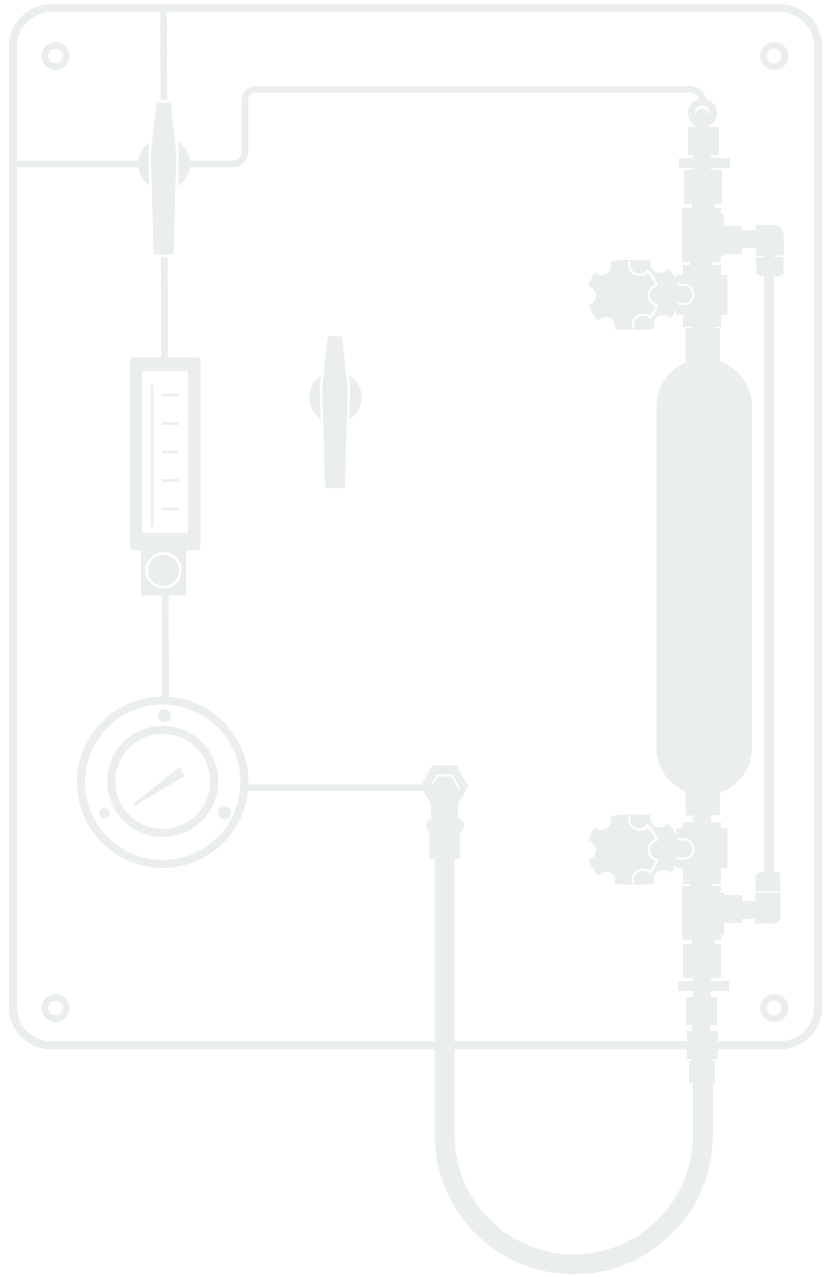


# Grab Sampling Systems

Application Guide



- Provides a simple, effective way to safely collect samples
- Keeps samples in their representative state for analysis
- Can be adapted to meet system requirements

Swagelok®

# Swagelok Application Solutions

Swagelok offers a series of solutions for use in all types of plants and facilities where fluids are being processed. Use Swagelok application solutions to create fully documented fluid sampling and control systems and bring consistency to your operations. Easy to install and operate, these solutions offer the high quality and support you expect from Swagelok.

## Contents

<b>What is Grab Sampling?</b> . . . . .	3	<b>Dimensions</b> . . . . .	26
<b>Why Use a Grab Sampling System?</b> . . . . .	3	<b>Ordering Information</b> . . . . .	27
<b>Sampling Basics</b> . . . . .	3	<b>Liquid-Only Sampling System (GSL)</b>	
<b>Specifying a Grab Sampling System</b> . . . . .	4	<b>Features</b> . . . . .	28
<b>Grab Sampling System Installation Tips</b> . . . . .	5	<b>Configuring a GSL</b> . . . . .	28
<b>Configurations</b> . . . . .	5	<b>System Descriptions</b> . . . . .	29
<b>Grab Sample Module (GSM)</b>		<b>Materials of Construction</b> . . . . .	36
<b>Features</b> . . . . .	7	<b>Pressure-Temperature Ratings</b> . . . . .	36
<b>Configuring a GSM</b> . . . . .	8	<b>Testing</b> . . . . .	37
<b>System Descriptions</b> . . . . .	8	<b>Cleaning and Packaging</b> . . . . .	37
<b>Materials of Construction</b> . . . . .	17	<b>Flow Data</b> . . . . .	37
<b>Pressure-Temperature Ratings</b> . . . . .	18	<b>Dimensions</b> . . . . .	38
<b>Testing</b> . . . . .	19	<b>Ordering Information</b> . . . . .	40
<b>Cleaning and Packaging</b> . . . . .	19	<b>Grab Sample Valve (GSV)</b>	
<b>Flow Data</b> . . . . .	19	<b>Features</b> . . . . .	42
<b>Dimensions</b> . . . . .	20	<b>Materials of Construction</b> . . . . .	43
<b>Ordering Information</b> . . . . .	21	<b>Ordering Information</b> . . . . .	44
<b>Grab Sample Cylinders (GSC)</b>		<b>Pressure-Temperature Ratings</b> . . . . .	44
<b>Features</b> . . . . .	22	<b>Dimensions</b> . . . . .	45
<b>Outage Tubes</b> . . . . .	23	<b>GSV Component Kit Information</b> . . . . .	46
<b>Assembly Descriptions</b> . . . . .	24	<b>Spring Return Handle</b> . . . . .	46
<b>Materials of Construction</b> . . . . .	25	<b>Sampling Body Details</b> . . . . .	46
<b>Pressure-Temperature Ratings</b> . . . . .	25	<b>Orifice Set Screw Details</b> . . . . .	47
<b>Testing</b> . . . . .	25	<b>Shroud Details</b> . . . . .	48
<b>Cleaning and Packaging</b> . . . . .	25	<b>Needle Assembly Details</b> . . . . .	49
		<b>Mounting Bracket Kit Details</b> . . . . .	50
		<b>Accessories</b> . . . . .	51
		<b>Glossary - Schematic Symbol Definitions</b> . . . . .	52

## What is Grab Sampling?

Grab sampling, also known as lab sampling or spot sampling, is the collecting of a sample of liquid or gas in a pipeline, tank, or system with the intent of transporting the sample to a laboratory for analysis.

## Why Use a Grab Sampling System?

Grab sampling can validate:

- process conditions
- end products meet quality specifications
- online analyzers are “fit for use”
- product quality during custody transfer

It can also provide verification of environmental emissions. In all of these uses, capturing a representative sample is essential.

However, placing a captured sample into an open bottle for transport back to the lab may not provide a representative sample. Some chemicals will evaporate or fractionate if not maintained under pressure.



**Grab Sampling System with Purge**

As more industries bring additional analytical equipment online, it becomes more imperative to have quality sample systems that can accurately capture the process for later analysis.

## Sampling Basics

Sampling is the science of safely capturing a sample from a process or a pipeline while maintaining the chemical composition during storage or transport for later analysis. Depending on the process phase, temperature, consistency, chemical makeup and other factors, there are a variety of approaches that can be used to extract a sample.

Determining the container type needed is the first decision that must be made in order to select the appropriate sampler.

Captured Phase	Container Type	
	Pressure-Containing	Non Pressure-Containing
Liquid	✓ Cylinder	✓ Cylinder
	X Bottle	✓ Bottle
Vapor	✓ Cylinder	✓ Cylinder
	X Bottle	X Bottle

✓ = recommended    X = not recommended

The product selection matrix on page 6 includes additional common system criteria.

Another important aspect is the temperature of the system fluid. Many processes operate at elevated temperatures and can pose a hazard from direct scalding during operator interaction or from the temperature limits of seats and seals being exceeded. Swagelok recommends consideration of a sample cooler when the supply temperature exceeds 140°F (60°C.) Note that thermal stability may affect sample integrity.

## Specifying a Grab Sampling System

The Swagelok grab sampling systems provide solutions to satisfy gas and liquid non-slurry sampling service in a consistent, reliable package. Two system types allow for capture into one of two types of containers — pressure-containing metal cylinders as found in the Grab Sample Module (GSM) or non pressure-containing glass or polyethylene bottles as found in the Liquid Only Sampling Module (GSL).

Given the wide variety of configurations available, there will be several criteria to consider in order to properly specify a grab sampling system:

- **Pressure:** Each GSM and GSL system has a maximum rated pressure, not to be exceeded. Note: The use of a rupture disc or relief valve is recommended with chemicals that may rapidly expand and pressurize due to temperature changes.
- **Temperature:** Each GSM and GSL system has a maximum fluid operating temperature. Note: Some models may have reduced pressure ratings at elevated temperatures. Also, some models may have minimum fluid operating temperatures, below which proper function cannot be assured.
- **Phase:** A cylinder sampler (GSM) can be suitable for either liquid or vapor systems. A bottle sampler (GSL) may not prevent the release of vapors and is better suited for most non-volatile liquid systems.
- **Hazardous/flammable material:** The sampling system must provide sufficient protection for the operator and environment from the system fluid. Certain chemicals such as aqueous chlorine and pyrophoric compounds require more stringent leak or chemical protection than may be provided by a Swagelok GSM or GSL.
- **Materials of Construction (including coatings, etc.):** The materials used in the sampling system must be compatible with the system fluid. The standard material of construction for Swagelok sampling systems is 316 stainless steel. Alternate materials such as alloy 400 are available for some configurations.
- **Surface treatments:** Surface treatments can reduce the absorption and adsorption of the sample fluid into metallic surfaces, leading to a more representative sample. Electropolished (EP) tubing is available. In addition to or in place of electropolishing, many coatings can be applied to the wetted components: SilcoNert®, Silcolloy®, and Dursan® are frequently requested coatings. Contact your authorized sales and service center for details.
- **Purge:** Some chemicals may leave residue or contaminate the lines if not flushed from the system. Selecting the purge option provides a means to introduce a purge fluid (air, solvent, etc.) to remove residual contamination from the sample lines.

## Grab Sampling System Installation Tips

Manual sample systems can be installed to draw from any point along a pressurized line where there is enough process or head pressure to drive the sample fluid through the process tubing. They may be used in an analyzer bypass or return line.

If the sample panel requires a return, ensure that the transport line is being returned to a lower pressure location, preferably through a separate tap. If the motive force from a pump is being used, the return sample can be placed upstream of the pump, as the flow through the pump will be sufficient to dilute any sample stream being returned to the process.

Panels should always be installed so that sample vessels (cylinders or bottles) remain oriented vertically. Failure to do so may result in contaminated samples.

**⚠ CAUTION: When installing a Swagelok grab sampling system, position the vent away from operating personnel. Always open vent/purge valves slowly. Operating personnel must protect themselves from exposure to system fluid.**

## Configurations

Swagelok offers two categories of grab sampling systems to fill a variety of intended uses.

The **Grab Sample Module (GSM)** is a sampling panel using cylinders for capturing either liquid or gas into a sealed, pressure-containing vessel. Closed loop sampling provides a sample that is fresh and extracted and held under the same process conditions that existed at the time of sample, with the exception of temperature. The sample vessel is docked in place and the process fluid is continuously circulated through the sample vessel. This means when the sample vessel is ready to be removed, the flow is isolated and the vessel is immediately ready to be removed – no waiting for lines to flush or bottles to fill.

A sample receiver is required for the capture of the sample with a GSM — the Grab Sample Cylinder (GSC). The sample cylinders available are approved for transportation and are available with DOT or TPED approvals. Rupture discs are standard. Relief valves and expansion chambers are offered as options.



**Grab Sample Module with Purge**

The **Grab Sample Liquid (GSL)** is a liquid-only sampling system for drawing fluid into a non-pressure containing bottle which can be drawn and transported without the risk of spillage or evaporation. This can be accomplished by using a bottle with a self-sealing septum cap. Bottles are a lower cost collection option that can be replaced easily if conditions warrant. Fixed volume samplers are an option that can be implemented for improved safety. This option completely separates the process pressure from the sample bottle and the user, preventing over-filling and overpressure conditions. See pages 34 and 35 for additional information.



**Fixed Volume Sample System**

### Product Selection Matrix

This table provides a summary of common system criteria and the grab sampling system recommended for the listed combinations.

Pressurized Storage	Sample Receiver	Sample Phase	Continuous Flow	Purge	Fixed Volume	Back Purge	Ordering Number	Reference Page Number
Yes	Cylinder	Liquid	No	No	Yes	No	GSM-L-1(-N)	9
Yes	Cylinder	Liquid	No	Yes	Yes	No	GSM-L-1(-P)	10
Yes	Cylinder	Liquid	Yes	No	Yes	No	GSM-L-2(-N)	13
Yes	Cylinder	Liquid	Yes	Yes	Yes	No	GSM-L-2(-P)	14
Yes	Cylinder	Gas	No	No	No	No	GSM-G-1(-N)	11
Yes	Cylinder	Gas	No	Yes	No	No	GSM-G-1(-P)	12
Yes	Cylinder	Gas	Yes	No	No	No	GSM-G-2(-N)	15
Yes	Cylinder	Gas	Yes	Yes	No	No	GSM-G-2(-P)	16
No	Bottle	Liquid	No	No	No	No	GSL1	29
No	Bottle	Liquid	No	Yes	No	No	GSL2	30
No	Bottle	Liquid	Yes	No	No	No	GSL3	31
No	Bottle	Liquid	Yes	Yes	No	No	GSL4	32
No	Bottle	Liquid	No	Yes	No	Yes	GSL5	33
No	Bottle	Liquid	No	No	Yes	No	GSL6	34
No	Bottle	Liquid	Yes	No	Yes	No	GSL7	35

## Grab Sample Module (GSM)

### Features

The GSM uses pressure-rated sample cylinders which prevent the sample from escaping, even under pressure, and are durable to prevent accidental breakage. The GSM is the most reliable method of capturing a sample.

The GSM closed-looped sampling system pulls from a positive-pressure process and returns back to the process at a lower pressure location (e.g. upstream of a pump), using the differential pressure to drive the fluid through the sample system. This circuit draws a flow path that connects to the sampler then returns to the process or to flare. A GSM can be left in the bypass or sample position indefinitely when using this arrangement, keeping the transport lines fresh (with zero flushing time) and ready for sample capture. A rupture disc is an available option for every GSM system. A relief valve can also be added to the sampling systems where there is additional concern regarding overpressure of the sample cylinder from temperature changes or overfilling.

Each sampling system configuration utilizes Swagelok tube fittings, with the exception of the cylinder end connections, which avoids the potential leak points of NPT connections.

A key feature of the GSM is the switching valve that directs flow. Using the Swagelok 40G series ball valve for this switching valve, configurations are available with either 2 or 3 valves.

