OMICRON

TESTSHOTNEWS

WORLD LEADER IN INNOVATIVE POWER SYSTEM TESTING SOLUTIONS

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INSIDE

Partial Discharge Testing

Reducing the impact of noise through multi-channel synchronous measuring

Measuring partial discharge (PD) phenomena in electrical insulation systems is a universally recognized method of quality control. It is widely used by manufacturers and utilities during routine and maintenance tests of transformers, generators, cables, switchgear and other components of electrical power systems.

Measuring PD is about detecting and evaluating minute discharges in the order of picocoulombs (pC) while dealing with test voltages of up to several hundred kV and, more often than not, severe external interference, or "noise", from nearby equipment or other radio frequency (RF) sources.

State-of-the-art PD instruments should facilitate measurements under such difficult environmental conditions while meeting key demands from PD test engineers.

A state-of-the-art PD instrument shall

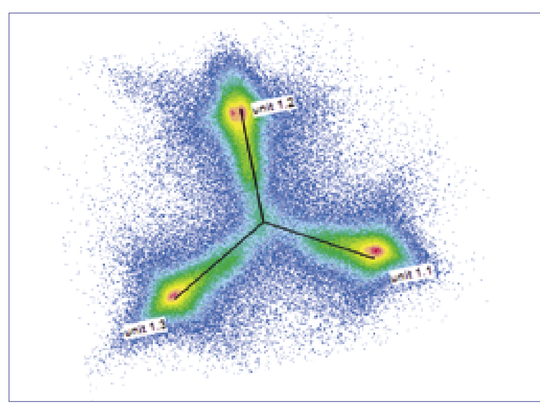
- be proven to conform to IEC 60270, the standard governing PD measurements
- deliver results comparable to legacy instruments (i.e. emulate various legacy PD instruments) thus leveraging experience in the organization
- be highly portable for on-site use
- be electrically isolated from the operator for high voltage safety and the removal of ground loops (i.e. use optical fiber connections instead of copper cables)
- feature the latest and most flexible noise-suppression technologies
- provide tools to aid the PD test engineer in assessing PD faults, in particular provide features to separate multiple sources of PD
- be able to completely record PD measurements taken under (often stressful) on-site conditions for later analysis

Meeting all of these demands, a new technology - **multi-channel synchronous PD measuring** - and the **3PARD** (3-phase amplitude relation diagram) is necessary.

The highly robust method uses a number of electrically isolated, yet fully synchronized measuring units connected by fiber optics to perform simultaneous PD measurements on multiple terminals of a test object.

Capturing PD pulses in parallel on all three high-voltage terminals of a transformer not only speeds up testing, it is also the basis for harnessing the power of the 3-Phase Amplitude Relation Diagram. For every single PD pulse (up to 1.4 million pulses per second!) the amplitude ratio is analyzed and entered into the 3PARD. Every source of PD is visible in this diagram as a separate "cluster".

If a source of PD is mostly present on phase 1, it will show up along the phase 1 axis in the diagram, likewise for other phases. External noise is typically present on all phases and will thus appear in the center of the diagram. By applying selective filtering in the 3PARD it is possible to isolate every source of PD in the diagram and obtain its individual "fingerprint".

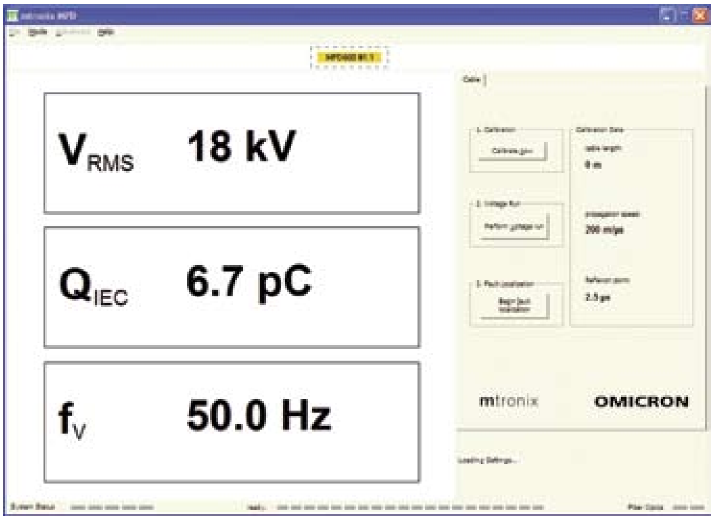


3-Phase Amplitude Relation Diagram (3 PARD)

Where previously a test engineer had to rely on guesswork over a fuzzy fingerprint that was really a superposition of several sources of PD, he or she can now get an instant overview of the number and severity of PD sources in transformers, generators and other equipment. All of these analysis methods operate in real-time during the actual measurement as well as off-line in the comfort of the office.

