User manual

Oil Tester

DTL C

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1 GENERAL

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1.1 Using this manual

This user manual contains all necessary information that is needed for the commissioning and operation of the described product.

- Read this user manual completely before operating the product for the first time.
- Consider this user manual to be a part of the product and store it in an easily accessible location.
- If this user manual is lost, please contact BAUR Prüf- und Messtechnik GmbH or your nearest BAUR representative (http://www.baur.at/worldwide/).

1.2 Warning signs and danger symbols

	**Risk of electric shock**
	**General danger**
	**Warning about explosive materials**
	**Warning about combustible materials**
	**Warning about hot surfaces**
	**Property damage**
	**Note**

Danger levels

DANGER	Leads to critical injuries or death.
WARNING	Can lead to critical injuries or death.
CAUTION!	Can lead to slight to moderately serious injuries.
ATTENTION	Can lead to property damage.
Note	Indicates useful information.

1.3 Other symbols in document

Symbol	Meaning
➢	You are prompted for an action.
1. 2 ...	Perform the actions in this sequence.
a. b.	If there are many options for an action, the sequence of the action steps for each option is specified with “a, b, c...”. Perform the actions in this sequence.
•	List

1.4 Appropriate use

The BAUR DTL Oil tester DTL C is used for measuring the dissipation factor, the specific resistance and the relative permittivity of insulating liquids.

If the product is used without observing these conditions, safe operation cannot be guaranteed. Proper use also indicates observing the user manual, the conditions for use, the technical data and complying with the maintenance conditions.

The manufacturer cannot be held liable for any damage to persons and property resulting from incorrect operation. Liability for such operation is entirely at the owner’s risk!

Further information on the monitoring and maintenance of insulating mineral oils in electric media is found in the standard IEC 60422:2005.

1.5 Safety instructions

All BAUR devices and systems are manufactured according to the state of the art and are reliable. The individual parts and the finished devices are continuously tested by our qualified personnel as part of our quality assurance system. Each device is fully tested before delivery.

This Oil Tester may be exclusively used by appropriately qualified and authorised technical staff. The user must read the user manual carefully and should become familiar with the operation of the device.

For your safety:

- Comply with local safety and accident prevention regulations.
- Comply with current applicable domestic and international standards and guidelines.
- Comply with all state-of-the-art safety regulations.

CAUTION! Safety deficiencies and device damage due to incorrect accessories and spare parts.

The use of spare parts, accessories and special facilities that are not tested and approved by BAUR could adversely affect the safety, function and characteristics of the product. BAUR is not liable for any resultant damage.

- Use only accessories and original spare parts recommended by BAUR.
- Upgrades, modifications or alterations to the product are fundamentally prohibited.

ATTENTION! Damage to device due to leaking fluids.

- Do not allow liquids to infiltrate the product.

CAUTION! Risk of injury due to hot surface.

The test cell can reach a temperature of up to 110 °C.

- Allow the test cell to cool before touching it.

1.6 Warranty

For warranty claims, please contact BAUR Prüf- und Messtechnik GmbH or your local BAUR representative (http://www.baur.at/worldwide/) . Warranty is cancelled in case of misuse. Wear parts are excluded from the warranty.

