Intrinsically Safe Pressure and Temperature Transducers

PTX Series

- One device measures both pressure and temperature in near-real time
- ANSI/ISA 76.00.02-compliant interface compatible with Swagelok® MPC series modular system or 1/4 in. and 6 mm Swagelok tube fitting end connections
- IP64 ingress protection
- ± 2 % full-scale pressure measurement accuracy; ± 9°F (± 5.0°C) absolute temperature measurement accuracy
- Low-volume flow path and rapid purge bowl design dramatically reduce delay time in sample systems
- Two analog outputs (0 to 5 V) for pressure and temperature

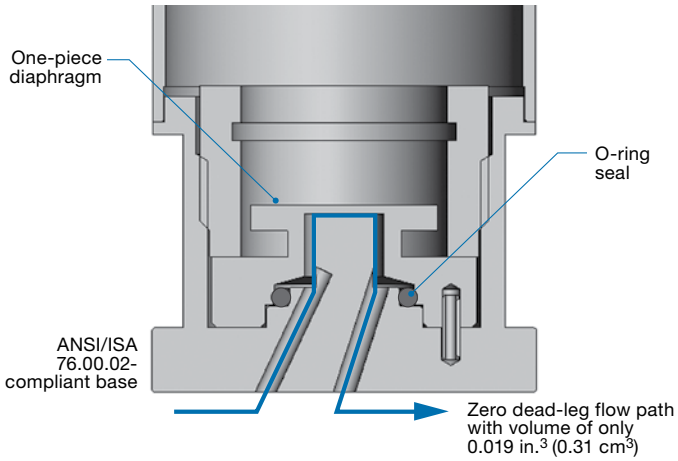
Swagelok

PTX Series Transducers

The intrinsically safe PTX series transducer provides two analog outputs to monitor fluid pressure and temperature in automated fluid systems. Each PTX communicates directly with the Swagelok intrinsically safe Intelligent Control Module™ (ICM™) product (patent pending) through one of the analog input connection ports on the unit. Each PTX can also interface with traditional automation equipment with suitable analog inputs such as Programmable Logic Controller (PLC), Distributed Control System (DCS), or Supervisory Control and Data Acquisition (SCADA) system.

Features

- MEMS pressure-sensing technology, fast response, excellent long-term stability.
- Network connectivity allows for one cable both to power the unit and to send pressure and temperature feedback in near real time.
- One-piece machined stainless steel diaphragm.
- Innovative flow path provides fast and complete purge
- UL® and ATEX certified for use in hazardous areas.

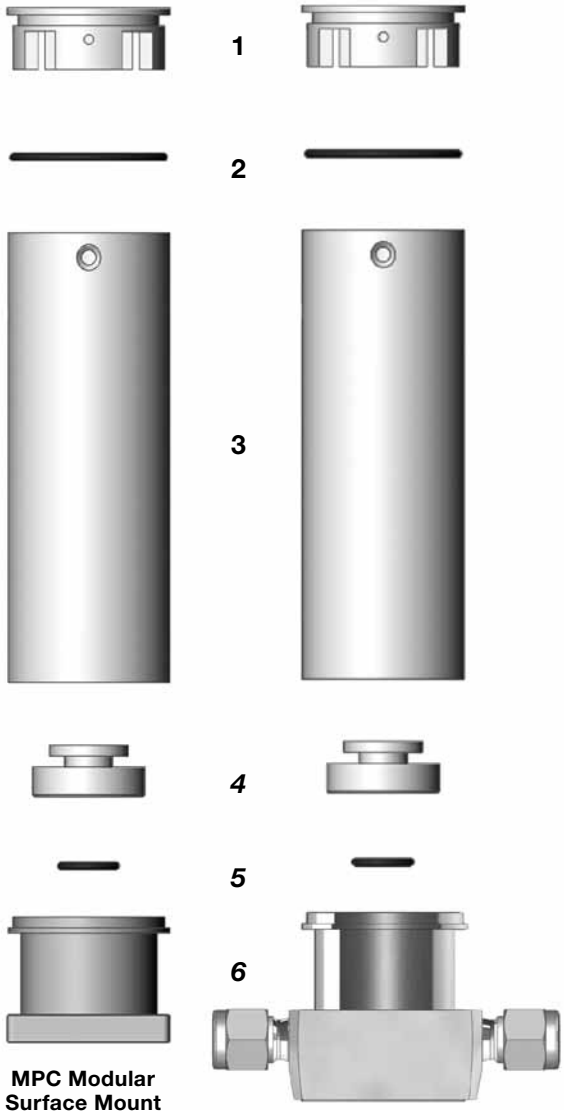


MPC Modular Surface Mount Configuration

MEMS Technology

The intrinsically safe PTX series transducer utilizes MEMS (micro-electro-mechanical systems) strain and temperature gauges that are diffused molecularly into the metal diaphragm using inorganic materials and high temperatures. As the temperature is reduced, the inorganic bonding material solidifies and secures the silicon gauges into position, thus creating a one-piece sensing element. With an operating strain at less than 15 % of the metal diaphragm's yield strength, the pressure-sensing element has less fatigue, higher proof/burst pressure capability, and excellent long-term stability. The MEMS gauge outputs are factory calibrated.

Materials of Construction



MPC Modular Surface Mount

Swagelok Tube Fitting End Connections

	Component	Material Grade/ ASTM Specification
1	Top cap	300 series SS
2	Housing O-ring	Fluorocarbon FKM
3	Housing	300 series SS
4	*Diaphragm with MEMS sensing element*	*316 SS/A479*
5	*Sensor O-ring*	*Kalrez® 6375*
6	*Body*	*316 SS/A479*

Wetted components listed in *italics*.

Technical Data

Accuracy (includes repeatability, hysteresis, and nonlinearity)

- Pressure: ± 2 % of full scale pressure, temperature compensated from 32 to 158°F (0 to 70°C), following setup in accordance with the Swagelok *Intrinsically Safe Pressure and Temperature Transducer, PTX, User's Manual, MS-13-229*
- Temperature: ± 9°F (± 5.0°C) absolute accuracy

Overrange Pressure

2 × full scale

Burst Pressure

5 × full scale

Operating Temperature

23 to 158°F (–5 to 70°C)

Storage Temperature

–40 to 158°F (–40 to 70°C)

Power

- Voltage input: 9.0 to 28 V (dc)
- Maximum current draw: 20 mA (dc) at 24 V (dc)

Approvals / Compliance

- ANSI/NFPA Class I, Division 1, Groups A, B, C, D, Temperature class T4
- UL
  - UL 913 - Edition 8
  - UL 60079-0 - Edition 6
  - UL 60079-11 - Edition 6
- cUL
  - CSA C22.2 NO. 157-92 - Edition 3
- ATEX Standards:
  - EN 60079-0:2012+A11:2013
  - EN 60079-11:2012
  - EN 60079-26:2007
- IEC:
  - IEC 60079-0 - Edition 6
  - IEC 60079-11 - Edition 6
  - IEC 60079-26 - Edition 2

Vibration / Shock Resistance

- Vibration: Sinusoidal Endurance IEC 60068-2-6:2007
  - 10 to 150 Hz, at 2.04 g
  - 10 sweeps at 0.5 Octave/min
- Shock: IEC 6068-2-27:1987
  - 50 g, 11 msec
  - 3 positive and 3 negative pulses each axis

Electromagnetic Compatibility

- EN 61326-1:2006
  - RF Emissions: EN 55011
  - ESD Immunity: EN 61000-4-2
  - RF Immunity: EN 61000-4-3
  - EFT Immunity: EN 61000-4-4
  - Conducted Immunity: EN 61000-4-6

Calibration

Every Swagelok intrinsically safe PTX series transducer is factory calibrated to ensure conformance to its stated accuracy. Recalibration is not needed because of the long-term stability of the MEMS sensors and high-precision components.

Ordering Information

Build a intrinsically safe PTX series transducer ordering number by adding the designators as shown below.

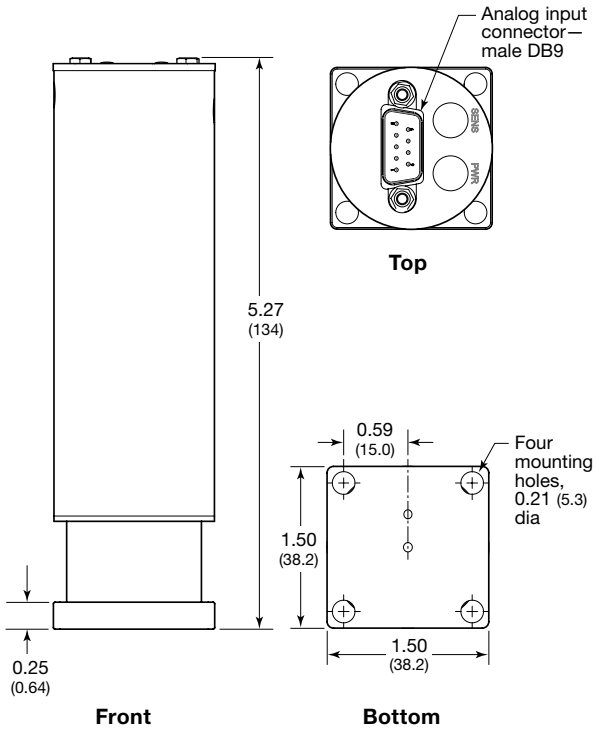
					A		B			
SS	-	PTX	-	A	-	**G050**	-	**S4**	-	K

A Full-Scale Range
G050 = 0 to 50 psig (3.4 bar)
G250 = 0 to 250 psig (17.2 bar)
G500 = 0 to 500 psig (34.4 bar)

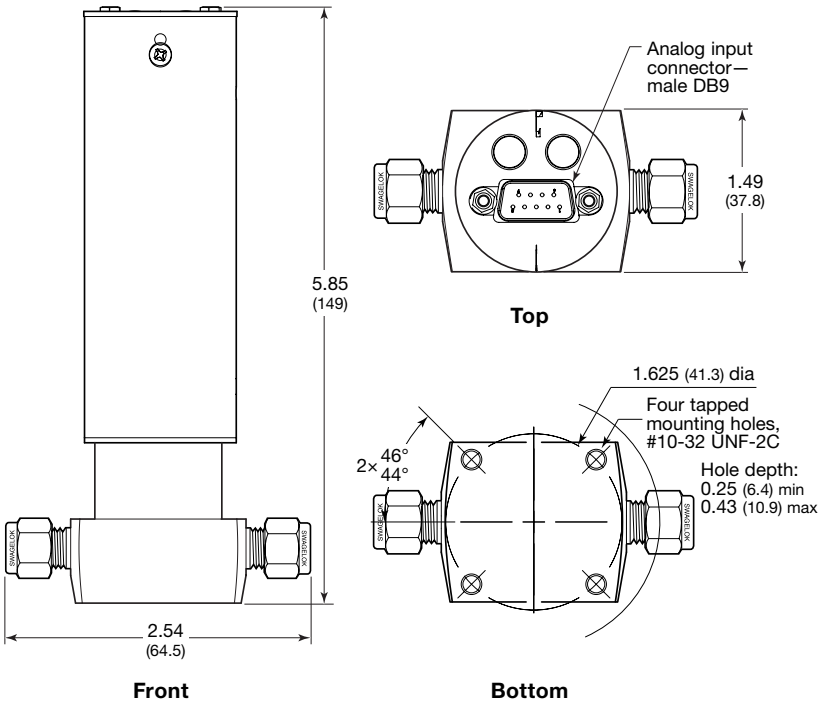
B End Connections
SM = 1.5 in. Swagelok MPC modular surface mount in accordance with ANSI/ISA 76.00.02
S4 = 1/4 in. Swagelok tube fittings
S6MM = 6 mm Swagelok tube fittings

Dimensions

Dimensions, in inches (millimeters) are for reference only and are subject to change.
Dimensions shown with Swagelok nuts finger-tight.



MPC Modular Surface Mount



Swagelok Tube Fitting End Connections

Additional Products

For the Swagelok Intelligent Control Module *(ICM)*, see the Swagelok *Intrinsically Safe Intelligent Control Module™ (ICM™) Product* catalog, MS-02-476.

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 or contact your authorized Swagelok representative.

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March 2015, R0
MS-02-475

Variable Area Flowmeters

G Series and M Series

- Glass and metal (armored) tube models, including miniature armored model
- Highly accurate measurement with individually calibrated scales based on flow tests
- Flexible and adaptable to specific system requirements
- High quality, durability, and repeatability
- 1/8 to 1 1/4 in. process end connections

Contents

Variable Area Flowmeters

Swagelok® variable area flowmeters measure the flow rate of liquids and gases by means of a tapered tube and float. The float is pushed up by increasing fluid flow and pulled down by gravity as fluid flow decreases, except for the spring-loaded M4H model. Variable area flowmeters do not require external power, but may be ordered with electrical or electronic options.

Most Swagelok models contain integral needle valves at the bottom (inlet) process connection; top mounting is available as an option.

Features

- Simple installation
- Easy to read
- No wearing parts
- Limit switches available
- 10-to-1 turndown ratio (the lowest measurement is one tenth of the full-scale reading).
- Meters are marked with the fluid media and unit of measure for which they are calibrated.

Calibration and Testing

Every Swagelok variable area flowmeter is factory calibrated to its media, flow range, and accuracy class using clean, dry air for air-flow range models and water for water-flow range models.

- G1, G2, G3, GM, and GP models are calibrated to 17.4 psia (1.2 bar) and 68°F (20°C).
- G4, M1, M2, M4, and M4H models are calibrated to 14.7 psia (1.013 bar) and and 68°F (20°C).

Meters can be calibrated to user-specific applications.

Cleaning and Packaging

All Swagelok variable area flowmeters are cleaned to remove dirt, debris, and burrs and are individually boxed. Oil- and grease-free cleaning are available on request.

Installation

Variable area flowmeters must be oriented vertically, except for the M4H model, which is mounted horizontally. For complete installation information, see the Swagelok *Variable Area Flowmeters Installation Instructions, G Series and M Series,* MS-CRD-0111, available *only* on your Swagelok website.

Choosing the Right Flowmeter

Variable Area Flowmeter Selection

Model	Process Temperature Rating °F (°C)	Ambient Temperature Rating °F (°C)	Maximum Inlet Pressure at 70°F (20°C) psig (bar)
G1	23 to 212 (–5 to 100)	–4 to 212 (–20 to 100)	145 (10.0)
G2	23 to 212 (–5 to 100)	–4 to 212 (–20 to 100)	145 (10.0)
G3	23 to 212 (–5 to 100)	–4 to 212 (–20 to 100)	145 (10.0)
G4	23 to 212 (–5 to 100)	–4 to 212 (–20 to 100)	145 (10.0)
GM	23 to 212 (–5 to 100)	–4 to 212 (–20 to 100)	58.0 (4.0)
GP	23 to 212 (–5 to 100)	–4 to 212 (–20 to 100)	58.0 (4.0)
M1	–4 to 302 (–20 to 150)	–4 to 158 (–20 to 70)	1885 (130)
M2	–4 to 302 (–20 to 150)	–4 to 158 (–20 to 70)	1885 (130)
M4 (1/2 in. dia tube)	–40 to 572 (–40 to 300)	–40 to 248 (–40 to 120)	2888 (199)
M4 (1 in. dia tube)	–40 to 572 (–40 to 300)	–40 to 248 (–40 to 120)	1393 (96.0)
M4H (1/2 in. dia tube)	–40 to 572 (–40 to 300)	–40 to 248 (–40 to 120)	2888 (199)
M4H (1 in. dia tube)	–40 to 572 (–40 to 300)	–40 to 248 (–40 to 120)	1393 (96.0)

Choosing the Right Flowmeter

Variable area flowmeters are fitted with measuring tubes made of glass or metal.

- Swagelok G series models contain glass measuring tubes, which allow direct viewing of the process fluid and direct reading of the flow.
- Swagelok M series models contain metal measuring tubes, which are used for difficult operating conditions where pressure, temperature, or both are factors. Because direct readings are not possible with metal tubes, these flowmeters are equipped with mechanical or electronic displays.

See the **Variable Area Flowmeter Selection** table below for a wide selection of flowmeters.

- Standard conditions (std ft^3/min and std ft^3/h air flow ranges) are defined as 14.7 psia (1.013 bar) at 59°F (15°C) in accordance with ISO 13443.
- Normal conditions (NL/min and NL/h air flow ranges) are defined as 14.7 psia (1.013 bar) at 32°F (0°C) in accordance with DIN 1343.

Fluids with properties different from those of air or water, as well as systems operating at higher pressures or temperatures, may require custom-calibrated flowmeters.

See **Custom Calibration**, page 22, for more information.

Variable Area Flowmeter Selection

Air Flow Ranges				Water Flow Ranges				Accuracy Class①	Process End Connections	Page
NL/min	NL/h	std ft^3/min	std ft^3/h	L/min	L/h	U.S. gal/min	U.S. gal/h			
0.011 to 0.11 through 2.0 to 20	0.5 to 5.0 through 120 to 1200	0.0004 to 0.004 through 0.07 to 0.7	0.018 to 0.18 through 4.5 to 45	0.004 to 0.04 through 0.27 to 2.7	0.25 to 2.5 through 16 to 160	0.001 to 0.01 through 0.07 to 0.7	0.065 to 0.65 through 4.2 to 42	4.0	1/4 in. NPT	5
0.011 to 0.11 through 8.4 to 84	0.5 to 5.0 through 500 to 5000	0.0004 to 0.004 through 0.3 to 3.0	0.018 to 0.18 through 18 to 180	0.004 to 0.04 through 0.28 to 2.8	0.25 to 2.5 through 16 to 160	0.001 to 0.01 through 0.07 to 0.7	0.065 to 0.65 through 4.2 to 42	2.5	1/4 in. NPT	6
0.027 to 0.27 through 1.3 to 13	1.6 to 16 through 80 to 800	0.001 to 0.01 through 0.05 to 0.5	0.06 to 0.6 through 3.0 to 30	0.008 to 0.08 through 0.17 to 1.7	0.5 to 5.0 through 10 to 100	0.002 to 0.02 through 0.045 to 0.45	0.13 to 1.3 through 2.5 to 25	2.5	1/4 in. NPT	7
0.027 to 0.27 through 5.0 to 50	1.6 to 16 through 300 to 3000	0.001 to 0.01 through 0.18 to 18	0.06 to 0.6 through 11 to 110	0.0007 to 0.007 through 0.17 to 1.7	0.04 to 0.4 through 10 to 100	0.00019 to 0.0019 through 0.045 to 0.45	0.01 to 0.1 through 2.5 to 25	1.0	1/4 in. NPT	8
0.011 to 0.11 through 1.3 to 13	0.5 to 5.0 through 80 to 800	0.0004 to 0.004 through 0.05 to 0.5	0.018 to 0.18 through 3.0 to 30	0.004 to 0.04 through 0.065 to 0.65	0.25 to 2.5 through 4.0 to 40	0.001 to 0.01 through 0.017 to 0.17	0.065 to 0.65 through 1.1 to 11	4.0	G 1/8 (ISO 228)	9
0.011 to 0.11 through 8.4 to 84	0.5 to 5.0 through 500 to 5000	0.0004 to 0.004 through 0.3 to 3.0	0.018 to 0.18 through 18 to 180	0.004 to 0.04 through 0.28 to 2.8	0.25 to 2.5 through 16 to 160	0.001 to 0.01 through 0.07 to 0.7	0.065 to 0.65 through 4.2 to 42	2.5	G 1/4 (ISO 228)	10
0.08 to 0.8 through 6.0 to 60	5.0 to 50 through 340 to 3400	0.003 to 0.03 through 0.2 to 2.0	0.18 to 1.8 through 13 to 130	0.005 to 0.05 through 0.17 to 1.7	0.3 to 3.0 through 10 to 100	0.0013 to 0.013 through 0.045 to 0.45	0.08 to 0.8 through 2.5 to 25	4.0	1/4 in. NPT	12
0.08 to 0.8 through 6.0 to 60	5.0 to 50 through 340 to 3400	0.003 to 0.03 through 0.2 to 2.0	0.18 to 1.8 through 13 to 130	0.005 to 0.05 through 0.17 to 1.7	0.3 to 3.0 through 10 to 100	0.0013 to 0.013 through 0.045 to 0.45	0.08 to 0.8 through 2.5 to 25	2.5	1/4 in. NPT	14
1.1 to 11 through 50 to 500	70 to 700 through 2800 to 28 000	0.04 to 0.4 through 1.6 to 16	2.5 to 25 through 100 to 1000	0.03 to 0.3 through 1.7 to 17	1.8 to 18 through 100 to 1000	0.008 to 0.08 through 0.45 to 4.5	0.48 to 4.8 through 25 to 250	1.6	1/2 and 3/4 in. NPT; 1/2, 3/4, and 1 in. ASME flange	16
25 to 250 through 300 to 3000	1400 to 14 000 through 18 000 to 180 000	1.0 to 10 through 10 to 1000	52 to 520 through 670 to 6700	0.8 to 8.0 through 10 to 100	48 to 480 through 630 to 6300	0.2 to 2.0 through 3.0 to 30	13 to 130 through 160 to 1600	1.6	3/4 and 1 in. NPT; 3/4 and 1 in. ASME flange	16
—	—	—	—	0.11 to 1.1 through 4.0 to 40	7.0 to 70 through 240 to 2400	0.03 to 0.3 through 1.07 to 10.7	2.0 to 20 through 64 to 640	1.6	3/4 in. NPT; 1/2, 3/4, and 1 in. ASME flange	18
—	—	—	—	2.0 to 20 through 17 to 170	130 to 1300 through 1000 to 10 000	0.6 to 6.0 through 4.5 to 45	35 to 350 through 270 to 2700	1.6	1 1/4 in. NPT; 1 in. ASME flange	18

① In accordance with VDI/VDE 3513 Sheet 2: 2008, accuracy class is effectively equivalent to permissible error above q_G = 50 %.

where:

G = Constant permissible error in percent of measured value above q_G

q_G = Flow limit value in percent of full scale

Above q_G, the permissible error is constant. Below q_G, the permissible error increases toward lower flow rates inversely proportional.

In sizing a flowmeter, q_G = 50 % allows for the greatest accuracy above 50 % of the full scale. For assistance with variable area flowmeter selection, contact your authorized Swagelok sales and service representative.

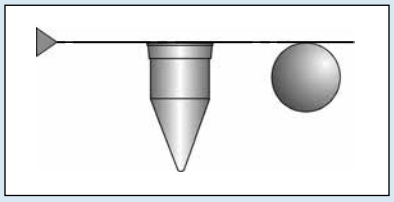
Fluid media, temperature, pressure, viscosity, and density also must be considered in selecting a variable area flowmeter. See **Custom Calibration,** page 22.

G Series (Glass Tube) Flowmeters—G1, G2, G3, G4, GM, and GP Models

Features

- Glass tube design
- Low maintenance
- Optional factory-installed limit switches
- Polycarbonate cover for protection
- Integral needle valve for fine metering, not intended for shutoff

Reading Glass-Tube Flowmeters



Glass-tube flowmeters are read by the position of the float or ball within the flowmeter tube. The flow rate is read at the top edge of the float or ball.

Materials of Construction

G1, G2, G3, and G4 Models

Component	Material / Specification
Flowmeter	
Head piece, foot piece	*316L stainless steel / EN 1.4404*
Float (G1, G2, G3)	*316 stainless steel / EN 1.4401*
Float (G4)	*316Ti stainless steel / EN 1.4571*
Measuring tube	*Borosilicate glass*
Float stops	*PFA with fluorocarbon (FKM) gaskets or PTFE with perfluorocarbon (FFKM) gaskets*
Head piece gasket, foot piece gasket	*Fluorocarbon (FKM), perfluorocarbon (FFKM), or EPDM*
Protective cover	Polycarbonate
Mounting rail	304 stainless steel / EN 1.4301
Needle Valve	
Needle	*316L stainless steel / EN 1.4404*
Gaskets	*PTFE*
O-rings	*Fluorocarbon (FKM), perfluorocarbon (FFKM), or EPDM*
Housing, spring	*316Ti stainless steel / EN 1.4571*
Spindle	316L stainless steel / EN 1.4404
Spindle lubricant	PTFE-based
Knob handle	Plastic
Knob handle insert	Brass
Knob handle set screw	A2 stainless steel

Wetted components listed in *italics*.

