Characteristic Harmonics of a p-Pulse Converter

Characteristic harmonic orders kp ± 1 of an ideal p-pulse rectifier, the first two harmonic currents by the 1/h rule and current THD up to a chosen order.

Method: Characteristic harmonics of ideal converters

Input parameters

Unit system: SI

Parameter	Value	Unit
Pulse number	6-pulse	
Fundamental current	500.00	A
Highest order counted	49.000	

Calculated results

Parameter	Value	Unit
Lowest characteristic order	5.0000	
Current at the lowest order	100.00	A
Current at the next order	71.429	A
Current THD (ideal)	30.015	%

Notes for this case

• Ideal rectangular line current: only orders h = kp ± 1 appear, with I_h = I₁/h. Real converters with commutation overlap have lower high-order harmonics; drives with no DC choke draw much more 5th and 7th (THD 80–120 %). Twelve-pulse cancellation needs equal loading and phase-shifted transformer windings.

Formula and method

$$h = kp \pm 1, \quad I_h = \frac{I_1}{h}, \quad THD_I = \sqrt{\sum_h \frac{1}{h^2}}$$

Variables

p	Pulse number	-
I_1	Fundamental current	A
h_{max}	Highest order counted	-
h_1	Lowest characteristic order	-
I_{h_1}	Current at the lowest order	A
I_{h_1+2}	Current at the next order	A
THD_I	Current THD (ideal)	-

Method and standards

Converter harmonics.

Assumptions and limits

- Ideal commutation; constant DC current; balanced supply.

References

Characteristic harmonics of ideal converters

Report details

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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/converter-characteristic-harmonics

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.