Model 461-S Regulator Brochure

UTILITY SOLUTIONS GROUP

Introduction

Who We Are

Utility Solutions Group is a manufacturer of natural gas regulators and relief valves based in Columbus, OH. All products are made in the USA and compliant with the requirements of the Build America, Buy America Act. Utility Solutions Group's Quality Management System is certified to ISO 9001 by Smithers Quality Assessments.

461 Regulators

The Model 461-S, 461-8S and 461-12S are balanced valve, spring type regulators designed for distribution and industrial applications where a single seat regulator is too small and the usual 2" balanced valve regulators are too large. They are made in 2" pipe sizes only and are used for inlet pressures up to 175 psi, and outlet pressure ranges of 0-10 psi.

The 461-S has an cast iron diaphragm case, while the 461-8S and 461-12S have an aluminum diaphragm case.

Maximum Inlet Pressure

Diaphragm Size (I.D.)	Diaphragm Case Material	Model	Maximum Inlet Pressure*
12"	Cast Iron	461-S	100 psi
8 ½"	Cast Iron	461-S	175 psi
12"	Aluminum	461-12S	100 psi
8"	Aluminum	461-8S	175 psi

* The regulator should not be used for pressures exceeding the recommended maximum inlet.

Maximum Differential and Inlet Pressure for Various Soft-Seated Valve Materials

The differential and inlet pressures given below are only to be used as general guidelines. In all cases, pressures must always remain within the ranges specified in Utility Solutions Group literature. For any given regulator, do not exceed the specified maximum pressures.

Valve Material	Maximum Pressure Differential	Maximum Inlet Pressure
Buna-N (Black, 50 to 55 duro)	250 psi	575 psi
Polyurethane (Red, 65 to 75 duro)	400 psi	720 psi
Polyurethane (Tan, 85 to 95 duro)	600 psi	1,200 psi

NOTE: The maximum temperature for the above materials are 150°F. Viton, if used, has a maximum temperature rating of 300°F and a maximum pressure differential of 250 psi.

Body Pressure Ratings

Regulator Body Type	Maximum Working Pressure*
Threaded	250 psi
Flanged ANSI 125 lb. FF 175 psi	175 psi
Flanged ANSI 250 lb. RF 575 psi	575 psi
Flanged ANSI 300 lb. RF	720 psi

* This only applies to the body. The regulator should not be used for inlet pressures that exceed the maximums specified in the Maximum Inlet Pressure table above.

Spring Ranges

Spring Color	Case Size (I.D.) and Material	Outlet Pressure	
		Minimum	Maximum
Aluminum	12" Cast Iron	2" w.c.*	2" w.c.
Green		2" w.c.	2" w.c.
Yellow		2" w.c.	2" w.c.
Gray		0.5 psi	1.75 psi
Blue		1 psi	3.5 psi
Red	12" Aluminum	2" w.c.	6 ½" w.c.
Blue		2" w.c.	6 ½" w.c.
Green		2" w.c.	2" w.c.
Orange		2" w.c.	2" w.c.
Black		1 psi	2 psi
Cadmium		1.5 psi	3 psi
Blue	8 ½" Cast Iron	3 psi	6 psi
Red		5 psi	10 psi
Orange	8" Aluminum	1 psi	2 psi
Black		2 psi	4.25 psi
Cadmium		3 psi	6.5 psi
Cadmium (Outer) with White (Inner)		6 psi	10 psi

Construction Features

Regulator is self-contained- No exposed parts, top is moisture sealed, and safe for pits by extending vent line.

Flow-contoured body- Large gas exit area turbulence reduction and increased capacity.

