RegO® Regulator Dependability

When RegO® LP-Gas Regulators are properly installed, safe, precise, trouble-free service is the result.

Dependability is built into every regulator ... the result of rigid standards of quality control and close tolerance machining. And this has been true for more than 60 years.

RegO® Products are manufactured from the finest materials, and assembled and tested using procedures second to none.

All give you a product that provides accurate gas delivery under varying pressure ranges and load conditions.

RegO® LP-Gas Regulators are UL listed and comply with applicable code requirements.

RegO® Products offer a complete line of LP-Gas Regulators with capacities for almost every application.

RegO® Regulator Selection

In order to properly size the RegO® Regulator, find the total load of the installation. The total load is calculated by adding up the input ratings (BTU or CFH) of all appliances in the installation. Input ratings may be obtained from the nameplates on the appliances or from the manufacturers' literature.

Determine the type of regulation needed referring to the chart below.

Type of System	Maximum Load	Suggested Regulator
First Stage in a Two Stage System	1,500,000 (a)	LV3403TR
	2,500,000 (b)	LV4403SR Series LV4403TR Series
Second Stage in a Two Stage System	935,000 (c)	LV4403B Series
	1,600,000 (c)	LV5503B4/B6
	2,300,000 (c)	LV5503B8
	9,800,000	LV6503B Series
Second Stage in a 2 PSIG System	1,000,000	LV4403Y4/Y46R
	2,200,000	LV5503Y6/Y8
Integral Twin Stage	200,000 (d)	LV404B23/29 Series
	525,000 (d)	LV404B4/B9 Series
Automatic Changeover	200,000 (d)	7525B23 Series
	450,000 (d)	7525B4 Series

* See catalog page for inlet and delivery specifications.

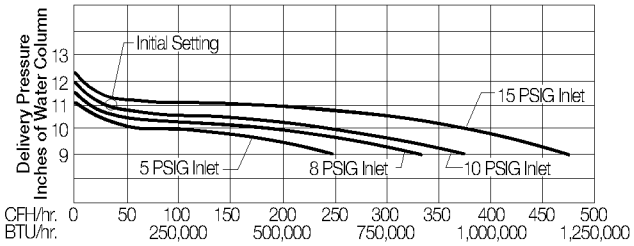
Now determine which regulator in the Series would be most suitable. Turn to the individual product pages and refer to the Performance Curves. Check the performance of the regulator with your actual load conditions at the minimum LP-Gas inlet pressure for the regulator. Use the pressure corresponding to your lowest winter temperatures shown in the chart below or refer to the delivery pressure of your first stage regulator.

Temperature		Approx. Pressure (PSIG)		Temperature		Approx. Pressure (PSIG)	
°F	°C	Propane	Butane	°F	°C	Propane	Butane
-40	-40	3.6		40	4	72	3.0
-30	-34	8		50	10	86	6.9
-20	-29	13.5		60	16	102	12
-10	-23	23.3		70	21	127	17
0	-18	28		80	27	140	23
10	-12	37		90	32	165	29
20	-7	47		100	38	196	36
30	-1	58		110	43	220	45

Example for a First Stage Regulator

1. Assume a load of 500,000 BTU's per hour.
2. Assume a minimum delivery pressure of 9.5 PSIG.
3. Assume a minimum tank pressure of 15 PSIG.
4. For these conditions, refer to chart for the LV4403TR Series, First Stage Regulator, shown below.
5. Find the line on the chart corresponding to the lowest anticipated winter tank pressure (note that each performance line corresponds to and is marked with a different inlet pressure in PSIG).
6. Draw a vertical line upward from the point of assumed load (500,000 BTU's per hour) to intersect with the line corresponding to the lowest tank pressure.
7. Read horizontally from the intersection of these lines to the delivery pressure at the left side of the chart. In this example the delivery pressure will be 9.7 PSIG. Since the delivery pressure will be 9.7 PSIG at the maximum load conditions and lowest anticipated tank pressure, the regulator will be sized properly for the demand.

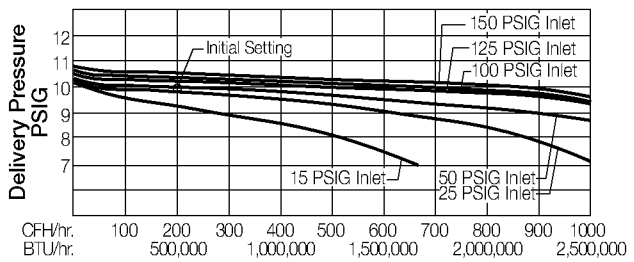
LV4403TR Series First Stage Regulator



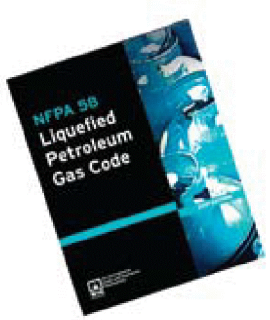
Example for a Second Stage Regulator

1. Assume load of 250,000 BTU's per hour.
2. Assume a minimum delivery pressure of 10" w.c.
3. Assume a minimum inlet pressure of 10 PSIG.
4. For these conditions, refer to chart for the LV4403B Series, Second Stage Regulator, shown below.
5. Find the line on the chart corresponding to the anticipated inlet pressure.
6. Draw a vertical line upward from the point of assumed load (250,000 BTU's per hour) to intersect with the line corresponding to the lowest inlet pressure.
7. Read horizontally from the intersection of these lines to the delivery pressure at the left side of the chart. In this example the delivery pressure will read 10.6" w.c. Since the delivery pressure will be 10.6" w.c. at the maximum load condition and lowest anticipated inlet pressure, the regulator is sized properly for the demand.

LV4403B Series Second Stage Regulator



Safety Warnings



Purpose

In its continuing quest for safety, Engineered Controls International, Inc. publishes a series of bulletins explaining the hazards associated with the use, misuse, and aging of LP-Gas valves and regulators. It is hoped that these factual bulletins will make clear to LP-Gas dealer managers and service personnel, that the utmost care and attention must be used in the installation, inspection, and maintenance of these products, or problems could occur which would result in injuries and property damage.

The National Fire Protection Association Pamphlet #58 - 2001 Edition, "Liquified Petroleum Gas Code" states in Section 1.5 that, "persons who transfer liquid LP-Gas, who are employed to transport LP-Gas, or whose primary duties fall within the scope of this code shall be trained in proper handling procedures. Refresher training shall be provided at least every three years. The training shall be documented." These "ECII® Safety Warnings" may be useful in training new employees and reminding older employees of hazards that can occur. It is recommended that all employees be furnished with a copy of NPGA Safety Pamphlet 306, "LP-Gas Regulator and Valve Inspection and Maintenance."

Nature of Warnings

It is recognized that warnings should be as brief as possible, but the factors involved in regulator failures are not simple. They need to be fully understood so that proper maintenance programs can be established. If there is a simple warning, it would be:

> Inspect regulators regularly as outlined in this safety warning and replace as required per these recommendations. When all of these recommendations are followed, the recommended service life of an ECII/RegO® regulator (except single stage) manufactured after 1995 is 25 years. The recommended service life of all other ECII/RegO® regulators is 15 years.

LP-Gas Regulators

This bulletin applies most particularly to permanent LP-Gas installations of cylinders and tanks. The warnings also apply in most cases to portable installations of recreational vehicles, barbecue grills, etc.

> This bulletin is not intended to be an exhaustive treatment of the subject of regulators and certainly does not cover all safety practices that should be followed in the installation and maintenance of LP-Gas systems.

It should not be necessary to remind readers of this bulletin that regulators must be installed in strict conformance with NFPA Pamphlets 54 and 58, and all other applicable codes and regulations. Codes, regulations and manufacturer's recommendations have been developed by experts with many years of experience in the LP-Gas industry.

Failure to fully follow these codes, regulations and recommendations could result in hazardous installations.

Pamphlet 58 states "All regulators for outdoor installations, except regulators used for portable industrial applications, shall be designed, installed or protected so their operation will not be affected by the elements (freezing rain, sleet, snow, ice, mud or debris). This protection may be integral with the regulator."

Failed and/or Inoperative Regulators

Failed regulators can cause three kinds of hazards:

- High pressure LP-Gas in a system downstream of the regulator; and
- Leaks of LP-Gas to atmosphere from the regulator itself.
- Loss of pressure due to a "freeze-up" in the orifice.

High Pressure LP-Gas in a System

Anything that prevents a regulator from regulating properly could result in high pressure gas at the regulator outlet and thus in a system.

High pressure gas into piping and appliances could cause piping leaks and damage to appliance burner controls with the potential for fires and explosions.

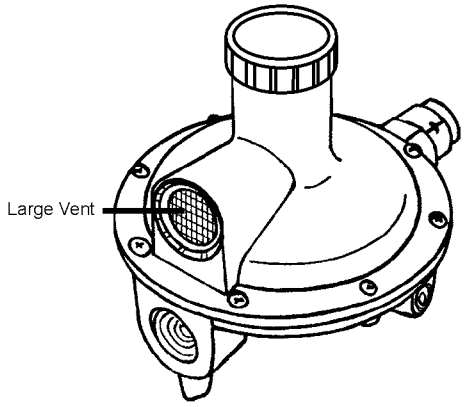
The Causes of High Pressure Gas in a System are:

1. Regulator vents that are clogged or obstructed.

Vents must be clear and fully open at all times.

Many regulators are equipped with a pressure relief valve which discharges to atmosphere through the vent. Ice, snow drifts, dirt, bugs, paint, or other foreign material can clog the vents.

An obstructed vent may prevent the pressure relief valve from operating properly.



Regulators should be installed with the vent facing down or protected so their operation will not be affected by the elements. In cases where the regulator vent is equipped with a discharge tube, the outlet of this tube must be facing down. The vents and/or discharge tubes must be protected from the elements and must be equipped with a screen to prevent bugs from obstructing the opening.

Action Required: Regulators should be properly installed and regularly inspected when tanks or cylinders are filled. If vents are clogged or the screen is missing, they must be cleaned or replaced. If the vent screen is missing and there is evidence of foreign material around the vent, the regulator should be replaced.

2. Foreign material lodging between the regulator nozzle and seat disc:

When this occurs, the regulator can remain open, allowing high pressure gas into the system.

This material can come from system piping between the container shut-off valve and the regulator. Chips created during piping installation or dirty piping can create this hazard. Corrosion inside of copper pigtails and piping can cause problems. This can occur particularly when LP-Gas contains high sulphur or excessive moisture.

