



AURATM

— GAS CONTROLS —



EXS

EXS Sub-Atmospheric Single Stage Pressure Reducing Regulator

Installation and Operation Instructions

Read and Comply with the Enclosed Instructions
Before Installing or Operating

AURA Gas Controls
1.800.582.2565
www.AURACONTROLS.com

Registered
ISO 9001:2008

99062065-AU-A 3.12



Warning: An appropriately sized pressure relief device downstream of the regulator should be installed in your system to prevent damage to equipment and/or injury to personnel should an internal failure of the regulator occur.

Warning: Maximum allowable working pressure indicated on product labeling is for the regulator only. Ratings for peripherals/accessories may be less than the pressure indicated on the product label. Do not exceed the pressure ratings of the attached peripherals/accessories and the regulator's maximum allowable working pressure. Please contact your gas supplier for more information.

Warning: for regulators with tube fittings, select the appropriate tubing. Use seamless tubing with the proper consideration given to wall thickness and material. Please contact your gas supplier for more information.

Description of Product

The AURA EXS Series is a high purity single stage regulator designed to regulate pressure under sub-atmospheric conditions in addition to low flow and pressure applications. The proprietary hybrid spring design pushes up the diaphragm, allowing precision pressure control under vacuum and forward pressure. Additionally, the EXS's oversized dual surface diaphragm allows for increased sensitivity and control in low flow and low pressure applications.

Intended Use of Product

This product is intended for use with high purity and corrosive gases such as helium, nitrogen, carbon dioxide, hydrogen sulfide, sulfur dioxide, and other specialty gases.

User Responsibility

This equipment will perform in conformity with the description contained in this manual and accompanying labels and/or inserts when installed, operated, maintained, and repaired in accordance with the instructions provided. This equipment must be checked periodically. Improperly working equipment should not be used. Parts that are broken, missing, worn, distorted or contaminated, should be replaced immediately. AURA recommends that a telephone or written request for service advice be made to AURA Customer Service.

- PHONE: 1-800-582-2565
- FAX: 1-757-422-3125
- E-MAIL: info@auracontrols.com.

This equipment or any of its parts should not be altered without prior written approval by AURA. The user of this equipment shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, damage, improper repair, or alteration by anyone other than AURA or a service facility designated by AURA.

Customer Service

In the event of equipment failure, call AURA Customer Service at 1-800-582-2565. Please be prepared to provide the model number and serial number of the equipment involved, in addition to some details regarding its application such as inlet pressures, flow rate, environmental conditions and gas service..

Things to consider before removing the regulator from the box....

1. Know the properties and special handling requirements of the gas being used. Many gases are quite dangerous (flammable, toxic, corrosive, simple asphyxiant, or oxidizers). Equipment failure or misuse may lead to problems such as a release of gas through the relief valve or regulator diaphragm. Proper safety measures should be established to handle these and other component failures.

2. Be sure that the assembly purchased is suitable for the gas and type of service intended. The system label provides the following information:

- a. Model number
- b. Serial number
- c. Maximum inlet pressure

Be sure that the equipment received conforms to the order specifications. The user is responsible for selecting equipment compatible with the gas in use, and conditions of pressure, temperature, flow, etc. Selection information can be found in AURA technical data sheets. In addition, AURA representatives are trained to aid in the selection process.

3. Inspect the assembly upon receipt to be sure that there is no damage or contamination. Pay particular attention to connecting threads. While AURA assembles system components to exacting leak-tight standards, the customer should also inspect for any loosening of parts that may occur in shipping or installation. Loose parts may be dangerously propelled from an assembly. If there are adverse signs (leakage or other malfunction), return the assembly to the supplier. While it is advised that soiled regulators be returned for cleaning, simple external dust or grease may be removed by a clean cloth and if required with aqueous detergent suitable for the application. If there are signs of internal contamination, return to the supplier.

4. Before system start-up, it is recommended that all systems be pressure tested, leak tested, and purged with an inert gas such as nitrogen.

To accomplish this with connections other than a CGA 580, it will be necessary to use an adapter. The recommended use of an adapter is for temporary use, for start-up and system checks only. Adapters should never be used on a permanent basis.

