Compact, High-Flow Gas Regulators

HF Series

- Precise pressure control
- Tamper-free design
- High-purity design
- Preset and adjustable dome-loaded models

Features

- Compact, high-flow design
  - Less than half the size of conventional diaphragm pressure regulators
  - Flows up to 300 std L/min
- Innovative gas-actuated pressure-sensing assembly
  - Low supply-pressure effect ensures precise pressure control
  - Low droop eliminates the need for adjustment in many systems
  - Outlet tolerates maximum rated inlet pressure without damage
- Self-centering poppet
  - Minimizes outlet pressure creep
- Tamper-free design
  - Reduces potential of improper adjustment
  - Simplifies installation
- High-purity design
  - Tied poppet for clean operation and positive shutoff
  - All-welded design—no seals to atmosphere
  - 5 µin. R_a electropolished finish
  - 316L VIM-VAR stainless steel body
- Choice of end connection/mounting styles
  - 1/4 in. VCR® split-nut connections
  - 1/4 and 3/8 in. butt weld connections
  - IGC™ II surface-mount

Swagelok® HF series gas pressure regulators use a gas-actuated pressure-sensing assembly to precisely control outlet pressure. A slight decrease or increase in the outlet pressure causes the pressure-sensing assembly to expand or contract, respectively. The expansion or contraction of the pressure-sensing assembly moves the poppet to provide precise pressure control.

Models

Preset Pressure Regulators

Preset pressure models are factory-charged with an inert gas mix to deliver 10, 20, 30, 50, or 80 psig (0.68, 1.3, 2.0, 3.4, or 5.5 bar) outlet pressures.

Cylinder Model (HFS4A Model)

Inline Point-of-Use Model (HFS4B Model)

Compact Inline Point-of-Use Model (HFS3B Model)

Dome-Loaded Pressure Regulators

Dome-loaded regulators may be adjusted during operation using a pilot regulator or can be factory-charged to deliver 10, 20, 30, or 50 psig (0.68, 1.3, 2.0, or 3.4 bar) outlet pressures.

Point-of-Use Models (HFD3B and MSM-HFD3B Models)

HFD3B Model
VCR split-nut option

MSM-HFD3B Model
IGC II modular surface-mount

Regulator Calibration

Preset pressure regulators are calibrated with filtered nitrogen at 1 std L/min flow rate.

- For outlet pressures up to 85 psig (5.8 bar), the inlet pressure is calibrated at 100 psig (6.8 bar).
- For outlet pressures greater than 85 psig (5.8 bar), the inlet pressure is calibrated at 160 psig (11 bar).

Technical Data

Model Number	Pressure Rating psig (bar)		Temperature Rating °F (°C)		Supply-Pressure Effect (SPE)	Flow Coefficient (C_v)	Flow Capacity std L/min	Orifice Size in. (mm)	Internal Volume with 1/4 in. Butt Weld Ends in.^{3} (cm^3)	Preset Outlet Pressure psig (bar)
	Max Inlet (p_1)	Outlet (p_2) Range	Operating	Bakeout①						
Preset										
HFS4A	3000 (206)②	5 to 150 (0.35 to 10.3)	–10 to 150 (–23 to 65)	302 (150)	0.4	0.1	200	0.090 (2.3)	0.97 (15.9)	80 (5.5)
HFS4B					0.9	0.2	300	0.120 (3.0)		10 (0.68) 20 (1.3) 30 (2.0) 50 (3.4)
HFS3B	1000 (68.9)				1.3		200		0.40 (6.6)	
Adjustable Dome-Loaded										
HFD3B	1000 (68.9)	5 to 150 (0.35 to 10.3)	–10 to 150 (–23 to 65)	302 (150)	1.6	0.2	200	0.120 (3.0)	0.28 (4.7)	10 (0.68) 20 (1.3) 30 (2.0) 50 (3.4)
MSM-HFD3B									0.24 (3.9)	

① Contact your authorized Swagelok sales and service representative for more information.

② Operating ranges for 10 and 20 psig (0.68 and 1.3 bar) preset HFS4B models are limited to 1000 and 2000 psig (70 and 137 bar) inlet pressure, respectively, due to the calibration method specified on page 937. To increase the operating range, a special calibration is available.

