Spray Nozzle Flow at Pressure, Coverage Width and Nozzle Count

Flow of a spray nozzle at a new pressure from its rated flow, the spray coverage width at a distance and the number of nozzles across a width with overlap.

Method: Orifice flow scaling and spray geometry

Input parameters

Unit system: SI

Parameter	Value	Unit
Rated flow	2.0000	L/min
Rated pressure	3.0000	bar
Operating pressure	4.0000	bar
Spray angle	90.000	°
Distance from nozzle to target	0.30000	m
Width to cover	2.0000	m
Overlap between neighbouring sprays	30.000	%

Calculated results

Parameter	Value	Unit
Flow at the operating pressure	2.3094	L/min
Coverage width of one nozzle	600.00	mm
Nozzle spacing	420.00	mm
Nozzles needed across the width	5.0000	
Total flow	11.547	L/min

Notes for this case

- Flow through a nozzle orifice rises with the square root of pressure, $Q_2 = Q_1\sqrt{(p_2/p_1)}$. The theoretical coverage of a spray of angle θ at distance h is 2h tan(θ/2); the actual angle narrows with distance and at low pressure, so overlap neighbouring sprays (20–30 % for flat fans) for even coverage. Spacing is the coverage less the overlap.

Formula and method

$$Q_2 = Q_1\sqrt{\frac{p_2}{p_1}}, \quad w_c = 2h\tan\frac{\theta}{2}, \quad n = \left\lceil \frac{W}{w_c(1-f_o)} \right\rceil$$

Variables

Q_1	Rated flow	m³/s
p_1	Rated pressure	Pa
p_2	Operating pressure	Pa
θ	Spray angle	rad
h	Distance from nozzle to target	m
W	Width to cover	m
f_o	Overlap between neighbouring sprays	-
Q_2	Flow at the operating pressure	m³/s
w_c	Coverage width of one nozzle	m
s	Nozzle spacing	m

n	Nozzles needed across the width	-
Q_t	Total flow	m^3/s

Method and standards

Spray nozzles.

Assumptions and limits

- Water-like liquid; nozzle in its normal pressure range.

References

Orifice flow scaling and spray geometry

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/piping/spray-nozzle-flow-coverage

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.