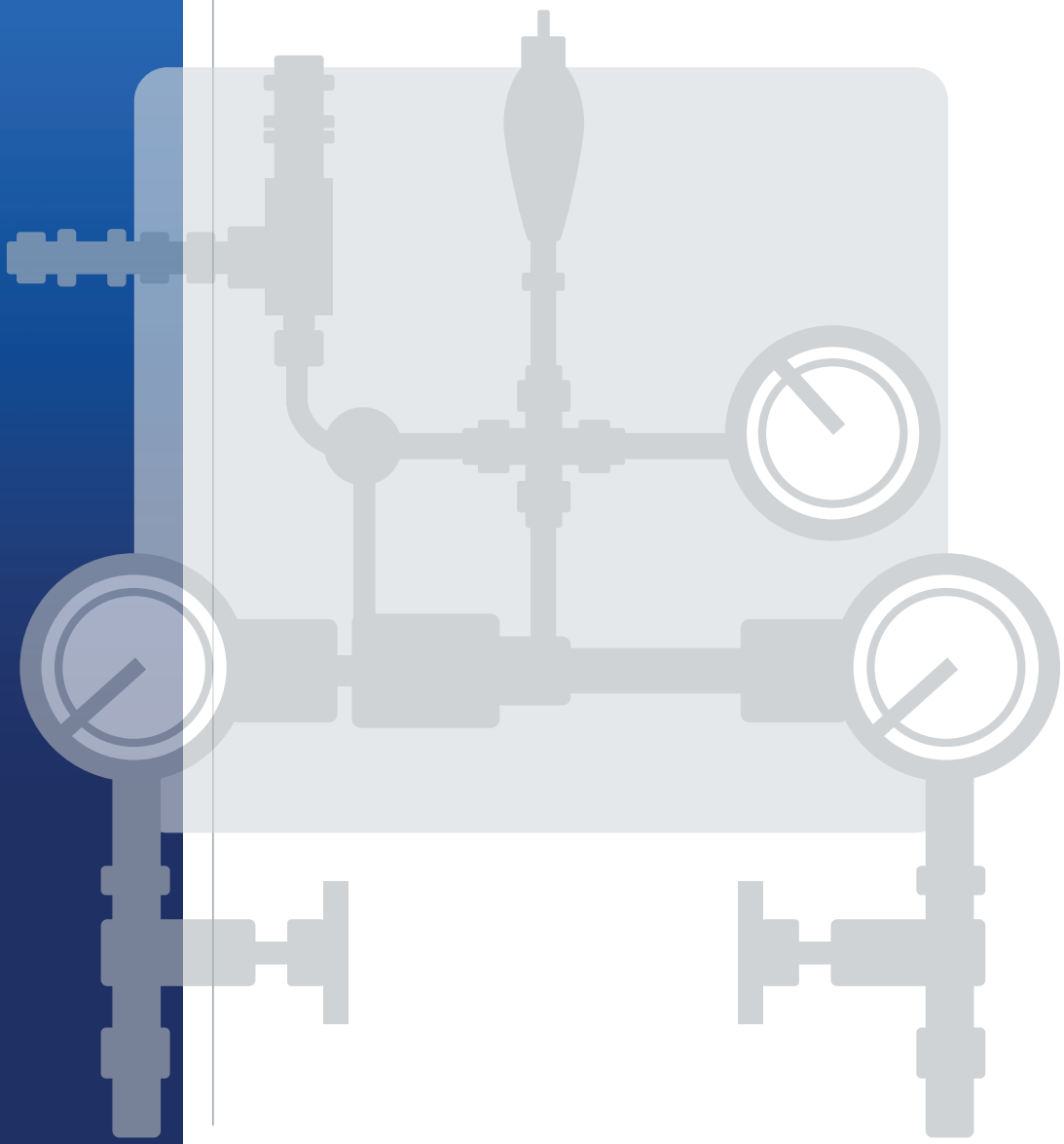
Swagelok® Changeover (SCO)

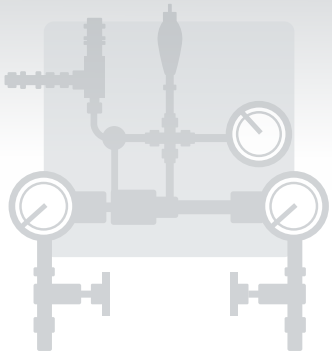
User Manual



Swagelok

Content

SCO User Manual



Swagelok® Changeover (SCO)