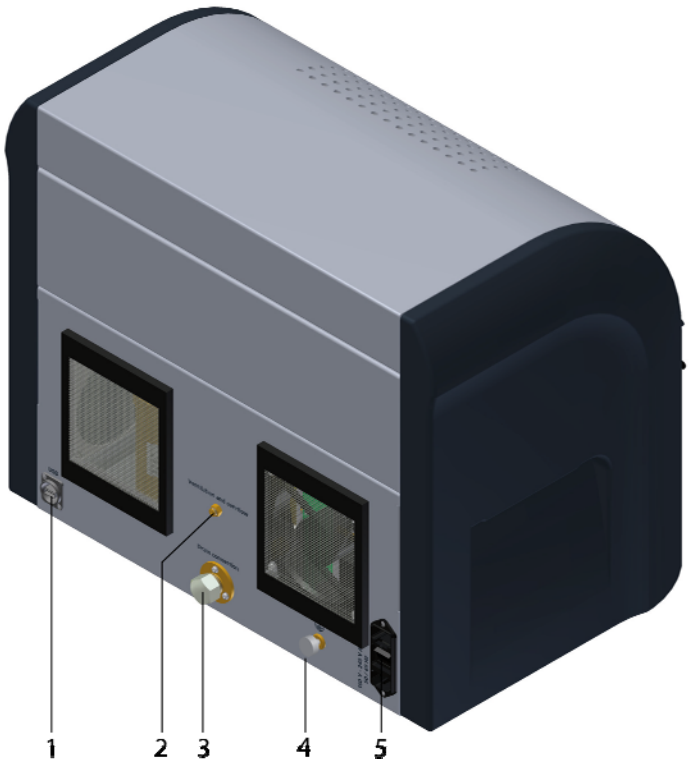
2 PRODUCT INFORMATION

Front view 9
Rear view 10
Test cell 11
Control panel and function keys 13

2.1 Front view

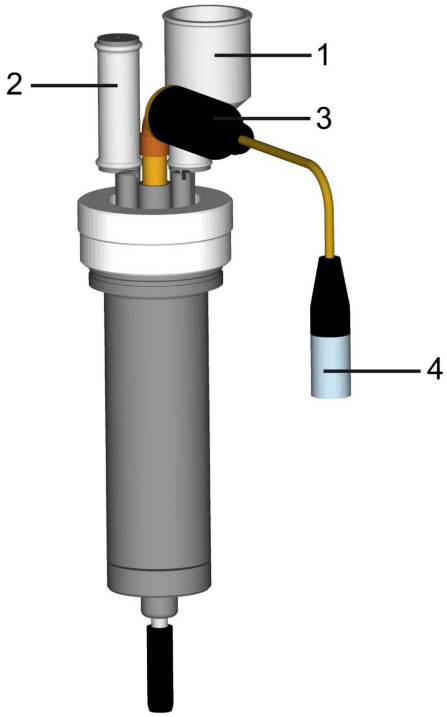
1. Dust cover
2. Test cell
3. Force-opened safety switch
4. Temperature sensor
5. Temperature sensor connection
6. Oil collection tray
7. Membrane keypad
8. Colour display
9. Colour display keys
10. Integrated plain paper printer

