Determining the Value $C_v$

$C_v$ calculation is an interactive process requiring knowledge of valve dynamics, piping geometry factors, and outlet velocities. In practice, this sizing chart is based on empirical values and will cater for most applications.

How To Use the Chart

Example 1. To find $C_v$ value for critical flow application.

- Steam Demand 1500 lb/hr
- Upstream Pressure 55 psi gauge
- Upstream Pressure 70 psi absolute

Refer to Selection Chart Opposite.
1) Draw 1500 lb/hr flow line (A-B)
2) Draw a horizontal line from 70 psi absolute to critical pressure drop line (C-D). At this intersection drop a vertical line.
3) At the crossing point of these two lines, read off the $C_v$ value required, i.e. $C_v$ 13
4) Select valve size required from the appropriate valve type technical information sheet.

Example 2. To find $C_v$ value for non critical flow application.

- Steam Demand 500 lb/hr
- Upstream Pressure 85 psi gauge
- Downstream Pressure 65 psi gauge
- Downstream Pressure 85 psi absolute

1) Draw 500 lb/hr flow line.
2) Draw a horizontal line from 100 psi absolute
3) At the intersection with 20 psi pressure drop, draw a vertical line.
4) At the crossing point with the 500 lb/hr horizontal line read off the $C_v$ value required, i.e. $C_v$ 3.8
5) Select valve size required from the appropriate valve type technical information sheet.

How to Use Formula

Proceed by calculating the required $C_v$ from given flow data, having prior determined whether the flow is critical or sub-critical. The following equations have been adapted from the ISA S75.01 standard to allow for practical everyday use without significant sacrifice in accuracy.

For Steam Service

- Subcritical Flow: When $\Delta P$ is less than $0.81 \sqrt{P_1}$
- Critical Flow: When $\Delta P$ is greater than $0.81 \sqrt{P_1}$

For Saturated Steam

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C_v = \frac{w}{2.1 \sqrt{\Delta P (P_1 + P_2)}} \quad \text{or} \quad C_v = \frac{w}{1.647 (P_1)}
\]

$C_v$ = Valve Coefficient
$P_1$ = Upstream Pressure, psia
$P_2$ = Downstream Pressure, psia
$\Delta P$ = Pressure drop $P_1 - P_2$, psia
$w$ = Flow Rate, lb/h

This chart is for example only. A complete chart for sizing is overleaf.

Local regulation may restrict the use of this product below the conditions quoted. Limiting conditions refer to standard connections only.
In the interests of development and improvement of the product, we reserve the right to change the specification.