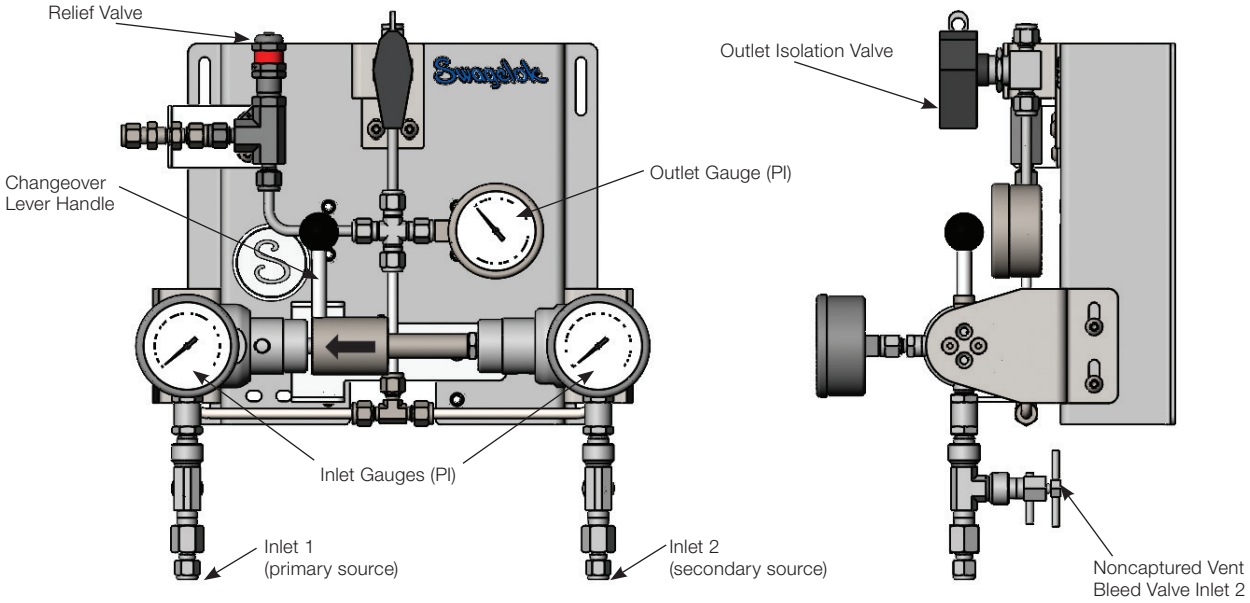
Introduction

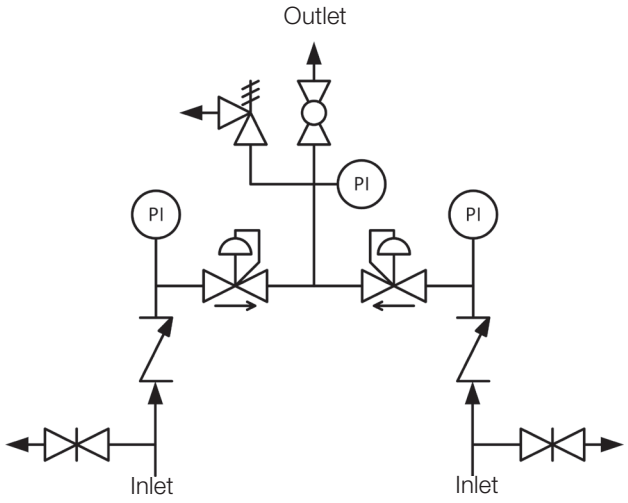
A Swagelok® changeover (SCO) is a special type of primary gas control system, pre-engineered for applications where the continuous supply of gas is critical. When one source is depleted below a selected changeover pressure, the continuous gas delivery system automatically switches to a back-up supply. The depleted source can then be changed, in-line, without downtime.

Configurations

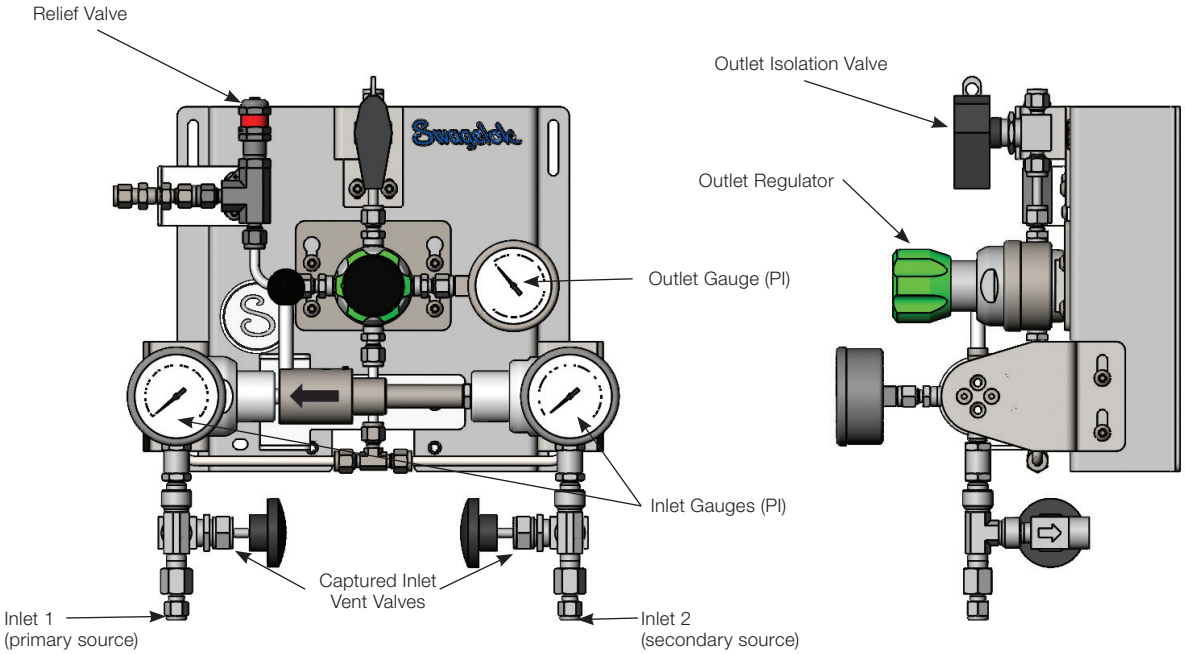
The SCO is available with captured or noncaptured inlet vent and relief valve options. See the SCO section of the *Gas Distribution Systems, Application Guide*, MS-02-486, for additional information.