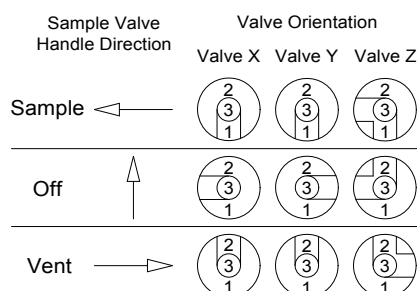
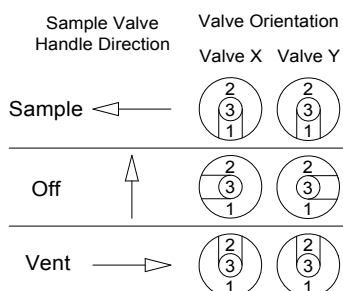
This allows for simultaneous control of fluid routing, reducing the number of sequencing steps required to draw a sample. The likelihood of errant sampling is reduced and a clear indication of sequencing is provided to the operator. This valve assembly is a standard on all GSM panels as well as fixed volume GSL panels.



**2-valve  
Switching Valve**

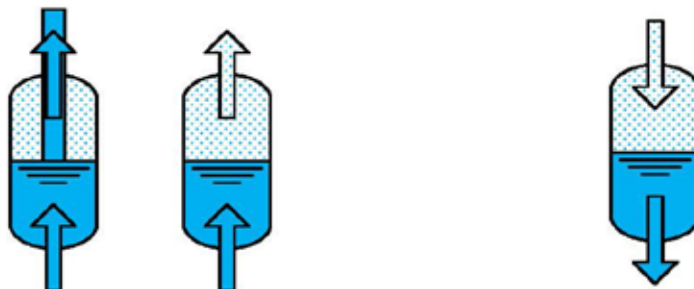


**3-valve  
Switching Valve**



## Configuring a GSM

The most critical piece of information for determining which GSM configuration should be used is the phase of the process fluid that the GSM is intended to collect. The flow path is different for liquids and gases and must be known when configuring the GSM. The flow path determines how out-of-phase fluid is purged from the cylinder (see illustrations below).



Liquids should fill from the bottom up. This displaces the vapor space, ensuring the cylinder is full. An outage tube can be added to liquid systems to ensure there is expansion space remaining in the cylinder.

Note: The vapor space may compress under pressure.

Gas should flow from the top down, pushing out any liquid / condensate from the sample cylinder as it fills.

## GSM System Descriptions

Additional features are available for each system shown (except as noted) such as an integrated purge line to clear residue and Sentry® coolers. See page 51 for a complete list of accessories.

The flow schematics that follow use the symbols defined in the glossary on page 52.

Note:

- All standard sampling systems have an “off” position, where flow will not be passed through the panel. This state may not be reflected in the schematics.
- All cylinder samplers can be set to allow process fluid to pass through the panel with the sample cylinder removed by connecting the hose directly to the matching quick connect.
- Some samplers require a minimum amount of process pressure to operate, which can vary depending on the properties of the sampled fluid.
- The purge option provides the ability to introduce a gas or liquid (e.g. solvent) into the system to flush the lines.
- The standard configuration halts sample transport flow during sampling. The continuous flow configurations allow the sample transport lines to continue flowing while sampling.



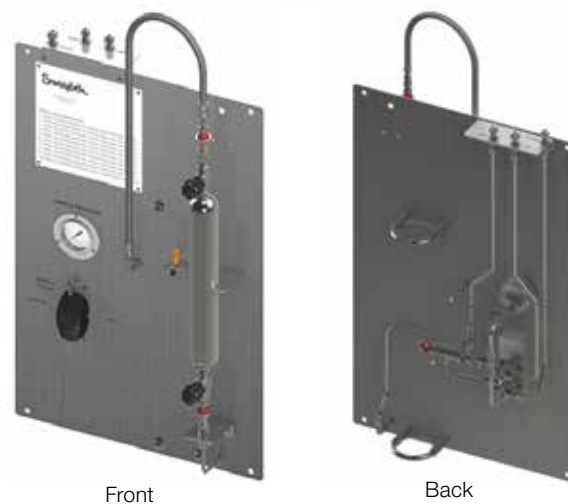
**GSM-L-1(-N) - Standard Liquid  
Sampler without Purge**

Use:

General use for liquid sampling.

Recommended for:

- fluids that are non- toxic and are not susceptible to settling in the sampler
- when the return is sent to flare

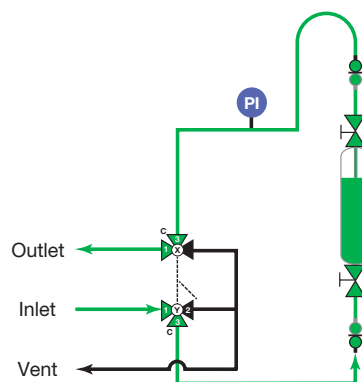


Front

Back

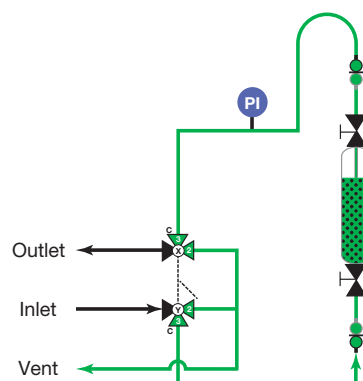
Sample handle position:

Process fluid flows through the sample cylinder and out the hose to the outlet port. Fluid will continue to flow as long as the handle remains in this position.



Vent handle position:

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



Off handle position:

All flow is halted.

### **GSM-L-1(-P) - Standard Liquid Sampler with Purge**

Use:

General use for liquid sampling. Purge option (using gas or a solvent) clears fluid before and/or after sample collection.

Recommended for:

- fluids that are toxic or may settle in the sampler
- for when the return is sent to flare



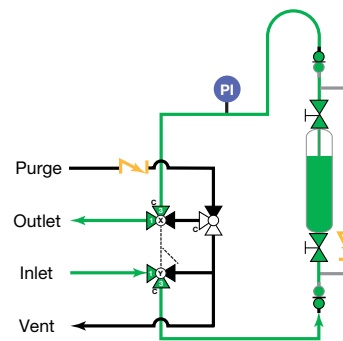
Front

Back

Sample handle position:

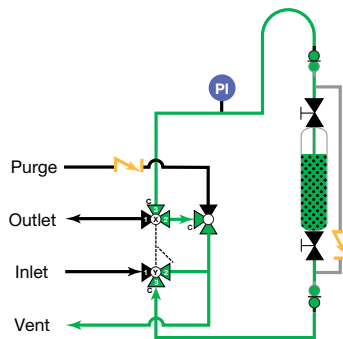
Process fluid flows through the sample cylinder and out the hose to the outlet port.

Fluid will continue to flow as long as the handle remains in this position.



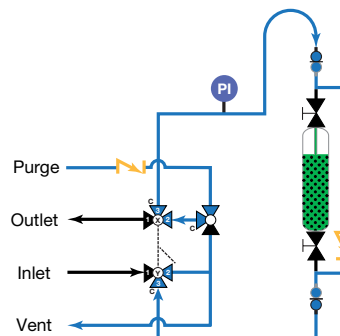
Vent handle position:

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



Vent handle position + Purge valve on:

After venting the fill lines, a purge can be activated to allow the fill lines to be purged (flushed) in the opposite direction of filling. This requires a purge-compatible sample cylinder in order to purge the lines without purging the cylinder itself.



Off handle position:

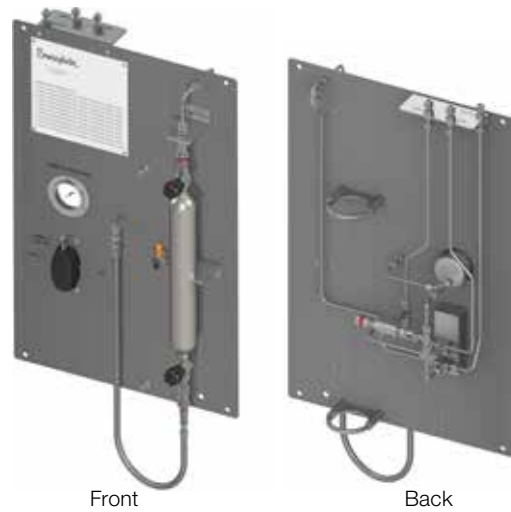
All flow is halted.

**GSM-G-1(-N) - Standard Gas  
Sampler without  
Purge**

Use:  
General use for gas sampling.

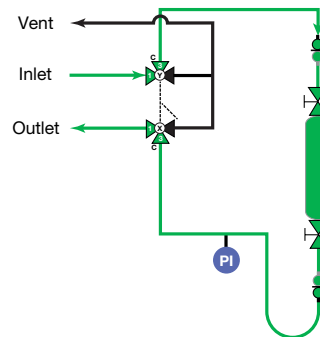
Recommended for:

- non-toxic gases and systems when the return is sent to flare



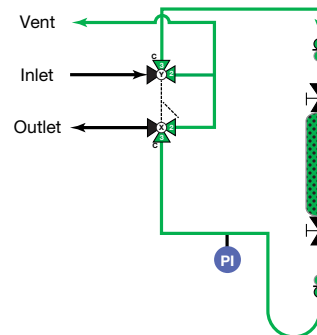
Sample handle position:

Process fluid flows through the sample cylinder and out the hose to the outlet port. Gas will continue to flow as long as the handle remains in this position.



Vent handle position:

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



Off handle position:

All flow is halted.

### **GSM-G-1(-P) - Standard Gas Sampler with Purge**

Use:

General use for gas sampling. Purge option clears sample gas before and/or after sample collection.

Recommended for:

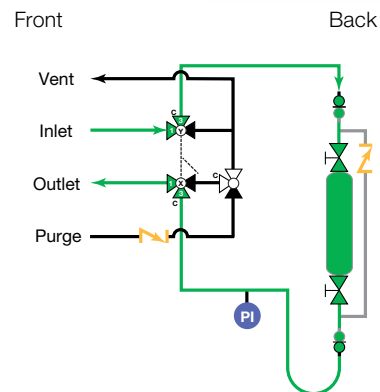
- gases that are toxic or with condensible hydrocarbons.
- systems when the return is sent to flare.



Sample handle position:

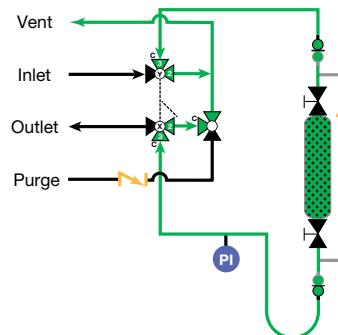
Process fluid flows through the sample cylinder and out the hose to the outlet port.

Fluid will continue to flow as long as the handle remains in this position.



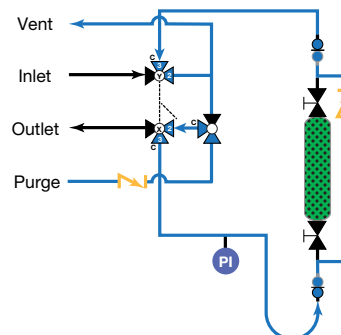
Vent handle position:

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



Vent handle position + Purge valve on:

After venting the fill lines, a purge can be activated to allow the fill lines to be purged (flushed) in the opposite direction of filling. This requires a purge-compatible sample cylinder in order to purge the lines without purging the cylinder itself.



Off handle position:

All flow is halted.

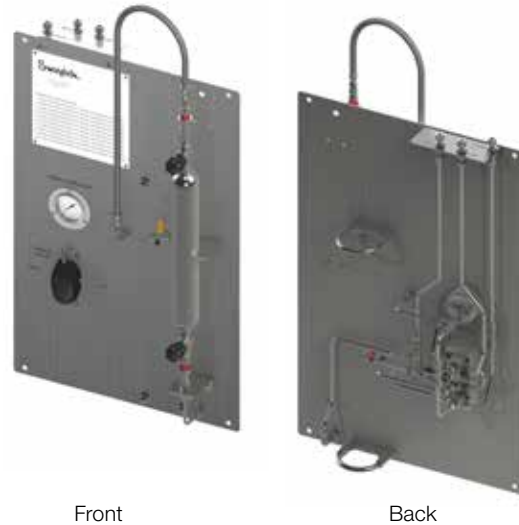
**GSM-L-2(-N) - Continuous Flow  
Liquid Sampler  
without Purge**

**Use:**

General use for liquid sampling when continuous flow is required from inlet to outlet.

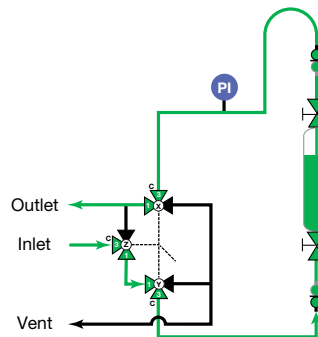
**Recommended for:**

- liquids that are non-toxic and are not susceptible to settling in the sampler.
- samplers installed directly in the sample stream, on a fast loop, or where long sample transport lines are used.



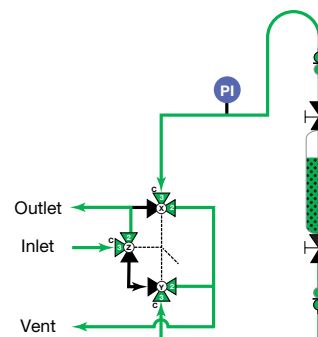
**Sample handle position:**

Process fluid flows through the sample cylinder and out the hose to the outlet port. Liquid will continue to flow through the cylinder as long as the handle remains in this position.



**Vent handle position:**

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



**Off handle position:**

Flow to the cylinder is halted. Flow from inlet to outlet is not halted.

### **GSM-L-2(-P) - Continuous Flow Liquid Sampler with Purge**

#### Use:

General use for liquid sampling when continuous flow is required from inlet to outlet. Purge option (using a gas or solvent) clears the sample fluid from the sample transport lines before and/or after sample collection.

#### Recommended for:

- liquids that are toxic and may settle in the sampler
- samplers installed directly in the sample stream, on a fast loop, or where long sample transport lines are used

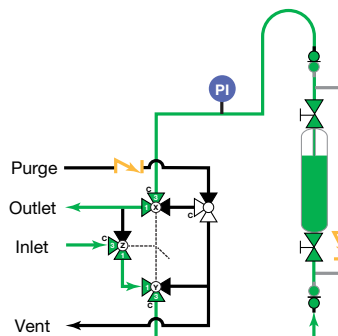


Front

Back

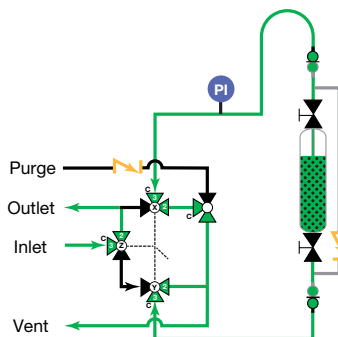
#### Sample handle position:

Process fluid flows through the sample cylinder and out the hose to the outlet port. Fluid will continue to flow through the cylinder as long as the handle remains in this position.