Process Specifications

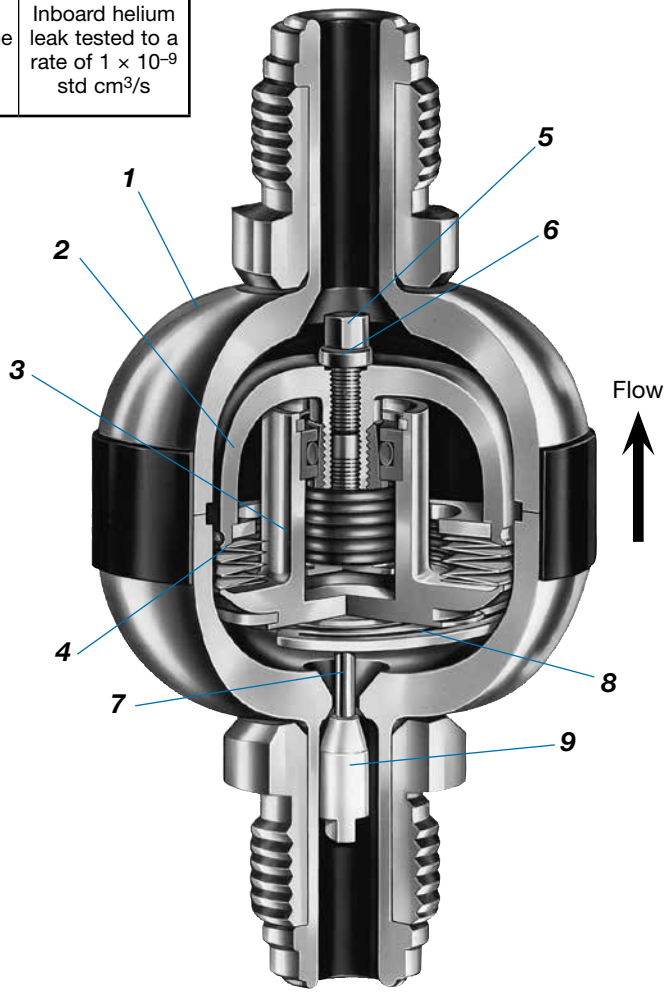
See Swagelok *Ultrahigh-Purity Process Specification (SC-01)* (MS-06-61), page 1180, for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R_a)	Testing
Ultrahigh-purity cleaning with a continuously monitored, deionized water, ultrasonic cleaning system	Performed in Class 100 work areas; regulators are individually bagged and vacuum sealed in cleanroom bags	5 µin. (0.13 µm) average, machine finished and electropolished	Inboard helium leak tested to a rate of 1 × 10^{-9} std cm^3/s

Materials of Construction

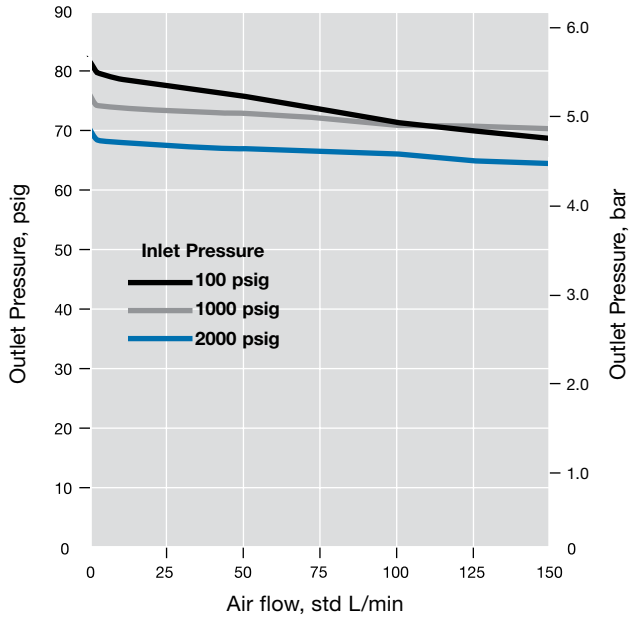
	Wetted Component	Material / Specification
1	*Body (inlet, outlet)*	*316L SS VIM-VAR / SEMI F20-0305 Ultrahigh-Purity①*
2	*Support housing*	
3	*Face plate*	
4	*Diaphragm*	*Alloy 625 / AMS 5879*
5	*Fill screw*	*316L SS / ASTM A479*
6	*Fill screw gasket*	*Nickel 200 / ASTM B160*
7	*Stem*	*316L SS / ASTM A479*
8	*Poppet-retaining wafer*	*Alloy X-750 / ASTM B637*
9	*Poppet*	*PCTFE / AMS 3650*
10	*Poppet port seal (not shown)*	*Nickel 200 / ASTM B160*

① 20 % minimum elongation allowed.