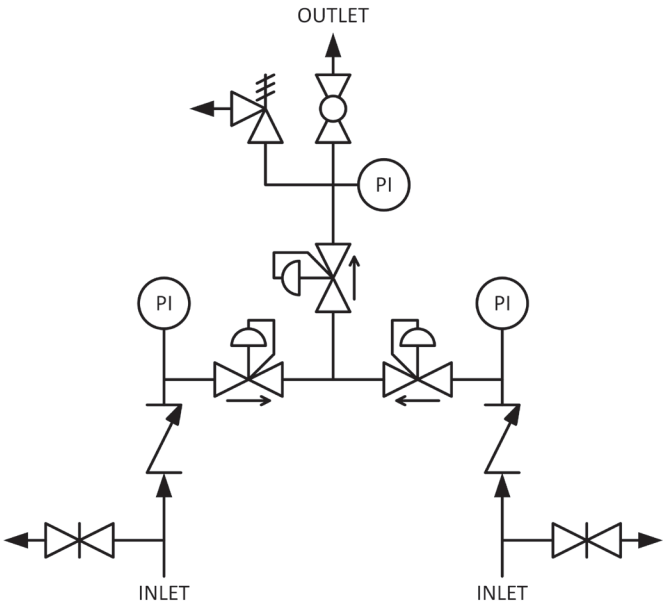
Configuration Symbols





Configuration 1: No Outlet Regulator, Relief Valve, Gauge, and Noncaptured Inlet Valve





Configuration 2: Outlet Regulator, Relief Valve, Gauge, and Captured Inlet Vent

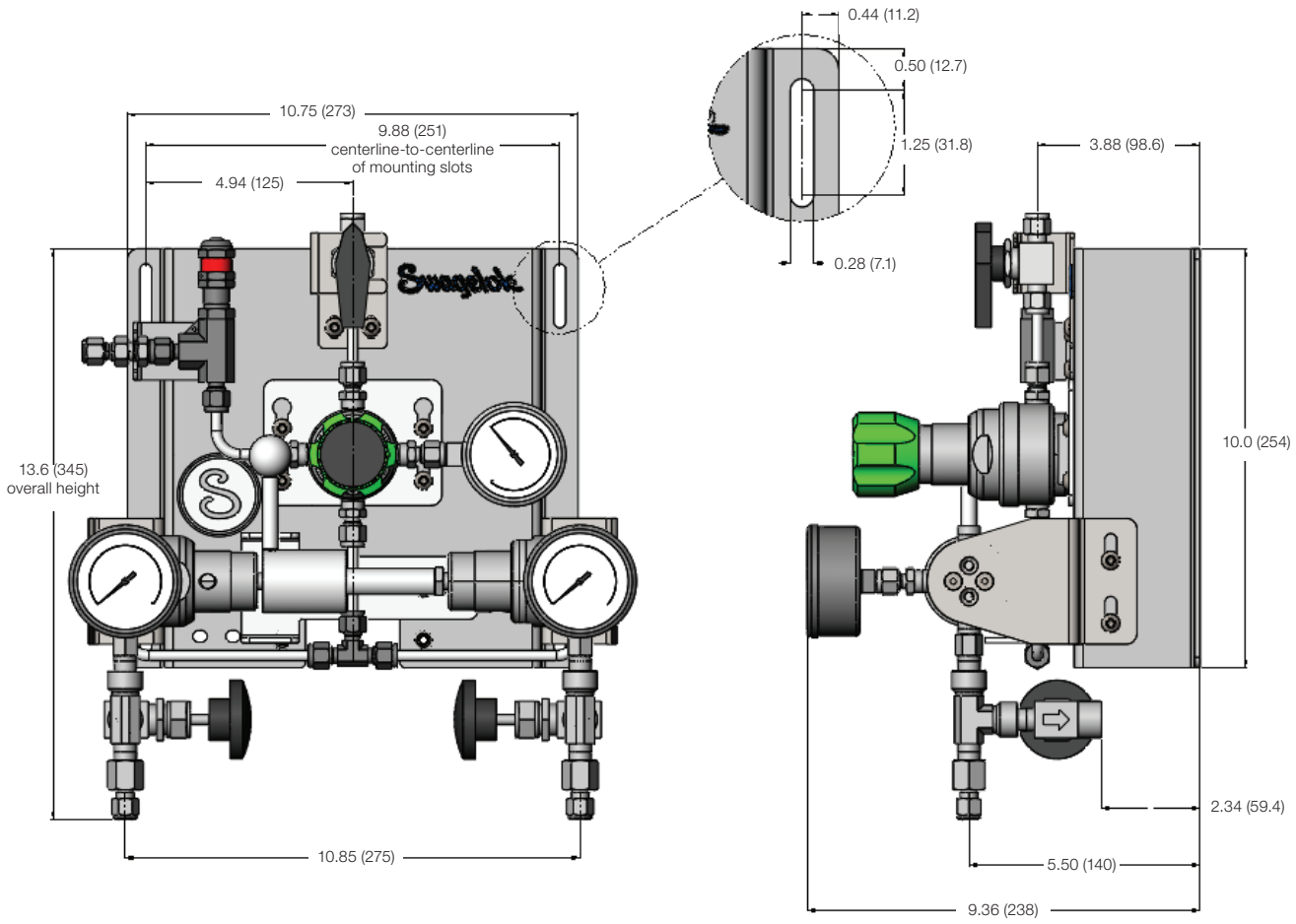
Mounting

The SCO must be mounted to a vertical face or wall and utilize all four (4) mounting slots for proper function. Mounting slots are designed for 1/4 in. or 6 mm fasteners. Approximate weight of the SCO is 20.4 lb (9.3 kg).

Dimensions

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

NOTE: Weight will vary based on options ordered.



