# IDAX 300/350
# IDAX 5.0

## Insulation Diagnostic Analyzers

# User's Manual



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|---|---|---|---|

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# Contents

# 1 Introduction

## 1.1 Product description

IDAX 300 is a very compact instrument and is used together with an external PC. The IDAX 350 has a built-in computer but can also be used with an external PC. IDAX 300/350 provides an accurate and reliable condition assessment of insulation in transformers, bushings, generators and cables. The IDAX system maximizes the outcome of maintenance activities allowing for load and service life optimization.

IDAX 300/350 instruments are small, light and fast. It maintains excellent accuracy and ability to provide reliable data using true AC DFR (Dielectric Frequency Response), also known as FDS (Frequency Domain Spectroscopy), for reliable test results in high interference environments. The software makes testing both easier and faster, allowing transformer moisture and oil assessment in about 23 minutes (20°C).

IDAX measures the capacitance and tan delta/power factor of the insulation between power transformer windings at multiple frequencies. Analyzing the results using modelling technique makes it possible to assess the moisture level in the solid insulation, oil conductivity/tan delta and power frequency tan delta at reference temperature (20°C). The test can be performed at any temperature as the temperature dependence of the dissipation factor can be estimated.

## 1.2 Features and benefits

- Automated measurement and analysis of moisture content, tan delta/power factor and oil conductivity
- Individual temperature correction (ITC) of tan delta/power factor and oil conductivity
- Reliable measurements in high-interference environments
- Multi-function test set for transformer measurements

# 1.3 Warranty

Products supplied by Megger are warranted against defects in material and workmanship for a period of one year following shipment.

Our liability is specifically limited to replacing or repairing, at our option, defective equipment.

This warranty does not include batteries, lamps or other expendable items, where the original manufacturer's warranty shall apply.

We make no other warranty. The warranty is void in the event of negligence abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

## Receiving instructions

This instrument has been thoroughly tested and inspected to meet rigid specifications before being shipped. It is ready for use when set up as indicated in this user manual.

- Check the equipment received against the packing list to ensure that all materials are present. Notify Megger of any shortage.
- Examine the instrument for damage received in transit. If damage is discovered, file a claim with the carrier at once and notify Megger, giving a detailed description of the damage.

## Warranty repair

- Equipment returned to the factory for repair must be shipped prepaid and insured.
- Contact your Megger representative for instructions and a return authorization (RA) number.
- Please indicate all pertinent information, including problem symptoms.
- Also specify the serial number and the catalog number of the unit.

# 1.4 Service and support

For technical assistance: please contact your local Megger representative or direct your request to the office in Sweden.

Checklist before calling/emailing for support

- Check for mains voltage to the unit.
- Check the mains fuse.
- Restart the unit and, if applicable, the computer.
- Try to repeat the operation if possible.
- If any error messages, make a print screen (or a note) and attach to your email.

When reporting an error please include

- The serial number of the unit
- Windows version
- IDAX software version

### Shipping

If you need to ship the unit back to your local representative or to Megger Sweden, make sure that the unit is well protected. Megger cannot take responsibility for any transport damages.

### Data backup (IDAX350 only)

Before shipping the unit, make sure you have made a backup of all relevant data in your unit before shipping. Megger cannot take responsibility for any corrupt or missing data during service or shipping.

## Contact information

Internet www.megger.se

Email seinfo@megger.com

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### Address

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Sweden

# 2 Safety

## 2.1 General

**Important**
Read and comply with the following instructions.
Always comply with local safety regulations.

### Symbols

| | |
|---|---|
|  | Caution, refer to accompanying documents. |
|  | Protective conductor terminal. |
|  | WEEE, Waste Electronic Equipment. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements. The unit can also be returned to Megger at any time at no charge for the disposal. |
|  | CE marking indicates that the product conforms to the applicable EC directives for products placed on the the market in the European Economic Area (EEA). |

### Warning and caution notices

Warning and caution notices are used throughout this manual where applicable and should be strictly observed. These notices appear in the format shown below and are defined as follows:

**Warning**
Warning, as used in this manual, is defined as a condition or practice which could result in personal injury or loss of life.

**Caution**
Caution, as used in this manual, is defined as a condition or practice which could result in damage to or destruction of the equipment or apparatus under test.

### Instrument safety

| | |
|---|---|
| 1. | This instrument operates from a single-phase power source. It has two-pole terminal with ground connector and requires a two-pole, three-terminal, live, neutral, and ground type connector. The voltage of the power source must be within the following rated operating voltage: 90- 135 V AC and 170-264 V AC, 47/63 Hz. |
| 2. | Before making connection to the power source, determine that the instrument rating matches the voltage of the power source and has a suitable two-pole terminal with ground connector. |
| 3. | The power input plug must be inserted only into a mating receptacle with a ground contact. Do not bypass the grounding connection. Any interruption of the grounding connection can create an electric shock hazard. Determine that the receptacle is properly wired before inserting the plug. |

# 2.2 Safety instructions

| | |
|---|---|
| 1. | It is not possible to eliminate all potential hazards from, and in using, electrical test equipment. For this reason, every effort has been made to point out in this instruction manual the proper procedures and precautions to be followed by the user in operating this equipment and to mark the equipment itself with precautionary warnings where appropriate. It is not possible to foresee every hazard which may occur in the various applications of this equipment. It is therefore essential that the user, in addition to following the safety rules in this manual, also carefully consider all safety aspects of the test before proceeding. |
| 2. | The test set and the specimen to which it is connected are a possible source of high-voltage electrical energy and all persons making or assisting in tests must use all safety practice precautions to prevent contact with energized parts of the test equipment and related circuits. |
| 3. | Persons actually engaged in the test must stand clear of all parts of the complete high-voltage circuit, including all connections, unless the test set is de-energized and all parts of the test circuit are grounded. Persons not directly involved with the work must be kept away from test activities by suitable barriers, barricades, or warnings. |
| 4. | Treat all terminals of high-voltage power equipment as a potential electric shock hazard. There is always the potential of voltages being induced at these terminals because of proximity to energized high-voltage lines or equipment. |
| 5. | Always ground connection points of the test specimen before connecting any leads from the test set. Whenever possible, always keep one side of the test specimen grounded at all times. Always use a safety ground stick to ground any high-voltage conductor. |
| 6. | The ground connection on the test set must be the first made and the last removed. Any interruption of the grounding connection can create an electric shock hazard. |
| 7. | Make sure that the instrument is properly grounded, both through its AC power cord and through the ground connector. The AC power cord is the disconnecting device. |
| 8. | Always disconnect test leads from test specimen before attempting to disconnect them at the test set. |
| 9. | High-voltage discharges and other sources of strong electric or magnetic fields may interfere with the proper functioning of heart pacemakers. Persons with heart pacemakers should obtain expert advice on the possible risks before operating this equipment or being close to the equipment during operation. |
| 10. | All persons making or assisting in tests must use all practical safety precautions to prevent contact with energized parts of the test equipment and related circuits. Also follow all local and company safety requirements. Persons actually engaged in the test must stand clear of all parts of the complete high- voltage circuit, including all connections, unless the test set is de-energized and all parts of the test circuit are grounded. Persons not directly involved with the work must be kept away from test activities by suitable barriers, barricades, or warnings. |
| 11. | Safety is the responsibility of the user. |
| 12. | Misuse of this high-voltage equipment can be extremely dangerous. |
| 13. | The purpose of this equipment is limited to use as described in this manual. Do not use the equipment or its accessories with any device other than specifically described. |
| 14. | Before making any connections, make sure that the instrument is de-energized and that all parts of the test circuit are properly grounded. |
| 15. | Never connect more than one output at the time. All outputs are energized by the same amplifier and therefore all outputs are energized simultaneously. |
| 16. | Operation is prohibited in rain or snow. |
| 17. | Do not use the test set in an explosive atmosphere. |
| 18. | Refer all servicing to qualified personnel. |
| 19. | A qualified operator should be in attendance at all times while the test equipment is in operation. |
| 20. | Observe all safety warnings marked on the equipment. |
| 21. | Corrective maintenance must only be performed by qualified personnel who are familiar with the design and operation of the test set and the hazards involved. |

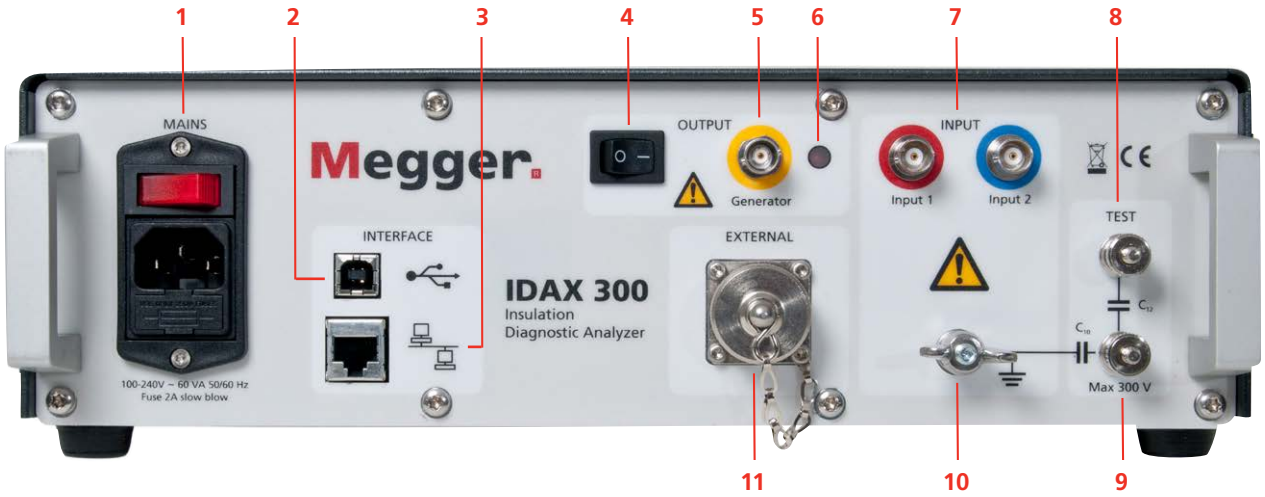
## Maintenance

| | |
|---|---|
| 1. | DISCONNECT the MAINS plug before any cleaning or maintenance. |

| | |
|---|---|
| 2. | Maintenance should be performed only by qualified personnel familiar with the hazards involved with high-voltage test equipment. |
| 3. | Refer all servicing to qualified personnel. |
| 4. | Routine maintenance is all that is required for these test sets. The cables and connector panel should be inspected frequently to be sure all connections are tight and all ground connections intact. |
| 5. | The appearance of the test set can be maintained by occasional cleaning of the case, panel and cable assemblies. The outside of the carrying case can be cleaned with detergent and water. Dry with a clean, dry cloth. The control panel can be cleaned with a cloth dampened with detergent and water. Do not allow water to penetrate panel holes, because damage to components on the underside may occur. A household all-purpose spray cleaner can be used to clean the panel. Polish with a soft, dry cloth, taking care not to scratch the display screen cover. The cables and mating panel receptacles can be cleaned with isopropyl or denatured alcohol applied with a clean cloth. |