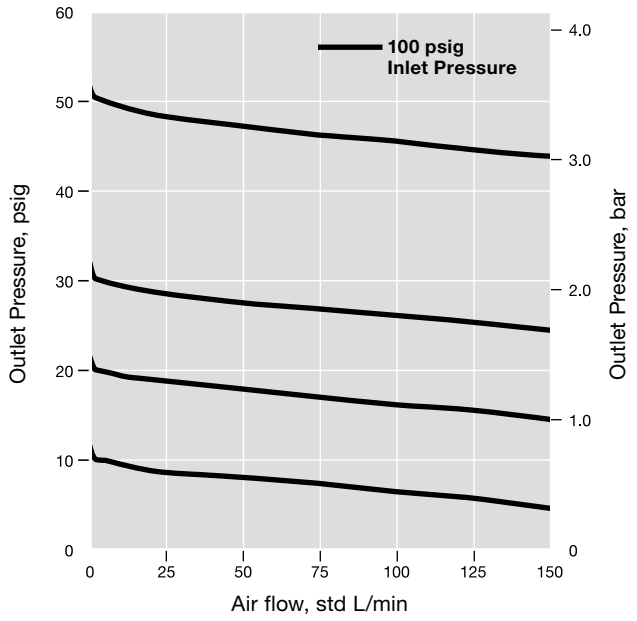


Flow Data

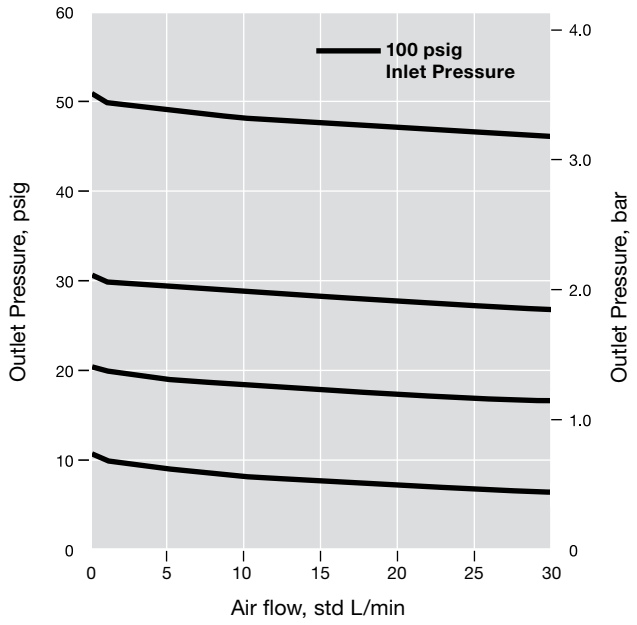
HFS4A Model



HFS4B Model



HFS3B, HFD3B, MSM-HFD3B Models



Calculating Outlet Pressures for Other Inlet Pressures

A change in inlet pressure will have an inverse effect on the outlet pressure. The adjusted outlet pressure is a function of the supply-pressure effect (SPE) and can be calculated by the equation:

$$p_4 = p_3 + ([p_1 - p_2]/100) \times \text{SPE}$$

where:

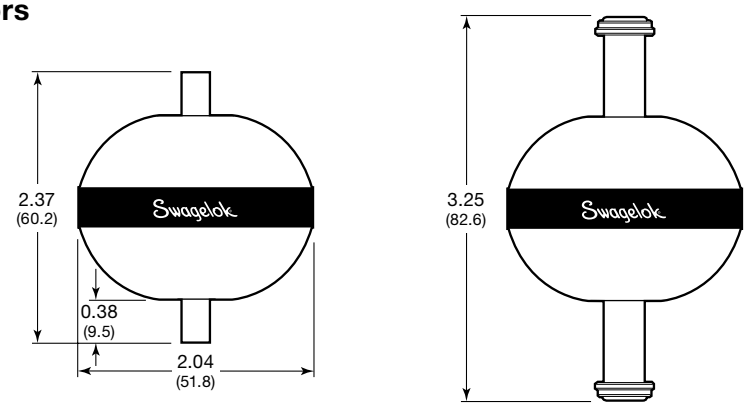
p_4 = adjusted outlet pressure
p_3 = initial outlet pressure
p_1 = initial inlet pressure
p_2 = new inlet pressure

Dimensions

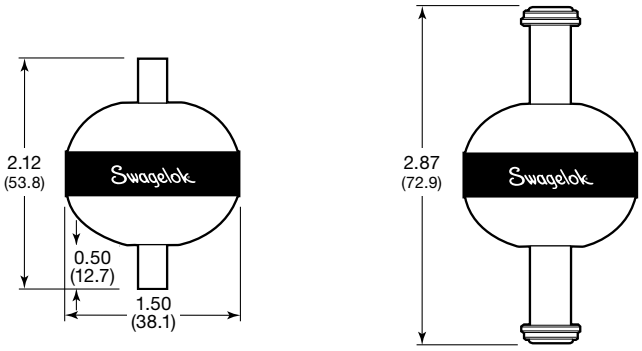
Dimensions, in inches (millimeters), are for reference only and are subject to change.

