

## IDA 200™

### Insulation Diagnostics System

Consequently GE Energy Services is now able to present the Insulation Diagnostics System IDA 200™. The measurement and analysis methods employed in IDA 200™ are based on research carried out at the Royal Institute of Technology in Stockholm with resources and input from major users and manufacturers of HV equipment. These methods together with the design and selection of components have resulted in a unique diagnostics system. In regards to size and weight as well as to accuracy and depth of analysis IDA 200™ is definitely in a class of its own.

With IDA 200™ it is possible to diagnose insulation material in most objects in a high voltage installation (e.g. power transformers, measuring transformers, bushings, paper insulated cables etc.) The diagnostic measurement is done by applying a relatively low voltage – up to 140 V.

IDA 200™ measures the capacitance and dielectric losses at discrete frequencies both above and below mains frequency. By avoiding the mains frequency and its harmonics, an efficient filtering of their corruptive effects is enabled.

## APPLICATION

IDA 200 is designed for diagnostic measurements of electrical insulation. Examples of application areas: Power and instrument transformers, Bushings and Paper insulated cables.

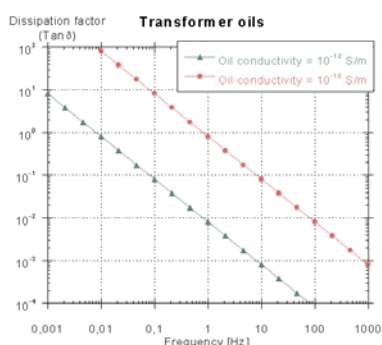
Electrical insulation come in all three states of matter: solid (such as cellulosic paper and porcelain), liquid (such as mineral oil), and gas. Insulation systems that include solid and/or liquid insulation are candidates for diagnostic measurements. IDA 200 is not suited for pure gas insulated systems.

Electrical insulation systems as found in the objects listed above usually consist of a combination of different materials. In the following, we will illustrate how IDA 200 can be used to determine the condition in some of the most commonly used insulation systems.

## APPLICATION EXAMPLES

### Dielectric properties of mineral oils

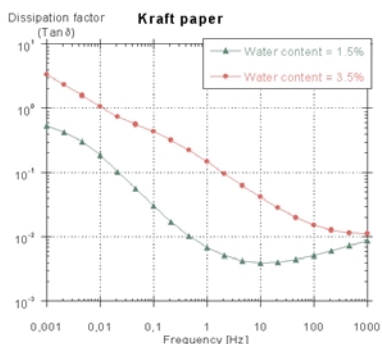
Transformer oil is a non-polar liquid with a capacitance that changes very little with frequency. But oil also has a DC conductivity that varies with the quality of the oil. As a result, measured dissipation factor is inverse proportional to the frequency.



The figure shows a typical response of oil with low conductivity and another oil with higher conductivity.

### Dielectric properties of cellulosic paper

Oil impregnated cellulose, e.g. transformer pressboard and Kraft paper used in paper cables have a more complex structure and it is characterized by frequency dependence in both capacitance and loss. Since ageing produces moisture, the moisture content of cellulose is used as an aging status indicator.



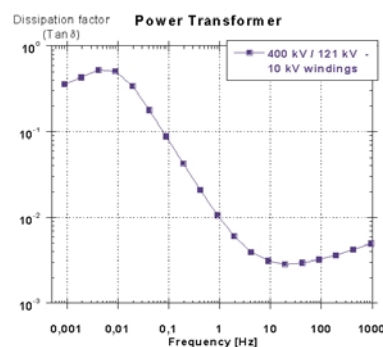
Here an example of how moisture affects the dissipation factor of Kraft paper at 20° C is plotted.

### Diagnosis of insulation in power transformers

The insulation system of most power transformers consists of oil and cellulose. Both these materials change their dielectric properties over the transformer's life span. When measured at a fixed frequency only, the property changes in the different materials cannot be discerned.

An analysis of the measured dissipation factor frequency characteristic allows for a more complete diagnostics of the examined insulation. The graph below shows the result of measurements done with IDA 200 on the insulation between primary and secondary to tertiary windings on an auto power transformer. At higher frequencies the pressboard and the oil volume determine the dielectric loss, at medium frequencies the oil conductivity is the dominant factor, and the lower frequency range is dominated by the pressboard dielectric loss.