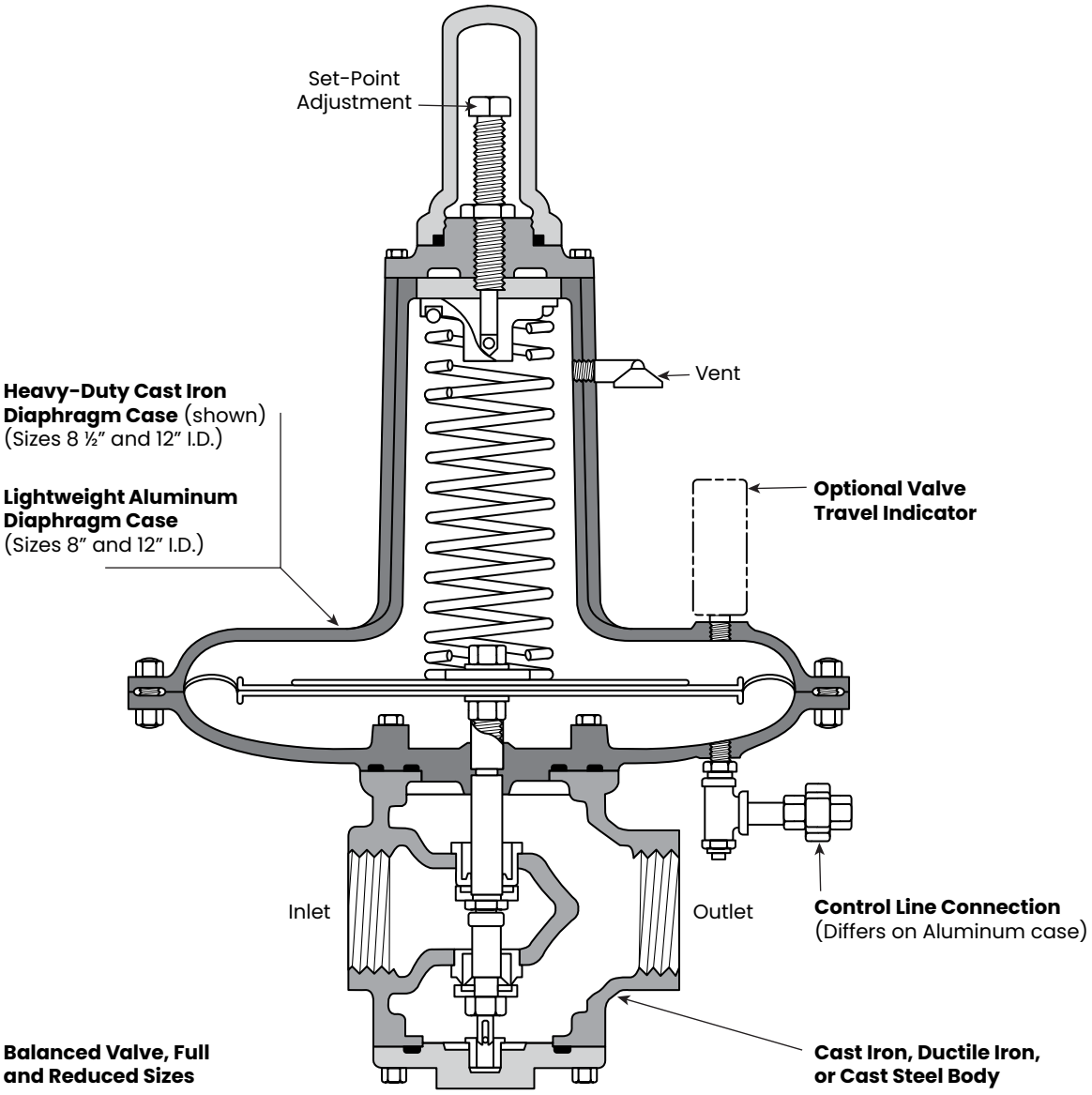
Side inspection plates- O-ring sealed for easy visual valve inspection and adjustments.

Balanced valve- Permits higher inlet pressures, eliminates variation effects, and provides greater capacity.

Soft seat valves- Tight lock-up at zero flow. Molded discs resist blow out. Adjustment valve spacing. Replaceable orifices (two interchangeable sizes).

Color-coded springs- self-aligning, and set-point adjustment is easily changed through gasket sealed top opening.

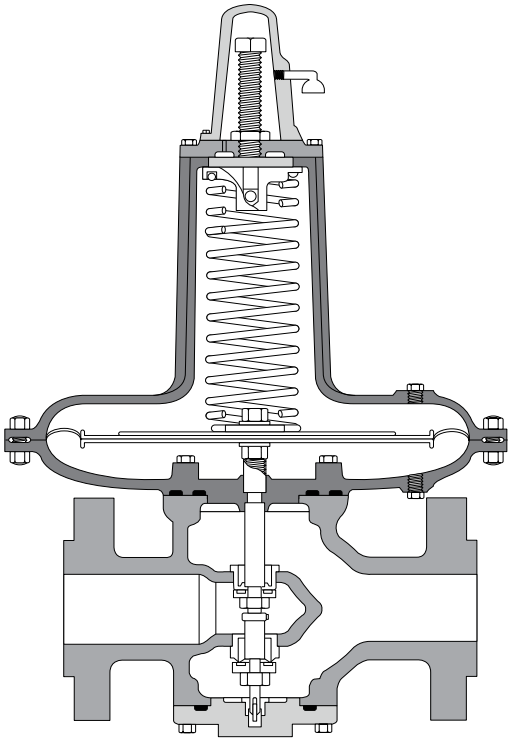
Model 461-S, 461-8S, and 461-12S Gas Pressure Regulators



