

# Diaphragm Valves



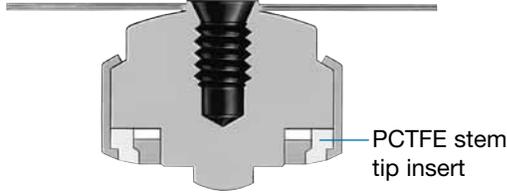
## LD Series

- 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)

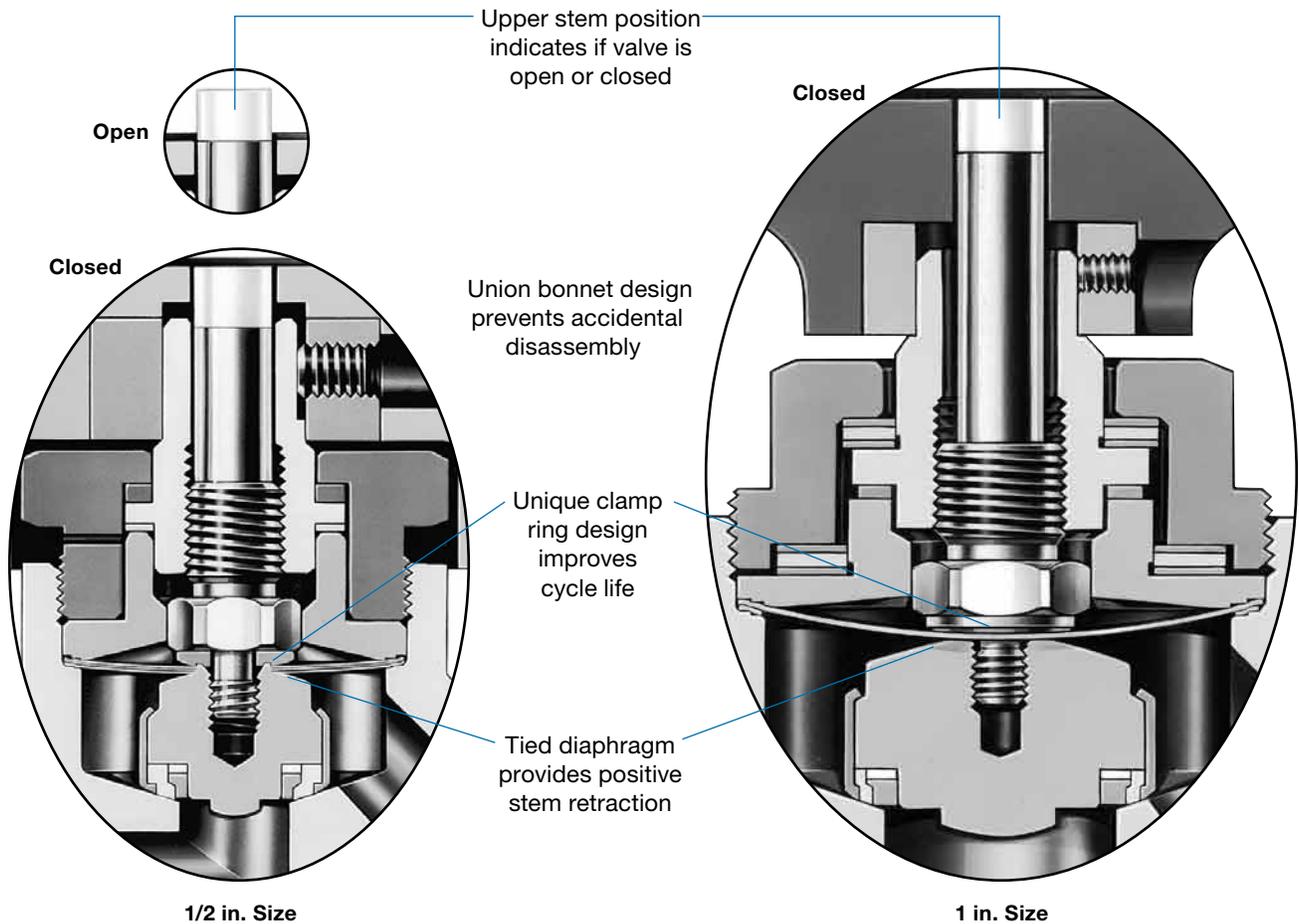
- Machined wetted surfaces in body are finished to an average of 20  $\mu\text{m}$ . (0.51  $\mu\text{m}$ )  $R_a$ .
- Optional electropolished body exteriors (ELD series) are available.
- Optional tube extension interiors electropolished to an average of 10  $\mu\text{m}$ . (0.25  $\mu\text{m}$ )  $R_a$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

