

!WARNING!

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage and personal injury or death.

Marshall Excelsior equipment must be installed, operated and maintained in accordance with federal, state and local codes and MEC instructions. The installation in most states must also comply with NFPA 54 and NFPA 58 standards.

Only personnel trained in the proper procedures, codes, standards and regulations of the LP-Gas industry shall install and service this equipment.

Things to tell the gas customer:

1. Show the customer the vent, vent assembly or vent line. Stress that this opening must remain unobstructed at all times. Tell the customer to check the vent opening after a freezing rain, sleet storm, or snow to make sure ice has not formed in the vent.
2. Show the customer the shutoff valve on the container. The customer should close this valve immediately if gas is smelled, appliance pilot lights fail to stay on or appear higher than usual or any other abnormal situation occurs.
3. Tell the customer to call your company to service the regulator if the regulator vents gas or a leak develops in the system. **Only a qualified gas service person shall install or service the regulators.**

Scope of the Manual

This instruction manual covers installation and maintenance for the first stage, second stage, and integral two-stage regulators used on LP-Gas vapor service applications. **They are not to be used on liquid service.**

Description

25 Year Recommended Replacement Life: The MEC Regulator Series is designed using rugged time-proven design concepts and constructed of corrosion resistant materials, both internally and externally. With proper installation and periodic inspection and maintenance, they will meet a 25 Year Recommended Replacement Life.

Screened Drip-Lip: Screened Drip-Lip is oriented either over the inlet, outlet, or at 90° depending on the configuration.

Pressure Tap Size Restrictions: 1/8" NPT / #54 (0.055") orifice on all pressure points.

Temperature Capabilities: -40°F to 160°F (-40°C to 71°C)

Contact the factory if the regulator is to be used on any service other than LP-Gas. The following information is located on the spring case: The Part Number, orifice size, spring range and date code.

2nd Stage Low Pressure Regulator - UL Listed:

The second stage regulator is designed to reduce the outlet pressure from a first-stage regulator (usually 10 psig (0,69bar)) to an outlet pressure of 11-inches water column (27 bar).

The combination of a high capacity relief valve and large vent provide overpressure protection which exceeds UL standards and is capable of limiting the downstream pressure to 2 psig (0,14 bar) even in a double failure situation when used with a first-stage regulator.

Integral Two-Stage Regulator - UL Listed:

The integral two-stage regulator contains a non-adjustable first stage regulator on the inlet of the second stage portion of the regulator. It is designed to reduce the tank pressure to an outlet pressure of 11 inches

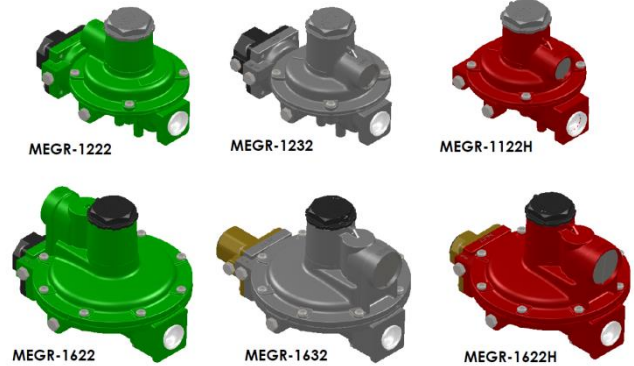


Figure 1: 1200 Series and 1600 Series Regulators

water column. The second stage portion has a high capacity internal relief valve construction. The first stage does not have an internal relief valve.

First Stage Regulator - UL Listed:

The first stage regulators are designed for high pressure (pounds per square inch) vapor service. These regulators have high capacity internal relief valves. The outlet pressure setting is factory set at a nominal 10 psig.

Installation

!WARNING!

All vents should be kept open to permit free flow of air in and out of the regulator. Protect vent openings against the entrance of rain, snow, ice formation, paint, mud, insects or any other foreign material that could plug the vent or vent line.

LP-Gas may discharge to the atmosphere through the vent. An obstructed vent which limits air or gas flow can cause abnormally high pressure that could result in personal injury or property damage.

The first stage and integral two-stage regulators are not suitable for indoor installations. Never use them on low pressure (inches of water column) service because personal injury or property damage could occur.

Before installation:

- Check for damage, which may have occurred in shipment.
- Check for and remove any dirt or foreign material that may have accumulated in the regulator body.
- Replace old pigtailed. Blow out any debris, dirt or copper sulfate in the copper tubing and the pipeline.
- Apply pipe compound to the male threads of the pipe before installing the regulator.
- Make sure gas flow through the regulator is in the same direction as the arrow on the body. "Inlet" and "Outlet" connections are clearly marked.

