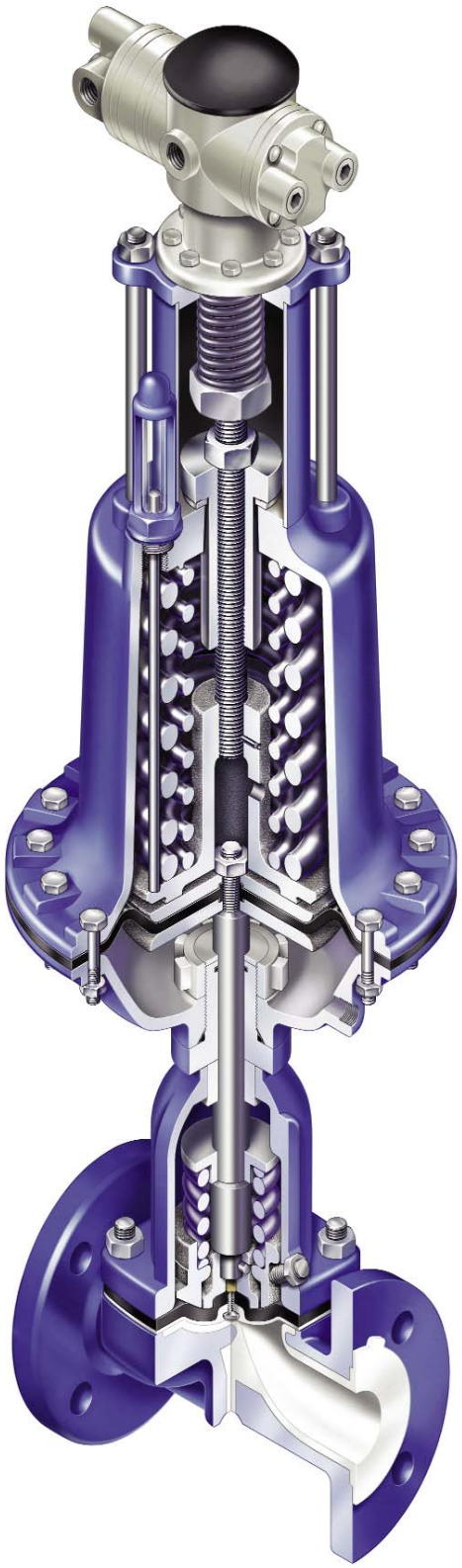
ITT

Dia-Flo®
Diaphragm Valves
Diaphragm Valve Actuation

Dualrange Control for Fine Throttling Service
Dualrange Weir Type Bonnet Assemblies



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Dualrange Control for Fine Throttling Service

Principle of Operation

The superior performance of the Dualrange® Control Valve is the result of a simple yet effective innovation in diaphragm valve design: a two-piece compressor.

The two-piece compressor design not only permits greater rangeability in the valve, hence improved flow control, but provides porting which is more conducive to streamlined flow. This type of opening can handle slurries without excessive abrasion, dewatering or wiredrawing. The Dualrange should be supplied whenever precise throttling is required.

How It Works

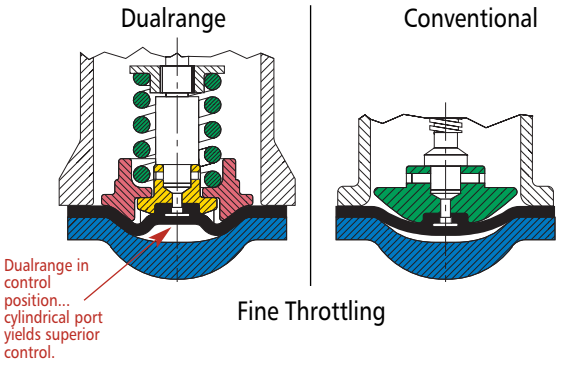
During the initial movement of the valve stem, only the inner compressor moves. This permits smaller increases in flow for the same increase in stroke resulting in better modulation than conventionally designed diaphragm valves. Because the valve can now control within desired parameters more accurately, it is better able to create the desired flow conditions or pressure drop through the valve and avoid control valve hunting.

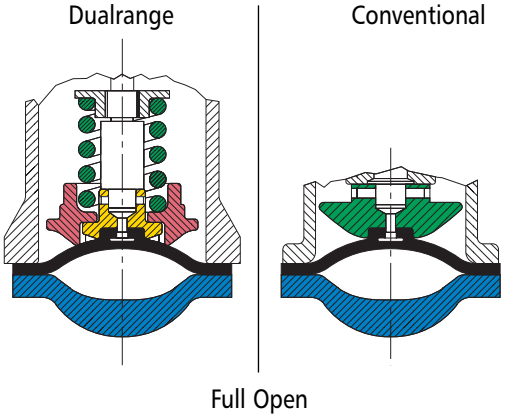
When the inner compressor is open to its limit, the outer compressor begins to open. From this point on, both compressors move as a unit. When wide open, the Dualrange provides the same full flow capacities as the conventional weir type designs.

The advantages gained in flow control by this design over the conventional diaphragm valve can be seen in the charts on page 3-20.

