What is a Pressure Regulator?

Definition

A Pressure Regulator is a mechanical device designed to regulate system flow pressure in response to upstream or downstream pressure changes.

Principles of Operation

Trerice Pressure Regulators are available in two basic configurations: a one-piece design with an integrated actuation system, or a two-piece design comprised of individual components (actuator and globe valve), which are factory assembled into a complete regulator.

One-Piece Pressure Regulators (Series 984, 988, 1002) have an internal diaphragm that is attached to a valve plug. The diaphragm is balanced between the downward force of an adjustment spring and the upward force of the reduced downstream pressure within the regulator. As the downstream pressure decreases, the adjustment spring pushes down on the diaphragm, which in turn opens the valve. Conversely, as downstream pressure increases, the diaphragm is forced upward, overcoming the force of the spring and closing the valve.

Two-Piece Pressure Regulators (Series 91500, 921) employ a user-supplied pressure line connecting the actuator to the point of regulation within the pipeline or process. Depending upon the model selected, the process pressure will either expand a bellows or depress a diaphragm within the actuator housing. The subsequent movement of the bellows or diaphragm will push an attached valve stem to the “in” position. Choice of a stem In-To-Close or stem In-To-Open globe valve will determine if the assembled pressure regulator is for reducing downstream pressure (ITC or normally open) or relieving upstream pressure (ITO or normally closed). These units feature spring-opposed actuation: when the controlled pressure decreases, the adjustment spring will push the diaphragm upward or compress the bellows, which will in turn move the valve stem back to the “out” position.

continued next page
What is a Pressure Regulator?

continued

Selecting a Pressure Regulator

- **Trerice 921 Series Pressure Regulators** provide a quick response to large system load changes, while maintaining precise flow regulation. The 921 Series is capable of both downstream pressure reduction and back pressure relief. Valve sizes from 1/2” through 6” port are available.

- **Trerice 91500 Series Pressure Regulators** are specifically designed for use on retorts and cooking vessels used within the food processing industry. Valve sizes from 1/2” through 4” port are available.

- **Trerice 984 Series Pressure Regulators** are designed to provide pressure regulation of steam, air, water, gas or oil. They are used primarily for small load process equipment and service line applications. Valve sizes from 1/4” through 1/2” port are available.

- **Trerice 988 Series Pressure Regulators** are designed for steam service and recommended for saturated and superheated steam applications. Valve sizes from 1/2” through 2 1/2” port are available.

- **Trerice 1002 Series Pressure Regulators** are designed for high volume water service applications. Valve sizes from 1/2” through 2 1/2” port are available.

Pressure Range and Set Point
Each Trerice Pressure Regulator is designed to operate efficiently within a specified operating range. The regulator, when properly specified, will modulate pressure flow at the set point desired within the selected pressure range. The set point can be modified using the range adjustment screw provided on the unit.

Pressure Regulator Availability

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<tr>
<th>Series</th>
<th>Body Material</th>
<th>Connection</th>
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Valve
Trerice Two-Piece Pressure Regulators are available with a wide variety of globe valve designs, materials, connections and sizes.

Style
Trerice Pressure Regulator Valve Bodies are available in single seated and double seated designs.

- **Single Seated Valves** are an excellent choice when a higher degree of shut-off is required. However, this design is unbalanced and limited in the pressure range.
What is a Pressure Regulator?
continued

that it will shut off against. The leakage rate is approximately 0.1% of the maximum capacity.

- **Double Seated Valves** are nearly pressure balanced and, therefore, are able to close the valve plug against higher operating pressures. However, since temperature fluctuations may cause expansion and contraction across the seats, tight shut-off is not always possible. The leakage rate is approximately 0.5% of the maximum capacity. Double seated valves have a faster flow response and greater capacity than single seated valves, and are recommended when tight shut-off is not required.

**Action**

Trerice 921 Series Pressure Regulators can be specified for use in either pressure reducing or back pressure relief applications. All other Trerice Pressure Regulators are designed for pressure reducing applications only.

<table>
<thead>
<tr>
<th>Pressure Regulator Valve Action</th>
<th>Application</th>
<th>Stem Action</th>
<th>Normal (Fail) Position</th>
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<td>Pressure Reducing</td>
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<tr>
<td></td>
<td>Back Pressure Relief</td>
<td>In-To-Open</td>
<td>Normally Closed</td>
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</tbody>
</table>

**Body Material and Connection**

Trerice Pressure Regulators are available with bronze or cast-iron valve bodies. Union and flanged connection styles are available.

**Trim**

Valve trim is composed of the stem and plug assembly, and the seats within the ports. Trerice single and double seated, bronze valve bodies employ a stainless steel, tapered plug for enhanced modulation, as well as permanently brazed-in stainless steel seats for smooth performance throughout the life of the valve. The valve plug is both top and bottom guided to ensure positive seating alignment.

**Packing**

Trerice valves feature a self-energizing Teflon V-Ring packing, which reduces leakage around the valve stem. V-Ring packing is spring loaded to maintain proper compression and does not require manual adjustment.

**Size**

The proper sizing of a regulating valve is one of the most important factors in its selection. A valve that is too small will not be able to provide the desired capacity during peak load conditions, while a valve that is too large may overshoot the control point and operate with the valve plug too close to the seat, resulting in undue wear of the plug and seat. The valve coefficient \( C_v \) is mathematically determined through an evaluation of the system service conditions (operating pressures and flow). From this evaluation, a valve body with the appropriate port size can be selected. Port sizes from \( \frac{1}{4}" \) through 6" and connection sizes from \( \frac{1}{2}" \) through 6" are available. Please consult the Valve Selection Section of this catalog.

**Pipeline Strainer**

A Trerice Series 1100 Pipeline Strainer should always be installed upstream of a Trerice Regulator. This Y-Type strainer employs a stainless steel screen to remove debris from the line, which will prevent jamming of the valve and extend its life.