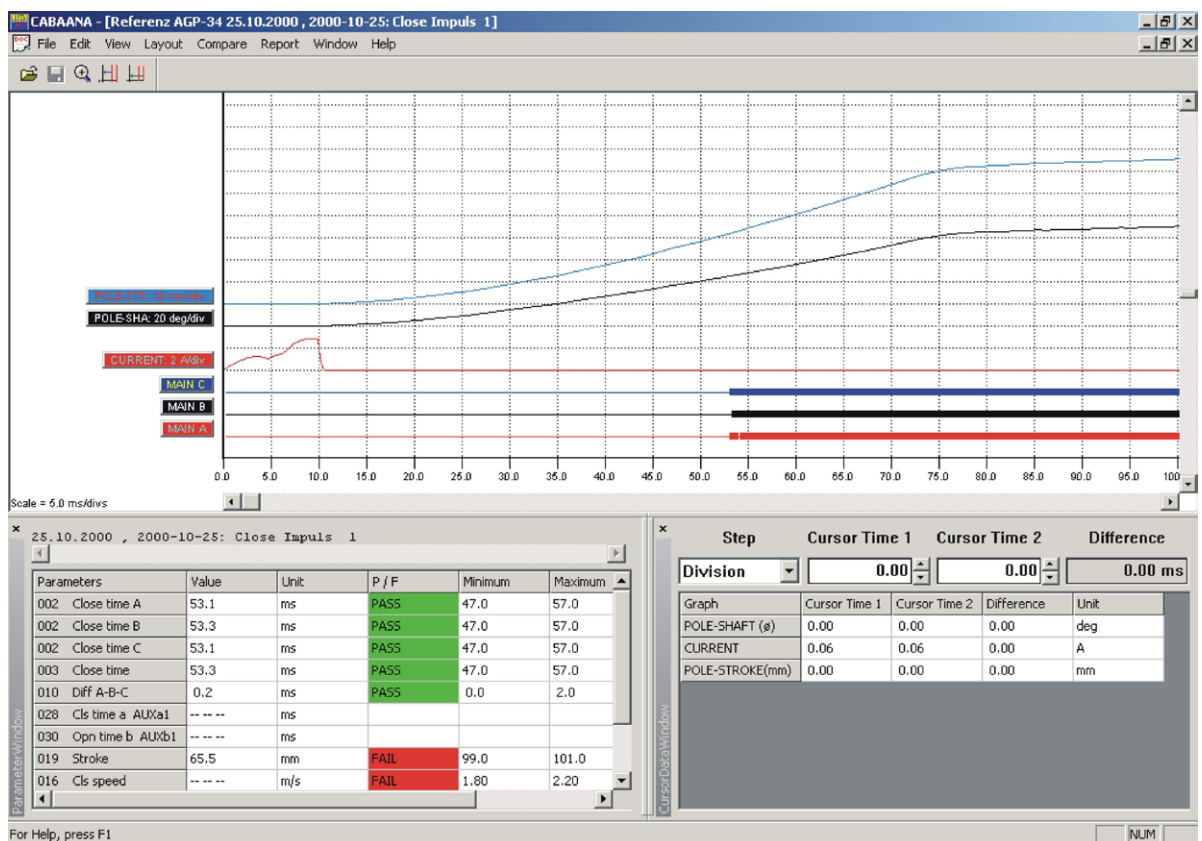


CABA Win

Windows® Software for Circuit Breaker Testing

User's Manual



Megger

WWW.MEGGER.COM

CABA Win

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User's Manual

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Postal address:

Megger Sweden AB
Box 724
SE-182 17 DANDERYD
SWEDEN

Visiting address:

Megger Sweden AB
Rinkebyvägen 19
SE-182 36 DANDERYD
SWEDEN

T +46 8 510 195 00 seinfo@megger.com
F +46 8 510 195 95 www.megger.com



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1

General information

1.1 User's registration

Please, send in the User's registration form to:

Megger Sweden AB

Box 724

SE-182 17 Danderyd

Sweden

By fax: +46 8 510 195 95

By e-mail: seinfo@megger.com

Note *It is very important that you register as a CABA Win user to get continuous product information and access to various improvements on your actual release.*

2 Installation

2.1 Computer system requirements

The recommended computer requirements are minimum PII 400 MHz, 512 MB RAM and screen resolution 1024 x 786. Check the requirements / recommendations for your operating system (including additional installed HW and SW). It is possible to run the program on a lower screen resolution but this will sometimes create vertical and horizontal scrollbars for accessing the full screen information and the short-cut buttons. Utilizing the "Auto hide" feature in the taskbar options minimizes this effect.

2.2 Installation of CABA Win

Version, R05A, of CABA Win is tested on and supported by following Windows versions:

- Windows XP with .NET 4.0
- Windows 7 Professional with .NET 4.0
- Windows 8 and 8.1 with .NET 4.0
- Windows 10

For instructions see document "Installation of CABA Win" delivered together with software CD.

2.3 PC communication

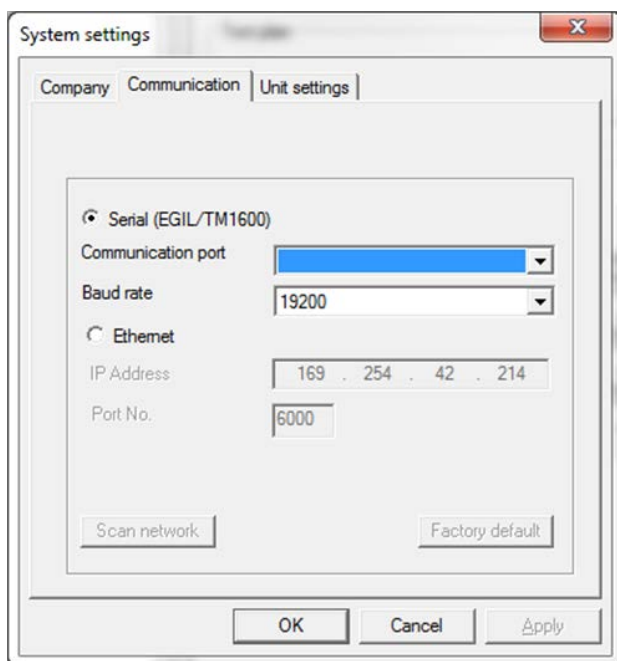
PC – TM1600 and EGIL

TM1600 and EGIL can be remotely controlled by CABA Win via serial port of PC.

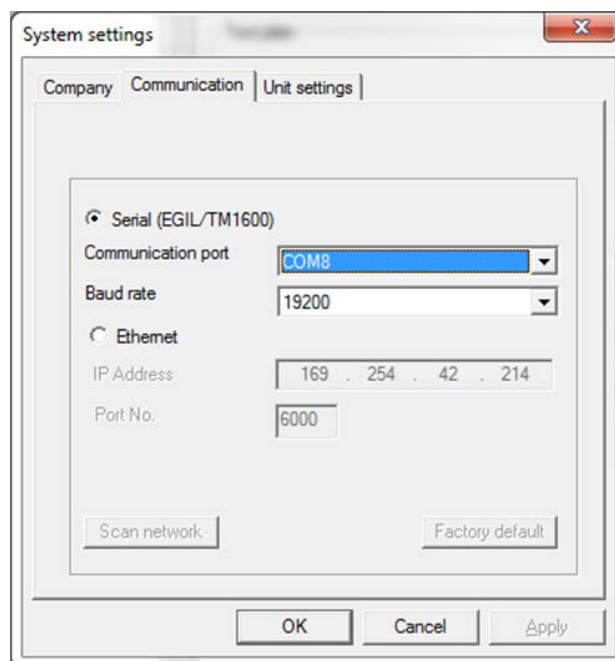
It is recommended that a MEGGER USB-fiber adapter (BL-90165) is used for communications with TM1600. USB-fiber cable requires installation of drivers, which can be found on CABA Win installation CD. EGIL requires the supplied USB cable.

The process of connection and communication is as follows:

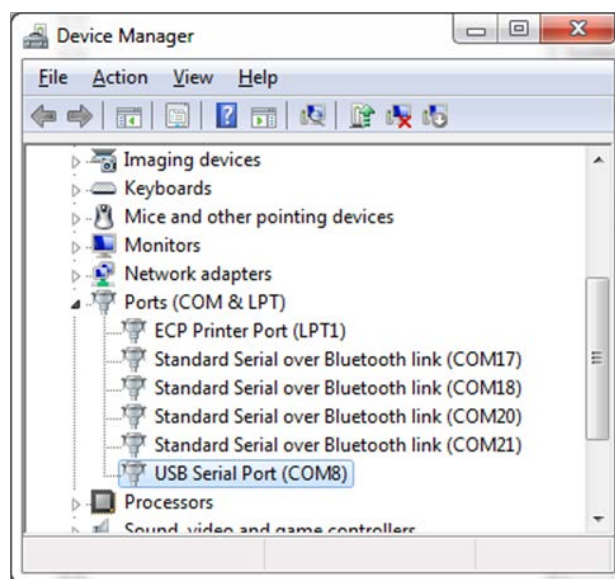
- 1] Connect the USB-fiber adapter for TM1600 or USB cable for EGIL between instrument and PC.
- 2] Start CABA Win
- 3] In "Options" select "System settings" and tab "Communication" as in picture below. Select "Serial" option.



- 4] In the drop down box select "Communication port" and click OK.



- 5] If in doubt which port is correct verify in the device manager:



- 6] Select or create new breaker and test.
- 7] Select recording to be performed.
- 8] Click button "New recording".
- 9] After the communication is established proceed with the measurement by turning the Measure knob on the breaker analyser.

PC – TM1700-series and TM1800

The TM1700-series and TM1800 use Ethernet connection.

If you have a TM1800 with S/N lower than 1300868 or a TM1700 with S/N lower than 1300060 it is recommended to use a USB to Ethernet adapter (Dongle)

at the PC side. We recommend to use a dongle with ASIX AX88772 chip. This can be ordered from Megger on part number HF-00030.

Note *Whether a dongle is required or not depends on the Ethernet adapter model in your PC.*

Installation of USB – Ethernet dongle

If it is the first time you use the dongle with the PC you need to install the driver.

Note *Do not use the driver that comes with the dongle.*

- 1] Make sure the PC is connected to Internet before you insert the Ethernet dongle into the USB port.
- 2] If you get prompted, choose the automatic search for the appropriate driver (Windows update).
- 3] Wait until the PC announces that the installation is ready.

Connect PC to test instrument

- 1] Interconnect the Dongle (or the PC's Ethernet port if you run without dongle) and the TM1700 / TM1800 with a "Cross over" Ethernet cable (delivered together with TM1700 / TM1800).
- 2] Wait for at least one minute to allow the connection to establish.
- 3] When the connection is up it will be shown:
On XP computers, "Limited or no connectivity" and an icon with a yellow triangle and an exclamation mark in the application bar in lower right of screen.
On Win 7 computers, "Unidentified network No internet access" with a yellow triangle and an exclamation mark in the application bar in lower right of screen.

Setting up the IP-address – Windows XP

- 1] Click on the icon with the yellow exclamation mark.
- 2] Choose "Support and Details..." to confirm that the PC has received an IP address that should be similar to "169.254.xxx.xxx".

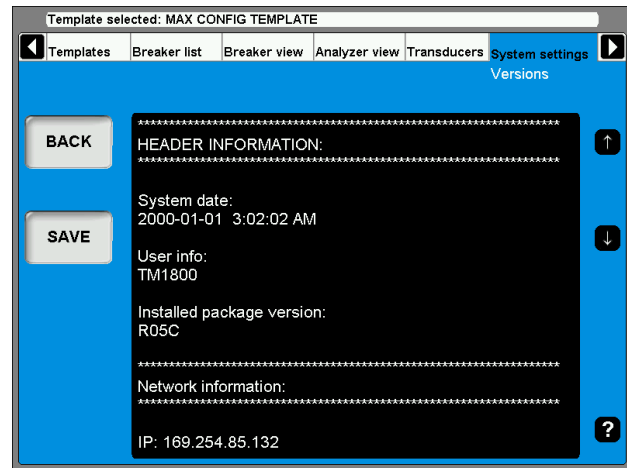
Setting up the IP-address – Windows 7

- 1] Click on the icon with the yellow exclamation mark.

- 2] Choose "Open Network and Sharing center" then "Local area connection x" and then "Details" to confirm that the PC has received an IP address that should be similar to "169.254.xxx.xxx".

TM1740/TM1750/TM1760/TM1800 IP address

If you have an instrument with screen you can also confirm that it has received an IP address by entering the "System settings" tab in CABA Local and pressing the "Versions" button.



Note *The Network connections in use, both in the instrument and in the PC, shall have the setting "Obtain an IP address automatically" (Factory default for TM1700 and TM1800).*

Connecting CABA Win to instrument

- 1] Start CABA Win.
- 2] Select "Options" -> "System settings..." -> "Communication".
- 3] Choose the "Ethernet" option.
- 4] Click the "Scan network" button.
- 5] If you get an alert from the Firewall you have to allow access for CABA Win to communicate on "Domain networks" and "Private networks".
- 6] Mark the instrument you want to work with (if more than one is connected to the local area network)
- 7] Click "OK".

3 Description

3.1 General concept

Effective circuit breaker maintenance requires accurate, comprehensive testing, and the ability to compare a circuit breaker's test results properly with previous test results is an important part of this. It must be possible to conduct tests in exactly the same way and under the same conditions as those conducted previously. Comparison can then provide a clear picture of any deviations and changes. Comparisons can be made between recordings done with different Megger analyzers.

The deviations or changes may indicate that the circuit breaker requires repair.

CABA Win can be used with the breaker analyzers: TM1800, TM1700-series, TM1600/MA61 and EGIL. CABA Win organizes all testing work and attempts to ensure that measurements are conducted in the same way for each object being tested. CABA Win then saves the results and generates the report. In the analysis section, you can work with a number of graphic windows, compare different measurements by overlaying graphs on each other in the same display, provide on-chart markings to clarify the presentation and use powerful zoom functions. CABA Win simplifies testing and ensures top-quality results.

CABA Win can be used for all applications, ranging from time measurement to dynamic resistance and vibration measurements. All settings are done automatically from the test plan provided for each circuit breaker. After a breaker is defined the first time it is tested, all of the data is kept together, thereby enabling CABA Win to step you through the test procedure in exactly the same way each time the circuit breaker is tested. This saves time, and since all tests are conducted using exactly the same settings regardless of who did the original testing, full and complete comparisons can be made from one test occasion to the next.

All test and circuit breaker data are saved together with the unique test plan. It is also possible to enter the results of tests done manually, and to enter separate comments for the breaker regarding the test in question. After the test, the circuit breaker with its tests can be moved to the database.

Each circuit breaker is given a unique identifier via user-defined ID fields. The way in which the breaker is to be tested is specified along with the electrical and mechanical data. The test plan is defined automatically, based on the specified test and breaker data.

The CABA Win system contains a number of different parts in one software package.

- CABA Test Plan Editor.
- CABA, where circuit breakers and tests are defined, measurements are conducted and results are analyzed and reported.
- CABA Remote for operating TM1700-series and TM1800 from PC.
- CABA Database where circuit breaker and test data are stored
- Accessory files for user's manual (PDF), multi-language facilities, report templates, test plans etc.

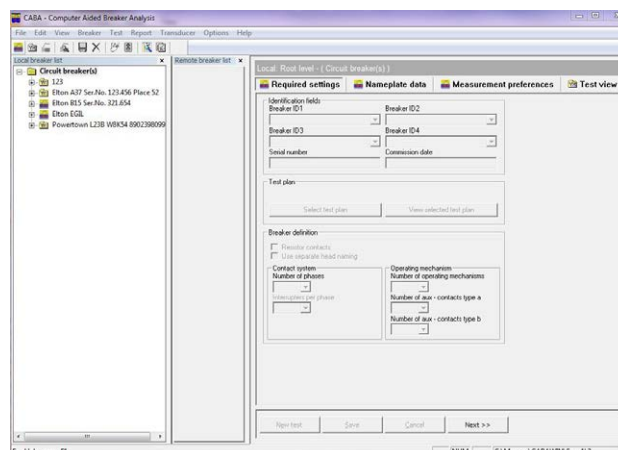
The following is a brief description of the general functions in the program. Descriptions of some standard Windows® functions have been omitted since it is assumed that users are familiar with the basic Windows® environment.

3.2 Terminology

- Recording** Recording of an operation. A recording consists of measured graphs, calculated parameters and notes (if entered).
- Operation** Breaker operation, e.g. Close, Open, Close-open, Open-close and Open-close-open. The measurement conditions are stored with the operation. Several recordings can be performed and stored for each operation. The set of operations is defined by the test plan and might vary between different test plans, for instance there might be operations named 'Close min. V', 'Close nom. V' or 'Open coil 1', 'Open coil 2' etc.
- Test** Test occasion, e.g. "Commissioning test". It is also good to include the date of test to keep structure and order. A test might comprise any number of operations with any number of recordings. Furthermore, manually entered data in text or numerical format and notes can be stored along with each test occasion.
- Breaker** Circuit breaker definition, containing test plan, breaker specific information and test data for each test occasion.
- Test plan** The test plan determines the activities to be performed for a test occasion, e.g. Perform recordings for Close, Open and C-O operation, fill out Main contact resistance in Manually entered data (Numerical) when the resistance is measured separately.

3.3 Start - Main view

The CABA Win starts showing the main view.



Top menu bar

File

New -> Breaker

Creates a circuit breaker definition in the circuit breaker list. You have to mark the root level in the breaker list to enable the function.

New-> Test

Creates a test occasion below the selected circuit breaker definition in the circuit breaker list. The option is enabled only if the breaker level in the breaker list is marked. Selecting the 'New test' option will automatically take you to the 'Test view' tab.

New -> Recording...

Initiates a recording session of the selected operation in the circuit breaker list. You can only make a new recording when the PC is connected to TM1600 or EGIL. The option is available only if the operation or recording level is marked in the breaker list.

Open -> Breaker list...

Opens a breaker list. You can organize your breakers in different lists.

Save

Saves the data you have entered/edited in the selected circuit breaker or test. The option is available only if any change has been done since last time save was performed.

Delete...

If a circuit breaker is selected:
Deletes the selected circuit breaker including its tests and recordings.

If a test is selected:

Deletes the selected test including its recordings.

If one or more recordings are selected:

Deletes the selected recording(s).

The option is available only if a breaker, test or recording is marked in the breaker list.

Load from database...

Browse and load circuit breakers from database to the currently opened breaker list.

Move to database...

Moves a breaker from the breaker list in CABA Win to the database. The breaker is deleted in the CABA Win breaker list and as a safety measure also copied to your recycle bin (if this is not deactivated in your Windows® setup). The option is available only if the breaker level is marked in the breaker list.

Export breaker

Exports the selected breaker to the location you browse to. Data format is *.arc. The option is available only if the breaker level is marked in the breaker list. You can only export one breaker at a time.

Note *The arc files can only be opened in CABA Win or CABA Local.*

Import breaker(s)...

Imports breaker(s) from the location you browse to. Data format is *.arc.

Note *The export/import path/directory names must not contain spaces.*

Open remote breaker list...

The program automatically scans for all TM1700 and TM1800 instruments connected to the same Local Area Network (LAN) as your PC, and shows them in the list.

1] Mark each instrument you want to establish connection with by clicking in the "Mapped" column, enter a name in the "Display name" column, and then press the "OK" button. The "Remote breaker list" window will appear on screen. The "Remote breaker list" contains a tab for each instrument mapped to the PC.

2] To access the breaker list in an instrument you have to right-click on its tab and select "Connect".

The breaker list will then appear in the "Remote breaker list" in CABA Win, and the instrument will show a grey screen with a message that it is in remote mode.

3] You can unlock the instrument either by pressing "Abort" on the instrument screen, or by right-clicking on the tab in CABA Win and selecting "Disconnect".

Note *You can use the "Refresh" button in the "Open remote breaker list" dialog to update the list if an instrument is connected to the network after you entered the "Open remote breaker list" dialog.*

If you are connected to a network that does not allow broadcast messages, you have to use the "Add" button to find an instrument. In this case you have to know the IP address of the instrument and type it in the "Add connection" dialog. See section 4.7 "Open remote breaker list" for more detailed description.

You can use 'drag-and-drop technique' to move breakers from a remote breaker list to the PC or the opposite way. Drag the selected breaker(s) to the root level of the target breaker list. You will then get a question whether you would like to 'Move' or 'Copy' the breaker(s) or 'Cancel' the operation.

If any of the drag-and-dropped breakers would already exist in the target breaker list you will get a message that the operation will be skipped for the breaker in question.

Test Plan Editor...

Test Plan Editor allows for creating a breaker with custom test plan. Existing breakers cannot be edited, however, new custom operations can be added. (See also chapter "7 TPE – Test Plan Editor" on page 52).

Exit

Exit CABA Win.

Edit

Duplicate breaker definition

Used when you want to create a new breaker with identical settings, including the graph settings, as an existing one. Breaker ID fields, tests and recordings are not copied. A breaker can only be duplicated in the local breaker list (PC) and not in a remote breaker list (TM1700 and TM1800).

Note *Only one breaker can be duplicated at a time.*

View

Toolbar

Views the toolbar when the option is checked.

Status bar

Views the status bar when the option is checked.

Local breaker list

Views the local breaker list (PC) when the option is checked.

Remote breaker list

Views the remote Breaker list (TM1700's and TM1800's breaker list) when the option is checked.

Available test plans

Opens the test plan list, where you can view, import and export test plans.

Required settings

Switches to the required settings tab.

Nameplate data

Switches to the Nameplate data tab.

Measurement preferences

Switches to the measurement preferences tab.

Test view tab

Switches to the test view tab of the selected test.

Refresh

After new breakers and/or tests have been defined or deleted/moved/imported, this function refreshes the list in alphabetical order.

Breaker

Add / remove parameters

Here, you edit the calculated parameters in the selected breaker. This can be done individually for each operation. Changes are only valid for tests created after the changes were done. The option is available only if the breaker level is marked. Editing parameter settings for an already created test can be done from the Test view.

Edit pass / fail limits

Used to specify the nominal, maximum and minimum values for each calculated parameter. Changes are only valid for tests created after the changes were done. The option is available only if the breaker level is marked. Editing pass / fail limits for an already created test can be done from the Test view.

Note *Add / remove parameters and Edit pass / fail limits are not available for operations created with CABA Test Plan Editor*

Test

View Recording(s)

Opens selected recording(s) for analysis.

Report

Report a test...

Reports the selected test. If there are several recordings for the same operation, the latest recording is reported. To get graphs in the report, "Generic graphs" must be activated, see section 8.4 "Reporting a test using List&Label@", 8.6 "Reporting with Word@" and section 8.7 "Reporting with Excel>". For description of the "Report a test" dialog controls, see section "Analysis window (CABAana)" "Report a test" below.

Transducer

Transducer list

Opens the transducer list, which is used to define and calibrate transducers and export/import transducer data and conversion tables.

Options

System Settings

Used to:

- specify company name and user defined labels and sort order for the first four fields in the breaker ID.
- set comport and baudrate for PC communication. + IP Address, "Scan network" for connected breaker analyzers.
- set system default measurement units.

Language

Set language for CABA Win and Database programs.

Help

About

Displays the version of the program.

Contents F1

Opens the on-line User's Manual.

Toolbar icons



Creates a circuit breaker definition in the circuit breaker list. You have to mark the root level in the breaker list to enable the function.



