

Diaphragm Valves



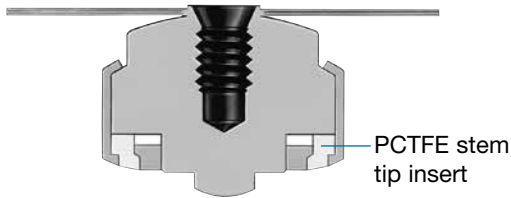
LD Series

- 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)

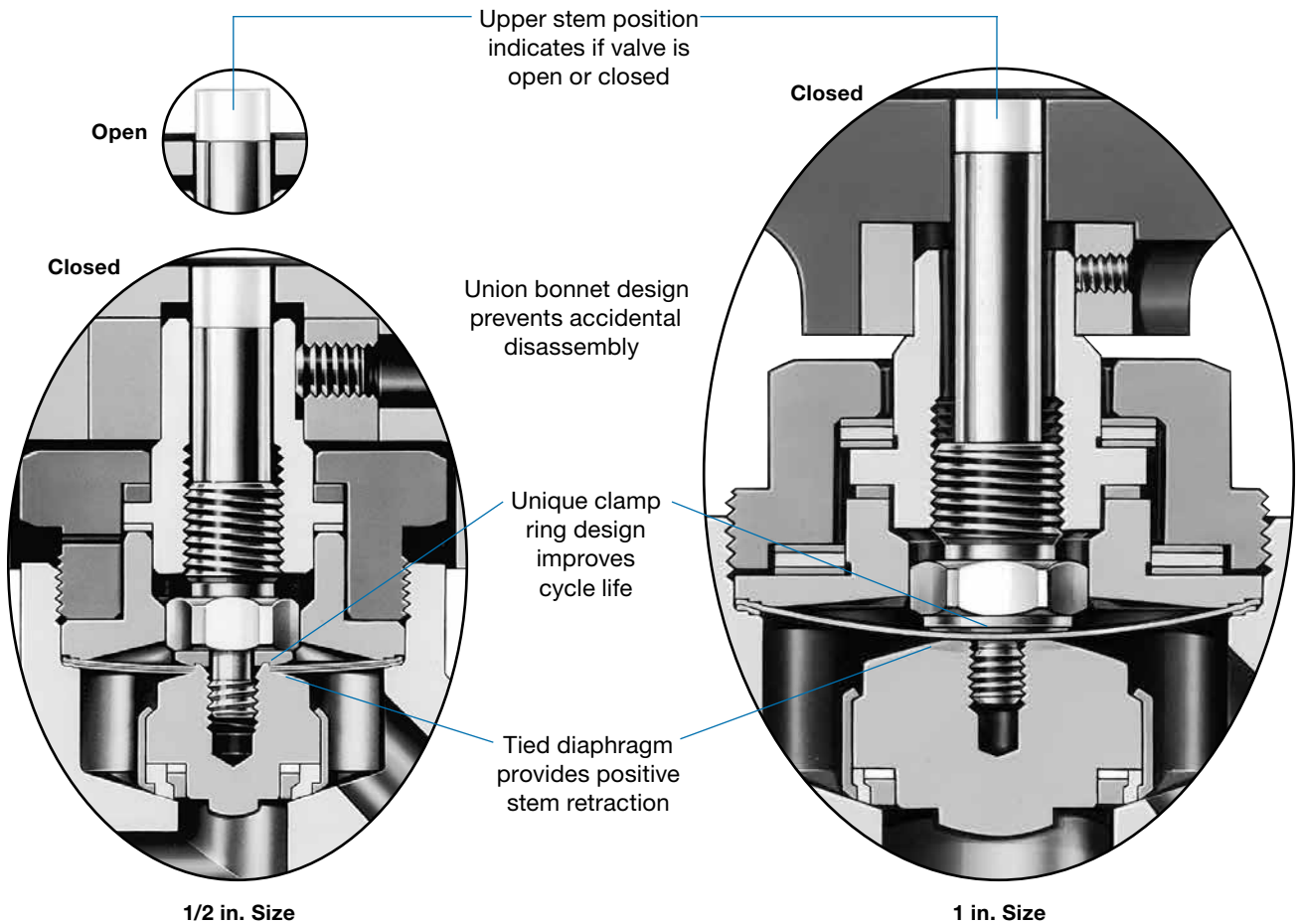
- Machined wetted surfaces in body are finished to an average of 20 $\mu\text{in.}$ (0.51 μm) R_a .
- Optional electropolished body exteriors (ELD series) are available.
- Optional tube extension interiors electropolished to an average of 10 $\mu\text{in.}$ (0.25 μm) R_a are available.