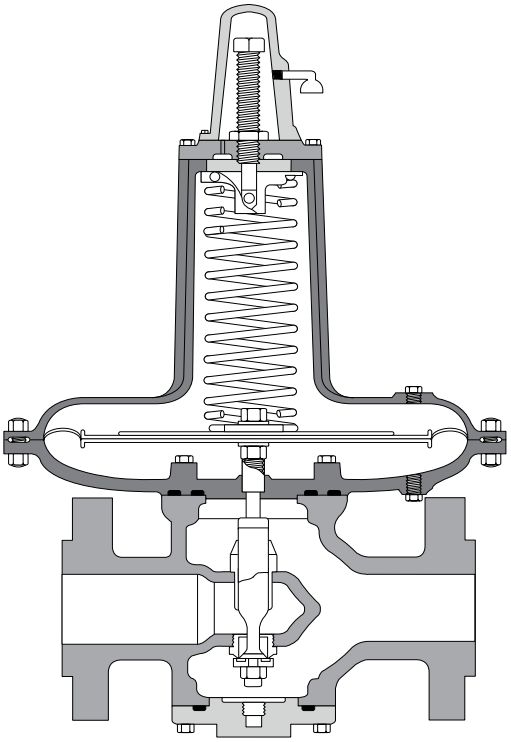
Fully Interchangeable Valve Assemblies

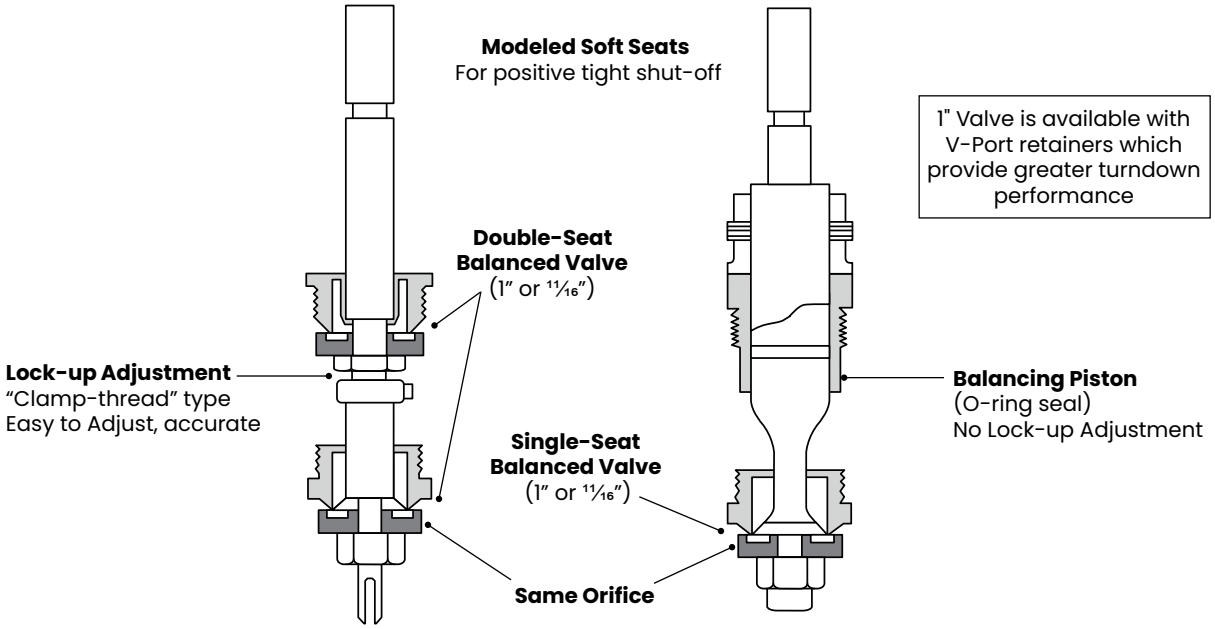
Valve assemblies can be interchanged with the regulator in place.