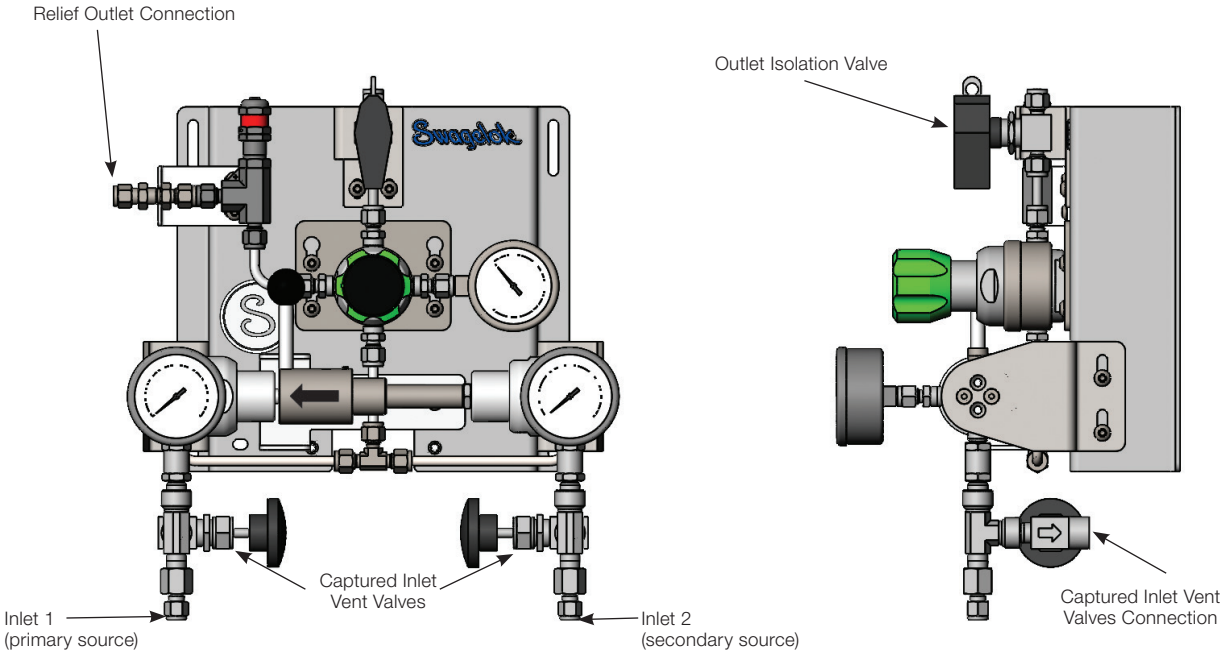
Installation

1/4 in. and 6 mm SCO systems have fractional or metric Swagelok tube fittings for all internal system connections. For metric systems when an R3A series is specified, refer to the supplied data sheet for outlet connection type and size for country/ regional-specific relief valve. For systems with a captured inlet vent, a needle valve will be used with a 1/4 in. NPT female end connection (illustrated below). For noncaptured inlet vent systems, a bleed valve is used to vent to atmosphere.

⚠ **CAUTION** **Position the bleed valve so that system fluid is directed away from operating personnel. Always open bleed valves slowly. Operating personnel must take suitable measures to protect themselves from exposure to system fluids.**

⚠ **CAUTION** **Do not allow any thread sealant to enter the regulator or fluid stream.**

Install the Swagelok tube fittings according to the *Tube Fitting Instructions for 1 in. (25 mm) and smaller fittings*, MS-12-01.



System Startup

⚠ **CAUTION** **Swagelok ball valves are designed to be used in a fully open or fully closed position.**

⚠ **CAUTION** **Valves that have not been cycled for a period of time may have a higher initial actuation torque. For valves not actuated for a period of time, initial relief pressure may be higher than the set pressure.**

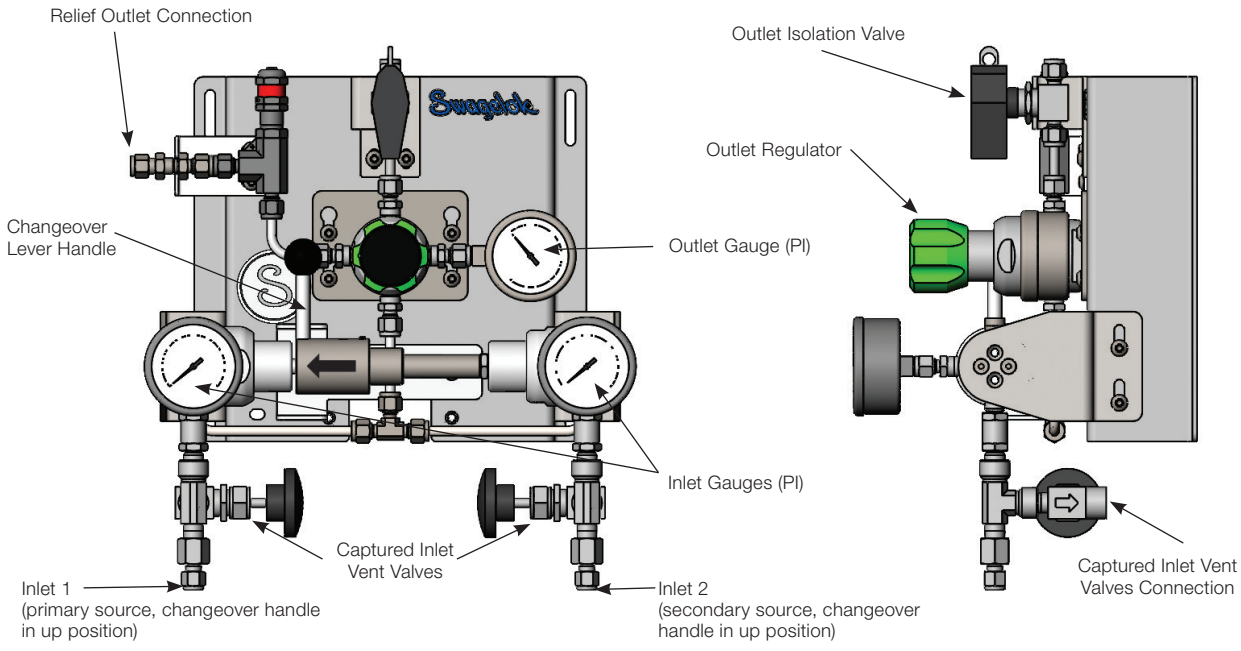
⚠ **CAUTION** **A packing adjustment may be required periodically for needle and ball valves to increase service life and to prevent leakage.**

⚠ **CAUTION** **Some system applications require relief valves to meet specific safety codes. The system designer and user must determine when such codes apply and whether these relief valves conform to them. Country/Regional standard relief valves are to be maintained in accordance with local rules and regulations of the country in which they are installed.**

