

**EnfCalibrationRig
Program**

Version 2.0.1

User's manual

2017

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SCOPE

The “EnfCalibrationRig” (EnForm-MTC) program (the program below) is a PC-oriented software component used to control the equipment included in the MTS ME 3.1KM test system, in particular: the reference meter Energomonitor 3.1KM or Energomonitor 3.3T1 (the reference meter below), phantom power source Energoforma 3.1 (the generator below) and meter error calculation unit Calmar-S (the error calculator or Calmar-S below).

The program makes it possible to:

1. Carry out accuracy testing of single- and three-phase electric energy meters in fully automatic mode
2. Perform sensitivity and creep tests for single- and three-phase electric energy meters in fully automatic mode
3. Perform adjustment (calibration) of single- and three-phase electric energy meters in semi-automatic mode (up to 15 meters at a time)
4. Carry out accuracy testing of single- and three-phase measuring converters with DC voltage or current outputs (up to 15 devices at a time) in fully automatic mode
5. Perform adjustment (calibration) of single- and three-phase measuring converters with DC voltage or current outputs in semi-automatic mode (up to 15 meters at a time)
6. Read, via a serial port, and display test results on a PC screen in both testing and adjustment (calibration) modes
7. Create test procedures for electric energy meters and measuring converters, save them to files or load from files stored on the hard disc
8. Generate signals included in previously created test procedures
9. Read test results from error calculators via the Ethernet interface (10 Mbit/s)
10. Display test results on a PC screen
11. Export test results into MS Excel files or MS Word and MS Excel templates

All test procedures are carried out with use of the Calmar-S error calculators (each device under test is connected to its own Calmar-S). The devices under test are connected to the test system according to the appropriate connection scheme and in the same way.

Meters are tested using the method of comparison of two frequencies. The pulse output of each meter under test is connected to the pulse input (F_{in}) of its own error calculator. The pulse output of the reference meter is connected to the reference pulse input $F_{(p)in}$ of each error calculator.

The program supports testing of meters measuring power of the following types:

- active
- apparent
- reactive (geometrical method)
- reactive (cross-connection method)
- reactive (phase-shift method)

The program supports meter sensitivity and creep testing.

NOTE!

If you use the EM 3.1KM as a reference meter, make sure that in the Frequency Divider screen of the EM3.1KM the division factor is set to the “No division” value.

When measuring converters are tested, the DC voltage or current output of each converter is connected to the respective DC voltage or current measuring input of its own error calculator.

The program supports testing of converters with the following measuring inputs:

- AC voltage
- AC current
- Active power
- Apparent power
- Reactive power
- Frequency

Tested converters may be rated at AC voltage up to 1000V.

The Calmar-S accepts DC signals on its inputs ranged as follows:

- [0 ... +5] V
- [0 ... +10] V
- [-5 ... +5] V
- [-10 ... +10] V
- [0 ... +20] mA
- [+4 ... +20] mA
- [0 ... +5] mA
- [-5 ... +5] mA

Refer to the Calmar-S user manual for the detailed description of its controls and connectors.

INSTALLATION AND START

System requirements

The program works under operation systems MS Windows 2000, XP, Vista and Windows 7 (32- or 64-bit architecture).

The following PC configuration is recommended for proper functioning of the program:

- Processor: Pentium III at 700 MHz or more powerful
- At least 256 Mb RAM
- Consumed disc space: at least 3 MB for installation (20 MB of additional space, if your operating system does not include the Microsoft .NET Framework package, version 4.0)
- Video adapter of 1024x768 resolution
- Two free COM-ports (RS-232)
- Ethernet adapter (RJ-45) for connecting Calmar-S units

If you need to control several Calmar-S devices from a PC, combine them into an Ethernet network. You may connect the Calmar-S to the Ethernet port on your PC via an Ethernet switch or directly via a crossover cable.

NOTE!

The program can work without MS Excel or MS Word installed on your computer. Test results are saved to files on the hard disc without use of MS Excel and MS Word applications. However, to view or print exported test results, you shall have these applications on your PC.

NOTE!

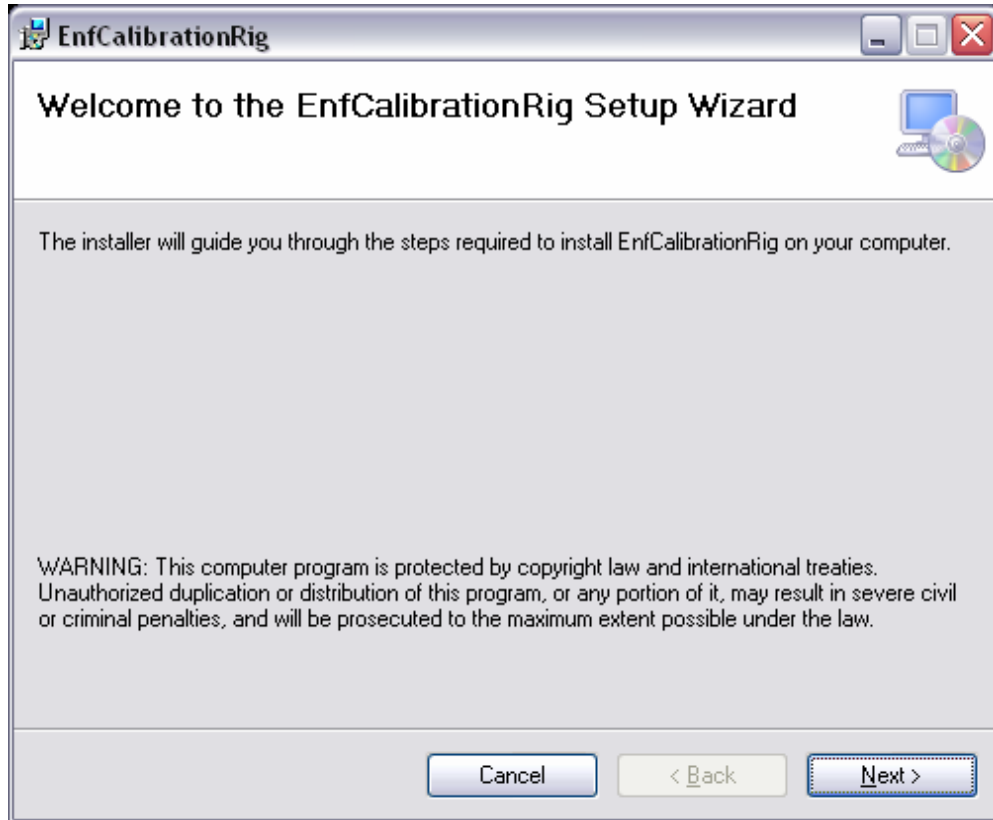
To run the program correctly under Windows Vista and Windows 7 it is necessary to turn off the User Account Control (UAC) option on your computer. See the corresponding Appendix of this manual for the instructions.

Installation

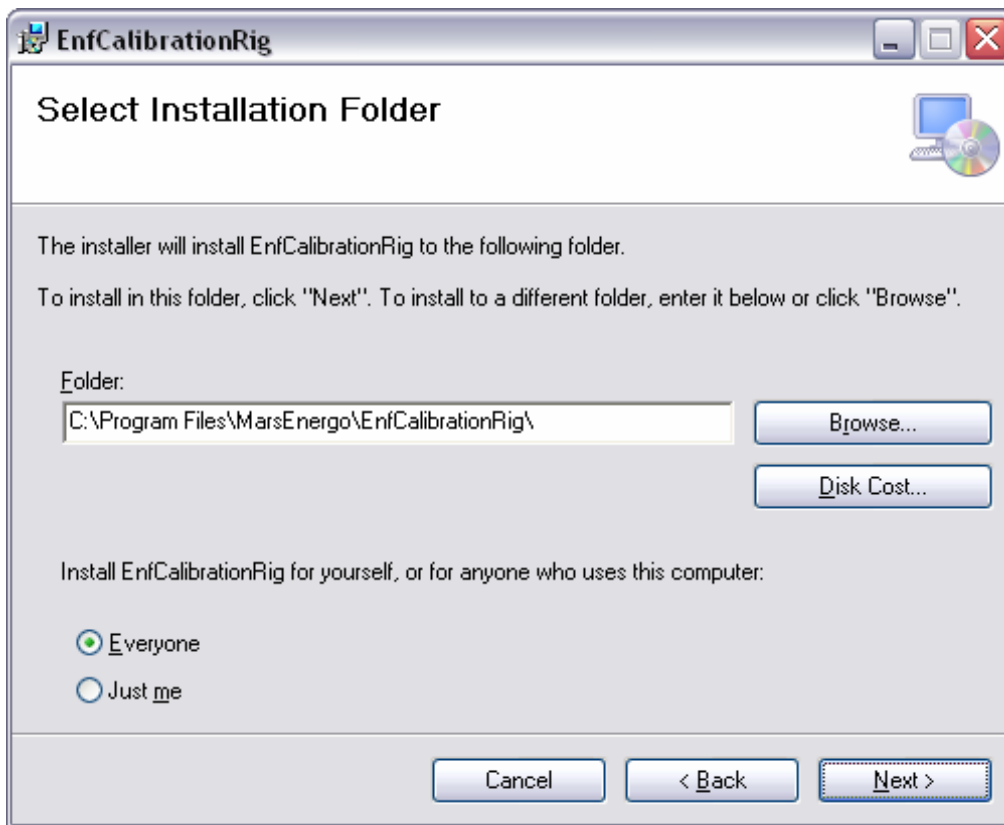
1. Insert the installation flash drive into a USB port of your computer.
2. Close all working Windows applications and launch the file **setup.exe** from the flash drive.
3. The program starts by checking if there is a “Microsoft .NET Framework version 4.0” package installed on your computer. If not found, you will be asked

to install the package, otherwise installation will be aborted. At the completion of the installation, you may be asked to restart your computer.

4. Follow on-screen instructions of the installation program realized as a “Wizard” where a number of dialog boxes are successively displayed.



During the installation, the user will be asked for the user’s name, company name and for the path to the directory where the software will be installed. By default, this path is "C:\Program Files\MarsEnergO\ EnfCalibrationRig \".



After the installation is finished, the program icon will be placed on your desktop, and the similar item will be included in the Start menu. The default path is “C:\Program Files\MarsEnerg\EnfCalibrationRig”.

Start

There are three ways to launch the program:

1. Run the “EnfCalibrationRig.exe” file from the directory where the program was installed (C:\ProgramFiles\MarsEnerg\EnfCalibrationRig is the default path)
2. Double-click on the icon " EnfCalibrationRig " on the desktop
3. Select " ProgramFiles\MarsEnerg\EnfCalibrationRig\EnfCalibrationRig " from the “Start” (“All programs”) menu

De-installation

To remove the program, open the Windows “Control Panel”, select “Add/Remove Programs”, choose “EnfCalibrationRig” and click on the “Remove” button. The un-installation program works in Wizard’s style as well.

DATA FORMATS

Commands for the reference meter

Data exchange between the reference meter and PC starts upon a PC command coming via a serial port. The following commands for the reference meter are supported:

1. To measure electrical parameters and transfer the results to a PC
2. To generate a signal proportional to the measured power on its frequency output
3. To activate required measurement ranges

Measurement results are transferred to a PC in the following format:

- RMS of phase currents and voltages per each phase
- RMS of three line voltages
- Three angles between phase voltages
- Phase angles between voltage and current per each phase
- Power factors per each phase
- Per phase and total active power
- Per phase and total apparent power
- Per phase and total reactive power (phase shift method)
- Per phase and total reactive power (geometrical method)
- Per phase and total reactive power (cross-connection method)
- AC frequency
- Active measurement range for current
- Active measurement range for voltage

The command for generating a proportional signal on the frequency output enables reading of measurement results as well.

The command to set measurement ranges contains the following data:

- Active measurement range for current
- Active measurement range for voltage

Commands for the generator

The generator is controlled via a serial port. It supports the following commands sent from a PC:

1. To display the status of the generator

2. To load the set of signals to be generated
3. To turn off generation

Upon the command to display status the following data is sent:

- Design version of the generator
- Status of the outputs (generation of waveforms enabled or disabled)
- Active voltage measurement range
- Active current measurement range

The command to load signals for generation

To create a three-phase system of currents and voltages it is necessary to specify:

- AC frequency
- Phase angles between voltages
- Phase angles between voltage and current per each phase
- RMS of the 1st current and voltage harmonic per each channel

Upon the command to turn off generation, the generator stops generating waveforms on its outputs.

Commands for the Calmar-S

The Calmar-S is controlled via the Ethernet interface (UDP protocol). The following commands sent from a PC are supported:

1. To display firmware version and serial number
2. To start count of pulses from the reference meter and meter under test (for testing of meters)
3. To start DC voltage or current measurements on the active measuring input (for testing of measuring converters)
4. To read measurement results according to the active mode (DC measurements or pulse counting)
5. To exit the measurement or pulse count mode

USING THE SOFTWARE

The program makes it possible to create and manage **test procedures** for testing certain meters or measuring converters irrespective of whether the devices under test are connected to the system or not.

The test procedure is a set of profiles prepared for accuracy testing of measuring instruments of a certain type. Each test procedure consists of profiles. Each profile corresponds to one test point included in the test procedure. When the program is launched, a test procedure containing no profiles is created by default.

The profile is a set of 6 waveforms which, when generated, simulate 3-phase AC circuit conditions.

Each profile contains the following data on the waveforms:

- 6 RMS values of 1st harmonics: $U_a(1)$, $I_a(1)$, $U_b(1)$, $I_b(1)$, $U_c(1)$, $I_c(1)$
- AC frequency
- Angles between phase voltages $\angle U_a U_b$, $\angle U_b U_c$, $\angle U_c U_a$ in degrees
- Angles between voltage and current per each phase: $\angle U_a I_a$, $\angle U_b I_b$, $\angle U_c I_c$ in degrees

The profile data cannot include harmonics (the profile-related test signals are always pure sine waves).

The number of profiles within one test procedure is unlimited.

The signal is an independent waveform determined by specifying its RMS value, frequency, harmonics, interharmonics, phase angles etc.

Initialization

The program has a standard Windows-based user interface.

Program settings are read from the configuration file on each startup. The configuration file contains information about the last used PC-communication settings:

- Port and data transfer rate selected for the reference meter and generator
- Calmar-S units in use and settings for each of them (IP address and communications port number)

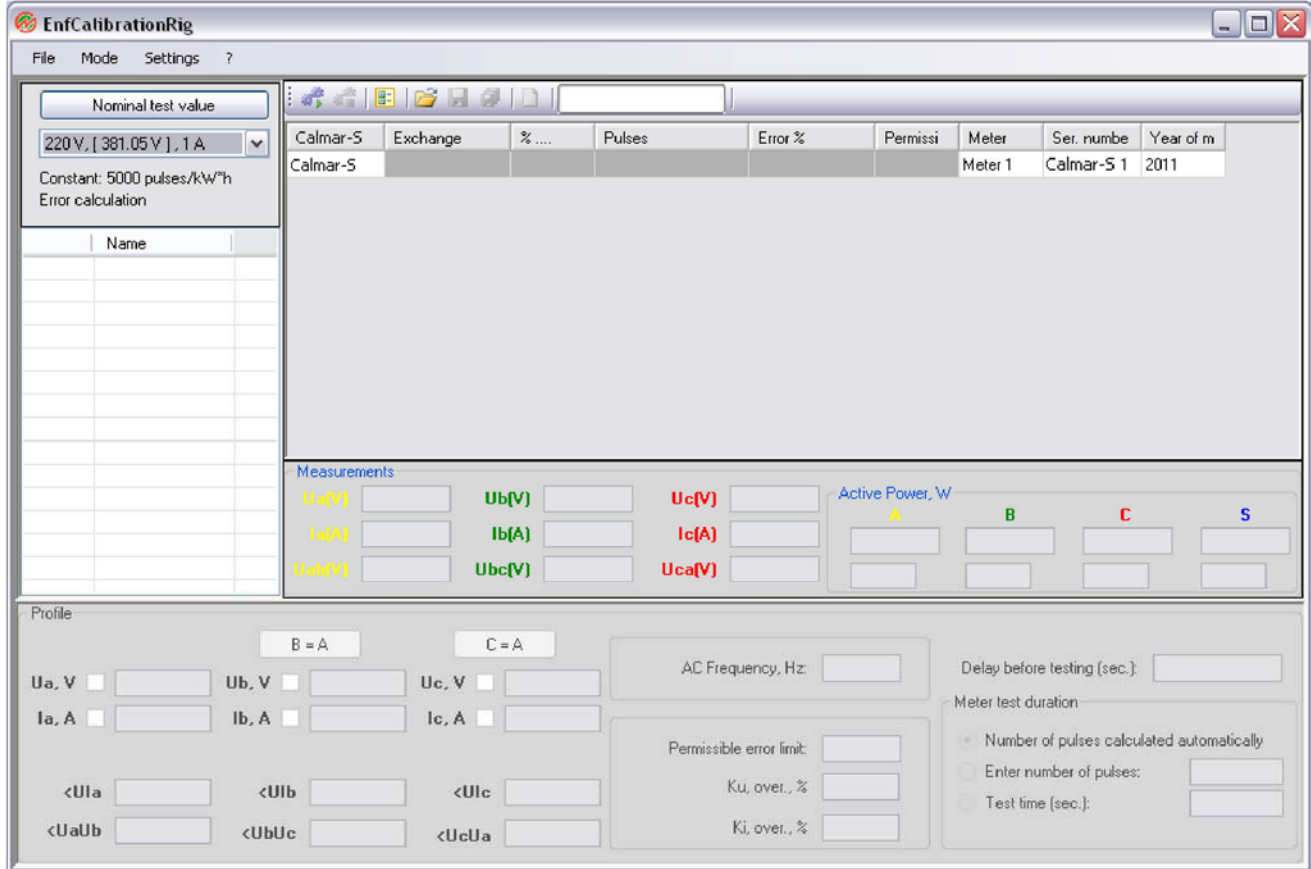
When the application is closed, the settings are saved to a file.

