Control Valve Characteristic: Flow at an Opening

Relative flow coefficient of a control valve at a travel for linear, equal-percentage and quick-opening characteristics, with the Cv at that opening.

Method: Inherent flow characteristics (IEC 60534-2-4; ISA-75.11.01)

Input parameters

Unit system: SI

Parameter	Value	Unit
Valve travel (opening)	50.000	%
Inherent rangeability (equal percentage)	50.000	
Rated Cv at full travel	100.00	

Calculated results

Parameter	Value	Unit
Linear: share of rated Cv	50.000	%
Equal percentage: share of rated Cv R^(x−1)	14.142	%
Quick opening (square-root form): share of rated Cv	70.711	%
Cv, linear	50.000	
Cv, equal percentage	14.142	

Notes for this case

- Inherent characteristics at constant DP; installed characteristics differ with valve authority. Real quick-opening trims vary by maker.

Formula and method

$$f_{lin} = x, \quad f_{eq} = R^{x-1}, \quad f_{qo} = \sqrt{x}$$

Variables

x	Valve travel (opening)	-
R	Inherent rangeability (equal percentage)	-
$C_{v,max}$	Rated Cv at full travel	-
f_{lin}	Linear: share of rated Cv	-
f_{eq}	Equal percentage: share of rated Cv R^(x−1)	-
f_{qo}	Quick opening (square-root form): share of rated Cv	-
$C_{v,lin}$	Cv, linear	-
$C_{v,eq}$	Cv, equal percentage	-

Method and standards

Inherent characteristics.

Assumptions and limits

- The ideal equal-percentage curve gives 1/R of rated Cv at zero travel, not zero: a real valve departs from the curve below its rangeability limit and shuts off at the seat.
- Constant DP across the valve.

References

- Inherent flow characteristics (IEC 60534-2-4; ISA-75.11.01)

Report details

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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-characteristic-flow

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.