Creates a test occasion below the selected circuit breaker definition in the circuit breaker list. The option is enabled only if the breaker level in the breaker list is marked. Selecting the 'New test' option will automatically take you to the 'Test view' tab.



Initiates a recording session of the selected operation in the circuit breaker list. You can only make a new recording when the PC is connected to TM1700, TM1800, TM1600 or EGIL. The option is available only if the operation or recording level is marked in the breaker list.



View the selected recording(s)



Save



Delete



Add / remove parameters



Edit pass / fail limits



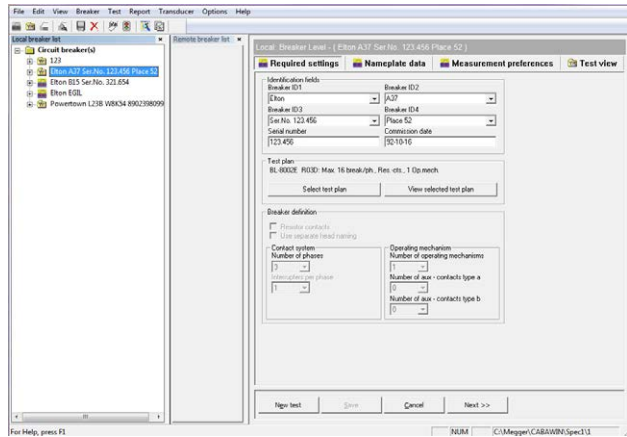
View available test plan(s)



Report current test

Local breaker list - Circuit breaker(s)

Circuit breakers and tests are displayed in alphabetical order in a file/tree structure. When you highlight a breaker, its data and settings are displayed in the first three tabs to the right. Highlighting a test (located below a breaker in the tree) causes the test identification tab to be shown. Selecting an operation (located below a test in the tree) causes stored recordings, if any, to be listed.



If you expand the breaker list tree below the selected test, all predefined activities that can be performed are shown, e.g. different breaker operations, notes etc. The keyboard entered parameters can be numerical, e.g. micro-ohmmeter readings, or text fields that may be used for various keyboard entries. All keyboard entered parameters, numerical and text, are available for reporting.

Previously performed activities are displayed in bold-faced characters in the tree (measurements as well as manually entered data and notes).

When you select an operation in the list, CABA Win shows the existing recordings.

All activities and definitions associated with the breakers and with measurement, analysis and reporting can be selected from this list. You can manage the list by mouse right-clicking in this part of the window. See "Top menu bar", "File" and "View" for description.

Remote breaker list

When connected to TM1700 or TM1800 you can read their breaker lists. You can also transfer data between a PC and the instrument. See "4.8 Open remote breaker list" on page 36.

Note *Measurements cannot be performed from the Remote breaker list. Testing from a PC can only be done in CABA Win Local breaker list.*

Local: Root level - (Circuit breaker(s))

Here are all settings, data, measurement preferences and a test view for the circuit breaker shown and editable.

Buttons at the bottom are:

New test

Creates a test occasion below the selected circuit breaker definition in the circuit breaker list. Clicking the *New test* button will automatically take you to the *Test view* tab.

Save

Saves the data you have entered/edited in the selected circuit breaker or test definition. The option is available only if any changes have been done since last time the breaker definition was saved.

Cancel

Discards the changes done in breaker view since the last time you saved the breaker or test.

Note *Change of test plan, parameters, Pass / fail limits or speed calculation point definitions are not restored with this cancel command.*

Next >>

Takes you to the next tab to the right. Clicking the *Next* button while you are in the *Measurement preferences* tab will cause the following:

- If the breaker does not contain any test a new test will automatically be created.
- If the breaker already contains tests you will be asked to either choose to create a new test or to select an existing test. If you choose to select an existing test the latest test will be selected by default.

Local: Breaker level - (XXXX)

When a breaker is selected in the "Local breaker list" its data are shown in the right part of the window. The data are sorted under three tabs: "Required settings", "Nameplate data" and "Measurement preferences". The fourth tab "Test view" contains data for the tests.

Required settings

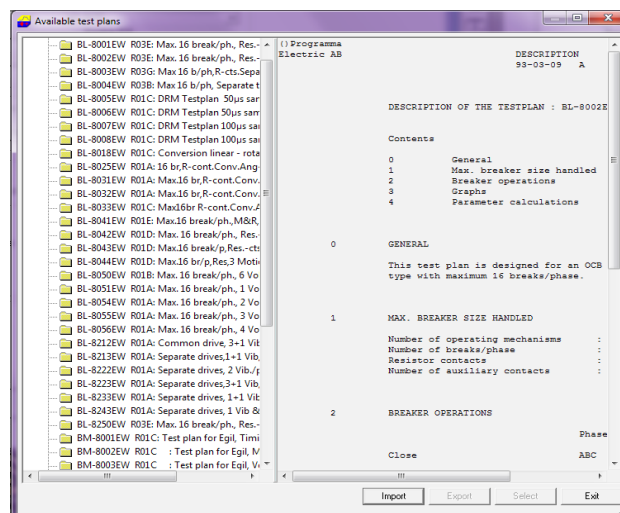
Identification fields

Each breaker is given a unique identifier (ID) in this window. The two top fields in both of the two columns are used for user-specific IDs. See section "System settings" how to change the labels.

The screenshot shows the 'Local: Breaker Level' window for 'Elton A37 Ser.No. 123.456 Place 52'. It has three tabs: 'Required settings', 'Nameplate data', and 'Measurement preferences'. The 'Required settings' tab is active, showing 'Identification fields' with dropdowns for Breaker ID1 (Elton), Breaker ID2 (A37), Breaker ID3 (Ser.No. 123.456), Breaker ID4 (Place 52), Serial number (123.456), and Commission date (92-10-16). Below is the 'Test plan' section showing 'BL-8002E R03D: Max. 16 break/ph., Res.-cts., 1 Op.mech.' with 'Select test plan' and 'View selected test plan' buttons. The 'Breaker definition' section has checkboxes for 'Resistor contacts' and 'Use separate head naming', and dropdowns for 'Number of phases' (3), 'Interrupters per phase' (1), 'Number of operating mechanisms' (1), 'Number of aux. contacts type a' (0), and 'Number of aux. contacts type b' (0).

Test plan

Use the "Select test plan" button to select or change test plan. Once you have selected a test plan the test plan ID and description is displayed here. Use the "View selected test plan" button to view a detailed description of the test plan attached to the selected breaker. The button is disabled if no test plan is selected.



Breaker definition

Here, you enter circuit breaker data that specifies the number of phases, operating mechanisms, main contacts and auxiliary contacts and also indicates whether or not times are to be measured for pre-insertion resistor contacts.

You can also choose to label a two-interrupter module as a head and the individual interrupters as Left and Right (Use separate head naming).

Nameplate data

Breaker nameplate

Technical data of the breaker for administrative purpose.

Close/Trip Coils

You can enter data for 2 close coils and 3 trip coils here. Select by clicking on the arrow in the desired field.

Units of measure

Selects the measurement units to be used for the circuit breaker. The units selected in "Systems settings" are used by default. Any changes made in this window affect only the selected breaker.

Measurement preferences

Options

Include coil current measurement

This option enables coil current measurement if it is applicable in the selected test plan.

Reference level

Here you specify the circuit breaker position that is used as the reference level (0-level) in graphic displays of test results.

Motion measurement

Include motion measurement

This option enables motion measurement if it is applicable in the selected test plan.

Nominal stroke

Specifies the nominal stroke length for the circuit breaker. This value is normally used when measuring with field-calibrated ("uncalibrated") transducers. The transducer is calibrated to the specified stroke length in the first single operation of a test. This method also goes under the name "Relative measurement". See chapter "Transducers".

Closing/opening speed calculations

You can specify calculation points for up to six different closing and opening speed calculations provided that the corresponding parameters are defined in the selected test plan.

Settings

Opens a window in which you define the speed calculation points. Two points define each speed calculation.

The upper point is defined as:

- a) Distance below closed position
- b) Distance above open position
- c) At contact touch / separation
- d) Time after / before lower point
- e) Distance above lower point
- f) Percentage of stroke below closed position
- g) Percentage of stroke above open position
- h) Angle below closed position
- i) Angle above open position
- j) Angle above lower point

The lower point is defined as:

- a) Distance below upper point
- b) Time before / after upper point
- c) Distance below closed position
- d) Distance above open position
- e) At contact touch / separation
- f) Percentage of stroke below closed position
- g) Percentage of stroke above open position
- h) Angle below closed position
- i) Angle above open position
- j) Angle below upper point

The default settings are:

Upper point: at contact touch / separation

Lower point: 10 ms before / after upper point

Damping points

Settings

Opens a window used to define the positions for calculating damping time.

The upper point is defined as:

- a) Distance below closed position
- b) Distance above open position
- c) At contact separation

The lower point is defined as:

- a) Distance below upper point
- b) Distance below closed position
- c) Distance above open position

The default settings are:

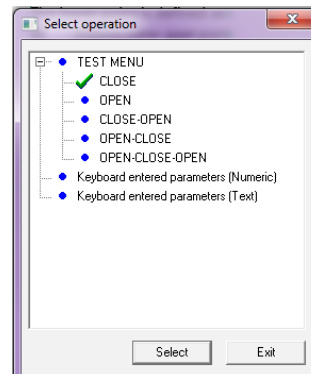
Upper point: Distance below closed position, 90 mm

Lower point: Distance above open position 10 mm

Parameter calculations

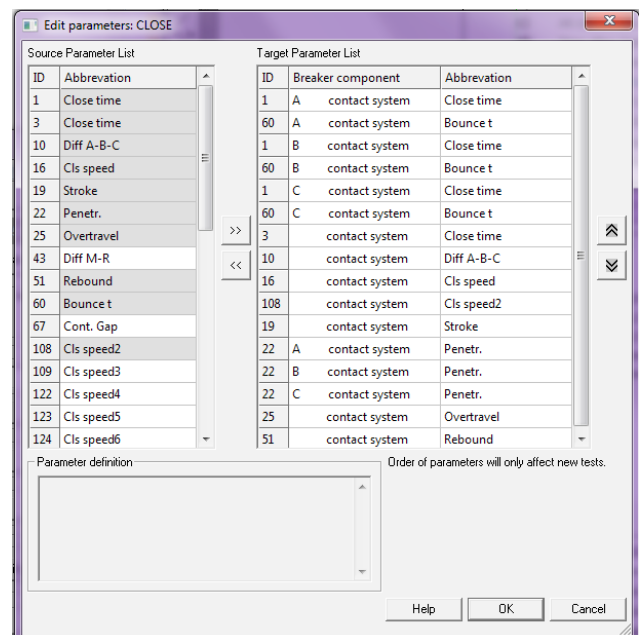
Add / remove parameters

Opens the "Select operation" window from which you select and edit calculation parameters for the selected operation.



Note *Operations created with the CABA Test Plan Editor are not possible to edit here and are therefore not shown in this dialogue.*

The readings that are to be calculated and presented are defined in each test plan. CABA Win makes it possible to delete and add parameters not specified in the original test plan. The source parameter list includes all parameters that can be calculated for the specific breaker/operation/connection. The target parameter list includes the parameters that are calculated in the existing/edited test plan.



Parameter changes in the test plan, done from this menu, will not affect existing measurements. The new adapted test plan with the changes implemented will be used from the next created test and onwards.

If you want to add / remove parameters in an already performed test you have to select the test first and

choose the "Add / remove parameters" button located in the "Test view" tab.

Right arrow

Adds selected parameters from the source parameter list to the target parameter list.

Left arrow

Deletes selected parameters from the target parameter list.

Up arrow

Moves the selected parameter up in the target list, which as well will affect the presentation order on screen.

Down arrow

Moves the selected parameter down in the target list, which as well will affect the presentation order on screen.

Cancel

Exits and sends you back to "Selection operation" without saving your changes.

OK

Exits and saves your changes.

Keyboard entered parameters (Numeric)

Add

Adds a new entry in the bottom of the parameter list. Double click in the "parameter" column to type or edit a parameter label, or copy/paste the parameter label from another line. Select unit and format from the drop-down lists.

Copy

Copies the selected entry.

Paste

Pastes the previously copied entry into the selected entry

Delete

Deletes the selected entry

Save

Saves changes

Exit

Exits the dialogue

Keyboard entered parameters (text)

Add

Adds a new entry in the bottom of the parameter list. Click twice in the "parameter" column to type or edit a parameter label, or copy/paste the parameter label from another line. Type the number of characters the

field should hold in the "Length" column, and the default text (if wanted) in the "Predefined" column.

Copy

Copies the selected entry

Paste

Pastes the previously copied entry into the selected entry

Delete

Deletes the selected entry

Save

Saves changes

Exit

Exits the dialogue

Edit pass / fail limits

Parameter	Minimum	Maximum	Nominal	Unit
Close time A	✓ 5	✓ 12	✓ 8	ms
Bounce t A	✓ 0	✓ 3	✓ 2	ms
Close time B	✓ 5	✓ 12	✓ 8	ms
Bounce t B				ms
Close time C				ms
Bounce t C				ms
Close time	✓ 5	✓ 12	✓ 8	ms
Diff A-B-C				ms
Cl's speed				m/s
Cl's speed2				m/s
Stroke				mm
Penetr. A				mm
Penetr. B				mm
Penetr. C				mm
Overtravel				mm
Rebound				mm

Here you can set limit values individually for each selected circuit breaker, test and operation. Test data from the TM1800, TM1700, TM1600/MA61 and EGIL as well as manually measured values can be processed.

Choose the desired item from the menu and click OK. Activate the parameters that are to be evaluated and enter the maximum, minimum and nominal values.

Pass / fail limit changes, done from this menu, will not affect existing measurements. The new changes will be used from the next created test and on.

If you want to edit pass / fail limits in an already performed test you have to select the test first and choose the *Edit pass / fail limits* button located in the *Test view* tab.

OK

Saves the entered values and takes you back to "selection of operations".

Cancel

Exits without saving.

Measurement time

Sets the measurement time for the different operations. Measurement times stated in custom designed test plans have priority over this value.

Open

Sets the measurement time for the open operation. The default setting is 100 ms.

Close

Sets the measurement time for the close operation. The default setting is 100 ms.

Close-open & open-close

Sets the measurement time for the close-open and open-close operations. The default setting is 300 ms.

Open-close-open

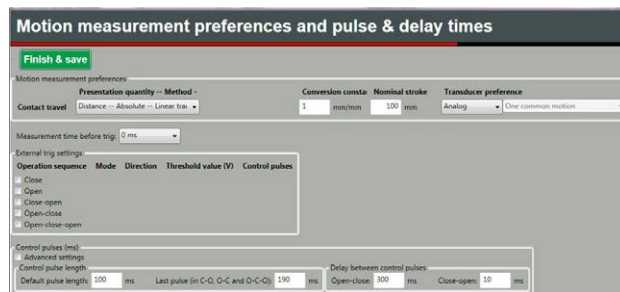
Sets the measurement time for the open-close-open operation. The default setting is 500 ms.

Test plan

Motion measurement preferences and pulse & delay times

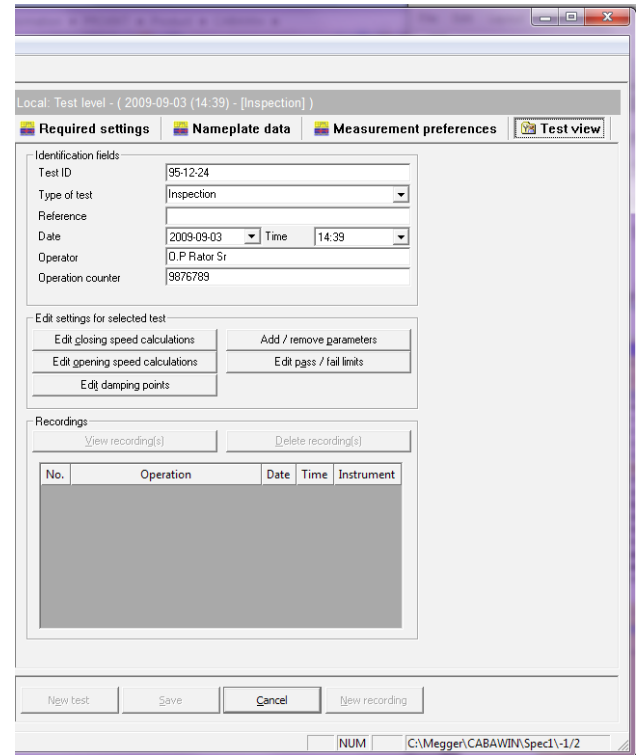
Motion preferences and pulse and delay times are altered in Measurement preferences tab by pressing button "Motion measurement preferences and pulse & delay times" which invokes a new dialog window (see below). Besides pulse and delay times for each operation it is possible to change transducer type, calibration, pre-trigger time and External trigger settings.

Transducer type can be Analog or Digital which are either absolute or relative. Depending on test plan the transducer will be either Linear or Angular. In case of Angular transducer a fixed conversion factor or a breaker specific conversion table is required.



When a conversion table is to be used, the appropriate table can be chosen by pressing the Select button and using dialog window browsing to the table.

Test view



Identification fields

There are seven individual fields/variables that can be used to identify a test.

In the breaker list, each test is automatically named by date and time followed by the contents of the "Type of test" field.

Note *When the new test ID has been entered you must use "Save" to store.*

Edit settings for selected test

You can edit closing/opening speed calculation points, damping points and pass/fail limits and add/remove parameter calculations for an existing test. After you have done your changes all recordings belonging to the test will be recalculated with the new values.

Recordings

View recording(s)

Opens the analysis window used to present the recordings. Mark the recording(s) to view and then press the View button. Several recordings can be viewed at the same time, each one in its own window. To open multiple recordings you have to select the recordings from the recording list in the test view (not from the breaker list tree). Click and drag over the recordings or use Shift + mouse click to select several recordings in a row or use Ctrl + mouse click to select or unselect single recordings.

Delete recording(s)

Deletes the selected recording. The option is only available if a recording is selected.

Buttons at the bottom of Test view

New test

To create a new test occasion for the current breaker. The option is enabled only if the breaker level in the breaker list is marked.

Save

Saves the data you have entered/edited in the selected test. The option is available only if any changes have been done since last time the breaker definition was saved.

Cancel

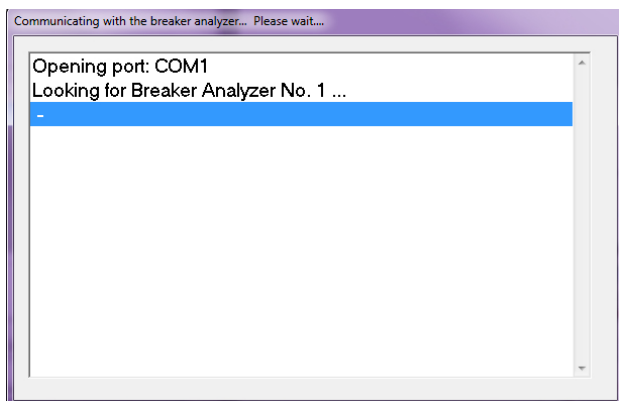
Discards the changes done in test view since the last time you saved the test. Exceptions: Change of parameters, pass / Fail limits or speed calculation point definitions are not restored with this cancel command. The option is available only if any changes have been done since last time the breaker definition was saved.

New recording

Starts communication with the breaker analyzer in order to conduct a new test. Mark the operation to perform and then press the *New recording* button. The option is available only if an operation or recording is marked.

Note *You are only allowed to perform recordings from the local breaker list (PC), not from the remote breaker list (TM1700 or TM1800).*

Communicating

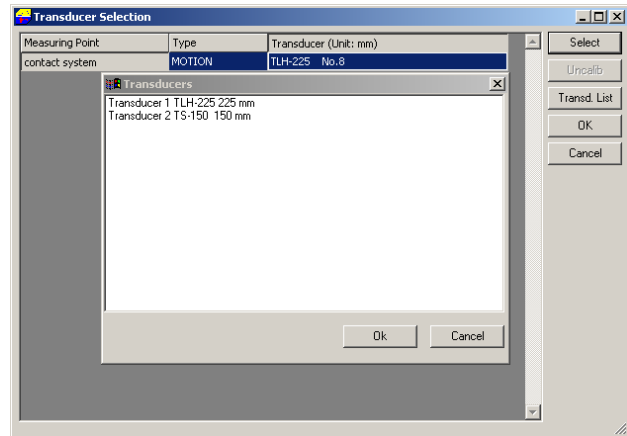


Shows that CABA Win has been connected to the breaker analyzer. The program searches for all units that are connected.

If you are using a TM1700 or TM1800 the CABA Win Remote window will be opened, see "4.2 Testing with TM1700 and TM1800" on page 31.

An error message is issued if communication cannot be established.

Transducer Selection



CABA Win asks which transducers are to be used for the different analog channels. Each transducer must be defined.

Select

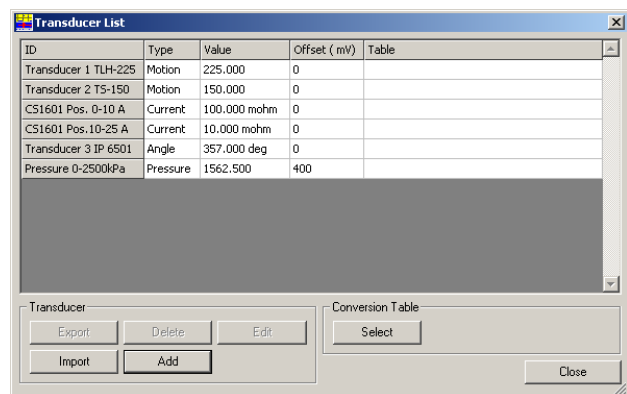
Select a transducer from the transducer list.

Uncalib

Only used for travel measurements when transducer is not calibrated. The measurement is made with reference to nominal stroke or as a relative measurement. Transducer is calibrated during the first single operation and nominal stroke is used as a calibration value.

Note *If the first recording fails (e.g. the breaker does not operate) and you are using "uncalibrated", you must double-click on "End the test" in the test menu and then start over again with "New recording" to get a correct calibration.*

Transducer List



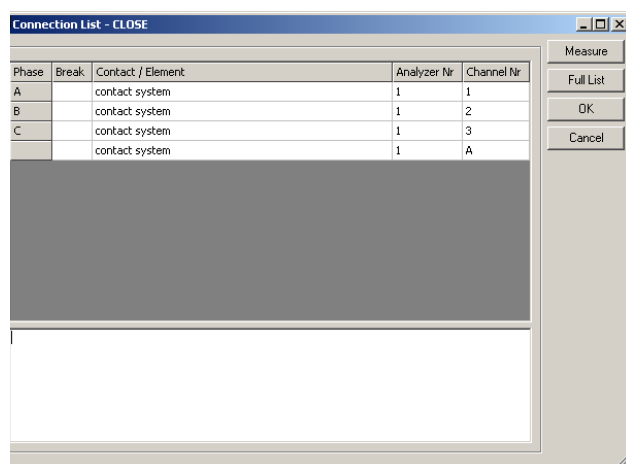
Opens the transducer list for defining a new transducer.

OK

Takes you to the connection list. Click the OK button after you have selected transducers for all items in the list.

Cancel

Returns to breaker list without performing the recording.

Connection list (TM1600 and EGIL)

CABA Win shows how to connect the circuit breaker analyzer to the breaker. If the list is empty, it indicates that the connection does not have to be changed from what was used for the previous measurement.