Action Required: Make sure regulator inlet piping is clean at the time of installation. Periodic checks should be made to assure piping remains clean without corrosion. Never use old pigtails on new LP-Gas installations. Old pigtails can also work harden and crack if they have been bent and twisted several times.

3. Wrong regulator installed for the application:

The proper regulator must be used for each system.

For example, installation of high pressure regulators not designed to reduce gas pressure to an appliance requirement of 11" w.c. will cause a hazard. Installing a regulator undersized for the load can cause improper combustion at the appliance burner with a potential for carbon monoxide poisoning.

Action Required: Make sure the regulator is correct for each application and test the system with a pressure gauge or a manometer.

4. Failure to external mechanical parts due to corrosion:

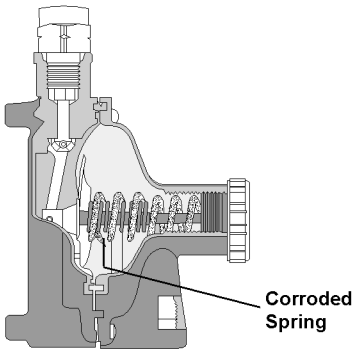
Adjusting springs and relief valve springs can rapidly corrode if exposed to salt air or industrial pollution. Even moisture condensation on these springs can cause them to rust and fail.

Failure of these springs will result in failure of the regulator to control the pressure.

With the vent of a regulator facing down, corrosion products from the springs could clog the regulator vent screen blocking the vent.

Action Required: Regulator inspection for corrosion should be made according to the guidelines listed below:

- For underground installations subject to submersion, the regulator should be inspected **every** time the container is filled.
- For known corrosive atmospheres of salt air or chemical pollution, the regulator should be inspected at least once a year.
- For other applications, the regulator should be inspected every 3 years.



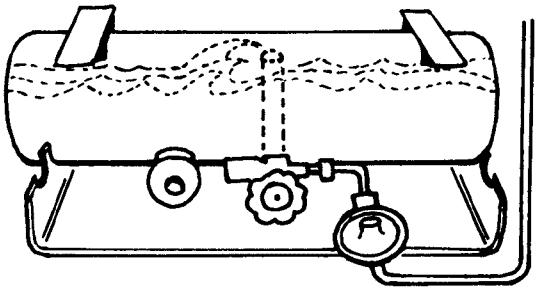
A casual inspection for corrosion can be made by examining the surface and looking into the bonnet after the bonnet cap has been removed. This sometimes will alert the inspector to corrosive conditions. Certainly the regulator should be examined in more detail by a qualified and trained technitian. For single stage, second stage and twin stage regulators remove the bonnet cap and examine the inside of the bonnet with a strong flashlight. For first stage regulators that have a bonnet cap, shut down the system, remove the bonnet cap and spring and examine the inside of the bonnet with a strong flashlight. After the inspection, the regulator must be adjusted to the proper pressure.

If any corrosion is evident, replace the regulator.

It is essential that the regulator bonnet cap be tightly in place at all times to prevent the entrance of water, bugs, dirt, etc. Foreign material can cause the regulator to function improperly with potentially hazardous results.

5. Liquid propane in the regulator:

This can occur on recreational vehicles, unless the regulator is installed substantially higher than the container shut-off valve. Here, sloshing propane could get into the regulator with the resulting high pressure downstream of the regulator. It could also occur on stationary installations if the regulator is installed below the shut-off valve and the container is over-filled.



Action Required: Be careful of regulator installation and never overfill any LP-Gas container.

Leaks of LP-Gas to Atmosphere

While the occurrences of leaking regulators are rare, they can and do occur with a potential for fires and explosions.

These leaks can be caused by:

1. Corrosion of the relief valve spring or foreign material on the seat disc which causes the relief valve to open, will cause LP-Gas to escape through the regulator vent, as well as permitting high pressure into the system.

Action Required: Regulator inspection for corrosion should be made according to the guidelines listed below:

- For underground installations subject to submersion, the regulator should be inspected **every** time the container is filled.
- For known corrosive atmospheres of salt air or chemical pollution, the regulator should be inspected at least once a year.
- For other applications, the regulator should be inspected every 3 years.

A casual inspection for corrosion can be made by examining the surface and looking into the bonnet after the bonnet cap has been removed. This sometimes will alert the inspector to corrosive conditions. Certainly the regulator should be examined in more detail by a qualified and trained technitian. For single stage, second stage and twin stage regulators remove the bonnet cap and examine the inside of the bonnet with a strong flashlight. For first stage regulators that have a bonnet cap, shut down the system, remove the bonnet cap and spring and examine the inside of the bonnet with a strong flashlight. After the inspection, the regulator must be adjusted to the proper pressure.

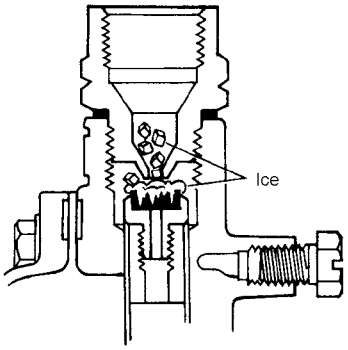
If any corrosion is evident, replace the regulator.

2. Bad piping connections at the regulator inlet and outlet. This can occur at the time of installation where connections are loose or the regulator may have been overstressed by excessive wrenching. It is important that proper wrenches, both on the piping and on the regulator inlet and outlet, be used when connecting the system piping, and that the regulator die cast body is not cracked by wrenching the pipe too deeply into the body.

Action Required: Always test for leaks at time of installation and inspect for leaks if there is reason to believe that pipe connections could cause a hazard.

Loss of Pressure

Freeze-up inside the regulator.



This will prevent the regulator from regulating properly.

Regulator freeze-ups occur because there is excessive moisture in the gas. Freeze-ups can also occur in pigtails that are kinked or bent where free flow of the LP-Gas is restricted. These freeze-ups can occur when the moisture, gas flow and temperature combine to create a hazardous condition. Freeze-ups can occur at temperatures above 32° F.

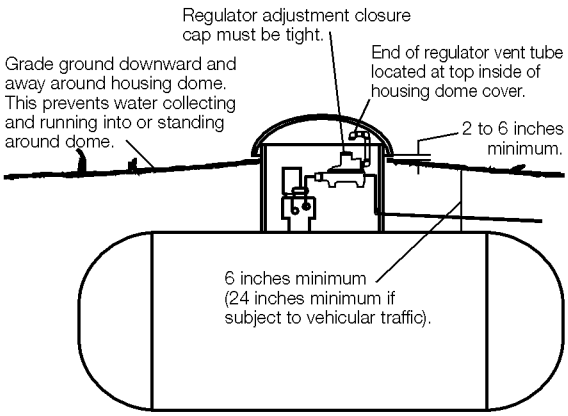
Action Required: All LP-Gas should be checked for moisture content prior to delivery to consumers and proper amounts of anhydrous methanol added if the gas cannot be returned to the supplier. Any container suspected of having excessive moisture should be treated with the proper amount of methanol.

Underground Installations

Special hazards can occur if regulators are not properly installed in underground systems. Water, dirt, mud and insects can get into the regulator if the bonnet cap is not tightly in place and the vent is not protected with a proper vent tube, opening above any potential water level.

Most problems occur because the waterproof dome on the buried storage tank does not extend above the ground level sufficiently to keep out water and mud.

Refer to NPGA No. 401.



Note: Water mark left in housing dome at level above regulator vent, or end of vent tube requires replacement of regulator. Then correct installation.

Customer Safety

Since regulators are often used by consumers without previous knowledge of the hazards of LP-Gas, and the LP-Gas dealers are the only ones who have direct contact with the consumers,

It is the dealer's responsibility to make sure that his customers are properly instructed in safety matters relating to their installation.

At the very minimum, it is desirable that these customers:

1. **Know the odor of LP-Gas and what to do in case they smell gas. Use the NPGA "Scratch 'n Sniff" leaflet.**
2. **Are instructed to never tamper with the system.**
3. **Know that when protective hoods are used to enclose regulators and/or valves, that these hoods must be closed, but not locked.**
4. **Keep snow drifts from covering regulators.**
5. **Know the location of the cylinder or tank shut-off valve in emergencies.**

General Warning

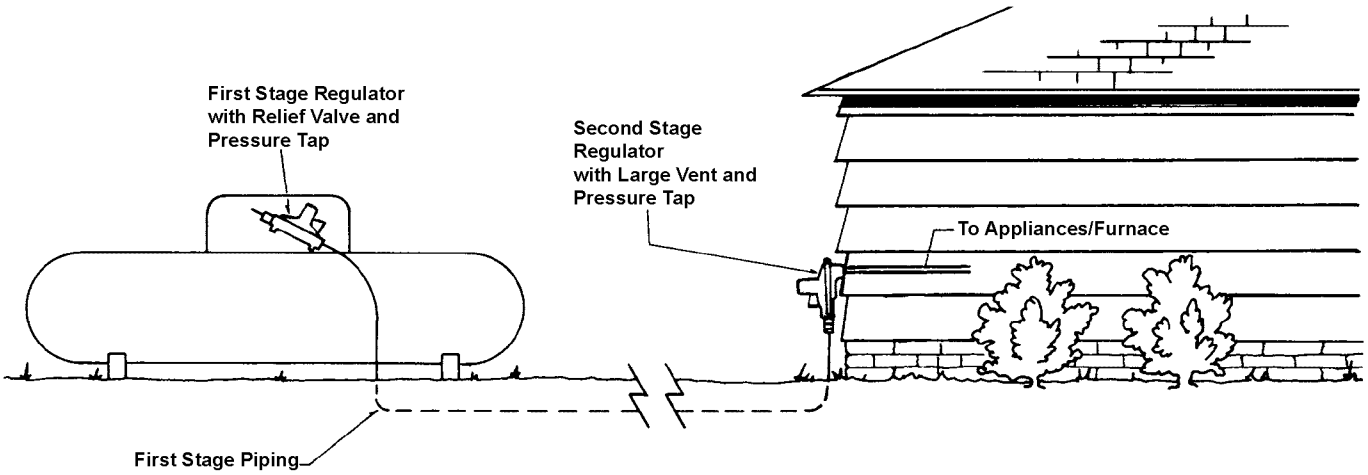
All ECII® Products are mechanical devices that will eventually become inoperative due to wear, contaminants, corrosion and aging of components made of materials such as metal and rubber. As a general recommendation,Regulators should be replaced in accordance with all of the recommendations outlined in this safety warning. The recommended service life of a regulator is one of many factors that must be considered in determining when to replace a regulator.