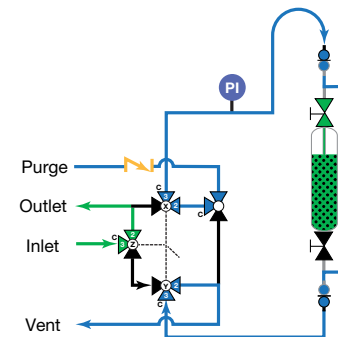
#### Vent handle position:

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



#### Vent handle position + Purge valve on:

After venting the fill lines, a purge can be activated to allow the fill lines to be purged (flushed) in the opposite direction of filling. This requires a purge-compatible sample cylinder in order to purge the lines without purging the cylinder itself.



#### Off handle position:

Flow to the cylinder is halted. Flow from inlet to outlet is not halted.

### **GSM-G-2(-N) - Continuous Flow Gas Sampler without Purge**

#### Use:

General use for gas sampling when continuous flow is required from inlet to outlet.

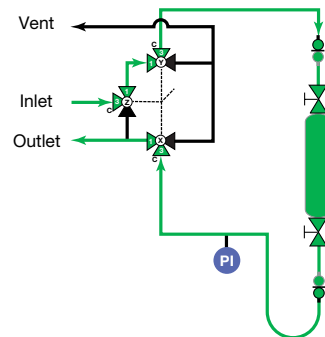
#### Recommended for:

- gases that are non-toxic
- samplers installed directly in the sample stream, on a fast loop, or where long sample transport lines are used



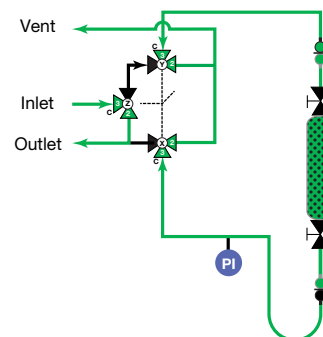
#### Sample handle position:

Process fluid flows through the sample cylinder and out the hose to the outlet port. Gas will continue to flow through the cylinder as long as the handle remains in this position.



#### Vent handle position:

When sampling is complete, the cylinder is closed and the handle can be turned to vent, isolating the supply/return lines and allowing fill lines to vent.



#### Off handle position:

Flow to the cylinder is halted. Flow from inlet to outlet is not halted.

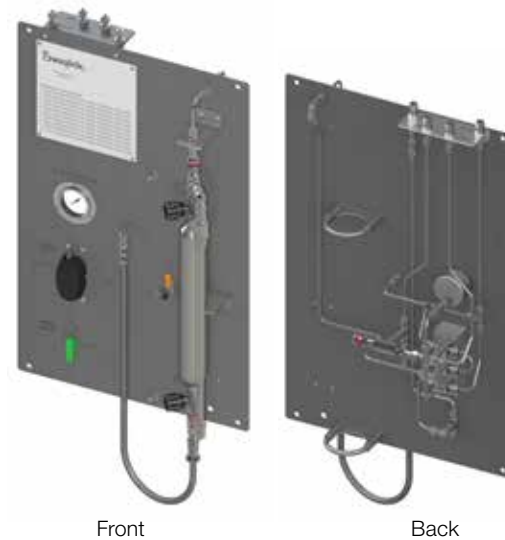
## **GSM-G-2(-P) - Continuous Flow Gas Sampler with Purge**

Use:

General use for gas sampling when continuous flow is required from inlet to outlet. Purge option clears sample fluid from the sample transport lines before and/or after sample collection.

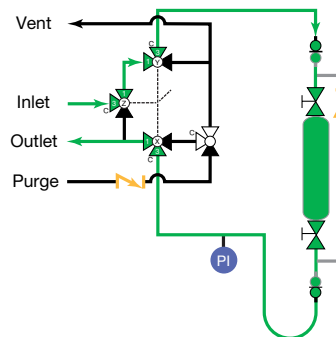
Recommended for:

- gases that are toxic or with condensible hydrocarbons
- samplers installed directly in the sample stream, on a fast loop, or where long sample transport lines are used



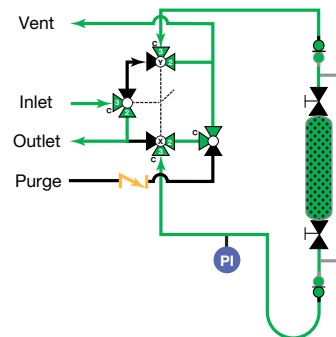
Sample handle position:

Process fluid flows through the sample cylinder and out the hose to the outlet port. Fluid will continue to flow through the cylinder as long as the handle remains in this position.



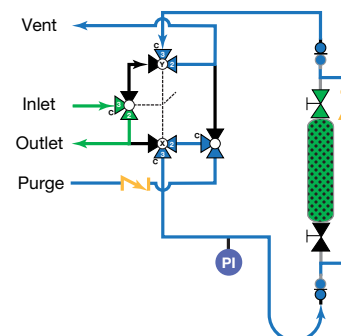
Vent handle position:

When sampling is complete, the cylinder can be closed and the handle is turned to vent, isolating the supply/return lines and allowing fill lines to vent.



Vent handle position + Purge valve on:

After venting the fill lines, a purge fluid can be activated to allow the fill lines to be purged (flushed) in the opposite direction of filling. This requires a purge-compatible sample cylinder in order to purge the lines without purging the cylinder itself.



Off handle position:

Flow to the cylinder is halted. Flow from inlet to outlet is not halted.



## GSM Materials of Construction

Component	Manufacturer Model	Material Grade/ASTM Specification
Switching valve	Swagelok 40G series	See Swagelok <i>One-Piece Instrumentation Ball Valves—40G Series and 40 Series</i> catalog, <a href="#">MS-02-331</a>
Check valve	Swagelok CH series	See Swagelok <i>Check Valves, C, CA, CH, and CPA Series</i> catalog, <a href="#">MS-01-176</a>
Hose	Swagelok FL and FM series	See Swagelok <i>Hose and Flexible Tubing</i> catalog, <a href="#">MS-01-180</a>
Pressure indicator	Swagelok S model pressure gauge	See Swagelok <i>Pressure Gauges, Industrial and Process—PGI Series</i> catalog, <a href="#">MS-02-170</a>
Relief valve, proportional	Swagelok R3A series	See Swagelok <i>Proportional Relief Valves</i> catalog, <a href="#">MS-01-141</a>
<b>System Hardware and Optional Components</b>		
Stainless steel tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gaugeable Tube Fittings and Adapter Fittings</i> catalog, <a href="#">MS-01-140</a>
Stainless steel quick connects	Swagelok	316 SS See Swagelok <i>Quick Connects QC, QF, QM, and QTM Series</i> catalog, <a href="#">MS-01-138</a>
Stainless steel panel, brackets, pipe stand clamps, screws	Swagelok	300 series stainless steel

## GSM Pressure-Temperature Ratings

Quick Connect Series	QC4 <sup>①</sup>					QC6 <sup>①</sup>			
Gauge Range, bar	10	25	60	100	160	10	25	60	100
Temperature, °F (°C)	Working Pressure, bar (psi)								
10 (-12) to 100 (37)	10.0 (145)	25.0 (362)	60.0 (870)	100 (1450)	160 (2320)	10.0 (145)	25.0 (362)	60.0 (870)	100 (1450)
150 (65)				86.8 (1260)					86.8 (1260)
200 (93)				158 (2300)	79.2 (1150)				
250 (121)				127 (1850)	66.8 (970)				
300 (148)				78.5 (1140)	96.4 (1400)				51.6 (750)

Quick Connect Series	QTM2 <sup>②</sup>				
Gauge Range, bar	10	25	60	100	160
Temperature, °F (°C)	Working Pressure, bar (psi)				
0 (-17) to 100 (37)	10.0 (145)	25.0 (362)	60.0 (870)	100 (1450)	160 (2320)
120 (48)				86.8 (1260)	
300 (148)				55.1 (800)	

Quick Connect Series	QC4 <sup>①</sup>					QC6 <sup>①</sup>			
Gauge Range, psi	160	400	800	1500	3000	160	400	800	1500
Temperature, °F (°C)	Working Pressure, psig (bar)								
10 (-12) to 100 (37)	160 (11.0)	400 (27.5)	800 (55.1)	1500 (103)	2500 (172)	160 (11.0)	400 (27.5)	800 (55.1)	1500 (103)
150 (65)				1260 (86.8)					1260 (86.8)
200 (93)				2300 (158)	1150 (79.2)				
250 (121)				1850 (127)	970 (66.8)				
300 (148)				1140 (78.5)	1400 (96.4)				750 (51.6)

Quick Connect Series	QTM2 <sup>②</sup>				
Gauge Range, psi	160	400	800	1500	3000
Temperature, °F (°C)	Working Pressure, psig (bar)				
0 (-17) to 100 (37)	160 (11.0)	400 (27.5)	800 (55.1)	1500 (103)	2500 (172)
120 (48)				1260 (86.8)	
300 (148)				800 (55.1)	

Higher temperature and pressure ratings may be available upon request. Contact your authorized sales and service center for more information.

① Ambient temperature range: 10°F to 140°F (-12°C to 60°C).

② Ambient temperature range: 0°F to 140°F (-17°C to 60°C).

### GSM Testing

Every Swagelok GSM is shell tested at the selected gauge pressure of the assembly, up to a maximum of 1000 psig (69 bar).

Additional testing available upon request.

### GSM Cleaning and Packaging

All Swagelok GSM systems are cleaned in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)*, MS-06-62.

### GSM Flow Data

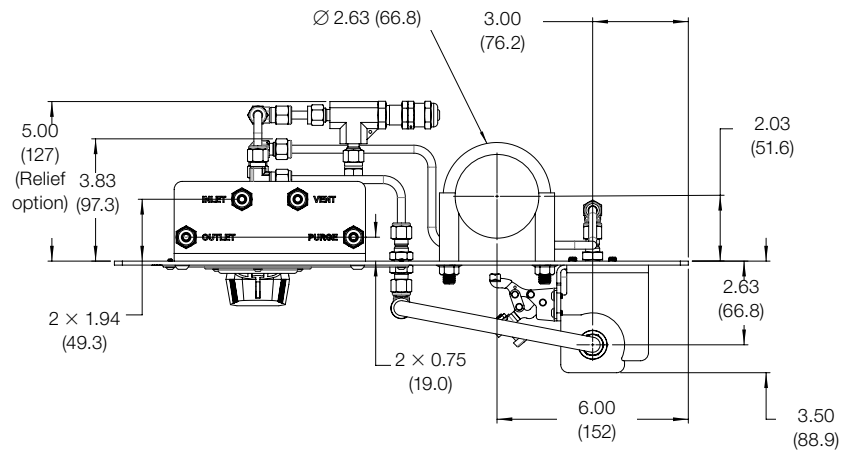
The GSM flow data is based on calculation using 70°F (20°C) as a reference point.

Pressure Drop to Atmosphere psi (bar)	Air Flow (Nitrogen) std ft <sup>3</sup> /min (std L/min)	Water Flow U.S. gal/min (L/min)
50 (3.4)	4.9 (138)	0.9 (3.4)
250 (17.2)	20.0 (566)	2.0 (7.6)
500 (34.5)	39.1 (1107)	2.8 (10.6)
1000 (68.9)	77.5 (2195)	3.9 (14.8)
1500 (103)	116.2 (3290)	4.8 (18.2)

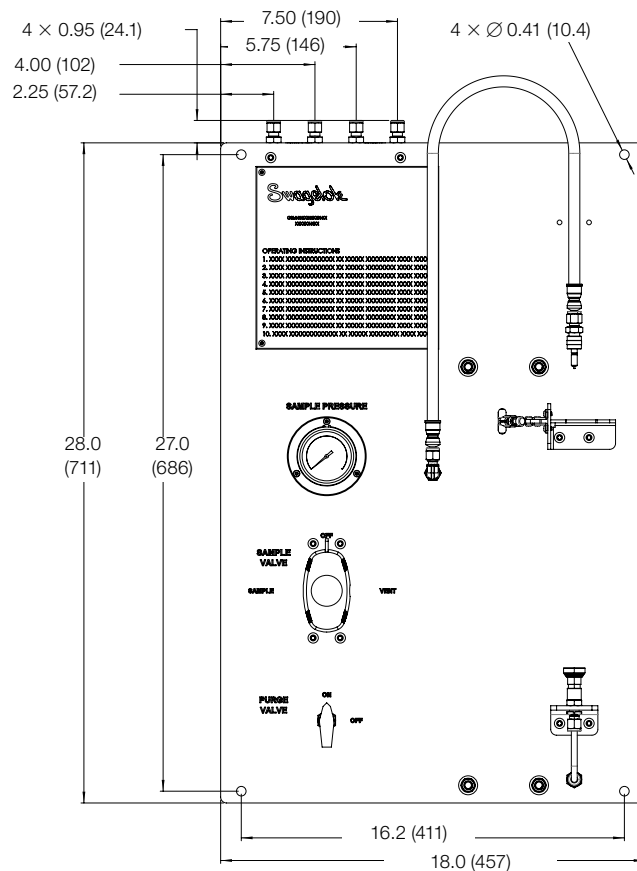
## GSM Dimensions

The following drawings provide basic panel dimensions. All GSM systems are configured on the same panel and will have the same basic dimensions. Exact system selected will determine final dimensions.

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



Top View



Front View

## GSM Ordering Information

Build a GSM solution ordering number by combining the designators in the sequence shown below. Sample cylinders are ordered separately, refer to page "GSC Ordering Information" on page 27.

1
2
3
4
5
6
7
8

GSM - **G** - **1** - **K** **4** **A** - **0400** **N** - **S4**

### 1 Fluid Type

**G** = Gas  
**L** = Liquid

### 2 Flow Pattern

**1** = Standard  
**2** = Continuous Flow

### 3 Dial Range

(primary scale: psi; secondary scale: kPa)

**B** = 0 to 160 psi

**D** = 0 to 400 psi

**E** = 0 to 800 psi

**F** = 0 to 1500 psi

**H** = 0 to 3000 psi

(primary scale: bar; secondary scale: psi)

**K** = 0 to 10 bar

**M** = 0 to 25 bar

**O** = 0 to 60 bar

**P** = 0 to 100 bar

**Q** = 0 to 160 bar

(primary scale: MPa; secondary scale: none)

**S** = 0 to 1 MPa

**U** = 0 to 2.5 MPa

**V** = 0 to 6 MPa

**W** = 0 to 10 MPa

**X** = 0 to 16 MPa

### 4 Quick Connect

**2** = QTM2

**4** = QC4

**6** = QC6<sup>①</sup>

① Not available with 0 to 3000 psi, 0 to 160 bar, or 0 to 16 MPa gauge.