If there is no configuration file (at the first start-up), the program installs the default settings that are as follows:

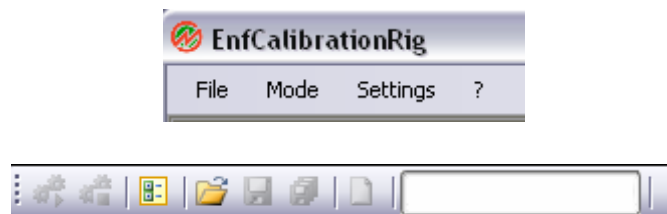
- COM1 — reference instrument
- COM2 — generator
- Data transfer rate: 115200 bps for each port.

The list of Calmar-S units in use remains empty.

Main window



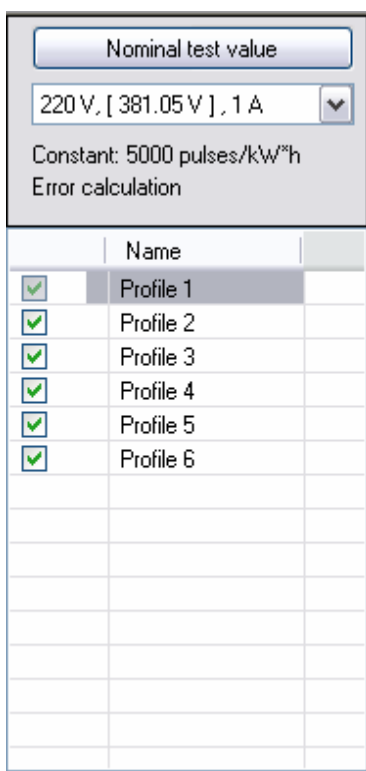
The main window consists of the menu bar and toolbar which provide access to the main functions of the application.



The window may be conventionally divided into several functional panels.

List of profiles

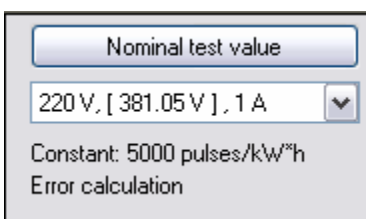
The list of profiles is located in the left part of the main window.



The data related to the highlighted profile is shown in the bottom part of the main window.

The list of profiles is created by the user in the process of creating a test procedure, or when the test procedure is loaded from a file.

1. The panel contains the “Nominal test value” button (which is used to change the rated values of the meter under test) and the dropdown list with the nominal (rated) values along with the current value of meter constant and the current mode of testing.



The dropdown list is a list containing the nominal values for which the currently active test procedure is applicable. On selecting the required option from the list of

nominal values, the list of profiles will display the profiles related to the selected item (the same is true for the meter constant and meter testing mode).

Three modes of testing meters are available:

- Error calculation
- Creep test
- Sensitivity test

The value of meter constant and the mode of testing are not displayed if an active test procedure was created for measuring converters.

The nominal values may be as follows:

- Phase voltage
- Line voltage
- Current
- Frequency

The sets of nominal values available in the dropdown list depend on the device under test type and connection scheme. Other nominal values are not used and can be set by the user.

For how to create the list of nominal values, see the “Nominal values” section.

Profile parameters

The “Profile” panel located in the bottom part of the main window allows the user to view and adjust profile parameters.

The following parameters are displayed for the profile selected from the list:

- RMS of phase voltages to be generated (U_a , U_b , U_c):

U_a , V 220
 U_b , V 220
 U_c , V 220

- RMS of phase currents to be generated (I_a , I_b , I_c):

I_a , A 1
 I_b , A 1
 I_c , A 1

- Angles between voltage and current per each phase ($\angle U_a I_a$, $\angle U_b I_b$, $\angle U_c I_c$):

$\angle U_a I_a$ 0
 $\angle U_b I_b$ 0
 $\angle U_c I_c$ 0

- Angles between phase voltages $\angle U_a U_b$, $\angle U_b U_c$, $\angle U_c U_a$:

$\angle U_a U_b$ 120
 $\angle U_b U_c$ 120
 $\angle U_c U_a$ 120

When the angles between A and B phases and B and C phases are specified, the third angle will be recalculated automatically.

- AC frequency:

AC Frequency, Hz: 50

- The limit of permissible measurement error for the given test point:

Permissible error limit: 0.5

- The overvoltage and overcurrent factors with respect to the voltage and current nominal values:

K_u , over., % 150
 K_i , over., % 150

- The delay before the program starts to calculate the value of meter error for each test point:

Delay before testing (sec.): 25

- The parameter that determines the duration of meter error calculation for each test point within a test procedure:

Meter test duration

Number of pulses calculated automatically

Enter number of pulses: 1

Test time (sec.): 1

There are 3 options to specify the test duration:

1. The **“Number of pulses calculated automatically”** option implies calculating the number of test pulses (width of the gate) for each test point based on the reference instrument constant, which depends on the active measurement ranges, meter constant and meter accuracy class
2. The **“Enter number of pulses”** option means that the time of testing is entered as a user-defined number of test pulses (width of the gate)
3. The **“Test time”** option means that the time of testing is set as a time interval in seconds, which also determines the number of test pulses (width of the gate)

For the creep and sensitivity tests, it is necessary to enter the time interval that determines test duration and the utmost number of pulses (a minimum permissible number of pulses for the sensitivity test and a maximum permissible number of pulses for the creep test).

Meter test duration

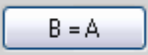
Number of pulses: 20

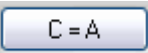
Time interval (sec.): 60

The “Test duration” and “Number of pulses” options are not displayed if the active test procedure was created for instrument converters.

The profile parameters specified by the user are transferred to the generator and simultaneously applied to the tested and reference instruments as test signals.

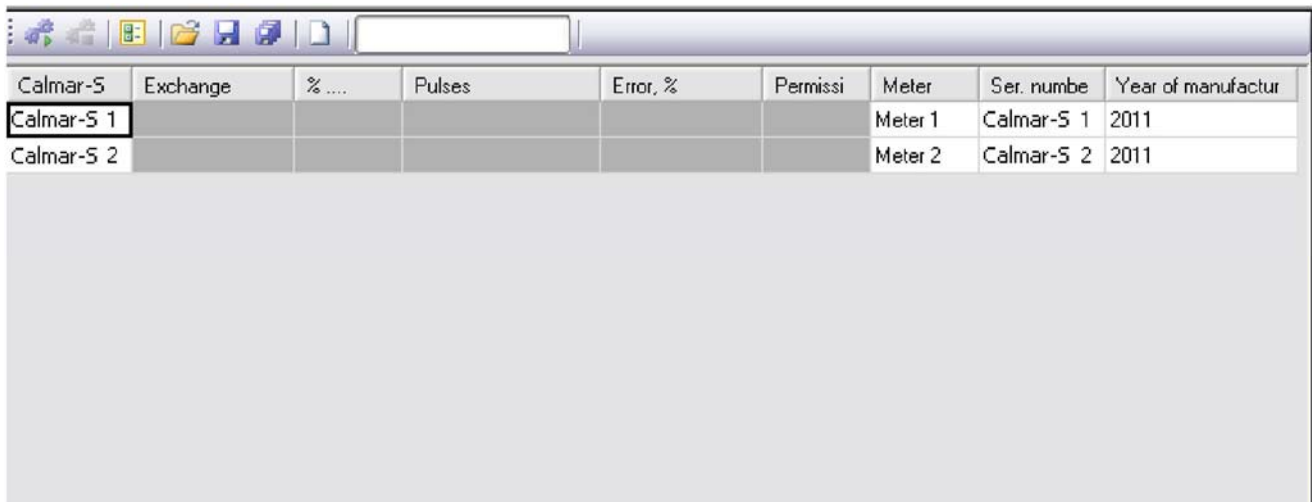
The check mark placed against any of the Ua, Ub, Uc, Ia, Ib, or Ic fields zeroes the corresponding signal on the generator’s output, while the numeric value in this field remains intact (may be useful for manual testing).

The button  sets voltages, currents and phase angles in phases A and B to the same value.

The button  sets voltages, currents and phase angles in phases A and C to the same value.

Readings from devices under test


The “Devices under test” panel makes it possible to view and analyze the test results obtained in testing or adjustment modes. It contains the toolbar, the table representing a list of connected Calmar-S units and the fields where the results are displayed.




Calmar-S	Exchange	% ...	Pulses	Error, %	Permissi	Meter	Ser. numbe	Year of manufactur
Calmar-S 1						Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011

The toolbar is a set of buttons that are used to control test procedures and analyze measurement results. When the cursor is positioned on a button, a tooltip with the description of the function will appear.

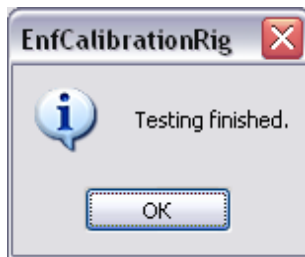



 — use to start an automatic test or adjustment (calibration) procedure. After starting the procedure, the button becomes unavailable until the process is stopped.


 — use to stop an automatic test or adjustment (calibration) procedure. The button is unavailable until a test procedure is started. When the button is pressed during testing, the program will display the following dialog box:

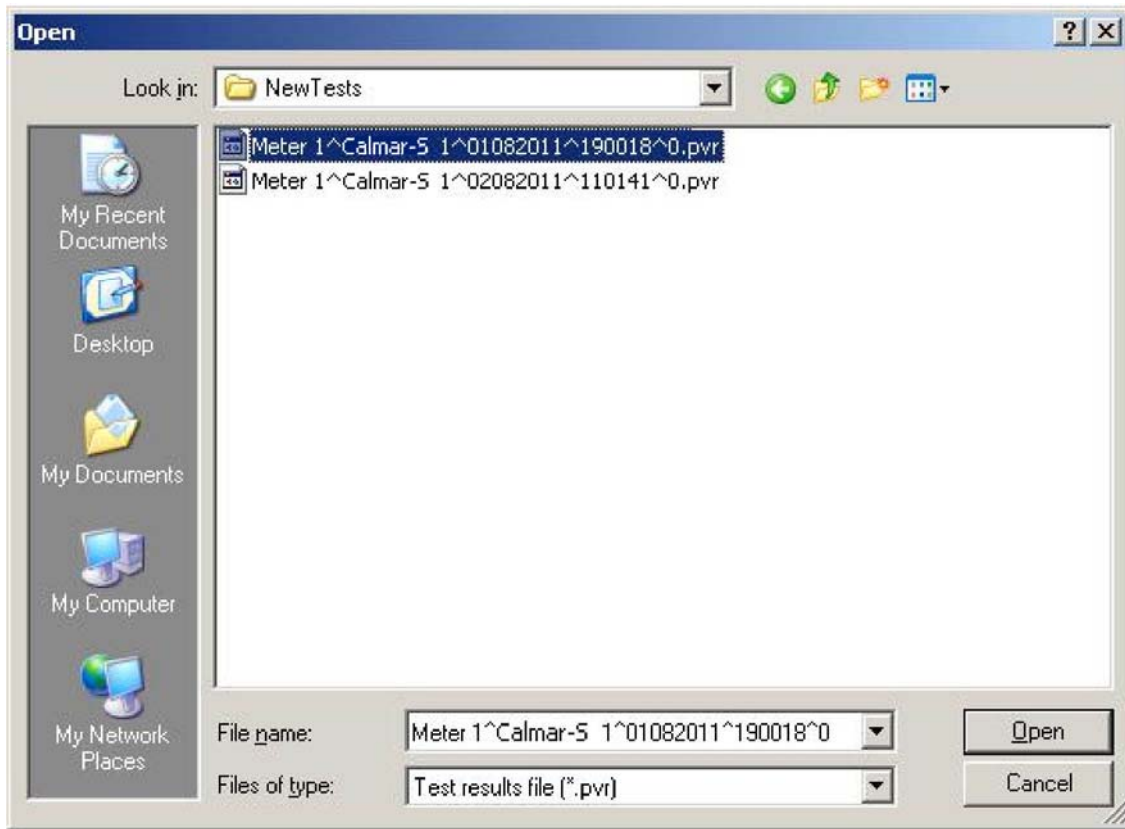


Pressing “Cancel” will continue the process. Pressing “OK” means that the procedure will be aborted. At this time, it is necessary to wait until the procedure is finished correctly (until the test signals on the generator’s outputs are disabled). The following message will pop up:




 — The button opens a dialog box where you can change general settings for a selected test procedure. After starting the procedure, the button becomes unavailable. Refer to section “Test procedure” for more information.

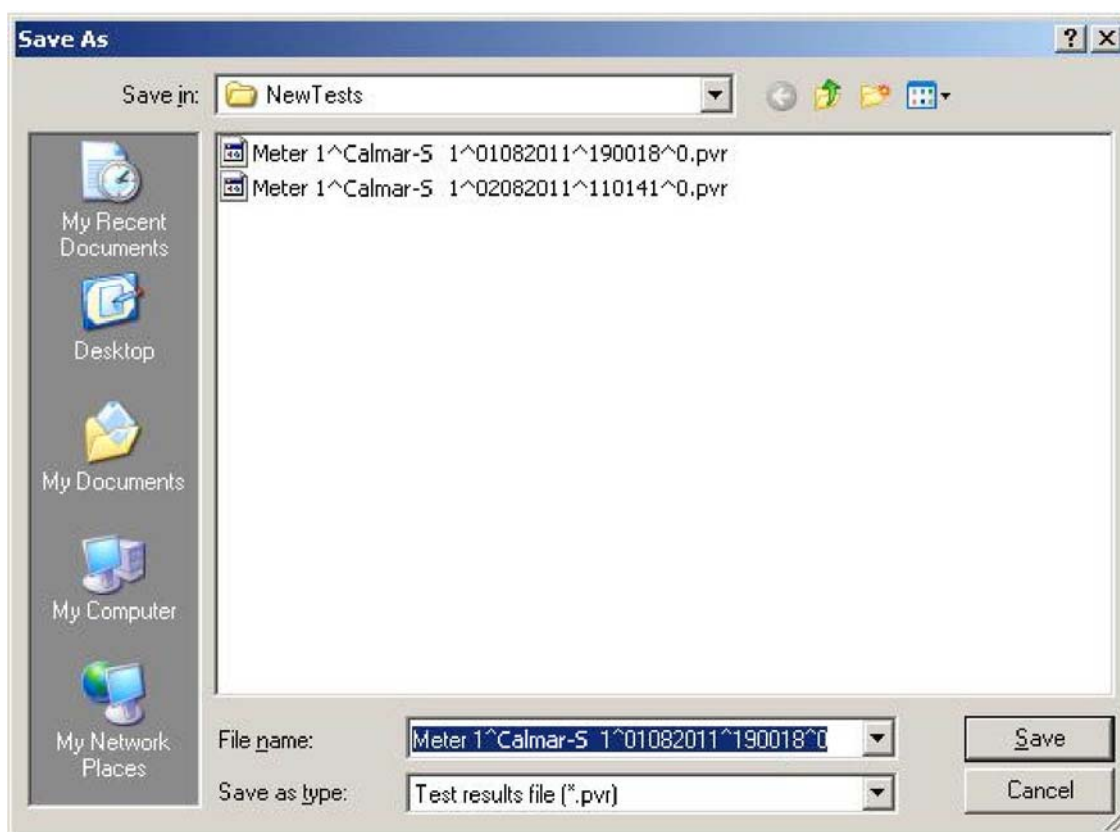
 —The button is used to retrieve measurement results previously saved to a file. The command brings up a standard MS Windows “Open file” dialog box. The extension for the files of this type is *.pvr.



