Inverter Reactive Power Capability at an Output

Reactive power an inverter can supply or absorb at a real power output from its kVA rating and minimum power factor.

Method: Inverter PQ capability

Input parameters

Unit system: SI

Parameter	Value	Unit
Inverter apparent power rating	3.3000	MVA
Real power output	3.0000	MW
Minimum power factor allowed	90.000	%

Calculated results

Parameter	Value	Unit
Reactive limit from the rating √(S² − P²)	1.3748	Mvar
Reactive limit from the power factor P tan φ	1.4530	Mvar
Reactive power available	1.3748	Mvar
Real power at which the rating limit binds	2.9700	MW

Notes for this case

• Capability circle Q ≤ √(S² − P²) intersected with the power-factor limit Q ≤ P tan(acos pf). Many grid codes require reactive capability at full output, so inverters are oversized in apparent power (e.g. 1.1 × P).

Formula and method

$$Q_{max} = \min\left(\sqrt{S^2 - P^2},\ P\tan(\arccos pf_{min})\right)$$

Variables

S	Inverter apparent power rating	VA
P	Real power output	W
pf_{min}	Minimum power factor allowed	-
Q_S	Reactive limit from the rating √(S² − P²)	var
Q_{pf}	Reactive limit from the power factor P tan φ	var
Q_{max}	Reactive power available	var
$P_{Q,full}$	Real power at which the rating limit binds	W

Method and standards

PQ capability.

Assumptions and limits

- Nominal voltage; ideal capability circle.

References

Inverter PQ capability

Report details

Report reference	FCC-DT75-2YDC (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Inverter Reactive Power Capability at an Output
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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/inverter-reactive-power-capability

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.