Measure

Opens the communication with the analyzer and waits for operating/triggering. After the measurement, data is automatically transferred to CABA Win.

Full list

If no changes in the connections from the last operation are necessary, the list is empty. "Full list" shows the complete list.

Save

Saves the changes you have done in the "Test instruction notes" entry. The file is located in CABAWIN Spec\XTTESTINST.

Cancel

Returns to breaker list without performing the recording.

Measure

CABA Win is activated/armed for measurement. The circuit breaker can be operated from the analyzer after "Ready" lights up on the TM1600/MA61 or after EGIL switches to the "Sequence Menu". The test results are transferred automatically to CABA Win. The program opens the analysis window and shows the results both graphically and as parameter values.

Note For TM1700 and TM1800 CABA Win Remote starts and breakers can be PC operated for measurements.

3.4 Analysis window (CABAana)

The test results are presented graphically and as parameter values here. The results can be analyzed in detail, and a report can be generated. In addition to the functions presented below, a number of Windows® functions are available (moving and editing windows and columns and using scrollbars for example).

The following functions are available in the instrument/analysis program:

File**Open Ctrl+O**

Opens a new recording. Double-click to select; breaker, test and recording.

Close

Close the recording in the active window.

Save Ctrl+S

Save new recording. If you exit without saving before, the program will ask if you want to save the recording.

Print

Open the printer dialogue box for printing the computer screen.

Print setup

Open the print setup dialogue box.

Exit

Exits

Edit**Notes...**

Used to edit notes for the selected recording.

Copy to clipboard -> Graph/Parameters

Copies the active/selected graph or parameter table to the clipboard for use in other programs.

Copy to file -> Graph/Parameters/Cursor data

Copies the graph/parameter list/cursor data of the active recording to the selected directory.

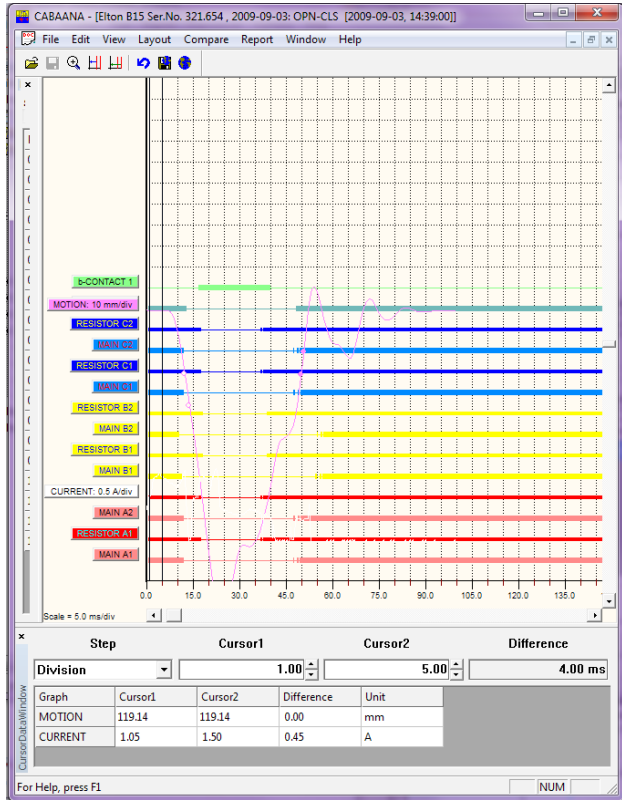
Reset cursor #1/#2

Puts the cursors to the 0 ms position.

View**Parameters**

Opens a parameter window used for measured/calculated parameters. To view all parameters use the scrollbar to the right to scroll the parameter window.

Cursor data



Opens an on-chart-marking window to facilitate detailed analysis. The two cursors can be moved with the mouse.

- 1] Click and drag with left mouse button, pick up at left edge of window.
- 2] Select cursor by clicking on Cursor 1 or Cursor 2. Movement steps are user-selectable.
- 3] To reset the cursors to time zero, use the icon buttons on the toolbar.

The table displays measurement values at time 1 and 2 and also the difference. Please Note that for the velocity graph the "difference" is instead the average velocity between the two cursor positions.

Speed calculation points

Select if the speed calculation points should be displayed.

Zoom in

Zooms the x-axis (time). Select zoom in, position the mouse at the left of zooming area, move the mouse to right of zooming area while holding down left button. Release left button. This function is also available on the tool bar.

Zoom out

Restores the display to the original setting.

Zoom in step

Position the area that you want to zoom in the center of the screen and select "View -> Zoom in step" or press the "Plus key" on the keyboard.

Zoom out step

Select "View -> Zoom out step" or press the "Minus key" on the keyboard.

Toolbar

Show/hide toolbar.

Status bar

Show/hide status bar.

Layout

Layout settings

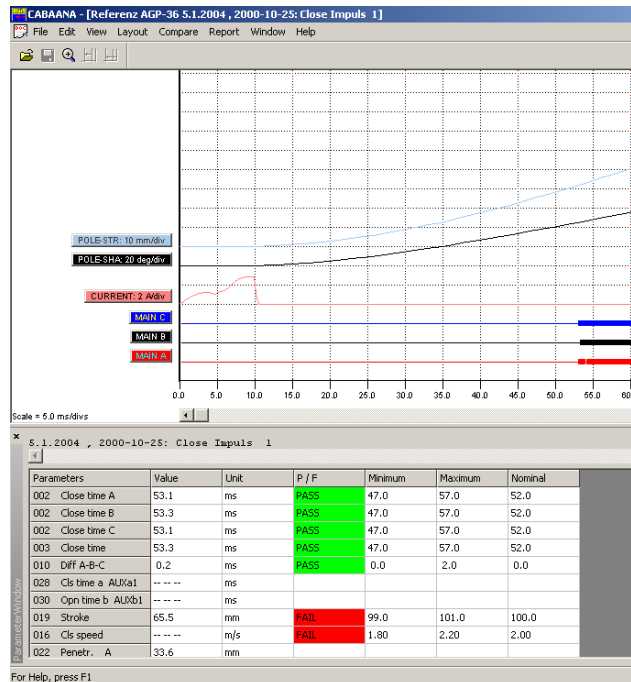
Opens a new window used for graph settings. On/off, colours, position, scaling, background colour etc.



Tip

It is also possible to change the display settings directly on the screen by right-clicking anywhere inside the graph window.

Pass/fail



Presents pass/fail results in the parameter list. The option is available only if the pass/fail function is activated for the test.

Undo layout changes

Restores the layout to the state it was at opening of the recording.

Apply global layout

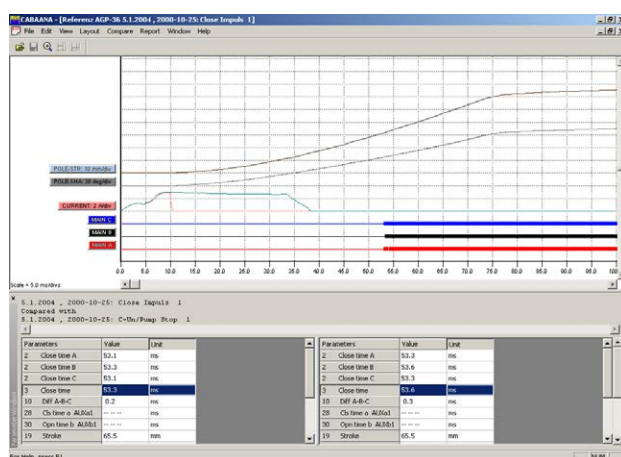
Switches the layout to the one saved with the "Save as global layout" command below.

The global layout can be applied to any breaker/test/operation you open. It is also automatically applied as default layout on operations in which layout settings are missing. This could for example be valid for new created breaker definitions.

Save as global layout

Saves the current layout settings as global layout.

Compare



The compare function overlays two recordings in the same graph. The arrow buttons in the upper right corner of the parameter window are used to scroll between possible comparisons (if any). In the top of the parameter window you can see the identity of the breaker, test and recording you compare with.

None

No comparison is made.

Within Test

Automatic selection of comparable recordings-within the same test. Example: You have made four recordings of the "open" operation. You view *Open 1* and select *Compare, Within test*. Now you can compare *Open 1* against *Open 2*, *Open 3* or *Open 4* by stepping between the recordings with the arrow buttons.

Between tests

Automatic selection of equal operations of different tests of the same circuit breaker. Example: There are three test occasions stored for a circuit breaker. Each test has "Close" recordings stored. You open up test 3, view the recording *Close 2* and select *Compare, Between tests*. Now you can compare *Close 2* of test 3 against the latest made "Close" recording of test 1 or test 2 by stepping between the recordings with the arrow buttons.

Free Selection

Free selection of comparisons.

DTW analysis

Performs Dynamic Time Warping Analysis between the active recording and a selected reference measurement. Select start time for the analysis and the reference recording. See section "Vibration Measurement and Analysis".

Note *This feature is only enabled if you have purchased the vibration analysis option for CABA Win.*

Report

Report a recording

Reports the active recording and its parameters in a table format. For more details please refer to chapter "8 Reporting", section "8.4 Reporting a test using List&Label®" section "Reporting from the analysis window" and section "8.6 Reporting with Word®".

Selecting the option will open the *Report wizard* dialog, which contains the following functions:

List&Label® report tab

Browse

Browse and select template. The template you select will be copied into the breaker, thus changes you make to this template only affect the selected breaker

New template

Open a new blank template.

Design template

Open the selected template for editing.

Note *The template you edit is valid only for this breaker, i.e. it is a copy of the original template.*

Print preview

Print preview of the report.

Print report

Print the report.

Delete template

Delete the selected template from the breaker.

Note *The operation will not delete the template from the "Report" folder located right below the folder where CABA Win is installed.*

Set as default template

Sets the selected template as default template for the breaker, among the preselected templates in the list. When the default template has the file extension ".lst" the List&Label® report tab will be selected by default.

Use monochrome graphs

Converts the graph to black and white.

Generic graphs

Use this option if the template is made for generic graphs, otherwise no graphs will appear in the report.

Save report preview

The preview file (*.ll format) will be stored together with the breaker and can be viewed in the database. Please Note that the preview file(-s) may take considerably disk space and default setting for this feature is "off" to avoid unnecessary use.

Use compression

Used in combination with the 'Save report preview' option in order to compress the preview file.

Exit

Close the dialogue box.

Word® / Excel® report tabs

Note *For Excel it is only possible to generate a report from "Report a test". A single operation cannot be reported.*

Browse

Browse and select template. The template you select will be copied into the breaker, thus changes you make to this template only affect the selected breaker

New template

Open a new blank template.

Design template

Open the selected template for editing.

Note *The template you edit is valid only for this breaker, i.e. it is a copy of the original template.*

Generate report

Generate the report.

Delete template

Delete the selected template from the breaker.

Note *The operation will not delete the template from the "Report" folder located right below the folder where CABA Win is installed.*

Set as default template

Sets the selected template as default template for the breaker, among the preselected templates in the list. When the default template has the file extension ".doc" the Word® report tab will be selected by default.

Use monochrome graphs

Converts the graph to black and white.

Generic graphs

Use this option if the template is made for generic graphs, otherwise no graphs will appear in the report.

Window**Cascade**

Cascades all open windows.

Tile

Tiles all open windows on full screen.

Help**About**

Displays the version of the program.

Contents F1

Opens the on-line User's Manual.

Graph Window**Labels**

Clicking on any of the graph labels will open a dialogue box used for making graph settings.

Right clicking on the graph background will open a dialogue box used for making display settings.

Lower Scrollbar

Changes x-axis offset.

Right Scrollbar

Changes y-axis offset.

3.5 Database

The database is where the circuit breakers (test objects) are stored together with their specifications and tests.

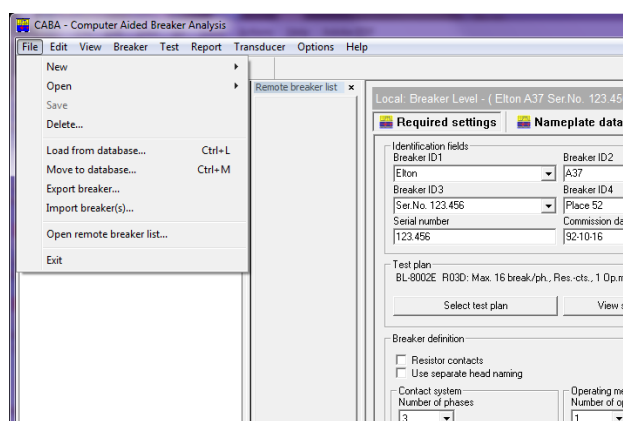
The database can be considered a passive archive where you can organize a large amount of data. CABA is the active part of CABA Win in which:

- a) breakers and tests are defined
- b) measurements (tests) are conducted and analyzed
- c) test results are reported

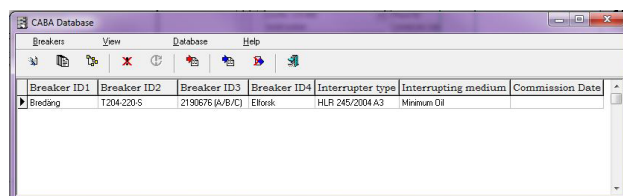
When all of this has been done, the breaker is moved to the database. The next time you wish to test the breaker, you retrieve it from the database and proceed with the new test.

Exporting test data to other users or central databases is another important function carried out in the database. Since CABA Database is based on Microsoft® Access®, other applications can obtain data using standard inter-database communication procedures.

- 1] Click "File" in the top menu .



- 2] Click "Load from database" and a list of all breakers in the database is shown.



This list can be sorted on any column by clicking on the desired column. Clicking a second time changes the sorting sequence from ascending to descending or vice versa. You can type letters or words for the field where the cursor is located. The cursor will move to the first circuit breaker that fulfils the conditions specified by the letter(-s) for the desired field. The contents of the columns displayed in the list are determined by the user as explained in section "Change Layout/selection".

If so desired, the contents of the database can be presented in a tree structure. This presents the circuit breakers, tests and test plans in a tree (Windows® Explorer) structure. When a breaker is highlighted, its data is shown. When a test is highlighted, its data is shown.



Tip

For selection and export/import/move breakers, matrix view is recommended.

Note

Circuit breakers are defined and edited in CABA Win. CABA Database is used for storing, organizing and exporting/importing breakers.

CABA Database menu	
Change Layout	Used to specify which data is to be shown in the columns and which selections to be used. 1] Double-click or select and use arrows to move variables between the fields. The selected fields can be moved in order by drag and drop.
Make selection	1] Mark one of the columns and proceed by selecting from the existing labels for all breakers. 2] Continue with selections for other columns if necessary and click "OK". Only the selected breakers will be displayed in the database.
Tree View	Displays the circuit breakers in the database in a tree structure while simultaneously presenting circuit breaker data and/or test data.
Grid View	Returns you to the grid-view display.
Delete Breakers	Deletes a circuit breaker or restores the most recently deleted breaker(-s). When a breaker is "deleted" it is still temporary stored and "undelete" restores all breakers that have been previously deleted. When the database program is closed, the deleted breakers are finally removed from the database.
Undo Deletion	
Import Breakers	Importing circuit breakers from the selected location. The selected breakers must have the same file format as in the breaker list in CABA Dos/ CABA Win.

Export Breaker	Export circuit breakers to the selected destination. Export file format is breaker list CABA Dos/CABA Win.
Move to CABA Win	Move selected circuit breaker(-s) to CABA Win. The breaker is deleted in the database.
Backup/Restore/Compact	Backup/restore function for the database. "Compact" invokes data packing (like "defrag" in your computer). Recommended after a lot of work with the database.
Exit CABA Database	Exits and returns to the CABA Win Main view.

Communication with other databases

CABA Database is based on Microsoft® Access®. Other applications can obtain data using standard inter-database communication procedures.

4 Using CABA Win

4.1 Testing with TM1600 and EGIL

- 1] Connect the computer to the circuit breaker analyzer using the optical fibre connection for the TM1600/MA61 or USB for EGIL (on old models RS232 connection).
- 2] Turn on the computer and start CABA Win from the Windows start menu (Megger\CABAWIN).
Turn on the breaker analyzer.
- 3] CABA Win presents a list of circuit breakers. Select the breaker that is to be tested or select "New Breaker", define a new circuit breaker and select an appropriate test plan.
- 4] Select "New Test" or, alternatively, select a previous test to continue on.
- 5] CABA Win presents a test menu. Select the operation that you want to measure or enter manually measured data and/or comments to the test. Activities carried out previously are displayed in bold-faced characters.
- 6] After you have selected the operation, CABA Win presents a list of previously conducted tests. Select an operation in the test menu and select "New recording".
- 7] CABA Win establishes communication with the breaker analyzer.
- 8] CABA Win asks which transducers are to be used. If a calibrated travel transducer has been defined and is to be used, select it from the transducer list by invoking "Select". If not, select "Uncalibrated", and then enter the nominal or measured stroke length of the breaker. Note that the nominal stroke length was often specified previously when the circuit breaker was defined. See also Chapter 6.
- 9] Select all other transducers to be used. If a transducer is not listed, define the new unit by selecting "Transducer list".
- 10] CABA Win presents a display instructing you how to connect the individual channels on the breaker analyzer to the circuit breaker.
- 11] Check that the operation, which was selected and highlighted in CABA Win, matches the operation that has been set on the breaker analyzer.

Note *The first recording with a new or changed travel transducer, position or test has to be a single operation (close or open).*

- 12] Before operating the circuit breaker, make sure that the breaker is in the right position.
- 13] Selecting the breaker operation sequence, setting the closing and opening pulse delay times (see the analyzer users manuals) and starting the operation sequence must all be done from the circuit breaker analyzer.
- 14] Select "Measure" and wait for the "Ready" light on the TM1600/MA61 to light up or for the display in EGIL to switch to sequence. Operate the circuit breaker from the breaker analyzer.
- 15] CABA Win reads the measured data automatically and presents the results graphically and in the parameter list.
- 16] Adjust the graphic layout if so desired. Colours, on/off, positioning, scaling, offset etc. can be adjusted by double-clicking on the label for the curve in question or by selecting "Layout". See also section "Analysis window".
- 17] Check and analyze the results. Additional measurements can be opened and displayed simultaneously. Zoom functions and on-chart markings/cursors can be selected using "View". Comparisons with other measurements can be made using "Compare".
- 18] Close the analysis window and save the measurements whenever desired.
- 19] CABA Win presents the tests conducted for this operation. Select "New recording" if the same operation is to be measured once again. If not, select another operation. Select "New recording" and continue measuring until all desired test results have been stored.
- 20] Conclude testing and disconnect the equipment. All results are stored so that you can analyze them further and prepare a report whenever desired.

4.2 Testing with TM1700 and TM1800

Ethernet connection

Note *If you have a TM1800 with S/N lower than 1300868 or a TM1700 with S/N lower than 1300060 it is recommended to use a USB to Ethernet adapter (Dongle) at the PC side.*

Note *We recommend to use a dongle with ASIX AX88772 chip. This can be ordered from Megger on part number HF-00030.*

Whether dongle is required or not depends on the Ethernet adapter model in your PC. If you find the connection to work without the dongle, it is perfectly ok to run in that way.

Installation of USB-Ethernet dongle

If it is the first time you use the dongle with the PC you need to install the driver.

- 1] Don't use the driver that comes with the dongle.
- 2] Make sure the PC is connected to Internet before you insert the Ethernet dongle into the USB port.
- 3] If you get prompted, choose the automatic search for the appropriate driver (Windows update).
- 4] Wait until the PC announces that the installation is ready.

Connect PC to test instrument

- 1] Interconnect the Dongle (or the PC's Ethernet port if you run without a dongle) and the TM1700 / TM1800 with a "Cross over" Ethernet cable (delivered together with TM1700 / TM1800)
- 2] Wait for at least one minute to allow the connection to establish.
 - When the connection is up it will say: on XP computers, "Limited or no connectivity" and show an icon with a yellow triangle and an exclamation mark in the application bar in lower right of screen.
 - on Win 7 computers, "Unidentified network No internet access" and show a similar icon.

Setting up the IP address

IP address XP

- 1] By clicking on the icon with the yellow exclamation mark and choosing Support and Details... you can confirm that the PC has received an IP address that should be similar to "169.254.xxx.xxx".

IP address Win 7/8.1/10

- 1] By clicking on the icon with the yellow exclamation mark and choosing Open Network and Sharing center and Local area connection x and Details you can confirm that the PC has received an IP address that should be similar to "169.254.xxx.xxx".

IP address TM1740/TM1750/TM1760/TM1800

- 1] If you have an instrument with screen you can also confirm that it has received an IP address by entering the "System settings" tab in CABA Local and pressing the "Versions" button

Network connection settings

Note *The Network connections in use, both in the instrument and in the PC, shall have the setting "Obtain an IP address automatically" (Factory default for TM1700 and TM1800).*

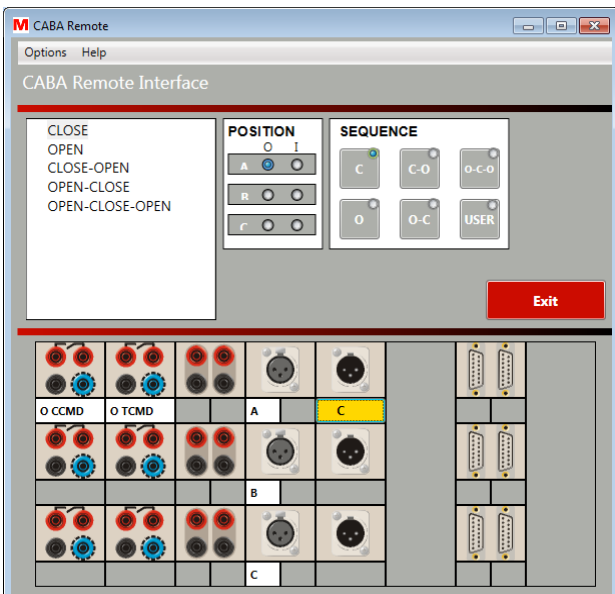
Connecting CABA Win to instrument

- 1] Start CABA Win
- 2] Select Options -> System settings... -> Communication
- 3] Choose the Ethernet option and Press the Scan network button
- 4] If you get an alert from the Firewall you have to allow access for Cabawin to communicate on Domain networks and Private networks.
- 5] Mark the instrument you want to work with (if more than one is connected to the local area network) and press OK
- 6] CABA Win presents a list of circuit breakers. Select the breaker that is to be tested or select "New Breaker", define a new circuit breaker and select an appropriate test plan.
- 7] Select "New Test" or, alternatively, select a previous test to continue on.