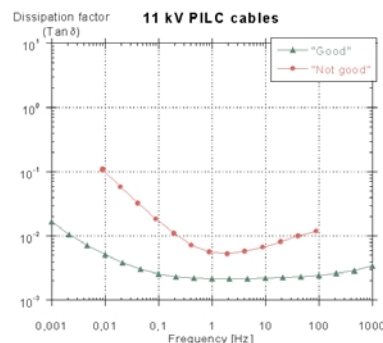
From analysis of the measurement results, using IDA 200 MODS software, a moisture content of 1 - 1.5% was deduced. Normally, moisture content above 3.5 - 4% should result in a replacement of the transformer to avoid insulation breakdown.



Measurement results of the insulation between primary and secondary to tertiary windings on a power transformer.

### Diagnosis of cellulosic power cable insulation

Since moisture gives a characteristic change of cellulose response, IDA 200 is suitable for assessing the average moisture content in paper insulated power cables (PILC cables).

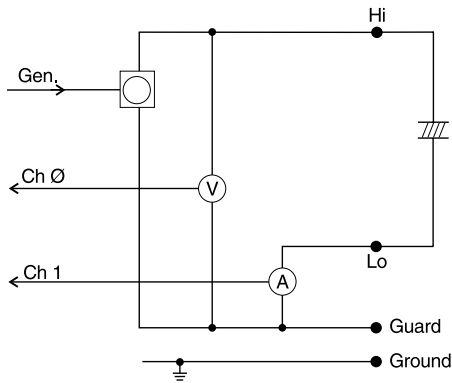


The graph shows the results from measurements of a new cable and a service aged cable.

## SPECIFICATIONS

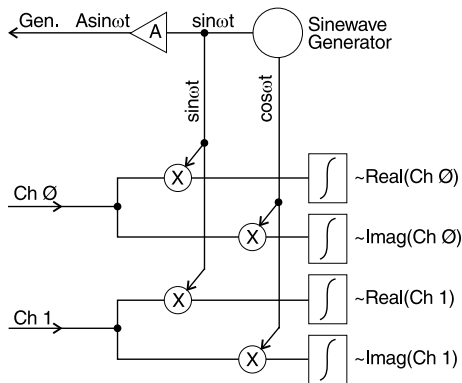
### Technical description

The system measures the impedance of a specimen at a variable voltage and frequency. A Digital Signal Processing (DSP) unit generates a test signal with the desired frequency. This signal is amplified with an internal amplifier and then applied to the specimen. The voltage over and the current through the specimen are measured with high accuracy using a voltage divider and an electrometer (Ampere meter).



Schematic block diagram of the IDA 200-system.

For the measuring input, IDA 200 uses the DSP unit that multiplies the input (measurement) signals with reference sine voltages, and then integrates the results over a number of cycles. With this method, noise and interference is almost completely rejected - allowing IDA 200 to work with low voltage levels and still achieve high accuracy.



Principle of the sine correlation technique

### General

**Description:** Portable, computerized insulation diagnostics system

**Design:** The instrument is intended for use in high-voltage substations and industrial environments

**Measurement:** Capacitance and dielectric losses in insulating materials at variable frequency

**Application:** Preventive maintenance – diagnostic measurements of electrical insulation in, eg:

- Power transformers
- Bushings
- Instrument transformers
- Cables

### Measurement signal

**Voltage/current:** 0 - 10 V<sub>peak</sub>/0 - 50 mA<sub>peak</sub> (low range)

**Voltage/current:** 0 - 200 V<sub>peak</sub>/0 - 50 mA<sub>peak</sub> (high range)

**Frequency:** 1000 Hz\* - 0.0001 Hz

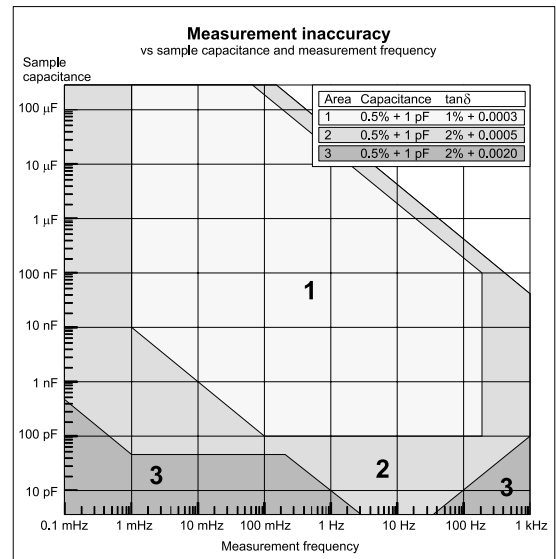
\* Upper frequency current limited

### Measurement ranges

**Capacitance:** Range 10 pF - 100 mF

**Dissipation factor:** Range 0 - 10

(with retained accuracy of capacitance – otherwise higher)



## Man Machine Communication

IDA 200 contains an integrated PC and proprietary IDA 200 application software based on a Windows® embedded NT platform.

