ICM*monitor* Portable

The ICM*monitor* is a compact instrument for evaluating the condition of medium and high voltage insulation. It comprises a spectrum analyzer, an acoustic detector, and a conventional PD monitor in one instrument. This combination enables PD measurements even with high levels of background noise, e .g. on power transformers within substations or power plants. A built-in multiplexer offers scanning of three-phase systems or multiple sensors. The instrument is used principally for permanent, continuous on-line monitoring of rotating machines, cable systems, power transformers, and gas-insulated switch gear (GIS).
The ICM*monitor* is an autonomous instrument, which can be used as stand-alone monitoring device. However, it is equipped with a serial computer interface for downloading of trending data and remote access e. g. by LAN network (TCP/IP) or telephone modem. The system can be adapted to utilize all commonly used types of couplers and sensors. It offers a relay output to give a warning if a preset threshold level is exceeded.

Partial discharge (PD) measurements are a proven method for effective, nondestructive evaluation of electrical insulation, preventing expensive unplanned outages by detecting insulation problems before they can cause breakdowns. The Power Diagnostix ICM*monitor* is a non-invasive digital PD detector for permanent installation and continuous monitoring of medium and high-voltage insulation.

Embedded Display
The ICM*monitor* has an easy-to-use push-button interface to navigate on-screen menus displayed on an embedded LCD panel. The LCD modes include a monochrome phase-resolved PD pattern display for classification of defects, a scope-like display showing charge pulses as a vertical line at the phase angle where they occur, a time trending display, and a monitoring display showing bar graphs of two key partial discharge quantities (Qp and NQS). Qp is the apparent charge value of the PD activity, and NQS is the absolute discharge current obtained by integrating the discharge values (summing up the total charge moved and dividing by the time interval, Q/t = [As]/[s]).

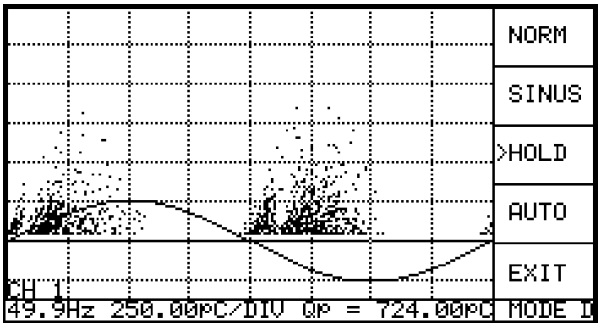

Fig. 1: Monochrome PD pattern display (SCOPE mode)

Noise Rejection
The ICM*monitor* features various noise handling techniques. The noise gating module can be connected to an antenna or a current transformer to sense and remove noise without losing significant PD data. Another method available is simple windowing, that supresses phase-stable pulses occuring in the defined windows. Additionally, an appropriate choice of the external preamplifiers can limit noise acquisition to a frequency band with less background noise.

Alarms and Trending
Users can set alarm levels of NQS or Qp that will trigger when those values are exceeded. A triggered alarm will appear on the LC display and activate an output relay on the ICM*monitor* that can be used to drive a relay for interfacing with a local alarm system. The ICM*monitor* also collects and displays PD data over a specified time interval for easy trending and observations of changes in the Qp and NQS levels in the monitored system. Optionally, up to eight DC signals such as temperature or load can be added to this trending.

Telemonitoring
Although the ICM*monitor* is an autonomous unit, it can be connected to download data or to implement remote control of the unit. With its built-in TCP/IP interface or an analog modem, the instrument can be controlled and observed remotely over a telephone or Internet connection anywhere in the world. Optionally, if a monitored system exceeds an alarm level set by the user, the ICM*monitor* can place a call to a user-selected number.

Spectrum Analysis
Observing the frequency spectrum of a harshly disturbed PD signal allows selecting frequency bands with fewer disturbances. Using this center frequency for a PD acquisition, gives a largely improved signal-to-noise ratio resulting in a clear pattern acquisition. The combination of spectrum analyzer and PD detector within one instrument greatly expands the measurement possibilities when analyzing the insulation systems in a noisy environment.
The standard version of the ICM*monitor* comes with a four-channel multiplexer to directly select the input signal.