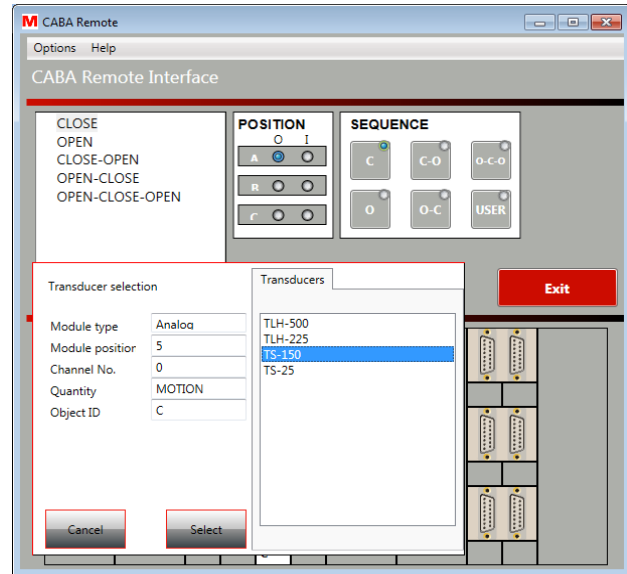
- 8] CABA Win presents a test menu. Select the operation that you want to measure or enter manually measured data and/or comments to the test. Activities carried out previously are displayed in bold-faced characters.
- 9] After you have selected the operation, CABA Win presents a list of previously conducted tests. Select an operation in the test menu and select "New recording"

Breakers which are created from test plans available in CABA Win (TM1600 and EGIL test plans) need to be adapted for measurements with TM1700/1800. When initiating new recording an intermediate dialog window opens where, if necessary, motion, pulse and delay settings can be altered. Even if nothing is changed it is mandatory to press "Finish & Save" in order to completely adapt the breaker for use with TM1700/1800. This step is performed only once for a new breakers, but it is possible to make changes in next tests by pressing button "Motion measurement preferences and pulse & delay times" in Measurement preferences tab and invoke this dialog, see page 21.

- 1] Select operation if needed, either from the menu to the left or from the SEQUENCE buttons on screen as well as at the instrument.
- 2] If a channel blinks yellow it means that a transducer has to be selected.
- 3] Channels in use has a label on a white background. In this example Close and Trip command, Timing of 1 break/phase and common motion.
- 4] Connect the instrument to the test object accordingly.



Transducer selection



- 5] Click on the channel and select transducer from your transducer database.
- 6] If the transducer database is empty you have to define your transducers in CABA Win Transducer list.

Operate and Operate / Measure buttons

- 7] You can view or hide the on-screen Operate and Operate / Measure buttons in the Options menu.
- 8] You can either initiate the operation / measurement by the rotary switches on the instrument or by clicking on the on-screen buttons keeping Ctrl-button pressed.

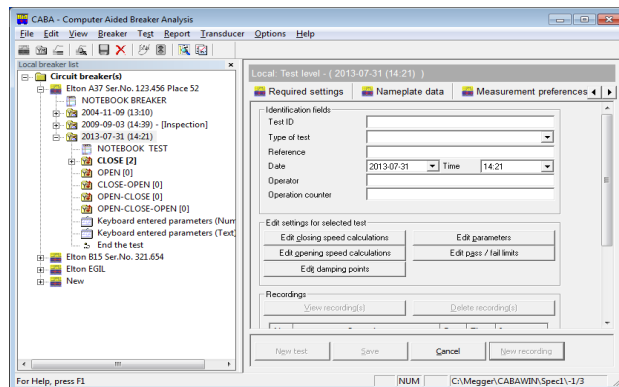
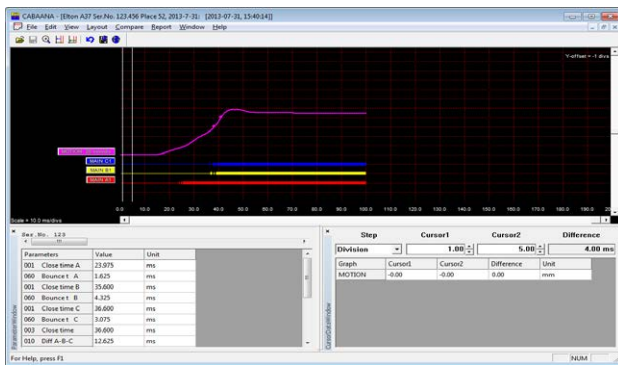
Auto-detect breaker state

- 9] You can enable and disable the Auto-detect breaker state function in the Options menu. With this function ON the POSITION indicators will reflect the state of the breaker.

The system will also warn if the selected operation is incompatible with the breaker state provided that the Auto-detect breaker state function is activated.

Measurement

After a measurement has been performed the result screen automatically appears.

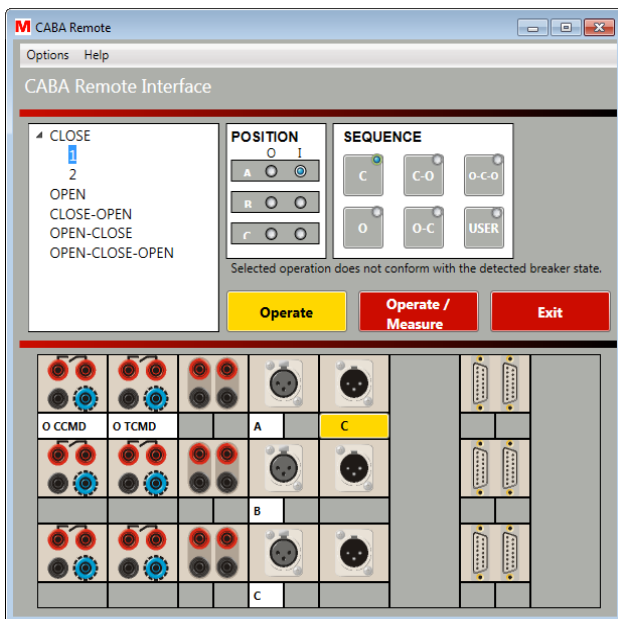


10] From here you can perform detailed analysis, comparison with reference measurements, report, etc.

11] When you are finished with the analysis, exit CABAANA and perform more measurements from the CABA Remote Interface.

View a recording

12] You can view a recording by double-clicking on the number below the operation in the left menu of the CABA Remote Interface



Exit CABA Remote Interface

13] When finished testing, exit CABA Remote Interface.

The Breaker list tree will automatically be updated with the new recordings made in the CABA Remote Interface.

14] You can continue as normal, from CABA Win, with analysis, comparison, reporting etc. of your new test results.

4.3 Evaluating previous measurements

- 1] Start CABA Win from the Windows start menu (Megger\CABAWIN), select "CABA". CABA Win presents a list of circuit breakers.
- 2] Select the breaker and test that are to be evaluated.
- 3] Select the operation and "View". The analysis window, which contains graphic and numeric data, appears.
- 4] Design the graphic display as desired.
- 5] If so desired, open additional measurements by selecting "Open" or "Compare".
- 6] Analyze the results by using the scaling and zoom functions, changing the window size and/or using the cursors.

4.4 Generating reports

- 1] Start CABA Win from the Windows start menu (Megger\CABAWIN), select "CABA". CABA Win presents a list of circuit breakers.
- 2] Select the breaker and test for which a report is to be generated.
- 3] Select the desired operation and recording and "View recording". The analysis window, which contains graphic and numeric data, appears.
- 4] Design the graphic display as desired.
- 5] Select "Report" and "report a recording". Select List&Label® report or Word® report tab.
- 6] The report generator asks you to specify the report template. Make your selection from the list or select "Browse" and go to another directory.
- 7] Select "Design template" if you wish to edit the report template (see Appendix C). If not, select "Print preview" (List&Label®) or "Generate report" (Word® report) and then, if everything is OK, select "Print".

Note *There are several report templates that fits all breakers and test plans in "report a recording", see chapter "Reporting".*

4.5 Report design

- 1] Go to the Main view.
- 2] Select any breaker, test, operation and recording and Click "View". Select "Report" -> "Report a test" and "List&Label", "Word report" or Excel report tab.
- 3] The report generator asks you to specify the report template. Make your selection from the list, or select "Browse" and go to another directory if there is a general report that you wish to use/edit. If not, select "New template".
- 4] Select "Design template" to edit the report form. If you want to design a template from scratch, select "New template". See chapter "Reporting" and Appendix C for details.
- 5] Store the template under a new name.



Tip!

Reports can also be designed from the analysis window in CABA Win.

4.6 Storing results/ database

- 1] Start CABA Win from the Windows start menu (Megger\CABAWIN), select "CABA".
- 2] Select the circuit breaker that you want to move to the database.
- 3] Select "File" and "Move to database".
- 4] The circuit breaker and all its test data will be copied to the database and deleted in your breaker list. As a temporary backup, the files are also copied to your recycle bin.
- 5] Proceed with moving the next breaker to the database.

4.7 Checklist to be run through before testing

Before you test a breaker you need:

- A Megger circuit breaker analyzer with a sufficient number of measurement channels.
- A computer that is running CABA Win.
- An Ethernet cable for TM1800/TM1700 or an optical fibre link for TM1600/MA61 or a USB cable (or RS232 cable) for EGIL
- Transducers — if time/travel or other analog values are to be measured.
- Timing and transducer cables.
- Mounting accessories for transducers.
- Cables for breaker operation, and information about how to connect them to the operating mechanism.

The breaker must be defined in CABA Win before testing starts.

You must:

- a) select a breaker in the list or
- b) define a new breaker or
- c) copy/edit and rename an existing circuit breaker.

If a calibrated transducer (and a conversion table) is to be used, it must also be defined in CABA Win before it can be selected for the test.

4.8 Open remote breaker list

Note *The remote breaker list can only be used together with a TM1800 or a TM1700 with screen.*

System requirements

TM1700-series

- TM1700 with screen

TM1800

- CABA Local R06A
- CABA Win R04D

Local Area Network (LAN)

- If both the PC and the TM1800 are connected to a Local Area Network (LAN), the LAN must have a DHCP server, which automatically assigns a dynamic IP address to each TM1800/TM1700 connected to the network. If your LAN does not have a DHCP server you might have to manually assign a static IP address to each TM1800/TM1700. Please see the section "Manually assign an IP address to TM1800" below.
- The LAN must allow broadcast messages otherwise CABA Win will not find the connected TM1800/TM1700 units automatically. For example, if there is a router in the LAN, broadcast messages may not come through. In this case you have to add the TM1800/TM1700 manually. Please see the section "Manually add a TM1800/TM1700" below.

PC directly interconnected to the TM1800 or TM1700 (w/o server)

Important

The network cable has to be a "Crossover, TP" cable.

- The PC network connection shall have the "Internet Protocol (TCP/IP)" setting: "Obtain an IP address automatically". See below 'How to check the network settings'.
- The TM1800/TM1700 network connection shall have the "Internet Protocol (TCP/IP)" setting: "Obtain an IP address automatically". See below 'How to check the network settings'.

Note *TM1800/TM1700 is delivered from the factory with the appropriate settings for this case.*

How to check the network settings

- 1] Press Ctrl+Alt+Del
- 2] Select "Task manager"
- 3] Select the "Applications" tab
- 4] Select "New task"
- 5] Type "Control" and click on "OK"
- 6] Double-click on "Network and Dial-up Connections"
- 7] Right-click on "Local Area Connection" and select "Properties"
- 8] Mark the "Internet protocol (TCP/IP)" item in the list of components and select "Properties"
- 9] Check your settings and make necessary changes

Manually assign an IP address to TM1800 or TM1700 with screen

- 1] Press ctrl+Alt+Del
- 2] Select "Task manager"
- 3] Select the "Applications" tab
- 4] Select "New task"
- 5] Type "Control" and click on "OK"
- 6] Double-click on "Network and Dial-up Connections"
- 7] Right-click on "Local Area Connection" and select "Properties"
- 8] Mark the "Internet protocol (TCP/IP)" item in the list of components and select "Properties"
- 9] Click on "Use the following IP address:"
- 10] Type in an IP address, e.g. 192.168.1.40.

Note *If you have more than one TM1800/TM1700 connected, the last group of digits in the IP address has to be unique.*

- 11] Type in a Subnet mask, e.g. 255.255.255.0.

Note *The Subnet mask has to be the same as you have on your PC.*

- 12] Click "OK" and "OK" again
- 13] You will receive a message saying that you have to restart your computer. Click "Yes".
- 14] The TM1800/TM1700 will now start up with the static IP address.

Manually add a TM1800 / TM1700

- 1] Connect the TM1800/TM1700 to the LAN using the network connector
- 2] TM1800/TM1700 must be completely started before attempting to establish a connection
- 3] In CABA Win, select "File" -> "Open remote breaker list".
- 4] If the TM1800/TM1700 does not pop up in the list, press "Add"
- 5] Type in the IP address of the TM1800/TM1700 and click "OK". If you don't know the IP address, see below: 'How to check the IP address'.
Note If you use a static IP address you have to make sure that the Subnet mask is the same in TM1800/TM1700 as in your PC. If you don't know the subnet mask, see below: 'How to check the IP address'.

How to check the IP address

You can do as below or open "Systems settings", see page 10.

- 1] Connect the TM1800 or TM1700 with screen to the LAN using the network connector
- 2] TM1800/TM1700 must be completely started
- 3] Press Ctrl+Alt+Del
- 4] Select "Task manager"
- 5] Select the "Applications" tab
- 6] Select "New task"
- 7] Type "cmd" and click on "OK"
- 8] Type "ipconfig" and press <Enter>
- 9] Now you can read the IP address and the Subnet mask.

How to use the "Open remote breaker list" function

- 1] Start CABA Win
- 2] Make sure that the PC and the TM1800/TM1700(s) are connected to the same Local Area Network (LAN), or that the PC and the TM1800/TM1700 are directly interconnected with a crossover TP cable, i.e a null modem cable.
- 3] Make sure that the remote units are switched on. TM1800/TM1700 must be completely started before attempting to establish a connection.

- 4] Select "File" -> "Open remote breaker list". The "Open remote breaker list" dialog opens and the TM1700 / TM1800 connected to the LAN or PC automatically pops up in the list. If not, please check the section "Fault tracing" below.
- 5] The "Status" column should say "Verified" on each line. If not, please refer to "Fault tracing" below
- 6] If you connect a TM1800/TM1700 to the LAN after you entered the "Open remote breaker list" dialog, you have to press the "Refresh" button. The program will then perform a new scan for TM1800/TM1700 units and list them in the dialog. The "Status" column should display "Verifying" a short while and then "Verified".
- 7] Click in the "Mapped" column for each remote unit (TM1800/TM1700 or PC) that you wish to connect to the PC, and type in a name in the "Display name" column. Click "OK".
- 8] The "Remote breaker list" window will automatically open and each mapped remote unit (TM1800/TM1700 or PC) will have its own tab.
- 9] To access the remote breaker list you have to right-click on the tab and select "Connect". The TM1800/TM1700's (or other PC's) breaker list will then appear in CABA Win and the TM1800/TM1700 will show a grey screen with a message that it is in remote mode.
- 10] You can unlock the TM1800/TM1700 either by pressing "Abort" on the TM1800/TM1700 screen, or by right-clicking on the tab in CABA Win and selecting "Disconnect".
- 11] All your connection settings, mapping, names, etc. will automatically be stored when you exit CABA Win.
- 12] Next time you start CABA Win the already mapped remote units will be shown in the "Remote breaker list" window, and CABA Win automatically attempts to establish a connection with each one of them.
- 13] The network icon on each tab indicates whether the communication succeeded (two computers) or failed (computer with cable crossed-out in red).
- 14] If the communication succeeded you can access the remote breaker lists by right-clicking on the tab and selecting "Connect".

**Tip!**

You can use 'drag-and-drop technique' to move breakers from a remote breaker list to the PC or the opposite way. Drag the selected breaker(s) to the root level of the target breaker list. You will then get a question whether you would like to 'Move' or 'Copy' the breaker(s) or 'Cancel' the operation.

Note If any of the drag-and-dropped breakers would already exist in the target breaker list you will get a message that the operation will be skipped for the breaker in question.

Connect CABA Win PC to other PC

It is also possible to use the "Open remote breaker list" function to connect one PC with CABA Win with another PC with CABA Win. This requires that you make some changes in the file "RemoteConnections.xml" located in the directory where CABA Win is installed and that you install the "TMService.exe" on the remote PC.

- 1] Install the TMService in the remote PC according to the section "Install TMService.exe" below.
- 2] Follow point 1 – 4 in the procedure above
- 3] The "Status" column will display "Unverified" due to that the remote PC has wrong user-name, password etc.
- 4] Click in the "Mapped" column and select "OK". The "Remote breaker list" opens and the tab belonging to the remote PC appears. The tab icon indicates that there is no connection by a computer symbol with crossed-out cable. You cannot right-click and select "Connect".
- 5] Shut down CABA Win
- 6] Open Windows Explorer and navigate to the directory where CABA Win is installed.
- 7] Open the file "RemoteConnections.xml" with Notepad.
- 8] Values for ComputerName, Display, MAC are already filled out by CABA Win. You have to fill out values for UserName, Password, ShareName and SpecPath according to the section "syntax for remoteConnections.xml" below.
- 9] Save and exit the "RemoteConnections.xml" after making the necessary changes

10] Make sure the folder or drive, of the remote PC, which CABA Win is installed in, is shared and has the same ShareName that you typed into the "RemoteConnections.xml". Refer to the section "Share folders" below.

11] Start CABA Win.

12] The icon of the remote PC's tab should now indicate that the connection is established.

Install TMService.exe

1] Make sure you have administrator rights on the remote PC.

2] Copy the file TMService.exe to the folder where CABA Win is installed on the remote PC. You can find the TMService.exe on TM1800/TM1700 D:\HMITMService.exe.
Note:The TMService.exe has to belong to TM1800/TM1700 software package R02K or later.

3] Press Ctrl+Alt+Del

4] Select "Task manager"

5] Select the "Applications" tab

6] Select "New task"

7] Type "cmd" and click on "OK"

8] Type the letter of the drive where CABAWIN is installed followed by colon (e.g. "C:") and press "Enter". No message will appear and the prompt will change to C:\

9] Type "cd\path to the folder where CABA Win is installed]" (e.g. "cd\Megger\CABAWIN") and press "Enter". No message will appear and the prompt will change to the typed path.

10] Type "TMService.exe Install" and press "Enter". No message will appear.

11] Close the command prompt window.

12] In the Windows Task Manager, select "New task"

13] Type "Services.msc" and click "OK"

14] Locate the "TM1800/TM1700 Broadcast Server" in the list, right-click on it and select "Start". The service will show "Started" in the Status column.

Syntax for RemoteConnections.xml

```
<RemoteConnection>
```

```
<Connection ComputerName="Computer name"
Display="Display name" MAC="nn-nn-nn-nn-nn-nn"
UserName="User name" Password="Password"
ShareName="Share name" SpecPath="?\Spec" />
```

```
</RemoteConnection>
```

ComputerName=	The entry is already filled out by CABA Win
Display=	The entry is already filled out by CABA Win. The value represents what you have named the connection in CABA Win
MAC=	The entry is already filled out by CABA Win
UserName=	Type, within quotation marks, the user name of the remote PC
Password=	Type, within quotation marks, the password (of the user name) of the remote PC
ShareName=	Type , within quotation marks, the share name of the folder in which CABA Win is installed (in the remote PC)
SpecPath=	Type, within quotation marks, the path to the SPEC directory from the level of the folder that is shared. E.g. if "C:" is shared and CABA Win is installed in: "C:\Megger\ CABAWIN" the SpecPath would be: "Megger\CABAWIN\SPEC"

Share folders

1] Press ctrl+Alt+Del.

2] Select "Task manager".

3] Select the "Applications" tab.

4] Select "New task".

5] Type "Explorer" and click on "OK".

6] Right-click on the folder or drive you want to share and select "Properties".

7] Select the "Sharing" tab and click on "Share this folder".

8] Fill out the "Share name" field and select "Apply" and then "OK".

Fault tracing

Fault 1

The "Status" column in the "Open remote breaker list" dialog displays "Unverified".

Possible causes

- A]** The remote unit (TM1800/TM1700 or possibly other PC) is mapped in CABA Win but it is not connected physically to the LAN or to the PC.
- B]** The remote unit (TM1800/TM1700 or possibly other PC) does not have the required folders shared. In TM1800 / TM1700 the D: drive shall be shared (Sharename: "DATA"), which it is when TM1800/TM1700 is delivered from the factory. If you are connected to another PC with CABA Win, the folder where CABA Win is installed shall be shared. Please also refer to the section "*Connect CABA Win PC to other PC*" above.
- C]** The remote unit (TM1800/TM1700 or possibly other PC) has wrong User name. The user name for the administrator account in the TM1800 / TM1700 has to be "*Administrator*", which it is when TM1800/TM1700 is delivered from the factory. If you are connected to another PC with CABA Win, you have to add the user name to an XML-file. See more the section "*Connect CABA Win PC to other PC*" above.
- D]** The remote unit (TM1800 / TM1700 or possibly other PC) has wrong Password for the administrator account. The password for the administrator account in the TM1800 / TM1700 shall be "energy" and this is how it is delivered from the factory. If you are connected to another PC with CABA Win, you have to add the password to an XML-file. See more the section "*Connect CABA Win PC to other PC*" above.
- E]** The TM1800/TM1700 has wrong subnet mask. Refer to section "*Manually assign an IP address to TM1800/TM1700*"

Fault 2

The error message "*Network problem! Make sure your network cable is connected and your network settings are correct.*" appears immediately when you select the "*Open remote breaker list*" option.

Possible causes

- A]** The PC is not connected to a LAN or to a TM1800/TM1700.

Fault 3

No TM1800/TM1700 pops up in the "*Open remote breaker list*" dialog.

Possible causes

- A]** The TM1800/TM1700 is not connected to the PC or to the LAN that the PC belongs to.
- B]** The LAN does not have a DHCP server. See section "*System requirements*" above.
- C]** There is a router, not forwarding broadcast messages, in the LAN. See section "*System requirements*" above.

Fault 4

The grey screen does not appear on TM1800/TM1700 after locking it from CABA Win.

Possible causes

- A]** The TM1800/TM1700 was not completely started when you attempted to establish the connection.

Fault 5

The "*Remote breaker list*" window is not shown on screen.

Possible causes

- A]** The "*Remote breaker list*" window is shut down. Select "*View*" -> "*Remote breaker list*".

5 Transducers

5.1 General

When measuring contact travel or other analog entities, some kind of transducer is needed. In order to maintain the accuracy of the measuring system, the calibration data for each transducer must be defined in CABA Win by the operator.

To make preparation easier, CABA Win provides a list of calibrated transducers, thereby eliminating the need to enter calibration data manually every time a transducer is used. Each transducer is given a unique ID, and the list contains the transducer's name and its calibration values.

It is also possible to link a conversion table to the transducer so that the transducer output data can be converted to the actual movement of the breaker. This is needed when there is no linear ratio between transducer movement and contact movement.

Note *This link between a conversion table and a transducer is only applicable at TM1600 / EGIL measurements using old type of test plans. When using a TM1700 / TM1800 test plan, a test plan created with CABA Test Plan Editor, or even a TM1600 / EGIL test plan converted to TM1700 / TM1800 style, the link to the conversion table is stored along with the breaker definition instead.*

When a transducer is used for a measurement, CABA Win automatically reads the calibration data and calculates the corresponding physical properties such as travel motion, current, pressure, vibration level and the like.

This chapter explains how to select an appropriate transducer and describes the different calibration procedures.

5.2 Importing transducers

To import transducers to CABA Win transducer list

- 1] Select "Transducer" and "Transducer list"
- 2] Select "Import" in the "Transducer" group
- 3] Browse to the *.db file from which you wish to import, and click "open"
- 4] Mark the transducers you wish to import by clicking in the left column and select "OK". (Initially all transducers are marked)
- 5] The selected transducers will be added into your current transducer list. If you import a transducer with the same name as an existing one, it will be added to the list without notice, i.e. two transducers with the same name will then exist in the list.