# 3 Instrument description

## 3.1 Front panel IDAX 300




1. **MAINS**
   To turn the instrument On/Off
   **Mains conctor**
   **Fuse**
   Use small screwdriver to gently pry out to change the fuse, F1, 2AT slow blow.
2. **USB port**
   For connecting a PC
3. **Ethernet**
   RJ45 connector for Ethernet connection via twisted pair cable.
4. **OUTPUT**
   **Enable switch**
   For activating / deactivating the generator output.
5. **Generator**
   Generator output triaxial connector
6. **LED**
   Lit when output is enabled, voltage may be generated.
7. **INPUT**
   Input 1 (red) and Input 2 (blue)
   First and second input channel.
   Do not connect to mains or energized test objects.
   Do not connect directly to Generator output.
8. **TEST**
   Test inputs.
   Can be used for controlling basic functionality and accuracy.
   Connect only to Generator, and Input 1 or 2.
9. ⏚
   Protective Earth/Ground connector
   Connector for connection to test object ground.
   This is also used as measurement input.
   Always connect the instrument to station earth/ground using the separate earth/ground cable.
   The separate earth/ground wire should be the first connection made and the last removed.
10. **EXTERNAL**
    Connector for external amplifier, e.g. VAX020 and VAX230.

**WARNING**
All test objects must be grounded at one end at all times to minimize risks for high voltage interference entering the instrument.

# 3.2 Front panel IDAX 350


**1. TEST**
Test inputs.
Can be used for controlling basic functionality and accuracy.
Connect only to Generator, and Input 1 or 2.

**2. EXTERNAL**
Connector for external amplifier, e.g. VAX020 and VAX230.

**3. OUTPUT**
Generator output triaxial connector

**4. LED**
Lit when output is enabled, voltage may be generated.
**Enable switch**
For activating / deactivating the generator output.

**5. INPUTS**
INPUT 1 (red) and INPUT 2 (blue)
First and second input channel.
Do not connect to mains or energized test objects.
Do not connect directly to Generator output.

**6.** ⏚
Protective Earth/Ground connector
Connector for connection to test object ground.
This is also used as measurement input.
Always connect the instrument to station earth/ground using the separate earth/ground cable.
The separate earth/ground wire should be the first connection made and the last removed.

**7. Mains**
For connecting to mains outlet.
When connecting to the mains, the internal computer will start.
**Power ON/OFF switch**
Turn the measurement and generator module on or off.
**Fuse**
Use small screwdriver to gently pry out to change the fuse, F1, 2AT slow blow.

**8.** Ethernet
RJ45 connector for Ethernet connection via twisted pair cable to internal computer.

**9.** USB Ports
for connecting an external mouse, keyboard or USB memory to the internal PC

**10.** USB Port
For connecting to an external computer. Put the switch in EXT position. To use the internal PC, put the switch in INT position.

# 3.3 Standard accessories

The following accessories are included as standard when ordering an IDAX with 18 meter cables:

- Mains cable
- Earth/ground cable, 2.5 $mm^2$, 5 m / 15 ft
- Generator cable, 18 meter
- Measuring Cable, Red, 18 meter
- Measuring Cable, Blue, 18 meter
- Soft bag for cables and accessories
- USB memory stick
- IDAX for Windows
- User Manual, IDAX
- Test & Calibration Certificate
- USB cable, A - B, 2 m / 5 ft (IDAX 300 only)
- Transport case IDAX 300 (IDAX 300 only)

Optional accessories see Appendix D.

# 3.4 Installation

The IDAX 350 comes with the IDAX software already installed on the internal computer. On the IDAX 300 and if you want to use the IDAX 350 with an external PC you have to install the software.

**Important**
**On the IDAX 350 make sure to close the IDAX software and the operating system before turning off the unit using the on/ off mains switch and disconnecting the mains cord.**

IDAX350 can be used as a central computer controlling other test instruments e.g Megger FRAX and TTR. Megger SW is checked for co-existence and can be used together with IDAX 4 and 5. Be careful if installing other manufacturer's software on the IDAX unit. Doing so may prevent the IDAX software from working as intended.

## Installation of IDAX 5.0 software

Make sure your software is properly installed. IDAX software will install on Windows XP, Vista, 7 and 10.

- To be able to install this SW package, you MUST be logged in with Administrator's rights.
- IDAX SW also requires "Microsoft .NET Framework 4.0" to be installed, if the IDAX installation program found that .NET Framework is not installed in your computer, then IDAX installation SW will automatically start this installation. This may take a while (several minutes).
- IDAX 5.0 SW will also install the necessary drivers to communicate with the IDAX 300 instrument using the USB port. The USB cable must not be connected to IDAX 300 at this time. In case of IDAX 350, switch the USB port PC selector to "EXT" (external computer position).

# 3.5 Preparing instrument

**Important**
Read and comply with the safety instructions “2 Safety” on page 8.
Always comply with local safety regulations.

**1]** First, connect the external safety ground cable to the IDAX instrument and then to the station’s ground near the test object/ transformer. Make sure the connection point is free from paint/dirt/rust. This ground lead should be the first connection made, and the last one removed.

**2]** Connect the mains lead (100-240V AC, 50-60Hz) to the IDAX instrument and switch it on.

**3]** For IDAX 300, connect a communication cable, either an Ethernet cable or USB cable, between IDAX 300 and the computer.
If you use Ethernet, you may connect it to company network.

**4]** The IDAX unit will be detected by the IDAX SW and the address identified. Allow connection to the IDAX instrument.

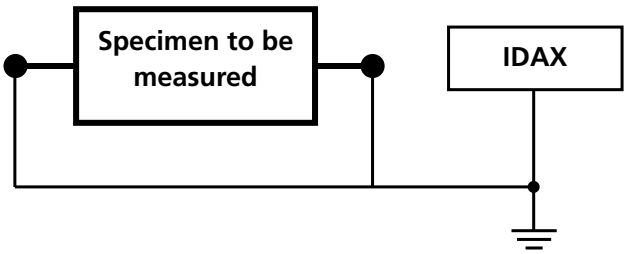
**Note** *If you have several instrument connected via e.g. a company network, confirm and make sure to connect the correct instrument intended to be used.*

**5]** In case the IDAX FW version needs to be changed, IDAX SW will identify this during the first connection to the instrument and initiate the corresponding upgrade. Follow exactly step-by step screen instructions to make sure the FW upgrade process is not interrupted in any way!

**Note** *Firmware update requires USB connection (no Ethernet). After the upgrade you may use USB or Ethernet*

# 3.6 Preparing test object

**1]** All test object capacitances must be discharged/grounded before connecting IDAX test leads.
This means that all test object electrodes must be short circuited and grounded.
The electrodes must remain grounded until IDAX leads are connected. See picture below depicting ground connections before measurement.



# 3.7 Configurations and connections

## Measurement terminals

All IDAX have 3 measurement terminals (red, blue and ground) that allows measuring multiple tests in an automatic sequence without having to change cable connections on the transformer.

The extended versions IDAX 300S and IDAX 350 have dual separate current measurement channel, that allows for two completely independent measurements at the same time, thus minimizing test time.

## Test modes

IDAX supports the following test modes:

| **UST: Ungrounded Specimen Testing** | | | |
|---|---|---|---|
| ***Test mode*** | ***Measure*** | ***Ground*** | ***Guard*** |
| UST-R | Red | Blue | - |
| UST-B | Blue | Red | - |
| UST-RB | Red and Blue | - | - |
| **GST: Grounded Specimen Testing** | | | |
| ***Test mode*** | ***Measure*** | ***Ground*** | ***Guard*** |
| GST-GND | Ground | Red and Blue | - |
| GSTg-R | Ground | Blue | Red |
| GSTg-B | Ground | Red | Blue |
| GSTg-RB | Ground | - | Red and Blue |

## Connection examples – Power transformers

IDAX transformer measurements/connections are organized as follows:

| **IDAX 300 (two winding transformer)** | | | | | |
|---|---|---|---|---|---|
| ***Test No.*** | ***Measure*** | ***Test mode*** | ***Output (Yellow)*** | ***Input 1 (Red)*** | ***Input 2 (blue)*** |
| 1 | CH | GSTg-RB | H | L | NC |
| 2 | CHL | UST-R | H | L | NC |
| 3 | CL | GSTg-RB | L | H | NC |

| **IDAX 300 (three winding transformer)** | | | | | |
|---|---|---|---|---|---|
| ***Test No.*** | ***Measure*** | ***Test mode*** | ***Output (Yellow)*** | ***Input 1 (Red)*** | ***Input 2 (blue)*** |
| 1 | CH | GSTg-RB | H | L | T |
| 2 | CHL | UST-R | H | L | T |
| 3 | CL | GSTg-RB | L | H | T |
| 4 | CLT | UST-B | L | H | T |
| 5 | CT | GSTg-RB | T | H | L |
| 6 | CTH | UST-R | T | H | L |

H = High Voltage Windings
L = Low Voltage Windings
T = Tertiary Windings
NC = Not Connected

**A]** In case of a two winding transformer the set-up of the test leads need to be moved between test 2 and test 3.

**B]** In case of a three winding transformer the IDAX 300 second input channel is utilized. The test leads need to be moved between test 2 and test 3 and between test 4 and test 5.