G1 Model

This G1 model is suitable for low flow rates in fine-metering applications such as gas chromatography.

Technical Data

See **Variable Area Flowmeter Selection**, page 2.

Ordering Information

Build a G1 model variable area flowmeter ordering number by combining the designators in the sequence shown below.

				4		5	6		7	
VAF	-	G1	-	**01M**	-	**1**	**1**	-	**A**	

4 Measured Flow Range

Air, NL/min

01L = 0.011 to 0.11
02L = 0.013 to 0.13
03L = 0.027 to 0.27
04L = 0.07 to 0.7
05L = 0.1 to 1.0
06L = 0.17 to 1.7
07L = 0.42 to 4.2
08L = 0.83 to 8.3
09L = 1.3 to 13
10L = 2.0 to 20

Air, NL/h

01M = 0.5 to 5.0
02M = 0.8 to 8.0
03M = 1.6 to 16
04M = 4.0 to 40
05M = 6.0 to 60
06M = 10 to 100
07M = 25 to 250
08M = 50 to 500
09M = 80 to 800
10M = 120 to 1200

Air, std ft³/min

01R = 0.0004 to 0.004
02R = 0.0005 to 0.005
03R = 0.001 to 0.01
04R = 0.002 to 0.02
05R = 0.0035 to 0.035
06R = 0.006 to 0.06
07R = 0.015 to 0.15
08R = 0.03 to 0.3
09R = 0.05 to 0.5
10R = 0.07 to 0.7

Air, std ft³/h

01S = 0.022 to 0.22
02S = 0.03 to 0.3
03S = 0.06 to 0.6
04S = 0.15 to 1.5
05S = 0.22 to 2.2
06S = 0.38 to 3.8
07S = 0.95 to 9.5
08S = 1.9 to 19
09S = 3.0 to 30
10S = 4.5 to 45

Water, L/min

A1L = 0.004 to 0.04
A2L = 0.008 to 0.08
A3L = 0.02 to 0.2
A4L = 0.04 to 0.4
A5L = 0.065 to 0.65
A6L = 0.1 to 1.0
A7L = 0.17 to 1.7
A8L = 0.2 to 2.0
A9L = 0.27 to 2.7

Water, L/h

A1M = 0.25 to 2.5
A2M = 0.50 to 5.0
A3M = 1.2 to 12
A4M = 2.5 to 25
A5M = 4.0 to 40
A6M = 6.0 to 60
A7M = 10 to 100
A8M = 12 to 120
A9M = 16 to 160

Water, U.S. gal/min

A1R = 0.001 to 0.01
A2R = 0.002 to 0.02
A3R = 0.005 to 0.05
A4R = 0.01 to 0.1
A5R = 0.017 to 0.17
A6R = 0.025 to 0.25
A7R = 0.045 to 0.45
A8R = 0.055 to 0.55
A9R = 0.07 to 0.7

Water, U.S. gal/h

A1S = 0.065 to 0.65
A2S = 0.13 to 1.3
A3S = 0.30 to 3.0
A4S = 0.65 to 6.5
A5S = 1.1 to 11
A6S = 1.6 to 16
A7S = 2.5 to 25
A8S = 3.0 to 30
A9S = 4.2 to 42

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas
LIQ = Liquid

5 Flowmeter Gasket, Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)
3 = EPDM

6 Limit Switches (See page 22.)

*The maximum process and ambient temperatures are reduced to 149°F (65°C) if limit switches are selected. Most G1 model flowmeters can accept up to two limit switches; models with measured water flow ranges **A8L, A9L, A8M, A9M, A8R, A9R, A8S,** and **A9S** cannot accept limit switches; also see footnote below.*

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = One switch
2 = Two switches①
3 = One switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
4 = Two switches and a two-channel isolated switch amplifier with relay output, 115 V (ac)①
5 = One switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
6 = Two switches and a two-channel isolated switch amplifier with relay output, 230 V (ac)①
A = One switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Two switches and a two-channel isolated switch amplifier with relay output, 24 V (dc)

① Not available with measured air flow ranges **10L, 10M, 10R,** and **10S,** or with measured water flow ranges **A7L, A7M, A7R,** and **A7S.**

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

A = Limit switch junction box
G = 5-point calibration record
H = Pressure test, certificate
J = Material certification
T = Wall mounting
W = Panel mounting
X = Oil- and grease-free cleaning (**required** for oxygen service)
Y = No needle valve
Z = Top-mounted needle valve

Dimensions

See page 20 for G1 model dimensions.

G2 Model

Commonly used in analytical instrumentation applications, the G2 model is appropriate for low to medium flow rates.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build a G2 model variable area flowmeter ordering number by combining the designators in the sequence shown below.

			4		5		6		7	
VAF	-	G2	-	**01M**	-	**1**	-	**1**	-	**A**

4 Measured Flow Range

Air, NL/min	*Air, NL/h*	*Water, L/min*	*Water, L/h*
01L = 0.011 to 0.11	**01M** = 0.5 to 5.0	**A1L** = 0.004 to 0.04	**A1M** = 0.25 to 2.5
02L = 0.013 to 0.13	**02M** = 0.8 to 8.0	**A2L** = 0.008 to 0.08	**A2M** = 0.50 to 5.0
03L = 0.027 to 0.27	**03M** = 1.6 to 16	**A3L** = 0.02 to 0.2	**A3M** = 1.2 to 12
04L = 0.07 to 0.7	**04M** = 4.0 to 40	**A4L** = 0.04 to 0.4	**A4M** = 2.5 to 25
05L = 0.1 to 1.0	**05M** = 6.0 to 60	**A5L** = 0.065 to 0.65	**A5M** = 4.0 to 40
06L = 0.17 to 1.7	**06M** = 10 to 100	**A6L** = 0.1 to 1.0	**A6M** = 6.0 to 60
07L = 0.42 to 4.2	**07M** = 25 to 250	**A7L** = 0.17 to 1.7	**A7M** = 10 to 100
08L = 0.83 to 8.3	**08M** = 50 to 500	**A8L** = 0.2 to 2.0	**A8M** = 12 to 120
09L = 1.3 to 13	**09M** = 80 to 800	**A9L** = 0.28 to 2.8	**A9M** = 16 to 160
10L = 1.7 to 17	**10M** = 100 to 1000		
11L = 3.0 to 30	**11M** = 180 to 1800	*Water, U.S. gal/min*	*Water, U.S. gal/h*
12L = 4.0 to 40	**12M** = 240 to 2400	**A1R** = 0.001 to 0.01	**A1S** = 0.065 to 0.65
13L = 5.0 to 50	**13M** = 300 to 3000	**A2R** = 0.002 to 0.02	**A2S** = 0.13 to 1.3
14L = 6.8 to 68	**14M** = 400 to 4000	**A3R** = 0.005 to 0.05	**A3S** = 0.30 to 3.0
15L = 8.4 to 84	**15M** = 500 to 5000	**A4R** = 0.01 to 0.1	**A4S** = 0.65 to 6.5
		A5R = 0.017 to 0.17	**A5S** = 1.1 to 11
Air, std ft³/min	*Air, std ft³/h*	**A6R** = 0.025 to 0.25	**A6S** = 1.6 to 16
01R = 0.0004 to 0.004	**01S** = 0.018 to 0.18	**A7R** = 0.045 to 0.45	**A7S** = 2.5 to 25
02R = 0.0005 to 0.005	**02S** = 0.03 to 0.3	**A8R** = 0.054 to 0.54	**A8S** = 3.0 to 30
03R = 0.001 to 0.01	**03S** = 0.06 to 0.6	**A9R** = 0.07 to 0.7	**A9S** = 4.2 to 42
04R = 0.002 to 0.02	**04S** = 0.15 to 1.5		
05R = 0.0035 to 0.035	**05S** = 0.22 to 2.2		
06R = 0.006 to 0.06	**06S** = 0.38 to 3.8		
07R = 0.015 to 0.15	**07S** = 0.95 to 9.5		
08R = 0.03 to 0.3	**08S** = 1.9 to 19		
09R = 0.05 to 0.5	**09S** = 3.0 to 30		
10R = 0.06 to 0.6	**10S** = 4.5 to 45		
11R = 0.1 to 1.0	**11S** = 6.5 to 65		
12R = 0.14 to 1.4	**12S** = 9.0 to 90		
13R = 0.18 to 1.8	**13S** = 11 to 110		
14R = 0.24 to 2.4	**14S** = 14 to 140		
15R = 0.3 to 3.0	**15S** = 18 to 180		

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

5 Flowmeter Gasket, Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)
3 = EPDM

Dimensions

See page 20 for G2 model dimensions.

6 Limit Switches (See page 22.)

The maximum process and ambient temperatures are reduced to 149°F (65°C) if limit switches are selected.

Most G2 model flowmeters can accept up to two limit switches; see footnote below.

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = One switch
2 = Two switches①
3 = One switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
4 = Two switches and a two-channel isolated switch amplifier with relay output, 115 V (ac)①
5 = One switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
6 = Two switches and a two-channel isolated switch amplifier with relay output, 230 V (ac)①
A = One switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Two switches and a two-channel isolated switch amplifier with relay output, 24 V (dc)

① Not available with measured air flow ranges **13L, 14L, 15L, 13S, 14S, 15S, 13M, 14M, 15M, 13R, 14R,** and **15R,** or with measured water flow ranges **A7L, A8L, A9L, A7M, A8M, A9M, A7R, A8R, A9R, A7S, A8S,** and **A9S.**

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

A = Limit switch junction box
G = 5-point calibration record
H = Pressure test, certificate
J = Material certification
T = Wall mounting
W = Panel mounting
X = Oil- and grease-free cleaning (**required** for oxygen service)
Y = No needle valve
Z = Top-mounted needle valve

G3 Model

The G3 model provides reliable, accurate measurement over the mid ranges of air or water flow.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build a G3 model variable area flowmeter ordering number by combining the designators in the sequence shown below.

				4		5	6		7	
VAF	-	G3	-	**01M**	-	**1**	-	**1**	-	**A**

4 Measured Flow Range

Air, NL/min	*Air, NL/h*
01L = 0.027 to 0.27	**01M** = 1.6 to 16
02L = 0.07 to 0.7	**02M** = 4.0 to 40
03L = 0.1 to 1.0	**03M** = 6.0 to 60
04L = 0.17 to 1.7	**04M** = 10 to 100
05L = 0.42 to 4.2	**05M** = 25 to 250
06L = 0.83 to 8.3	**06M** = 50 to 500
07L = 1.3 to 13	**07M** = 80 to 800
Air, std ft³/min	***Air, std ft³/h***
01R = 0.001 to 0.01	**01S** = 0.06 to 0.6
02R = 0.002 to 0.02	**02S** = 0.15 to 1.5
03R = 0.0035 to 0.035	**03S** = 0.21 to 2.1
04R = 0.006 to 0.06	**04S** = 0.38 to 3.8
05R = 0.015 to 0.15	**05S** = 0.95 to 9.5
06R = 0.03 to 0.3	**06S** = 1.9 to 19
07R = 0.05 to 0.5	**07S** = 3.0 to 30
Water, L/min	***Water, L/h***
A1L = 0.008 to 0.08	**A1M** = 0.5 to 5.0
A2L = 0.02 to 0.2	**A2M** = 1.2 to 12
A3L = 0.04 to 0.4	**A3M** = 2.5 to 25
A4L = 0.065 to 0.65	**A4M** = 4.0 to 40
A5L = 0.1 to 1.0	**A5M** = 6.0 to 60
A6L = 0.17 to 1.7	**A6M** = 10 to 100
Water, U.S. gal/min	***Water, U.S. gal/h***
A1R = 0.002 to 0.02	**A1S** = 0.13 to 1.3
A2R = 0.005 to 0.05	**A2S** = 0.25 to 2.5
A3R = 0.01 to 0.1	**A3S** = 0.65 to 6.5
A4R = 0.017 to 0.17	**A4S** = 1.1 to 11
A5R = 0.025 to 0.25	**A5S** = 1.6 to 16
A6R = 0.045 to 0.45	**A6S** = 2.5 to 25

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

5 Flowmeter Gasket, Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)
3 = EPDM

6 Limit Switches (See page 22.)

The maximum process and ambient temperatures are reduced to 149°F (65°C) if limit switches are selected. Most G3 model flowmeters can accept up to two limit switches; see footnote below.

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = One switch
2 = Two switches①
3 = One switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
4 = Two switches and a two-channel isolated switch amplifier with relay output, 115 V (ac)①
5 = One switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
6 = Two switches and a two-channel isolated switch amplifier with relay output, 230 V (ac)①
A = One switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Two switches and a two-channel isolated switch amplifier with relay output, 24 V (dc)

① Not available with measured flow ranges **A6L, A6M, A6R,** and **A6S.**

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

A = Limit switch junction box
G = 5-point calibration record
H = Pressure test, certificate
J = Material certification
T = Wall mounting
W = Panel mounting
X = Oil- and grease-free cleaning (**required** for oxygen service)
Y = No needle valve
Z = Top-mounted needle valve

Dimensions

See page 20 for G3 model dimensions.

G4 Model

Suitable for laboratory applications, the large-size G4 model is highly accurate over its full measured flow range.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build a G4 model variable area flowmeter ordering number by combining the designators in the sequence shown below.

			4		**5**	**6**	**7**			
VAF	-	G4	-	**05M**	**-**	**1**	**-**	**1**	**-**	**A**

4 Measured Flow Range

Air, NL/min

01L = 0.027 to 0.27
02L = 0.042 to 0.42
03L = 0.068 to 0.68
04L = 0.1 to 1.0
05L = 0.15 to 1.5
06L = 0.23 to 2.3
07L = 0.33 to 3.3
08L = 0.5 to 5.0
09L = 0.83 to 8.3
10L = 1.33 to 13.3
11L = 2.0 to 20
12L = 3.33 to 33.3
13L = 5.0 to 50

Air, NL/h

01M = 1.6 to 16
02M = 2.5 to 25
03M = 4.0 to 40
04M = 6.0 to 60
05M = 9.0 to 90
06M = 14 to 140
07M = 20 to 200
08M = 30 to 300
09M = 50 to 500
10M = 80 to 800
11M = 120 to 1200
12M = 200 to 2000
13M = 300 to 3000

Air, std ft³/min

01R = 0.001 to 0.01
02R = 0.0015 to 0.015
03R = 0.0023 to 0.023
04R = 0.0035 to 0.035
05R = 0.0051 to 0.051
06R = 0.0082 to 0.082
07R = 0.012 to 0.12
08R = 0.018 to 0.18
09R = 0.03 to 0.3
10R = 0.05 to 0.5
11R = 0.072 to 0.72
12R = 0.12 to 1.2
13R = 0.18 to 1.8

Air, std ft³/h

01S = 0.06 to 0.6
02S = 0.095 to 0.95
03S = 0.15 to 1.5
04S = 0.22 to 2.2
05S = 0.35 to 3.5
06S = 0.50 to 5.0
07S = 0.75 to 7.5
08S = 1.1 to 11
09S = 1.9 to 19
10S = 3.0 to 30
11S = 4.5 to 45
12S = 7.5 to 75
13S = 11 to 110

Water, L/min

A1L = 0.0007 to 0.007
A2L = 0.001 to 0.01
A3L = 0.0017 to 0.017
A4L = 0.0025 to 0.025
A5L = 0.004 to 0.04
A6L = 0.007 to 0.07
A7L = 0.01 to 0.1
A8L = 0.017 to 0.17
A9L = 0.025 to 0.25
B1L = 0.04 to 0.4
B2L = 0.065 to 0.65
B3L = 0.1 to 1.0
B4L = 0.17 to 1.7

Water, L/h

A1M = 0.04 to 0.4
A2M = 0.063 to 0.63
A3M = 0.1 to 1.0
A4M = 0.16 to 1.6
A5M = 0.25 to 2.5
A6M = 0.4 to 4.0
A7M = 0.6 to 6.0
A8M = 1.0 to 10
A9M = 1.6 to 16
B1M = 2.5 to 25
B2M = 4.0 to 40
B3M = 6.3 to 63
B4M = 10 to 100

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas
LIQ = Liquid

Water, U.S. gal/min

A1R = 0.00019 to 0.0019
A2R = 0.0003 to 0.003
A3R = 0.00045 to 0.0045
A4R = 0.0007 to 0.007
A5R = 0.001 to 0.01
A6R = 0.0019 to 0.019
A7R = 0.0025 to 0.025
A8R = 0.0045 to 0.045
A9R = 0.007 to 0.07
B1R = 0.01 to 0.1
B2R = 0.017 to 0.17
B3R = 0.03 to 0.3
B4R = 0.045 to 0.45

Water, U.S. gal/h

A1S = 0.01 to 0.1
A2S = 0.016 to 0.16
A3S = 0.025 to 0.25
A4S = 0.04 to 0.4
A5S = 0.065 to 0.65
A6S = 0.1 to 1.0
A7S = 0.16 to 1.6
A8S = 0.25 to 2.5
A9S = 0.4 to 4.0
B1S = 0.65 to 6.5
B2S = 1.0 to 10
B3S = 1.6 to 16
B4S = 2.5 to 25

5 Flowmeter Gasket, Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)
3 = EPDM

Dimensions

See page 20 for G4 model dimensions.

6 Limit Switches (See page 22.)

The maximum process and ambient temperatures are reduced to 149°F (65°C) if limit switches are selected.

*Most G4 model flowmeters can accept up to two limit switches; models with measured air flow ranges **01L, 02L, 03L, 11L, 12L, 13L, 01M, 02M, 03M, 11M, 12M, 13M, 01R, 02R, 03R, 11R, 12R, 13R, 01S, 02S, 03S, 11S, 12S,** and **13S,** or with measured water flow ranges **A1L, A2L, A3L, B2L, B3L, B4L, A1M, A2M, A3M, B2M, B3M, B4M, A1R, A2R, A3R, B2R, B3R, B4R, A1S, A2S, A3S, B2S, B3S,** and **B4S** cannot accept limit switches.*

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = One switch
2 = Two switches
3 = One switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
4 = Two switches and a two-channel isolated switch amplifier with relay output, 115 V (ac)
5 = One switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
6 = Two switches and a two-channel isolated switch amplifier with relay output, 230 V (ac)
A = One switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Two switches and a two-channel isolated switch amplifier with relay output, 24 V (dc)

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

A = Limit switch junction box
G = 5-point calibration record
H = Pressure test, certificate
J = Material certification
W = Panel mounting
X = Oil- and grease-free cleaning (**required** for oxygen service)
Y = No needle valve
Z = Top-mounted needle valve

GM Model

This miniature glass-tube model has a plastic head and foot piece and can be panel mounted easily.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Materials of Construction

Component	Material / Specification
Flowmeter	
Head piece, foot piece	*PVDF*
Float	*316 stainless steel / EN 1.4401*
Measuring tube	*Borosilicate glass*
Float stops	*PFA with fluorocarbon (FKM) gaskets or PTFE with perfluorocarbon (FFKM) gaskets*
Head piece gasket, foot piece gasket	*Fluorocarbon (FKM)*
Protective cover	Polycarbonate
Mounting rail	Aluminum 6060
Needle Valve	
Needle	*316L stainless steel / EN 1.4404*
Gaskets	*PTFE*
O-rings	*Fluorocarbon (FKM)*
Housing, spring	*316Ti stainless steel / EN 1.4571*
Spindle	316L stainless steel / EN 1.4404
Spindle lubricant	PTFE-based
Knob handle	Aluminum 6060
Knob handle insert	Brass
Knob handle set screw	A2 stainless steel

Wetted components listed in *italics*.

Ordering Information

Build a GM model variable area flowmeter ordering number by combining the designators in the sequence shown below.

VAF - GM - **4** **01M** - **5** **Z**

4 **Measured Flow Range**

Air, NL/min

01L = 0.011 to 0.11
02L = 0.013 to 0.13
03L = 0.027 to 0.27
04L = 0.07 to 0.7
05L = 0.1 to 1.0
06L = 0.17 to 1.7
07L = 0.42 to 4.2
08L = 0.83 to 8.3
09L = 1.3 to 13

Air, NL/h

01M = 0.5 to 5.0
02M = 0.8 to 8.0
03M = 1.6 to 16
04M = 4.0 to 40
05M = 6.0 to 60
06M = 10 to 100
07M = 25 to 250
08M = 50 to 500
09M = 80 to 800

Air, std ft^3/min

01R = 0.0004 to 0.004
02R = 0.0005 to 0.005
03R = 0.001 to 0.01
04R = 0.002 to 0.02
05R = 0.0035 to 0.035
06R = 0.006 to 0.06
07R = 0.015 to 0.15
08R = 0.03 to 0.3
09R = 0.05 to 0.5

Air, std ft^3/h

01S = 0.018 to 0.18
02S = 0.03 to 0.3
03S = 0.06 to 0.6
04S = 0.15 to 1.5
05S = 0.22 to 2.2
06S = 0.38 to 3.8
07S = 0.95 to 9.5
08S = 1.9 to 19
09S = 3.0 to 30

Water, L/min

A1L = 0.004 to 0.04
A2L = 0.008 to 0.08
A3L = 0.02 to 0.2
A4L = 0.04 to 0.4
A5L = 0.065 to 0.65

Water, L/h

A1M = 0.25 to 2.5
A2M = 0.50 to 5.0
A3M = 1.2 to 12
A4M = 2.5 to 25
A5M = 4.0 to 40

Water, U.S. gal/min

A1R = 0.001 to 0.01
A2R = 0.002 to 0.02
A3R = 0.005 to 0.05
A4R = 0.01 to 0.1
A5R = 0.017 to 0.17

Water, U.S. gal/h

A1S = 0.065 to 0.65
A2S = 0.13 to 1.3
A3S = 0.30 to 3.0
A4S = 0.65 to 6.5
A5S = 1.1 to 11

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

5 **Options** (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

W = Panel mounting
Z = Top-mounted needle valve

Dimensions

See page 20 for GM model dimensions.

GP Model

The GP model offers a plastic head and foot piece, including end connections.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build a GP model variable area flowmeter ordering number by combining the designators in the sequence shown below.

4	5	6	7

VAF - GP - **01M** - **1** - **1** - **A**

4 Measured Flow Range

Air, NL/min	*Air, NL/h*
01L = 0.011 to 0.11	**01M** = 0.5 to 5.0
02L = 0.013 to 0.13	**02M** = 0.8 to 8.0
03L = 0.027 to 0.27	**03M** = 1.6 to 16
04L = 0.07 to 0.7	**04M** = 4.0 to 40
05L = 0.1 to 1.0	**05M** = 6.0 to 60
06L = 0.17 to 1.7	**06M** = 10 to 100
07L = 0.42 to 4.2	**07M** = 25 to 250
08L = 0.83 to 8.3	**08M** = 50 to 500
09L = 1.3 to 13	**09M** = 80 to 800
10L = 1.7 to 17	**10M** = 100 to 1000
11L = 3.0 to 30	**11M** = 180 to 1800
12L = 4.0 to 40	**12M** = 240 to 2400
13L = 5 to 50	**13M** = 300 to 3000
14L = 6.8 to 68	**14M** = 400 to 4000
15L = 8.4 to 84	**15M** = 500 to 5000
Air, std ft³/min	***Air, std ft³/h***
01R = 0.0004 to 0.004	**01S** = 0.018 to 0.18
02R = 0.0005 to 0.005	**02S** = 0.03 to 0.3
03R = 0.001 to 0.01	**03S** = 0.06 to 0.6
04R = 0.002 to 0.02	**04S** = 0.15 to 1.5
05R = 0.0035 to 0.035	**05S** = 0.22 to 2.2
06R = 0.006 to 0.06	**06S** = 0.38 to 3.8
07R = 0.015 to 0.15	**07S** = 0.95 to 9.5
08R = 0.03 to 0.3	**08S** = 1.9 to 19
09R = 0.05 to 0.5	**09S** = 3.0 to 30
10R = 0.06 to 0.6	**10S** = 4.5 to 45
11R = 0.1 to 1.0	**11S** = 6.5 to 65
12R = 0.14 to 1.4	**12S** = 9.0 to 90
13R = 0.18 to 1.8	**13S** = 11 to 110
14R = 0.24 to 2.4	**14S** = 14 to 140
15R = 0.3 to 3.0	**15S** = 18 to 180

Water, L/min	*Water, L/h*
A1L = 0.004 to 0.04	**A1M** = 0.25 to 2.5
A2L = 0.008 to 0.08	**A2M** = 0.50 to 5.0
A3L = 0.02 to 0.2	**A3M** = 1.2 to 12
A4L = 0.04 to 0.4	**A4M** = 2.5 to 25
A5L = 0.065 to 0.65	**A5M** = 4.0 to 40
A6L = 0.1 to 1.0	**A6M** = 6.0 to 60
A7L = 0.17 to 1.7	**A7M** = 10 to 100
A8L = 0.2 to 2.0	**A8M** = 12 to 120
A9L = 0.28 to 2.8	**A9M** = 16 to 160
Water, U.S. gal/min	***Water, U.S. gal/h***
A1R = 0.001 to 0.01	**A1S** = 0.065 to 0.65
A2R = 0.002 to 0.02	**A2S** = 0.13 to 1.3
A3R = 0.005 to 0.05	**A3S** = 0.30 to 3.0
A4R = 0.01 to 0.1	**A4S** = 0.65 to 6.5
A5R = 0.017 to 0.17	**A5S** = 1.1 to 11
A6R = 0.025 to 0.25	**A6S** = 1.6 to 16
A7R = 0.045 to 0.45	**A7S** = 2.5 to 25
A8R = 0.054 to 0.54	**A8S** = 3.0 to 30
A9R = 0.07 to 0.7	**A9S** = 4.2 to 42

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

5 Flowmeter Gasket, Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)
3 = EPDM

Dimensions

See page 20 for GP model dimensions.