5.3 Exporting transducers

To export transducers from CABA Win transducer list

- 1] Select *"Transducer"* and *"Transducer list"*
- 2] Mark the transducers you wish to export and select *"Export"*
- 3] Browse to the desired target directory, enter a file name and select *"Save"*. The program will automatically add the extension *.db*
- 4] If the target file already exists you will get a question whether you would like to replace it or not.

5.4 Motion transducers

One of the most common ways to test a breaker is to perform motion measurements. Measuring travel motion provides much more information about contact travel and the damping phase than a conventional timing check.

Positioning of the transducer

When measuring motion, try to position the transducer as close as possible to the moving part that will be measured and also, if possible, at a position where there is a 1:1 ratio to actual contact travel – an ideal situation that simplifies both transducer calibration and the processing of output data.

However, on many breakers it is impossible to attach a transducer to the moving contact. Some users solve this problem by measuring the motion of another point on the breaker and using the result as a breaker footprint (signature) or as a reference measurement that can be compared with future test results. Unfortunately, this may make it more difficult to calculate parameter values that correspond exactly to the manufacturer's specifications.

Conversion tables

With CABA Win, there is a solution to the problem. If the ratio between the transducer attachment point and the moving contact is known, a conversion factor or conversion table can be used together with a calibrated transducer. CABA Win can thus reproduce actual contact travel and calculate the parameters properly.

Stroke

In CABA Win the breaker stroke is called the nominal stroke. This should be assigned to the breaker when the breaker is first defined. When testing a breaker, the assigned nominal stroke is used as the default value, which you can either confirm or change. This value is used for field calibration of the transducer.

Calibrated transducer

In CABA Win there are two transducer/method choices: *"Calibrated transducer"* (Absolute measurement) and *"Uncalibrated transducer"* (Relative measurement). The first uses a transducer defined in the transducer list, while the second uses a transducer defined at the test.

"Calibrated transducer" is to be used when the ratio between the actual contact travel and the measurement position is known, and the transducer has been

calibrated accordingly. The following situations can be encountered, depending on the design of the breaker:

A. Linear 1:1 ratio between contact travel and measurement position.

The transducer is calibrated to its actual length and can be used generally for different types of breakers. The presented result matches the actual contact travel.

B. Linear 1:X ratio between contact travel and measurement position.

The transducer is calibrated to the actual contact travel by adding a linear scale factor. The presented result comprises the contact travel calculated as the transducer travel multiplied by the scale factor. Here, the transducer can only be used for types of breaker having the same ratio between contact travel and measurement position.

C. Non-linear ratio between contact travel and measurement position.

The transducer is calibrated to its actual length and is defined in the transducer list together with a conversion table used to convert transducer motion to actual contact travel. The presented result comprises the contact travel calculated as the transducer travel multiplied by the conversion-table values (some test plans also present the transducer motion). Here, the transducer can only be used for the type of breaker defined in the conversion table being used.

Defining a digital transducer

- 1] From menu "Transducers" select "Transducer list", select "Add" and depending on transducer select either "Angle" or "Motion".
- 2] Select "Digital" under "Transducer type".
- 3] Enter the calibration values in the fields – "degrees" or "mm" and "pulses".
- 4] Type in a significant name for the transducer into the "Transducer ID" field.

Field calibration – Uncalibrated or Relative measurement (Nominal stroke used as reference)

When selecting an uncalibrated (field-calibrated) transducer, it must be calibrated at the test. This method can always be used, irrespectively of the breaker type and transducer position.

Note *When measuring with Uncalibrated transducer (Relative measurement) any transducer type (Linear or Rotary) can be used, however, the result will always be presented as distance vs. time.*

The breaker stroke (either nominal length as set forth in the breaker data or actual measured length) is used as the calibration value for the first operation and remains unchanged for subsequent measurements. The following situations can be encountered, depending on the design of the breaker:

A. Linear ratio between actual contact travel and measurement position.

The transducer is automatically calibrated to the specified breaker stroke. The presented result comprises actual contact travel.

B. Non-linear ratio between contact travel and measurement position.

Total transducer travel is defined automatically at the first operation as the specified breaker stroke. The presented result does not show the true contact travel trace. If the breaker manufacturer defined measurement and test data in the same way, a direct comparison can be made. If not, the measurement can be used as a footprint (signature) and compared directly with other measurements conducted in the same way.

Note *If the first recording fails (e.g. the breaker does not operate) and you are using "uncalibrated", you must double-click on "End the test" in the test menu and then start over again with "New recording" to get a correct calibration.*

5.5 Transducer calibration

Linear transducer

Equipment

- TM1800, TM1700, TM1600/MA61 or EGIL
- Transducer to be calibrated
- Calliper or folding ruler

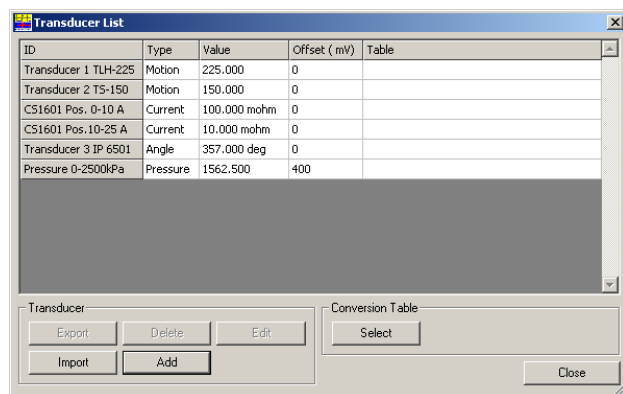
For TM1800 and TM1700 see respectively user manual for how to make the calibration.

For a TM1710/20 you can only write the values:
0 mm - 0 mV and transducer length (mm) - 4095 mV.

Preparations

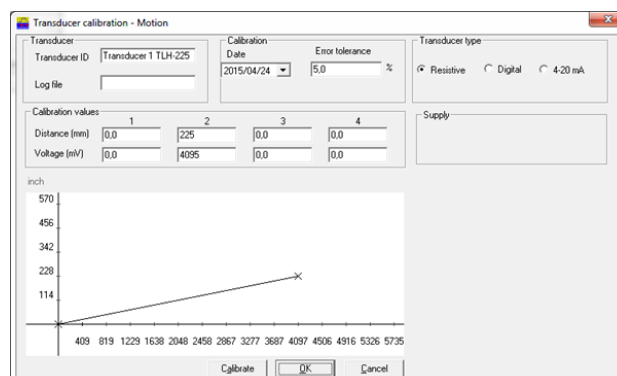
- 1] Connect the transducer to one of the analog channels on the analyzer.
- 2] Set the channel to 0-4 V voltage measurement (see TM1600/MA61 users manual). For EGIL, set the Analog channel to Voltage mode and External voltage divider to 1:1.
- 3] Measure the voltage output at a maximum of four positions along the transducer. Try to get very accurate readings of position and output voltage. Try to avoid the absolute end positions of the transducer.
- 4] Note the values or enter them directly into CABA Win.

Calibration procedure



- 1] Select "Transducer" – "Transducer list" to reach the transducer list.
- 2] Select "Add" and "Motion".
- 3] Type in the calibration value(-s) and the desired error tolerance.
- 4] Select "Calibrate". Calibration takes place, whereupon the display indicates whether or not the accuracy

condition was met. If not, change the error tolerance and try to calibrate again.



You can choose transducer type such as "Resistive", "Digital" or "4-20 mA".

Note *Digital and 4-20mA transducers are not compatible with TM1600 or EGIL.*

Motion transducer with scale factor

For many breakers it is impossible to attach the transducer directly to the moving contact. The true stroke can still be measured with a simple calibration procedure if the breaker has a known linear ratio between transducer position movement and contact travel.

Note *TM1700 / TM1800 test plans and test plans created with CABA Test Plan Editor have the linear scale factor integrated with the Breaker definition, thus, a special transducer definition is not necessary needed in such case.*

Note *This type of transducer calibration is only valid for circuit breakers/transducer positions having the same ratio.*

Angular transducer

The procedure is the same as for a linear transducer, but here you specify an angle instead of a position.

For TM1800 and TM1700 see respectively user manual for how to make the calibration.

For a TM1710/20 you can only write the values:
0° - 0 mV and transducer angular span (°) - 4095 mV

Note *A special kit is available for calibrating an angular transducer.*

If there is a known (linear or "accepted") ratio between rotation and contact travel you can calibrate a rotary transducer as a linear transducer for direct measurement of contact travel.

Note *In CABA Test Plan Editor you can set the conversion factor between measured angle and presented distance making the special transducer definition unnecessary. The ratio is then stored along with the Breaker definition instead of in the transducer database.*

- 1] Determine the ratio between rotation and contact travel (e.g. 2.5 mm/degree).
- 2] Select "Transducer" – "Transducer list" to reach the transducer list.
- 3] Select "Add" and "Motion" (assigning the rotary transducer as a linear transducer).
- 4] Enter the calibration values in mm by multiplying the values in degrees with the actual ratio mm/degree. Set an appropriate error tolerance.
- 5] Select "Calibrate". If the accuracy conditions were not met, change the error tolerance and try to calibrate again.

Current transducers

The calibration procedure is as follows:

- 1] Select "Transducer" – "Transducer list" to reach the transducer list.
- 2] Select "Add" and "Current".
- 3] Type in the calibration value for the current shunt.
Use the data specified for the shunt or measure the output voltage at the defined current.

Pressure transducers

The procedure is the same as for a linear transducer, but here you specify a pressure instead of a position.

For TM1800 and TM1700 see respectively user manual for how to make the calibration.

For a TM1710/20 you can only write the values:
kPa - 0 mV and transducer pressure span (kPa)
- 4095 mV

The calibration procedure is as follows:

- 1] Select "Transducer" – "Transducer list" to reach the transducer list.
- 2] Select "Add" and "Pressure".
Measure a maximum of four output voltages from the transducer for pressures measured to a defined accuracy or, alternatively, use calibration data supplied by the manufacturer.

- 3] Type in the calibration value(-s) for the transducer and the desired error tolerance.
- 4] Select "Calibrate".
Calibration takes place, whereupon the display indicates whether or not the accuracy condition was met. If not, change the error tolerance and try to calibrate again.

Voltage transducer

The calibration procedure is as follows:

- 1] Select "Transducer" – "Transducer list" to reach the transducer list.
- 2] Select "Add" and "Voltage"
- 3] Type in the calibration value for the voltage transducer.

Vibration transducer (accelerometer)

The calibration procedure is as follows:

- 1] Select "Transducer" – "Transducer list" to reach the transducer list.
- 2] Select "Add" and "Vibration".
- 3] Type in the calibration value for the transducer set forth in the manufacturer's specifications.

Note *If an absolute value is to be measured, the gain setting for the signal conditioning amplifier must be included, and a separate transducer with a unique ID must be defined for each gain setting (multiply the output voltage with the gain setting).
If an absolute value is not necessary, the transducer may be calibrated as set forth in the manufacturer's specifications (Gain=1)*

5.6 Conversion tables

General

On many breakers it is impossible to attach the transducer to the moving contact. In such cases it may be difficult to calculate parameter values that correspond to the manufacturer's specifications. With CABA Win, there is a solution to this problem. If the relationship between the transducer attachment point and the moving contact is known, a conversion factor or a conversion table can be used. CABA Win will then be able to reproduce actual contact travel and calculate the parameters properly.

Please Note that special test plans are needed when using conversion tables. Contact your Megger representative for information on available plans and tables.

Creating a conversion table

The conversion table recalculates the transducer output at any given position to the true contact travel. A conversion table is used most frequently to convert from angular measurements to linear motion.

Conversion tables can be ordered from Megger. There are a number of tables for different circuit breakers and mechanisms available and if needed a breaker/transducer-specific conversion table can be prepared. To create such a conversion table, Megger will need a mathematical expression for the transfer function (ratio) between the transducer and contact travel or, alternatively, simultaneous time/travel measurements for the two positions. Special test plans are available for these measurements.

Selecting a conversion table

The conversion table is associated with an angle transducer in the transducer list.

Note *This link between a conversion table and a transducer is only applicable at TM1600 / EGIL measurements using old type of test plans. When using a TM1700 / TM1800 test plan, a test plan created with CABA Test Plan Editor, or even a TM1600 / EGIL test plan converted to TM1700 / TM1800 style, the link to the conversion table is stored along with the breaker definition instead.*

Note *To associate a conversion table to a Breaker definition (when applicable) click the "Motion measurement preferences and pulse & delay times" option in the "Measurement preferences" tab, see page page 21.*

- 1] Select "Transducer" – "Transducer list" to reach the transducer list.
- 2] Mark the angle transducer you want to associate a conversion table with.
- 3] Click the "Select" button in the "Conversion table" group.
- 4] Mark the desired conversion table and press "Select". The dialog will close and the selected conversion table will show up in the transducer list.
- 5] You can also change/unselect conversion table.
- 6] If there are no conversion tables in the list you can import, please see below.

Importing conversion tables

To import conversion tables to CABA Win

- 1] Select any existing travel transducer.
- 2] Click the "Select" button in the "Conversion table" group.
- 3] Select "Import" and specify the file path to the correct directory.

Note *The imported conversion table will NOT be linked to the transducer in the importing procedure.*

Exporting conversion tables

To export conversion tables from CABA Win.

- 1] Select any existing travel transducer.
- 2] Click the "Select" button in the "Conversion table" group.
- 3] Mark the conversion table you want to export and select "Export".
- 4] Specify the file path to the correct directory.

6 Test plans

6.1 General

A test plan defines the breaker operations to be recorded and the data that are to be measured manually and entered during the test. It also controls the ways in which the results are displayed graphically and reported. For each breaker, a test plan and the breaker data (number of interrupters, operating mechanism, speed calculation points etc.) are stored together with information about how the breaker is to be tested. The test plan reduces the need for manual settings to a minimum and ensures that tests conducted at different times will be carried out in the same way.

A test plan can be designed specifically for a certain breaker type and/or test. It can also have a more general design that can be used with many types of breakers. A number of general test plans are included with the CABA Win program. Custom-designed test plans for certain breakers and/or test procedures can be ordered from Megger.

A test plan covers measurement results obtained from the breaker analyzer as well as results measured with other instruments. It includes forms for manual data entry, and general comments and observations can be entered as notes. These items of information can be included in the report and stored together with the TM1800, TM1700, TM1600/MA61 or EGIL recording.

To view the available test plans

- 1] Select "View" -> "Available test plans" from the drop down menu, or click on the "View available test plans" icon on the tool bar.

All available test plans will be presented in the list and when you mark a plan in the list its description is displayed.

Note *These test plans are all of TM1600/MA61 and EGIL type and have limited flexibility. For more flexible testplans taking advantage of TM1700/TM1800 features it is recommended to use CABA Test Plan Editor.*

To import test plans

- 1] Select "View" -> "Available test plans" from the drop down menu, or click on the "View available test plans" icon on the tool bar.
- 2] Select "Import" and the appropriate file path to your test plan directory

6.2 Selecting a test plan

A test plan defines the following for each breaker operation:

- Breaker contacts to be measured.
- How the measurement channels on the circuit breaker analyzer is used.
- Breaker analyzer settings.
- Graphs that are calculated and displayed.
- Parameters that are calculated and displayed.
- How to enter/view/report manually entered data e.g. notes, special data entry forms, other measurements.

When selecting a test plan there are a few things that must be considered and checked against the description of the test plan.

- 1] To read the descriptions of the different test plans in your list, select "View" -> "Available test plans" from the drop down menu, or click on the "View available test plans" icon on the tool bar and then select the test plan you wish to view.

Checklist

Before selecting a test plan for your breaker, it's a good idea to run through the following checklist:

- Does the test plan support the analyzer? Note that there are specific test plans for the EGIL analyzer.
- How many operating mechanisms does the plan support?
- Does the test plan support the total number of contacts to be measured?
- Are there enough? If not, choose another plan or increase the number of channels.
- Does the plan contain all test sequences?
- Are all required graphs displayed?
- Are all parameter calculations present?

If there is no test plan suitable for your breaker, contact your Megger representative. Custom-designed test plans can be prepared on request.

6.3 Adapting the test plan

Each test plan is designed for a maximum number of breaker contacts and analog measurement channels. If the circuit breaker has fewer contacts and/or does not need all available analog channels, there is no problem. The test plan will be automatically adapted to the breaker when the breaker is defined. Just make sure that the selected test plan can accommodate at least the measurements of interest.

As a rule the general test plans are “oversized” for a typical breaker testing application, and they are significantly reduced when adapted to the specific circuit breaker.

Defining a breaker

When defining a breaker, CABA Win asks you to specify the test plan to use for the test. There should be a number of test plans available in the test plan list.

Select a test plan that covers the type of breaker you are about to test and the measurements you plan to do.

The test plan selected for a breaker can be changed to a different test plan during the lifetime of the breaker. The test plan adapted for each test is thus stored when the test is conducted. This enables the results to be reproduced and provides an accurate record of the conditions that prevailed when the breaker was tested.

Every time a new test is started, the current adapted plan for the breaker is copied to the test.

Note *If you change a breaker/test plan, the changes will not affect the previous existing measurements. The new breaker/test data will only be used in future measurements.*

6.4 Test menu

Each breaker operation and each form included in a test plan has a name. A list of these names comprises the available activities, and this list is called the test menu.

The following is an example of a test menu:

- Breaker data (breaker-specific information)
- Manually entered parameters (enter results measured with other test equipment)
- Notebook (used for comments and observations)
- Close (records a close operation)
- Open (records an open operation)



Tip!

You are free to choose in which sequence the activities in the menu should be done. Activities may also be excluded.

Entering data into a form can be interrupted and continued later.

A breaker operation recording can be repeated several times and all recordings can be stored (or deleted).

It is also possible to interrupt the entire test and continue it at a later time.

6.5 Test plan editing

CABA Win permits you to delete/add calculation parameters from/to a test plan.

- 1] Select the breaker you want to edit parameters in from the breaker list. Select "Breaker" -> "Add / remove parameters" from the drop down menu, press the "Add / remove parameters" icon in the tool bar or press "Add/remove parameters" button in the "Parameter calculations" group in the "Measurement preferences" tab.
- 2] Select the operation that is to be edited.

Note *Operations created with CABA Test Plan Editor are hidden here and can only be edited through CABA TPE.*

A detailed description of all parameters is presented in Appendix A.

- 3] CABA Win displays two lists: source parameters and target parameters. Source parameters include all parameters that can be calculated for the actual breaker, connection and operation. The target parameters are those included in the present test plan.
- 4] To delete a parameter, highlight it in the target list and select left arrow button (<<). To add a parameter, highlight it in the source list and select right arrow button (>>).
- 5] Continue editing until finished and then select "OK" to store your changes.
- 6] Select a new operation for editing.

Note *There are a large number of parameters available and many of them can only be used in special applications. Available CABA Win parameters are listed in Appendix A.*

6.6 Exporting/importing test plans

Test plans can be exported/imported from/to the test plan list.

Import

- 1] From CABA Win, select "View" -> "Available test plans" from the drop down menu, or click on the "View available test plans" icon on the tool bar.
- 2] Select "Import".
- 3] The dialogue box asks where the test plan is to be imported from. You must specify the desired path/directory. File format is *.arc. A number of standard test plans are included in the CABA Win installation. To reach these, browse to the "\CABAWIN\Standard test plans" folder, select wanted language and the available test plans will be listed.
- 4] Select test plan(-s) and "Import".

Export

- 1] From CABA Win, select "View" -> "Available test plans" from the drop down menu, or click on the "View available test plans" icon on the tool bar.
- 2] Select the test plan for export.
- 3] Select "Export"
- 4] The dialogue box asks where the test plan is to be exported. Specify the desired path/directory. File format is *.arc.

7 TPE – Test Plan Editor

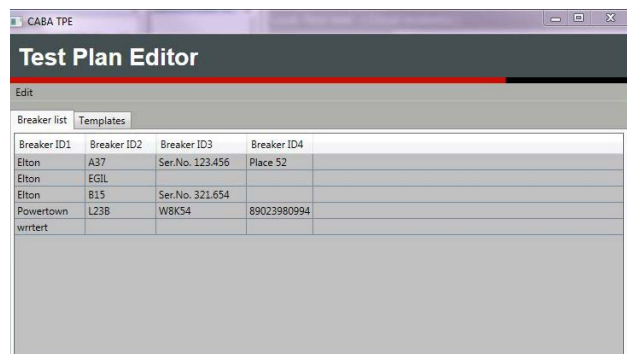
7.1 General

The TPE is a wizard for easy creating and editing all data for a circuit breaker test. The TPE shares the breaker list with CABA Win.

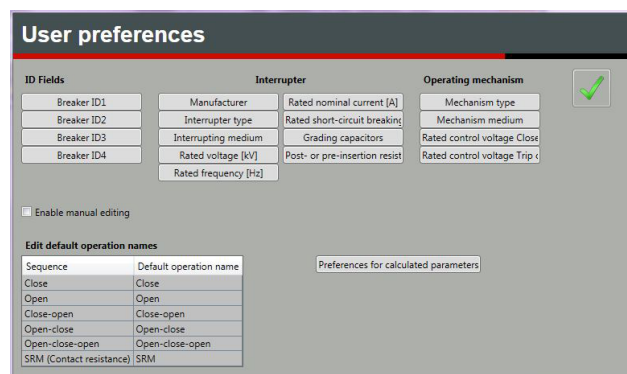
7.2 Preferences for calculated parameters

To simplify the creation of test plans it is recommended to first set your preferences for calculated parameters. By doing this you can create your own preference regarding the set of parameters that will be automatically added to each breaker operation you define.

- 1] Start the Test Plan Editor by selecting menu item "Test Plan Editor" from CABA Win "File" menu.
- 2] In "Test Plan Editor" start screen, click "Edit" and then "User preferences".



- 3] In the "User preferences" screen, click the button "Preferences for calculated parameters".



In the table you have three options how parameters will appear in the "Operation" window:

- Neither "Default" nor "Exclude" checked:
The parameter calculation will be available but not preselected when applicable.

- “Default” checked:
The parameter calculation is automatically preselected when applicable.
- “Exclude” checked:
The parameter calculation will be unavailable to select.