Installation Location, see Figure 2:

- The installed regulator should be adequately protected from vehicular traffic and damage from other external sources.
- **Install the regulator with the vent pointed vertically down.** If the vent cannot be installed in a vertically down position, the regulator must be installed under a separate protective cover. Installing the regulator with the vent down allows condensation to drain,

minimizes the entry of water or other debris from entering the vent, and minimizes vent blockage from freezing precipitation.

- **Do not install the regulator in a location where there can be excessive water accumulation or ice formation**, such as directly beneath a down spout, gutter or roof line of building. Even a protective hood may not provide adequate protection in these instances.
- Install the regulator so that any gas discharge through the vent or vent assembly is over 3 -feet (0,9 meters) horizontally from any building opening below the level of discharge and not less than 5-feet in any direction away from any source of ignition, openings into direct vent appliances, or mechanical ventilation air intakes.
- Install the regulator high enough above ground level - at least 24-inches (60 cm) - so that rain splatter cannot freeze in the vent.
- Some installations, such as in areas with heavy snowfall, may require a hood or enclosure to protect the regulator from snow load and vent freeze over.

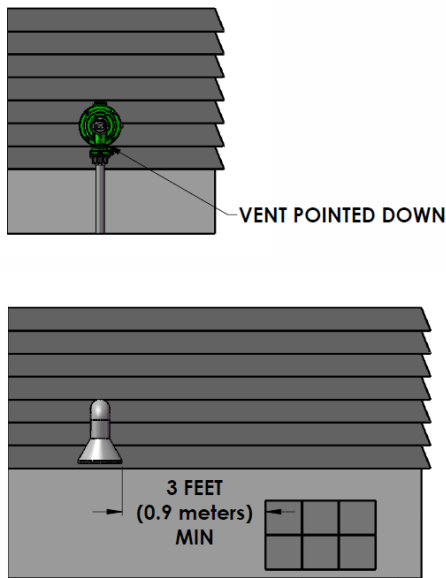


Figure 2: Regulator with Vent Pointed Down

Horizontally Installed Regulators, see Figure 3:

Horizontally mounted regulators, such as found in single cylinder installations and ASME tanks, must be installed beneath a protective cover or under the ASME tank dome. If possible, slope or turn the vent down sufficiently to allow any condensation to drain out of the spring case. Be careful that the slot in the tank dome or protective cover for the regulator's outlet piping does not expose the vent to the elements. The first stage vent on the integral two-stage regulator should be pointed down.

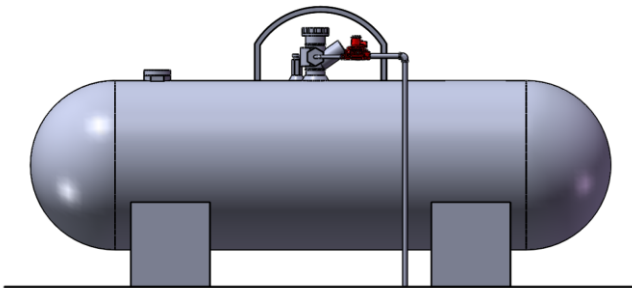


Figure 3: Tank Installation

Indoor Installations, see Figure 4:

The first stage and integral regulators are not recommended for indoor installations. The second stage regulator may be installed indoors as follows.

By code, regulators installed indoors have limited inlet pressure, and they **require** a vent line to the outside of the building. A vent assembly, such as MEC ME960 or at least 3/4" NPT pipe, Gray PVC Schedule 40 Rigid Non-Metallic Electrical Conduit for above Ground Service, per UL 651, should be used. The same installation precautions, previously discussed throughout this manual for the regulator vent, apply to the end of the vent tube assembly. Vent lines must not restrict the gas flow from the regulator's internal relief valve. To install the vent line, remove the vent screen and apply a good grade of pipe compound to the male threads of the line. Vent lines should be as straight as possible with a minimum number of bends.