On pressing the “Open” button, the program reads measurement results from a selected file and shows them in the “Measurement results” window. In this case, the previously displayed measurement results are not deleted.

After starting the procedure, the button becomes unavailable.

 — The button saves measurement results obtained from the Calmar-S error calculator selected from the list to a file. On pressing the button, the program opens a standard MS Windows “Save file” dialog box. For each file with the results of testing electric energy meters, its name generated by the program is automatically represented as a line containing the following data



Each parameter in the file name is separated by the symbol “^”:

- Meter name
- Serial number
- Date of completing the test procedure (ddmmyyyy)
- Time of completing the test procedure (ddmmyyyy)
- Actual type of power (designated by digits from 0 to 4)

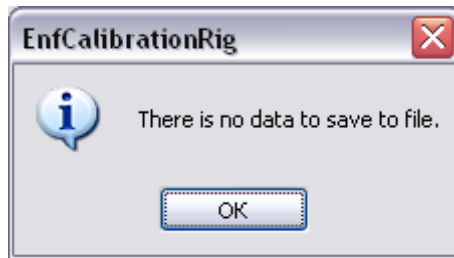
For each file with the results of testing instrument converters, its name generated by the program is automatically represented as a line containing the following data separated by the symbol “^”:


- Converter name
- Serial number
- Date of completing the test procedure (ddmmyyyy)
- Time of completing the test procedure (ddmmyyyy)
- Type of the converter (designated by digits from 0 to 5)

Select a folder and press the “Save” button to save the file. The extension for the files of this type is *.pvr. The files may then be opened for viewing.

After starting the procedure, the button becomes unavailable.


If no testing has been performed, the program shows the following message:



 — The button saves measurement results obtained from all Calmar-S error calculators present in the list to a file. On pressing the button, the program opens a standard MS Windows “Save file” dialog box.




File names are automatically generated by the program on the same principle as for saving the results for one Calmar-S.

 — Use the button to view the results of testing meters or instrument converters. It opens a dialog box with the data in tabular form.

After starting the procedure, the button becomes unavailable.

How to view test results is described in details in section “Viewing and exporting test results”.

 — The progress bar indicates that testing or adjustment is in progress.

`N(met. pulses) = 22000, N(ref. pulses.) = 240000, T(sec.) = 20 | t=6`

— In addition, the toolbar displays an actual status of the test (calibration, adjustment) procedure. In the meter error calculation mode, the toolbar shows:

- N (met., pulses) — the number of pulses coming from the meter that determines a gate for calculation (meter error calculation time)
- N (ref., pulses) — the number of pulses to be generated by the reference instrument (theoretical or calculated value)
- T (sec.) — the total time of meter testing to be accumulated during receiving of N (met., pulses) pulses from the meter
- t — the number of seconds passed from the moment of starting calculation of pulses

`Measurement and pulse count ... T(sec.) = 20 | t=7`

— For the sensitivity and creep tests, the toolbar shows:

- T (sec.) — the total test time
- t — the number of seconds passed from the moment of starting calculation of pulses

The “Measurements” panel represents the following values taken from the reference instrument during testing (calibration, adjustment):

- RMS values of voltage per each phase
- RMS values of current per each phase
- RMS of line voltages
- Per phase and total power
- Per phase and total power factors (PF)

As for displaying power, its type corresponds to the power type against which the meter is being tested. If the meter is tested against another parameter, the panel shows the values of active power.

If the meter is tested for reactive power, the values of Q / S are displayed in the power factor fields instead of power factors. In the rest of the cases the displayed parameters are power factors.

The “Calmar-S” table represents test results: the readings taken from the reference instrument and device under test as well as the device under test errors. Each table line corresponds to a certain Calmar-S connected to the device under test.

Table structure depends on the type of the test procedure being worked on.

When working with a test procedure created for electric energy meters, the data in the Calmar-S table is ranged as follows:


Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1						Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011



1. Calmar-S — the column indicates the names of error calculators to which devices under test can be connected. Each new error calculator added to the table is automatically assigned a number. You can change a name by clicking on it and selecting the “Parameters” option. The name is a user-specified parameter not used in the course of testing.


Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1						Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011



2. Data Exchange — the field shows the firmware version, serial number and actual status of the highlighted error calculator.
 - If the highlighted Calmar-S has not been scanned by the program, the field remains empty:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1						Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011


- If the connection between the Calmar-S and PC has been successfully established, the field will contain the firmware version and serial number of this error calculator along with the icon :



Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144 					Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 					Meter 2	Calmar-S 2	2011

- If the Calmar-S has been disconnected programmatically or by the user, this will be indicated by the icon :

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1						Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011



The connection between the Calmar-S and PC may fail for the following reasons:

- An error occurred during data exchange in the testing or adjustment modes
 - The program fails to get the serial number and firmware version of the error calculator before testing or adjustment
 - Upon user's command to exclude the Calmar-S from testing
- If an error calculator is in the process of testing or adjustment, the field contains the icon :

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144 	26.82 %	96586 [360000]	...	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 	26.57 %	95667 [360000]	...	0.5	Meter 2	Calmar-S 2	2011

3. % — the field shows how many reference pulses have been counted by the moment with respect to the calculated number of pulses for a given test point (in %). On selecting a test point from the list of profiles, the fields are updated for each error calculator in the table. The field is non-editable and independent from the actual status of an error calculator.

- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144 					Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 					Meter 2	Calmar-S 2	2011

- If a meter test (error calculation) procedure is being carried out in the selected test point, the field shows the number of pulses counted by the moment with respect to the calculated (theoretical) number of pulses (in %):

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144 	26.82 %	96586 [360000]	...	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 	26.57 %	95667 [360000]	...	0.5	Meter 2	Calmar-S 2	2011

- If a meter test (error calculation) procedure has been completed in the given test point, the field shows 100%:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	100 %	360632 [360000]	-0.1752	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	100 %	360633 [360000]	-0.1755	0.5	Meter 2	Calmar-S 2	2011

- If a meter error calculation procedure has been stopped, the corresponding field shows the percentage value calculated by this moment:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	15.55 %	56014 [360000]	...	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011

4. Pulses — the field shows an actual number of reference pulses counted by the moment. The square brackets enclose the calculated (theoretical) number of pulses for a given test point. On selecting a test point from the list of profiles, the fields are updated for each error calculator in the table. The field is not editable. In the creep and sensitivity test modes, the field represents the total number of pulses received from the device under test.

- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011

- If a meter error calculation procedure is being carried out in the selected test point, the field shows an actual number of reference pulses counted by the moment and the calculated (theoretical) number of reference pulses (in square brackets):

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	26.82 %	96586 [360000]	...	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	26.57 %	95667 [360000]	...	0.5	Meter 2	Calmar-S 2	2011

In the creep and sensitivity test modes, after enabling a test procedure the field is empty.

- If a meter error calculation procedure has been completed in the given test point, the field shows the real number of reference pulses counted during testing and the calculated (theoretical) number of reference pulses (in square brackets):

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	100 %	360615 [360000]	-0.1705	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2					Meter 2	Calmar-S 2	2011

- If a meter creep or sensitivity test procedure has been completed or stopped for a given test point, the field contains the real number of pulses received from the meter under test:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	100 %	3903	-	3900	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2	100 %	3829	-	3900	Meter 2	Calmar-S 2	2011

- If a calibration (adjustment) procedure has been stopped for a given test point, the field shows the real number of reference pulses counted by the moment and the calculated (theoretical) number of reference pulses (in square brackets):

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	20.97 %	75494 [360000]	100	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011

5. Error — the field shows the value of meter error calculated in the process of testing in the meter error calculation mode. The field is not editable. In the creep and sensitivity test modes, the meter error is not determined.

- If there are no measurement results obtained for the selected test point, the field is empty.

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2					Meter 2	Calmar-S 2	2011

- If a meter error calculation procedure is being carried out in the given test point, the field shows a line of dots:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	26.82 %	96586 [360000]	...	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2	26.57 %	95667 [360000]	...	0.5	Meter 2	Calmar-S 2	2011

- If a calibration (adjustment) procedure is being carried out in the given test point, the field represents the value of meter error calculated for the previous iteration of pulses.

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	20.97 %	75494 [360000]	100	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011

- If a meter error calculation procedure has been completed in a selected test point, the field shows the value of relative error calculated for this test point:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	100 %	360615 [360000]	-0.1705	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2					Meter 2	Calmar-S 2	2011

- If a calibration (adjustment) procedure has been completed in a selected test point, the field shows the value of meter error calculated for the previous iteration of pulses:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	20.97 %	75494 [360000]	100	0.5	Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011

- If a meter creep or sensitivity test procedure is being carried out, the meter error is not calculated. This is indicated by the “-” symbol in the corresponding field:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	N: 102; 1.144	100 %	3903	-	3900	Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2	100 %	3829	-	3900	Meter 2	Calmar-S 2	2011




6. Permissible error limit — in the meter error calculation mode the field shows the value of permissible error limit for a given test point specified by the user when configuring the test procedure. In the creep and sensitivity test modes, the field displays the threshold number of pulses. The field is not editable.


For the meter test (error calculation) mode:




- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2					Meter 2	Calmar-S 2	2011

- If the actual value of meter error exceeds its permissible limit in the selected test point, this will be indicated by the icon :



Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	 20.97 %	75494 [360000]	100	0.5	 Meter 1	Calmar-S 1	2011
Calmar-S 2						Meter 2	Calmar-S 2	2011


- If the actual value of meter error does not exceed its permissible limit in the selected test point, the icon  will be displayed:





Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	 100 %	360615 [360000]	-0.1705	0.5	 Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011

For the sensitivity test mode:





- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011

- If the number of pulses received from the meter is less than the threshold value specified for a given test point, the icon  will be displayed:



Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	 100 %	3903	-	3900	 Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	 100 %	3829	-	3900	 Meter 2	Calmar-S 2	2011

- If the number of pulses received from the meter exceeds the threshold value specified for a given test point, the icon  will be displayed:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	 100 %	3903	-	3900	 Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	 100 %	3829	-	3900	 Meter 2	Calmar-S 2	2011


For the creep test mode:

- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011

- If the number of pulses received from the meter exceeds the threshold value specified for a given test point, the icon  will be displayed:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	100 %	3903	-	3900	Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	100 %	3829	-	3900	Meter 2	Calmar-S 2	2011

- If the number of pulses received from the meter is less than the threshold value specified for a given test point, the icon  will be displayed:

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of manufact
Calmar-S 1	Nº 102; 1.144	100 %	3903	-	3900	Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	100 %	3829	-	3900	Meter 2	Calmar-S 2	2011

7. Meter — the field shows the meter name as it will be in the test report. The name is not used during testing and may be specified at user option. When adding a new Calmar-S to the table, the corresponding meter name is numbered by default. The field is editable.

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011
Calmar-S 3						Meter 3	Calmar-S 3	2011
Calmar-S 4						Meter 4	Calmar-S 4	2011



8. Serial number — the field contains the serial number of the meter under test as it will be in the test report. On adding a new device to the table, the field will display its name by default. The serial number entered in the field is not used during testing and may be specified at user option. The field is editable.

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011
Calmar-S 3						Meter 3	Calmar-S 3	2011
Calmar-S 4						Meter 4	Calmar-S 4	2011



9. Year of manufacture — the field shows the year of manufacture of the meter under test as it will be in the test report. On adding a new device to the table, the current year will be displayed in the field by default. The year of manufacture entered in the field is not used during testing and may be specified at user option. The field is editable.

Calmar-S	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144					Meter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2					Meter 2	Calmar-S 2	2011
Calmar-S 3						Meter 3	Calmar-S 3	2011
Calmar-S 4						Meter 4	Calmar-S 4	2011

When working with a test procedure created for measuring converters, the data in the Calmar-S table is ranged as follows

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissi	Converter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144 	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 	P _s =					Converter 2	Calmar-S 2	2011


1. Calmar-S — the column indicates the names of error calculators to which measuring converters under test will be connected. Each new error calculator added to the table is automatically assigned a number. You can change a name by clicking on it and selecting the “Parameters” option.



Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissi	Converter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144 	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 	P _s =					Converter 2	Calmar-S 2	2011


2. Data Exchange — the field contains the firmware version, serial number and actual status of the error calculator.



- If the Calmar-S has not been scanned by the program, the field remains empty:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year of m
Calmar-S 1		P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011

- If the connection between the Calmar-S and PC has been successfully established, the field will contain its firmware version and serial number along with the icon :


Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissi	Converter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144 	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2 	P _s =					Converter 2	Calmar-S 2	2011




- If the Calmar-S has been disconnected programmatically or by the user, this will be indicated by the icon :

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year of m
Calmar-S 1		P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011



The connection between the Calmar-S and PC may fail for the following reasons:

- An error occurred during data exchange in the testing or adjustment modes
- The program fails to get the serial number and firmware version of the error calculator before testing or adjustment
- Upon user's command to exclude the Calmar-S from testing.

- If an error calculator is in the process of testing or adjustment, the field contains the icon :



Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144	 $P_s =$	864.7055	866.09 [5.0003]	0.1598	0.5	 Converter 1	Calmar-S 1	2011
Calmar-S 2		 $P_s =$					Converter 2	Calmar-S 2	2011

3. Parameter — the field contains a dropdown list with the reference parameters against which the measurement error will be calculated. The list of the parameters is programmatically created according to the converter type and connection scheme specified for a given test procedure. The reference parameters are selected when error calculators are connected to the different phases (channels) of the test system. When a test procedure is enabled, the field becomes unavailable.




Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144	 $U_a =$					Converter 1	Calmar-S 1	2011
Calmar-S 2		 $U_a =$ $U_{ab} =$ $U_b =$ $U_{bc} =$ $U_c =$ $U_{ca} =$					Converter 2	Calmar-S 2	2011

4. Reference — the field displays the measured value of the reference parameter selected from the dropdown list. The field is not editable.

- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissi	Converter	Ser. numbe	Year of m
Calmar-S 1	Nº 102; 1.144	 $P_s =$					Converter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2	 $P_s =$					Converter 2	Calmar-S 2	2011

- If a test or adjustment procedure is being carried out in the selected test point, the field shows the measured value of the corresponding reference parameter:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144	 $P_s =$	864.7055	866.09 [5.0003]	0.1598	0.5	 Converter 1	Calmar-S 1	2011
Calmar-S 2		 $P_s =$					Converter 2	Calmar-S 2	2011

- If a test or adjustment procedure has been completed for the selected test point, the field shows the measured value of the corresponding reference parameter:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	N: 102; 1.144	P _s =	864.7055	866.09 [5.0003]	0.1598	0.5	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011

5. Measurements — the field displays the voltage or current value on the DC output of the converter under test measured by the Calmar-S (in square brackets) and the calculated (theoretical) value of the measured voltage or current for this output.

If the output of the converter under test is set to voltage, the output value is represented in volts, if it is set to current — the output value is represented in mA.

