
INSTRUCTIONS FOR HIGH PURITY, CHANGEOVER REGULATOR SYSTEMS (PCS, CRS SERIES)

THIS BOOKLET CONTAINS PROPRIETARY INFORMATION OF ADVANCED SPECIALTY GAS EQUIPMENT CORP. AND IS PROVIDED TO THE PURCHASER SOLELY FOR USE IN CONJUNCTION WITH HIGH PURITY, CHANGEOVER REGULATOR SYSTEMS (PCS, CRS SERIES).



IMPORTANT

These instructions are for experienced operators who know the general principles and safety precautions to be observed in handling specialty gases and operating specialty gas equipment. If you are not certain you fully understand the safety precautions for handling gases, we urge you to obtain and read the Material Safety Data Sheet (MSDS) for each gas being used.

Do not permit untrained persons to install, operate, or maintain this equipment. Do not attempt to install or operate this equipment until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your Advanced Specialty Gas Equipment Distributor.

Be sure this information reaches the operator. Your supplier has extra copies.



SAFETY PRECAUTIONS

Protect yourself and others. Read and understand the following instructions before attempting to use this equipment. Failure to understand and follow these instructions could result in serious personal injury and/or damage to equipment.

- Know and understand the physical and chemical properties of the gas being used.
- Observe general precautions for the use of gases.
- Observe safety precautions for the gas being used.
- Read and follow precautions on cylinder labels.
- Never use this equipment with gases not compatible with the materials of construction. The use of gases not compatible with the materials of construction may cause damage to equipment or injury to personnel.
- If flammable gases are used with this equipment do not locate it near open flames or any other source of ignition.
- If toxic or flammable gases are used with this equipment, emergency equipment applicable to the gases in use should be available in the operating area.
- Many gases can cause asphyxiation by displacing oxygen in the atmosphere. Make certain the area where this equipment is operated is well ventilated. Provide a device to warn personnel of oxygen depletion in the work area.
- Do not release toxic or flammable gases in the vicinity of personnel. Use this equipment only in well ventilated areas. Vent gases to the outside atmosphere, and in an area away from personnel. Be sure that venting and disposal methods are in accordance with Federal, State and local requirements. Locate and construct vent lines to prevent condensation or gas accumulation. Be sure the vent outlet cannot be obstructed by rain, snow, ice, insects, birds, etc. Do not interconnect vent lines; if more than one vent is needed, use separate lines.
- Relief devices should be installed and properly vented in all gas handling systems to protect against regulator failure and overpressurization.
- Never use oil or grease with this equipment. Oil and grease are easily ignited and may combine violently with some gases under pressure.
- Never connect this equipment to a supply source having a pressure greater than the maximum rated pressure. Refer to the Product Specifications (page 14) for maximum inlet pressures.

MANUFACTURER STATEMENT

The information contained in this instruction booklet has been compiled by Advanced Specialty Gas Equipment Corp., (the Company), from what it believes are authoritative sources and is offered solely as a convenience to its customers. While the Company believes that this information is accurate and factual as of the date printed, the information including design specifications is subject to change without prior notice.

DESCRIPTION

PCS Series

Primary Changeover Systems are designed for use in processes incorporating downstream line or station regulators located at the point of use. The PCS Series incorporates two regulators set at slightly different delivery pressures. Gas discharges from the side with the higher setting first (primary side) which is indicated by the "In Service" arrow located on the hand knob. The side with the lower delivery pressure setting will remain closed until the primary side has been exhausted (approximately 150 psi residual pressure). The changeover will automatically switch to the reserve bank (secondary side). A fluctuation in pressure will occur at this point at the outlet of the changeover. Downstream line regulator(s) (not included) will eliminate pressure variations to the process.

CRS Series

Changeover Regulator Systems provide constant delivery pressure control to instrumentation by incorporating an outlet line regulator and utilize a compact design housing two changeover regulators in a single body. Downstream line or station regulation is not necessary unless various distribution point pressures are required. Operation is the same as described for the PCS Series with approximately 200 psi residual cylinder pressure maintained.

OPTIONAL EQUIPMENT

Pressure Switches – used to monitor line pressure and activate an external alarm (such as a Model SG6550, or SG6551 Annunciator – sold separately) when a certain predetermined pressure is reached. These switches are generally connected to the ends of the single row manifold headers.