Because the Dualrange Control Valve must be able to position itself in an infinite range of positions from full open to full closed and hold these positions, it must be used in conjunction with a positioner. The positioner is the device that modulates the plant air to the valve operator in relation to the instrument air signal being fed by a control device.

Dualrange vs Conventional Weir Valve





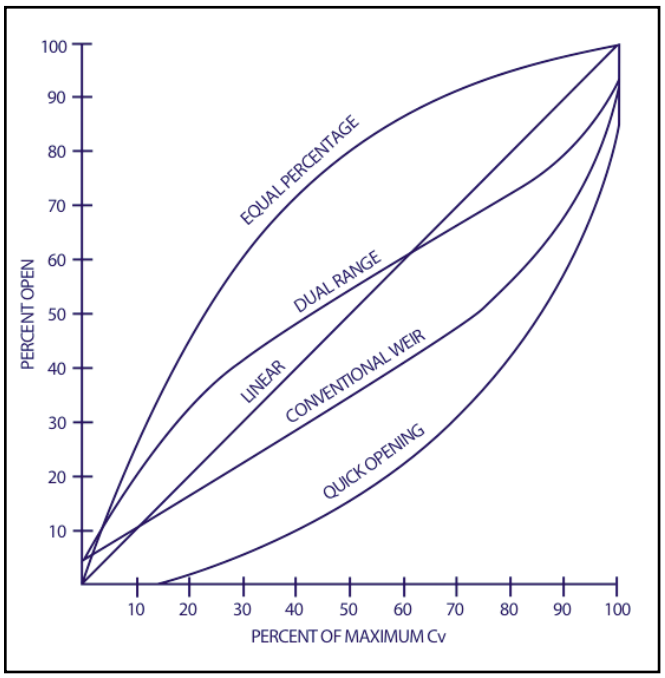
Dualrange Control for Fine Throttling Service

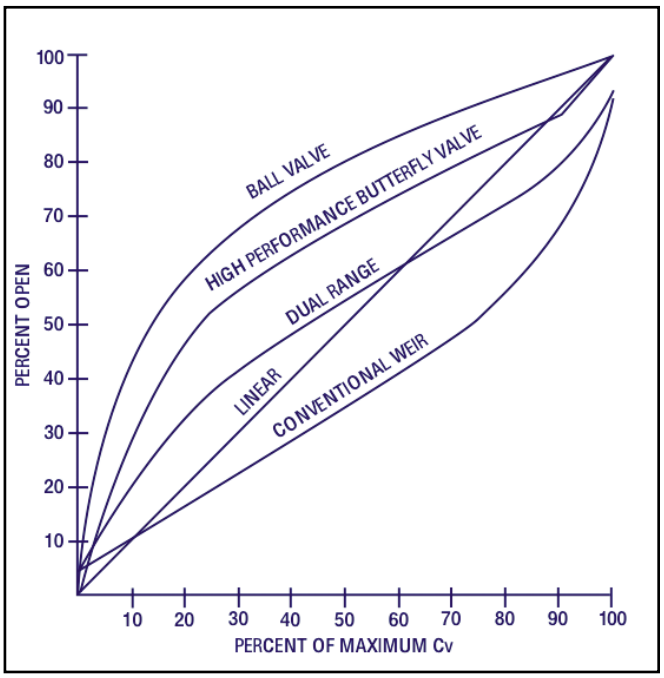
Applications

The Dualrange Control Valve is designed to operate at a maximum line pressure of 100 psi (689 kPa) and is recommended for use with the Dia-Flo® weir type diaphragm for applications as follows:

- Where a cost effective control valve is required on corrosive services.
- Where abrasives reduce valve life on throttling applications.
- Wherever positive closure and/or fine throttling are required in a control application.
- Where slurries may clog ordinary diaphragm valves when throttling.
- Where valves large enough to handle normal process flows cannot throttle low enough to control small amounts of flow required during start-up operations.
- Where split-ranging has been necessary to provide rangeability not available in a single diaphragm valve.