The environment and conditions of use will determine the safe service life of these products. Periodic inspection and maintenance are essential.

Because ECII® Products have a long and proven record of quality and service, LP-Gas dealers may forget the hazards that can occur because a regulator is used beyond its safe service life. Life of a regulator is determined by the environment in which it "lives." The LP-Gas dealer knows better than anyone what this environment is.

NOTE: There is a developing trend in state legislation and in proposed national legislation to make the owners of products responsible for replacing products before they reach the end of their safe useful life. LP-Gas dealers should be aware of legislation which could affect them.

Advantages of Two-Stage Regulation



The regulator is truly the heart of an LP-Gas installation. It must compensate for variations in tank pressure from as low as 8 PSIG to 220 PSIG – and still deliver a steady flow of LP-Gas at 11" w.c. to consuming appliances. The regulator must deliver this pressure despite a variable load from intermittent use of the appliances.

Though a single-stage system may perform adequately in many installations, the use of a two-stage system offers the ultimate in pin-point regulation. Two-stage regulation can result in a more profitable LP-Gas operation for the dealer resulting from less maintenance and fewer installation callbacks – and there is no better time than now for installing RegO® Regulators in two-stage systems.

Uniform Appliance Pressure

The installation of a two-stage system – one high pressure regulator at the container to compensate for varied inlet pressures, and one low pressure regulator at the building to supply a constant delivery pressure to the appliances – helps ensure maximum efficiency and trouble-free operation year-round. It is important to note that while pressure at the appliances can vary up to 4" w.c. using single-stage systems, two-stage systems keep pressure variations within 1" w.c. New high-efficiency appliances require this closer pressure control for proper ignition and stable, efficient operation. In fact, one major manufacturer requires the use of two-stage systems with their appliances.

Reduced Freeze-ups/Service Calls

Regulator freeze-up occurs when moisture in the gas condenses and freezes on cold surfaces of the regulator nozzle. The nozzle becomes chilled when high pressure gas expands across it into the regulator body. This chilling action is more severe in single-stage systems as gas expands from tank pressure to 11" w.c. through a single regulator nozzle.

Two-stage systems can greatly reduce the possibility of freeze-ups and resulting service calls as the expansion of gas from tank pressure to 11" w.c. is divided into two steps, with less chilling effect at each regulator. In addition, after the gas exits the first-stage regulator and enters the first-stage transmission line, it picks up heat from the line, further reducing the possibility of second-stage freeze-up.

Service calls for pilot outages and electronic ignition system failures are also reduced as a result of more uniform appliance pressure from two-stage systems.

Economy of Installation

In a single-stage system, transmission line piping between the container and the appliances must be large enough to accommodate the required volume of gas at 11" w.c. In contrast, the line between the first and second stage regulators in two-stage systems can be much smaller as it delivers gas at 10 PSIG to the second-stage regulator. Often the savings in piping cost will pay for the second regulator.

As an additional benefit, single-stage systems can be easily converted to two-stage systems using existing supply lines when they prove inadequate to meet added loads. This is the least expensive and best method of correcting the problem.

Allowance for Future Appliances

A high degree of flexibility is offered in new installations of two-stage systems. Appliances can be added later to the present load – provided the high pressure regulator can handle the increase – by the addition of a second low pressure regulator. Since appliances can be regulated independently, demands from other parts of the installation will not affect their individual performances.

Size The System Correctly

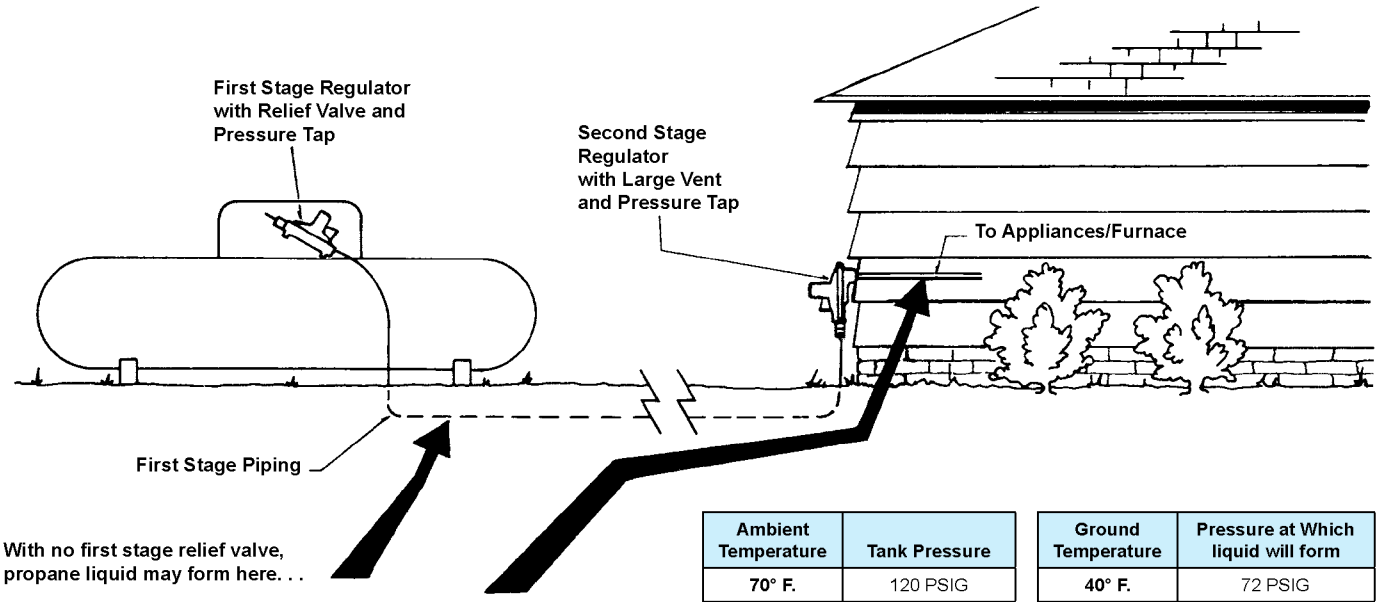
Prior to installing your two-stage system, be sure the system pipe and tubing is properly sized. Proper sizing will help ensure constant delivery pressure to the appliances during fluctuating loads at all times. Just as important, be sure the RegO® Regulators you choose are capable of handling the desired load. This is another advantage of two-stage systems – they are capable of handling much more BTU's/hr. than single-stage systems. The RegO® "LP-Gas Serviceman's Manual" provides complete information on pipe sizing and proper regulator selection.

Replace Pigtails

If you are replacing an old regulator, remember to replace the copper pigtail. The old pigtail may contain corrosion which can restrict flow. In addition, corrosion may flake off and wedge between the regulator orifice and seat disc – preventing proper lock-up.

Two-Stage LP-Gas Systems ...

Require First Stage Regulators with Built-in Relief Valves



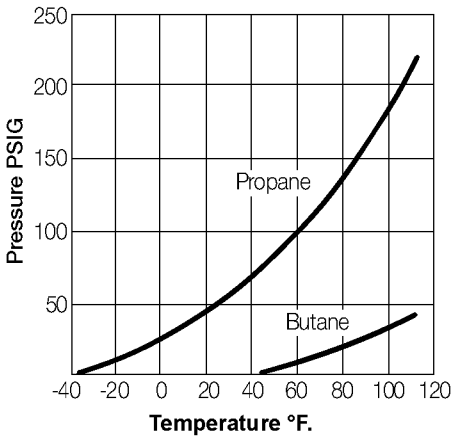
Resulting in sudden pressure surge due to flashing into vapor here! First stage relief can prevent liquid from forming in first stage piping during periods with no gas demand! ! !

Ambient Temperature	Tank Pressure
70° F.	120 PSIG
80° F.	140 PSIG
90° F.	165 PSIG

Ground Temperature	Pressure at Which liquid will form
40° F.	72 PSIG
50° F.	86 PSIG
60° F.	102 PSIG

Pressure at which liquid can form at various temperatures.

Vapor Pressures of LP Gases



The Problem

Many modern LP-Gas appliances are equipped with pilotless ignition systems. Water heaters and older appliances use pilot lights, but it has become a common practice for energy conscious homeowners to shut-off the pilot when leaving home for extended periods of time. In each instance, there is **no gas demand at all** for extended periods.

The Consequences

If the first stage regulator fails to lock-up tight, usually as a result of a worn seat disc or foreign material lodged between nozzle and seat disc, pressure will build-up in the first stage piping – possibly to a level that approaches tank pressure. Combining this with warm ambient temperatures and cool ground, **propane liquid may form** in the first stage piping.

When gas demand resumes, this liquid may pass through the second stage regulator into the appliances and furnace. NOTE – the second stage regulator will not relieve the pressure in first stage piping. The rapid vaporization of the liquid may cause a rapid pressure surge that could seriously damage critical components of the appliance and furnace controls.

A fire or explosion could occur as a consequence.

The Solution

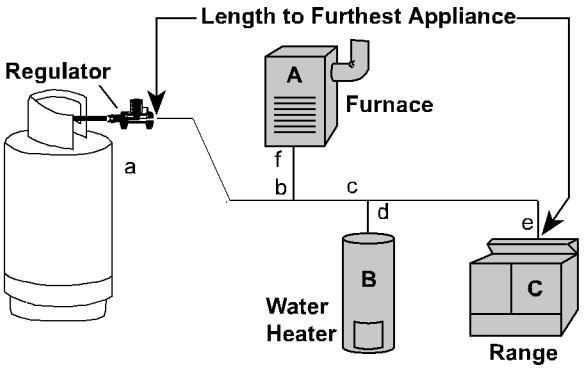
RegO® LV4403 Series First Stage Regulators with Built-In Relief Valves reduce the possibility of this serious hazard in two stage applications. The built-in relief valve is designed to vent as needed and reduce the possibility of first stage piping pressure from becoming high enough to form liquid.

Pipe and Tubing Selection Guide

Use the following simple method to assure the selection of the correct sizes of piping and tubing for LP-Gas vapor systems. Piping between first and second stage regulators is considered, as well as low pressure (inches water column) piping between second stage, single stage, or integral twin stage regulators and appliances.

