Combined Power Factor and Current of Several Loads

Total real, reactive and apparent power, overall power factor and line current of up to four loads with different power factors, lagging or leading.

Method: Power triangle summation

Input parameters

Unit system: SI

Parameter	Value	Unit
Line-to-line voltage	415.00	V
Load 1 power	50.000	kW
Load 1 power factor (negative = leading)	0.80000	
Load 2 power	30.000	kW
Load 2 power factor	0.90000	
Load 3 power	20.000	kW
Load 3 power factor	1.0000	
Load 4 power	0	kW
Load 4 power factor	0.85000	

Calculated results

Parameter	Value	Unit
Total real power	100.00	kW
Total reactive power (+ lagging)	52.030	kvar
Total apparent power	112.73	kVA
Overall power factor	0.88711	
Line current	156.82	A

Notes for this case

• Add real and reactive powers separately (Q = P·tan φ, negative for leading loads); never average power factors. The overall power factor is P/S.

Formula and method

$$P = \sum P_k, \quad Q = \sum P_k \tan \varphi_k, \quad pf = \frac{P}{\sqrt{P^2 + Q^2}}$$

Variables

V	Line-to-line voltage	V
P_1	Load 1 power	W
pf_1	Load 1 power factor (negative = leading)	-
P_2	Load 2 power	W
pf_2	Load 2 power factor	-
P_3	Load 3 power	W
pf_3	Load 3 power factor	-
P_4	Load 4 power	W
pf_4	Load 4 power factor	-
P	Total real power	W

Q	Total reactive power (+ lagging)	var
S	Total apparent power	VA
pf	Overall power factor	-
I	Line current	A

Method and standards

Power summation.

Assumptions and limits

- Balanced three-phase loads at one voltage.

References

Power triangle summation

Report details

Report reference	FCC-B63Q-06C3 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Combined Power Factor and Current of Several Loads
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 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/combined-power-factor-loads

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.