Valve Flow Characteristics





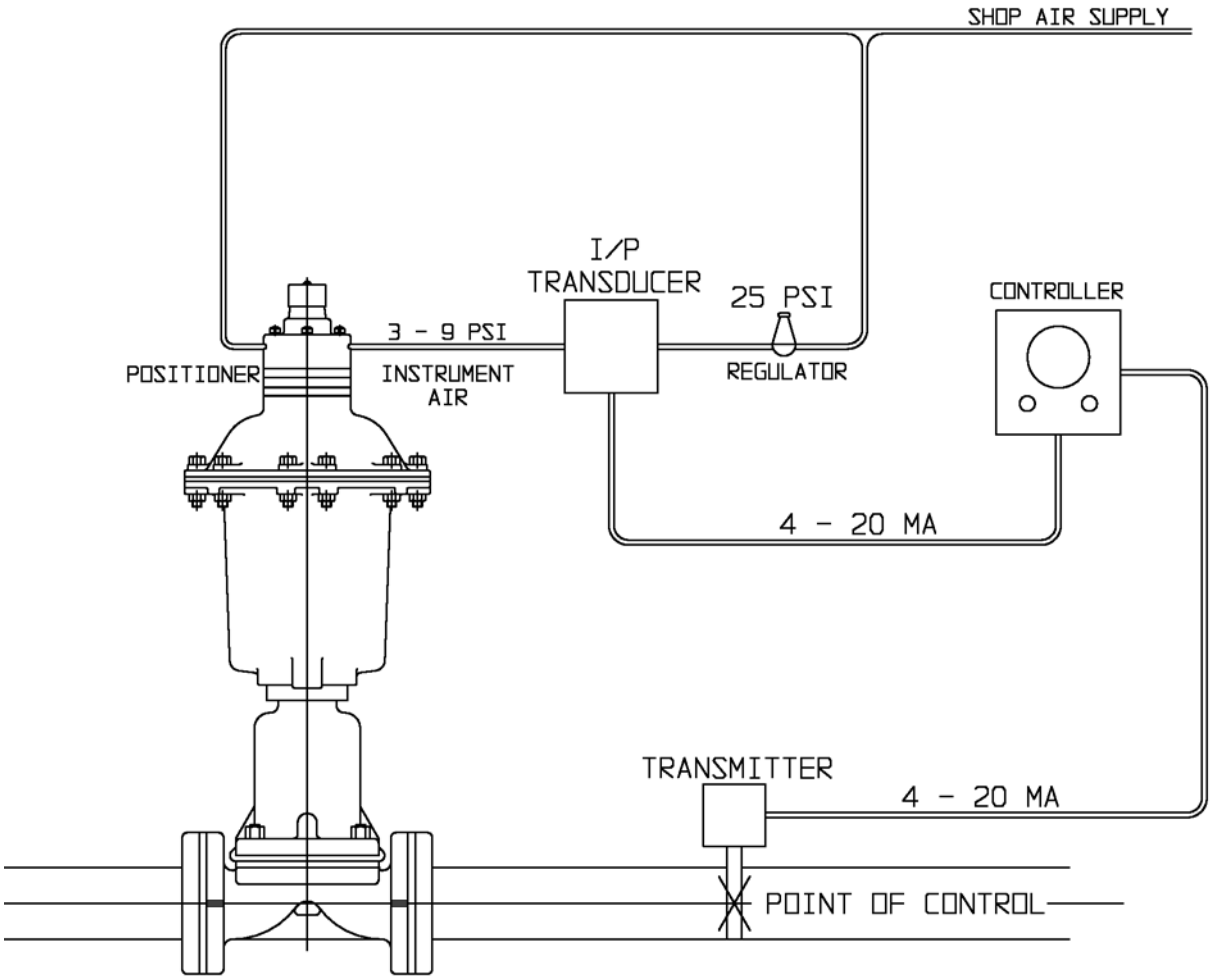
Dualrange Valve Notes…

- For use on weir type valves only
- Positioners are required
- Maximum line pressure is 100 psi
- Available size range 1"-6"

Dualrange Control for Fine Throttling Service

Control Systems

With the Dualrange Control Valve
Dualrange Control Valves are used in a variety of throttling applications where fine control is required. Typical applications include flow control, level control, back pressure control and many others. The Dualrange, however, is merely a single component in a complex system known as the control loop. In order to properly apply the Dualrange Control Valve, it is important to understand not only how the control loop works, but also what is trying to be accomplished downstream of the valve. The following schematic shows a typical single valve control loop:



Dualrange Control for Fine Throttling Service

Sizing a Dualrange Control Valve

Dia-Flo® Dualrange valves are modulating control valves. As a result, precautions must be taken in sizing and selecting the valve versus an on-off valve. The following information must be known:

1. **FLUID** – Description of fluid including type of fluid, solids content, abrasive nature, etc.
2. **CONCENTRATION** – This would include chemical concentration and solids concentration.
3. **SPECIFIC GRAVITY**
4. **FLOW RATE** – It is important when sizing a control valve to have the minimum, maximum, and normal flow rates.
5. **PRESSURE DROP** – To be taken across valve, also known as delta-P or Δ P. It's important to have minimum, maximum, and normal also.
6. **INSTRUMENT SIGNAL OR CONTROL SIGNAL** – This would normally be a 3-15 psi control signal. Other pneumatic signals are available such as 6-30, 3-9, etc. In addition, electronic signals are available such as 4-20 ma (milliamp).
7. **LINE SIZE** - When the above information is available, the proper valve size can be determined. You may use the flow formulas that appear in the technical section of this binder.

The diaphragm valve is sensitive to two conditions in a throttling situation. After you have determined valve size the following two tests must be done:

1. **PRESSURE DROP (Δ P) Across Valve** – The internal flow path of a diaphragm valve closely approximates the design of a high recovery valve. The valve is not designed to withstand large pressure drops. To avoid cavitation, Δ P shall be limited to 25% of P1 absolute (P1a). P1a = inlet gage pressure plus 14.7.
2. **VELOCITY OVER THE WEIR AREA** – For optimum performance, velocity over the weir should be limited to 15-20 fps (feet per second) for clear fluids and 8-10 fps for light slurries. See the technical section of this binder for area over the weir and velocity equation.