Per-Unit Impedance Base Conversion

Convert a per-unit or percent impedance from one MVA and kV base to another, with the base current, base impedance and the impedance in ohms.

Method: Per-unit system (Stevenson, Elements of Power System Analysis)

Input parameters

Unit system: SI

Parameter	Value	Unit
Impedance on the old base	6.0000	%
Old base power	2.0000	MVA
Old base voltage	11.000	kV
New base power	100.00	MVA
New base voltage	11.000	kV

Calculated results

Parameter	Value	Unit
Impedance on the new base	300.00	%
Base impedance (new base)	1.2100	Ω
Base current (new base)	5,248.6	A
Impedance in ohms	3.6300	Ω

Formula and method

$$Z_{pu,new} = Z_{pu,old}\,\frac{S_{new}}{S_{old}}\left(\frac{V_{old}}{V_{new}}\right)^2, \quad Z_b = \frac{V^2}{S}, \quad I_b = \frac{S}{\sqrt{3}\,V}$$

Variables

$Z_{pu,old}$	Impedance on the old base	-
S_{old}	Old base power	VA
V_{old}	Old base voltage	V
S_{new}	New base power	VA
V_{new}	New base voltage	V
$Z_{pu,new}$	Impedance on the new base	-
Z_b	Base impedance (new base)	Ω
I_b	Base current (new base)	A
Z	Impedance in ohms	Ω

Method and standards

Per-unit definitions, three-phase bases.

Assumptions and limits

- Three-phase power and line voltage bases.

References

- Per-unit system (Stevenson, Elements of Power System Analysis)

Report details

Report reference	FCC-KE69-A0N2 (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Per-Unit Impedance Base Conversion
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/protection/per-unit-base-conversion

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.