

High-Pressure, Pneumatically Actuated Bellows-Sealed Valves



HB Series

- Packless valves with all-metal seal to atmosphere
- Working pressures up to 3500 psig (241 bar)
- Temperatures up to 400°F (204°C)
- VCR® face seal fitting, Swagelok® tube fitting, and weld end connections

Features

Valve

- Flow coefficient (C_v) of 0.30
- Full pressure rating in either flow direction for system versatility
- Easily purged to maintain clean operation

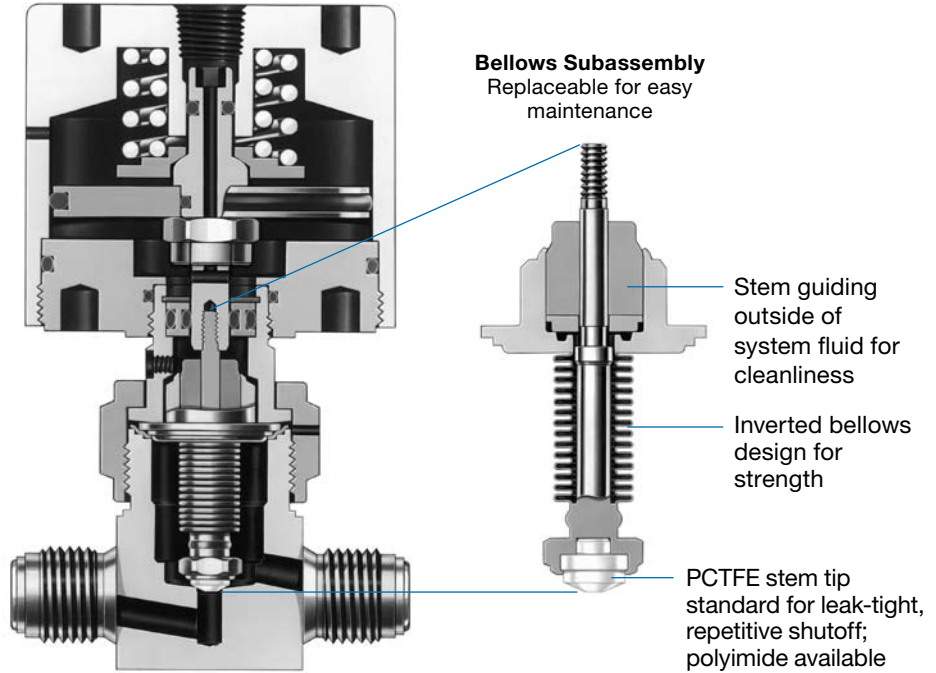
Pneumatic Actuator

- Normally closed and normally open models
- Actuation pressure as low as 30 psig (2.1 bar)

Technical Data

| Flow Coefficient ^① (C_v) | Orifice in. (mm) | Internal Volume ^① in. ³ (cm ³) |
|---|------------------|--|
| 0.30 | 0.15 (3.8) | 0.27 (4.4) |

① Determined using valves with Swagelok tube fitting end connections.



Materials of Construction

Valve

| Component | Material Grade/ ASTM Specification |
|---|---------------------------------------|
| <i>Body, stem, weld ring, end connections</i> | 316L SS/A479 |
| <i>Bellows</i> | 316L SS/A269 |
| <i>Gasket</i> | PTFE-coated 316L SS/A240 |
| <i>Stem tip</i> | PCTFE/D1430 |
| Bonnet, bonnet nut | 316 SS/A479 |
| Bushing | Bronze/B139 |
| Backstop washer | 303 SS/A582 |
| Lubricant | Petroleum-based |

Wetted components listed in *italics*.

Pneumatic Actuator

| Component | Material |
|----------------|---------------------------|
| Cylinder, base | 2024-T4 aluminum/ B211 |
| O-rings | Fluorocarbon FKM |

Pressure-Temperature Ratings

Valve

| Body Material | 316 SS | |
|-----------------------|-----------------------------|------------|
| Stem Tip Material | PCTFE | Polyimide |
| Temperature °F (°C) | Working Pressure psig (bar) | |
| -40 (-40) to 100 (37) | 3500 (241) | 3500 (241) |
| 150 (65) | 3220 (221) | 3220 (221) |
| 200 (93) | — | 2950 (203) |
| 300 (148) | — | 2640 (181) |
| 400 (204) | — | 2400 (165) |

Pneumatic Actuator

| Pressure Rating at 70°F (20°C) | Temperature Rating °F (°C) |
|---------------------------------|----------------------------|
| 30 to 110 psig (2.1 to 7.5 bar) | -10 to 400 (-20 to 204) |