⚠ **CAUTION** **Swagelok proportional relief valves should never be used as ASME Boiler and Pressure Vessel Code safety relief devices.**

⚠ **CAUTION** **Swagelok proportional relief valves are not "Safety Accessories" as defined in the Pressure Equipment Directive 2014/68/EU.**

1. Ensure the **changeover lever handle** is in the correct orientation, coinciding with the desired primary bottle source. The black arrow on the handle hub will point to the primary bottle source.
2. Verify the **inlet vent valves** are CLOSED.
3. Verify the **outlet isolation valve** is CLOSED (where applicable).
4. Supply bottle pressure to both **inlets**.
5. Verify the **inlet gauges** are reading correct pressures.
6. Set the **outlet regulator** (if present) to desired outlet pressure.
7. Verify the **relief valve** is not relieving pressure.
8. Open the **outlet isolation valve** to begin system flow (if applicable).
9. Adjust outlet pressure by turning the handle on the outlet pressure control regulator (if present) while the system is flowing.



Operation

The primary gas source of the SCO system is indicated by the changeover handle arrow direction. As the primary gas source depletes and its pressure equals the secondary source regulator outlet pressure setting, the changeover will occur. The system will then automatically start pulling from the secondary gas source, supplying an uninterrupted flow downstream.

Note: Due to the regulator orientation, turning the changeover lever handle will increase the outlet pressure setting of the regulator the arrow will be pointing to after the switch (the “new” primary gas source.) It also decreases the outlet pressure setting of the regulator the arrow was pointing to prior to the switch (the “new” secondary/depleted gas source.)

⚠ **CAUTION** **Swagelok proportional relief valves are not “Safety Accessories” as defined in the Pressure Equipment Directive 2014/68/EU.**

⚠ **CAUTION** **Do not use the regulator as a shutoff device.**

1. To change the primary gas source from the left-hand (LH) source to the right-hand (RH) source, pull the changeover lever handle from the upward position (12 o’clock) to the downward position (6 o’clock).

   Note: The primary gas source changeover regulator is set to a slightly higher outlet pressure than the opposing (secondary) gas source, establishing the supply for the downstream system. Refer to ***Setting the Regulator Changeover Pressure***.

2. To change out a depleted gas bottle, turn the changeover lever handle fully to its opposing position (i.e., up/down), reversing the arrow direction. This designates the opposing source as the primary gas source. The depleted gas bottle can now be safely isolated, vented, and removed, and a full bottle can be installed.

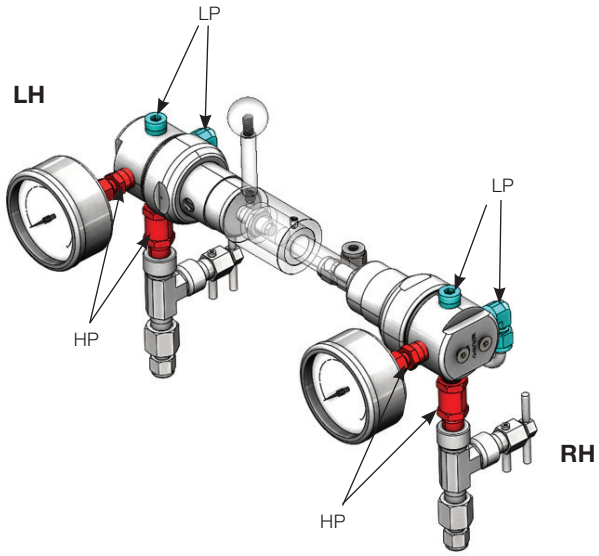
   When the replacement of the depleted gas bottle is complete, it is best to allow the SCO to continue depleting the newly in-use gas source rather than manually switching to the new bottle early. This practice will ensure the secondary gas source is full when needed.

Note: When the SCO is used as a gas bottle backup to a large gas store such as a gas generator, typically Inlet 1 is connected to the bulk storage of the generator and Inlet 2 is connected to an emergency backup gas bottle. In these applications, the handle should be switched back to the bulk storage supply from the backup as soon as practical.

Maintenance

Changeover Regulator Port Configurations

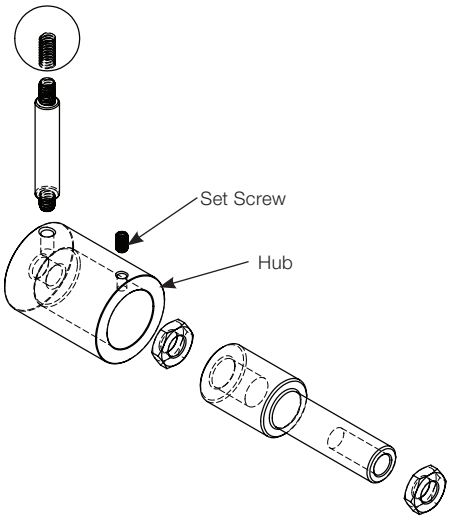
The illustration below is a reference for the user on the changeover regulator port locations. When a regulator has been removed for service, use the illustration below as a reference for changeover port locations when assembling the left-hand (**LH**) and right-hand (**RH**) regulators to their respective mounting brackets.



High-Pressure (HP) Ports Are Shown in Red. Low-Pressure Ports Are Shown in Blue. The Regulators Are E-Pattern.

