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
Bellows- and Diaphragm-Sealed Valves

**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) $R_a$.

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- Machined wetted surfaces in body are finished to an average of 20 μin. (0.51 μm) $R_a$.
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Materials of Construction

![Diagram of diaphragm valve components]

**Component** | **Valve Body** | **Cast** | **Forged** | **Bar Stock**
--- | --- | --- | --- | ---
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 $4 \times 10^{-9}$ 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 $1 \times 10^{-9}$ 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**

<table>
<thead>
<tr>
<th>Valve Body</th>
<th>Cast</th>
<th>Forged and Bar Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature, °F (°C)</strong></td>
<td><strong>Working Pressure, psig (bar)</strong></td>
<td></td>
</tr>
<tr>
<td>–20 (–28) to 100 (37)</td>
<td>300 (20.6)</td>
<td>300 (20.6)</td>
</tr>
<tr>
<td>200 (93)</td>
<td>265 (18.2)</td>
<td>255 (17.5)</td>
</tr>
<tr>
<td>300 (148)</td>
<td>240 (16.5)</td>
<td>230 (15.8)</td>
</tr>
</tbody>
</table>

**Flow Data at 70°F (20°C)**

**1/2 in. Size**
0.500 in. (12.7 mm) orifice, 2.8 $C_v$

<table>
<thead>
<tr>
<th>Pressure Drop to Atmosphere (Δp) psi (bar)</th>
<th>Air Flow std ft$^3$/min (std L/min)</th>
<th>Water Flow U.S. gal/min (L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (0.68)</td>
<td>31 (870)</td>
<td>9 (34)</td>
</tr>
<tr>
<td>50 (3.4)</td>
<td>84 (2300)</td>
<td>20 (75)</td>
</tr>
<tr>
<td>100 (6.8)</td>
<td>148 (4100)</td>
<td>28 (100)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pressure Drop to Atmosphere (Δp) psi (bar)</th>
<th>Air Flow std ft$^3$/min (std L/min)</th>
<th>Water Flow U.S. gal/min (L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (0.68)</td>
<td>140 (3900)</td>
<td>41 (150)</td>
</tr>
<tr>
<td>50 (3.4)</td>
<td>390 (11 000)</td>
<td>92 (340)</td>
</tr>
<tr>
<td>100 (6.8)</td>
<td>690 (19 500)</td>
<td>130 (490)</td>
</tr>
</tbody>
</table>

**Swagelok Process Specifications**

<table>
<thead>
<tr>
<th>Series</th>
<th>Wetted Surface Roughness Average ($R_a$)</th>
<th>Swagelok Process Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD cast body</td>
<td>20 (0.51)—body machined surfaces</td>
<td>SC-11</td>
</tr>
<tr>
<td>ELD cast body</td>
<td>20 (0.51)—body machined surfaces; 10 (0.25)—tube extensions</td>
<td>SC-11</td>
</tr>
<tr>
<td>Forged body</td>
<td>5 (0.13)—P process</td>
<td>SC-01</td>
</tr>
<tr>
<td>Bar stock body</td>
<td>5 (0.13)—P process</td>
<td>SC-01</td>
</tr>
</tbody>
</table>

**Flow Coefficient at Turns Open**

![Graph](chart1.png)
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**

![Diagram of LD8 Series]

**LD16 Series**

![Diagram of LD16 Series]

### 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

<table>
<thead>
<tr>
<th>Purge Port End Connections</th>
<th>Dimensions, in (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td><strong>LD8 Series</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0.88 (22.4)</td>
</tr>
<tr>
<td>1/4 in. male VCR fittings</td>
<td>1.69 (42.9)</td>
</tr>
<tr>
<td><strong>LD16 Series</strong></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>1.35 (34.3)</td>
</tr>
<tr>
<td>1/4 in. male VCR fittings</td>
<td>2.16 (54.9)</td>
</tr>
</tbody>
</table>

Dimensions shown with Swagelok tube fitting nuts finger-tight.

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

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.

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-ELD8-11M-P

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

Example: 6L-ELD8-11MX-P

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

Example: 6L-ELD8-11XM-P

End Connections

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

Forged-Body Valves with Purge Ports

Rotatable male VCR fitting

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Series</th>
<th>Ordering Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 × 0.065 in.</td>
<td>LD8</td>
<td>6L-LDE-2B1P-A</td>
</tr>
<tr>
<td>1/2 × 0.049 in.</td>
<td></td>
<td>6L-LDE-2H1P-A</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Main</th>
<th>Branch</th>
<th>Series</th>
<th>Ordering Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 × 0.049 in.</td>
<td>1/4 × 0.035 in.</td>
<td>1/2 × 0.049 in.</td>
<td>1/2 in. rotatable male VCR fitting</td>
<td>6L-LDA-1A1P-A</td>
</tr>
<tr>
<td>3/4 × 0.065 in.</td>
<td>1/2 × 0.049 in.</td>
<td>1/2 in. rotatable male VCR fitting</td>
<td>6L-LDA-1H1P-A</td>
<td></td>
</tr>
<tr>
<td>1 × 0.065 in.</td>
<td>1/2 × 0.049 in.</td>
<td>1/2 in. rotatable male VCR fitting</td>
<td>6L-LDA-3B1P-A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Main</th>
<th>Branch</th>
<th>Series</th>
<th>Ordering Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 × 0.049 in.</td>
<td>1/2 × 0.049 in.</td>
<td>1/2 in. rotatable male VCR fitting</td>
<td>6L-LDA-1B1P-A</td>
<td></td>
</tr>
<tr>
<td>3/4 × 0.065 in.</td>
<td>1/2 × 0.049 in.</td>
<td>1/2 in. rotatable male VCR fitting</td>
<td>6L-LDA-2B1P-A</td>
<td></td>
</tr>
<tr>
<td>1 × 0.065 in.</td>
<td>1/2 × 0.049 in.</td>
<td>1/2 in. rotatable male VCR fitting</td>
<td>6L-LDA-3B1P-A</td>
<td></td>
</tr>
</tbody>
</table>

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 shut-off 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

<table>
<thead>
<tr>
<th>Tubing Size</th>
<th>Ordering Number</th>
<th>Series</th>
<th>Dimensions, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td>Outlet</td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>1/2 x 0.049 in.</td>
<td>1/2 x 0.049 in.</td>
<td>LD8</td>
<td>8.28</td>
</tr>
<tr>
<td>3/4 x 0.065 in.</td>
<td>3/4 x 0.065 in.</td>
<td>6L-LDF-2C1P-A</td>
<td>8.42</td>
</tr>
<tr>
<td>3/4 x 0.065 in.</td>
<td>3/4 x 0.065 in.</td>
<td>LD16</td>
<td>9.46</td>
</tr>
<tr>
<td>1 x 0.065 in.</td>
<td>1 x 0.065 in.</td>
<td>6L-LDS-2C1P-Q</td>
<td>9.46</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>210</td>
</tr>
</tbody>
</table>

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

Oxygen Service Hazards


⚠️ WARNING

Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.

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

MS-01-172, RevI, October 2021
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.

- **WARNING**
  - Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.