Preset Pressure Regulators

HFS4A and HFS4B Models

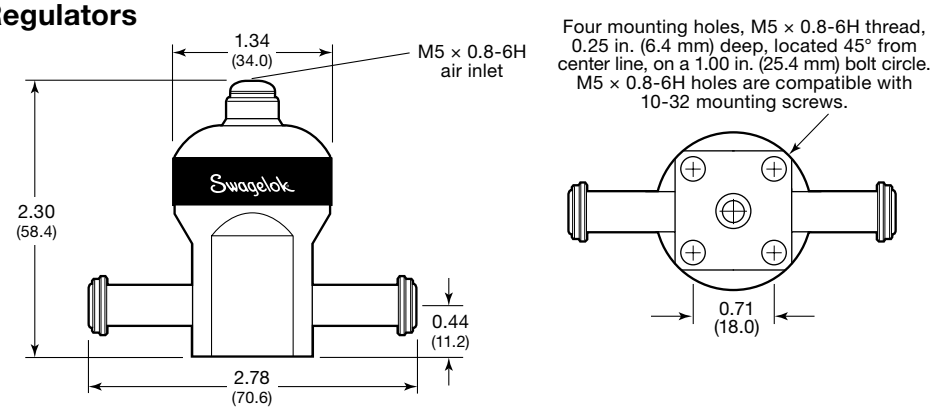


HFS3B Model

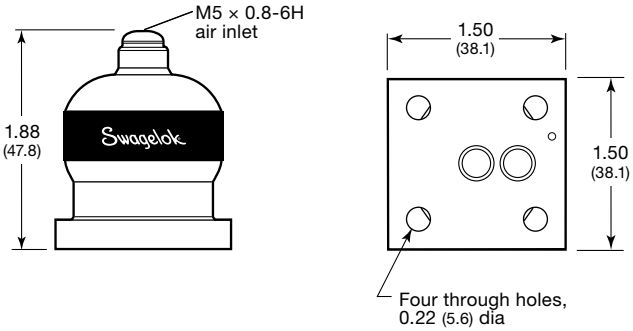


Dome-Loaded Pressure Regulators

HFD3B Model



MSM-HFD3B Surface-Mount Model



Ordering Information

Create a regulator ordering number by adding the designators as shown below.

SS – **HFS4A** __ – **HVCR4** – P **80**

Body Material
316L VIM-VAR stainless steel

Model
HFS4A = Preset cylinder
HFS4B = Preset inline point-of-use
HFS3B = Preset compact inline point-of-use
HFD3B = Dome-loaded, point-of-use
MSM-HFD3B = Dome-loaded, point-of-use surface-mount

Poppet Material
None = PCTFE
V = Polyimide

Preset Outlet Pressure
All models except HFS4A
10 = 10 psig (0.68 bar)
20 = 20 psig (1.3 bar)
30 = 30 psig (2.0 bar)
50 = 50 psig (3.4 bar)
HFS4A model only
80 = 80 psig (5.5 bar)

Process
Swagelok *Ultrahigh-Purity Process Specification (SC-01);* electropolished, R_a 5 µin. (0.13 µm) average

End Connections
HVCR4 = 1/4 in. high-flow VCR gland (all except HFD3B)①
VCR4 = 1/4 in. VCR gland (HFD3B only)①
BW4 = 1/4 in. tube butt weld
BW6 = 3/8 in. tube butt weld (HFS4 only)
None = C-seal surface-mount (MSM-HFD3B only)

① Swagelok VCR split-nut assemblies must be ordered separately. See below.

Swagelok VCR Split-Nut Assemblies

Swagelok VCR split-nut technology offers:

- Flexibility of inventory
- Shorter end-to-end dimensions
- Rotatable, nonwelded S17400 end connections.

When ordering a regulator with VCR end connections, VCR split-nut assemblies must be ordered separately. VCR split-nut assemblies are field assembled. To order, select the ordering number for the male or female assemblies.

Male split-nut assembly ordering number:
SS-4-VCR-4-SN

Female split-nut assembly ordering number:
SS-4-VCR-1-SN

Caution: Do not mix or interchange parts with those of other manufacturers.

About this document

Thank you for downloading this electronic catalog, which is part of General Product catalog Swagelok published in print. This type of electronic catalog is updated as new information arises or revisions, which may be more current than the printed version.

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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.