2.2 Rear view



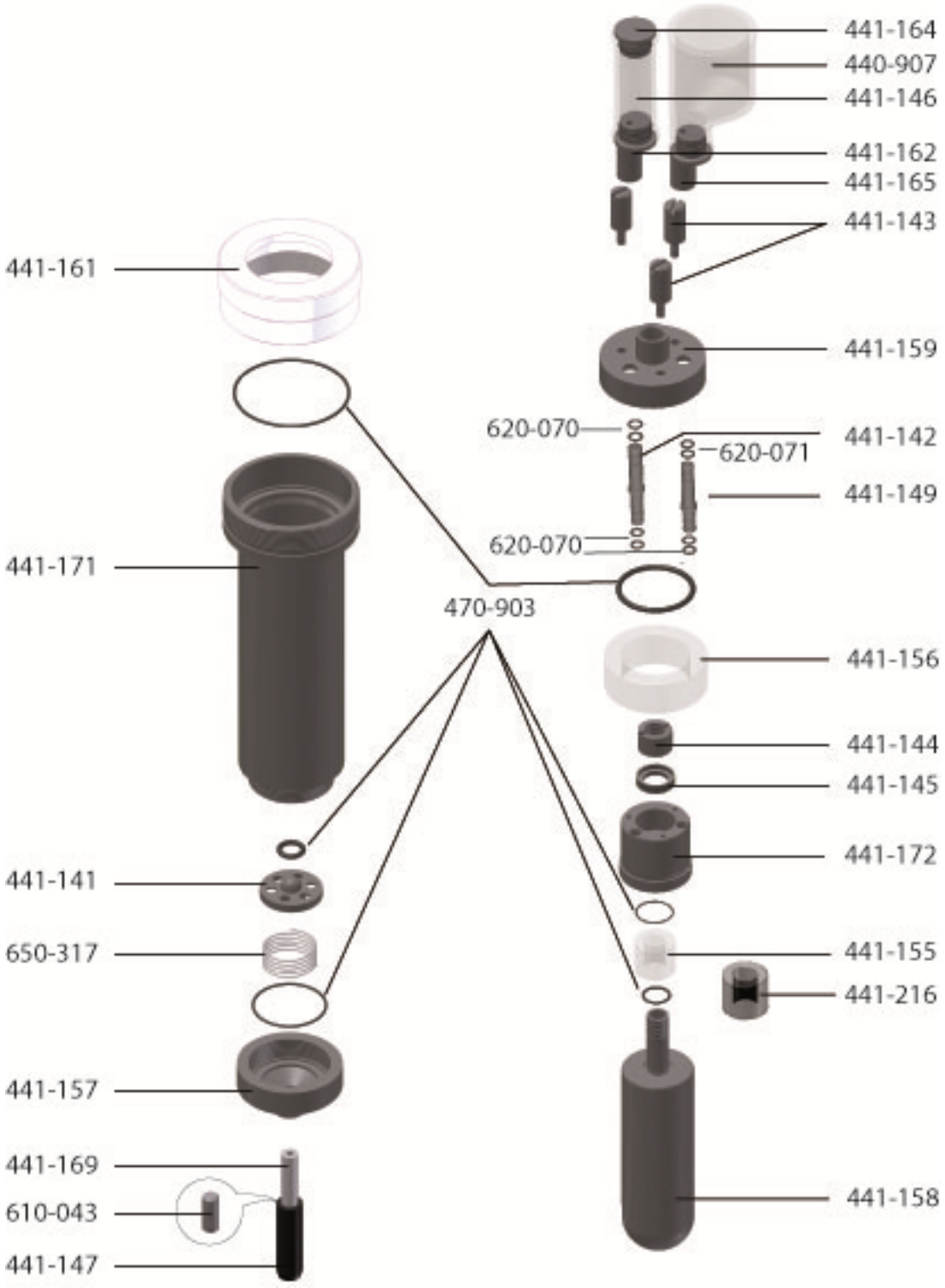
1. USB interface
2. Ventilation and overflow
3. Oil discharge
4. Earth connection
5. Mains connection

