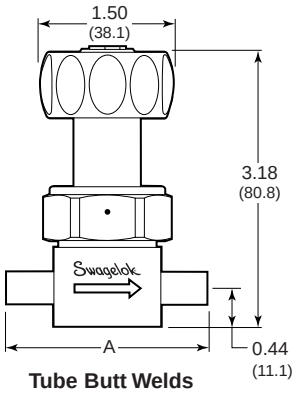
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Pneumatic Actuator



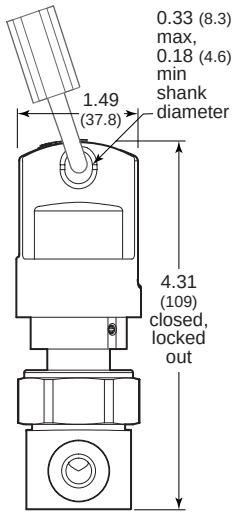
Rotatable Male "H" Type VCR Fittings

Round Handle

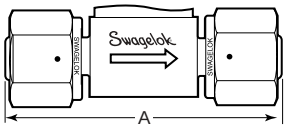


Tube Butt Welds

Integral Lockout Handle

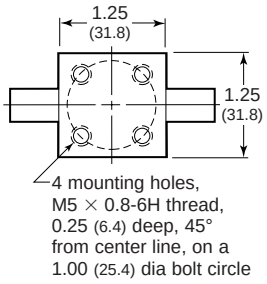


End Connections		Basic Ordering Number	A in. (mm)
Inlet/Outlet	Size		
Female "H" type VCR fittings	1/4 in.	6LV-DFHFR4-	2.78 (70.6)
Rotatable male "H" type VCR fittings	1/4 in.	6LV-DFHMR4-	2.96 (75.2)
Female/rotatable male "H" type VCR fitting	1/4 in.	6LV-DFHFR4HMR4-	2.96 (75.2)
Female VCR fittings	1/2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



Female VCR Fittings

Bottom



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** P process, black handle

6LV-DFHMR4-**P1-C** P1 process, normally closed pneumatic actuator

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

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** P process, black handle

6LV-DF**L**HMR4-**P1-BL** P1 process, blue handle

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

Multiport and Elbow Valves

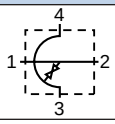
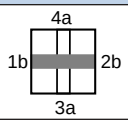
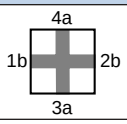
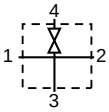
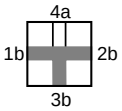
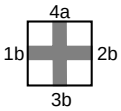
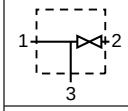
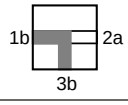
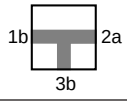
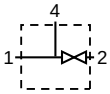
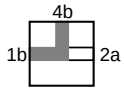
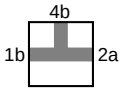
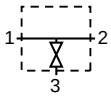
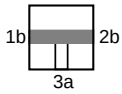
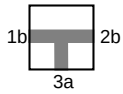
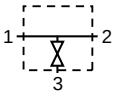
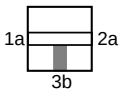
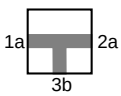
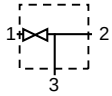
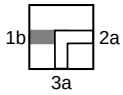
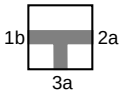
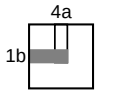
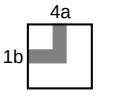
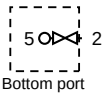
To order a valve, select designators for:

- multiport or elbow flow path
- end connections for each port
- process
- manual or pneumatic actuation.

Flow Path

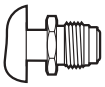
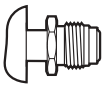
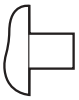
Select a flow path as viewed from the top of the valve. Insert the flow path designator in the valve ordering number, as shown on the next page.

- An **a** next to the port number in the Flow Path column indicates a port **above** the valve seat.
- A **b** next to the port number in the Flow Path column indicates a port **below** the valve seat.