6 Limit Switches (See page 22.)

The maximum process and ambient temperatures are reduced to 149°F (65°C) if limit switches are selected.

Most GP model flowmeters can accept up to two limit switches; see footnote below.

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = One switch
2 = Two switches①
3 = One switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
4 = Two switches and a two-channel isolated switch amplifier with relay output, 115 V (ac)①
5 = One switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
6 = Two switches and a two-channel isolated switch amplifier with relay output, 230 V (ac)①
A = One switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Two switches and a two-channel isolated switch amplifier with relay output, 24 V (dc)

① Not available with measured air flow ranges **13L, 14L, 15L, 13M, 14M, 15M, 13R, 14R, 15R, 13S, 14S,** and **15S** or with measured° water flow ranges **A7L, A8L, A9L, A7M, A8M, A9M, A7R, A8R, A9R, A7S, A8S,** and **A9S.**

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

A = Limit switch junction box
G = 5-point calibration record
H = Pressure test, certificate
T = Wall mounting
W = Panel mounting
X = Oil- and grease-free cleaning (**required** for oxygen service)
Y = No needle valve
Z = Top-mounted needle valve

GP Model

Materials of Construction

Component	Material / Specification
Flowmeter	
Head piece, foot piece	*PVDF*
Float	*316 stainless steel / EN 1.4401*
Measuring tube	*Borosilicate glass*
Float stops	*PFA with fluorocarbon (FKM) gaskets, PTFE with perfluorocarbon (FFKM) gaskets, or EPDM*
Head piece gasket, foot piece gasket	*Fluorocarbon (FKM) or Perfluorocarbon (FFKM)*
Protective cover	Polycarbonate
Mounting rail	304 stainless steel / EN 1.4301
Needle Valve	
Needle	*316L stainless steel / EN 1.4404*
Gaskets	*PTFE*
O-rings	*Fluorocarbon (FKM), perfluorocarbon (FFKM), or EPDM*
Housing, spring	*316Ti stainless steel / EN 1.4571*
Spindle	316L stainless steel / EN 1.4404
Spindle lubricant	PTFE-based
Knob handle	Plastic
Knob handle insert	Brass
Knob handle set screw	A2 stainless steel

Wetted components listed in *italics*.

M Series (Metal Tube) Flowmeters—M1, M2, M4, and M4H Models

Features

- Armored design for extreme operating conditions
- Measurement in multiple flow directions
- Ideal for industrial sector applications
- Metal measuring tube for increased durability
- Horizontal mounting (M4H model) available

Materials of Construction

M1 and M2 Models

Component	Material / Specification
Flowmeter	
Head piece, foot piece, float, measuring tube, upper plug	*316L stainless steel / EN 1.4404 / Alloy C-276 / Alloy K-500*
Upper float stop (spring)	*316Ti stainless steel / EN 1.4571*
Plug gasket, lower float stop	*PTFE*
Indicator housing	Painted aluminum
Needle Valve	
Needle	*316L stainless steel / EN 1.4404*
Gaskets	*PTFE*
O-rings	*Fluorocarbon (FKM) or Perfluorocarbon (FFKM)*
Housing, spring	*316Ti stainless steel / EN 1.4571*
Spindle	316L stainless steel / EN 1.4404
Spindle lubricant	PTFE-based
Knob handle	Plastic
Knob handle insert	Brass
Knob handle set screw	A2 stainless steel

Wetted components listed in *italics*.

M4 and M4H Models

Component	Material / Specification
Measuring tube, float, float stops, receiver, guide	*316L stainless steel / EN 1.4404 / Alloy C-276 / Alloy K-500*
Flange or NPT end connections	*316L stainless steel / EN 1.4404 / Alloy C-276 / Alloy K-500*
Indicator housing	Painted aluminum

Wetted components listed in *italics*.

M1 Model

The miniature M1 model is compact, yet offers protection against harsh environments and higher pressures with an armored measuring tube.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build an M1 model variable area flowmeter ordering number by combining the designators in the sequence shown below.

				4		5	6		7	
VAF	-	M1	-	**01M**	-	**1**	**1**	-	**F**	

4 Measured Flow Range

Air, NL/min

01L = 0.08 to 0.8
02L = 0.17 to 1.7
03L = 0.25 to 2.5
04L = 0.67 to 6.7
05L = 1.3 to 13
06L = 2.0 to 20
07L = 3.33 to 33.3
08L = 4.2 to 42
09L = 6.0 to 60

Air, NL/h

01M = 5.0 to 50
02M = 10 to 100
03M = 15 to 150
04M = 40 to 400
05M = 80 to 800
06M = 125 to 1250
07M = 200 to 2000
08M = 250 to 2500
09M = 340 to 3400

Air, std ft³/min

01R = 0.003 to 0.03
02R = 0.006 to 0.06
03R = 0.01 to 0.1
04R = 0.025 to 0.25
05R = 0.05 to 0.5
06R = 0.075 to 0.75
07R = 0.12 to 1.2
08R = 0.15 to 1.5
09R = 0.2 to 2.0

Air, std ft³/h

01S = 0.18 to 1.8
02S = 0.37 to 3.7
03S = 0.55 to 5.5
04S = 1.5 to 15
05S = 3.0 to 30
06S = 4.5 to 45
07S = 7.5 to 75
08S = 9.5 to 95
09S = 13 to 130

Water, L/min

A1L = 0.005 to 0.05
A2L = 0.008 to 0.08
A3L = 0.018 to 0.18
A4L = 0.04 to 0.4
A5L = 0.07 to 0.7
A6L = 0.1 to 1.0
A7L = 0.13 to 1.3
A8L = 0.17 to 1.7

Water, L/h

A1M = 0.3 to 3.0
A2M = 0.5 to 5.0
A3M = 1.0 to 10
A4M = 2.5 to 25
A5M = 4.0 to 40
A6M = 6.0 to 60
A7M = 8.0 to 80
A8M = 10 to 100

Water, U.S. gal/min

A1R = 0.0013 to 0.013
A2R = 0.0022 to 0.022
A3R = 0.0045 to 0.045
A4R = 0.01 to 0.1
A5R = 0.018 to 0.18
A6R = 0.025 to 0.25
A7R = 0.035 to 0.35
A8R = 0.045 to 0.45

Water, U.S. gal/h

A1S = 0.08 to 0.8
A2S = 0.13 to 1.3
A3S = 0.25 to 2.5
A4S = 0.65 to 6.5
A5S = 1.1 to 11
A6S = 1.6 to 16
A7S = 2.0 to 20
A8S = 2.5 to 25

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas
LIQ = Liquid

5 Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)

M1 Model

Electrical Connections

- Up to two limit switches; junction box included

Temperature Ranges With Limit Switches

- As ambient temperature increases, the process temperature maximum is reduced.

Process °F (°C)	Ambient °F (°C)
293 (145)	104 (40)
275 (135)	122 (50)
257 (125)	140 (60)

6 Limit Switches with Junction Box (See page 22.)

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

- **0** = None
- **1** = Minimum switch
- **2** = Maximum switch
- **3** = Minimum and maximum switch
- **4** = Minimum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
- **5** = Maximum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
- **6** = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 115 V (ac)
- **7** = Minimum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
- **8** = Maximum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
- **9** = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 230 V (ac)
- **A** = Minimum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
- **B** = Maximum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
- **C** = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 24 V (dc)

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

- **B** = FM Approval certificate
- **F** = Certificate of compliance
- **G** = 5-point calibration record
- **H** = Pressure test, certificate
- **I** = Silconert Coating
- **J** = Material certification
- **X** = Oil- and grease-free cleaning (**required** for oxygen service)
- **Y** = No needle valve
- **Z** = Top-mounted needle valve

Note: For non stainless steel Alloys add the prefix HC and M.

Non Stainless Steel Options

M = Alloy K-500 **HC** = Alloy C-276

Example: **M**-VAF-M1-02M-1-0

Dimensions

See page 20 for M1 model dimensions.

M2 Model

The M2 model offers versatility, with an integral junction box and choice of mechanical or electronic display.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build an M2 model variable area flowmeter ordering number by combining the designators in the sequence shown below.

				4		5	6		7	
VAF	-	M2	-	**01M**	-	**1**	**1**	-	**F**	

4 Measured Flow Range

Air, NL/min	*Air, NL/h*	*Water, L/min*	*Water, L/h*
01L = 0.08 to 0.8	**01M** = 5.0 to 50	**A1L** = 0.005 to 0.05	**A1M** = 0.3 to 3.0
02L = 0.17 to 1.7	**02M** = 10 to 100	**A2L** = 0.008 to 0.08	**A2M** = 0.5 to 5.0
03L = 0.25 to 2.5	**03M** = 15 to 150	**A3L** = 0.018 to 0.18	**A3M** = 1.0 to 10
04L = 0.67 to 6.7	**04M** = 40 to 400	**A4L** = 0.04 to 0.4	**A4M** = 2.5 to 25
05L = 1.3 to 13	**05M** = 80 to 800	**A5L** = 0.07 to 0.7	**A5M** = 4.0 to 40
06L = 2.0 to 20	**06M** = 125 to 1250	**A6L** = 0.1 to 1.0	**A6M** = 6.0 to 60
07L = 3.33 to 33.3	**07M** = 200 to 2000	**A7L** = 0.13 to 1.3	**A7M** = 8.0 to 80
08L = 4.2 to 42	**08M** = 250 to 2500	**A8L** = 0.17 to 1.7	**A8M** = 10 to 100
09L = 6.0 to 60	**09M** = 340 to 3400	*Water, U.S. gal/min*	*Water, U.S. gal/h*
Air, std ft³/min	*Air, std ft³/h*	**A1R** = 0.0013 to 0.013	**A1S** = 0.08 to 0.8
01R = 0.003 to 0.03	**01S** = 0.18 to 1.8	**A2R** = 0.0022 to 0.022	**A2S** = 0.13 to 1.3
02R = 0.006 to 0.06	**02S** = 0.37 to 3.7	**A3R** = 0.0045 to 0.045	**A3S** = 0.25 to 2.5
03R = 0.01 to 0.1	**03S** = 0.55 to 5.5	**A4R** = 0.01 to 0.1	**A4S** = 0.65 to 6.5
04R = 0.025 to 0.25	**04S** = 1.5 to 15	**A5R** = 0.018 to 0.18	**A5S** = 1.1 to 11
05R = 0.05 to 0.5	**05S** = 3.0 to 30	**A6R** = 0.025 to 0.25	**A6S** = 1.6 to 16
06R = 0.075 to 0.75	**06S** = 4.5 to 45	**A7R** = 0.035 to 0.35	**A7S** = 2.0 to 20
07R = 0.12 to 1.2	**07S** = 7.5 to 75	**A8R** = 0.045 to 0.45	**A8S** = 2.5 to 25
08R = 0.15 to 1.5	**08S** = 9.5 to 95		
09R = 0.2 to 2.0	**09S** = 13 to 130		

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

5 Valve O-Ring Material

1 = Fluorocarbon (FKM) (standard)
2 = Perfluorocarbon (FFKM)

M2 Model

Electrical Connections

- Up to two limit switches
- 2-wire, 4 to 20 mA output signal with LED display available

Temperature Ranges

- As ambient temperature increases, the process temperature maximum is reduced.

With Limit Switches

Process °F (°C)	Ambient °F (°C)
302 (150)	104 (40)
257 (125)	122 (50)
212 (100)	140 (60)

With 4 to 20 mA Output Signal

Process °F (°C)	Ambient °F (°C)
275 (135)	104 (40)
230 (110)	122 (50)
182 (85)	140 (60)

6 Limit Switches or Electronic Display (See page 22.)

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

- **0** = None
- **1** = Minimum switch
- **2** = Maximum switch
- **3** = Minimum and maximum switch
- **4** = Minimum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
- **5** = Maximum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
- **6** = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 115 V (ac)
- **7** = Minimum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
- **8** = Maximum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
- **9** = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 230 V (ac)
- **A** = Minimum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
- **B** = Maximum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
- **C** = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 24 V (dc)
- **E** = LED display of measured flow with 4 to 20 mA output signal

7 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

- **F** = Certificate of compliance
- **G** = 5-point calibration record
- **H** = Pressure test, certificate
- **I** = Silconert Coating
- **J** = Material certification
- **X** = Oil- and grease-free cleaning (**required** for oxygen service)
- **Y** = No needle valve
- **Z** = Top-mounted needle valve

Note: For non stainless steel Alloys add the prefix HC and M.

Non Stainless Steel Options

M = Alloy K-500 **HC** = Alloy C-276

Example: **HC**-VAF-M2-05R-1-0

Dimensions

See page 20 for M2 model dimensions.

M4 Model

This metal-tube flowmeter, with rugged design, is suited for extreme operating conditions and high flow rates.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build an M4 model variable area flowmeter ordering number by combining the designators in the sequence shown below.
Choose end connections and measured flow range designators based on measuring tube size.

4	5	6	7	8	9
VAF - M4 -	**1** -	**1** -	**01M** -	**1**	**A** - **F**

4 Measuring Tube Size

1 = 1/2 in.
2 = 1 in.

5 End Connections

1/2 in. Measuring Tube

1 = 1/2 in. NPT
2 = 3/4 in. NPT
3 = 1/2 in. ASME class 150 flange
4 = 3/4 in. ASME class 150 flange
5 = 1 in. ASME class 150 flange

1 in. Measuring Tube

1 = 3/4 in. NPT
2 = 1 in. NPT
3 = 3/4 in. ASME class 150 flange
4 = 1 in. ASME class 150 flange

6 Measured Flow Range

1/2 in. Measuring Tube

Air, NL/min	*Air, NL/h*
01L = 1.1 to 11	**01M** = 70 to 700
02L = 1.7 to 17	**02M** = 100 to 1000
03L = 2.6 to 26	**03M** = 160 to 1600
04L = 4.0 to 40	**04M** = 220 to 2200
05L = 6.0 to 60	**05M** = 360 to 3600
06L = 10 to 100	**06M** = 550 to 5500
07L = 17 to 170	**07M** = 1000 to 10 000
08L = 25 to 250	**08M** = 1400 to 14 000
09L = 30 to 300	**09M** = 1800 to 18 000
10L = 50 to 500	**10M** = 2800 to 28 000
Air, std ft³/min	***Air, std ft³/h***
01R = 0.04 to 0.4	**01S** = 2.5 to 25
02R = 0.06 to 0.6	**02S** = 4.0 to 40
03R = 0.1 to 1.0	**03S** = 5.8 to 58
04R = 0.14 to 1.4	**04S** = 8.0 to 80
05R = 0.2 to 2.0	**05S** = 13 to 130
06R = 0.35 to 3.5	**06S** = 20 to 200
07R = 0.6 to 6.0	**07S** = 38 to 380
08R = 0.8 to 8.0	**08S** = 52 to 520
09R = 1.0 to 10	**09S** = 65 to 650
10R = 1.6 to 16	**10S** = 100 to 1000

1/2 in. Measuring Tube

Water, L/min	*Water, L/h*
A1L = 0.03 to 0.3	**A1M** = 1.8 to 18
A2L = 0.04 to 0.4	**A2M** = 2.5 to 25
A3L = 0.05 to 0.5	**A3M** = 3.0 to 30
A4L = 0.07 to 0.7	**A4M** = 4.0 to 40
A5L = 0.095 to 0.95	**A5M** = 5.5 to 55
A6L = 0.105 to 1.05	**A6M** = 6.3 to 63
A7L = 0.13 to 1.3	**A7M** = 8.0 to 80
A8L = 0.17 to 1.7	**A8M** = 10 to 100
A9L =0.2 to 2.0	**A9M** = 12 to 120
B1L = 0.27 to 2.7	**B1M** = 16 to 160
B2L = 0.35 to 3.5	**B2M** = 20 to 200
B3L = 0.4 to 4.0	**B3M** = 25 to 250
B4L = 0.6 to 6.0	**B4M** = 35 to 350
B5L = 0.7 to 7.0	**B5M** = 40 to 400
B6L = 0.85 to 8.5	**B6M** = 50 to 500
B7L = 1.05 to 10.5	**B7M** = 63 to 630
B8L = 1.2 to 12	**B8M** = 70 to 700
B9L = 1.7 to 17	**B9M** = 100 to 1000
Water, U.S. gal/min	***Water, U.S. gal/h***
A1R = 0.008 to 0.08	**A1S** = 0.48 to 4.8
A2R = 0.01 to 0.1	**A2S** = 0.65 to 6.5
A3R = 0.015 to 0.15	**A3S** = 0.8 to 8.0
A4R = 0.018 to 0.18	**A4S** = 1.1 to 11
A5R = 0.025 to 0.25	**A5S** = 1.5 to 15
A6R = 0.03 to 0.3	**A6S** = 1.6 to 16
A7R = 0.035 to 0.35	**A7S** = 2.0 to 20
A8R = 0.045 to 0.45	**A8S** = 2.5 to 25
A9R = 0.05 to 0.5	**A9S** = 3.0 to 30
B1R = 0.07 to 0.7	**B1S** = 4.2 to 42
B2R = 0.09 to 0.9	**B2S** = 5.0 to 50
B3R = 0.11 to 1.1	**B3S** = 6.5 to 65
B4R = 0.15 to 1.5	**B4S** = 9.0 to 90
B5R = 0.18 to 1.8	**B5S** = 10 to 100
B6R = 0.22 to 2.2	**B6S** = 13 to 130
B7R = 0.28 to 2.8	**B7S** = 16 to 160
B8R = 0.3 to 3.0	**B8S** = 18 to 180
B9R = 0.45 to 4.5	**B9S** = 25 to 250

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

M4 Model

Electrical Connections

- Up to two limit switches (M20 × 1.5 cable glands standard)
- 2-wire 4 to 20 mA output signal available

Temperature Ranges With Limit Switches or 4 to 20 mA Output Signal

- Ambient low temperature is limited to –13°F (–25°C) with limit switches.
- As ambient temperature increases, the process temperature maximum is reduced.

Process °F (°C)	Ambient °F (°C)
392 (200)	104 (40)
356 (180)	140 (60)

6 Measured Flow Range

1 in. Measuring Tube

Air, NL/min

01L = 25 to 250
02L = 40 to 400
03L = 60 to 600
04L = 100 to 1000
05L = 200 to 2000
06L = 300 to 3000

Air, NL/h

01M = 1400 to 14 000
02M = 2300 to 23 000
03M = 3500 to 35 000
04M = 5000 to 50 000
05M = 11 000 to 110 000
06M = 18 000 to 180 000

Air, std ft³/min

01R = 1.0 to 10
02R = 1.5 to 15
03R = 2.0 to 20
04R = 3.0 to 30
05R = 6.5 to 65
06R = 10 to 100

Air, std ft³/h

01S = 52 to 520
02S = 85 to 850
03S = 130 to 1300
04S = 190 to 1900
05S = 400 to 4000
06S = 670 to 6700

Water, L/min

A1L = 0.8 to 8.0
A2L = 1.05 to 10.5
A3L = 1.5 to 15
A4L = 1.7 to 17
A5L = 2.0 to 20
A6L = 2.7 to 27
A7L = 3.0 to 30
A8L = 4.2 to 42
A9L = 5.5 to 55
B1L = 7.0 to 70
B2L = 10 to 100

Water, L/h

A1M = 48 to 480
A2M = 63 to 630
A3M = 82 to 820
A4M = 100 to 1000
A5M = 120 to 1200
A6M = 160 to 1600
A7M = 170 to 1700
A8M = 250 to 2500
A9M = 320 to 3200
B1M = 400 to 4000
B2M = 630 to 6300

Water, U.S. gal/min

A1R = 0.2 to 2.0
A2R = 0.28 to 2.8
A3R = 0.35 to 3.5
A4R = 0.45 to 4.5
A5R = 0.5 to 5.0
A6R = 0.7 to 7.0
A7R = 0.75 to 7.5
A8R = 1.0 to 10
A9R = 1.5 to 15
B1R = 1.8 to 18
B2R = 3.0 to 30

Water, U.S. gal/h

A1S = 13 to 130
A2S = 16 to 160
A3S = 22 to 220
A4S = 25 to 250
A5S = 32 to 320
A6S = 42 to 420
A7S = 45 to 450
A8S = 65 to 650
A9S = 85 to 850
B1S = 110 to 1100
B2S = 160 to 1600

Custom

*See **Custom Calibration,** page 22.*

GAS = Gas **LIQ** = Liquid

7 Limit Switches (See page 22.)

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = Minimum switch
2 = Maximum switch
3 = Minimum and maximum switch
4 = Minimum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
5 = Maximum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
6 = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 115 V (ac)
7 = Minimum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
8 = Maximum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
9 = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 230 V (ac)
A = Minimum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Maximum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
C = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 24 V (dc)

8 Output Signal

Omit designator if output signal not ordered.

A = 4 to 20 mA

9 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

B = FM Approval Class I, Division 1 IS
C = FM Approval Class I, Division 1 XP
D = FM Approval Class I, Division 2 NI
F = Certificate of compliance
G = 5-point calibration record
H = Pressure test, certificate
I = Silconert Coating
J = Material certification
L = Dye penetration test, certificate
N = X-ray test, report
P = Hardness test, report
R = 1/2 in. female NPT conduit gland
S = M20 × 1.5 cable gland
X = Oil- and grease-free cleaning (**required** for oxygen service)

Note: For non stainless steel Alloys add the prefix HC and M.

Non Stainless Steel Options

M = Alloy K-500 **HC** = Alloy C-276

Example: **M**-VAF-M4-1-1-01L-0

Dimensions

See page 20 for M4 model dimensions.

M4H Model

This horizontal model offers liquid flow reading left-to-right or right-to-left to meet system requirements.

Technical Data

See **Variable Area Flowmeter Selection,** page 2.

Ordering Information

Build an M4H model variable area flowmeter ordering number by combining the designators in the sequence shown below. **Choose end connections and measured flow range designators based on measuring tube size.**

			4	5	6	7	8	9	10	
VAF	-	M4H	- **1**	- **1**	- **A1M**	- **1**	**A**	- **RL**	- **F**	

4 Measuring Tube Size

1 = 1/2 in.
2 = 1 in.