If using IDAX 300S or IDAX350 with two separate current measurement channels, the two set-ups using same cable set-up can be measured simultaneously, e.g. test 1 and test 2 (test 3 and test 4; test 5 and test 6).

**Note** *Test 6, CTH (Energize T and measure H), in many cases are replaced by CHT (Energize H and Measure T).*

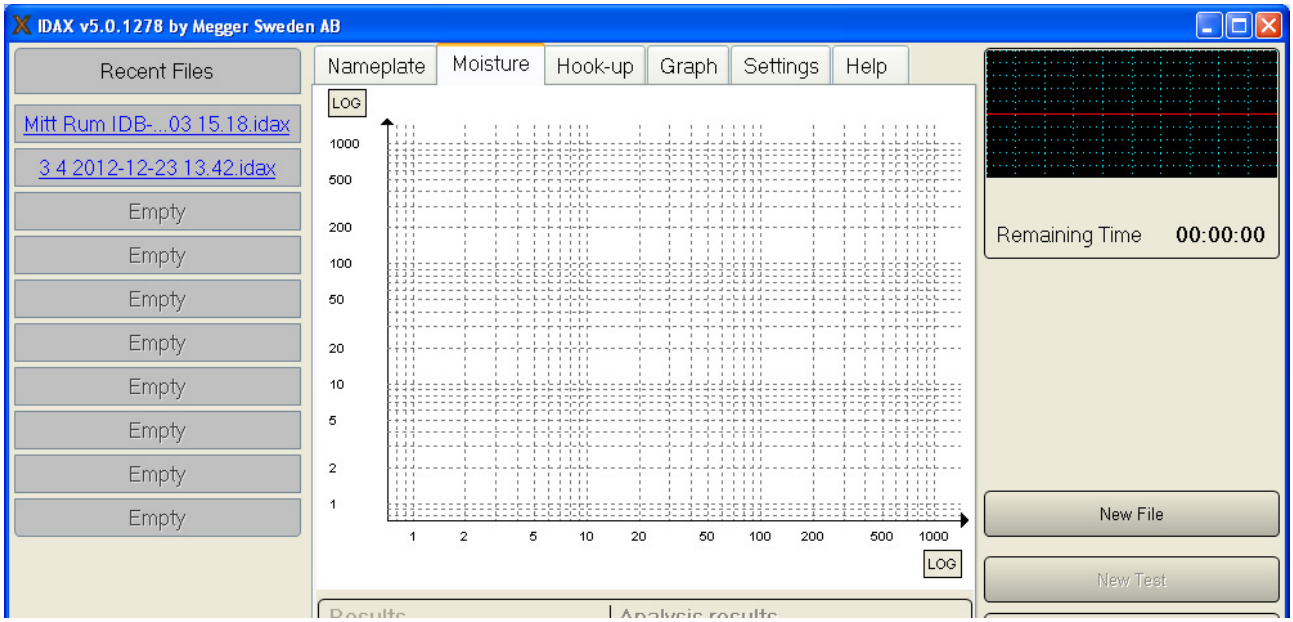
# 4 IDAX 5.0 User guide

## 4.1 Quick moisture test

This section describes the procedure to perform moisture assessment measurements on a 2-winding (single or three-phase) power transformer using IDAX 5.0 SW. Step-by-step instructions are provided, intended for the non-experienced user.

### Start the IDAX 5.0 SW

**1]** Begin set-up measurement by pressing the "New File"-button.




**2]** Select "Single Test" tab, "Moisture" button (see left-hand side arrows).

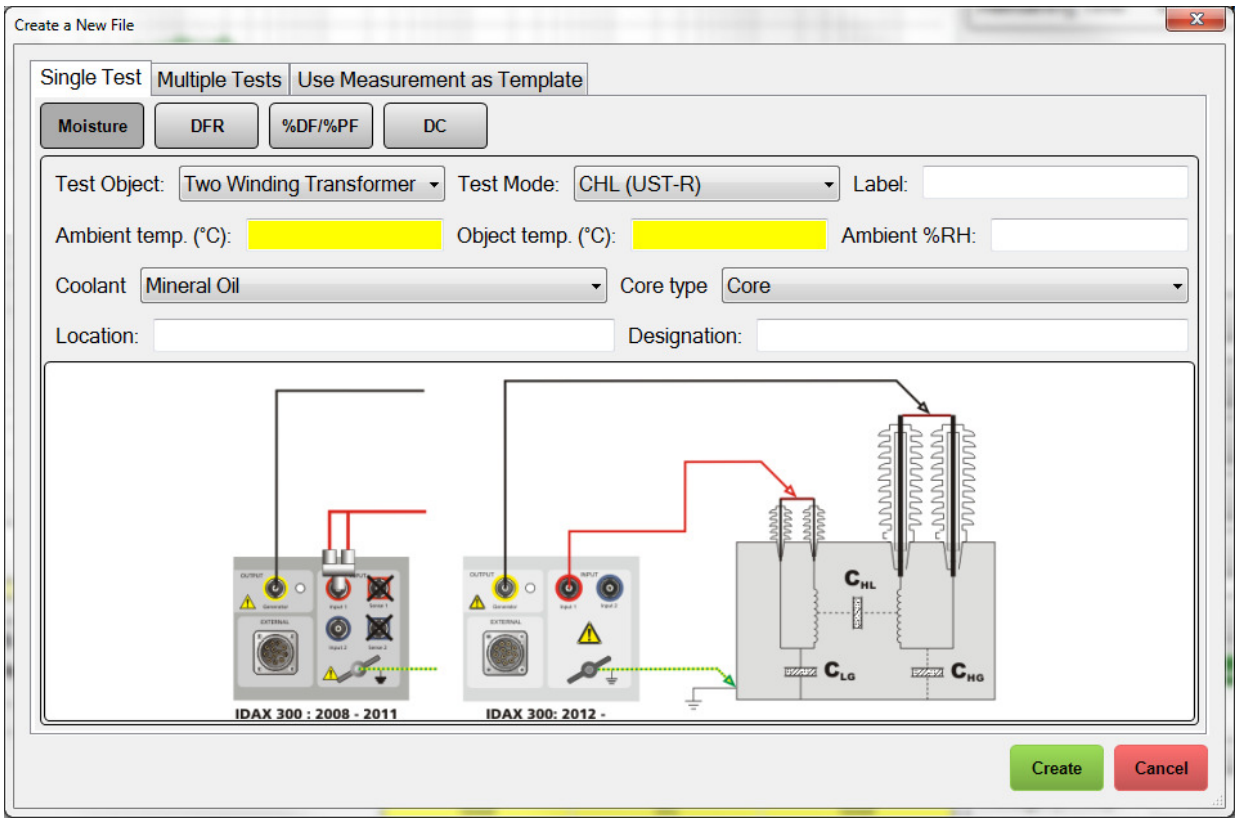
**3]** Then choose suitable test object template, e.g. 2W-transformer (two-winding transformer).

**4]** Enter mandatory temperature data for ambient and object temperature (highlighted). Object temp. (°C) refers to insulation temperature. Top oil or winding temperature is normally used as insulation temperature for the transformer. Designation is the tag or identification code of the UUT (unit under test) e.g. T2 (transformer No. 2). Suggested file name will be "Location"+"Designation"+"Date"+Time".

**5]** Press the green "Create"-button at the low right-hand side of the window.

**6]** Select the folder where the measurement will be saved and name the file. The default name is composed of: "Location"+"Designation"+"Date"+Time".

**Note** *At any time you may access Nameplate and change/add information by pressing "Edit Nameplate" button in the program main window.*




Now you have a "File" with one "Test", the CHL configuration, visible on the legend in the left-hand side of the main window (see picture below). On the top you have several "Tabs" showing Nameplate, The Test (Named Moisture), Hook-up, Graph (and table), Settings and Help.

**7]** Press the "Hook-up" tab to show the cable connections from the instrument to the object.

There are two pictures showing the two versions of IDAX300, IDAX 300 delivered 2011 or earlier (to the left) and IDAX 300 delivered 2012 or later.

**Note** *If you have an older IDAX300 with two input connector for each channel, the SENSE input must NOT be connected*

**8]** Ensure that the safety ground cable is connected to the IDAX 300 instrument and to the station ground near the test object/transformer. This cable acts as safety ground AND test input lead.

**9]** Make sure that all HV phase terminals and any exposed neutral terminal are connected together. While connecting together the terminals with bare copper wire, the phases/ windings should be connected to ground.

**10]** Make sure that all LV phase terminals and any exposed neutral terminal are connected together. While connecting together the terminals with bare copper wire, the phases/ windings should be connected to ground.

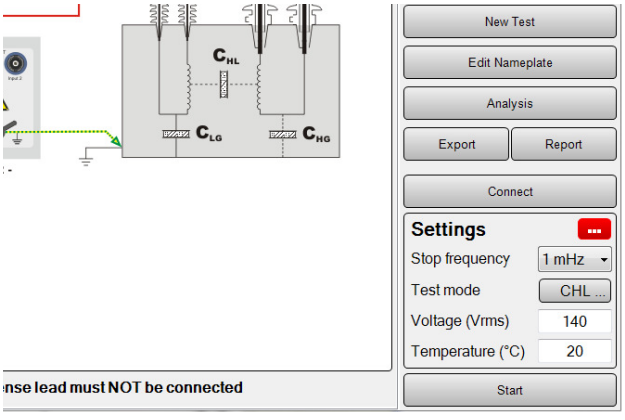
**11]** Connect the Generator cable to the high voltage winding – according to the picture in Hookup tab.