Changeover Handle Assembly

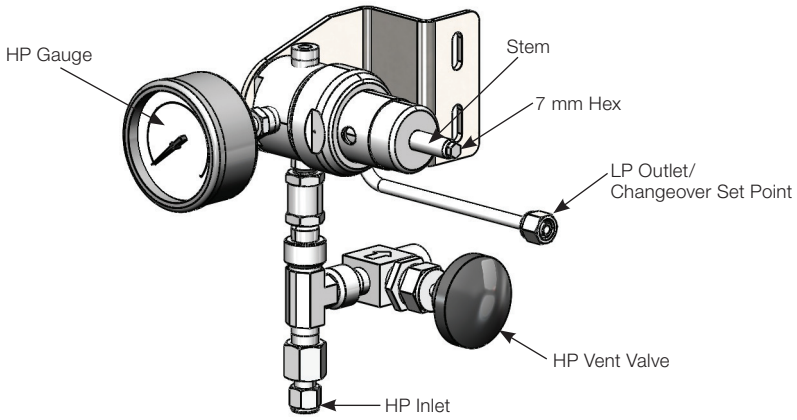
To decouple the changeover regulators as required for disassembly from the main panel or during the setting of changeover pressure, the **set screw** in the **hub** of the handle assembly must be loosened to allow the hub and shaft to slide apart. Use the illustration below to guide disassembly of the changeover handle assembly.



Setting the Regulator Changeover Pressure

Follow these instructions when either of the changeover regulators need to be serviced, replaced, or reset to ensure the regulator changeover pressure setting is correct and the LH and RH regulators are assembled in the proper orientation.

1. Establish the requested changeover pressure from the ordering number.
2. Use the 7 mm hex on the end of the **stem** to set the regulator to the desired changeover pressure.
3. For the LH regulator only, once the desired pressure is reached, rotate the **stem** clockwise an additional half turn (180° of rotation).
4. Mark the end of the **stem** with a line at the bottom. This will allow you to confirm nothing has moved after screwing on the hub.



5. Slowly and without changing the set pressure, screw on the machined changeover **SCO hub** to the LH regulator. Stop the hub around 5/32 in. (4 mm) before contacting the regulator body. The **changeover lever handle** must be pointed toward the top of the panel.

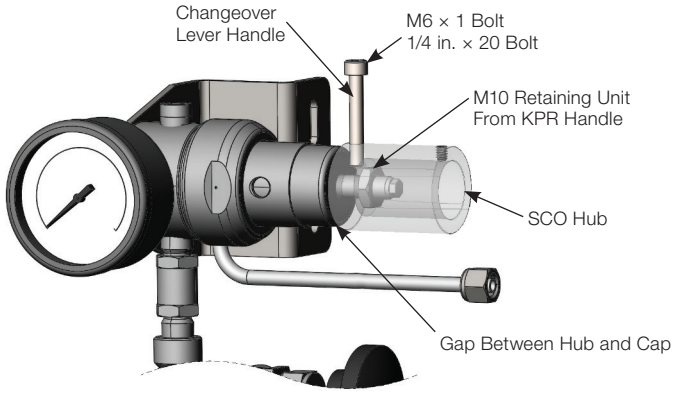
6. Screw the regulator handle lock nut (**M10** x 1 mm) back onto the regulator stem.

7. Tighten the **M10** nut all the way down inside the SCO hub. Tighten while holding the **changeover lever handle** in place pointed towards the top of the panel. The **changeover lever handle** must point towards the outlet of the panel at all times.

8. The regulator set point should remain unchanged after tightening (a slight change within +0.5 bar/7 psig is acceptable). Visually verify that the stem has not rotated by checking the location of the mark placed in step 4.

9. Ensure the **SCO hub** rotates through its full movement of 180 degrees. The handle should rotate from 12 o'clock to 6 o'clock freely without the **SCO hub** hitting the body or slipping on the shaft.

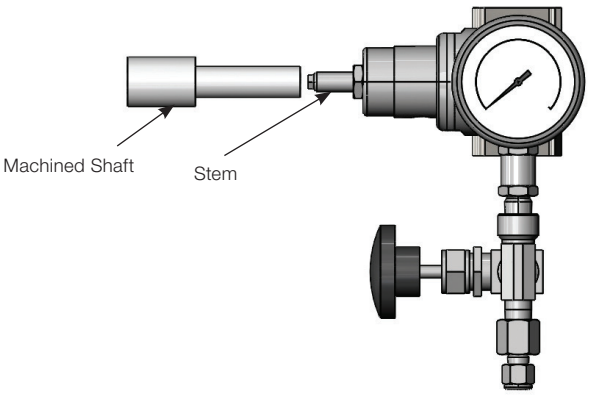
10. The LH regulator is now set.



11. Set RH regulator by following steps 1 through 4. It is imperative that once the set point is reached it is held by ensuring the stem does not move. Do NOT add half a turn increase or adjust the set point in any way on the RH regulator, as doing so will result in gas being drawn from both bottles. It may be easier to do this with the LH regulator removed from the back plate.

12. Fit the M10 × 1 mm nut onto the stem, ensuring the stem does not move. Tighten nut all the way to the body. Then turn nut slightly to ensure the stem will not move when the shaft is fitted. Do not overtighten the nut.

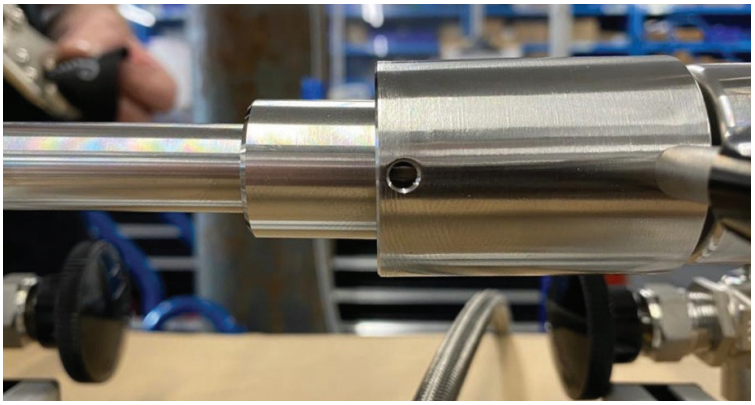
13. Screw the **machined shaft** onto the regulator **stem**, ensuring the stem does not rotate.



14. Reassemble the LH regulator and bracket to the main panel mounting holes. Slide the shaft into the hub.

15. The shaft should be adjusted on the stem so engagement allows for the regulator bracket to sit flat and parallel to the main panel.

