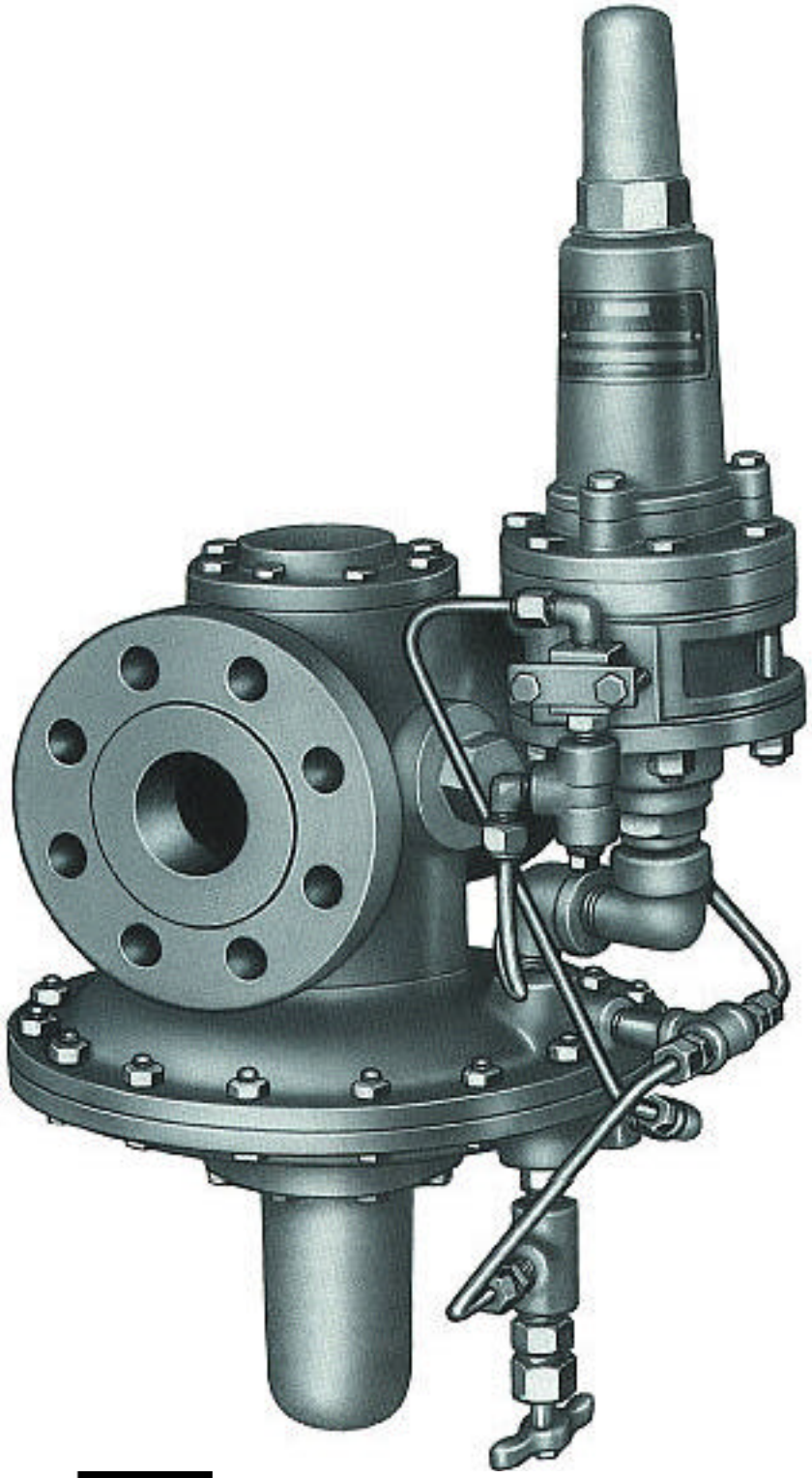
Model 1200
Pilot Operated Regulators

R-1342 Rev. 6



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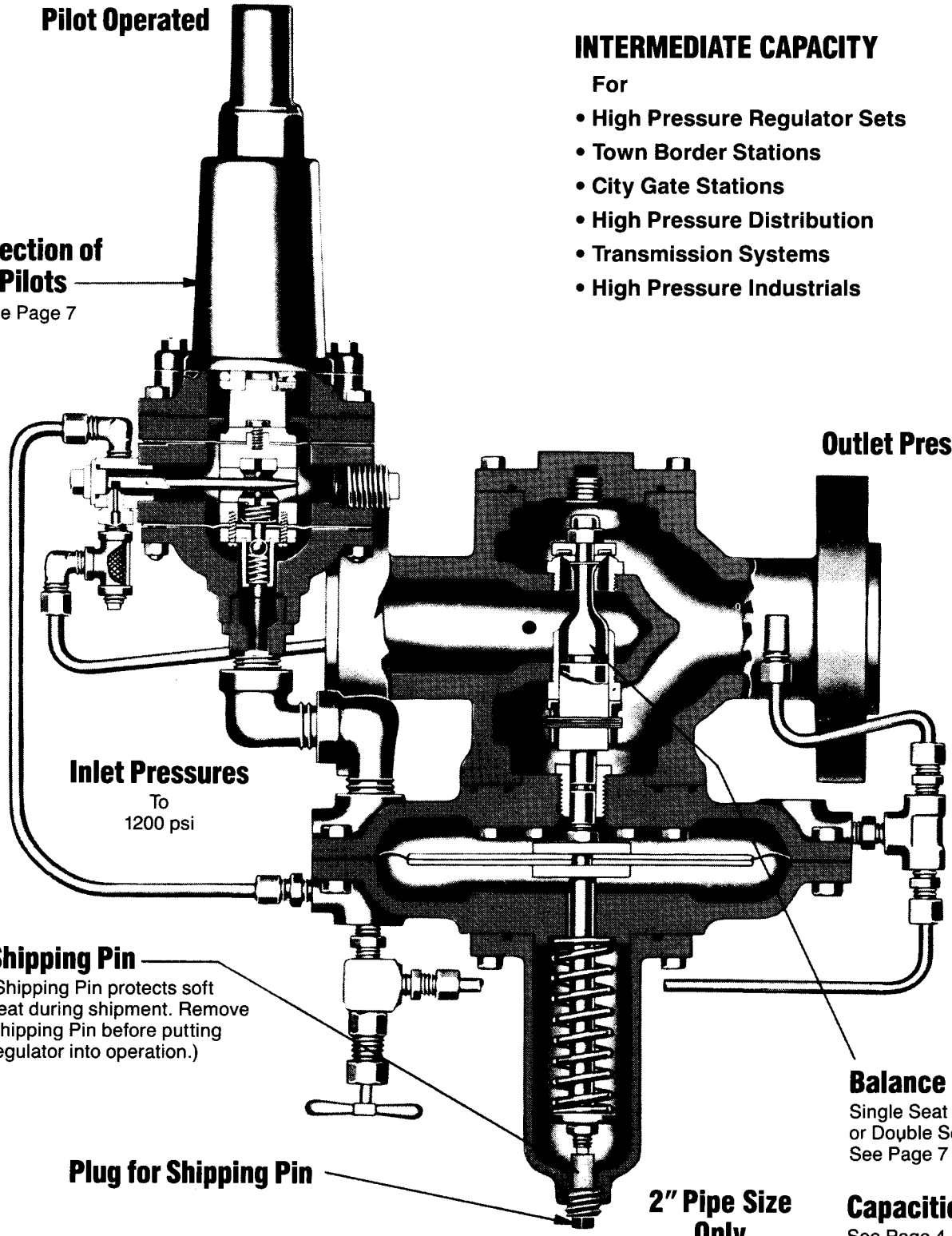