If the regulator includes gas specific inlet connections, their purpose is to prevent usage on the wrong gases. Adaptation or alteration for use on other gases can be dangerous, and is not recommended.



General Safety Practices

- Comply with precautions listed in C.G.A. Pamphlet P-1, Safe Handling of Compressed Gases in Containers.
- Consult the cylinder distributor for the proper use of cylinders and for any restrictions on their use (such as flow rate and temperature requirements).
- Never use an open flame when leak testing.
- Always open valves slowly when high-pressure gases are being used.
- Always be sure that a cylinder contains the correct gas before connecting it to any regulator.
- Always leak-test any manifold or distribution pipeline before using.
- Always be sure that the gas in the system is the correct gas for the intended use.

For the United States, some applicable safety rules and precautions are listed below:

1. Local Ordinances
2. O.S.H.A. Standard 29 CFR
3. C.G.A. Pamphlet C-4, American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained.
4. C.G.A. Pamphlet G-4, Oxygen – Information on the properties, manufacture, transportation, storage, handling, and use of oxygen.
5. C.G.A. Pamphlet G-4.1, Equipment Cleaned for oxygen service.
6. C.G.A. Pamphlet G-4.4, Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems.
7. C.G.A. Pamphlet G-5, Hydrogen – Information on the properties, manufacture, transportation, storage, handling, and use of hydrogen.

8. C.G.A. Pamphlet G-6, Carbon Dioxide – Information on the properties, manufacture, transportation, storage, handling, and use of carbon dioxide.
9. C.G.A. Pamphlet G-6.1, Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites.
10. C.G.A. Pamphlet P-1, Safe Handling of Compressed Gases in Containers.
11. C.G.A. Safety Bulletin SB-2, Oxygen Deficient Atmospheres.

*C.G.A. pamphlets can be obtained from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202-3239, (703) 979-0900. Publications: (703) 979-4341. Fax: (703) 979-0134.



CAUTION

Installation

Sound engineering principles should be applied when selecting a gas control. Material compatibility, pressure regulation, temperature, environmental and function are a partial list of variables that will impact the performance of the gas control. Please observe the previously mentioned safety precautions before actual installation.

Section 1: Connection to a Gas Cylinder

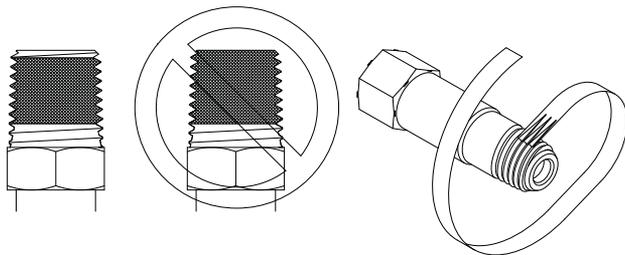
1.1 Before removing the cylinder cap, move the cylinder of gas to the work site:

- a. Secure cylinder to floor, wall or bench with appropriate chain or stand to prevent toppling.
- b. Remove the cylinder cap.
- c. Be sure the cylinder valve is tightly closed (clockwise).
- d. Remove the cylinder valve plug, if any.
- e. Inspect the cylinder valve and threads for damage or contamination.

1.2 Following procedures below, secure the regulator inlet connector to the outlet connector on the cylinder. Use an open-end wrench, not a pipe wrench.

- a. The connection should be easily threaded. Do not force. If it is not easy, you may have the wrong regulator for the gas you are using.
- b. LEFT HAND THREADS are used on some inlet connectors and are indicated by a notch in the middle of the hex nut.
- c. GASKETS are used on some inlet connectors. If so, it will be

Figure 1. Tape Installation procedures.



provided with the regulator. Be sure the gasket is in good shape. Do not overtighten to avoid squashing the gasket into the gas line. You may want to order an extra supply of these gaskets from your gas supplier.

- d. Never use oil or grease on regulator or cylinder fittings, as you may contaminate pure gases, or create a fire hazard.

1.3 Close the regulator by turning the pressure control knob, or handle, counterclockwise. As the control knob is closed, turning should become easier.