The field is not editable.

- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissi	Converter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2	P _s =					Converter 2	Calmar-S 2	2011

- If a test or adjustment (calibration) procedure is being carried out in the selected test point, the field contains the measured value of the DC signal on the Calmar-S input (in square brackets) and the calculated (theoretical value) of the parameter measured by the converter under test:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	N: 102; 1.144	P _s =	864.7055	866.09 [5.0003]	0.1598	0.5	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011

- If a test or adjustment (calibration procedure) has been completed for the selected test point, the field shows the measured value of the DC signal on the Calmar-S input (in square brackets) and the calculated (theoretical value) of the parameter measured by the converter under test:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	N: 102; 1.144	P _s =	864.7055	866.09 [5.0003]	0.1598	0.5	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011

6. Error, % — the field shows the measurement error of the converter under test calculated in the process of its testing or adjustment (calibration). The error is recalculated each time when the reading coming from the Calmar-S is updated.

The error type is specified by the user when configuring the test procedure. The field is not editable.

- If there are no measurement results obtained for the selected test point, the field is empty:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	N: 102; 1.144	P _s =	864.7055	866.09 [5.0003]	0.1598	0.5	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011

- If a test or adjustment (calibration) procedure is being carried out in the selected test point, the field shows the measurement error of the converter under test:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	N: 102; 1.144	P _s =	864.7055	866.09 [5.0003]	0.1598	0.5	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011

- If a test or adjustment (calibration) procedure has been completed for the selected test point, the field shows the measurement error of the converter under test:



Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissi	Converter	Ser. numbe	Year of m
Calmar-S 1	N: 102; 1.144	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	N: 66; 1.2	P _s =					Converter 2	Calmar-S 2	2011

7. Permissible error limit — the field shows the value of permissible error limit for a given test point specified by the user when configuring the test procedure. The field is not editable.



- If there are no measurement results obtained for the selected test point, the field is empty
- If the actual value of measurement error exceeds the permissible error limit for the selected test point, this will be indicated by the icon :

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	N: 102; 1.144	P _s =	299.3622	300.4868 [1.734]	0.1298	0.1	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011



- If the actual value of measurement error does not exceed the permissible error value for the selected test point, the icon will be displayed:

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144 	P _s =	864.7055	866.09 [5.0003]	0.1598	0.5 <input checked="" type="checkbox"/>	Converter 1	Calmar-S 1	2011
Calmar-S 2		P _s =					Converter 2	Calmar-S 2	2011



8. Converter — the field contains the name of the converter under test as it will be in the test report. The name is not used during testing and may be specified at user option. On adding a new Calmar-S to the table, the corresponding name of the converter is numbered by default. The field is editable.

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144 	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2 	P _s =					Converter 2	Calmar-S 2	2011
Calmar-S 3		P _s =					Converter 3	Calmar-S 3	2011
Calmar-S 4		P _s =					Converter 4	Calmar-S 4	2011

9. Serial number — the field contains the serial number of the converter under test as it will be in the test report. On adding a new Calmar-S to the table, the field will display its name by default. The serial number entered in the field is not used during testing and may be specified at user option. The field is editable.

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144 	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2 	P _s =					Converter 2	Calmar-S 2	2011
Calmar-S 3		P _s =					Converter 3	Calmar-S 3	2011
Calmar-S 4		P _s =					Converter 4	Calmar-S 4	2011

10. Year of manufacture — the field shows the year of manufacture as it will be in the test report. The field is editable. On adding a new device to the table, the current year will be displayed in the field by default. The year of manufacture entered in the field is not used during testing and may be specified at user option. The field is editable.

Calmar-S	Exchange	Parameter	Reference	Measurements	Error, %	Permissible error	Converter	Ser. numbe	Year c
Calmar-S 1	Nº 102; 1.144 	P _s =					Converter 1	Calmar-S 1	2011
Calmar-S 2	Nº 66; 1.2 	P _s =					Converter 2	Calmar-S 2	2011
Calmar-S 3		P _s =					Converter 3	Calmar-S 3	2011
Calmar-S 4		P _s =					Converter 4	Calmar-S 4	2011

Main menu

The commands under the main menu:

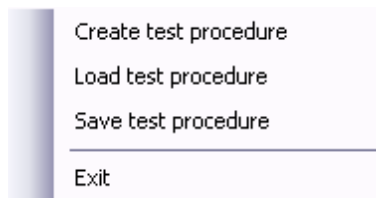


1. File
2. Mode
3. Settings
4. Help


“File” menu

The “File” menu includes the options:


- Create test procedure
- Load test procedure
- Save test procedure
- Exit



Create test procedure

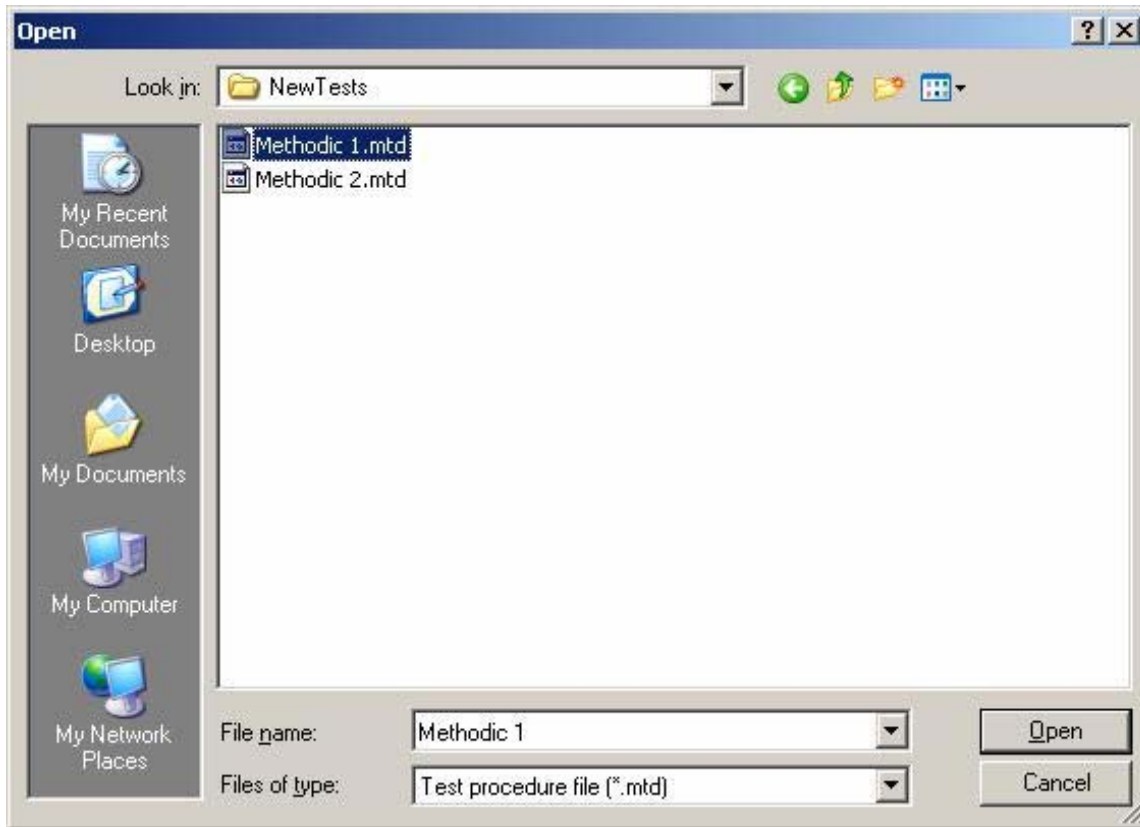
The program creates a new test procedure of the type (for a meter or converter) specified before (by selecting the required option in the window called up with the toolbar button ). The new test procedure contains no profiles (the list of profiles is empty).

Please note that, on selecting the “Create test procedure” command, the previously active test procedure is cleared from the screen with all its data.

Then the new test procedure should be configured by the user by selecting its type, connection scheme etc. in the “Parameters of test procedure” window () and by adding profiles and setting their parameters and nominal values.

Load test procedure

This option allows you to load a previously created test procedure from a file. The command brings up a standard MS Windows “Open file” dialog box. The extension of test procedure files is *.mtd.

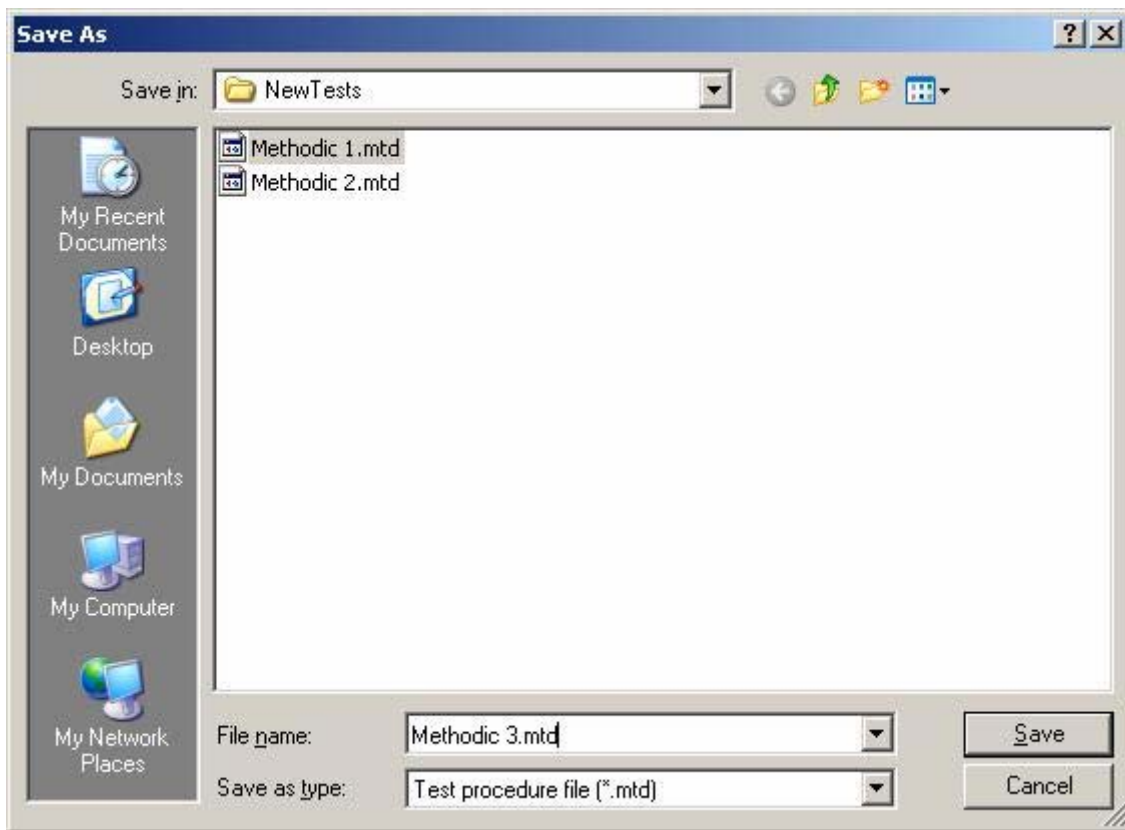


On pressing the “Open” button, the program clears the currently operated test procedure with all its data from the screen and loads the selected one with all its data (lists of nominal values and profiles). The new test procedure is now active and ready to be modified or used for testing.

If, when trying to open the file, the program detects an error, or the user clicks on the “Cancel” button, the program will leave the previously operated test procedure on the screen.

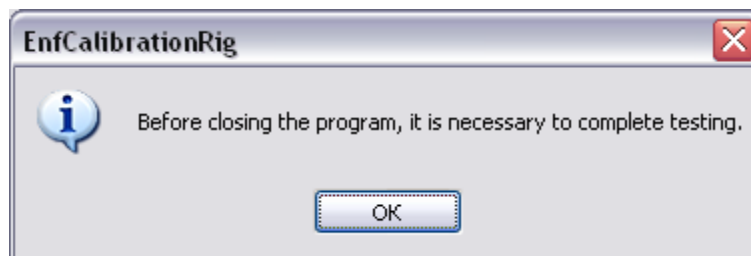
Save test procedure

The command is used to save an active test procedure to a file. It opens a standard Windows dialog box where the user can save the selected test procedure including its general parameters, list of nominal values and profiles to a file on the hard disc. The extension of test procedure files is *.mtd.

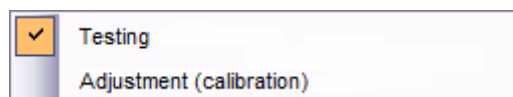


Exit

The command instructs the program to quit provided that no test or adjustment (calibration) procedure is enabled. Otherwise the program will display the following warning message:



“Mode” menu



The menu is used to set test modes:

- Testing: testing of meters or measuring converters
- Adjustment (calibration): adjustment of meters or measuring converters

“Testing” mode

In the “Testing” mode the program performs the following actions:

- Activates signals selected from the list of profiles
- Activates proper voltage and current measurement ranges for each test point in the reference instrument
- Activates the “Correction and averaging” mode (with preset correction parameters) in the reference instrument
- Scans the reference instrument and error calculators for measurement results
- Determines measurement errors for each test point and each error calculator.

On selecting the proper set of nominal test values from the drop-down list, the program will automatically display the associated test points in the list of profiles.

Mark the profiles you need for testing in the list of profiles with check marks (☑). In the process of testing the check marks are hidden.

Before starting up, the program additionally checks the correctness of preset parameters and connection to the test equipment. If some parameters have been configured incorrectly, or disconnection to the test equipment has been detected, the program generates the corresponding message and aborts the process.

In case of no errors, in the beginning of the test procedure the program deletes the measurement results that currently exist for the test points marked with check marks ☑. During testing, the program sequentially scans each connected Calmar-S (displayed in the table) along with the reference instrument. As the readings are received, the program recalculates the theoretical values of tested parameters and determines the measurement errors of the instruments under test. The theoretical values and measurement error values are displayed in the corresponding table for each Calmar-S. When the measurement error has been determined for each Calmar-S in one test point, the program automatically goes to the next one. Upon completion of the process in the last test point, the procedure is stopped.

When testing electrical energy meters, pulses are counted in each test point until the number of pulses from the meter under test (calculated as sufficient to determine the error) is achieved.

When testing measuring converters, measurements are performed in each test point until the number of readings from the reference instrument (specified as the delay before data accumulation for averaging) is achieved.

The program allows you to stop the process or disconnect any of the connected Calmar-S units at any time.

Should an error in data exchange with one of the Calmar-S error calculators be detected, this device is automatically excluded from testing until the end of the procedure.

In case of an error in data exchange with the reference instrument, the program stops the test procedure.

During testing, it is possible to view test results (by placing the cursor on the corresponding position in the list) for any test point selected from the list of profiles.

Adjustment (calibration) mode

In the “Adjustment (Calibration)” mode the program performs the following actions:

- Activates signals selected from the list of profiles
- Activates proper voltage and current measurement ranges for each test point in the reference instrument
- Activates the “Correction and averaging” mode (with preset correction parameters) in the reference instrument
- Scans the reference instrument and error calculators for measurement results
- Determines measurement errors for each test point and each error calculator.

On selecting the proper set of nominal test values from the drop-down list, the program will automatically display the associated test points in the list of profiles.

In the adjustment (calibration) mode, check marks are not displayed near the profiles. To select a test point, place the cursor on the required profile and start the adjustment procedure.

Before starting up, the program additionally checks the correctness of preset parameters and connection to the test equipment. If some parameters have been configured incorrectly, or disconnection to the test equipment has been detected, the program generates the corresponding message and aborts the process.

In case of no errors, in the beginning of the adjustment procedure, the program deletes the measurement results that currently exist for the selected test point. During adjustment, the program sequentially scans each connected Calmar-S (displayed in the table) along with the reference instrument. As the readings are received, the program recalculates the theoretical values of adjusted parameters and determines the measurement errors of the instruments under test. The theoretical values and measurement error values are displayed in the corresponding table for each Calmar-S.

When the measurement error has been determined once, the program reproduces the same procedure as a cycle. Cycling is stopped upon user's command.

