

# 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

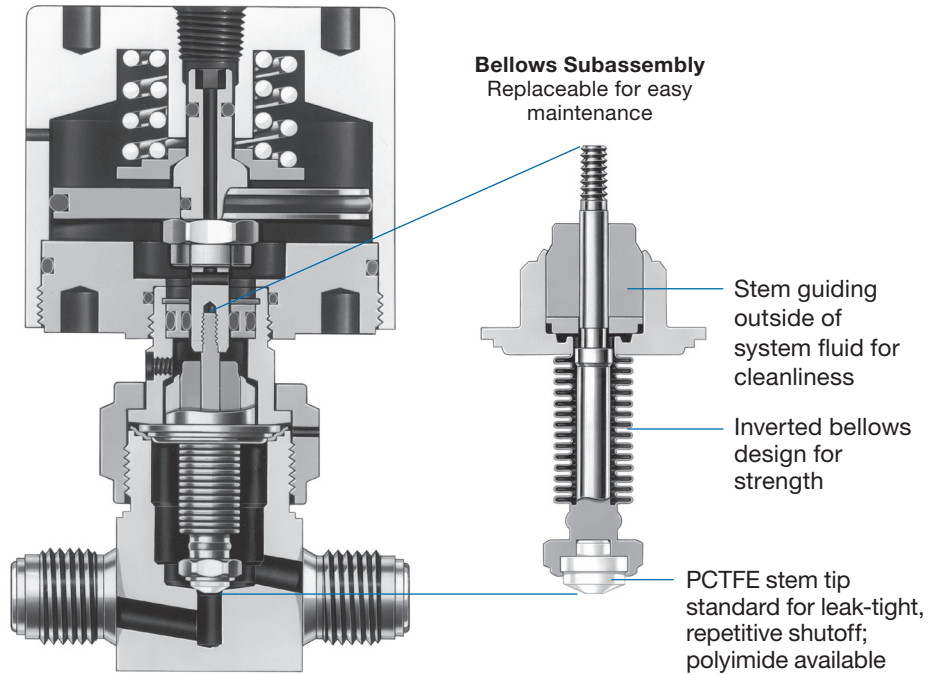
### Pneumatic Actuator

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

## Technical Data

Flow Coefficient <sup>①</sup> ( $C_v$ )	Orifice in. (mm)	Internal Volume <sup>①</sup> in. <sup>3</sup> (cm <sup>3</sup> )
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
Bonnet, bonnet nut	316 SS/A479
Bushing	Bronze
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)

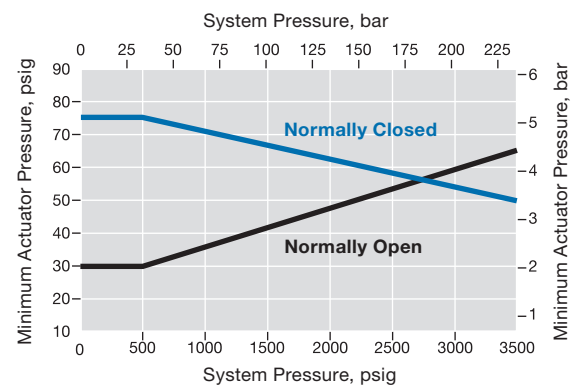
## Flow Data at 70°F (20°C)

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 <sup>3</sup> /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)* catalog, [MS-06-61](#); *Swagelok Photovoltaic Process Specification (SC-06)* catalog, [MS-06-64](#); and *Swagelok Special Cleaning and Packaging (SC-11)* catalog, [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 $\mu\text{m}$ ) average, machine finished	Inboard helium leak tested to a rate of $4 \times 10^{-9}$ std $\text{cm}^3/\text{s}$ at the seat, envelope, and all seals  Pneumatic actuator leak tested to a maximum leak rate of 1 std $\text{cm}^3/\text{min}$
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 $\mu\text{m}$ ) 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 $\mu\text{m}$ ) 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 $\mu\text{m}$ ) average, machine finished and electropolished	

## Performance Specifications

Refer to *HB Series Diaphragm Valve Technical Report*, [MS-06-04](#), for additional 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.