Instructions:

1. Determine the total gas demand for the system by adding up the BTU/hr input from the appliance nameplates and adding demand as appropriate for future appliances.
2. For second stage or integral twin stage piping:
   - A. Measure length of piping required from outlet of regulator to the appliance *furthest away*. *No other length is necessary to do the sizing.*
   - B. Make a simple sketch of the piping, as shown.
   - C. Determine the capacity to be handled by each section of piping. For example, the capacity of the line between a and b must handle the total demand of appliances A, B, and C; the capacity of the line from c to d must handle only appliance B, etc.
   - D. Using Table 3 select proper size of tubing or pipe for each section of piping, using values in BTU/hr for the length determined from step #2-A. If exact length is not on chart, use next longer length. Do not use any other length for this purpose! Simply select the size that shows at least as much capacity as needed for each piping section.
3. For piping between first and second stage regulators
   - A. For a simple system with only one second stage regulator, merely measure length of piping required between outlet of first stage regulator and inlet of second stage regulator. Select piping or tubing required from Table 1.
   - B. For systems with multiple second stage regulators, measure length of piping required to reach the second stage regulator that is furthest away. Make a simple sketch, and size each leg of piping using Table 1, 2, or 3 using values shown in column corresponding to the length as measured above, same as when handling second stage piping.



Example 1

Determine the sizes of piping or tubing required for the twin-stage LP-Gas installation shown.

Total piping length = 84 feet (use Table 3 @90 feet)

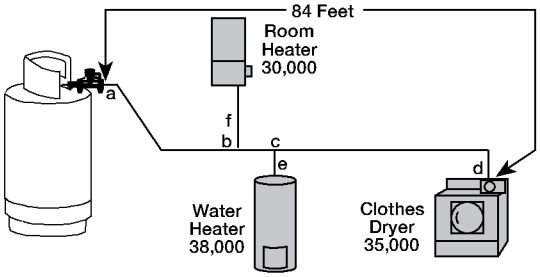
From a to b, demand = 38,000 + 35,000 + 30,000
= 103,000 BTU/hr; use 3/4" pipe

From b to c, demand = 38,000 + 35,000
= 73,000 BTU/hr; use 1/2" pipe or 3/4" tubing

From c to d, demand = 35,000 BTU/hr; use 1/2" pipe or 5/8" tubing

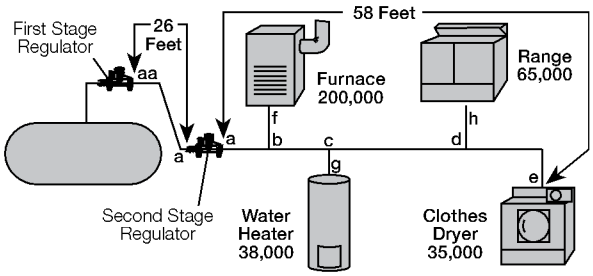
From c to e, demand = 38,000 BTU/hr; use 1/2" pipe or 5/8" tubing

From b to f, demand = 30,000 BTU/hr; use 1/2" pipe or 1/2" tubing



Example 2.

Determine the sizes of piping or tubing required for the two-stage LP-Gas installation shown.



Total first stage piping length = 26 feet; first stage regulator setting is 10psig (use Table 1 or 2 @ 30 feet)

From aa to a, demand = 338,000 BTU/hr; use 1/2" pipe, 1/2" tubing, or 1/2" T plastic pipe.

Total second stage piping length = 58 feet (use Table 3 @ 60 feet)

From a to b, demand = 338,000 BTU/hr; use 1" pipe

From b to c, demand = 138,000 BTU/hr; use 3/4" pipe or 7/8" tubing

From c to d, demand = 100,000 BTU/hr; use 1/2" pipe or 3/4" tubing

From d to e, demand = 35,000 BTU/hr; use 1/2" pipe or 1/2" tubing

From b to f, demand = 200,000 BTU/hr; use 3/4" pipe or 7/8" tubing

From c to g, demand = 38,000 BTU/hr; use 1/2" pipe or 1/2" tubing

From d to h, demand = 65,000 BTU/hr; use 1/2" pipe or 5/8" tubing

Example 3

Determine the sizes of piping or tubing required for the 2 PSI LP-Gas installation shown.

Total first stage piping length = 26 feet; first stage regulator setting is 10psig (use Table 1 or 2 @ 30 feet)

Total 2 PSI Piping Length = 19 ft. (use Table 4 @ 20 ft. or Table 6 @ 20 ft.)

From aa to a, demand= 338,000 BTU
use 3/8" CSST or 1/2" copper tubing or 1/2" pipe

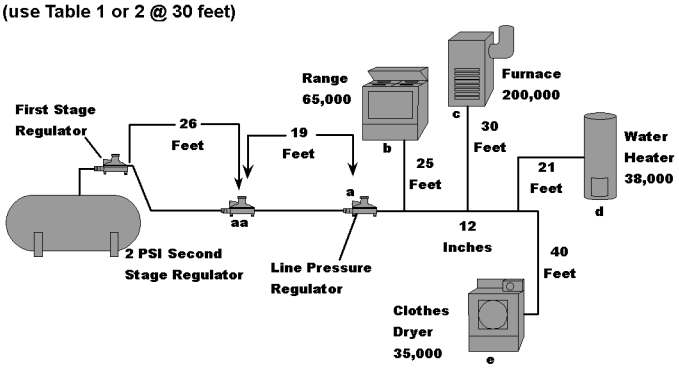
From Regulator a to each appliance:

From a to b, demand= 65,000 BTU; length = 25 ft. (Table 5),
use 1/2" CSST

From a to c, demand= 200,000 BTU; length = 30 ft. (Table 5)
use 3/4" CSST

From a to d, demand= 38,000 BTU; length = 21 ft.* (Table 5)
use 3/8" CSST *use 25 ft. column

From a to e, demand= 35,000 BTU; length = 40 ft. (Table 5)
use 1/2" CSST



Pipe and Tubing Selection Guide

Table 1 – First Stage Pipe Sizing (Between First and Second Stage Regulators) 10 PSIG Inlet with a 1 PSIG Pressure Drop Maximum capacity of pipe or tubing, in thousands of BTU/hr or LP-Gas

Size of Pipe or Copper Tubing, Inches		Length of Pipe or Tubing, Feet*																				
		10	20	30	40	50	60	70	80	90	100	125	150	175	200	225	250	275	300	350	400
Copper	3/8	558	383	309	265	235	213	196	182	171	161	142	130	118	111	104	90	89	89	82	76
Tubing	1/2	1387	870	700	599	531	481	443	412	386	365	323	293	269	251	235	222	211	201	185	172
(O.D.)	5/8	2360	1622	1303	1115	988	896	824	767	719	679	601	546	502	467	438	414	393	375	345	321
	3/4	3993	2475	2205	1887	1672	1515	1394	1297	1217	1149	1018	923	843	790	740	700	664	634	584	543
Pipe Size	1/2	3339	2295	1843	1577	1398	1267	1165	1084	1017	961	852	772	710	660	619	585	556	530	488	454
	3/4	6982	4799	3854	3298	2923	2649	2437	2267	2127	2009	1780	1613	1484	1381	1296	1224	1162	1109	1020	949
	1	13153	9040	7259	6213	5507	4989	4590	4270	4007	3785	3354	3039	2796	2601	2441	2305	2190	2089	1922	1788
	1-1/4	27004	18560	14904	12756	11306	10244	9424	8767	8226	7770	6887	6240	5741	5340	5011	4733	4495	4289	3945	3670
	1-1/2	40461	27809	22331	19113	16939	15348	14120	13136	12325	11642	10318	9349	8601	8002	7508	7092	6735	6426	5911	5499
	2	77924	53556	43008	36809	32623	29559	27194	25299	23737	22422	19871	18005	16564	15410	14459	13658	12971	12375	11385	10591

* Total length of piping from outlet of first stage regulator to inlet of second state regulator (or to inlet of second stage regulator furthest away).
Notes: 1) To allow 2 PSIG pressure drop, multiply total gas demand by .707, and use capacities from table. 2) For different first stage pressures, multiply total gas demand by the following factors, and use capacities from table. Ex: 1,000,000 BTU load at 5 PSI: 1,000,000 (1.12) = 1,200,000 BTU then use chart bases on 1,200,000 BTU

First Stage Pressure PSIG	Multiply By
20	.844
15	.912
5	1.120

Data Calculated per NFPA #54 & 58

Table 2 – First Stage Plastic Tubing Sizing 10 PSIG Inlet with a 1 PSIG Pressure Drop Maximum capacity of plastic tubing in thousands of BTU/hr of LP-Gas

Size of Plastic Tubing		Length of Tubing, Feet*																			
NPS	SDR	10	20	30	40	50	60	70	80	90	100	125	150	175	200	225	250	275	300	350	400
1/2T	7.00	1387	954	766	655	581	526	484	450	423	399	354	321	295	274	257	243	231	220	203	189
1/2	9.33	3901	2681	2153	1843	1633	1480	1361	1267	1188	1122	995	901	829	772	724	684	649	620	570	530
3/4	11.00	7811	5369	4311	3690	3270	2963	2726	2536	2379	2248	1992	1805	1660	1545	1499	1369	1300	1241	1141	1062
1T	11.50	9510	6536	5249	4492	3981	3607	3319	3088	2897	2736	2425	2197	2022	1881	1765	1667	1583	1510	1389	1293
1T	12.50	10002	6874	5520	4725	4187	3794	3490	3247	3046	2878	2551	2311	2126	1978	1856	1753	1665	1588	1461	1359
1	11.00	14094	9687	7779	6658	5901	5346	4919	4578	4293	4055	3594	3257	2996	2787	2615	2470	2346	2238	2059	1916
1¼	10.00	24416	16781	13476	11534	10222	9262	8521	7927	7438	7026	6226	5642	5190	4829	4531	4280	4064	3878	3567	3318
2	11.00	66251	45534	36566	31295	27737	25131	23120	21509	20181	19063	16895	15308	14084	13102	12293	11612	11028	10521	9680	9005

* Total length of piping from outlet of first stage regulator to inlet of second state regulator or to inlet of second stage regulator furthest away.

