Electric Duct Heater: Power and Current

Power of an electric duct heater to warm an air flow from one temperature to another (moist-air enthalpy), with the current for a single- or three-phase supply.

Method: Moist-air energy balance (ASHRAE Handbook—Fundamentals ch. 1); P = √3 U I for three-phase

Input parameters

Unit system: SI

Parameter	Value	Unit
Air flow (at the inlet)	3,000.0	m³/h
Inlet air temperature	10.000	°C
Inlet relative humidity	50.000	%
Outlet air temperature	30.000	°C
Supply voltage (line)	415.00	V
Supply	Three-phase	
Barometric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Heater power	20.922	kW
Line current	29.106	A
Outlet relative humidity	14.460	%

Formula and method

$$P = \dot{m}_{da}\left[h(T_2, W) - h(T_1, W)\right], \quad I = \frac{P}{\sqrt{3}\,U}\ (\mathrm{three-phase}), \quad I = \frac{P}{U}\ (\mathrm{single-phase})$$

Variables

$\dot{V}$	Air flow (at the inlet)	m³/s
T_1	Inlet air temperature	K
φ_1	Inlet relative humidity	-
T_2	Outlet air temperature	K
U	Supply voltage (line)	V
phases	Supply	-
p	Barometric pressure (absolute)	Pa
P	Heater power	W
I	Line current	A
φ_2	Outlet relative humidity	-

Method and standards

Energy balance.

Assumptions and limits

- Resistive heater, unity power factor.

References

- Moist-air energy balance (ASHRAE Handbook—Fundamentals ch. 1); P = √3 U I for three-phase

Report details

Report reference	FCC-1DE1-ZKXE (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Electric Duct Heater: Power and Current
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/psychrometry/duct-heater-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.