Automatic Diaphragm Valves
How To Size Saunders Type Valves

For On-Off Service: The pipe size in the system ordinarily will determine the valve size. End connections are available flanged, screwed, socket weld, butt weld or sanitary ends to match the piping system.

For Throttling Service: If properly sized, the diaphragm valve will exhibit excellent straight line response to an instrument air signal with accurate reproducibility — this capability is especially valuable in services handling viscous, abrasive, or fibrous slurries which would rule out other types of control valves.

For throttling service, best results can be obtained if the valve is sized to deliver the desired normal flow at approximately 40% open.

Flow Computations: Since rate of flow depends upon the pressure drop through the valve, we show on page nine the Cv values for the various types of valves at various stages of opening from 0% to 100%.

The Cv is the valve coefficient of flow and represents the flow of water through the valve with a 1 psig. pressure drop. By using the Cv values shown on page nine in the formula for liquid flow or gas flow shown below, the correct valve size can easily be determined.

When using the Cv tables on page nine, use 100% opening for ON-OFF service and 40% opening for THROTTLING service.

Liquid Flow Formula

At pressure drops of other than 1 psig.

$$Q = C_v\sqrt{\frac{\Delta P}{G}}$$

Where:

- Q = actual flow in GPM.
- ΔP = actual pressure drop (psig)
- G = specific gravity
- Cv = flow factor from tables on page nine.

Example:
To find the rate of flow of water through a 3" plastic lined valve at the half-open position with a pressure drop of 5 psig.

Solution:

$$Q = Cv\sqrt{\frac{5}{1}}$$

$$Q = 131\sqrt{5}$$

$$Q = 293 \text{ GPM}$$

Gas Flow Formula

$$Q = 1360\, C_v\sqrt{\frac{\Delta P}{GT}}\quad\sqrt{\frac{P_1 + P_2}{2}}$$

Where:

- Q = Volumetric Flow (SCFH)
- G = Specific Gravity of Gas (air at 0 psig and 60F is 1.0)
- T = Absolute Temperature of Flowing medium (F + 460)
- P_1 = Inlet Pressure (psia)
- P_2 = Outlet Pressure (psia)
- ΔP = (P_1 − P_2) Pressure Drop
- Cv = Flow Factor from tables on page nine.

Example:
To find the flow in SCFH of compressed air at 50 psig through a 2" unlined valve vented to atmosphere. Temperature of the inlet air pressure is 100 F. and the valve is wide open.

Solution:

$$Q = 1360 \times 80\sqrt{\frac{50}{560}}\sqrt{\frac{64.7 + 14.7}{2}}$$

$$Q = 204260 \text{ SCFH}$$