### Forged (1/2 in. Size)

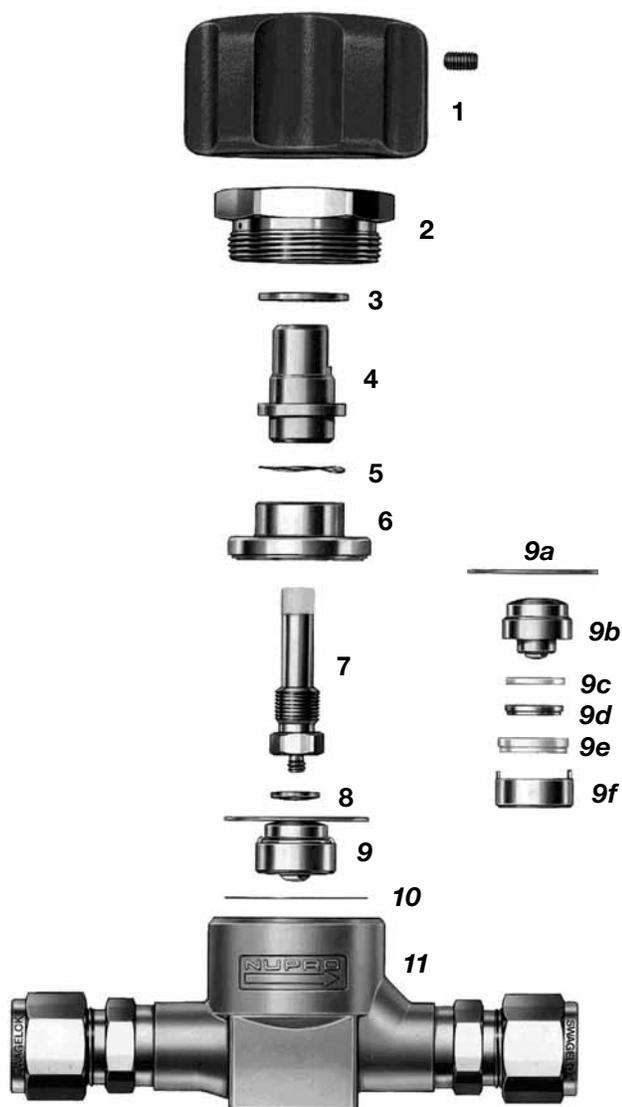
- Design results in compact size, lower internal volume.
- Wetted surfaces are electropolished to an average of 5  $\mu\text{m}$ . (0.13  $\mu\text{m}$ )  $R_a$ .

### 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  $\mu\text{m}$ . (0.13  $\mu\text{m}$ )  $R_a$ .



## 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)*, MS-06-63, is helium leak tested to a maximum leak rate of  $4 \times 10^{-9}$  std cm<sup>3</sup>/s.

### SC-01 Process

Every LD series diaphragm valve processed in accordance with Swagelok *Ultrahigh-Purity Process Specification (SC-01)*, MS-06-61, is helium leak tested to a maximum leak rate of  $1 \times 10^{-9}$  std cm<sup>3</sup>/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)*, 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)*, 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)*, MS-06-61. Cleaning 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 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 ( $R_a$ ) $\mu\text{in. } (\mu\text{m}) \text{ avg}$	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  $C_v$

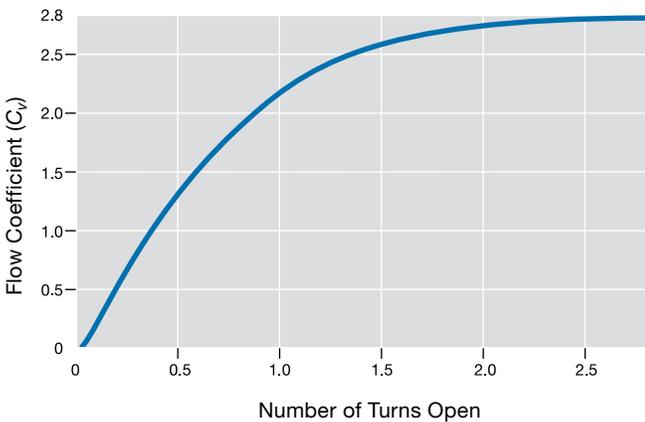
Pressure Drop to Atmosphere ( $\Delta p$ ) psi (bar)	Air Flow std ft <sup>3</sup> /min (std L/min)	Water Flow U.S. gal/min (L/min)
10 (0.68)	31 (870)	9 (34)
50 (3.4)	84 (2300)	20 (75)
100 (6.8)	148 (4100)	28 (100)