### 5 Relief Valve

**A** = Proportional

**X** = None

### 6 Cylinder Bracket Size (GSC specific)

**0150** = 150 cm<sup>3</sup>

**0300** = 300 cm<sup>3</sup>

**0400** = 400 cm<sup>3</sup>

**0500** = 500 cm<sup>3</sup>

**1000** = 1000 cm<sup>3</sup>

### 7 Purge

**N** = No Purge

**P** = Purge

### 8 End Connection

**S4** = 1/4 in. Swagelok tube fitting

**6M** = 6 mm Swagelok tube fitting

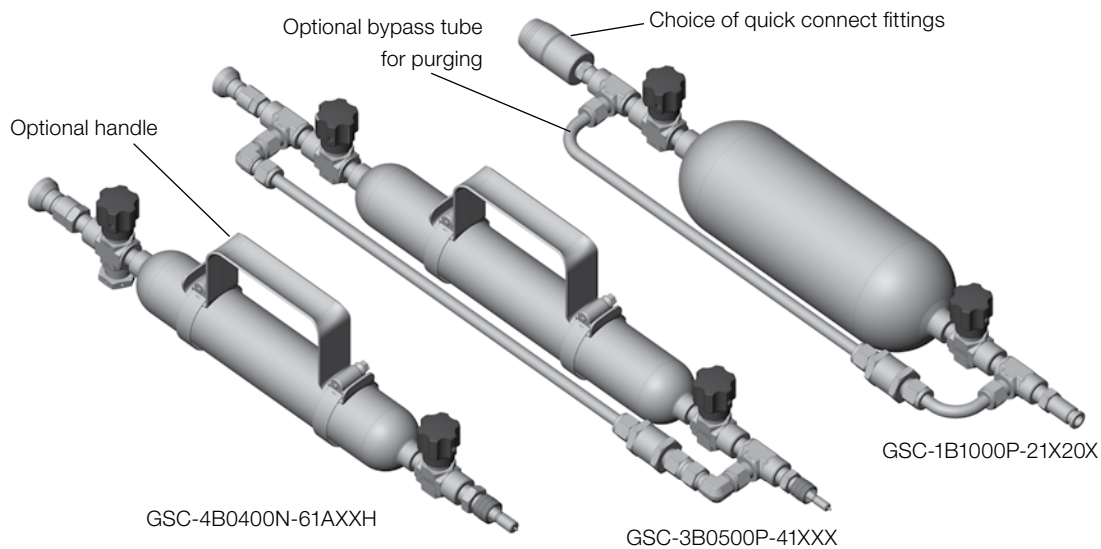
## Grab Sample Cylinders (GSC)

### Features

A sample cylinder is required for every GSM system and should be ordered separately when purchasing a new GSM. Various configurations of sample cylinder assemblies, defined as Grab Sample Cylinders (GSC), are available. The options available for GSC assemblies include:

- Five standard cylinder sizes (150, 300, 400, 500, & 1000 cm<sup>3</sup>)
- Multiple cylinder and valve material options
- With or without purge bypass tube
- Choice of quick connects
- Outage tubes, rupture discs, and handles
- Cylinder treatment/certification
- Stem and body protectors
- PTFE coated inner wall, SilcoNert® coating, or electropolished inner diameter
- Cylinders with DOT, TC or TPED certification  
(see *Sample Cylinders, Accessories, and Outage Tubes*, [MS-01-177](#), and *Swagelok Products Compliant with the Transportable Pressure Equipment Directive (TPED)*, [MS-02-193](#), for additional information.)
- Valves with TPED certification

Note: Only certain components are available with the certification options listed. The certification does not apply to the entire assembly.



## Outage Tubes

Outage tubes provide a vapor space of the desired volume in cylinders containing liquefied gases, so that the liquid in the cylinder can expand if the temperature increases. Without enough vapor space, a small temperature increase can cause the liquid to expand and increase the pressure dramatically. See local regulations and other appropriate guidelines for safe filling limits for your application.

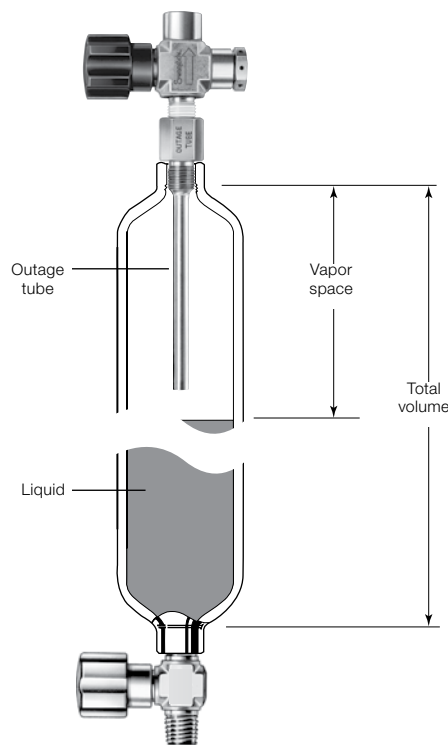
### Use

Outage is the vapor space in the cylinder expressed as a percentage of the total volume of the cylinder.

$$\% \text{ outage} = (\text{vapor space} / \text{total volume}) \times 100$$

The cylinder is held vertically with the outage tube at the top, as shown. The length of the outage tube determines the amount of vapor space. Sampling methods and the use of the outage tube are described in technical publications such as ASTM D1265, *Standard Practice for Sampling Liquefied Petroleum (LP) Gases (Manual Method)*.

See *Sample Cylinders, Accessories, and Outage Tubes*, [MS-01-177](#), and *Swagelok Products Compliant with the Transportable Pressure Equipment Directive (TPED)*, [MS-02-193](#), for additional information.



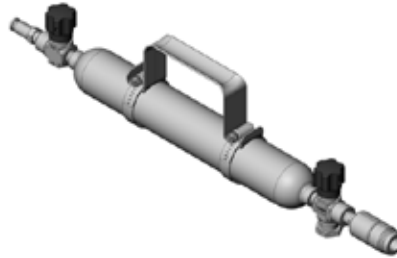
## GSC Assembly Descriptions

Swagelok offers two types of GSC assemblies.

Note: Regardless of orientation and implementation, the flow direction on all GSC isolation valves is away from the cylinder. Needle valves have a preferential shutoff direction for restraining pressure and the valve will be oriented such that it is best situated for resisting the internal pressure of the cylinder.

### Standard

A cylinder assembly for general use or for use with GSM systems without a purge option.



### Purge

A cylinder assembly for use with GSM systems with a purge option specified.





## GSC Materials of Construction

Component	Manufacturer Model	Material Grade/ASTM Specification
Cylinder	Swagelok	See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, <a href="#">MS-01-177</a>
Check valve	Swagelok CH series	See Swagelok <i>Check Valves, C, CA, CH, and CPA Series</i> catalog, <a href="#">MS-01-176</a>
Isolation valve	Swagelok D series	See Swagelok <i>Nonrotating-Stem Needle Valves, D Series</i> catalog, <a href="#">MS-01-42</a>
Stainless steel tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gaugeable Tube Fittings and Adapter Fittings</i> catalog, <a href="#">MS-01-140</a>
Stainless steel quick connects	Swagelok	316 SS See Swagelok <i>Quick Connects QC, QF, QM, and QTM Series</i> catalog, <a href="#">MS-01-138</a>
Handle	Swagelok	304L SS See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, <a href="#">MS-01-177</a>
Rupture disc	Swagelok	316L SS body, Alloy 600 rupture disc See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, <a href="#">MS-01-177</a>
Outage tube	Swagelok	316 SS See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, <a href="#">MS-01-177</a>

## GSC Pressure-Temperature Ratings

Quick Connect Series	QC4		QC6		QTM2	
	304L/316L	Alloy 400	304L/316L	Alloy 400	304L/316L	Alloy 400
Cylinder Material	304L/316L	Alloy 400	304L/316L	Alloy 400	304L/316L	Alloy 400
Temperature, °F (°C)	Working Pressure, psig (bar)					
0 (-17) to 10 (-12)	—	—	—	—	1800 (124)	1800 (124)
10 (-12) to 100 (37)	1800 (124)	1800 (124)	1500 (103)	1500 (103)	1360 (93.7)	1580 (108)
120 (48)	1360 (93.7)	1580 (108)	1350 (93.0)	1350 (93.0)	800 (55.1)	800 (55.1)
150 (65)			1150 (79.2)	1150 (79.2)		
200 (93)						

Higher temperature and pressure ratings may be available upon request. Contact your authorized sales and service center for more information.

### GSC Testing

Every Swagelok GSC is shell tested at the selected gauge pressure of the assembly, up to a maximum of 1000 psig (69 bar). Additional testing available upon request.

### GSC Cleaning and Packaging

All Swagelok GSC assemblies are cleaned in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)*, [MS-06-62](#).

### ⚠ Warning:

- Pressure rating restrictions apply when coupling and uncoupling quick-connects.
- Do not uncouple single-end shutoff quick-connects under pressure.

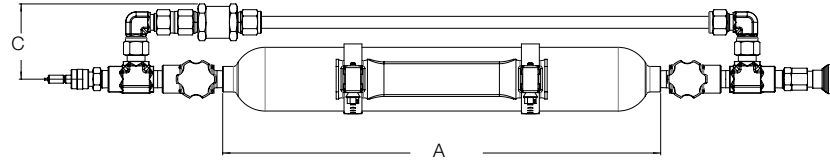
### Caution:

- Do not rotate quick-connects while coupled.
- Do not insert foreign objects into uncoupled bodies or stems.

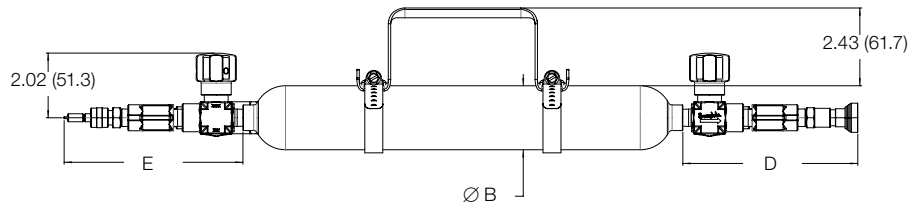
Refer to *Quick-Connects QC, QF, QM and QTM Series* catalog, [MS-01-138](#) for additional quick-connect information.

## GSC Dimensions

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



**Top View**



**Front View**

Cylinder Volume, cm <sup>3</sup>	Dimensions, in. (mm)		
	A	B	C
150	5.25 (133)	2.00 (50.8)	2.36 (59.9)
300	8.94 (227)	2.00 (50.8)	2.36 (59.9)
400	11.4 (290)	2.00 (50.8)	2.36 (59.9)
500	13.8 (350)	2.00 (50.8)	2.36 (59.9)
1000	10.9 (276)	3.50 (88.9)	3.10 (78.7)

Quick Connect	Dimensions, in. (mm)			
	Without Purge		With Purge	
	D	E	D	E
QTM2	4.63 (117)	3.52 (89.4)	6.33 (161)	5.22 (133)
QC4	3.99 (101)	4.05 (103)	5.69 (144)	5.75 (146)
QC6	3.77 (95.8)	3.89 (98.8)	5.47 (139)	5.59 (142)

## GSC Ordering Information

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

1   
 2   
 3   
 4   
 5   
 6   
 7   
 8   
 9   
 10

GSC - **1 A 0300 N - 4 1 X XX X - EP**

### 1 Cylinder Material

- 1 = 304L SS
- 2 = 304L SS SilcoNert 2000
- 3 = 316 SS
- 4 = 316 SS SilcoNert 2000
- 5 = Alloy 400

### 2 Valve Material

- A = 316 SS
- B = 316 SS SilcoNert 2000
- C = Alloy 400

### 3 Cylinder Size

- 0150 = 152 cm<sup>3</sup>
- 0300 = 300 cm<sup>3</sup>
- 0400 = 400 cm<sup>3</sup><sup>①</sup>
- 0500 = 500 cm<sup>3</sup>
- 1000 = 1000 cm<sup>3</sup><sup>①</sup>

<sup>①</sup> Available only in 304L SS

Certain configurations above 1450 psi/100 bar may invalidate TPED approval. See *Swagelok Products Compliant with the Transportable Pressure Equipment Directive (TPED)*, [MS-02-193](#), for additional information on TPED approved cylinders.

### 4 Purge

- N = No purge
- P = Purge

### 5 Quick-Connect Type

- 2 = QTM2
- 4 = QC4
- 6 = QC6<sup>①</sup>

<sup>①</sup> Pressure rating limited to 1500 psig (103 bar).

### 6 Valve Type

- 1 = D series

### 7 Rupture Disc

- A = 1900 psig (130 bar)
- B = 2800 psig (192 bar)
- X = None

### 8 Outage Tube

- XX = None
- 10 = 10%
- 20 = 20%
- 30 = 30%
- 40 = 40%
- 50 = 50%

### 9 Cylinder Handle

- H = Handle<sup>①</sup>
- X = No handle

<sup>①</sup> Available only on cylinders 400 cm<sup>3</sup> and larger

### 10 Options

- EP = Electropolished cylinder<sup>①</sup>
- LE = Laser-etched cylinder, followed by specific information
- PD = TPED cylinder certification<sup>②</sup>
- SB = Stem and body protectors<sup>④</sup>
- T = PTFE cylinder coating<sup>①③</sup>
- Omit = No options added

<sup>①</sup> Electropolishing and PTFE coating cannot be combined

<sup>②</sup> Not available in Alloy 400

<sup>③</sup> Not available with SilcoNert 2000 coating

<sup>④</sup> Not available with QTM2 quick-connects

## Liquid-Only Sampling System (GSL)

### Features

A liquid-only sampling system (GSL) can be used in a number of liquid applications where the process fluid is not at risk of fractionating or evaporating when stored at atmospheric pressure. This allows the use of less expensive glass laboratory bottles to draw and store the sample. Using bottles also provides immediate feedback on the visual quality of the sample stream. Swagelok GSL systems use the same switching valve as a GSM system to provide simplified operation for complex tasks. The GSL systems also include a Swagelok GSV grab sampling valve to draw a sample into a bottle. The GSV is equipped with a spring-return handle to help prevent unintentional dispensing. Swagelok GSL systems are designed around the use of Boston Round or media bottles but can accommodate other bottle geometries and materials. GSL systems are assembled with Swagelok tube fittings, avoiding the potential leak points of NPT fittings.

### Configuring a GSL

The most critical piece of information for determining whether a GSL is suitable for the application is whether or not the sample needs to be held in an airtight container under pressure. Typically, a GSL will be used with water or other low vapor-pressure liquids. Bottle sampling prevents maintaining a sample at more than a few psi/kPa. A lid or septum cap can be used to contain only a limited amount of pressure and any possibility of increasing internal pressure may cause an escapement to atmosphere.

If the application is suitable for bottle sampling, the next criteria will be determining whether continuous flow and purging is required or a fixed-volume option is more appropriate. Continuous flow is useful when the sample requires constant motion or there is a long tubing run leading up to the sample point. The continuous flow at the panel will ensure the sampled fluid is timely as it has not been sitting in the tubes for an extended amount of time. When continuous flow is not available or the sampled fluid has the potential to solidify in place, a purge option aids in cleaning the dispensing needle and internal tubing.

The fixed-volume option should be considered if the sampled fluid is under high pressure or hazardous. The fixed-volume option isolates the process pressure from the user while limiting the volume of dispensed fluid which helps prevent accidental overfilling.

**⚠ CAUTION: When installing a Swagelok GSL, position the vent away from operating personnel. Always open vent/purge valves slowly. Operating personnel must protect themselves from exposure to system fluid.**

## GSL System Descriptions

Additional features are available for each system shown (except as noted), such as an integrated purge line to remove residual contamination from the sample lines, coolers, and a range of needle sizes to allow for sampling of more viscous fluids. See page 51 for a complete list of accessories.

The flow schematics that follow use the symbols defined in the glossary on page 52.

Note:

Physical characteristics of the fluid to be sampled may require more or less pressure in various applications.

### GSL1 - Simple

Use:

General use for liquid sampling.

Recommended for:

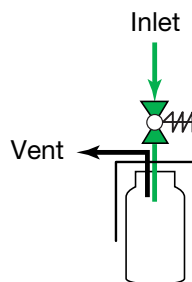
- non-toxic liquids.