16. Thread the shaft onto the regulator stem to achieve engagement of the shaft and hub, ensuring the regulator stem does not rotate. The shaft should extend past the set screw hole.



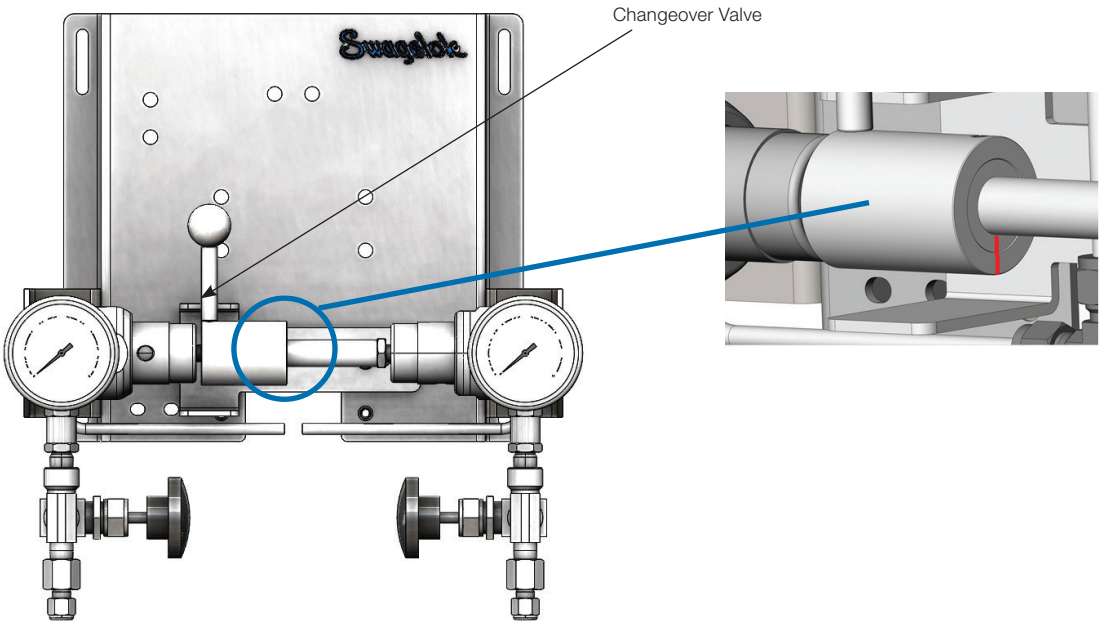
17. Once this engagement has been set, tighten the stem nut to the shaft without the stem rotating. This locks the shaft to the stem. Use soft grips to hold the shaft in place as you tighten the stem nut.

18. Check that the hub and shaft are aligned.

19. Connect the hub and the shaft by tightening the set screw in the hub, with the handle lever at the 12 o'clock position. The handle should always be pointing to the top of the panel (12 o'clock).

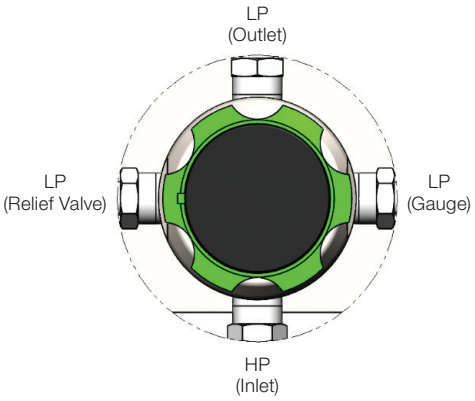
20. Mark the hub and shaft. Cycle the **changeover valve** several times to ensure smooth operation. Check to ensure there is no slippage between the hub and shaft.

21. Reconnect all tubing and end connections.

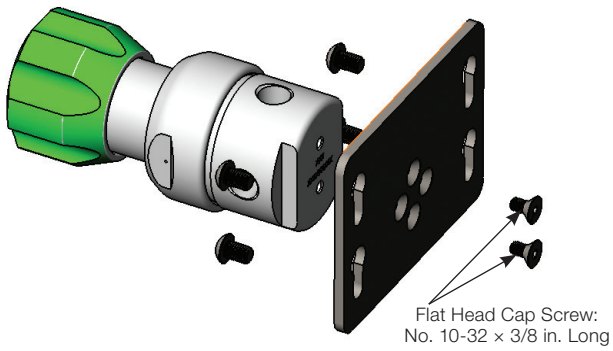


Outlet Regulator Mounting

The outlet regulator is an L-Pattern KPR series regulator mounted in the orientation shown. The regulator is assembled to the mounting bracket with two No. 10-32 flat head cap screws. The screw heads are recessed on the rear of the bracket so it can assemble to the main panel flush and without interference. To remove the regulator, the 1/4 in. or 6 mm button head cap screws must be loosened to remove the mounting bracket and access the regulator mounting screws.



Second Stage KPR L-Pattern Port Orientation



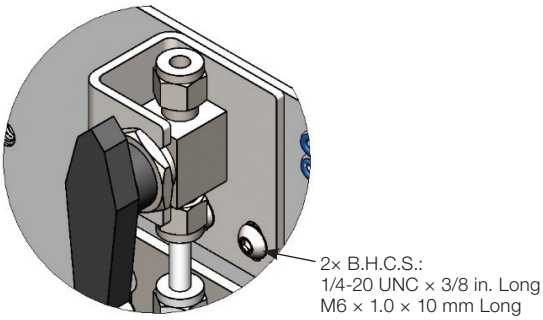
KPR Regulator and Bracket Mounting

Outlet Isolation Valve Mounting

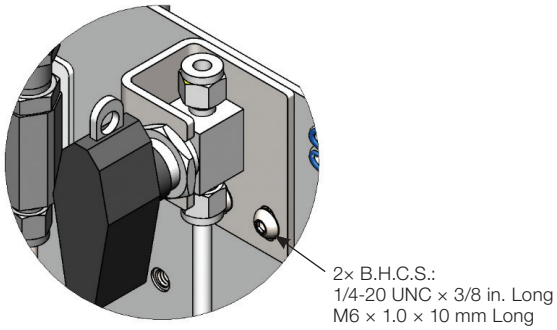
⚠ **WARNING Before removing valve from service, to avoid personal injury, you must:**