#### 1 in. Size

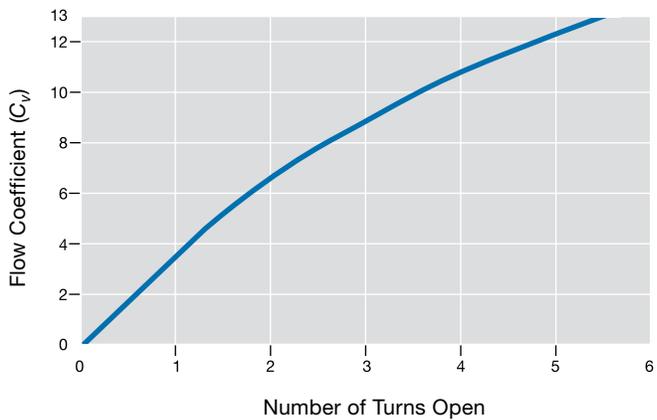
1.125 in. (28.6 mm) orifice, 13  $C_v$

Pressure Drop to Atmosphere ( $\Delta p$ ) psi (bar)	Air Flow std ft <sup>3</sup> /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



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

## Ordering Information and Dimensions

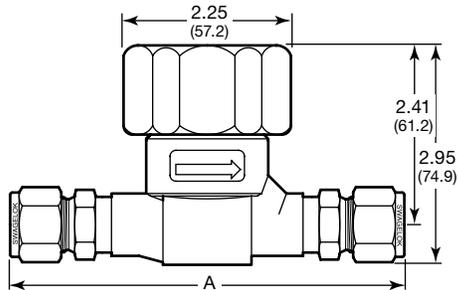
Dimensions, in inches (millimeters), are for reference only and are subject to change.

### Cast-Body Valves

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

Example: 6L-ELD8-BBXX-DU

#### LD8 Series

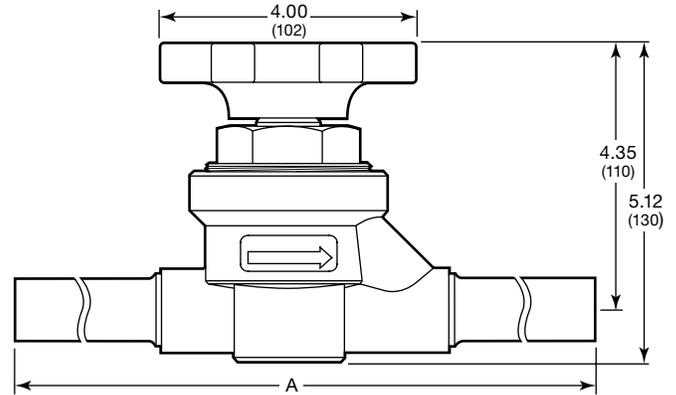


End Connections		Ordering Number	A in. (mm)
Type	Size		
Swagelok tube fitting	1/2 in.	6L-LD8-BBXX	5.30 (135)
		6L-ELD8-BBXX	
	12 mm	6L-LD8-DDXX	
		6L-ELD8-DDXX	
Male VCR fitting	1/2 in.	6L-ELD8-CCXX	4.58 (116)
Female NPT	1/2 in.	6L-LD8-EEXX	5.61 (142)
Female ISO <sup>①</sup>	1/2 in.	6L-LD8-FFXX	
Tube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

<sup>①</sup> 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	
	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	
		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

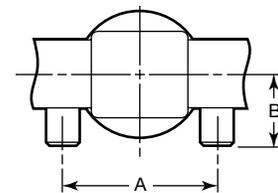
Replace **XX** with **XB** for no inlet purge port and 1/4 in. integral male VCR fitting outlet purge port.