Model SG6540	General Service Pressure Switch
Model SG6541	Explosion-Proof Pressure Switch

Annunciators – used in conjunction with pressure switches to provide both an audible alarm and visual indication of pressure switch activation.

Model SG6550	Nema 4x Single Point Annunciator
Model SG6551	Nema 1 Single Point Annunciator

Flashback Arrestors (SG6545) for acetylene service only – designed to be used on acetylene cylinders to prevent a flash or flame from entering the cylinder through a cylinder lead.

Flexible Hoses – Double Braided (all metal) three foot stainless steel flexible hoses (available for cylinder leads) extend service life and provide ease of connecting cylinders.

Check Valves – Prevent discharge of gas from manifold and pigtails when changing cylinders.

Purge/Vent Valves – allow for complete removal of entrapped air and moisture from the system upon start-up, or after a cylinder change out thus maintaining the high purity nature of the system.

SG6680	(Set of 2) For Brass Systems
SG6681	(Set of 2) For Stainless Steel Systems

INSTALLATION

WARNING: Before attempting to install and operate this equipment, read and fully understand the safety precautions on page 2 in this booklet. Failure to follow the safety precautions may result in serious personal injury and/or damage to equipment.

The PCS and CRS Series Changeover Regulator Systems can be used either with two cylinders by connecting the inlet leads directly to each of the cylinders or with four or more cylinders by connecting the leads to the ends of two single-row manifolds. Typical layouts for use with two single-row manifolds are shown in Figures 1 and 2.

Note: The PCS Series is factory preset to changeover at approximately 150 psig. The CRS Series is factory preset to changeover at approximately 200 psig. Liquefied gases or cryogenic liquids with vapor pressures less than 300 psig should not be used with standard preset units. Contact your Advanced distributor if lower factory settings are required.

1. Securely mount the metal panel with attached changeover to a wall. Panel mounting dimensions are shown in Fig. 3 and Fig. 4. The panel should be located such that the regulator gauges are at eye level with the operator (approximately 5–6 ft.). The single row manifold outlets (or cylinder valves, if a two-cylinder system is installed) should be located approximately 10 to 12 inches outward from the changeover regulator isolation valves.
2. Connect the process line (downstream piping) to the ¼ in. NPT outlet port of the changeover regulator system. Use Teflon® tape on pipe threads to prevent galling.
3. Attach the inlet leads to the changeover regulator isolation valves by inserting the O-Rings provided in the grooves located in each valve inlet adaptor. The inlet leads (rigid pigtailed) may be carefully bent to align them with the manifold or cylinder valve fittings. Avoid sharp bends that could kink the tubing.
4. Single-row manifolds are shipped without cylinder leads connected to prevent damage to the leads. Manifolds over four stations long are shipped in sections and require assembly.

To assemble single row manifold sections (if required), align the manifold sections and insert the O-Rings provided in the groove located in the threaded end of the pipe tee. Connect the sections being careful not to chip or dislodge the O-Ring.

To attach cylinder leads to the manifold, insert the small O-Rings in the groove of the station valves. Connect the cylinder leads (pigtailed) to the station valves being careful not to chip or dislodge the O-Ring.

5. Securely mount the two manifolds on a wall. Mounting dimensions for single-row manifolds are shown in Figure 5 (page 9).
6. Provide a means of securely supporting the cylinders connected to the system. The clamping brackets, chains, straps, etc. used must be capable of holding the cylinders in place to prevent them from falling.
7. If the system is sized for more than two cylinders, connect the inlet leads of the changeover regulator to the outlets of the two single row manifolds.
8. Close the two inlet isolation valves by turning the hand knobs fully clockwise. Turn the changeover regulator handknob clockwise on the PCS Series and counter-clockwise on the CRS Series until the “IN SERVICE” arrow points left. Close the line regulator on the CRS Series by turning the pressure adjusting knob counter-clockwise until it reaches the stop. Do not turn the adjustment knob past the stop. Damage to the regulator could result.
9. After the changeover regulator system is installed and the downstream piping is connected, the system connections should be leak tested at the maximum working pressure.