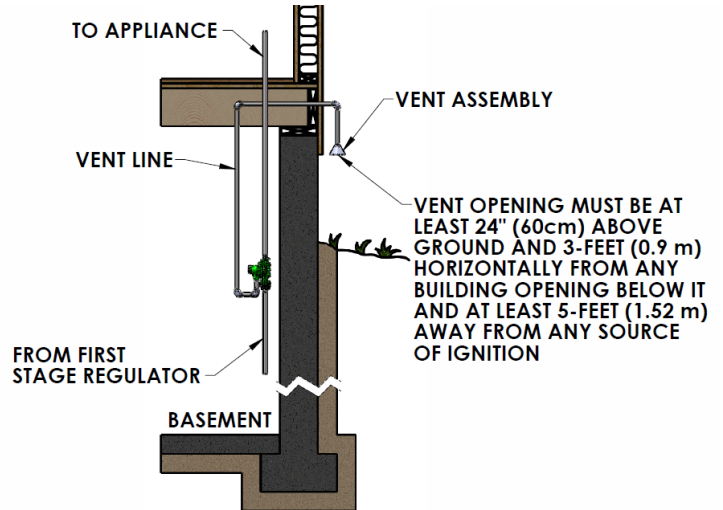


Figure 4: Basement Installation

Underground Installations, see Figure 5:

!WARNING!

The integral two-stage regulators require 2 vent lines, one for the first stage vent (1/4" OD copper tube inverted flare connection: 7/16-24 UN thread) and the other for the second stage vent (3/8" NPT) of the regulator. Failure to use 2 separate vent tubes can result in early regulator failure and / or over pressuring the second stage that could result in fire or personal injury.

A regulator installed in the dome of an underground container requires a vent line to prevent water from entering the regulator spring case.

Remove the vent screen(s) and install a vent line(s). The vent line must be run from the regulator vent(s) to above the maximum water table. The vent line opening(s) must terminate at the extreme top inside of the dome cover. Make sure the regulator's closing cap is on tightly, and maintain drainage away from the dome at all times.

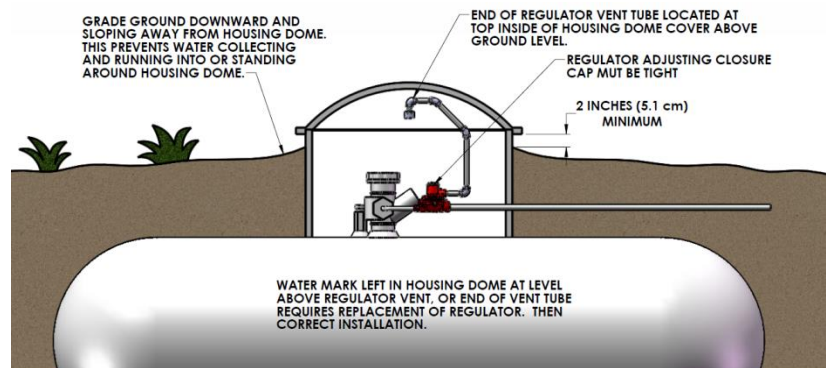


Figure 5: Underground Installation

Adjustment

Each regulator is factory set. If it becomes necessary to increase the outlet pressure, remove the closing cap and turn the adjustment screw clockwise. Turn the adjusting screw counterclockwise to decrease the outlet pressure.

The inlet and outlet pressure tap plugs may be removed using a 7/16" wrench. The pressure tap is restricted with a #54 orifice, so the plug can be removed with pressure in the regulator. Install a pressure gauge to determine the regulator's inlet pressure and outlet setting during adjustment. Actual pressure at the second stage regulator may be less due to line loss. After setting, add thread sealant to the pipe plug and reinstall it. Replace the closing cap. Check the plug for leakage.

Overpressure Protection

!WARNING!

Some type of overpressure protection is needed if actual inlet pressure can exceed the inlet pressure rating. Overpressuring any portion of this equipment above the limits shown in the Specifications may cause damage to regulator parts, leaks in the regulator, or personal injury due to bursting of pressure-containing parts or explosion of accumulated gas.

If any portion of the regulator is exposed to an overpressure condition that exceeds the limits in the Specifications, it must be inspected for damage that may have occurred.

Large volumes of gas may discharge though the regulator vent during internal relief valve operation, which can, if not controlled, result in fire or explosion from accumulated gas.

The first stage, integral two-stage, and second stage series regulator, **except for the first stage of the integral two-stage**, contain internal relief valves. The internal relief valve in all units will give overpressure protection against excessive build-up resulting from seat leakage due to worn parts, chips or foreign material on the orifice. The amount of internal relief protection provided varies with the regulator type and the cause for the overpressure relief valve operation. When the internal relief valve opens, gas escapes to the atmosphere through the regulator's vent.

Some type of additional external overpressure protection must be provided if the outlet pressure in an overpressure condition exceeds the inlet pressure rating of the gas system or downstream equipment. Common methods of external overpressure protection include relief valves, monitoring regulators, shutoff devices, and series regulation.