Example: 6L-ELD8-BBXB

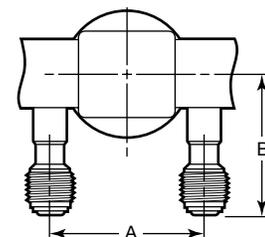
#### Purge Ports

Purge Port End Connections	Dimensions, in. (mm)	
	A	B
<b>LD8 Series</b>		
None	1.83 (46.5)	0.88 (22.4)
1/4 in. male VCR fittings		1.69 (42.9)
<b>LD16 Series</b>		
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



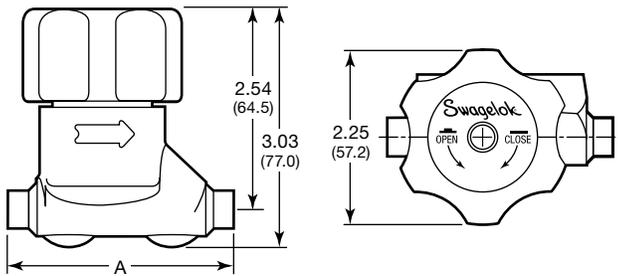
## Ordering Information and Dimensions

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)*, 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 × 0.049 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 × 0.049 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.

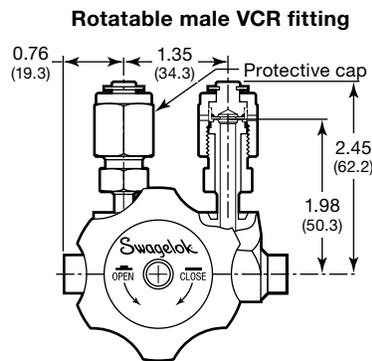
Example: 6L-ELD8-11**M**-P

Replace **X** with **MX** for 1/4 in. integral male VCR 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

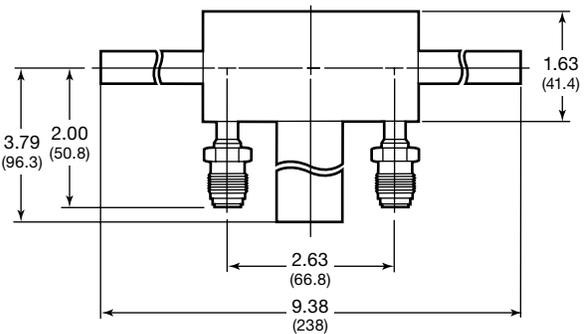
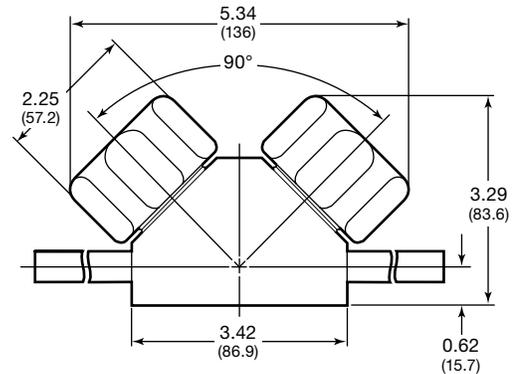
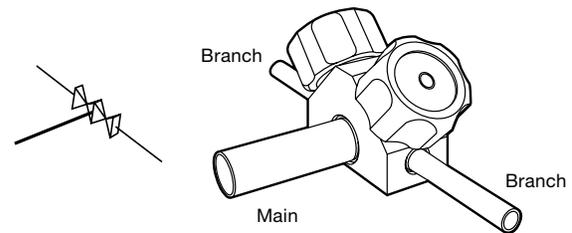
- Valves eliminate need for tee and cross fittings.
- Branches contain shutoff valves.
- Main line and branches are in same plane.
- Purge ports are 1/4 in. rotatable male VCR fittings.

Select an ordering number. To order optional cleaning in accordance with Swagelok *Special Cleaning and Packaging (SC-11)*, 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

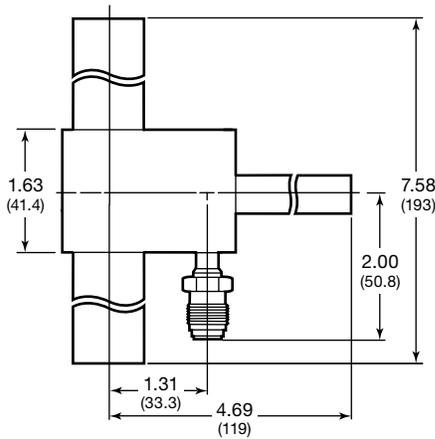
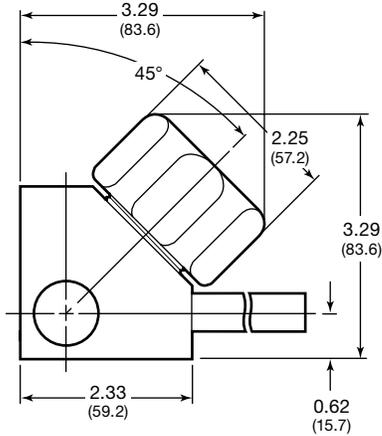
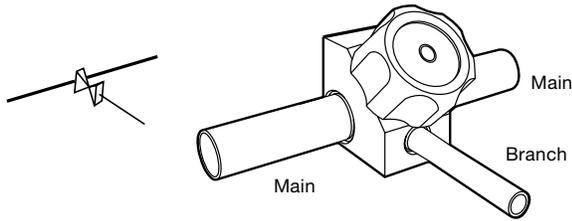
Length of main and branch line tubing is 3 in. (76.2 mm).

