Megger


# IDAX User's Manual

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# 1 IDAX

## 1.1 Overview

IDAX is an insulation diagnostic system for investigations/analysis of dielectric materials, normally insulators. The measurement method used is dielectric spectroscopy, i.e. measurement of the dielectric properties of the material as a function of the frequency, and in some cases also as a function of the voltage. By studying the dielectric material properties as functions of frequency it is possible to make a distinction between different types of phenomena. For example, it is possible to separate polarization loss from leakage currents.

The system applies a sinusoidal voltage with desired frequency over the sample. This voltage will generate a current in the sample. By accurately measuring the voltage and the current, the sample impedance can be calculated. Depending upon the actual sample model, various parameters can be calculated from the impedance, such as capacitance, loss, resistance etc. This procedure can then be repeated at the specified frequencies and voltage levels and even more information on the sample can be revealed. More information can be found in the chapter "Measurement technique".

The system is fully computerized and most of the measurements can be performed automatically.

More technical and safety details are given in sections:
Specifications
System and accessories
Safety precautions

### 1.1.1 Specifications

The Insulation Diagnostic System IDAX measures the insulation impedance, at different frequencies, for insulation materials present in high and medium voltage transmission and distribution networks. The measurement results are used for insulation diagnosis.

The IDAX uses voltages up to 200 Vpeak (~140 V RMS). The voltage range can be increased by adding an external high voltage unit (the high voltage unit is specified separately).

#### 1.1.1.1 IDAX-300 Specifications

**General**

The Insulation Diagnostic System IDAX-300 measures the insulation impedance, at different frequencies, for insulation materials present in high and medium voltage transmission and distribution networks. The measurement results are used for insulation diagnosis.

The IDAX-300 uses voltages up to 200 Vpeak (~140 V RMS). The voltage range can be increased by adding an external high voltage unit (the high voltage unit is specified separately). The IDAX-300 is operated using an external laptop/PC.

The IDAX-300 uses a three electrode set-up, which allows for measurements of non-grounded as well as grounded objects with and without guard.

The IDAX-300 system applies sinusoidal shaped voltages at different frequencies across the test object and simultaneously measures the current through it. The output voltage is either taken from a 10 $V_{peak}$ arbitrary waveform generator or from a 200 $V_{peak}$ arbitrary waveform generator.

## Output

| | |
|---|---|
| **Voltage/current range, 10V:** | 0 - 10 $V_{peak}$, 0 - 50 $mA_{peak}$ |
| **Voltage/current range, 200V:** | 0 - 200 $V_{peak}$, 0 - 50 $mA_{peak}$ |
| **Frequency range:** | 0.1 mHz - 10 kHz |

## Measurements

| | |
|---|---|
| **Inputs:** | Channel 1, channel 2, ground |
| **Capacitance Range:** | 10 pF - 100 uF |
| **Accuracy:** | 0.5% + 1 pF |
| **Dissipation Factor Range:** | 0 - 10 (with retained accuracy of capacitance; otherwise higher) |
| **Accuracy:** | >1% +0.0003, 1 mHz - 100 Hz, C > 1 nF<br>>2% +0.0005, 100 Hz - 1 kHz, C > 1 nF |
| **Noise Level:** | Max 500 uA at 50 Hz/60 Hz |
| **Test Modes, 2 Channels:** | UST-1, UST-2, UST-1+2, GST, GST-Guard-1, GST-Guard-2, GST-Guard-1+2<br>With 2-ch measurement option additionally UST-1+UST-2, UST-1+GST-Guard-2, UST-2+GST-Guard-1, UST-1+2+GST |
| **Calibration:** | Calibration box allows field calibration, recommended interval 2 years |

## General

| | |
|---|---|
| **Mains Input (nominal):** | 90 - 265 V ac, 50/60 Hz |
| **Power Consumption (max):** | 250 VA |
| **Communication Ports:** | USB 2.0 and LAN |

## Physical

| | |
|---|---|
| **Instrument Weight:** | 4.9 kg/11 lbs |
| **Case and Instrument Weight:** | 9.9 kg/22 lbs |
| **Accessories Weight:** | 8.5 kg/18 lbs (soft bag) |
| **Dimensions:** | 335 x 300 x 99 mm<br>17.7 x 6.3 x 16.1 in |
| **Dimensions with Case:** | 520 x 430 x 220 mm<br>20.5 x 17 x 8.7 in. |

## Environmental

| | |
|---|---|
| **Operating Ambient Temp:** | 0°C to +50°C /-32°F to +122°F |
| **Storage Ambient Temp:** | -40°C to 70°C / -40°F to +158°F |
| **Humidity:** | 20% - 95% RH, non-condensing |
| **CE Standards:** | IEC61010 (LVD) EN61326 (EMC) |

## PC Requirements

| | |
|---|---|
| **Operating System:** | Windows 2000/ XP / Vista |
| **CPU/RAM:** | Pentium 500 MHz/512 Mb or better |
| **Interface:** | USB 2.0 |

## 1.1.2 System and Accessories

### 1.1.2.1 IDAX-300 System and Accessories

**IDAX-300**


**Transport case**

**Cables**

### 1.1.3 Safety Precautions

A "⚠ ***Warning***" statement denotes hazardous conditions and actions that can cause bodily harm or death.

A "**Caution!**" statement denotes conditions and actions that can damage the IDAX or the equipment being tested.

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**Warning!**

***Always follow local safety regulations when working on high voltage equipment.***

***Make certain all personnel working with IDAX have been trained in its correct use and that all applicable safety precautions are taken.***

***BEFORE connecting this unit to the mains outlet user must verify that only a single protective ground systems exists AND no measurable voltage potential exists between the mains outlet protective ground and the test object protective ground. If a voltage potential is found between mains outlet protective ground and the test object protective ground then additional measures described in local safety standards should be applied to ensure personal safety.***

***The measurement system can generate hazardous and even lethal voltages.***

***Do not attempt to service the IDAX yourself as opening or removing covers may expose you to dangerous voltage.***

***Do not use any accessories that are not intended for use together with the IDAX.***

***Unplug the IDAX from the mains supply when it is left unattended or not in use.***

***Before cleaning, unplug the IDAX from the mains supply. Use a damp cloth for cleaning. Do not use liquid or aerosol cleaners.***

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**Caution!**

***Make sure that the mains voltage selected on the selector switch located on the back panel corresponds to the voltage level before connecting the mains.***

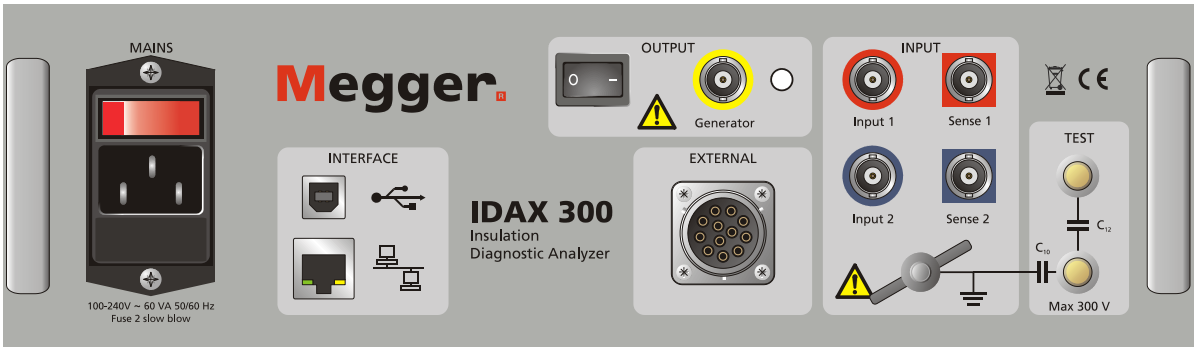
***Refer all servicing to qualified service personnel.***

***If you need to return your IDAX, please use either the original crate or one of equivalent strength.***

## 1.2 Instrument Panels

### 1.2.1 IDAX-300 Front Panel

#### Overview

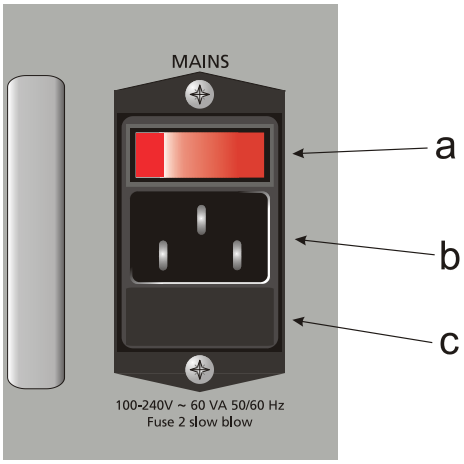



#### Power

**a) Power ON/OFF switch**
Turns unit on and off.

**b) Mains connector**
For connecting to mains outlet.

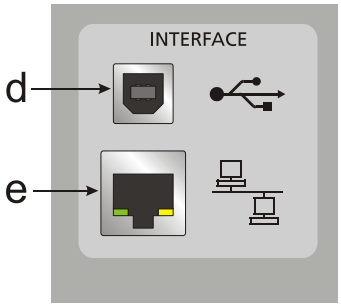
**c) Fuse**
Use small screwdriver to gently pry out to change the fuse, F1, 2A slow blow.




#### Interface

**d) USB Port**
for connecting computer

**e) ETHERNET**
RJ45 connector for Ethernet connection via twisted pair cable.

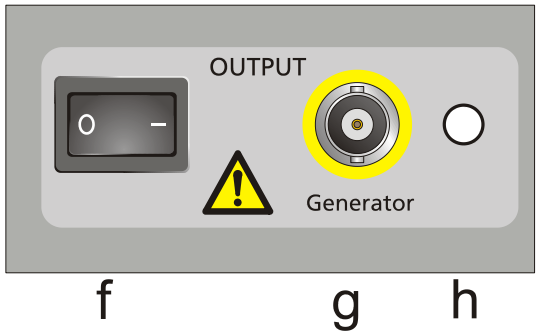


## Output

**f) Enable switch**
**1** for activating the output of voltage.
**0** for deactivating the output of voltage.

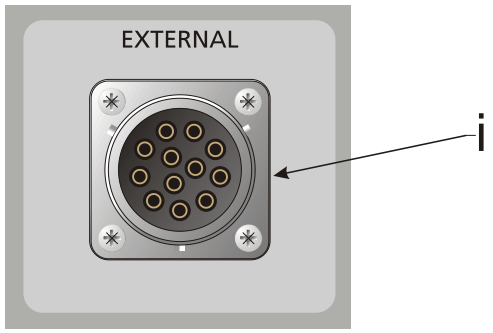
**g) Generator**
Generator output connector.

**h) Active**
**Red** high intensity LED. Is lit when the output is switched on, dark when the output is switched off.




## External

**i) AMPLIFIER**
Connector for external amplifier



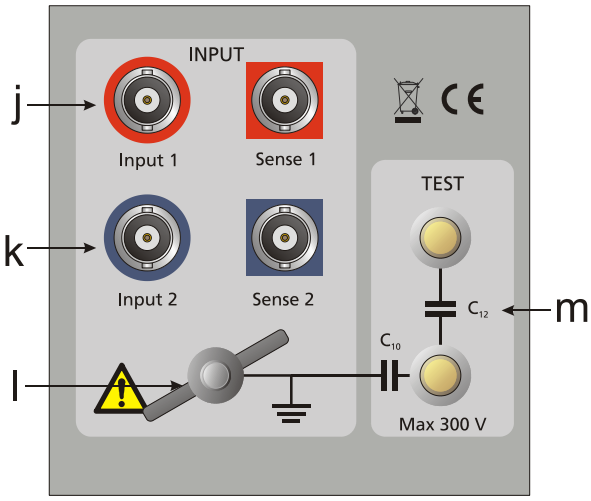

## Input

**j) Input 1 and Sense 1**
First input channels.

**k) Input 2 and Sense 2**
Second input channels.

**l) Protective ground**
Connector for connection to station ground.

**m) Test**
Test inputs.



## 1.3 Software Installation

The IDAX-206 come with the measurement and display software already installed on the internal computer. On the IDAX-300 and if you want to use the IDAX-206 with an external PC you have to install the software.

To start installing the software insert the USB memory stick and run the program *IDAXInstall XXXX.exe* from it.

When first starting the IDAX software after installing it make sure the IDAX206/300 is connected and turned on. For the IDAX-206 also check that the switch in the rear panel is set to *EXT USB*. When the software starts it will look for the IDAX hardware and connect to it automatically.

## 1.4 Measurement Technique

Short overview of measurement principle is given in this section.

| | |
|---|---|
| How impedance is measured | Gives basic principle of IDAX operation |
| Sample modeling | Describes theoretical models used for presenting measurement results |

### 1.4.1 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 resistance, capacitance and loss 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.

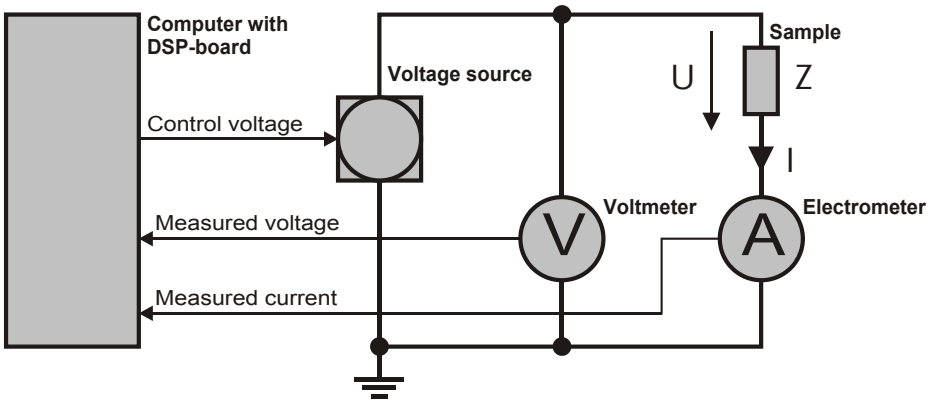



**Fig.1. Measurement of electrical impedance.**

The impedance is calculated using Ohm's law:

$$Z = \frac{U}{I}$$

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.

### 1.4.2 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:**

$$Z = Abs\{Z\} \quad \varphi = Arg\{Z\}$$

**Rectangular:**

$$Z_{Re} = \mathrm{Re}\{Z\} \quad Z_{Im} = \mathrm{Im}\{Z\}$$

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:

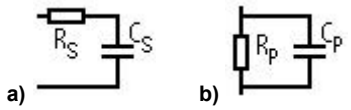



**Fig.1. Equivalent circuit models: a) series RC circuit, b) parallel RC circuit.**

**Parallel:**

$$Z = \frac{R_P}{1 + j\omega R_P C_P}$$

$$C_P = \mathrm{Re}\left\{\frac{1}{j\omega Z}\right\}$$

$$R_P = \frac{1}{\mathrm{Re}\left\{\frac{1}{Z}\right\}}$$

**Series:**

$$Z = R_S + \frac{1}{j\omega C_S}$$

$$C_S = -\frac{1}{\omega\,\mathrm{Im}\{Z\}}$$

$$R_S = \mathrm{Re}\{Z\}$$

where $\omega = 2\pi f$ 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:

$$Z = \frac{1}{j\omega C} \qquad \text{where} \quad C = C' - jC''$$

**Complex C:**

$$C' = \mathrm{Re}\left\{\frac{1}{j\omega Z}\right\}$$

$$\Delta C' = C' + k$$

$$C'' = -\mathrm{Im}\left\{\frac{1}{j\omega Z}\right\}$$

The $\Delta C'$ 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, tanδ, or a power factor (PF or cosφ). The capacitance, tanδ and cosφ/PF are defined as follows:

**C, PF, Tan-Delta:**

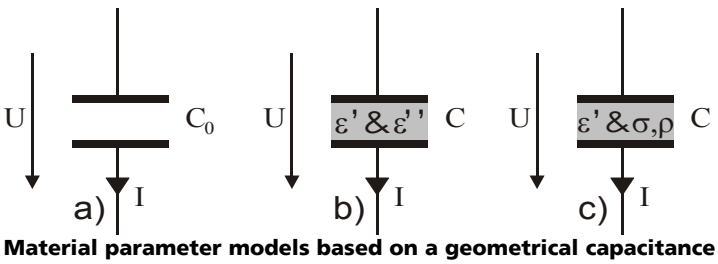
$$C' = \mathrm{Re}\left\{\frac{1}{j\omega Z}\right\}$$

$$\mathrm{PF} = \cos\varphi = \frac{\mathrm{Re}\{Z\}}{|Z|}$$

$$\tan\delta = -\frac{\mathrm{Re}\{Z\}}{\mathrm{Im}\{Z\}}$$

If tanδ and cosφ (PF) are small, then tanδ » cosφ = PF (E.g. tanδ=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 $C_0$, 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.




**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:

$$Z = \frac{1}{j\omega C}$$

$$C = C_0(\varepsilon' - j\varepsilon'')$$

**Dielectric:**

$$\varepsilon' = \mathrm{Re}\left\{\frac{1}{j\omega C_0 Z}\right\}$$

$$\Delta\varepsilon' = \varepsilon' + k$$

$$\varepsilon'' = -\mathrm{Im}\left\{\frac{1}{j\omega C_0 Z}\right\}$$

**Resistive:**

$$\varepsilon' = \mathrm{Re}\left\{\frac{1}{j\omega C_0 Z}\right\}$$

$$\rho = \frac{C_0}{\varepsilon_0 \,\mathrm{Re}\left\{\frac{1}{Z}\right\}}$$

$$\sigma = \frac{1}{\rho}$$

If geometrical capacitance, $C_0$, is unknown it can be set by the user by entering a permittivity (dielectric constant), $\varepsilon'$, for the material. Entering a permittivity, $\varepsilon'$, will let the system calculate an approximate $C_0$ 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:

$$C_0 = \frac{C'}{\varepsilon_r} = \frac{1}{\varepsilon_r} \cdot \mathrm{Re}\left\{\frac{1}{j\omega Z}\right\}$$

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

## 1.5 Getting Started with IDAX

This describes how to perform a diagnostic measurement on a specific test specimen. More details about the software functions can be found in IDAX System Control and IDAX Results.

It is recommended to start using IDAX by going through the procedure in this section in order to become familiar with the instrument and the software. This procedure is also a good test to perform whenever a confirmation of the proper functioning of the instrument is required. This test is executed using the standard equipment delivered with IDAX.

Before starting to use IDAX certain preparatory procedures must be followed.

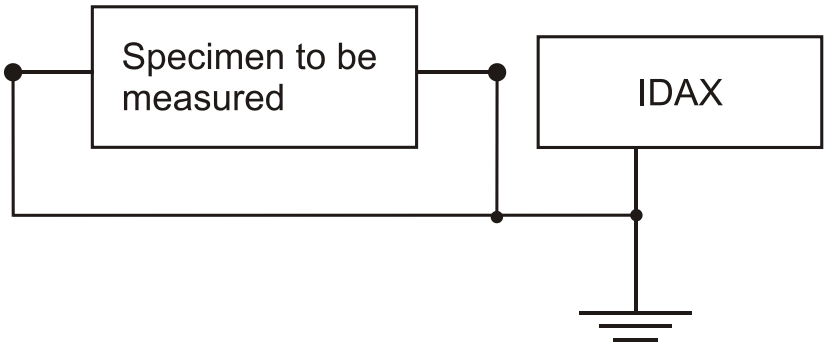
### Preparatory Procedure: IDAX instrument

1. Before connecting IDAX instrument power cord to the mains outlet:
   - read the safety precautions
   - connect the transparent ground lead to a protective earth (ground) close to measurement specimen and to panel of instrument.

2. Connect IDAX instrument to a mains outlet which meets the requirements in User's Manual and local safety regulations, and switch on IDAX instrument using the mains switch **POWER** on the front panel.

### Preparatory Procedure: Specimen

1. All specimen capacitances must be discharged before connecting IDAX leads. This means that all specimen electrodes must be short circuited and grounded. The electrodes must remain grounded until IDAX leads are connected. Below a general picture of ground connections is shown.




2. In the case of Test Capacitor, keeping the electrodes grounded while connecting IDAX leads is complicated. Therefore, in this particular case with Test Capacitor, it is permitted to remove the ground connections before connecting IDAX.

## 1.5.1 Measurement

1. Make sure that IDAX is properly connected to mains outlet.

2. Turn on IDAX using the mains switch **POWER** on the front panel. The IDAX performs a self-test and start-up procedure.

3. Activate the Results window if not active after start-up.

4. In Results create new object selecting **Object** from menu **File / New**. Click "Browse" and select *!!Test Capacitor.obj* template and enter arbitrary name as Object Name, for example "Test" and click OK.

5. By default all measurement templates listed as Associated Measurement Templates will be available for performing the measurements. It is possible to deselect one or more measurement templates from Associated Measurement Templates. As shown in picture below, four Measurement Templates *!!C10 (GST-Guard)*, *!!C12 (UST)*, *!!C12, C10, C10+C12* and *!!C20 (GST-Guard)* are associated with the object "Test" for IDAX-206, similar procedure as IDAX-300.

6. Fill in available fields with relevant information.

7. Create new measurement sequence selecting **Measurement Sequence** from menu **File / New**. Arbitrary name can be entered as Measurement Sequence, for example "Getting Started" and press **OK**. New measurement sequence with corresponding Measurement Plan files will appear in Test Browser.

8. Fill in available fields with relevant information.

#### 1.5.1.1 Test Sequence for IDAX-300

## This is Getting Started test sequence when using IDAX-300

The specimen to be measured using the built-in capacitance box built into the system that terminates at the front panel. The respective capacitances are:

$C_{10}$ = ~2.5 nF

$C_{12}$ = ~4.7 nF

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**Warning!**

**The measurement system can generate hazardous and even lethal voltages. Carefully read "Safety precautions".**

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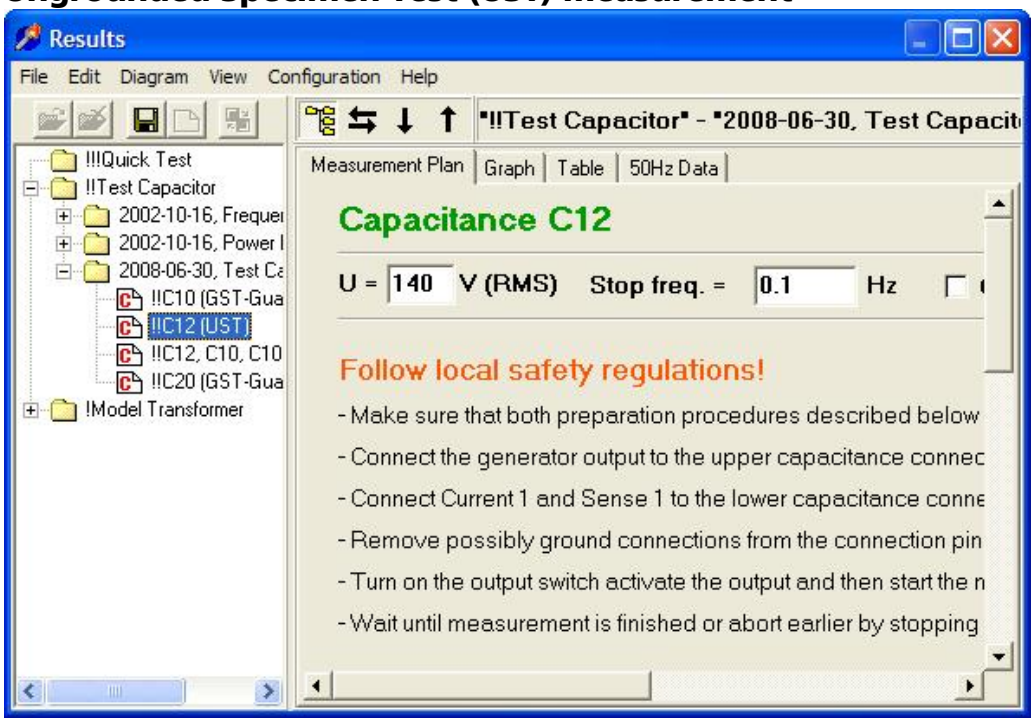
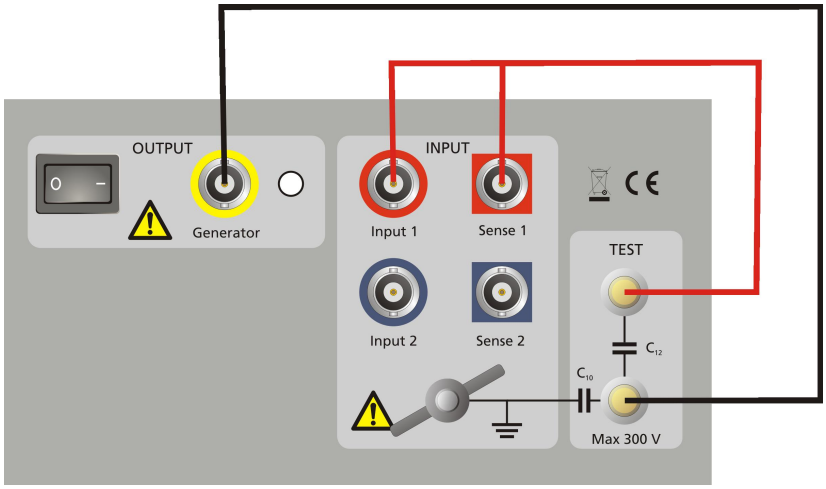
## Ungrounded Specimen Test (UST) Measurement






In Test Browser select Measurement Plan file *!!C12 (UST)*, carefully read and follow the instructions. Or follow the instructions below.