5 End Connections

1/2 in. Measuring Tube

1 = 3/4 in. NPT
2 = 1/2 in. ASME class 150 flange
3 = 3/4 in. ASME class 150 flange
4 = 1 in. ASME class 150 flange

1 in. Measuring Tube

1 = 1 1/4 in. NPT
2 = 1 in. ASME class 150 flange

6 Measured Flow Range

1/2 in. Measuring Tube

Water, L/min	***Water, L/h***
A1L = 0.11 to 1.1	**A1M** = 7.0 to 70
A2L = 0.2 to 2.0	**A2M** = 12 to 120
A3L = 0.3 to 3.0	**A3M** = 18 to 180
A4L = 0.5 to 5.0	**A4M** = 28 to 280
A5L = 0.75 to 7.5	**A5M** = 45 to 450
A6L = 1.2 to 12	**A6M** = 70 to 700
A7L = 2.0 to 20	**A7M** = 120 to 1200
A8L = 2.5 to 25	**A8M** = 160 to 1600
A9L = 4.0 to 40	**A9M** = 240 to 2400
Water, U.S. gal/min	***Water, U.S. gal/h***
A1R = 0.03 to 0.3	**A1S** = 2.0 to 20
A2R = 0.05 to 0.5	**A2S** = 3.0 to 30
A3R = 0.08 to 0.8	**A3S** = 5.0 to 50
A4R = 0.12 to 1.2	**A4S** = 8.0 to 80
A5R = 0.2 to 2.0	**A5S** = 12 to 120
A6R = 0.3 to 3.0	**A6S** = 20 to 200
A7R = 0.5 to 5.0	**A7S** = 32 to 320
A8R = 0.7 to 7.0	**A8S** = 43 to 430
A9R = 1.07 to 10.7	**A9S** = 64 to 640

1 in. Measuring Tube

Water, L/min	***Water, L/h***
A1L = 2.0 to 20	**A1M** = 130 to 1300
A2L = 3.0 to 30	**A2M** = 200 to 2000
A3L = 5.0 to 50	**A3M** = 300 to 3000
A4L = 8.0 to 80	**A4M** = 500 to 5000
A5L = 15 to 150	**A5M** = 850 to 8500
A6L = 17 to 170	**A6M** = 1000 to 10 000
Water, U.S. gal/min	***Water, U.S. gal/h***
A1R = 0.6 to 6.0	**A1S** = 35 to 350
A2R = 0.9 to 9.0	**A2S** = 55 to 550
A3R = 1.4 to 14	**A3S** = 80 to 800
A4R = 2.2 to 22	**A4S** = 130 to 1300
A5R = 4.0 to 40	**A5S** = 230 to 2300
A6R = 4.5 to 45	**A6S** = 270 to 2700

Custom

*See **Custom Calibration,** page 22.*

LIQ = Liquid

7 Limit Switches (See page 22.)

Limit switch amplifiers are required. Amplifiers can be ordered with the flowmeter or customer supplied.

0 = None
1 = Minimum switch
2 = Maximum switch
3 = Minimum and maximum switch
4 = Minimum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
5 = Maximum switch and a one-channel isolated switch amplifier with relay output, 115 V (ac)
6 = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 115 V (ac)
7 = Minimum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
8 = Maximum switch and a one-channel isolated switch amplifier with relay output, 230 V (ac)
9 = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 230 V (ac)
A = Minimum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
B = Maximum switch and a one-channel isolated switch amplifier with relay output, 24 V (dc)
C = Minimum and maximum switch and a two-channel isolated switch amplifier with relay output, 24 V (dc)

M4H Model

Electrical Connections

- Up to two limit switches (M20 × 1.5 cable glands standard)
- 2-wire 4 to 20 mA output signal available

Temperature Ranges With Limit Switches or 4 to 20 mA Ouput Signal

- Ambient low temperature is limited to –13°F (–25°C) with limit switches.
- As ambient temperature increases, the process temperature maximum is reduced.

Process °F (°C)	Ambient °F (°C)
392 (200)	104 (40)
356 (180)	140 (60)

8 Output Signal

Omit designator if output signal not ordered.

A = 4 to 20 mA

9 Flow Direction

RL = Right-to-left
LR = Left-to-right

10 Options (See page 22.)

Add multiple designators in alphabetical order; omit final dash (-) if no options are ordered.

B = FM Approval Class I, Division 1 IS
C = FM Approval Class I, Division 1 XP
D = FM Approval Class I, Division 2 NI
F = Certificate of compliance
G = 5-point calibration record
H = Pressure test, certificate
J = Material certification
L = Dye penetration test, certificate
N = X-ray test, report
P = Hardness test, report
R = 1/2 in. female NPT conduit gland
S = M20 × 1.5 cable gland
X = Oil- and grease-free cleaning (**required** for oxygen service)

Note: For non stainless steel Alloys add the prefix HC.

Non Stainless Steel Options

HC = Alloy C-276

Example: **HC**-VAF-M4H-2-2-A4R-0-LR

Dimensions

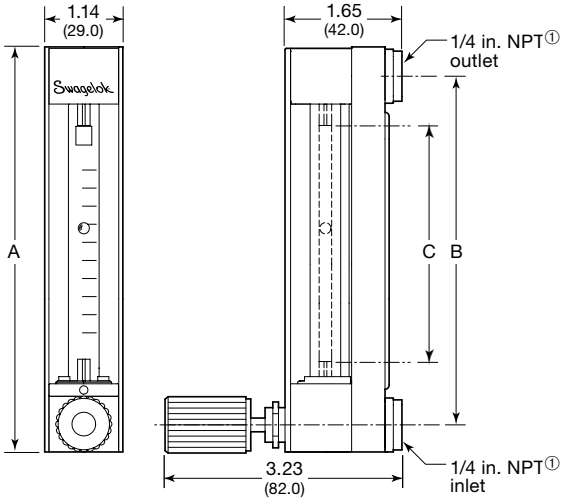
See page 21 for M4H model dimensions.

Left-to-Right Flow Model

Dimensions

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

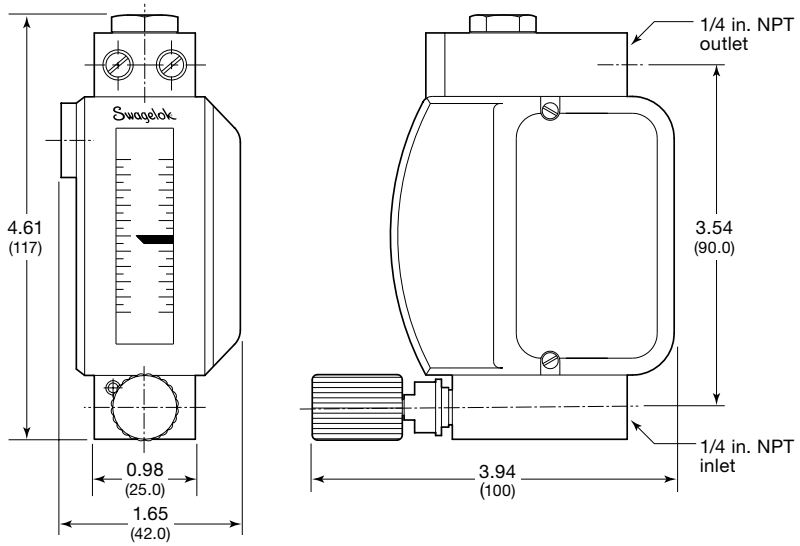
G1, G2, G3, G4, and GP Models



① GP model: G 1/4.

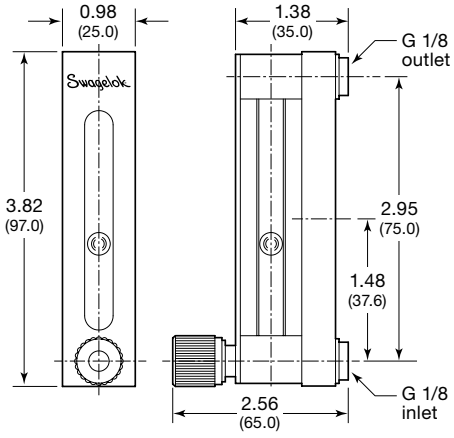
Model	Dimensions, in. (mm)			Weight lb (kg)
	A	B	C	
G1	4.37 (111)	3.54 (90.0)	1.77 (45.0)	0.80 (0.36)
G2	5.75 (146)	4.92 (125)	3.15 (80.0)	0.89 (0.40)
G3	7.72 (196)	6.89 (175)	5.12 (130)	0.98 (0.44)
G4	13.6 (346)	12.8 (325)	11.0 (280)	1.35 (0.61)
GP	5.75 (146)	4.92 (125)	3.15 (80.0)	0.44 (0.20)

M1 Model



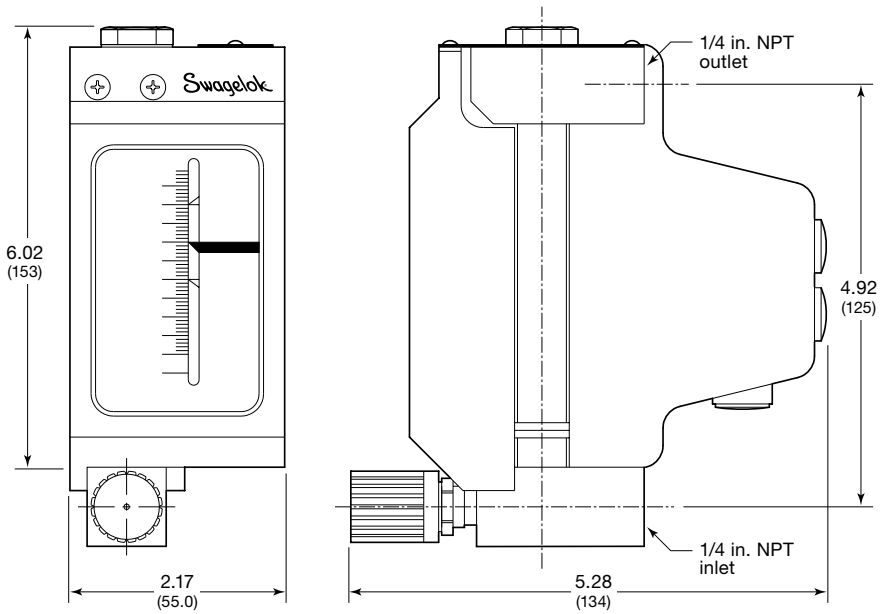
Weight: 1.53 lb (0.7 kg)

GM Model



Weight: 0.18 lb (0.08 kg)

M2 Model

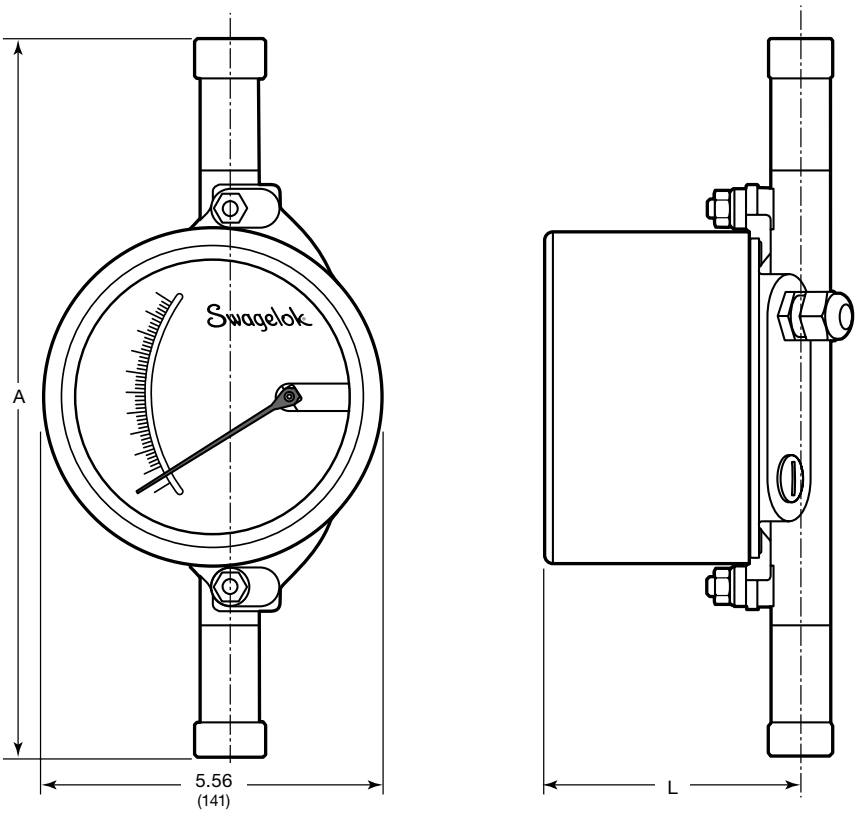


Weight: 2.2 lb (1.0 kg)

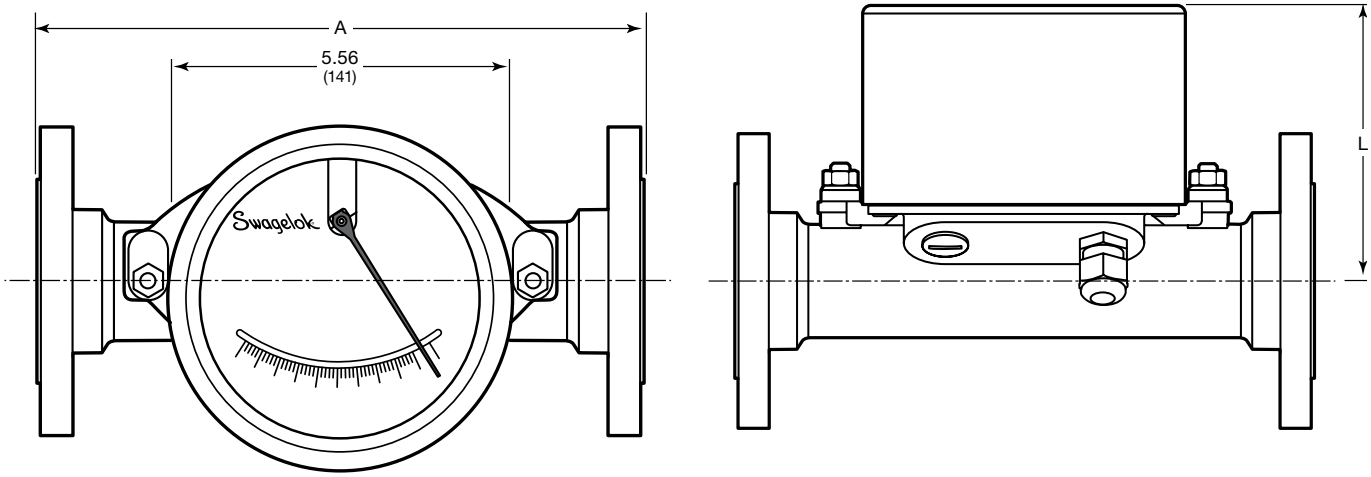
Dimensions

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

M4 Model



M4H Model



Right-to-Left Flow Model

M4 Model and M4H Model

Tube Size in.	Process End Connection	Dimensions, in. (mm)		Weight lb (kg)
		A	L	
1/2	NPT	11.8 (300)	4.49 (114)	4.4 (2.0)
	Flange	9.84 (250)	4.49 (114)	7.7 (3.5)
1	NPT	11.8 (300)	5.00 (127)	7.7 (3.5)
	Flange	9.84 (250)	5.00 (127)	11 (5.0)

Custom Calibration

Standard Swagelok variable area flowmeters are factory calibrated to their media, flow range, and accuracy class using clean, dry air for air-flow range models and water for water-flow range models. Standard units of measure marked on the scale are calibrated to:

- 17.4 psia (1.2 bar) and 68°F (20°C) for G1, G2, G3, GM, and GP models.
- 14.7 psia (1.013 bar) and and 68°F (20°C) for G4, M1, M2, M4, and M4H models.

Custom-calibrated flowmeters are available for fluids with properties substantially different from those of air or water, as well as systems operating at higher pressures or temperatures.

Flowmeters calibrated for one fluid at a specific pressure and temperature can be used to measure other fluids and different pressures and temperatures by using a conversion factor. See the Swagelok *Variable Area Flowmeters Installation Instructions, G Series and M Series,* MS-CRD-0111, for more information.

In liquids, higher temperature can reduce viscosity and density, resulting in lower readings. In gases, higher fluid temperature can increase volume and result in higher readings. Knowing the specific fluid temperature enables us to calibrate the scale more accurately.

Increased pressure can compress gases and lead to lower meter readings. Knowing the system pressure enables us to calibrate the scale properly for your application.

To order a custom Swagelok variable area flowmeter calibrated to meet your requirements as shown below, use **GAS** or **LIQ** as the flow range designator in the desired model ordering number and contact your authorized Swagelok representative. You will need to specify:

1. Fluid to be measured
2. Fluid dynamic viscosity, typically in cP or mPa·s, or kinetic viscosity, typically in cSt or m^2/s, at operating pressure and temperature
3. Fluid density in lb/ft^3 or kg/m^3 at operating pressure and temperature
4. Fluid temperature at operating conditions, with unit of measure
5. Fluid pressure at operating conditions, with unit of measure
6. Flow measurement range and unit of measure.

Swagelok custom-calibrated variable area flowmeters must maintain a 10-to-1 turndown ratio and are matched as closely as possible to the desired flow measurement range. Custom-calibrated flowmeters are marked with the fluid media and unit of measure for which they are calibrated.

Options

Options are specified in variable area flowmeter ordering numbers as shown in **Ordering Information** for each model.

Electrical Options

Two electrical options are available with select Swagelok variable area flowmeter models:

- discrete limit switch outputs for indicating high/low flow
- 4 to 20 mA output signal.

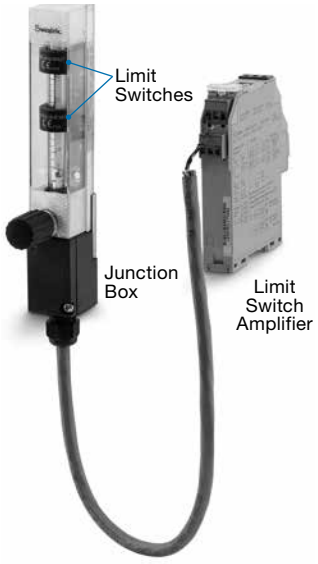
Limit Switches

Optional minimum or maximum limit switches available for most models are compliant with NAMUR IEC 60947-5-6 (EN 60947-5-6).

Output Signal

Some variable area flowmeter models are available with a separate two-wire 4 to 20 mA output signal. These models require auxiliary power of 14.8 to 30 V (dc).

For more information about electrical options, see the Swagelok *Variable Area Flowmeters Installation Instructions, G Series and M Series,* MS-CRD-0111, available *only* on your Swagelok website.



G Series Flowmeter with Limit Switches, Junction Box, and Isolated Switch Amplifier with Relay Output

Junction Boxes

Junction boxes, available on select Swagelok variable area flowmeter models, can be mounted to the flowmeter to facilitate electrical connections between the flowmeter and the control system. Junction boxes are suggested when limit switches are ordered.

Valve Position

An integral needle valve for fine metering is provided on some products, on the bottom (inlet) side of the flowmeter. Upon request, the valve can be mounted on the top (outlet) side or omitted from the assembly.

For gas applications, the valve is typically on the top (behind the measuring cone) to help maintain constant pressure in the measuring cone despite changes in density caused by gas compression or decompression. For liquids, the valve can be on the bottom or the top, because pressure changes do not affect liquid density.

Options

Options are specified in variable area flowmeter ordering numbers as shown in **Ordering Information** for each model.

Certificates and Test Reports

FM Approvals Certificate

Swagelok M1, M4, and M4H models are available with FM Approvals certificates of compliance.

M1 Model

- Intrinsically safe for Class I, Division 1, Groups A, B, C, and D
- Nonincendive for Class I, Division 2, Groups A, B, C, and D
- Explosion proof Class I, Division 1, Groups A, B, C, and D
- Type 4X

M4 and M4H Model

- Intrinsically safe for Class I, Division 1, Groups A, B, C, and D
- Associated apparatus nonincendive for Class I, Division 2, Groups A, B, C, and D
- Nonincendive for Class I, Division 2, Groups A, B, C, and D
- Type 4X

Certificate of Compliance

This document certifies that the products supplied to the customer by the manufacturer are in compliance with the requirements of the order, in accordance with EN 10204.

5-Point Calibration Record

The calibration record shows actual flow performance, theoretical performance, and error over the measurement range.

Pressure Test and Certificate

A hydrostatic pressure test based on EN 10204 is available.

Material Certification

This inspection certificate, in accordance with EN 10204, shows the material and heat numbers of the pressure-bearing and wetted materials, as well as the original mill material certifications of the wetted materials.

Dye Penetration Test and Certificate

A dye penetration test is available for wetted welds. For acceptance criteria, the related material standard is used.

X-Ray Test and Report

An X-ray test is available for wetted welds. The test procedure follows EN 1435-1 Class B. Acceptance criteria are in accordance with ISO 5817 group.

Hardness Test and Report

A hardness test on wetted metal components, based on ASTM A956, is available.

Oil- and Grease-Free Cleaning

An additional degreasing operation is available that meets the requirements of DIN 25410 and KWU-AVS 8/0 D. This option must be selected on flowmeters calibrated for oxygen service.

Oxygen Service Hazards

For information about hazards and risks of oxygen-enriched systems, see the Swagelok *Oxygen System Safety* technical report, (MS-06-13).

Options

Options are specified in variable area flowmeter ordering numbers as shown in **Ordering Information** for each model.

Mounting Brackets

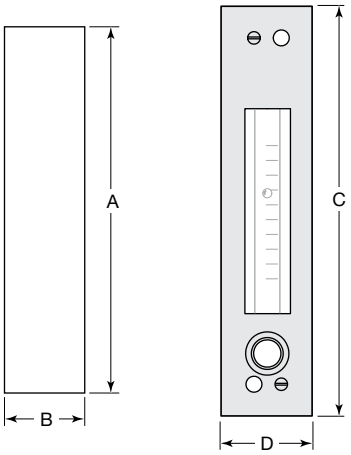
Panel Mounting

Panel mounting is available for G1, G2, G3, G4, GM, and GP model flowmeters. The face plate is aluminum, and the rear brackets are steel.

G1, G2, G3, G4, and GP models are mounted with four nickel-plated steel fasteners, included; GM models are mounted with an anodized aluminum clamp clip and 4 mm stainless steel Allen screw.

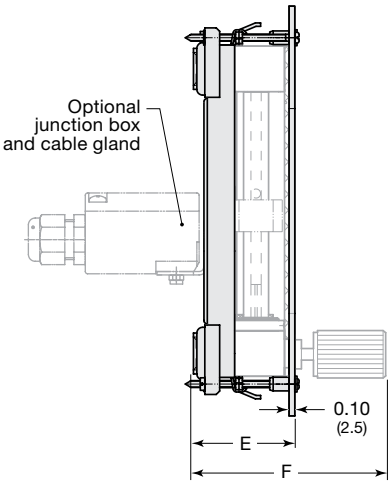
Dimensions, in inches (millimeters) are for reference only and are subect to change.

Model	Dimensions, in. (mm)					
	A	B	C	D	E	F
G1	5.04 (128)	1.26 (32.0)	5.71 (145)	1.58 (40.0)	1.75 (44.5)	3.23 (82.0)
G2, GP	6.42 (163)	1.26 (32.0)	7.09 (180)	1.58 (40.0)	1.75 (44.5)	3.23 (82.0)
G3	8.39 (213)	1.26 (32.0)	9.06 (230)	1.58 (40.0)	1.75 (44.5)	3.23 (82.0)
G4	14.3 (363)	1.26 (32.0)	15.0 (380)	1.58 (40.0)	1.75 (44.5)	3.23 (82.0)
GM	3.70 (94.0)	0.91 (23.0)	3.82 (97.0)	0.98 (25.0)	1.38 (35.0)	2.56 (65.0)

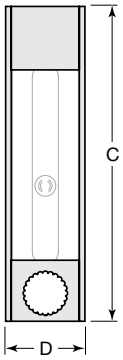


Panel Cutout

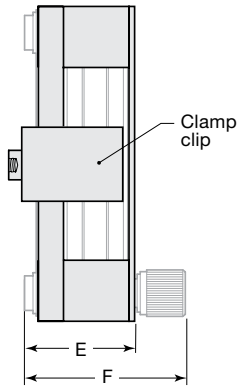
G1, G2, G3, G4, GP Model Face Plate



G1, G2, G3, G4, GP Model Side



GM Model Face Plate



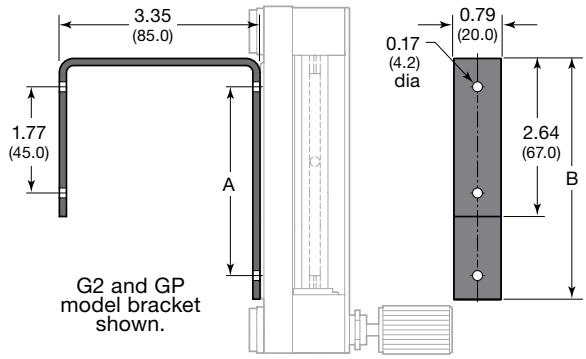
GM Model Side

Wall Mounting

Black anodized aluminum wall mounting brackets are available for G1, G2, G3, and GP model flowmeters.