### Ordering Information and Dimensions

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

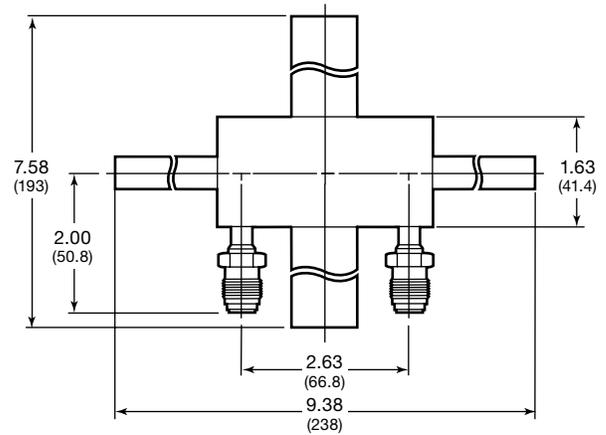
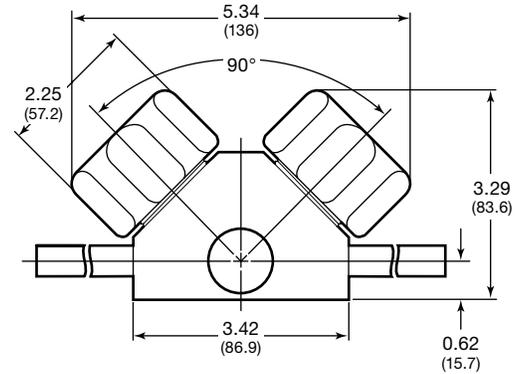
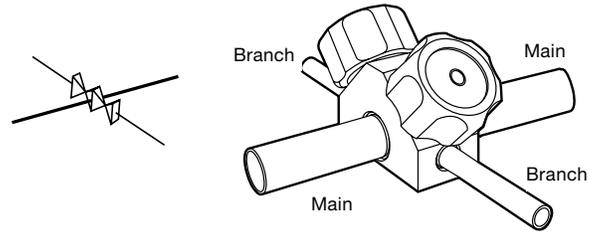
#### Single Horizontal Cross

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

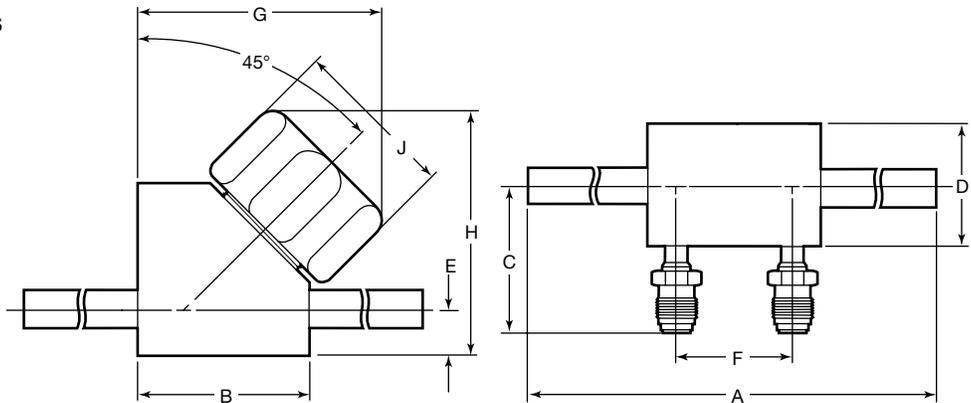
Dimensions are for reference only and are subject to change.

### 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)*, 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.

## 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.

### 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

### 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](http://swagelok.com) or contact your authorized Swagelok representative.