CHAUVIN ARNOUX®
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NETWORK DIAGNOSTICS

WITH A THREE-PHASE NETWORK AND POWER ANALYSER

An SME specialized in selling IT equipment regularly suffers from power supply outages because the LV circuit-breaker is tripped. As the overload LED is lit, the customer first looks at the possible causes of the overload. During these measurements, the currents in the neutral are also monitored.

Indeed, the current flowing in the neutral conductor corresponds to the unbalance between the single-phase loads connected between the phases rather than the presence of loads producing triplen harmonics.

A measurement campaign is set up to check whether the disturbances on the network justify tripping of the main circuit-breaker.

According to the earthing scheme (IT) of the company's electrical installation, the settings of the circuit-breaker as a function of the source power are correct. The connections comply with the requirements of the standards. In accordance with the regulations, the neutral conductor must have half-neutral protection due to its cross-section.

Power survey

Measurement campaign

EN 61000-2-4

EN 50160

Measure up

The current

The characteristics of the current in the neutral conductor, obtained during the measurement campaign, show a maximum value of 67 A. This does not justify tripping, as the overload setting on the circuit-breaker is 600 A.

Further measurements are performed after replacing the circuit-breaker and the adjustable rating plugs. The trip test is OK.

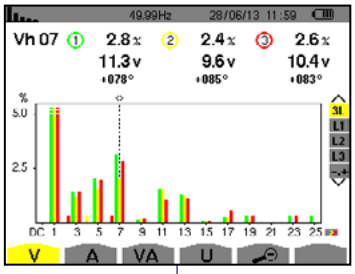
The currents are measured again:
The max. value of the currents flowing on each phase is approximately 50% of the value of the tripping threshold. The neutral current is approximately 8 times lower than the threshold.

The measurement campaign will help to identify the quality of the network, and above all the currents in the neutral, in order to determine whether the disturbances are causing the tripping. The first series of measurements is performed downstream of the circuit-breaker with a Qualistar+ C.A 8336, as per the EN 50160 and EN 61000-2-4 standards.

The standards

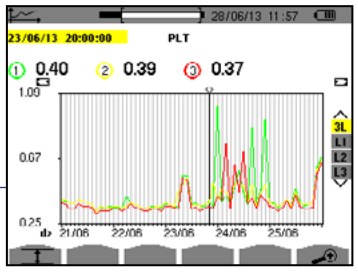
- **EN 61000-2-4**: electromagnetic compatibility – part 2, Compatibility levels in industrial plants for low-frequency conducted disturbances.
- **EN 50160**: voltage characteristics of electricity supplied by public distribution networks.

The total harmonic distortion (THD) values are correct.
However, the measurements of the harmonics show high values for 5th and 7th order harmonics; but remain below the maximum values tolerated by the European standard.



The other measurements performed, at a constant frequency of 50 Hz, do not show any particular dysfunction **or quality problems in the voltage supplied:**

- Flicker: OK
- Unbalance: OK
- Slow variations: OK
- Overvoltages: none
- etc.



Voltage dips, short outages and long outages (> 10 minutes) were captured. According to the measurements, these disturbances mainly affected L1.

Once again, these characteristics do not justify tripping of the circuit-breaker.

	L1	L2	L1	L123-N
Overvoltages	0	0	0	0
Voltage dips	16	4	9	9
Short outages	12	4	4	16
Long outages	4	1	1	1

ANALYSIS

Analysis of these various measurements allows us to formulate the following hypothesis:
when one of the phases exceeds half the value of the tripping threshold, the circuit-breaker switches to overload.
As the adjustable rating plugs make it possible to select the time before tripping for overloads, tests are performed with various settings.
The results point to the rating plugs, which seem to treat the current measured on one phase as the neutral current.

CONCLUSION

It turns out that the rating plug for the neutral channel was inverted with the plug for one of the phases, as suggested in the analysis.

Only an inspection carried out on their site by the technical teams from the circuit-breaker manufacturer enables the hypothesis to be confirmed.

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