Voltage Distortion from Harmonic Currents and Fault Level

Individual harmonic voltages and voltage THD at a bus from the harmonic currents of a load and the system short-circuit level, assuming an inductive source.

Method: Harmonic voltage drop across the source reactance

Input parameters

Unit system: SI

Parameter	Value	Unit
Bus voltage (line-to-line)	415.00	V
Short-circuit level	20.000	MVA
Fundamental current	500.00	A
5th harmonic current	150.00	A
7th harmonic current	90.000	A
11th harmonic current	40.000	A
13th harmonic current	30.000	A

Calculated results

Parameter	Value	Unit
5th harmonic voltage	2.6955	%
7th harmonic voltage	2.2642	%
11th harmonic voltage	1.5814	%
13th harmonic voltage	1.4017	%
Voltage THD	4.1058	%
Current THD	36.387	%

Notes for this case

• V_h = h·X_s·I_h with X_s = V²/S_sc (source reactance rising with frequency). Background distortion and capacitor resonance are ignored: a capacitor bank near a resonant order can multiply these voltages.

Formula and method

$$X_s = \frac{V^2}{S_{sc}}, \quad V_h = \frac{h X_s I_h}{V/\sqrt{3}}, \quad THD_V = \sqrt{\sum V_h^2}$$

Variables

V	Bus voltage (line-to-line)	V
S_{sc}	Short-circuit level	VA
I_1	Fundamental current	A
I_5	5th harmonic current	A
I_7	7th harmonic current	A
I_{11}	11th harmonic current	A
I_{13}	13th harmonic current	A
V_5	5th harmonic voltage	-
V_7	7th harmonic voltage	-
V_{11}	11th harmonic voltage	-
V_{13}	13th harmonic voltage	-

THD_V	Voltage THD	-
THD_I	Current THD	-

Method and standards

Harmonic voltage.

Assumptions and limits

- Inductive source; no background distortion.

References

Harmonic voltage drop across the source reactance

Report details

Report reference	FCC-SH67-YDH0 (the same inputs always give the same reference)
Generated	23 November 2026, 17:50 UTC
Calculator	Voltage Distortion from Harmonic Currents and Fault Level
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-quality/voltage-thd-from-harmonic-currents

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.