Sample system has a single process connection to dispense the sample into a bottle.



Valve handle in open position:

In the open position, process fluid flows into the bottle while vapors and displaced air are captured and routed to the vent.



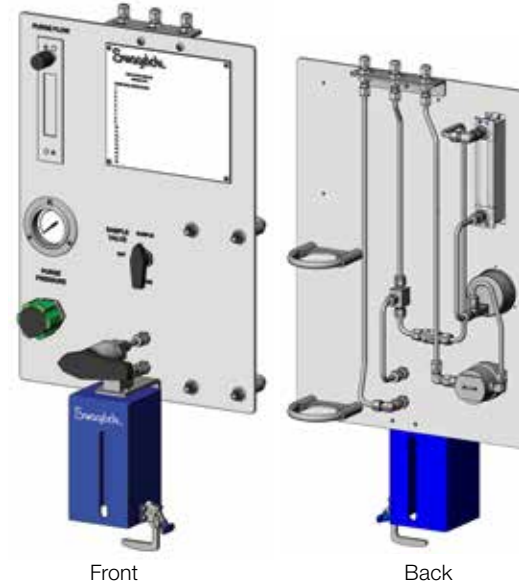
### GSL2 - Simple with Purge

Use:

General use for liquid sampling. Purge option clears sample fluid before and/or after sample collection.

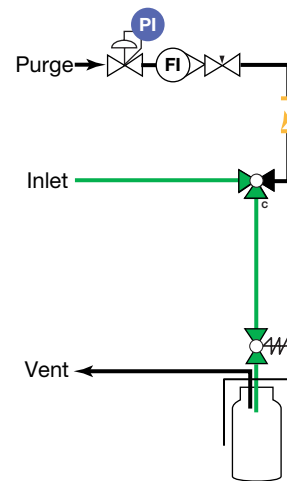
Recommended for:

- non-toxic liquids that may settle in the sampler



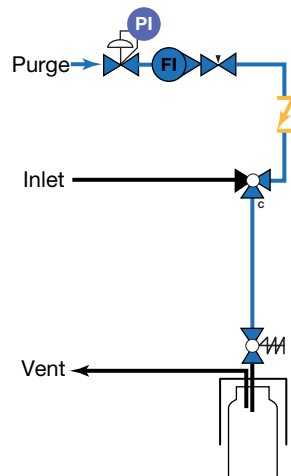
Sample handle position:

Process fluid flows through the GSV grab sampling valve and into the bottle while vapors and displaced air are captured and routed to the vent.



Purge handle position:

For forward purge, a purge fluid can be activated to allow the fill lines to be purged (flushed) in the direction of filling. Supply/return lines are blocked, bottle is allowed to vent.



**⚠ CAUTION: Residual fluid in the line will splatter if a bottle is not in place.**

### GSL3 - Continuous Flow

**Use:**

General use for liquid sampling when continuous flow is required from inlet to outlet.

**Recommended for:**

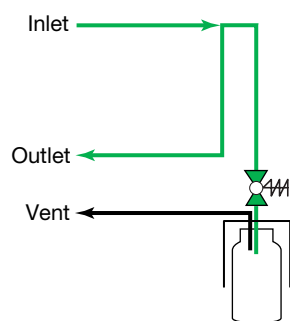
- non-toxic liquids
- samplers installed directly in the sample stream, in a fast loop, or where long sample transport lines are used

Sample system has an inlet port to supply the sample panel and an outlet port to allow for bypass flow.



**Valve handle in open position:**

Process fluid flows through the GSV grab sampling valve and into the bottle while vapors and displaced air are captured and routed to the vent.



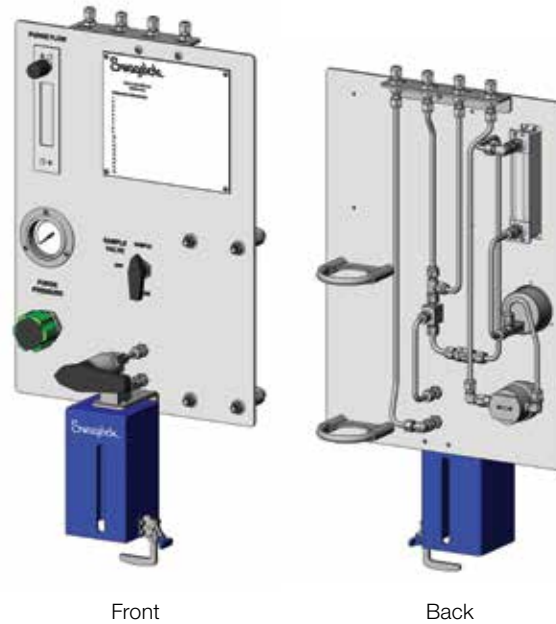
### GSL4 - Continuous Flow with Purge

Use:

General use for liquid sampling when continuous flow is required from inlet to outlet. Purge option clears sample fluid from the sampler before and/or after sample collection.

Recommended for:

- non-toxic liquids that may settle in the sampler
- samplers installed directly in the sample stream, in a fast loop, or where long sample transport lines are used

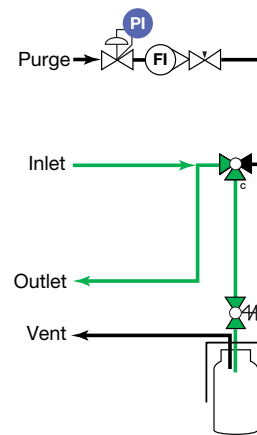


Front

Back

Sample handle position:

Process fluid flows through the GSV grab sampling valve and into the bottle while vapors and displaced air are captured and routed to the vent.



Purge handle position:

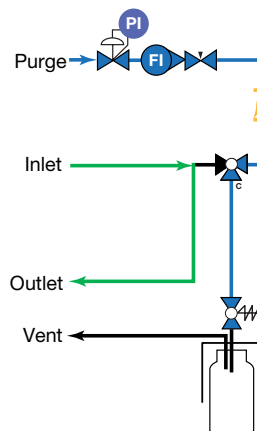
A purge fluid can be activated to allow the fill lines to be purged (flushed) in the direction of filling.

Supply/return lines are blocked, bottle is allowed to vent.

**⚠ CAUTION: Residual fluid in the line will splatter if a bottle is not in place.**

Off handle position:

Flow to the bottle is halted. Flow from inlet to outlet is not halted.





### GSL5 - Back Purge

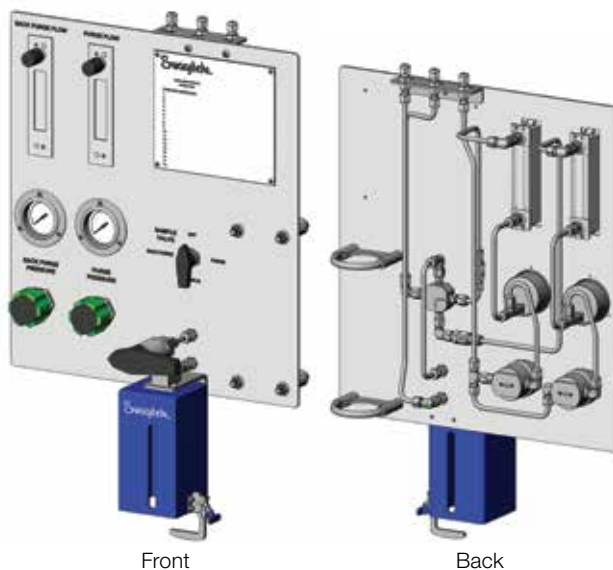
Use:

Purge and back purge allow both the needle and inlet line to be purged before and/or after sample collection.

Recommended for:

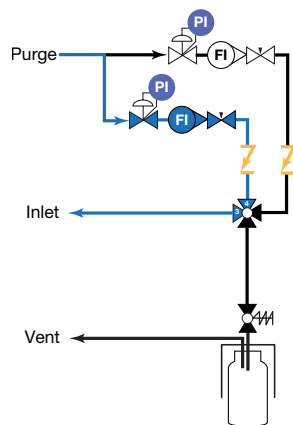
- non-toxic liquids with long stagnant sample inlet lines

Not recommended for processes that cannot tolerate the introduction of purge gas.



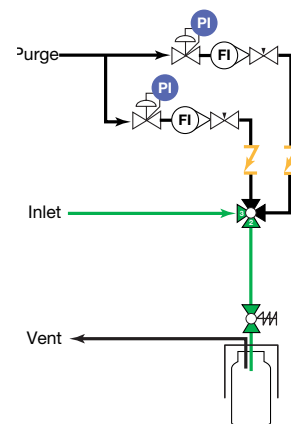
Back purge handle position:

A purge fluid flows through the inlet line back to the process, purging the inlet line in the opposite direction of filling.



Sample handle position:

Process fluid flows through the GSV grab sampling valve and into the bottle while vapors and displaced air are captured and routed to the vent.



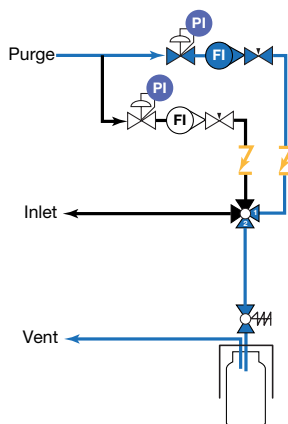
Purge handle position:

Open the valve handle to purge the fill line. This activates the purge fluid to allow the fill line to be purged in the direction of filling.

**⚠ CAUTION: Residual fluid in the line will splatter if a bottle is not in place.**

Off handle position:

Flow to the bottle is halted.



### GSL6 - Fixed Volume

Use:

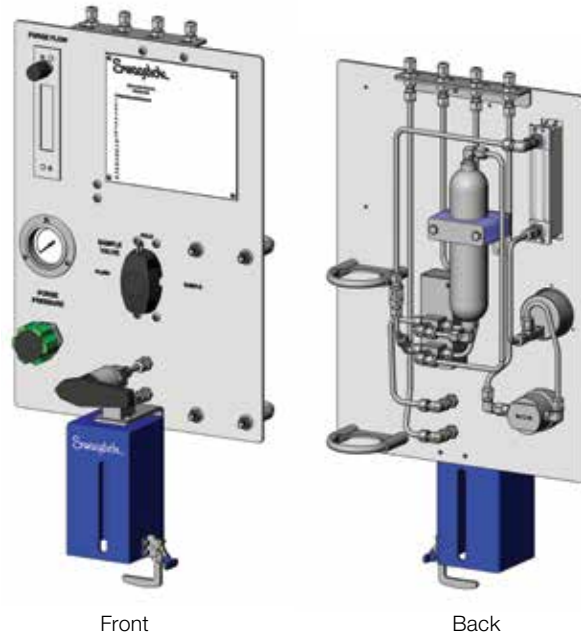
Fixed volume sampling prevents overfilling of the sampler. A sample is drawn into a fixed volume reservoir, held, and then dispensed into the sampler.

Recommended for:

- ensuring 60-80% fill of the sample container.

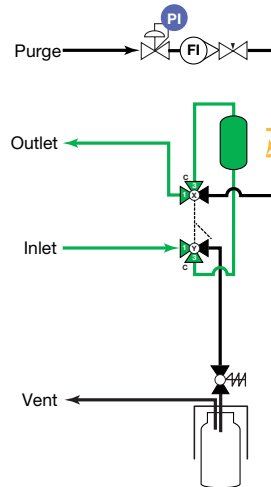
Note:

This requires a sample bottle that is larger than the fixed volume reservoir.



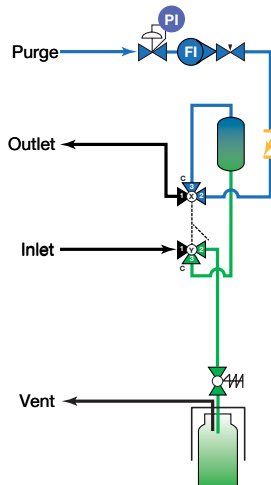
Flush handle position:

Flow is directed through the fixed volume chamber on the panel. The sample fluid fills a fixed volume chamber on the panel that measures a specific volume of fluid.



Sample handle position:

Using the purge gas pressure, the process fluid is pushed from the fixed volume chamber, through the GSV grab sampling valve, and into the bottle. Vapors and displaced air are captured and routed to the vent.



Hold handle position:

Flow to the bottle is halted.

## GSL7 - Fixed Volume with Continuous Flow

Use:

Fixed volume sampling prevents overfilling the sampler in systems where continuous flow is required from inlet to outlet. A sample is drawn into a fixed volume reservoir, held, and then dispensed into the sampler.

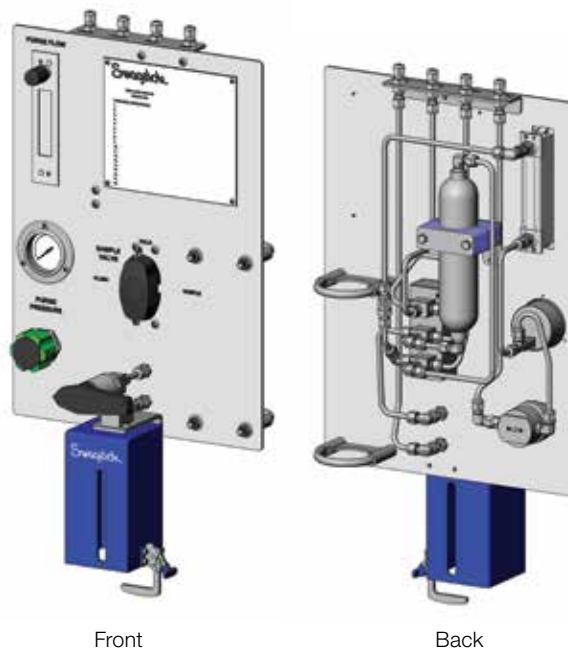
Recommended for:

- ensuring 60-80% fill of the sample container.

Note:

This requires a sample bottle that is larger than the fixed volume reservoir.

- samplers installed directly in the sample stream, in a fast loop, or where long sample transport lines are used.

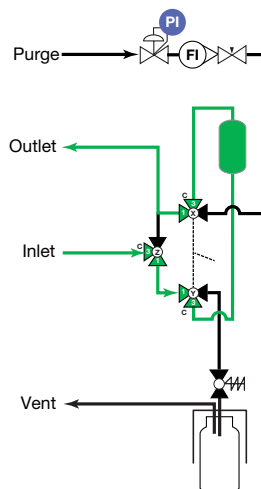


Front

Back

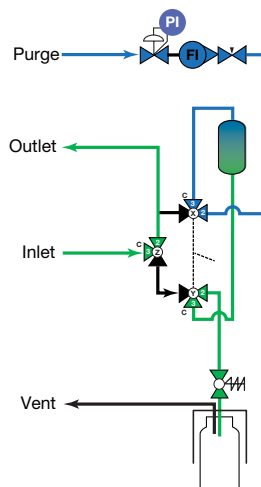
Flush handle position:

Flow is directed through the fixed volume chamber on the panel. The sample fluid fills a fixed volume chamber on the panel that measures a specific volume of fluid.



Sample handle position:

Using the purge gas pressure, the process fluid is pushed from the fixed volume chamber, through the GSV grab sampling valve, and into the bottle. Vapors and displaced air are captured and routed to the vent.



Hold handle position:

Flow to the bottle is halted. Flow from inlet to outlet is not halted.