1.4 Shut the regulator outlet valve (if supplied) by turning the knob on the valve clockwise.

1.5 Observing the following procedures; make connections from the regulator outlet to your downstream equipment.

- a. **BE SURE TO CONSIDER ALL FACTORS WHEN SELECTING MATERIALS.** For example, if you have both high pressure and corrosive service, select material that is suitable for both.
- b. Do not use oil or grease on fittings, especially not on oxidizing gas service equipment.
- c. Be sure that all fittings are secure and leak tight. Teflon tape should be used on pipe fittings, but avoid impinging on the gas stream. Before applying Teflon tape, inspect the NPT threads and if necessary, clean the fitting to remove any dirt or thread sealant that remains on the threads. Start the Teflon tape on the second thread as shown above; make sure the tape does not overlap the end of the fitting. As the tape is wrapped in the direction of the thread spiral, pull tightly on the end of tape so that the tape conforms to the threads. Apply two overlapping layers of Teflon tape. Cut off the excess tape and press the end firmly into the threads.

- d. CAPTURED VENT SPRING CASE. Some regulators have captured vent spring cases. If you are using corrosive, toxic or flammable gases, be sure to connect suitable tubing from the vent fitting to a safe discharge area. Consult instructions for captured vent kit for installation.
- e. RELIEF VALVE. Some regulators are equipped with a relief valve. The purpose of a relief valve is to protect the regulator and its components. If there is pressure sensitive equipment downstream of the regulator it is recommended that a relief valve be installed in the line to protect this equipment. If you are using toxic, corrosive, or flammable gases, it is recommended that the exhaust from the valve be piped to a safe discharge area.

Section 2: Connection to a Piping System

1.6 The AURA regulator has multiple connection options. For national pipe thread options follow these instructions.

- a. BE SURE TO CONSIDER ALL FACTORS WHEN SELECTING MATERIALS. For example, if you have both high pressure and corrosive service, select material that is suitable for both.
- b. Do not use oil or grease on fittings, especially not on oxidizing gas service equipment.
- c. Be sure that all fittings are secure and leak tight. Teflon tape should be used on pipe fittings, but avoid impinging on the gas stream. Before applying Teflon tape, inspect the NPT threads and if necessary, clean the fitting to remove any dirt or thread sealant that remains on the threads. Start the Teflon tape on the second thread as shown above; make sure the tape does not overlap the end of the fitting. As the tape is wrapped in the direction of the thread spiral, pull slightly on the end of tape so that the tape conforms to the threads. Apply two overlapping layers of Teflon tape. Cut off the excess tape and press the end firmly into the threads.
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recommended that a relief valve be installed in the line to protect this equipment. If you are using toxic, corrosive, or flammable gases, it is recommended that the exhaust from the valve be piped to a safe discharge area.

1.7 Before pressurizing the regulator the adjusting screw should be backed out all the way.

a. The exception to this would be a preset model tested and shipped directly from the factory for OEM applications.

Operation

Read the “Safety” and “Installation” sections before operating your equipment.

2.1 It is advised that high purity systems be thoroughly purged before use.

2.2 The regulator adjusting knob should be turned fully counterclockwise (see 1.3) and the outlet valve should be closed (see 1.4).

2.3 Put on safety glasses and gloves.

If using with compressed gas cylinders, proceed to step 2.4 - 2.7; otherwise proceed to step 2.8.

2.4 Position yourself with the cylinder between you and the regulator. Keep hands off the regulator while opening the cylinder valve.

2.5 To avoid damage to regulator parts, slowly open the cylinder valve. Observe the high pressure gauge for a rise in pressure up to full cylinder pressure.

2.6 Observe all connections for leaks.

- a. An approved leak detection solution may be applied to the connections, if compatible to your usage. Leaks are indicated by bubbling.
- b. To further check for leaks, or if you cannot use the leak detection solution, reclose the cylinder valve for five minutes, and observe the high pressure gauge for a drop in pressure. If so indicated, recheck the CGA connection and all other high pressure port connections.

