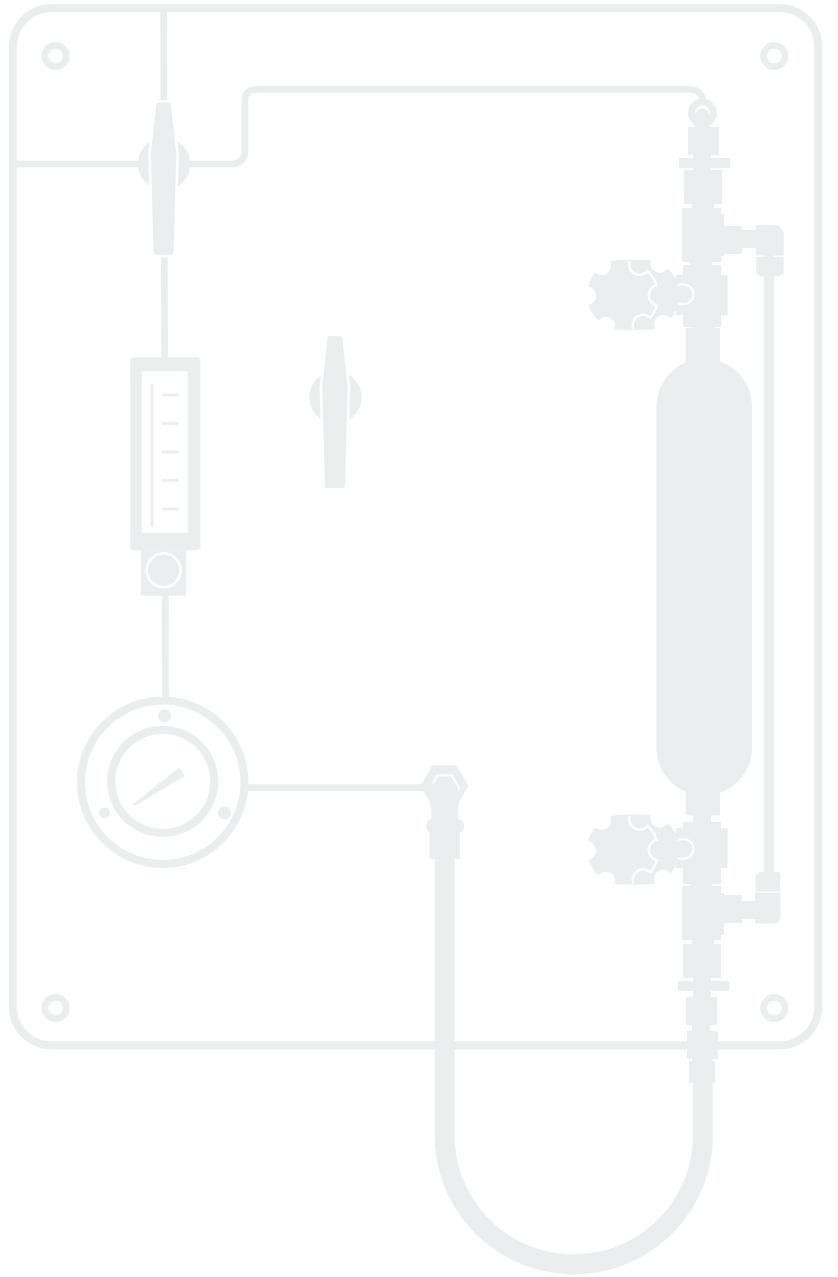


Grab Sampling Systems

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.

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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
	× Bottle	✓ Bottle
Vapor	✓ Cylinder	✓ Cylinder
	× Bottle	× Bottle

✓ = recommended × = 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 safety 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 brass and 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.

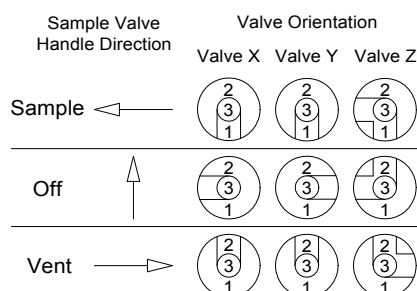
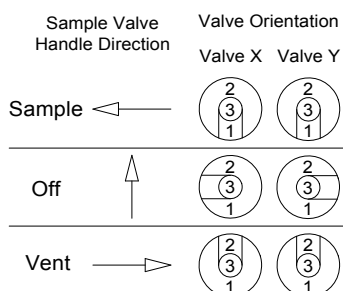
This allows for simultaneous control of fluid routing, reducing the number of sequencing steps required to draw a sample. The likelihood of errant sampling is reduced and a clear indication of sequencing is provided to the operator. This valve assembly is a standard on all GSM panels as well as fixed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



**2-valve
Switching Valve**

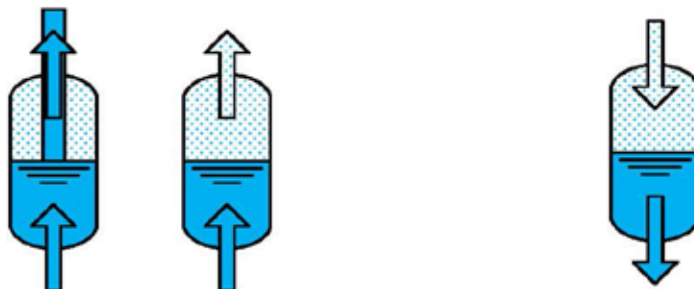


**3-valve
Switching Valve**



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 42 for a complete list of accessories.

The flow schematics that follow use the symbols defined in the glossary on page 43.

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.

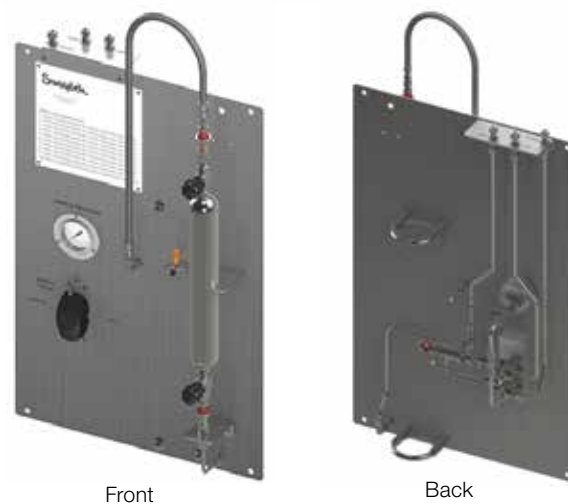
**GSM-L-1(-N) - Standard Liquid
Sampler without Purge**

Use:

General use for liquid sampling.

