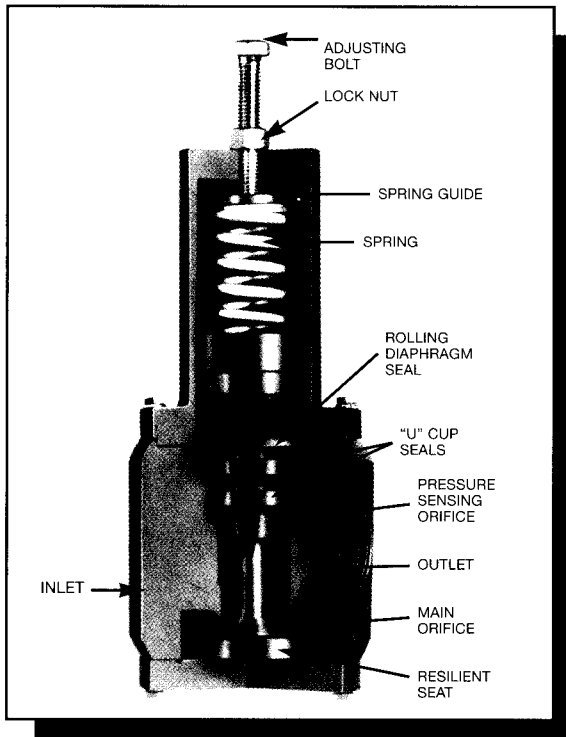
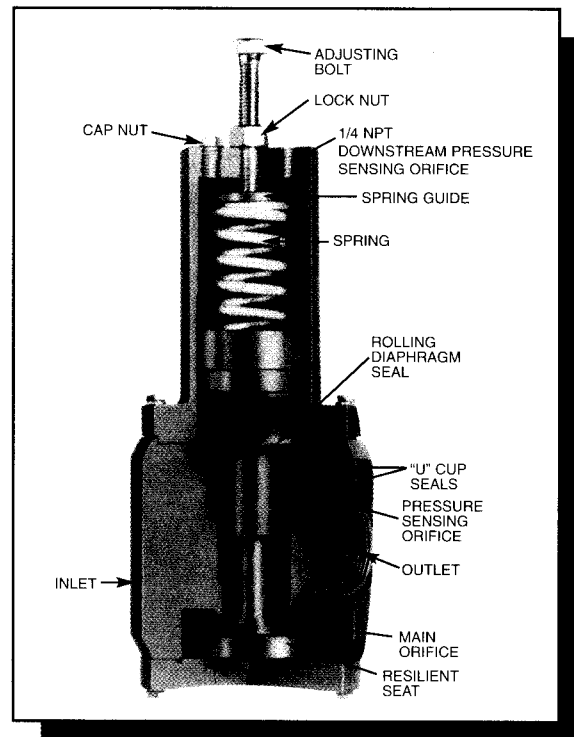


The What, How, Where and Why of Pressure Regulators

(AKA Pressure Reducing Valves)



PRESSURE REGULATOR



DIFFERENTIAL PRESSURE REGULATOR

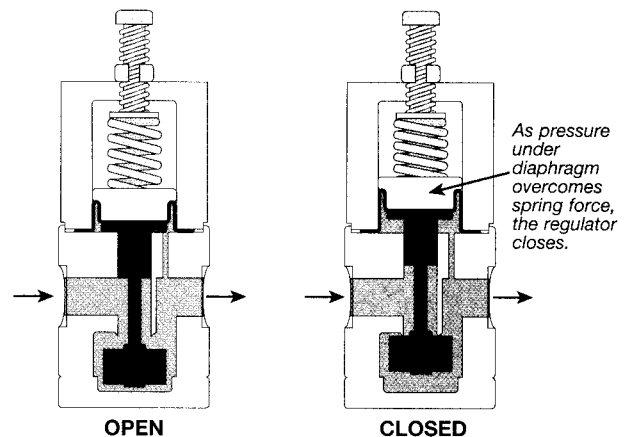
I. WHAT styles are available?

- A. Standard/low pressure set (5 - 50 PSI) **Series "PR"**
- B. High pressure set (30 - 125 PSI) **Series "PRH"**
- C. Compact, lower flow-pressure set (10 - 125 PSI) **Series "PRE"** (3/4" and 1" only)
- D. Pressure differential regulator (5 - 70 PSI) **Series "PRD"**

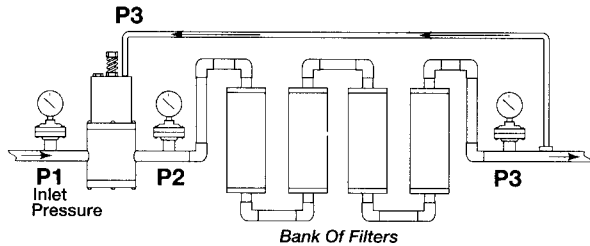
II. HOW do they operate?

