Sprinkler and Nozzle K-Factor Flow Q = K√P

Flow from a fire sprinkler, spray nozzle or water mist head at a pressure, or the pressure needed for a flow, from its K-factor, in metric and US units.

Method: Orifice discharge Q = K√P (NFPA 13 and EN 12845 K-factor convention)

Input parameters

Unit system: SI

Parameter	Value	Unit
Find	Flow at a pressure	
K-factor, L/min per bar^½ From the sprinkler or nozzle data sheet. A K given in US gpm/psi^½ times 14.42 gives L/min/bar^½.	80.000	
Pressure at the sprinkler or nozzle	1.0000	bar
Flow wanted	80.000	L/min

Calculated results

Parameter	Value	Unit
Flow	80.000	L/min
Pressure	1.0000	bar
K-factor in US gpm per psi^½	5.5493	

Notes for this case

- Minimum pressures, densities and design areas come from the fire code (NFPA 13, EN 12845 or your local rules) and the listing of the sprinkler.

Formula and method

$$Q = K\sqrt{P} \quad (\mathrm{L/min},\ \mathrm{bar}), \quad P = \left(\frac{Q}{K}\right)^2$$

$$K = 14.42\, K_{US}$$

Variables

find	Find	-
K	K-factor, L/min per bar^½	-
P	Pressure at the sprinkler or nozzle	Pa
Q	Flow wanted	m³/s
K_{US}	K-factor in US gpm per psi^½	-

Method and standards

A sprinkler or nozzle behaves as an orifice; its K-factor lumps the area and discharge coefficient. The conversion factor follows from the exact definitions of the US gallon and psi.

Assumptions and limits

- Water at ordinary temperature.
- K-factor from the listing or data sheet.

References

- Orifice discharge Q = K√P (NFPA 13 and EN 12845 K-factor convention)

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/mechanical/fluid-mechanics/sprinkler-nozzle-k-factor

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.