Model 461-S with Double-Seat Balanced Valve



Model 461-S with Single-Seat Balanced Valve



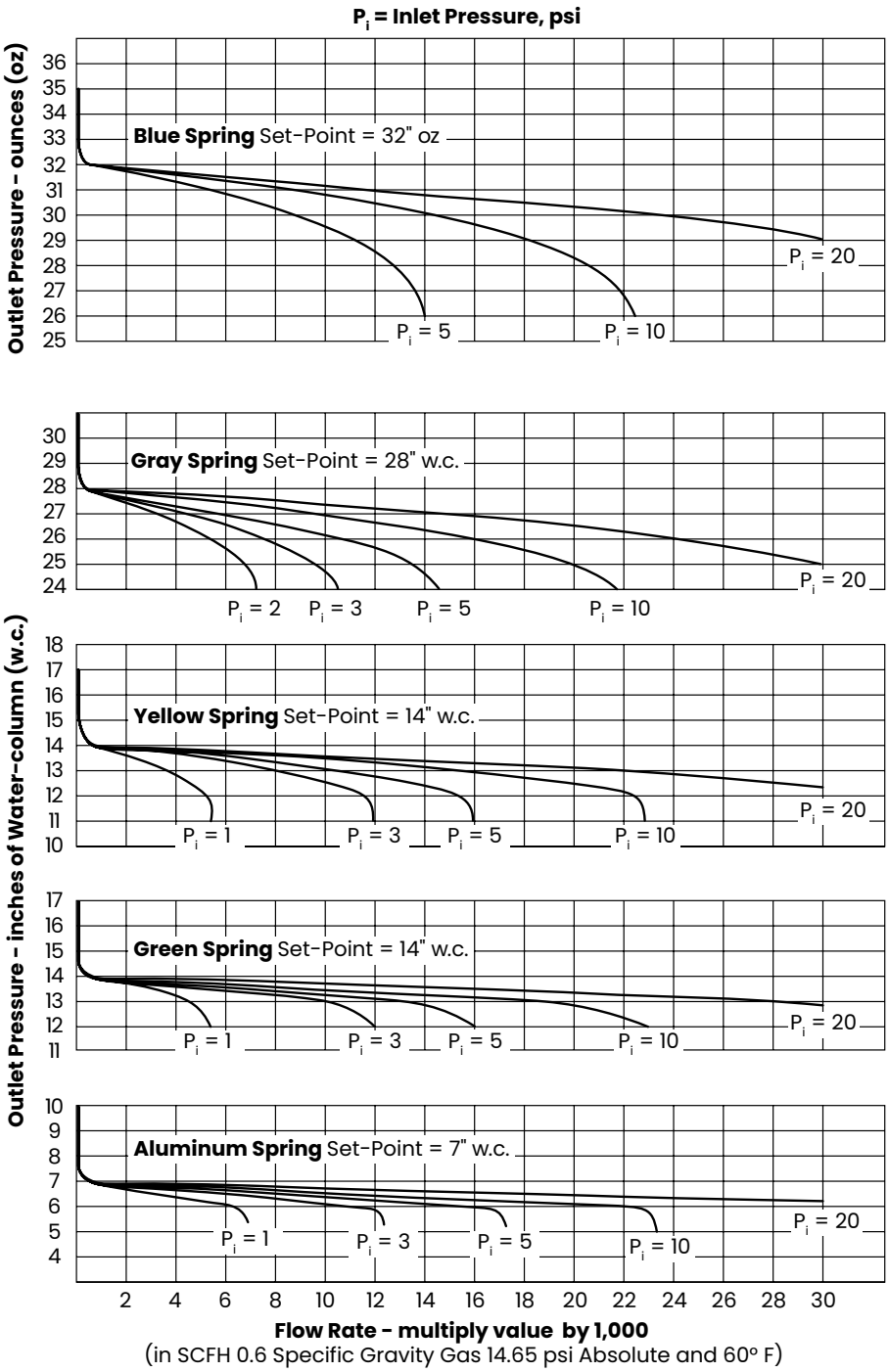


CAUTION

Turn gas on slowly. If an outlet stop valve is used, it should be opened first. Do not overload the diaphragm with a sudden surge of inlet pressure. Monitor the outlet pressure during start-up to prevent an outlet pressure overload. REFER TO RM-1330 FOR MORE DETAILED START-UP PROCEDURES.