To go to the next test point, the user should stop an active adjustment procedure, select the required test point from the list of profiles (by placing the cursor on it), and start a new one.

The program allows you to stop the process and to disconnect or restart any of the connected Calmar-S units at any time. The restart can be performed for either disconnected (by the program or user) or running Calmar-S.

Should an error in data exchange with one of the Calmar-S error calculators be detected, this device is automatically excluded from testing until the end of the procedure.

In case of an error in data exchange with the reference instrument, the program stops the adjustment procedure.

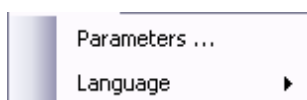
During adjustment, it is possible to view test results (by placing the cursor on the corresponding position in the list) for any test point selected from the list of profiles.

When adjusting electric energy meters, the user sets a test signal on the generator and enables the procedure of pulse counting (meter error calculation). Each time after calculating the error, the counting of pulses is restarted automatically to enable calculation of a new error value in the same test point. The program allows you to manually restart pulse count or stop error calculation in the given test point. In the latter case, the meter error value displayed on the screen refers to the previous iteration of pulses.

When adjusting measuring converters, the user sets the required signal on the generator and enables the measuring mode on the reference instrument for each connected Calmar-S. The measurement error is recalculated each time after updating measurement results in the reference instrument.

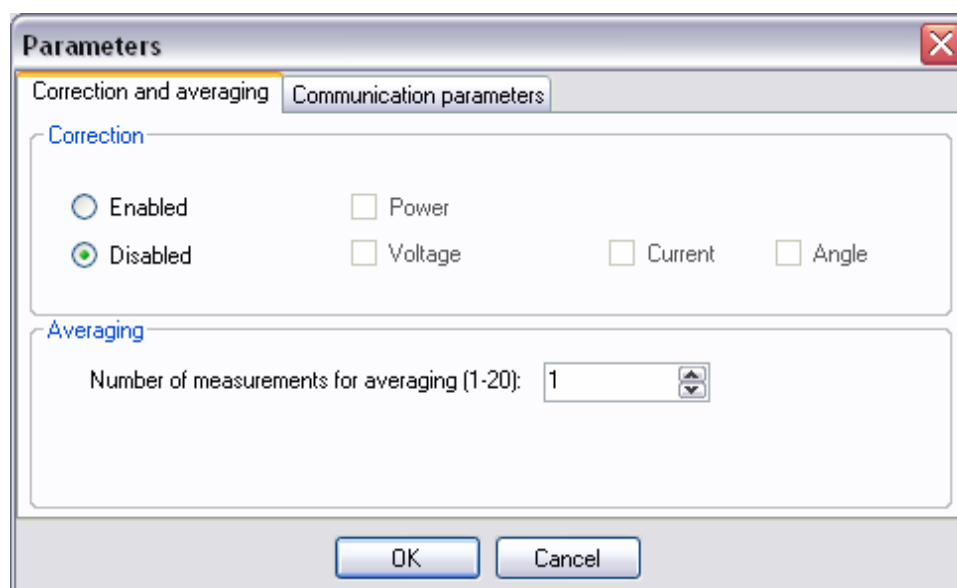
The program allows the user to manually restart measurement or error calculation procedure in the Calmar-S in the given test point.

“Settings” menu



Parameters ...

The command opens a dialog box where the user can specify the parameters of COM ports for data exchange with the generator and reference instrument and configure the “Correction and Averaging” mode.



In the “Correction and Averaging” tab the user can configure the function of correction and averaging applied to generated waveforms. The function provides for better accuracy of output settings in the generator.

The correction is made on the basis of readings taken from the reference instrument. The readings are average values of voltage, current, angles between voltage and current and power. The correction values, calculated on the basis of arithmetic means of accumulated readings, are then applied to the profiles of output waveforms being generated.

The following parameters are corrected:

- Voltage
- Current
- Phase angle
- Power

The correction of voltage, current and angles can be selected independently of one another. On selecting the “Power” correction, the voltage, current and angle correction modes are selected automatically. The correction of power is performed in two steps:

1. Correcting voltage, current and angle values
2. Correcting power by adjusting current

The type of power being corrected is determined by the type of power measured by the instrument under test.

Before the correction is applied, the program takes a pause of a length equal to some readings of the reference instrument. Then the program starts the process of applying averaging to the accumulated readings as specified by the user in the “Number of measurements for averaging” field and corrects the current, voltage and phase angle parameters of generated waveforms.

The correction of current and voltage is performed under condition that the relative error (in absolute value) between the originally set value and the calculated average does not exceed 10%.

The correction of angles is performed under condition that the absolute error (in absolute value) between the originally set value and the calculated average does not exceed 3 degrees.

To disable the correction mode, select the “Disabled” option.

The image shows a software interface for the 'Correction' settings. It features a title bar labeled 'Correction'. Below the title bar, there are two radio buttons: 'Enabled' (which is selected) and 'Disabled'. To the right of these radio buttons are four checkboxes: 'Power', 'Voltage', 'Current', and 'Angle'. The 'Power' checkbox is checked, and the other three are unchecked.

To configure the correction function, choose the “Enabled” option and select the parameters to be corrected with the check mark.

Correction

Enabled Power
 Disabled Voltage Current Angle

Correction

Enabled Power
 Disabled Voltage Current Angle

If none of the parameters are selected, the correction mode is inactive.

With the correction function enabled, it is necessary to specify the number of measurements accumulated for averaging.

Averaging

Number of measurements for averaging (1-20):

If the correction mode is disabled, the value in this field has no effect on generated waveforms.

When a test procedure is saved to a file, the “correction and averaging” configuration settings made for the procedure are saved to this file and applied when the procedure is loaded to the program.

The “Communication parameters” tab allows you to configure serial ports of your PC for data exchange with the reference instrument and generator.

Parameters

Correction and averaging **Communication parameters**

Reference

Serial port: COM5 Device:
Data exchange speed: 19200 Ser. number:
Firmware version:
Check

Generator

Serial port: COM3 Generator:
Data exchange speed: 115200 Generating:
Check

OK Cancel

To establish data exchange with the reference instrument, it is necessary to select:

- COM port to which the reference meter is connected
- Data exchange speed (must be the same as specified in the reference instrument)

Reference

Serial port: COM5

Data exchange speed: COM5

Device:
Ser. number:
Firmware version:

Check

Reference

Serial port: COM5

Data exchange speed: 19200

Device:
Ser. number:
Firmware version:

Check

Click on the button to make sure that the connection has been established. On detecting the reference instrument connected to the PC, the program will display its type, serial number and firmware version:

Device: EM3.1 02
Ser. number: 98
Firmware version: 3.4.01000

If the reference instrument was not found, these fields are empty:

Device:
Ser. number:
Firmware version:

To establish data exchange with the generator, it is necessary to select:

- The COM port to which the generator is connected
- Data exchange speed (must be the same as specified in the generator)

Generator

Serial port: COM3

Data exchange speed: COM3

Generator:
Generating:

Check


Generator

Serial port: COM3

Data exchange speed: 115200

Generator:
Generating:

Check

Click on the  button to make sure that the connection has been established. On detecting the generator connected to the PC, the program will display its type and status (generation enabled or disabled):

Generator: EF - 31
Generating: off

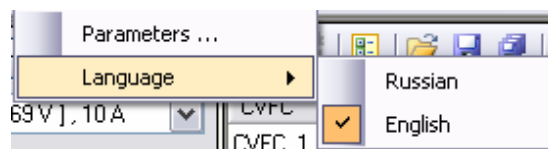
If the generator was not found, these fields are empty:

Generator:
Generating:

Click “OK” to save the data exchange or correction / averaging configuration settings in the memory. Click “Cancel” to exit the tab without saving changes.

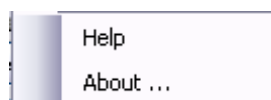
Language

The option gives the possibility to choose the language and includes two items: Russian and English.



Select a required option by placing a check mark. The language will be changed only after the restart of the application.

“?” menu

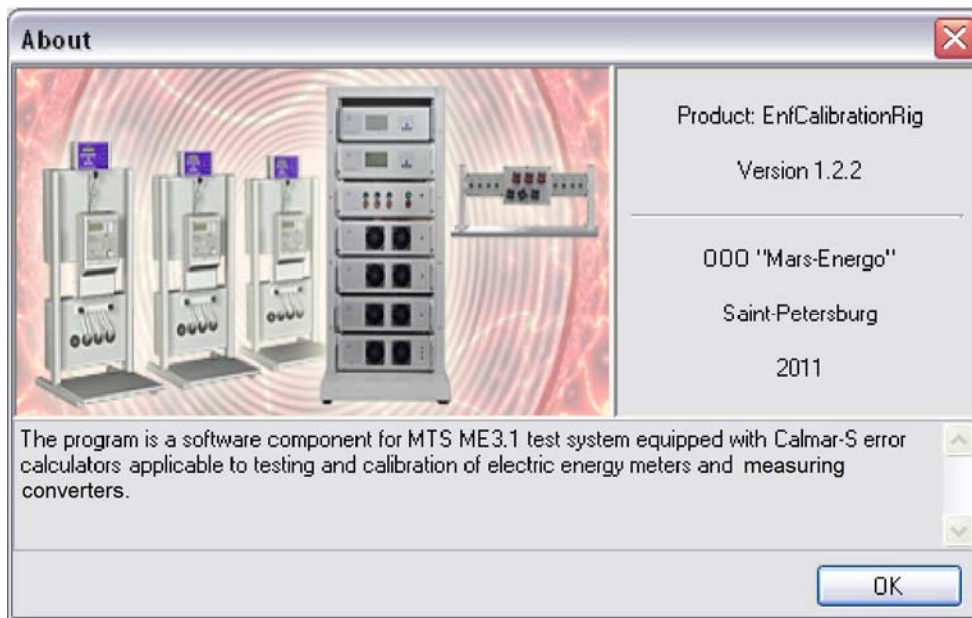


Help

The option opens a pdf-file with the EnfCalibrationRig user manual. Adobe Acrobat Reader (5.0 or above) must be installed on your PC.

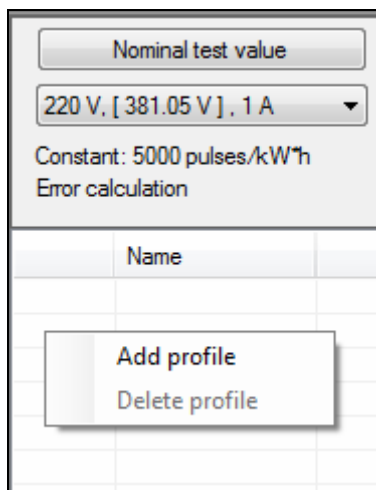
About...

Selecting this command brings up a screen pictured below. It gives a brief description of the program, including its product name, version number, manufacturer and key functions.



Contextual menu of the list of profiles

The menu called up by clicking on the list of profiles with the right mouse button contains the “Add profile” and “Delete profile” options.



Add profile

The command adds a new profile to the list of profiles. The new profile is placed in the next position to the selected one and has the parameters identical to the selected profile. When a new profile is added to the empty list of profiles, it will have the default parameters:

- RMS of phase voltages 220V
- RMS of phase currents 1A

- Angles between voltages and currents 0 degrees
- Angles between phase voltages 120 degrees

The added profile will correspond to the nominal values currently selected from the drop-down list of nominal values. The number of added profiles is unlimited.

Delete profile

The command deletes a selected profile from the list. If the list of profiles is empty, the command is unavailable.

After adding or deleting a profile, the list is renumbered automatically.

When a test or adjustment procedure is in progress, the “Add profile” and “Delete profile” options become unavailable.

Contextual menu of the list of error calculators

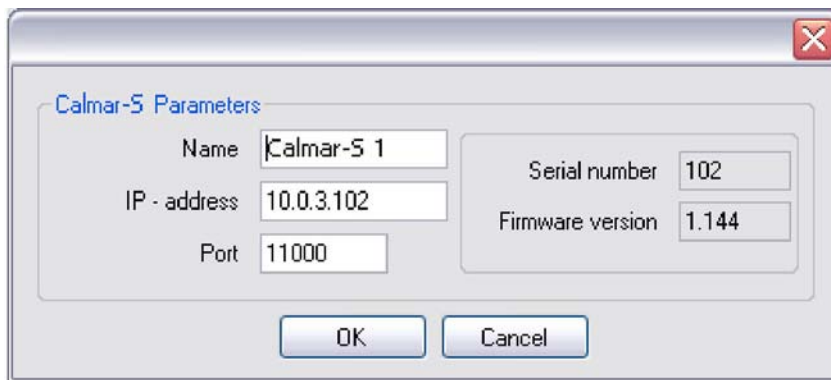
The menu called up by clicking on the list of Calmar-S units with the right mouse button looks as follows:



Parameters

The “Parameters” option opens a dialog where you can configure the communication between an error calculator and your PC. To do this, select the required error calculator from the list and right-click on it to bring up the contextual menu.

If the list of error calculators is empty, the option is unavailable.



The “Calmar-S Parameters” dialog box contains the following fields:

— The name of the error calculator

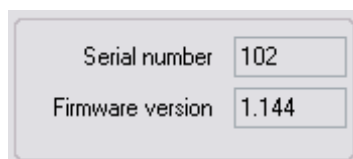
— The IP-address of the error calculator within a LAN

It is necessary to specify just the same IP-address as in the menu of the Calmar-S.

If several error calculators are connected to a LAN, their IP-addresses and the IP address of the PC within the LAN must be different.

— The number of the port for communication with the Calmar-S

The port number in this field and the port number set in the menu of the Calmar-S must be identical. The port numbers can be specified from 1 to 65535 (identical numbers for different devices are possible).



— The serial number and firmware version of the connected Calmar-S

The values in these fields are valid if communication with this error calculator was established earlier. Otherwise the fields will contain zeroes. The parameters are not editable.

The settings are applied on clicking “OK” and rejected on clicking “Cancel”.

When a test or adjustment procedure is in progress, the options become unavailable.

Add Calmar-S device

The command adds a new Calmar-S to the table of error calculators. The new device is displayed in the last position of the list. When a new Calmar-S is added to the

table, its parameters are set to default values, so it is necessary to specify the IP-address and port number of the new device.

The default name of a new error calculator consists of the identifier (Calmar-S) and the sequential number in the list.

The default name of a device to be tested with an error calculator contains the type identifier (“Meter” or “Converter”) and its sequential number in the list.

The default serial number is set to the name of the added Calmar-S.

The year of manufacture defaults to the current year.

The table may contain an unlimited number of error calculators.

When a test or adjustment procedure is in progress, the option becomes unavailable.

Delete Calmar-S device

The command deletes a selected Calmar-S from the list after asking for confirmation:



When a test or adjustment procedure is in progress, the options become unavailable.

Restart Calmar-S device

The command is applicable either for meters or measuring converters in the adjustment mode. In the testing mode the option is not functional.

The command performs a restart of the error calculator selected in the list. The restart can be executed regardless of whether the Calmar-S is programmatically connected or disconnected from the system.

In case of adjusting meters, the command cancels the process of pulse counting and starts it again from the beginning.


As for instrument converters, the command restarts measuring the signal on the input of the error calculator.

Disable Calmar-S device

The command excludes the selected error calculator from scanning by the program while the device is not deleted from the table.

When an error calculator is disconnected in this way, this means that it will be skipped during testing or adjustment.

The command can be activated either before or in the process of testing or adjustment. In addition, the program automatically excludes the Calmar-S from scanning in case of a connection error.

When the error calculator is disabled, this is indicated by the icon .

Calmar-S 2				Meter 2	Calmar-S 2	2011
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In the “Adjustment (calibration)” mode, a disabled error calculator can be included in the process by selecting the option “Restart Calmar-S device” from the same contextual menu.


In the “Testing” mode, a disabled Calmar-S is excluded from scanning.


If the list of error calculators is empty, the command is unavailable.





Applying the “Disable Calmar-S device” command does not mean that the readings and measurement errors calculated for other test points of the currently active test procedure will be deleted.

Scan all devices

The command makes it possible to detect all Calmar-S devices added to the list of error calculators. Selecting the “Scan all devices” option lets the program successively interrogate all devices in the table for firmware versions and serial numbers.