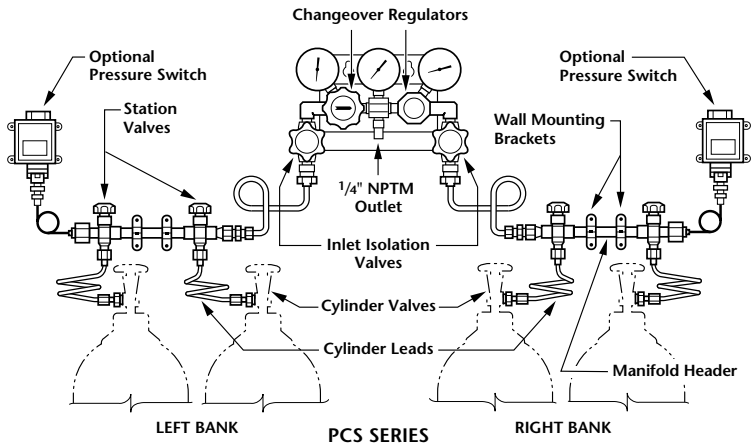


Figure 1 – Typical Installation of PCS Series System with Two Single Row Manifolds and Optional Pressure Switches.

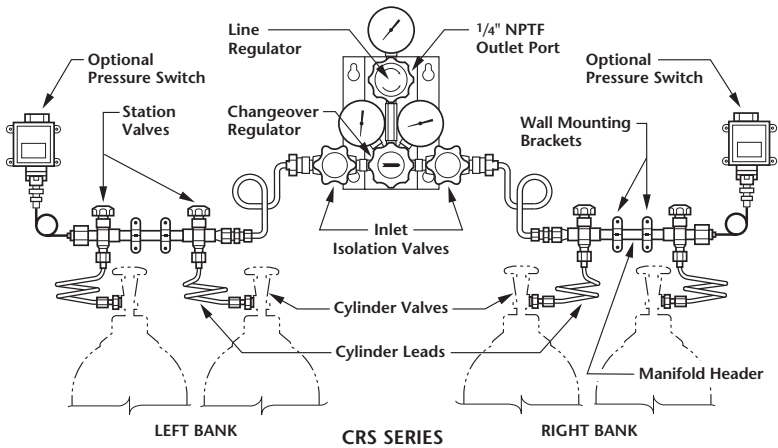
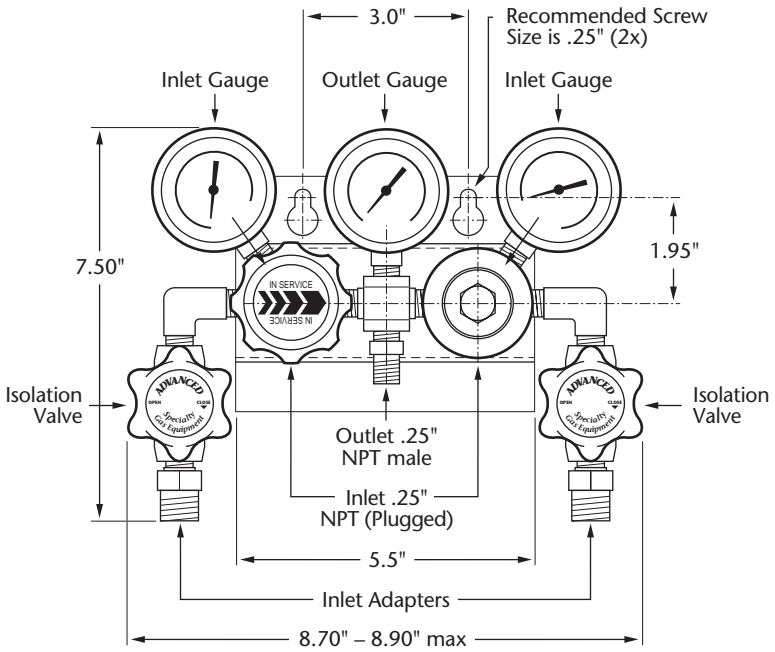
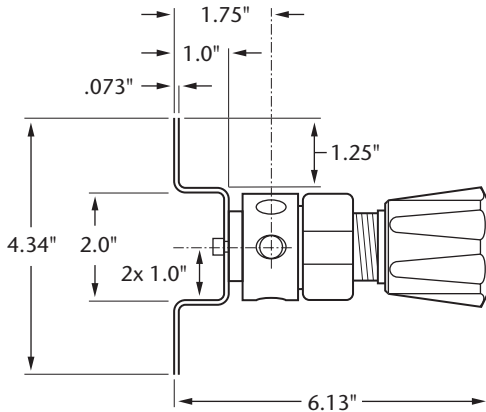


Figure 2 – Typical Installation of CRS Series System with Two Single Row Manifolds and Optional Pressure Switches.