First Stage Pressure PSIG	Multiply By
20	.844
15	.912
5	1.120

Data Calculated per NFPA #54 & 58

Table 3 – Second Stage or Integral Twin Stage Pipe Sizing 11 Inches Water Column Inlet with a 1/2 Inch Water Column Drop Maximum capacity of pipe or tubing in thousands of BTU/hr of LP-Gas

Size of Pipe or Copper Tubing, Inches		Length of Pipe or Tubing, Feet*																			
		10	20	30	40	50	60	70	80	90	100	125	150	175	200	225	250	275	300	350	400
Copper	3/8	49	34	27	23	20	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tubing	1/2	110	76	61	52	46	42	38	36	33	32	—	—	—	—	—	—	—	—	—	—
(O.D.)	5/8	206	151	114	97	86	78	71	67	62	59	—	—	—	—	—	—	—	—	—	—
	3/4	348	239	192	164	146	132	120	113	105	100	—	—	—	—	—	—	—	—	—	—
	7/8	536	368	296	253	224	203	185	174	161	154	—	—	—	—	—	—	—	—	—	—
Pipe	1/2	291	200	161	137	122	110	102	94	87	84	74	67	62	58	54	51	48	46	43	40
Size	3/4	608	418	336	287	255	231	212	198	185	175	155	141	129	120	113	107	101	97	89	83
	1	1146	788	632	541	480	435	400	372	349	330	292	265	244	227	213	201	191	182	167	156
	1-1/4	2353	1617	1299	1111	985	892	821	764	717	677	600	544	500	465	437	412	392	374	344	320
	1-1/2	3525	2423	1946	1665	1476	1337	1230	1144	1074	1014	899	815	749	697	654	618	587	560	515	479
	2	6789	4666	3747	3207	2842	2575	2369	2204	2068	1954	1731	1569	1443	1343	1260	1190	1130	1078	992	923

* Total length of piping from outlet of regulator to appliance furthest away.

Data Calculated per NFPA #54 & 58

Table 4-Maximum Capacity of CSST In Thousands of BTU per hour of undiluted LP-Gases Pressure of 2 psi and a pressure drop of 1 psi (Based on a 1.52 Specific Gravity Gas)*

Size	EHD** Flow Designation	Length of Tubing, Feet												
		10	25	30	40	50	75	80	110	150	200	250	300	400	500
	13	426	262	238	203	181	147	140	124	101	86	77	69	60	53
3/8	15	558	347	316	271	243	196	189	169	137	118	105	96	82	72
	18	927	591	540	469	420	344	333	298	245	213	191	173	151	135
1/2	19	1106	701	640	554	496	406	393	350	287	248	222	203	175	158
	23	1735	1120	1027	896	806	663	643	578	477	415	373	343	298	268
3/4	25	2168	1384	1266	1100	986	809	768	703	575	501	448	411	355	319
	30	4097	2560	2331	2012	1794	1457	1410	1256	1021	880	785	716	616	550
1	31	4720	2954	2692	2323	2072	1685	1629	1454	1182	1019	910	829	716	638

Table does not include effect of pressure drop across the line regulator. If regulator loss exceeds 1/2 psi (based on 13 in. water column outlet pressure), **DO NOT USE THIS TABLE.** Consult with regulator manufacturer for pressure drops and capacity factors. Pressure drops across a regulator may vary with flow rate.
CAUTION: Capacities shown in table may exceed maximum capacity for a selected regulator. Consult with regulator or tubing manufacturer for guidance.
*Table includes losses for four 90-degree bends and two end fittings. Tubing runs with larger number of bends and/or fittings shall be increased by an equivalent length of tubing according to the following equation: L-1.3n where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends.
**EHD — Equivalent Hydraulic Diameter — A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Table 5-Maximum Capacity of CSST In Thousands of BTU per hour of undiluted LP-Gases Pressure of 11 Inch Water Column and a Pressure Drop of 0.5 Inch Water Column (Based on a 1.52 Specific Gravity Gas)*

Size	EHD** Flow Designation	Length of Tubing, Feet																
		5	10	15	20	25	30	40	50	60	70	80	90	100	150	200	250	300
	13	72	50	39	34	30	28	23	20	19	17	15	15	14	11	9	8	8
3/8	15	99	69	55	49	42	39	33	30	26	25	23	22	20	15	14	12	11
	18	181	129	104	91	82	74	64	58	53	49	45	44	41	31	28	25	23
1/2	19	211	150	121	106	94	87	74	66	60	57	52	50	47	36	33	30	26
	23	355	254	208	183	164	151	131	118	107	99	94	90	85	66	60	53	50
3/4	25	426	303	248	216	192	177	153	137	126	117	109	102	98	75	69	61	57
	30	744	521	422	365	325	297	256	227	207	191	178	169	159	123	112	99	90
1	31	863	605	490	425	379	344	297	265	241	222	208	197	186	143	129	117	107

*Table includes losses for four 90-degree bends and two end fittings. Tubing runs with larger number of bends and/or fittings shall be increased by an equivalent length of tubing according to the following equation: L = 1.3n where L is additional length (ft) of tubing and n is the number of additional fittings and/or bends. **EHD — Equivalent Hydraulic Diameter — A measure of the relative hydraulic efficiency between different tubing sizes. The greater the value of EHD, the greater the gas capacity of the tubing.

Table 6 – Copper Tube Sizing or Schedule 40 Pipe Sizing* In Thousands of BTU per hour of undiluted LP-Gases 2 PSIG inlet with a 1 PSIG pressure drop (Between 2 PSIG service regulator & line pressure regulator).

Size of Pipe or Copper Tubing, Inches		Length of Pipe or Tubing, Feet*																				
		10	20	30	40	50	60	70	80	90	100	150	200	250	300	350	400	450	500	600	700
Copper	3/8	451	310	249	213	189	171	157	146	137	130	104	89	79	72	66	61	58	54	49	45
Tubing	1/2	1020	701	563	482	427	387	356	331	311	294	236	202	179	162	149	139	130	123	111	102
(O.D.)	5/8	1900	1306	1049	898	795	721	663	617	579	547	439	376	333	302	278	258	242	229	207	191
	3/4	3215	2210	1774	1519	1346	1219	1122	1044	979	925	743	636	563	511	470	437	410	387	351	323
Pipe	1/2	2687	1847	1483	1269	1125	1019	938	872	819	773	621	531	471	427	393	365	343	324	293	270
Size	3/4	5619	3862	3101	2654	2352	2131	1961	1824	1712	1617	1298	1111	985	892	821	764	717	677	613	564
	1	10585	7275	5842	5000	4431	4015	3694	3436	3224	3046	2446	2093	1855	1681	1546	1439	1350	1275	1155	1063
	1-1/4	21731	14936	11994	10265	9098	8243	7584	7055	6620	6253	5021	4298	3809	3451	3175	2954	2771	2618	2372	2182
	1-1/2	32560	22378	17971	15381	13632	12351	11363	10571	9918	9369	7524	6439	5707	5171	4757	4426	4152	3922	3554	3270
	2	62708	43099	34610	29621	26253	23787	21884	20359	19102	18043	14490	12401	10991	9959	9162	8523	7997	7554	6844	6297

RegO® Regulator Designs

Typical of the LV4403 Low Pressure Regulators and LV4403 High Pressure Regulators.

RegO® LP-Gas Regulators have been designed to give outstanding performance and dependability with a minimum of maintenance.

Nozzle Orifice
Replaceable and precision machined to prevent scoring of the seat disc.

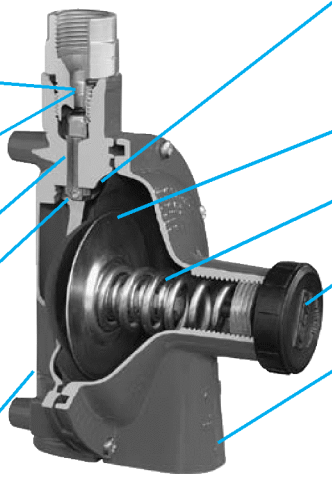
Seat Disc
Replaceable, resilient construction gives sure closing at lock up pressure. Straight line seat disc to nozzle operation provides even seat disc wear and positive lock up.

Pivot Pin
Fully enclosed in regulator body.

Control Linkage
Provides quick response to diaphragm movement; moves directly perpendicular to nozzle orifice to meter gas flow, give positive closure and reduce seat disc wear.

Built-In Pressure Tap
Provides a convenient way to check downstream pressure on both high and low pressure models.

Body & Bonnet
Painted, heavy-duty zinc resists corrosion and gives long-life protection, even under "salty air" conditions.



Molded Diaphragm Assembly
Twin layers of molded synthetic rubber sandwich a tough, flexible fabric to give super sensitive response in a temperature range of -40° to +165°F. Molded diaphragm seals in a groove between the body and bonnet.

Diaphragm Plate
Rigid diaphragm plate transmits pressure variations to control linkage.

Relief Valve
It is built in and tamper resistant. Large bonnet vent allows high capacity relief on second stage regulators.

Bonnet Cap
Bonnet cap incorporates travel stop to help control downstream pressure in the unlikely event of a regulator malfunction.

Large Bonnet Vent
Large vent is equipped with protective screen and threaded for ¾" F. NPT vent piping. Large vent helps prevent ice from building up and blocking the vent during inclement weather. The regulator should be installed with vent down and the vent protected against blockage.

Typical of the 1580 Industrial High Pressure Regulators

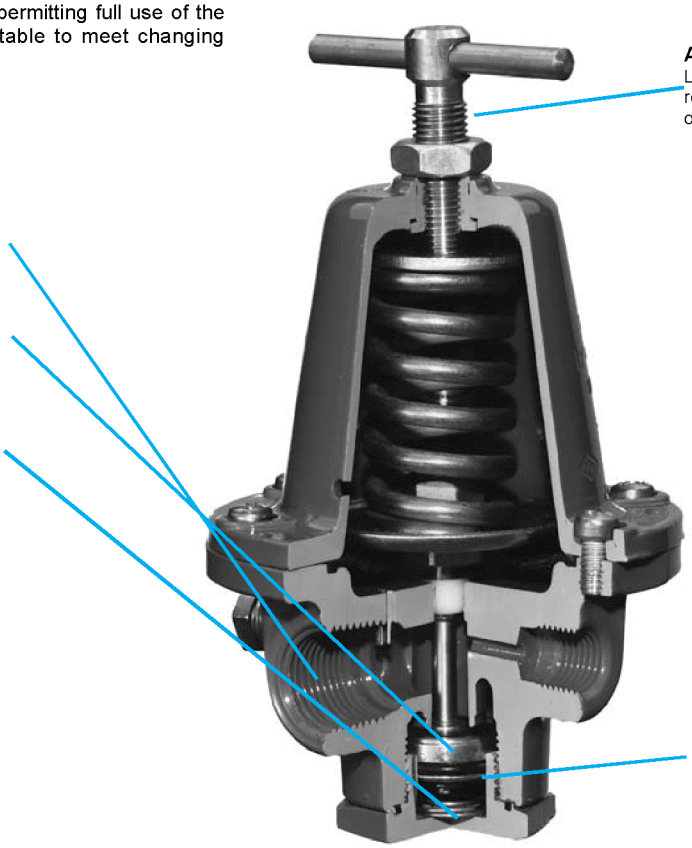
The pounds-to-pounds, industrial regulator gives higher delivery pressure as tank pressure decreases, thus permitting full use of the gas in the tank. Most units are field adjustable to meet changing conditions.