In case of successful communication, the firmware version and serial number of the Calmar-S (along with the icon ) will be displayed in the “Exchange” column of the table.

In case of a connection error or no reply from an error calculator, its serial number and firmware version are not displayed, and the icon  appears in the “Exchange” column. The Calmar-S is automatically set to the disabled state and excluded from scanning during testing or adjustment (calibration).

CVFC	Exchange	% ...	Pulses	Error %	Permissi	Meter	Ser. numbe	Year of m
CVFC 1	N: 102; 1.144 					Meter 1	CVFC 1	2011
CVFC 2	N: 66; 1.2 					Meter 2	CVFC 2	2011
CVFC 3						Meter 3	CVFC 3	2011
CVFC 4						Meter 4	CVFC 4	2011

The “Scan all devices” command is executed for all connected error calculators including the ones disabled by the user with the “Disable Calmar-S device” option.

If a programmatically disabled Calmar-S has been detected with the “Scan all devices” command, it will be included in testing or adjustment (calibration) from this moment.

On starting a testing or adjustment procedure, the option becomes unavailable.

Scan device

The command works similar to the “Scan all devices” command, but it is executed for an error calculator currently selected from the list.

On starting a testing or adjustment procedure, the option becomes unavailable.

Stop scanning

The command stops the process of scanning Calmar-S devices (or one Calmar-S). After selecting the command, the communication status of the error calculators scanned by the moment is updated, and the status of other devices remains the same.

The command becomes available only if the “Scan all devices” or “Scan device” command is active.

Test procedure

A test procedure is a set of profiles (test points) successively applied for accuracy testing of a certain measuring instrument. To create a test procedure, it is necessary to configure its general settings and the parameters of each test point (any test point is determined by its profile).

The program supports test procedures of two types: for electrical energy meters and for measuring converters. The electrical parameters specified for a test procedure depend on its type. The test procedure created already can be saved to a file on the hard disc, and then it can be loaded and applied to testing the instruments of the intended type.

Within one test procedure, there can be test points (profiles) related to different sets of nominal values. When a new profile is added to the test procedure, this profile is associated with the set of nominal values active at the moment.


Before testing or adjustment (calibration), the program selects the test points related to the set of nominal values indicated by the user.

The user can specify an unlimited number of sets with nominal values. The number of profiles specified for each set of nominal values is also unlimited.

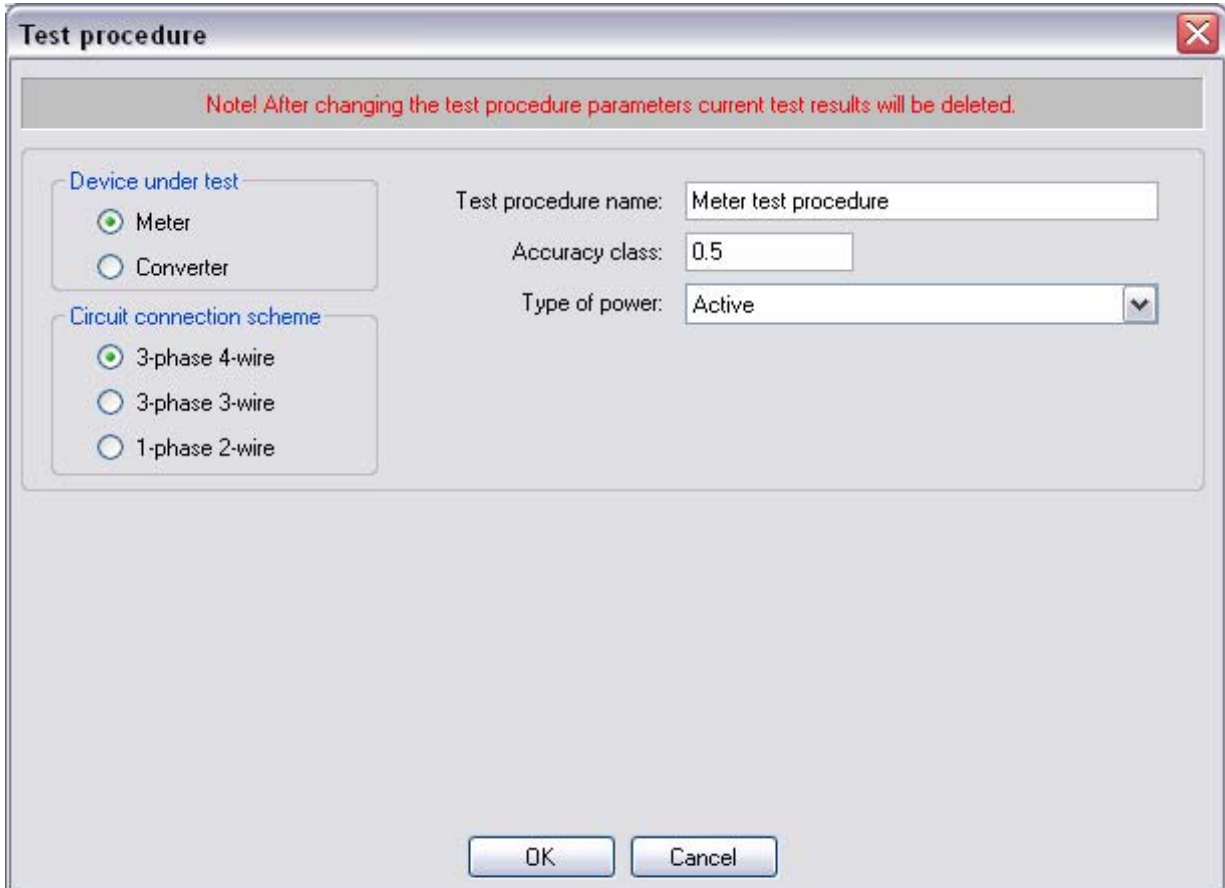
When a set of nominal values is deleted from the test procedure, all associated profiles are also deleted.

In the course of testing or adjustment (calibration) of energy meters, the program calculates a relative measurement error on the basis of the difference between the frequencies coming from the reference instrument and from the meter under test.

As for measuring converters, the type of error to be calculated is selected by the user while creating the test procedure.

The general settings of an active test procedure can be viewed in the dialog box called up by clicking the toolbar button . The displayed set of general settings depends on the selected type of the test procedure (meter or converter).

General settings for a meter-type test procedure:



General settings for a converter-type test procedure:

Test procedure

Note! After changing the test procedure parameters current test results will be deleted.

Device under test

Meter

Converter

Test procedure name: Converter test procedure

Accuracy class: 0.5

Circuit connection scheme

3-phase 4-wire

3-phase 3-wire

1-phase 2-wire

Converter parameters

Measurements on the Converter input: Voltage

Converter output: [0 ... +5] V

Error: Reduced

	Min	Max
Output	0 V	5 V
Input	0	100

OK Cancel

Test procedure name: — The name entry field (not mandatory for a test procedure created for adjustment (calibration))

Device under test

Meter

Converter

— Determines the type of the test procedure

Circuit connection scheme

3-phase 4-wire

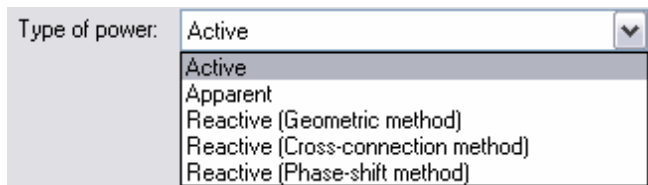
3-phase 3-wire

1-phase 2-wire

— When testing meters, the setting determines the circuit connection of the meter under test

— When testing converters, the setting determines the circuit connection of the reference instrument, which depends on the number of devices under test and phases (channels) to which they are connected

Accuracy class: — Accuracy class of the meter under test (the number of pulses required for meter error calculation is determined on this basis)



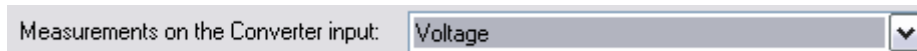
— Selection of the power type for which the meter error is calculated

The following power types are available:

- Active
- Apparent
- Reactive (geometrical method)
- Reactive (cross-connection method)
- Reactive (phase-shift method)

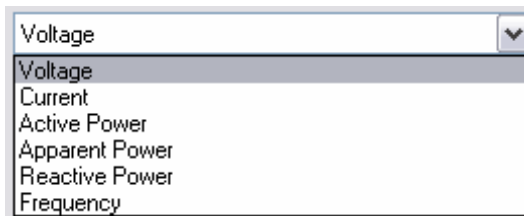
The list is hidden for converter- type test procedures.

In addition to the above the following fields are displayed for testing measuring converters:



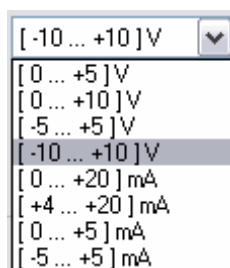
with available types of converters:

- Voltage
- Current
- Active power
- Apparent power
- Reactive power
- Frequency



— Drop-down list reflecting DC signals taken from the output of the converter under test

The following DC output signals are available:



Note!

To test a measuring converter with the DC output selected from the list, the output of the converter under test must be connected to the corresponding input of the Calmar-S device.

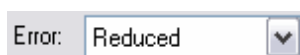
When the type and the range of output signals of the converter under test are selected, it is necessary to specify the range of signals applied to the converter's input. The range of the input parameter measured by the converter under test determines the max and min levels of the output signals of the converter.

	Min	Max
Output	-10 V	10 V
Input	0	100

— This table is used to specify the correspondence between the input and output ranges of the converter

The “Output” field shows the output range of the converter already selected from the drop-down list.

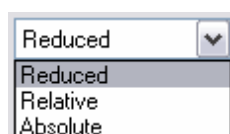
The “Input” field is specified by the user. The upper (max) and lower (min) levels of signals applied to the converter's input will be associated with the converter's output range and used for error calculation.



— The drop-down list with the types of the error to be calculated during testing or adjustment


The error types may be as follows:

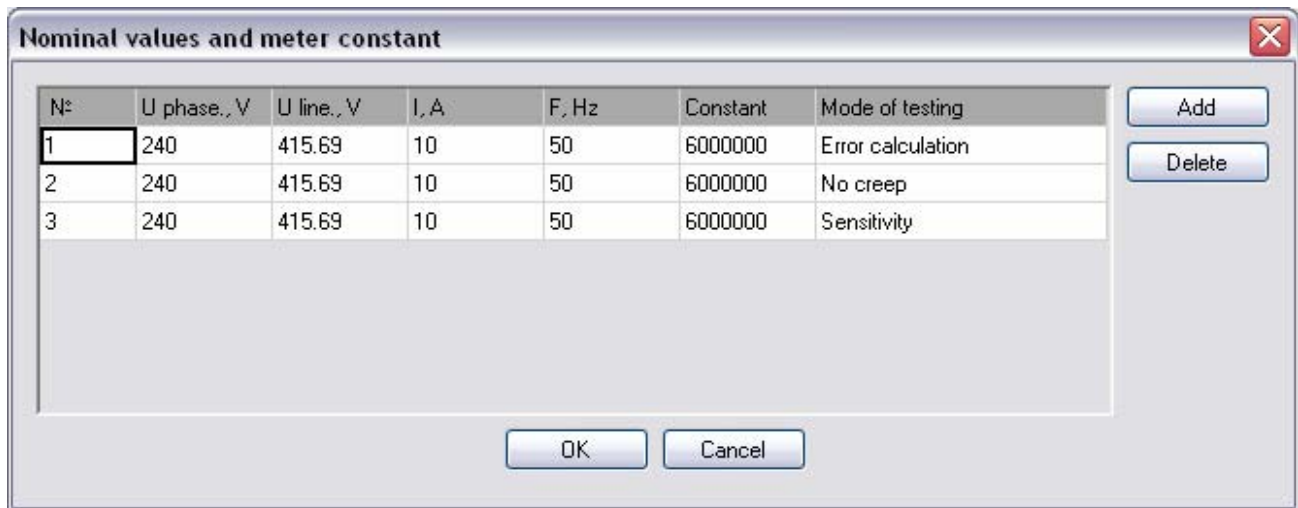
- Reduced (calculated with respect to the nominal value of the range in %)
- Relative (calculated with respect to the value measured by the reference instrument in %)
- Absolute



On clicking “OK”, the general settings made for the test procedure are saved in the memory; on clicking “Cancel” the changes are rejected.

Nominal values

The list of nominal (rated) values available within the active test procedure is shown in a dialog box opened by clicking on the button  in the main window.

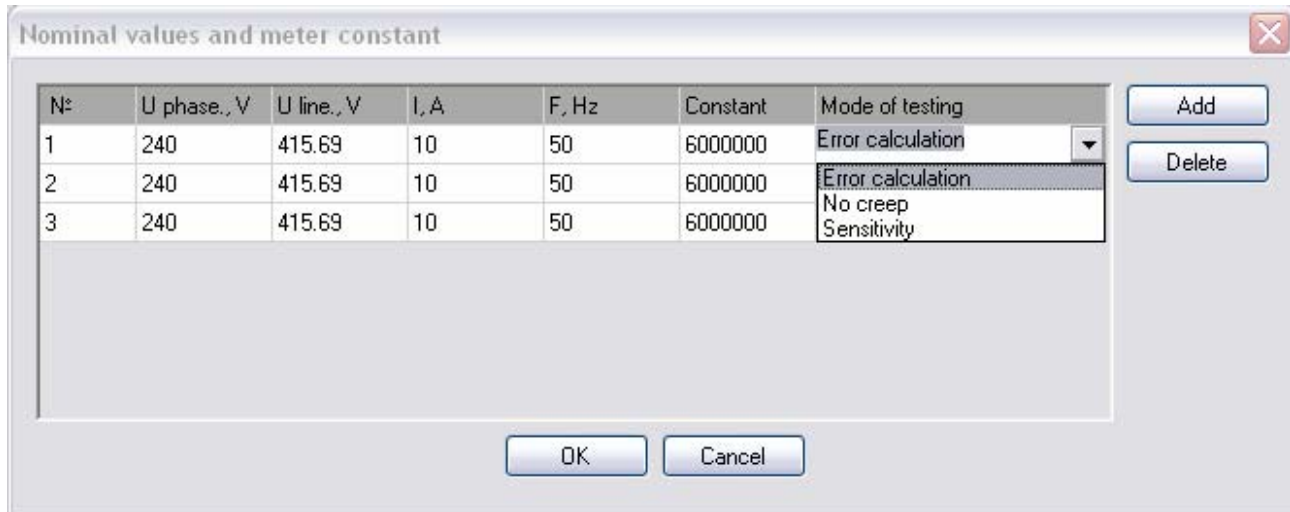


The nominal values are entered in the following table columns:

- N — sequential number
- U phase, V — nominal phase voltage
- U line, V — nominal line voltage
- I, A — nominal current
- F, Hz — nominal frequency
- Constant (pulses / Kw*h, pulses / KVar*h) — instrument constant of the meter under test (not applicable for measuring converters)
- Mode of testing — not applicable for measuring converters

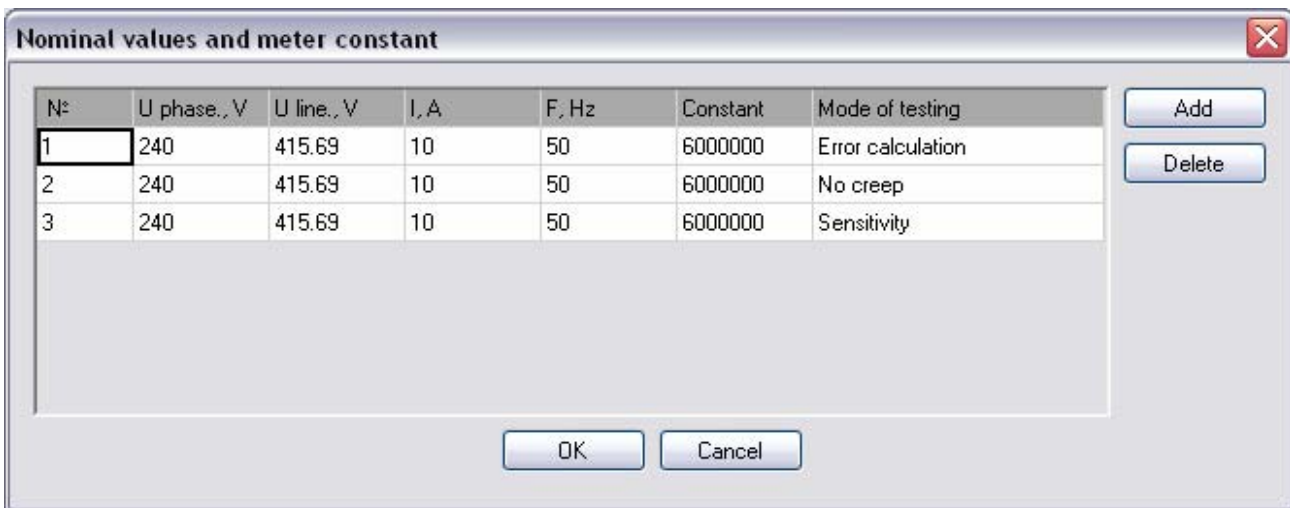
The values in the fields are manually specified by the user. Should the user specify the phase voltage, the line voltage will be recalculated automatically (and vice versa).