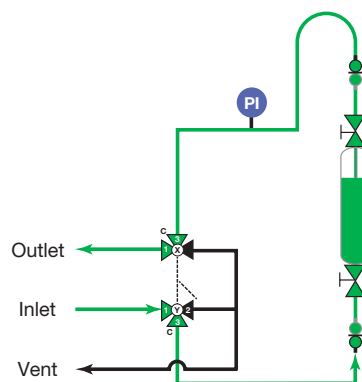
Recommended for:

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



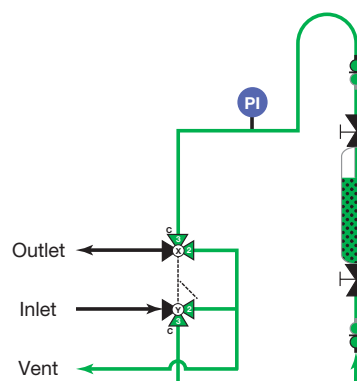
Sample handle position:

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

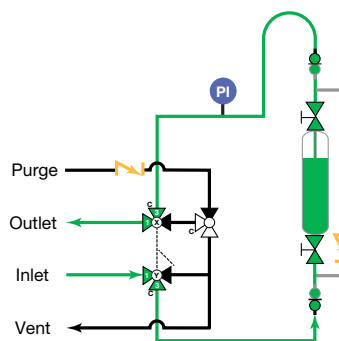


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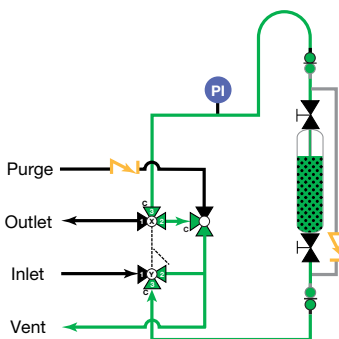
Sample handle position:

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.



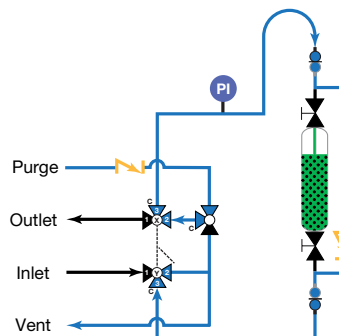
Vent handle position:

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:

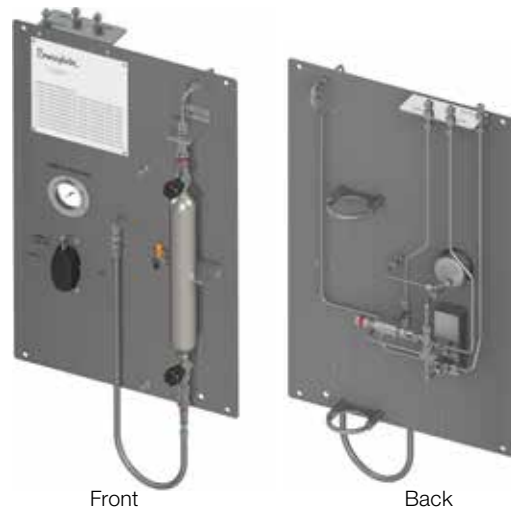
All flow is halted.

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

Use:
General use for gas sampling.

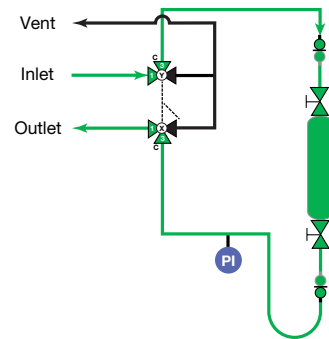
Recommended for:

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



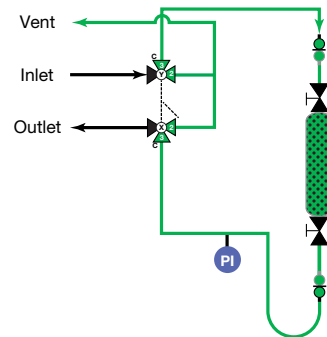
Sample handle position:

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.

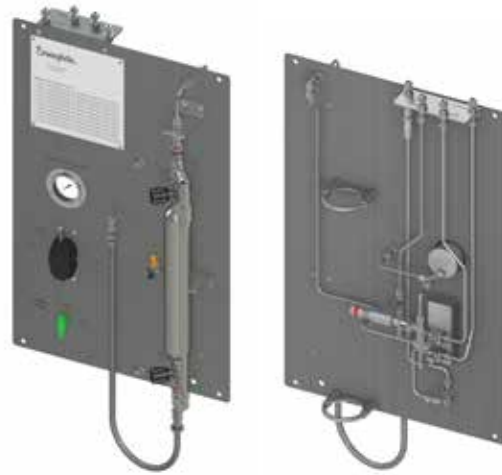
GSM-G-1(-P) - Standard Gas Sampler with Purge

Use:

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

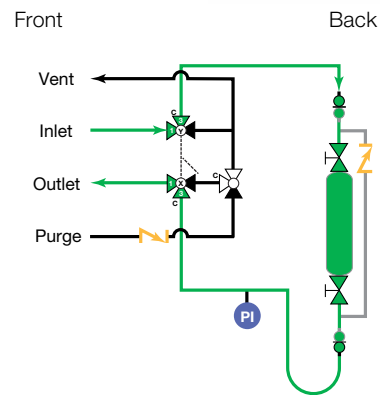
Recommended for:

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



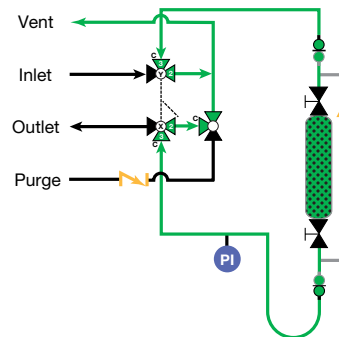
Sample handle position:

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.



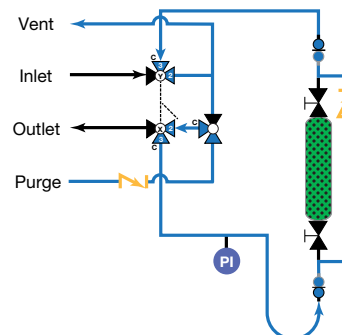
Vent handle position:

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.

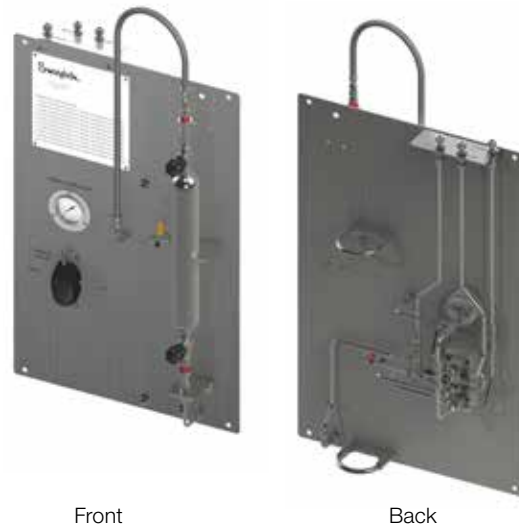
GSM-L-2(-N) - Continuous Flow Liquid Sampler without Purge

Use:

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

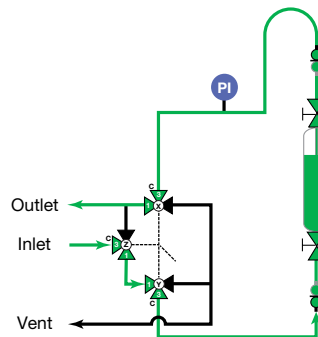
Recommended for:

- 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.



