

# 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  $\mu$ in.  $R_a$  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 <sub>v</sub> )	Flow Capacity std L/min	Orifice Size in. (mm)	Internal Volume with 1/4 in. Butt Weld Ends in. <sup>3</sup> (cm <sup>3</sup> )	Preset Outlet Pressure psig (bar)
	Inlet (p <sub>1</sub> )	Outlet (p <sub>2</sub> ) Range	Operating	Bakeout <sup>①</sup>						
<b>Preset</b>										
HFS4A	Vacuum to 3000 (206) <sup>②</sup>	Vacuum to 150 (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		300			10 (0.68) 20 (1.3) 30 (2.0) 50 (3.4)
HFS3B	Vacuum to 1000 (68.9)				1.3	200	0.40 (6.6)			
<b>Adjustable Dome-Loaded</b>										
HFD3B	Vacuum to 1000 (68.9)	Vacuum to 150 (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 2. To increase the operating range, a special calibration is available.

## Process Specifications

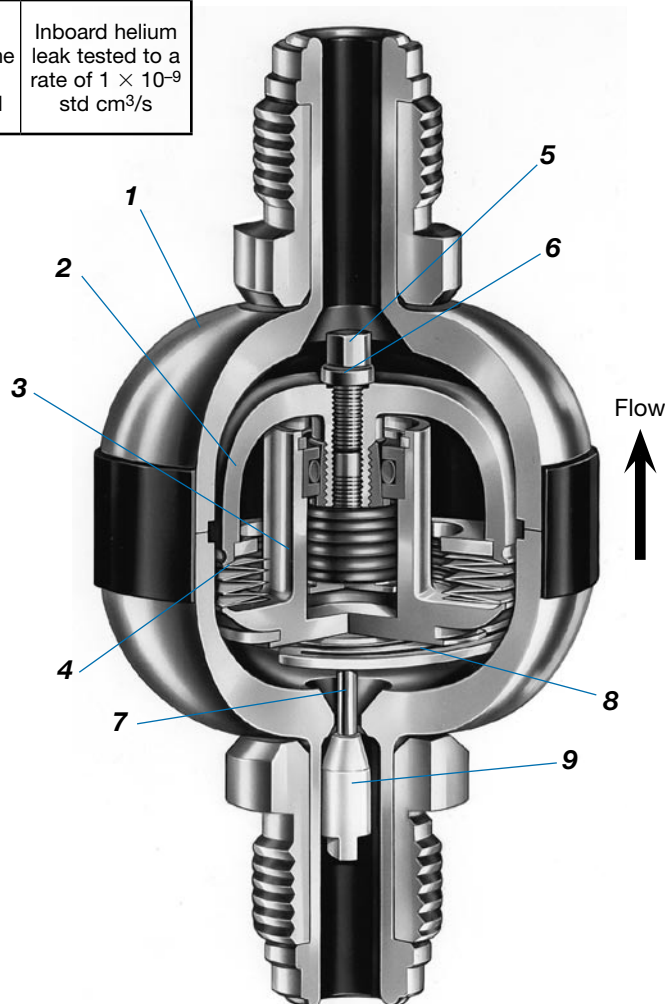
See Swagelok *Ultrahigh-Purity Process Specification (SC-01)*, MS-06-61, for details on processes, process controls, and process verification.

Cleaning	Assembly and Packaging	Wetted Surface Roughness (R <sub>a</sub> )	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 <sup>-9</sup> std cm <sup>3</sup> /s