## GSL Materials of Construction

Component	Manufacturer Model	Material Grade/ASTM Specification
Sample valve	Swagelok 40T/40G series and 60 series	See Swagelok <i>One-Piece Instrumentation Ball Valves—40G Series and 40 Series</i> catalog, MS-02-331 and <i>Ball Valves, General Purpose and Special Application</i> catalog, <a href="#">MS-01-146</a>
Check valve	Swagelok CH series	See Swagelok <i>Check Valves, C, CA, CH, and CPA Series</i> catalog, <a href="#">MS-01-176</a>
Regulator	Swagelok KPR series	See Swagelok <i>Pressure Regulator, K Series</i> catalog, <a href="#">MS-02-230</a>
Pressure indicator	Swagelok S model pressure gauge	See Swagelok <i>Pressure Gauges, Industrial and Process—PGI Series</i> catalog, <a href="#">MS-02-170</a>
Flowmeter	Swagelok G2 model	See Swagelok <i>Variable Area Flowmeters, G Series and M Series</i> catalog, <a href="#">MS-02-346</a>
Cylinder	Swagelok	See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, <a href="#">MS-01-177</a>
GSV grab sampling valve	Swagelok	See GSV Materials of Construction, page 43.
System Hardware and Optional Components		
Stainless steel tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gageable Tube Fittings and Adapter Fittings</i> catalog, <a href="#">MS-01-140</a>
Stainless steel panel, brackets, pipe stand clamps, screws	Swagelok	300 series stainless steel

## GSL Pressure-Temperature Ratings

Pressure/temperature ratings assume fluorocarbon FKM seals. Maximum sample inlet temperature for any GSL system with a cooler is 650°F (343°C).

GSL System Type	1 and 3	2 <sup>①</sup> and 4 <sup>①</sup>	5 <sup>①</sup>	6 <sup>①</sup> and 7 <sup>①</sup>
Temperature, °F (°C)	Working Pressure, psig (bar)			
-65 (-53) to -10 (-23)	3000 (206)	—	—	—
-10 (-23) to 100 (37)	3000 (206)	3000 (206)	100 (6.8)	1000 (68.9) <sup>②</sup> 1800 (124) <sup>③</sup>
150 (65)	2580 (177)	2580 (177)		840 (57.8) <sup>②</sup> 1360 (93.7) <sup>③</sup>
194 (90)	2580 (177)	2580 (177)		840 (57.8) <sup>②</sup> 1360 (93.7) <sup>③</sup>
200 (93)	2580 (177)	2580 (177)		—
250 (121)	2340 (161)	2340 (161)		—
300 (148)	2340 (161)	2340 (161)		—

① Ambient temperature range: 10°F to 140°F (-12°C to 60°C).

② Applicable to 2 oz and 50 cm<sup>3</sup> bottles only.

③ Applicable to all other sizes.

Higher temperature and pressure ratings may be available upon request. Contact your authorized sales and service center for more information.

### **GSL Testing**

Every Swagelok GSL is shell tested at the selected gauge pressure of the assembly, up to a maximum of 1000 psig (69 bar).

Additional testing available upon request.

### **GSL Cleaning and Packaging**

All Swagelok GSL systems are cleaned in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)*, MS-06-62.

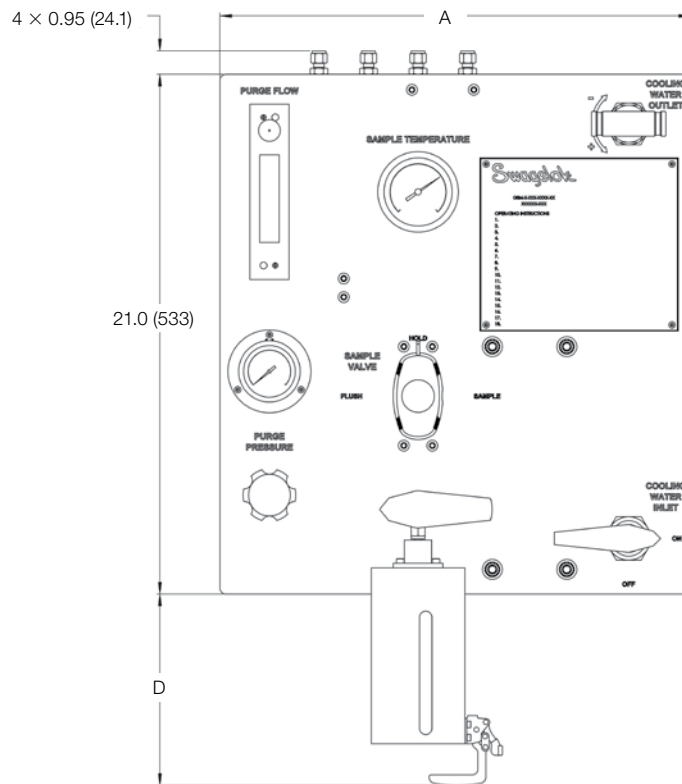
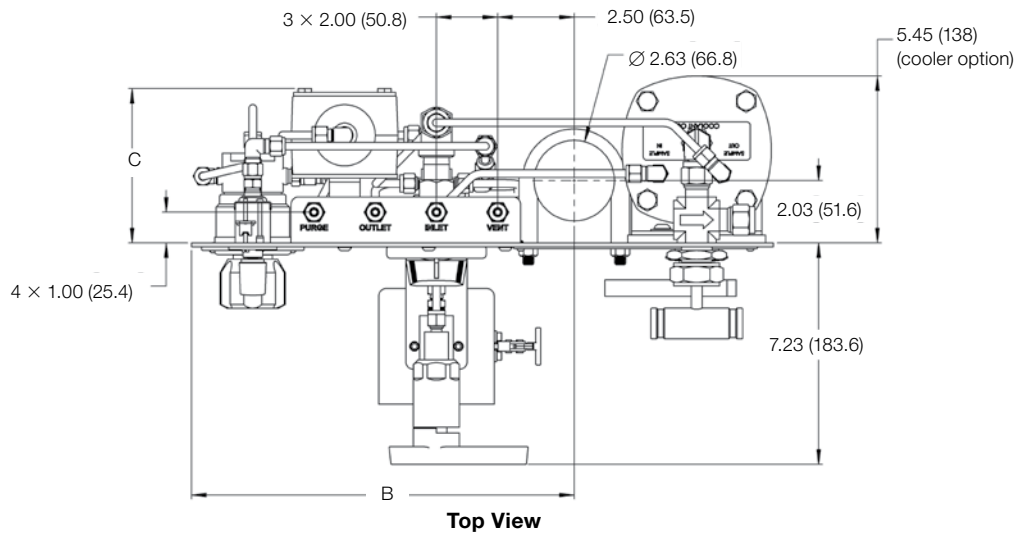
### **GSL Flow Data**

Dispensing and fill rates will be affected by needle selection and process fluid density, viscosity, and back pressure. Please contact your authorized sales and service representative for additional information.

## GSL Dimensions

The following drawings provide basic panel dimensions. Refer to page 39 for specific configuration dimensions.

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



GSL6 shown

Front View

## GSL Dimensions continued

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

System Style	A	B	C
GSL1 - Simple	11.0 (279)	8.50 (216)	1.92 (49.0)
GSL1 - Simple with cooler	15.0 (381)	8.50 (216)	1.92 (49.0)
GSL2 - Simple with purge	15.0 (381)	12.5 (318)	4.52 (115)
GSL2 - Simple with purge and cooler	19.0 (483)	12.5 (318)	4.52 (115)
GSL3 - Continuous flow	11.0 (279)	8.50 (216)	1.92 (49.0)
GSL3 - Continuous flow with cooler	15.0 (381)	8.50 (216)	1.92 (49.0)
GSL4 - Continuous flow with purge	15.0 (381)	12.5 (318)	4.52 (115)
GSL4 - Continuous flow with purge and cooler	19.0 (483)	12.5 (318)	4.52 (115)
GSL5 - Simple with back-purge	19.0 (483)	16.5 (419)	4.52 (115)
GSL5 - Simple with back-purge and cooler	23.0 (584)	16.5 (419)	4.52 (115)
GSL6 - Fixed volume	15.0 (381)	12.5 (318)	5.04 (128)
GSL6 - Fixed volume with cooler	19.0 (483)	12.5 (318)	5.04 (128)
GSL7 - Fixed volume continuous flow	15.0 (381)	12.5 (318)	5.04 (128)

Bottle Size	D <sup>①</sup>	D <sup>②</sup>
8 oz Boston Round	0.13 (3.3)	6.13 (156)
16 oz Boston Round	1.36 (34.5)	7.36 (187)
32 oz Boston Round	2.84 (72.1)	8.84 (225)
250 cm <sup>3</sup> media bottle	0.26 (6.6)	6.26 (159)
500 cm <sup>3</sup> media bottle	1.73 (43.9)	7.73 (196)
1000 cm <sup>3</sup> media bottle	3.68 (93.4)	9.68 (264)

① GSL1 and GSL3

② GSL2, GSL4, GSL5, GSL6, GSL7

## GSL Ordering Information

Build a GSL solution ordering number by combining the designators in the sequence shown below. Bottles are ordered separately, refer to page 41.

1    2    3    4    5    6  
 GSL - **1** - **02OZ** - **C** - **B** - **S4** - **KZ**

### 1 System Type

- 1 = Simple
- 2 = Simple with purge
- 3 = Continuous flow
- 4 = Continuous flow with purge
- 5 = Simple with back purge
- 6 = Fixed volume
- 7 = Fixed volume with continuous flow

### 2 Bottle Fixture Size<sup>①</sup>

- 08OZ** = 8 oz Boston Round
- 16OZ** = 16 oz Boston Round
- 32OZ** = 32 oz Boston Round
- 0250** = 250 cm<sup>3</sup> media bottle
- 0500** = 500 cm<sup>3</sup> media bottle
- 1000** = 1000 cm<sup>3</sup> media bottle

<sup>①</sup> Fixture accepts standard bottle without safety coating. For applications requiring a safety coated bottle, please contact your authorized sales and service center.

### 3 Needles

#### Side-by-Side Needles

- A** = 0.065 in. (1.7 mm) process and vent needles
- B** = 0.083 in. (2.1 mm) process and vent needles
- C** = 0.109 in. (2.8 mm) process needle and 0.083 in. (2.1 mm) vent needle

#### Tube Stub and Vent Orifice

- E** = 0.25 in. (6.4 mm) tube stub

### 4 Sample Cooler

**X** = No cooler or thermometer

(primary scale: Fahrenheit; secondary scale: Celsius)

- B** = Cooler with -40 to 160°F thermometer
- C** = Cooler with 0 to 200°F thermometer
- D** = Cooler with 0 to 250°F thermometer
- E** = Cooler with 50 to 300°F thermometer
- F** = Cooler with 50 to 550°F thermometer

(primary scale: Celsius; secondary scale: none)

- G** = Cooler with -40 to 70°C thermometer
- H** = Cooler with -15 to 90°C thermometer
- I** = Cooler with -20 to 120°C thermometer
- J** = Cooler with 10 to 150°C thermometer
- K** = Cooler with 10 to 290°C thermometer

### 5 End Connection

- S4** = 1/4 in. (1/2 in. cooling water)
- 6M** = 6 mm (12 mm cooling water)

### 6 Options

**EN** = Instrumentation will be provided in imperial units (psig/std ft<sup>3</sup>/h) in place of metric (bar/std L/min)<sup>②</sup>

**KZ** = Perfluorocarbon FFKM<sup>①</sup>

**MP** = Pressure gauges provided with MPa primary units and no secondary units.<sup>②</sup>

**S** = No PTFE tape allowed

**Omit** = No options added

- <sup>①</sup> Check valves on purge line(s) provided with perfluorocarbon FFKM O-rings.
- <sup>②</sup> EN and MP options cannot be ordered together.



The standard configuration of the GSL is designed to dispense into a Boston Round or media bottle without safety coating. Each sampler must be used with a matching-sized sample bottle. Bottles can be used with either a septum or solid cap.

A septum cap forms a resilient seal against the dispensing needle during sampling, preventing unintentional escape of vent gases. Once the bottle is withdrawn from the sampler, the septum reduces the chance of spillage or off-gassing during transport without any additional action by the operator.

If open-bottle sampling is preferred, a solid cap can be screwed onto the bottle after withdrawal for storage or transport. This option is not recommended for volatile liquids, as internal pressure can build after the cap is secured.

Glass bottles for use with the GSL samplers are available from Swagelok, along with the supporting septa and solid caps; ordering numbers are shown below. The GSL samplers are compatible with many commercially available Boston Round bottles with the same nominal sizes.

Boston Round								
Bottle Dimensions				Ordering Numbers				
Size oz	Diameter in (mm)	Height in (mm)	Thread Size	Clear Bottle	Amber Bottle	Solid Cap	Hole Cap	Septum
8	2.4 (60)	5.4 (137)	24-400	GSL-BOTTLE-08OZ	GSL-BOTTLE-08OZ-AM	GSL-CAP-24-400	GSL-CAP-24-400-H	GSL-SEPTUM-24
16	3.0 (75)	6.6 (168)	28-400	GSL-BOTTLE-16OZ	GSL-BOTTLE-16OZ-AM	GSL-CAP-28-400	GSL-CAP-SEPTUM-28-400	
32	3.7 (94)	8.3 (210)	33-400	GSL-BOTTLE-32OZ	GSL-BOTTLE-32OZ-AM	GSL-CAP-33-400	GSL-CAP-SEPTUM-33-400	

Notes:

- Bottles are glass and are provided without a cap.
- Solid caps are black phenolic with a polyethylene cone liner.
- Hole caps are black phenolic
- For 28-400 and 33-400 thread sizes, hole caps are white polypropylene with bonded PTFE-faced silicone septa.
- Septa are PTFE-faced silicone.

Media Bottles								
Bottle Dimensions				Ordering Numbers				
Size cm <sup>3</sup>	Diameter in (mm)	Height in (mm)	Thread Size	Clear Bottle	Amber Bottle	Solid Cap	Hole Cap	Septum
250	2.8 (70.0)	5.4 (138)	GL45	GSL-BOTTLE-0250	GSL-BOTTLE-0250-AM	GSL-CAP-GL45	GSL-CAP-GL45-H	GSL-SEPTUM-GL45
500	3.4 (86.0)	6.9 (176)	GL45	GSL-BOTTLE-0500	GSL-BOTTLE-0500-AM	GSL-CAP-GL45	GSL-CAP-GL45-H	GSL-SEPTUM-GL45
1000	4.0 (101)	8.9 (225)	GK45	GSL-BOTTLE-1000	GSL-BOTTLE-1000-AM	GSL-CAP-GL45	GSL-CAP-GL45-H	GSL-SEPTUM-GL45

## Grab Sample Valves (GSV)

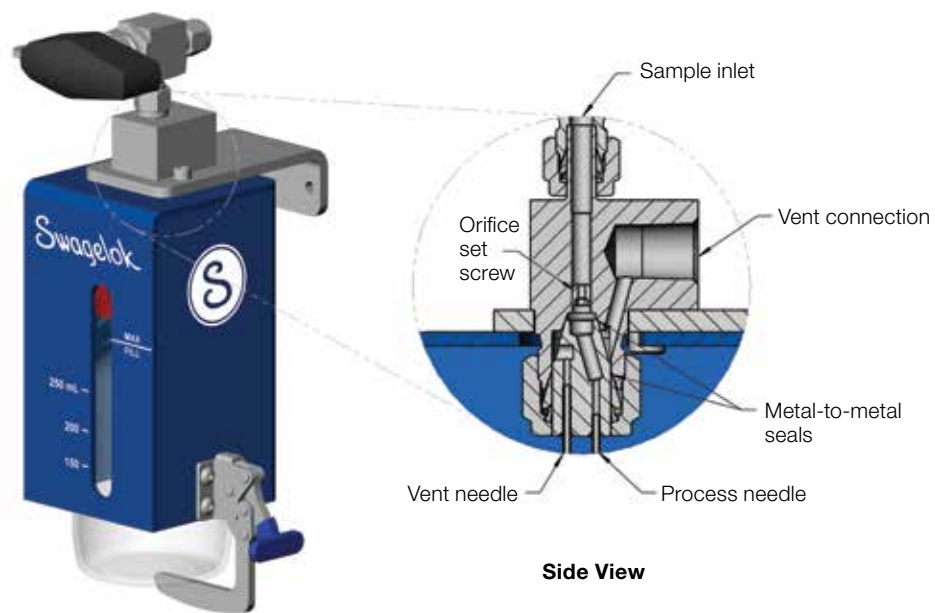
### Features

We designed the Swagelok® grab sampling valve to help you overcome the challenges associated with standard bottle sampling panels, and in turn:

- reduce leaks
- protect operator and environment
- enhance quality of sample
- save time and money

The Swagelok grab sampling valve features a replaceable needle assembly that attaches to the valve body using a Swagelok® tube fitting. This strong, leak-tight design better protects operators and the environment by reducing exposure to process fluids.