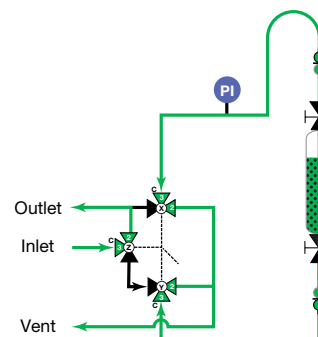
Sample handle position:

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

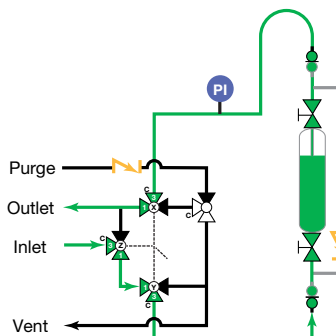


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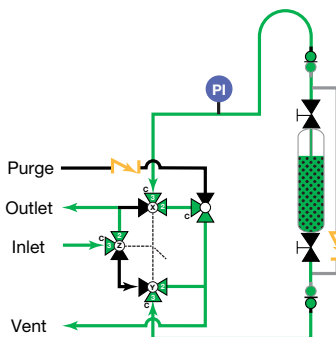
Sample handle position:

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.



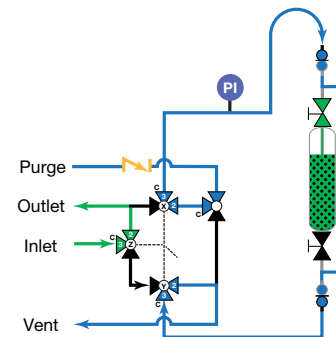
Vent handle position:

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.

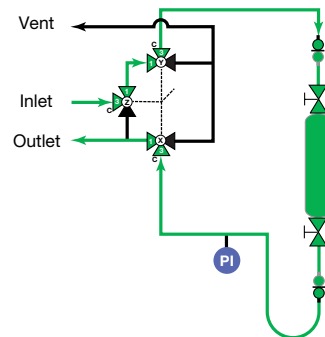
Recommended for:

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



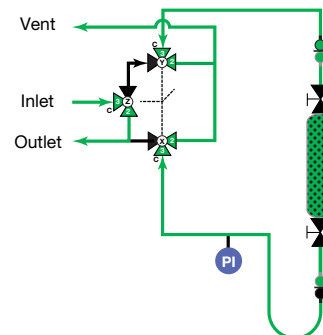
Sample handle position:

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.

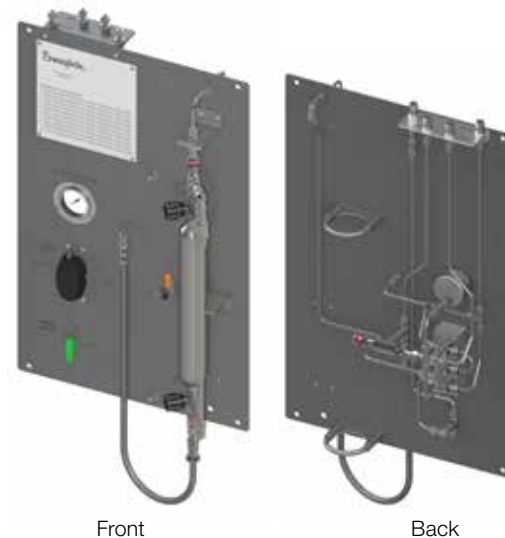
GSM-G-2(-P) - Continuous Flow Gas Sampler with Purge

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.

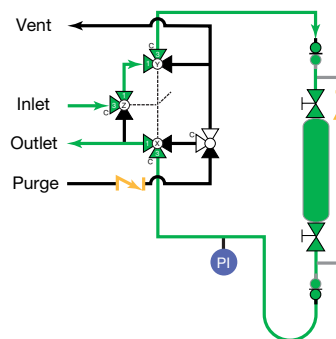
Recommended for:

- 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



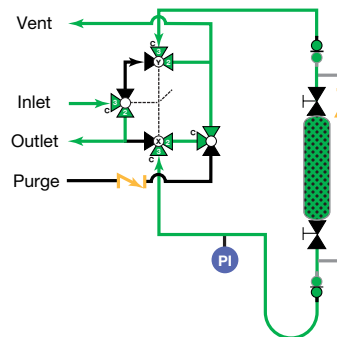
Sample handle position:

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.



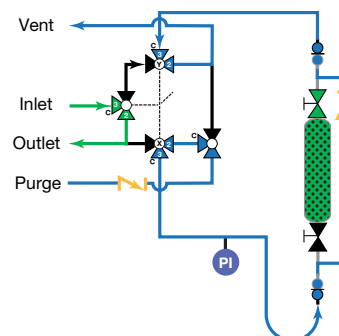
Vent handle position:

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, MS-02-331
Check valve	Swagelok CH series	See Swagelok <i>Check Valves, C, CA, CH, and CPA Series</i> catalog, MS-01-59
Hose	Swagelok FL and FM series	See Swagelok <i>Hose and Flexible Tubing</i> catalog, MS-01-180
Pressure indicator	Swagelok S model pressure gauge	See Swagelok <i>Pressure Gauges, Industrial and Process—PGI Series</i> catalog, MS-02-170
Relief valve, proportional	Swagelok R3A series	See Swagelok <i>Proportional Relief Valves</i> catalog, MS-01-141
System Hardware and Optional Components		
Stainless steel tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gaugeable Tube Fittings and Adapter Fittings</i> catalog, MS-01-140
Stainless steel quick connects	Swagelok	316 SS See Swagelok <i>Quick Connects QC, QF, QM, and QTM Series</i> catalog, MS-01-138
Stainless steel panel, brackets, pipe stand clamps, screws	Swagelok	300 series stainless steel

GSM Pressure-Temperature Ratings

Quick Connect Series	QC4 [®]					QC6 [®]			
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)	103 (1500)
120 (48)				86.8 (1260)					86.8 (1260)
150 (65)					158 (2300)				79.2 (1150)
200 (93)				78.5 (1140)					127 (1850)
250 (121)					96.4 (1400)				51.6 (750)
300 (148)									

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

Quick Connect Series	QTM2				
Gauge Range, bar	10	25	60	100	160
Temperature, °F (°C)	Working Pressure, bar (psi)				
0 (-17) to 10 (-12)	10.0 (145)	25.0 (362)	60.0 (870)	100 (1450)	160 (2320)
10 (-12) to 100 (37)				86.8 (1260)	
120 (48)					

Quick Connect Series	QC4 [®]					QC6 [®]			
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)
120 (48)				1260 (86.8)	2500 (172)				1260 (86.8)
150 (65)					2300 (158)				1150 (79.2)
200 (93)				1140 (78.5)					1850 (127)
250 (121)					1400 (96.4)				750 (51.6)
300 (148)									

