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THE LINDE GROUP

*Linde*

**Pressure Regulators**  
**Operating and Maintenance Instructions**

## Introduction

The “Linde” line of regulators includes single and dual stage regulators available in a number of materials of construction and designs to accommodate the many different operating requirements of gas handling systems. These requirements include the type of gas used, the inlet and delivery pressure requirements, flow rates and control requirements. All of these variables must be considered when selecting a pressure regulator for a particular application to be assured of safe and proper pressure regulation for specific gases and flow requirements. Typically, two stage regulators are recommended for optimum stability of the delivery pressure under decaying inlet pressures as occurs when the gas is supplied from a high pressure cylinder or gas storage tank. The single stage regulator can be used for applications where slight variations in delivery pressure (usually a rise in pressure with decaying supply pressure) can be tolerated or compensated for by periodic regulator adjustments. Just as varying inlet pressures can result in changes in delivery pressures, increasing or decreasing the flow rates can result in changes to the delivery pressures.

## Safety Recommendations

Only personnel trained in the proper use of regulators and the operational requirements of associated equipment should operate regulators.

Operating personnel should also be familiar with the hazards associated with the gases being used. Material safety data sheets (MSDS) will list recommended handling and emergency response procedures.

Never subject a pressure regulator to higher pressures than the rated pressures of the regulator.

Pressure regulators should never be used with gases that are not compatible with the materials of construction.

Never attempt to disassemble or alter a pressure regulator. Only a qualified repair technician should perform regulator service.

Never attempt to solder, braze, or weld fittings to an assembled regulator. Severe damage to internal components can result.

Any regulator that leaks should be removed immediately from service.

A leaking regulator can be dangerous to personnel and equipment.

Never attempt to tighten a leaking fitting without first turning off the gas supply and then bleeding off the line pressure.

Never subject the internals of a pressure regulator to dirt, dust, oil, or grease. Oil or grease can react violently with certain gases such as oxygen.

Protect all line components and equipment connected to the low pressure side of the regulator with a safety valve having an appropriate set pressure and flow rating.

### **Mounting Requirements**

All pressure regulators must be properly supported to handle their weight and the mechanical loads encountered when adjusting the pressure setting. A high pressure regulator that is mounted directly to a gas cylinder should be close coupled to the cylinder valve with an appropriate CGA mating fitting. Additional supporting may be required for regulators provided with tubing extensions or other long and less rigid connections. A mounting bracket or plate can be attached to the backside of the regulator by utilizing the tapped mounting holes provided on most regulators. If your regulator is not provided with tapped holes, then the regulator should be supported with pipe clamps on both sides of the regulator body.

**IMPORTANT: When using clamps, be sure to provide ample free space behind the regulator valve body to avoid bending the line connections at the regulator body.**

## **Handling**

When handling and installing regulators, it is important to maintain the factory cleanliness of the connection and sealing surfaces to avoid contamination of the regulator internals and flow stream. Do not allow grease, oil, or other foreign material to contaminate these surfaces.

## **System Cleanliness**

All system components internals must be clean. Special cleaning is required in some cases, i.e. oxygen service. An upstream filter is recommended for use in all but the cleanest of media.

## **Regulator Installation and Testing**

Remove the protective wrapping and connection closures or plugs from the regulator and inspect the connections for damaged seating surfaces, damaged threads, and the presence of foreign materials such as dirt, dust, oil, and grease. If any of these problems are present, contact Linde for corrective action before installing the regulator. Identify the high pressure and low pressure connections on the regulator. The high pressure connections will be marked "Inlet," "In" or "H.P." The low pressure connections will be identified as "Outlet," "Out" or "L.P." Install appropriate fittings as required and mount the regulator. A regulator should never be used as a shut-off valve. Shut-off should be accomplished by a valve installed on the high pressure side of the regulator. Connect the high pressure side of the regulator to the gas supply source and the low pressure side to the delivery line.

Verify all connections are securely tightened before pressurizing the system. The system should be leak tested using either nitrogen or helium gas before being placed in service. Helium gas is preferred for maximum test sensitivity and required for helium mass spectrometer testing. The delivery line must be blanked off for the test. Turn the handle on the regulator fully counterclockwise (decreasing pressure) until it reaches the outward stop. "Crack open" the shut-off valve on the gas supply line and allow the system to slowly pressurize.

**NOTE:** Do not stand in front or behind the regulator when opening the gas supply valve.

The test pressure must not exceed the pressure rating of the regulator or any components in the system. Observe the readings on the high and low pressure gauges. If the low pressure gauge indicates an increasing delivery pressure, close the supply valve and consult a qualified technician before continuing the test. If no problems are detected, proceed with the next step.

Slowly pressurize the delivery line by turning the regulator knob clockwise. Increase the pressure by turning the knob  $\frac{1}{4}$  turn increments, waiting approximately 10 seconds between each adjustment. If there are no audible or other indications of a leak, continue the process until the maximum delivery pressure is reached or the maximum allowed line pressure is reached, whichever is less.

Leak test all connections on both sides of the regulator using an appropriate technique. If leaks are found, shut off the supply valve and bleed off all pressure before repairing leaks.

## Operation

Changing the delivery pressure is accomplished by rotating the large control knob or handle on the face of the regulator. The delivery pressure is increased by rotating the control knob clockwise and decreased by rotating it counterclockwise. All initial settings should begin with the control knob rotated fully counterclockwise until the knob reaches its outer mechanical stop.

When adjusting regulators to increase pressure settings, increase the pressure slowly and make the initial setting slightly below the desired setting. Allow a minute or two for the system to stabilize, then slowly increase the setting to the desired pressure. This will help avoid over-pressurization of a system. Occasionally verify that system operating pressures are within acceptable limits.

With variations in supply pressures and operating conditions, it may be necessary to compensate for the variables by re-adjusting the regulator. Most regulators used in gas service are of the "non-venting" type. When decreasing the delivery pressure in a "non-flowing" system, it will be necessary to bleed off some of the gas on the downstream side. First, turn the regulator knob counterclockwise,

then bleed off some of the gas on the downstream side and re-adjust the regulator to the desired set pressure.

## Maintenance

Occasionally verify the following:

1. Pressure gauges are not sticking or reading incorrectly: Replace any defective gauges.
2. Verify that the delivery pressure is maintained within acceptable limits: See troubleshooting section.
3. The system connections and the regulator is leak tight: A leaking regulator can be dangerous and should be immediately removed from service.
4. Repairs: Do not attempt to disassemble a regulator. All repairs requiring service to the internals should be performed by a qualified regulator service technician.

## Troubleshooting

### Regulator Creep:

This is an unexpected, unauthorized increase in delivery pressure of a pressure regulator. A small amount of creep for a regulator in dead-ended service is normal, especially for low molecular weight gases such as helium. When a regulator exhibits excessive creep, this is usually an indication that some particles have lodged themselves on the seat of the regulator preventing proper closure. In extreme cases, it may be a seat failure (cracks).

### Leaks:

Gas leaks out of the vent hole on the regulator bonnet. This is an indication of a defective diaphragm or seal.

### Remedies:

Call Linde Customer Service and/or Sales Representative @ [1-800-932-0624](tel:1-800-932-0624) to arrange for a Return Authorization Number and a price quote on a repair. Please have the following information when you call; Original Linde Sales Order number, gas service, and how much creep over a certain time period.