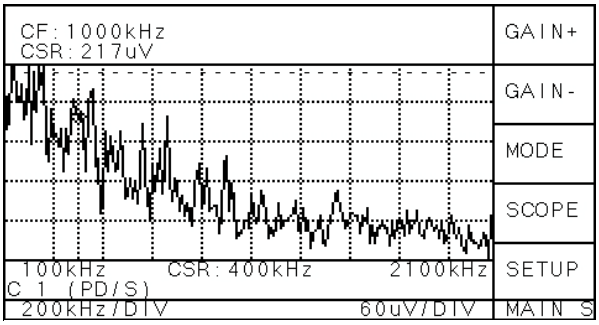

Fig. 3: Spectrum display

Display Modes

SPEC Mode
The spectrum display of the ICM*monitor* shows the frequency spectrum of the input signal up to 10 MHz. Three traces for the current input channel allow storing, comparing and processing of this spectrum. The bandwidth of the demodulated signal can be set to 9 kHz or 270 kHz, respectively.

SCOPE Mode
The SCOPE mode displays the PD pattern versus phase as known from the ICM series. Hereby, the selected center frequency and bandwidth of the SPEC mode is used, in order to disregard frequency ranges occupied with disturbances. The SCOPE mode offers viewing an oscilloscopic display as well as a pattern display.

MON Mode
The monitoring display allows setting alarm levels of NQS or Qp that will trigger when those values are exceeded.

PROJ Mode
The projection display mode PROJ shows the amplitude distribution graph of the measured PD pulses. This distribution graph reveals the contribution of each charge amplitude to the overall discharge current (NQS).

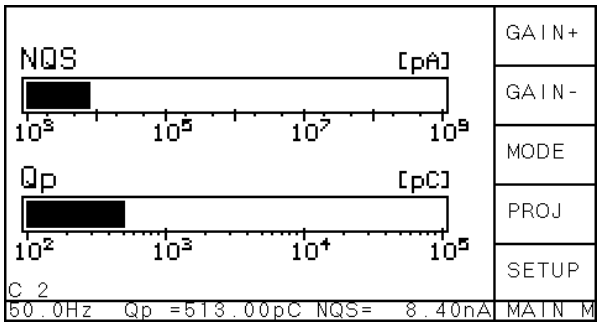

Fig. 2: Projection display

TIME Mode
Additionally, the ICM*monitor* collects and displays PD data over a specified time interval for easy trending and observations of changes in the Qp and NQS levels of the monitored system.

Available Software

Besides these autonomous functions, the instrument can be connected to a computer via serial interface, modem, or TCP/IP. Special software allows the remote control of the instrument and the download of the stored data, such as instrument setups, NQS and Qp values, alarm events, projection data, and colored PD pattern.

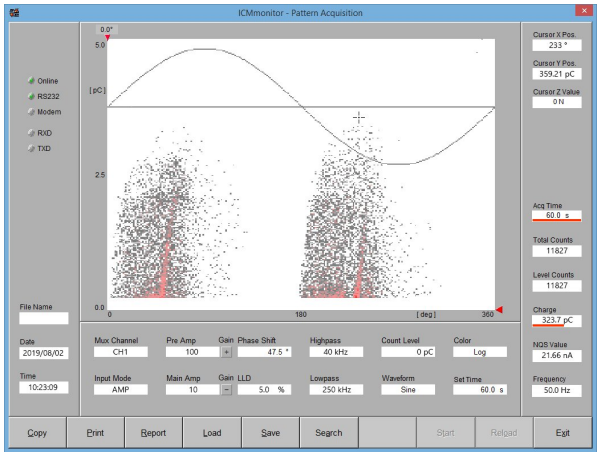

Fig. 4: Colored pattern acquisition

An auto-scan function takes the trending information as well as the phase-resolved pattern of one or multiple units.

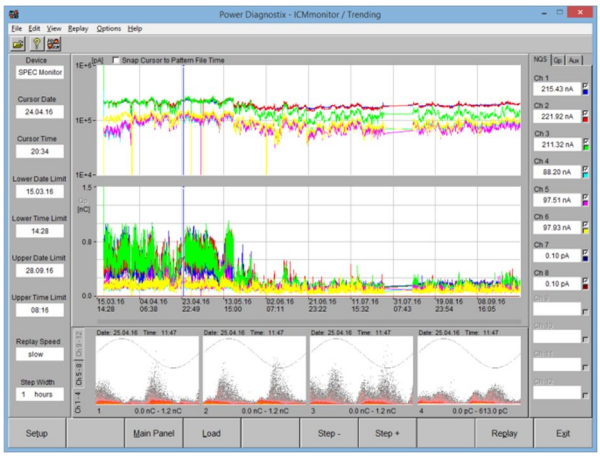

Fig. 5: Trending display of the software

Options

- MUX8
  Eight input channels for PD and synchronization signals.