1. Make sure that preparation procedures (both IDAX and Specimen) have been followed.

2. Connect the output to the lower capacitance connector.

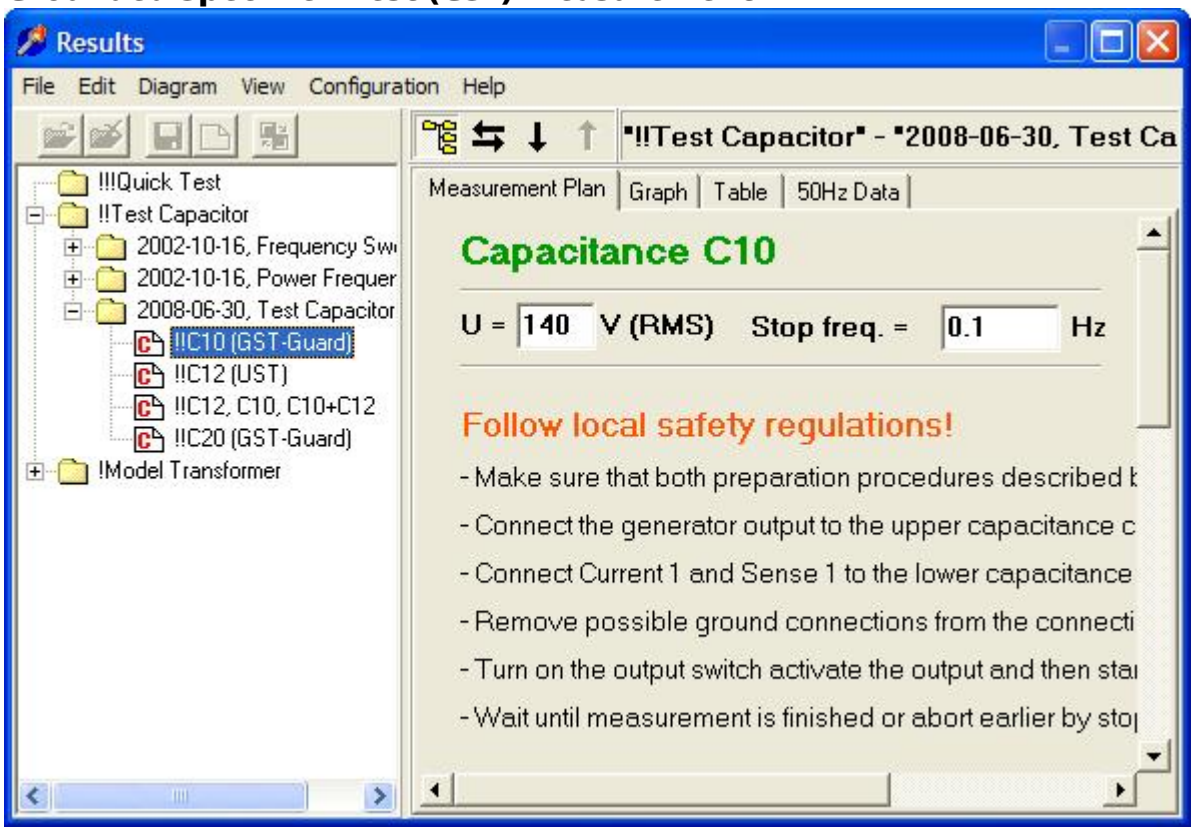
3. Connect Current 1 and Sense 1 to the top capacitance connector.

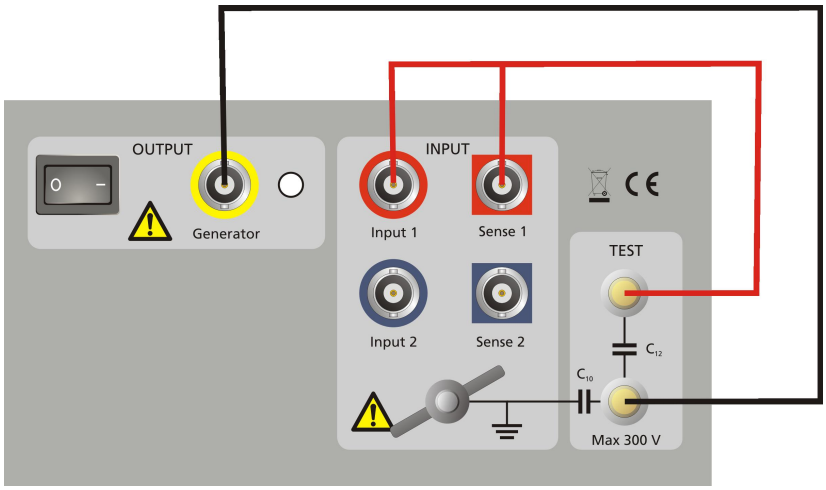
4. Remove possible ground connections from somewhere.

5. Turn on the output switch activate the output and then start the measurement.

6. Wait until measurement is finished or abort earlier by stopping the measurement.

## Grounded Specimen Test (GST) Measurement






In Test Browser select Measurement Plan file *!!C10 (GST-Guard)*, carefully read and follow the instructions. Alternatively, follow the instructions below.

1. Make sure that preparation procedures have been followed (see also "Ungrounded Specimen Test (UST) Measurement").
2. Connect the generator output to the upper capacitance connector.
3. Connect Current 1 and Sense 1 to the lower capacitance connector.
4. Remove possible ground connections from the connection pins.
5. Turn on the output switch activate the output and then start the measurement.
6. Wait until measurement is finished or abort earlier by stopping the measurement.

### 1.5.1.2 Comparing 1-ch IDAX-206 and 2-ch IDAX-300

**IDAX-300 (two winding transformer)**

| Test no. | Measure | Configuration | Energize (Gen, Yellow) | Channel 1 (Red) | Channel 2 (blue) |
|---|---|---|---|---|---|
| 1 | CH | GST-Guard-1+2 | H | L | NC |
| 2 | CHL | UST-1 | H | L | NC |
| 3 | CL | GST-Guard-1+2 | L | H | NC |

**IDAX-206 (two winding transformer)**

| Test no. | Measure | Configuration | Energize (Hi, Red) | Channel 1 (Lo, Blue) | |
|---|---|---|---|---|---|
| 1 | CH | GST-Guard | H | L | |
| 2 | CHL | UST | H | L | |
| 3 | CL | GST-Guard | L | H | |

**IDAX-300 (three winding transformer)**

| Test no. | Measure | Configuration | Energize | Channel 1 | Channel 2 |
|---|---|---|---|---|---|

| | | | (Gen, Yellow) | (Red) | (blue) |
|---|---|---|---|---|---|
| 1 | CH | GST-Guard-1+2 | H | L | T |
| 2 | CHL | UST-1 | H | L | T |
| 3 | CL | GST-Guard-1+2 | L | H | T |
| 4 | CLT | UST-2 | L | H | T |
| 5 | CT | GST-Guard-1+2 | T | H | L |
| 6 | CTH | UST-1 | T | H | L |

**IDAX-206 (three winding transformer)**

| Test no. | Measure | Configuration | Energize (Hi, Red) | Channel 1 (Lo, Blue) | |
|---|---|---|---|---|---|
| 1 | CH | GST-Guard | H | L | T shorted to L |
| 2 | CHL | UST | H | L | T shorted to tank |
| 3 | CL | GST-Guard | L | H | T shorted to H |
| 4 | CLT | UST | L | H | T shorted to tank |
| 5 | CT | GST-Guard | T | H | L shorted to H |
| 6 | CTH | UST | T | H | L shorted to tank |

In case of a two winding transformer the set-up of IDAX-206 (IDA 200) and IDAX-300 are very similar; the leads need to be moved between test 2 and test 3.

In case of a three winding transformer the IDAX-300 second input channel is utilized (standard); the leads need to be moved between test 2 and test 3, between test 4 and test 5. If use IDAX-206 (IDA 200) on a three winding transformer, the leads need to be moved between every test.

If using IDAX-300 with two electrometers (option), the two set-ups using same cable set-up can be measured simultaneously, e.g. test 1 and test 2 (test 3 and test4; test 5 and test 6).

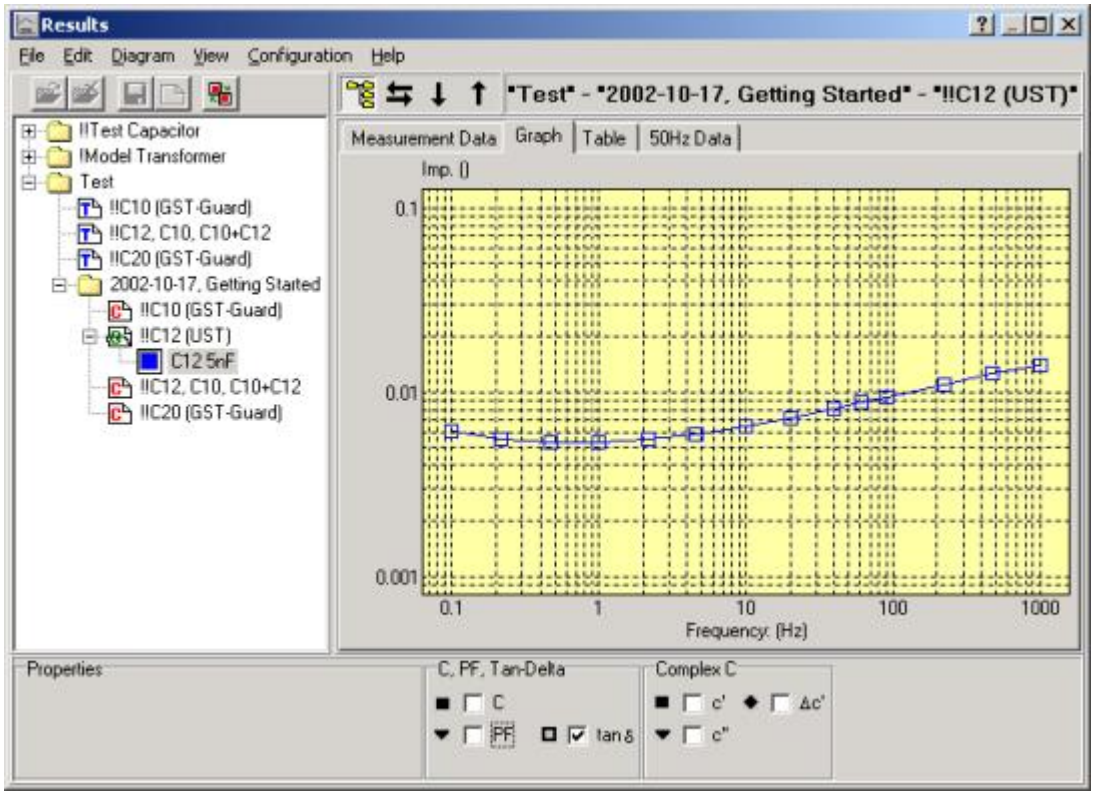
Note that Test 6, CTH (Energize T and measure H), in many cases are replaced by CHT (Energize H and Measure T):

- IDAX-300: CHT, UST-2, H, L, T (same cable set-up as Test 1 and Test 2)
- IDAX-206: CHT, UST, H, T, L shorted to tank

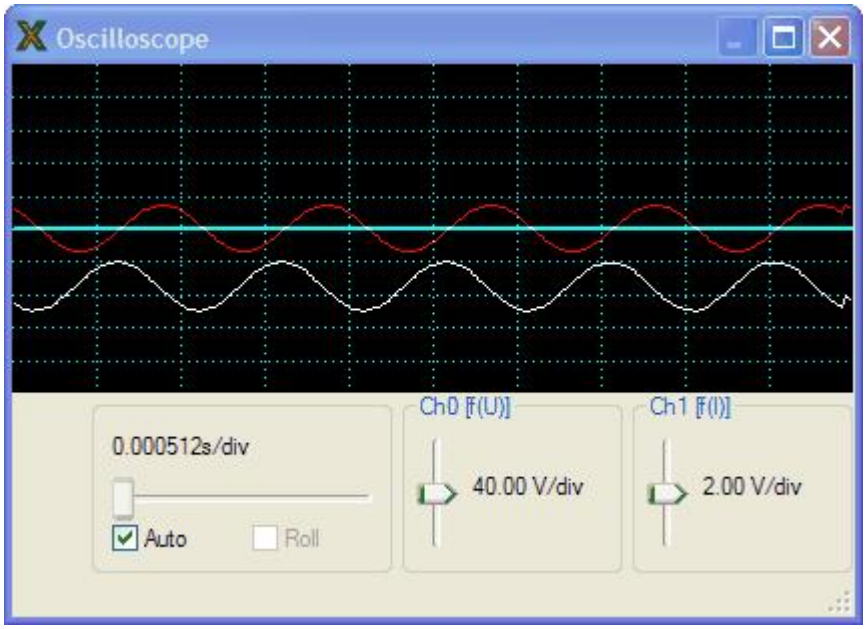
### 1.5.2 During Measurement

When the measurement has been started the measurement file icon changes to an icon corresponding to the data file.

1. By pressing <F4> on the keyboard, Results window can be activated if not already active and the measurement progress can be viewed when selecting Graph tab. The graph shows the dissipation factor for the Test Capacitor in the frequency range 0.1 - 1000 Hz .




2. By pressing <F5> on the keyboard, an oscilloscope will be displayed on the screen. The **Ch 0** (red) signal in the oscilloscope displays the applied voltage over the sample, **Ch 1** (white) is the output voltage from the first electrometer and **Ch 2** (blue) is the output voltage from the second electrometer. The output voltage from the electrometer is a function of the current through the sample.




3. The instrument stops automatically after the last measurement point is completed, however, the measurement can be interrupted earlier by a stop command. You can press stop button or, on the IDAX-206, the **OUTPUT OFF** button. On the IDAX-206 a lit green **READY** LED on the front panel indicates that the measurement is stopped or finished.

### 1.5.3 Presenting Results

By default the measurement data is presented using a model defined in the measurement plan. However, additional models can be added while inspecting the results (see Selecting Models for details).

Depending on which parameters are of interest to the user, the measurement data can be presented using different models. E.g. in the tanδ model the dissipation and/or power factor as well as capacitance can be displayed in the graph as a function of frequency. See also how to select models in sections "Configuration / Models" and "Sample Modelling".

The results can be viewed using three additional tabs: **Graph**, **Table** and **50/60 Hz data** as shown in pictures below.

**Graph tab is active**

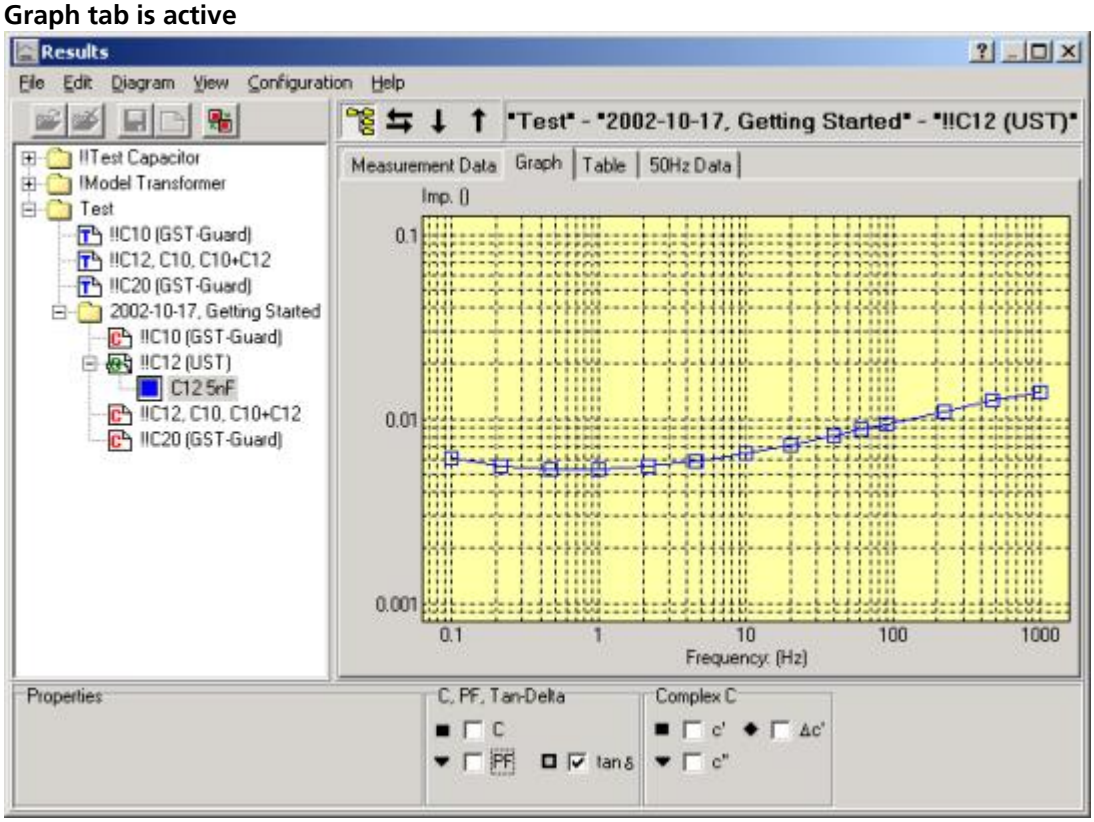
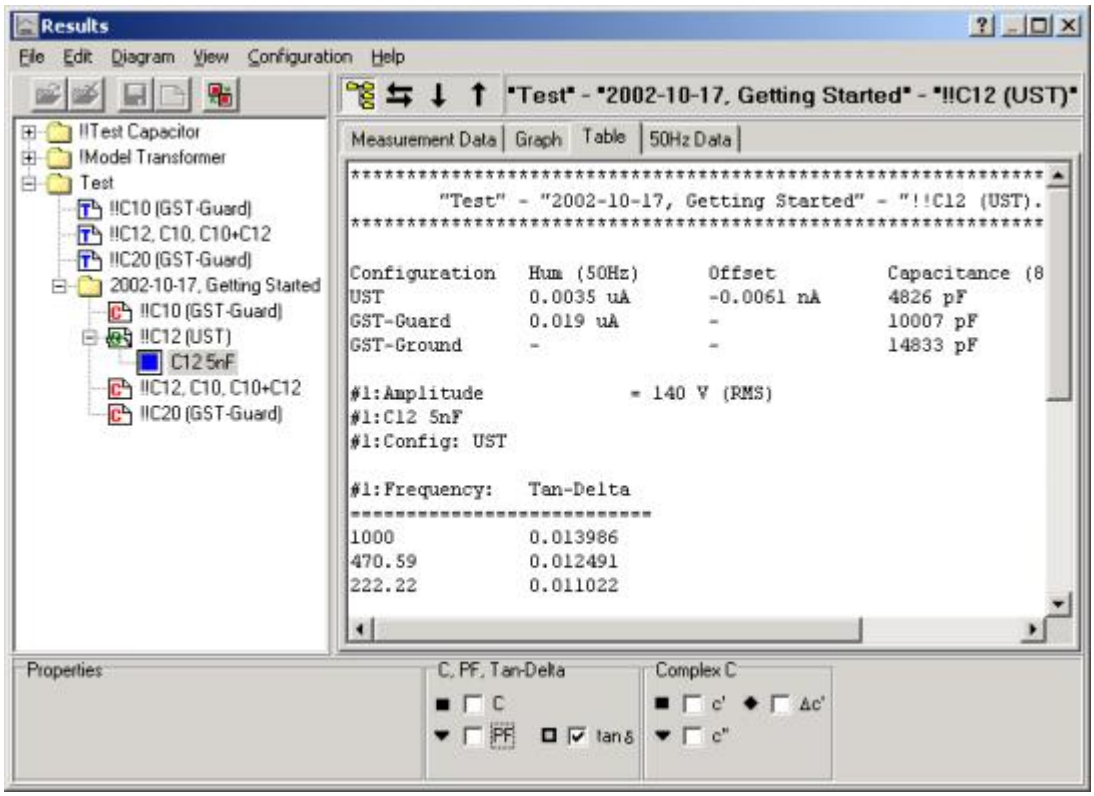
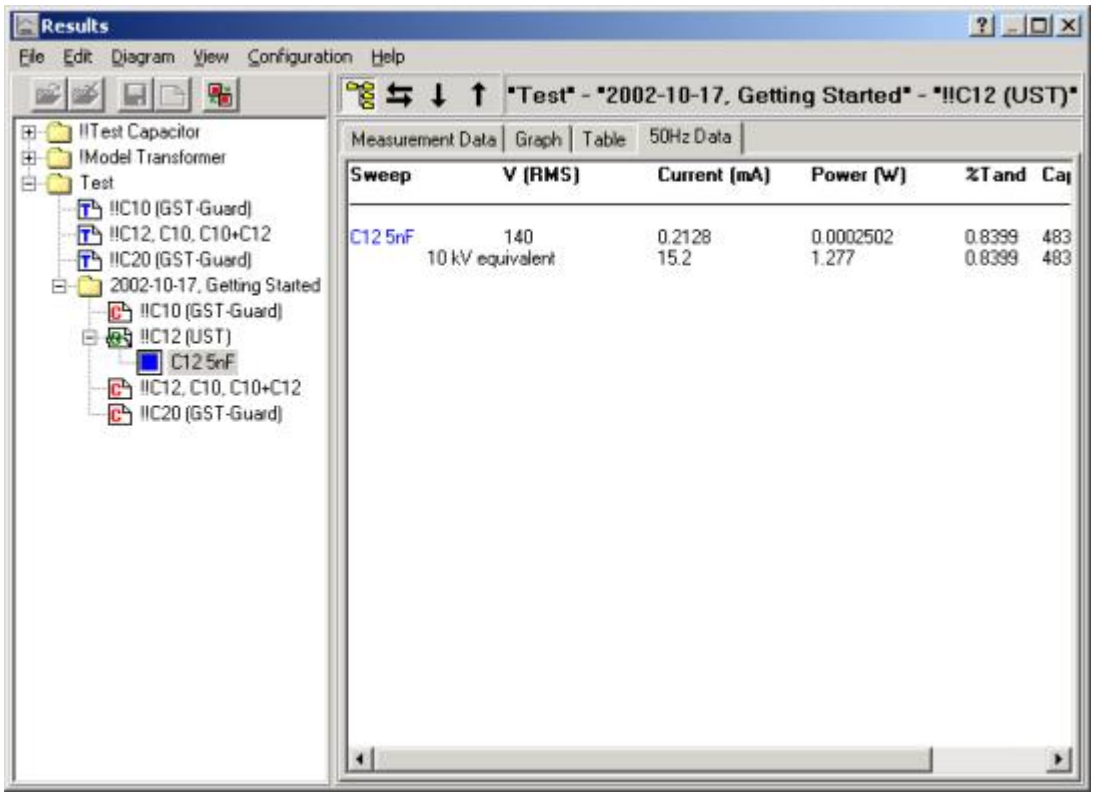


**Table tab is active**

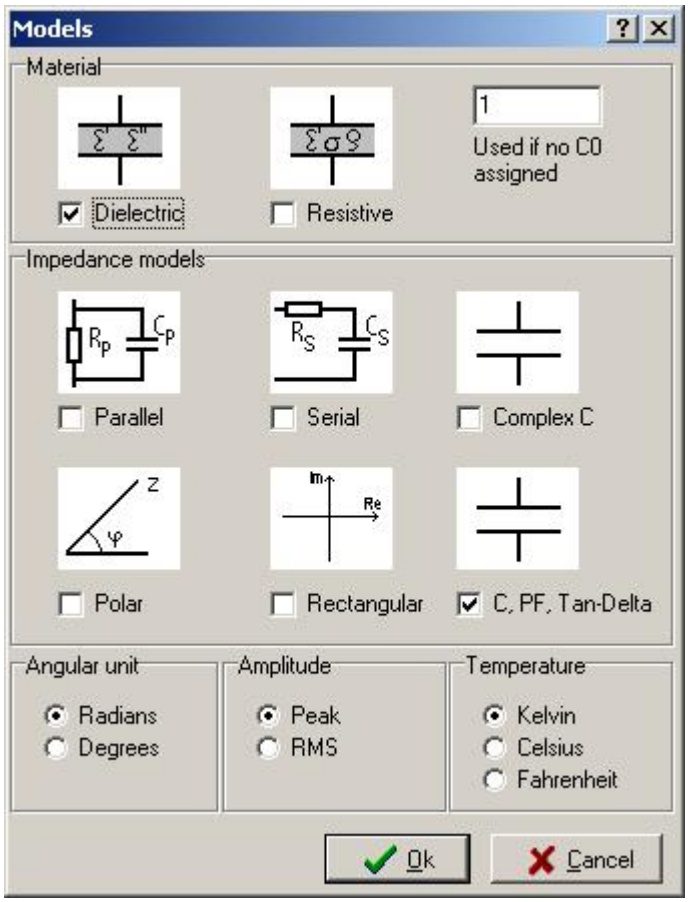



**50/60 Hz Data tab is active**

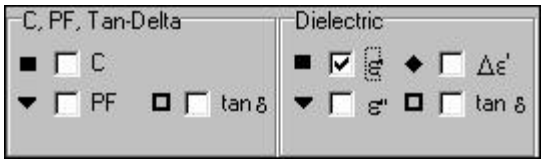



## 1.5.4 Selecting Models

1. Select **Configuration / Models** in Results window and all available models will be presented as shown below. In this picture, both the "*Dielectric*" and "*C, PF, Tan-delta*" models are ticked. Select the desired models and click OK.