INTERMEDIATE CAPACITY

For

- High Pressure Regulator Sets
- Town Border Stations
- City Gate Stations
- High Pressure Distribution
- Transmission Systems
- High Pressure Industrials

Other Features:

- **Standard Face to Face Dimensions**
- **Standardized "461" Bodies & Inner Valve Assemblies**—easy maintenance—parts are interchangeable with other 461 models.
- **Molded Polyurethane Soft Seats**—positive, tight shut-off—high erosion resistance—will not blow out.
- **O-Ring Stem Seal**—with removable stainless steel bushing.
- **Side Inspection Plates**—on both sides of regulator bodies—quickly removable.
- **O-Ring Body Seals**—eliminates gaskets on upper and lower body openings and side inspection plates.

How it works

Why Pressure Loading

In the conventional spring or weight loaded regulator, the outlet pressure being controlled is applied to one side of a diaphragm, and is opposed by the balancing force of a compressed spring or weights. The diaphragm itself must withstand the difference in pressure between the controlled pressure on one side and atmospheric pressure on the spring or weight side.

Since this differential increases as the outlet pressure increases, the diaphragm is made heavier and smaller, decreasing its sensitivity and increasing its friction. This fact, together with the change in diaphragm area and loss of spring force as a regulator opens, accounts for the rapid fall-off in the controlled pressure as the flow rate increases.

This undesirable characteristic limits the capacity potential of a regulator, since the maximum capacity is then limited by the permissible fall-off in the controlled pressure.

Constant Pressure Loading

As a solution, pressure loading was introduced. An accurately controlled constant pressure, supplied by reducing the available line pressure to the required value by a small regulator, is applied to one side of the diaphragm to balance the pressure being controlled on the other.

This pressure, termed the **loading pressure**, is usually slightly higher than the controlled pressure. However, the pressure differential across the diaphragm is relatively small even at high controlled pressures, so that a large flexible diaphragm may be used to provide sensitivity and improved accuracy.

The regulator diaphragm is still the control diaphragm, and the valve is positioned by the change in differential pressure across the diaphragm caused by a decrease or increase in the controlled pressure; the loading pressure being constant.

This method still requires some fall-off in the controlled pressure to secure maximum valve travel.

Variable Pressure Loading

The principle of operation used in the Model 1200 is a further refinement of pressure loading, which provides the greatest degree of sensitivity and control accuracy. Instead of being constant, the loading pressure is varied to correct for any change in the controlled pressure. Variable pressure loading is usually called pilot (relay) operation.

The pilot control diaphragm becomes the control diaphragm and the regulator diaphragm is only a means to position the valve. If the controlled pressure changes, the pilot valve changes the loading pressure to position the regulator valve as necessary to restore the controlled pressure to its set point. This restoration of the controlled pressure on increased flow rates is not possible in spring or constant pressure loaded types, since some fall-off is required to open the valve.

This system insures positioning of the regulator valve in response to flow changes to maintain the controlled pressure at the desired point from zero flow to the maximum potential capacity of the regulator.

Model 1200 Operation

The operation of the Model 1200 is very simple and may be observed in the operating diagram in which the inlet pressure shows ■■■, the loading pressure ▒▒▒ and the controlled pressure ▒▒▒. See illustration on page 4. The regulator is assembled as shown complete with tubing connections, except for illustration the pilot assembly has been moved off the regulator centerline.

The regulator is installed with the inlet pressure connected to the ■■■ side. One connection may be required from the point shown to the downstream line if an optional remote control point is required. This may be ½" pipe or smaller tubing.

The **regulator spring** has been factory set to close the valve and requires no further adjustment.

The downstream connection transmits the controlled pressure to the body side of the **regulator diaphragm** and to the **pilot control diaphragm chamber**. The controlled pressure is balanced by the **pilot valve spring**, which is adjusted for the required controlled pressure by turning the **adjustment screw** in to increase, or out to decrease.

Tubing from the inlet side of the body conveys **inlet pressure** through a small screen strainer to the **pilot orifice**. The **pilot valve** reduces this pressure to the required loading pressure which is contained within the loading pressure chamber by the **diaphragm**. Both diaphragms are connected to the yoke assembly, so that the force of the variable loading pressure is off-set and imparts no motion to the pilot valve. **Tubing** conveys the **loading pressure** to the closing spring side of the regulator diaphragm. There is a slight continuous bleed from the loading chamber to the control chamber through orifice.