2.3 Test cell



1. Filler glass
2. Riser glass
3. Temperature sensor
4. Temperature sensor connector

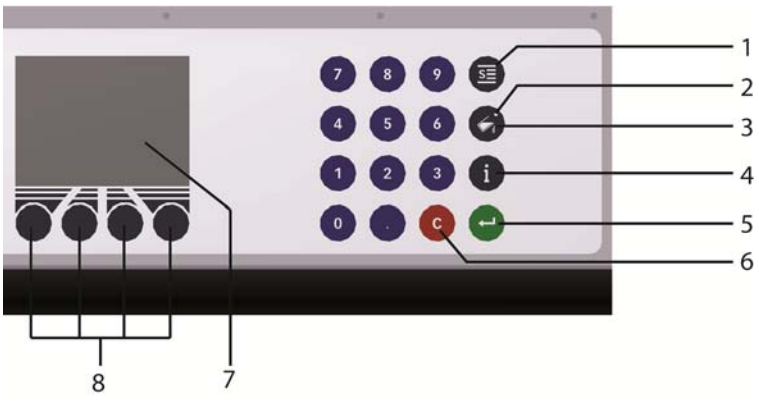
2.3.1 Overview of parts for test cell



2.3.2 Order numbers

Order number	Description	Order number	Description
444-161	Cap nut	441-164	Sealing plug
441-171	High voltage electrode	440-907	Filler view glass
441-141	Spherical valve	441-146	Riser view glass
650-317	Compression spring	441-165	Riser view glass nipple
441-157	Valve cover	441-162	Filler view glass nipple
441-169	Insulating piece	441-143	Contact screw
610-043	Threaded pin	441-159	Contact socket
441-147	Armature	441-142	Riser pipe
		441-149	Filler pipe
470-903	Gasket set	441-156	Glass ring (large)
		441-144	Slotted nut
		441-145	Contact pressure ring
		441-172	Protective ring
		441-155	Glass ring (small)
		441-216	Plastic ring for transport
		441-158	Measurement electrode
		620-070	O-ring ∅ 4.0 x 1.0
		620-071	O-ring ∅ 4.5 x 1.0

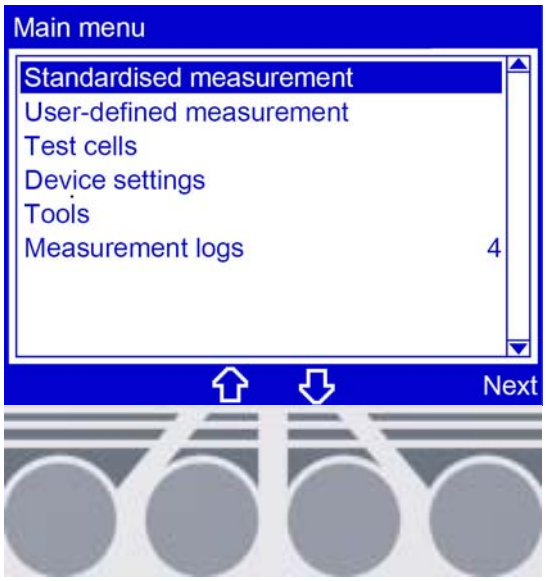
2.4 Control panel and function keys



1. Standardised measurement menu - (see "Standardised measurement" on page 32)
2. Discharge display light
3. Discharge valve key
4. About menu - (see "Info on device" on page 67)
5. Enter key
6. Delete key: Deletes the character at the cursor position
7. Colour display
8. Control keys

2.4.1 Menu navigation

The control menu is displayed on the display. The menu is operated with the control keys under the colour display and the function keys on the membrane keypad . The meaning of the relevant control key is displayed in plain text or as a symbol in the lowest row of the display.



All functions and user settings can be accessed from the main menu.

Menu item	**Description**
Standardised measurement	Configure settings for measurements in compliance with integrated standards and start measurements.
User-defined measurement	Configure settings for user-defined measurements and start measurements.
Test cells	Manage test cells: • Add test cell • Select a test cell for a measurement • Calibrating the test cell • Delete test cell

Device settings	You can define or change general system settings for the device: • Set display lighting • Select language • Switch printer on/off • Set date • Set time • Define whether before starting each individual measurement a query for the test cell currently used should appear. • Display intermediate result after each measurement step • Configure settings for deleting measurement logs when the measurement log memory is full (overwrite measurement logs) • Define whether the calibration date will be printed on the measurement log • Define the temperature units (°F or °C) • Define whether the device should measure the specific resistance • Define whether the device should be preheated to shorten the heating time immediately before the measurement • View info about the USB interface
Tools	• Overview of data on the oil tester (serial number, date of last calibration and manufacturer contact details) and information on the test cell (cell description and capacity) • Activation of the “Communication ITS” option. Follow the operating manual and safety instructions for the ITS oil testing software. • Checking the dissipation factor measurement system with a TE C dissipation factor tester (optional). Follow the instructions in the user manual for the TE C tester. • Checking the precision of the dissipation factor measurement system with a KA TD C calibrator (optional). Follow the instructions in the user manual for the KA TD C calibrator.
Measurement logs	Display, print and delete measurement logs.

3 COMMISSIONING

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Earthing the device 17
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Clean the test cell 19
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Turning on the oil tester 22

For your safety:

- Comply with local safety and accident prevention regulations.
- Comply with current applicable domestic and international standards and guidelines.
- Comply with all state-of-the-art safety regulations.

