Pneumatic Cylinder Air Consumption

Free air consumed by a double- or single-acting pneumatic cylinder per cycle and per minute from bore, rod, stroke, pressure and cycles, with the force.

Method: Swept volume × compression ratio (p + p_atm)/p_atm

Input parameters

Unit system: SI

Parameter	Value	Unit
Bore	63.000	mm
Rod diameter	20.000	mm
Stroke	200.00	mm
Supply pressure (gauge)	6.0000	bar
Cycles per minute	10.000	
Cylinder	Double acting	

Calculated results

Parameter	Value	Unit
Free air per cycle	8.1956	L
Free air consumption	81.956	L/min
Theoretical extend force	1.8703	kN

Notes for this case

- Free air at atmospheric pressure; add the volume of hoses and valve passages, and leakage, in practice 10 to 20 % more.

Formula and method

$$V_c = [As + (A - a)s]\frac{p + p_{atm}}{p_{atm}}, \quad Q = V_c\, n_c$$

Variables

D	Bore	m
d	Rod diameter	m
S	Stroke	m
p	Supply pressure (gauge)	Pa
n_c	Cycles per minute	-
acting	Cylinder	-
V_c	Free air per cycle	m³
Q	Free air consumption	m³/s
F	Theoretical extend force	N

Method and standards

Swept volume at supply pressure converted to free air.

Assumptions and limits

- Full stroke each cycle.
- Free air is at standard atmospheric pressure (101.325 kPa) and the supply-air temperature (isothermal filling); a FAD or ANR figure quoted at another reference temperature differs slightly.

References

- Swept volume × compression ratio (p + p_atm)/p_atm

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/hydraulics-pneumatics/pneumatic-cylinder-air

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.