Ports	Schematic	Flow Path: Closed	Flow Path: Open	Designator
4				D
				E
3				A
				B
				C
				F
				G
2				L
	 Bottom port			N
				R

End Connections

Select an end connection for each port on the body in numerical order. Insert the end connection designator in the valve ordering number in the same sequence it is selected.

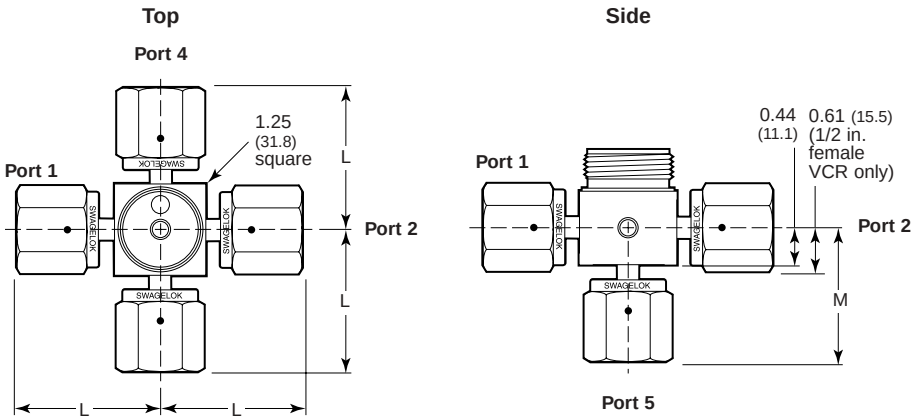
End Connection		Designator
1/4 in. female "H" type VCR fitting		D
1/4 in. rotatable male "H" type VCR fitting		E
1/2 in. female VCR fitting		8
1/2 in. rotatable male VCR fitting		7
3/8 in. tube butt weld, 0.50 in. (12.7 mm) tube stub, 0.035 in. wall		9

Process Specification and Actuator

See **Ordering Information,** next page, for selection details.

Dimensions

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



Not shown: 4 bottom mounting holes same as 2-port body, page 4. Exception: Valve with bottom port (port 5, N body), no mounting holes.

End Connection	Dimensions, in. (mm) L	Dimensions, in. (mm) M
1/4 in. female "H" type VCR fitting	1.39 (35.3)	1.21 (30.7)
1/4 in. rotatable male "H" type VCR fitting	1.48 (37.6)	1.30 (33.0)
1/2 in. female VCR fitting	2.08 (52.8)	1.90 (48.3)
1/2 in. rotatable male VCR fitting		
3/8 in. tube butt weld, 0.50 in. (12.7 mm) tube stub	1.12 (28.4)	0.95 (24.1)

Ordering Information

Build a valve ordering number by combining the designators in the sequence shown below.

6LV – D F C D D D P – GR – PM

Material
316L VAR stainless steel

Series
DF = DF series high-flow springless diaphragm valve
DFL = DF series high-flow springless diaphragm valve with integral lockout handle

Flow Path
See page 4.

Seat Material
None = PCTFE
V = Polyimide (See page 8.)

End Connections
See page 4.
Port 1
Port 2
Port 3
Port 4
Port 5

Process
P = Swagelok *Ultrahigh-Purity Process Specification (SC-01);* electropolished, R_a 5 µin. (0.13 µm) average
P1 = Swagelok *Special Cleaning and Packaging (SC-11);* electropolished, R_a 5 µin. (0.13 µm) average

Actuation
Pneumatic
C = Normally closed
O = Normally open
CM = Normally closed with indicator switch
Manual (Handle Color)
BK = Black **RD** = Red
BL = Blue **WH** = White
GR = Green **YW** = Yellow
OR = Orange

Option
PM = Panel mount (Manual actuator only; see page 8.)

