Duct Leakage: Scaling a Test Result to Operating Pressure

Duct leakage at operating pressure from a leakage test at another pressure by the power law, as a share of system air flow.

Method: Power-law leakage Q = C Δpⁿ with n = 0.65 for ducts (ASHRAE Handbook—Fundamentals (2017), ch. 21, duct leakage)

Input parameters

Unit system: SI

Parameter	Value	Unit
Leakage measured at the test pressure	50.000	L/s
Test pressure	50.986	mmWC
Average operating pressure	30.591	mmWC
Flow exponent 0.5 for sharp orifices, 1 for laminar cracks; 0.65 is the usual assumption for ducts.	0.65000	
System air flow	9,000.0	m³/h

Calculated results

Parameter	Value	Unit
Leakage at operating pressure	35.873	L/s
Share of system air flow	1.4349	%

Formula and method

$$\dot{V}_2 = \dot{V}_1 \left(\frac{\Delta p_2}{\Delta p_1} \right)^n, \quad x = \frac{\dot{V}_2}{\dot{V}_s}$$

Variables

$\dot{V}_1$	Leakage measured at the test pressure	m³/s
Δp_1	Test pressure	Pa
Δp_2	Average operating pressure	Pa
n	Flow exponent	-
$\dot{V}_s$	System air flow	m³/s
$\dot{V}_2$	Leakage at operating pressure	m³/s
x	Share of system air flow	-

Method and standards

Power law.

Assumptions and limits

- Same leak paths at both pressures.
- The share is not shown when the system air flow is zero.

References

• Power-law leakage Q = C Δpⁿ with n = 0.65 for ducts (ASHRAE Handbook—Fundamentals (2017), ch. 21, duct leakage)

Report details

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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-leakage-pressure-scaling

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Reopens the calculator with the inputs of this report.