Typical Performance Curves

These performance curves are typical for the Model 461-S. Outlet pressure for each chart was set under the stated conditions, and was not further adjusted during changes in inlet pressure or flow. Settings in general were made at an inlet of 5 psi. Set-point to lock-up at zero flow requires a pressure increase of not more than 3" w.c.



Models 461-S, 461-8S, and 461-12S Capacities

Measurements in 1,000 SCFH of Natural Gas
(0.6 Specific Gravity - 14.65 psi - 60°F)

Inlet Pressure (psi)	Outlet Pressure	Double-Seat Balanced Valve		Single-Seat Balanced Valve	
		1"	¾"	½"	11⁄16"
0.25	4" w.c.	2.5	1.25	-	-
0.5	4" w.c.	4.5	2.27	-	-
	7" w.c.	3.8	1.9	-	-
1	4" w.c.	7.0	3.5	-	-
	7" w.c.	6.6	3.3	-	-
	0.5 psi	5.4	2.73	-	-
2	4" w.c.	10.4	5.2	-	-
	7" w.c.	10.0	5.0	-	-
	0.5 psi	9.4	4.7	-	-
	1 psi	7.8	3.9	-	-
3	4" w.c.	12.8	6.4	-	-
	7" w.c.	12.6	6.3	-	-
	0.5 psi	12.2	6.1	-	-
	1 psi	11.0	5.5	7.1	3.5
	2 psi	8.0	4.0	5.2	2.6
4	4" w.c.	15.0	7.5	-	-
	7" w.c.	14.8	7.4	-	-
	0.5 psi	14.4	7.2	-	-
	1 psi	13.6	6.8	8.8	4.4
	2 psi	11.4	5.7	7.4	3.7
	3 psi	8.4	4.2	5.4	2.7
5	4" w.c.	16.8	8.4	-	-
	7" w.c.	16.6	8.3	-	-
	0.5 psi	16.4	8.2	-	-
	1 psi	15.6	7.8	10.1	5.0
	2 psi	14.0	7.0	9.1	4.5
	3 psi	11.8	5.9	7.6	3.8
	4 psi	8.6	4.3	5.6	2.8
6	7" w.c.	18.2	9.1	-	-
	0.5 psi	18.0	9.0	-	-
	1 psi	17.6	8.8	11.4	5.7
	2 psi	16.2	8.1	10.5	5.2
	3 psi	14.4	7.2	9.3	4.3
	4 psi	12.2	6.1	7.9	3.9
	5 psi	8.8	4.4	5.7	2.8
8	7" w.c.	21.2	10.6	-	-
	0.5 psi	21.0	10.5	-	-
	1 psi	20.8	10.4	13.5	6.7
	2 psi	19.8	9.9	12.8	6.4
	3 psi	18.6	9.3	12.1	6.0
	4 psi	17.2	8.6	11.1	5.6
	5 psi	15.2	7.6	9.8	4.9
	6 psi	12.8	6.4	8.3	4.1
10	7" w.c.	23.8	11.9	-	-
	0.5 psi	23.6	11.8	-	-
	1 psi	23.4	11.7	15.2	7.6
	2 psi	23.0	11.5	14.9	7.4
	3 psi	22.2	11.1	14.4	7.2
	4 psi	21.0	10.5	13.6	6.8
	6 psi	18.0	9.0	11.7	5.8
	8 psi	13.4	6.7	8.7	4.3
12	7" w.c.	26.2	13.1	-	-
	0.5 psi	26.0	13.0	-	-
	1 psi	25.8	12.9	16.7	8.3
	2 psi	25.6	12.8	16.6	8.3
	3 psi	25.2	12.6	16.3	8.2
	4 psi	24.4	12.2	15.8	7.9
	6 psi	22.2	11.1	14.4	7.2
	8 psi	19.0	9.5	12.3	6.1
	10 psi	14.0	7.0	9.1	4.5
15	1 psi or less	29.4	14.7	19.1	9.5
	2 psi	29.2	14.6	18.9	9.4
	3 psi	29.0	14.5	18.8	9.4
	4 psi	28.6	14.3	18.6	9.3
	6 psi	27.2	13.6	17.6	8.8
	8 psi	25.0	12.5	16.2	8.1
	10 psi	22.2	11.1	14.4	7.2
20	3 psi or less	34.6	17.3	22.5	11.2
	6 psi	34.0	17.0	22.1	11.0
	8 psi	32.8	16.4	21.3	10.6
	10 psi	31.4	15.7	20.4	10.2
25	6 psi or less	39.6	19.8	25.7	12.8
	8 psi	39.2	19.6	25.4	12.7
	10 psi	38.4	19.2	24.9	12.4
30	10 psi or less	44.4	22.2	28.8	14.4
40		54.4	27.2	35.3	17.6
50		64.4	32.2	41.8	20.9
60		74.4	37.2	48.3	24.1
80		94.2	47.1	61.2	30.6
100		114	57.2	74.3	37.1
125		139	69.6	90.4	45.2
150		164	82.0	106	53.3
175		189	94.8	123	61.6
"K" Factors for Standard Valves		2,000	1,000	1,300	650
"K" Factors for V-Port Valves, Multiply table by:		.750	N/A	.750	N/A