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

Model	Dimensions, in. (mm)	
	A	B
G1	1.77 (45.0)	2.64 (97.0)
G2, GP	3.15 (80.0)	4.02 (102)
G3	5.12 (130)	5.98 (152)



Accessories

Damping Device

For unstable flows or low operating (inlet) pressures, particularly with gas applications, the measuring section can be fitted with a float damping device on some M4 and M4H models. This device is self-locating, with working parts of high-tech ceramic to ensure a long service life.

For more information, contact your authorized Swagelok representative.

Additional Products

Pressure Regulators

Swagelok offers a variety of pressure regulators.

- Spring-, dome-, and air-loaded models
- Pressure-reducing regulators
- Back-pressure regulators
- Gas cylinder changeover manifolds
- Electrically heated and steam-heated vaporizing regulators.

For more information, see the Swagelok *Pressure Regulators* catalog, MS-02-230, and the Swagelok *Pressure Regulators, RHPS Series* catalog, MS-02-430.

Metering Valves

Swagelok metering valves offer:

- Low- and high-pressure service
- Repeatable vernier handles
- Brass and 316 stainless steel materials.

For more information, see the Swagelok *Metering Valves* catalog, MS-01-142.

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

Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page the individual catalog; for example, the Swagelok *Gaugeable Tube Fittings and Tube Adapters* catalog is MS-01-140, RevW. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

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 or contact your authorized Swagelok representative.

Temperature Measurement Devices

Bimetal Thermometers and Thermowells

- Accurate to ± 1 % of full scale in accordance with ASME B40.200
- Easy-to-read dial sizes with single and dual scales
- Dampened movement for protection against vibration
- Stainless steel construction

Contents

Dampened-Movement Bimetal Thermometers

Swagelok® thermometers are actuated by a bimetal helix coil. Silicone-free gel dampens vibration effects, and cases are hermetically sealed in accordance with ASME B40.200 to prevent fogging and moisture damage to internal components.

Features

- Acrylic, glass, polycarbonate, and safety-glass lenses to meet application requirements
- All-welded 304 stainless steel construction standard; 316 stainless steel process connection and stem available
- Adjustable-angle, center-back, and lower-back mount process connections
- External adjustment for field calibration
- 50 % over- and under-range protection against damage to internal components up to 500°F (260°C)
- Anti-parallax dial for easy reading

Technical Data

Dial

- Temperature measurement ranges:
  - –100 to 150° through 200 to 1000°F
  - –70 to 70°C through 100 to 540°C.

Case

- Stem angle adjusts more than 180°; case rotates 360°.
- Maximum ambient operating temperature 200°F (93°C)

Stem

- Stem is welded at tip and process connection.
- Temperature-sensing bimetal helix is carefully sized and tested, heat treated, and aged to relieve inherent stresses and ensure continued accuracy.

Materials of Construction

Component	Material
Stem	*304 SS*
Case, bezel, staff rod, bellows, bracket, screws	304 SS
Adjustment screw	303 SS
O-ring	Silicone
Dial, pointer	Aluminum
Bimetal element	Varies with temperature range
Dampening media	Silicone-free inert gel
Lens gasket	Neoprene (dial ranges 500°F [260°C] and under); Silicone (dial ranges over 500°F [260°C])
Lens	Acrylic, glass, polycarbonate, or safety glass

Wetted components listed in *italics*.

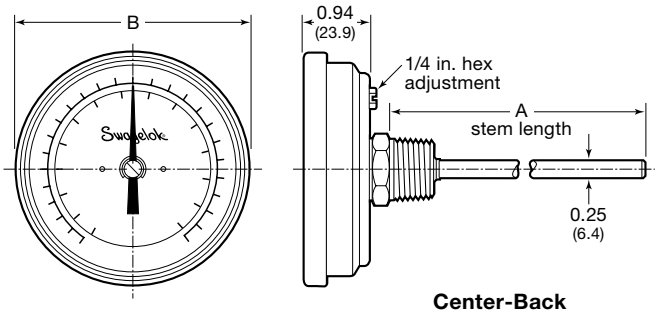
Testing

Every Swagelok dampened-movement bimetal thermometer is factory calibrated to meet ASME B40.200.

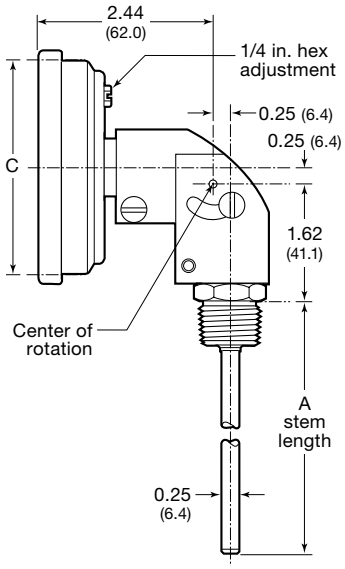
Dampened-Movement Bimetal Thermometers

Dimensions

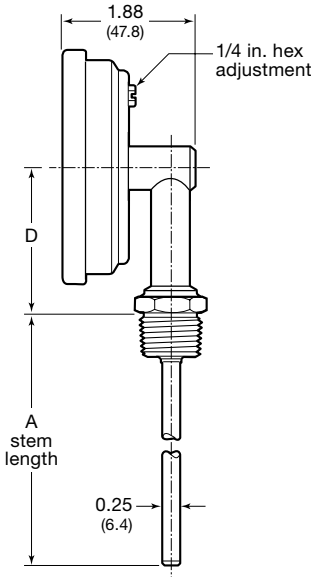
Dimensions, in inches (millimeters), are for reference only and are subject to change.



Center-Back Mount



Adjustable-Angle Mount



Lower-Back Mount

Dial Size in. (mm)	Dimensions, in. (mm)			
	A	B	C	D
Adjustable-Angle Mount				
3 (76.2)	2.5 (63.5), 4 (102), 6 (152), 9 (229), or 12 (305)	3.31 (84.1)	3.00 (76.2)	—
5 (127)		5.25 (133)	5.00 (127)	—
Center-Back Mount				
3 (76.2)	2.5 (63.5), 4 (102), 6 (152), 9 (229), or 12 (305)	3.25 (82.6)	3.00 (76.2)	—
5 (127)		5.25 (133)	5.00 (127)	—
Lower-Back Mount				
3 (76.2)	2.5 (63.5), 4 (102), 6 (152), 9 (229), or 12 (305)	3.25 (82.6)	3.00 (76.2)	1.94 (49.3)
5 (127)		5.25 (133)	5.00 (127)	2.94 (74.7)

Ordering Information

Build a dampened-movement bimetal thermometer ordering number by combining the designators in the sequence shown below.

1		2		3		4		5		6		7
T48A	-	025	-	FS	-	01	-	G	-	8	-	NT

1 Dial Size, Mounting

T48A = 3 in. (76.2 mm), adjustable angle
T48C = 3 in. (76.2 mm), center back
T48L = 3 in. (76.2 mm), lower back
T80A = 5 in. (127 mm), adjustable angle
T80C = 5 in. (127 mm), center back
T80L = 5 in. (127 mm), lower back

2 Stem Length

025 = 2.5 in. (63.5 mm)
040 = 4 in. (102 mm)
060 = 6 in. (152 mm)
090 = 9 in. (229 mm)
120 = 12 in. (305 mm)

3 Scale

CS = Celsius
DS = Dual Fahrenheit (primary) and Celsius (secondary)
FS = Fahrenheit

4 Dial Range

See below.

Dial Ranges

Fahrenheit (°F)	Celsius (°C)	Designator
–100 to 150	–70 to 70	01
–40 to 160	–40 to 70	19
0 to 200	–15 to 90	05
0 to 250	–20 to 120	06
50 to 300	10 to 150	08
50 to 550	10 to 290	16①
150 to 750	65 to 400	11①
200 to 1000	100 to 540	12①②

① Dial range not available with silicone liquid fill.
② Not recommended for continuous use over 800°F (426°C).

5 Lens Material

A = Acrylic
G = Glass (standard)
P = Polycarbonate
S = Laminated safety glass

6 Process Connection

8 = 1/2 in. male NPT
9 = Male G1/2B

7 Options

ND = No dampening
NT = NIST-traceable calibration certificate
SF = Silicone liquid fill (not available with standard dampening, with glass lens options, or for dial ranges over 500°F [260°C])
SS = 316 stainless steel process connection and stem
UN = NPT union lock nut

Thermowells

Thermowells are recommended to protect Swagelok dampened-movement bimetal thermometers from damage that could result from contact with pressurized, corrosive, flowing, viscous, or abrasive process fluids. They also enable removal of thermometers for replacement or service without affecting the process or system.

Features

- 304 stainless steel construction standard; 316 stainless steel available
- Accommodate 2.5 through 12 in. (63.5 through 305 mm) thermometer stem lengths in reduced-, straight-, and tapered-shank configurations
- Available with lag extensions for use in insulated piping applications

Technical Data

Instrument Connection

1/2 in. female NPSM straight pipe thread for mechanical joints standard; female G1/2B connection available

Process Connection

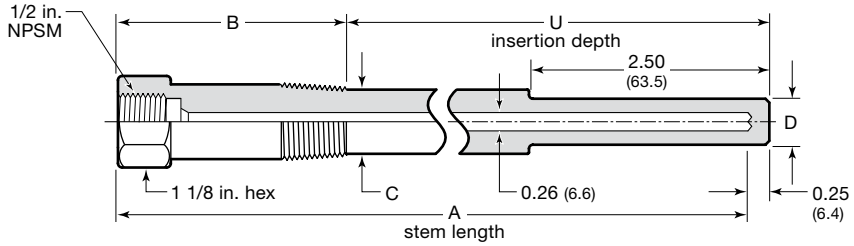
- ASME B16.5 raised-face flange
- 3-A–compliant sanitary Kwik-Clamp
- Threaded (NPT)
- Weld socket

Dimensions

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

The U dimension is the depth the thermowell is inserted into the fluid system and is specified in the ordering number. See **Ordering Information,** page 6.

Threaded (TWT) Process Connection

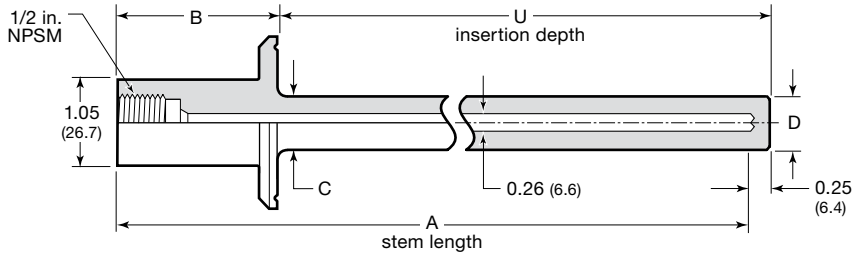


Lag and Reduced Shank Shown

Dimensions, in. (mm)														
A Stem Length	B		1/2 in. Size						3/4 in. Size					
			C			D			C			D		
	No Lag	With Lag	R	S	T	R	S	T	R	S	T	R	S	T
2.5 (63.5) 4 (102)	1.75 (44.4)	—	0.50 (12.7)	0.62 (15.7)	—	0.50 (12.7)	0.62 (15.7)	—	0.50 (12.7)	0.62 (15.7)	—	0.50 (12.7)	0.62 (15.7)	—
6 (152)		3.75 (95.2)	0.62 (15.7)		0.62 (15.7)			0.50 (12.7)	0.75 (19.0)		088 (22.4)			0.62 (15.7)
9 (229) 12 (305)		4.75 (121)												

R denotes reduced shank; **S** denotes straight shank; **T** denotes tapered shank.

Kwik-Clamp (TWS) Process Connection



No Lag and Straight Shank Shown

Dimensions, in. (mm)								
A Stem Length	B		C			D		
	No Lag	With Lag	R	S	T	R	S	T
4 (102)	1.75 (44.4)	—	0.50 (12.7)	0.50 (12.7)	—	0.50 (12.7)	0.50 (12.7)	—
6 (152)		3.75 (95.2)	0.75 (19.0)		0.88 (22.4)			0.62 (15.7)
9 (229) 12 (305)		4.75 (121)						

R denotes reduced shank; **S** denotes straight shank; **T** denotes tapered shank.

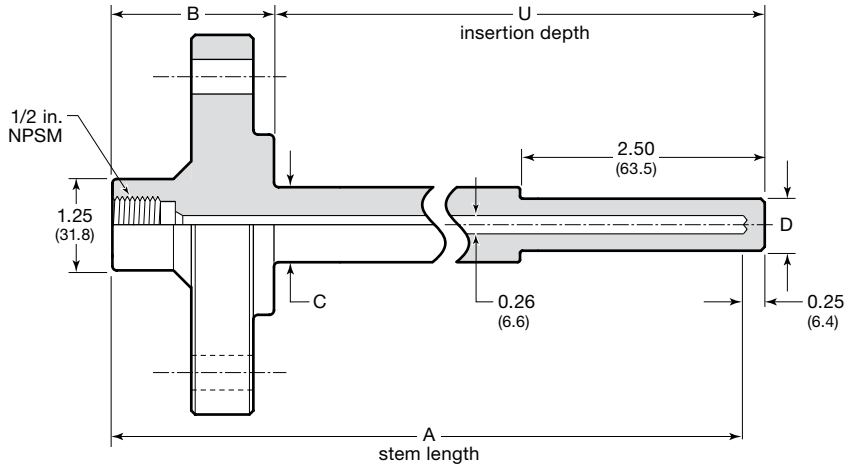
Thermowells

Dimensions

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

The U dimension is the depth the thermowell is inserted into the fluid system and is specified in the ordering number. See **Ordering Information,** page 6.

Raised-Face Flange (TWF) Process Connection

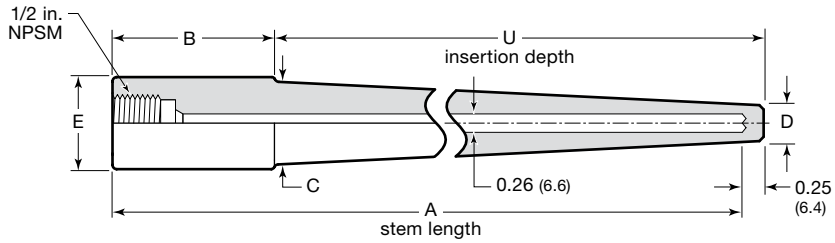


No Lag and Reduced Shank Shown

Dimensions, in. (mm)								
A Stem Length	B		C			D		
	No Lag	With Lag	R	S	T	R	S	T
4 (102)	2.25 (57.2)	—	0.88 (22.4)	0.75 (19.0)	—	0.50 (12.7)	0.75 (19.0)	—
6 (152)		4.25 (108)			0.88 (22.4)			0.62 (15.7)
9 (229) 12 (305)		5.25 (133)						

R denotes reduced shank; **S** denotes straight shank; **T** denotes tapered shank.

Weld Socket (TWW) Process Connection

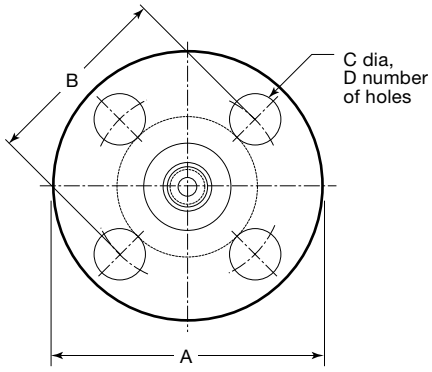


No Lag and Tapered Shank Shown

Dimensions, in. (mm)										
A Stem Length	B		C			D			E	
	No Lag	With Lag	R	S	T	R	S	T	3/4 in. Size	1 in. Size
4 (102)	1.75 (44.4)	—	0.62 (15.7)	0.75 (19.0)	—	0.50 (12.7)	0.75 (19.0)	—	1.05 (26.7)	—
6 (152)		3.75 (95.2)			0.88 (22.4)			0.62 (15.7)		1.35 (34.3)
9 (229) 12 (305)		4.75 (121)								

R denotes reduced shank; **S** denotes straight shank; **T** denotes tapered shank.

Flange Dimensions



ASME Class 150

Nominal Flange Size in.	Dimensions in. (mm)			Mounting Holes
	A	B	C	D
1	4.25 (108)	3.12 (79.2)	0.62 (15.7)	4
1 1/2	5.00 (127)	3.88 (98.6)	0.62 (15.7)	
2	6.00 (152)	4.75 (121)	0.75 (19.0)	

ASME Class 300

Nominal Flange Size in.	Dimensions in. (mm)			Mounting Holes
	A	B	C	D
1	4.88 (124)	3.50 (88.9)	0.75 (19.0)	4
1 1/2	6.12 (155)	4.50 (114)	0.88 (22.4)	4
2	6.50 (165)	5.00 (127)	0.75 (19.0)	8

⚠ **Qualified personnel should perform welding.**

Thermowells

Ordering Information

Build a thermowell ordering number by combining the designators in the sequence shown below.

1	2	3	4	5	6	7
TWF	- 110	- R	- 1	- L	- 2.00	- CS

1 Process Connection

TWF = ASME B16.5 raised-face flange
TWS = Sanitary clamp
TWT = Threaded
TWW = Weld socket

2 Process Connection Size

TWF Process Connection

110 = 1 in. ASME class 150
115 = 1 1/2 in. ASME class 150
120 = 2 in. ASME class 150
310 = 1 in. ASME class 300
315 = 1 1/2 in. ASME class 300
320 = 2 in. ASME class 300

TWS Process Connection

C15 = 1 1/2 in. Kwik-Clamp
C20 = 2 in. Kwik-Clamp

TWT Process Connection

008 = 1/2 in. male NPT
012 = 3/4 in. male NPT

TWW Process Connection

P12 = 3/4 in. pipe
P16 = 1 in. pipe

3 Shank

R = Reduced
S = Straight
T = Tapered①

① Tapered shanks are not available for thermowells with U dimensions of 4.00 in. (102 mm) or less.

4 Bore Diameter

1 = 0.260 in. (6.6 mm)

5 Lag Extension

L = Lag extension①
N = No lag extension

① Not available for thermometer stems less than 6 in. (152 mm) long. Lag is 2 in. (50.8 mm) for 6 in. (152 mm) thermometer stems and 3 in. (76.2 mm) for thermometer stems longer than 6 in. (152 mm).

6 U Dimension

Connections with Lag Extensions

TWF Process Connection

2.00 = 2.00 in. (50.8 mm) (6 in. stem)
4.00 = 4.00 in. (102 mm) (9 in. stem)
7.00 = 7.00 in. (178 mm) (12 in. stem)

TWS and TWW Process Connections

2.50 = 2.50 in. (63.5 mm) (6 in. stem)
4.50 = 4.50 in. (114 mm) (9 in. stem)
7.50 = 7.50 in. (190 mm) (12 in. stem)

TWT Process Connection

2.50 = 2.50 in. (63.5 mm) (6 in. stem)
4.50 = 4.50 in. (114 mm) (9 in. stem)
7.50 = 7.50 in. (190 mm) (12 in. stem)

Connections with No Lag Extensions

TWF Process Connection

2.00 = 2.00 in. (50.8 mm) (4 in. stem)
4.00 = 4.00 in. (102 mm) (6 in. stem)
7.00 = 7.00 in. (178 mm) (9 in. stem)
10.0 = 10.0 in. (254 mm) (12 in. stem)

TWS and TWW Process Connections

2.50 = 2.50 in. (63.5 mm) (4 in. stem)
4.50 = 4.50 in. (114 mm) (6 in. stem)
7.50 = 7.50 in. (190 mm) (9 in. stem)
10.5 = 10.5 in. (267 mm) (12 in. stem)

TWT Process Connection

1.00 = 1.00 in. (25.4 mm) (2.5 in. stem, 1/2 in. connection)
1.63 = 1.63 in. (41.4 mm) (2.5 in. stem, 3/4 in. connection)
2.50 = 2.50 in. (63.5 mm) (4 in. stem)
4.50 = 4.50 in. (114 mm) (6 in. stem)
7.50 = 7.50 in. (190 mm) (9 in. stem)
10.5 = 10.5 in. (267 mm) (12 in. stem)

7 Options

CS = Protective stainless steel cap and chain
G1 = Female G1/2B instrument connection
SS = 316 stainless steel material

TTW Series Thermowell Tees

Thermowells are recommended to protect thermometers from damage that could result from contact with pressurized, corrosive, flowing, viscous, or abrasive process fluids. They also enable removal of thermometers for replacement or service without affecting the process.

Features

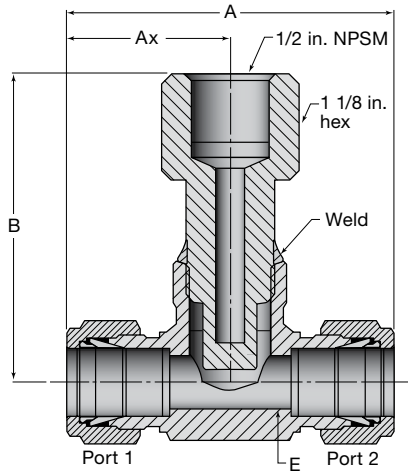
- 316 stainless steel construction
- Seal-welded connection between tee and thermowell
- Instrument connection: 1/2 in. female NPSM straight pipe threads
- Instrument stem length: 2.5 in (63.5 mm)

Ordering Information

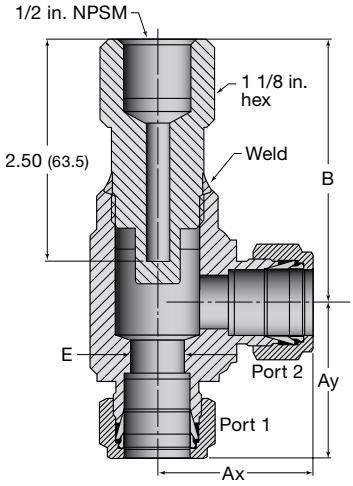
Select an ordering number. Dimensions, in inches (millimeters), are for reference only and are subject to change.

End Connections			Straight Pattern Ordering Number	Angle Pattern Ordering Number	Dimensions, in. (mm)					Pressure Rating psig (bar)
Port 1	Port 2	Size			A	Ax	Ay	B	E	
Swagelok Tube Fittings		3/8 in.	SS-TTW-S6	—	2.84 (72.1)	1.42 (36.1)	1.42 (36.1)	2.86 (72.7)	0.28 (7.1)	4900 (337)
		1/2 in.	SS-TTW-S8	SS-TTW-S8-A	3.06 (77.7)	1.53 (38.9)	1.53 (38.9)	2.86 (72.7)	0.41 (10.4)	4900 (337)
		5/8 in.	SS-TTW-S10	—	3.06 (77.7)	1.53 (38.9)	1.53 (38.9)	2.86 (72.7)	0.50 (12.7)	4900 (337)
		3/4 in.	SS-TTW-S12	SS-TTW-S12-A	3.52 (89.4)	1.76 (44.7)	1.76 (44.7)	2.96 (75.2)	0.62 (15.7)	4600 (316)
		1 in.	SS-TTW-S16	SS-TTW-S16-A	3.86 (98.0)	1.93 (49.0)	1.93 (49.0)	2.96 (75.2)	0.88 (22.4)	4600 (316)
		12 mm	SS-TTW-S12MM	SS-TTW-S12MM-A	3.06 (77.7)	1.53 (38.9)	1.53 (38.9)	2.86 (72.7)	0.37 (9.5)	4900 (337)
		16 mm	SS-TTW-S16MM	SS-TTW-S16MM-A	3.06 (77.7)	1.53 (38.9)	1.53 (38.9)	2.86 (72.7)	0.50 (12.7)	4900 (337)
		18 mm	SS-TTW-S18MM	SS-TTW-S18MM-A	3.52 (89.4)	1.76 (44.7)	1.76 (44.7)	2.96 (75.2)	0.59 (15.0)	4600 (316)
Male NPT	Female NPT	1/2 in.	SS-TTW-M8-F8	SS-TTW-M8-F8-A	3.12 (79.2)	1.56 (39.6)	1.56 (39.6)	2.93 (74.4)	0.47 (11.9)	5600 (385)
		3/4 in.	SS-TTW-M12-F12	SS-TTW-M12-F12-A	3.59 (91.2)	1.92 (48.8)	1.67 (42.4)	3.26 (82.7)	0.62 (15.7)	5100 (351)
Female NPT		1/2 in.	SS-TTW-F8	SS-TTW-F8-A	3.12 (79.2)	1.56 (39.6)	1.56 (39.6)	2.93 (74.4)	0.94 (23.9)	5600 (385)
		3/4 in.	SS-TTW-F12	SS-TTW-F12-A	3.84 (97.5)	1.92 (48.8)	1.92 (48.8)	3.26 (82.7)	1.17 (29.7)	5100 (351)

Straight Pattern



Angle Pattern



Introduction

Since 1947, Swagelok has designed, developed, and manufactured high-quality, general-purpose and specialty fluid system products to meet the evolving needs of global industries. Our focus is on understanding our customers' needs, finding timely solutions, and adding value with our products and services.