**12]** Connect the Red input lead to the low voltage winding – according to according to the picture in Hook-up tab.

**13]** Remove any grounding connection from the windings before you start the measurement.

**14]** Connect to the IDAX instrument using the "Connect" button located on the right-hand side of the main window or simply press the "Start" button (that will connect to IDAX 300 if not connected yet).

**15]** Press "Start" to initiate the measurement/test



## Measurement

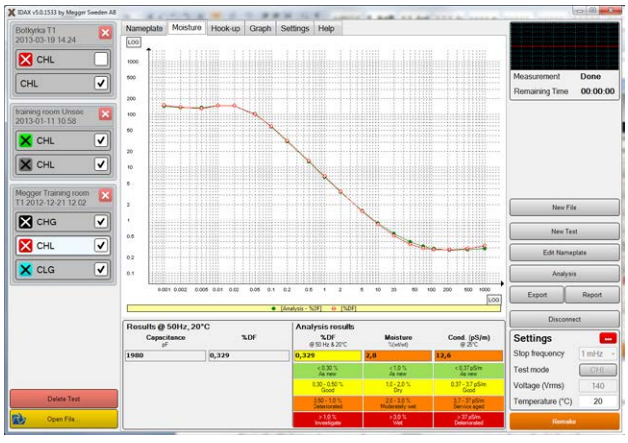
The Moisture Test will start a routine initiation procedure where the system measures all[1)] capacitances, including stray capacitances in the test object as well as the interference level. This routine procedure sets up the instrument and the model ensures the highest possible accuracy over the selected frequency range.

**Note** *A capacitance check is also performed and in case the measured capacitance to ground does not match with the sum of individually measured capacitances, the measurement will be stopped. If so, re-check that all connections are correct and start the measurement again.*

**Note** *1) From 2012, IDAX has single input terminals and utilizing a new methodology where stray capacitance are estimated and compensated for based on pre-measurements on all terminals, red, blue and ground. In previous IDAX models with dual input terminals, "input" and "sense", some stray capacitances were not compensated for. Note: The compensation is only important for higher frequencies well above 50/60 Hz.*

Next, the Dielectric Frequency Response (DFR) measurement starts from the highest selected frequency (usually 1000 Hz) and then steps down to the set "Stop frequency" of e.g. 1 mHz. After measuring 40 Hz, power frequency capacitance and dissipation factor are calculated and presented.

## Analysis




In a Moisture Test; when DFR sweep passes 1 Hz, the first automatic analysis is performed and preliminary results are presented in the "Analysis results" section. After the test is completed (last frequency point measured) the final analysis results are displayed:

- Measured capacitance and %DF
- Calculated dissipation factor at 20°C reference temperature using ITC (individual temperature correction)
- Moisture content in the solid insulation
- Oil conductivity at

### Insulation assessment guidelines

Default limits for %DF/%PF @ 20°C are based on recommendations in IEEE PC57.152 and CIGRE TB442. For moisture assessment, average values between IEC and IEEE recommendations are used. Oil classification is based on IEEE C57.106 "IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment", differentiating "new" and "service aged" mineral oils.

### Insulation geometry

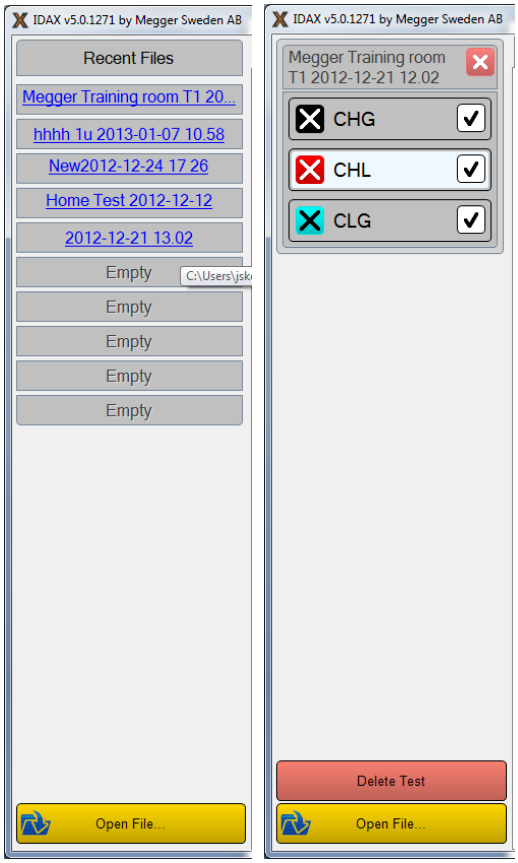
In Moisture Test, limits for insulation geometry matching are based on the selected test object. For power transformer, limits are pending if the design is shell or core type, as described in the application note "Dielectric Frequency Response (DFR) Measurement and Analysis Settings (IDAX/MODS)". The resulting geometry model parameters can be viewed in the "Analysis" window by pressing the "Analysis" button in the right-hand side of the main window.

## Disconnect/re-connect

It is possible to disconnect the computer and let the IDAX unit run standalone by pressing the "Run Standalone" button and then disconnect your computer. The data will automatically be stored in the IDAX instrument's internal memory and uploaded to the IDAX 5.0 when it is re-connected (you may even close IDAX 5.0 SW and turn off your computer but if you re-connect using a different computer, you will only get test data which does not include general e.g. Nameplate data).

# 4.2 Operating IDAX 5.0

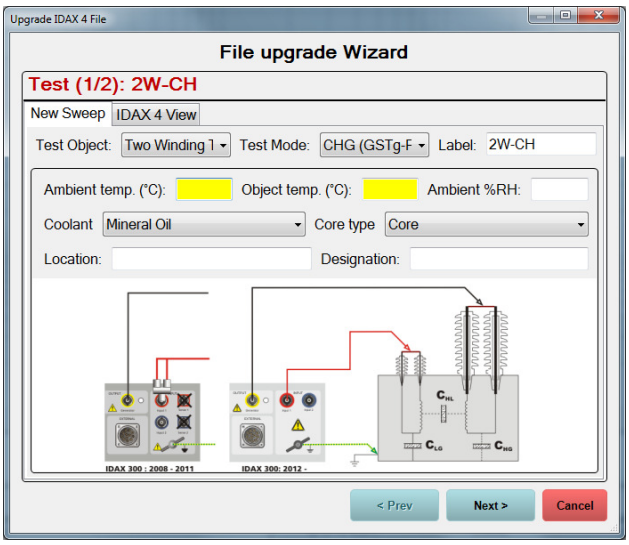
## Left-section of the main window




When no file is loaded the left section shows the latest used files for quick access and a button for opening other saved files. If you open an old IDAX file in either IDF or IZF format you will be given the option of either just open the file or convert it to the new IDAX format.

## File conversion wizard

A file conversion wizard will be started if the choice is to convert the file. Here you will be required to add necessary information that is missing and you can also correct faulty information.




When a file is loaded the wizard displays a list of the sweeps in the file. You can select what sweeps to show clicking the X in the colored square to the left of the sweep name. If you right-click the colored square you can change the sweep color. If you double-click the sweep name you can add a short description of it.

## Sweep (test) actions

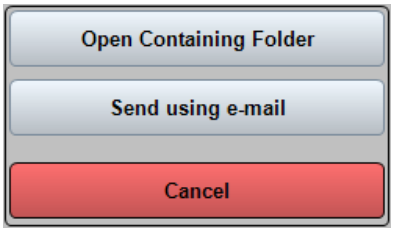
**1]** **A sweep with no tick to the right of the sweep name is not measured and you can start the measurement with F9 or "Start".**

A ticked sweep is measured can be re-measured with "Remake".

**Note** *The new measurement will be performed as by the actual measurement settings and not necessarily exactly as the old measurement.*

- Sweep labels can be changed by double-clicking the name.
- Sweep color can be changed by double-clicking the colored name.

**2]** **By clicking the name at the top you open up a menu for handling the file where you can open the folder it is save in or send the file via e-mail.**

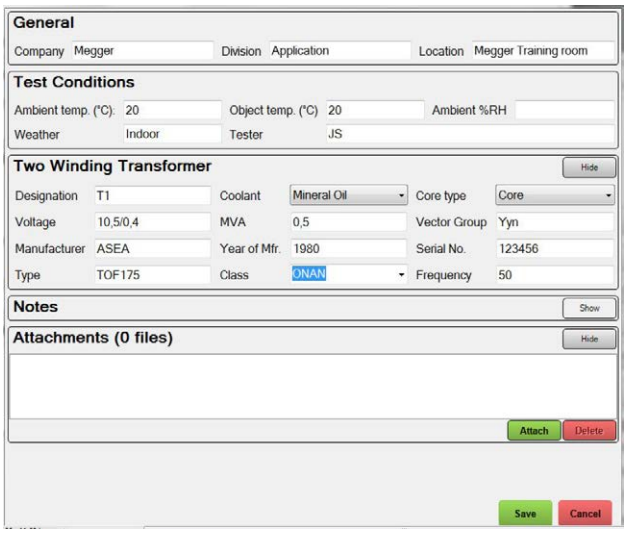



- Clicking the red X in the upper right closes the file.
- At the bottom there is a button for deleting the selected sweep as well as the button for opening a new file.

# Middle section of the main window

## Nameplate tab

The Nameplate Tab shows the information about the test object; it reflects the necessary specifications corresponding to the type of object selected e.g. number of bushings and capacitances to be tested. If the nameplate information needs to be modified after the measurement has been completed, you can press the Edit Nameplate button, see “Edit nameplate” on page 25., and modify the information as needed.