FRONT VIEW



SIDE VIEW

Figure 3 – Mounting Dimensions for PCS Series Changeover Regulator System and Panel

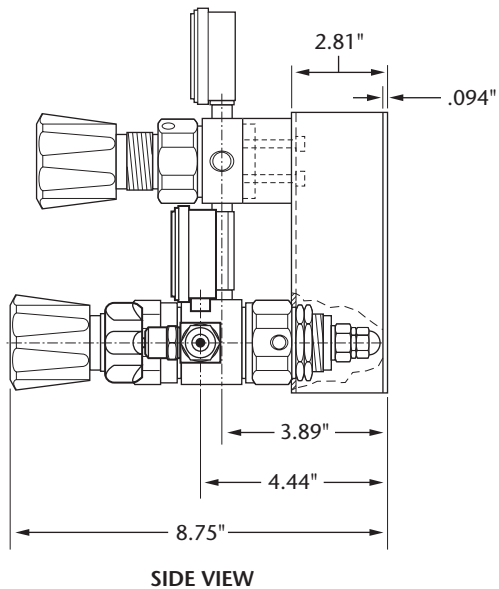
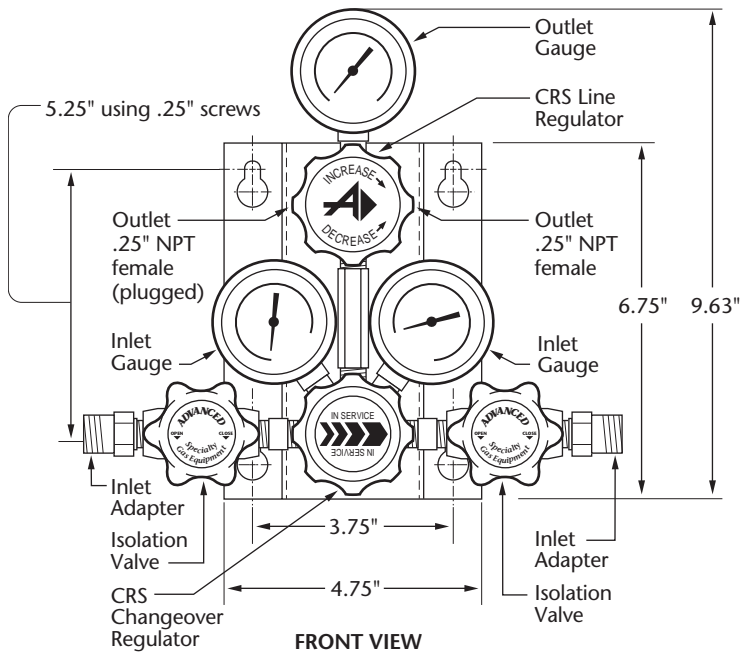


Figure 4 – Mounting Dimensions for CRS Series Changeover Regulator System and Panel

