

# ICMflex

The ICMflex high voltage instrument family offers inherent operator safety and greatly simplifies distribution-class cable testing and other field tasks involving partial discharge detection, loss factor (tan delta) measurements, and PD fault location. It has been designed to simplify the application and to combine different measurement tasks within one instrument. With the unique concept of the ICMflex instruments, the entire acquisition hardware is placed on high voltage potential right at the position where the signals are. Thus, no signal cables are needed, as the instrument is fully self-contained and battery operated. In case that the instruments are used for measurements in an environment with high frequency (HF) disturbance, they can be equipped with a gating input for effective noise reduction. Every ICMflex instrument is fully remote controlled via Bluetooth or fibre optic communication.



## Unique Concept

The ICMflex instrument family is available with different options and for different voltage levels. Additionally, the self-contained ICMflex acquisition unit can be placed on top of any third-party coupling or reference capacitor. The option TD offers tan delta and power factor (PF) measurements. The option PD provides partial discharge measurements according to the IEC 60270, whereas the option LOC includes partial discharge location for power cables. Finally, the optional high voltage T-filter for sensitive partial discharge measurements can reduce disturbance signals from a high voltage supply. The detachable NiMH battery provides more than eight hours of continuous operation, while a second battery is charged. Any high voltage AC source can be used including resonant test sets and VLF high voltage sources.

Testing distribution-class cables in a field environment becomes an easy and inherently safe task. The ICMflex unit is simply placed between high voltage source and the cable to be tested – no further leads required. Thus, with one unit requiring only high voltage and ground connection all essential measurements on laid power cable are performed in one step: Tan delta, partial discharge, and partial discharge location.

Off-line testing of generator and motor stator coils is simplified in the same way. Using any high voltage source, the critical AC measurements on the stator coil are done simultaneously: Tan delta, PF, and partial discharge.

## Option TD

The tan delta analyser uses an unbalanced bridge formed by internal shunt capacitors, the reference capacitor, and the device under test. Here, the ICMflex software shows tan delta, PF, capacitance, voltage, and frequency.

## Option PD

With the option PD the ICMflex software offers a meter display according to IEC 60270 and an oscilloscopic display of the partial discharge activity as well as a coloured  $\phi$ -q-n pattern based on the data received via Bluetooth or fibre optic connection. Placing the quadrupole and acquisition unit on high voltage potential greatly improves the sensitivity and avoids any noise pickup on signal cables.

## Option LOC

The partial discharge location option uses high speed (100 MSamples) sampling of the PD pulses traveling the cable. Along with the analogue bandwidth of 20 MHz this enables precise location and mapping of the discharge activity along the cable.

## Option TF

The ICMflex unit can be equipped with a high voltage T-filter to block high frequency noise signals from the HV supply.



Fig. 1: ICMflex (right) with HV filter (left)

## Software

The Instrument is fully computer controlled. The corresponding ICMflex software is a typical front panel system that gives access to all main functions, graphs, and settings. It offers three display modes for different testing tasks.

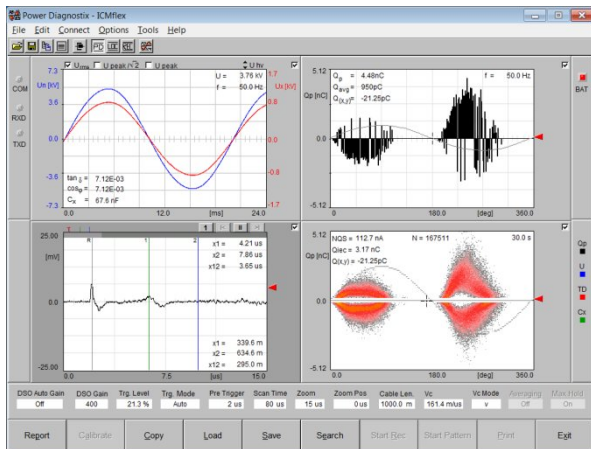


Fig. 2: ICMflex software in PD mode

## PD Mode

The PD display mode is mainly used for PD measurements and is required for calibration of the apparent charge's amplitude. For cable testing the cable length and pulse velocity can be calibrated in this screen as well.

## LOC Mode

The LOC display mode serves to perform PD fault location measurements on medium and high voltage cables.

## REC Mode

The REC mode is used to plot results into a summarizing table or graph. The collected data can be displayed vs. time or vs. voltage.

## Technical Data

Mains supply:	Battery operated
Power requirements:	Approx. 20 VA
Operation:	Remote controlled via ICMflex software
PD input impedance:	1 kΩ/50 pF
PD input sensitivity: (without test object)	< 150 μV, corresponds to 0.2 pC
PD lower cut-off (-6 dB):	40, 80, or 100 kHz (software controlled)
PD upper cut-off (-6 dB):	250, 600, or 800 kHz (software controlled)
PD A/D converter:	8 bit (±7 bit)
PD location (TDR):	8 bit, 100 MSamples
Specimen cable length:	10 to 25000 m, for a sample rate of 320 μs & v <sub>c</sub> = 160 m/μs
Location precision:	1 m + 0.1% of the cable length
Voltage measurement:	16 bit, 100 kSamples
Voltage values displayed:	U <sub>RMS</sub> value, $\hat{U}/\sqrt{2}$ value, crest factor
Tan delta resolution:	5 x 10 <sup>-5</sup>
Tan delta precision:	1 x 10 <sup>-4</sup>
Synchronization:	External on reference voltage
Synchronization range:	20 Hz–510 Hz (normal mode) 0.1 Hz, 0.05 Hz, 0.02 Hz (VLF)
Operation temperature:	0–55 °C (non-condensing)
Interfaces:	Bluetooth (921 kBit/s) Fibre optic serial link (921 kBit/s)