Example Ordering Numbers

Designator	6LV-DFLEEP-RD	6LV-DFCV999P1-O	6LV-DFLADDDP1-BK
Material	6LV		
Series	DF		
Flow path	L	C	A
Seat	PCTFE	Polyimide	PCTFE
Port 1 end connection	1/4 in. rotatable male "H" type VCR fitting	3/8 in. tube butt weld	1/4 in. female "H" type VCR fitting
Port 2 end connection	—	3/8 in. tube butt weld	1/4 in. female "H" type VCR fitting
Port 3 end connection	—	3/8 in. tube butt weld	1/4 in. female "H" type VCR fitting
Port 4 end connection	1/4 in. rotatable male "H" type VCR fitting	—	—
Port 5 end connection	—	—	—
Process	Swagelok *Ultrahigh-Purity Process Specification (SC-01)*	Swagelok *Special Cleaning and Packaging (SC-11)*	Swagelok *Special Cleaning and Packaging (SC-11)*
Actuator	Red round handle	Normally open	Black integral lockout handle

Multivalve Manifolds

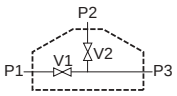
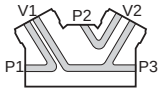
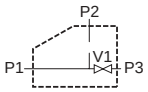
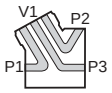
To order a multivalve manifold, select designators for:

- 1- or 2-valve flow path
- end connections for each port
- process
- manual or pneumatic actuation.

Flow Path

Select a flow path. Insert the flow path designator in the manifold ordering number, as shown on the next page.

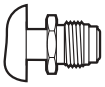
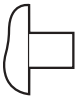
- P1, P2, and P3 designate port numbers.
- V1 and V2 designate valve numbers.

Manifold	Schematic	Flow Path	Designator
2-valve, 3-port			1V
1-valve, 3-port			5V

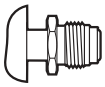
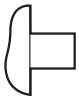
End Connections

Select an end connection for each port on the body in numerical order. Place the end connection designator in the valve ordering number in the same sequence it is selected.

Ports 1 and 3

End Connection		Designator
1/4 in. female "H" type VCR fitting		D
1/4 in. rotatable male VCR fitting		E
3/8 in. tube butt weld, 0.50 in. (12.7 mm) tube stub, 0.035 in. wall		9

Port 2

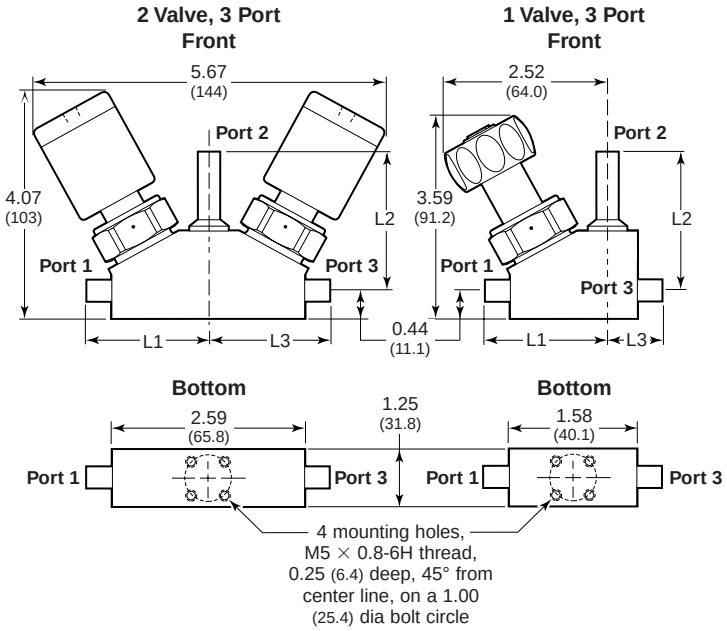
End Connection		Designator
1/4 in. female VCR fitting		2
1/4 in. rotatable male VCR fitting		1
1/4 in. tube butt weld, 0.30 in. (7.6 mm) tube stub, 0.035 in. wall		3

Process Specification and Actuator

See **Ordering Information,** next page, for selection details.

