Springless Diaphragm Valves for High Performance

**DP Series**

- Suitable for ultrahigh-purity applications
- 316L VIM-VAR stainless steel body
- Low-pressure and high-pressure models
- VCR®, tube butt weld, and modular surface-mount end connections
- Manual or pneumatic actuation
Bellows- and Diaphragm-Sealed Valves

DP SERIES

DIAPHRAGM

Seat
- Fully contained PCTFE seat design provides:
  - Excellent resistance to swelling and contamination
  - Improved helium leak test performance
  - Minimal particle generation
  - Long cycle life.

Diaphragm
- Cobalt-based superalloy (UNS R30003) material for strength and corrosion resistance
- Optimal design for long cycle life

Body
- 316L VIM-VAR stainless steel body material for ultrahigh-purity applications
- Fully swept flow path
  - Minimizes entrapment areas
  - Facilitates purging
  - Maximizes flow capacity.

Technical Data

<table>
<thead>
<tr>
<th>Model</th>
<th>Working Pressure psig (bar)</th>
<th>Temperature Rating °F (°C)</th>
<th>Flow Coefficient ($C_v$)</th>
<th>Orifice in. (mm)</th>
<th>Internal Volume in.³ (cm³)</th>
<th>Pneumatic Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operating Burst Operating Short-Term Bakeout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Actuation Pressure psig (bar) Air Displacement in.³ (cm³)</td>
</tr>
<tr>
<td>Low-pressure</td>
<td>Vacuum to 250 (17.2) 3200 (220) 10 to 150 (23 to 65) 302 (150) (valve open)</td>
<td>0.27 0.16 (4.1)</td>
<td></td>
<td></td>
<td></td>
<td>60 to 120 (4.2 to 8.2) 0.09 (1.5)</td>
</tr>
<tr>
<td>High-pressure</td>
<td>Vacuum to 3045 (210) 12200 (840)</td>
<td></td>
<td>0.20 (4.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See Options and Accessories, page 8, for high-temperature seat materials.
Materials of Construction

**Component**
- **Body and integral end connections**: 316L VIM-VAR SS/SEMI F20-0305 Ultrahigh-Purity
- **Welded VCR end connections**: 316L VAR SS/SEMI F20-0305 High-Purity
- **Swagelok tube fittings**: 316 SS/A276
- **Seat**: PCTFE/D1430
- **Diaphragm**: Cobalt-based superalloy (UNS R30003)/AMS 5876
- **Support diaphragm**: Silver-plated cobalt-based superalloy (UNS R30003)/AMS 5876
- **Washer**: S17700
- **Bonnet**: S17400 SS
- **Bonnet nut**: 316 SS

**Pneumatic Actuator**
- **Cylinder, cap, pistons**: Aluminum
- **O-rings**: Buna N
- **Springs**: S17700 SS
- **Button**: 316 SS

**Manual Actuator**
- **Actuator**: 316 SS
- **Button**: 316 SS

**Wetted components listed in italics.**

O-rings are lubricated with PTFE-based lube; no lubricants on wetted components.

① 20% minimum elongation allowed.

Process Specifications

See Swagelok Ultrahigh-Purity Process Specification (SC-01) (MS-06-61); Swagelok Photovoltaic Process Specification (SC-06) (MS-06-64); and Swagelok Special Cleaning and Packaging (SC-11) (MS-06-63), for details on processes, process controls, and process verification.

<table>
<thead>
<tr>
<th>Cleaning</th>
<th>Assembly and Packaging</th>
<th>Process Designator</th>
<th>Process Specification</th>
<th>Wetted Surface Roughness ($R_a$)</th>
<th>Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system</td>
<td>Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags.</td>
<td>P</td>
<td>Ultrahigh-Purity Process Specification (SC-01)</td>
<td>Electropolished and finished to an average of 5 µm. (0.13 µm)</td>
<td>Inboard helium leak tested to a rate of $1 \times 10^{-9}$ std cm³/s at the seat, envelope, and all seals. The DP series design has been helium leak tested to maximum leak rate of $1 \times 10^{-10}$ std cm³/s.</td>
</tr>
<tr>
<td>High-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system</td>
<td>Performed in specially cleaned areas; valves are individually bagged.</td>
<td>P6</td>
<td>Photovoltaic Process Specification (SC-06)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Special cleaning with non-ozone-depleting chemicals</td>
<td>Performed in specially cleaned areas; valves are individually bagged.</td>
<td>P1</td>
<td>Special Cleaning and Packaging (SC-11)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Performance Specifications

See the DP Series Diaphragm Valve Technical Report, MS-06-15, for more information on helium leak testing, particle counting, moisture analysis, hydrocarbon analysis, ionic cleanliness, and lab cycle testing data.

