Duct Velocity and Velocity Pressure

Air velocity and velocity pressure in a round or rectangular duct from flow and size, with the air density from temperature and pressure.

Method: Velocity pressure p_v = ρv²/2 (ASHRAE Handbook—Fundamentals (2017), ch. 21); dry-air density from the ideal gas law

Input parameters

Unit system: SI

Parameter	Value	Unit
Air flow	8,000.0	m³/h
Duct shape	Rectangular	
Diameter (round)	500.00	mm
Width (rectangular)	600.00	mm
Height (rectangular)	400.00	mm
Air temperature	20.000	°C
Barometric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Air density (dry air)	1.2042	kg/m³
Velocity	9.2593	m/s
Velocity pressure ρv²/2	5.2636	mmWC

Formula and method

$$v = \frac{\dot{V}}{A}, \quad p_v = \frac{\rho v^2}{2}, \quad \rho = \frac{pM}{RT}$$

Variables

$\dot{V}$	Air flow	m³/s
shape	Duct shape	-
D	Diameter (round)	m
W	Width (rectangular)	m
H	Height (rectangular)	m
T	Air temperature	K
p	Barometric pressure (absolute)	Pa
ρ	Air density (dry air)	kg/m³
v	Velocity	m/s
p_v	Velocity pressure ρv²/2	Pa

Method and standards

Bernoulli.

Assumptions and limits

- Uniform velocity.
- Dry air of standard composition: humidity and flue-gas composition change the density (flue gas is often 3–5 % denser than air at the same temperature), so for flue gas use a calculator that takes its density.

References

• Velocity pressure p_v = ρv²/2 (ASHRAE Handbook—Fundamentals (2017), ch. 21); dry-air density from the ideal gas law

Report details

Report reference	FCC-F6W5-63FQ (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Duct Velocity and Velocity Pressure
Method last reviewed	12 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/hvac/ducts/duct-velocity-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.