## Materials of Construction

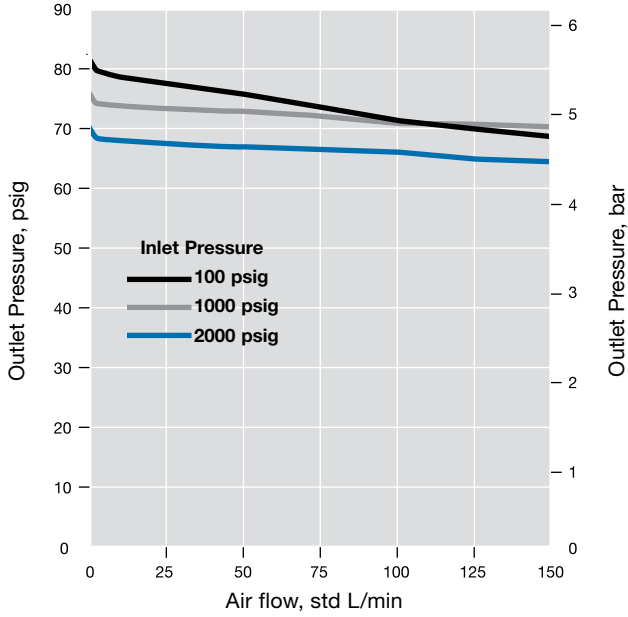
Wetted Component	Material / Specification
1 Body (inlet, outlet)	316L SS VIM-VAR / SEMI F20-0305 Ultrahigh-Purity <sup>①</sup>
2 Support housing	
3 Face plate	
4 Diaphragm	Alloy 625 / AMS 5879
5 Fill screw	316L SS / ASTM A479
6 Fill screw gasket	Nickel 200 / ASTM B160
7 Stem	316L SS / ASTM A479
8 Poppet-retaining 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.