* The single-seat balanced valve should not be used for outlet pressures below 1 psi.

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Expanded Outlet Line

These flow rates represent the amount of gas the regulator can actually pass at the given pressure reduction. This amount often exceeds the amount a 2" outlet line can take away, and the flow is restricted to the line capacity.

To take advantage of regulator capacity, make certain the outlet line has equal capacity, and increase the line size at the regulator outlet as necessary, to secure adequate capacity.

NOTE: The performance data, (see Capacity tables Page 5), are based on normal testing at 70" flowing temperature. Changes in performance can occur at extreme low flowing temperatures.

Size each regulator on based on the minimum expected inlet pressure, and the maximum required outlet pressure.

Overpressurization Protection

Methods of overpressuirzation protection include relief valves, monitor regulators, shutoff devices, or similar mechanisms. These protect the downstream piping system and the regulator's low-pressure chambers against overpressurization due to possible regulator malfunction or failure to achieve complete lockup. The allowable outlet pressure is the lowest of the maximum pressures permitted by federal codes, state codes, and other applicable standards.

Maximum Emergency Pressures

For complete Maximum Emergency Pressure information for Model 461-S Regulators, refer to Utility Solutions Group bulletin RDS-1498, Regulator Pressure Ratings. If the maximum outlet pressure is exceeded, the regulator must be removed from service and carefully inspected. Damaged or otherwise unsatisfactory parts must be replaced before returning the regulator to service.

Monitoring

The 461-S, 461-8S, or 461-12S make an excellent monitors; a standby regulator installed in series which assumes control if a failure in the operating regulator permits the outlet pressure to exceed the set-point.

The fast response rate enables it to take over quickly when necessary, and outstanding performance means that it will provide excellent standby regulation. It can be located in either the upstream or the downstream position.

When a 461 is used to monitor a regulator with an identical inner valve, the total maximum capacity through both can be figured at 70% of the capacity
of one of them alone. This applies with the monitor located either upstream or downstream.

Other Gases

The Model 461-S regulator is mainly used with natural gas. However, they perform equally as well with liquid propane gas (LPG), nitrogen, dry carbon dioxide (CO_2), air and others. When using with other gases, the regulator capacities must be adjusted using the following correction factors:

Type of Gas	Correction Factor
Air (Specific Gravity 1.0)	0.77
Propane (Specific Gravity 1.53)	0.63
1350 BTU Propane-Air Mix (Specific Gravity 1.20)	0.71
Nitrogen (Specific Gravity 0.97)	0.79
Dry Carbon Dioxide (Specific Gravity 1.52)	0.63

For other non-corrosive gases, use the following formula:

$$\text{Correction factor} = \sqrt{\frac{0.60}{\text{Specific gravity of the gas}}}$$

For use with gases not listed above, please contact your Utility Solutions Group representative or Authorized Distributor.

Capacities at Other Pressures

Capacity for pressure reductions not listed on Page 5 can be calculated with the following formula:

$Q = K\sqrt{P_o(P_i - P_o)}$ ..... (for P_i/P_o less than 1.894)

$Q = \frac{K P_i}{2}$ ..... (for P_i/P_o less than 1.894)

Q = Maximum capacity of regulator, in SCFH of 0.6 specific gravity natural gas

K = the "K" factor, the regulator constant (see table below)

P_i = absolute inlet pressure (psi)

P_o = absolute outlet pressure (psi)

Temperature Limits

The Model 461-S Regulator can be used for flowing temperatures from -20°F to 150°F.