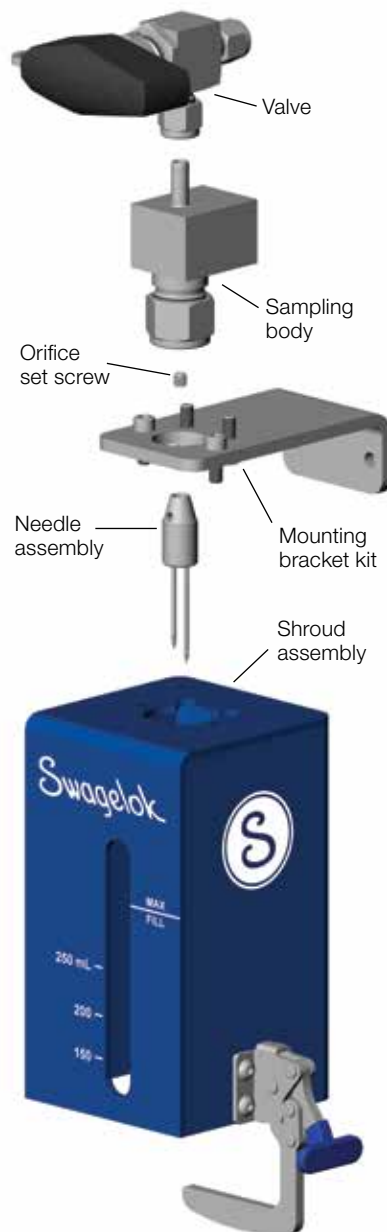
You can also save time and cost on system maintenance due to the Swagelok grab sampling valve's easy needle replacement, improved needle design, absence of elastomer seals, and interchangeable shrouds.



Note: bottle not included

## GSV Materials of Construction

Assembly Subsection	Component	Material Grade/ Specification
Valve	1 series needle valve	See Swagelok <i>Integral-Bonnet Needle Valves</i> Catalog, <a href="#">MS-01-164</a>
	43G series ball valve	See Swagelok <i>One-Piece Instrumentation Ball Valves</i> Catalog, <a href="#">MS-02-331</a>
Sampling bodies	Body	316/316L SS / ASTM A479
	Orifice set screw	316 SS / ASTM F880
	Nut and ferrules	316/316L SS / ASTM A276
Mounting bracket kit	Bracket	304 SS / ASTM A240
	Screws	300 series SS
Shroud assembly	Shroud	304 SS / ASTM A240 TGIC-Polyester powder-coat paint
	Clamp	300 series SS, vinyl handle sleeve
	Screws	300 series SS
Needle assemblies	Adapter	316/316L SS / ASME A479/ ASME SA479 and ASM A276
	Needles	316 SS / ASTM A269 and ASTM A908
	Braze filler	Silver alloy / AMS 4763
	Tubing	316/316L SS / ASTM A213/ A269
Sealants	Thread tape (standard)	PTFE / A-A-58092
	SWAK™ sealant (optional)	Resin (containing methacrylic ester) and PTFE particles



## GSV Testing

Every Swagelok grab sample valve is tested for leaks to atmosphere.

## GSV Cleaning and Packaging

All Swagelok grab sample valves are cleaned in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)*, MS-06-62.

## GSV Complete Assembly Ordering Information

Build a grab sample valve ordering number by combining the designators in the sequence shown below.

**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **11**  
**SS - GSV - 43 F4 A D - 31 M D 0500 - S**

### 1 Material

**SS** = 316 SS

### 2 Series

**GSV** = Grab sample valve

### 3 Valve Series

**1R** = 1 Series Needle Valve

**43** = 43G Series Ball Valve

**WV** = Without valve<sup>①</sup>

### 4 Inlet Connection<sup>②</sup>

**43G and 1 series options**

**F4** = 1/4 in. female NPT

**S4** = 1/4 in. tube fitting

**6M** = 6mm tube fitting

**Without valve options**

**M4** = 1/4 in. male NPT

**T4** = 1/4 in. tube adapter

**T6M** = 6mm tube adapter

### 5 Body Style

**S** = Straight<sup>①</sup>

**A** = Angle

### 6 Handle Style<sup>③</sup>

**43G series options**

**D** = Spring return handle

**K** = Nylon oval

**L** = Latch lock

**N** = Nylon directional

**S** = Stainless steel directional

**1 series valve options**

**A** = Aluminum bar

**P** = Phenolic round

**S** = Stainless bar

**Without valve**

**X** = No handle

### 7 Orifice

**20** = 0.020 in. orifice

**31** = 0.031 in. orifice

**41** = 0.041 in. orifice

**52** = 0.052 in. orifice

**63** = 0.063 in. orifice

**XX** = None

### 8 Mounting

**M** = Mounting bracket

**S** = Shroud adapter

**X** = None<sup>④</sup>

### 9 Needle Adapter (Process/Vent)

**A** = 0.063 in./ 0.063 in. side-by-side

**B** = 0.083 in./ 0.083 in. side-by-side

**C** = 0.109 in./ 0.083 in. side-by-side

**D** = 0.083 in./ 0.134 in. concentric

**E** = 1/4 in. tube stub/orifice

**X** = None

### 10 Shroud Size

**08OZ** = 8 oz Boston round

**16OZ** = 16 oz Boston round

**32OZ** = 32 oz Boston round

**0250** = 250 cm<sup>3</sup> media bottle

**0500** = 500 cm<sup>3</sup> media bottle

**1000** = 1000 cm<sup>3</sup> media bottle

**XXXX** = None

### 11 Options

**S** = SWAK thread sealant<sup>④</sup>

① Straight Body Style is required for sampler assemblies without a valve.

② Vent connection is 1/4 in. female NPT.

③ Black is the standard color for nylon, phenolic, and aluminum handles.

④ Applicable only to assemblies that include NPT connections.

## GSV Pressure-Temperature Ratings

Pressure/temperature ratings equal to the lowest-rated component in the assembly.

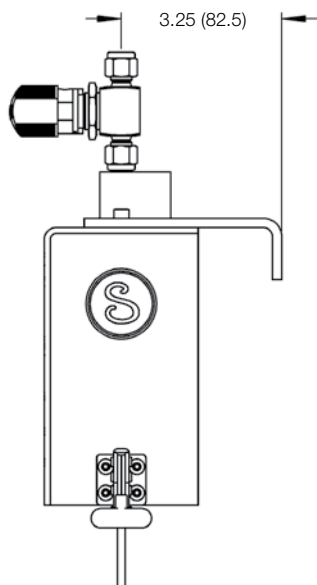
Temperature rating limited to 350°F (176°C) for assemblies with SWAK thread sealant.

Temperature rating limited to 450°F (232°C) for assemblies with PTFE tape sealant (standard).

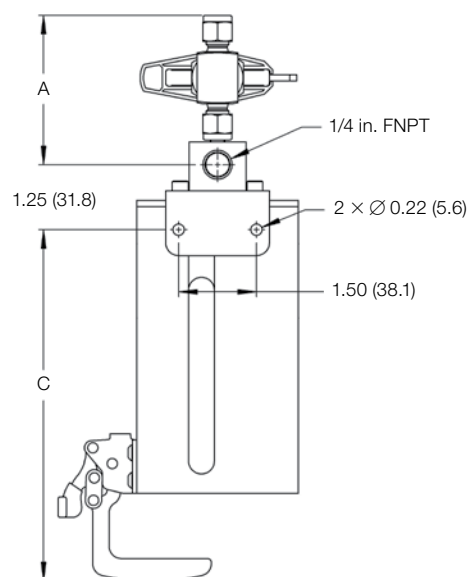
See Swagelok *Integral-Bonnet Needle Valves Catalog*, [MS-01-164](#), and Swagelok *One-Piece Instrumentation Ball Valves Catalog*, [MS-02-33](#), for additional valve dimensions. See the following pages for ratings of the sampling body and needle assemblies.

## GSV Dimensions

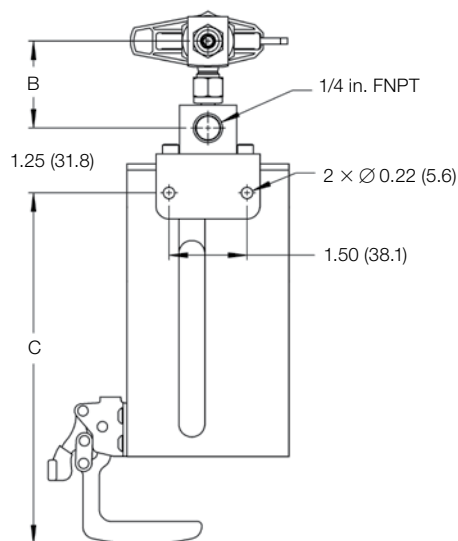
Dimensions, in inches (millimeters), are for reference only and are subject to change.



Side View – Straight Pattern



Rear View – Straight Pattern



Rear View – Angle Pattern

Inlet Connection	Dimensions, in. (mm)	
	A	B
<b>43G Series Ball Valve</b>		
1/4 in. Swagelok Tube Fitting	2.87 (72.9)	1.67 (42.4)
6 mm Swagelok Tube Fitting	2.89 (73.4)	1.69 (42.9)
1/4 in. Female NPT	2.77 (70.4)	1.74 (44.2)
<b>1 Series Needle Valve</b>		
1/4 in. Swagelok Tube Fitting	2.75 (69.9)	1.62 (41.1)
6 mm Swagelok Tube Fitting	2.77 (70.4)	1.64 (41.7)
1/4 in. Female NPT	2.84 (72.0)	1.68 (42.7)

Shroud Size	Dimensions, in. (mm)
	C
<b>Boston Round Bottles</b>	
8 oz	6.63 (168)
16 oz	7.86 (200)
32 oz	9.34 (237)
<b>Media Bottles</b>	
250 cm <sup>3</sup>	6.76 (172)
500 cm <sup>3</sup>	8.23 (209)
1000 cm <sup>3</sup>	10.18 (259)

### Notes:

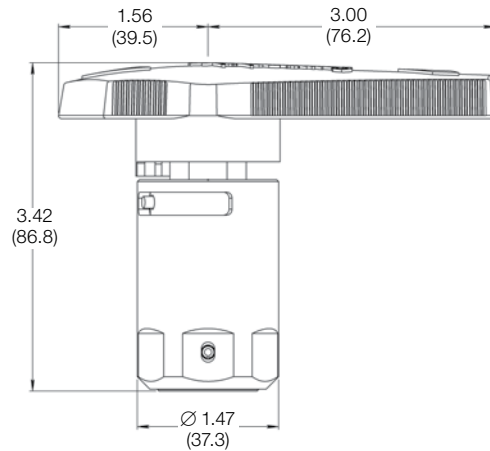
See Swagelok *Integral-Bonnet Needle Valves* Catalog, [MS-01-164](#), and Swagelok *One-Piece Instrumentation Ball Valves* Catalog, [MS-02-33](#), for additional valve dimensions.

See sections that follow for additional component dimensions.

## GSV Component Kit Information

### Spring Return Handle Details

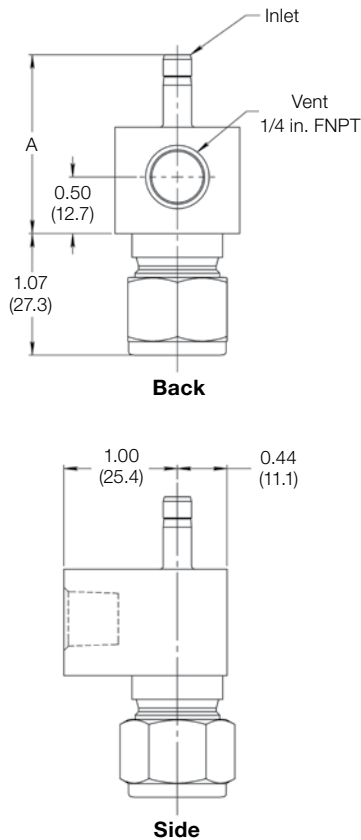
Dimensions, in inches (millimeters), are for reference only and are subject to change.



Ordering Number	Handle Color
MS-5K-43GD-BK	Black
MS-5K-43GD-BL	Blue
MS-5K-43GD-GR	Green
MS-5K-43GD-OR	Orange
MS-5K-43GD-RD	Red
MS-5K-43GD-YW	Yellow

The spring return handle kit can be added to a standard 43G straight or angle pattern valve. The standard kit contains a patent-pending 45 series spring return handle for added torque and ease of actuation.