Forged (1/2 in. Size)

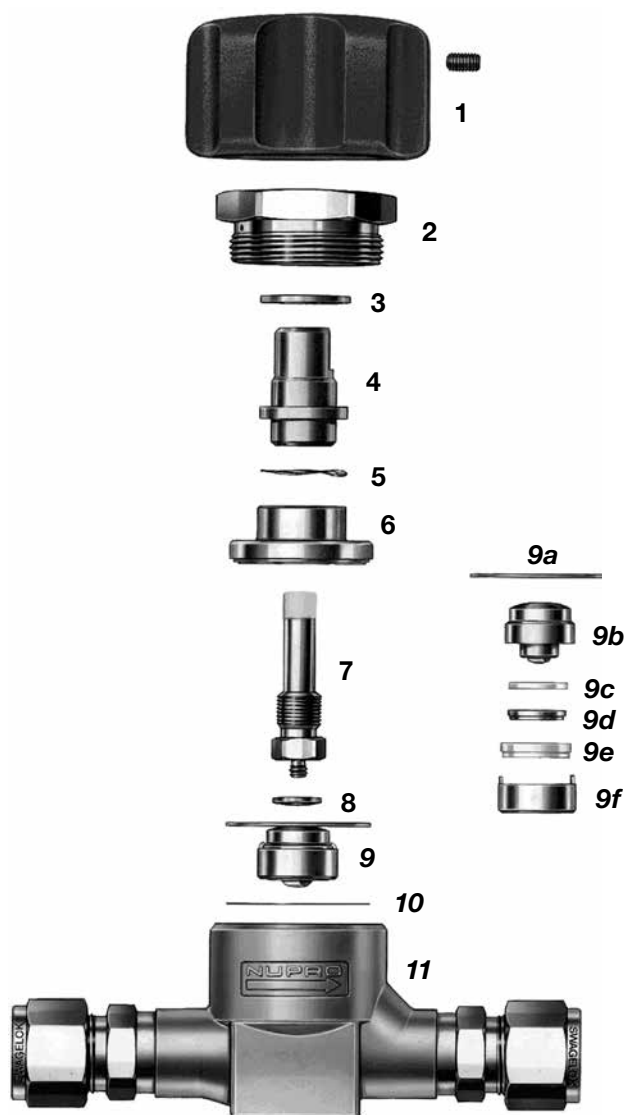
- Design results in compact size, lower internal volume.
- Wetted surfaces are electropolished to an average of 5 $\mu\text{in.}$ (0.13 μm) R_a .

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 $\mu\text{in.}$ (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	<i>See individual components below</i>		
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 cm³/s.

SC-01 Process

Every LD series diaphragm valve processed in accordance with Swagelok *Ultrapurity Process Specification (SC-01)* catalog, MS-06-61 is helium leak tested to a maximum leak rate of 1×10^{-9} std cm³/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 *Ultrapurity 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 *Ultrapurity 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) $\mu\text{in. } (\mu\text{m})$ 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

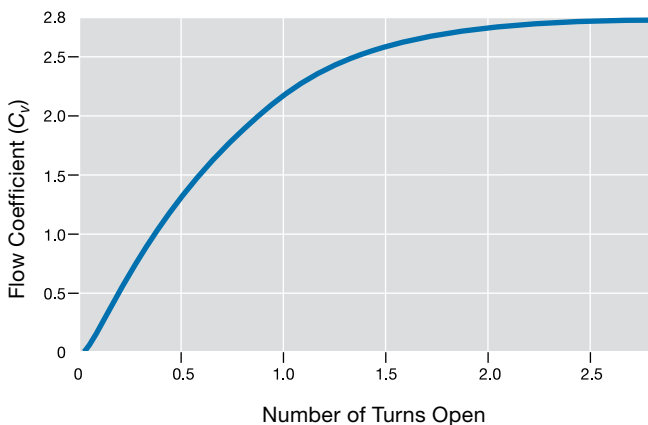
Pressure Drop to Atmosphere (Δp) psi (bar)	Air Flow std ft ³ /min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	31 (870)	9 (34)
50 (3.4)	84 (2300)	20 (75)
100 (6.8)	148 (4100)	28 (100)

