Total Harmonic Distortion (THD) and TDD of Current

Total harmonic distortion, total demand distortion, total rms current and distortion power factor from the fundamental and the harmonic currents of a load.

Method: IEEE 519 definitions of THD and TDD; IEC 61000-2-2 harmonic definitions

Input parameters

Unit system: SI

Parameter	Value	Unit
Fundamental current (50 or 60 Hz)	100.00	A
3rd harmonic	5.0000	A
5th harmonic	18.000	A
7th harmonic	10.000	A
11th harmonic	6.0000	A
13th harmonic	4.0000	A
All other harmonics together (rms)	0	A
Maximum demand load current (for TDD)	120.00	A

Calculated results

Parameter	Value	Unit
Harmonic current, rms of all harmonics	22.383	A
Total harmonic distortion (on the fundamental)	22.383	%
Total demand distortion (on the maximum demand current)	18.653	%
Total rms current	102.47	A
Distortion power factor $1/\sqrt{(1 + \mathrm{THD}^2)}$	97.585	%

Notes for this case

- The same sums give voltage THD when voltages are entered. Limits at the point of common coupling come from IEEE 519 or your utility, not from this page.

Formula and method

$$I_H = \sqrt{\sum_h I_h^2}, \quad THD_I = \frac{I_H}{I_1}, \quad TDD = \frac{I_H}{I_L}$$

$$I_{rms} = \sqrt{I_1^2 + I_H^2}, \quad \cos\varphi_d = \frac{1}{\sqrt{1 + THD^2}}$$

Variables

I_1	Fundamental current (50 or 60 Hz)	A
I_3	3rd harmonic	A
I_5	5th harmonic	A
I_7	7th harmonic	A
I_{11}	11th harmonic	A
I_{13}	13th harmonic	A
I_o	All other harmonics together (rms)	A
I_L	Maximum demand load current (for TDD)	A
I_H	Harmonic current, rms of all harmonics	A

THD_I	Total harmonic distortion (on the fundamental)	-
TDD	Total demand distortion (on the maximum demand current)	-
I_{rms}	Total rms current	A
$\cos\varphi_d$	Distortion power factor 1/√(1 + THD²)	-

Method and standards

The harmonic currents are combined as a root-sum-square and related to the fundamental (THD) or to the maximum demand load current (TDD), as defined in IEEE 519. The distortion power factor shows how much the harmonics lower the true power factor.

Assumptions and limits

- Steady-state rms values.
- Limits are for the point of common coupling in your utility's rules.

References

- IEEE 519 definitions of THD and TDD
- IEC 61000-2-2 harmonic definitions

Report details

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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/harmonic-distortion-thd

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.