- **Depressurize the system**
- **Cycle the valve**
- **Purge system to remove any residual system media left in valve**

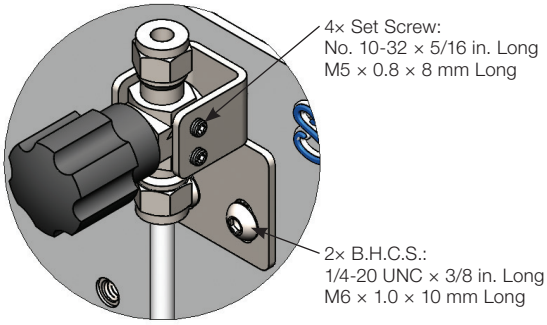
The illustrations below identify all outlet isolation selections paired with their respective mounting brackets. To remove a valve from the panel, first unscrew the 1/4 in. or 6 mm button head cap screws to remove the bracket from the main panel. The 1/4 in. or 6 mm Swagelok tube fittings can then be loosened, and the valve and bracket are removed as a subassembly.



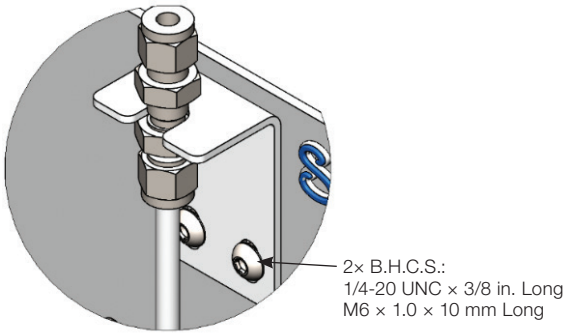
1/4-Turn Ball Valve



1/4-Turn Ball Valve (lockable)



Multiturn Needle Valve



No Outlet Isolation Valve

Maintenance by System Component

System Component	Replacement Ordering Information
Proportional relief valve (R3A series)	*Proportional Relief Valves, R Series,* MS-01-141
Swagelok tube fitting	*Gaugeable Tube Fittings and Adapter Fittings,* MS-01-140
Needle valve – flow indicator (1/4 in. systems – M1 series)	*Variable Area Flowmeters, G Series and M Series,* MS-02-346
KPR series regulator	*Pressure Regulators, K Series,* MS-02-230
D series needle valve	*Nonrotating-Stem Needle Valves, D Series,* MS-01-42
Ball valve (40G or 40 series)	*One-Piece Instrumentation Ball Valves, 40G Series and 40 Series,* MS-02-331
Pressure indicator (PGI series, C model)	*Pressure Gauges, Industrial and Process, PGI Series,* MS-02-170
Check valve (CP/CPA and CH series)	*Check Valves, C, CA, CH, CP, and CPA Series,* MS-01-176
BV series bleed valve	*Bleed Valves and Purge Valves,* MS-01-62

Reference Instruction Documents

Swagelok Tube Fitting Instructions for 1 in (25 mm) and smaller fittings, MS-12-01
40G Ball Valve Packing Adjustment, MS-INS-40G
R3A Series Externally Adjustable Relief Valve Maintenance Instructions, MS-CRD-0013
Service Instructions, CH Series Check Valve, MS-CRD-0025
CA and CPA Series Check Valve Cracking Pressure Adjustment, MS-CRD-0047
D Series Maintenance Instructions, MS-INS-DK-1
Pressure-Reducing Regulators, KPR Series Maintenance Instructions, MS-CRD-KPRMAINT

Troubleshooting

Symptom	Cause	Remedy
HP inlet pressure gauge shows no (or low) pressure.	There is an obstruction upstream of the SCO.	Check that flow is passing through the inlet subassemblies by checking inlet vent needle/bleed valve.
	There is no process pressure.	Check that the supply line is pressurized.
	The inlet vent valve is open.	Close the vent valve.
LP outlet gauge shows no (or low) pressure.	Bottles are empty.	Change bottles.
	Outlet regulator set to zero outlet pressure.	Adjust regulator outlet pressure.
	Relief valve is set at too low of a pressure.	Check relief valve set point and outlet regulator pressure setting. If relief valve needs to be reset, contact your authorized Swagelok sales and service center.
	Outlet regulator damaged.	Inspect, repair, and/or replace regulator.
LP outlet gauge shows high pressure.	Regulator creep.	Inspect, repair, and/or replace regulator.
	Pressure gauge is damaged.	Inspect, repair, and/or replace gauge.
	Additional pressure source downstream in system.	Identify and correct system malfunctions.
Changeover function not operating properly.	Changeover handle assembly has slipped.	Check alignment marks on changeover handle hub and shaft assembly. Refer to maintenance section.
Secondary source pressure is dropping/ both sources draining simultaneously.	Regulator creep.	Inspect, repair, and/or replace regulator.
	Both source bottle pressures are below the changeover point.	Replace both source bottles.
	Inlet vent valves leaking.	Inspect, repair, and/or replace inlet vent valve.
	Inlet vent valve open.	Close inlet vent valves.
Relief valve is relieving pressure.	Incorrect relief valve set point.	Check relief valve set point. If relief valve needs to be reset, contact your authorized Swagelok sales and service center.
	Regulator creep.	Inspect, repair, and/or replace regulator.
	Additional pressure source downstream in system.	Identify and correct system malfunctions.

For any symptoms not identified in the above table, please contact your authorized Swagelok sales and service center.

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 or contact your authorized Swagelok sales and service center.

MS-13-336 RevA, August 2022

Swagelok®