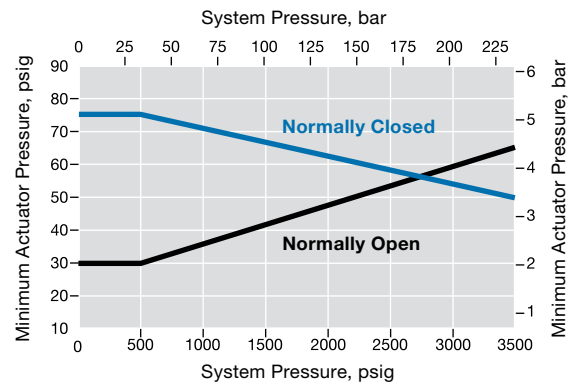
Flow Data at 70°F (20°C)

0.15 in. (3.8 mm) orifice, 0.30 C_v

| Pressure Drop to Atmosphere psi (bar) | Water Flow U.S. gal/min (L/min) | Air Flow std ft ³ /min (std L/min) |
|---------------------------------------|---------------------------------|---|
| 10 (0.68) | 0.95 (3.6) | 3.4 (96) |
| 50 (3.4) | 2.1 (7.9) | 9.0 (250) |
| 100 (6.8) | 3.0 (11) | 16 (450) |

Pneumatic Actuator Performance

For optimum valve performance, the normally open pneumatic actuator should be limited to 30 psi (2.1 bar) above the pressures shown in the graph.



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. See **Cleaning Process Availability**, page 4, for ordering information.

| Cleaning | Assembly and Packaging | Process Designator | Process Specification | Wetted Surface Roughness (R_a) | Testing |
|--|--|--------------------|---|---|---|
| Special cleaning with non-ozone-depleting chemicals | Performed in specially cleaned areas; valves are individually bagged. | None | <i>Special Cleaning and Packaging (SC-11)</i> | 20 $\mu\text{in.}$ (0.51 μm) average, machine finished | Inboard helium leak tested to a rate of 4×10^{-9} std cm^3/s at the seat, envelope, and all seals Pneumatic actuator leak tested to a maximum leak rate of 1 std cm^3/min |
| High-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system | Performed in specially cleaned areas; valves are individually bagged. | -SC06 | <i>Photovoltaic Process Specification (SC-06)</i> | 20 $\mu\text{in.}$ (0.51 μm) average, machine finished | |
| High-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system | Performed in specially cleaned areas; valves are individually bagged. | -P6 | <i>Photovoltaic Process Specification (SC-06)</i> | 8 $\mu\text{in.}$ (0.20 μm) average, machine finished and electropolished | |
| Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system | Performed in ISO Class 4 work areas; valves are double bagged and vacuum sealed in cleanroom bags. | -P | <i>Ultrahigh-Purity Process Specification (SC-01)</i> | 8 $\mu\text{in.}$ (0.20 μm) average, machine finished and electropolished | |

Performance Specifications

See the *HB Series Diaphragm Valve Technical Report*, MS-06-04, for more information on surface finish specifications, particle counting, moisture analysis, hydrocarbon analysis, ionic cleanliness, and lab cycle testing data.

Ordering Information and Dimensions

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

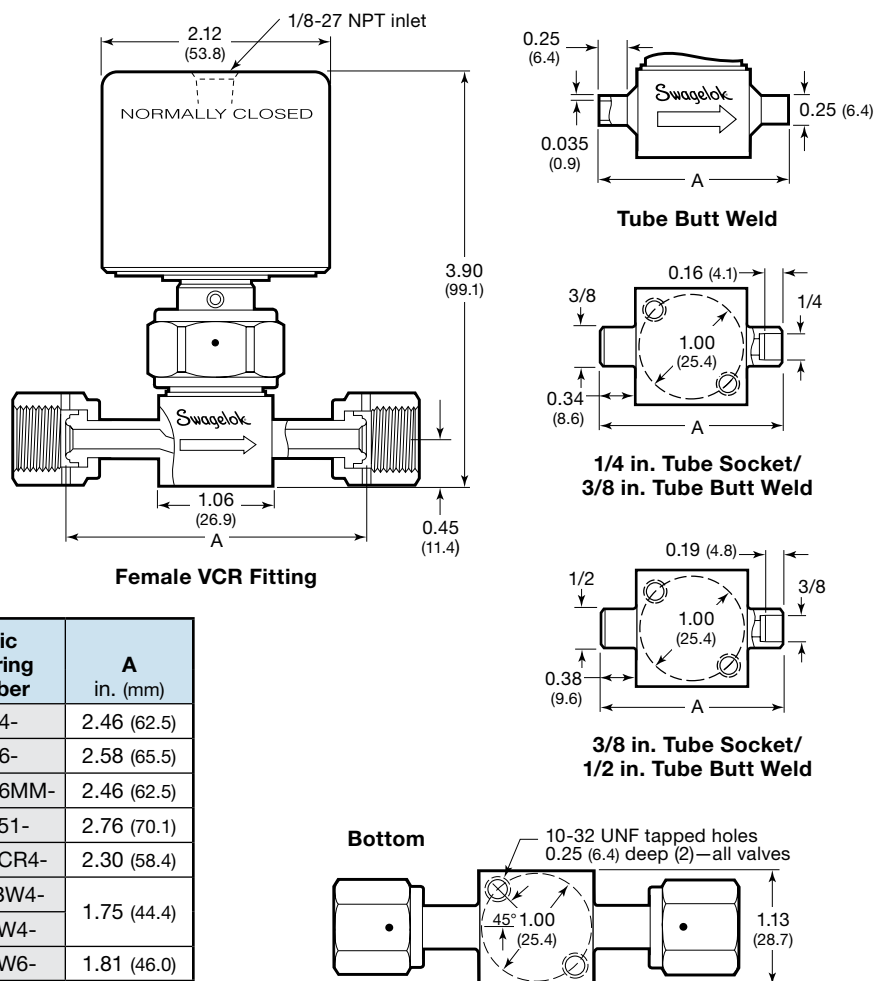
For a complete ordering number, add **C** for a normally closed pneumatic actuator or **O** for a normally open pneumatic actuator to the basic ordering number.