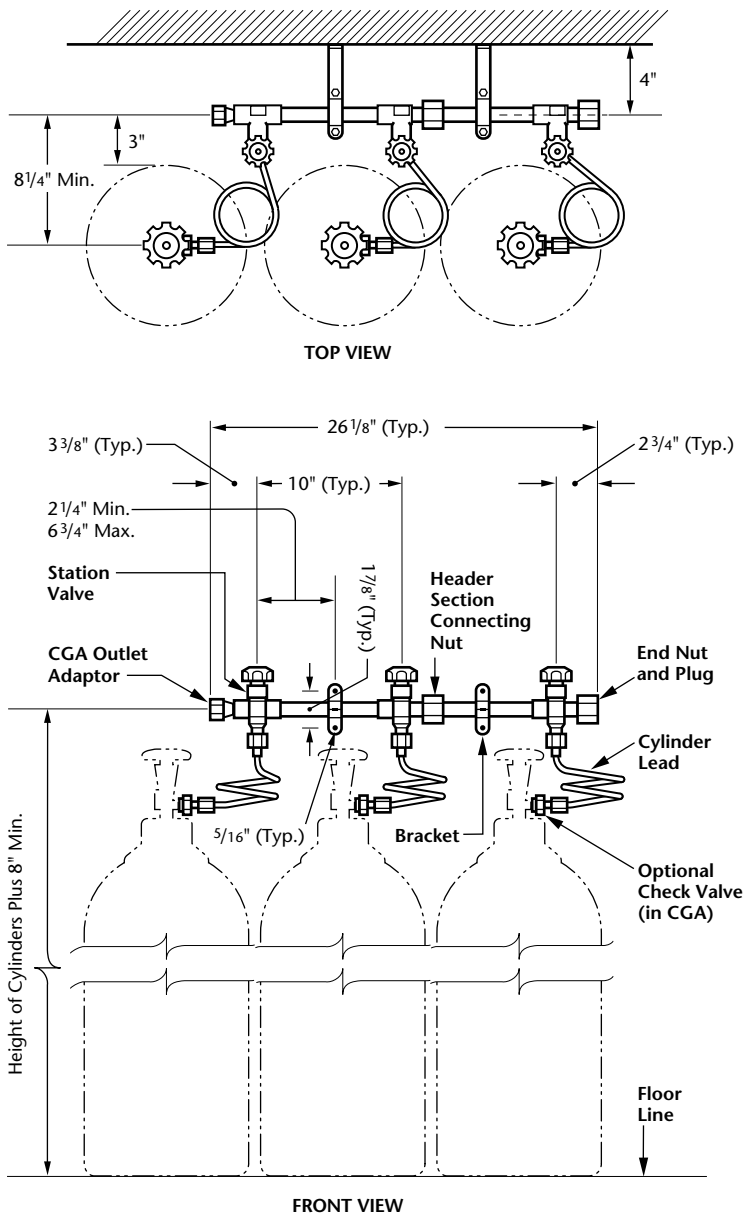


Figure 5 – Mounting Dimensions for a Single Row Manifold used on the Right Side of a Changeover Regulator System

LEAK TESTING AND PURGING

CAUTION: Care should be exercised when bending cylinder leads to connect them to cylinders. Brass is especially subject to work hardening and may fail if continuously re-bent.

1. Connect cylinders to cylinder leads and connectors provided.

CAUTION: Cylinder leads containing check valves can be pressurized with system pressure only up to the check valve seat. The threaded joints on the pigtail, including the CGA connection will not be pressurized with the process gas.

2. Use the process gas to leak test and purge the system. If the process gas is hazardous (flammable, toxic and/or corrosive) or sensitive to atmospheric contaminants, use clean dry nitrogen as a purge gas to leak test and purge the changeover system.
3. Isolate downstream side of the changeover regulator system by closing a downstream process isolation valve.
4. Stand to the side of the changeover regulator and slowly open the purge gas from the left side of the changeover. Open the isolation valve located on the left side of the changeover regulator and check inlet gauge for pressure into the regulator. Repeat the same procedure for the right side of the changeover.

Note: By opening either isolation valve, cylinder pressure enters the changeover regulator automatically reducing the pressure to approx 200 psig on the CRS Series and 150 psig on the PCS Series.

5. On the CRS system, open the line regulator by turning the pressure adjusting knob clockwise until the desired pressure is indicated on the outlet gauge.
6. With cylinders connected but with the cylinder valves closed, leak check all connections with either a soap solution, such as Snoop® or a gas leak detector.

Note: The line regulator on the CRS System does not vent downstream system pressure when the pressure adjusting knob is turned counterclockwise to reduce delivery pressure. For applications where atmospheric constituents could contaminate your gas system, install a vent valve on the downstream side of the changeover regulator to vent pressure. Connect outlet of vent valve to a safe disposal area.

7. Purge both right and left sides of the changeover system if the process gas is hazardous or sensitive to atmospheric contaminants. Turn the changeover handknob clockwise on the PCS Series and counterclockwise on the CRS Series until the "IN SERVICE" arrow points to the left. This will allow gas to flow from the left side first. Turn the handknob 180° (one half turn) ("IN SERVICE" arrow points right) to flow gas from the right side.
8. Vent the system to atmospheric pressure. Close both regulator isolation valves by turning the hand knobs fully clockwise. On the CRS Series, close the line regulator by turning hand knob counterclockwise until it reaches the stop.

OPERATION

WARNING: Never operate a gas handling system under any circumstances if it is leaking or otherwise malfunctioning. DO NOT repair any leaks while system is under pressure. Damage to equipment and/or injury to personnel may result.