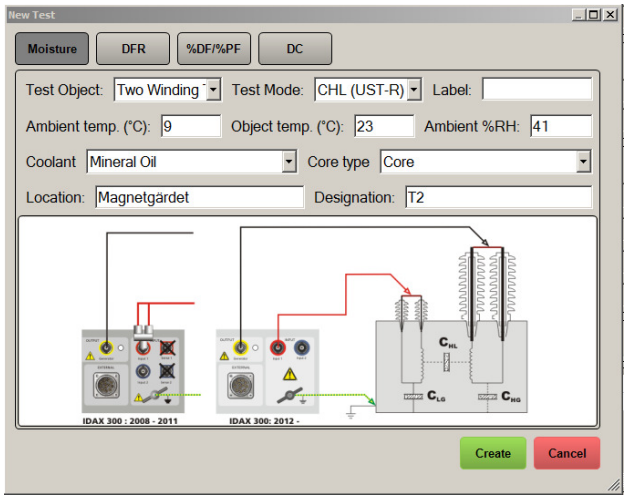

Notes is intended for noting specific details for the particular measurements.

Attachements may be photos or other files describing the test object/test conditions etc

## New test

New test creates a new measurement/sweep where the type of measurement can be:

- Moisture
- DFR
- %PF/%DF
- DC



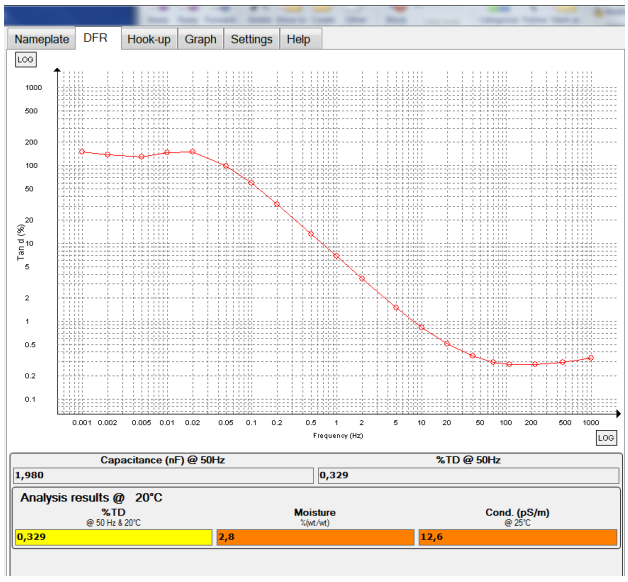

For every measurement the object and test mode can be defined as well as other data necessary for the test.

### Moisture

See section “Analysis” on page 20 for information about Moisture tab.

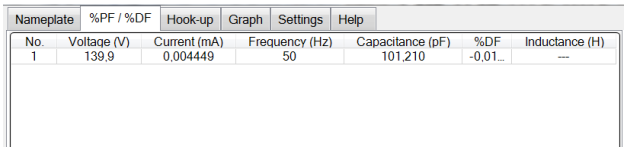
### DFR

In the DFR Tab the measurement is performed at multiple frequencies in the same way as in the Moisture Tab but no automatic analysis is performed. Analysis is started manually from the Analysis button, see section “Analysis” on page 25. The results of the analysis will only be displayed after an analysis has been performed (as “DFR” or “Moisture”).




### %PF/%DF

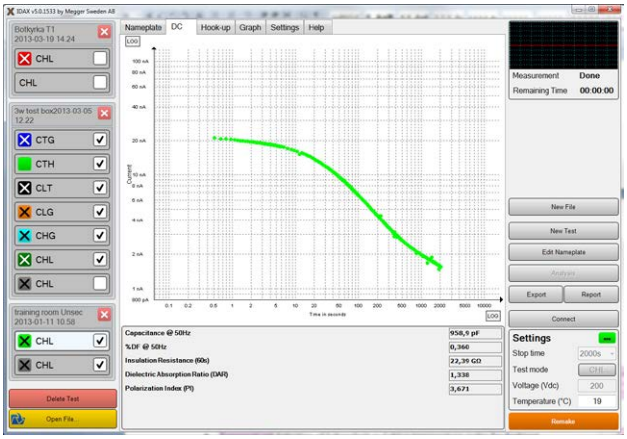
In the %PF / %DF tab, 50 or 60 Hz values for capacitance, dissipation factor/tan delta and excitation current can be measured. Multiple recordings can be made by repeating “start”. Results are presented in table format.




## DC

In the DC tab you can perform DC insulation measurements. Results are presented as polarization current versus time as well as Insulation Resistance (IR) at 60 seconds, Dielectric Absorption Ratio (DAR) and Polarization Index (PI).

**Note** *The measurement time needs to be sufficient (10 minutes) to display all values.*

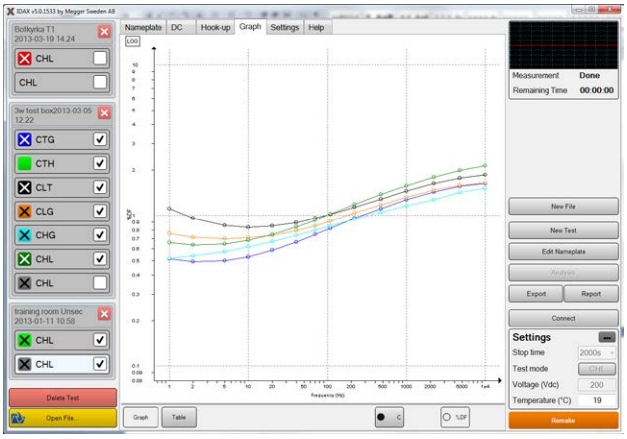


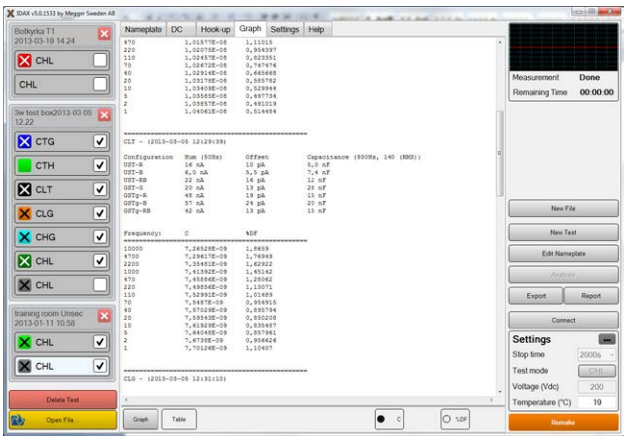
## Hook-up tab

This tab displays how to connect the cables of the IDAX instrument to the test object for the particular test.

## Graph tab (Table)

The graph tab will let you view and compare multiple measurements. You can look at both %DF/%PF or capacitance at the same time. A Y-axis will appear for display. It is also possible to view the measurement points in a table.





## Settings tab

## General

| | |
|---|---|
| **Language** | Different languages can be selected form this menu. After selecting a different language, the SW needs to be re-started in order of this change to apply. |
| **Line frequency** | Frequency selection for the power network where the actual component is measured (not necessarily the AC input to IDAX). Will set frequency for presentation in Test tabs, for Line Frequency %DF/%PF measurements and power frequency interference measurements (in the initialization procedure). |
| **%DF/PF/TD** | Selection of %DF (percentage Dissipation factor), %PF (percentage Power Factor) or %TD (percentage Tan-delta = %DF). |
| **Bushings** | Bushing terminals in Multiple Sweeps are labeled according to ANSI (H1, H2…), IEC (1U, 1V), ABC (A, B …) or Customized labeling that is possible to edit. |
| **Temperature** | Selection of Fahrenheit or Celsius for ambient temperature entry. |
| **Note** | Object/insulation temperature is always entered as degree Celsius. |
| **Enable keypad** | Enables or disables the pop-up keypad suitable for touch screen operation. |
| **Enable oscilloscope** | Enables the Oscilloscope (see upper right corner in the main window) |

## Instrument configuration

| | |
|---|---|
| **Generator** | The IDAX has two internal voltage sources. One of maximum 200V peak (approximately 140 V RMS) output voltage. The second source has maximum 10 V peak (approximately 7 V RMS). By selecting "External, VAX" and connecting the external VAX 020 amplifier, the output voltage levels can reach up to 2000 V peak (approximately 1400 V RMS). |
| **Test Leads** | The influence of capacitances and resistances in the test leads is taken into account in IDAX SW. By defining the type of test leads being used, the highest possible accuracy is achieved. It is especially important for high capacitive specimens and highfrequency measurements. By pressing the "Edit" button, a window appears where adding additional test leads or changing values of existing test leads is possible. |

## DFR (Frequency sweep)

Enable or disable the use of multi-frequency generating/measuring technique for measurements below 1 Hz. Multi-frequency mode generate and measure three frequencies simultaneously, significantly reducing the measurement time in the frequency range < 1Hz.

**Note** *Multi-frequency technique is preferred when measuring to very low frequencies, typically for moisture measurements in power transformers. When measuring low capacitance objects e.g. bushings or instrument transformers, or in situations with very high interference, standard single-frequency measurements are recommended.*

"Frequencies" lists the frequencies to be used to perform the frequency sweep. If edited (not recommended for standard measurements).

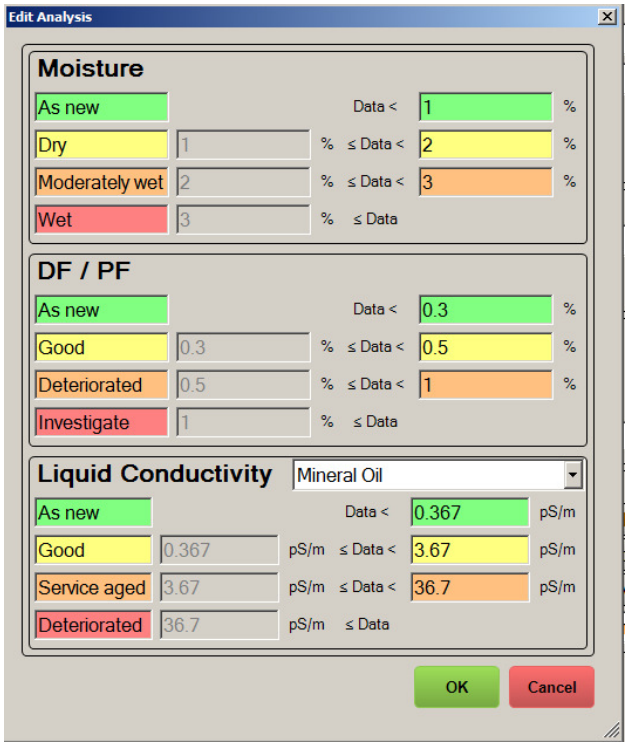
**Important**
**Do NOT use any frequency in the interval of line frequency ±3 Hz or any multiple of the line frequency value (e.g. 101 Hz for a 50 Hz system or 119 Hz for a 60 Hz system is forbidden)**

## Models

Selection of what parameters to be available in graphs and tables. The options are as follows:

| | |
|---|---|
| C | Capacitance |
| %DF | % Dissipation Factor (it will change to %TD if %TD is selected in General) |
| %PF | % Power Factor |
| C" | The imaginary part of the complex capacitance (C is capacitance AND the real part of the complex capacitance. 1/Z = Y = j*w*(C-jC")). |

## Analysis settings




In the Moisture tab, interpretation levels for %DF @ 20°C, Moisture content in cellulose and liquid conductivity (or %DF /%PF) @ 25°C is set.