How to Order

SPECIFY:

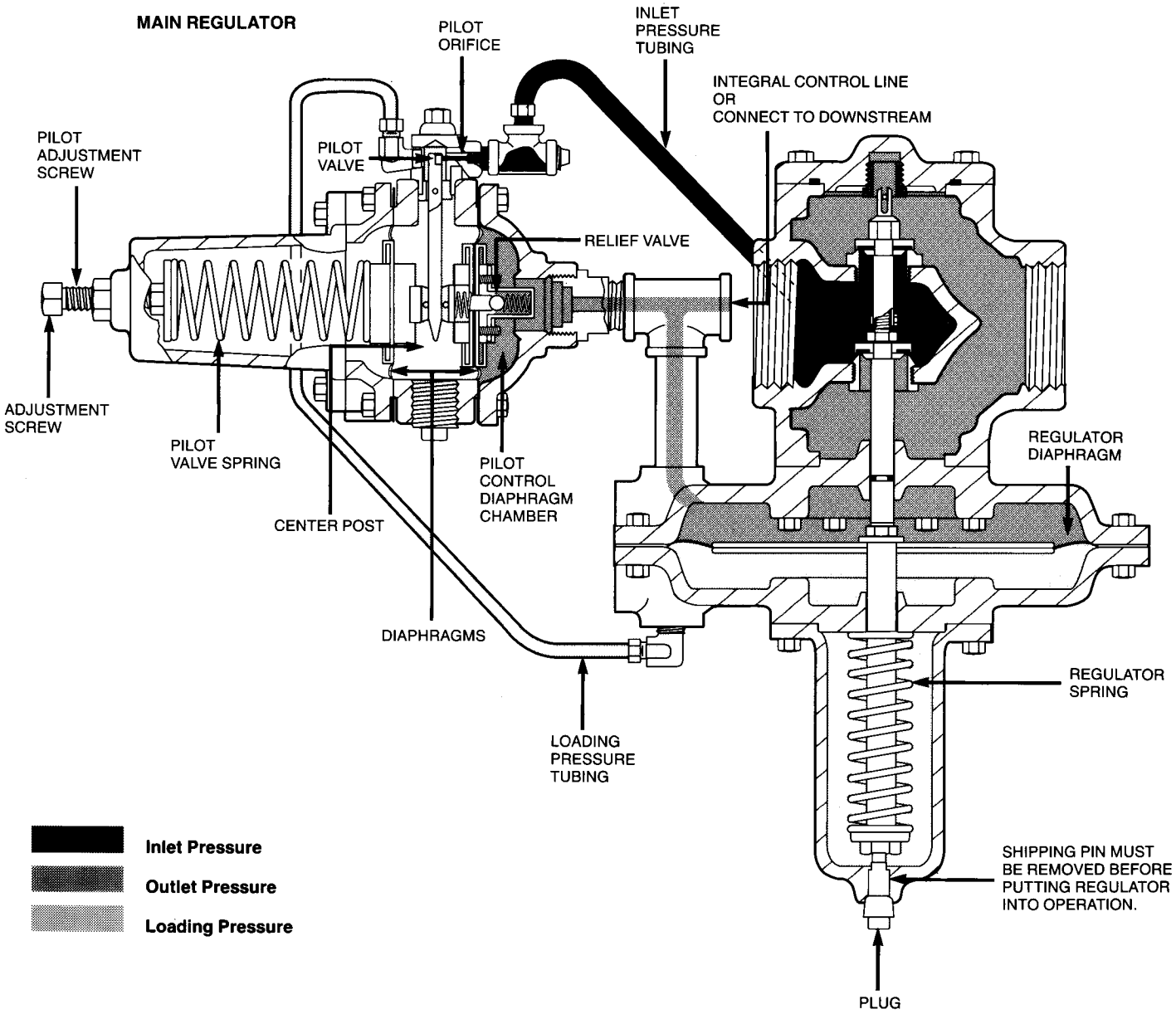
1. 2" Model 1200
2. Piping connections & body material (see table on Page 5)
3. Outlet pressure
4. Inlet pressure (maximum & minimum, if available)
5. Capacity required (SCFH)
6. Kind of gas (natural gas, propane, etc.)
7. Type of Pilot (Refer to Page 5)
8. Valve size (1" or 11/16")
9. Double seat or single seat (see Page 9)

A decrease in controlled pressure lowers the pressure on the regulator diaphragm and simultaneously on the control diaphragm, permitting the pilot spring to open the pilot valve and increase the loading pressure to the regulator diaphragm, which opens the valves to increase the flow and restore the controlled pressure to its set point.

An increase in controlled pressure moves the pilot valve toward its seat and decreases the loading pressure to the regulator diaphragm, which permits the valves to reduce the flow through the regulator until the set pressure is restored, or to close tightly at zero flow.

A **relief valve** guards against overpressure in case pilot valve is damaged or blocked open, by limiting the maximum differential possible between the loading and controlled pressures.

The **center post** of the pilot diaphragm yoke is spring balanced to limit the maximum closing force on the pilot valve lever. This prevents any damage to the valve lever, if the pilot valve is suddenly subjected to a high closing pressure, possibly created by a high back pressure in an open piping system, or quick acting shut-off valves in a closed system.



The Equimeter Model 1200 Pilot Operated Regulator is a 2" intermediate capacity regulator for high pressure applications. It is the high outlet pressure version of the widely used Model 1100. General arrangement and design of the two regulators are almost identical and, as a bonus, many parts are interchangeable.

The 511 pilot, which is standard on the 1100 is also used on the 1200. In addition the 1200 can be equipped with Types 521 and 53 high pressure pilots (outlet pressures to 400 or 600 psig respectively).

