BACHMANN Whitepaper

Residual-current analysis

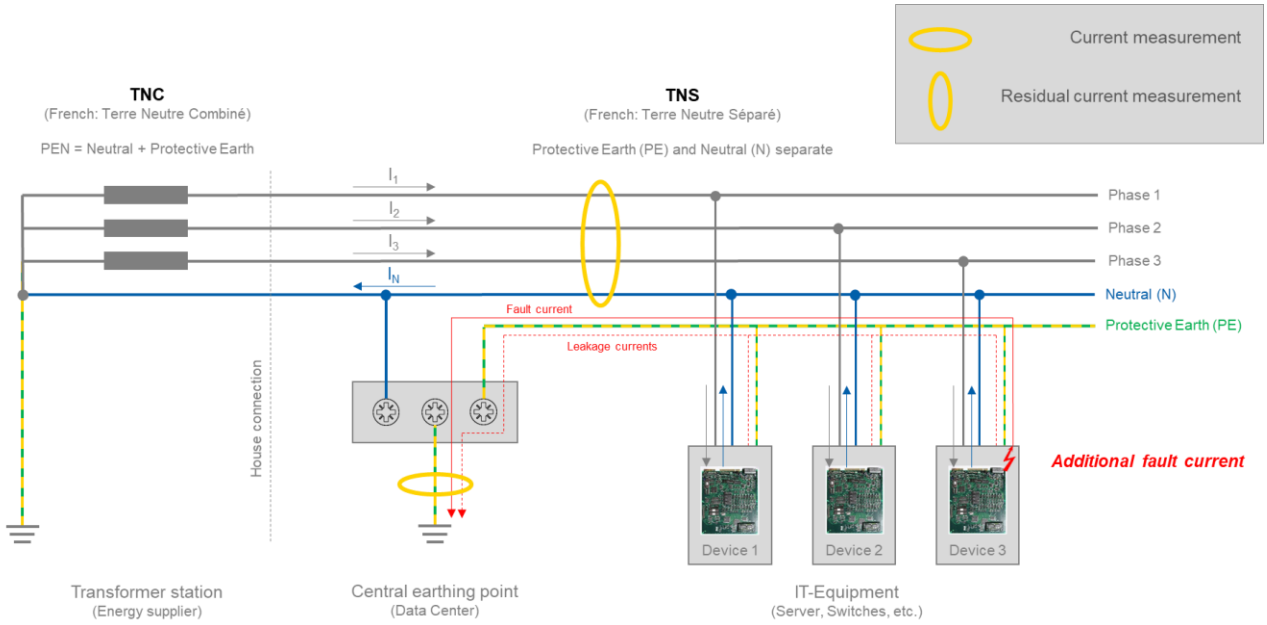
Predicting failure risks using big data in the cloud

Availability and operating costs

Safe and reliable operation of a data centre's electrical system can be guaranteed by a combination of regular maintenance intervals and a superordinate management system comprising residual-current monitoring and targeted analysis of measured values. On the one hand, regular maintenance work forms the prerequisite for component or system longevity, yet on the other, represents an immense cost factor. New concepts are emerging on the market, and the IT sector is following trends in the automotive industry. Leading car manufacturers dispensed with fixed maintenance intervals long ago, preferring sensors which determine the exact condition of brake or clutch pads. The vehicle information system lets the driver know in advance when their vehicle needs maintenance or worn parts must be replaced. In addition, independent repair shops are now authorised to perform maintenance on vehicles. As such, customers have the advantage of choosing a low-cost, time-optimised solution. So why not apply the same principle to data centres?

Fault currents vs leakage currents

The switch power supplies of modern IT components (servers, switches, routers, etc.) generate operational leakage currents, which in large data centres amount to several amperes [A] on the protective conductor (green/yellow). Leakage currents of this nature can be measured in TN-S networks at the central earthing point.