3.1 Inspection before commissioning

CAUTION! Safety defects due to use of damaged device.

- Never use devices that are visibly damaged or clearly have a malfunction. Secure it against accidental start.
- Get faults rectified immediately.

1. Check the oil tester for mechanical damages.
2. Check the electrical connections and lines for damage.

3.2 Earthing the device

1. Earth connection screw
2. Earth cable lug
3. Earth connection

1. Unscrew the earth connection screw (1).
2. Insert the cable lug of the earth cable (2) on the earth connection screw (1).
3. Insert the earth connection screw in the earth connection (3) again.

3.3 Dismounting the test cell

CAUTION! Risk of injury due to hot surface.

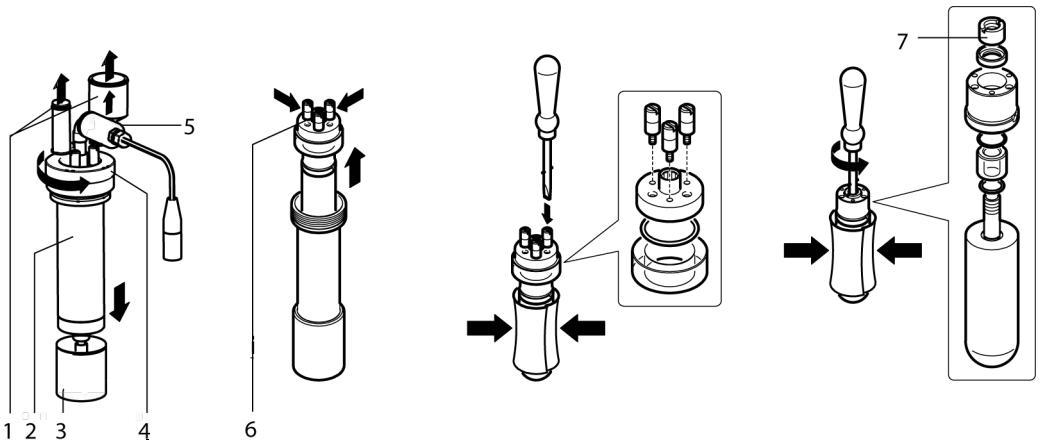
The test cell can reach a temperature of up to 110 °C.

- Allow the test cell to cool before touching it.

ATTENTION! Damage to the test cell and measurement electrode due to improper handling.

- Handle the test cell with utmost care to prevent damages.

- Always wear plastic gloves or use lint-free paper to touch the measurement electrode. The measurement electrode can be damaged by grease residue.



1. Filler and riser view glass with pipes
2. Test cell
3. Base
4. Cap nut
5. Temperature sensor
6. Contact screws
7. Slotted nut

1. Place the test cell on the base.
2. Introduce the temperature sensor (5).
3. Remove the filler and riser view glass (1) with the pipes.
4. Loosen and remove the white cap nut (4).
5. Remove the measurement electrode on the contact screws carefully from the high voltage electrode. Always wear plastic gloves or use lint-free paper to touch the measurement electrode!
6. Loosen the three contact screws and remove the pressure plate and the big glass ring.
7. Loosen the slotted nut (7) and remove the individual parts.

3.4 Clean the test cell

CAUTION! Risk of injury due to hot surface.

