Short-Circuit Ratio and Grid Strength at a Connection

Short-circuit level, short-circuit ratio and X/R ratio at a generator's connection point from the grid impedance, with an approximate voltage change at full export.

Method: Short-circuit level and short-circuit ratio

Input parameters

Unit system: SI

Parameter	Value	Unit
Line-to-line voltage at the connection	33.000	kV
Grid Thevenin resistance (per phase)	1.5000	Ω
Grid Thevenin reactance (per phase)	6.0000	Ω
Plant rated output	50.000	MW

Calculated results

Parameter	Value	Unit
Short-circuit level V²/|Z|	176.08	MVA
Short-circuit ratio S_sc/P	3.5216	
X/R ratio	4.0000	
Approximate voltage rise at full export, unity power factor	6.8871	%

Notes for this case

• S_sc = V²/|Z| and SCR = S_sc/P. Inverter-based plants on weak grids (SCR below about 3) risk voltage instability and control interactions and may need grid-forming capability.

Formula and method

$$S_{sc} = \frac{V^2}{|Z|}, \quad SCR = \frac{S_{sc}}{P}$$

Variables

V	Line-to-line voltage at the connection	V
R	Grid Thevenin resistance (per phase)	Ω
X	Grid Thevenin reactance (per phase)	Ω
P	Plant rated output	W
S_{sc}	Short-circuit level V²/	Z
SCR	Short-circuit ratio S_sc/P	-
X/R	X/R ratio	-
$\Delta V/V$	Approximate voltage rise at full export, unity power factor	-

Method and standards

Grid strength.

Assumptions and limits

- Thevenin equivalent; steady state.

References

Short-circuit level and short-circuit ratio

Report details

Report reference	FCC-0CZK-BP28 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Short-Circuit Ratio and Grid Strength at a Connection
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/short-circuit-ratio-grid-strength

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.