1 in. Size

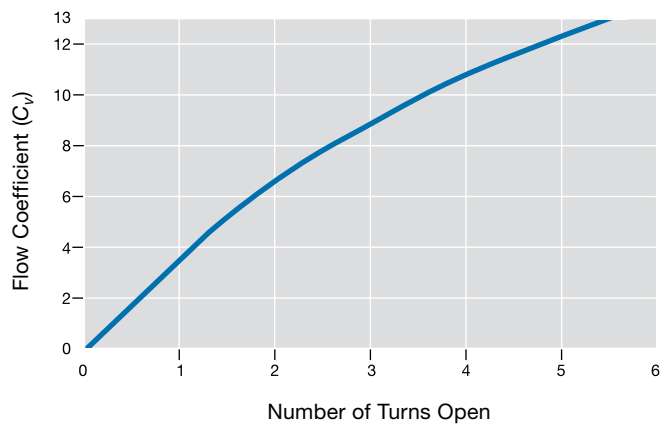
1.125 in. (28.6 mm) orifice, 13 C_v

Pressure Drop to Atmosphere (Δp) psi (bar)	Air Flow std ft ³ /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



Flow Coefficient at Turns Open



Ordering Information and Dimensions

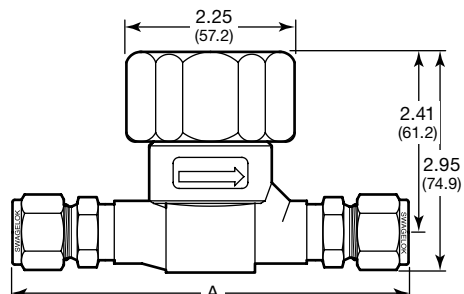
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Cast-Body Valves

Select an ordering number. To order optional cleaning and packaging in accordance with *Ultra-high-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

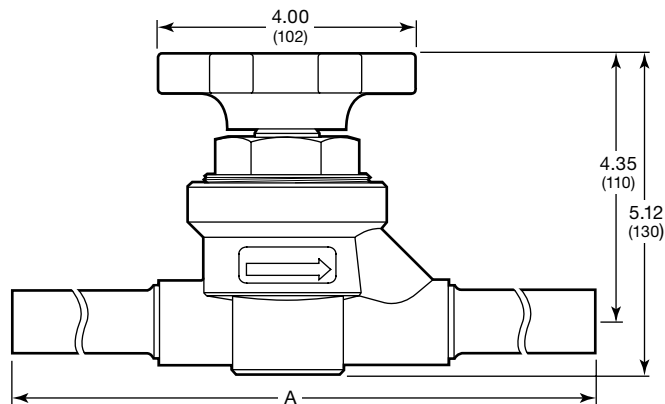


End Connections		Ordering Number	A in. (mm)
Type	Size		
Swagelok tube fitting	1/2 in.	6L-LD8-BBXX	5.30 (135)
		6L-ELD8-BBXX	
	12 mm	6L-LD8-DDXX	
		6L-ELD8-DDXX	
Male VCR fitting	1/2 in.	6L-ELD8-CCXX	4.58 (116)
Female NPT	1/2 in.	6L-LD8-EEXX	5.61 (142)
Female ISO ^①	1/2 in.	6L-LD8-FFXX	
Tube extension, 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)

Dimensions shown with Swagelok tube fitting nuts finger-tight.

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

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	
6L-ELD16-BBXX		8.63 (219)	
Tube extension, 3 in. (76.2 mm) long	25 mm	6L-LD16-EEXX	10.9 (277)
		6L-LD16-55XX	
	1 × 0.065 in.	6L-ELD16-11XX	
		6L-ELD16-33XX	

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-BBBB

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

Example: 6L-ELD8-BBBX

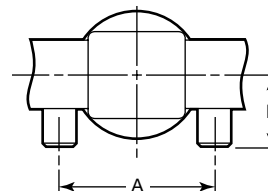
Replace **XX** with **XB** for no inlet purge port and 1/4 in. integral male VCR fitting outlet purge port.