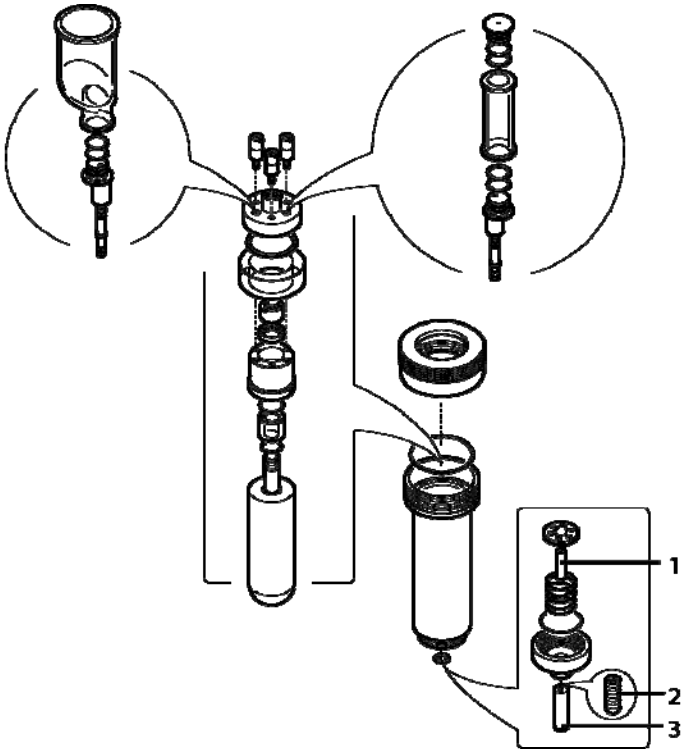
The test cell can reach a temperature of up to 110 °C.

- ➢ Allow the test cell to cool before touching it.

ATTENTION! Damage to the test cell and measurement electrode due to improper handling.

- ➢ Handle the test cell with utmost care to prevent damages.

- ➢ Always wear plastic gloves or use lint-free paper to touch the measurement electrode. The measurement electrode can be damaged by grease residue.



1. Insulating piece
2. Threaded pin
3. Armature

1. Fill a tub with petroleum ether or other similar mild solvent.

CAUTION! Danger of fire!

Petroleum ether is easily inflammable and can lead to fire under certain circumstances.

- ➢ No smoking.
- ➢ Avoid open fire.

2. Clean the parts separately. Use a clean brush.

   The insulating piece (1), the threaded pin (2) and the armature (3) are secured with instant glue. Clean these parts only if they have become loose.

3. Dry the parts separately with a blow drier or a clean, lint-free cloth. Always wear plastic gloves or use lint-free paper to touch the measurement electrode!

3.5 Assembling the test cell

ATTENTION! Device damage due to improper handling.

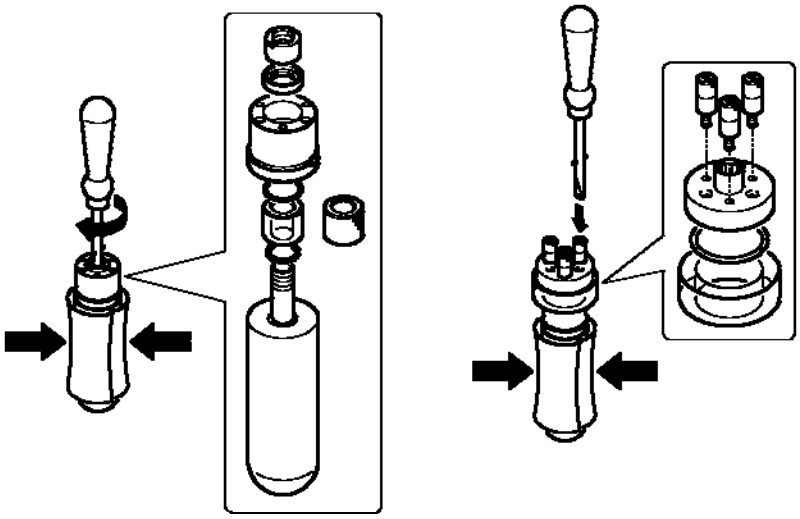
Incorrectly assembled or damaged test cells (e.g. uneven electrode surface) can lead to breakdowns and consequently damage the measurement input!

Before assembling the test cell:

- Clean all parts before assembly (see "Clean the test cell" on page 19).
- Always wear plastic gloves or use lint-free paper to touch the measurement electrode.
- Lubricate the O-rings with test oil and ensure that they are sitting properly and are not jammed.

For transport and at temperatures below 0 °C:

- Replace the small glass ring (441-155) with the plastic ring (441-216)!