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

Quick Connect Series	QTM2				
Gauge Range, psi	160	400	800	1500	3000
Temperature, °F (°C)	Working Pressure, psig (bar)				
0 (-17) to 10 (-12)	160 (11.0)	400 (27.5)	8700 (60.0)	1500 (103)	2500 (172)
10 (-12) to 100 (37)				1260 (86.8)	2500 (172)
120 (48)					

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

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

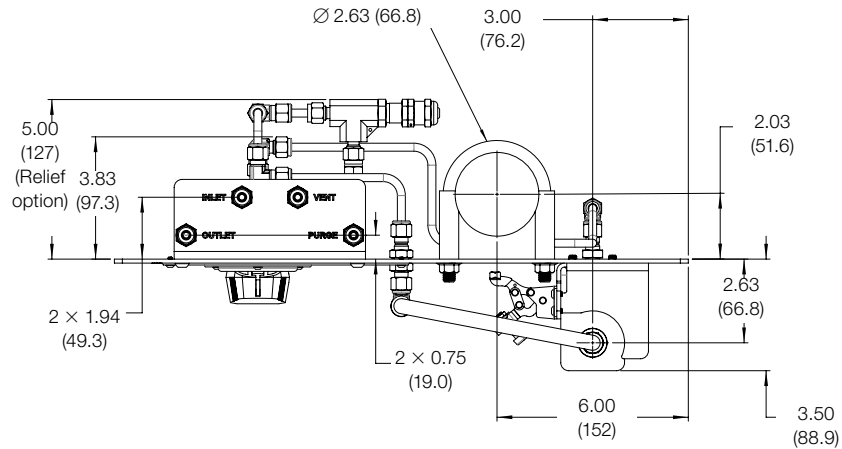
The GSM flow data is based on calculation using 70°F (20°C) as a reference point.

Pressure Drop to Atmosphere psi (bar)	Air Flow (Nitrogen) std ft ³ /min (std L/min)	Water Flow U.S. gal/min (std 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)

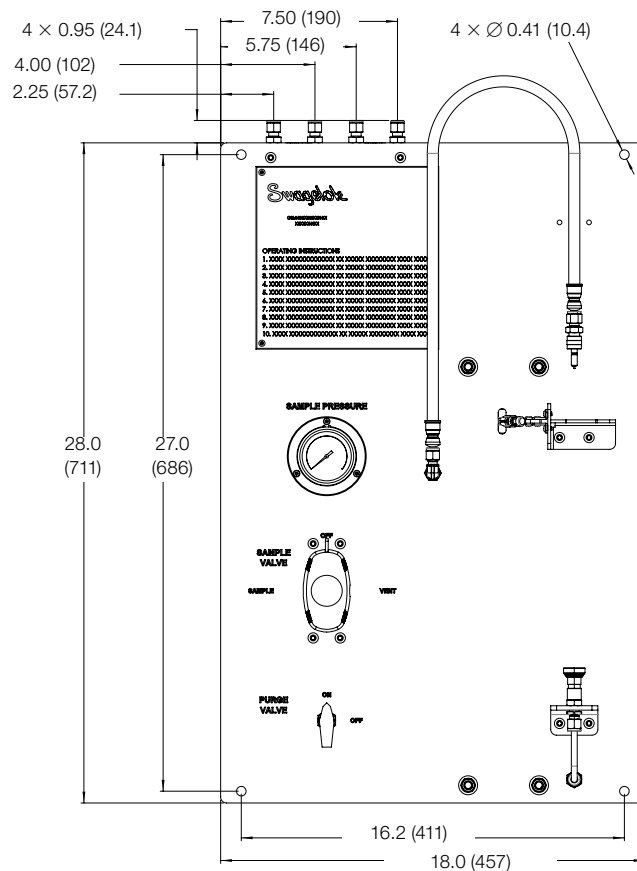
GSM Dimensions

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

5 Relief Valve

A = Proportional
X = None

2 Flow Pattern

1 = Standard
2 = Continuous Flow

6 Cylinder Bracket Size (GSC specific)

0150 = 150 cm³
0300 = 300 cm³
0400 = 400 cm³
0500 = 500 cm³
1000 = 1000 cm³

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

7 Purge

N = No Purge
P = Purge

8 End Connection

S4 = 1/4 in. Swagelok tube fitting
6M = 6 mm Swagelok tube fitting

4 Quick Connect

2 = QTM2
4 = QC4
6 = QC6[Ⓢ]

Ⓢ Not available with 0 to 3000 psi or 0 to 160 bar gauge.

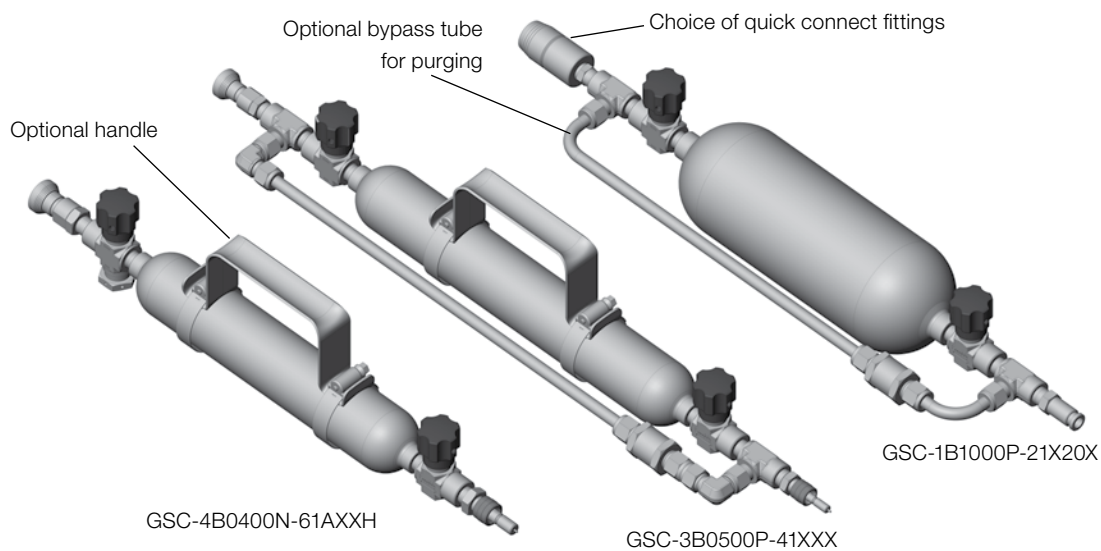
Grab Sample Cylinders (GSC)

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 cm³)
- 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.

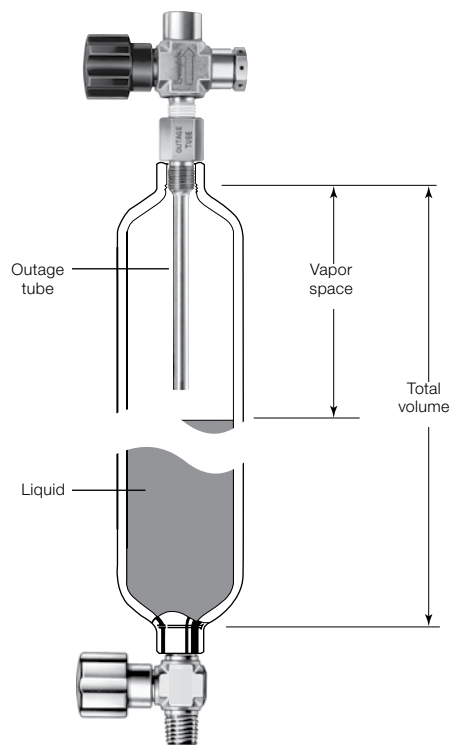
Use

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.