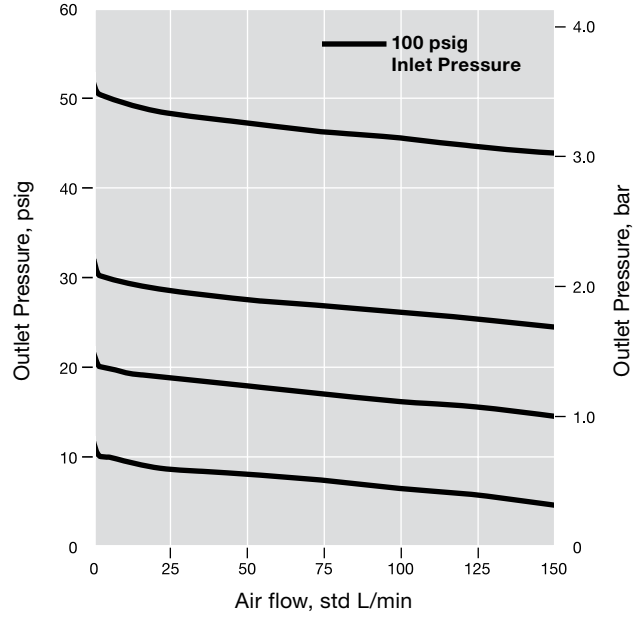


## Flow Data

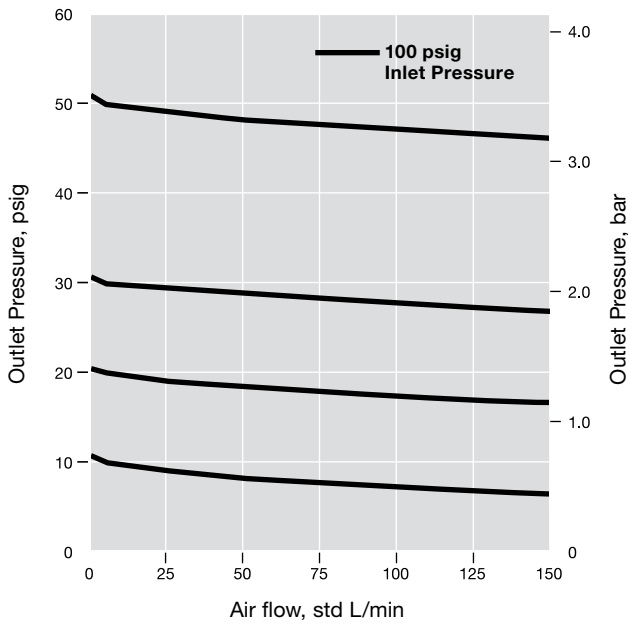
### HFS4A Model



### 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:

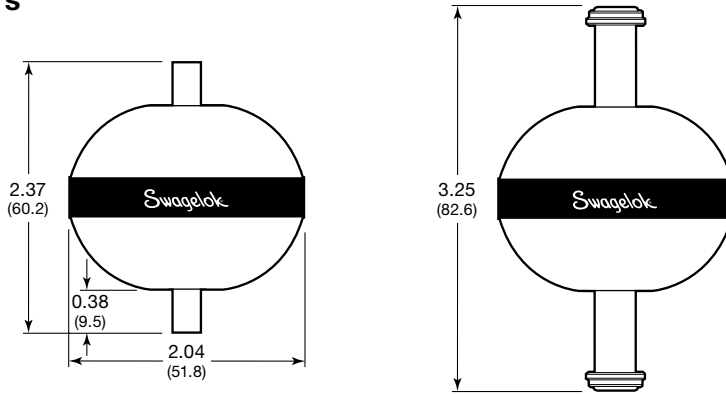
- $p_4$  = adjusted outlet pressure
- $p_3$  = initial outlet pressure
- $p_1$  = initial inlet pressure
- $p_2$  = new inlet pressure

## Dimensions

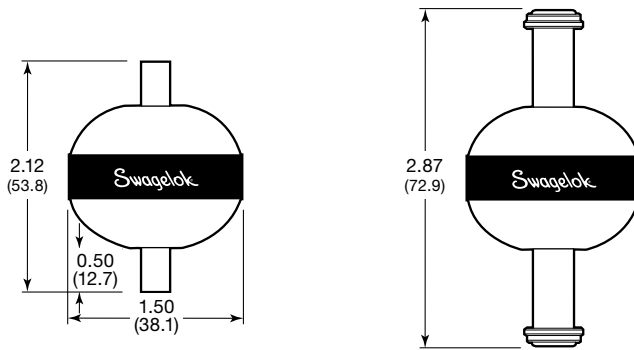
Dimensions, in inches (millimeters), are for reference only and are subject to change.