2.7 (Open the cylinder valve fully in order to form a good seal at the cylinder valve packing.) Keep the valve hand wheel or wrench on the open cylinder valve at all times to allow prompt emergency shutoff.

2.8 Adjust to the desired working pressure by turning the pressure control knob or handle clockwise, while observing the delivery pressure gauge for the approximate desired setting.

- a. Do not exceed the maximum delivery pressure indicated on the regulator label.
- b. Again check for leaks on the low pressure ports.
- c. Check the delivery pressure gauge for any drop in pressure. If a drop is indicated, check all low pressure ports for leakage.

2.9 Again set the delivery pressure, open the outlet valve if any, and check your system for leaks and otherwise proper functioning.

- a. With gas flowing through your system, some adjustment to delivery pressure may be required.
- b. After the above final setting of delivery pressure, you may have to periodically adjust delivery pressure as the cylinder depletes.
- c. As a general rule, a cylinder should be considered EMPTY when the cylinder pressure drops to a value of two (2) times the delivery pressure or less. This avoids the possibility of dangerous suck-back conditions. However, particular system requirements may indicate greater or less margin than the recommendation. Contact your AURA representative if you have any questions.

Shutdown and Disassembly

As indicated in the “Operation” section, a cylinder should be regarded as empty when the cylinder pressure has dropped to twice the delivery pressure or less. This will avoid the possibility of dangerous suck-back conditions, where other system gases are pulled back into the regulator and cylinder.

3.1 BRIEF SHUTDOWN (less than 30 minutes). Simply close the regulator outlet valve (if supplied). If the regulator does not have an outlet valve use procedure 3.2.

3.2 EXTENDED SHUTDOWN (beyond 30 minutes).

- a. **NORMALLY OPEN SYSTEMS** or **COMPLETE SYSTEM DISASSEMBLY**. This section applies when there is no concern about entry of atmospheric gases into the system.
 1. Close the gas cylinder valve.
 2. Shut down any other gas supplies which may be connected to your system.
 3. Turn the adjusting knob clockwise and open the outlet valve to drain the line through your usage points. Both regulator gauges should descend to zero.

4. With HAZARDOUS GASES run an inert purging gas through the regulator and system before disassembly.
 5. After venting (and purging when applicable), turn the adjusting knob fully counterclockwise and close the outlet valve.
 6. Disconnect downstream equipment.
 7. In disassembling, slowly loosen the cylinder valve connection, while listening for gas seepage. If leaking is evident, retighten the connection, and check for effective closing of the cylinder valve.
 8. Cap the cylinder after disconnecting the regulator. Mark the cylinder "EMPTY" if this is the case, and move it to the storage area for return cylinders.
 9. If HAZARDOUS GASES have been used, and there has not been a purging procedure as recommended, some benefit can be gained by directing a stream of dry nitrogen through the fully opened regulator. When using HAZARDOUS GASES or when in a CONFINED AREA, be sure to provide a safe discharge area when clearing the regulator.
 10. Install a new cylinder, if called for.
 11. When a regulator is out of service, close the pressure control knob by turning counterclockwise until the spring tension relieves, and close the outlet valve. Also cap open ends of the regulator, or if removed, store it in a plastic bag to prevent contamination, especially by unobserved particulate buildup inside the regulator.
- b. ISOLATED GAS SYSTEMS. Some practices (especially on high purity systems), demand that ambient air be excluded from the system. There are several methods in use:
1. Seal the usage gas in the system.*
 2. Exert a vacuum on the system after shutdown.
 3. Replace the system gas with an inert gas.

*This method should not be used with hazardous gases for more than a brief time.

3.3 CYLINDER CHANGE - ISOLATED GAS SYSTEMS. For cylinder change on ISOLATED GAS SYSTEMS, a valve upstream of the regulator is required.

- a. Tightly close the gas cylinder valve.
- b. Close the valve upstream of the regulator.
- c. With hazardous gases, purge the cylinder valve cavity using procedures contained in the specific instruction manual for your purge assembly.