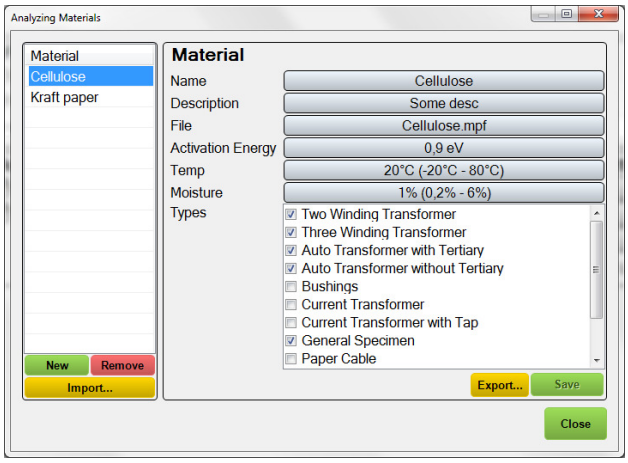
**1]** Press the Edit Ranges button, the Edit Analysis window will pop up and modifications to default setting values are possible.

**Note** *Each type of liquid has its own limits.*

*In the Edit Analysis window, it is possible to enter only values for conductivity; however, these values are automatically presented as e.g. %DF based on settings in Insulation Liquid Loss*

**2]** The suggested stop frequency value for Moisture Test is based on the object/insulation temperature vs. stop frequency table that can be edited under the "Edit Stop Frequency" button.

### Edit materials




Edit materials will let you choose which materials to use in the analysis window for specific objects. A transformer usually has cellulose while an instrument transformer typically has Kraft paper as insulation material. Default materials are Cellulose and Kraft paper, more materials can be added.

### Insulation liquid loss

This item represents the losses for material 2, normally mineral oil, in the analysis window, the different options are:

- Conductivity (S/m)
- %TD, Tan delta value in percent
- %DF, Dissipation Factor value in percent
- %PF, Power Factor value in percent

### Factory settings

This will restore the settings to the default factory settings from original installation.

## Right-section of the main window

### Oscilloscope

The Oscilloscope displays the IDAX 300 internal signals in Red, White and Green. The red signal is corresponds to the output voltage, the white signal shows the main electrometer output voltage (which is a function of the input current) and the Green signal shows the optional 2nd electrometer output voltage (IDAX300S and IDAX350). The oscilloscope time base is automatic.

Below the oscilloscope, the first row displays the status of measurement and the frequency or frequencies used. The second row shows an estimate of remaining measurement time.

**Note** *As the oscilloscope displays the internal (measured) signals they can differ from the actual output e.g. using IDAX + VAX020 in time domain the positive DC output will be displayed as negative as the actual measured signal comes from an inverted divider.*

### New file

All tests (DFR sweeps, %DF tests and more) on an object are stored in one single XML data file. Either you add a test to an existing file (by select an open test and press New Test button) or you create a New File/new measurement session by pressing the New File button.

### New test

Add a new test to a File (see 4.2 New Test)

### Edit nameplate

Open up the Nameplate for editing.

### Analysis

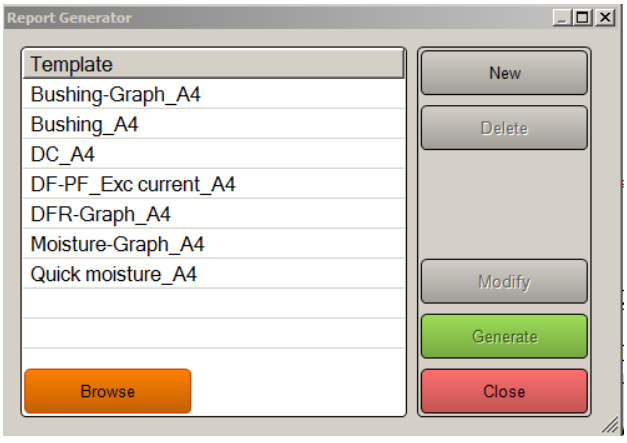
Open up the Analysis window (similar to MODS 2.0 program in IDAX 4.1).

### Export

Opens up a dialog box to export measurement data into text format, compatible with e.g. MODS 2.0

### Report

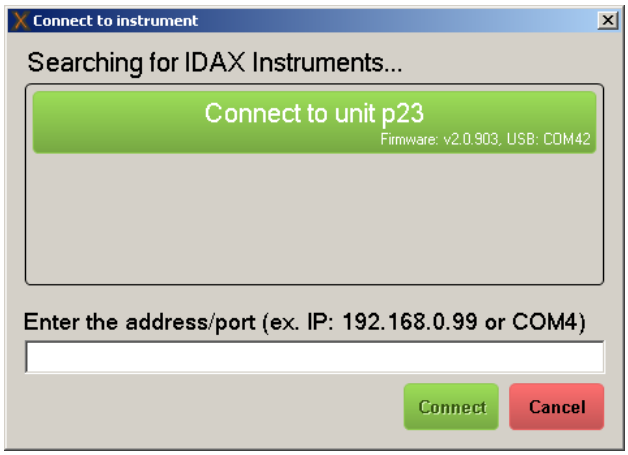
Opens up a Microsoft Word report dialog where pre-defined report templates are available




### Connect/Disconnect/Run Standalone button

**1]** Press the Connect button to connect the IDAX 5.0 SW to the IDAX instrument.
The Connect button will open up a Connect to instrument window. If any IDAX instrument is found via USB or Ethernet, they will

pop-up as a button labelled e.g. “Connect to unit p23”.




**2]** Press this button to connect to this specific unit.
In case this automatic detection does not work you may alternatively enter the address/port in the field at the bottom of the window and then press the Connect button. Any IDAX connected via USB will be shown in green colour and via Ethernet in blue colour.

**Note** *Connection via Ethernet can be done by direct cable or via Network/LAN-hub; using a LAN you will be able to operate the IDAX from remote places. In case you have several instrument connected via Network/LAN-hub, make sure connect to correct instrument.*

**3]** When the IDAX system is connected, the button will change label to a Disconnect button and you may use this button to disconnect the IDAX.

When a long and time consuming test is initiated, it is possible to disconnect the PC from the IDAX and let the unit store the measurement data until it is connected again. In cases where this is possible, the button is labelled Run Standalone.

## Settings section

In this section you may change the settings for the specific test:

- Change colour of e.g. graphs by pressing the color button.
- Change Test mode by clicking the test mode button (currently set to measure CHL for this test
- Change test voltage level by changing test voltage.
- Change temperature of object/insulation tested.

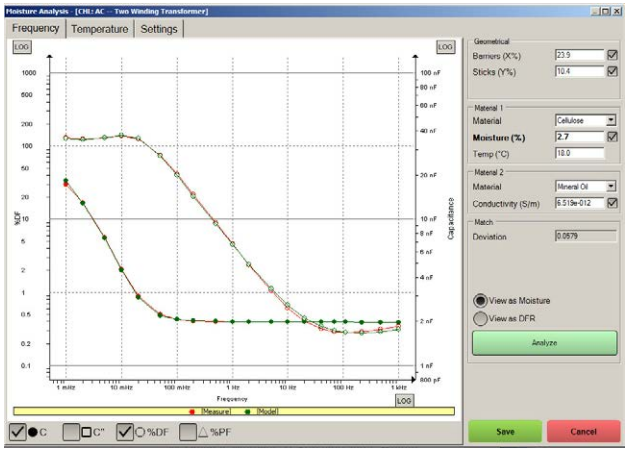
## Start/Stop/Remake button

**1]** Press button“Start”to start a test, and press the button “Stop” to stop a test.
If you have marked an executed test in the legend, you are not able to override this test and therefore the button change function and is labelled “Remake”. The Remake guides you to make a new test as a copy of the executed test.

**Note** *Using the Remake-button will make the settings used in the previous measurement but not copy the settings from the section “Settings tab” such as frequency, generator and cable setting.*

# Analysis window

This tab performs insulation modelling of the measured Dielectric Frequency Response, DFR.




**1]** Press “Analyze” to make the modelling SW to perform an automatic “matching” of a modelled insulation (X-Y model) with the measured response.

## Geometrical

Barriers (%X) represent the amount of barriers in relation to total insulation thickness and sticks (%Y) represent the area the sticks cover. These parameters are the same as in MODS 2.0. If checked (default and recommended), the analysis function automatically calculates a geometry of the modelled insulation.

Limits for X/Y depend on the test object and default settings as in table below. Recommended X&Y Parameters for insulation modelling.

| Apparatus | X parameter range | Y parameter range |
|---|---|---|
| Core Form Transformer | 15-55 | 10-35 |
| Shell Form Transformer | 55-90 | 10-35 |
| Bushings and CTs | 20-100 | 0-5 |

### Materials

"Material 1" is the solid insulation, "Cellulose" or "Kraft paper". "Cellulose" is the same default database as in IDAX/MODS 2/3/4, "Kraft paper" is a slightly different database tailored for CTs and other objects containing mainly paper and little or no pressboard. "Material 2" is the "liquid" insulation; mineral oil, different types of ester oil, silicone oil or air/vacuum.