(Continued from page 1)

While most measurements are performed using single or three-phase configurations, mtronix (since autumn 2006 member of the OMICRON group) PD technology has been used in the largest 400 kV XLPE cable commissioning projects worldwide.



Cable mode option

In London in 2005 a 25-channel system distributed over 20 km was used in the commissioning of the "London connection" between Elstree and St. John's Wood. Synchronously capturing PD activity on all cable joints and terminations enabled the tracing of single PD pulses as they propagated along the cable.

Revolutionary Partial Discharge Analysis System MPD 600

The Partial Discharge Analysis System MPD 600 with mtronix technology is a high-precision modular high-end acquisition and analysis toolkit for detecting, recording, and analyzing partial discharge events in the following laboratory and on-site applications:

- Transformers
- Rotating machines
- Cable systems (including HV and EHV cables)

The MPD 600's fully synchronous multi-channel measuring ability together with its outstanding digital filtering options and high-resolution digital data processing deliver highly accurate and transparent measuring results especially for large-scale applications (e.g. in power grid applications).

The MPD 600 system uses the unique mtronix high-speed fiber optical network technology which provides superior safety, scalability and synchronicity between the different acquisition units.

The easy-to-use integrated software features various real-time visualization and analysis options giving the user full control over all PD detection and analysis parameters.

Features and Benefits

- **Multi-channel synchronicity**
  Up to 960 acquisition units can be connected to each measuring system while 64 channels can be processed simultaneously with complete synchronicity (an invaluable asset for long-distance cable measurements e.g. the NGC LONDON-CONNECTION with 25 channels over a distance of 20 km).
- **High-resolution digital data processing**
  A wide range of variable input filter settings (center frequency 0 – 20 MHz, bandwidth 9 kHz - 3 MHz) and the mtronix Dynamic Noise Gating technology for external noise suppression ensure superior reliability and repeatability.
- **mtronix fiber optical network technology**
  Complete electrical isolation between the individual acquisition units and the controlling PC provides a significant improvement of safety as well as reduced interferences due to the elimination of ground loops.
- **On-line 3PARD (Three-Phase Amplitude Relation Diagram)**
  Reliable discrimination of different PD sources during 3-phase measurements for optimum gating of unwanted signals, such as noise, external discharges, etc.

All system components fully comply with IEC 60270-2000. Please find more detailed information in the product brochure available under www.omicron.at.

Coming later in 2007

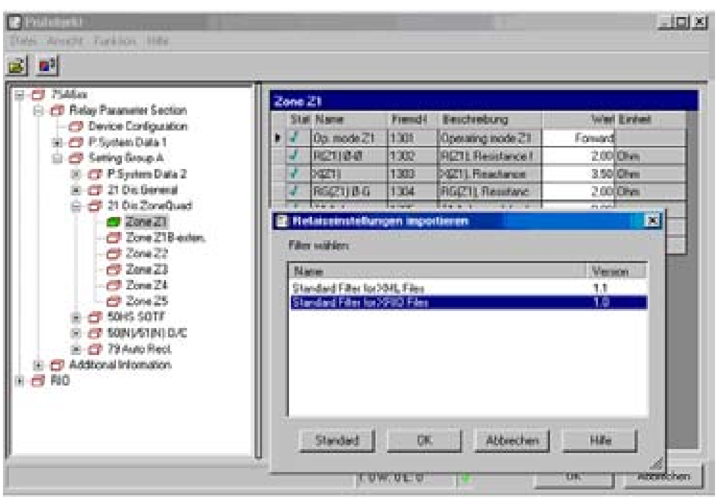
Later this year OMICRON will introduce the DIRANA - Dielectric Response Analyzer - the analysis tool for transformer insulation, HV bushings and cables.

Please look out for further information in one of our next newsletters and from your local OMICRON office.

Parameter import for XRIO converters

Developments in the field of digital protection in recent years lead to an enormous increase of relay parameters. This, of course, also effects protection testing. XRIO converters can facilitate testing in so far as they reproduce the parameter structure of the relay software and automatically calculate the corresponding characteristic curves. This process can be further improved by so-called import filters. These filters enable the easy automatic transfer of export data, e.g. from the relay software, to the corresponding XRIO converters and thus make the error-prone manual transfer of parameters unnecessary. Special import filters are available to cover the large number of relay manufacturers and the resulting wide variety of data export file formats.

The import filter can be selected using the menu item "File | Import Relay Settings" after specifying the corresponding XRIO converter. It is important to use only compatible import filters and XRIO converters according to the parameter source (data export from the relay software). For example, to use the XRIO export from Siemens/Digsi 4.8 this way, it is necessary to have the corresponding OMICRON XRIO converter and import filter available. The XRIO converters and import filters are available for download free of charge in the customer area of the OMICRON website under www.omicron.at.