Flow Data

<table>
<thead>
<tr>
<th>Pressure Drop to Atmosphere psig (bar)</th>
<th>Low-Pressure Models $C_v = 0.27$</th>
<th>High-Pressure Models $C_v = 0.20$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water U.S. gal/min (L/min)</td>
<td>Air std ft³/min (std L/min)</td>
</tr>
<tr>
<td>10 (0.68)</td>
<td>0.85 (3.2)</td>
<td>3.0 (86)</td>
</tr>
<tr>
<td>50 (3.4)</td>
<td>1.9 (7.2)</td>
<td>8.1 (230)</td>
</tr>
<tr>
<td>100 (6.8)</td>
<td>2.7 (10.2)</td>
<td>14.3 (410)</td>
</tr>
</tbody>
</table>
Actuation Options

Manual Actuators

- Low-pressure valves have blue handles as standard.
- High-pressure valves have white handles as standard.
- Seven handle colors are available; see Options and Accessories—Handle Colors, page 8.

Directional
- Quick, quarter-turn actuation
- Handle shape provides visual indication of OPEN and CLOSED position
- Available on high- and low-pressure models

Integral Lockout
- Quick, quarter-turn actuation
- Lockable in the CLOSED position for safety
- Handle shape and window indicator provides visual indication of OPEN and CLOSED position.
- Available on high- and low-pressure models

Round
- Quick, quarter-turn actuation
- Handle with window provides visual indication of OPEN and CLOSED positions
- Available on high- and low-pressure models

Toggle
- Spring-loaded toggle design for quick actuation
- Lockable in the CLOSED position for safety
- Handle position provides visual indication of OPEN and CLOSED positions
- Narrow handle profile allows close parallel mounting of valves
- Available on low-pressure models with PCTFE seats

Pneumatic Actuators

- Normally open pneumatic actuators are marked with a green ring on top of the cylinder.

High-Pressure Pneumatic Actuator

Low-Pressure Pneumatic Actuator

IGC II Modular Surface-Mount Valves

- 1.5 in. C-seal design
- Low-pressure valves: directional, integral lockout, round, toggle, and pneumatic actuators
- High-pressure valves: directional and integral lockout handles
- Available in two- or three-port configurations
- For more information on IGC II integrated gas components, see the IGC II Integrated Gas Components—Substrates, Manifolds, Mounting Components, and Assembly Hardware catalog, MS-02-134.
Ordering Information and Dimensions

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

Low-Pressure Valves

To order, add a process designator, P, P1, or P6 (see page 3), to the basic ordering number, then specify the actuator style as shown:

- For a **directional handle**, no additional designators are required.
- Example: 6LVV-DPBW4-P
- For an **integral lockout handle**, insert L.
  - Example: 6LVV-DPLBW4-P
- For a **round handle**, insert R.
  - Example: 6LVV-DPRBW4-P
- For a **toggle handle**, insert T.
  - Example: 6LVV-DPTVR4-P
- For a **pneumatic actuator**, add -C for normally closed actuation or -O for normally open actuation.
  - Example: 6LVV-DPBW4-P-C

---

<table>
<thead>
<tr>
<th>End Connection</th>
<th>Basic Ordering Number</th>
<th>H in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 in. tube butt weld</td>
<td>6LVV-DPBW4-</td>
<td>1.74 (44.2)</td>
</tr>
<tr>
<td>0.30 in. (7.6 mm) tube stub, 0.035 in. wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4 in. tube butt weld</td>
<td>6LVV-DPBW4S-</td>
<td>1.61 (40.9)</td>
</tr>
<tr>
<td>0.26 in. (6.6 mm) tube stub, 0.035 in. wall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mm tube butt weld, 1 mm wall</td>
<td>6LVV-DPBW6M-</td>
<td>1.74 (44.2)</td>
</tr>
<tr>
<td>1/4 in. female VCR fitting</td>
<td>6LVV-DPFRR4-</td>
<td>2.78 (70.6)</td>
</tr>
<tr>
<td>1/4 in. rotatable male VCR fitting</td>
<td>6LVV-DPMR4-</td>
<td></td>
</tr>
<tr>
<td>1/4 in. integral male VCR fitting</td>
<td>6LVV-DPVR4-</td>
<td>2.30 (58.4)</td>
</tr>
<tr>
<td>1/4 in. Swagelok tube fitting</td>
<td>6LVV-DPS4-</td>
<td>2.46 (62.5)</td>
</tr>
<tr>
<td>6 mm Swagelok tube fitting</td>
<td>6LVV-DPS6M-</td>
<td>2.45 (62.2)</td>
</tr>
</tbody>
</table>

1. Low-pressure valves have blue handles. For other colors, see Options and Accessories—Handle Colors, page 8.
2. Not available with P, P1, or P6 processing; omit process designator from ordering number.
Ordering Information and Dimensions
Dimensions, in inches (millimeters), are for reference only and are subject to change.