An integral built-on downstream control line is standard for the 1200. This makes the 1200 a completely self-contained regulator for maximum ease of installation. However, if a more remote control point is required, the built-on control line can easily be removed and replaced with a separate control line for connection to the desired point.

The inner valve assembly is the standard 461 type, in stainless steel trim. It offers proven performance and stability as well as exceptional ease of maintenance. The balanced single seat valve is used for smaller capacities and the double seat configuration for larger ones.

Although used most extensively for natural gas, the 1200 is equally effective for other (dry) gases such as air, propane, propane-air mixtures, nitrogen, carbon dioxide, etc.

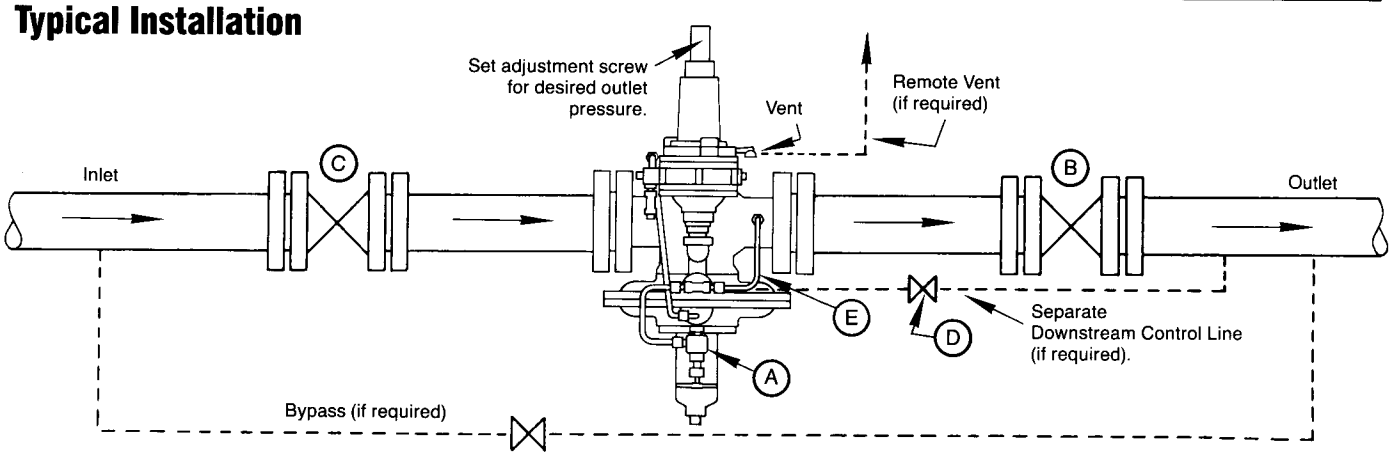
When precision regulation at high pressure is a "must," keep the 1200 in mind. And if help is needed in handling a gas pressure regulation problem, please contact your Equimeter Sales Office.

2" Pipe Size Only Operating Conditions Body Materials Weights

Model	Regulator Body Flange Rating	461 Body Material	Body Working Pressure	Maximum Inlet (psig)	Outlet Range (psig)	Pilot	Shipping Weight (lbs.)
1200-37	ANSI 250 RF	Ductile Iron	575	575	20 to 150	511	105
1200-38	ANSI 300 RF	Cast Steel	720	600	20 to 150	511	108
1200-39	ANSI 600 RF	Cast Steel	1200	600	20 to 150	511	110
1200-47	ANSI 250 RF	Ductile Iron	575	575	50 to 400	521	110
1200-48	ANSI 300 RF	Cast Steel	720	720	50 to 400	521	113
1200-49	ANSI 600 RF	Cast Steel	1200	1200	50 to 400	521	115
1200-57	ANSI 250 RF	Ductile Iron	575	575	50 to 573	53	120
1200-58	ANSI 300 RF	Cast Steel	720	720	50 to 600	53	123
1200-59	ANSI 600 RF	Cast Steel	1200	1200	50 to 600	53	125

Ductile Iron acc. to ASTM A395 gr 60-40-18—Cast Steel acc. to ASTM A216 gr WCB

Typical Installation



The above diagram shows a typical installation. Actual details and valving arrangement vary with individual practices and requirements.

As a precaution, inlet piping should be adequately purged to remove dirt and debris which could damage the regulator or impair its operation. Where this cannot be done, an upstream filter or strainer should be installed.

The shipping Pin (see page 2) must be removed before starting up the regulator. The following sequence is recommended when putting the regulator into operation:

1. Open starting valve (A).
2. *Slowly* open outlet block valve (B).
3. *Very slowly* open inlet block valve (C).
4. If a separate downstream control line is used, open starting valve (D) *very slowly.*
5. Close starting valve (A).
6. Set adjusting screw for desired outlet pressure, firmly tighten locknut and replace seal cap. *Only adjust outlet pressure when gas is flowing.*

When taking the 1200 out of service, starting valve (A) should be opened first and then valves (D), (C) and (B) closed in that order.

Standard construction of the 1200 includes a built-on downstream control line. When a separate control line is required, tubing (E) has to be removed, the body opening plugged, and then a control line be installed to the desired downstream location.

Overpressurization Protection

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, Equimeter Bulletin RDS-1498, or other applicable standards. The method of protection can be a relief valve, monitor regulator, shutoff device, or similar mechanism.

Model 1200 Pilot Operated Regulator Capacity Tables

SENSUS

Capacity in 1000 SCFH of Natural Gas (0.6 Specific Gravity—16.65 psia—60°F). **Note:** The performance data herebelow are based on normal testing at 70°F flowing temperature. Changes in performance may occur at extreme low flowing temperatures.

