Control Valve Cavitation Index (σ)

Cavitation index σ of a control valve for liquid from inlet, outlet and vapour pressures, against the valve's incipient and constant cavitation values.

Method: Cavitation index σ = (p₁ − p_v)/(p₁ − p₂) (ISA-RP75.23 definition)

Input parameters

Unit system: SI

Parameter	Value	Unit
Inlet pressure (absolute)	8.0000	bar
Outlet pressure (absolute)	3.0000	bar
Vapour pressure of the liquid	0.20000	bar
Incipient cavitation index of the valve From the valve maker for the valve type and opening.	2.0000	

Calculated results

Parameter	Value	Unit
Cavitation index (p₁ − p_v)/(p₁ − p₂)	1.5600	
Pressure drop ratio (p₁ − p₂)/(p₁ − p_v)	64.103	%
Largest drop before incipient cavitation	390.00	kPa

Notes for this case

- σ at or below the incipient value: cavitation is expected; consider anti-cavitation trim or staging.

Formula and method

$$\sigma = \frac{p_1 - p_v}{p_1 - p_2}, \quad \Delta p_i = \frac{p_1 - p_v}{\sigma_i}$$

Variables

p_1	Inlet pressure (absolute)	Pa
p_2	Outlet pressure (absolute)	Pa
p_v	Vapour pressure of the liquid	Pa
σ_i	Incipient cavitation index of the valve	-
σ	Cavitation index (p₁ − p_v)/(p₁ − p₂)	-
x_F	Pressure drop ratio (p₁ − p₂)/(p₁ − p_v)	-
Δp_i	Largest drop before incipient cavitation	Pa

Method and standards

Definition of the cavitation index.

Assumptions and limits

- σ_i from the maker usually comes from tests on a small valve at modest pressure. ISA-RP75.23 corrects it for valve size and upstream pressure (scale effects), which generally make larger valves cavitate at a higher σ; those corrections are not applied, so the result may be optimistic for large valves or high pressures.
- Liquid service.

References

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Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/control-valves/valve-cavitation-index

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.