Maintenance

!WARNING!

To avoid personal injury or equipment damage, do not attempt any maintenance or disassembly without first isolating the regulator from system pressure and relieving all internal pressure.

Regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by MEC should be used for repairing MEC regulators. Relight pilot lights according to normal startup procedures found in the appliance manufacturers instructions.

Due to normal wear or damage that may occur from external sources, these regulators must be inspected and maintained periodically. The frequency of inspection and replacement of the regulators depends upon the severity of service conditions or the requirements of local, state and federal regulations. Even under ideal conditions, these regulators should be replaced after 25 years from date of manufacture or sooner should inspection reveal the need.

Visually inspect the regulator each time a gas delivery is made for:

- Improper installation; such as vent not pointed vertically down or under a cover, no vent line on underground systems
- Plugged or frozen vent
- Wrong regulator or no regulator in the system
- External corrosion
- Flooded Regulator; water in spring case, regulator submersed on underground tanks
- Regulator age
- Any other condition that could cause the uncontrolled escape of gas

Failure to do the above could result in personal injury or property damage.

Vent Opening

Make sure the regulator vent, vent assembly, or vent line does not become plugged by mud, insects, ice, snow, paint, etc. The vent screen aids in keeping the vent from becoming plugged; the screen should be clean and properly installed.

Water inside Regulators from Floods, Weather or Water Table on Underground Systems

Replace any regulator that has been flooded or has been submersed below the water, has water in the spring case or shows evidence of external or internal corrosion. Checking for internal corrosion on the first stage and integral two-stage of the second stage portion, can be done by removing the closing cap and with the aid of a flashlight observing the condition of the relief valve spring, main spring and internal spring barrel area. A more detailed examination will require shutting down the gas system and the complete removal of the adjusting screw. The second stage regulator must be completely disassembled by a qualified person to look for internal corrosion. Closely examine regulators installed with their vent horizontal for signs of corrosion. Correct any improper installations.

Regulator Replacement

Older regulators are more likely to fail catastrophically because of worn or corroded parts. Replace all regulators over 25 years of age. Other service or environmental conditions may dictate replacement of the regulator before the end of its 25 year service life.

Regulators that are installed on underground systems and in areas that are subject to sea salt (coastal) atmospheres should be inspected annually for external and internal corrosion and may require replacement sooner.

Regulator Repair

Only personnel trained in the proper procedures, codes, standards and regulations of the LP-Gas industry shall install and service this equipment.

Regulators that have been disassembled for repair must be tested for proper operation before being returned to service. Only parts manufactured by MEC should be used to repair MEC regulators. Be sure to give the complete Part Number of the regulator when corresponding with the factory.

The part number, orifice size, and spring range are on a label attached to the spring barrel. The date of manufacture is stamped on the regulator. Always provide this information in any correspondence with your MEC Distributor regarding replacement parts or technical assistance. **If construction changes are made in the field, be sure that the regulator marking is also changed to reflect the most recent construction.**

TABLE 1: 1100 AND 1200 SERIES SPECIFICATIONS

REGULATOR APPLICATION	PART NUMBER	CAPACITY BTU/HR PROPANE (1)	INLET CONNECTION	OUTLET CONNECTION	3/8-INCH FNPT SCREENED VENT STANDARD LOCATION	NOMINAL RELIEF VALVE START-TO-DISCHARGE	MAX OUTLET PRESSURE WITH DISC REMOVED		ORIFICE SIZE	MAX ALLOWABLE INLET PRESSURE	MAX EMERGENCY INLET PRESSURE	OUTLET PRESSURE STANDARD SETPOINT	OUTLET PRESSURE SPRING RANGE	REGULATOR COLOR
							INLET PRESSURE	MAX OUTLET PRESSURE						
Second Stage	MEGR-1232-BAF	500,000	1/2-in FNPT		Over Inlet	1 psi (0.069 bar)	30 psig (2.07 bar)	0.14-in (3.6 mm)	10 psig (0.69 bar)	7.5 psi (5.2 bar)	11-in w.c. (27 mbar)	9.3 to 13-in w.c. (24 to 32 mbar)	Green	
	MEGR-1232-8BF						2 psig (0.14 bar)	0.17-in (4.3 mm)	10 psig (0.69 bar)	7.5 psi (5.2 bar)	11-in w.c. (27 mbar)	9.3 to 13-in w.c. (24 to 32 mbar)	Green	
Integral Two-Stage	MEGR-1232-HBF	450,000	1/4-in FNPT	1/2-in FNPT	First Stage (2): Down Second Stage: Over Outlet Opposite Gauge Taps	1 psi (0.069 bar)	30 psig (2.07 bar)	0.15-in (3.8 mm)	10 psig (0.69 bar)	7.5 psi (5.2 bar)	10 psi (0.69 bar)	8 to 12 psi (0.55 to 0.83 bar)	Red	
	MEGR-1232-HBFXA						2 psig (0.14 bar)	0.17-in (4.3 mm)	10 psig (0.69 bar)	7.5 psi (5.2 bar)	10 psi (0.69 bar)	8 to 12 psi (0.55 to 0.83 bar)	Red	
First Stage	MEGR-1122H-AAU	1,000,000	1/4-in FNPT		Over Outlet Over Gauge Taps	16 psi (1.10 bar)	30 psig (2.07 bar)	0.15-in (3.8 mm)	10 psig (0.69 bar)	7.5 psi (5.2 bar)	10 psi (0.69 bar)	8 to 12 psi (0.55 to 0.83 bar)	Red	
	MEGR-1122H-AAUX8						2 psig (0.14 bar)	0.17-in (4.3 mm)	10 psig (0.69 bar)	7.5 psi (5.2 bar)	10 psi (0.69 bar)	8 to 12 psi (0.55 to 0.83 bar)	Red	