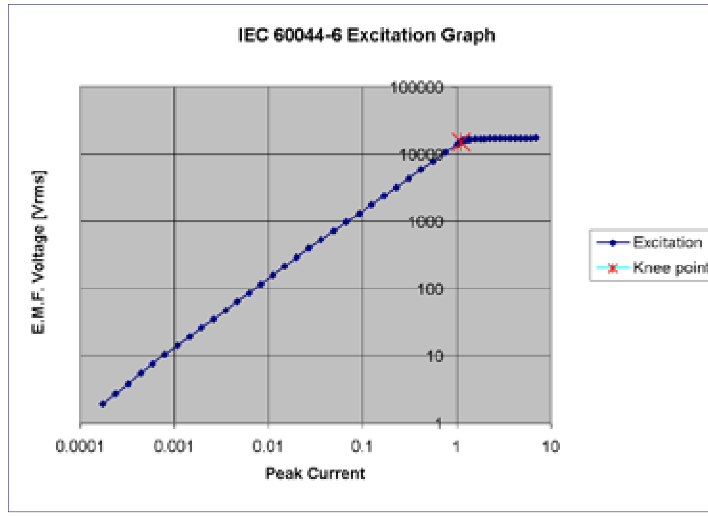


Example for an import of relay settings from Digsi 4.8 to the corresponding XRIO converter 7SA6xx using an XRIO import filter

New Unique Features for CT-Analyzer

Testing CTs with knee point voltages up to 15 kV

With the CT Analyzer it is now for the first time possible to test CTs with knee point voltages up to 15 kV as it is necessary for CTs used in applications with large primary time constants. Testing such CTs without destroying the insulation is only possible with the patented low frequency test principle of the CT Analyzer. Conventional existing test equipment uses the nominal frequency and can thus cause a breakdown of the winding insulation during testing.

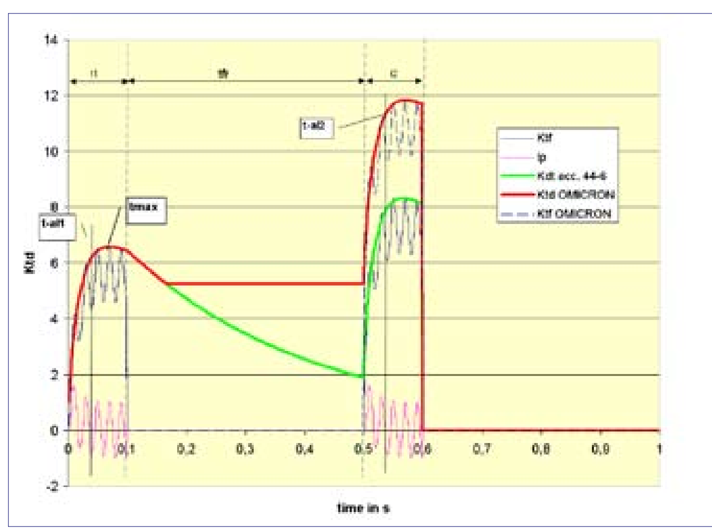


Excitation graph with knee point at 15kV

Support for IEC 60044-6

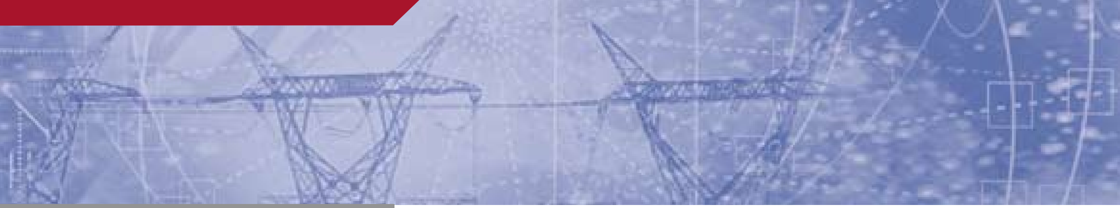
The CT Analyzer is the only device available on the market that allows CT testing according to IEC 60044-6. The measurement is done according to the standard (low frequency) and delivers all relevant parameters (such as K_{ssc}, K_{td}, ε_t, $\hat{\varepsilon}$, V_{kn}, I_{kn}) under consideration of the duty cycle and the necessary timing definition. After the test, the device allows an assessment to determine whether the CT fulfills the specified requirements.