Example: SS-HBS4-C

Polyimide Stem Tip

To order a valve with a polyimide stem tip, insert **V** into the valve ordering number.

Example: SS-HBVS4-C



| End Connections | | Basic Ordering Number | A in. (mm) |
|--------------------------------|-----------------|-----------------------|---------------|
| Type | Size | | |
| Swagelok tube fitting | 1/4 in. | SS-HBS4- | 2.46 (62.5) |
| | 3/8 in. | SS-HBS6- | 2.58 (65.5) |
| | 6 mm | SS-HBS6MM- | 2.46 (62.5) |
| Female VCR fitting | 1/4 in. | SS-HBV51- | 2.76 (70.1) |
| Male VCR fitting | 1/4 in. | SS-HBVC4- | 2.30 (58.4) |
| Tube butt weld | 1/4 in. | 6LV-HBBW4- | 1.75 (44.4) |
| Tube socket and tube butt weld | 1/4 and 3/8 in. | SS-HBTW4- | |
| | 3/8 and 1/2 in. | SS-HBTW6- | 1.81 (46.0) |

Dimensions shown with Swagelok tube fitting nuts finger-tight.

Cleaning Process Availability

See **Process Specifications**, page 3, for more information about Swagelok cleaning and packaging processes.

Standard (SC-11)

Swagelok HB series valves are processed in accordance with Swagelok *Special Cleaning and Packaging (SC-11)*, MS-06-63, to ensure compliance with product cleanliness requirements as stated in ASTM G93 Level C.

Photovoltaic (SC-06)

Swagelok HB series valves with VCR or weld end connections are available cleaned and packaged in accordance with Swagelok *Photovoltaic Process Specification (SC-06)*, MS-06-64, to meet the process requirements of solar cell production. To order, insert **-SC06** into the ordering number.

Example: SS-HBBW4-**SC06**-C

SC-06-cleaned HB series valves with VCR or weld end connections are available with controlled wetted surface finishes and electropolishing. To order, insert **-P6** into the ordering number.

Example: SS-HBVCR4-**P6**-O

Ultrahigh-Purity (SC-01)

Swagelok HB series valves with VCR or weld end connections are available with wetted surface finishing, cleaning, and packaging in accordance with Swagelok *Ultrahigh-Purity Process Specification (SC-01)*, MS-06-61. To order, insert **-P** into the ordering number.

Example: SS-HBBW4-**P**-C

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.

Maintenance Kits

Bellows, stem tip/adaptor, and gasket kits are available. See the Swagelok *Bellows-Sealed Valve Maintenance Kits* catalog, MS-02-66.

Multiport and Elbow Valves and Multivalve Manifolds

HB series valves are available in multiport and elbow configurations; see the Swagelok *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves* catalog, MS-02-85. Multivalve manifolds are also available; contact your authorized Swagelok representative for more information.

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.

Options and Accessories

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 inline clip.
- Is available assembled on any normally closed or normally open, pneumatically actuated HB 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
 - **M-2** for a normally closed switch or
 - **M2** for a switch that indicates open and closed
- to the valve ordering number.

Examples: SS-HBS4-**CM**
SS-HBS4-**CM-2**
SS-HBS4-**OM2**

Actuator with Indicator Switch Kits for Field Assembly

To order a kit for an existing HB series valve, select an ordering number from the table below.

| Actuator Position Indicated | Actuator/Switch Retrofit Kit Ordering Number |
|-------------------------------|--|
| Normally Closed Valves | |
| Open | MS-ISK-HB-CM |
| Closed | MS-ISK-HB-CM-2 |
| Open and closed | MS-ISK-HB-CM2 |
| Normally Open Valves | |
| Closed | MS-ISK-HB-OM |
| Open | MS-ISK-HB-OM-2 |
| Open and closed | MS-ISK-HB-OM2 |

Warranty Information

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