Neutral Current from Triplen Harmonics

Neutral current in a three-phase four-wire system with balanced single-phase non-linear loads, from phase current and its 3rd, 9th and 15th harmonic content.

Method: Triplen harmonic addition in the neutral; I_N = 3√ΣI_3k² (power quality definitions)

Input parameters

Unit system: SI

Parameter	Value	Unit
Fundamental phase current	100.00	A
3rd harmonic share	70.000	%
9th harmonic share	15.000	%
15th harmonic share	5.0000	%

Calculated results

Parameter	Value	Unit
Phase rms current (triplens and fundamental)	123.09	A
Neutral rms current	215.29	A
Neutral-to-phase ratio	1.7491	

Notes for this case

• Balanced loads: fundamental and non-triplen harmonics cancel in the neutral, triplens add arithmetically (×3). Other harmonics in the phase current are not included here.

Formula and method

$$I_N = 3\sqrt{I_3^2 + I_9^2 + I_{15}^2}, \quad I_{ph} = \sqrt{I_1^2 + I_3^2 + I_9^2 + I_{15}^2}$$

Variables

I_1	Fundamental phase current	A
I_3/I_1	3rd harmonic share	-
I_9/I_1	9th harmonic share	-
I_{15}/I_1	15th harmonic share	-
I_{ph}	Phase rms current (triplens and fundamental)	A
I_N	Neutral rms current	A
I_N/I_{ph}	Neutral-to-phase ratio	-

Method and standards

Triplen addition.

Assumptions and limits

- The phase rms current includes only the fundamental and the triplen harmonics entered. Real rectifier currents also carry 5th, 7th, 11th … harmonics, which raise the phase current but cancel in the neutral, so the neutral-to-phase ratio shown is an upper value.
- Balanced single-phase loads.

References

• Triplen harmonic addition in the neutral
• I_N = 3√ΣI_3k² (power quality definitions)

Report details

Report reference	FCC-JKQS-3ARX (the same inputs always give the same reference)
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Release checks	2 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/triplen-neutral-current

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.