Inlet Pressure psig	Outlet Pressure psig	Double Seat Balanced		Single Seat Balanced	
		1" Valve	11/16" Valve	1" Valve	11/16" Valve
50	20 & less	64.4	32.2	41.8	20.9
	25	62.8	31.4	40.8	20.4
	30	59.6	29.8	38.7	19.3
	40	46.6	23.3	30.3	15.1
60	25 & less	74.4	37.2	48.3	24.1
	30	73.2	36.6	47.5	23.8
	40	66.0	33.0	42.9	21.4
	50	50.8	25.4	33.0	16.5
80	35 & less	94.2	47.1	61.2	30.6
	40	93.2	46.6	60.5	30.3
	50	87.7	43.9	57.0	28.5
	60	77.2	38.6	50.1	25.1
100	45 & less	114	57.2	74.3	37.1
	50	113	56.8	73.8	36.9
	60	109	54.6	70.9	35.5
	80	86.8	43.4	56.4	28.2
120	55 & less	134	67.2	87.3	43.6
	60	133	66.9	86.9	43.4
	80	122	61.4	79.8	39.9
	100	95.6	47.8	62.1	31.0
140	70 & less	154	76.9	100	49.9
	80	150	75.3	97.9	48.9
	100	135	67.6	87.8	43.9
	120	103	51.8	67.3	33.6
160	80 & less	174	87.2	113	56.6
	100	165	82.8	107	53.8
	120	146	73.3	95.3	47.6
	140	111	55.6	72.2	36.1
180	90 & less	194	97.2	126	63.1
	100	191	95.7	124	62.2
	120	179	89.9	116	58.3
	150	140	70.2	91.2	45.6
200	100 & less	214	107	139	69.6
	120	207	103	134	67.4
	150	181	90.7	118	58.9
	175	137	68.8	89.4	44.7
225	110 & less	239	120	155	77.8
	125	236	118	153	76.7
	150	222	111	144	72.1
	175	195	97.3	126	63.2
250	125 & less	264	132	171	85.9
	150	256	128	166	83.2
	175	238	119	154	77.3
	200	206	103	134	66.9
275	140 & less	289	144	188	94.0
	175	276	138	179	89.7
	200	253	126	164	82.4
	225	218	109	142	71.1
300	150 & less	314	157	204	102
	175	307	154	200	100
	200	292	146	190	95.1
	250	230	115	149	74.7
350	180 & less	364	182	236	118
	200	358	179	233	116
	250	325	162	211	105
	300	250	125	162	81.2
400	205 & less	414	207	269	134
	250	398	199	258	129
	300	354	177	230	115
	350	270	135	175	87.7
450	230 & less	464	232	301	151
	250	460	230	299	149
	300	434	217	282	141
	350	382	191	248	124
	400	288	144	187	93.6
500	260 & less	514	257	334	167
	300	500	250	326	162
	350	466	233	304	152
	400	406	203	263	132
	450	304	152	197	98.8
550	280 & less	564	282	366	183
	300	560	280	364	182
	350	540	270	351	175
	400	498	249	323	161
	450	432	216	280	140
	500	320	160	208	104
600	310 & less	614	307	399	199
	350	604	302	392	196
	400	576	288	374	187
	450	528	264	343	172
	500	452	226	295	147
	550	336	168	219	109
700	360 & less	714	357	464	232
	400	702	351	457	228
	450	682	341	443	221
	500	642	321	417	208
	550	582	291	378	189
	600	**496**	**248**	322	161
800	415 & less	—	—	529	264
	500	—	—	510	254
	550	—	—	488	244
	600	—	—	455	227
900	470 & less	—	—	594	297
	500	—	—	588	294
	600	—	—	547	273
1000	520 & less	—	—	659	329
	600	—	—	644	321
1200	600 & less	—	—	**789**	**394**
"K" FACTORS		**2000**	**1000**	**1300**	**650**

1. Last capacity figure **(bold type)** for each column in capacity at **maximum recommended inlet pressure** for optimum performance.
2. Size each regulator on the basis of the **minimum expected inlet pressure** and the **maximum required outlet pressure.**
3. For **best performance** of the Model 1200, use full capacity values.
4. For **larger capacity** see Model 441-VPC (Bulletin R 1370).
5. For **lower pressure** see Model 1100 (Bulletin R 1341).

Minimum Differential

The minimum operating differential (inlet pressure minus outlet pressure) is approximately 10 psig.

Monitoring

The Model 1200 can be used as a monitor; a standby regulator installed in series, which assumes control if a failure in the operating regulator causes the outlet pressure to exceed the set point. The 1200 can be used to monitor another 1200 or to monitor a different regulator. When any standard pilot operated regulator, such as a Model 1200 is used as a monitor, a load limiting regulator should be installed in the inlet supply to the pilot. Its purpose is to prevent chattering in the small relief valve (ball-and-spring type) located in the bottom end of the pilot. Use a small capacity regulator such as an Equimeter 041 with a 3/32" or 1/8" orifice. Adjust it for a set-point 5 psi higher than the set-point of the regulator. When a Model 1200 is used to monitor a regulator with an identical inner valve (another Model 1200), the toal maximum capacity through both regulators can be figured at 70% of the capacity of one of them alone. This applies with the monitor located either up or downstream. For additional information or help with your monitoring requirements, please contact your Equimeter Sales Office.

Capacities at Other Pressures

Capacity for pressure reductions not listed in the table can be calculated with the following formulae:

$$1.\ Q = K\sqrt{P_O\,(P_I - P_O)}$$

$$2.\ Q = \frac{KP_I}{2}$$

Q = maximum capacity of the regulator (in SCFH of 0.6 specific gravity natural gas).
K = the **"K" factor**, the regulator constant (from bottom of table, Page 4).
P_I = **absolute** inlet pressure (psia).
P_O = **absolute** outlet pressure (psia).

Use formula 1. when $\frac{P_I}{P_O}$ is less than 1.894.

Use formula 2. when $\frac{P_I}{P_O}$ is greater than 1.894.