2. In the Graph tab you can select the desired parameters. For example, the dielectric parameter ε'.

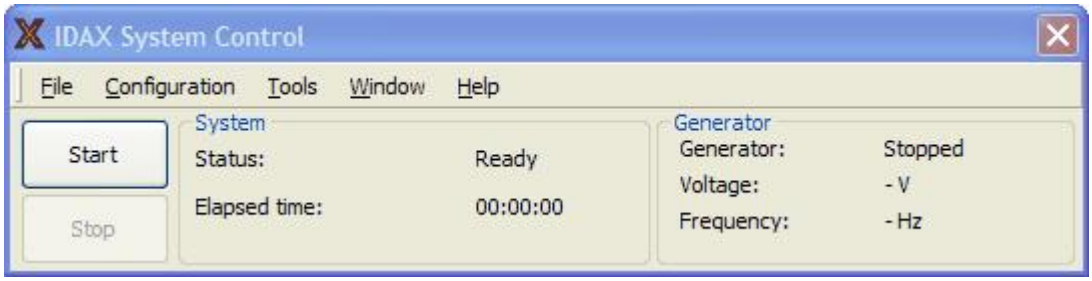



3. In Results window menu the choices **File / Export**, **File / Print** and **File / Report** allow for exporting the measurement data and creation of reports.

All measurements are stored on the IDAX 206 system hard disk or the measurement computer's hard disk on an IDAX-300 system and can be opened and analysed at any time. For comparison purposes, many measurements can be loaded into the same Results window.

## 1.6 IDAX System Control

The IDAX System Control performs a measurement according to commands pre-arranged in a Measurement plan or command file (C-file), using programming syntax described in IDAX Command and Variable References. The Measurement plan used is available in **Results** tab **Measurement plan**.

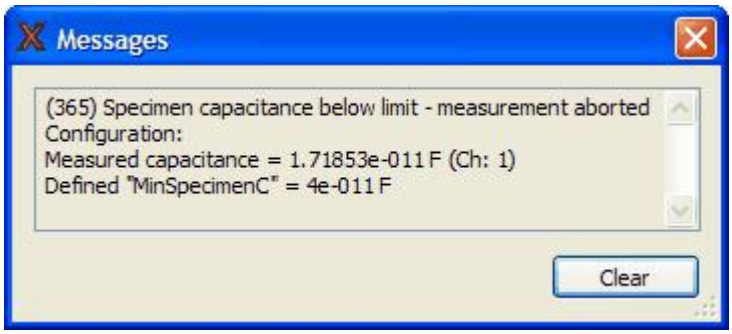



In addition to the IDAX System Control program window, a few more windows are accessible from here.

| Window | Functions |
|---|---|
| Results | Editing of measurement plans and displaying the results. Window is activated after up-start by default |
| Comments | Adding comments to the actual measurement. |
| Messages | Displaying messages from the software during a measurement. |
| Oscilloscope | Viewing the actual voltage and current curve forms. |

### 1.6.1 Message Window

Messages from IDAX system to the user will be displayed in the Messages window. For example, if a measurement was aborted prematurely by the program, the reason for it will be displayed here.

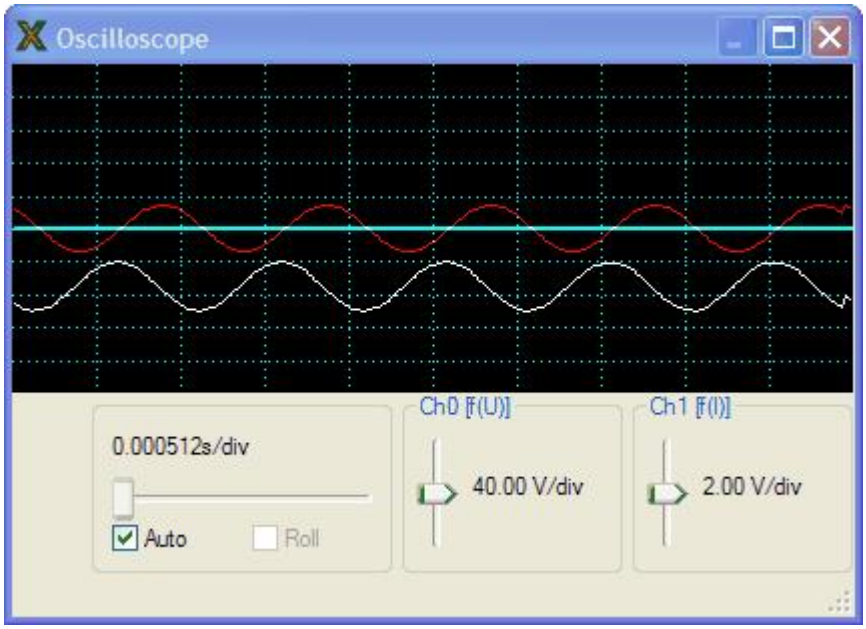



### 1.6.2 Connect and Disconnect

In the File menu you have the choice to connect (if not connected) and disconnect (if connected) to the IDAX unit. If you are not connected and the software needs to connect to the IDAX unit it will be done automatically.

### 1.6.3 Oscilloscope

The Oscilloscope displays the signals present on channel 0 (white, Ch0) and channel 1 (red, Ch1) inputs of the analogue IO unit.




**Ch0 and Ch1 and their check boxes**
The Ch0 and Ch1 check boxes select the channels that are displayed. Trace 0, white, is proportional to the sample voltage. Trace 1, red, shows the electrometer output voltage, which is a function of the input current.

**Horizontal control**
The oscilloscope time base can be set either on auto scale or manual. On auto scale, the time base is set from the generator signal from the DSP. In the manual mode, the time base is set by the Time/div slide bar. The time above the slide bar refers to the time per division, the full oscilloscope window width consists of ten divisions.

**Roll**
The Roll check box can be used for slow signals that the oscilloscope may otherwise have difficulties to accurately lock.

**Vertical control**
The gain of the input channels can be adjusted with the two vertical slide bars next to the Grid check box at the oscilloscope window. The voltage range is displayed beside the Ch0 and Ch1 check boxes. The offset of the displayed signals can be adjusted by placing the mouse pointer inside the oscilloscope window and dragging it up and down while holding the mouse button.

**Grid**
The Grid check box displays or hides the grid.

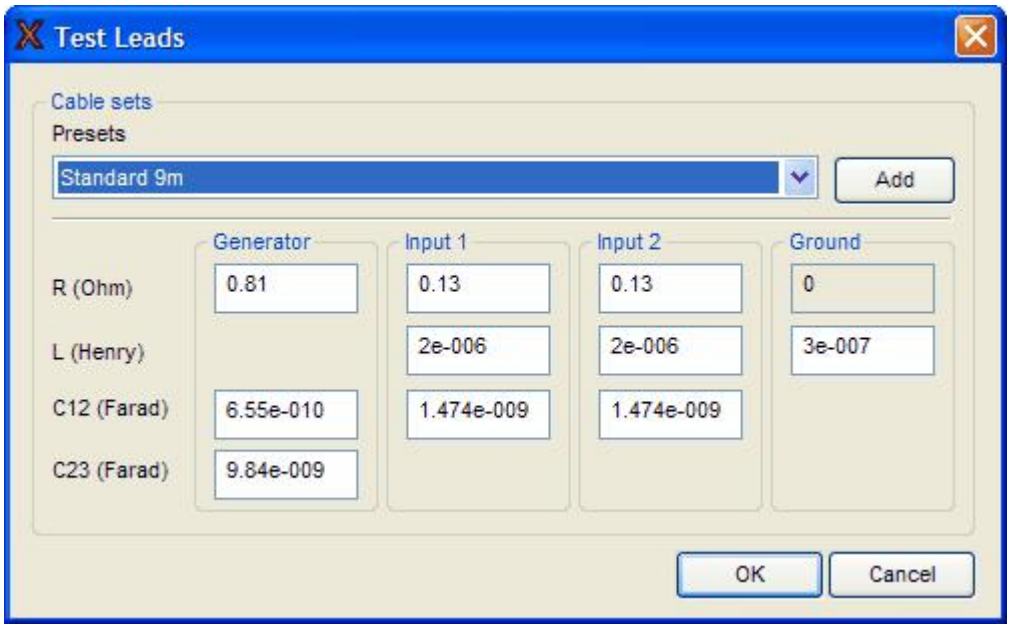
### 1.6.4 Changing Language

The language in which IDAX user interface (IDAX software) is displayed can be changed. The following languages are available:
- English
- Swedish
- German
- French
- Spanish

Language is changed selecting menu **Configuration / Change Language** in IDAX System Control, which opens a file opening dialog. The selected language file, *.lng, is loaded and it will be used after restarting the IDAX program. Each language has its own language file, *.lng, and all language files are located in the directory *D:\IDA\Language files*.

In addition to IDAX interface language, the language of Measurement Templates is changed if a translation is available. The translation files are stored in directory *D:\IDA\Language files*.

### 1.6.5 Test Leads




The Test Leads dialog is used to select and, possible edit the settings for different cable sets. The presets drop-down is used to select what cable set you are to use for a measurement. If the cable set you are planning to use is not included you can use the "Add" button to add a new preset.

The settings for a cable set can be edited. What the different settings means is explained in this table.

| | **Generator** | **Input 1** | **Input 2** | **Ground** |
|---|---|---|---|---|
| **R (Ohm)** | Resistance of centre conductor | Resistance of centre conductor | Resistance of centre conductor | Resistance of earth/ground conductor |
| **L (Henry)** | ----- | Inductance of input 1 cable | Inductance of input 1 cable | Inductance of earth/ground cable |
| **C12 (Farad)** | Capacitance between centre conductor and middle shield | Cap. between conductor and shield | Cap. between conductor and shield | ----- |
| **C23 (Farad)** | Capacitance between middle shield and outer shield | ----- | ----- | ----- |

### 1.6.6 About

In "About" window the software versions of installed IDAX system, its program components and information about the operating system are displayed.

### 1.6.7 Calibration

The IDAX system presents its measurement results derived from measured voltage and current. Therefore, the IDAX system should mainly be calibrated with voltage and current standards.

Calibration of the IDAX-206 system is performed using an external calibration box containing voltage, current and impedance references. The system can be calibrated against the calibration box every year or every 6 months. On the other hand, if the system is used and stored outside certain temperature/moisture limits, more frequent calibration is recommended.

The system may also require more frequent calibration to compensate for exposure to temperature gradients during measurement work, or if the calibration temperature differs too much from the ambient temperature. Moreover, one may recommend more frequent calibration if tighter accuracy specifications are to be met. Using the external calibration box for calibration of the system makes it possible to always have a calibrated system which eliminates the need to send the whole system away for calibration. The only thing that needs to be sent away is the external calibration box. It is recommended to calibrate the box every two years.

### 1.6.8 Calibration Procedure IDAX-300

It is recommended to calibrate the IDAX-300 at least once a year. There are two options regarding calibration of IDAX-300:
- The IDAX unit can be sent to Pax 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
- Calibration Software
- Cables and connectors
- User's Manual

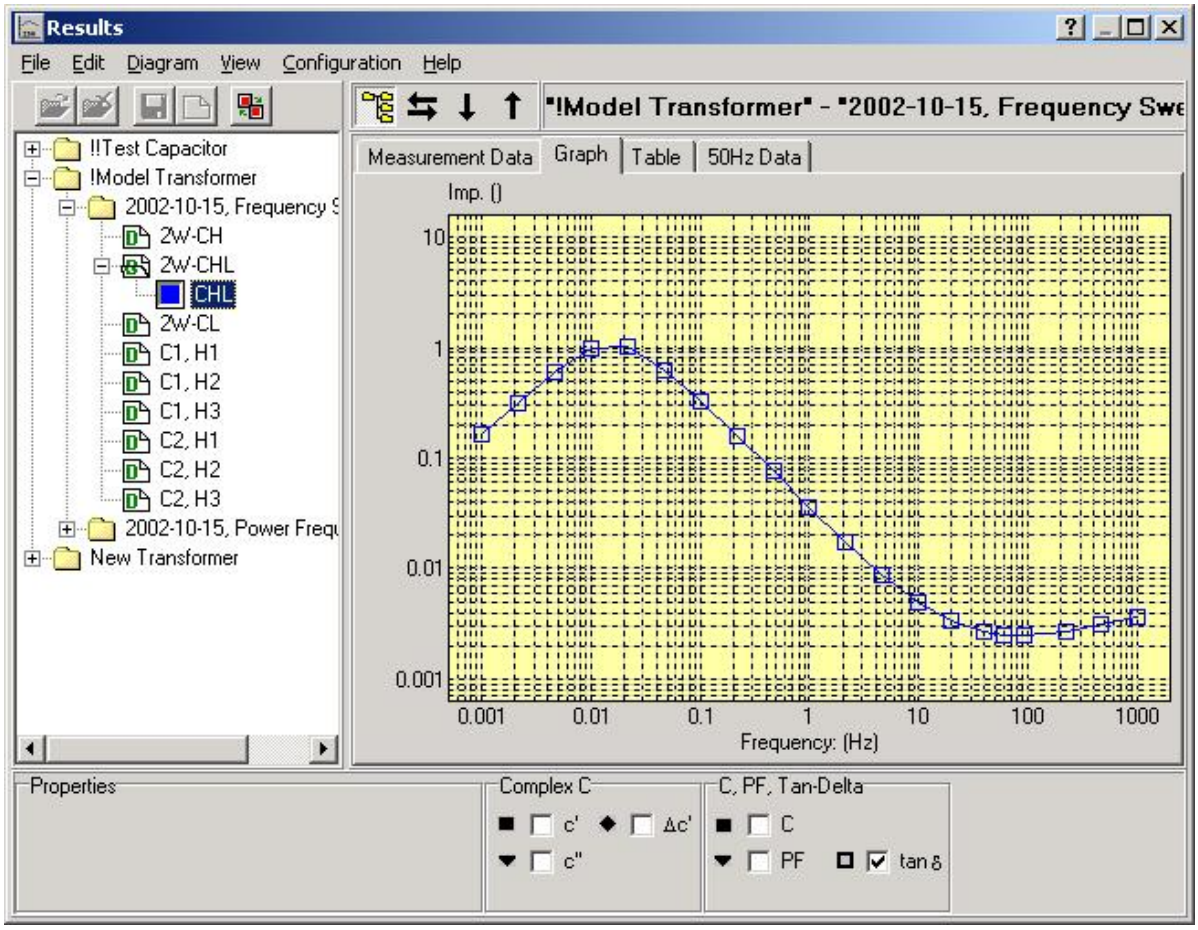
The only thing that needs to be sent away is the Calibration Box and calibration of the Calibration Box can be performed by any local accredited laboratory or testing facility handling test and measure instruments.

# 2 Results User Interface

**Results** program is the window where all data from the measurement are displayed in a graphical or text format. Earlier performed measurements can also be opened for comparison purposes. Moreover, a measurement plan for the measurement to be performed can be edited here.

Interaction with the program is done via windows and toolbar menu, the functions are described in "Results Menus and Commands"

Results window is divided into two sections:
- Test Browser (left-side)
- Measurement Plan and presentation of the measurement results in graphical and table format (right-side)




## 2.1 Results Menus and Commands

### Windows menu

| Menu | Description |
|---|---|
| File Menu | Operations with measurement objects, measurement files, etc. |
| Edit Menu | Editing and changing properties of opened measurements. |
| Diagram Menu | Zooming features |
| View Menu | Selection of presentation form |
| Configuration Menu | Configuration of Results window settings |
| Help Menu | On-line Help |

### Icon menu

Icon menu is designed for easier navigation and operations with Test Browser.


 Open measurement

 Close measurement

 Save

 New Measurement Sequence

 Toggle between Show and Hide sweep

 Show/Hide Test Browser

 Switch between Measurement Sequence and Measurement Plan or data file

 Go one Measurement Plan or data file Down in Measurement Sequence if there are more than one

 Go one Measurement Plan or data file UP in Measurement Sequence if there are more than one

## 2.1.1 Results File Menu

| Menu Command | Description |
|---|---|
| New | Create new objects and Measurement Sequences |
| Add/Remove Templates | Add new or remove existing Measurement templates |
| Open Measurement | Open selected measurement(s) |
| Close Measurement | Close selected measurements |
| Remake Measurement | Repeat a measurement |
| Save | Save current template or Measurement Plan |
| Save As... | Save the current template under a new name. |
| Load D-file... | Temporarily load a measurement file into Results |
| Import | Import measurement data |
| Export | Export measurement data |
| Print | Print short summary of measurement |
| Report | Create detailed report about measurement |
| Send to... | Send data to an external analysis program |
| Rename File/Folder | Rename individual file, test sequence or object folder |
| Delete File/Folder | Delete individual file(s), test sequence(s) or object folder(s) |
| Exit | Close Results program |

### 2.1.1.1 File / New

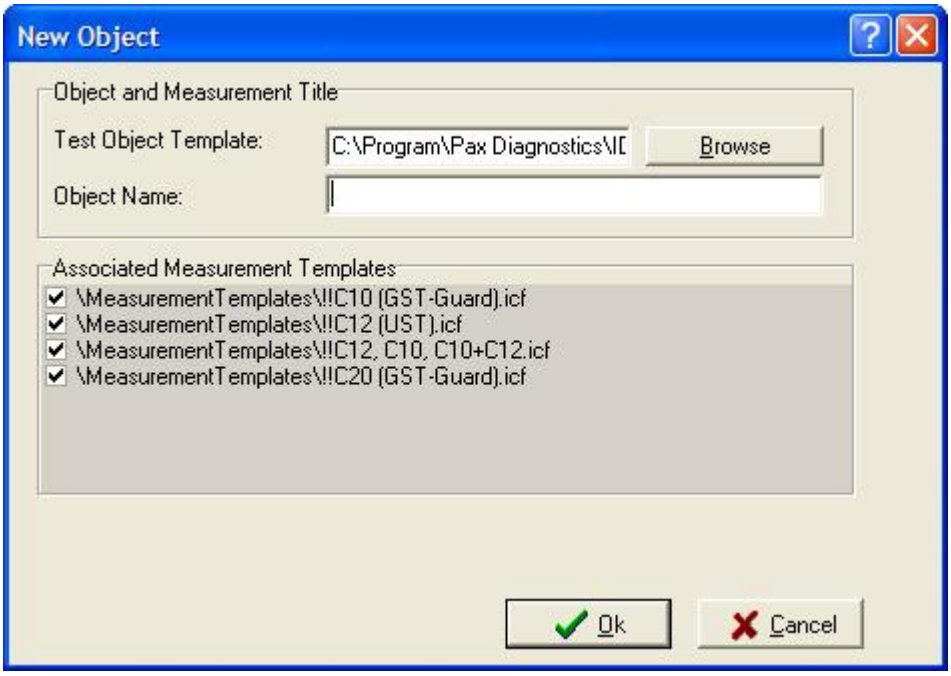
Depending on selected file or folder in Test Browser user can create:

| | |
|---|---|
| New Object | Create new Object is created if the object to be measured is not among those in Test Browser |
| New Test Sequence | Create new Measurement Sequence for a selected Object |

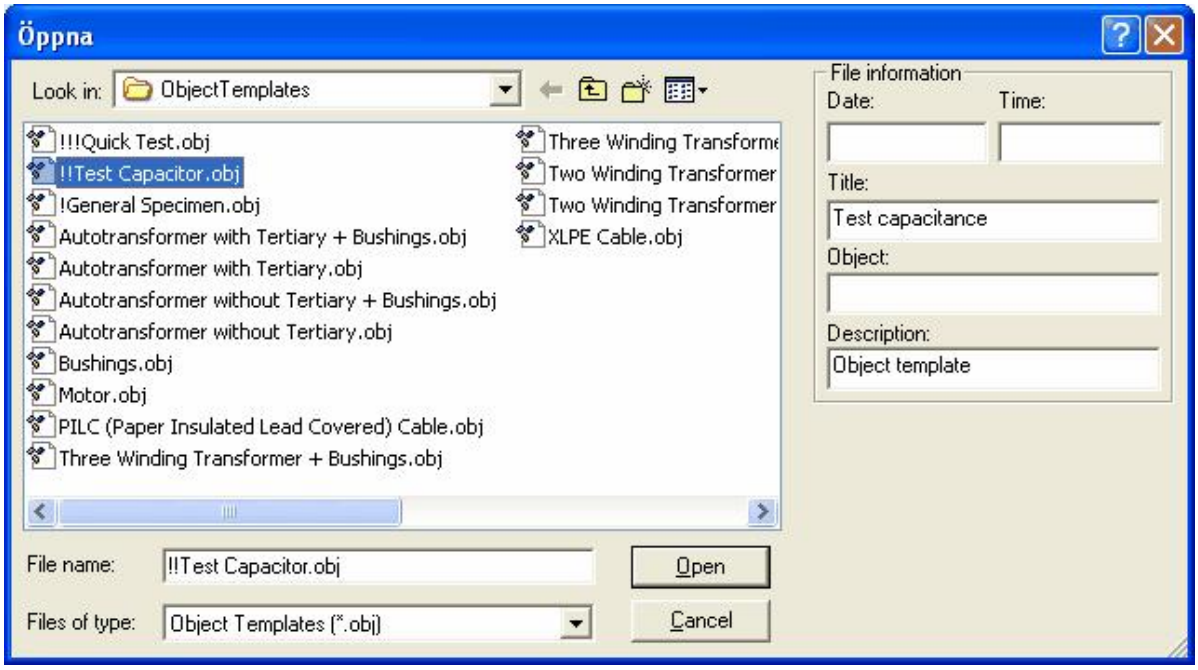
2.1.1.1.1 File / New / Object

New object is created if the object to be measured is not among those in Test Browser.