A, B & C: These styles are normally open and respond to downstream (outlet) pressure. A small orifice at the outlet of the valve (called the "sensing orifice") allows liquid up under a large area rolling diaphragm. This causes the rolling diaphragm to sense - and react to - the downstream (outlet) pressure. The valve seat, shaft and piston are all attached to the sensing diaphragm. As the force (force = pressure x area) sensed under the rolling diaphragm becomes less or greater than the spring force, it causes the regulator seat to move toward the full open or full closed position.

The pressure setting is done manually by turning the adjusting bolt clockwise to raise the pressure setting and counter-clockwise to lower it. This varies the compressive force of the internal spring, pushing the seat away from the regulator's orifice. The more it is compressed, the higher the set pressure will be. When the downstream pressure reaches the pre-determined set pressure, the force created by the downstream pressure beneath the rolling diaphragm is greater than the force exerted by the spring and the seat rises to and seals against the orifice, closing the regulator.



D. Pressure differential regulators sense the difference between the pressure into and out of a piece of equipment and adjust their opening such that the pressure differential across the equipment will not exceed the regulator's setting. The operation of a pressure differential regulator is similar to a pressure regulator, except that a sensing line (capillary tube) is connected from the downstream side (P3) of the piece of equipment being protected to the spring chamber of the pressure differential regulator. (Refer to illustration)



Schematic of typical filtering system with Plast-O-Matic Differential Pressure Regulator

Take for example, the bank of filters shown above. The filter manufacturer rates their product for a maximum pressure drop of 20 PSI. When the filters are "clean", we would like to get as much flow through them as possible, but as they become "dirty", we want to limit the ΔP to 20 PSI, the manufacturer's rating.

As you see from the performance test data below, the pressure differential regulator is fully open allowing maximum flow (77 GPM) when the filters are clean ($\Delta P = 2$). At this point, the piping downstream of the filters is the main restriction in the system (ΔP across filters is low, and P3 is high). As the filtering system begins to collect more sediment, it obstructs and lessens flow (GPM) and the pressure (PSI) at P3 drops. When the filters are significantly clogged, the flow drops to 27 GPM. The filters are now the main restriction in the system. The ΔP or pressure differential is now 16 PSI across the filtering system but is still below the set pressure of 20 PSI.

PERFORMANCE TEST DATA
1 1/2" Series PRD150B-PV

Inlet Pressure (PSI)	Set Pressure (PSI)	P2 Pressure (before filters) (PSI)	P3 Pressure (after filters) (PSI)	Flow Rate (through filters) (GPM)	ΔP Pressure (drop across filters) (PSID)
75	20	22	20	77	2
80		23	19	72	4
85		22	13	61	9
100		18	8	49	10
116		18	2	27	16

III. WHERE would I use a Pressure Regulator?

A, B & C: Typically, pressure regulators are specified wherever systems, equipment and/or components need to be protected from pressures higher than they are rated for (i.e. filters, membranes, control sensors, etc.). If the pressure at the equipment/components reaches the regulator's setting, the regulator will close (bubble-tight, no "creep") preventing an increase in pressure and possible damage.

NOTE: Pressure regulators should not be confused with pressure relief valves in system, equipment and/or component protection. For discussion of these valves, please refer to "The What, How, Where and Why of Relief Valves".

D: Wherever pressure drops across a component (i.e. filters) must not exceed a pre-set value.

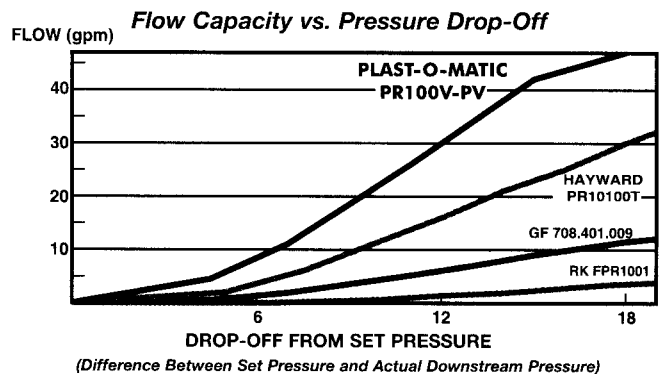
IV. WHY would I use a Regulator versus some other comparable function valve?

Generally speaking, the only other style valve used to control varying upstream pressures to a predetermined maximum downstream pressure is either an air-operated 3 to 15 PSI or 4 to 20 milli amp electrical control valve. These alternatives, however, require various accessory items (transducers, positioners, air regulators, filters, lubricators, etc.) for their operation and are considerably more expensive and complex.

Pressure regulators are most popular due to their compact size, ease of setting/readjustment, repeatability, and self contained operation.

Special caution must be used, however, in the proper sizing of pressure regulators since there are *considerable differences* in both flow capacity and pressure drop-off values amongst identical sizes of competitive models. The following graph provides ample evidence (1" size) of the variances that can seriously effect the ultimate performance of one's systems, equipment, and/or components.

COMPARISON OF 1" PRESSURE REGULATORS PERFORMANCE CURVES



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