High-Pressure Valves

End Connection | Basic Ordering Number | H in. (mm)
--- | --- | ---
Inlet and Outlet | | |
1/4 in. tube butt weld | 6LVV-DPHBW4- | 1.74 (44.2)
0.30 in. (7.6 mm) tube stub, 0.035 in. wall | | |
1/4 in. tube butt weld short 0.26 in. (6.6 mm) tube stub, 0.035 in. wall | 6LVV-DPHBW4S- | 1.61 (40.9)
6 mm tube butt weld, 1 mm wall | 6LVV-DPHBW6M- | 1.74 (44.2)
1/4 in. female VCR fitting | 6LVV-DPHFR4- | |
1/4 in. rotatable male VCR fitting | 6LVV-DPHMR4- | 2.78 (70.6)
1/4 in. integral male VCR fitting | 6LVV-DPHVR4- | 2.30 (58.4)
1/4 in. Swagelok tube fitting | 6LVV-DPHS4- | 2.46 (62.5)
6 mm Swagelok tube fitting | 6LVV-DPHS6M- | 2.45 (62.2)

To order, add a process designator, P, P1, or P6 (see page 3), to the basic ordering number, then specify the actuator style as shown:

- For a **directional handle**, no additional designators are required.
  Example: 6LVV-DPHBW4-P
- For an **integral lockout handle**, insert L.
  Example: 6LVV-DPHLBW4-P
- For a **round handle**, insert R.
  Example: 6LVV-DPHRBW4-P
- For a **pneumatic actuator**, add -C for normally closed actuation or -O for normally open actuation.
  Example: 6LVV-DPHBW4-P-C

1. High-pressure valves have white handles. For other colors, see Options and Accessories—Handle Colors, page 8.
2. Not available with P, P1, or P6 processing; omit process designator from ordering number.
Ordering Information and Dimensions
Dimensions, in inches (millimeters), are for reference only and are subject to change.

IGC II Modular Surface-Mount Valves

Directional and Round Handles

Integral Lockout Handle

Toggle Handle

Pneumatic Actuator

Dimensions
For other valve dimensions, see Ordering Information and Dimensions for low-pressure or high-pressure valves on pages 5 and 6.

<table>
<thead>
<tr>
<th>Handle Type</th>
<th>Dimensions, in. (mm)</th>
<th>Low-Pressure</th>
<th>High-Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H Open</td>
<td>H Closed</td>
<td>H Open</td>
</tr>
<tr>
<td>Directional and round</td>
<td>2.36</td>
<td>2.34</td>
<td>2.36</td>
</tr>
<tr>
<td>(59.9)</td>
<td>(59.4)</td>
<td></td>
<td>(59.9)</td>
</tr>
<tr>
<td>Integral lockout</td>
<td>3.25</td>
<td>3.59³</td>
<td>3.41</td>
</tr>
<tr>
<td>(82.6)</td>
<td>(91.2)</td>
<td></td>
<td>(86.6)</td>
</tr>
<tr>
<td>Toggle</td>
<td>2.83</td>
<td>4.04</td>
<td>—</td>
</tr>
<tr>
<td>(71.9)</td>
<td>(103)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

³ Closed and locked position.

Low-Pressure Models

<table>
<thead>
<tr>
<th>Actuation</th>
<th>2 Port</th>
<th>3 Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional handle</td>
<td>6LVV-MSM-DP-2-P</td>
<td>6LVV-MSM-DP-3-P</td>
</tr>
<tr>
<td>Integral lockout</td>
<td>6LVV-MSM-DPL-2-P</td>
<td>6LVV-MSM-DPL-3-P</td>
</tr>
<tr>
<td>Round handle</td>
<td>6LVV-MSM-DPR-2-P</td>
<td>6LVV-MSM-DPR-3-P</td>
</tr>
<tr>
<td>Pneumatic, normally closed</td>
<td>6LVV-MSM-DPH-2-P-C</td>
<td>6LVV-MSM-DPHL-3-P-C</td>
</tr>
<tr>
<td>Pneumatic, normally open</td>
<td>6LVV-MSM-DPH-2-P-O</td>
<td>6LVV-MSM-DPH-3-P-O</td>
</tr>
</tbody>
</table>

High-Pressure Models

<table>
<thead>
<tr>
<th>Actuation</th>
<th>2 Port</th>
<th>3 Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional handle</td>
<td>6LVV-MSM-DPH-2-P</td>
<td>6LVV-MSM-DPH-3-P</td>
</tr>
<tr>
<td>Integral lockout handle</td>
<td>6LVV-MSM-DPHL-2-P</td>
<td>6LVV-MSM-DPHL-3-P</td>
</tr>
<tr>
<td>Round handle</td>
<td>6LVV-MSM-DPHR-2-P</td>
<td>6LVV-MSM-DPHR-3-P</td>
</tr>
</tbody>
</table>
Options and Accessories

Handle Colors (excluding multivalve manifolds)
Seven handle colors are available for color coding of process lines.
Select a basic kit ordering number and add a color designator.