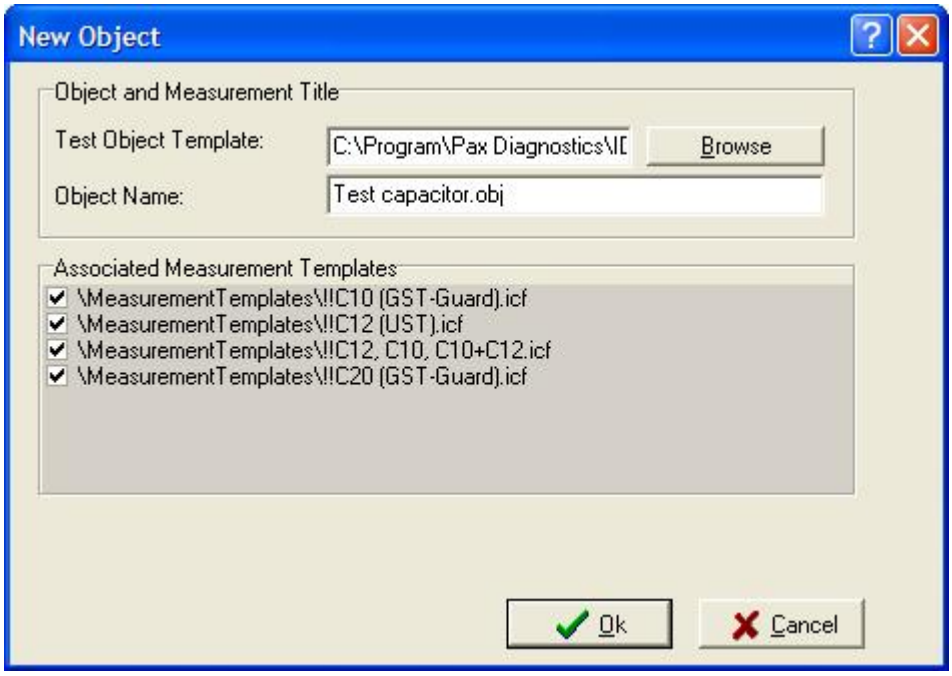
1. Select **New** / **Object** from File menu which opens New Object dialog



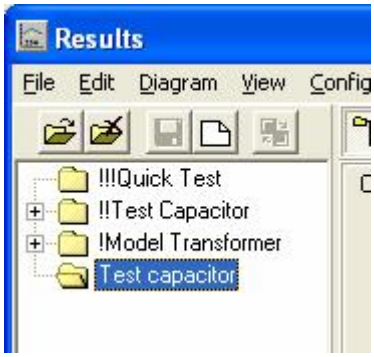

2. Select appropriate object template by using **Browse** button and press **Open**




3. Enter name for the new object, for example, "Test capacitor.obj" and press **OK**.




4. Newly created object appears in Test Browser as shown below.




2.1.1.1.2 File / New / Measurement Template

1. From **View** menu select **View / Browse Measurement Templates**

2. From File menu select **File / New / Measurement Template**, enter a name, e.g. *template.icf* , for new template and press **Save**. New empty template will appear in Text View mode for editing. See also section "IDAX 206 Commands and Variables".


2.1.1.1.3 File / New / Object Template

1. From **View** menu select **View / Browse Object Templates**

2. From File menu select **File / New / Object Template**, enter a name for new template and

press **Save**. New empty template will appear in Text View mode for editing. See also section "IDAX 206 Commands and Variables".


2.1.1.1.4 File / New / Measurement Sequence

New Measurement Sequence is created when:

- new measurement is to be performed on new object
- new measurement is to be performed on an existing object
- individual measurement file(s) is imported

---

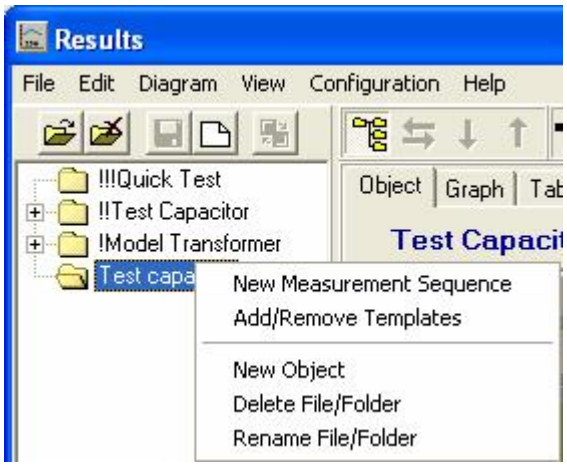
**Note!**

**Before creating new Measurement Sequence, at least one measurement template must be associated with the test object.**

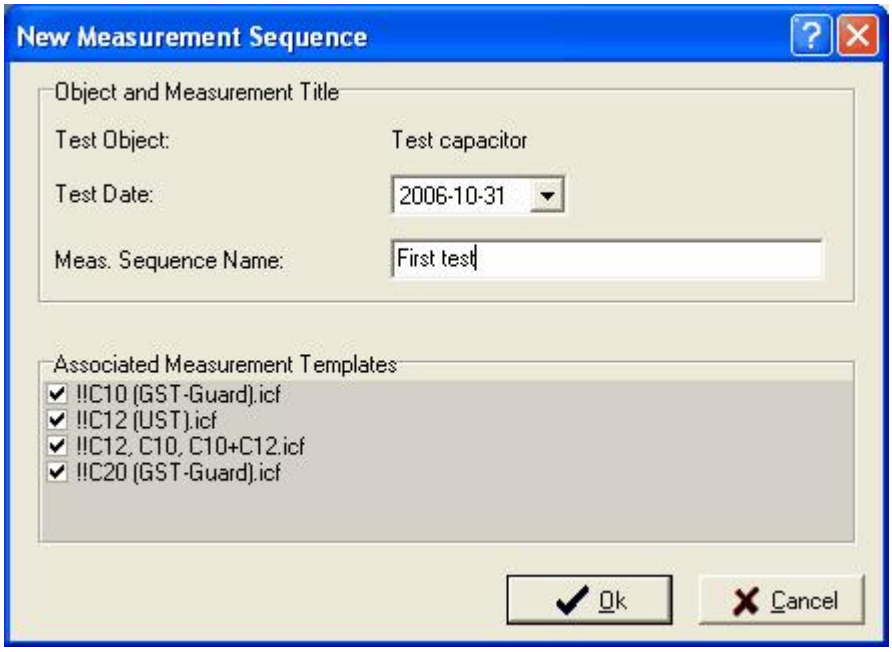
---

1. To create new test sequence:
   - select **New** / **Measurement Sequence** from File menu

   or
   - right-click on chosen test object and from menu selecting **New Measurement Sequence** (see picture below)

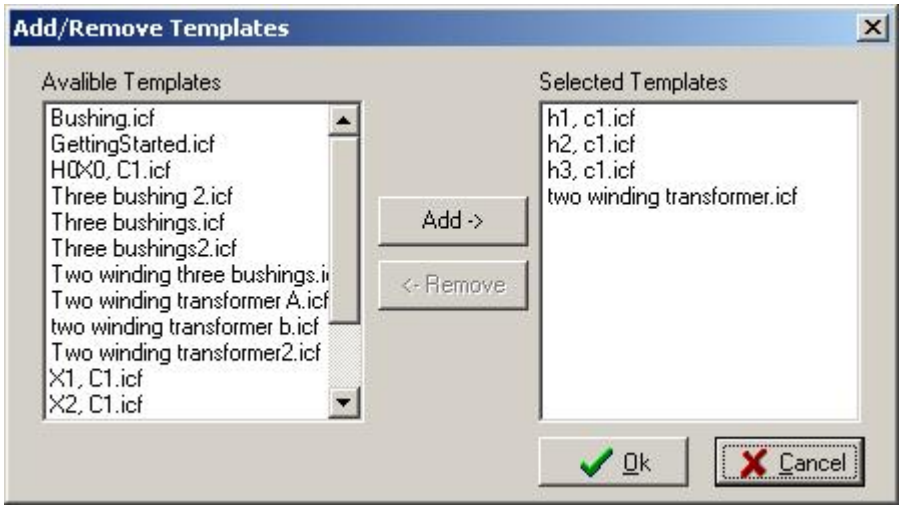



2. New Measurement Sequence will be automatically assigned a name in form of date as shown below (date has the format according to International Standard ISO 8601). The name for Measurement Sequence (i.e. "First Test" as in picture below) is optional.

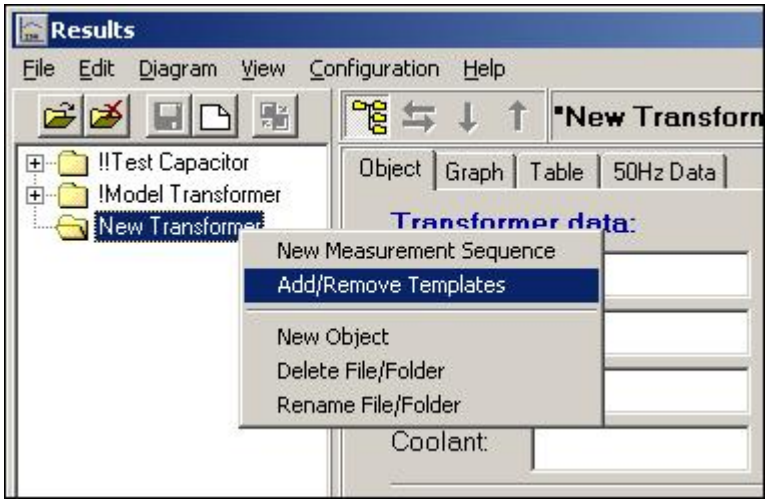



#### 2.1.1.2 File / Add/Remove Templates

User can add or remove Measurement Templates, (C-files) for selected measurement object using this command. It invokes a dialog window where user can manipulate with available Measurement Templates (see picture below).




This dialog window can be also invoked by right mouse click on selected object and choosing **Add/Remove Templates** from the menu which appears as shown below.




#### 2.1.1.3 File / Open Measurement

One or more measurements can be opened by this command depending on selected item in Test Browser.

| Selected item | Data to be opened |
|---|---|
| Single data file | All sweeps in selected data file |
| Measurement Sequence | All sweeps in all data files under selected Measurement Sequence |
| Object | All sweeps in all data files in all Measurement Sequences under selected Object |

#### 2.1.1.4 File / Close Measurement

One or more measurements can be closed by this command depending on selected item in Test Browser.

| Selected item | Data to be closed |
|---|---|
| Single data file | All sweeps in selected data file |
| Measurement Sequence | All sweeps in all data files under selected Measurement Sequence |
| Object | All sweeps in all data files in all Measurement Sequences under selected Object |

#### 2.1.1.5 File / Remake Measurement

In cases when user is dissatisfied with a certain measurement it is possible to repeat this measurement with the same settings using **Remake Measurement** as follows:

1. Connect IDAX to the test object if not connected.
2. Select the measurement file, (D-file) to be repeated (obligatory).
3. Choose **Remake Measurement**. It will create a Measurement Plan, (C-file) from the selected data file, i.e. all measurement settings from this data file are copied into the new Measurement Plan, (C-file).
4. Make corrections in Measurement Plan if needed.
5. Press **ON** on IDAX front panel to start the measurement.

#### 2.1.1.6 File / Save

Save any changes made to the current template or Measurement Plan.

#### 2.1.1.7 File / Save As

1. Select template which is to be saved under new name.
2. Invoke Save As dialog from menu File / Save As...

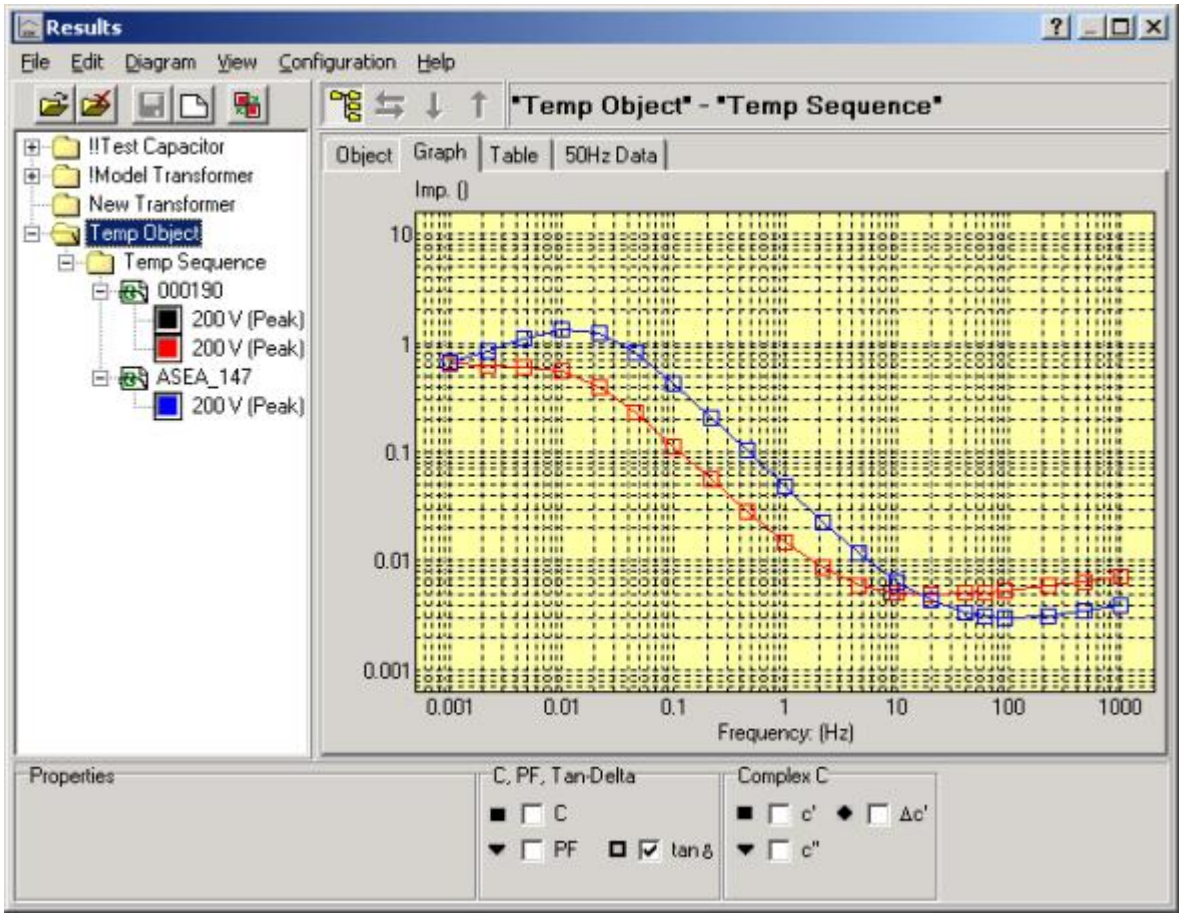
3. Enter new name for the template and press **OK**.


***Note:*** The Object Templates are saved in Object Templates directory and Measurement Templates under Measurement Templates directory

### 2.1.1.8 File / Load D-file

**Shortcut keys:** Ctrl+L

This command allows for temporary loading of single measurement files, D-files. During loading a Temporary Object and Temporary Sequence are created as shown in picture below. All subsequent data files are opened under the same Temporary Sequence.




The opened files can be then imported under an existing object by using **File** / **Import File / To Structure**.

If Results program is opened as an independent program and the data files are temporary opened, then closing Results program, user is asked if the opened files should be imported into the existing data structure.


### 2.1.1.9 File / Import

When sharing measurement data between different IDAX instruments or computers, Import function facilitates the process of insertion of individual measurements into existing data structure. Data are imported in a fashion which corresponds that they can be appropriately imported back into the same or other data structure.

Depending on data to be imported type and structure the following options are available:

| | |
|---|---|
| IDA Zip File | Import archived measurement data |
| File to Structure | Import selected file into existing structure |
| Measurement Templates | Import selected Measurement Templates |
| Object Templates | Import selected Object Templates |

#### 2.1.1.9.1 File / Import / IDA Zip File

**Short-cut keys:** Ctrl+Alt+I

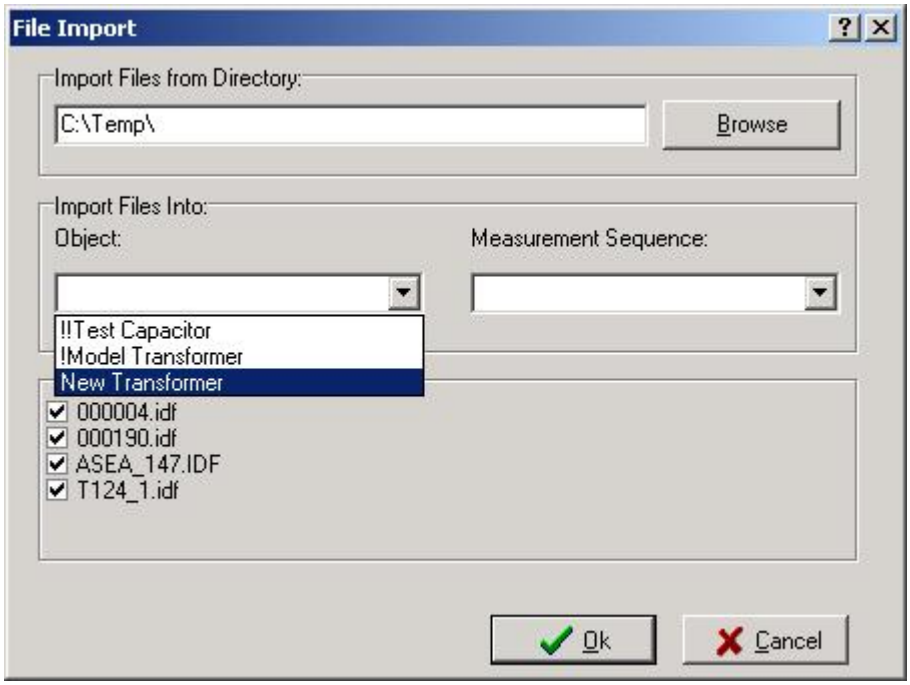
Import the data in from archived (*.izf) format. Data are inserted among existing measurements preserving the structure of the archived file.

1. Choose **File / Import / IDA Zip File** to invoke regular **Open** dialog.
2. Select file to be imported and press **OK**.

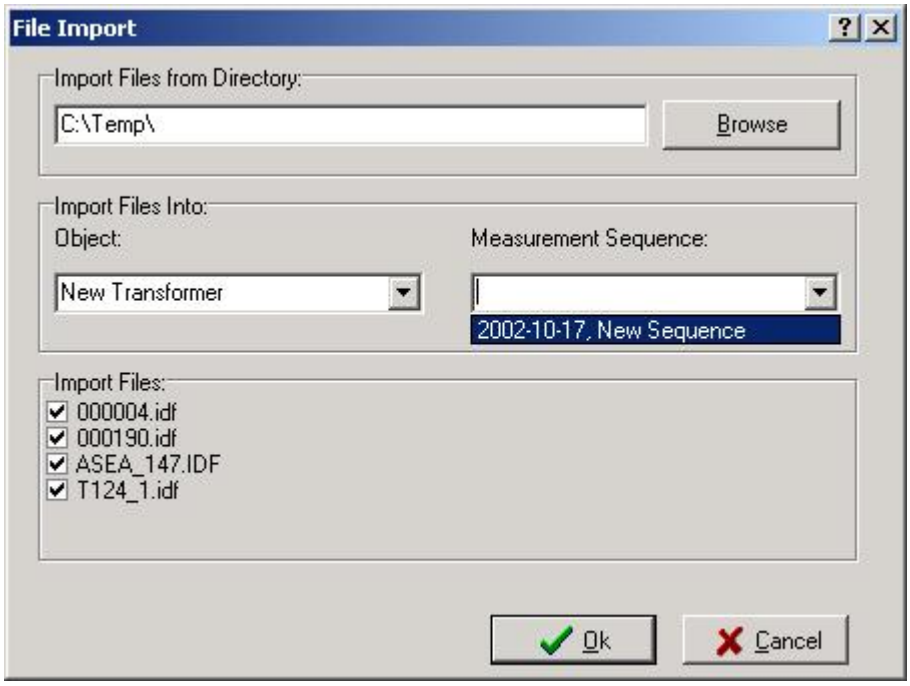
#### 2.1.1.9.2 File / Import / File to Structure

Command is used to import individual measurement files into existing data structure, i.e. it requires an Object and a Measurement Sequence. New Object and Measurement Sequence need to be defined in case there is no object and/or sequence to import the data.

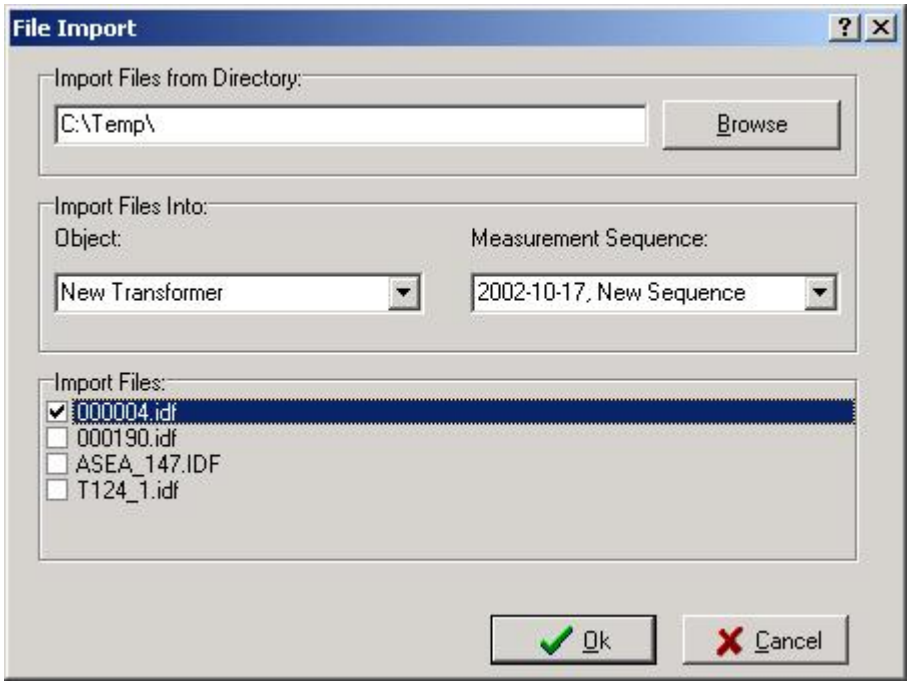
1. From menu **File / Import / File to Structure** invoke import dialog.
2. Select the directory where measurement(s) to be imported are located.
3. Select **Object** under which the measurement must be imported.



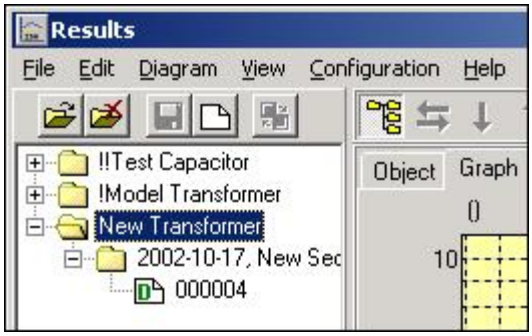

4. Select the **Measurement Sequence**.




5. Select measurement(s) to be imported. By default all measurements located in given directory are imported. Deselect those which not to import by unchecking appropriate check boxes.