The CT Analyzer performs all calculations necessary to determine the transient dimensioning factor (K_{td}).



$$K'_{td} = \left\{ \left[\frac{\omega T_p T_s}{(T_p - T_s)} \right] \left[e^{\frac{-t'}{T_p}} - e^{\frac{-t'_{al}}{T_s}} \right] + 1 \right\} e^{\frac{-(t_{fr} + t''_{al})}{T_s}} + \left[\frac{\omega T_p T_s}{(T_p - T_s)} \right] \left[e^{\frac{-t''_{al}}{T_p}} - e^{\frac{-t''_{al}}{T_s}} \right] + 1$$

K_{td} calculation



OMICRON EVENTS

Diagnostic Measurements on Power Transformers
Workshop
Austria
October 2-3, 2007
www.omicron.at/events/transformer

International Protection Testing Symposium
Austria
October 4-5, 2007
www.omicron.at/events/IPTS

UPCOMING FAIRS

Hanover Fair
Hanover, Germany
April 16-20, 2007
www.hannovermesse.de

FIEE - Eletrica Tradeshow
Anhembi Park
Sao Paulo, Brazil
April 23-27, 2007
www.fiee.com.br

TechCon Asia Pacific
Sydney Convention & Exhibition Centre
Sydney, Australia
May 01-02, 2007
combined with (common registration):
OMICRON Workshop on "Diagnostic Measurements on Power Transformers"
April 30, 2007
www.regonline.com/120184

Georgia Tech Protective Relay Conference
Ballroom Atlanta D
Renaissance Hotel
Atlanta, Georgia, USA
May 2-4, 2007

Electro
Palais des Expositions d'Alger
Algiers, Algeria
May 5-8, 2007
www.electro-automation.info

Rebuild Iraq
International Exhibition Center Abdali
Amman, Jordan
May 07-10, 2007
www.rebuild-iraq-expo.com

Elfack
Swedish Exhibition Centre
Booth No. K01:44
Gothenburg, Sweden
May 07-11, 2007
www.elfack.com

Electricity Fair
Tokyo, Japan
May 23-25, 2007

FOR THE RECORD WITH COMICRON

A series of questions most commonly asked, and responses from OMICRON's renowned test Guru...

Q: We received a new license file for a CMC test set. How do we update the Test Universe software license on the computer?

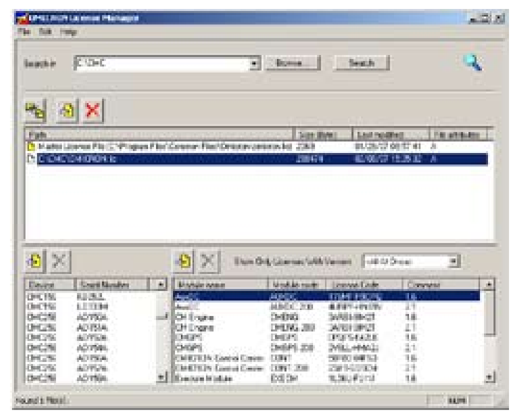
A: The license of a CMC test set has to be available in the so-called master license file in order to be effective.

If the file OMICRON.lic is available (which contains the license codes of the corresponding modules for one or several test sets), the new license can be easily added to the master license file using the License Manager utility contained in the Test Universe software. Since TU version 2.0, the License Manager can be launched from the Test Universe Start Page under "Miscellaneous | Utilities | License Manager". This utility provides support when browsing the system for license files (OMICRON.lic) and lets you easily add a new license to the master license file. It also displays the individual modules licensed for the corresponding devices.

If, after a module extension, the license file contains a module that has not yet been enabled on the Test Universe Start Page, this module remains disabled (grayed out) despite the update of the master license file.

When performing a module extension within the same TU version, inserting the installation CD will enter the "Modify" mode of the operation system. In this mode it is possible to enable the modules for the user interface.

In case of software extensions by individual modules or module packages, OMICRON always delivers a Test Universe CD containing a customized license file with all licenses available for the devices purchased by the customer. If the Test Universe version contained on this CD is newer than the version installed on the PC, the update installation process automatically updates the master license file and the user interface of the installed software accordingly.



OMICRON License Manager

Coming soon: IEC 61850-9 Sampled Values support for the CMC 256 + NET-1 option

Again, OMICRON takes the lead for testing solutions and will realize the generation of sampled values (SV) in the protection test set CMC 256. This realizes the vision of the "fully networked protection test", without secondary signals and hard-wired binary signals.

The realization of the concepts in IEC 61850 goes on. After the successful application for SCADA and the utilization of GOOSE for fast peer-to-peer signaling, the introduction of SVs is on its way. This is the transmission of instantaneous values of currents and voltages of the power system for protection and metering over the substation network, thus replacing secondary values. First pilot projects are currently set up and several manufacturers already provide evaluation versions or first products for such applications.

At the CIGRÉ 2006 exhibition in Paris, the usability of this technology was impressively demonstrated with interoperating devices of different vendors. The showcased prototype from OMICRON is currently developed into a regular product.