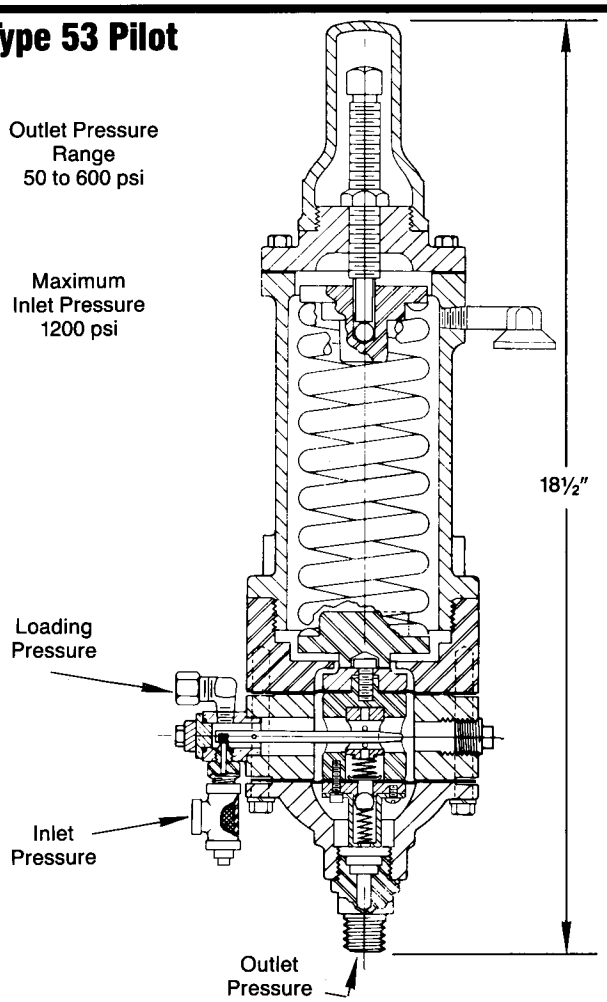
Capacities for Other Gases

The capacity data on Page 6 applies to natural gas. To find the capacity of the Model 1200 when used for other gases, multiply the SCFH values from Page 6 by a correction factor from the following table:

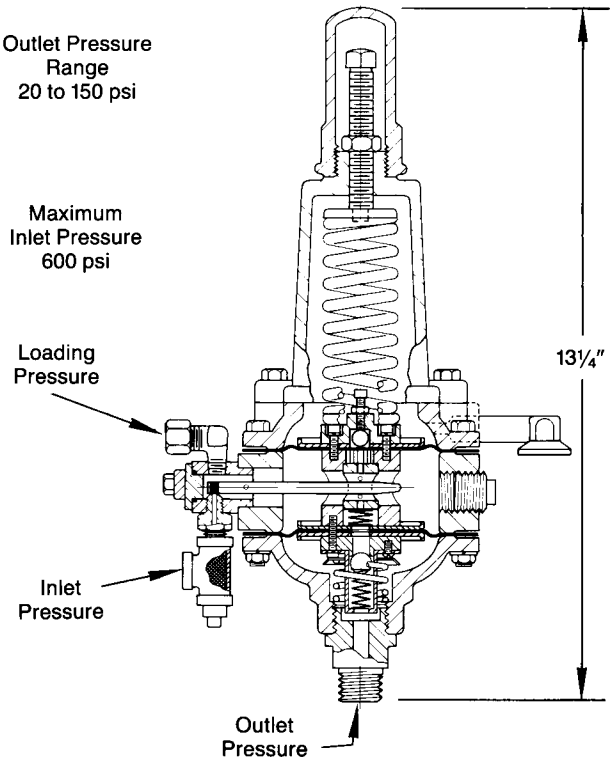
TYPE OF GAS	Specific Gravity	Correction Factor
Air	1.0	**0.77**
Propane	1.53	**0.63**
1350 BTU Propane-Air Mix	1.20	**0.71**
Nitrogen	0.97	**0.79**
Dry Carbon Dioxide	1.52	**0.63**

For Other Gases: Correction Factor $= \sqrt{\frac{0.6}{\text{Specific Gravity of the Gas}}}$

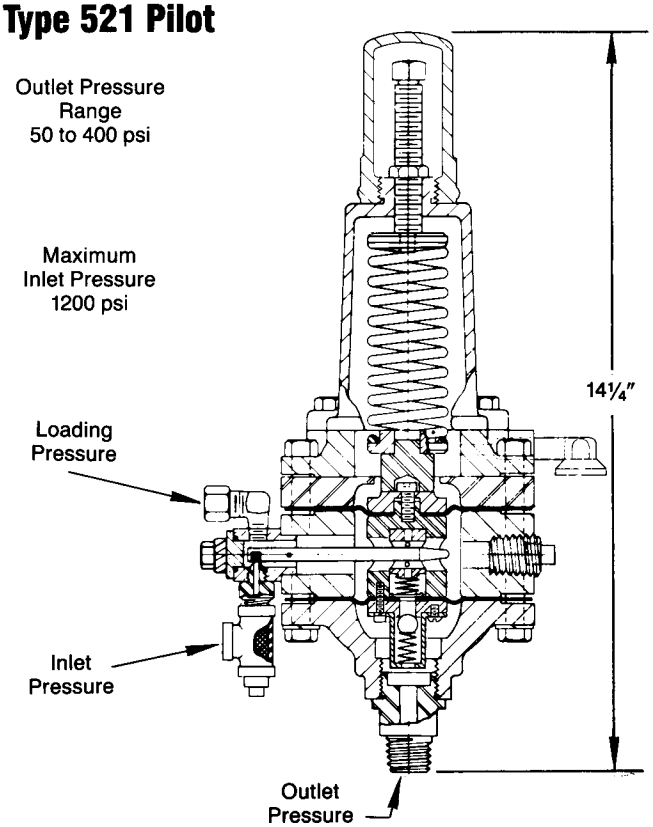
Type 53 Pilot



Type 511 Pilot



Type 521 Pilot



Maximum Emergency Pressures

The maximum pressure to which the regulator inlet may be subjected under abnormal conditions without causing damage to the regulator is as follows:

ANSI 250 RF Model 1200 with Type 511 Pilot . . . . . 635 psig
ANSI 300 RF Model 1200 with Type 511 Pilot . . . . . 675 psig
ANSI 300 RF Model 1200 with Type 521 or 53 Pilot . . 795 psig
ANSI 600 RF Model 1200 with Type 511 Pilot . . . . . 700 psig
ANSI 600 RF Model 1200 with Type 521 or 53 Pilot . . 1320 psig

The maximum presssure to which the regulator outlet (control line—see page 5) may be subjected without causing damage to the internal parts of the regulator equals set-point +10 psi (set-point is defined as the outlet pressure which a regulator is adjusted to deliver).

