Average Power Factor from kWh and kvarh Readings

Average power factor over a billing period from the kWh and kvarh consumed (or kWh and kVAh), with the kVAh, tan φ and the phase angle.

Method: Power triangle applied to energies

Input parameters

Unit system: SI

Parameter	Value	Unit
Active energy in the period (kWh)	120,000	
Reactive energy in the period (kvarh)	60,000	

Calculated results

Parameter	Value	Unit
Average power factor	0.89443	
Apparent energy (kVAh)	134,164	
tan φ (kvarh / kWh)	0.50000	
Average phase angle	26.565	°

Formula and method

$$\cos\varphi = \frac{E_P}{\sqrt{E_P^2 + E_Q^2}}, \quad E_S = \sqrt{E_P^2 + E_Q^2}$$

Variables

E_P	Active energy in the period (kWh)	-
E_Q	Reactive energy in the period (kvarh)	-
$\cos\varphi$	Average power factor	-
E_S	Apparent energy (kVAh)	-
$\tan\varphi$	tan φ (kvarh / kWh)	-
φ	Average phase angle	rad

Method and standards

Power triangle with energies over the period.

Assumptions and limits

- Lagging kvarh only; harmonics ignored.
- kVAh is the vector sum of the period energies; an integrating kVAh meter reads higher when the load varies.

References

- Power triangle applied to energies

Report details

Report reference	FCC-0Z6C-XFD0 (the same inputs always give the same reference)
Generated	17 November 2026, 19:45 UTC
Calculator	Average Power Factor from kWh and kvarh Readings
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/electrical/power/power-factor-from-meter-readings

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.