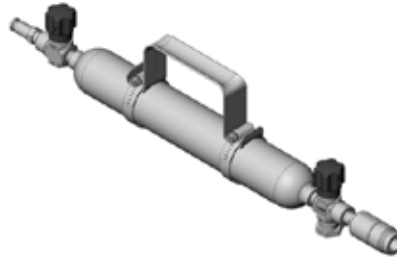
GSC Assembly Descriptions

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, MS-01-177
Purge valve	Swagelok CH series	See Swagelok <i>Check Valves, C, CA, CH, and CPA Series</i> catalog, MS-01-59
Isolation valve	Swagelok D series	See Swagelok <i>Nonrotating-Stem Needle Valves, D Series</i> catalog, MS-01-42
Stainless steel tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gaugeable Tube Fittings and Adapter Fittings</i> catalog, MS-01-140
Stainless steel quick connects	Swagelok	316 SS See Swagelok <i>Quick Connects QC, QF, QM, and QTM Series</i> catalog, MS-01-138
Handle	Swagelok	304L SS See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, MS-01-177
Rupture disc	Swagelok	316L SS body, Alloy 600 rupture disc See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, MS-01-177
Outage tube	Swagelok	316 SS See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, MS-01-177

GSC Pressure-Temperature Ratings

Quick Connect Series	QC4		QC6		QTM2	
	Cylinder Material	304L/316L	Alloy 400	304L/316L	Alloy 400	304L/316L
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)	—	—
150 (65)					—	—
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).

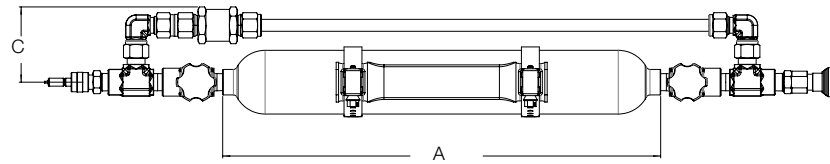
Additional testing available upon request.

GSC Cleaning and Packaging

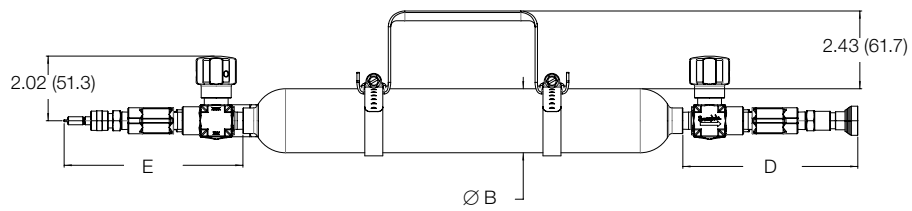
All Swagelok GSC assemblies are cleaned in accordance with Swagelok *Standard Cleaning and Packaging (SC-10)*, MS-06-62.

GSC Dimensions

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



Top View



Front View

Cylinder Volume, cm ³	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 = 150 cm³
- 0300 = 300 cm³
- 0400 = 400 cm³^①
- 0500 = 500 cm³
- 1000 = 1000 cm³^①

^① 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 = QC6^②

^② 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^③
- X = No handle

^③ Available only on cylinders 400 cm³ and larger

10 Options

- EP = Electropolished cylinder^④
- LE = Laser-etched cylinder, followed by specific information
- PD = TPED cylinder certification^⑤
- SB = Stem and body protectors^⑦
- T = PTFE cylinder coating^{④⑥}
- Omit = No options added

^④ Electropolishing and PTFE coating cannot be combined

^⑤ Not available in Alloy 400

^⑥ Not available with SilcoNert 2000 coating

^⑦ 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 Sentry Equipment's Model MVS to draw a sample into a bottle. The MVS is equipped with a spring-return handle to 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 42 for a complete list of accessories.

The flow schematics that follow use the symbols defined in the glossary on page 43.

Note:

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

GSL1 - Simple

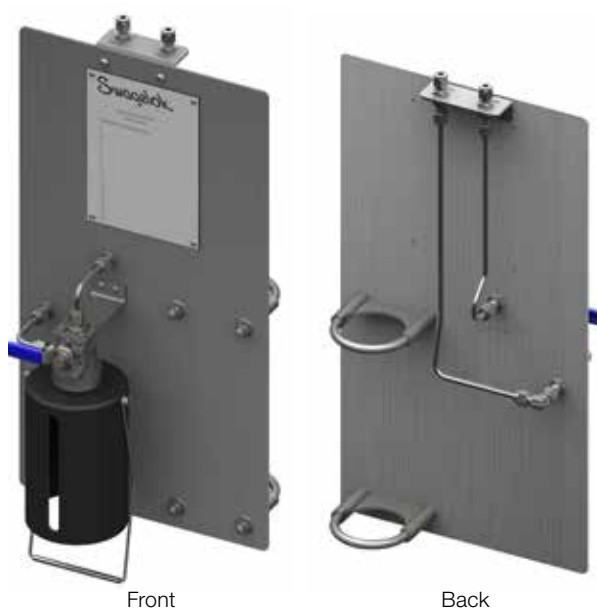
Use:

General use for liquid sampling.

Recommended for:

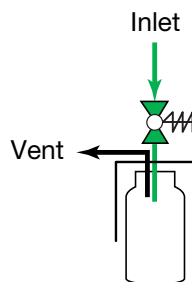
- non-toxic liquids.

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



Valve handle in open position:

Process fluid flows into the bottle. Fluid will continue to flow as long as the handle remains in this position.



GSL2 - Simple with Purge

Use:

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

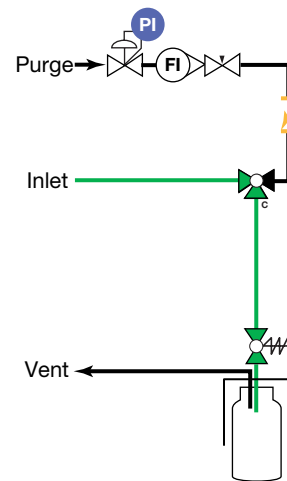
Recommended for:

- non-toxic liquids that may settle in the sampler



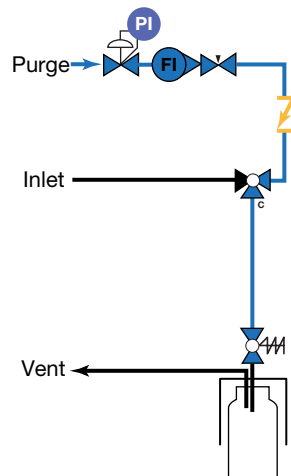
Sample handle position:

Process fluid flows through the bottle and out the tubing to the outlet port towards the dispensing valve. Bottle will fill while dispensing valve is held open. Fluid will continue to flow as long as the handle remains in this position.