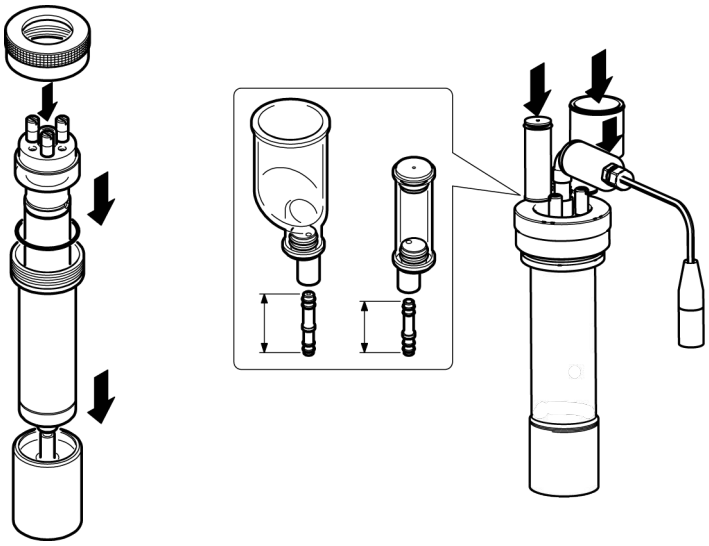
1. Mount the individual parts and tighten the slotted nuts properly.

ATTENTION! Danger of glass breakage!

- The slotted nuts should only be hand-tightened.

2. Insert the big glass ring and mount the pressure plate.

3. Tighten the three contact screws.



4. Place the high voltage electrode on the base.
5. Introduce the measurement electrode carefully into the high voltage electrode.
6. Mount the white cap nut.
7. Introduce the riser pipe into the riser view glass.
8. Introduce the filler pipe into the filler view glass.
9. Introduce the filler and riser view glass with the pipes into the measurement electrode until stop.
10. Introduce the temperature probe into the receptacle of the test cell.
11. Insert the temperature probe in the oil tester’s temperature probe connection of the oil tester.

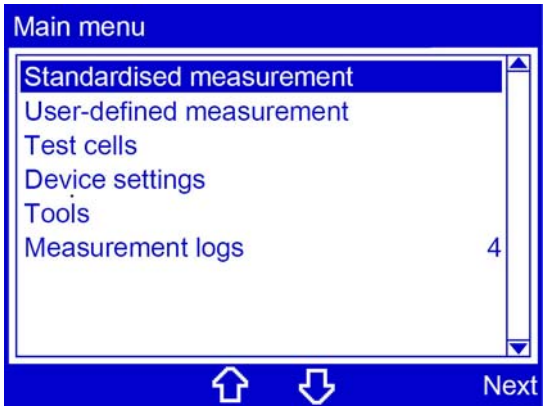
NOTE: Calibration of empty cell is recommended after every dismantling and assembly to ensure that the test cell was assembled correctly.

3.6 Turning on the oil tester

1. Ensure that your supply voltage matches the specifications on the rating plate.
2. Connect the oil tester to the mains voltage.
3. There is a mains switch on the back of the device. Use it to switch on the device.
4. Open up the operating unit. The control unit is the panel on which the control panel and membrane keypad are located.

   After the control unit is folded out, the device runs a self-test.

The main menu is displayed on the display panel.



4 MANAGING TEST CELLS

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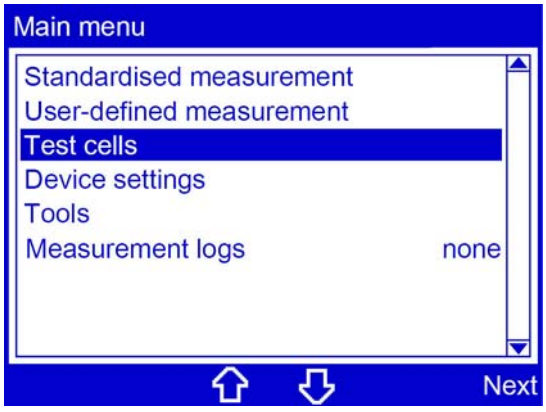
Selecting a test cell for a measurement 28
Editing the data of a test cell 29
Delete test cell 31