1. Close the two regulator isolation valves by turning the hand knobs fully clockwise. Turn the changeover regulator handknob to choose a side to become the primary side ("IN SERVICE" arrow points either left or right). The side chosen will function as the primary side (bank no.1). On the CRS System, close the line regulator by turning the pressure adjusting knob counterclockwise until it reaches the stop.
2. Ensure that any purge or system vents are closed.
3. Isolate downstream side of the changeover regulator system by closing the downstream process isolation valve.
4. Stand to the side of the regulator and slowly open the cylinder gas from the primary side (bank no. 1) of the changeover. Open primary side regulator isolation valve and check inlet gauge for pressure into the regulator. Repeat the same procedure for the reserve side (bank no. 2) of the changeover.

Note: By opening either isolation valve, cylinder pressure enters the changeover regulator which automatically reduces the pressure to approximately 200 psig on the CRS Series and 150 psig on the PCS Series.

5. On the CRS Series, open the line regulator by turning the pressure adjusting knob clockwise until the desired pressure is indicated on the outlet gauge.
6. Open the downstream process isolation valve to allow gas to flow from the changeover regulator system to the use point.

The system is now in operation with gas being supplied from the primary side (bank no. 1), which is indicated by the "IN SERVICE" arrow located on the handknob. The reserve side (bank no. 2) remains closed.

When the gas from the primary bank has been exhausted (approximately 200 psig on the CRS and 150 psig on the PCS systems), the regulator will automatically switch to the reserve bank.

7. Once a changeover has occurred, the hand knob on the changeover regulator should be turned 180° to indicate that bank no. 2 is now in service. This also resets the changeover regulator with bank no. 2 becoming the primary bank. A fluctuation in outlet pressure will occur at this point at the changeover regulator; however, the built-in line regulator on the CRS Series eliminates this fluctuation and insures a constant delivery pressure to the use point. Installation of a downstream line regulator(s) is required with the PCS Series to eliminate pressure variations to the use point.

CYLINDER REPLACEMENT

1. Close the regulator isolation valve for the side containing the exhausted cylinder(s).
2. On the side containing the exhausted cylinders, close all cylinder valves and manifold station valves (if single row manifolds are used in the system).

WARNING: Hazardous gases must be discharged into a safety vent. Be sure to use a venting procedure that is environmentally acceptable and complies with Federal, State and local requirements.

3. Nonhazardous gases may be vented by carefully loosening the cylinder lead connector(s).
If a hazardous gas is in use, vent inlet leads through a safety vent or the optional purge/vent valve. Purge the leads with clean dry nitrogen gas. Continue purging until the hazardous gas level is below the TLV for the gas.
4. Disconnect exhausted cylinder(s) and replace with full cylinder(s).
5. If the gas connected to the manifold is nonhazardous, use it to leak test and purge the cylinder lead. If the process gas is hazardous (flammable, toxic and/or corrosive) or sensitive to atmospheric contaminants, use clean dry nitrogen as a purge gas to leak test and purge the cylinder lead.
6. Slowly open cylinder valve(s) (and manifold station valves, if applicable). Open the regulator isolation valve and check inlet gauge for pressure into the regulator. This now becomes the reserve cylinder bank.

SHUTDOWN

WARNING: Hazardous gases must be discharged into a safety vent. Be sure to use a venting procedure that is environmentally acceptable and complies with Federal, State and local requirements.

1. Close the cylinder valves.
2. Vent the system pressure to zero psig. If a hazardous gas was used, purge the entire system with clean dry nitrogen gas. Continue purging until the hazardous gas level in the system is below the TLV for the gas.
3. Close all system valves by turning the hand knobs fully clockwise.
4. On the CRS Series, close the line regulator by turning the hand knob counterclockwise until it reaches the stop.

REPAIRS

If the any part of the changeover leaks or malfunctions, take it out of service immediately. Repairs should be made by Advanced Specialty Gas Equipment Corp. who have the special tools, test equipment and trained personnel required to make a safe repair. Tampering with the changeover voids the warranty. Contact your Advanced Specialty Gas Equipment Distributor to arrange for repair.

If a changeover leaks or malfunctions, take it out of service immediately. Do not attempt to repair these changeovers. Repairs should be made only by Advanced Specialty Gas Equipment Corp. who has the special tools, test equipment and trained personnel required to make a safe repair. Tampering with the changeover voids the warranty. Contact your Advanced Specialty Gas Equipment Distributor to arrange for repair.

Repairs to changeovers done after the initial warranty period has expired are chargeable to the customer. Upon receipt at the factory, the changeover will be inspected and you will be contacted with a repair cost estimate. No item will be repaired until approval is received. There will be an evaluation charge assessed for equipment not repaired. All repairs should be arranged through your Advanced Specialty Gas Equipment Distributor.