Adjusting Assembly
Large handle with lock-nut release allows easy resetting of delivery pressure.

Connections
Machined and threaded into the body casting; also includes ¼" NPT pressure gauge ports.

Seat Disc
Synthetic rubber assembly attached directly to the yoke assembly to ensure proper movement and regulation.

Back Cap Spring
Provides added upward force to help provide a positive lock-up.



Integral O-Ring
Minimizes tendency to vibrate or hum under extreme loads.

Sensitivity

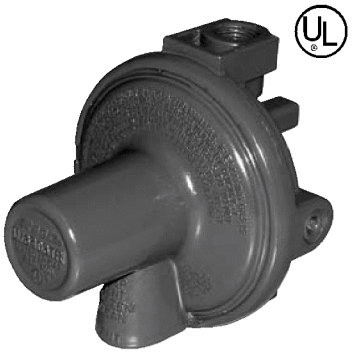
In those cases where there is a choice of delivery pressure ranges, the **lowest** spring range which will fulfill your requirements is recommended because the sensitivity of a regulator decreases as the range of the adjusting spring increases.

Relief Valves

Most high pressure regulators are not equipped with integral relief valves. For certain applications where it is desirable to protect equipment downstream of the regulator, relief valves must be installed in the line.

Compact High Pressure First Stage Regulator

Ideal for use as a first stage regulator on any domestic size ASME or DOT container in propane gas installations requiring no more than 1,500,000 BTUs/hour. These regulators are factory set to reduce tank pressure to an intermediate pressure of approximately 10 PSIG.



Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane*
LV3403TR	¼" F.NPT	½" F.NPT	¼"	10 PSIG	Over Outlet	1,500,000

* Maximum flow based on 15 PSIG inlet pressure and 8 PSIG delivery

High Pressure First Stage Regulators

Provides accurate first stage regulation in two-stage bulk tank systems. These regulators handle vaporization of tanks up to 1200 gallons. Reduce tank pressure to an intermediate pressure of 5 to 10 PSIG. Also used to supply high pressure burners for applications like industrial furnaces or boilers. Also incorporated in multiple cylinder installations.

Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure (PSIG)	Adjustment Range* (PSIG)	Integral Relief Included	Vapor Capacity BTU/hr Propane**
LV4403SR4	½" F. NPT	½" F. NPT	¼"	5	1-5	Yes	2,500,000
LV4403TR4				10	5-10		
LV4403SR9	F. POL			5	1-5		
LV4403TR9				10	5-10		
LV4403SR96		¾" F. NPT		5	1-5		
LV4403TR96				10	5-10		

* When used for final stage pressure control, must either incorporate integral relief valve or separate relief valve should be specified in accordance with NFPA Pamphlet 58.

** Maximum flow based on inlet pressure 20 PSIG higher than the regulator setting and delivery pressure 20% lower than the setting.

Second Stage Regulator For 2 PSIG Systems

Designed to reduce first stage pressure of 10 PSIG down to 2 PSIG. Systems that utilize this regulator use smaller than normal piping inside of the building. A special final stage regulator, not the appliance regulator, is required to reduce this intermediate 2 PSIG pressure down to 11" w.c.

LV4403Y Series

LV5503Y Series

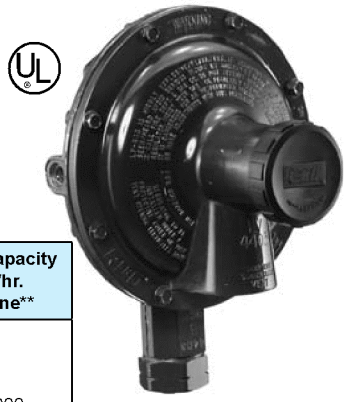
Part Number	Inlet Connection	Outlet Connection	Orifice Size	Adjustment Range	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane***
LV4403Y4	1/2" F. NPT	1/2" F. NPT	1/4"	2 PSIG @ 10 PSIG Inlet	Over Inlet	1,000,000
LV4403Y46R	1/2" F. NPT	3/4" F. NPT	1/4"	2 PSIG @ 10 PSIG Inlet	Over Inlet	1,000,000
LV5503Y6	3/4" F. NPT	3/4" F. NPT	1/4"	2 PSIG @ 10 PSIG Inlet	Over Inlet	2,200,000
LV5503Y8	3/4" F. NPT	1" F. NPT	9/32"	2 PSIG @ 10 PSIG Inlet	Over Inlet	2,200,000

Low Pressure Second Stage Regulators

Designed to reduce first stage pressure of 5 to 20 PSIG down to burner pressure, normally 11" w.c. Ideal for medium commercial installations, multiple cylinder installations and normal domestic loads.

Backmount Design

Mounts directly to house line piping. Eliminates need for union joints, elbows, and mounting brackets. Quick and easy to install.



Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane**
LV4403B4	½" F. NPT	1½"	#28 Drill	11" w.c. at 10 PSIG Inlet	9" to 13" w.c.	Over Inlet	935,000
LV4403B46		¾" F. NPT					
LV4403B46R*							
LV4403B66	¾" F. NPT						
LV4403B66R*							
LV4403B66RA			3/16"				1,000,000
LV4403B66RAB							

* Backmount design
** Maximum flow based on 10 PSIG inlet and 9" w.c. delivery pressure.

Low Pressure Second Stage Regulators

Designed to reduce first stage pressure of 5 to 20 PSIG down to burner pressure,normally 11" w.c. Ideal for larger commercial and industrial applications, multiple cylinder installations and large domestic systems.

LV5503 Series

LV6503 Series

Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane
LV5503B4	½" F. NPT	¾" F. NPT	¼"	11" w.c. at 10 PSIG Inlet	9" - 13" w.c.	Over Inlet	1,600,000
LV5503B6	¾" F. NPT						
LV5503B8		1" F. NPT	"				2,300,000
LV6503B14	1½" F. NPT	1½" F. NPT	⅝"		8½" - 14" w.c.		8,000,000
LV6503B16	2" F. NPT	2" F. NPT					9,750,000

Low Pressure Second Stage Tobacco Barn Regulator

Especially developed for drying barns in the tobacco industry. The 2503G regulator will supply a steady and constant flow of fuel to as many as 12 to 20 burners throughout the barn.

Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane*
LV5503G4	½" F. NPT	¾" F. NPT	¼"	15" w.c. at 15 PSIG Inlet	8" - 18" w.c.	Above Inlet	1,750,000

* Maximum flow is based on 15 PSIG inlet and 12" w.c. delivery pressure.

Compact Twin Stage Regulators

This compact two-stage regulator is designed to reduce container pressure down to 11" w.c. delivery pressure. It is ideal for "on-site" cylinder applications, mobile homes and average domestic service including small ASME and 100 to 420 pound DOT cylinders.

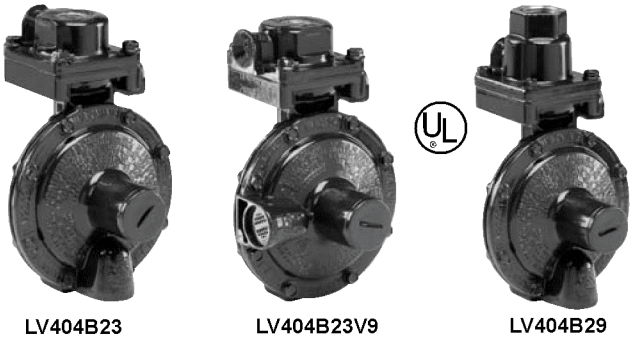
Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range 2nd Stage	Bonnet Vent Position 1st Stage	Bonnet Vent Position 2nd Stage	Capacity BTU/ hr Propane*	Accessories
									1st Stage Vent Pipe-Away
LV404B4	¼" F. NPT	½" F. NPT	.219	11" w.c. at 100 PSIG Inlet	9" - 13" w.c.	Down	Over Outlet	525,000	**404PE**
LV404B4V9						9 o'clock	9 o'clock		
LV404B46		¾" F. NPT				Down	Over Outlet		
LV404B46V9						9 o'clock	9 o'clock		
LV404B9	F. POL	½" F. NPT				Down	Over Outlet		
LV404B9V9						9 o'clock	9 o'clock		
LV404B96		¾" F. NPT				Down	Over Outlet		
LV404B96V9						9 o'clock	9 o'clock		

* Maximum flow based on 25 PSIG inlet pressure and 9" w.c. delivery pressure.

Compact Twin Stage Regulators

The LV404B23 and LV404B29 Series Regulators are designed for small domestic applications with flow requirements up to 200,000 BTU's/hr. These regulators are ideal for mobile homes, cottages and "on-site" cylinder applications.

These regulators can also be used in RV applications if a protective cover is also supplied.



LV404B23 LV404B23V9 LV404B29

Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range 2nd Stage	Bonnet Vent Position 1st Stage	Bonnet Vent Position 2nd Stage	Capacity BTU/hr Propane*	Accessories		
									1st Stage Vent Pipe-Away	2nd Stage Vinyl Cover	Bracket
LV404B23	¼" F. NPT	½" F. NPT	.100	11" w.c. at 100 PSIG Inlet	9-13" w.c.	Rear	Over Outlet	200,000	**404PE**	**2302-55**	**2302-31**
LV404B29	F. POL										
LV404B23V9	¼" F. NPT					Left	9 o'clock				
LV404B29V9	F. POL										

* Maximum flow based on 25 PSIG inlet pressure and 9" w.c. delivery pressure.

Twin Stage Automatic Changeover Regulators

These combination automatic changeover, two stage regulators are especially suitable for homes, mobile homes, cottages, construction and other portable two cylinder installations. Empty containers may be replaced without interrupting customer's gas service.