- IEC61850
  Hardware based protocol converter for IEC 61850 compliant communication, built-in or as additional module (DCG61850). Instruments equipped with this option have an additional terminal for communication via LAN, which can be used to transfer the following data: Average discharge current, acoustic level of partial discharge, apparent charge of partial discharge; peak level, UHF level of partial discharge, partial discharge alarm.

- MWS
  Monitoring web server providing an Ethernet gateway for platform independent remote access to an ICM*monitor* instrument. The module is available for DIN rail mounting or as built-in plug-in card.

- Modem
  An external/internal modem allows accessing the ICM*monitor* via a common phone line. By the ICM*monitor* software all functions can be remote controlled. The current PD pattern as well as the trending data can be downloaded to the PC and put together in a collective file. If a monitored system exceeds an alarm level, set by the user, the instrument can place a phone call.

Technical Data

Acquisition Unit

Mains supply:	90–264 V_{AC}, 47–440 Hz (automatic)
Line fuse:	1.6 A (time-lag)
Power requirements:	Approx. 60 VA (while battery is charged)
Battery lifetime:	Up to 3 hours
Display:	Backlit LCD
Display size:	120 mm x 64 mm
Display resolution:	128 x 240 Pixel B/W
Operation:	5 menu supported push-buttons/5 fix function pushbuttons or remote controlled via software
Operation temp.:	10–40 °C (non-condensing)
Opt. recorder output:	0–10 V with R=100 Ω
Input impedance:	50 Ω// 50 pF (AMP IN)
A/D converter (PD):	8 bit (unipolar) / ±7 bit (bipolar)
Size: (W x H x D)	305 x 144 x 270 mm^3 (closed)
	305 x 360 x 270 mm^3 (open)
Weight:	Approx. 4.4 kg

Available Communication Interfaces

USB 2.0
LAN
Modem
UMTS

Alarm Relay

Contact rating:	5 A/160 V_{AC}, 5 A/30 V_{DC}
Min. contact load:	100 mA / 5 V_{DC}

Standard PD Mode

Lower cut-off (-6 dB):	40, 80, or 100 kHz (software controlled)
Upper cut-off (-6 dB):	250, 600, or 800 kHz (software controlled)
Input sensitivity:	< 500 μV_{rms}/5pC (without preamplifier)
Gain range:	1, 2, 4, 8, 10, 20 …, 200, 400, 800

Preamplifier

Input impedance:

RPA1/RPA1D:	10 kΩ // 50 pF
RPA1L/RPA1H:	1 kΩ // 50 pF

Input sensitivity:

RPA1/RPA1D:	< 50 μV_{rms}/0.03 pC
RPA1L:	< 15 μV_{rms} /0.02 pC
RPA1H:	< 40 μV_{rms}/0.05 pC
RPA2:	< 800 μV_{rms}/1 pC
RPA3:	< 2 μV_{rms}
FCU2:	< 200 μV_{rms} (46 dBµV)

Bandwidth:

RPA1/RPA1D:	40–800 kHz
RPA1L/RPA1H:	40 kHz–20 MHz
RPA2:	2–20 MHz
RPA3:	200 MHz–1 GHz
FCU2:	100 MHz–1800 MHz

Synchronization

Sync. Frequency:	8–320 Hz
Maximum voltage:	200 V_{peak} (140 V_{rms}), 100 V_{rms} nom.
Input impedance:	10 MΩ

Spectrum Function

Input sensitivity	< 5 μV_{rms} / 0.5 pC (270 kHz bandwidth)
	< 1 μV_{rms}/ 2 pC (9 kHz bandwidth)
Max. input voltage	120 mV_{rms} (270 kHz bandwidth)
	5 mV_{rms} (9 kHz bandwidth)
2.5 mV_{rms} (RIV)	
Frequency range	10 kHz–10 MHz (in steps of 10 kHz)
Bandwidth	9 kHz or 270 kHz
Precision:	Typ. < 5%

Power Diagnostix Systems · Vaalser Strasse 250 · 52074 Aachen · Germany · ☎ +49 241 74927 · 🖷 +49 241 79521 · www.pdix.com