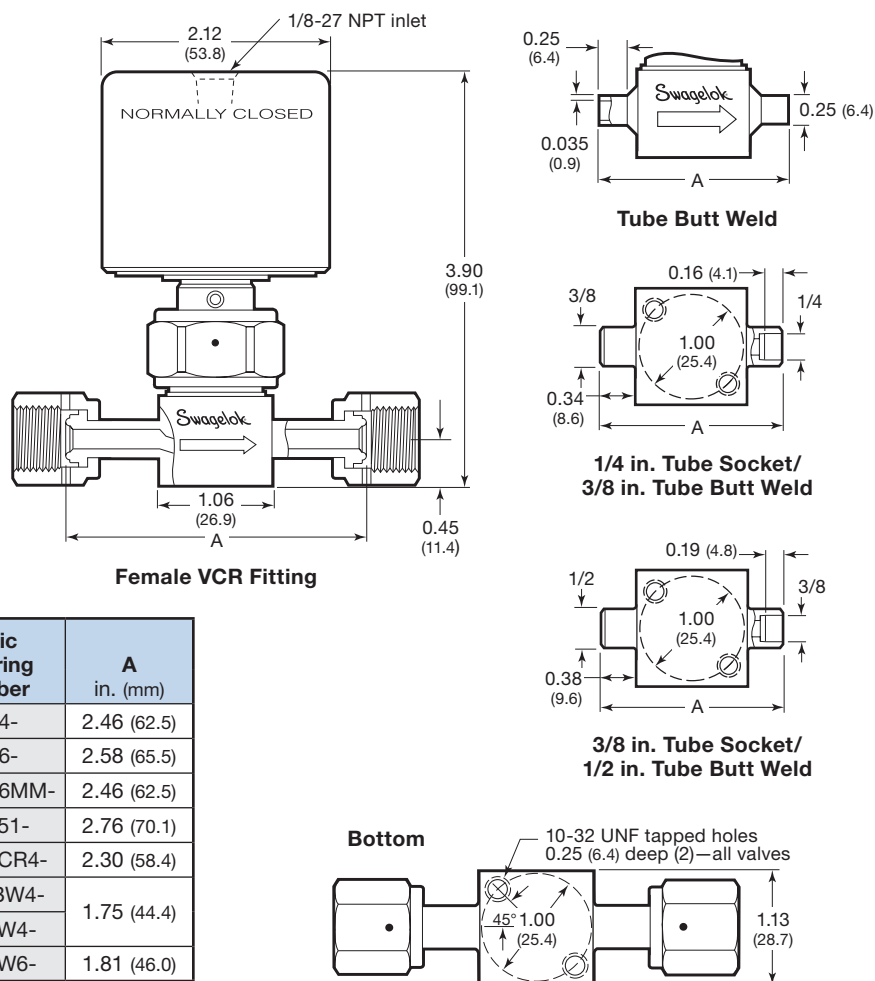
For a complete ordering number, add **C** for a normally closed pneumatic actuator or **O** for a normally open pneumatic actuator to the basic ordering number.

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-HBVCr4-	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)* catalog, [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)* catalog, [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)* catalog, [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, refer to *Oxygen System Safety* technical report, [MS-06-13](#).

## Maintenance Kits

Bellows, stem tip/adaptor, and gasket kits are available. Refer to *Bellows-Sealed Valve Maintenance Kits* catalog, [MS-02-66](#).

## Multiport and Elbow Valves and Monoblock Manifolds

HB series valves are available in multiport and elbow configurations and monoblock manifolds; refer to *Bellows- and Diaphragm-Sealed Multiport and Elbow Valves and Monoblock Manifolds* catalog, [MS-02-442](#).

### 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.

## Options and Accessories

### Indicator Switch

- Transmits a signal to an electrical device indicating either the open or closed position of a *normally closed* pneumatically actuated valve.
- Features a single-pole, single-throw switch rated at:
  - 1/2 A for 115 V (ac) for 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 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-**CM2**

### 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
Open	MS-ISK-HB-CM
Closed	MS-ISK-HB-CM-2
Open and closed	MS-ISK-HB-CM2

## 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.

### ⚠ 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.