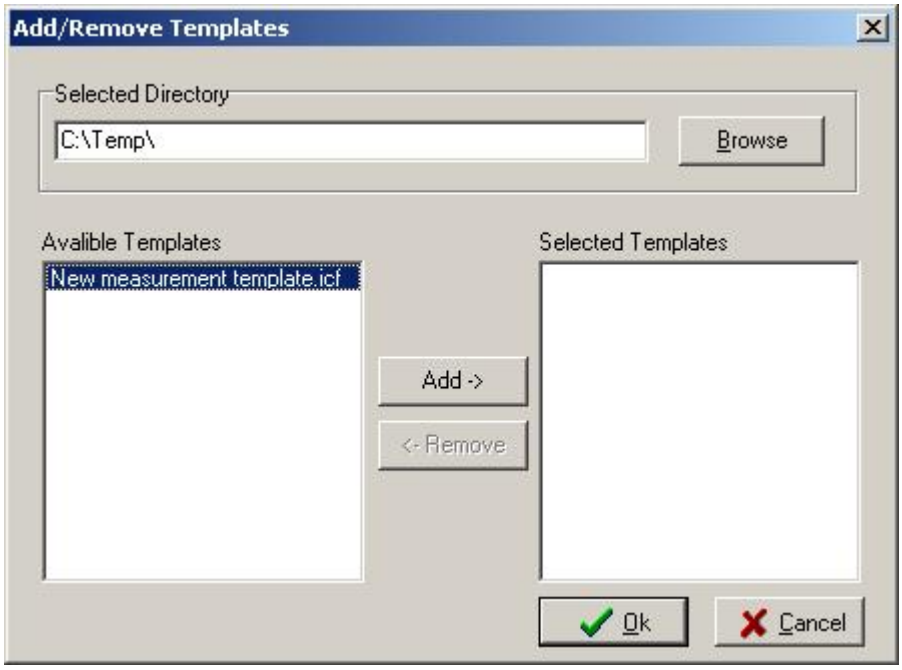

6. Press **OK** button and the measurement will appear in the Test Browser.




2.1.1.9.3 File / Import / Measurement Templates

Measurement Templates can be imported from a selected location on the IDAX hard drive or user's computer. It is done by invoking a dialog window shown below from menu **File / Import / Measurement Templates**:

1. Choose directory where template(s) to be imported are located by typing in the path manually or using **Browse** button.
2. Select template(s) to be imported from available templates in the left hand side.

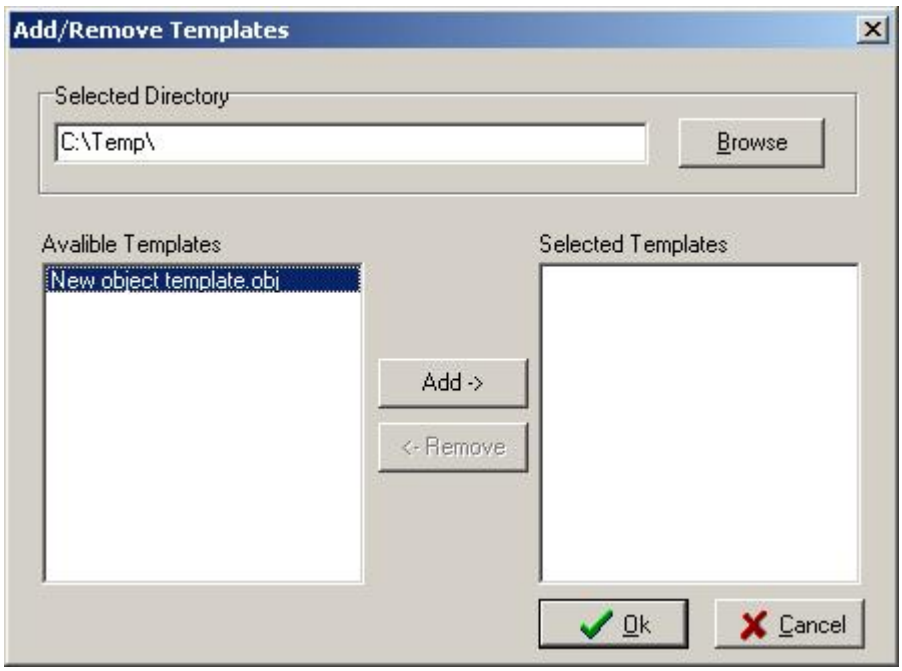



3. Press **Add** button or double click by left mouse button on chosen template.
4. Press **OK** button.

2.1.1.9.4 File / Import / Object Templates

Object Templates can be imported from a selected location on the IDAX hard drive or user's computer. It is done by invoking a dialog window shown below from menu **File / Import / Object Templates**:

1. Choose directory where the template(s) to be imported are located by typing in the path manually or using **Browse** button.
2. Select the template(s) to be imported from available templates in the left hand side.




3. Press **Add** button or double click by left mouse button on chosen template.

4. Press **OK** button.

#### 2.1.1.10 File / Export

When sharing measurement data between different IDAX instruments or computers, Export function facilitates the process of extraction of individual measurements or templates from existing data structure. Data are exported in such a fashion that they can be appropriately imported back into the same or other data structure.

Depending on objective the Export function can be used in differently:

| | |
|---|---|
| IDA Zip File | Export data structure to a single file |
| Data | Export tab-delimited data or graph into a file |
| Measurement Templates | Export selected Measurement Templates |
| Object Templates | Export selected Object Templates |

2.1.1.10.1 File / Export / IDA Zip File

**Short-cut keys:** Ctrl+Alt+E

Export of the data in an archived (*.izf) format. By exporting data into an IDA Zip File, the data structure is preserved. It is possible to export:

- individual measurements - Object and Measurement Sequence information are included.
- Measurement Sequences - Object information and all measurements in this sequence are included.
- Objects - all Measurement Sequences with respective measurements are included.

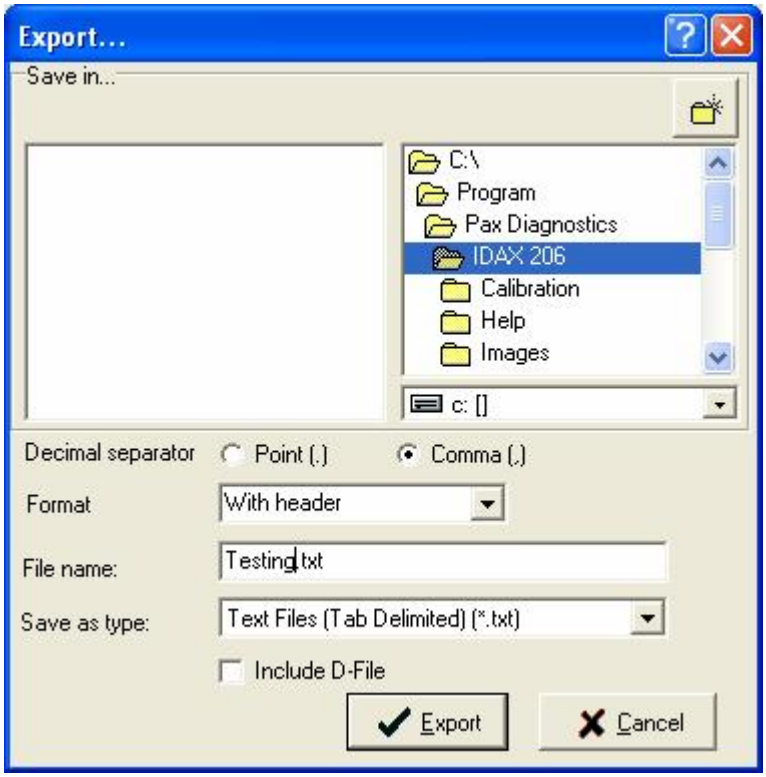
2.1.1.10.2 File / Export / Data

**Short-cut keys:** Ctrl+E

The "Export" command invokes an export-dialog with two different file type options, export to a file as a graph or the measurement points:

- WMF (Windows metafile)
- TXT (Tab delimited format)

If the measurement data is exported as a TXT-file one can also select appropriate Format and Decimal separator. The Format option allows user to remove the header of the file, which makes it easier to import the data into another program. Decimal numbers are written in the file using chosen Decimal separator option - point or comma.




Moreover, it is possible to export also the measurement file itself by checking checkbox "*Include D-File*", which may be favourable when exporting to floppy disk.

2.1.1.10.3 Header

***Export with header***

```
**********************************************************************************
D:\IDA 200\ObjectData\Demo transformer\2002-08-01, test 1\two winding transformer.idf - 11111
**********************************************************************************


#1:Amplitude          = 140 V (RMS)
#1:CHL
#1:Config: UST


#1:Frequency:      #1:Tan-Delta       #1:C
=====================================
1000               0.0035781          6.9455E-9
470.59             0.0030685          6.9538E-9
222.22             0.0026718          6.962E-9
90.395             0.0024607          6.9703E-9
60.15              0.0024873          6.9737E-9
40                 0.0026297          6.9767E-9
20                 0.0032896          6.9849E-9
10                 0.0048769          6.9891E-9
4.6417             0.008734           6.9935E-9
2.1546             0.017233           6.9991E-9
1                  0.035673           7.0043E-9
0.46417            0.075152           7.0342E-9
0.21544            0.15846            7.1148E-9
0.1                0.32781            7.3387E-9
0.046416           0.63518            8.0057E-9
0.021544           1.0359             9.946E-9
0.0099999          0.98981            1.7707E-8
```

***Export without header***

| | | |
|---|---|---|
| 1000 | 0.0035781 | 6.9455E-9 |
| 470.59 | 0.0030685 | 6.9538E-9 |
| 222.22 | 0.0026718 | 6.962E-9 |
| 90.395 | 0.0024607 | 6.9703E-9 |
| 60.15 | 0.0024873 | 6.9737E-9 |
| 40 | 0.0026297 | 6.9767E-9 |
| 20 | 0.0032896 | 6.9849E-9 |
| 10 | 0.0048769 | 6.9891E-9 |
| 4.6417 | 0.008734 | 6.9935E-9 |
| 2.1546 | 0.017233 | 6.9991E-9 |
| 1 | 0.035673 | 7.0043E-9 |
| 0.46417 | 0.075152 | 7.0342E-9 |
| 0.21544 | 0.15846 | 7.1148E-9 |
| 0.1 | 0.32781 | 7.3387E-9 |
| 0.046416 | 0.63518 | 8.0057E-9 |
| 0.021544 | 1.0359 | 9.946E-9 |
| 0.0099999 | 0.98981 | 1.7707E-8 |

2.1.1.10.4 Point/Comma

***Point as a decimal separator***

```
********************************************************************************
D:\IDA 200\ObjectData\Demo transformer\2002-08-01, test 1\two winding transformer.idf - 11111
********************************************************************************


#1:Amplitude          = 140 V (RMS)
#1:CHL
#1:Config: UST


#1:Frequency:      #1:Tan-Delta       #1:C
=====================================
1000               0.0035781          6.9455E-9
470.59             0.0030685          6.9538E-9
222.22             0.0026718          6.962E-9
90.395             0.0024607          6.9703E-9
60.15              0.0024873          6.9737E-9
40                 0.0026297          6.9767E-9
20                 0.0032896          6.9849E-9
10                 0.0048769          6.9891E-9
4.6417             0.008734           6.9935E-9
2.1546             0.017233           6.9991E-9
1                  0.035673           7.0043E-9
0.46417            0.075152           7.0342E-9
0.21544            0.15846            7.1148E-9
0.1                0.32781            7.3387E-9
0.046416           0.63518            8.0057E-9
0.021544           1.0359             9.946E-9
0.0099999          0.98981            1.7707E-8
```

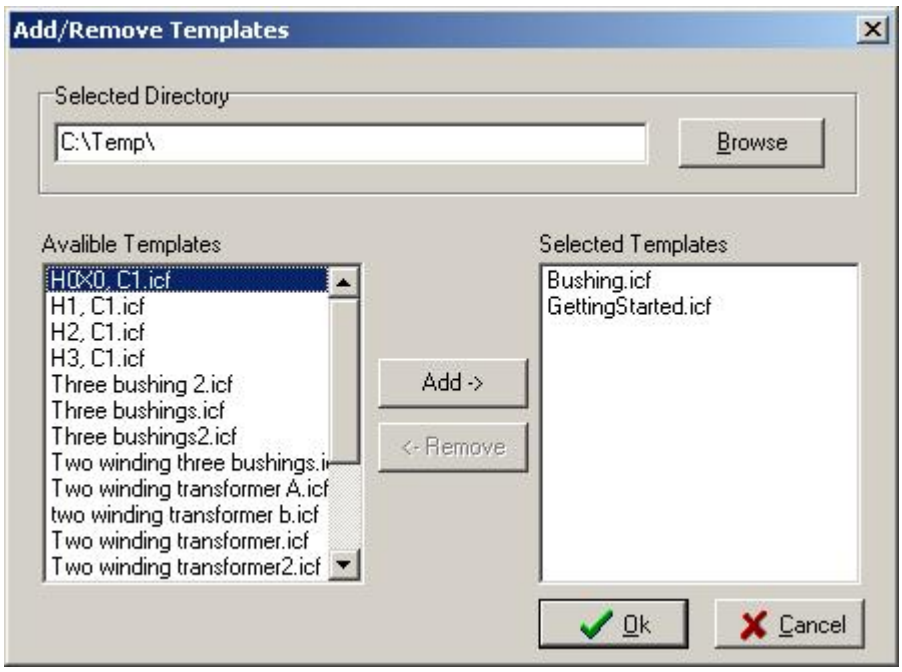
***Comma as a decimal separator***

| | | |
|---|---|---|
| 1000 | 0,0035781 | 6,9455E-9 |
| 470,59 | 0,0030685 | 6,9538E-9 |
| 222,22 | 0,0026718 | 6,962E-9 |
| 90,395 | 0,0024607 | 6,9703E-9 |
| 60,15 | 0,0024873 | 6,9737E-9 |
| 40 | 0,0026297 | 6,9767E-9 |
| 20 | 0,0032896 | 6,9849E-9 |
| 10 | 0,0048769 | 6,9891E-9 |
| 4,6417 | 0,008734 | 6,9935E-9 |
| 2,1546 | 0,017233 | 6,9991E-9 |
| 1 | 0,035673 | 7,0043E-9 |
| 0,46417 | 0,075152 | 7,0342E-9 |
| 0,21544 | 0,15846 | 7,1148E-9 |
| 0,1 | 0,32781 | 7,3387E-9 |
| 0,046416 | 0,63518 | 8,0057E-9 |
| 0,021544 | 1,0359 | 9,946E-9 |
| 0,0099999 | 0,98981 | 1,7707E-8 |

2.1.1.10.5 File / Export / Measurement Templates

Measurement Templates can be exported to a selected location on the IDAX hard drive or user's computer. It is done by invoking a dialog window shown below from menu **File / Export / Measurement Templates**:

1. Select templates to be exported side from available templates in the left hand.
2. Press **Add** button or double click by left mouse button.
3. Choose destination directory typing in the path or using **Browse** button.
4. Press **OK** button.



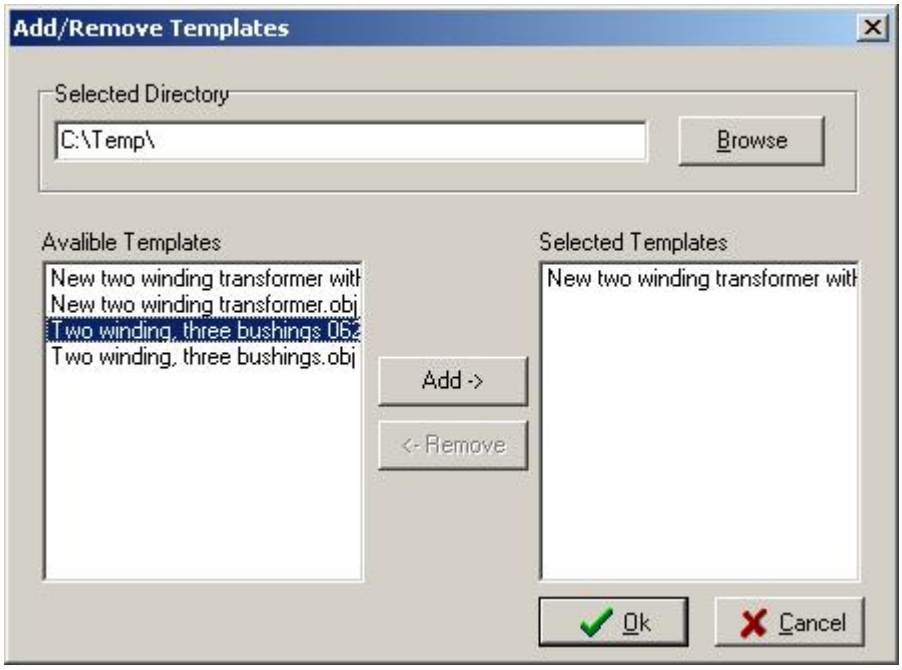

To remove a template:

1. Select it from the right hand side from selected templates.
2. Press **Remove** button or double click by left mouse button.

2.1.1.10.6 File / Export / ObjectTemplates

Object Templates can be exported to a selected location on the IDAX hard drive or user's computer. It is done by invoking a dialog window shown below from menu **File / Export / Object Templates**:

1. Select templates to be exported side from available templates in the left hand.
2. Press **Add** button or double click by left mouse button.
3. Choose destination directory typing in the path or using **Browse** button.
4. Press **OK** button.




To remove a template:

1. Select it from the right hand side from selected templates.
2. Press **Remove** button or double click by left mouse button.

### 2.1.1.11 File / Print

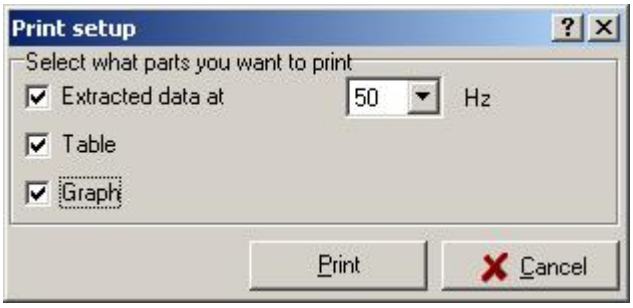
**Shortcut keys:** Ctrl+P

The **Print** command allows user to print out a simple report of the measurement results in a text format.

## Graph, Table or 50/60 Hz Data view

Pressing **Print** first invokes a special window for **Print Setup**, where user can compose the appearance of the report. By checking in given options one can print out a report consisting of:

- calculated values such as equivalent current, dissipated power, power factor and capacitance at 10 kV and at 50/60 Hz,
- table containing the data, which are selected in the Results window,
- graphical presentation of the measurement.




### Test Plan view

When in **Measurement Plan** view and in **Text View** mode user can print test plan text. If not in **Text View** mode, the **Print** command is inactive.

#### 2.1.1.12 File / Report

**Shortcut keys:** Ctrl+Alt+P

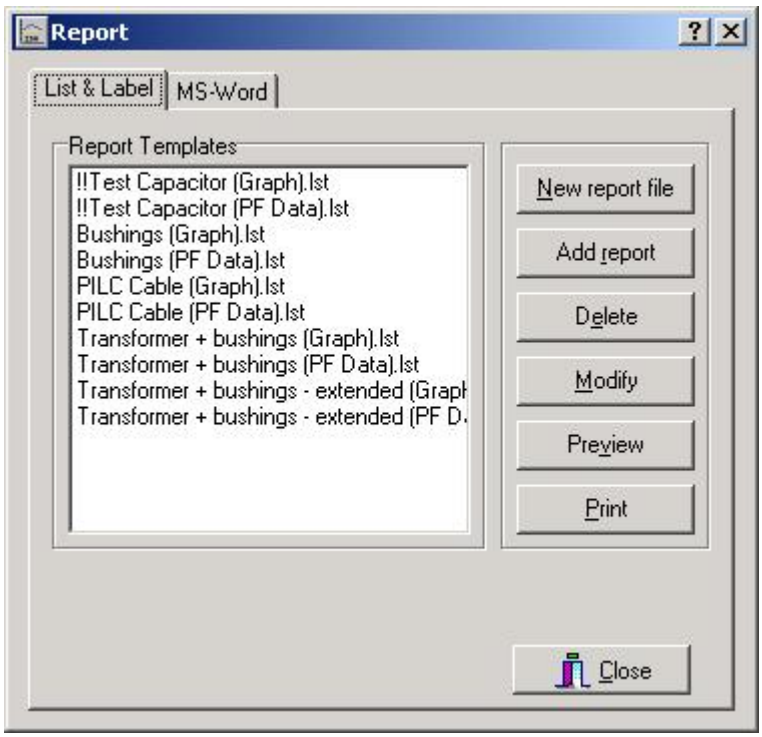
This command invokes a dialog window where two report generators are available.

| Report Generator | Description |
|---|---|
| List&Label | Create report using special set of drivers (only option available when creating report on IDAX) |
| MS Word | Create Report using features Microsoft Word text editor (Requires MS Word application installed on computer) |

##### 2.1.1.12.1 List&Label Report

List&Label is a set of special drivers provided for designing, viewing and printing reports.

When invoking List&Label report generator, a dialog window allows for choosing between various options as shown in the picture below. If there are already prepared report file(s) they will be listed in the left side of the dialog window and can be selected to work with.

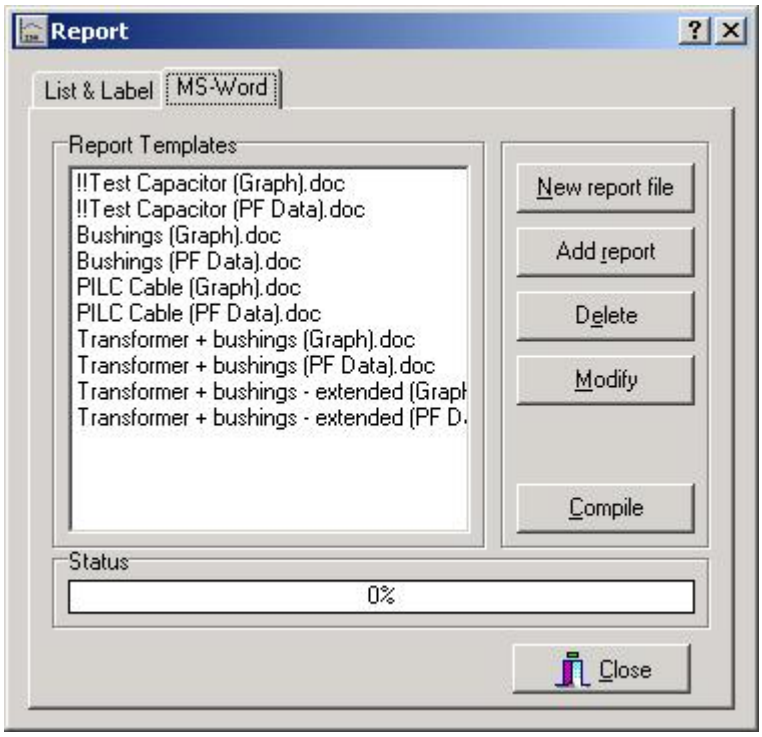


| Menu functions | Description |
|---|---|
| New report file | Create new report file. See also separate manual for List&Label. |
| Add report | Add a report to the list of available reports |
| Delete | Delete the selected report file |
| Modify | Modify in selected report file can be done. It means that the layout, appearance, etc. can be changed. (See separate manual for List&Label). |
| Preview | Preview selected report file with the users data |
| Print | Print the report according to previously designed layout from selected report file, for example, Two winding transformer + bushings.lst |
| Close | Close Report dialog |

2.1.1.12.2 MS Word Report

MS Word report generator allows for designing, viewing and printing reports using Microsoft Word features.

When invoking MS Word report generator, a dialog window allows for choosing between various options as shown in the picture below. If there are already prepared report file(s) they will be listed in the left side of the dialog window and can be selected to work with.