Note: All equipment being returned must be purged of all hazardous materials using a clean, dry inert gas (e.g. Dry Nitrogen) prior to return.

SPECIFICATIONS

Manifolds

Maximum Inlet Pressure	3000 psig
Flow Coefficient (each station valve)	$C_V = 0.43$
Inlet Connections	CGA connection as specified

Changeover Regulators

Maximum Inlet Pressure	3000 psig
Minimum Inlet Pressure	300 psig*
Inlet Pressure Gauge	0–4000 psig
Gauge Size	2 in. dial
Operating Temperature Range	-40°F to +165°F
Flow Coefficient	$C_V = 0.06$
Outlet Connection (PCS Series)	¼ in. NPT male

Line Regulators (CRS Series only)

Maximum Inlet Pressure	3000 psig
Delivery Pressure Range	10–150 psig
Delivery Pressure Gauge	0–200 psig
Gauge Size	2 in. dial
Operating Temperature Range	-40°F to +165°F
Flow Coefficient	$C_V = 0.15$
Outlet Connection	¼ in. NPT female

* Contact your Advanced distributor if lower factory settings are required.

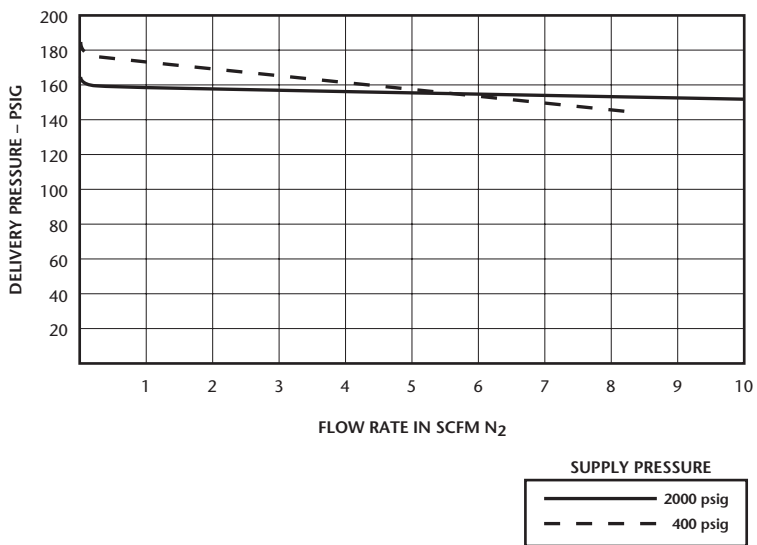


Figure 6 – Typical Performance PCS Series

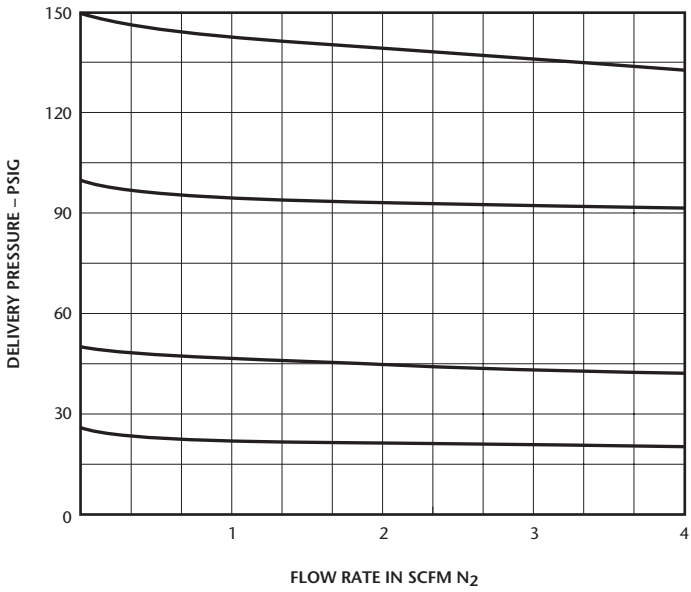


Figure 7 – Typical Performance CRS Series

MATERIALS OF CONSTRUCTION

Manifolds

Metal Parts	Brass or Type 316 Stainless Steel (as specified when ordering)
Seals	Teflon®
Check Valve Seats	EPDM with Brass Pigtails Viton® with Stainless Steel Pigtails
Station Valve Seats	PCTFE

