Air Receiver Size (Compressed Air Tank)

Volume of a compressed-air receiver to supply a demand for a set time while the pressure falls between two limits, by the isothermal storage equation.

Method: Isothermal ideal-gas storage equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Air drawn from the receiver (free air) The demand not met by the compressors during the time: a peak above their output, or the full demand while a standby compressor starts.	10.000	m³/min
Time the receiver must supply it	1.0000	min
Pressure at the start (cut-out)	8.0000	bar g
Lowest acceptable pressure	6.0000	bar g
Atmospheric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Receiver volume	5.0663	m³
Free air released	10.000	m³

Notes for this case

- Isothermal: the air in the receiver stays at room temperature. Choose the next standard size up.

Formula and method

$$V = \frac{\dot{V}_a \, t \, p_a}{p_1 - p_2} \qquad V_a = \dot{V}_a \, t$$

Variables

$\dot{V}_a$	free air drawn from the receiver	m³/s
t	time	s
p_1	start pressure	Pa
p_2	lowest pressure	Pa
p_a	atmospheric pressure	Pa
V	receiver volume	m³
V_a	free air released	m³

Method and standards

Boyle's law at constant temperature between the two receiver pressures.

Assumptions and limits

- Isothermal; leaks during the time not included. For a fast drawdown (close to adiabatic) the volume needed is up to about 1.4 times larger.

References

- Isothermal ideal-gas storage equation

Report details

Report reference	FCC-NYCB-VPY5 (the same inputs always give the same reference)
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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/compressors/air-receiver-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.