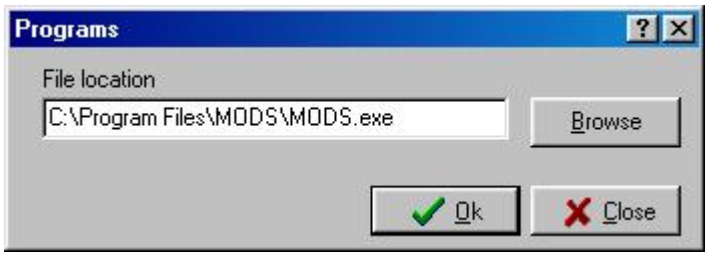



| Menu functions | Description |
|---|---|
| New report file | Create new report file using MS Word |
| Add report | Add a report to the list of available reports |
| Delete | Delete the selected report file |
| Modify | Modify in selected report file can be done. It means that the layout, appearance, etc. can be changed. |
| Compile | Preview selected report file with the users data. Printing is done using MS Word print options. |
| Close | Close Report dialog |

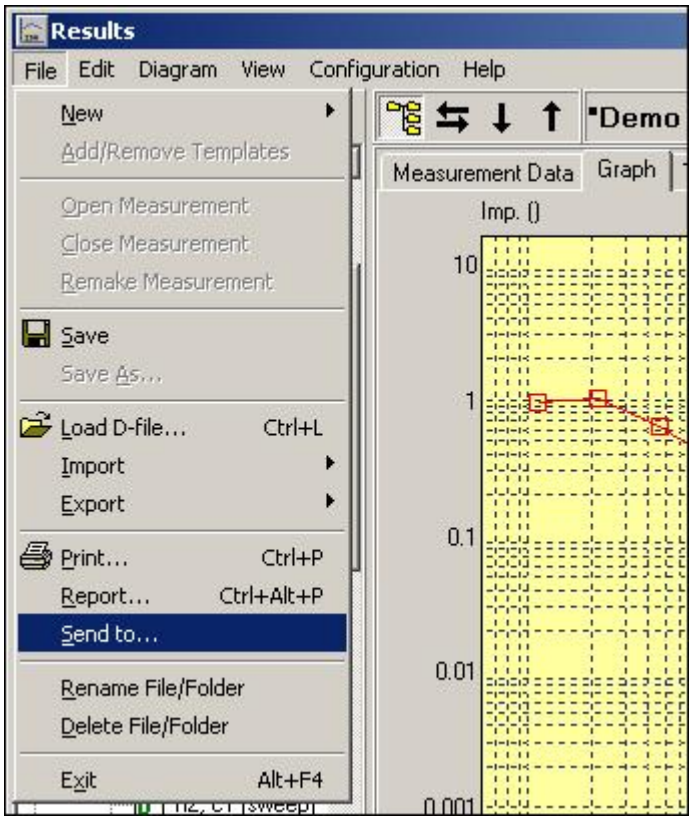
### 2.1.1.13 File / Send to

**Shortcut keys:** Ctrl+D

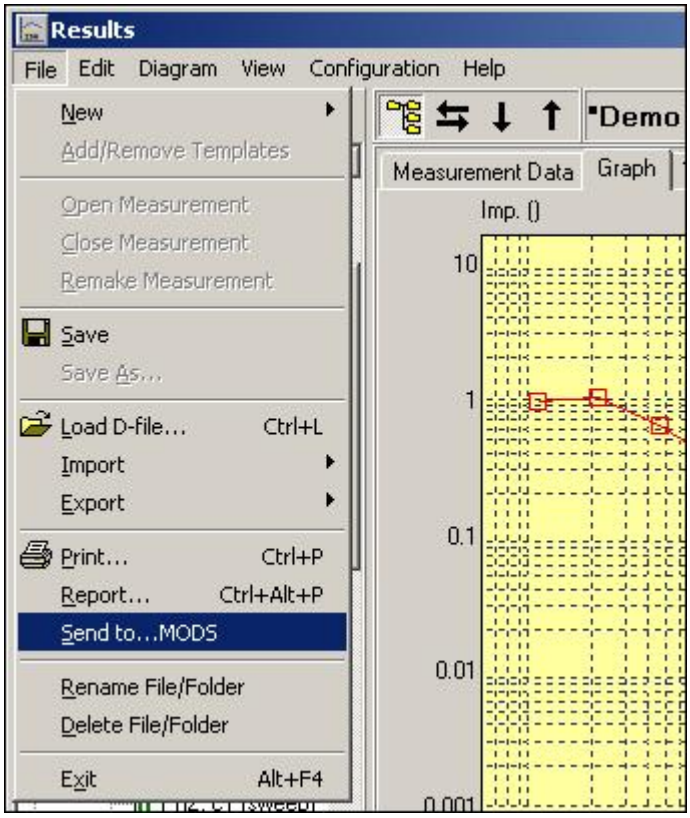
In addition to different data export options, the measurement data file, (D-file) can be sent to other programs directly for further analysis. For this purpose **Results** are configured by providing search path to the external program. The configuration is made from menu **Configuration / Program...** where the appropriate executable file is selected in dialog box.



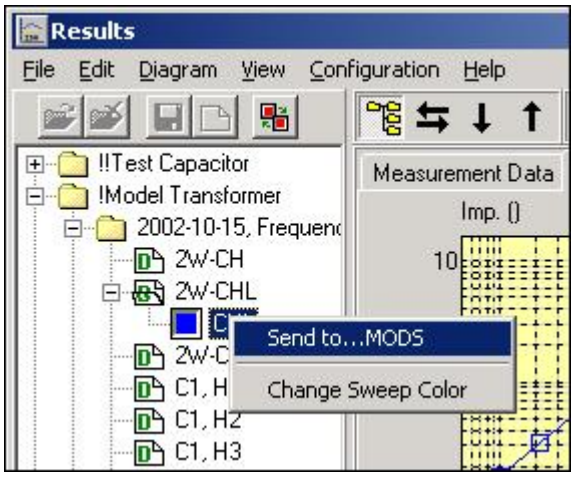

Now the data file loaded into Results can be sent to the chosen external program from **File / Send to...** as shown below. If the configuration step has been omitted, the dialog shown above appears and user is prompted to enter the search path at this stage.




When a executable application is selected, the name of the executable is added to the **Send to...** menu as shown below, where **MODS** has been chosen as application where data are to be sent.




The data can also be send to selected application by right mouse click and selecting **Send to .. MODS** as shown in picture below.

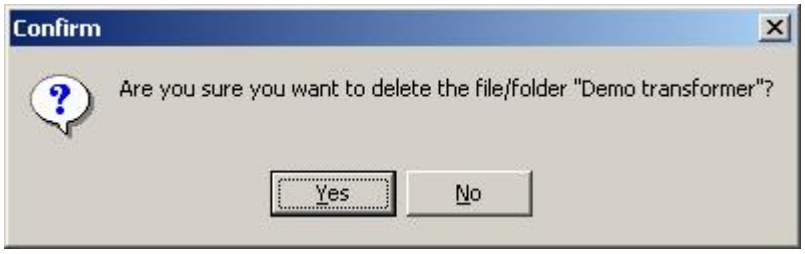



### 2.1.1.14 File / Rename File/Folder

1. Select the file or folder to be renamed
2. Choose **Rename File/Folder** from menu or right-click on the file or folder
3. Type new file or folder name and press **Enter**

### 2.1.1.15 File / Delete File/Folder

1. Select the file or folder to be deleted
2. Choose **Delete File/Folder** from menu or right-click on the file or folder. A pop-up window will appear:




3. To confirm, select **Yes** and press **Enter** or left-click, otherwise select **No**.

#### 2.1.1.16 File / Exit

**Shortcut keys:** Alt+F4

1. Closes Results program, without quitting IDAX System Control program. Results can be restored by pressing F4 or selecting from menu **Windows / Results** in IDAX System Control window.
2. If Results were launched as stand-alone application - File / Exit quits Results program without saving changes.

### 2.1.2 Results Edit Menu

#### Commands for handling text and objects

| Menu Command | Description |
|---|---|
| Undo | Undo last operation |
| Copy | Copy object(s) or text to clipboard |
| Copy All | Copy all selected objects or text to clipboard |
| Cut | Cut object(s) or text to clipboard |
| Paste | Paste object(s) or text from clipboard |
| Select All | Select all object(s) or text from Results window |

#### Commands for handling graphical output

| Menu Command | Description |
|---|---|
| Toggle Sweep | Toggles between show and hide measurement sweep |
| Mark Sweep | Shows measurement sweep |
| Unmark Sweep | Hides measurement sweep |
| Change Sweep Color | Changes colour appearance of measurement sweep |

#### 2.1.2.1 Edit / Undo

**Shortcut keys:** Ctrl+Z

Reverse the effect of the last action performed, such as typing, deleting or formatting text, etc.

#### 2.1.2.2 Edit / Copy

**Shortcut keys:** Ctrl+C

Place a duplicate of the selected text or object(s) onto the Clipboard where it can be pasted elsewhere.

#### 2.1.2.3 Edit / Copy All

**Shortcut keys:** Ctrl+Alt+C

**Graph**
Copy Results window to Clipboard. i.e. make screen dump as using Alt+Print Screen.

**Table**
Copy content of the table to Clipboard

**50/60 Hz Values**
Copy measured values at 50/60 Hz to Clipboard.

**Test Plan**
Highlight all text in the current text frame (Text View) and place a duplicate of it onto the Clipboard where it can be pasted elsewhere.

#### 2.1.2.4 Edit / Cut

**Shortcut keys:** Ctrl+X

Delete the selected text from Measurement Plan or Template and place it on the Clipboard where it can be pasted elsewhere.

#### 2.1.2.5 Edit / Paste

**Shortcut keys:** Ctrl+V

Place the contents of the clipboard (the last text cut or copied) back into Test Plan.

#### 2.1.2.6 Edit / Select All

**Shortcut keys:** Ctrl+A

Highlight all text in the current text frame (Text View) for subsequent copying.

#### 2.1.2.7 Edit / Toggle Sweep

Toggles between **Mark Sweep** and **Unmark Sweep**, i.e. displays or hides the selected sweep(s) in the graph, table and the values at power frequency. The effect of **Toggle Sweep** depends on position in Test Browser.

| Position in Test Browser | Displayed sweeps |
|---|---|
| Object | All opened measurements under this object are displayed/hidden |
| Measurement Sequence | All opened measurements in this sequence are displayed/hidden |
| Measurement file | All sweeps in this file are displayed/hidden |
| A sweep selected | Only selected sweep is displayed/hidden |

#### 2.1.2.8 Edit / Mark Sweep

Displays the selected sweep in the graph, table and shows values at power frequency. In order to have an effect of **Mark Sweep**:

- the sweeps must be unmarked (hidden)
- the sweeps to be displayed also depends on selected position in Test Browser.

| Position in Test Browser | Displayed sweeps |
|---|---|
| Object | All opened measurements under this object are displayed |
| Measurement sequence | All opened measurements in this sequence are displayed |
| Measurement file | All sweeps in this file are displayed |

| | |
|---|---|
| A sweep selected | Only selected sweep is displayed |

#### 2.1.2.9 Edit / Unmark Sweep

Hides the selected sweep in the graph, table and the values at power frequency. In order to have an effect of **Unmark Sweep**:

- the sweeps must be marked (displayed)
- the sweeps to be hidden also depends on selected position in Test Browser.

| Position in Test Browser | Displayed sweeps |
|---|---|
| Object | All opened measurements under this object are hidden |
| Measurement sequence | All opened measurements in this sequence are hidden |
| Measurement file | All sweeps in this file are hidden |
| A sweep selected | Only selected sweep is hidden |

#### 2.1.2.10 Edit / Change Sweep Color

Changes colour appearance of selected sweep. **Change Sweep Color** invokes a colour dialog window from which a desired colour for sweep can be selected. This command can also be invoked right-click on selected sweep.

#### 2.1.2.11 Edit / Read Only

Allows for changes in those fields which are read only by default:

- object data when measurement sequence is selected
- Measurement plan for data files (D-files)

By selecting **Edit / Read Only** this feature is removed and user can change the content of all fields.

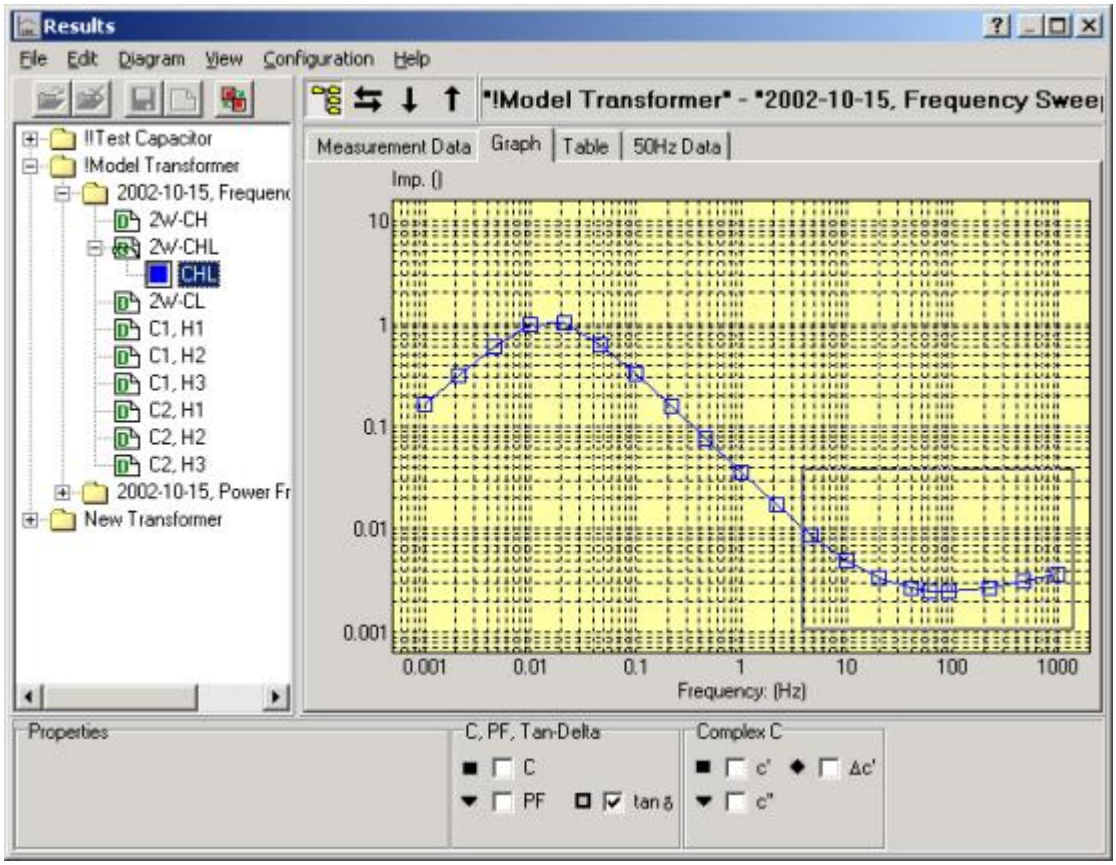
### 2.1.3 Results Diagram Menu

| Menu command | Description |
|---|---|
| Zoom in | Zooming in into a selected area |
| Zoom out | Returning to full graph |

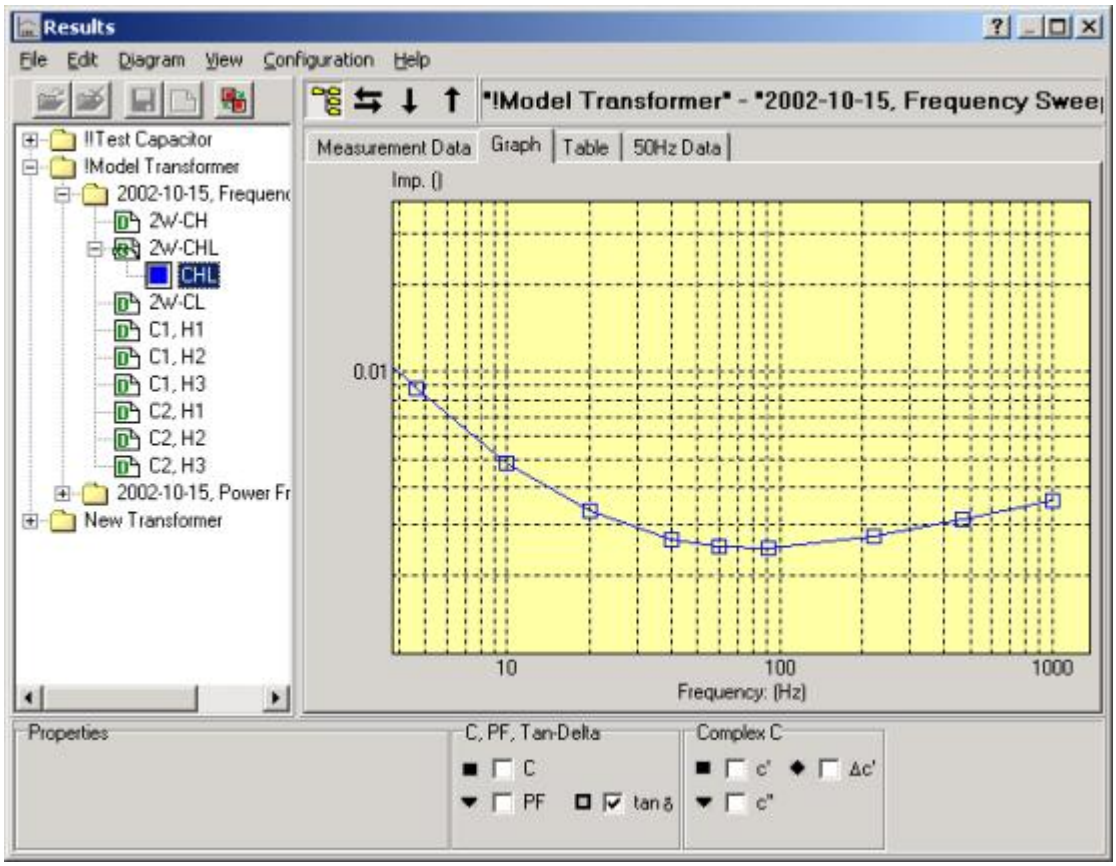
#### 2.1.3.1 Diagram / Zoom In

**Shortcut keys:** Ctrl+I

1. The **Zoom In** command allows user to select a rectangular area of the by dragging a rectangle with the mouse.




2. The marked area will the be magnified to cover the entire graph area as shown below.



#### 2.1.3.2 Diagram / Zoom Out

**Shortcut keys:** Ctrl+O

Zoom out command fully displays all active curves similarly as turning on Autoscale in axis settings. The axis settings in the axis settings, however, remain unchanged.

### 2.1.4 Results View Menu

| Menu Command | Description |
|---|---|
| Browser | Show/Hide Test Browser. |
| Browse Object Tree | Allow to select which items are displayed Test Browser. |
| Browse Measurement Templates | Show only Measurement Templates |
| Browse Object Templates | Show only Object Templates |
| Information | Display information about Object, Measurement Sequence, Measurement Plan etc. |
| Graph | Show graphical representation of measurements |
| Table | Show table view of the measurement results |
| 50/60 Hz Data | Present the values at power frequency |
| Text View | Open Measurement Plan or Template programming commands for its interface and measurement settings for review and editing |
| Show Measurement Templates | Show/Hide Measurement Templates |

#### 2.1.4.1 View / Browser

Toggles between hide and show Test Browser. It may be convenient to hide it in order to maximise the area for graphical output as well as for table and when editing measurement plans.

#### 2.1.4.2 View / Browse Object Tree

Displays all objects inclusive associated Measurement Templates, Measurement Sequences, Measurement Plans, (C-files) and measurement data files, (D-files).

#### 2.1.4.3 View / Browse Measurement Templates

Displays all available Measurement Templates and it is possible to edit any of them as well as create new ones.

#### 2.1.4.4 View / Browse ObjectTemplates

Displays all available Object Templates and it is possible to edit any of them as well as create new ones.

#### 2.1.4.5 View / Information

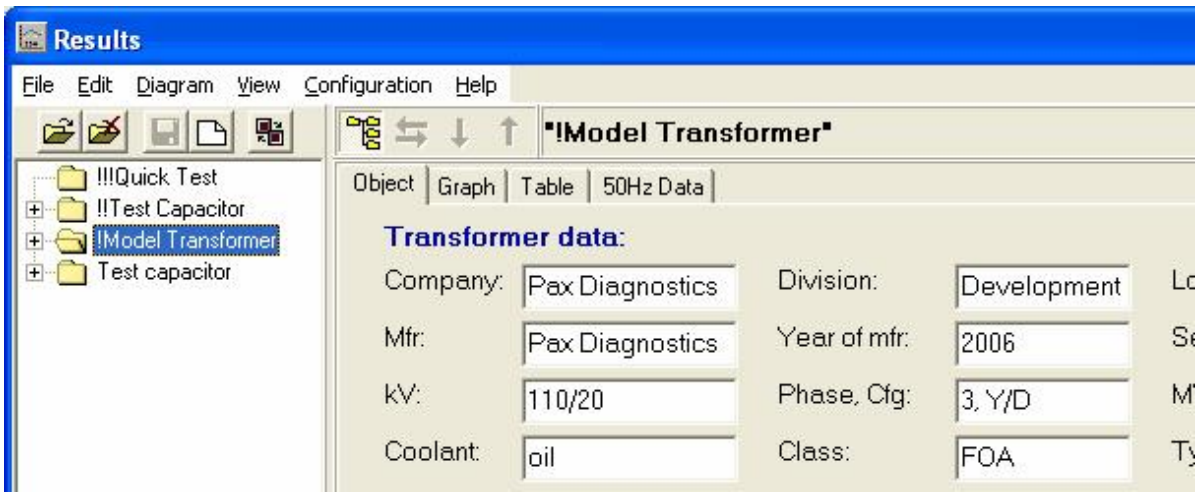
Measurements performed by IDAX are described in a command file, called Measurement Plan or C-file (*.icf). This text file contains all information specific for the measurement in question, and is in its entirety saved in the data file (*.idf) before the measurement data.

Displayed content of **Information** tab depends on selected place in Test Browser. There are several possibilities:

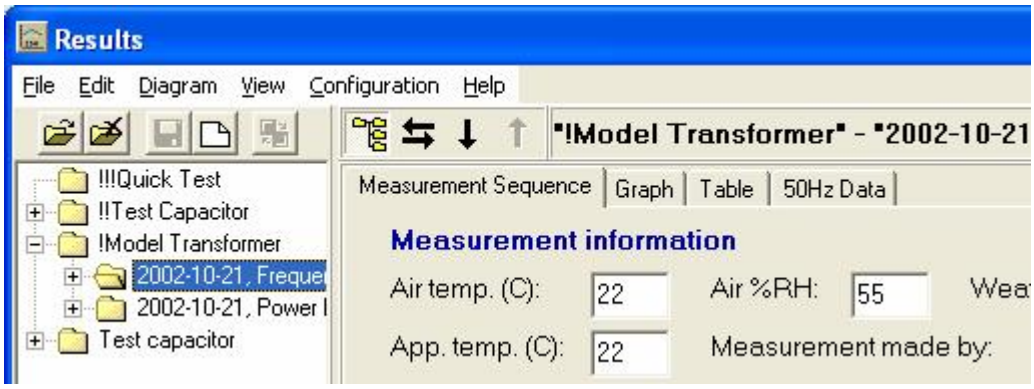
- Object selected
- Measurement Sequence selected

- Measurement Template selected
- Measurement Plan selected
- Measurement Data selected

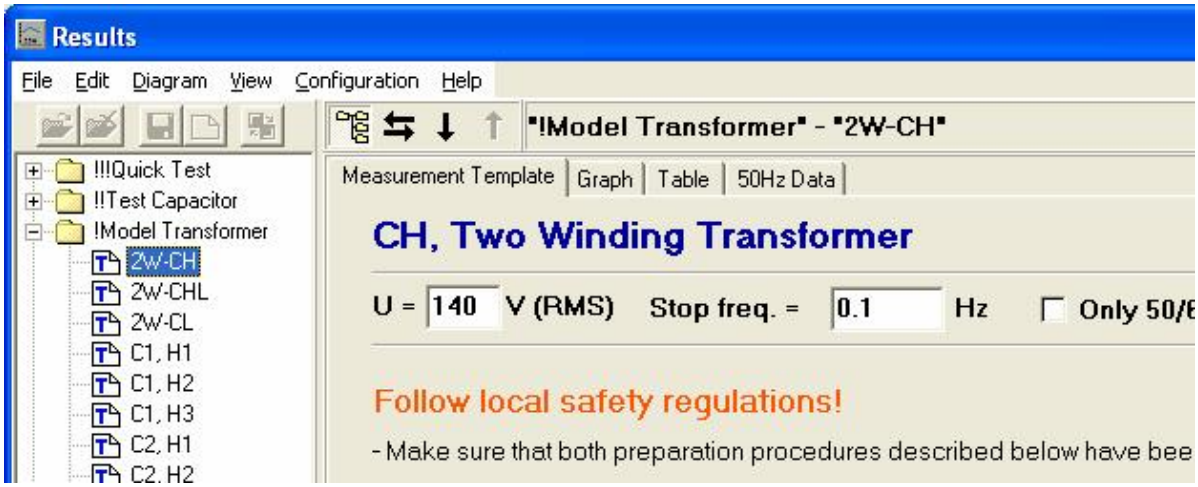
**Information - Object**
Displays information about object corresponding to the chosen Object Template. Object information can be edited using also **Text view** mode. The changes made here will, however, be unique for the given object. Permanent changes must be made in Object Template(s).