- d. Follow steps 3.2a 7, 8, and 9.
- e. Method 3.2b 2, maintaining a vacuum after shutdown, requires that the system be well sealed, as any leaks will pull impurities into the system.
- f. Method 3.2b 3, filling the system with an inert gas, provides the advantage of maintaining positive pressure on the system, greatly reducing the probability of entry of impurities.

General

A unit which is not functioning properly should not be used until all required repairs have been completed and the unit has been tested to ascertain that it is in proper operating order.

Service

It is recommended that all servicing be done by a service facility authorized by AURA. Contact the AURA Customer Service Department or the nearest AURA District Sales Office for assistance.

If so advised, the unit should be sent to a service facility authorized by AURA, adequately packaged, in the original shipping container if possible, and shipped prepaid, with a statement of observed deficiency. The gas service that the equipment has been subjected to must be clearly identified. All equipment must be purged before shipment to protect the transporter and service personnel. The purging is especially important if the equipment has been in hazardous or corrosive gas service. Return trip transportation charges are to be paid by Buyer. In all cases other than where warranty is applicable, repairs will be made at current list price for the replacement part(s) plus a reasonable labor charge.

Test regulator for leaks on a routine schedule.

Trouble Shooting

Symptoms

Probable Cause

Gas leakage at the regulator outlet when the adjusting screw is turned fully counterclockwise.

Seat leak or creep, have regulator repaired.

With no flow through the system (downstream valves closed), outlet pressure increases steadily above the set pressure.

Seat leak or creep, have regulator repaired.

Gas leakage from spring case or bonnet.

Diaphragm failure, have regulator repaired.

Excess drop in outlet pressure with regulator flow open.

Blockage in seat assembly or inlet filter. Have regulator repaired.

Gas leakage from any pipe thread joint.

Loose fitting, remove connection clean, reapply Teflon tape and retighten.

Gas leakage from relief valve.

Possible faulty relief valve, replace. Possible seat leak or creep, have repaired.

Inconsistent repeat reading

Seat sticking, have regulator repaired. Possible bad pressure gauge.

Inlet or outlet pressure gauge does not return to zero with no pressure applied to the regulator

Gauge has suffered physical damage, replace gauge.

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Warranties are extended only with respect to the purchase of PRODUCTS directly from AURA or its authorized DISTRIBUTOR as new goods and are extended to the first Buyer thereof other than for the purpose of resale.

For the life of the PRODUCTS to the first Buyer the PRODUCTS are warranted to be free from functional defects in materials and workmanship and to conform to the description of this equipment contained in its manual and any accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use and that regular periodic maintenance and service is performed or replacements made in accordance with the instructions provided. All electrical components in PRODUCTS are warranted to be free from functional defects in material and workmanship for only twelve (12) months from the date of purchase.

AURA's sole and exclusive obligation and DISTRIBUTOR's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at AURA's option, the PRODUCTS, which are reported to DISTRIBUTOR from whom purchased, and which if so advised, is returned with a statement of the observed deficiency, to AURA or its designated service facility during normal business hours, transportation charges prepaid, and which, upon examination, is found not to comply with the above warranties. Return trip transportation charges for the equipment shall be paid by DISTRIBUTOR.

There are no express or implied warranties which extend beyond the warranties hereinabove set forth. AURA makes no warranty of merchantability or fitness for a particular purpose with respect to the goods or parts thereof.

This Warranty does not cover any damage to PRODUCTS that result from improper installation, accident, abuse, misuse, natural disaster, insufficient or excessive electrical supply, abnormal mechanical or environmental conditions, debris or particles in the gas or liquid source of supply, corrosion, or any unauthorized disassembly, repair, or modification.

The foregoing warranties shall not apply if the PRODUCTS have been 1) repaired other than by AURA or its designated service facility, 2) not in accordance with written instructions provided by AURA, or 3) altered by anyone other than AURA.

AURA SHALL NOT BE OTHERWISE LIABLE FOR ANY DAMAGES INCLUDING BUT NOT LIMITED TO INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES, OR SPECIAL DAMAGES, WHETHER SUCH DAMAGES RESULT FROM NEGLIGENCE, BREACH OF WARRANTY OR OTHERWISE.



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