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:

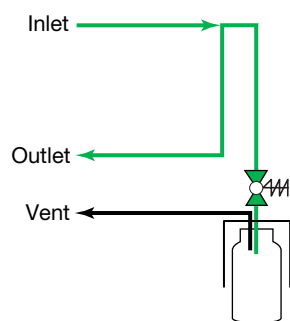
- non-toxic liquids
- samplers installed directly in the sample stream, in a fast loop, or where long sample transport lines are used

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



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.

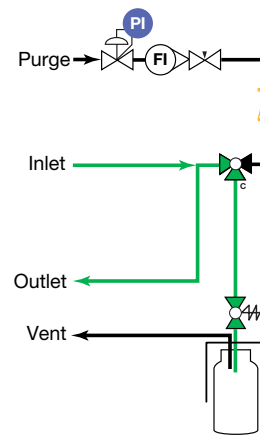
Recommended for:

- 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



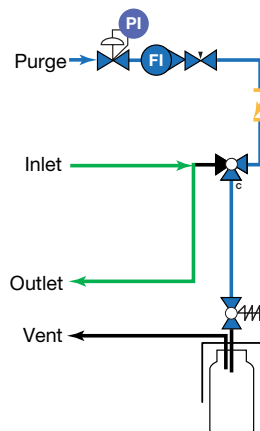
Sample handle position:

Process fluid flows through the bottle and out the tubing to the outlet port towards the dispensing valve. Bottle will fill while dispensing valve is held open. Fluid will continue to flow as long as the handle remains in this position.



Purge handle position:

A purge fluid can be activated to allow the fill lines to be purged (flushed) in the opposite 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

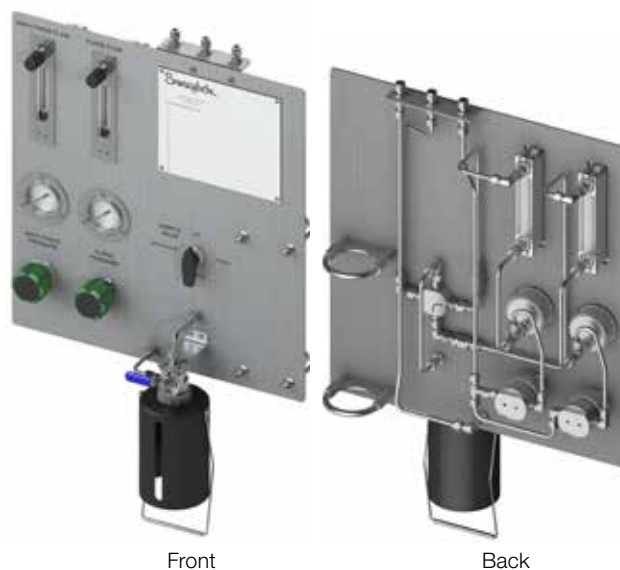
Use:

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 bottle and out the tubing to the outlet port towards the dispensing valve. Bottle will fill while dispensing valve is held open. Fluid will continue to flow as long as the handle remains in this position.

Purge:

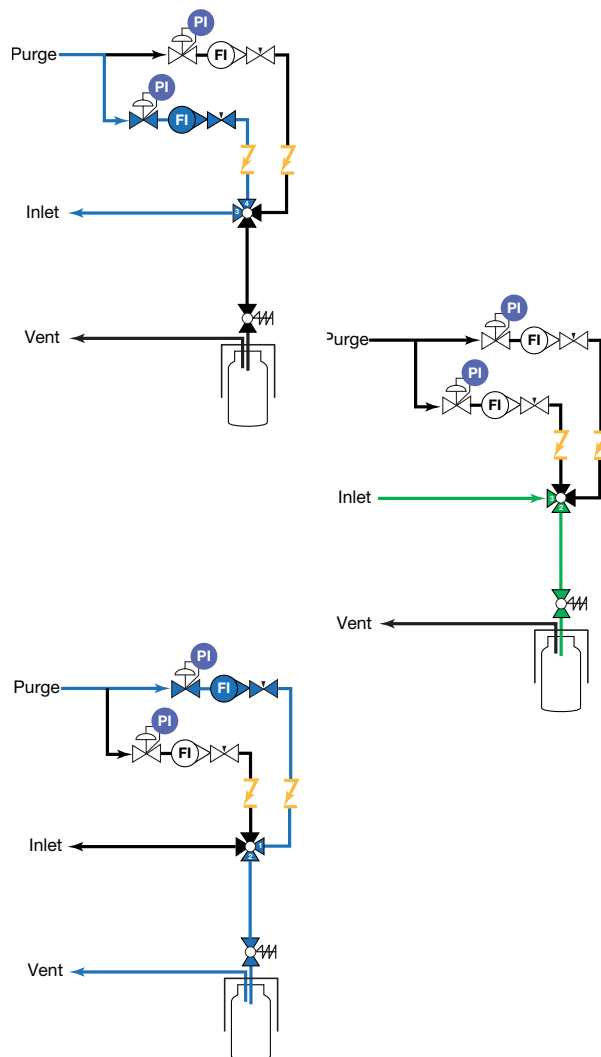
Open the valve handle to purge the fill line. This activates the purge fluid to allow the fill line to be purged in the direction of filling.

CAUTION

Residual fluid in the line will splatter if a bottle is not in place.

Off:

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.

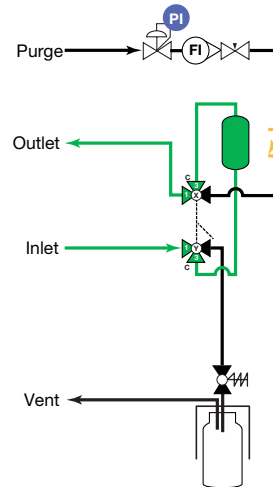
Note:

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



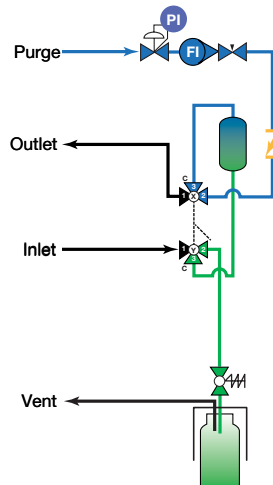
Flush handle position:

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:

Flow is directed through the tubing and towards the dispensing valve using the purge gas pressure. Process fluid flows from the fixed volume chamber into the bottle. Bottle will fill while dispensing valve is held open until the full volume has been dispensed and the reservoir is empty.



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.