Dimensions

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



Ports 1 and 3

End Connection	Dimensions, in. (mm)		
	2-Valve, 3-Port	1-Valve, 3-Port	
	L1, L3	L1	L3
3/8 in. tube butt weld, 0.50 in. (12.7 mm) tube stub, 0.035 in. wall	1.81 (46.0)	1.81 (46.0)	0.90 (22.9)
1/4 in. female "H" type VCR fitting	2.03 (51.6)	2.18 (55.4)	1.18 (30.0)
1/4 in. rotatable male "H" type VCR fitting	2.39 (60.7)		

Port 2

End Connection	2-Valve, 3-Port	1-Valve, 3-Port
	L2, in. (mm)	
1/4 in. tube butt weld, 0.30 in. (7.6 mm) tube stub, 0.035 in. wall	2.79 (70.9)	2.54 (64.5)
1/4 in. female VCR fitting	2.66 (67.6)	
1/4 in. rotatable male VCR fitting	3.35 (85.1)	

Ordering Information

Build a valve ordering number by combining the designators in the sequence shown below.

6LV – F 1V D 2 D P – A A

Material
316L VAR stainless steel

Series
F = DF series high-flow diaphragm valve
FL = DF series high-flow diaphragm valve with integral lockout handle

Flow Path
1V = 2-valve, 3-port body
5V = 1-valve, 3-port body

Seat Material
None = PCTFE
V = Polyimide (See page 8.)

End Connections
See page 6.
Port 1
Port 2
Port 3

Actuation
Add a designator for each valve.
Pneumatic
A = Normally closed
B = Normally open
C = Normally closed with indicator switch
Manual (Handle Color)
T = Black **W** = Red
U = Blue **X** = White
S = Green **Y** = Yellow
V = Orange

Process
P = Swagelok *Ultrahigh-Purity Process Specification (SC-01);* electropolished, R_a 5 µin. (0.13 µm) average
P1 = Swagelok *Special Cleaning and Packaging (SC-11);* electropolished, R_a 5 µin. (0.13 µm) average

Example Ordering Numbers

Designator	6LV-F1V939P1-AB	6LV-F5VD1EP-S
Material	6LV	
Series	DF	
Flow path	1V	5V
Seat	PCTFE	PCTFE
Port 1 end connection	3/8 in. tube butt weld	1/4 in. female "H" type VCR fitting
Port 2 end connection	1/4 in. tube butt weld	1/4 in. rotatable male VCR fitting
Port 3 end connection	3/8 in. tube butt weld	1/4 in. rotatable male VCR fitting
Process	Swagelok *Special Cleaning and Packaging (SC-11)*	Swagelok *Ultrahigh-Purity Process Specification (SC-01)*
Valve 1 actuator	Normally closed	Green round handle
Valve 2 actuator	Normally open	—

Options and Accessories

Polyimide Seat Material

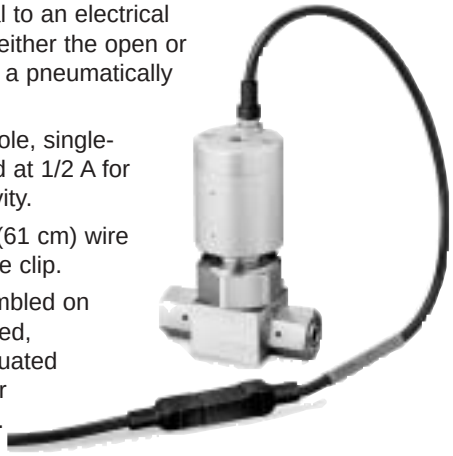
- DF series valves with polyimide seats are rated for operating temperatures from 50 to 270°F (10 to 132°C).
- Pneumatic actuators contain fluorocarbon FKM O-rings.
- All other materials and ratings remain the same.

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 single-pole, single-throw switch rated at 1/2 A for 115 V (ac) resistivity.
- Includes a 24 in. (61 cm) wire lead with an in-line 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, 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.

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.

Select a kit ordering number.

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

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**

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

Warranty Information

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

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Printed in U.S.A., GLI
August 2005, R4
MS-02-24