We are pleased to provide this global edition of the book-bound *Swagelok Product Catalog,* which compiles more than 100 separate product catalogs, technical bulletins, and reference documents into one convenient, easy-to-use volume. Each product catalog is up to date at the time of printing, with its revision number shown on the last page the individual catalog; for example, the Swagelok *Gaugeable Tube Fittings and Tube Adapters* catalog is MS-01-140, RevW. Subsequent revisions will supersede the printed version and will be posted on the Swagelok website and in the Swagelok electronic Desktop Technical Reference (eDTR) tool.

For more information, visit your Swagelok website or contact your authorized Swagelok sales and service representative.

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 or contact your authorized Swagelok representative.

Pressure Gauges

Industrial and Process

PGI Series

- 40, 50, 63, 100, 115, and 160 mm (1 1/2, 2, 2 1/2, 4, 4 1/2 and 6 in.) dial sizes
- Accuracy in accordance with ASME, EN, and JIS
- Available with a variety of end connections, including Swagelok® tube adapters
- Center-back, lower-back, and lower mount configurations
- Stainless steel and reinforced thermoplastic construction
- Available unfilled or liquid filled

Contents

Features

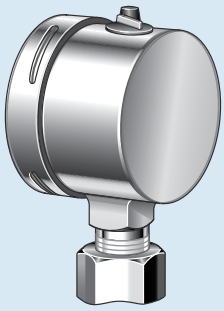
- Monitor vacuum and positive system pressures up to 15 000 psi, 1000 bar, or 100 MPa
- Manufactured in accordance with industry standards
- Available with Swagelok tube adapter end connections

Testing and Calibration

Every Swagelok industrial pressure gauge is factory calibrated and pressure tested.

Swagelok Tube Adapters Solve Alignment Problems

Swagelok tube adapters can help eliminate difficult alignment problems and can be used with any Swagelok tube fitting.



Typical Alignment Problem

When installing a gauge with a pipe fitting end connection, it is often difficult to align the dial to the desired position without damaging the gauge.

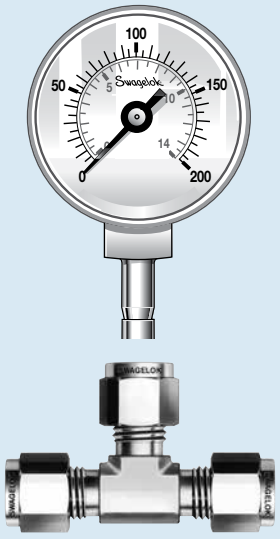
Swagelok Tube Adapters

Gauges with integral Swagelok tube adapters eliminate alignment problems.

Installation Instructions

1. Insert the gauge with integral Swagelok tube adapter into a Swagelok tube fitting.
2. Align the gauge dial to the desired position.
3. Install the fitting.

⚠ **Swagelok tube adapters are to be used ONLY in Swagelok tube fittings. Use in fittings made by other manufacturers may result in leakage or slippage.**



Process Connections

Connection	Maximum Pressure	Specification
Swagelok Tube Adapter		
1/4 in. and 6 mm	10 000 psi, 600 bar, 60 MPa	—
3/8 in. and 10 mm	7500 psi, 500 bar, 50 MPa	
1/2 in. and 12 mm	6000 psi, 400 bar, 40 MPa	
Male NPT		
1/8 in.	6000 psi, 400 bar, 40 MPa	ASME B1.20.1
1/4 and 1/2 in.	15 000 psi, 1000 bar, 100 MPa	
Male ISO Parallel Gauge Thread (EN)		
G1/8B (EN)	6000 psi, 400 bar, 40 MPa	EN 837-1 EN 837-3
G1/4B (EN) G1/2B (EN)	15 000 psi, 1000 bar, 100 MPa	
Male ISO Parallel Gauge Thread (JIS)		
G1/4B (PF) G1/2B (PF)	15 000 psi, 1000 bar, 100 MPa	JIS B7505
Male ISO Tapered Thread		
R1/8 (PT)	6000 psi, 400 bar, 40 MPa	ISO 7/1 JIS B0203
R1/4 (PT) R1/2 (PT)	15 000 psi, 1000 bar, 100 MPa	

G1/8B (EN), G1/4B (EN), and G1/2B (EN) are for use with Swagelok **RG** adapter fittings.
G1/8B (PF), G1/4B (PF), and G1/2B (PF) are for use with Swagelok **RJ** adapter fittings.

Model Selection Guide

Dial Range	Dial Size mm (in.)	Accuracy	Adjustable Pointer	Solid Front	Liquid Fillable	Configurations①			Model
						LBM	CBM	LM	
Positive pressures: 0 to 10 psi, 400 mbar, or 50 kPa	63 (2 1/2)	± 1.5 % of span ASME B40.100 Grade B, EN 837-3 Class 1.6, JIS B7505 Class 1.6	—	—	—	—	—	Yes	L
	100 (4)		—	—	—	Yes	—	Yes	
Compound pressures: Vacuum to 200 psi, 9 bar, or 1.5 MPa Positive pressures: 0 to 10 000 psi, 600 bar, or 60 MPa	40 (1 1/2)	± 2.5 % of span ASME B40.100 Grade C, EN 837-1 Class 2.5, JIS B7505 Class 2.5	—	—	—	—	Yes	Yes	M
	50 (2)								
Compound pressures: Vacuum to 200 psi, 9 bar, or 1.5 MPa Positive pressures: 0 to 15 000 psi, 1000 bar, or 100 MPa	63 (2 1/2)	± 1.5 % of span ASME B40.100 Grade B, EN 837-1 Class 1.6, JIS B7505 Class 1.6	Yes	Yes	Yes②	Yes	—	Yes	S
			Yes	—	Yes	—	Yes	Yes	B
			—	—	Yes	—	Yes	Yes	C
	100 (4)	± 1 % of span ASME B40.100 Grade 1A, EN 837-1 Class 1.0 JIS B7505 Class 1.0	Yes	Yes	Yes②	Yes	—	Yes	S
			Yes	—	Yes	Yes	—	Yes	B
			—	—	Yes	Yes	—	Yes	C
	160 (6)		Yes	—	Yes	Yes	—	Yes	B
Compound pressures: Vacuum to 400 psi, 9 bar, 1.5 MPa, or 2500 kPa	115 (4 1/2)	± 0.5 % of span ASME B40.100 Grade 2A	Yes	Yes	Yes	Yes	—	Yes	P
Positive pressures: 0 to 15 000 psi, 1000 bar, 100 MPa, or 100 000 kPa	160 (6)		Yes	Yes	Yes	Yes	—	Yes	P

① Configurations: **LBM** = lower-back mount
CBM = center-back mount
LM = lower mount.

② Liquid-fillable model available in lower mount configuration only.

⚠ **Glycerin- and silicone-filled gauges cannot be used where strong oxidizing agents are present.**

Swagelok

B Model: General-Purpose Stainless Steel Gauge

Features

- 63, 100, and 160 mm (2 1/2, 4, and 6 in.) dial sizes are available.
- Bayonet ring allows easy access to pointer.
- Lens is constructed of polycarbonate for additional protection.
- Design is liquid fillable.

Technical Data

Dial Ranges

Compound Gauges

- Vacuum to 0 psi through vacuum to 200 psi
- Vacuum to 0 bar through vacuum to 9 bar
- Vacuum to 0 MPa through vacuum to 1.5 MPa

Positive-Pressure Gauges

- 0 to 15 psi through 0 to 15 000 psi
- 0 to 1 bar through 0 to 1000 bar
- 0 to 0.1 MPa through 0 to 100 MPa

Accuracy

- 63 mm (2 1/2 in.): ± 1.5 % of span (ASME B40.100 Grade B, EN 837-1 Class 1.6, JIS B7505 Class 1.6)
- 100 and 160 mm (4 and 6 in.): ± 1.0 % of span (ASME B40.100 Grade 1A, EN 837-1 Class 1.0, JIS B7505 Class 1.0)

Configurations

- 63 mm (2 1/2 in.): center-back and lower mount
- 100 and 160 mm (4 and 6 in.): lower-back and lower mount

End Connections

63 mm (2 1/2 in.) Dial Size

- 1/4 and 3/8 in.; 6 and 10 mm Swagelok tube adapter
- 1/4 in. male NPT
- G1/4B (EN)
- G1/4B (PF)
- R1/4 (PT)

100 mm (4 in.) Dial Size

- 1/2 in. and 12 mm Swagelok tube adapter
- 1/4 and 1/2 in. male NPT
- G1/2B (EN)
- G1/2B (PF)
- R1/2 (PT)

160 mm (6 in.) Dial Size

- 1/2 in. male NPT
- G1/2B (EN)
- G1/2B (PF)
- R1/2 (PT)

Weather Protection

- Weather-tight (NEMA 4X/IP65)

Operating Temperature

Ambient

- Unfilled: –40 to 140°F (–40 to 60°C)
- Glycerin-filled: –4 to 140°F (–20 to 60°C)
- Low-temperature glycerin-filled: –29-to 140°F (–34 to 60°C)
- Silicone-filled: –40 to 140°F (–40 to 60°C)

Media

- Unfilled: 392°F (200°C) maximum
- Liquid-filled: 212°F (100°C) maximum

Temperature Error

± 0.4 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

Component	Material
End connection	*316 SS*
Bourdon tube	
Case	304 SS
Fill fluid (if ordered)	Glycerin, low-temperature glycerin, or silicone
Movement	Stainless steel
Lens	Polycarbonate
Lens gasket	Buna N
Dial	Aluminum
Pointer	

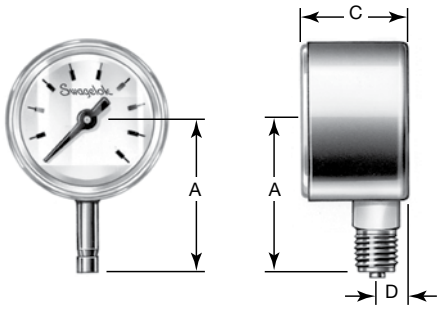
Wetted components listed in *italics*.

See page 21 for options and accessories for field installation.

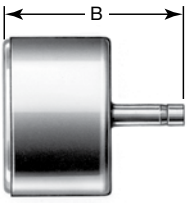
Dimensions

Dimensions are for reference only and are subject to change.

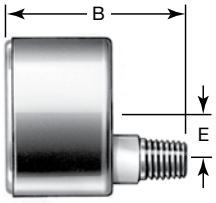
Lower Mount



Center-Back Mount



Lower-Back Mount



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)				
	Size	Type	A	B	C	D	E
63 (2 1/2)	1/4 in.	Swagelok tube adapter	2.26 (57.3)	2.39 (60.8)	1.30 (33.0)	0.39 (10.0)	—
		Male NPT	2.09 (53.0)	2.24 (57.0)			
		G1/4B (EN)					
		G1/4B (PF)					
		R1/4 (PT)					
	3/8 in.	Swagelok tube adapter	2.31 (58.8)	2.45 (62.3)			
	6 mm		2.26 (57.3)	2.39 (60.8)			
	10 mm		2.31 (58.8)	2.45 (62.3)			
100 (4)	1/4 in.	Male NPT	3.15 (80.0)	3.27 (83.0)	1.97 (50.0)	0.63 (16.0)	1.18 (30.0)
	1/2 in.	Swagelok tube adapter	3.60 (91.4)	3.44 (87.4)			
		Male NPT	3.43 (87.0)	3.27 (83.0)			
		G1/2B (EN)					
		G1/2B (PF)					
		R1/2 (PT)					
	12 mm	Swagelok tube adapter	3.60 (91.4)	3.44 (87.4)			
160 (6)	1/2 in.	Male NPT	4.65 (118)	3.27 (83.0)①	1.97 (50.0)①		1.97 (50.0)
		G1/2B (EN)					
		G1/2B (PF)					
		R1/2 (PT)					

① **B** is 3.90 in. (99.0 mm) and **C** is 2.60 in. (66.0 mm) for gauges with lower-back mount and pressure ratings of 1500 psi, 10 MPa, 100 bar or higher.

Ordering Information

Build a B model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - **63B** - **PG100** - **L** **AQ** **X** - **ABJ**

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
63B = 63 mm (2 1/2 in.) dial
100B = 100 mm (4 in.) dial
160B = 160 mm (6 in.) dial

Dial Range
See page 18 and 19.

Process Connection Location
L = Lower mount (all dial sizes)
C = Center-back mount (63 mm [2 1/2 in.] dial size only)
B = Lower-back mount (100 and 160 mm [4 and 6 in.] dial sizes only)

Fitting Size and Type

63 mm (2 1/2 in.) Dial Size
AQ = 1/4 in. Swagelok tube adapter
BG = 3/8 in. Swagelok tube adapter
AS = 6 mm Swagelok tube adapter
BH = 10 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AV = G1/4B (EN)
AX = G1/4B (PF)
BD = R1/4 (PT)

100 mm (4 in.) Dial Size
AR = 1/2 in. Swagelok tube adapter
AT = 12 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AP = 1/2 in. male NPT
AW = G1/2B (EN)
AZ = G1/2B (PF)
BE = R1/2 (PT)

160 mm (6 in.) Dial Size
AP = 1/2 in. male NPT
AW = G1/2B (EN)
AZ = G1/2B (PF)
BE = R1/2 (PT)

Liquid Fill Fluid (see page 21)
X = Unfilled
1 = Glycerin
2 = Low-temperature glycerin
3 = Silicone

Options (see page 21)
A = ASME B40.100 level IV cleaning①
B = Certificate of calibration
E = Material certification
F = Panel-mount clamp②
G = Front flange②
H = Rear flange
I = Maximum indicating pointer③
J = Adjustable pointer④
K = Safety glass
N = Orifice (0.023 in. [0.58 mm])

① Available for unfilled gauges only.
② Not available in lower mount gauge configuration. Not available with maximum indicator pointer.
③ Not available with adjustable pointer; not available with dial range maximums lower than 54 psi (3.7 bar, 0.37 MPa). Not available with front flange.
④ Not available with maximum indicating pointer.

C Model: General-Purpose Stainless Steel Gauge

Features

- 63 and 100 mm (2 1/2 and 4 in.) dial sizes are available.
- Crimped ring provides a permanent seal of gauge case to lens.
- Lens is constructed of clear polycarbonate.
- Design is liquid fillable.

Technical Data

Dial Ranges

Compound Gauges

- Vacuum to 0 psi through vacuum to 200 psi
- Vacuum to 0 bar through vacuum to 9 bar
- Vacuum to 0 MPa through vacuum to 1.5 MPa

Positive-Pressure Gauges

- 0 to 15 psi through 0 to 15 000 psi
- 0 to 1 bar through 0 to 1000 bar
- 0 to 0.1 MPa through 0 to 100 MPa

Accuracy

- 63 mm (2 1/2 in.): ± 1.5 % of span (ASME B40.100 Grade B, EN 837-1 Class 1.6, JIS B7505 Class 1.6)
- 100 mm (4 in.): ± 1.0 % of span (ASME B40.100 Grade 1A, EN 837-1 Class 1.0, JIS B7505 Class 1.0)

Configurations

- 63 mm (2 1/2 in.): center-back and lower mount
- 100 mm (4 in.): lower-back and lower mount

End Connections

63 mm (2 1/2 in.) Dial Size

- 1/4 and 3/8 in.; 6 and 10 mm Swagelok tube adapter
- 1/4 in. male NPT

100 mm (4 in.) Dial Size

- 1/2 in. and 12 mm Swagelok tube adapter
- 1/4 and 1/2 in. male NPT

Weather Protection

- Weather-tight (NEMA 4X/IP65)

Operating Temperature

Ambient

- Unfilled: –40 to 140°F (–40 to 60°C)
- Glycerin-filled: –4 to 140°F (–20 to 60°C)
- Low-temperature glycerin-filled: –29-to 140°F (–34 to 60°C)
- Silicone-filled: –40 to 140°F (–40 to 60°C)

Media

212°F (100°C) maximum

Temperature Error

± 0.4 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

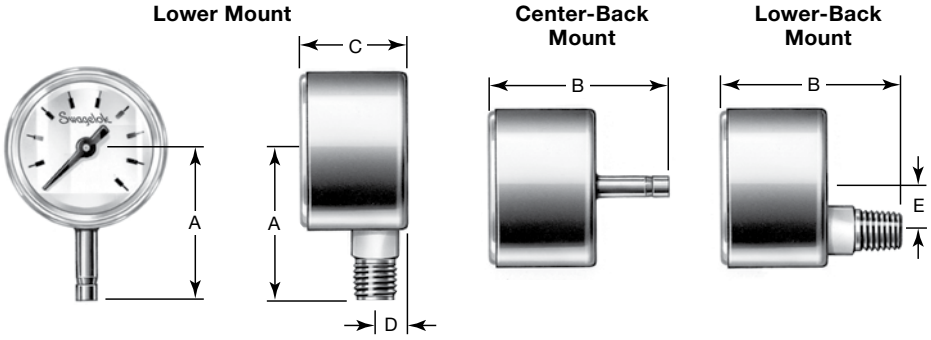
Component	Material
End connection	*316 SS*
Bourdon tube	
Case	304 SS
Fill fluid (if ordered)	Glycerin, low-temperature glycerin, or silicone
Movement	Stainless steel
Lens	Polycarbonate
Lens gasket	Buna N
Dial	Aluminum
Pointer	

Wetted components listed in *italics.*

See page 21 for options and accessories for field installation.

Dimensions

Dimensions are for reference only and are subject to change.



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)				
	Size	Type	A	B	C	D	E
63 (2 1/2)	1/4 in.	Swagelok tube adapter	2.22 (56.3)	2.37 (60.3)	1.30 (33.0)①	0.39 (10.0)	—
		Male NPT	2.09 (53.0)	2.24 (57.0)			
	3/8 in.	Swagelok tube adapter	2.28 (57.8)	2.43 (61.8)			
	6 mm		2.22 (56.3)	2.37 (60.3)			
	10 mm		2.28 (57.8)	2.43 (61.8)			
100 (4)	1/4 in.	Male NPT	3.15 (80.0)	3.27 (83.0)	1.97 (50.0)	0.63 (16.0)	1.18 (30.0)
	1/2 in.	Swagelok tube adapter	3.64 (92.4)	3.48 (88.4)			
		Male NPT	3.43 (87.0)	3.27 (83.0)			
	12 mm	Swagelok tube adapter	3.64 (92.4)	3.48 (88.4)			

① 1.10 (28.0) for center-back mount.

Ordering Information

Build a C model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - **63C** - **PG100** - **L** **AQ** **X** - **ABH**

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
63C = 63 mm (2 1/2 in.) dial
100C = 100 mm (4 in.) dial

Dial Range
See page 18 and 19.

Process Connection Location
L = Lower mount (all dial sizes)
C = Center-back mount (63 mm [2 1/2 in.] dial size only)
B = Lower-back mount (100 mm [4 in.] dial size only)

Fitting Size and Type

63 mm (2 1/2 in.) Dial Size
AQ = 1/4 in. Swagelok tube adapter
BG = 3/8 in. Swagelok tube adapter
AS = 6 mm Swagelok tube adapter
BH = 10 mm Swagelok tube adapter
AO = 1/4 in. male NPT

100 mm (4 in.) Dial Size
AR = 1/2 in. Swagelok tube adapter
AT = 12 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AP = 1/2 in. male NPT

Liquid Fill Fluid (see page 21)
X = Unfilled
1 = Glycerin
2 = Low-temperature glycerin
3 = Silicone

Options (see page 21)
A = ASME B40.100 level IV cleaning①
B = Certificate of calibration
E = Material certification
F = Panel-mount clamp②
G = Front flange②
H = Rear flange
I = Maximum indicating pointer③
N = Orifice (0.023 in. [0.58 mm])
9320 = White
9321 = Orange
9322 = Green
9323 = Glow

① Available for unfilled gauges only.
② Not available in lower mount gauge configuration.
③ Not available with dial range maximums lower than 54 psi (3.7 bar, 0.37 MPa).

S Model: Solid-Front Stainless Steel Safety Gauge

Features

- 63 and 100 mm (2 1/2 and 4 in.) dial sizes are available.
- Lower mount configuration is liquid fillable.
- Solid front and blowout back for severe service.
- Design meets safety requirements of ASME B40.100 and EN 837-1.

Technical Data

Dial Ranges

Compound Gauges

- Vacuum to 0 psi through vacuum to 200 psi
- Vacuum to 0 bar through vacuum to 9 bar
- Vacuum to 0 MPa through vacuum to 1.5 MPa

Positive-Pressure Gauges

- 0 to 15 psi through 0 to 15 000 psi
- 0 to 1 bar through 0 to 1000 bar
- 0 to 0.1 MPa through 0 to 100 MPa

Accuracy

- 63 mm (2 1/2 in.): ± 1.5 % of span (ASME B40.100 Grade B, EN 837-1 Class 1.6, JIS B7505 Class 1.6)
- 100 mm (4 in.): ± 1.0 % of span (ASME B40.100 Grade 1A, EN 837-1 Class 1.0, JIS B7505 Class 1.0)

Configurations

Lower-back and lower mount

End Connections

63 mm (2 1/2 in.) Dial Size

- 1/4 and 3/8 in.; 6 and 10 mm Swagelok tube adapter
- 1/4 in. male NPT
- G1/4B (EN)
- G1/4B (PF)
- R1/4 (PT)

100 mm (4 in.) Dial Size

- 1/2 in. and 12 mm Swagelok tube adapter
- 1/4 and 1/2 in. male NPT
- G1/2B (EN)
- G1/2B (PF)
- R1/2 (PT)

Weather Protection

- Weather-tight (NEMA 4X/IP65)

Operating Temperature

Ambient

- Unfilled: –40 to 140°F (–40 to 60°C)
- Glycerin-filled: –4 to 140°F (–20 to 60°C)
- Low-temperature glycerin-filled: –29-to 140°F (–34 to 60°C)
- Silicone-filled: –40 to 140°F (–40 to 60°C)

Media

- Unfilled: 392°F (200°C) maximum
- Liquid-filled: 212°F (100°C) maximum

Temperature Error

± 0.4 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

Component	Material
End connection	*316 SS*
Bourdon tube	
Case	304 SS
Fill fluid (if ordered)	Glycerin, low-temperature glycerin, or silicone
Movement	Stainless steel
Lens	Polycarbonate
Lens gasket	Buna N
Dial	Aluminum
Pointer	

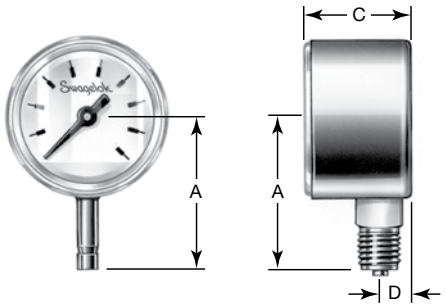
Wetted components listed in *italics.*

See page 21 for options and accessories for field installation.

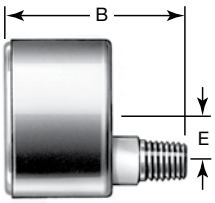
Dimensions

Dimensions are for reference only and are subject to change.