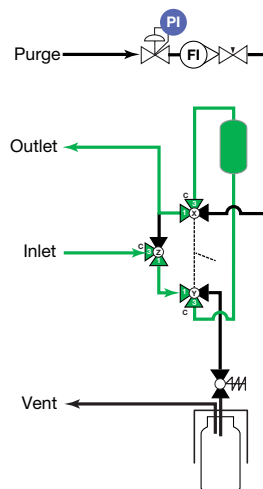


Front

Back

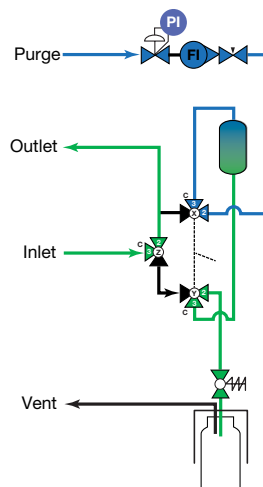
Flush position:

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:

Flow is directed through the tubing and towards the dispensing valve using the purge gas pressure. Process fluid flows from the fixed volume chamber into the bottle. Bottle will fill while dispensing valve is held open until the full volume has been dispensed and the reservoir is empty.



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
Sampling ball 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, MS-01-146
Check valve	Swagelok CH series	See Swagelok <i>Check Valves, C, CA, CH, and CPA Series</i> catalog, MS-01-59
Regulator	Swagelok KPR series	See Swagelok <i>Pressure Regulator, K Series</i> catalog, MS-02-230
Pressure indicator	Swagelok S model pressure gauge	See Swagelok <i>Pressure Gauges, Industrial and Process—PGI Series</i> catalog, MS-02-170
Flowmeter	Swagelok G2 model	See Swagelok <i>Variable Area Flowmeters, G Series and M Series</i> catalog, MS-02-346
Cylinder	Swagelok	See Swagelok <i>Sample Cylinders, Accessories, and Outage Tubes</i> catalog, MS-01-177
MVS	Sentry	See Sentry 1.5.23 catalog
System Hardware and Optional Components		
Stainless steel tube fittings	Swagelok	316 SS/A276 or A182 See Swagelok <i>Gaugeable Tube Fittings and Adapter Fittings</i> catalog, MS-01-140
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 [®] and 4 [®]	5 [®]	6 [®] and 7 [®]
Temperature, °F (°C)	Working Pressure, psig (bar)			
-20 (-28) to -10 (-23)		—	—	—
-10 (-23) to 100 (37)	2200 (151)	2200 (151)	100 (6.8)	1000 (68.9) ^② 1800 (124) ^③
150 (65)	1850 (127)	1850 (127)		840 (57.8) ^② 1360 (93.7) ^②
194 (90)	1500 (103)	1500 (103)		840 (57.8) ^① 1360 (93.7) ^③
200 (93)				—
250 (121)	1150 (79.2)	1150 (79.2)		—
300 (148)	800 (55.1)	800 (55.1)		—
350 (176)	560 (38.5)	—	—	—
400 (204)	330 (22.7)	—	—	—
450 (232)	100 (6.8)	—	—	—

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

② Applicable to 2 oz and 50 cm³ 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.

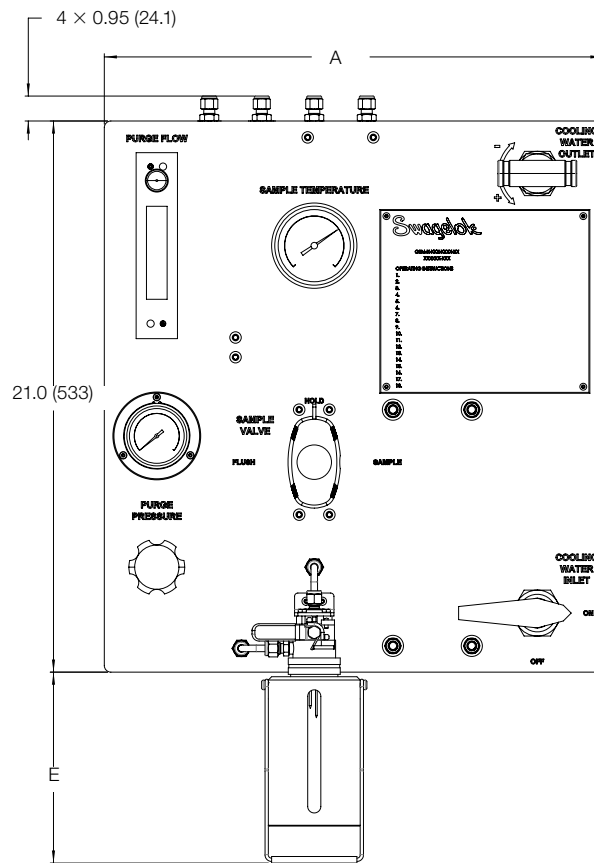
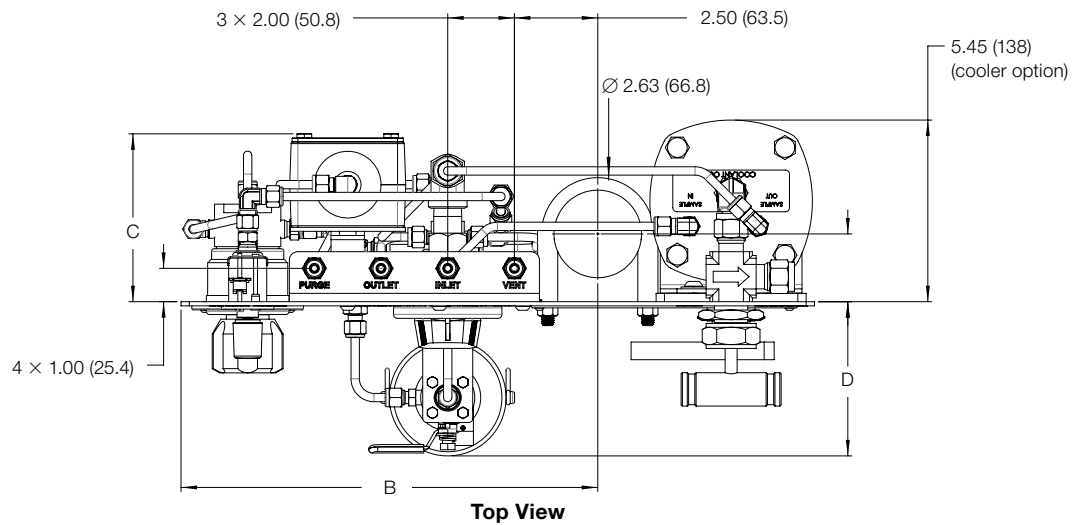
GSL Flow Data

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

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	E ^①	E ^②
2 oz	4.54 (115)	—	4.40 (112)
4 oz	4.54 (115)	—	4.96 (126)
8 oz	4.54 (115)	—	5.96 (151)
16 oz	4.63 (117)	—	7.28 (185)
32 oz	4.91 (125)	1.40 (36.0)	8.90 (226)
50 cm ³	4.54 (115)	—	4.40 (112)
100 cm ³	4.54 (115)	—	4.96 (126)
250 cm ³	4.54 (115)	—	5.96 (151)
500 cm ³	4.63 (117)	—	7.28 (185)
1000 cm ³	4.91 (125)	1.40 (36.0)	8.90 (226)

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 7
 GSL - 1 - 02OZ - 1 1 - 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

- 02OZ = 2 oz Boston Round
- 04OZ = 4 oz Boston Round
- 08OZ = 8 oz Boston Round
- 16OZ = 16 oz Boston Round
- 32OZ = 32 oz Boston Round
- 0050 = 50 cm³ media bottle
- 0100 = 100 cm³ media bottle
- 0250 = 250 cm³ media bottle
- 0500 = 500 cm³ media bottle
- 1000 = 1000 cm³ media bottle

3 Process Needle^①

- 1 = 0.065 in. (1.7 mm)
- 2 = 0.083 in. (2.1 mm)
- 3 = 0.110 in. (2.8 mm)
- 4 = 0.188 in. (4.8 mm) tube

4 Vent Needle^①

- 1 = 0.065 in. (1.7 mm)
- 2 = 0.083 in. (2.1 mm)
- 3 = 0.110 in. (2.8 mm)
- 4 = 0.140 in. (3.6 mm) vent orifice, no needle included

^① Valid combinations: 11, 12, 22, 23, 32, and 44.
32 is recommended as a standard configuration.

