

HOTnote

Current Zero and Acceptance Testing FAQ

"Current zero" in General

What does "Current zero (CZ)" mean?

Current zero (CZ) refers to the interruption phenomena in high power circuit-breakers. Today it seems improbable that high voltage circuits could be interrupted economically by other means than the electric arc.

What are the current zero measurements used for?

All circuit-breakers are working based on contacts moving away from each other, thus creating an electrical arc between the contacts. The current zero phenomena is an indicator for the pressure, temperature, ion density, plasma flow, etc. Current zero measurements are used to understand the phenomena of the arc and to identify the dominant parameters for a successful interruption of the current.

Who is interested in current zero measurements?

Current zero measurements are performed by researchers to understand and improve the descriptive mathematical model of the arc. With the knowledge of the dominant parameters, it becomes feasible to improve the circuit-breaker design and to reach even higher interruption capability.

International Standards and Acceptance Testing

Does an international standard exist for CZ measurements?

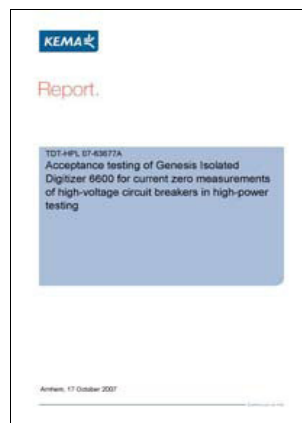
No, CZ measurements are a research tool to understand the phenomena. The international standards for circuit-breakers cover the test procedures and requirements for the final product.

What is acceptance testing used for?

Acceptance testing is normally used to verify the published specifications of a product by a third party test house. The external test house uses its expertise to act as an independent authority between buyer and seller.

Who defines what to test?

Mainly the buyer specifies, which of the published specifications of the product he wants to have verified. The external test house will use international standards and procedures where applicable, combined with experience from the past.



Hardware Requirements for a Current Zero Measurement System

Why is the vertical resolution so important?

A high dynamic range of the input is required because for example currents in the order of 100mA should be measured immediately after the interruption of many tens of kA of short circuit current.

Why is the required bandwidth so important?

Although the mains frequency is most of the time only 50Hz or 60Hz, the relevant processes occur on a sub-microsecond scale.

Why is immunity against fast transients so important?

Very severe electrical transients arise both in current as well as in voltage during the switching process.

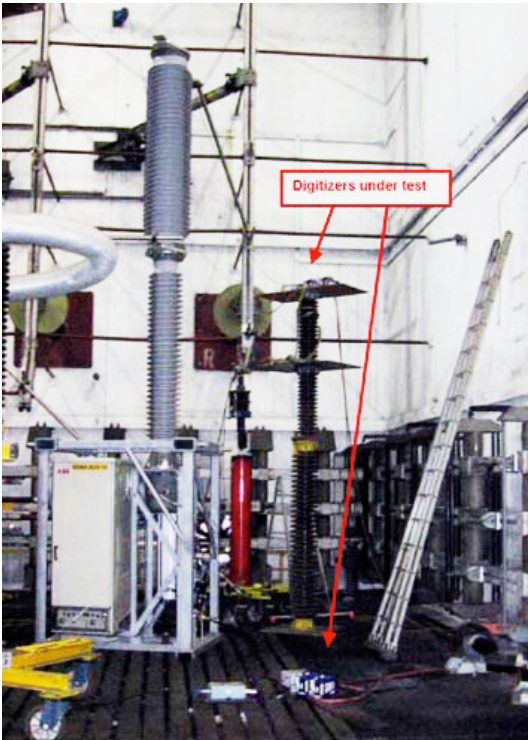
Why is immunity against magnetic fields so important?

A fiber optic digitizer should be placed as close as possible to the test object to keep the analogue cables as short as possible and so to get the best possible measurement results.

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What were the criteria to meet the acceptance test performed on the isolated digitizer 6600?

A fiber optic digitizer needs to deliver at least the same performance in terms of signal quality as the existing KEMA system (comparison with known system). In terms of electromagnetic immunity, the system needs to withstand the transients and the magnetic fields and operate undisturbed and uninterrupted.



Short line fault test set-up

Acceptance testing results

How relevant are the results of the acceptance test?

The acceptance test is designed to verify the proper operation under the most severe conditions in a high-power lab. Passing this worst case scenario implies that the operation under less severe conditions should not cause any significant problems.

Why are the conditions in a high-power HV lab most severe?

The worst electromagnetic conditions are seen in high-power laboratories testing high-voltage circuit-breakers, as here the highest voltages and the highest currents occur at the same time. Here the highest amount of energy is used.

What is different in MV and LV labs?

In MV and LV tests, the currents and voltages are lower, means there is less energy used to perform the tests. Overall, all components are exposed to less stress.

Acceptance test report

Is the acceptance test report available?

Yes, the test report can be downloaded from the HBM webpage at www.hbm.com/power in the Current Zero section

What do I gain from this acceptance test?

The gain from the acceptance test is the confidence, that the GEN DAQ isolated digitizer 6600 HV was tested in the most severe environment and passed.

Can I trust this acceptance test?

The test was performed at the KEMA High Power lab in Arnhem in the Netherlands, one of the leading experts in terms of High Power testing. Given the absence of standards and generally accepted calibration methods against which to test, KEMA decided to set up a dedicated test program, based on experience gained in ten years of current zero measurements.

Why does the report not mention HBM?

The product was tested in 2007 by KEMA. At that time, the 6600HV was sold under the LDS brand name (see also the document: Brand change to HBM Genesis HighSpeed) on the webpage www.hbm.com/power in the Current Zero section.

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