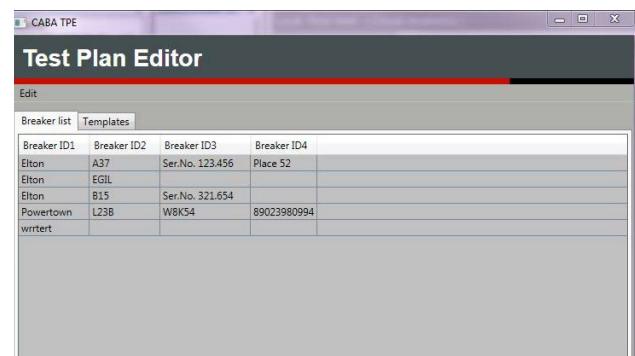
Preferences for calculated parameters

Sequence: All Sort on: ID Parameters: All

ID	Sequence	Name	Breaker part	Default	Exclude
1	Close	Close time	MainContact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1	Close	Close time	ResistorConta	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Close	Close time	BreakerPhase	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Close	Close time	Breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Open	Open time	MainContact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Open	Open time	ResistorConta	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Open	Open time	BreakerPhase	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	Open	Open time	Breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Close-open	CO time	MainContact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
7	Close-open	CO time	ResistorConta	<input checked="" type="checkbox"/>	<input type="checkbox"/>
8	Close-open	CO time	BreakerPhase	<input checked="" type="checkbox"/>	<input type="checkbox"/>
9	Close-open	CO time	Breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10	Close	Diff A-B-C	Breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>
11	Open	Diff A-B-C	Breaker	<input checked="" type="checkbox"/>	<input type="checkbox"/>
13	Close	Diff phase	BreakerPhase	<input checked="" type="checkbox"/>	<input type="checkbox"/>
14	Open	Diff phase	BreakerPhase	<input checked="" type="checkbox"/>	<input type="checkbox"/>
16	Close	Cls speed	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
16	Close	Cls speed	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
17	Open	Opn speed	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
17	Open	Opn speed	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
19	Close	Stroke	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
19	Close	Stroke	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
20	Open	Stroke	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
20	Open	Stroke	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
21	Close-open	Stroke	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
21	Close-open	Stroke	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
22	Close	Penetr.	MainContact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
23	Open	Penetr.	MainContact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
24	Close-open	Penetr.	MainContact	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25	Close	Overtravel	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25	Close	Overtravel	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
26	Open	Overtravel	BreakerOrBrei	<input checked="" type="checkbox"/>	<input type="checkbox"/>
26	Open	Overtravel	Mechanism	<input type="checkbox"/>	<input type="checkbox"/>
27	Open	Damp time	BreakerOrBrei	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa3	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa4	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa5	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa6	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa7	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa8	<input type="checkbox"/>	<input type="checkbox"/>
28	Close	Cls time a	AUXa9	<input type="checkbox"/>	<input type="checkbox"/>

7.3 Define a new breaker

- 1] Start the Test Plan Editor by selecting menu item “Test Plan Editor” from CABA Win File menu.



Breaker definition

- 2] Click "Edit" and then "New breaker"
The window “Breaker definition” appears.

The window for “Breaker definition” contains a number of fields to fill in. These fields are mostly used for identification of the breaker in the breaker list as well as to register breaker specific parameters.

The 'Breaker definition' dialog box contains the following sections:

- Identification fields:** Four dropdown menus for Breaker ID1, Breaker ID2, Breaker ID3, and Breaker ID4.
- Breaker definition:**
 - Phases: 3, Interrupters per phase: 1
 - Resistor contacts: (Nameplate data)
 - Dead Tank breaker (Integrated CT):
 - BLG mechanism:
- Operating mechanisms:** 1
- Auxiliary contacts:**
 - a-contacts per operating mechanism: 0
 - b-contacts per operating mechanism: 0
- Motion measurement preferences:**
 - Presentation quantity: Method -- Transducer type
 - Contact travel: 100 mm (Nominal stroke)
 - Mechanism travel: [dropdown]
- Pressure measurement:**
 - Interrupter:
 - Mechanism:

- 3] Fill in the four ID fields, which will correspond to the breaker title as displayed in CABA Win.

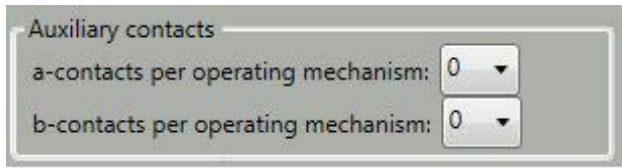
Note *It is recommended to fill out all four ID fields for easier identification of the test object. If CABA DB is to be used, all four fields must have values.*

The labels for the four ID-fields can be modified from the "Options" -> "System settings" menu in CABA Win.

- 4] Breaker specific details such as number of "Phases", "Interrupters per phase", number of "Operating mechanisms", presence of "Resistor contacts", number of "Auxiliary contacts", etc are selected.

If number of either “a” or “b” in “Aux Contacts” is “1” then they are regarded as in coil circuit, i.e.

in series with close and trip coils while others are considered as separate contacts and will be measured by channels intended explicitly for auxiliary contact measurements.

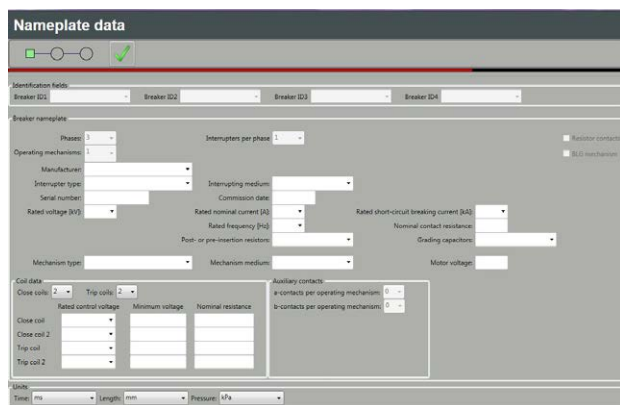



If the damping curve of the ABB BLG mechanism is to be measured, then check the "BLG mechanism" check box.

Check the "Dead Tank breaker (Integrated CT)" check box if contact resistance is to be measured on such breaker.

Nameplate data

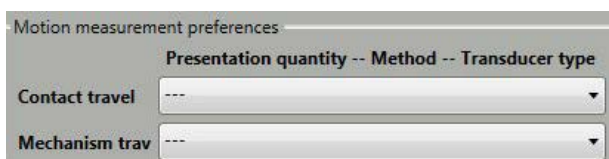
- 1] Click "Nameplate data".
The window "Nameplate data" appears. Here you can fill in breaker data and select measurement units for time, distance and pressure.



- 2] Click  to close the window and return to "Breaker definition".

Motion measurement preferences

- 1] If motion measurement is to be performed desired presentation quantity, measurement method and a suitable type of transducer shall be defined in section "Motion measurement preferences".



- 2] Select "Contact travel" and "Mechanism travel" from drop-down list.

- 3] Only the motion to be performed (Contact travel or Mechanism travel) needs to be defined.


Note *Normally only contact motion is measured.*

When measuring contact travel (distance) with angular transducer and the relation between angle and linear travel is constant during whole stroke, a single conversion factor can be used. Such factor would convert angle directly to distance in mm, for example if factor is 2.5 then 1 degree corresponds to 2.5 millimeters.

Note *The value of conversion factor or nominal stroke must be confirmed from the breaker manufacturer.*

Pressure measurement

There is also a selection available for pressure transducers where appropriate checkbox shall be checked if pressure is to be measured.

- 4] When all necessary and desired settings are completed press  to go to "General settings".

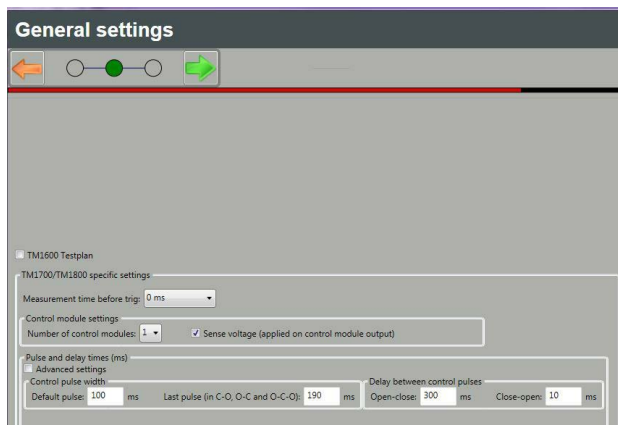
General settings

Settings for speed and damping calculations are on top of this view. Depending on breaker specifications the default settings for points on travel curve can be changed to reflect requirements. It is also possible to define more than one set of points by changing number of "Closing speed points" and "Opening speed points" in respective drop down menu.



Tip

Each set of points is associated with a particular parameter number. For example parameter number 16 "Close speed" uses closing speed calculation point set 1 and parameter number 108 "Close speed2" uses set 2



- 1] If the test plan is intended to be used with TM1600 you must tick the checkbox "TM1600 Testplan".

If not the settings for TM1700/1800 can be changed to reflect measurement requirements and configuration of instrumentation.

Measurement time before trig (Pre-trig)

Pre-trig time by default is "0", but it can be changed to 100, 200, 500 or 1000 ms. During this time events happening before sending control pulse to breaker coils are recorded.

Note *"Pre-trig" time is used for more advanced measurements when it is needed to record event before control pulse is sent to breaker coils. For regular measurements it can be set to "0".*

Transducer preferences

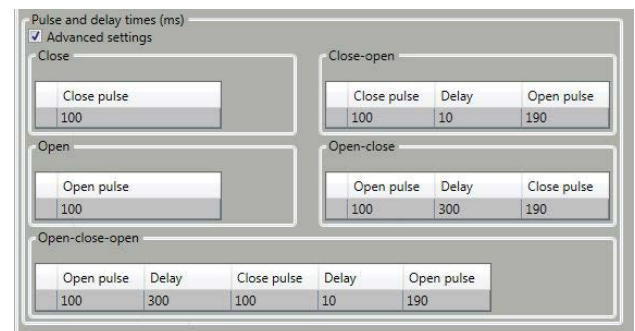
Select analog or digital for contact travel and mechanism travel.



Control module settings

Set number of control modules etc.

Pulse and delay times

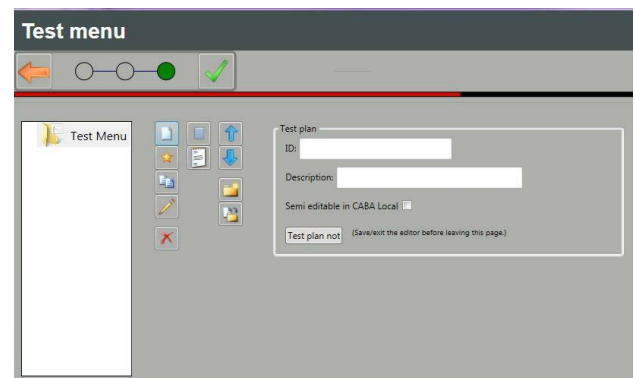
- 1] Tick the checkbox "Advanced Settings" to open a new window where you can set pulse and delay times required for different operations and even make individual settings per phase in case of three operating mechanisms.



- 2] When ready, press  "Test menu" will be opened.
- 3] When all necessary and desired settings are completed press  to go to "Test menu".

Test menu

"Test menu" is window where desired breaker operations are created. Creation and editing of operations are done using the buttons.














Test plan section

ID and description for the test plan can be entered here as well as Test plan notes. Neither of the entries is mandatory.

Check the "Semi editable in CABA Local" check box to allow changes of the test plan in CABA Local, e.g. Pulse and Delay settings, Nominal stroke or Speed calculation points.



Note *Changes made in CABA Local may not be reflected back in Test plan editor.*

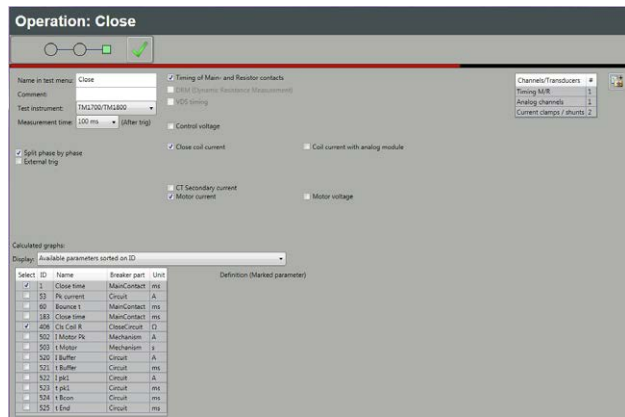
Test menu buttons

	New operation An operation is added to the test.
	Add a preset operation to the test A preset operation is added to the test. The preset operations are formed by first creating a new operation, changing settings of this operation and saving it as a preset operation. See section "New operation" on next page.
	Create a copy of the selected operation
	Edit the selected menu item
	Delete the selected menu item Deletes the selected menu item. If selected item is a subfolder all contents of it is deleted.
	Add a Notebook to the breaker Notebook (comment section) can be added to the breaker (top level).
	Add a Notebook to the test Notebook (comment section) can be added to the test (test level).
	Move the selected menu item up
	Move the selected menu item down
	Add a submenu to the test Adds a submenu in shape of a folder to the test menu.
	Move the selected menu item to/from a submenu Moves the selected menu into and from a submenu. The menu where to move given item is selected in the dialog window from drop down menu "Move".


New operation

Definition of operations in test is important part in the process of test plan creation. The entities to be measured and parameters must be chosen to correctly reflect available instrumentation and result in required data.

- 1] In "Test Menu" click 
- 2] In "New operation" window select the desired operation and press 



In the new window you can design the operation according to measurement requirements. Here the instrumentation, measurement entities and channels, as well as parameters associated with given operation can be selected.

- 3] To save the operation as a "Preset operation" for future use, enter a file name, and click Save.
- 4] To create a new operation from a Preset operation click  on the Test menu page.

Settings in the Measurement field

What checkboxes that will be shown depends on settings and selections earlier in the setup.

Name in test menu	As it will be shown in test menu.
Comment	If there are any comments to be made for given operation. Note! Can only be viewed here in CABA TPE.
Test instrument	Either TM1700/1800 or TM1600.
Measurement time	Measurement time from 100 ms to 200 s. The time defined here is used as default for next operation you create.

Checkboxes

Trip coil 2	If the breaker is equipped with two trip coils you can allocate a control channel to the second trip coil. Note! Only available at common operating mechanism.
--------------------	--

Split phase by phase	Instrument is configured to make measurement phase wise and thus one operation for each phase is created. Note! If operation for one phase is deleted the other two are deleted as well.
External trig	Opens the "External trig settings" field, see below.
Timing of Main- and Resistor contacts	Main contact timing is included in the measurement.
DRM (Dynamic Resistance Measurement)	Dynamic resistance measurement (DRM) is enabled. In order to enable this checkbox Timing M/R must be unchecked, since DRM measurement uses Timing M/R module channels for voltage measurement.
VDS timing	Enables timing via the Voltage Detection System interface on medium voltage bays. For this measurement an optional accessory is required. Art.No. XB-39260
Contact motion	Enables measurement of main contact travel.
Mechanism motion	Enables measurement of the mechanism's travel.
Control Voltage	Enables measurement of station voltage which feeds the breaker coils.
Close coil current Trip coil current	Enables measurement of close and/or trip coil current. Default measurement is done with Control channels of TM1700/1800. With three operating mechanisms selected there will be two options shown for the measurement: One common coil current for all three phases or separate coil currents.
Coil current with analog module	In some breaker designs coil current need to be measured at other places than directly in the Control module. Then current clamps and an analog module can be used instead.

CT Secondary current	Measurement of current in on-line tests e.g. first trip test.
Motor current	Allocates analog channel for measurements of motor current for spring charge mechanism.
Motor voltage	Allocates analog channel for measurements of motor voltage for spring charge mechanism.

External trig settings field

The settings for using an external signal to start the measurement. The options are:

- Mode – contact or voltage
- Direction – closing / opening for contact or rising / falling of voltage with specified threshold.
- Send control pulse can be disabled if breaker is operated by other means than control module on TM1600/1700/1800 and it is not used for other purposes.

Graph calculations field

If motion is measured you can add "Contact velocity" and "Contact acceleration" of contact movement by ticking the checkboxes. Corresponding is also applicable for "Mechanism travel" if this is activated.

Parameter calculations field

Each operation contains a number of parameters which are calculated from measured signals. Most of these parameters are applicable only for a particular operation, while some can be used in two or more operations. When an operation is created the applicable parameters are listed in a tabular form. The description of each parameter can be read when selecting it.


You can sort the parameters according to their ID or name. Another option is to display only selected parameters.



Tip

To set availability of calculated parameters please refer to section "7.2 Preferences for calculated parameters" on page 52.

Finish the settings

- 1] When all required settings and parameters are selected you close the operation view by clicking . The operation appears in the test menu.

8

Reporting

CABA Win contains a complete report generator called List & Label® for making specific layouts and reports. All functions in List & Label® are available and the program is described in Appendix C.

You can also use MS Word® or MS Excel if installed on your PC.

CABA Win also contains a number of standard report templates that have been prepared as generalized reports suitable for most breakers and tests. These can be used as is or edited as desired.

After a report has been generated for a breaker, the report template can be saved in the test plan (under a new name) as default to be used again without making any changes the next time the breaker is tested.

8.1 General

To create a report you use different report templates depending on the type of breaker, test and your personal preferences for which graphs and variables you want to see in the report. Reports can contain identification and specification data, general variables and test parameters, tables, graphs etc. depending on the report template.

The file format for the templates used in CABA Win is *.lst for List&Label® reports, *.doc for Word® reports and *.xls format for Excel.

The main feature of these formats is that the templates can handle tables of variable size. This makes it possible to create report templates that fit all breaker measurements and test plans.

From the report generator it is possible to edit or redesign an existing template and save it as a new template under a new name. Minor changes like changing pictures/logotype, lines, fonts and size is very straightforward. To create a new report design need a little bit more experience from using the program. Please use the standard templates in CABA Win for training in List&Label®, Word® and Excel®.

List&Label®, Word® and Excel® are separate software programs integrated in CABA Win.

1] To enter the programs select breaker, test, operation and recording and "View", then select "Report" -> "Report a recording", "List&Label®" or "Word® report" tab and "New template" or select an existing template and "Design template". This will take you to the selected application for designing report templates.

Note *Word® report is available as report generator only if you have installed MS Word® on your computer.*

This is a short introduction on how to use the List&Label® and Word® report generator. For more detailed information about List&Label® see Appendix C. For details about Word® click "Help" in Word®.

Note *Excel® reporting is only possible when you report a test, not for single recordings.*

8.2 Terminology for List & Label®

<i>Project</i>	The report/template you are working with.
<i>Object</i>	The actual item (line, text object, graph etc.) on the template.
<i>Layers</i>	Describes how the objects appear on different pages in the report.
<i>Variables</i>	Data, text, values, images etc from the test we are reporting.
<i>Parameters</i>	Calculated parameters from the CABA test
<i>Text objects</i>	Used to print text or numerical values. This may be variables, parameters or fixed text.
<i>Tables</i>	Data organized in a table format.

8.3 Basic functions for List & Label®

Create objects

Use the short-cut buttons at the left side of the screen to create new objects. The following objects are available:

- Text Text/variables/parameters
- Rectangle
- Circle
- Line
- Picture Graphs/Pictures
- Barcode
- Table
- Formatted Text

Move objects

- 1] Click the "Select" button or double click on the object.
- 2] Put the mouse on the square in the centre of the object, press left mouse button and drag it into the new position.

Add/Change text

- 1] Click "Select" or double-click on the text object.
- 2] Click "Insert" or "Edit" (or "Delete") paragraphs.
- 3] Select the "Text" tab
- 4] Insert the text in the upper window
- 5] Click the "Insert" button
- 6] Click "OK"
- 7] Select font
- 8] Click "OK"

Add/Change Variables/Parameters

- 1] Click "Select" or double-click on the text object.
- 2] Click "Insert" or "Edit" (or "Delete") paragraphs.
- 3] Select the "Variables" tab
- 4] Select directory and variable from the "explorer" list or drag and drop to the upper window.

- 5] Click the "Insert" button
- 6] Click "OK"

Insert lines

- 1] Use the "Insert line" button, drag the line from start to end.

Insert rectangles

- 1] Use the "Insert rectangles" button, drag the rectangle with the mouse.

Multiple copies

- 1] Create a rectangle
- 2] Select it with the "Select" button
- 3] Right click (mouse) and select "Multiple copies"
- 4] Define the number of copies, in columns and rows.

Group

- 1] Select the objects to group.
- 2] Click the "Select" button and use <Shift>+left mouse button to mark the objects, or mark several objects in an area using the mouse.
- 3] Right click and select "Group".
The grouped objects will be moved and aligned together.

Ungroup

- 1] Select the object to ungroup.
- 2] Right click and select "Ungroup".

Align

With these buttons you can align different objects. Align left, right, up or down. You can also get the same horizontal and vertical size.

- 1] Click the "Select" button and use <Shift>+left mouse button to mark the objects, or mark several objects in area by drawing a rectangle with the mouse.

Save

- 1] When you have created a new *.lst-file (report template), it should be saved in the "Report" directory of CABA Win.
If you have edited a report template for a specific

circuit breaker it should be saved in the test/plan directory of the breaker (default).



Tip

The "Report wizard" dialog box is limited to 8 letters when displaying file names for report templates. After redesigning a report, try to rename with 8 letters or less.

8.4 Reporting a test using List & Label®

This section is a brief summary of reporting procedures. For full information, please read the separate List&Label® manual in appendix C.

When a circuit breaker has been reported, the template can be stored as default in the test plan. This means that report/template design/editing normally is done just once. Next time the breaker is to be reported, simply select the default report format and print.

Standard List & Label® templates in CABA Win

The following standard templates are included in the present version of CABA Win. Naming for "Report a test" templates starts with the corresponding test plan name.

The table describes each template design with respect to:

- File name
- Test plan specific or general/one recording
- Number of graphs in the report
- Frame size of the graph(-s)
- Comments

Name	Rec/Test	Graph
Frame size, mm	Comments	
BL8001E	Test	None
–		
BL8002E	Test	None
–		
BL8002E1G	Test	1
185 x 103		
BL8002E4G	Test	4
86 x 51		
BL8003E	Test	None
–		
BL8005E	Test	None
–		
BL8006E	Test	None
–		
BL8007E	Test	None
–		
BL8008E	Test	None
–		
BM8001E	Test	None

–	For EGIL	
BM8001E	Test	None
–	For EGIL	
REC1A4	Recording	1
185 x 103		
REC1Letter	Recording	1
185 x 103	Letter size	
REC1A4PF	Recording	1
185 x 103	With Pass/fail	
REC1LetterPF	Recording	1
185 x 103	Letter, pass/fail	
1GraphPort	Recording	1
260 x 144	Graph only	
1GraphLand	Recording	1
185 x 103	Graph only	
Standard	Recording	1
185 x 103		

Graph grid sizing

The grid size in the graph report is defined by the frame size in the template and the settings in the analysis window for X- and Y-divisions in the display layout. The following table is a design guide to get a defined grid size/division in the report.

Note *The printed graph in the report is not depending on the actual window size and shape in the analysis program.*

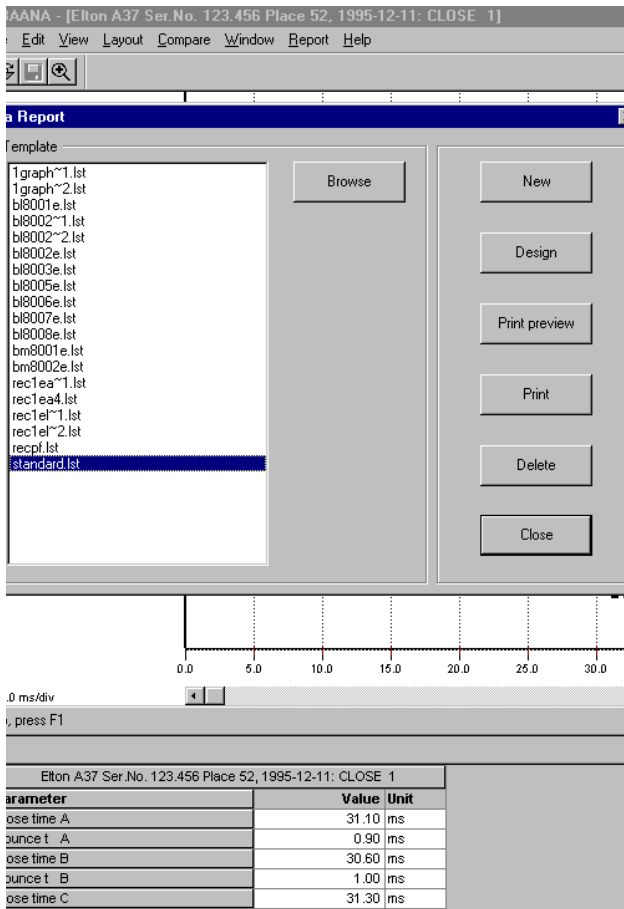
Frame size, X x Y, mm	Grid size, mm
X / Y -div setting	Graph – Report
260 x 144	10 x 10
21 / 14	Full size – Landscape
260 x 144	5 x 5
42 / 28	Full size – Landscape
185 x 103	10 x 10
15 / 10	1 graph template
185 x 103	5 x 5
30 / 20	1 graph template
86 x 51	2.5 x 2.5
28 / 18	4 graph template

Reporting from the analysis window

This section covers reporting from the analysis window in CABA Win.

