Flow Nozzle (ISA 1932) Liquid Flow

Liquid flow through an ISA 1932 flow nozzle from differential pressure, pipe and throat bores and fluid properties, with a Reynolds-dependent C.

Method: ISA 1932 nozzle discharge coefficient C = 0.9900 − 0.2262β^4.1 − (0.00175β² − 0.0033β^4.15)(10⁶/Re_D)^1.15 (ISO 5167-3 form)

Input parameters

Unit system: SI

Parameter	Value	Unit
Differential pressure	25.000	kPa
Pipe inside diameter	200.00	mm
Throat diameter	120.00	mm
Density	998.00	kg/m³
Viscosity	1.0000	cP

Calculated results

Parameter	Value	Unit
Diameter ratio	0.60000	
Discharge coefficient	0.96165	
Pipe Reynolds number	524,254	
Volume flow	297.05	m³/h
Mass flow	296.46	t/h

Formula and method

$$Q = \frac{C}{\sqrt{1-\beta^4}} \frac{\pi d^2}{4} \sqrt{\frac{2\Delta p}{\rho}}, \quad C = 0.9900 - 0.2262\beta^{4.1} - (0.00175\beta^2 - 0.0033\beta^{4.15}) \left(\frac{10^6}{Re_D}\right)^{1.15}$$

Variables

Δp	Differential pressure	Pa
D	Pipe inside diameter	m
d	Throat diameter	m
ρ	Density	kg/m³
μ	Viscosity	Pa·s
β	Diameter ratio	-
C	Discharge coefficient	-
Re_D	Pipe Reynolds number	-
Q	Volume flow	m³/s
$\dot{m}$	Mass flow	kg/s

Method and standards

ISA 1932 nozzle.

Assumptions and limits

- Incompressible flow; standard installation.
- The range check is 0.3 ≤ β ≤ 0.8 and 2×10⁴ ≤ Re_D ≤ 10⁷. ISO 5167-3 is tighter for β below 0.44 (a higher lower Reynolds-number limit) and for pipes outside about 50–500 mm; a note appears in those cases.

References

• ISA 1932 nozzle discharge coefficient C = 0.9900 − 0.2262β^4.1 − (0.00175β² − 0.0033β^4.15)(10⁶/Re_D)^1.15 (ISO 5167-3 form)

Report details

Report reference	FCC-HDFR-20AB (the same inputs always give the same reference)
Generated	17 November 2026, 19:35 UTC
Calculator	Flow Nozzle (ISA 1932) Liquid Flow
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/flow/flow-nozzle-isa1932

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.