**Display screen:** 16 cm (6.4") TFT Color Monitor

**Mouse / Keyboard:** Included as standard accessory

**Floppy Disk Drive:** 1.44 MB

**USB port:** For external keyboard

**Ethernet**

**Serial port:** RS232

**Parallel port**

**Analog video port:** SVGA

## Environmental conditions

**Operating temperature:** -20°C to +55°C (-4°F to 131°F)

**Storage temperature:** -40°C to +70°C (-40°F to 158°F)

**Humidity:** <95% RH (Non condensing) 30 days/year, 85% RH remaining time

**LVD:** 73/23/EEC: EN 61 010-1 (Section 6),  
EN 61 010-1/A2

**EMC:** 89/336/EEC:

Emission EN 50 081-2: EN 55 011

Immunity EN 61 000-6-2: EN 61 000-4-2,

EN 61 000-4-3, EN 61 000-4-4,

EN 61 000-4-5, EN 61 000-4-6,

ENV 50 140, ENV 50 141, ENV 50 204

**Mechanics:** EN 60 068-2-31, EN 60 068-2-32

## Other

**Mains voltage:** 115/230 V AC (switch selectable)  $\pm 10\%$ , 50-60 Hz.

**Power Consumption:** Max. 250 VA

**Dimensions:** 450 x 160 x 410 mm (17.7" x 6.3" x 16.1")

**Weight:** 15 kg (33 lbs) instrument only. 30 kg (66 lbs) with accessories and transport case.

The above specifications are valid at nominal input voltage and an ambient temperature of +25°C (+77°F).

Specifications are subject to change without notice.

## OPTIONAL ACCESSORIES

### IDA 200 HVU

The High Voltage Unit (HVV) is used with the IDA 200 system to increase the output voltage up to 30 kV (21 kV<sub>RMS</sub>). The main application for this combination is for diagnosis of water tree deteriorated XLPE-cables. The system works equally well when other types of non linear materials are to be characterized.

**Art.No:** CK-29090

## ORDERING INFORMATION

IDA 200 Insulation Diagnostic System

**Art.No:** CK-19090

For mains voltage 115/230 V AC (switch selectable)

IDA 200 Insulation Diagnostic System (for use together with the HVU)

**Art.No:** CK-19092

For mains voltage 115/230 V AC (switch selectable)

### Complete with:

IDA 200 instrument

IDA 200 instrument software

IDA 200 MODS software

Transport case

**Art.No:** GD-00270

User's manual

Mains supply cable

Keyboard with integrated mouse

Calibration box

**Art.No:** CK-90010

Termination box IDA 200

**Art.No:** CK-90030

Multi-cable (blue)

1 x 15 m (49 ft)

**Art.No:** GA-00615

Test capacitor box

**Art.No:** CK-90050

Ground cable with alligator clip

1 x 10 m (32.8 ft)

**Art.No:** GA-00208



IDA 200 HVU



IDA 200 can be operated while it is in the transport case.







- ❶ Mains switch/indicator
- ❷ Ethernet Interface
- ❸ USB-port
- ❹ Computer screen for integrated PC
- ❺ Terminal for connecting optional external voltage amplifier
- ❻ Measuring status indicator
- ❼ Terminal for connecting sample to be diagnosed (Voltage output/measuring input)
- ❽ Output On/Off buttons
- ❾ Floppy Disk Drive (1.44 MB).



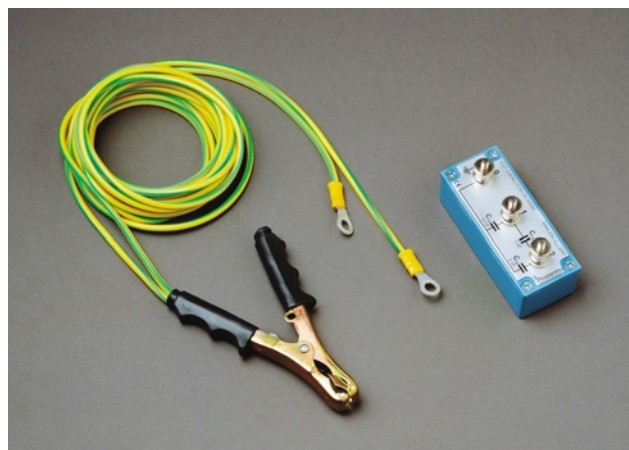
Calibration box



Termination box



Multi-cable



Test capacitor box and ground cable