The mode of testing is set by selecting the required option from the drop-down list.

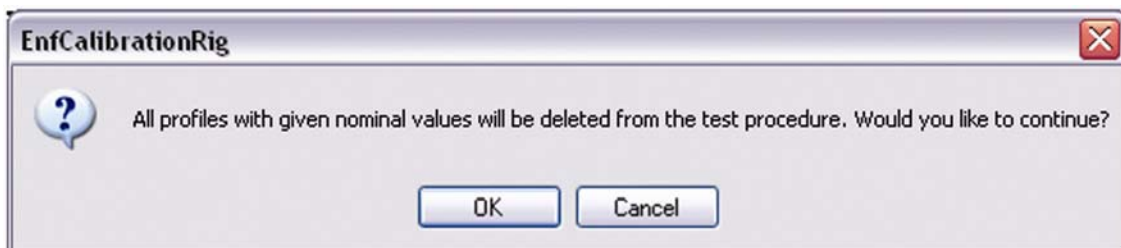


Nominal values required for testing are determined by the type of the test procedure and device under test and by the connection scheme.

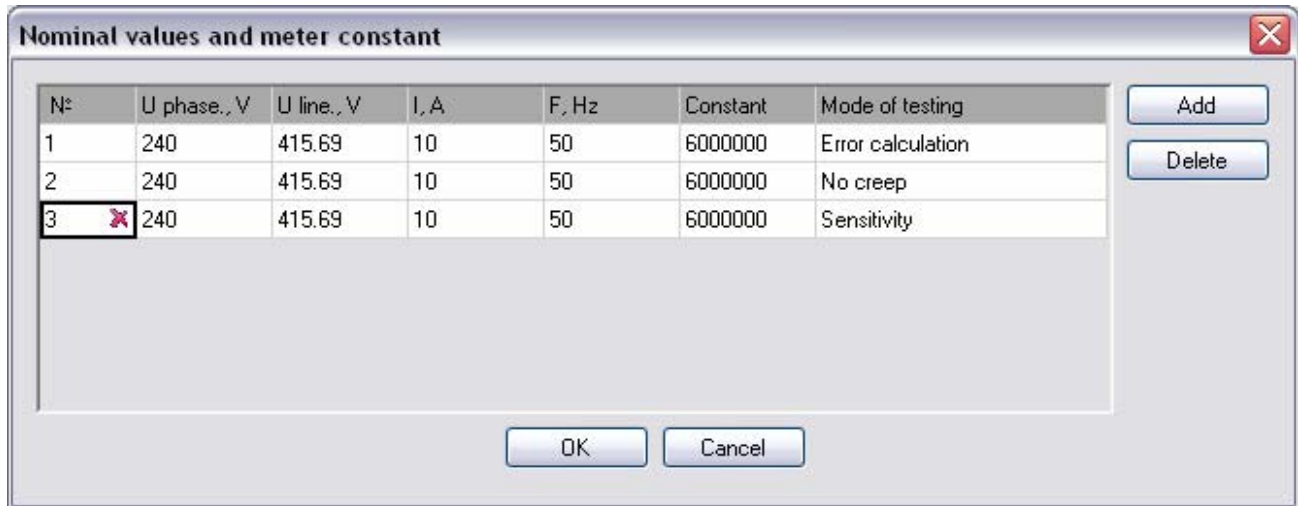
Each table line corresponds to one set of nominal values. A new set is added by clicking on the “Add” button. The program adds a new line to the table with the default values in the fields that can be modified to get the nominal values as required .



To delete a line, select it by clicking on any field and press the “Delete” button. The program asks the user for confirmation and deletes the selected set with all of the profiles created for this set.



The deleted line is marked with ✖. It remains in the table until the dialog box is closed.




The “Delete” button is unavailable, if the test procedure contains only one set of nominal values.

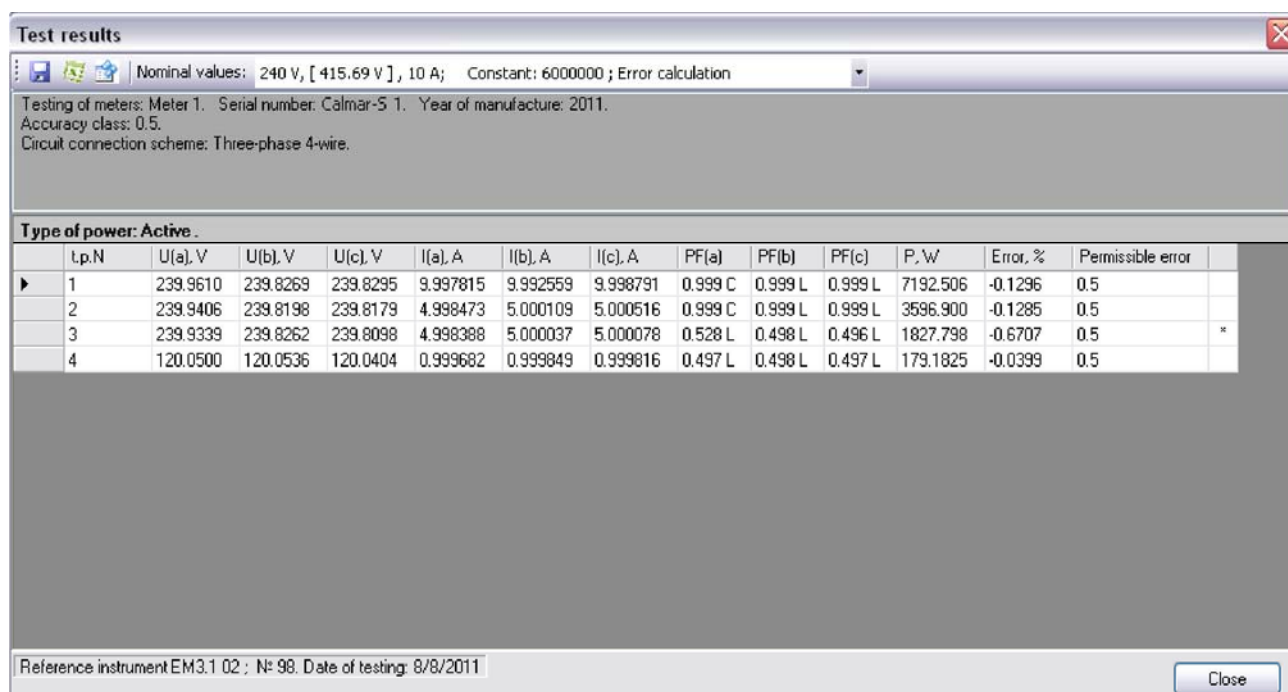
It is possible to create several sets with identical nominal values. In this case the sets are considered as different sets.

On clicking “OK”, the settings made in this dialog are saved in the memory; on clicking “Cancel” the changes are rejected.


Viewing and exporting test results


The results of testing or adjustment are called up with the toolbar button  in the main window.

The “Test results” dialog box will also be displayed on loading the results from a file.




The “Test results” toolbar contains the following elements:

 — saves the results of testing or adjustment to a file (the button duplicates the same button on the main toolbar)

 — exports the results to a MS Excel file

 — exports the results to a MS Word or MS Excel template

240 V, [415.69 V], 10 A; Constant: 6000000 ; Error calculation  — The drop-down list that displays the sets of nominal values, meter constants and modes of testing within a test procedure.

The dialog box with test results includes:

1. A panel with general information about the device under test:

Testing of meters: Meter 1. Serial number: Calmar-S 1. Year of manufacture: 2011.
Accuracy class: 0.5.
Circuit connection scheme: Three-phase 4-wire.

Information about the meter:

- Name
- Serial number
- Year of manufacture
- Accuracy class
- Circuit connection scheme

Information about the converter:

- Name
- Serial number
- Year of manufacture
- Accuracy class
- Circuit connection scheme
- Range of input signal
- Range of output signal

2. The table with test results:

Type of power: Active													
t.p.N	U(a), V	U(b), V	U(c), V	I(a), A	I(b), A	I(c), A	PF(a)	PF(b)	PF(c)	P, W	Error, %	Permissible error	
1	239.9610	239.8269	239.8295	9.997815	9.992559	9.998791	0.999 C	0.999 L	0.999 L	7192.506	-0.1296	0.5	
2	239.9406	239.8198	239.8179	4.998473	5.000109	5.000516	0.999 C	0.999 L	0.999 L	3596.900	-0.1285	0.5	
3	239.9339	239.8262	239.8098	4.998388	5.000037	5.000078	0.528 L	0.498 L	0.496 L	1827.798	-0.6707	0.5	*
4	120.0500	120.0536	120.0404	0.999682	0.999849	0.999816	0.497 L	0.498 L	0.497 L	179.1825	-0.0399	0.5	

The header of the table shows:

- Type of power measured during testing (for electrical energy meters)
- Type of measurement error selected for testing (for measuring converters)

The structure of the table depends on the type of the device under test, its connection scheme, mode of testing, and parameters selected for testing.

The table columns display readings received from the reference instrument and device under test as well as the values of measurement errors (or the number of pulses).

Each table line is associated with a certain test point. If a test point was skipped during testing, its data will not be added to the table.


If, in a given test point, an error value exceeds the specified tolerance (permissible error limit), the corresponding field of the last column will contain the symbol *.

P, W	Error, %	Permissible error	
7192.506	-0.1296	0.5	
3596.900	-0.1285	0.5	
1827.798	-0.6707	0.5	*
179.1825	-0.0399	0.5	

For the creep and sensitivity test modes, the “Error” and “Permissible error” columns are replaced with the “Number of pulses” and “Calculated number of pulses” fields.


The table with test results currently shows the test points associated with the set of nominal values selected from the drop-down list. On selecting another set, the table will be updated with the readings obtained for the selected set.

240 V, [415.69 V], 10 A; Constant: 6000000 ; Error calculation	▼
240 V, [415.69 V], 10 A; Constant: 6000000 ; Error calculation	
240 V, [415.69 V], Constant: 6000000 ; No creep	
240 V, [415.69 V], 10 A; Constant: 6000000 ; Sensitivity	

To save the results to a file, click on the button  either in the dialog box or in the main window.

Test results may be exported in two ways:

- To a MS Excel file
- To a user-configured MS Excel or MS Word template

To get a MS Excel file, click on the button .


On starting MS Excel, the program will export all test data (general information and test results) for each set of nominal values into a MS Excel file. If a particular set of nominal values was excluded from the test procedure, the program will generate just the table header.

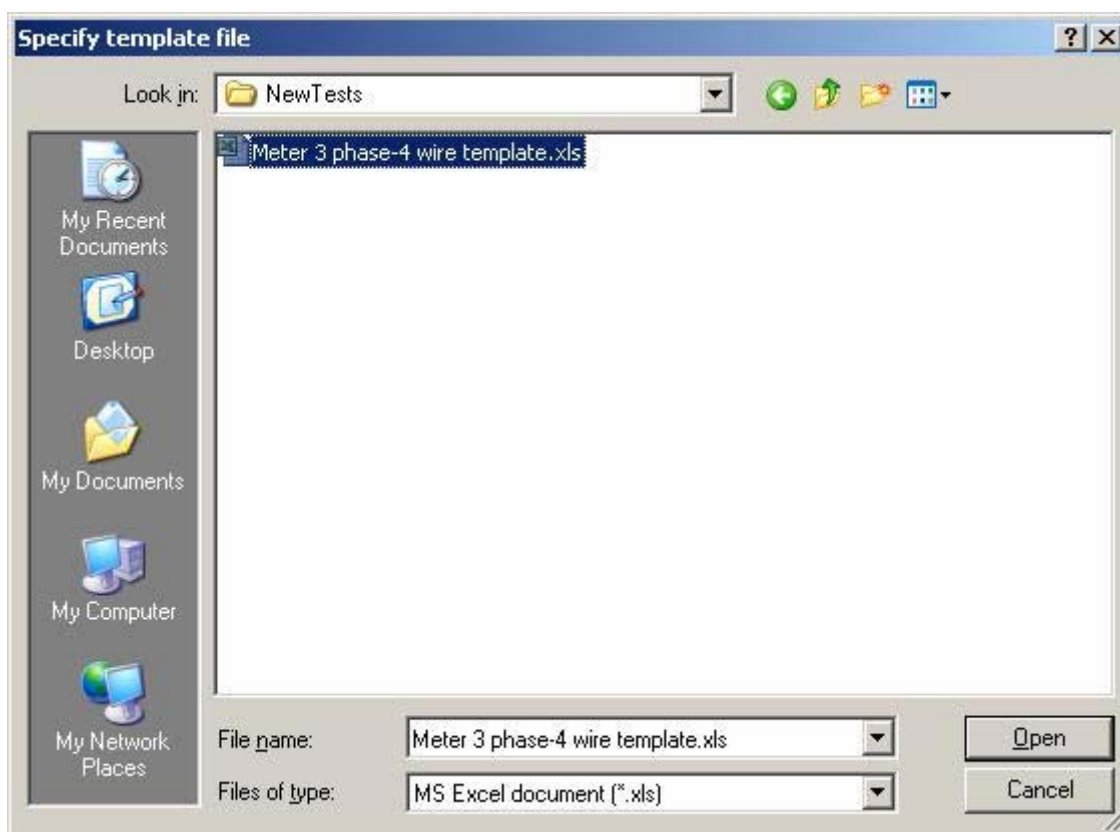
The “Test results” table displayed in the dialog box and its analogue exported to MS Excel are identically structured.

At the completion of an export procedure, save the MS Excel file to the hard disc using the Windows file manager.

Data exported into MS Excel:

Meter: Meter 1												
Serial number: CVFC 1												
Year of manufacture: 2011												
Accuracy class: 0.5												
Circuit connection scheme: Three-phase 4-wire												
Active Power												
Meter constant: 6000000 pulses/kW*h												
Nominal values:												
Phase voltage: 240 V												
Line voltage: 415.69 V												
Current: 10 A												
t.p.N	U(a), V	U(b), V	U(c), V	I(a), A	I(b), A	I(c), A	PF (a)	PF (b)	PF (c)	P, W	Error, %	Permissible error
1	239.924	239.8361	239.8851	9.998127	9.993144	9.999387	0.999 C	0.999 L	0.999 L	7193.362	-0.0847	0.5
2	239.8994	239.8201	239.863	4.998297	5.0002	5.000418	0.999 C	0.999 L	0.999 L	3596.866	-0.0809	0.5
3	239.8879	239.8252	239.8582	4.998183	4.999938	5.000393	0.528 L	0.498 L	0.496 L	1828.032	-0.8723	0.5
4	120.0317	120.0509	120.0513	0.99969	0.99981	0.999896	0.497 L	0.497 L	0.496 L	179.1435	-0.2493	0.5
Creep test												
Meter constant: 6000000 pulses/kW*h												
Nominal values:												
Phase voltage: 240 V												
Line voltage: 415.69 V												
t.p.N	U(a), V	U(b), V	U(c), V	Number of pulses	Limit							
1	239.9349	239.8345	239.8573	59	54							
2	120.0318	120.017	119.9961	201	66							
Active Power, Sensitivity test												
Meter constant: 6000000 pulses/kW*h												
Nominal values:												
Phase voltage: 240 V												
Line voltage: 415.69 V												
Current: 10 A												
t.p.N	U(a), V	U(b), V	U(c), V	I(a), A	I(b), A	I(c), A	PF (a)	PF (b)	PF (c)	P, W	Number of pulses	Minimum
1	239.9563	239.8339	239.8487	10.00189	9.992274	9.99879	0.999 C	0.999 L	0.999 L	7194.078	42686	42850
2	120.0353	120.0116	119.992	4.998084	5.00006	5.000648	0.999 C	0.999 L	0.999 L	1799.661	10671	10600
											Date of testing: 8/9/2011	

To get a MS Word or MS Excel template, click on the button . The program will open a standard Windows dialog box where the user can select a MS Word or MS Excel template file. To start export, select a previously configured template and click on the “Open” button.