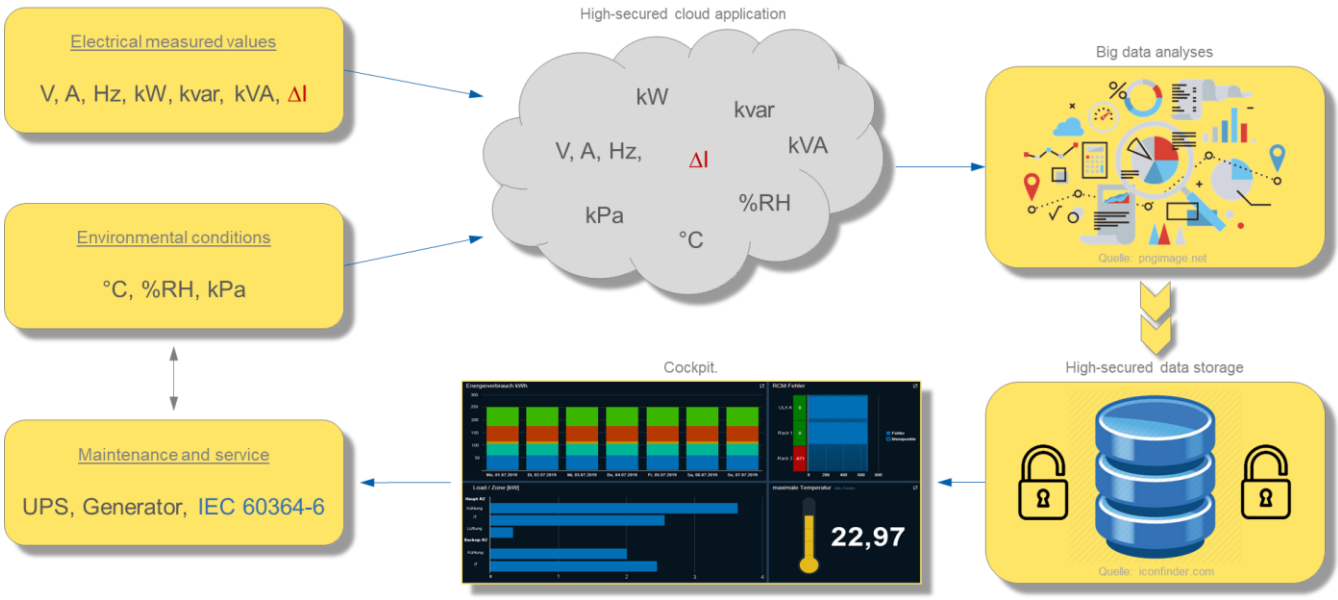


In the first instance, this constitutes a risk to life and limb because the protective conductor actually has a protective function (baseline protection). The responsible electrical manager should therefore take care to monitor these leakage currents.

Permanent monitoring with measuring technology
Permanent monitoring of leakage currents lets the electrical manager correctly assess the electrotechnical condition of the data centre, detect deviations at an early stage and initiate appropriate countermeasures. Another benefit is that the measurement logs of an electrical retest in line with international regulations (IEC 60364-6 Low voltage electrical installations – Part 6: Verification) can be used to prove the proper condition of the system, thus eliminating the need for insulation measurement and shutdown. However, which electrician (electrical manager or qualified electrician) deems themselves capable of distinguishing leakage currents and residual currents carrying the potential risk of failure for the data centre?

Preventative current analysis using big data in the cloud
Power-supply leakage currents are generally pulsating currents, while fault currents take the form of classic DC fault currents caused by component wear and tear. If these DC fault currents are greater than 6 mA, they are only detected by Type B RCM sensors. But who then decides what is “normal” and what is “dangerous”?

Very few specialists actually possess the many years of experience required to classify residual currents accurately and make definitive statements. Such experience relates to both basic electrotechnical applications and special metrological characteristics in systems with high leakage currents. Both can be combined in a unique solution approach: the measurement data from the RCM sensors in a data centre are transmitted to a high-security cloud application, where they are compared with big data from many current analyses in other data centres. In this way, the measured values of leakage/fault currents can be evaluated and correctly interpreted by experienced measurement engineers. Parallels to use-oriented maintenance in the automotive industry can be identified here.



Operators and IT administrators are offered two additional benefits:

the cloud application sends the operator or user daily or weekly reports via email drawing their attention to possible or potential dangers. However, the measurement data are not only processed high-secured, but are also permanently stored immune to falsification. Finally, the resultant measurement logs can also be used as proof of the safe insulation level for the overall system, thus replacing insulation measurement as part of a retest in line with IEC 60364-6. This measurement and evaluation procedure is recognised by both the employers' liability insurance association and insurance companies.

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