Buried Service

The Model 461-S Regulator is not recommended for buried service.

Relief Valves and Back Pressure Valves

Use Model 461-SR for those applications which require a higher degree of accuracy and sensitivity than is possible with standard poppet type reliefs. Essentially, it is a regulator arranged to provide inlet pressure control.

The 461-SR is the same as the 461-S except that inner valve is reversed, the body is turned around, and the control line is arranged for connection to the inlet sign (upstream).

When operating as a relief valve, it limits inlet pressure to a set maximum. At pressures below this, it remains closed. If the pressure should attempt to exceed this, it opens and bleeds off the excess.

As a back pressure valve, it prevents gas from exiting a system until the system pressure reaches the set-point. At set-point it begins to open and then regulates the discharge to hold the system at set-point.

Relief Pressure Range

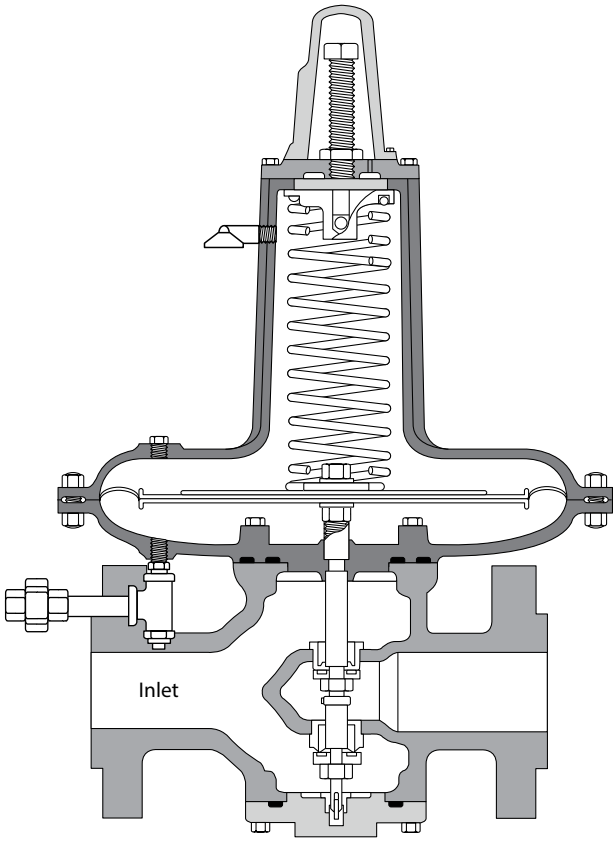
3" w.c. to 10 psi (for range of each spring and diaphragm combination, see table, Page 1).

Installation

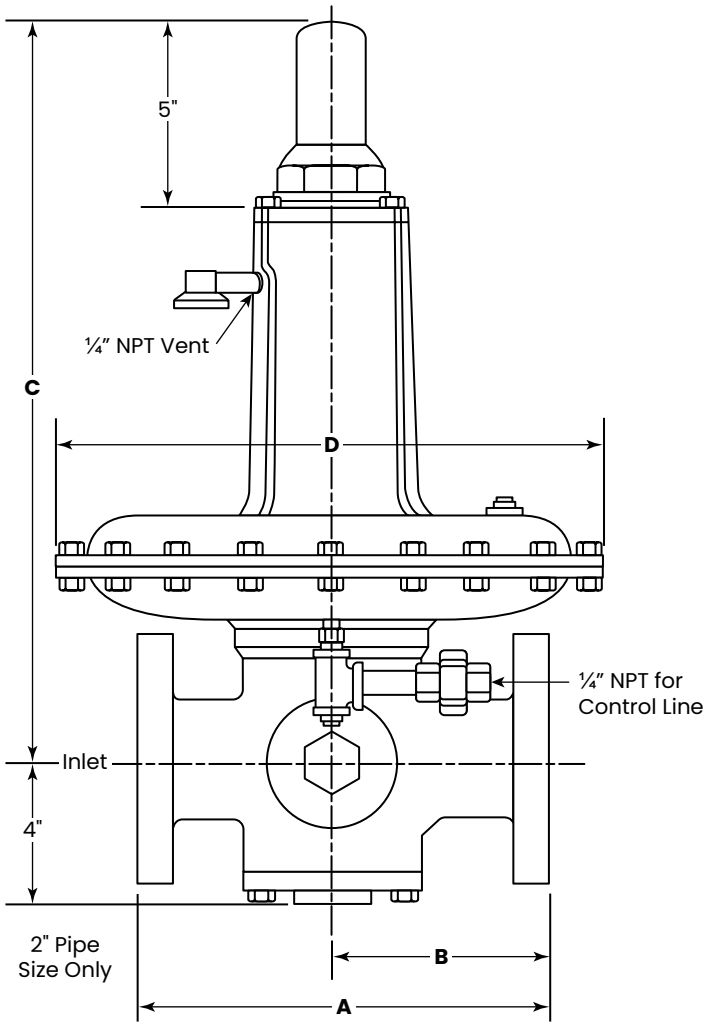
1. Install in line as shown with pressure connected to side marked Inlet.
2. For gas, pipe outlet to safe discharge point.
3. Connect inlet line to ¼" union.
4. By turning adjustment screw, set valve to open at desired pressure. Turning clockwise increases opening pressure.