TABLE 2: 1600 SERIES SPECIFICATIONS

REGULATOR APPLICATION	PART NUMBER	CAPACITY BTU/HR PROPANE (1)	INLET CONNECTION	OUTLET CONNECTION	3/4-INCH FNPT SCREENED VENT STANDARD LOCATION	NOMINAL RELIEF VALVE START-TO-DISCHARGE	MAX OUTLET PRESSURE WITH DISC REMOVED		ORIFICE SIZE	MAX ALLOWABLE INLET PRESSURE	MAX EMERGENCY INLET PRESSURE	OUTLET PRESSURE STANDARD SETPOINT	OUTLET PRESSURE SPRING RANGE	REGULATOR COLOR
							INLET PRESSURE	MAX OUTLET PRESSURE						
Second Stage	MEGR-1622-8CF	710,000	1/2-in FNPT	1/2-in FNPT	First Stage (2): Down Second Stage: Over Outlet	1 psi (0.069 bar)	50 psig (3.4 bar)	7/32-in (5.6 mm)	10 psig (0.69 bar)	15 psig (1.03 bar)	11-in w.c. (27 mbar)	9 to 13-in w.c. (22 to 32 mbar)	Green	
	MEGR-1652-CFF						2 psig (0.14 bar)	7/32-in (5.6 mm)	10 psig (0.69 bar)	15 psig (1.03 bar)	11-in w.c. (27 mbar)	9 to 13-in w.c. (22 to 32 mbar)	Green	
Integral Two-Stage	MEGR-1632-HCF	950,000	1/4-in FNPT	3/4-in FNPT	First Stage (2): Down Second Stage: Opposite Gauge Taps	1 psi (0.069 bar)	250 psig (17.2 bar)	7/32-in (5.6 mm)	250 psig (17.2 bar)	250 psig (17.2 bar)	10 psi (0.69 bar)	8 to 12 psi (0.55 to 0.83 bar)	Red	
	MEGR-1632-CFF						2 psig (0.14 bar)	7/32-in (5.6 mm)	250 psig (17.2 bar)	250 psig (17.2 bar)	10 psi (0.69 bar)	8 to 12 psi (0.55 to 0.83 bar)	Red	
First Stage	MEGR-1622H-HGI	2,500,000	3/4-in FNPT	3/4-in FNPT	Over Inlet	4 psi (0.28 bar)	50 psig (3.4 bar)	10 psig (0.69 bar)	15 psig (1.03 bar)	2 psig (0.14 bar)	1 to 2 psi (0.069 to 0.15 bar)	Green		
	MEGR-1622H-DGI						5 psig (0.34 bar)	10 psig (0.69 bar)	15 psig (1.03 bar)	2 psig (0.14 bar)	1 to 2 psi (0.069 to 0.15 bar)	Green		

(1): Capacities Based on:
 Second Stage: 10 psig (0.69 bar) inlet pressure with 2-inches w.c. (5 mbar) droop.
 Integral Second Stage: 30 psig (2.07 bar) inlet pressure and 2-inches w.c. (5 mbar) droop.
 First Stage: 30 psig (2.07 bar) inlet pressure and 20% droop.
 (2): Integral First Stage Vent size: 7/16-24 UN thread for 1/4-inch OD copper tube inverted flare fitting.