If any of the above pressure limits are exceeded, the regulator must be taken out of service and thoroughly inspected. Damage or otherwise unsatisfactory or suspected parts must be repaired or replaced.

The maximum pressures that can be safely contained by the diaphragm case and pilot (i.e. no leakage as well as no bursting) are:

All Model 1200 with Type 511 Pilot . . . . . 200 psig
All Model 1200 with Type 521 Pilot . . . . . 465 psig
ANSI 250 RF Model 1200 with Type 53 Pilot . . . . . 575 psig
ANSI 300 and 600 RF Model 1200 with Type 53 Pilot . . 650 psig

CAUTION: *Before using any of the above data, make sure this entire section is clearly understood.*

The above data are meant to conform with "Title 49 of the Code of Federal Regulations, Department of Transportation, Part 192" rule 192.195 (b) (1) and the applicable section of the "ASME Guide for Gas Piping Systems".

Materials of Construction

Bodies . . . . . See Page 5
Diaphragm Covers . . . . . Cast Steel (ASTM A216 gr. WCB)
Spring Cage . . . . . Steel
Upper Diaphragm Cover, Type 521 and 53 Pilot . . . . . Steel
Upper Diaphragm Cover,
Type 511 Pilot . . . . . Cast Iron (ASTM A126 Class B)
Pilot Loading Pressure Chamber and
Lower Diaphragm Cover . . . Cast Iron (ASTM A216 Class B)
Spring Cage, Type 511 &
521 Pilot . . . . . Ductile Iron (ASTM A395 gr. 60-40-18)
Spring Cage, Type 53 Pilot . . Cast Iron (ASTM A126, Class B)
Diaphragm Plates . . . . . Steel
Diaphrams . . . . . Buna-N with Nylon Fabric Reinforcement
Stems, Bushings, Guides . . . . . Stainless Steel
Valve Soft Seats . . Polyurethane, Pressure Molded into Holder
Holder for Molded Valve . . . . . Steel
Optional: Nylon Seat Material in Stainless Steel Holder
Valve Retainer . . . . . Stainless Steel
Removable Seats (Orifices) . . . . . Stainless Steel
Pilot Orifices . . . . . Stainless Steel
Pilot Valve Disk . . . . . Polyurethane
Pilot Tubing . . . . . ¼" Steel
Tubing Connections . . . . . Compression Type Tube Fittings

Temperature Limit

Model 1200 Regulator is suitable for gas temperatures from −20 to +150°F.

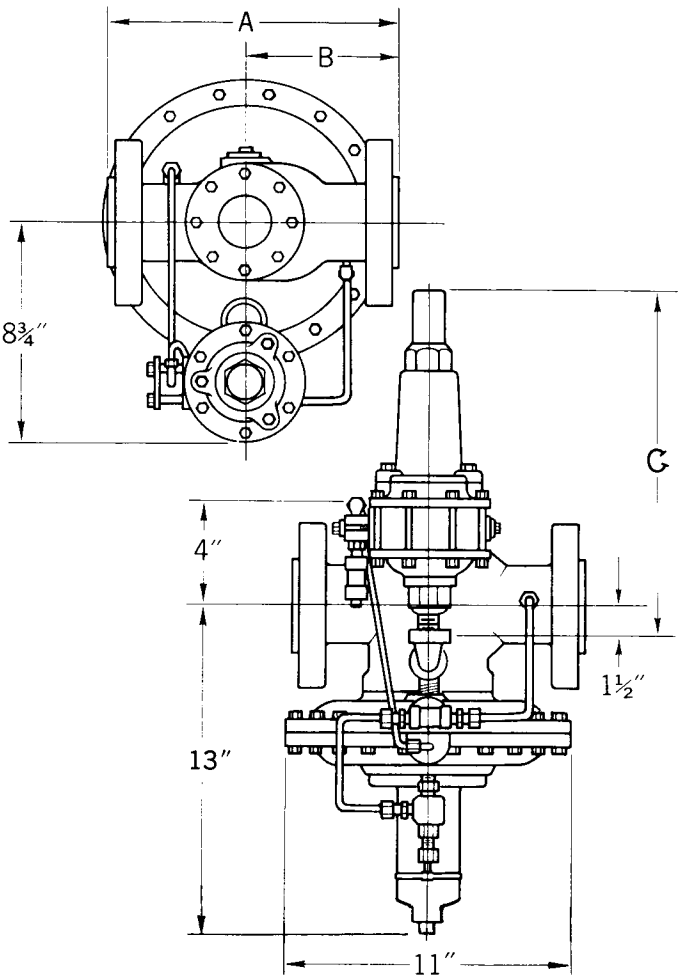
Spare Parts . . . . . See Bulletin RP 1342

Buried Service

The Model 1200 regulator is designed for above ground or vault installation and is *not recommended* for direct buried service.

Dimensions

Model	Shipping Weight (lbs.)	Dimensions			Pilot
		A	B	C	
1200-37	105	10½"	5½"	13¼"	511
1200-38	108				
1200-39	110				
1200-47	110	10½"	5⅝"	14¼"	521
1200-48	113				
1200-49	115				
1200-57	120	11¼"	6	18½"	53
1200-58	123				
1200-59	125				



Periodic Inspection

Regulators are pressure control devices with many moving parts which are subject to wear depending on operating conditions. To assure continuous satisfactory operation, a periodic inspection schedule must be followed, with the frequency of inspection determined by the severity of the application and the prevailing laws and regulations.