### Sampling Body Details



Ordering Number	Inlet Connection	Dimensions, in. (mm)
		A
SS-GSV-SB-T4	1/4 in. Tube Adapter	1.58 (40.1)
SS-GSV-SB-TM6	6 mm Tube Adapter	1.60 (40.6)
SS-GSV-SB-M4	1/4 in. Male NPT	1.50 (38.1)

### Pressure-Temperature Ratings

Sampling Body Working Pressure, psig (bar)		
Temperature, °F (°C)	Inlet Rating	Vent Rating
-65 (-53) to -20 (-29)	3000 (206)	1200 (82.7)
100 (37)	3000 (206)	1200 (82.7)
150 (65)	2580 (177)	1032 (71.2)
200 (93)	2580 (177)	1032 (71.2)
250 (121)	2340 (161)	936 (64.5)
300 (148)	2340 (161)	936 (64.5)
350 (176)	2130 (146)	852 (58.7)
400 (204)	2130 (146)	852 (58.7)
450 (232)	1980 (136)	792 (54.6)
500 (260)	1980 (136)	792 (54.6)
550 (287)	1890 (130)	756 (52.1)
600 (315)	1890 (130)	756 (52.1)
650 (343)	1830 (126)	732 (50.5)
700 (371)	1800 (124)	720 (49.6)
750 (398)	1770 (122)	708 (48.8)
800 (426)	1740 (119)	696 (48.0)
850 (454)	1740 (119)	696 (48.0)
900 (482)	1710 (117)	684 (47.2)
950 (510)	1710 (117)	684 (47.2)
1000 (537)	1680 (115)	672 (46.3)

## Orifice Set Screw Details

Sampling valves can be ordered with an orifice to help control the sample flow. Shown below is the approximate water flow rate for each orifice size, based on sample pressure. For liquids other than water, the flow rate can be approximated by multiplying the water flow rate by a conversion factor:

$$q_{\text{SAMPLE}} = q_{\text{H}_2\text{O}} \times \text{Square Root } (\rho_{\text{H}_2\text{O}}/\rho_{\text{SAMPLE}})$$

where:

$q_{\text{SAMPLE}}$  = flow rate of sample fluid

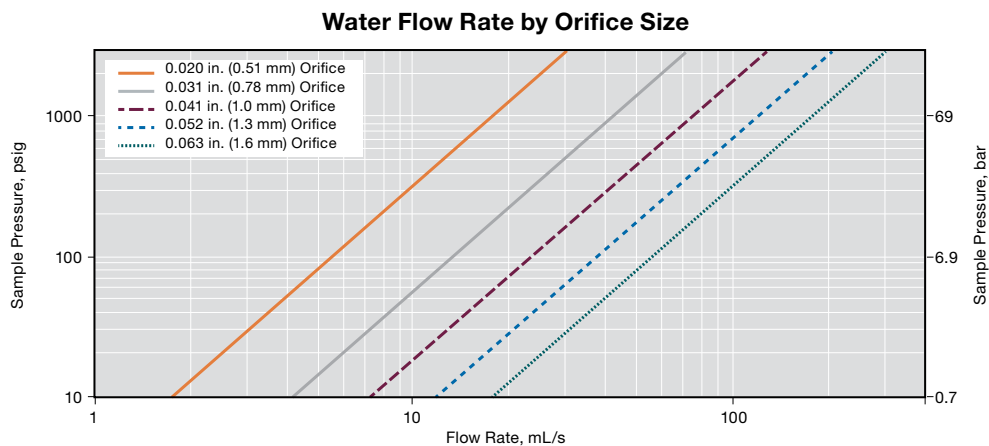
$q_{\text{H}_2\text{O}}$  = flow rate of water

$\rho_{\text{SAMPLE}}$  = density of SAMPLE fluid

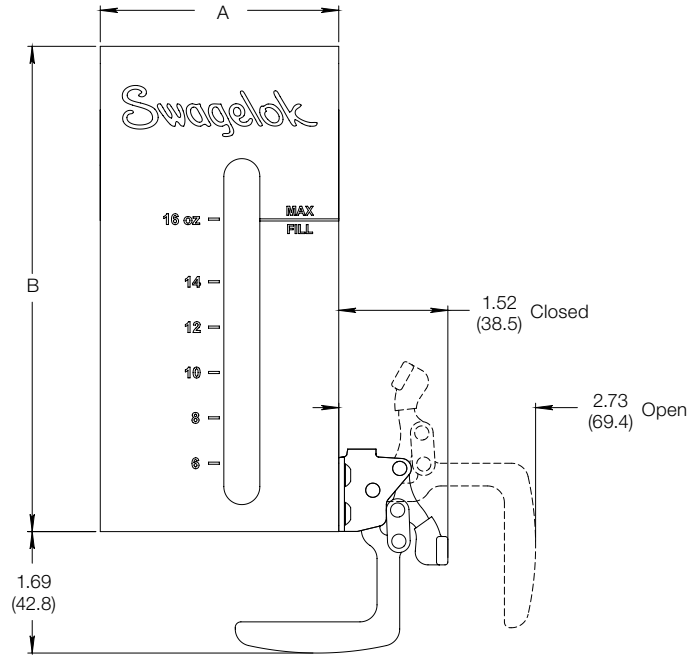
$\rho_{\text{H}_2\text{O}}$  = density of water

## Orifice Set Screws

Ordering Number	Orifice Size, in. (mm)
K-SS-6SS-GSV-20	0.020 (0.51)
K-SS-6SS-GSV-31	0.031 (0.78)
K-SS-6SS-GSV-41	0.041 (1.0)
K-SS-6SS-GSV-52	0.052 (1.3)
K-SS-6SS-GSV-63	0.063 (1.6)



## Shroud Assembly Details

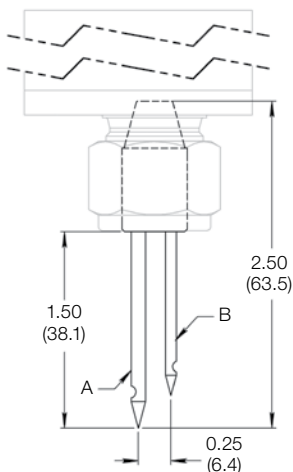


Ordering Number	Shroud Size	Dimensions, in. (mm)	
		A	B
<b>Boston Round Bottles</b>			
304-GSV-SHROUD-08OZ	8 oz	2.74 (69.6)	5.51 (140)
304-GSV-SHROUD-16OZ	16 oz	3.31 (84.1)	6.74 (171)
304-GSV-SHROUD-32OZ	32 oz	4.11 (104)	8.22 (209)
<b>Media Bottles</b>			
304-GSV-SHROUD-0250	250 cm <sup>3</sup>	3.12 (79.1)	5.64 (143)
304-GSV-SHROUD-0500	500 cm <sup>3</sup>	3.77 (95.6)	7.11 (181)
304-GSV-SHROUD-1000	1000 cm <sup>3</sup>	4.36 (111)	9.06 (230)

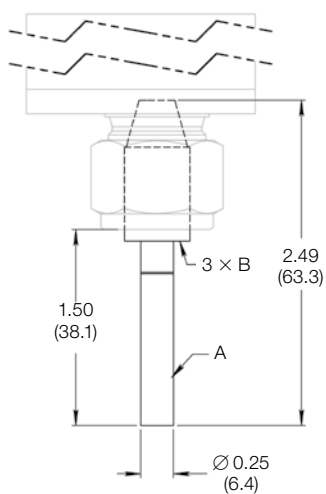


## Needle Assembly Details

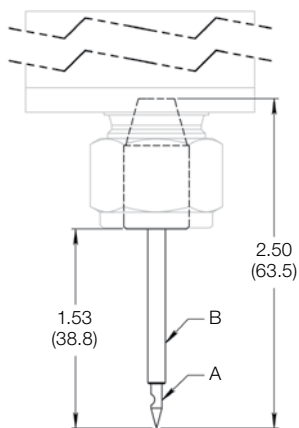
Dimensions, in inches (millimeters), are for reference only and are subject to change.



**Side-by-Side Needles**



**Tube Stub**



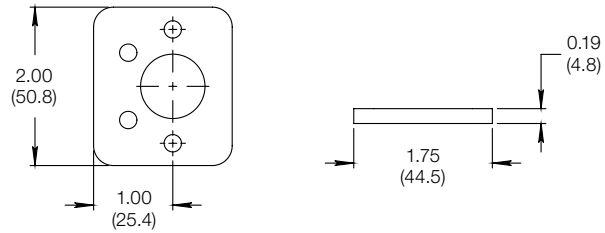
**Concentric Needles**

Ordering Number	Dimensions, in. (mm)	
	Process (A)	Vent (B)
<b>Side-by-Side Needles</b>		
SS-GSV-NEEDLE-A	0.065 (1.7)	0.065 (1.7)
SS-GSV-NEEDLE-B	0.083 (2.1)	0.083 (2.1)
SS-GSV-NEEDLE-C	0.109 (2.8)	0.083 (2.1)
<b>Concentric Needles</b>		
SS-GSV-NEEDLE-D	0.083 (2.1)	0.134 (3.4)
<b>Tube Stub</b>		
SS-GSV-NEEDLE-E	1/4 in. x 0.035 Tube	3 x 0.07 (1.8) Orifice

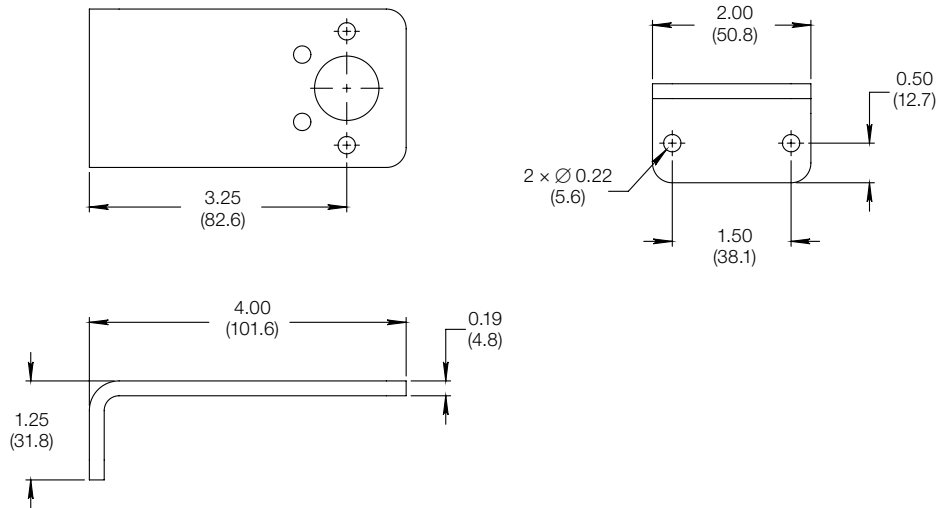
Needle Assembly Working Pressure, psig (bar)			
Temperature, °F (°C)	Side-by-Side Needles	Concentric Needles	Tube Stub
-65 (-53) to -20 (-29)	3000 (206)	3000 (206)	3000 (206)
100 (37)	3000 (206)	3000 (206)	3000 (206)
150 (65)	2580 (177)	2580 (177)	2580 (177)
200 (93)	2580 (177)	2580 (177)	2580 (177)
250 (121)	2340 (161)	2340 (161)	2340 (161)
300 (148)	2340 (161)	2340 (161)	2340 (161)
350 (176)	-	2130 (146)	2130 (146)
400 (204)	-	2130 (146)	2130 (146)
450 (232)	-	1980 (136)	1980 (136)
500 (260)	-	1980 (136)	1980 (136)
550 (287)	-	1890 (130)	1890 (130)
600 (315)	-	1890 (130)	1890 (130)
650 (343)	-	1830 (126)	1830 (126)
700 (371)	-	1800 (124)	1800 (124)
750 (398)	-	1770 (122)	1770 (122)
800 (426)	-	1740 (119)	1740 (119)
850 (454)	-	1740 (119)	1740 (119)
900 (482)	-	1710 (117)	1710 (117)
950 (510)	-	1710 (117)	1710 (117)
1000 (537)	-	1680 (115)	1680 (115)

## Mounting Bracket Kit Details

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



**Shroud/Enclosure Adapter**  
(Ordering Number - 304-GSV-MBK-S)



**Wall Bracket**  
(Ordering Number - 304-GSV-MBK-M)

## Accessories

Several options are available for your grab sampling system, such as:

- Additional instrumentation - gauges, flowmeters, and transducers
- Sample coolers - Sentry sample coolers
- Process connections - threaded and flanged connections
- Enclosures and stands (see below for a detailed example)
- Automation - add a pneumatically or electrically actuated valve to automate your sampling sequence
- Exotic alloys - certain components are available in alloy 400, alloy C-276, or alloy 600

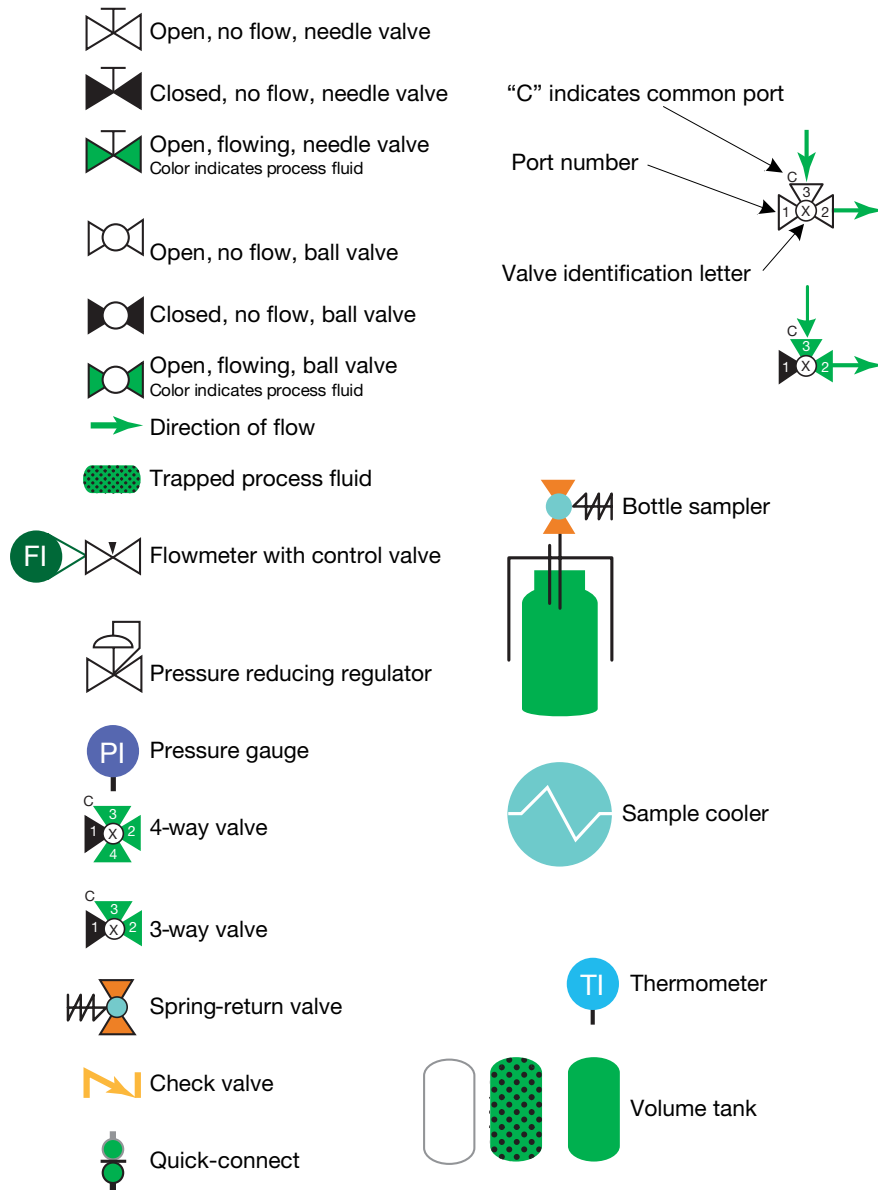
Contact your authorized sales and service center for details.



**Grab Sampling enclosure and stand**

## Glossary - Schematic Symbol Definitions

The following symbols are used in the flow schematics of the sampling systems described in this application guide. Please refer back to this page for reference.



#### **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.**

#### **⚠ WARNING**

**Do not mix/interchange Swagelok products or components not governed by industrial design standards, including Swagelok tube fitting end connections, with those of other manufacturers.**

## **Warranty Information**

Swagelok products are backed by The Swagelok Limited Lifetime Warranty. For a copy, visit [swagelok.com](http://swagelok.com) or contact your authorized Swagelok representative.