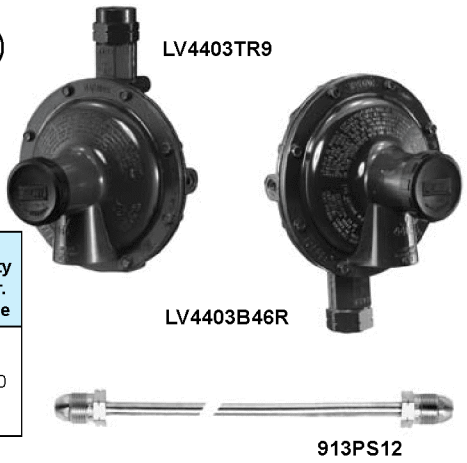
7525B23 Series 7525B4 Series

Part Number	Service & Reserve Indicator	Inlet Connections	Outlet Connections	Factory Delivery Pressure*	Adjustment Range	Bonnet Vent Position	Bracket Included	Capacity BTU/hr. Propane**
7525B23	Integral	1/4" Inverted Flare	1/2" F. NPT	11" w.c.	9"-13" w.c.	over outlet	**2302-31**	200,000
7525B4							**2503-22A**	450,000

* Set at 100 PSIG inlet pressure.
** Maximum flow based on 25 PSIG inlet pressure and 9" water column delivery pressure.

Two Stage Regulator Outfits

These outfits contain the equipment required to provide two-stage regulation.



913PS12

Kit Number	1st Stage Regulator Included		2nd Stage Regulator Included		Bracket Included	Pigtail Included	Capacity BTU/hr. Propane
	Part Number	Inlet x Outlet Female	Part Number	Inlet x Outlet F. NPT			
5807	LV4403TR9	POL x ½" NPT	LV4403B4	½" x ½"	2503-22	913PS12	935,000
5808			LV4403B46R	½" x ¾"	Not Required		
5820	LV4403TR96	POL x ¾" NPT	LV4403B66R	¾" x ¾"			

Twin Stage Regulator Outfit

This outfit contains the equipment required to provide twin-stage regulation.


2503-22

Kit Number	Twin Stage Regulator Included	Inlet F. NPT	Outlet F. NPT	Pigtails Included	Capacity BTU / hr. Propane
5828	LV404B4	¼"	½"	912JS12	525,000
5832	LV404B23V9				200,000


LV404B4

912JS12


LV404B23V9

Automatic Changeover Regulator Outfits

These outfits contain the equipment required to provide automatic changeover regulation.


912FA20

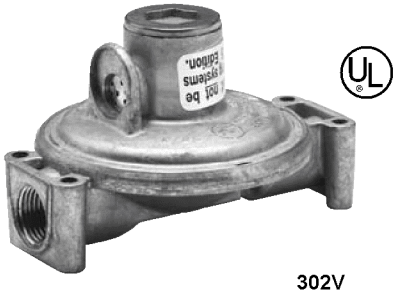

7525B4 Series


7525B23 Series

Kit Number	Automatic Changeover Regulator Included	Inlet	Outlet	Pigtails Included-2	Bracket Included	Capacity BTU/hr. Propane
5726B23	7525B23	1/4" Inverted Flare	1/2" F. NPT	912FA20	2302-31	200,000
5727B23	7525B23			912FS20		
5754B4	7525B4			912FA20	2503-22	450,000
5755B4	7525B4			912FS20		

Compact Regulators

These compact regulators are designed for smaller outdoor grills and fish cookers. It is intended for use on small portable appliances that use 100,000 BTU's/hr. or less. It may not be used on fixed pipe systems per NFPA 58, 1995 edition.



302V

Part Number	Type	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane*
301	High Pressure	¼" F. NPT	¼" F. NPT	No. 50 Drill	15 PSIG at 100 PSIG inlet	Not Adjustable	Small Vent	125,000
301S		Soft M. POL w/60 DMS orifice						
302	Single Stage	¼" F. NPT	3/8" F. NPT		11" w.c. at 100 PSIG inlet	9-13" w.c.	Small Vent Above Inlet	
302S		Soft M. POL w/60 DMS orifice						
302V		¼" F. NPT					Drip Lip Above Inlet	
302V9		¼" F. NPT					Drip Lip at 9 o'clock	
302V9LS		Soft POL w/o orifice						

* Maximum flow based on 25 PSIG inlet and factory delivery pressure.

Low Pressure Single Stage Regulators

A compact, sturdy regulator incorporating many of the quality features found in larger domestic regulators. Ideal for outdoor LP-Gas grills. The regulator reduces cylinder pressure down to burner pressure, normally 11" w.c. It is intended for use on small portable appliances that use 100,000 BTU's/hr. or less. It may not be used on fixed pipe systems per NFPA 58, 1995 edition.

Part Number	Inlet Connection	Outlet Connection	Orifice Size	Factory Delivery Pressure	Adjustment Range	Bonnet Vent Position	Vapor Capacity BTU/hr. Propane*
LV2302A2	¼" F. NPT	3/8" F. NPT	No. 49 Drill	11" w.c. at 100 PSIG Inlet	9"-13" w.c.	Over Outlet	150,000
LV2302P	M. POL						

High Pressure Industrial / Commercial Pounds-to-Pounds Regulators

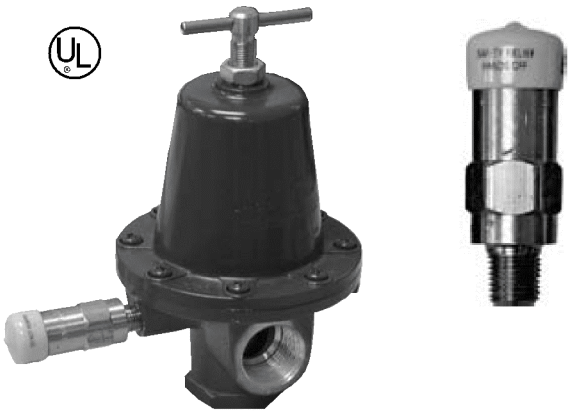
Designed to reduce propane gas container pressure down to between 3 and 100 PSIG. Ideal for liquid or vapor service, they can be used in a variety of applications including salamander heaters, weed burning torches, fish cookers, tar pot heaters, and other industrial type services.

Part Number	Adjustment Method	Inlet Connection	Outlet Connection	Recommended Delivery Pressure Range (PSIG)	Capacity Determined at Set Pressure of PSIG*	Capacity BTU/hr. Propane**
597FA	Tee Handle	1/4" NPT	1/4" NPT	1-15	10	1,750,000
597FB				10-30	20	3,000,000
597FC				20-45	30	3,500,000
597FD				40-100	40	4,500,000

* Set pressure established at 100 PSIG inlet and a flow of 250,000 BTU/hr.
** Capacity determined at actual delivery pressure 20% less than set pressure with inlet pressure 20 PSIG higher than the set pressure.

High Pressure Industrial / Commercial Pounds-to-Pounds Regulator Accessories

Designed for use as a relief valve on first stage regulators that comply with NFPA 58 2.5.7.5 exception: "first stage regulators with a rated capacity of more that 500,000 BTU/hr. shall be permitted to have a seperate relief valve.



Part Number	Set Pressure	Regulator Settings	Connection Size	Height	Width	Flow Capacity at 120% of Set Pressure (SCFH Propane)
3139-18	18 PSIG	10 PSIG	¼" M. NPT	2 27/32"	1 1/16"	1357*
3139-26	26 PSIG	15 PSIG				1725**
3139-38	38-PSIG	20 PSIG				2304***

* Flow recorded at 21.6 PSI inlet pressure for this valve.
** Flow recorded at 31.2 PSI inlet pressure for this valve.
*** Flow recorded at 45.6 PSI inlet pressure for this valve.

High Pressure Industrial / Commercial Pounds-to-Pounds Regulators

Designed to reduce LP-Gas and anhydrous ammonia container pressures to between 3 and 125 PSIG. Precision-built with a multi-million BTU capacity, the 1580M series is perfect for such big, tough jobs as crop dryers, asphalt batch mixing plants, road building "tar wagons", heat treating and other large industrial and commercial loads. It's also ideal as a first stage regulator in large multiple operations. The AA1580M series is ideal for use in anhydrous ammonia applications such as blue print machines and heat treating.

Part Number	Service	Adjustment Method	Inlet & Outlet Connections	Recommended Delivery Pressure Range (PSIG)	Width	Height (max.)	Capacity Determined at Set Pressure of PSIG	Capacity**
AA1582MW	NH_3	Tee Handle	¼" F. NPT	3-25	2 3/16"	4⅛"	20	2,100 CFH NH_3
AA1582MK		Hex Head						
AA1582ML		Tee Handle		20-50			30	2,400 CFH NH_3
AA1582MH				45-125			60	2,600 CFH NH_3
1584MN	LP-Gas		½" F. NPT	3-30	2 15/16"	4⅞"	20	7,000,000 BTU/hr. LPG
1584ML				25-50			30	7,500,000 BTU/hr. LPG
1584MH				45-125			60	8,000,000 BTU/hr. LPG
AA1584MW	NH_3			3-25			20	4,500 CFH NH_3
AA1584ML				20-50			30	4,800 CFH NH_3
AA1584MH				45-125			60	5,100 CFH NH_3
1586MN	LP-Gas		¾" F. NPT	3-30	3 ½"	7"	20	11,000,000 BTU/hr. LPG
1586ML				25-50			30	12,000,000 BTU/hr. LPG
1586MH				45-125			60	14,000,000 BTU/hr. LPG
AA1586MW	NH_3			3-25			20	7,000 CFH NH_3
AA1586ML				20-50			30	7,700 CFH NH_3
AA1586MH				45-125			60	8,900 CFH NH_3
1588MN	LP-Gas		1" F. NPT	3-30			20	11,000,000 BTU/hr. LPG
1588ML				25-50			30	12,000,000 BTU/hr. LPG
1588MH				45-125			60	14,000,000 BTU/hr. LPG

* Set pressure is established with 100 PSIG inlet pressure and a flow of 500,000 BTU/hr. propane for 1580M Series, 90 CFH/hr. NH_3 for AA1582M Series and 180 CFH/hr. NH_3 for AA1584M and AA1586M Series.

** Capacities determined at actual delivery pressure 20% less than set pressure with inlet pressure 20 PSIG higher than set pressure.