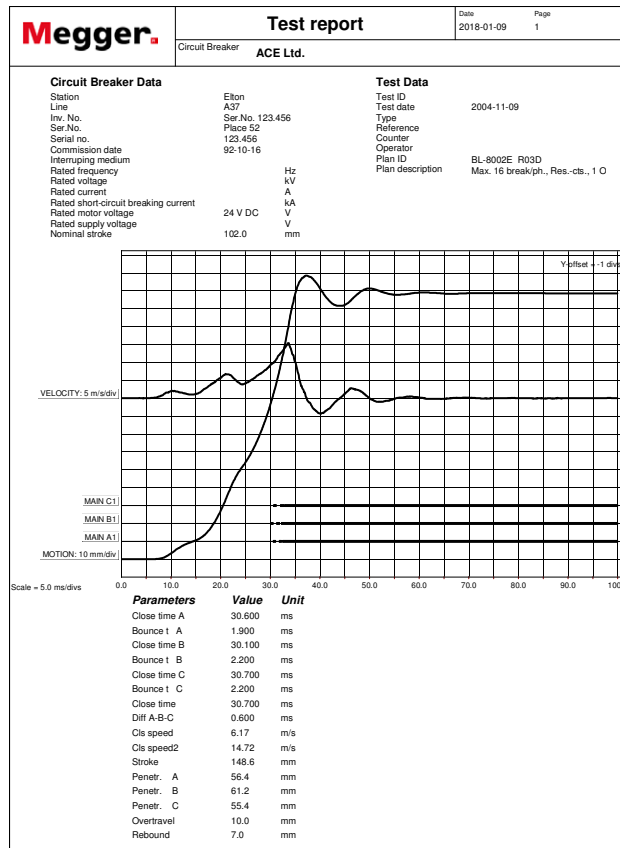
Single recording

This report procedure and templates is intended to work for all breakers and test plans. Only single recordings can be reported and for a user familiar with CABA Dos, this is a very similar procedure.



- 1] Select the circuit breaker test, operation and recording that you want to report.
- 2] Open the recording.
- 3] Design the analysis window as desired.
- 4] Select "Report a recording"
- 5] Select the Standard or REC*.lst template you want to use and "Design template" for editing the report or "Print Preview".
- 6] Check that the report is OK. Edit if necessary.
- 7] Save the report in "Design template" under a new name if you want to keep the changes until next time you want to report this circuit breaker.
- 8] Print the report.

Note *Depending on the type of report and your computer/printer configuration it might take some time before the report is printed on paper.*



Breaker data will be reported as seen in the template. Variables for the different fields can be changed for other data in the list of variables.

The printed graph is always the active graph window.

The parameters are reported in a table format. All parameters in the test plan are reported.

Manually entered data (e.g. contact resistance measurements) as well as notes will be reported if existing.

Single recording – test plan template

This procedure uses a report template with specific variables and parameters in specified fields and positions.

- 1] Select the circuit breaker test to be reported
- 2] Select "Report a test".
- 3] Select a template (*testplanname*.lst) suitable for this breaker and test plan. Edit/Save under a new name if desired and print.

Breaker data/nameplate will be reported as seen in the template. Variables may be exchanged for others in the variable list.

Parameters will be reported as seen in the template and not as in the test plan. Parameters may be exchanged for others in the parameter list. Make sure that the test plan contains at least the parameters asked for in the template.

Note *If the template contains parameters or graphs from different operations, e.g. close, open, close-open, all recordings must be opened in the analysis window.*

In the standard templates the reported graphs are numbered 1,2,3... If "generic graphs" is marked in the template selection window (default), these numbers correspond to the graph numbers in the "Window" drop-down menu in the analysis window. If it is unmarked, the template must have the exact graph name.

Summary report – no graphs

This reporting procedure covers breaker data and parameters from several operations.

- 1] Select the circuit breaker test to be reported and open all the recordings that are included in the report.
- 2] Select "Report a test".
- 3] Select a template suitable for this breaker and test plan. Edit if desired, check the report in "Design template" and print.

Parameters will be reported as seen in the template and not as in the test plan. Parameters may be exchanged for others in the parameter list. Make sure that the test plan contains at least the parameters asked for in the template. No graphs are reported.

Summary report with graphs

This reporting procedure covers breaker data and parameters from several operations.

- 1] Select the circuit breaker test to be reported and open all the recordings that are included in the report.
- 2] Select "Report a test"
- 3] Select a template suitable for this breaker and test plan. Edit if desired, check the report in "Design template" and print.

Parameters will be reported as seen in the template and not as in the test plan.

Parameters may be exchanged for others in the parameter list. Make sure that the test plan contains at least the parameters asked for in the template.

Graphs will be reported as seen in the template. In the standard templates the reported graphs are numbered 1,2,3...If "generic graphs" is marked in the template selection window (default), these numbers correspond to the graph numbers in the "Window" drop down menu in the analysis window. If it is unmarked, the template must have the exact graph name.

If the graphs are correctly named by operations as in the test plan/variable list, the graphs will be selected accordingly and the template may be used as a default template for all similar breakers/test plans.

Customized reporting – free selections

This report can be designed exactly as desired. The general rules are:

- 1] Make sure that all recordings to be reported are opened.
- 2] Make sure that the test plan contains all the variables and parameters to be reported.
- 3] Save the graphs manually with "copy to image file".
- 4] Design the template/report variables and parameters as desired.
- 5] Assign the graphs in the template as the copied image files.
- 6] Preview the report and print.

Reporting from CABA Win breaker or test view

- 1] Select "Report" In the CABA Win Breaker or Test View.
- 2] Select a template suitable for this breaker and test plan. Edit if desired, check the report in "Design template" and print.

Parameters will be reported as seen in the template and not as in the test plan. Parameters may be exchanged for others in the parameter list. Make sure that the test plan contains at least the parameters asked for in the template.

If "generic graphs" is marked in the template selection window (default), Graphs will be reported automatically according to the following general rules.

If a breaker is selected:

Graph 1 will be the last recording for the first operation in the test menu of the latest test. Graph 2 will be the second operation in the test menu, Graph 3 will be the third operation etc.

It a test is selected:

Graph 1 will be the last recording for the first operation in the test menu of the selected test. Graph 2 will be the second operation etc.

If the graphs in the template are correctly named by operations as in the test plan/variable list, the graphs will be selected accordingly and the template may be used as a default template for all similar breakers/test plans.

8.5 Designing reports

Designing reports is possible from CABA Win Breaker View or from the analysis window.

- 1] Select a breaker/test and "Report" or open one or several recordings in the analysis window and select "Report a recording" or "Report a test".
- 2] Select a template for editing and "Design template" or select "New template" for starting on an empty template.
- 3] Use the standard List&Label® functions to change/create the template form with lines, text fields, picture fields etc. Then start to fill the report template with text, variables, parameters tables and graphs. See the List&Label users manual in appendix C.

Note *CABA Win is only supporting *.lst format. A template must always contain a table field even if it is empty and not visible in the report.*

Breaker data

Breaker data is found in the List of variables directory "Breaker". ID labels are the names of the four user defined nameplate/designation data, ID fields are the actual data entries. All other variables are data entries.

Test data

Test ID data is found in the List of variables directory "Test". All variables are the actual data entries.

Parameters

Calculated parameters are found in the List of variables directory "Parameter". Each operation has its own directories with parameter names, values and units. The parameter ID number is unique and corresponds to the list in appendix A.

When working with templates for "report a recording", the parameters are also available in a table format found under the directory "Fields". Using this format creates a table containing all parameters defined in the actual test plan.

Manually entered data

Manually entered data e.g. contact resistance readings, coil resistance, hydraulic pressure., is available in a table format found under the directory "Fields". Using this format creates a table with all parameters defined in the actual test plan.

Graphs

Graph definitions and naming

"Active graph" is the actual active graph in the analysis window independent of how many graphs that are presented on the screen.

Graph 1, 2, 3, etc. are opened graphs in the analysis window numbered as in the "Window" drop-down menu.

Graph name is the actual name of a graph for a specific operation as presented in the list of variables.

"Generic graphs" in the analysis window are opened graphs numbered as in the "Window" drop-down menu (Graph 1, 2, 3 etc.).

"Generic graphs" in breaker/test view are defined as follows:

If a breaker is selected:

Graph 1 will be the last recording for the first operation in the test menu of the **latest test**. Graph 2 will be the second operation in the test menu. Graph 3 will be the third operation etc.

If a test is selected:

Graph 1 will be the last recording for the first operation in the test menu of the **selected test**. Graph 2 will be the second operation etc.

Graph variables

Graphs are found in the "Variables" directory. Each graph directory has "name" and "image". Graph 1-10 can be either generic graphs or numbered graphs in the analysis window. The directory "Graph" contains the actual graph variable names and images for the recordings.

Grid size

The grid size in the graph report is defined by the frame size in the template and thsettings in the analysis window for X- and Y-divisions in the display layout. The following table is a design guide to get a defined grid size/division in the report.

Frame size, X x Y, mm	Grid size, mm	X / Y -div	Graph – Report
260 x 144	10 x 10	21 / 14	Full size – Landscape
260 x 144	5 x 5	42 / 28	Full size – Landscape
185 x 103	10 x 10	15 / 10	1 graph template
185 x 103	5 x 5	30 / 20	1 graph template
86 x 51	2.5 x 2.5	28 / 18	4 graph template

Note *The printed graph in the report is not depending on the actual window size and shape in the analysis program.*

Multiple pages

The number of pages in the report is determined by the number of layers in the report. The base layer is printed on every page and the following layers (1, 2, 3 etc.) are printed on the corresponding page. As an example, a report template that has a base layer, layer 1, layer 2 and layer 3, will always be printed as a three-page report.

When designing a multiple page report, simply assign the actual variables, graphs etc. to the desired layer.

8.6 Reporting with Word®

Report a recording

Report a recording from the analysis window

- 1] Mark the recording you want to report and click "View".
- 2] Adjust the layout of the graph window if necessary ("Layout" -> "Graph"/"Display"/"Pass/fail"). The report generator uses the same layout settings as on screen.
- 3] Select "Report" -> "Report a recording" from the menu bar
- 4] Click on the "Word® report" tab. All Word® report templates (*.doc) in the "Report" folder, located right below the folder where CABA Win is installed, are listed.
- 5] Select a template from the list or click "Browse" to select a template from another location. A recommendation is to choose the generic template "Table Report recording.doc", which is suitable to report a recording since it shows all calculated and manually entered numerical parameters in a table format.

If you don't find a suitable template you can create a new or edit an existing template. Please refer to the section "Create/edit 'report a recording' template" below.

- 6] Check the "Use monochrome graphs" option if you want a black and white print out.
- 7] Click "Generate". MS Word® opens and displays the report.
- 8] Click "Print preview" to preview the report if desired.
- 9] Click "Print" to print the report.
- 10] Save the report if desired. The format is MS Word® (*.doc).

Create/edit "Report a recording" template

- 1] Mark any recording and click "View".
- 2] Select "Report" -> "Report a recording" from the menu bar.
- 3] Click on the "Word® report" tab.
- 4] Click "New template" to create a new template, or mark the template you wish to edit

and click "Design template". In the template you wish to edit is not in the list, you can browse to any other folder to select template.

- 5] Edit the template by using the standard functions in Word®.



Tip!

If the template is protected you have to select "Tools" -> "Unprotect" to make it editable. You can drag and drop items from the variable list into the document. Refer to section "Report building tips" below for more details.

Note You can only insert the graph from one recording in a "report a recording" template. When you generate a report, and more than one recording is open, the report generator will use the graph in the window that is active.

You can only insert "Keyboard entered parameters (Numeric)" (ManualDataTable) and calculated parameters (ParameterTable) in a table format in a "report a recording" template, i.e. it is not possible to insert the parameters one by one.

It is not possible to insert "Keyboard entered parameters (Text)" in a "report a recording" template.

- 6] Save the template. Use "File" -> "Save as..." if you wish to keep the original template, or "Ctrl+S" or "File" -> "Save and return" to overwrite the original template.

Note *Clicking on the "X" in the upper right corner of the window will exit the design window without saving your changes.*

Report a test

Report a test from the analysis window

- 1] Open all recordings (within the same test) that you wish to report by selecting "File" -> "Open" from the Analysis window.
- 2] Adjust the layout of the graph window if necessary ("Layout" -> "Graph"/"Display"/"Pass/fail"). The report generator uses the same layout settings as on screen.

- 3] Select "Report" -> "Report a test" from the menu bar
- 4] Click on the "Word® report" tab. All Word® report templates (*.doc), preselected for the breaker (if any), are listed.
- 5] If there are no preselected templates for the breaker you can browse to the "Report" folder or any other folder and select a template. The selected template will then be copied into the breaker (\\SPEC\N\PLAN*.doc). Changes done to this template (if any) will affect only this breaker.
- 6] Select a template from the list.
- 7] If you don't find a suitable template you can create a new or edit an existing template. Please refer to the sections "Create/edit 'report a test' template (non-generic graphs)" or "Create/edit 'report a test' template (generic graphs)" below.
- 8] Check the "Use monochrome graphs" option if you want a black and white print out.

Note *If you have selected a template designated for generic graphs you have to check the "Generic graphs" option.*

If you have selected a template designated for generic graphs and you report from the analysis window the report generator will pick the graphs in the order opened. Example: Four graphs are required in the template and you open Close 1, Close 2, Open 1, Open 2 and Close-open 1. Now only Close 1&2 and Open 1&2 will be reported. If you report from the CABA Win Breaker/test window the latest recording of the four first operations will be reported.

- 9] Click "Generate". MS Word® opens and displays the report.
- 10] Click "Print preview" to preview the report if desired
- 11] Click "Print" to print the report
- 12] Save the report if desired. The format is MS Word® (*.doc).

Report a test from CABA Win Breaker/ Test view

- 1] Mark the test you wish to report. (If you mark the breaker level the latest test will automatically be selected.)

- 2] Select "Report" from the menu bar
- 3] Click on the "Word® report" tab. All Word® report templates (*.doc), preselected for the breaker (if any), are listed.
- 4] If there are no preselected templates for the breaker you can browse to the "Report" folder or any other folder and select a template. The selected template will then be copied into the breaker (SPEC\PLAN*.doc). Changes done to this template (if any) will affect only this breaker.
- 5] Select a template from the list.
- 6] If you don't find a suitable template you can create a new or edit an existing template. Please refer to the sections "Create/edit 'report a test' template (non-generic graphs)" or "Create/edit 'report a test' template (generic graphs)" below.
- 7] Check the "Use monochrome graphs" option if you want a black and white print out.
Note *If you have selected a template designated for generic graphs you have to check the "Generic graphs" option.*
- 8] Click "Generate". MS Word® opens and displays the report.

Note *If the template is designated for generic graphs the report generator will automatically pick the latest recording (if any) of each operation, starting from the operation in the top of the test menu and ending when the required number of graphs is completed.*

If the template is designated for non-generic graphs the report generator will automatically pick the latest recording (if any) of the operation specified in template.

- 9] Click "Print preview" to preview the report if desired.
- 10] Click "Print" to print the report.
- 11] Save the report if desired. The format is MS Word® (*.doc).

Create/edit "Report a test" template (non-generic graphs)

Use this kind of template if you wish to specify exactly the operations included in the report. Example: You wish to report one Close, one Open and one Open-close-open operation.

- 1] Open all recordings (within the same test) that you want to report by selecting "File" -> "Open" from the Analysis window.

Note *You can also access the "Report a test" function from CABA Win Breaker/Test view, and when you do that the latest recording (if any) of each operation, within the selected test, are automatically accessible for the report generator.*

- 2] Select "Report" -> "Report a test" from the menu bar.
- 3] Click on the "Word® report" tab. All Word® report templates (*.doc), preselected for the breaker (if any), are listed.
- 4] If there are no preselected templates for the breaker you can browse to the "Report" folder or any other folder and select a template. The selected template will then be copied into the breaker (SPEC\PLAN*.doc). Thus, changes done to this template (if any) will affect only this breaker.
- 5] Uncheck the "Generic graphs" option
- 6] Click "New template" to create a new template, or mark the template you wish to edit in the list of preselected templates and click "Design template".
- 7] Edit the template by using the standard functions in Word®.



Tip!

If the template is protected you have to select "Tools" -> "Unprotect" to make it editable. You can drag and drop items from the variable list into the document. Refer to section "Report building tips" below for more details.

You cannot insert calculated parameters in a table format in a "report a test" template, i.e. you have to insert each parameter one by one.

- 8] Save the template. Use "File" -> "Save as..." if you wish to keep the original template, or "Ctrl+S" or "File" -> "Save and return" to overwrite the preselected template for the breaker. If you wish make the new template accessible for other breakers you have to save it with a new name to the "Report" folder.

Note *Clicking on the "X" in the upper right corner of the window will exit the design window without saving your changes.*

Create/edit "Report a test" template (generic graphs)

Use this kind of template if you wish to make a generic template suitable for many breakers. Example: If you make a report with four generic graphs, the four first opened graphs will be reported if you report from the analysis window. If you report from CABA Win Breaker/test window the latest recording of the four first operations will be reported.

- 1] Open all recordings (within the same test) that you want to report by selecting "File" -> "Open" from the Analysis window.

Note You can also access the "Report a test" function from CABA Win Breaker/Test view, and when you do that the latest recording (if any) of each operation, within the selected test, are automatically accessible for the report generator.

- 2] Select "Report" -> "Report a test" from the menu bar
- 3] Click on the "Word® report" tab. All Word® report templates (*.doc), preselected for the breaker (if any), are listed.
- 4] If there are no preselected templates for the breaker you can browse to the "Report" folder or any other folder and select a template. The selected template will then be copied into the breaker (SPEC\n\PLAN*.doc). Thus, changes done to this template (if any) will affect only this breaker.
- 5] Check the "Generic graphs" option
- 6] Click "New template" to create a new template, or mark the template you wish to edit in the list of preselected templates and click "Design template".
- 7] Edit the template by using the standard functions in Word®.



Tip

If the template is protected you have to select "Tools" -> "Unprotect" to make it editable. You can drag and drop items from the variable list into the document. Refer to section "Report building tips" below for more details.

Note You cannot insert calculated parameters in a table format in a "report a test" template, i.e. you have to insert each parameter one by one.

You should use the graphs named "Graph1-10" to enable the generic graph feature.

- 8] Save the template. Use "File" -> "Save as..." if you wish to keep the original template, or "Ctrl+S" or "File" -> "Save and return" to overwrite the preselected template for the breaker. If you wish make the new template accessible for other breakers you have to save it with a new name to the "Report" folder.

Note Clicking on the "X" in the upper right corner of the window will exit the design window without saving your changes.

Word® report from the test menu

Note This option is only available in custom designed test plans.

When the option is activated there will be three additional menu items in the test menu: "Select template", "Modify word report" and "Finish word report". Each one of them will be described below.

Select template

Double-clicking on this item will open a dialogue where you can select the template you wish to attach to the breaker. All *.doc files located in the Report directory will be listed. You can browse to any other location to choose a template. Once you have selected a template, it is copied to the \spec\n\plan\ folder of the selected breaker. Furthermore, a copy with the name determined in Plan.def (e.g. Template.doc) is copied to the \spec\n\test\n\plan\ of the selected breaker and test. This will be the report that you modify with the menu item "Modify word report".

Note Each time you select a template the file, e.g. *Template.doc*, located in the `spec\test\plan\` of the selected breaker and test will be overwritten without warning. If you already have started to fill out your report the entered data will be lost.

You can have several report forms in the same test menu. You just have to define each one of them in the `plan.def` file and use different labels and file names. If you do that make sure that you also add entries for "Modify word report" and "Finish word report" for the corresponding files.

Modify word report

This option will open the report located in the `\spec\test\plan` folder of the selected breaker and test. This is the place where you actually fill out your report. You can close and re-enter the report as many times you like. Once you are ready with the report you choose "Finish word report".

Finish word report

This option will generate the report, i.e. bring all specified graphs and values of CABA Win fields, parameters, notes, etc., into the report.

Plan.def modifications

To enable this report functionality you have to add a few entries in the `plan.def` file located in the `spec\plan` folder belonging to the breaker in question. Then you have to begin a new test to activate the changes.

ITEM "Select Template"

```
SEQUENCE BEGIN
    SELECT_WORDR TEMPLATE.DOC
SEQUENCE END
```

ITEM "Modify Word Report"

```
SEQUENCE BEGIN
    EDIT_WORDR TEMPLATE.DOC
SEQUENCE END
```

ITEM "Finish Word Report"

```
SEQUENCE BEGIN
    GEN_WORDR TEMPLATE.DOC
SEQUENCE END
```

Report building tips

Insert values from variable list

There is a list of variables on the left side of the design window. The value of each variable (if any value) is shown within brackets. You can drag and drop each of the variables into the template. Once you drop the variable only the value is shown, not the variable name. You can change font, size, colour etc. as you like.

Insert graph

Below the "Graph" folder, in the variable list, you find the variables "Name" and "Image". You can drag and drop them into the template. The graph will cover the whole width of the template. If you would like to have a smaller graph, proceed as in section "Graph size" below.

Graph size

There are two ways to adjust the width of the graph.

A:

- 1] Insert the graph in the template
- 2] High-light the "<<(Picture)>>" and select "Format" -> "Columns...". Select "Two" columns and adjust the width and spacing. Uncheck the "Equal column width" if necessary.

B:

- 1] Select "Table" -> "Insert" -> "Table". Set number of columns and number of rows to "1". Select "Fixed column width" and adjust the width with the spin-box. Click "OK".
- 2] Click in the table and select "Table" -> "Table properties..." and choose the desired "Alignment" and "Text wrapping". If you don't want any borders, click on "Borders and shading..." and select "None". Select "Options" and uncheck the "Automatically resize to fit contents" option. Click "OK" twice.
- 3] Drag the graph from the variable list into the table.
- 4] You can proceed in a similar way if you want more than one graph in the template. If you e.g. want four graphs with labels above each, just create a table with "2" columns and "4" rows and drag the corresponding label/graph into the table.

ParameterTable

Note (Only valid for "Report a recording") or "ManualDataTable".

These features provide tables containing all calculated parameters and “*Keyboard entered parameters (Numeric)*”. The tables are dynamic, i.e. they will adapt to the actual number of parameters in the recording. Below the “*ParameterTable*” and “*ManualDataTable*” folders, in the variable list, you find the corresponding variables. Proceed as follows to create a parameter table in the template:

- 1] Select “Table” -> “Insert” -> “Table”. Set number of rows to “2” and number of columns to a suitable value, e.g. “3” if you only want to display Name, Value and Unit or “7” if you want to display Pass/Fail information as well. Click “OK”.
- 2] Drag the “NAME_LABEL” field into the upper row of the first column and the “Name” field into the row below. Proceed in the same way with the rest of the fields.