### Preset Pressure Regulators

#### HFS4A and HFS4B Models

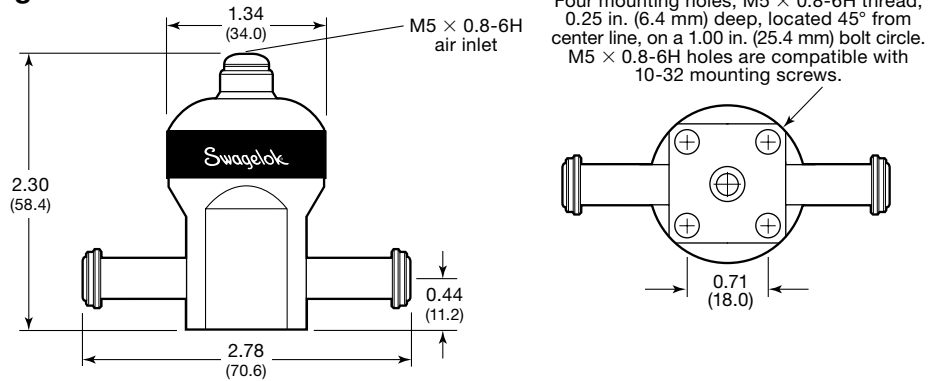


#### HFS3B Model

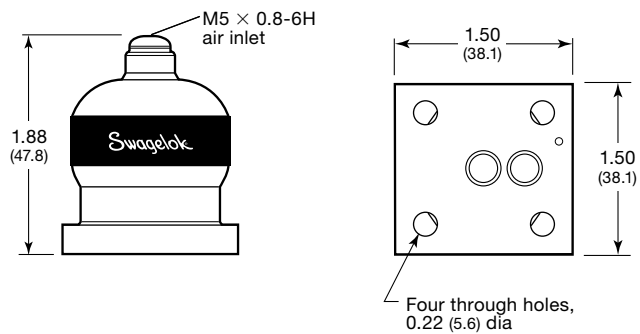


### Dome-Loaded Pressure Regulators

#### HFD3B Model

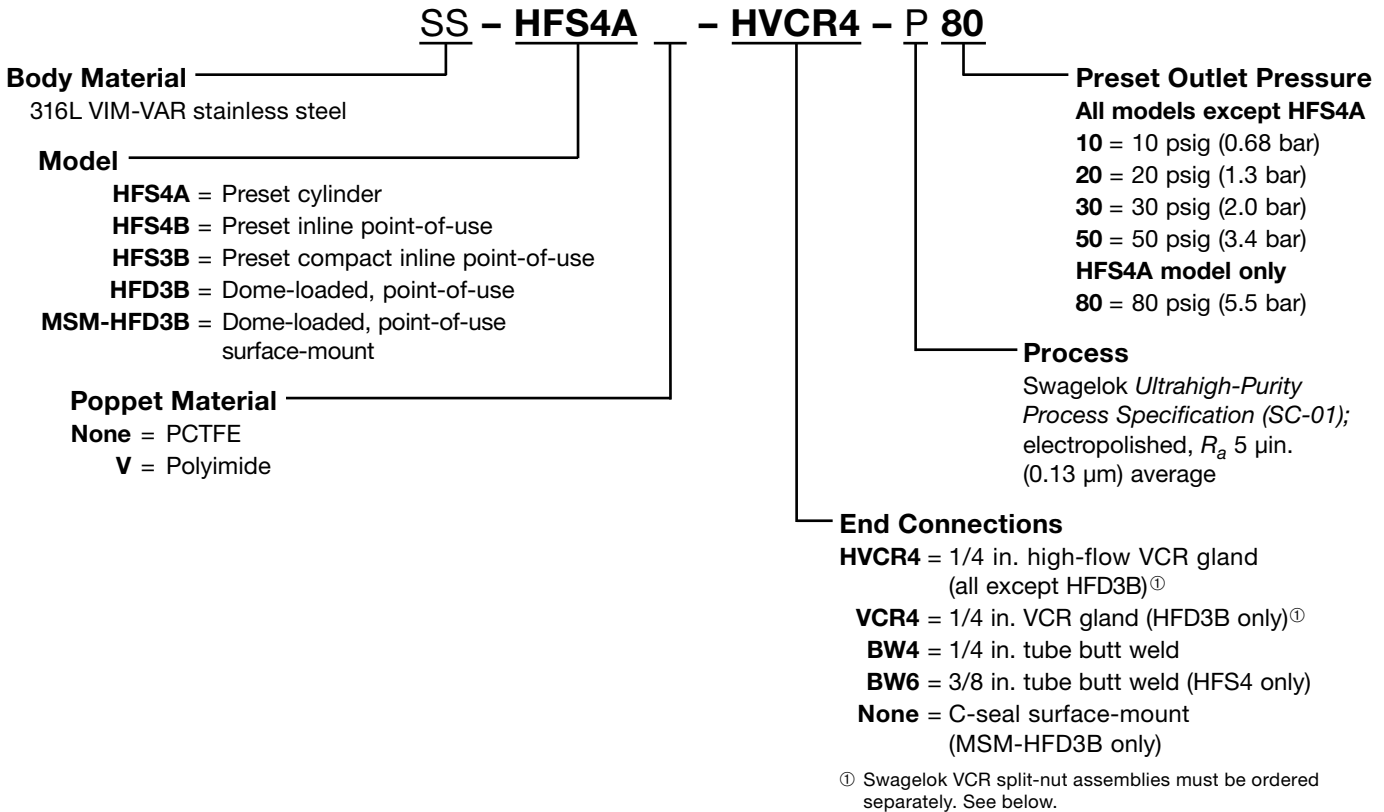


#### MSM-HFD3B Surface-Mount Model



## Ordering Information

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



## Swagelok VCR Split-Nut Assemblies

Swagelok VCR split-nut technology offers:

- Flexibility of inventory
- Shorter end-to-end dimensions
- Rotatable, nonwelded 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**



### 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.**

## 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.