<table>
<thead>
<tr>
<th>Handle Kit</th>
<th>Basic Ordering Number</th>
<th>Color</th>
<th>Designator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional</td>
<td>NY-5K-DP-</td>
<td>Black</td>
<td>BK</td>
</tr>
<tr>
<td>Integral lockout</td>
<td>NY-5K-DPL-</td>
<td>Blue</td>
<td>BL</td>
</tr>
<tr>
<td>Round handle replacement</td>
<td>PY-50K-DPR-</td>
<td>Green</td>
<td>GR</td>
</tr>
<tr>
<td>Round handle retrofit</td>
<td>PY-5K-DPR-</td>
<td>Orange</td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red</td>
<td>RD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>White</td>
<td>WH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yellow</td>
<td>YW</td>
</tr>
</tbody>
</table>

Example: NY-5K-DP-RD for a red directional handle kit.

Diaphragm Replacement Kits

- Include two diaphragms and replacement instructions.
- Are available for high- or low-pressure valves.

Ordering number: E-3DK-DP

Actuator Replacement Kits

Include actuator and service instructions.
Select a kit ordering number:

<table>
<thead>
<tr>
<th>Actuator Replacement Kit</th>
<th>Ordering Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directional handle</td>
<td>NY-DP-K1-BL</td>
</tr>
<tr>
<td>Integral lockout handle</td>
<td>NY-DPL-K1-BL</td>
</tr>
<tr>
<td>Round handle</td>
<td>PY-DPR-K1-BL</td>
</tr>
<tr>
<td>Toggle handle</td>
<td>SS-DPT-K1-BL</td>
</tr>
<tr>
<td>Pneumatic normally closed</td>
<td>A-DP-K1-C</td>
</tr>
<tr>
<td>Pneumatic normally open</td>
<td>A-DPK-K1-O</td>
</tr>
<tr>
<td>High-temperature pneumatic normally closed</td>
<td>A-DPV-K1-C</td>
</tr>
<tr>
<td>High-temperature pneumatic normally open</td>
<td>A-DPV-K1-O</td>
</tr>
</tbody>
</table>

- For high-pressure 1V and 2V monoblock configurations, insert M into the ordering number as shown.
- Examples: A-DPH-M-1K-C, A-DPH-MV-K1-C

⚠️ Do not interchange high- and low-pressure actuators.

High-Temperature Seat Material—Polyimide

- Temperature rating is from 50 to 300°F (10 to 150°C).
- Fluorocarbon FKM O-rings in pneumatic actuator are included.
- All other materials and ratings remain the same.

To order, insert V in the valve ordering number.
Examples: 6LVV-DPV111P-C, 6LVV-DPHV-BW4P-C

Indicator Switch

- Transmits a signal to an electrical device, indicating the open or closed position of the pneumatically actuated valve.
- Features a single-pole, single-throw switch rated at:
  - 1/2 A for 115 V (ac) for a normally open switch;
  - 1/4 A for 115 V (ac) for a normally closed switch;
  - –40 to 185°F (–40 to 85°C) temperature.
- Includes a 24 in. (61 cm) wire lead with an inline clip.
- Is available assembled on any normally closed and high-pressure, normally open, pneumatically actuated DP series valve, or as a kit 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: 6LVV-DPF4-P-CM, 6LVV-DPBW4-P-CM-2

Indicator Switch Kits

Include actuator and switch. Select an ordering number.

<table>
<thead>
<tr>
<th>Indicator Switch Kit</th>
<th>Ordering Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Pressure</td>
<td>High-Pressure</td>
</tr>
<tr>
<td>Normally open</td>
<td>MS-ISK-DP-CM</td>
</tr>
<tr>
<td>Normally closed</td>
<td>MS-ISK-DPH-CM-2</td>
</tr>
</tbody>
</table>

- For high-pressure 1V and 2V monoblock configurations, insert M into the ordering number as shown.
- Example: MS-ISK-DPHM-CM

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).

Caution: Do not mix or interchange parts with those of other manufacturers.
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Visit www.swagelok.com to locate your Swagelok representative and obtain any information on features, technical information and product references, or to learn about the variety of services available only through authorized sales centers and service Swagelok.

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.

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