### Match

The matching algorithm is based on complex capacitance. Deviation is based on a summation of deviation between the measured and modelled response and indicates the "quality" of the match. If the deviation is too large, no results will be displayed as "Moisture".

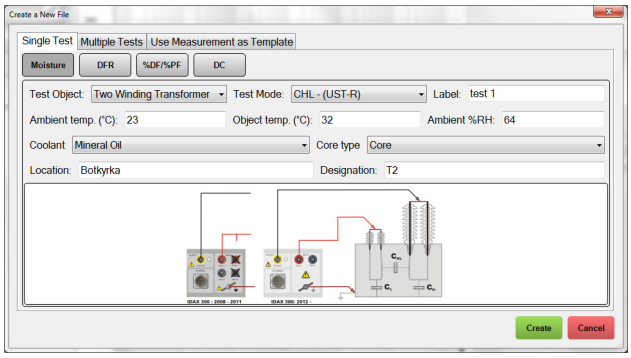
### Temperature tab

In this view, the modelled insulation is presented as dissipation factor at power frequency (50/60 Hz, single frequency) versus temperature.

### Save/Cancel

Changes made in this analyze window can either be saved to the test, Moisture test or DFR test or not saved to test (Cancel).

## New File




## Moisture

Moisture tab allows for performing measurement with automatic estimation of moisture content. Besides qualitative analysis of moisture content, parameters such as capacitance, dissipation factor both measured and calculated at 20°C according to individual temperature correction (ITC) as well as oil conductivity at reference temperature of 25°C are displayed.

## DFR

The Dielectric Frequency Response (DFR) tab opens for a general DFR measurement of capacitance and dissipation factor over a frequency range. In this tab, the user defines test object and setup, frequency range, if and how the results should be analyzed etc.

## %DF/%PF

In this tab IDAX performs standard capacitance and dissipation factor measurement as well as excitation current measurements at a single frequency e.g. at power frequency for the selected test object/test mode.

## DC

In the DC tab you can perform DC insulation measurements. Results are presented as polarization current versus time as well as Insulation Resistance (IR) at 60 seconds, Dielectric Absorption Ratio (DAR) and Polarization Index (PI).

**Note** The measurement time needs to be sufficient (10 minutes) to display all values.

# 5 Calibration

It is recommended to calibrate the IDAX at least once a year. There are two options regarding calibration of IDAX:

- The IDAX unit can be sent to Megger for calibration
- Calibration can be performed by the customer using the optional Calibration Set

The second option means that the IDAX instrument is available since it does not need to be sent away for calibration. The calibration procedure is easy to perform using the optional Calibration Set, which consists of:

- Calibration Box CAL 300
- Calibration Software
- Cables and connectors
- User Manual

The only thing that needs to be sent away is the Calibration Box and calibration of the Calibration Box can be performed by any local accredited laboratory or testing facility handling test instruments.

# 6 Appendix A Error messages

## 6.1 Error messages

| No. | Message | Explanation |
|---|---|---|
| 347 | Output voltage is not within specified levels. | The applied voltage differs from the desired. |
| 361 | Overvoltage | An overvoltage occurred. |
| 364 | Measured capacitances don't match | Disagreement between values of capacitance measured for different configurations |
| 365 | Specimen capacitance below limit. | Measured capacitance below specified limit. |
| 366 | Specimen capacitance above limit. | Measured capacitance above specified limit. |
| 367 | Measured DC current>MaxDCCurrent | Measured DC current exceeds limits set by MaxDCCurrent variable. |
| 368 | Measured hum current>MaxHumCurrent | Measured interference (hum) current exceeds limits set by MaxHumCurrent variable. |

### (347) Output voltage is not within specified limits

Measured output voltage is outside specified limits.

#### Possible reasons and countermeasures

1. **Voltage electrode, Generator, is grounded:**

- check measurement set-up and disconnect ground
- change measurement configuration if terminal of test object cannot be disconnected from ground

2. **Voltage electrode, Generator, is connected to measuring electrode, Input or Ground:**

- check measurement set-up and disconnect measuring or guard electrodes from the voltage electrode. Voltage electrode, Generator, must not be connected to either measuring or guard electrode

3. **High stray capacitances to ground or high capacitance of the test object:**

- Lower the highest frequency used in measurement plan (see also Measurement variables)
- Lower the InitFrequency in the measurement plan (see also Measurement variables)
- Lower the test voltage

4. **If you try to use an old version of IDAX SW, version 3.2 or earlier but the firmware in IDAX is** for IDAX SW 4.0 or newer, the IDAX SW do not understand the incapability and it usually result in error 347. Please check IDAX SW and if version 3.2 or earlier. Please upgrade to 4.0 or newer (this new SW will automatically upgrade firmware if necessary).

### (361) Overvoltage

Measurement aborted due to overvoltage detected on measuring electrode, Lo. Potential difference between signal ground and real ground exceeds limiting value.

#### Possible reasons and countermeasures

1. **Ground electrode is not connected to true ground:**

- connect Ground electrode to true station/substation ground

2. **Transients caused by accidentally disconnected ground connection:**

- check ground connection

### (364) Measured capacitances don't match

Values of capacitance measured for different configurations, the UST, GST-Guard and GSTGround are in disagreement.

#### Possible reasons and countermeasures

1. **When performing UST measurement, measuring electrode, Lo, is connected together with Ground electrode or Lo is connected to ground:**

- check measurement set-up and make sure that measuring electrode, Lo, is connected to a nongrounded terminal of the test object and that Ground electrode is connected to ground.

### (365) Specimen capacitance below limit

Measured capacitance below limit specified in C-file by MinSpecimenC.

### Possible reasons and countermeasures

1. **Measured capacitance higher than 10 pF.**
   Specimen size is very small which results in low value of capacitance:

- change limit set by MinSpecimenC to an approximately 10% lower value than measured capacitance
- select another measurement configuration if possible

2. **Measured capacitance lower than 10 pF.**
   Most likely no contact with specimen:

- check connections with specimen for loose contacts
- check measurement cables for damage

For more information of actual measured capacitance, please see Message Window.

## (366) Specimen capacitance above limit

Measured capacitance above limit specified in test plan by MaxSpecimenC.

### Possible reasons and countermeasures

1. **Large size of test object results in high values of capacitance:**

- change limit set by MaxSpecimenC to an approximately 10% higher value than measured capacitance
- select another measurement configuration if possible
- decrease in test voltage allows for measuring at higher frequencies

## (367) Measured DC current > MaxDCCurrent

Measured DC current exceeds the limits set in test plan by MaxDCCurrent.

### Possible reasons and countermeasures

1. **The far most common reason is too low resistance between measurement electrode and guard, e.g. measuring a UST configuration between high and low voltage windings of a two winding transformer, the low voltage winding has too low impedance to ground (inductive voltage transformer connected, internal damage of transformer, neutral connected to ground via a Peterson coil. For a GST measurement, same applies to guard electrode, i.e. a too low resistance Guard electrode to ground may introduce DC currents**

- Make sure that floating electron has high resistance to ground, if not possible use another setup (e.g. measure to ground without use of guard)
- It is possible increase limit level for DC current in Measurement Template, but only when difference is very small and all other possibilities excluded

## (368) Measured hum current > MaxHumCurrent

Measured interference or hum current exceeds the limits set in test plan by MaxHumCurrent.

### Possible reasons and countermeasures

1. **Level of interferences is very high:**

Try to reduce the interference level by

- Disconnect still connected bush-bars that pick-up interference
- Select another set-up, e.g. a CHG+CHL is much less influenced by interference compared to CHG
- As last option, it is possible increase the limit for hum current in the Measurement Template

# 7 Appendix B Measurement technique

Short overview of measurement principle is given in this chapter.

| | |
|---|---|
| How impedance is measured | Gives basic principle of IDAX operation |
| Modelling principles | Description of the model |
| Sample modelling | Describes theoretical models used for presenting measurement results |

## 7.1 How impedance is measured

IDAX measures impedance. By measuring the impedance at one point, i,e, at a specific frequency and amplitude, parameters such as tan delta/power factor, capacitance and resistance can be calculated.

The impedance of a sample is measured by applying a voltage across the sample. This voltage will generate a current through the sample. By accurately measuring the voltage and the current, the impedance can be calculated, see illustration below.

V A

U Z

I

Voltmeter Electrometer

Computer with

DSP-board

Voltage source

Sample

Measured voltage

Measured current

Control voltage

*Fig.1. Measurement of electrical impedance.*

The impedance is calculated using Ohm's law:

where Z, U and I are complex entities.

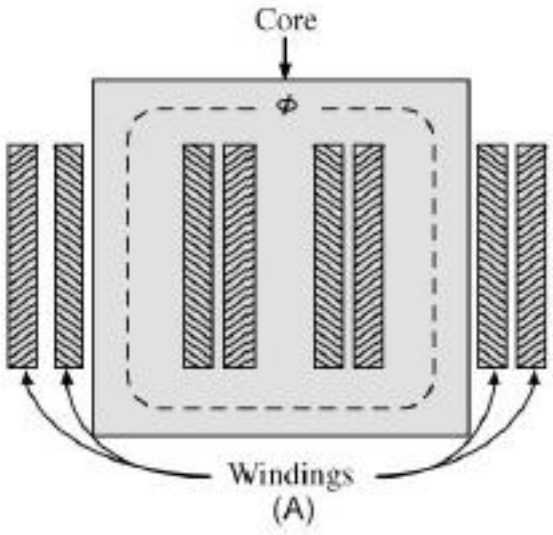
The voltage (and the current) is generated by a voltage source. There are currently two internal voltage sources available in the IDAX system, which can deliver a maximum peak output of 10 Vpeak and 200 Vpeak, respectively. The voltage is measured by means of a voltmeter and the current is measured by an ammeter or electrometer which acts as a current-to-voltage converter.

The analogue signals (voltages) are then converted to digital samples of the signals that are used in subsequent calculations.