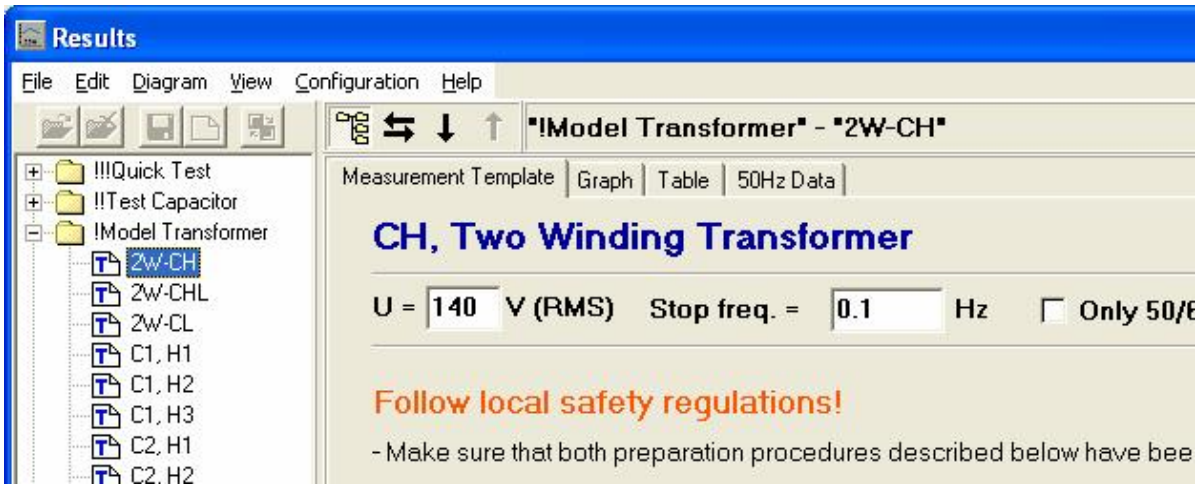

**Information - Measurement Sequence**
Measurement Sequence displays information relevant to given measurement occasion. Measurement Sequence can be edited using also **Text view** mode. The changes made here will, however, be unique for the given Measurement Sequence only. Permanent changes must be made in Object Template(s).




**Information - Measurement Template**
1. Selected Measurement Template is associated with an object
   Displays the appearance of Measurement Plan for specific conditions (see also Measurement Templates) and given object. Measurement Template(s) can be edited using also **Text view** mode. The changes made here will, however, be unique for the given object only. Permanent changes must be made in Measurement Template(s).

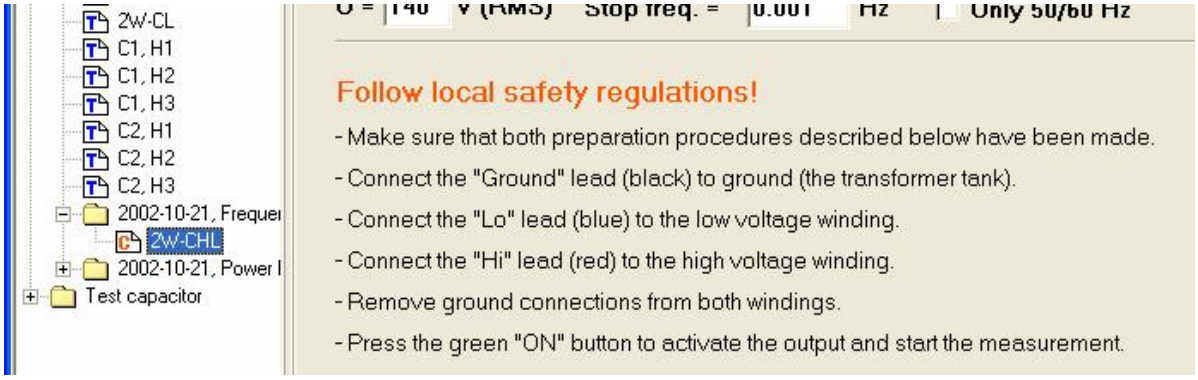



2. When using **View / Browse Measurement Templates**
   Similar as above, but the changes made in **Text view** mode will be permanent and will have effect when creating next new object or adding given Measurement Template to existing object(s).




**Information - Measurement Plan**

Measurement Plan displays the same information as Measurement Template and can be edited also using **Text view** mode. In the **Text view** mode appearance of the Measurement Plan view can be specified, thus hiding irrelevant information from the user. The changes made here will, however, be unique for the given measurement. Permanent changes must be made in Measurement Template(s).




**Information - Measurement Data**

Measurement Data displays the same information as Measurement Plan. The data itself is not visible, yet can be viewed in **Text mode**.

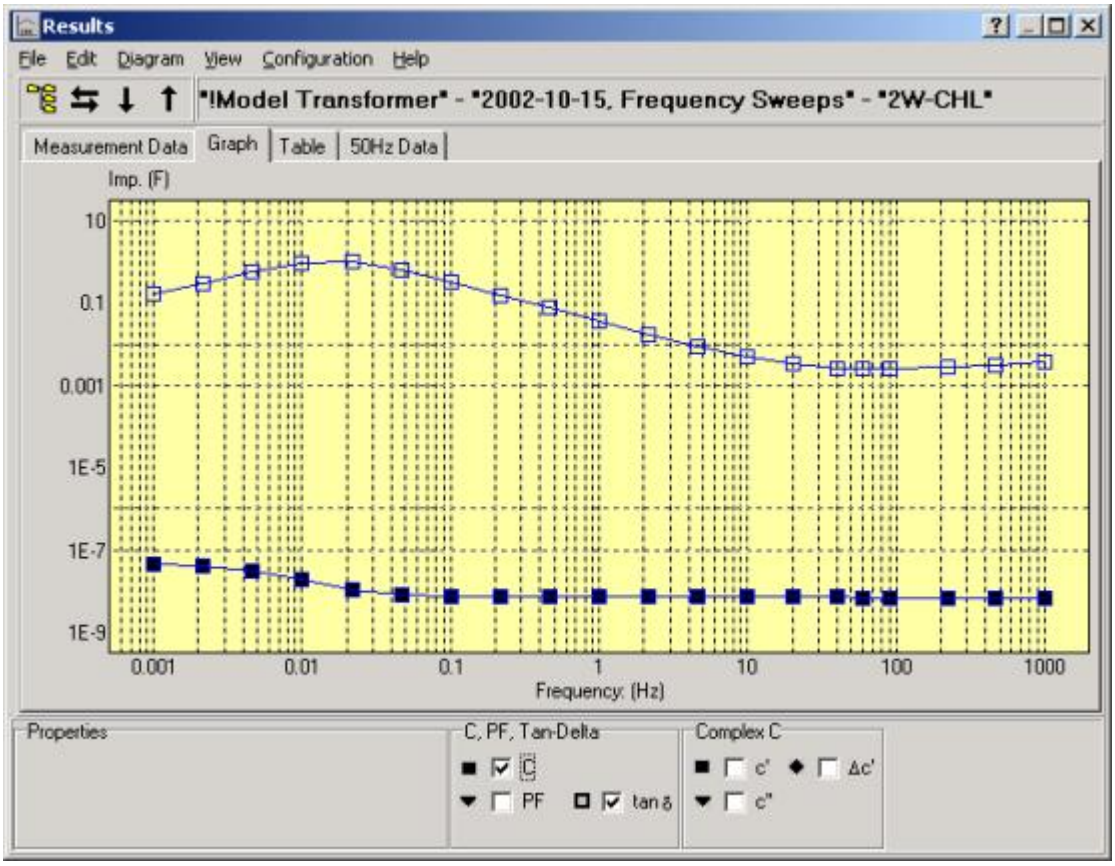
***Caution:*** The data files are Read-only and even the editing is possible after disabling Read-only attribute, it is strongly discouraged. Any data loss or damage caused by editing of data files is user's responsibility.

The IDAX System Control reads the Measurement Plan and each line is interpreted in subsequent order. Normally, every variable or command is contained in a separate row. However, multiple variables and commands can be entered in the same row if they are separated with semicolons. When the measurement is started, current Measurement Plan is copied to a file LastC.icf in *D:\IDA* catalogue, which is then read and executed by the IDAX System Control.

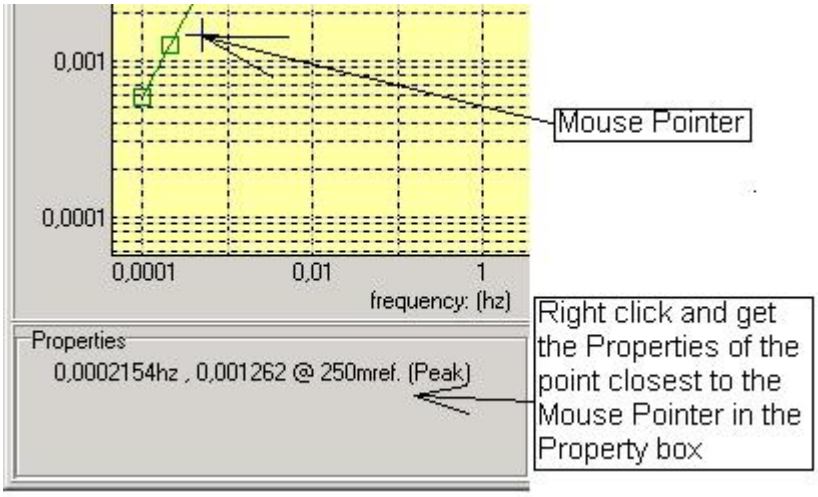
#### 2.1.4.6 View / Graph

**Shortcut keys:** Ctrl+G

Displays graphical output of an ongoing measurement and/or previously made and opened measurements. It is possible to display graphical representation of the measurements using different parameters, i.e. loss tangent, power factor, PF, capacitance, C and others (see also Configuration / Models).



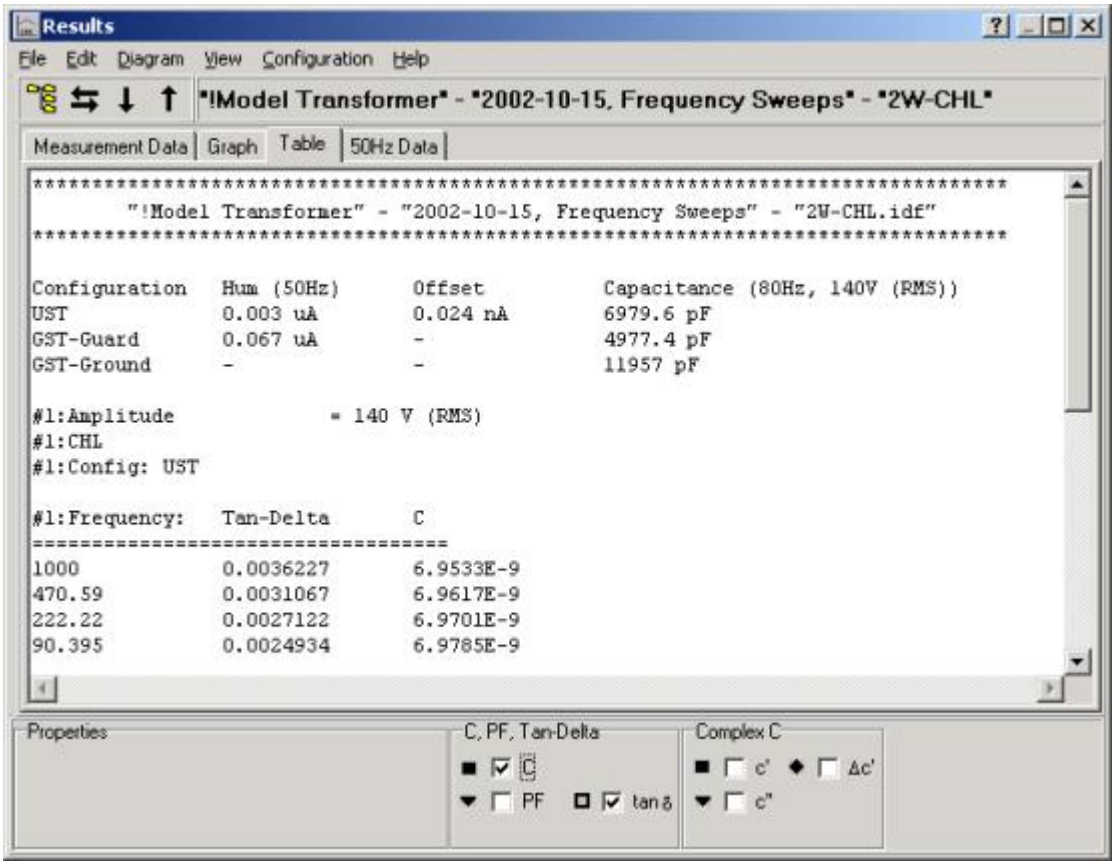

By clicking right mouse button on a measurement point the properties of this point are shown in Properties box in left lower corner of Results window.




### 2.1.4.7 View / Table

**Shortcut keys:** Ctrl+T

Ongoing measurement and/or previously made and opened measurements are displayed in a text mode. In addition to measured values loss tangent, power factor, PF, capacitance, C and others, in Table mode also hum current, DC offset and object's capacitance are shown for specified configurations.




### 2.1.4.8 View / 50/60 Hz Data

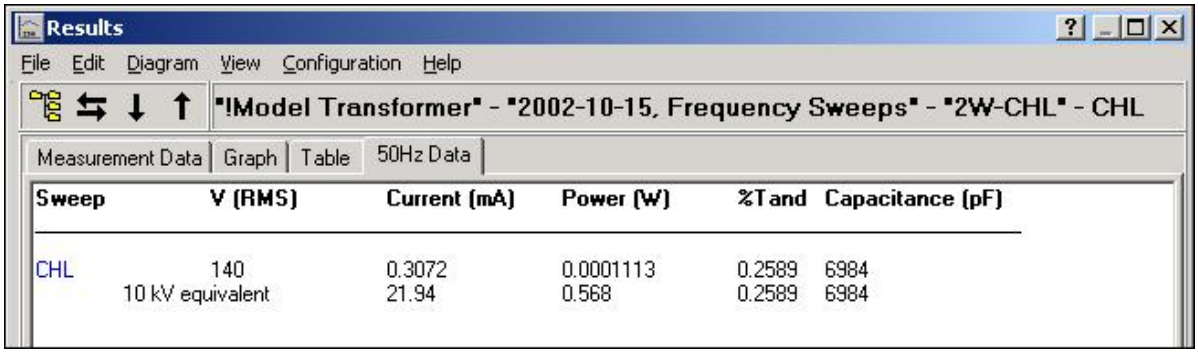
## Measured values

When a frequency sweep is performed, the measurements are done at certain pre-defined frequencies. Due to possible interferences at power frequency (50 or 60 Hz) it is generally

recommended to avoid this frequency. Instead, two measurements near the power frequency are performed and the values at power frequency are obtained by interpolation.

### 10 kV equivalents

The 10 kV equivalents are values that are calculated from the measured values. Using low voltage, e.g. 200 Vpeak, will result in a certain current through the sample. A linear insulating material, such as oil and/or paper, will have the same dissipation factor and capacitance also at a 10 kV test voltage. Therefore, it is possible to calculate the current and power at 10 kV from the measured values.




#### 2.1.4.9 View / Text View

Displays text behind the Measurement Plan or Template. In Text View all formatting and measurement settings are shown for user and editing is enabled. It is also possible to view data files (D-files), but their editing is disabled.

#### 2.1.4.10 View / Show Measurement Templates

Shows or hides Measurement Templates associated to objects in Test Browser. Hiding templates saves space in Test Browser, which may be recommended.

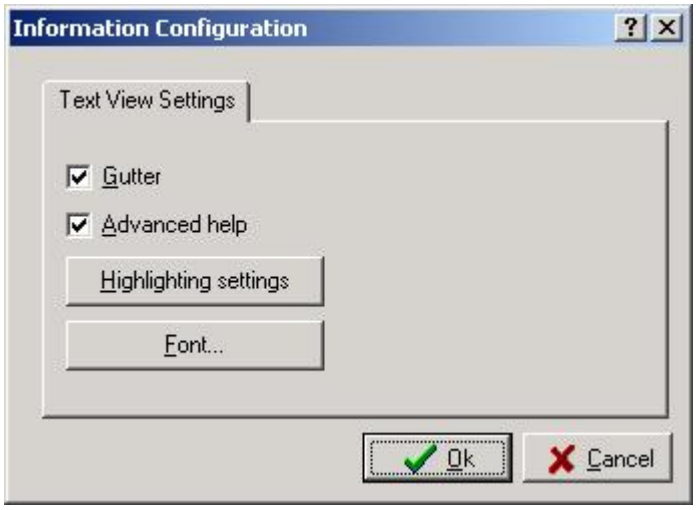
## 2.1.5 Results Configuration Menu

There are commands under this menu which allow user to configure output of measurement results, display desired measured values in both graphical and text format as well as edit measurement plan(s).

| Menu command | Description |
|---|---|
| Information | Configure appearance and Template and Measurement Plan editing tools |
| Graph | Configure appearance of graphical output |
| Table | Configure Table view |
| Power Frequency Data | Display values of losses and capacitance at power (network) frequency (50 or 60 Hz) |
| Send to | Select an external program for data analysis |
| Models | Display available models for presentation of results |

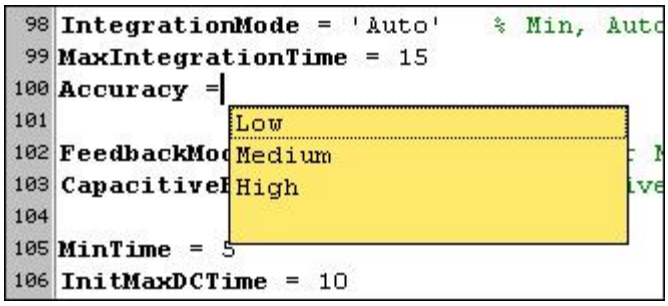
#### 2.1.5.1 Configuration / Information

Editing of Measurement and Object Templates and Measurement Plans in **Text View** mode can be facilitated by means of this dialog window.

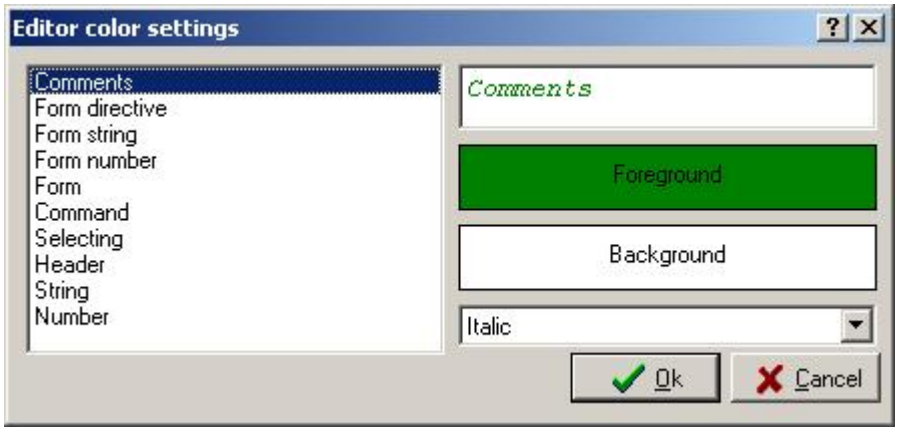



1. Checking/unchecking **Gutter** displays/hides line numbering in the left side.

2. **Advanced help** enables automatic appearance of alternatives for variables. When typing a variable name followed by "=" sign, the alternatives appear as a drop-down menu (see below) and user can select the appropriate one.




3. **Highlighting settings** allows user to change the color scheme for appearance of text editor (see example below).




4. **Font...** allows user to select the fonts to be used in Text view of Measurement or Object Templates and Measurement Plan.

### 2.1.5.2 Configuration / Graph

Allows user to configure appearance of graphical output

| Menu commands | Description |
|---|---|

| | |
|---|---|
| Display Title | Toggle ON/OFF display title |
| Axis | Configure Axis settings |
| Background | Change background color |

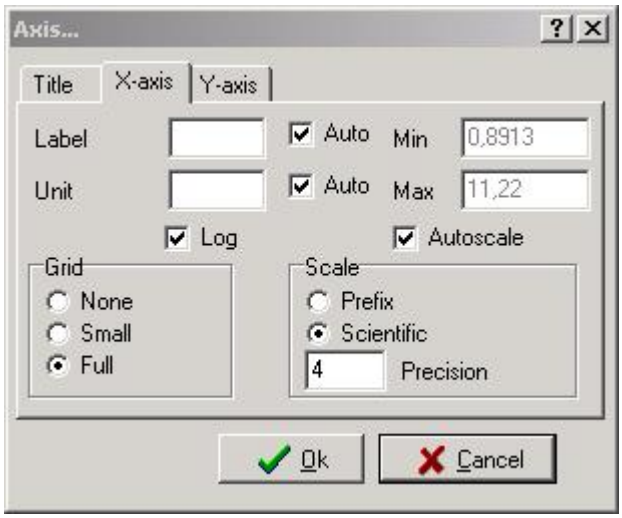
2.1.5.2.1 Configuration / Graph / Display Title

Toggles **ON/OFF** the graph title.

2.1.5.2.2 Configuration / Graph / Axis

The Axis command invokes the axis dialog window. This window allows the names, scales, grid, prefixes, etc. on the axes to be modified. The dialog is divided into three parts:

- Title
- X-axis
- Y-axis.




2.1.5.2.2.1 Autoscale

Autoscale automatically sets the scale so that all active curves are displayed in the graph.

---

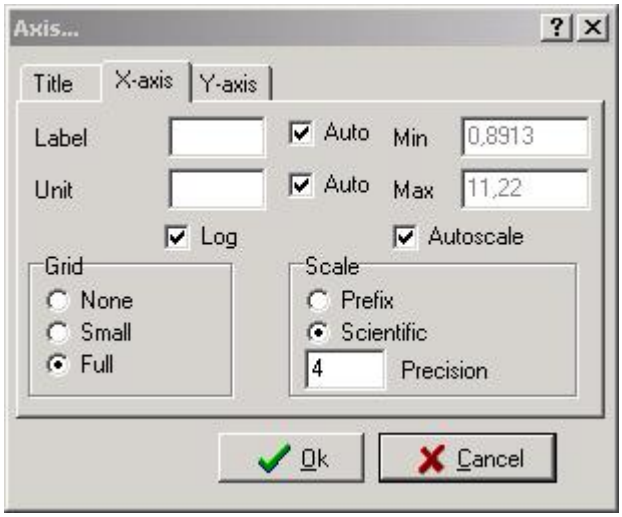
**Note!**

**Negative values are not possible to display in logarithmic scale.**

2.1.5.2.2.2 Grid

For grid settings, three options are available:

- None, no grid is shown.
- Small, also called tics. Only an indication at the axis, no lines in the graph.
- Full, all lines are displayed in the graph.




2.1.5.2.2.3 Label

Allows user to enter a label text for both X- and Y- axis.

2.1.5.2.2.4 Log/Lin

Makes it possible to change between logarithmic and linear scale for the X and/or Y axis.

---

**Note!**

**Negative values are not possible to display in logarithmic scale.**

2.1.5.2.2.5 Precision

Precision sets how many digits of the point is presented in the Graph/Table.

2.1.5.2.2.6 Prefix/Scientific

Changes between Prefix or Scientific notation in the Graph/Table.

| Prefix | Scientific |
|---|---|
| E | 1,00E+18 |
| P | 1,00E+15 |
| T | 1,00E+12 |
| G | 1,00E+09 |
| M | 1,00E+06 |
| k | 1,00E+03 |
| m | 1,00E-03 |
| u | 1,00E-06 |
| n | 1,00E-09 |
| p | 1,00E-12 |
| f | 1,00E-15 |
| a | 1,00E-18 |

2.1.5.2.2.7 Title

Here the title for the graph in Results can be written. If **Auto** is checked, the title of the measurement will be displayed for the measurement. If more than one measurements are

loaded in the results window, with different titles, no title will be displayed.