Model 461-SR offers these advantages:

- Accurate setting and control at low relieving pressure because of large, sensitive diaphragm.
- Tight shutoff without leakage due to soft-seat valve construction.
- Large relieving capacity due to large size double valves.



Dimensions



How to Order

1. Specify Model 461-S, 461-12S or 461-8S.
2. Body Type (see table, on Page 9).
3. Outlet Pressures and Spring (see tables Page 1).
4. Inlet Pressure (also, minimum and maximum inlet pressures, if available).
5. Capacity required (SCFH).
6. Type of Gas (natural gas, propane, etc.).
7. Trim (brass or stainless steel).
8. Valve size (1" or 1 1/16").
9. Double-seat or Single-seat (see Page 3). If not specified, Double-seat will be furnished.

Model 461-S

Regulator Body Type	A	B	C	D (12")	D (8 ½")
Threaded End	6 ½"	-	19 ½"	14 ¼"	11"
Flanged 125 lb	10"	5 ¼"	19 ½"	14 ¼"	11"
Flanged 250 lb	10 ½"	5 ½"	19 ½"	14 ¼"	11"
Flanged 300 lb	10 ½"	5 ½"	19 ½"	14 ¼"	11"

Model 461-8S

Regulator Body Type	A	B	C	D (12")	D (8 ½")
Threaded End	6 ½"	-	-	10 3/16"	11"
Flanged 125 lb	10"	5 ¼"	18 ⅜"	10 3/16"	11"
Flanged 250 lb	10 ½"	5 ½"	18 ⅜"	10 3/16"	11"
Flanged 300 lb	10 ½"	5 ½"	18 ⅜"	10 3/16"	11"

Model 461-12S

Regulator Body Type	A	B	C	D (12")	D (8 ½")
Threaded End	6 ½"	-	-	14"	11"
Flanged 125 lb	10"	5 ¼"	13 ¼"	14"	11"
Flanged 250 lb	10 ½"	5 ½"	13 ¼"	14"	11"
Flanged 300 lb	10 ½"	5 ½"	13 ¼"	14"	11"

Regulator Body Types

Regulator Body Type	Shipping Weight (lb.)	Body Material
Threaded End	75	Cast Iron (ASTM A126-71 Class B)
Flanged 125 lb	80	Cast Iron (ASTM A126-71 Class B)
Flanged 250 lb	85	Ductile Iron (ASTM A395-71 Gr. 60-40-18)
Flanged 300 lb	90	Cast Steel (ASTM A216-70a Gr. WCB)

Construction Materials

Diaphragm Housing and Spring Case (461-S)	Cast Iron (ASTM A126-71 Class B)
Diaphragm Housing and Spring Case (461-8S and 461-12S)	Aluminum
Diaphragm Plates	Steel
Diaphragm	Buna-N with Nylon Fabric Reinforcement
Valve Stems	Brass or Stainless Steel
Removable Seats (Orifice)	Brass or Stainless Steel
Soft Seat Valve Material	Buna-N or Polyurethane pressure molded in holder
Holder for Molded Valve	Steel
Valve Retainer	Brass or Stainless Steel
Bodies (see "Regulator Body Type" table)	-

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