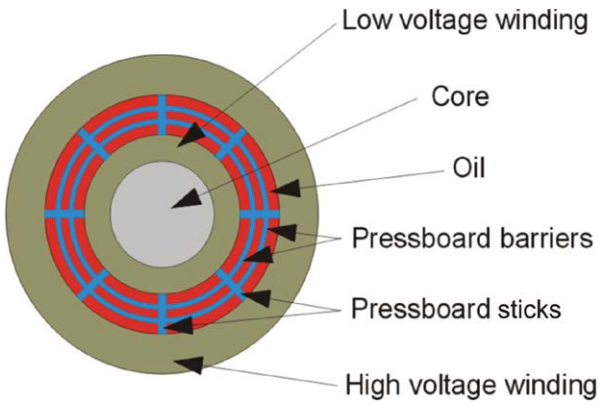
# 7.2 Modelling principles

## Description of the model

The windings in a power transformer are generally placed concentrically around the magnetic core, for example, as in picture below.




Normally the low voltage winding is located closer to the core and high voltage winding encloses the low voltage winding. In order to ensure required dielectric strength as well as provide sufficient cooling the windings are kept apart. This is achieved by using a number of cylindrical pressboard barriers between two windings. The barriers are mechanically separated by a certain amount of spacers. Oil is allowed to freely flow in ducts between barriers and spacers. A simplified illustration of two windings is given by a picture bellow.




For modelling purposes the insulation structure between two windings is represented by the relative amount of spacers and barriers in the duct. Parameter, X, is defined as the ratio of the sum of all barriers in the duct, lumped together, and divided by the duct width. The spacer coverage, Y, is defined as the total width of all the spacers divided by the total length of the periphery of the duct.

Describing the complex geometry of barriers and spacers/stick between the windings as one simple capacitance is a simplification of the real conditions. This is one of the reasons why the modelled geometry may not correspond exactly to the "real" geometry in the transformer. In most cases, best matching/ modelling is achieved by letting the SW automatically calculate the geometry.

The permittivities of oil, oil, spacers, spac ers and barriers, barriers are complex functions of both frequency and temperature resulting in the total or measured frequency response:

Taking into account the amounts of barriers and spacers, the total response of insulation duct can be expressed as:

Oil can be represented by its relative permittivity 2,2 and conductivity, thus its frequency response can be modelled as follows:

Frequency response of pressboard is, however, much more complex function, for modelling of which a number of reference frequency responses are used. The reference responses are obtained from measurements on pressboard and impregnated paper samples having controlled parameters.

The influence of temperature must be also taken into account. Temperature changes result in horizontal shift of the pressboard response, therefore it can be modelled using Arrhenius type relationship:

where W - activation energy of pressboard 0,9 eV
k - Boltzman constant, T=1/T-1/T20 - temperature difference (K)
ω20- angular frequency at 20°C

# 7.3 Sample modelling

The impedance, Z, can be presented directly or by using different impedance models. Two ways of presenting Z directly are the polar and the rectangular, as follows:

Polar:

Z Abs Z Arg Z

Rectangular:

Z Re Z Re Z Im Z Im

Two simple models which are usually used in circuit analysis, although more seldom in insulation analysis, are capacitance, C, and resistance, R. The equivalent RC circuit models available are series and parallel models (see Fig.1) calculated as follows:

a) b)

*Fig.1. Equivalent circuit models: a) series RC circuit, b) parallel RC circuit.*

Parallel:

P P

P

j R C

Z R

1

j Z

CP

Re 1

Z

RP 1 Re

1

Series:

S

S j C

Z R 1

Z

CS Im

1

R Z S Re

where = 2 f and f is frequency.

Another model, more often used in insulation diagnostics, is the complex capacitance model describing the insulation impedance as a complex capacitance, where the imaginary part of the capacitance represents the losses. The complex capacitance model is defined as follows:

j C

Z 1

where

C C jC

Complex C:

C Re 1

C C k

j Z

C Im 1

The C′ is defined as the capacitance, C′, with an arbitrary constant k (usually negative) added. The aim of this parameter is to make it possible to distinguish between small changes in capacitance in graphical presentation.

A model, very often used in insulation diagnostics, is a description of the insulation impedance as a capacitance combined with a dissipation factor, tan , or a power factor (PF or cos ). The capacitance, tan and cos /PF are defined as follows:

C, PF, Tan-Delta:

j Z

C Re 1

Z

PF cos Re Z

Z

Z

Im

tan Re

If tan and cos (PF) are small, then tan » cos = PF (E.g. tan =0.1 corresponds to PF=0.0995)

Insulation diagnostics is based on material characterization and therefore material models are often used. To be able to define material parameters from measured impedance Z the geometry of the sample, described in terms of the geometrical capacitance C0, has to be defined. In the illustration below, a vacuum (or air-filled) capacitor of defined geometry is shown. Since no "material" is between the electrodes, the capacitance of a) is the geometrical capacitance.

I

U C0

I

U C

I

'& " U '& C

a) b) c)

## Material parameter models based on a geometrical capacitance C0 and material parameters.

In the above illustration b) and c) a material is inserted between the electrodes and it will influence the current, I, flowing in the circuit. The influence of the material can be described by different parameters using either a dielectric model or a conductive model. In the dielectric model the "material capacitance", the permittivity, is a complex function describing both the capacitance and the loss. Whereas in the conductive model the capacitance is described by a permittivity and the loss by a conductivity (or resistivity). The dielectric and resistive models are derived as follows:

j C

C C j 0

Dielectric:

j C Z 0

Re 1

k

j C Z 0

Im 1

Resistive:

j C Z 0

Re 1

Z

C

Re 1 0

0

1

If geometrical capacitance, C0, is unknown it can be set by the user by entering a permittivity (dielectric constant), ', for the material. Entering a permittivity, ', will let the system calculate an approximate C0 making use of the material models available. Yet, one must be aware that the accuracy of the absolute values are limited by the accuracy of the entered permittivity. If the geometrical capacitance is unknown and an approximate permittivity is given, the geometrical capacitance is calculated as follows:

j Z

C C

r r

1 Re 1

0

The impedance value, Z, used in the calculation is the first measurement point in the actual

measurement.

# 8 Specifications

## SPECIFICATIONS IDAX 300/350

| | |
|---|---|
| **Environmental** | |
| *Application field* | The instrument is intended for use in medium and high-voltage substations and industrial environments. |
| *Ambient temperature* | |
| *Operating* | IDAX300: -20°C to +55°C (-4°F to +131°F)<br>IDAX350: -10°C to +55°C (14°F to +131°F) |
| *Storage* | -40°C to 70°C (-40°F to +158°F) |
| *Humidity* | < 95%RH, non-condensing |
| **CE-marking** | |
| *EMC* | 2004/108/EC |
| *LVD* | 2006/95/EC |
| **General** | |
| *Mains voltage* | 100 – 240V ±10%, 50/60 Hz |
| Power consumption | 250 VA (max) |
| *Dimensions* | |
| *IDAX 300* | 335 x 300 x 99 mm (17.7" x 6.3" x 16.1") |
| *IDAX 300 Flight case* | 520 x 430 x 220 mm (20.5" x 17" x 8.7") |
| *IDAX 350* | 520 x 430 x 220 mm (20.5" x 17" x 8.7") |
| *Weight* | |
| *IDAX 300* | 4.9 kg (11 lbs), 9.9 kg (22 lbs) incl. flight case |
| *IDAX 350* | 13.5 kg (29.8 lbs) |
| *Accessories* | 8.5 kg (18 lbs) soft bag |
| **Measurement section** | |
| **Inputs** | Channel 1, channel 2, ground |
| *Capacitance range* | 10 pF – 100 µF |
| *Inaccuracy* | 0.5% + 1 pF |
| *Dissipation factor range* | 0 - 10 (with retained accuracy of capacitance; otherwise higher) |
| *Inaccuracy* | < 0.5% + 0.0001, 45-70 Hz, C > 100 pF (with VAX020)<br>< 0.5% + 0.0002, 45-70 Hz, C > 300 pF<br>< 1% + 0.0003, 1 mHz-100 Hz, C > 1000pF<br>< 2% + 0.0005, 100 Hz-1 kHz, C > 1000 pF |
| *Max AC interference* | 1 mA, 1:10 SNR (IDAX) 10 mA, 1:10 SNR (VAX020) |
| *Max DC interference* | 2 µA (IDAX) 20 µA (VAX020) |
| *Test modes** | UST: ungrounded Specimen Testing<br>UST-R: UST: Measure Red, Ground Blue<br>UST-B: UST: Measure Blue, Ground Red<br>UST-RB: UST: Measure Red and Blue<br>GST: Grounded Specimen Testing<br>GST-GND: GST: Ground Red and Blue<br>GSTg-R: GST: Guard Red, Ground Blue<br>GSTg-B: GST: Guard Blue, Ground Red<br>GSTg-RB GST: Guard Red and Blue<br>*IDAX300 can measure mutiple test modes in an automatic sequence. IDAX 300S/350 can measure two test modes simultaneously. |
| *Calibration* | Calibration set allows field calibration |
| **Time Domain Current Measurement (PDC)** | |
| *Range* | ±50 mA |
| *Resolution* | 0.1 pA |
| *Inaccuracy* | 0.5% ±1 pA |
| *Input resistance (DC mode)* | ≤10 kΩ |

| | |
|---|---|
| **Outputs** | |
| **GENERATOR** | |
| *Voltage/current ranges, 10 V* | 0 – 10 Vpeak 0 – 50 mA peak |
| *Voltage/current ranges, 200 V* | 0 – 200 Vpeak 0 – 50 mA peak |
| *Frequency range* | DC – 10 kHz |
| **EXTERNAL** | |
| *For external amplifier* | E.g. VAX020 |
| **PC Requirements** | |
| *Operating system* | Windows 2000/ XP / Vista / 7 / 8 |
| *Processor* | Pentium 500 MHz |
| *Memory* | 512 Mb RAM or more |
| *Interface* | USB 2.0 and LAN |

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