Example: 6L-ELD8-BBXB

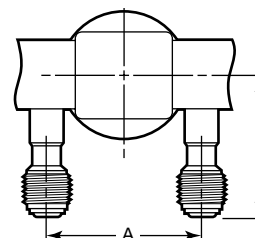
Purge Ports

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



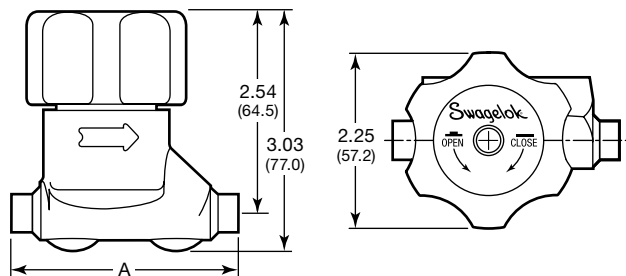
Ordering Information and Dimensions

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-VWX-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	
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.

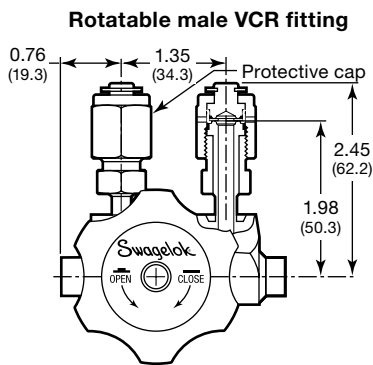
Example: 6L-ELD8-11**M**-P

Replace **X** with **MX** for 1/4 in. integral male VCR fitting 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 fitting outlet purge port.

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



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.

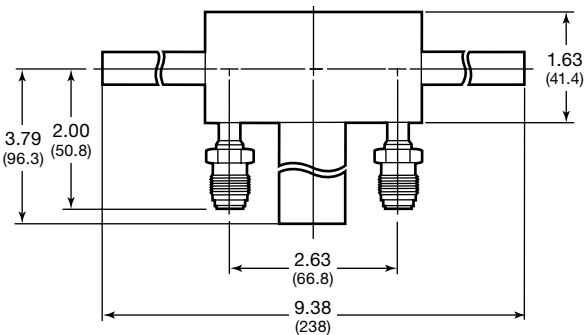
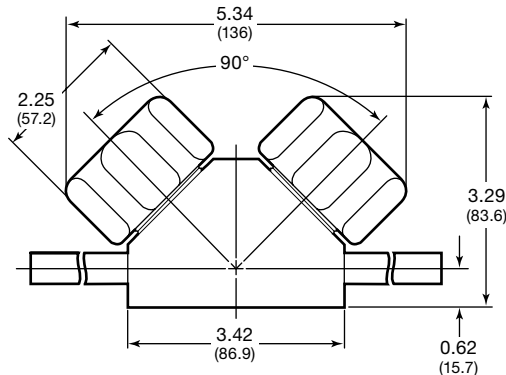
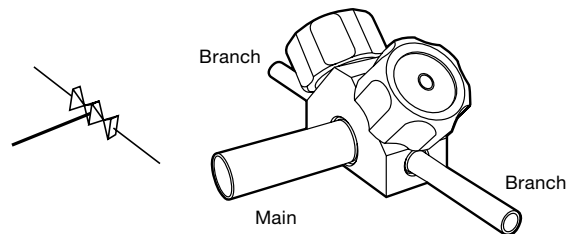
Purge ports are 1/4 in. rotatable male VCR fittings.

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

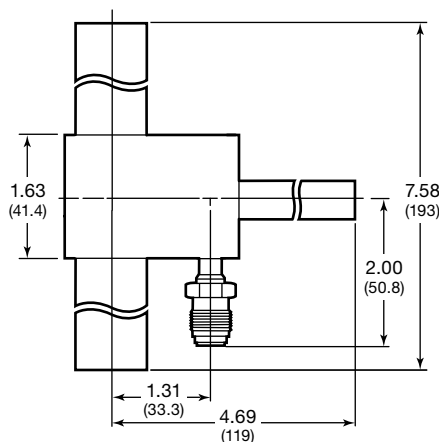
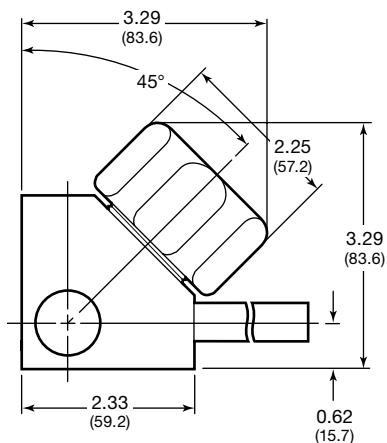
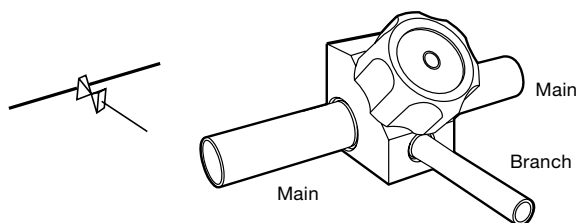
Length of main and branch line tubing is 3 in. (76.2 mm).