NOTE: Care must be taken to prevent re-liquification of propane at normal temperatures by heat tracing or other effective means. Use of a relief valve upstream or downstream of these regulators is recommended in accordance with NFPA 58.

High Pressure / High Temperature Industrial / Commercial Pounds-to-Pounds Regulators

Designed to reduce LP-Gas container pressures to between 3 and 50 PSIG. Ideal for crop drying, heat treating, asphalt batch mixing and other large industrial and commercial load application utilizing high temperature LP-Gas or high temperature atmosphere under conditions up to 300˚F. Also ideal as a first stage regulator in large multiple operations.

Part Number	Service	Adjustment Method	Inlet & Outlet Connections	Recommended Delivery Pressure Range (PSIG)	Capacity Determined at Set Pressure of PSIG*	Capacity BTU/ hr. Propane**
X1584MN	LP-Gas	Tee Handle	1/2" F. NPT	3-30	20	7,000,000
X1584ML				25-50	30	7,500,000
X1586MN			3/4" F. NPT	3-30	20	11,000,000
X1586ML				25-50	30	12,000,000

* Set pressure is established with 100 PSIG inlet pressure and a flow of 500,000 BTU/hr. propane.

** Capacities determined at actual delivery pressure 20% less than set pressure with inlet pressure 20 PSIG higher than set pressure.

NOTE: Care must be taken to prevent re-liquification of propane at normal temperatures by heat tracing or other effective means. Use of a relief valve upstream or downstream of these regulators is recommended in accordance with NFPA 58.

Accessories

Copper Pigtails

Pigtails are available in a variety of connections, sizes and styles. Care should always be taken in selecting the proper pigtail for a particular application.

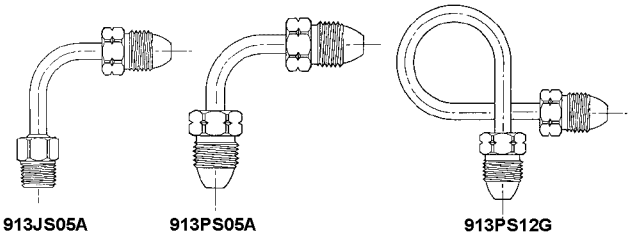
Note: Engineered Controls International, Inc. recommends a new pigtail be installed with every new and replaced regulator.

Straight Pigtails Ordering Information

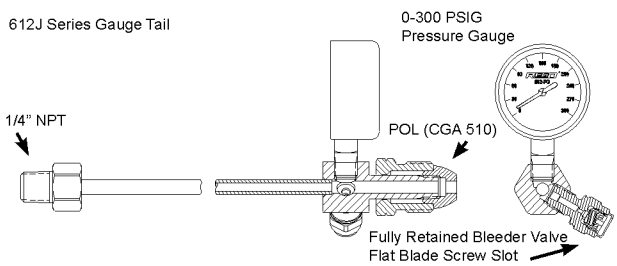
Connections	Approximate Length	Part Number ¼" Tube ⅞" Hex Short Nipple	Part Number ¼" Tube 1⅛" Hex Long Nipple	Part Number ⅜" Tube ⅞" Hex Short Nipple
M.POL x M.POL	5"	-	½"	**913JS05**
	12"	**912PS12**	-	**913PS12**
	20"	**912PS20**	**912PA20**	**913PS20**
	30"	**912PS30**	-	**913PS30**
	36"	**912PS36**	**912PA36**	**913PS36**
	48"	**912PS48**	**912PA48**	**913PS48**
¼" Inverted Flare x M.POL	12"	**912FS12**	-	-
	20"	**912FS20**	**912FA20**	-
	30"	**912FS30**	-	-
	36"	**912FS36**	-	-
¼" M.NPT x M.POL	5"	-	-	**913JS05**
	12"	**912JS12**	-	-
	20"	**912JS20**	-	-
	36"	**912JS36**	-	-
½" M.NPT x M.Pol	12"	-	-	**913LS12**
½" M.NPT x ⅜" M.Pol	12"	-	-	**913KL12**

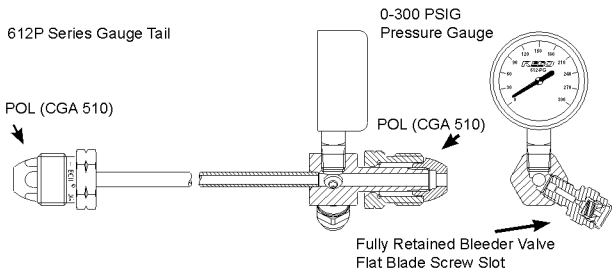
Bent Pigtails Ordering Information

Connections	Approximate Length	Part Number ⅜" Tube ⅞" Hex Short Nipple	Type/Degree of Bend
¼" M. NPT x M. POL	5"	**913JS05A**	90°
M. POL x M. POL		**913PS05A**	
	12"	**913PS12G**	270° Right Hand
		913PS12H	270° Left Hand
		913PS12S	360°



Part Number	Length	7/8" Hex Male - POL Short Nipple	7/8" Hex Male - POL Short Nipple	1/4" Male NPT
612JS12	12"	X		X
612JS20	20"	X		X
612PS12	12"	X	X	
612PS20	20"	X	X	





Accessories

Inlet Fittings

These inlet fittings are available for assembly into either first stage of single stage regulators. All have ¼" M. NPT connections and are machined from brass.

Part Number	Description
970	Hard nose POL with wrench nut.
970AX	Hard nose POL with wrench nut and excess flow.
970AXS	Soft nose POL with wrench nut and excess flow.
3199W	Heavy duty hard nose POL with wrench nut and excess flow.
970AW	Soft nose POL with Handwheel.
970HT	Soft nose POL with Handwheel and 60 DMS orifice.
970S	Soft nose POL with wrench nut and 60 DMS orifice.

970 970AX 970AXS 970AW 970HT 970S

3199W

Brackets

RegO® Brackets are especially designed for use in installing RegO® Regulators in applications requiring the use of a bracket.

Part Number	Material	For Use With Regulator Model:
2302-31	Cadmium Plated Steel	2302 Series/404B23
2503-22		LV404 Series, 2503 Series LV4403 Series
2503-19	Aluminum	

2503-19

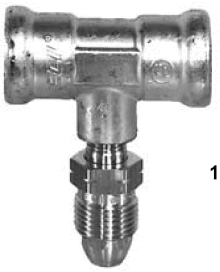
2503-22

2302-31

Tee Check Manifolds

For use in systems that require uninterrupted gas service during cylinder exchange. Especially for summer cottages, mobile homes and single appliance loads. Floating disc check minimizes discharge of gas to the atmosphere when empty cylinder is being replaced.

Part Number	Inlet Connections	Outlet Connection
1350R	F. POL	M. POL
1450R	¼" Inverted Flare	¼" M. NPT



1350R

1450R

Accessories

Multiple Cylinder Manifolds

Use with suitable pigtails to connect multiple cylinders together. Ideal for loads that require more than one cylinder to be in service at a time. Provides a three-way tee function without an internal disc check.

Part Number	Inlet Connections	Outlet Connection
1350E	F. POL	M. POL
1450E	¼" Inverted Flare	¼" M. NPT

1350E

1450E

Low Pressure Test Set

This kit provides the equipment necessary for checking regulator delivery pressure (low pressure) at the appliances. The basic set contains a 2424A-2 low pressure gauge and a 3 foot — 3/16" O.D. flexible synthetic rubber tube. Adapters are also available.

Part Number	Contents	Adapters
2434A	Test Kit	**1328**
		1331
		1332

2434A

Adapter

High Pressure Gauge Adapter

Designed for testing high pressure lines. Adapter has 0 to 300 PSIG gauge. A bleeder valve allows you to bleed down to correct pressure during pressure tests.

Part Number	Inlet Connection	Outlet Connection	Pressure Gauge Range (PSIG)
2962	Soft Nose M. POL	F. POL	0 - 300

Water Manometer Kit

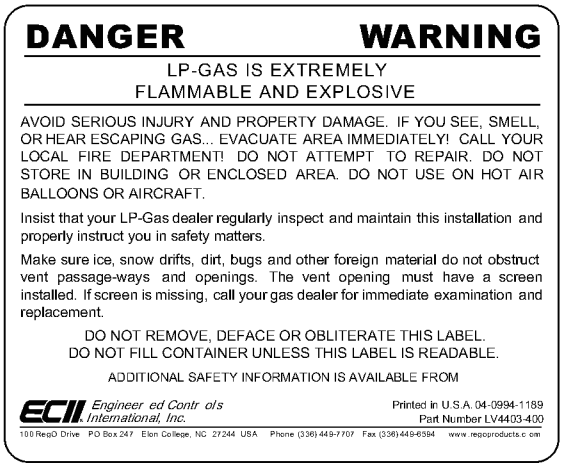
The water manometer kit is especially suited for use with low pressure LP-Gas systems. It is ideal for pressure checks downstream of the low pressure regulator and at the appliances.

Part Number	Description
1212 KIT	Flexible Tube Water Manometer Kit

Adhesive Warning Labels

These adhesive warning labels are intended for application as close as possible to the LP-Gas regulator once the regulator has been installed.

Part Number	Description
LV4403-400	Adhesive Warning Label



DANGER **WARNING**

LP-GAS IS EXTREMELY
FLAMMABLE AND EXPLOSIVE

AVOID SERIOUS INJURY AND PROPERTY DAMAGE. IF YOU SEE, SMELL, OR HEAR ESCAPING GAS... EVACUATE AREA IMMEDIATELY! CALL YOUR LOCAL FIRE DEPARTMENT! DO NOT ATTEMPT TO REPAIR. DO NOT STORE IN BUILDING OR ENCLOSED AREA. DO NOT USE ON HOT AIR BALLOONS OR AIRCRAFT.

Insist that your LP-Gas dealer regularly inspect and maintain this installation and properly instruct you in safety matters.

Make sure ice, snow drifts, dirt, bugs and other foreign material do not obstruct vent passage-ways and openings. The vent opening must have a screen installed. If screen is missing, call your gas dealer for immediate examination and replacement.

DO NOT REMOVE, DEFACE OR OBLITERATE THIS LABEL.
DO NOT FILL CONTAINER UNLESS THIS LABEL IS READABLE.

ADDITIONAL SAFETY INFORMATION IS AVAILABLE FROM

ECII Engineered Controls International, Inc.

Printed in U.S.A. 04-0994-1189
Part Number LV4403-400

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