Lower Mount



Lower-Back Mount



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)				
	Size	Type	A	B	C	D	E
63 (2 1/2)	1/4 in.	Swagelok tube adapter	2.26 (57.3)	2.59 (65.8)	1.65 (42.0)	0.71 (18.0)	0.71 (18.0)
		Male NPT	2.13 (54.0)	2.48 (63.0)			
		G1/4B (EN)					
		G1/4B (PF)					
		R1/4 (PT)					
	3/8 in.	Swagelok tube adapter	2.31 (58.8)	2.65 (67.3)			
	6 mm		2.26 (57.3)	2.59 (65.8)			
	10 mm		2.31 (58.8)	2.65 (67.3)			
100 (4)	1/4 in.	Male NPT	3.15 (80.0)	3.39 (86.0)	2.28 (58.0)	0.94 (24.0)	1.18 (30.0)
	1/2 in.	Swagelok tube adapter	3.44 (87.4)	3.83 (97.4)			
		Male NPT	3.43 (87.0)	3.66 (93.0)			
		G1/2B (EN)					
		G1/2B (PF)					
		R1/2 (PT)					
	12 mm	Swagelok tube adapter	3.44 (87.4)	3.83 (97.4)			

Ordering Information

Build a S model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - **63S** - **PG100** - **L** **AQ** **X** - **ABJ**

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
63S = 63 mm (2 1/2 in.) dial
100S = 100 mm (4 in.) dial

Dial Range
See page 18 and 19.

Process Connection Location
L = Lower mount
B = Lower-back mount

Fitting Size and Type

63 mm (2 1/2 in.) Dial Size
AQ = 1/4 in. Swagelok tube adapter
BG = 3/8 in. Swagelok tube adapter
AS = 6 mm Swagelok tube adapter
BH = 10 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AV = G1/4B (EN)
AX = G1/4B (PF)
BD = R1/4 (PT)

100 mm (4 in.) Dial Size
AR = 1/2 in. Swagelok tube adapter
AT = 12 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AP = 1/2 in. male NPT
AW = G1/2B (EN)
AZ = G1/2B (PF)
BE = R1/2 (PT)

Liquid Fill Fluid (see page 21)
(Lower mount configuration only)
X = Unfilled
1 = Glycerin
2 = Low-temperature glycerin
3 = Silicone

Options (see page 21)
A = ASME B40.100 level IV cleaning①
B = Certificate of calibration
E = Material certification
G = Front flange②
I = Maximum indicating pointer③
J = Adjustable pointer④
K = Safety glass
N = Orifice (0.023 in. [0.58 mm])

① Available for unfilled gauges only.
② Not available in lower mount gauge configuration.
③ Not available with adjustable pointer; not available with dial range maximums lower than 54 psi (3.7 bar, 0.37 MPa).
④ Not available with maximum indicating pointer.

M Model: Stainless Steel Miniature Gauge

Features

- 40 and 50 mm (1 1/2 and 2 in.) dial sizes are available.
- Miniature size allows placement in compact spaces.
- Snap-in lens saves space when compared to twist-on lens.

Technical Data

Dial Ranges

Compound Gauges

- Vacuum to 0 psi through vacuum to 200 psi
- Vacuum to 0 bar through vacuum to 9 bar
- Vacuum to 0 MPa through vacuum to 1.5 MPa

Positive-Pressure Gauges

- 0 to 15 psi through 0 to 10 000 psi
- 0 to 1 bar through 0 to 600 bar
- 0 to 0.1 MPa through 0 to 60 MPa

Accuracy

± 2.5 % of span (ASME B40.100 Grade C, EN 837-1 Class 2.5, JIS B7505 Class 2.5)

Configurations

Center-back and lower mount

End Connections

- 1/8 in. and 1/4 in. male NPT
- G1/8B (EN) and G1/4B (EN)
- R1/8 (PT) and R1/4 (PT)
- 1/4 and 3/8 in.; 6 and 10 mm Swagelok tube adapter
- G1/4B (PF)

Weather Protection

- Weather-tight (NEMA 3/IP54)

Operating Temperature

Ambient

–40 to 140°F (–40 to 60°C)

Media

212°F (100°C) maximum

Temperature Error

± 0.4 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

Component	Material
End connection	*316 SS titanium alloy*
Bourdon tube	
Case	304 SS
Movement	Stainless steel
Lens	Polycarbonate
Dial	Aluminum
Pointer	

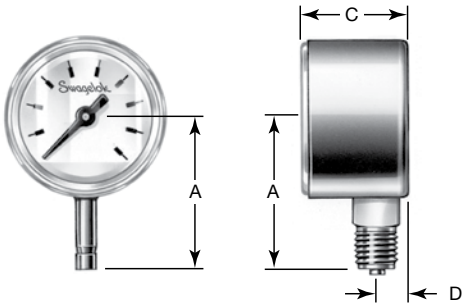
Wetted components listed in *italics.*

See page 21 for options and accessories for field installation.

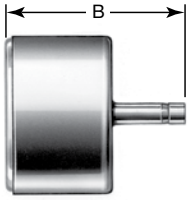
Dimensions

Dimensions are for reference only and are subject to change.

Lower Mount



Center-Back Mount



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)			
	Size	Type	A	B	C	D
40 (1 1/2)	1/8 in.	Male NPT	1.42 (36.1)	1.95 (49.5)	0.98 (25.0)	0.35 (9.0)
		G1/8B (EN)				
		R1/8 (PT)				
	1/4 in.	Swagelok tube adapter	1.67 (42.3)	2.20 (55.8)①		
		Male NPT	1.54 (39.0)	2.07 (52.6)		
		G1/4B (EN)				
		G1/4B (PF)				
		R1/4 (PT)				
	3/8 in.	Swagelok tube adapter	1.73 (43.9)	2.26 (57.4)		
	6 mm		1.67 (42.3)	2.20 (55.8)①		
	10 mm		1.73 (43.9)	2.26 (57.4)		
50 (2)	1/8 in.	Male NPT	1.73 (43.9)	1.99 (50.5)	1.02 (25.9)	0.31 (7.9)
		G1/8B (EN)				
		R1/8 (PT)				
	1/4 in.	Swagelok tube adapter	1.98 (50.3)	2.24 (56.8)		
		Male NPT	1.85 (47.0)	2.11 (53.6)		
		G1/4B (EN)	1.85 (47.0)	2.11 (53.6)		
		G1/4B (PF)	1.97 (50.0)	2.22 (56.4)		
		R1/4 (PT)	1.85 (47.0)	2.11 (53.6)		
	3/8 in.	Swagelok tube adapter	2.04 (51.8)	2.30 (58.3)		
	6 mm		1.98 (50.3)	2.24 (56.8)		
	10 mm		2.04 (51.8)	2.30 (58.3)		

① 2.22 in. (56.3 mm) for gauges with front flange.

Ordering Information

Build an M model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - **50M** - **PG100** - **L** **AQ** X - **ABE**

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
40M = 40 mm (1 1/2 in.) dial
50M = 50 mm (2 in.) dial

Dial Range
See page 18 and 19.

Process Connection Location
C = Center-back mount
L = Lower mount

Fitting Size and Type
AQ = 1/4 in. Swagelok tube adapter
BG = 3/8 in. Swagelok tube adapter
AS = 6 mm Swagelok tube adapter
BH = 10 mm Swagelok tube adapter
AN = 1/8 in. male NPT
AO = 1/4 in. male NPT
AU = G1/8B (EN)
AV = G1/4B (EN)
AX = G1/4B (PF)
BC = R1/8 (PT)
BD = R1/4 (PT)

Liquid Fill Fluid—Not Available
Unfilled

Options (see page 21)
A = ASME B40.100 level IV cleaning
B = Certificate of calibration
E = Material certification
F = Panel-mount clamp①
G = Front flange①
L = Glass lens with friction ring
N = Orifice (0.023 in. [0.58 mm])

① Available factory installed only. Not available in lower mount configuration.

L Model: Stainless Steel Low-Pressure Gauge

Features

- 63 and 100 mm (2 1/2 and 4 in.) dial sizes are available.
- Diaphragm capsule design offers low-pressure measurement capability.
- A zero adjustment screw is on the dial.
- Lens is constructed of polycarbonate.

Technical Data

Dial Ranges

Positive-Pressure Gauges

- 0 to 15 in. H_2O through 0 to 200 in. H_2O
- 0 to 5 psi through 0 to 10 psi
- 0 to 40 mbar through 0 to 400 mbar
- 0 to 4 kPa through 0 to 50 kPa

Accuracy

± 1.5 % of span (ASME B40.100 Grade B, EN 837-3 Class 1.6, JIS B7505 Class 1.6)

Configurations

- 63 mm (2 1/2 in.): lower mount
- 100 mm (4 in.): lower-back and lower mount

End Connections

63 mm (2 1/2 in.) Dial Size

- 1/4 and 3/8 in.; 6 and 10 mm Swagelok tube adapter
- 1/4 in. male NPT
- G1/4B (EN)
- G1/4B (PF)
- R1/4 (PT)

100 mm (4 in.) Dial Size

- 1/2 in. and 12 mm Swagelok tube adapter
- 1/4 and 1/2 in. male NPT
- G1/2B (EN)
- G1/2B (PF)
- R1/2 (PT)

Weather Protection

- Weather-tight (NEMA 3/IP54)

Operating Temperature

Ambient

–40 to 140°F (–40 to 60°C)

Media

212°F (100°C) maximum

Temperature Error

± 0.6 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

Component	Material
End connection	*316 SS*
Diaphragm capsule	
Case	304 SS
Movement	Stainless steel
Lens	Polycarbonate
Dial	Aluminum
Pointer	

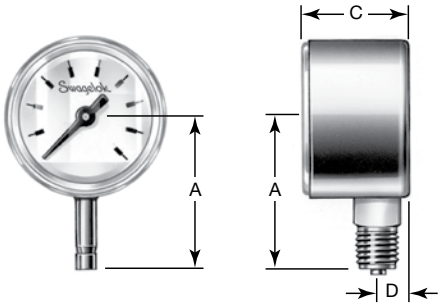
Wetted components listed in *italics*.

See page 21 for options and accessories for field installation.

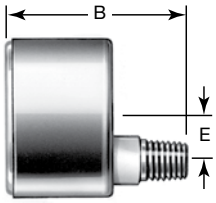
Dimensions

Dimensions are for reference only and are subject to change.

Lower Mount



Lower-Back Mount



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)				
	Size	Type	A	B	C	D	E
63 (2 1/2)	1/4 in.	Swagelok tube adapter	2.26 (57.3)	—	1.65 (42.0)	0.35 (9.0)	—
		Male NPT	2.05 (52.0)				
		G1/4B (EN)					
		G1/4B (PF)					
		R1/4 (PT)					
	3/8 in.	Swagelok tube adapter	2.31 (58.8)				
	6 mm		2.26 (57.3)				
	10 mm		2.31 (58.8)				
100 (4)	1/4 in.	Male NPT	3.15 (80.0)	3.27 (83.0)	2.28 (58.0)	0.63 (16.0)	1.18 (30.0)
	1/2 in.	Swagelok tube adapter	3.60 (91.4)	3.44 (87.4)			
		Male NPT	3.43 (87.0)	3.27 (83.0)			
		G1/2B (EN)					
		G1/2B (PF)					
		R1/2 (PT)					
	12 mm	Swagelok tube adapter	3.60 (91.4)	3.44 (87.4)			

Ordering Information

Build an L model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - **63L** - **IG30** - **L** **AQ** X - **ABH**

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
63L = 63 mm (2 1/2 in.) dial
100L = 100 mm (4 in.) dial

Dial Range
See page 18.

Process Connection Location
L = Lower mount (all dial sizes)
B = Lower-back mount (100 mm [4 in.] dial size only)

Fitting Size and Type

63 mm (2 1/2 in.) Dial Size
AQ = 1/4 in. Swagelok tube adapter
BG = 3/8 in. Swagelok tube adapter
AS = 6 mm Swagelok tube adapter
BH = 10 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AV = G1/4B (EN)
AX = G1/4B (PF)
BD = R1/4 (PT)

100 mm (4 in.) Dial Size
AR = 1/2 in. Swagelok tube adapter
AT = 12 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AP = 1/2 in. male NPT
AW = G1/2B (EN)
AZ = G1/2B (PF)
BE = R1/2 (PT)

Liquid Fill Fluid—Not Available
Unfilled

Options (see page 21)
A = ASME B40.100 level IV cleaning
B = Certificate of calibration
E = Material certification
F = Panel-mount clamp①②
G = Front flange①
H = Rear flange
I = Maximum indicating pointer②③
K = Safety glass
N = Orifice (0.023 in. [0.58 mm])

① Not available in lower mount gauge configuration.
② Available for 100 mm (4 in.) dial size only.
③ Not available with dial range maximums lower than 1.5 psi (103 mbar, 10.3 kPa, 41.5 in. H_2O).

P Model: Reinforced Thermoplastic Industrial Process Gauge

Features

- 115 and 160 mm (4 1/2 and 6 in.) dial sizes are available.
- Solid front and blowout back for severe service.
- Design meets safety requirements of ASME B40.100.
- Adjustable pointer is standard.
- Threaded cover ring allows easy access to pointer.
- Lens is constructed of clear acrylic plastic.
- Design is liquid fillable.

Technical Data

Dial Ranges

Compound Gauges

- Vacuum to 0 psi through vacuum to 400 psi
- Vacuum to 0 bar through vacuum to 9 bar
- Vacuum to 0 MPa through vacuum to 1.5 MPa
- Vacuum to 0 kPa through vacuum to 2500 kPa

Positive-Pressure Gauges

- 0 to 15 psi through 0 to 15 000 psi
- 0 to 1 bar through 0 to 1000 bar
- 0 to 0.1 MPa through 0 to 100 MPa
- 0 to 60 kPa through 0 to 100 000 kPa

Accuracy

± 0.5 % of span (ASME B40.100 Grade 2A)

Configurations

Lower-back mount and lower mount

End Connections

115 mm (4 1/2 in.) Dial Size

- 1/2 in. Swagelok tube adapter
- 1/4 and 1/2 in. male NPT

160 mm (6 in.) Dial Size

- 1/2 in. male NPT

Weather Protection

- Weather resistant (NEMA 3/IP54)—dry case
- Weather-tight (NEMA 4X/IP65)—liquid-fillable case

Operating Temperature

Ambient

- Unfilled: –40 to 140°F (–40 to 60°C)
- Glycerin-filled: –4 to 140°F (–20 to 60°C)
- Silicone-filled: –40 to 140°F (–40 to 60°C)

Media

- 212°F (100°C) maximum
- Maximum media temperature for the brass process gauge is 140°F (60°C)

Temperature Error

± 0.4 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

Component	Material
End connection	*316 SS*①
Bourdon tube	
Case	Black glass-reinforced thermoplastic
Fill fluid (if ordered)	Glycerin, low-temperature glycerin, or silicone
Movement	Stainless steel
Lens	Acrylic
Lens gasket	Buna N
Dial	Aluminum
Pointer	

Wetted components listed in *italics*.

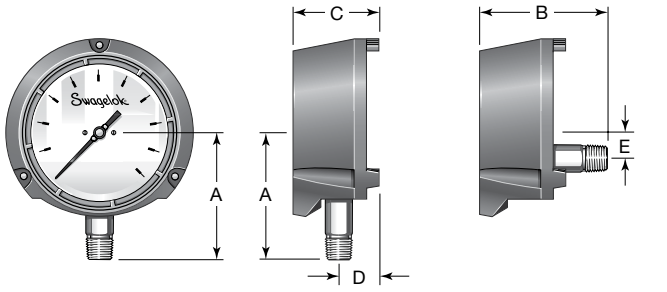
① 115 mm (4 1/2 in.) P model gauges are available in alloy 400 materials; lower mount gauges are also available in brass.

See page 21 for options and accessories for field installation.

Dimensions

Dimensions are for reference only and are subject to change.

Lower Mount **Lower-Back Mount**



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)				
	Size	Type	A	B	C	D	E
115 (4 1/2)	1/2 in.	Swagelok tube adapter	4.27 (108)	4.95 (126)	3.31 (84.0)	1.57 (40.0)	1.12 (28.5)
	1/4 in.	Male NPT	3.82 (97.0)	4.50 (114)			
	1/2 in.		4.06 (103)	4.74 (120)			
160 (6)	1/2 in.		4.82 (123)	4.86 (123)	3.46 (88.0)		

Ordering Information

Build a P model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - **115P** - **OG160** - **L** **AR** **X** - **AB** J

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
115P = 115 mm (4 1/2 in.) dial
160P = 160 mm (6 in.) dial

Dial Range
See page 18, 19, and 20.

Process Connection Location
L = Lower mount
B = Lower-back mount

Fitting Size and Type
115 mm (4 1/2 in.) Dial Size
AR = 1/2 in. Swagelok tube adapter
AO = 1/4 in. male NPT
AP = 1/2 in. male NPT
BT = 1/2 in. long Swagelok tube adapter①
① For use with female Swagelok end connections.

160 mm (6 in.) Dial Size
AP = 1/2 in. male NPT
AR = 1/2 in. Swagelok tube adapter

Liquid Fill Fluid (see page 21)
X = Unfilled
1 = Glycerin
2 = Low-temperature glycerin
3 = Silicone

Pointer
Standard adjustable pointer

Options (see page 21)
A = ASME B40.100 level IV cleaning①
B = Certificate of calibration
F = Panel-mount clamp②③
I = Maximum indicating pointer③
K = Safety glass④
M = Liquid-fill membrane⑤
N = Orifice (0.023 in. [0.58 mm])
Q = Brass (wetted components)⑥
R = Alloy 400 (wetted components)③
S = Mark pointer③
9320 = White
9321 = Orange
9322 = Green
9323 = Glow

① Available for unfilled gauges only.
② Not available in lower mount gauge configuration.
③ Available on 115 mm (4 1/2 in.) dial size only.
④ Not available on gauges with maximum indicating or mark pointer.
⑤ Required for lower-back mount configuration with liquid fill. Standard on lower mount configurations.
⑥ Available on 115 mm (4 1/2 in.) dial size with lower mount only.

A Model: Refrigeration Ammonia Gauge

Features

- Refrigerant ammonia pressure measurement and temperature with ammonia refrigerant scales on dial.
- 63 and 100 mm (2 1/2 and 4 in.) dial sizes are available.
- Crimped ring provides a permanent seal of gauge case to lens.
- Lens is constructed of clear polycarbonate.
- Design is liquid fillable.

Technical Data

Dial Ranges

Compound Gauges

- 30 in. Hg / 0 to 150 psi (89°F)
- 30 in. Hg / 0 to 300 psi (126°F)

Positive-Pressure Gauges

- 0 to 150 psi (89°F)
- 0 to 300 psi (126°F)

Accuracy

- 63 mm (2 1/2 in.): ± 1.5 % of span (ASME B40.100 Grade B
- 100 mm (4 in.): ± 1.0 % of span (ASME B40.100 Grade 1A

Configurations

- 63 mm (2 1/2 in.): center-back and lower mount
- 100 mm (4 in.): lower-back and lower mount

End Connections

63 mm (2 1/2 in.) Dial Size

- 1/4 and 3/8 in.; 6 and 10 mm Swagelok tube adapter
- 1/4 in. male NPT

100 mm (4 in.) Dial Size

- 1/2 in. and 12 mm Swagelok tube adapter
- 1/4 and 1/2 in. male NPT

Weather Protection

- Weather-tight (NEMA 4X/IP65)

Operating Temperature

Ambient

- Unfilled: –40 to 140°F (–40 to 60°C)
- Glycerin-filled: –4 to 140°F (–20 to 60°C)
- Low-temperature glycerin-filled: –29-to 140°F (–34 to 60°C)
- Silicone-filled: –40 to 140°F (–40 to 60°C)

Media

212°F (100°C) maximum

Temperature Error

± 0.4 % for every 18°F (10°C) temperature change from 68°F (20°C)

Materials of Construction

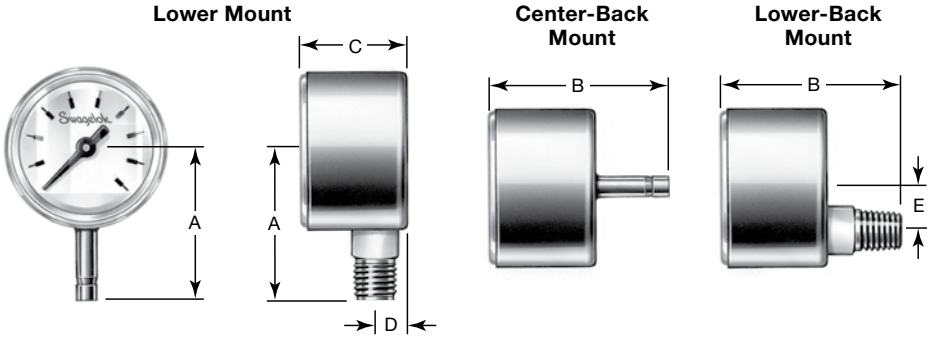
Component	Material
End connection	*316 SS*
Bourdon tube	
Case	304 SS
Fill fluid (if ordered)	Glycerin, low-temperature glycerin, or silicone
Movement	Stainless steel
Lens	Polycarbonate
Lens gasket	Buna N
Dial	Aluminum
Pointer	

Wetted components listed in *italics.*

See page 21 for options and accessories for field installation.

Dimensions

Dimensions are for reference only and are subject to change.



Dial Size mm (in.)	End Connection		Dimensions, in. (mm)				
	Size	Type	A	B	C	D	E
63 (2 1/2)	1/4 in.	Swagelok tube adapter	2.22 (56.3)	2.37 (60.3)	1.30 (33.0)①	0.39 (10.0)	—
		Male NPT	2.09 (53.0)	2.24 (57.0)			
	3/8 in.	Swagelok tube adapter	2.28 (57.8)	2.43 (61.8)			
	6 mm		2.22 (56.3)	2.37 (60.3)			
	10 mm		2.28 (57.8)	2.43 (61.8)			
100 (4)	1/4 in.	Male NPT	3.15 (80.0)	3.27 (83.0)	1.97 (50.0)	0.63 (16.0)	1.18 (30.0)
	1/2 in.	Swagelok tube adapter	3.64 (92.4)	3.48 (88.4)			
		Male NPT	3.43 (87.0)	3.27 (83.0)			
	12 mm	Swagelok tube adapter	3.64 (92.4)	3.48 (88.4)			

① 1.10 (28.0) for center-back mount.

Ordering Information

Build a A model gauge ordering number by combining the designators as shown below. **List option designators *alphabetically.***

PGI - 63A - NG150 - L AQ X - BH

Product Function and Type
Pressure gauge, industrial

Dial Size and Model
63A = 63 mm (2 1/2 in.) dial
100A = 100 mm (4 in.) dial

Dial Range
See page 18 and 19.

Process Connection Location
L = Lower mount (all dial sizes)
C = Center-back mount (63 mm [2 1/2 in.] dial size only)
B = Lower-back mount (100 mm [4 in.] dial size only)

Fitting Size and Type

63 mm (2 1/2 in.) Dial Size
AQ = 1/4 in. Swagelok tube adapter
BG = 3/8 in. Swagelok tube adapter
AS = 6 mm Swagelok tube adapter
BH = 10 mm Swagelok tube adapter
AO = 1/4 in. male NPT

100 mm (4 in.) Dial Size
AR = 1/2 in. Swagelok tube adapter
AT = 12 mm Swagelok tube adapter
AO = 1/4 in. male NPT
AP = 1/2 in. male NPT

Liquid Fill Fluid (see page 21)
X = Unfilled
1 = Glycerin
2 = Low-temperature glycerin
3 = Silicone

Options (see page 21)
B = Certificate of calibration
E = Material certification
F = Panel-mount clamp①
G = Front flange①
H = Rear flange
I = Maximum indicating pointer
N = Orifice (0.023 in. [0.58 mm])

① Not available in lower mount gauge configuration.

Dial Range Designators

The selected dial range should be approximately two times the system working pressure, and the system working pressure should be in the middle half (25 to 75 %) of the dial range. Contact your authorized Swagelok sales and service representative if the system working pressure will exceed 75 % of the dial range.

Maximum pressure is limited by the end connection and materials of construction of wetted components.

Not all dial ranges and end connections are available on all models.