2.1.5.2.2.8 Unit

Units for both X- and Y- axis.

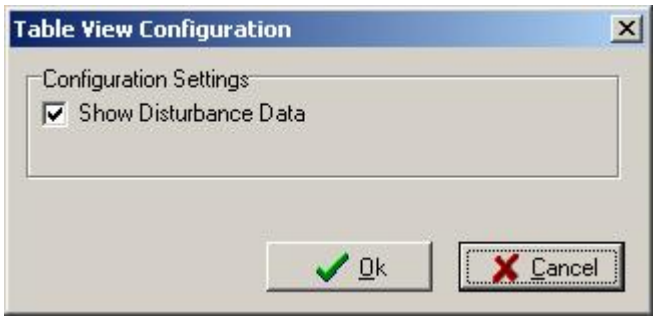
2.1.5.2.3 Configuration / Graph / Background

**Shortcut keys:** Ctrl+B

Using this command the background of the graph can be changed. The selected color is used on display and in files exported in **.wmf* format, however, when printing the background color is set to white.

### 2.1.5.3 Configuration / Table

Allows user to choose between displaying or hiding the disturbance data when in Table mode.



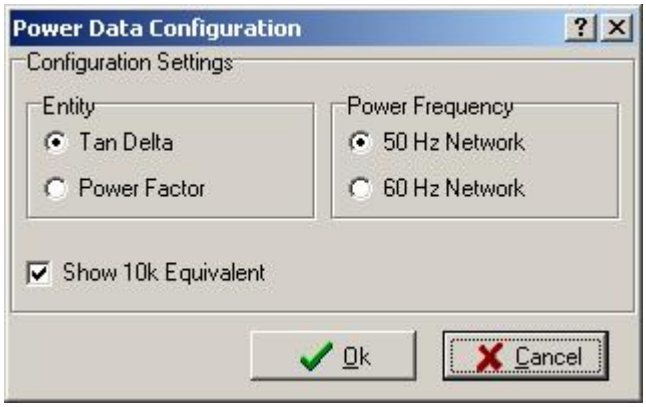

### 2.1.5.4 Configuration / Power Data

Configures display of desired values at power frequency (50 or 60 Hz). This command invokes a dialog window shown below. The options are as follows:

1) showing either loss tangent (tan$\delta$) or Power Factor (PF)

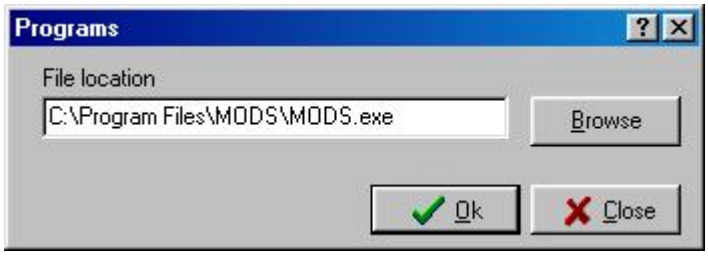
2) select power frequency
   - 50 Hz, e.g. Europe, Australia, most part of Africa and Asia
   - 60 Hz, e.g. USA, Canada, Mexico, certain countries in South America

3) showing interpolated 10 kV equivalents for current, dissipated power, Power Factor and capacitance




#### 2.1.5.5 Configuration / Program...

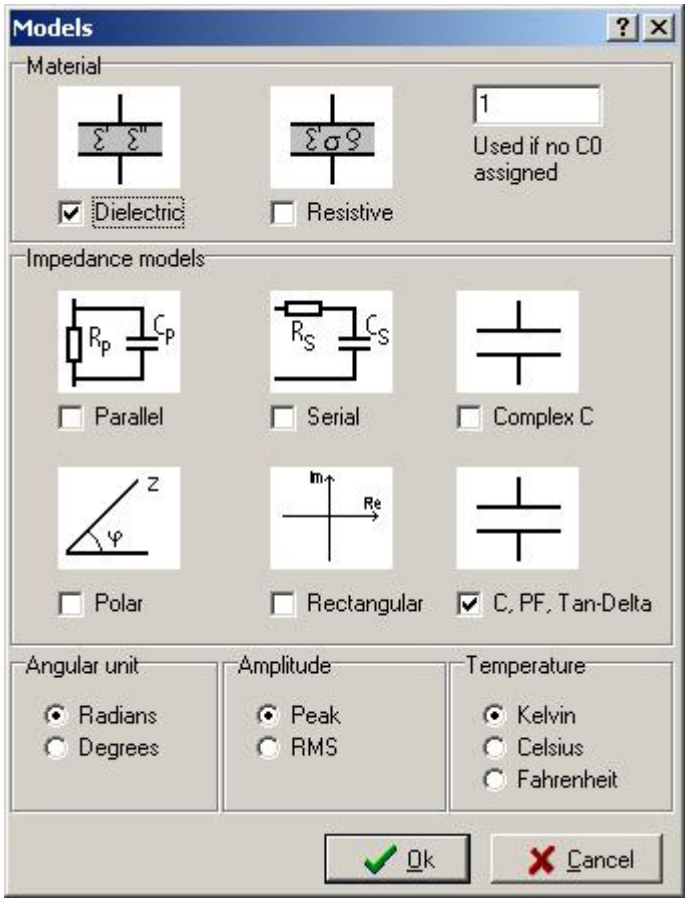
The dialog window, which appears when selecting this menu command, allow user to choose an external application for further data analysis. This is done by providing the search path to this program as shown below.



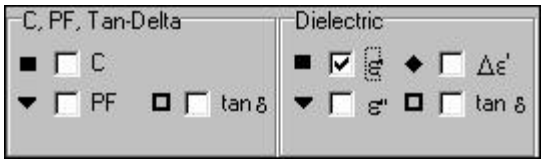

#### 2.1.5.6 Configuration / Models...

**Shortcut keys:** Ctrl+M

Command **Configuration / Models...** invokes a window where available models for presentation of measurement results are shown. Different models can be selected and the corresponding results in graphical or text format will be simultaneously displayed.




Selected models appear at the bottom of Results window, where one can choose which parameters are to be shown. Below the Dielectric and C, PF, Tan-Delta models are chosen to be used in Results and ε′ as a parameter is displayed in the graph.




## 2.1.6 Impedance models

The following impedance models and their parameters are available:

| | |
|---|---|
| Dielectric | $\varepsilon'$, $\Delta\varepsilon'$, $\varepsilon''$, $\tan\delta$<br>(start value for $\Delta\varepsilon' = 0.9\varepsilon'$) |
| Resistive | $\varepsilon'$, $\rho$, $\sigma$ |
| Parallel | Cp, Rp |
| Series | Cs, Rs |
| Complex C | c',Δc', c''<br>(start value for Δc' = 0.9c') |
| Polar | Z, $\varphi$ |
| Rect. | Re{Z}, Im{Z} |
| Tand | C, tan $\delta$, PF |

### 2.1.7 Results Help Menu

| Menu command | Description |
|---|---|
| Contents | Show content of all IDAX Help |
| Results Help | Display help for Results only |
| What's this? | Pop-up help for unclear fields or menu |

#### 2.1.7.1 Help / Contents

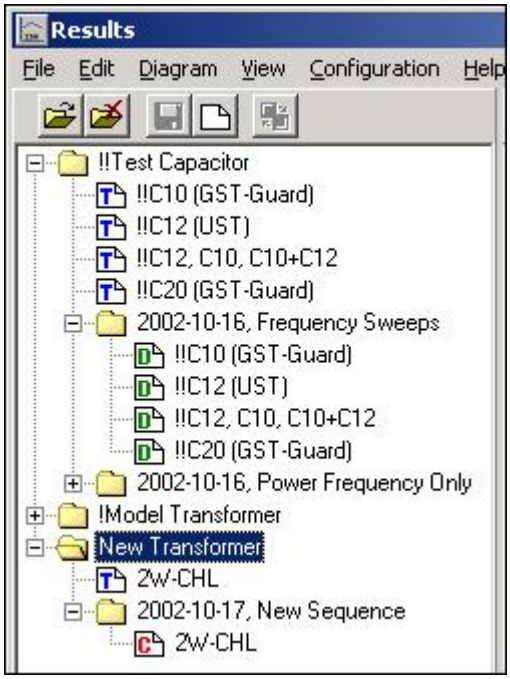
IDAX Help contents displays available Help topic:

| Topic | Description |
|---|---|
| IDAX | Overview of IDAX operating principle and functions |
| Results User Interface | Preparation of measurements and presentation of results |
| Command and Variable Reference | Reference of programming directives |
| IDAX Error Messages | Error messages generated by IDAX and possible countermeasures |

## 2.2 Test Browser

Test Browser is located at the left hand side of the Results window and it works similarly to Microsoft Windows Explorer. The main purpose of the Test Browser is to facilitate:

- navigation between already performed measurements, Object and Measurement Templates
- organisation of new measurements on the existing or new objects
- creation and editing Measurement and Object Templates




### 2.2.1 Data Structure

Test Browser is arranged as a tree-like structure consisting of:

- Objects
- Measurement Sequences
- Measurement Plans and data files

#### Objects

Each object is represented by an object template specified in a file *Object.obj*. This file contains the information about the object which is constant such as owner, manufacturer, serial number, etc. There are several pre-defined Object Templates for power transformers, bushings and cables. Depending on user's needs these files can also be modified as well as new templates can be created.

When creating new objects it is recommended to select Measurement Templates which can be associated to those objects.

#### Measurement Sequence

Measurement Sequence is created in order to make a measurement and therefore at least one Measurement Template must be associated with the Object.

#### Measurement structure

In order to perform a measurement a Measurement Sequence must be available or a new one must be created. New sequence is created by selecting desired object and press **File / New / Measurement Sequence**. This will result in:

- A dialog will appear where a test date and an optional name of Measurement Sequence can be defined
- All Measurement Templates associated with the object will be copied to the folder of new Measurement Sequence (inclusive the object information) as command or C-files (*.icf).
- In order to run a measurement, a command file from those under Measurement Sequence is chosen and IDAX is started by pressing **ON**.
- When measurement is started, the command file is replaced by a data file containing both information from the command file and measurement data. Finished measurement can be

repeated by selecting data file and choosing **File / Remake Measurement**. This will create a new command file copy from data file, which is possible to start again. (The name of command file will remain the same as original data file with additional number at the end, for example xxxxx-2 or yyyy-3, where number indicates times the measurement has been repeated.

- When measurement is finished the next command file in given Measurement Sequence can be selected and run until the entire Measurement Sequence is done. Unwanted command files can be deleted or simply left as they are.

### 2.2.2 Measurement Templates

Measurement Templates are templates which are recommended to use when performing various measurements on power and distribution transformers, bushings and cables. The form view of Measurement Template is pre-specified, however, can be modified to satisfy different requirements. For information about the commands in the IDAX C file see the Commands and Variable Reference in the program help file or included pdf manual.

In all Measurement Templates it is provided that user can choose to perform either:
1) frequency sweep down to a specified stop frequency, or

2) measurement only at power frequency (50 or 60 Hz). This last option is not available for XLPE cable measurements and in limited extent in general measurement plans.

#### Two winding transformer

Available Measurement Templates are:
- 2W-CH - measurement of insulation between high voltage winding and ground
- 2W-CHL - measurement of insulation between high and low voltage windings
- 2W-CL - measurement of insulation between low voltage winding and ground

#### Three winding transformer

Available Measurement Templates are:
- 3W-CH - measurement of insulation between high voltage winding and ground
- 3W-CHL - measurement of insulation between high and low voltage windings
- 3W-CHT - measurement of insulation between high voltage and tertiary winding
- 3W-CLT - measurement of insulation between low voltage and tertiary winding
- 3W-CL - measurement of insulation between low voltage winding and ground
- 3W-CT - measurement of insulation between tertiary winding and ground

#### Autotransformer without tertiary winding

Available Measurement Templates are:
- 2WA-CH - measurement of insulation between high/low voltage winding and ground

#### Autotransformer with tertiary winding

Available Measurement Templates are:
- 3WA-CH - measurement of insulation between high/low voltage winding and ground
- 3WA-CHT - measurement of insulation between high/low voltage and tertiary windings
- 3WA-CT - measurement of insulation between tertiary winding and ground

#### Bushings

Available Measurement Templates are (for each phase):
- C1, H1 - measurement of bushing H1* main insulation, C1
- C1, H2 - measurement of bushing H2 main insulation, C1
- C1, H3 - measurement of bushing H3 main insulation, C1
- C2, H1 - measurement of bushing H1 insulation between test tap and ground sleeve, C2
- C2, H2 - measurement of bushing H2 insulation between test tap and ground sleeve, C2
- C2, H3 - measurement of bushing H3 insulation between test tap and ground sleeve, C2

* H1, H2 and H3 are default labels for bushings of different phases.

### PILC Cables

- PILC Cable, A - measurement of insulation of phase A*
- PILC Cable, B - measurement of insulation of phase B
- PILC Cable, C - measurement of insulation of phase C

* A, B and C are default labels for different phases of the cable.

### XLPE Cables

- XLPE Cable, A - measurement of insulation of phase A*
- XLPE Cable, B - measurement of insulation of phase B
- XLPE Cable, C - measurement of insulation of phase C

* A, B and C are default labels for different phases of the cable.

### General measurements

Available Measurement Templates are:

- General (PF Data) - generic measurement plan for measuring only at power frequency (50/60 Hz)
- General (Sweep) - generic measurement plan for measuring of frequency sweep
- General HV - generic measurement plan for measurements using IDA High Voltage Unit

## 2.2.3 Object Templates

Object Templates are templates which are recommended to use when creating new objects. Available pre-specified templates are:

- !!Test Capacitor
- !General Specimen
- Autotransformer with Tertiary + Bushings
- Autotransformer with Tertiary
- Autotransformer without Tertiary + Bushings
- Autotransformer with Tertiary
- Bushings
- PILC (Paper Insulated Lead Covered) Cable
- Three Winding Transformer + Bushings
- Three Winding Transformer
- Two Winding Transformer + Bushings
- Two Winding Transformer
- XLPE Cable

The form view of Object Template is pre-specified, however, it can be modified to satisfy different requirements. For information about the commands in the IDAX C file see the Commands and Variable Reference in the program help file or included pdf manual.

# 3 IDAX Error Messages

## System messages

| No | Message | Explanation |
|---|---|---|
| 101 | `Filename missing` | File name not specified file dialog. Specify a file name. |
| 103 | `Not string` | A string variable is expected. |
| 104 | `Could not open file:` | Wrong file name, file is missing or path is incorrect. |
| 105 | `Could not open or create key` | Problem accessing Windows Registry. |

| No | Message | Explanation |
|---|---|---|
| 106 | Key could not be deleted | Problem accessing Windows Registry. |
| 107 | Redeclaration of variable | A variable is declared two or more times in the C–file. |
| 108 | Error writing to file | The log file from a Calibration or a Self test could not be created. |
| 109 | Incorrect data type | The Data type specified does not exist. |
| 112 | Cannot start measurement | Displayed when IDAX is not properly set up in order to perform a measurement. Usually accompanied by a more detailed message. |
| 113 | Error reading Windows registry | Problem accessing Windows Registry. |

## Errors associated with C-file

| No | Message | Explanation |
|---|---|---|
| 201 | Not a complex number | Variable is expected to be complex number in "X+Yi" format. |
| 202 | Illegal assignment | Wrong type has been assigned to variable. |
| 203 | Unknown directive | Incorrect command. Most likely a typing error. |
| 204 | No "Data type" specified | Type must be specified before data field. Example: $ Type = 'R' |
| 205 | No "Category" specified | Category must be specified before data field. Example $ Cat = 'C' |
| 206 | Incorrect "Category" | Wrong variable in category (Cat) has been used. |
| 208 | Error on line | Indicates the number of line in C-file, where error was detected. |
| 209 | "VoltageSource" incorrect | "VoltageSource" has to be of a defined type. Most likely a typing error. |
| 210 | Boolean is expected for check box ("CB") | Check boxes can have only Boolean values. |
| 211 | Not an integer | Parameter values must be of the same type as in the parameter declaration. |
| 212 | Not a real | Parameter values must be of the same type as in the parameter declaration. |
| 213 | Not a Boolean | Parameter values must be of the same type as in the parameter declaration. |
| 214 | Unknown "Data type" | "Data type" must be of a defined type. Most likely a typing error. |
| 216 | Wrong number of arguments | Too few or too many arguments in a variable. |
| 217 | Syntax error | Undefined error in the syntax. Usually accompanied by additional information. |
| 218 | To few radio buttons in group ("RB") | There must be at least two buttons in a radio group |
| 219 | Not a radio buttons item ("RB") | The function is assigned to a value that does not match any radio button. Most likely a typing error. |
| 220 | Not an array of integers | Parameter values have to be of the same type as in the parameter declaration. |
| 221 | Invalid bitmap "Image" | Image is not a *.bmp file or the file is corrupted. |
| 222 | Variable not declared | All new variables must be declared with a "New" function. |
| 223 | "AmplitudeScale" not assigned | "AmplitudeScale" must be assigned. See User's Manual for options. |
| 224 | "VoltageSource" not assigned | "VoltageSource" must be assigned. See User's Manual for options. |
| 225 | "FileType" not assigned | "FileType" must be assigned. See User's Manual for options. |
| 226 | "SpecVersion" not assigned | "SpecVersion" must be assigned. See User's Manual for options |

| No | Message | Explanation |
|---|---|---|
| 227 | "DraftSpecVersion" not assigned | "DraftSpecVersion" must be assigned. See User's Manual for options. |
| 228 | "Configuration" not assigned | "Configuration" must be assigned if using a Termination Box with relays. See User's Manual for options. |
| 229 | Value not assigned | If cat 'P' is assigned, the field can not be left blank. |

## Errors related to IDAX 206 system and measurement settings

| No | Message | Explanation |
|---|---|---|
| 301 | Wrong argument in "LinSweep" function | Wrong number/type of argument. See User's Manual Appendix A.6 for options |
| 302 | Wrong argument in "LogSweep" function | Wrong number/type of argument. See's Manual Appendix A.6 for options. |
| 303 | Settings could not be saved | User settings could not be saved. |
| 306 | No DSP device name | The name of the DSP instrument is not valid, contact a service supplier. |
| 307 | Could not open DSP | The DSP instrument did not connect properly. |
| 308 | No geometric capacitance | |
| 309 | Error initializing DSP. DSP not present or inactive. | The DSP instrument did not connect properly. |
| 311 | Neither the file LastC.icf nor specified file could be found | The C-file is not found in the system. Probably problem with reading/writing to disc or Windows registry. |
| 312 | Unknown "C-File" command | The specified command does not exist. Most likely a typing error. |
| 313 | Wrong number of arguments | Too few or too many arguments in a command. |
| 314 | No "Amplitude" | "Amplitude" must be assigned. See User's Manual Appendix A.5 for options. |
| 315 | No "Frequency" | "Frequency" must be assigned. See User's Manual Appendix A.5 for options. |
| 319 | No measurement to comment | Comments are possible during a measurement or directly after the measurement. |
| 320 | No current measurement | No measurement which has been started. |
| 321 | DSP variables wrong | The DSP-variables (e.g. MinTime, MinCycles, etc.) are wrong. |
| 322 | DSP code not found | No or wrong DSP code found in the system. |
| 323 | Index does not exist in NT registry | Problems accessing Windows Registry. |
| 324 | Could not interpolate calibration data | Could not interpolate transfer functions. |
| 325 | No voltage source selected | A voltage source must be selected before measuring. |
| 327 | Could not get info from DSP | Problems with the connection to the DSP instrument. |
| 329 | "MeasurementPerPoints" must be greater than zero. | One measurement at each frequency must be performed. |
| 330 | DSP reset failed | Problems with the connection to the DSP instrument |
| 331 | "Else" without "if" | Syntax error in C-file. |
| 332 | "End" without "if" | Syntax error in C-file. |
| 333 | Only variables or constants are allowed | Only variables or constants are allowed in an if–else statement. |
| 334 | Types does not match | Wrong type of data (e.g. string assigned to an integer). |
| 339 | Error updating "D-File" | Measured data was not properly added to the D-file. |
| 340 | Invalid voltage | The desired voltage is out of the specified limits. Possible typing error in the C-file. |
| 341 | Invalid current | The applied settings results in a current that is too |

| No | Message | Explanation |
|---|---|---|
| | | high. |
| 342 | Invalid frequency | The desired frequency is out of the specified limits. Possible typing error in the C-file. |
| 343 | Cable parameter not found: | The specified parameter was not found in the sample cable. |
| 344 | Cable parameters not found | No cable data was found. |
| 345 | "Temination box" parameter not found: | The specified parameter was not found in the "Termination Box". |
| 346 | "Termination box" parameters not found | No "Termination Box" data were found. |
| 347 | Output voltage is not within specified levels. | The applied voltage differs from the desired. |
| 351 | "InitMeasureZ" settings: | Not possible to perform InitMeasureZ measurement. This message is followed by one of 340-342. |
| 352 | No "Amplifier type" selected | High Voltage amplifier not selected. |
| 356 | Electrometer Overload | Overload in Electrometer instrument during a measurement.Measurement point is probably inaccurate. Message also written in point property. |
| 357 | Error reading backplane serial | Problem accessing instrument backplane. |
| 358 | Cannot find the Name option in file | Syntax error in Calibration or Self test files. |
| 359 | Cannot find the Connection option in file | Syntax error in Calibration or Selftest files. |
| 360 | Error in file ... at line ... | Syntax error in Calibration or Selftest files. |
| 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. |

## Errors associated with D-file

| No | Message | Explanation |
|---|---|---|
| 400 | No sweep | Error in D-file syntax. |
| 401 | No points in sweep | Error in D-file syntax. |
| 403 | Wrong model | Error in D-file syntax. |
| 404 | Wrong parameter | Error in D-file syntax. |
| 405 | Printer error: | Displays error from printer routines. |
| 406 | Illegal value for x-min | Illegal settings for axis values. |
| 407 | Illegal value for y-min | Illegal settings for axis values. |
| 408 | Error: y-max is less than y-min | Illegal settings for axis values. |
| 409 | Error: x-max is less than x-min | Illegal settings for axis values. |
| 410 | Error: Table not exported | The D-file table was not exported properly. |
| 411 | No information to show | The information dialog could not display the information. |
| 412 | Cannot read from A:\ (floppy) | Results cannot read from floppy disk. Possibly damaged floppy. |
| 413 | Cannot read from drive | Results cannot read from specified drive. |

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

Measured output voltage is outside specified limits.

**Possible reasons and countermeasures**

1) Voltage electrode, Hi, 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, Hi, is connected to measuring electrode, Lo or Ground:
- check measurement set-up and disconnect measuring or guard electrodes from the voltage electrode. Voltage electrode, Hi, 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 C-file (see also Measurement variables)
- Lower the InitFrequency in the C-file (see also Measurement variables)

## 3.2 (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

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

Values of capacitance measured for different configurations, the UST, GST-Guard and GST-Ground 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 non-grounded terminal of the test object and that Ground electrode is connected to ground

## 3.4 (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

## 3.5 (366) Specimen capacitance above limit

Measured capacitance above limit specified in C-file by MaxSpecimenC.

**Possible reasons and countermeasures**

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

## 3.6 (367) Measured DC current > MaxDCCurrent

Measured DC current exceeds the limits set in C-file by MaxDCCurrent.

**Possible reasons and countermeasures**

Features of the test object as well as certain configurations can result in high values of DC current, use caution when analyzing the data.
- increase the limit for DC current set by MaxDCCurrent

## 3.7 (368) Measured hum current > MaxHumCurrent

Measured interference or hum current exceeds the limits set in C-file by MaxHumCurrent.

**Possible reasons and countermeasures**

1) Level of interferences is very high:
- try to reduce the influence of interferences by placing measuring cables close to each other and avoiding cable loops
- increase the limit for hum current set by MaxHumCurrent

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