Vent Line

It is the user's responsibility to ensure that the vent line is as short as possible with a minimum of bends or elbows. The vent line outlet must be protected against the entry of water or foreign matter, but must allow unobstructed venting to a non-hazardous location *away from any potential source of ignition.* Each regulator must be individually vented and common vent lines must not be used.

SENSUS

Fully Interchangeable Valve Assemblies

Valve assemblies can be interchanged with the regulator in place in the line.

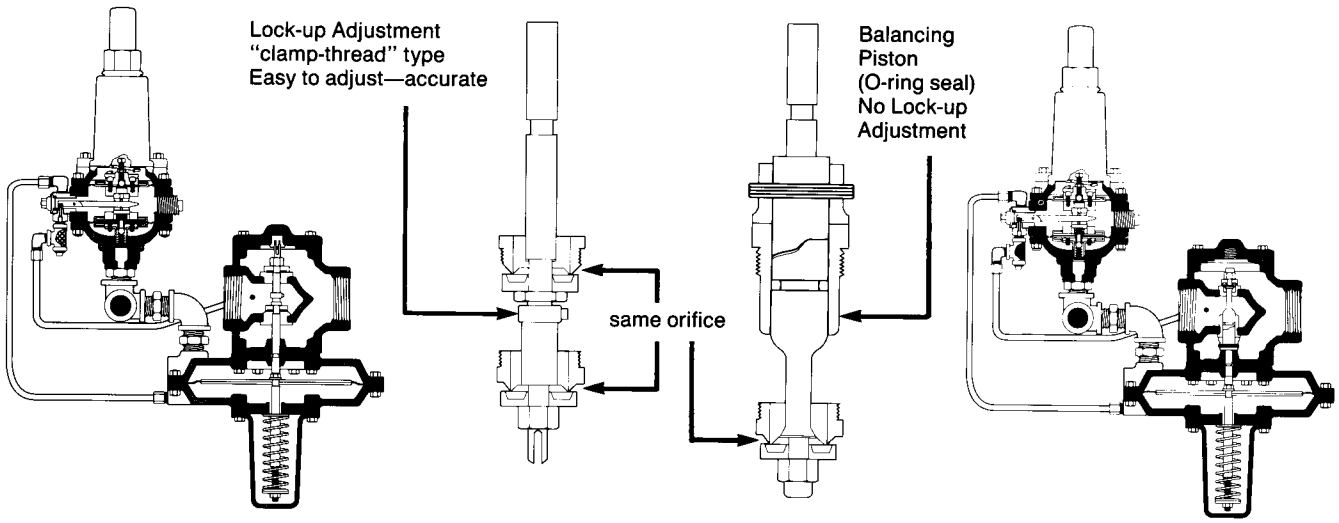
Use the 11/16" Single Seat initially for small loads. Then in the future, as loads grow, change only the Valve Assembly, up to 1" Double Seat for maximum capacity.

Molded Soft Seats for positive tight shut-off will not blow out

Lock-up Adjustment "clamp-thread" type Easy to adjust—accurate

Balancing Piston (O-ring seal) No Lock-up Adjustment

same orifice



2" Model 1200
Double Seat
Balanced Valve

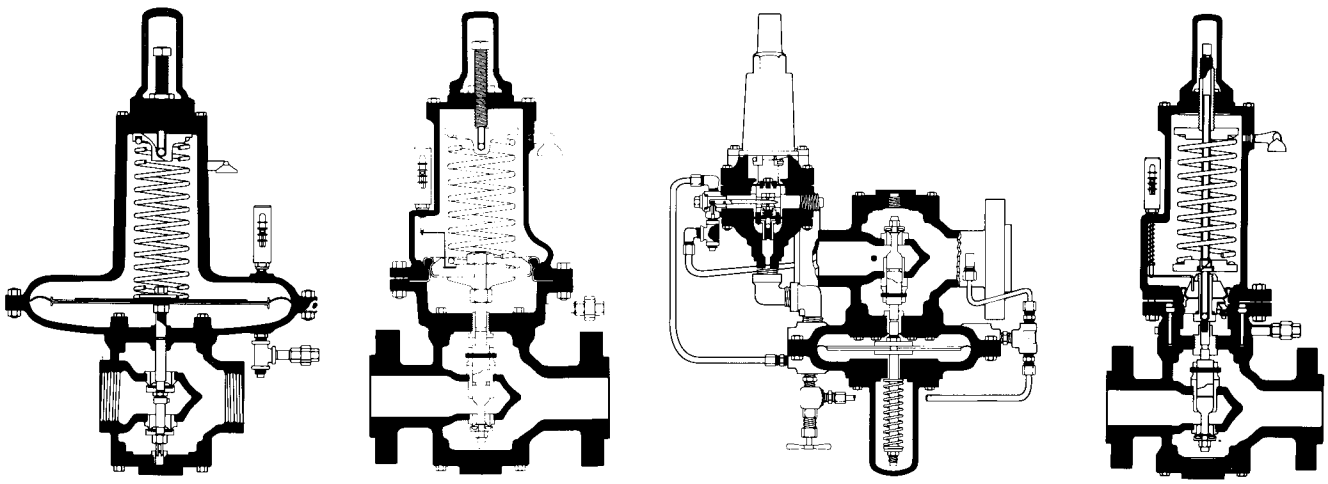
Double Seat Balanced Valve
1" or 11/16"

Single Seat Balanced Valve
1" or 11/16"

2" Model 1100
Single Seat
Balanced Valve

The 461 Family of Regulators

Other Models Which Use Type 461 Balanced Valves



2" Model 461-S
Outlet Pressures in w.c. to 10 psi
See Bulletin R 1330

2" Model 461-57S
"Roll-Out" Diaphragm
Outlet Pressures 3 to 100 psi See Bulletin R 1331

2" Model 1100
Outlet Pressure in w.c. to 150 psi
See Bulletin R 1341

2" Model 461-X57
"Roll-Out" Diaphragm
Outlet Pressures
75 to 250 psi
See Bulletin R 1332

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