The template files should be configured before export. Data being exported is arranged within the template with use of specific markers.

The marker is a string with the name associated with a certain type of data. The string begins and ends with the % tag.

The following markers are used for generating test reports for electricity meters:

- **%device%** — device-under-test name
- **%factory_num%** — serial number
- **%manuf_year%** — year of manufacture
- **%class%** — accuracy class
- **%schem%** — connection scheme
- **%meter_const%** — meter constant
- **%U_phas%** — nominal phase voltage
- **%U_line%** — nominal line voltage
- **%I%** — nominal current
- **%f%** — nominal frequency
- **%power_type%** — type of power associated with meter measurement error
- **%calib_date%** — date of the last testing (adjustment) of the meter
- **%date%** — date of generating test (adjustment) report
- **%table_metrolog%** — table of measurement results recorded for the error calculation mode

- **%table_chuvstv%** — table of measurement results recorded for the sensitivity test mode
- **%table_samohod%** — table of measurement results recorded for the creep test mode

The following markers are used for generating test reports for measuring converters:

- **%device%** — converter-under-test name
- **%factory_num%** — serial number
- **%manuf_year%** — year of manufacture
- **%class%** — accuracy class
- **%schem%** — connection scheme
- **%in_range%** — measurement range of input signal
- **%out_range%** — measurement range of output signal
- **%U_phas%** — nominal (rated) phase voltage
- **%U_line%** — nominal (rated) line voltage
- **%I%** — nominal current
- **%f%** — nominal frequency
- **%calib_date%** — date of the last testing (adjustment) of the converter
- **%date%** — date of generating test (adjustment) report
- **%table_preob%** — table of measurement results recorded for the converter

Position of each marker in the template file determines the location of data of the associated type. If the marker of a certain data type is not positioned in the template file, the associated data will not be exported. This way of export makes it possible to create user-defined templates with fixed text blocks and variable data representing general test information and tables of test results.

The table with test results retains their structure (lines and columns) after export.

When an export procedure is completed, the MS Excel file must be saved to the hard disc under a user-specified name.

Caution!

The current version of the program supports the export into MS Word or MS Excel templates under the following conditions: only 1 table (i.e. test results for 1 set of nominal values) for the meter error calculation mode, 1 table for the sensitivity mode, 1 table for the creep test mode, and 1 table for measuring converters.

To export several tables, use the first export method.

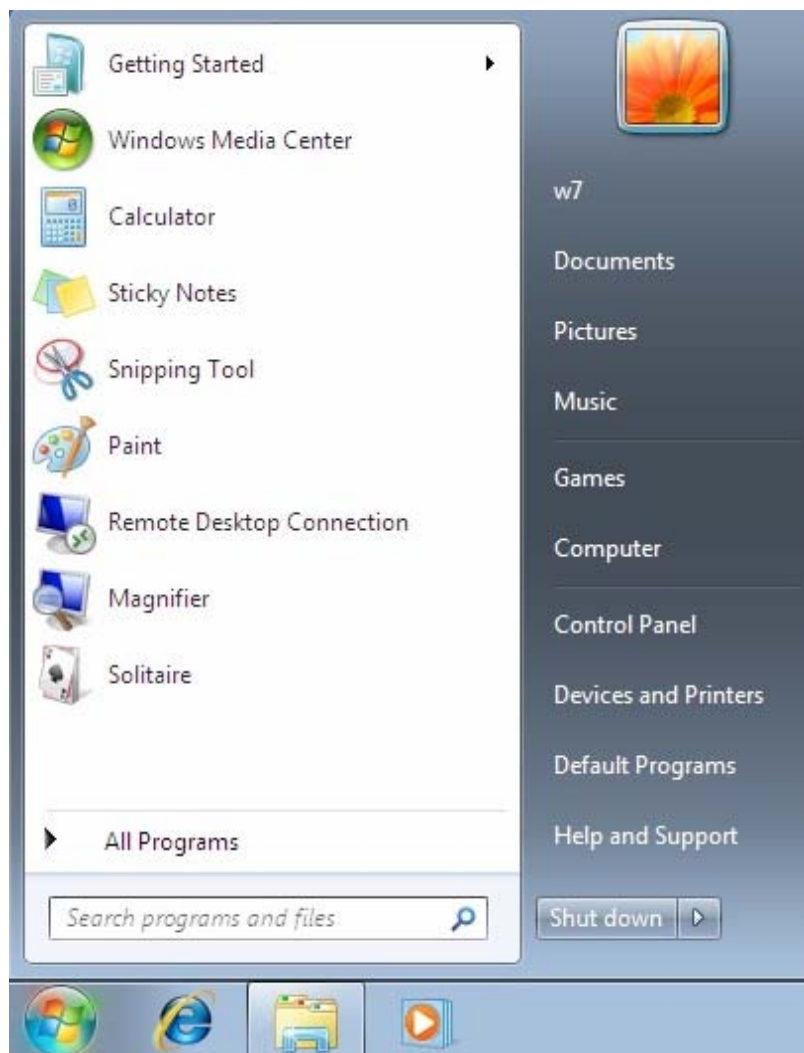
APPENDICES

Turning off UAC option

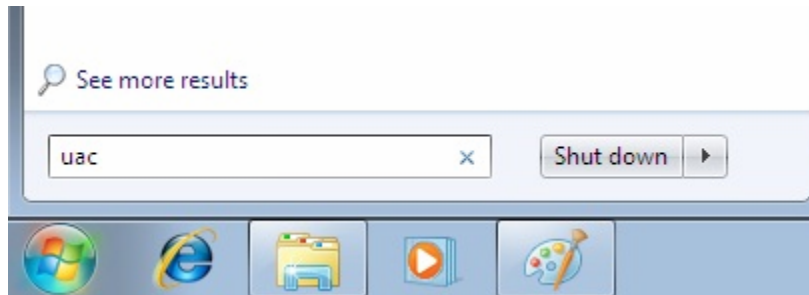
To correctly run the program under Windows Vista and Windows 7 (x86 и x64) and upper versions, it is necessary to turn off Windows UAC (User Account Control) option.

To do it, proceed as follows:

1. Run the operation system under the rights of the Administrator.
2. Click on the “Start” button to open the list of programs installed.

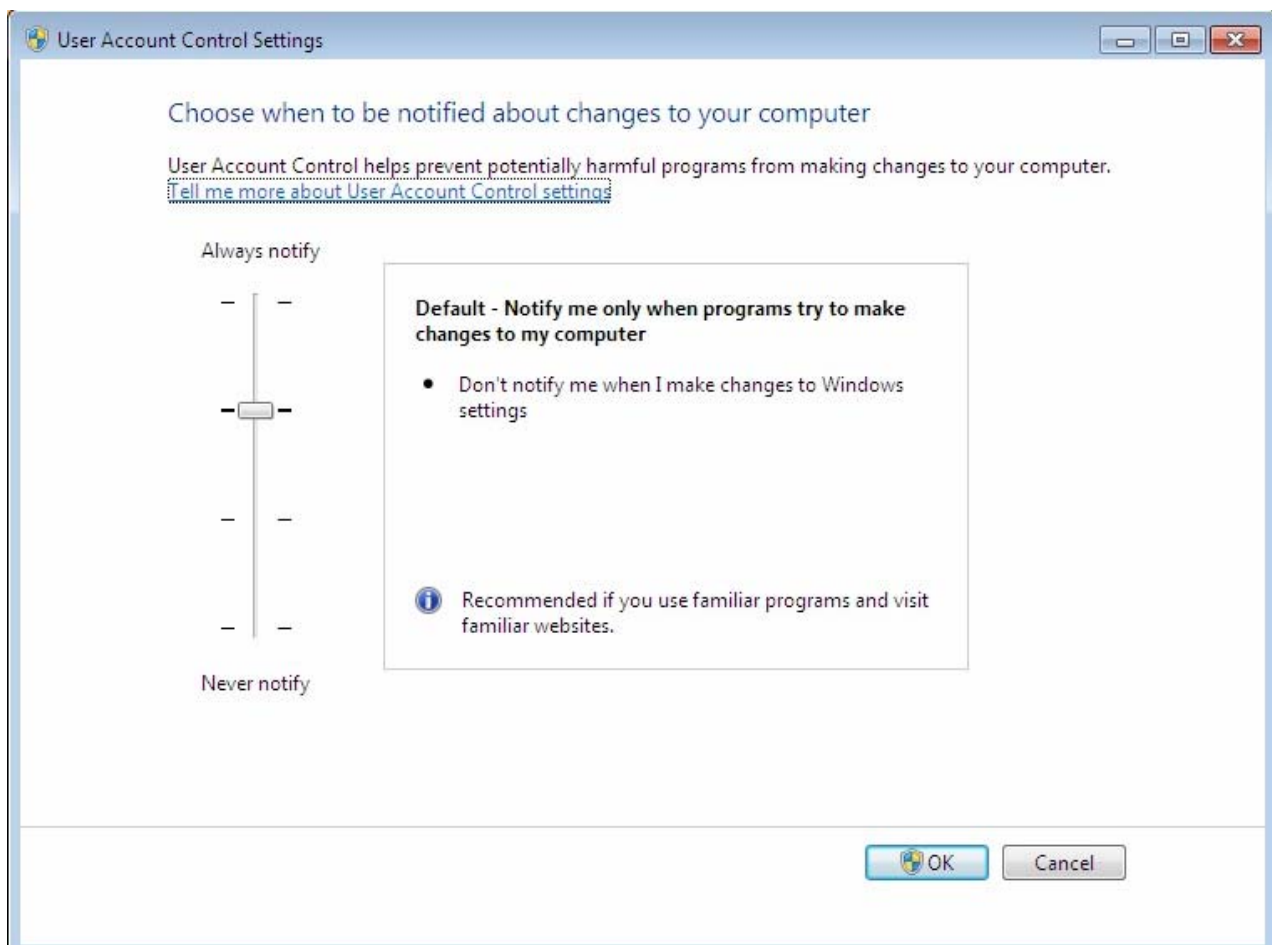


3. To launch the User Account Control manager, type in “uac” command (without quotes) in the “Search programs and files” field (under “All programs” option) and click on “Change User Account Control Settings” when it appears.

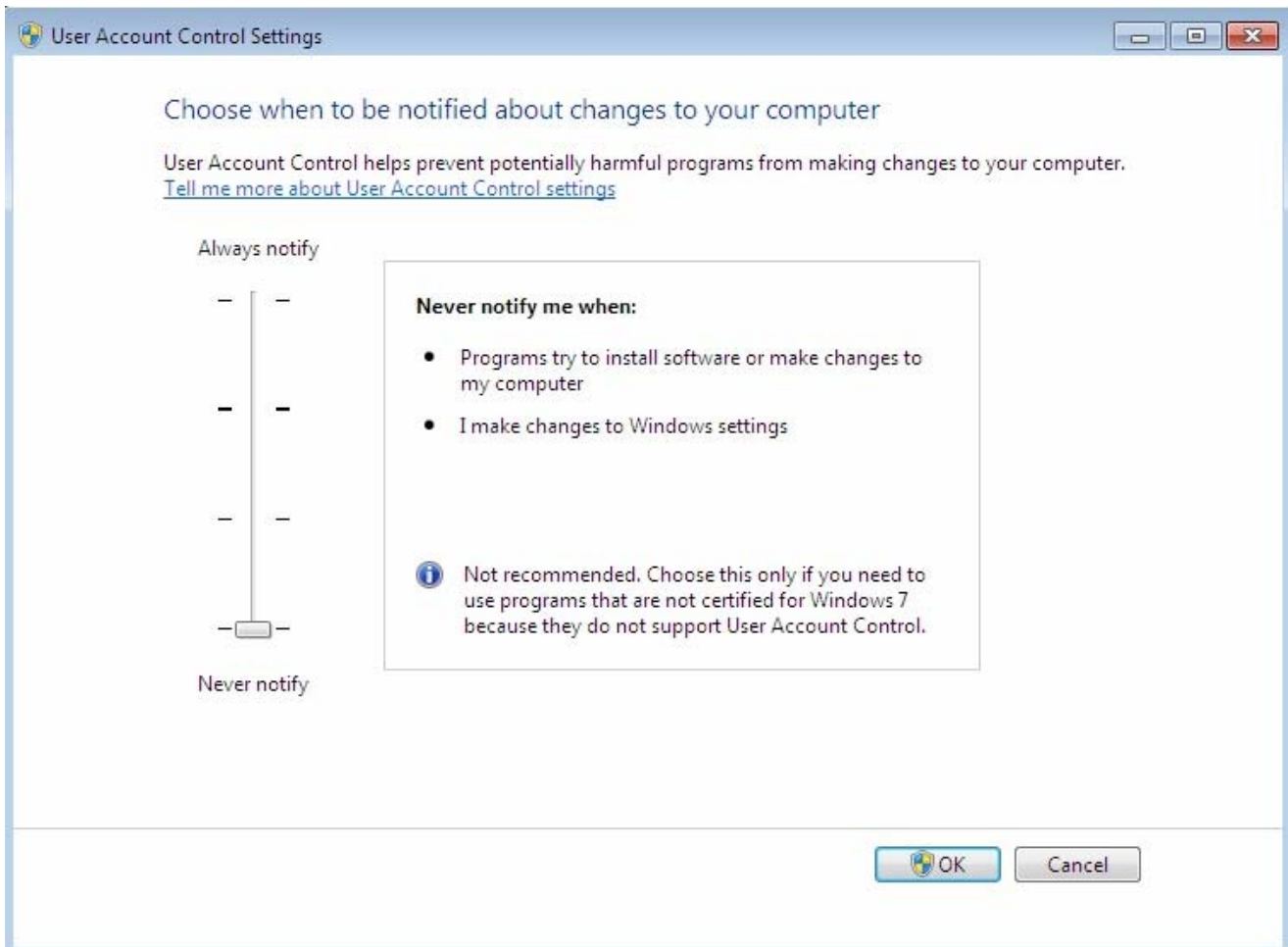


Another way to launch the UAC manager is to select “Control Panel” → “User Accounts” → “Change User Account Control settings” from the Start menu. Press ENT when ready.

4. The OS will open the User Account Control Settings dialog box. The scrollbar thumb shows the security level active at the moment.



- To disable the security control function, drag the scrollbar thumb to the low-
ermost position. This authorizes the user to change Windows System Parameters.



- Save the changes by clicking “OK”. The User Account Control Settings dialog box will be closed.
- Restart the computer to enable the changes.

TECHNICAL SUPPORT

Should any questions arise while installing or using the program, try first of all to find the answers in the documentation available. Commonly faced problems may well be solved by visiting Technical Support section of our Web site www.mars-energo.com.

Should you still need help after reviewing all of the available materials, contact us by E-mail mail@mars-energo.ru or by phone: +7 (812) 327-2111. We would greatly appreciate your providing our Technical Support group with the following information:

- Contact person (Name and Surname)
- Company's name
- Phone (fax, e-mail)
- Software version number (see the menu ?/About)
- Name and serial number of the reference instrument
- Description of the problem, including the complete text of error message (if there was any)
- Type of your PC
- Windows OS version
- Other information that you consider to be important.

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