L Model

Dial Range, psi (primary scale: psi; secondary scale: bar)		
Minimum	**Maximum**	**Designator**
0	5	PG5
	10	PG10

L Model

Dial Range, kPa (primary scale: kPa; secondary scale mm H_2O)		
Minimum	**Maximum**	**Designator**
0	4	RG4
	5	RG5
	7	RG7
	10	RG10
	15	RG15
	20	RG20
	50	RG50

L Model

Dial Range, kPa (primary scale: kPa; no secondary scale)		
Minimum	**Maximum**	**Designator**
0	4	JG4
	5	JG5
	7	JG7
	10	JG10
	15	JG15
	20	JG20
	50	JG50

A Model

Dial Range, psi (primary scale: psi; secondary scale: temperature)		
Minimum	**Maximum**	**Designator**
0	150	NG150
0	300	NG300
–30	150	NC150
–30	300	NC300

L Model

Dial Range, in. H_2O (primary scale: in. H_2O; no secondary scale)		
Minimum	**Maximum**	**Designator**
0	15	IG15
	20	IG20
	30	IG30
	60	IG60
	100	IG100
	200	IG200

B, C, M, S, and P Models

Dial Range, bar (primary scale: bar; secondary scale: psi)		
Minimum	**Maximum**	**Designator**
Vacuum –1 bar	0	BC0
	0.6	BC.6
	1.5	BC1.5
	3	BC3
	9	BC9
0	1	BG1
	1.6	BG1.6
	2.5	BG2.5
	4	BG4
	6	BG6
	10	BG10
	16	BG16
	25	BG25
	40	BG40
	60	BG60
	100	BG100
	160	BG160
	250	BG250
	400	BG400
	600	BG600
	1000	BG1000

L Model

Dial Range, mbar (primary scale: mbar; no secondary scale)		
Minimum	**Maximum**	**Designator**
0	40	FG40
	60	FG60
	100	FG100
	160	FG160
	250	FG250
	400	FG400

B, C, M, S, and P Models

Dial Range, MPa (primary scale: MPa; secondary scale: kgf/cm²)		
Minimum	**Maximum**	**Designator**
Vacuum –0.1 MPa	0	LC0
	0.06	LC.06
	0.15	LC.15
	0.30	LC.3
	0.50	LC.5
	0.90	LC.9
	1.5	LC1.5
0	0.1	LG.1
	0.16	LG.16
	0.25	LG.25
	0.40	LG.4
	0.60	LG.6
	1	LG1
	1.6	LG1.6
	2.5	LG2.5
	4	LG4
	6	LG6
	10	LG10
	16	LG16
	25	LG25
	40	LG40
	60	LG60
	100	LG100

Dial Range Designators

The selected dial range should be approximately two times the system working pressure, and the system working pressure should be in the middle half (25 to 75 %) of the dial range. Contact your authorized Swagelok representative if the system working pressure will exceed 75 % of the dial range.

Maximum pressure is limited by the end connection and materials of construction of wetted components.

Not all dial ranges and end connections are available on all models.

B, C, M, S, and P Models

Dial Range, MPa (primary scale: MPa; no secondary scale)		
Minimum	**Maximum**	**Designator**
Vacuum –0.1 MPa	0	MC0
	0.06	MC.06
	0.15	MC.15
	0.30	MC.3
	0.50	MC.5
	0.90	MC.9
	1.5	MC1.5
0	0.1	MG.1
	0.16	MG.16
	0.25	MG.25
	0.40	MG.4
	0.60	MG.6
	1	MG1
	1.6	MG1.6
	2.5	MG2.5
	4	MG4
	6	MG6
	10	MG10
	16	MG16
	25	MG25
	40	MG40
	60	MG60
	100	MG100

B, C, M, S, and P Models

Dial Range, psi (primary scale: psi; secondary scale: kPa)		
Minimum	**Maximum**	**Designator**
Vacuum –30 in. Hg	0	OC0
	15	OC15
	30	OC30
	60	OC60
	100	OC100
	160	OC160
	200	OC200
0	15	OG15
	30	OG30
	60	OG60
	100	OG100
	160	OG160
	200	OG200
	300	OG300
	400	OG400
	500	OG500
	600	OG600
	800	OG800
	1 000	OG1000
	1 500	OG1500
	2 000	OG2000
	3 000	OG3000
	4 000	OG4000
	5 000	OG5000
	6 000	OG6000
	10 000	OG10K
	15 000	OG15K

B, C, M, S, and P Models

Dial Range, psi (primary scale: psi; secondary scale: bar)		
Minimum	**Maximum**	**Designator**
Vacuum –30 in. Hg	0	PC0
	15	PC15
	30	PC30
	60	PC60
	100	PC100
	160	PC160
	200	PC200
0	15	PG15
	30	PG30
	60	PG60
	100	PG100
	160	PG160
	200	PG200
	300	PG300
	400	PG400
	500	PG500
	600	PG600
	800	PG800
	1 000	PG1000
	1 500	PG1500
	2 000	PG2000
	3 000	PG3000
	4 000	PG4000
	5 000	PG5000
	6 000	PG6000
	10 000	PG10K
	15 000	PG15K

Dial Range Designators

The selected dial range should be approximately two times the system working pressure, and the system working pressure should be in the middle half (25 to 75 %) of the dial range. Contact your authorized Swagelok representative if the system working pressure will exceed 75 % of the dial range.

Maximum pressure is limited by the end connection and materials of construction of wetted components.

Not all dial ranges and end connections are available on all models.

P Model

Dial Range, KPa (primary scale: KPa; no secondary scale)		
Minimum	**Maximum**	**Designator**
Vacuum –100 KPa	0	JC0
	60	JC60
	150	JC150
	300	JC300
	500	JC500
	900	JC900
	1 500	JC1500
	2 500	JC2500
0	60	JG60
	100	JG100
	160	JG160
	250	JG250
	400	JG400
	600	JG600
	1 000	JG1000
	1 600	JG1600
	2 500	JG2500
	4 000	JG4000
	6 000	JG6000
	10 000	JG10K
	16 000	JG16K
	25 000	JG25K
	40 000	JG40K
	60 000	JG60K
	100 000	JG100K

P Model

Dial Range, psi (primary scale: psi; no secondary scale)		
Minimum	**Maximum**	**Designator**
Vacuum –30 in. Hg	0	NC0
	15	NC15
	30	NC30
	60	NC60
	100	NC100
	160	NC160
	200	NC200
	300	NC300
	400	NC400
0	15	NG15
	30	NG30
	60	NG60
	100	NG100
	160	NG160
	200	NG200
	300	NG300
	400	NG400
	500	NG500
	600	NG600
	800	NG800
	1 000	NG1000
	1 500	NG1500
	2 000	NG2000
	3 000	NG3000
	4 000	NG4000
	5 000	NG5000
	6 000	NG6000
	10 000	NG10K
	15 000	NG15K

P Model

Dial Range, psi (primary scale: psi; secondary scale kgf/cm^2)		
Minimum	**Maximum**	**Designator**
Vacuum –30 in. Hg	0	QC0
	15	QC15
	30	QC30
	60	QC60
	100	QC100
	160	QC160
	200	QC200
	300	QC300
	400	QC400
0	15	QG15
	30	QG30
	60	QG60
	100	QG100
	160	QG160
	200	QG200
	300	QG300
	400	QG400
	500	QG500
	600	QG600
	800	QG800
	1 000	QG1000
	1 500	QG1500
	2 000	QG2000
	3 000	QG3000
	4 000	QG4000
	5 000	QG5000
	6 000	QG6000
	10 000	QG10K
	15 000	QG15K

Options and Accessories

Factory-installed options are specified in gauge ordering numbers, as shown in **Ordering Information** for each gauge model. Some items are available only as factory-installed options; others are available for field installation, as described below.

Adjustable Pointers

Gauges are available with adjustable pointers that allow resetting to zero. Adjustable pointers are standard for all P model gauges and are optional for B and S model gauges.

Orifices

Orifices are used to restrict flow, reducing the immediate effect of pulsations and pressure spikes. All Swagelok industrial and process gauges are available with orifices as factory-installed options.

Threaded orifices (0.023 in. [0.58 mm] inside diameter) are available for P model industrial process gauges as accessories for field installation.

P Model Threaded Orifice Kits

Orifice Material	Ordering Number
Stainless steel	PGI-P-ORIFICE
Brass	PGI-P-ORIFICE-Q
Alloy 400	PGI-P-ORIFICE-R

Special Cleaning

Special cleaning is available as an option for unfilled gauges. Internal components are cleaned in accordance with ASME B40.100, Section IV, which states that the gauge shall be free of visually detectable moisture and foreign matter (chips, slivers, weld slag or splatter, shop soil, greases, oils, or other contaminants) that could be mechanically detrimental to proper function of the gauge. The gauge is then capped and bagged to maintain cleanliness.

Certificates of Calibration

This option provides the user with a calibration sheet and a serial-numbered gauge that has been calibrated with a gauge traceable to DKD for gauges manufactured in Germany or to NIST for gauges manufactured in the U.S. Certificates of calibration are available for all Swagelok gauges.

Material Certifications

This option provides the user with a General Material Certificate of Compliance, EN 10204 2.2, stating that the gauges were manufactured from material purchased and certified as being in accordance with the specifications listed in this catalog. Material certifications are available for B, C, S, M, and L model gauges.

Liquid Fill

Liquid-filled gauges enhance the reliability and integrity of the measuring system for long periods under extreme operating conditions by dampening vibration and lubricating the gauge movement. B, C, S, and P model gauges are available liquid filled.

Because the type of liquid used to fill the gauge may vary with the application, Swagelok offers glycerin, low-temperature glycerin, and silicone. It is important to choose the proper fill liquid based on the operating temperature and pressure.

Ambient Operating Temperature

Temperature °F (°C)	Fill Fluid
–40 to 140 (–40 to 60)	Unfilled
–4 to 140 (–20 to 60)	Glycerin
–29 to 140 (–34 to 60)	Low-temperature glycerin
–40 to 140 (–40 to 60)	Silicone

Operating Pressure (Dial Range)

If the dial range selected is equal to or below 60 psi, 4 bar, 0.4 MPa, or equivalent, liquid-filled gauges must use low-temperature glycerin or silicone fill liquid to ensure fastest response and gauge accuracy.

In addition, if a maximum indicating pointer is selected in a liquid-filled gauge, the fill liquid should be low-temperature glycerin or silicone.

⚠ **Glycerin- and silicone-filled gauges cannot be used where strong oxidizing agents are present.**

Glycerin and low-temperature glycerin fill liquid are available as accessories for field installation.

Fill Liquid	Size	Ordering Number
Glycerin	8 oz (236 mL) squirt bottle	PGI-GLY-8
	1 gal (3.8 L) bottle	PGI-GLY-128
Low-temperature glycerin	8 oz (236 mL) squirt bottle	PGI-GLY-8-86/14
	1 gal (3.8 L) bottle	PGI-GLY-128-86/14

Options and Accessories

Panel-Mount Clamps

Stainless steel panel-mount clamps are available for flush mounting Swagelok industrial gauges. The panel-mount clamp is easily installed on the gauge. This option is not available on lower mount or S model gauges. Panel-mount clamps on M model gauges must be factory installed and are available as accessories for field installation on A, B, C, L, and P model gauges.

Panel-Mount Clamp Kits

Gauge Model	Ordering Number
B model 63 mm (2 1/2 in.) size	PGI-63B-PMC
A, C model 63 mm (2 1/2 in.) size	PGI-63C-PMC
A, B, C, and L models 100 mm (4 in.) size	PGI-100BCL-PMC
P model 115 mm (4 1/2 in.) size	PGI-P-115-PMC

Front Flanges

Polished stainless steel front flanges are available for flush panel mounting of Swagelok industrial gauges. This option is not available on lower mount or P model gauges and must be factory installed on C and M model gauges.

S, B, and L Model Front Flange Kits

Gauge Size	Ordering Number
63 mm (2 1/2 in.)	PGI-63SBL-FF
100 mm (4 in.)	PGI-100SBL-FF

Rear Flanges

Stainless steel rear flanges are available for mounting on the front of the panel. This option is not available on M, S, and P model gauges. Rear flanges are available factory installed on A, B, and C model gauges and as accessories for field installation.

A, B, and C Model Rear Flange Kits

Gauge Size	Ordering Number
63 mm (2 1/2 in.)	PGI-63BCL-RF
100 mm (4 in.)	PGI-100BCL-RF

Maximum Indicating Pointers

Maximum indicating pointers (MIP), available for S, B, C, L, and P models, identify pressure spikes in a system and are helpful during system startup and troubleshooting. The MIP adds an additional 1 % error to the gauge because of the increased load on the bourdon tube. This option must be factory installed on A and C model gauges and is available for field installation on S, B, L, and P model gauges.

Maximum Indicating Pointer Kits

Gauge Model	Ordering Number
S, B, and L 63 mm (2 1/2 in.) size	PGI-63-MIP-SG
S, B, and L 100 mm (4 in.) size	PGI-100-MIP-SG
P 115 mm (4 1/2 in.) size	PGI-P-115-MIP-A

Options and Accessories

Gauge Faces for Low Light Environments

Illumination options, combined with larger numerals on the dial face, offer improved visibility in low light environments. Possible applications include: low light plant interiors, limited access areas, behind machinery and ductwork, areas where steam may inhibit visibility, and outdoor areas requiring gauge reading from a distance. These face options are available on all C Model, P Model, gauges and thermometers.

Option 1

Option 1 includes a retro-reflective material affixed to the dial face. The fluorescent color absorbs non-visual UL light, reflecting additional light and making the gauge more visible.

Option 2

Option 2 includes a retro-reflective, photo-luminescent dial design that illumintes the entire front of the instrument dial for an extended amount of time after exposure to a light source for as little as 10 seconds. The appearance of the dial face is white when not illuminated.

Gauge Faces

Gauge Face	Ordering Number
White (Option 1)	9320
Orange (Option 1)	9321
Green (Option 1)	9322
Glow (Option 2)	9323

Options and Accessories

Coil Steam Siphons

Siphons protect pressure instruments in live steam service or other high-temperature vapor applications. The vapor condenses inside the coil of the siphon, preventing the high-temperature vapors from reaching the sensing element of the pressure instrument. Siphons are available in carbon and stainless steel.

Coil Steam Siphon Kits

Material	End Connection	Wall Schedule	Ordering Number
Steel	1/4 in. NPT	40	PGI-4-CSS-S-SC40
		80	PGI-4-CSS-S-SC80
	1/2 in. NPT	80	PGI-8-CSS-S-SC80
		160	PGI-8-CSS-S-SC160
Stainless steel		80	PGI-8-CSS-SS-SC80
		160	PGI-8-CSS-SS-SC160

Strap Wrenches

Strap wrenches are used to remove the bayonet ring of the S, B, and L model gauges.

Strap wrench ordering number: **PGI-SB-CRR**

Accessories for Field Installation

Additional items for gauges can be ordered for field installation.

Kit	Ordering Number
Safety glass, 115 mm (4 1/2 in.) size	PGI-P-115-SGLASS
Safety glass, 160 mm (6 in.) size	PGI-P-160-SGLASS
Safety glass, 63 mm (2 1/2 in.) size	PGI-63-SGLENS
Safety glass, 100 mm (4 in.) size	PGI-100-SGLENS
Fill plug with toggle, for 63 mm dials	PGI-63-TOGGLE
Fill plug without toggle, for 63 mm dials	PGI-63-FILLPLUG
Fill plug with toggle, for 100 mm dials	PGI-100-TOGGLE
Fill plug without toggle, for 100 mm dials	PGI-100-FILLPLUG
Cover ring remover, 115 mm (4 1/2 in.) size	PGI-P-115-CRR
Liquid-fill kit lower mount (includes membrane and plug)	PGI-P-FILLKIT-LM
Liquid-fill kit lower-back mount (includes membrane and plug)	PGI-P-FILLKIT-LBM
Mark pointer	PGI-P-115-MARK-A

Positionable Gauge Adapters

Features

- Positionable gauge adapter allows 360° orientation of pressure gauges.
- Inlet connection is 1/2 in. male NPT.
- Available with 1/2 in. NPT and ISO parallel gauge connections.
- All 316 stainless steel construction.
- Optional gauge siphon/snubber helps protect the instrument from steam and vapor and dampens pressure fluctuations.

Materials of Construction

Component	Material Grade/ ASTM Specification
Connector	316, 316L/A479
Gauge nut, coupling	*316, 316L/A479*
Seal washer	*Annealed 316 SS*
Siphon tube, damper tube, plug	*316 SS*

Wetted components listed in *italics*.

Ordering Information

Select a gauge adapter ordering number.

Outlet Connection	Pressure Rating	
	6000 psig (413 bar)	10 000 psig (689 bar)
	Gauge Adapter Ordering Numbers	
1/2 in. female NPT	SS-PGA-7-8	SS-PGA-7-8-10K
1/2 in. male NPT	SS-PGA-1-8	SS-PGA-1-8-10K
G1/2 female ISO (RG)	SS-PGA-7-8RG	SS-PGA-7-8RG-10K

To order an optional gauge siphon/snubber, add **-SN** to the gauge adapter ordering number.

Example: SS-PGA-7-8**-SN**

Options and Accessories

Snubber Fittings—Gauge Protectors

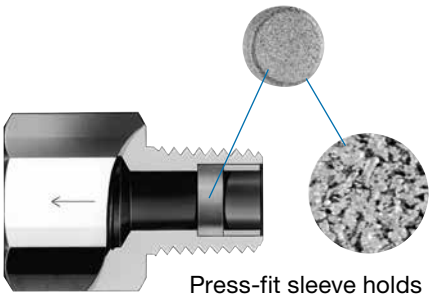
Swagelok snubber fittings protect gauges and instruments from system pressure surges and shocks. Pressure damping (snubbing) is accomplished through the use of a porous sintered 316 stainless steel element.

Installing a Swagelok snubber fitting upstream from the gauge reduces the gauge's response rate. The response rate generally varies with the initial pressure drop across the porous element of the snubber fitting and allows the gauge to reach line pressure smoothly.

Snubber fittings should be used only to protect against pressure shocks, impulses, and surges. Systems requiring control of contaminants should use filters suited to the application. Refer to Swagelok *Filters* catalog, MS-01-92.

Elements

With five basic elements available, snubber fittings can meet the requirements of fluid applications ranging from light gases to liquids with viscosities above 1000 SUS (Saybolt universal seconds) (220 cSt [mm²/s]). Element designators are stamped on all fittings for proper identification.



Sintered 316 stainless steel element (magnified 13×)

Press-fit sleeve holds element in place

Fluid	Average Fluid Flow Estimate L/min①	Element Designator
Light gases from 69 to 79 SUS (13 to 16 cSt [mm²/s])	0.05 at 25 psig (1.72 bar)	G
Air-steam from 75 to 119 SUS (15 to 25 cSt [mm²/s])	2.4 at 25 psig (1.72 bar)	A
Water, light oils from 75 to 250 SUS (15 to 54 cSt [mm²/s])	3.3 at 25 psig (1.72 bar)	W
Oils from 250 to 1000 SUS (54 to 220 cSt [mm²/s])	1.3 at 10 psig (0.68 bar)	L
Oils of 1000 SUS (220 cSt [mm²/s]) and above	0.9 at 10 psig (0.68 bar)	H②

① Product is tested with air at ambient temperature. Flow estimate is the average air flow multiplied by a ratio of nominal kinematic viscosities (air/fluid).

② Not available for ordering number -4-SRA-2.

Typical Installation

Effective Element Area

Fittings with 1/8 in. Male NPT Ends

0.019 in.² (12.3 mm²)

All Other Fittings

0.062 in.² (40.0 mm²)

Materials of Construction

Component	Material Grade/ASTM Specification
Fitting body	*316 SS/A276 or brass/B453*
Ferrules, nut	316 SS/A276 or brass/B453
Sleeve	*316 SS/A276*
Element	*316 SS*

Wetted components listed in italics.

Pressure Ratings Basis

Pressure ratings are based on ASME Code for Process Piping B31.3, at 70°F (20°C).

Maximum Differential Pressure

Stainless Steel Fittings with 1/8 in. Male NPT Ends

5000 psig (344 bar)

All Other Fittings

Stated working pressures

⚠ **Pressure must be applied only in the direction of the flow arrow.**

Temperature Ratings

Fitting Material	Maximum Operating Temperature °F (°C)
Brass	400 (204)
316 SS	1000 (538)

Options and Accessories

Snubber Fittings—Gauge Protectors

Ordering Information

Select a basic ordering number from the tables below.

Example: **-4-SA-E**

Add a body material designator.

Material	Designator
316 SS	SS
Brass	B

Example: **SS**-4-SA-E

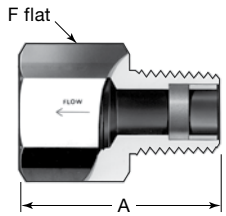
Add an element designator from the table on page 25.

Example: SS-4-SA-E**G**

Dimensions

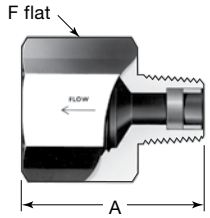
Dimensions are for reference only, and are subject to change.
Dimensions shown with Swagelok tube fitting nuts finger-tight.

Adapter



NPT Male/ Female Pipe Size in.	Basic Ordering Number	Dimensions in. (mm)		Working Pressure at 70°F (20°C) psig (bar)	
		A	F	Brass	316 SS
1/4	-4-SA-E	1.40 (35.6)	3/4	2200 (151)	4400 (303)
1/2	-8-SA-E	1.94 (49.3)	1 1/16	2400 (165)	4900 (337)

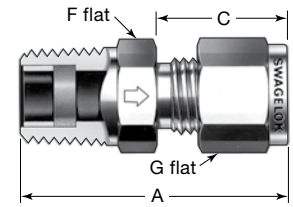
Reducing Adapter



NPT Female Pipe Size in.	NPT Male Pipe Size in.	Basic Ordering Number	Dimensions in. (mm)		Working Pressure at 70°F (20°C) psig (bar)	
			A	F	Brass	316 SS
1/4	1/8	-4-SRA-2-E	1.26 (32.0)	3/4	3300 (227)	6600 (454)①
1/2	1/4	-8-SRA-4-E	1.76 (44.7)	1 1/16	2200 (151)	4400 (303)
	3/8	-8-SRA-6-E	1.83 (46.5)		2400 (165)	4900 (337)

① Maximum differential pressure: 5000 psig (344 bar).

Male NPT to Swagelok Tube Fitting



NPT Male Pipe Size in.	Tube OD in.	Basic Ordering Number	Dimensions in. (mm)				Working Pressure① at 70°F (20°C) psig (bar)	
			A	C	F	G	Brass	316 SS
1/4	1/4	-4-SM-A-400	1.48 (37.6)	0.70 (17.8)	9/16	9/16	2200 (151)	4400 (303)
	3/8	-4-SM-A-600	1.57 (39.9)	0.76 (19.3)	5/8	11/16		

① For more information about pressure ratings of Swagelok tube fittings, refer to Swagelok *Tubing Data* catalog, MS-01-107.

Additional Products

Pressure Regulators

Swagelok offers as full range of pressure regulators:

- Pressure-reducing models
- Back-pressure models
- Gas cylinder changeover model
- Vaporizing models

Refer to Swagelok *Pressure Regulators* catalog, MS-02-230, for additional information.

Tube Fittings

Swagelok gaugeable tube fittings and adapter fittings are available in sizes from 1/16 to 2 in. and 2 to 50 mm in a wide variety of materials and configurations.

Refer to Swagelok *Gaugeable Tube Fittings and Adapter Fittings* catalog, MS-01-140, for additional information.

Pressure Gauges For Panel Builders

Swagelok panel builders gauges monitor vacuum and positive system pressures up to 15 000 psi, 1000 bar, or 100 000 kPa and fit industry-standard 2 9/16 in. (65.0 mm) panel hole cutout.

Refer to Swagelok *Pressure Gauges for Panel Builders—PBG Series* catalog, MS-02-333, for additional information.

Tubing Products

Swagelok offers a wide variety of tubing products.

Contact your authorized Swagelok representative or see these Swagelok catalogs for more information:

- *Stainless Steel Seamless Tubing, Fractional, Metric, and Imperial Sizes* catalog, MS-01-181
- *Ultrahigh-Purity and High-Purity Stainless Steel Tubing, Fractional, Metric, and Imperial Sizes* catalog, MS-01-182

Transducers

Swagelok industrial pressure transducers electronically monitor fluid system pressure in a variety of analytical and process applications.

Refer to Swagelok *Industrial Pressure Transducers* catalog, MS-02-225, for additional information.

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

About this document

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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.