Ordering Information and Dimensions

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

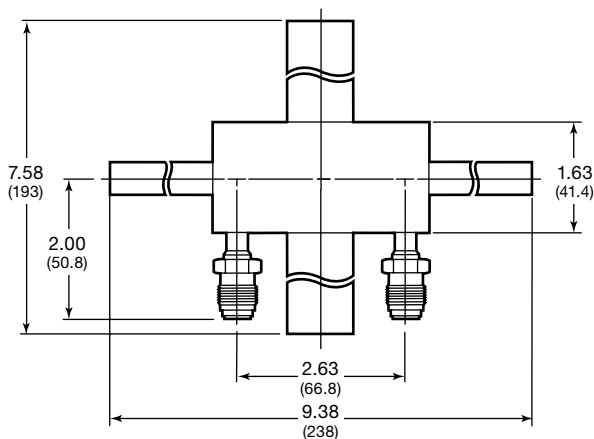
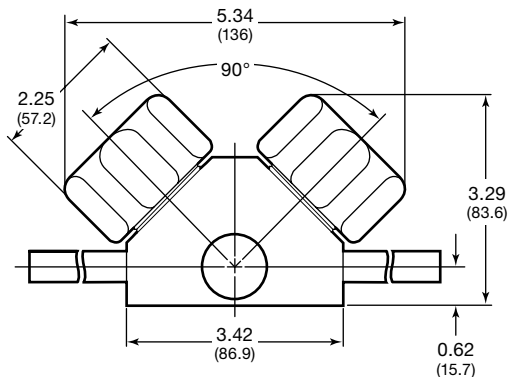
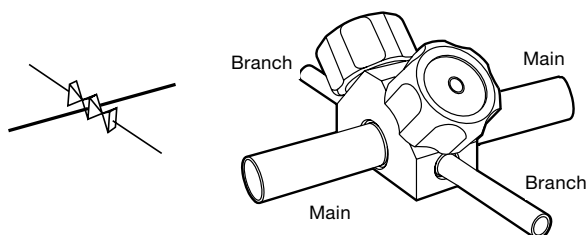
Single Horizontal Cross

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

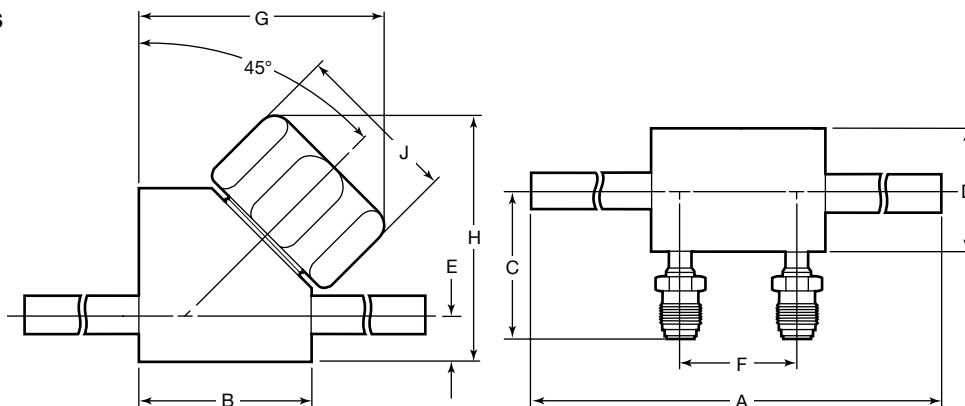
Dimensions are for reference only and are subject to change.

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-VVXBL-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.

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.