5 Sample Cooler

(primary scale: Fahrenheit;
secondary scale: Celsius)

- X = No cooler or thermometer
- 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

6 End Connection

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

7 Options

- EN = Instrumentation will be provided in fractional units (psig/std ft³/h) in place of metric (bar/std L/min)
- KZ = Perfluorocarbon FFKM[®]
- S = No PTFE tape allowed
- Omit = No options added

[®] MVS and check valves on purge line(s) provided with perfluorocarbon FFKM O-rings.

The standard configuration of the GSL is designed to dispense into a Boston Round or media bottle. 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	Safety-Coated Bottle	Solid Cap	Hole Cap	Septum
2	1.5 (39)	3.7 (94)	20-400	GSL-BOTTLE-02OZ	GSL-BOTTLE-02OZ-AM	GSL-BOTTLE-02OZ-SC	GSL-CAP-20-400	GSL-CAP-20-400-H	GSL-SEPTUM-20
4	1.9 (48)	4.4 (112)	22-400	GSL-BOTTLE-04OZ	GSL-BOTTLE-04OZ-AM	GSL-BOTTLE-04OZ-SC	GSL-CAP-22-400	GSL-CAP-22-400-H	GSL-SEPTUM-22
8	2.4 (60)	5.4 (137)	24-400	GSL-BOTTLE-08OZ	GSL-BOTTLE-08OZ-AM	GSL-BOTTLE-08OZ-SC	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-BOTTLE-16OZ-SC	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-BOTTLE-32OZ-SC	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 ³	Diameter in (mm)	Height in (mm)	Thread Size	Clear Bottle	Amber Bottle	Safety-Coated Bottle	Solid Cap	Hole Cap	Septum
50	1.8 (46.0)	3.5 (88.0)	GL32	GSL-BOTTLE-0050	-	-	GSL-CAP-GL32	GSL-CAP-GL32-H	GSL-SEPTUM-GL32
100	2.2 (56.0)	3.9 (100)	GL45	GSL-BOTTLE-0100	GSL-BOTTLE-0100-AM	GSL-BOTTLE-0100-SC	GSL-CAP-GL45	GSL-CAP-GL45-H	GSL-SEPTUM-GL45
250	2.8 (70.0)	5.4 (138)	GL45	GSL-BOTTLE-0250	GSL-BOTTLE-0250-AM	GSL-BOTTLE-0250-SC	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-BOTTLE-0500-SC	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-BOTTLE-1000-SC	GSL-CAP-GL45	GSL-CAP-GL45-H	GSL-SEPTUM-GL45

Accessories

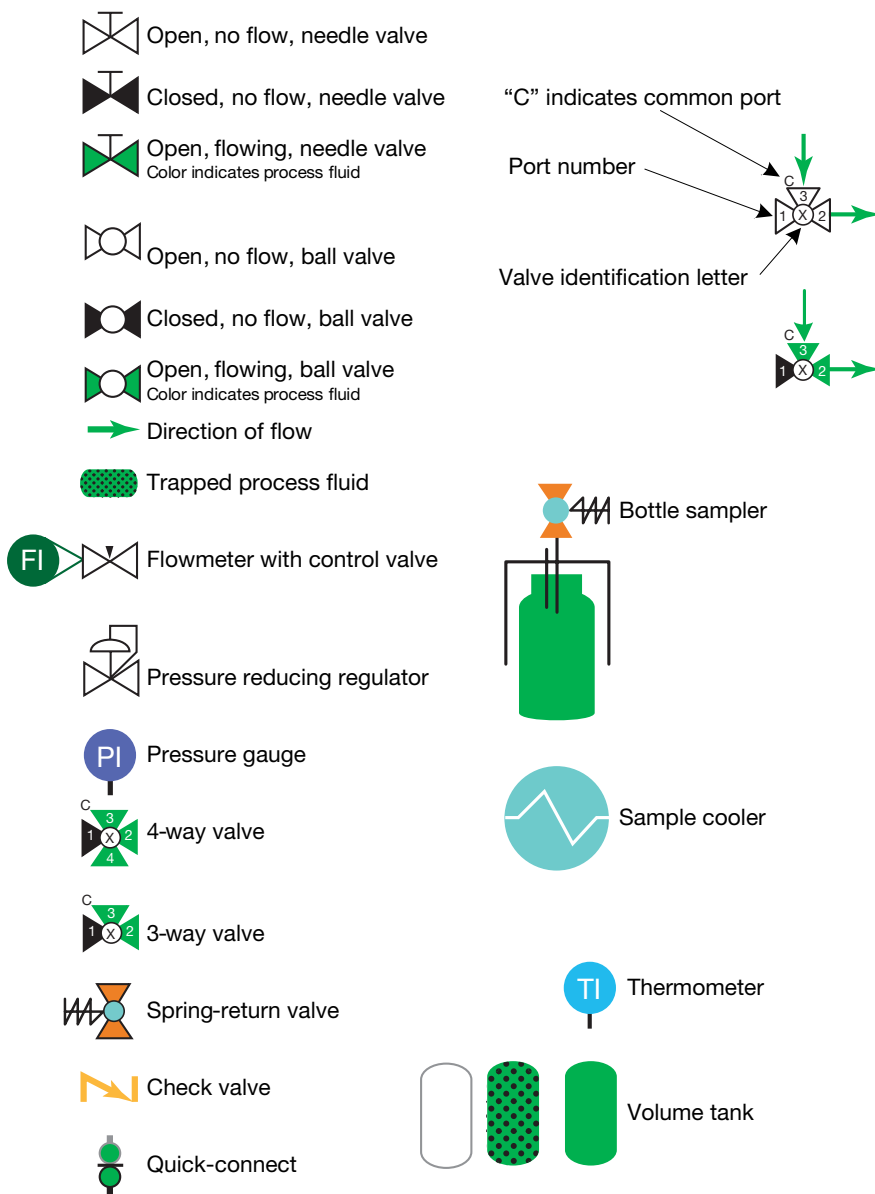
Several options are available for your grab sampling system, such as:

- Additional instrumentation - gauges, flowmeters, and transducers
- Sample coolers - Sentry sample coolers
- Process connections - threaded and flanged connections
- Enclosures and stands
- 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.

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.

Caution: Do not mix or interchange Swagelok product components 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.