Forms and fields

- 1] Right-click on the tool bar in Word® Report Designer and check the “Forms” option.
- 2] The “forms” toolbar show up on screen. Here you can insert text fields, check boxes and drop-down fields.
- 3] Click on the “Form field options” button to set properties of the inserted fields.
- 4] Click on “Protect form” once you are ready.

8.7 Reporting with Excel®

Report a recording

Note *Reporting in Excel can only be done with non-generic graphs and from CABA Win breaker/test view.*

Report a test from CABA Win Breaker/Test view

- 1] Mark the test you wish to report. (If you mark the breaker level the latest test will automatically be selected).
- 2] Select “Report” from the menu bar.
- 3] Click on the “Excel® report” tab. All Excel® report templates (*.doc), pre-selected for the breaker (if any), are listed. If there are no pre-selected templates for the breaker you can browse to the “Report” folder or any other folder and select a template. The selected template will then be copied into the breaker (SPEC\PLAN*.xls). Changes done to this template (if any) will affect only this breaker.
- 4] Select a template from the list. If you don’t find a suitable template you can create a new or edit an existing template. Please refer to the sections “Create/edit Report a test” template (non-generic graphs) or “Create/edit Report a test template (generic graphs)” below.
- 5] Check the “Use monochrome graphs” option if you want a black and white print out.
- 6] Click “Generate”.
MS Excel® opens and displays the report.
- 7] Click “Print preview” to preview the report if desired.
- 8] Click “Print” to print the report.
- 9] Save the report if desired.
The format is MS Excel® (*.xls).

Create “Report a test” template (nongeneric graphs)

- 1] Mark the test you wish to report. (If you mark the breaker level the latest test will automatically be selected.)
- 2] Select “Report” from the menu bar.
- 3] Uncheck the generic graphs.

- 4] Click on the "Excel® report" tab.
All Excel report templates (*.doc), pre-selected for the breaker (if any), are listed.
- 5] Select "New template".
Wait to let generator enter all available data, text and graphs. This can take a few minutes.
All data gets entered one data per row.
- 6] Format your report. Place, enter label for data, change text format.
- 7] Adapt your graphs. To get graph readable you have to change the size of the row to at least 235 and add the rule "ASPECT_HEIGHT".

Note *You must use upper case.*

Edit "Report a test" template (nongeneric graphs)

- 1] Mark the test you wish to report. (If you mark the breaker level the latest test will automatically be selected.)
- 2] Select "Report" from the menu bar.
- 3] Uncheck the generic graphs.
- 4] Click on the "Excel® report" tab.
All Excel® report templates (*.xls), pre-selected for the breaker (if any), are listed.
If there are no pre-selected templates for the breaker you can browse to the "Report" folder or any other folder and select a template. The selected template will then be copied into the breaker (\SPEC\n\PLAN*.xls). Thus, changes done to this template (if any) will affect only this breaker.
- 5] Wait to let generator enter all available data, text and graphs. All data gets entered as configured by selected template.
- 6] Format your report. Place, enter label for data, change text format.
- 7] Adapt your graphs. To get graph readable you have to change the size of the row to at least 235 and add the rule ASPECT_HEIGHT.

9 Vibration measurement and analysis

9.1 General

Acoustic/vibration testing is based on the premise that all mechanical movements in a circuit breaker produce sound/vibrations. By measuring the vibrations and comparing the result with a previous reference, the condition of the circuit breaker can be evaluated. The reference level must have been previously measured on a unit known to be fault free. All measurements on the test object are then related to this reference level in order to determine whether or not the measured vibration level is "normal," or indicating a change of mechanical properties.

Vibration measurements on a circuit breaker are very straightforward. The problems encountered in vibration testing of a circuit breaker are instead tied to the analysis. The vibrations in a circuit breaker are transient and analyzing these signals requires sophisticated methods. By combining known measurement technology with new analysis methods, CABA Win offers a complete, ready-to-use system for circuit breaker vibration testing.

The analysis package containing algorithms for Dynamic Time Warping is available as an option to CABA Win. The vibration measurements can be performed with the TM1600/MA61-S circuit breaker analyzer and appropriate accessories for signal acquisition.

Vibration testing has a broad application range. The circuit breaker can be tested on-line or traditionally off-line and grounded on one or both sides. GIS or outdoor breakers at various voltage levels and the same sensor can be used for all types of circuit breakers. Timing, travel and other diagnostic tests can be done at the same time as vibration measurements.

9.2 Measurements

The mechanical sound/vibration of the circuit breakers is measured with accelerometers. Vibration test data is stored with all other test data so that it can be studied and analyzed together with conventional measurement data such as contact times, travel curves, coil currents, voltage drop, pressure etc.

Accelerometer mounting positions

The accelerometer mounting position must be selected properly. A mounting position where there is no relevant trace of mechanical events cannot contribute anything to the analysis. A mounting position close to the mechanically generated events that is unaffected by background disturbances provides clear signals and highly reliable evaluation data. It is desirable to locate the accelerometers at places where vibration levels remain consistent and unchanged, unless of course, if there has been a change in the performance of the circuit breaker.

Different circuit breakers require different measurement positions. On all circuit breakers, one should find a position where the mechanical events provide clear signals that are separated in time. Examples of good locations are close to the actuator, the linkage system and/or the circuit breaker poles. Measurement positions on external parts such as the tank of a bulk oil breaker or the casing of a circuit breaker located in gas insulated do not provide good data.

Stable, consistent mounting of the sensors (accelerometers) is required in order to measure and compare high-frequency vibrations. Best results are achieved using accelerometers with threaded mountings. When the position(-s) have been selected for a given type of circuit breaker, it is very important to continue to use them in subsequent tests. This provides directly comparable test data. Analysis is meaningless if the measurement positions are not identical.

Connection

The accelerometers are connected to the Megger SCA606 Preamplifier/Signal Conditioning Unit. The SCA606 supplies the accelerometers with the necessary power and also conditions the output signal by amplification and filtering. The vibration signals are sent to the analog inputs of the circuit breaker analyzer.

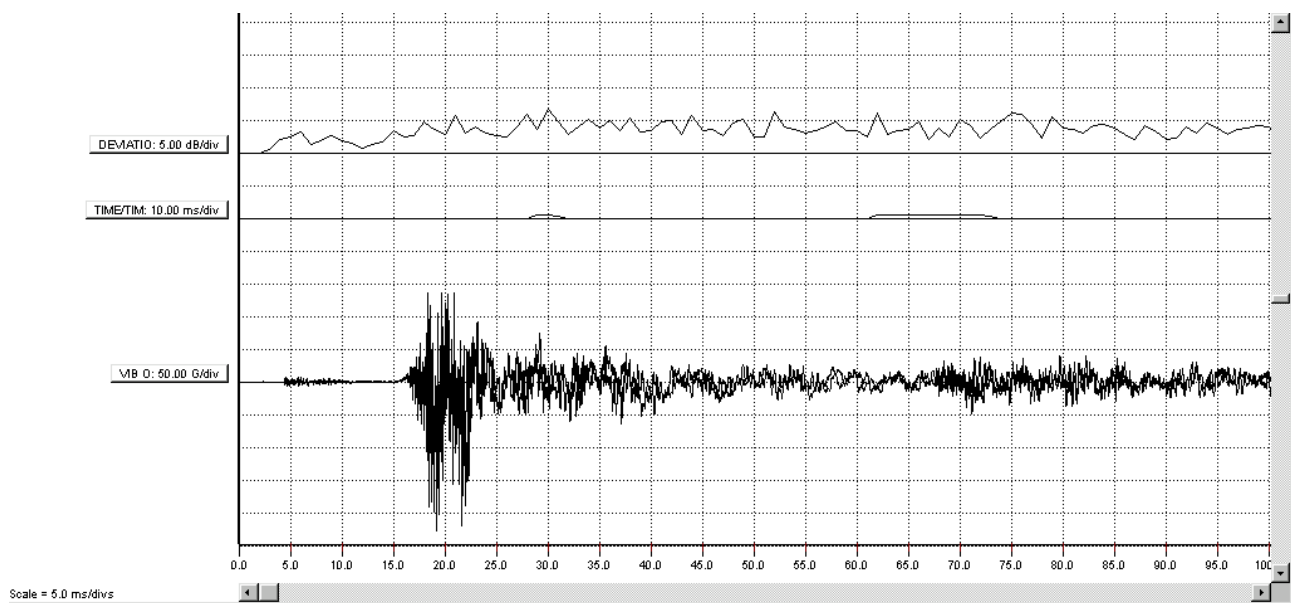
9.3 Vibration analysis

The vibration analysis method in CABA Win is called Dynamic Time Warping (DTW). DTW entails searching across time for similarities in two signals and reporting/presenting the best possible matching between the vibration signatures.

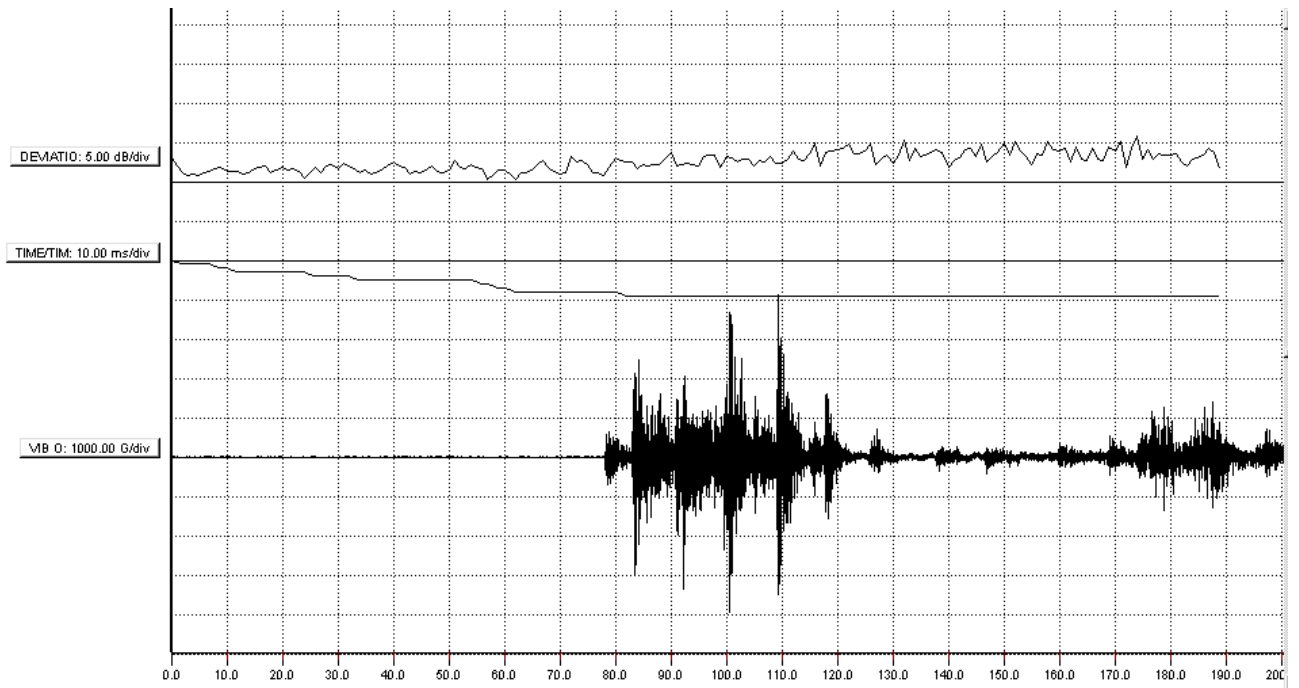
Comparisons between the two signals are based on frequency analysis (FFT). The frequency content and amplitude of the recorded time signal are analyzed each millisecond and the results are compared with a corresponding analysis of the reference signal. DTW analysis requires a high bandwidth and dynamic range. The mechanical events that are to be measured and analyzed generate transient vibrations and/or sounds having substantial frequency content and wide level differences. The TM1600/MA61-S/CABA Win system, with 14-bit resolution and 40 kHz sampling frequency, supports frequency analysis up to 15 kHz. The TM1700 and TM1800 work with 16-bit resolution and 40 kHz sampling frequency.

The analysis program searches for the best possible match between signals and presents its findings in a time vs. time diagram. In a perfect match, vibrations at each millisecond of the measured signal correspond exactly to the vibrations at these same times in the reference signal. The time vs. time diagram illustrates that each mechanical event occurring in the circuit breaker corresponds to an event that occurred at the same time in the reference test. The analysis therefore indicates that there has been no change over time.

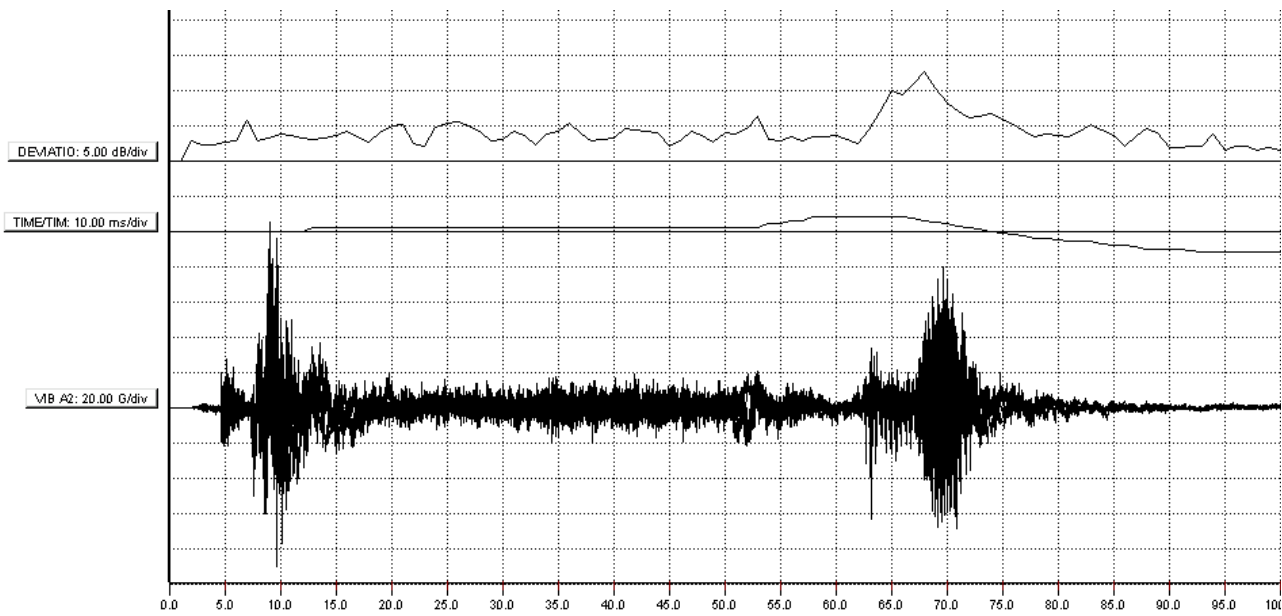
The result from the best possible time match between the two signals is presented in the analysis as a deviation diagram on which the total difference (fault) is shown in decibels (dB). A perfect match indicates that the signals are identical and that any deviation and/or fault is minimal. This means that for each event taking place in the circuit breaker, a corresponding event occurred during the reference test. Consequently, no mechanical change has taken place.



The diagram illustrates an example in which a second test was conducted on the same circuit breaker immediately after the first test. As the figure illustrates there has been no change between tests, and the analysis plainly corroborates this. The time vs. time diagram shows no deviation between measurements, and the deviation diagram shows low values throughout the entire time cycle.



Timing errors in a circuit breaker lead primarily to deviations in the time vs. time diagram. The analysis shows that the circuit breaker has about a 10 ms delay and the deviation diagram shows low values throughout the entire time cycle. The timing error occurred at the beginning of the cycle, but after about 100 ms when the circuit breaker started to move, the events are in synchronism. This is indicated in the analysis by the fact that the timing error remains constant throughout the rest of the operation. The measurements show that the circuit breaker is faulty in some way when contact travel is being initiated, thereby causing a delay. Faulty lubrication might cause this. The deviation diagram shows low values, indicating that the circuit breaker, after the initial delay, performed the same motion as recorded during the reference test.



Mechanical deviations are illustrated in the last example. The time vs. time diagram indicates small deviations at the beginning of the cycle, while at the end of the movement there is a small time variation and also a difference in the deviation curve. This indicates that;

- a) the mechanical cycle has changed relative to that which occurred during the reference test, and
- b) events occurred at virtually the same times, but they changed.

Since the deviation occurred at the end of the cycle of events, changes in the damping mechanism are the probable cause.

Vibration measurements are never fully identical. Even two measurements taken in quick succession on the same circuit breaker have certain differences. Experience shows that deviations in the order of 5 dB or less are normal, while deviations greater than 10-12 dB indicate that there are mechanical differences between two measurements.

Please Note that the DTW-analysis is valid only for the time period when mechanical events occur. In practice, this means that when results are evaluated, one must ignore deviations and time differences for time periods at the beginning and end of the operation where there are no events to analyze.

9.4 Performing a vibration test

Vibration measurements are conducted in the same way as conventional time and motion measurements. The circuit breaker to be tested is first defined by means of a test plan used for vibration testing. The test results are saved by the CABA Win program where the directly transmitted vibration signals can be evaluated. Overload indication is used to set sensitivity/gain in the SCA606.

To proceed with DTW analysis, select a reference test that can be used for comparison. This is preferably a former measurement on the same breaker in as-new condition. If there are no previous measurements available it is sometimes possible to use measurements from other breakers of the same type as reference. After the analysis, the time vs. time and deviation vs. time diagrams are generated automatically. Subsequent evaluation and reporting are then done in the usual way in the CABA Win analysis window and in the report generator.

To perform a vibration test

- 1] Connect the TM1600/MA61-S, TM1700 or TM1800 to the circuit breaker the same way as in a standard time-travel test.
- 2] Select mounting positions for the accelerometer(-s), attach the sensors to the circuit breaker and connect them to the SCA606. The "Error" indication is lit when no transducer is connected or if the transducer/cable is broken.
- 3] Select an appropriate gain setting on the SCA606 unit and operate the circuit breaker.

If the "overload" indicator turns on, select a lower gain setting, if not, try a higher setting. The optimum setting is one step below "overload" setting.

- 4] Start CABA Win, define the breaker and select an appropriate test plan. Note that there are different test plans for vibration testing depending on the number of mechanisms and sensor positions.
- 5] Make sure the accelerometers are calibrated in the transducer list. See section "Transducers"
- 6] Start a new test, select an operation, select transducers, check the connection list and measure.
- 7] CABA Win presents the results. Adjust the graph/display if necessary. Close the window and save the test.
- 8] Continue with the next operation.
- 9] To perform a DTW-analysis, start by opening the actual test for analysis.
- 10] Select "Compare" and "DTW-analysis"
- 11] Select the starting time for the analysis. Max. time window for the analysis is 190 ms and if the recording time is longer, make sure the analysis is performed over an appropriate time period.
- 12] Select the reference measurement for this circuit breaker. This is preferably a former measurement on the same breaker. If there are no previous measurements available it is sometimes possible to use measurements from other breakers of the same type as reference.
- 13] The DTW-analysis is performed and the comparison is displayed as an overlay in the analysis window. Make sure the "deviation" and "time-time" graphs are active to see the results of the analysis.
- 14] Report the analysis, on a template with a graph printout.
- 15] Close the recording. Please Note that the DTW-analysis can not be stored since it is a unique comparison between two individual recordings.

10 Troubleshooting

10.1 Error Messages

“Couldn’t find any Breaker Analyzer” or “Communication error”

Checklist/measures to fix communication problems, The list is not in priority order and not a complete and consistent list of measures (some of the measures make no difference at all in most computers).

- Try again, the analyzer/program was not ready for communication.
- Try another USB-port
- Make sure that the connection is OK and connected to the correct computer serial port.
- Check system settings in CABA Win. Standard is Com 1 and 19200 baud.
- Try a lower baud rate.
- Make sure that the analyzer has power supply.
- Restart the computer.
- Do a general reset of the analyzer by holding the two outer buttons on the MA31/61 (TM1600) while turning on the analyzer.
- Check that light is coming from the fibre connector and that the connector is polarized in the way that this pin fits into the lower hole of the upper connector of the TM1600.
- Verify the function of the serial port of the computer by running a previously working procedure.
- Check that the serial port of the computer is able to run on the assigned baudrate.
- Check that there are no addressing conflicts between different I/O-units in your computer.
- Disable the IR-port on your computer.
- Disable modems and any other communication devices that might be using the actual comport.
- Check that other programs are not using the comport (some programs using the comport do not release it until the program is shut down).
- Turn off all kinds of power saving functions in the computer.
- If running CABA Dos, try to run the software in MS-DOS mode.
- Turn off your screen saver.

- Deactivate any antivirus software.

“The test equipment has not the number of channels required by the test plan”

Measures

- Choose another plan if possible.
- Use another system with more channels.
- Check if some measurements can be turned off, e.g. coil current and/or auxiliary contacts, and edit the test data in the breaker specification.

10.2 General

Unexpected or strange test results.

Possible causes (not a complete list)

- The first sequence measured after mounting the transducer was not a single (open or close) sequence.
- The transducer is not calibrated and/or the nominal stroke of the breaker is not correct.
- The test plan is not compatible with the breaker or the test equipment.
- The reference measurement did not succeed and the wrong calibration data is used for your second measurement. Make a new test and start from the beginning.

10.3 Repairing a broken optical fibre link

To repair a broken fibre optical link, do as follows:

- 1] Cut off the broken part of the fibre.
- 2] Separate the channels approximately 50 mm (2.0 ") back from the ends to permit connecting and polishing.
- 3] For the duplex connector end (connected to TM1600): strip off approximately 7 mm (0.3 ") of the outer jacket with a 16-gauge wire stripper. The cable must be stripped to equal length on each channel to allow easy and proper seating of the cable into the connector. The end connected to the modem does not need to be stripped.
- 4] For the duplex connector end (connected to TM1600): Place the crimp ring and the connector over the end of the cable; the fibre should protrude about 3 mm (0.12 ") through the end of the connector. Carefully position the ring so that it is entirely on the connector with the rim of the crimp ring flush with the connector, leaving a small space between the crimp ring and the flange. Then crimp the ring in place with the crimping tool.
- 5] The single connectors at the modem side have to be separated in two parts to remove of the old fibre.
- 6] Then place both contact parts over the fibre end and tighten them together. The fibre should protrude a few millimetres through the end of the connector.
- 7] Any excess fibre protruding from the connector may be cut off; however, the trimmed fibre should extend at least 1.5 mm (0.06") from the connector end.
- 8] Place a 600 grit abrasive paper on a flat smooth surface. Polish the fibre using a figure eight pattern of strokes until the fibre is flush with the connector. The connector must be held perpendicular to the abrasive paper during the polishing.
- 9] Connect the fibre cable to the modem. Make sure that the transmitter of the fibre modem is connected to the receiver of TM1600 and vice versa. The cable is now ready for use.

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Postal address:

Megger Sweden AB
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SE-182 17 DANDERYD
SWEDEN

Visiting address:

Megger Sweden AB
Rinkebyvägen 19
SE-182 36 DANDERYD
SWEDEN

T +46 8 510 195 00 seinfo@megger.com
F +46 8 510 195 95 www.megger.com