Regulators

Body	
Brass Systems	Brass Bar Stock
Stn. Stl. Systems	Type 316 Stn. Stl. Bar Stock
Gauges	
Brass Systems	Brass
Stn. Stl. Systems	Type 316 Stainless Steel
Bonnets	
Brass Systems	Brass Bar Stock
Stn. Stl. Systems	300 Series SS Bar Stock
Internal Metal Parts	
Exposed to Gas	
Brass Systems	Brass and Stainless Steel
Stn. Stl. Systems	Type 316 Stainless Steel
Seats	Teflon®
Diaphragms	Type 316 Stainless Steel
Seals	Teflon®

REPLACEMENT PARTS

Teflon® O-Ring Kits (package of 25 O-Rings)

for connection between pigtail & station valve SG6081

for header connection on

brass systems SG6082B

stainless steel systems SG6082S

Replacement Pigtails, Rigid Type

brass without check valves SG6640-(CGA)

brass with check valves SG6641-(CGA)

stainless steel without check valves SG6642-(CGA)

stainless steel with check valves SG6643-(CGA)

Replacement Pigtails, Flexible Type

without check valves SG6638-(CGA)

with check valves SG6639-(CGA)

Replacement Station Valves

brass 0202-5083A

stainless steel not available

Additional Stations

(for adding stations to the following existing manifolds)*

brass system with rigid pigtails
without check valves SG6660-(CGA)

brass system with rigid pigtails
with check valves SG6661-(CGA)

brass system with flexible pigtails
without check valves SG6662-(CGA)

brass system with flexible pigtails
with check valves SG6663-(CGA)

stainless steel system with rigid pigtails
without check valves SG6664-(CGA)

stainless steel system with rigid pigtails
with check valves SG6665-(CGA)

stainless steel system with flexible pigtails
without check valves SG6666-(CGA)

stainless steel system with flexible pigtails
with check valves SG6667-(CGA)

* Specify left bank or right bank when ordering.

Note: Insert applicable CGA connection number to complete part number. Example: SG6667-580.

WARRANTY

Advanced Specialty Gas Equipment Corp.,(the Company), warrants to the initial purchaser of each changeover regulator system described herein, that such equipment will be free from defects in material and workmanship which result in breakdown or failure under normal use during a period of 12 months from date of shipment by the Company if used and maintained according to Advanced Specialty Gas Equipment written instructions. Purchaser is aware that this equipment is designed for specific applications and that using this equipment with the wrong or improperly purged gas or at the wrong pressure may damage or corrode the unit and cause personal injury. This warranty does not cover damage or malfunction due to contamination or corrosion. Purchaser must confirm that this equipment is compatible with the gas being passed through it. If there is any doubt about compatibility, consult your Advanced Specialty Gas Equipment Corp. distributor.

The Company's liability under this warranty shall be limited to the repair, or at its option, replacement or refund of the purchase price, of such equipment which proves to be defective, provided; however, that this warranty shall only apply if the purchaser (1) gives the Company written notice within ten (10) days after discovery of such defect, (2) immediately on discovery of the claimed defect, discontinues all use of such equipment, and (3) returns such equipment freight prepaid to plant of manufacture.

THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SPECIFIED HEREIN. NO WARRANTIES BY ADVANCED SPECIALTY GAS EQUIPMENT CORP. (OTHER THAN WARRANTY OF TITLE AS PROVIDED IN THE UNIFORM COMMERCIAL CODE) SHALL BE IMPLIED OR OTHERWISE CREATED UNDER ANY APPLICABLE LAW, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

No claim against the Company of any kind, whether as to equipment delivery or for nondelivery of equipment and whether or not based on contract, warranty, negligence, strict liability in tort or otherwise, shall be greater in amount than the purchase price of the equipment in respect of which such claim is made. Without limiting the generality of the foregoing, Advanced Specialty Gas Equipment Corp. shall not be liable for any special, indirect, or consequential damage, such as failure of parts resulting from corrosion.

If it is determined by Advanced Specialty Gas Equipment Corp. that the equipment is to be repaired or replaced under the terms of this warranty, the cost of returning said equipment to the initial purchaser will be paid by the Company. If, however, equipment returned to the Company in connection with a claim under this warranty is found by the Company not to be defective hereunder, then such equipment will be returned to the initial purchaser, shipping charges collect, and additionally, a service charge will be paid by the purchaser to the Company to cover the cost of handling and testing such equipment.



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