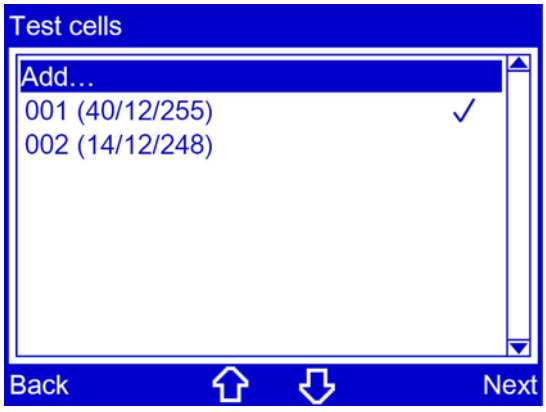
4.1 Add new test cell

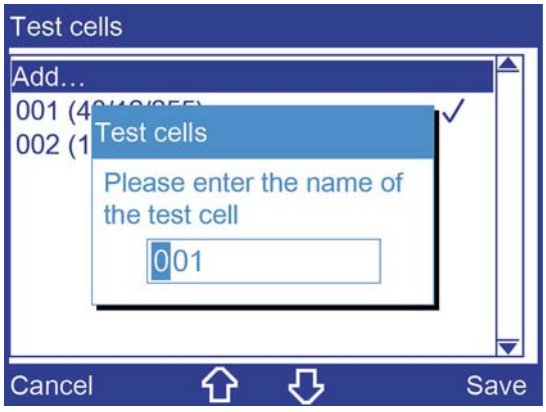
Main menu > Test cells



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The “Test cells” window opens.



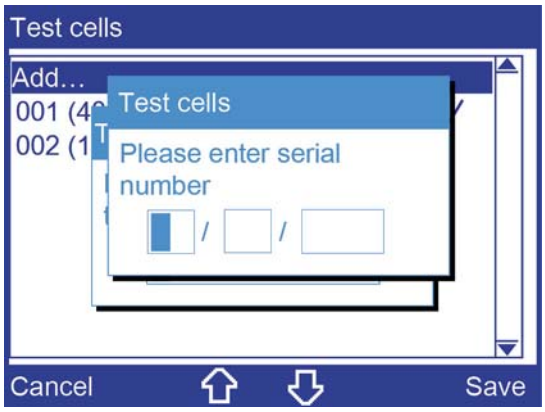


3. Select “Add..." using the arrow keys.
4. Click "Next" to confirm the entry.

A prompt to enter a cell name appears.

5. Enter an cell name with the number keys on the membrane keypad.
6. Click "Save" to confirm the entry.

   A prompt to enter the serial number appears.

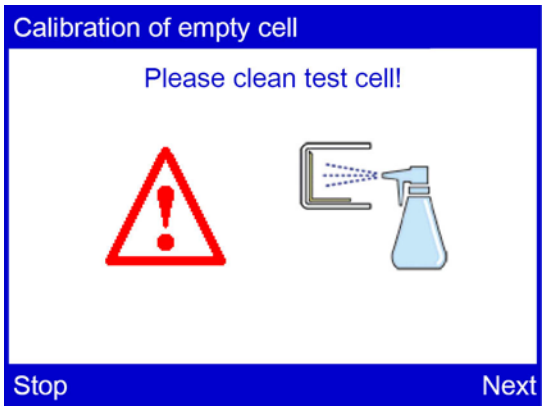


7. The serial number is on the side of the test cell. Enter the serial number with the number keys on the membrane keypad.

   The serial number of the test cell will be indicated in the measurement log.

8. Click "Save" to confirm the entry.

   The device switches to calibration of the new test cell. A prompt appears telling you to clean the test cell (on page 19).

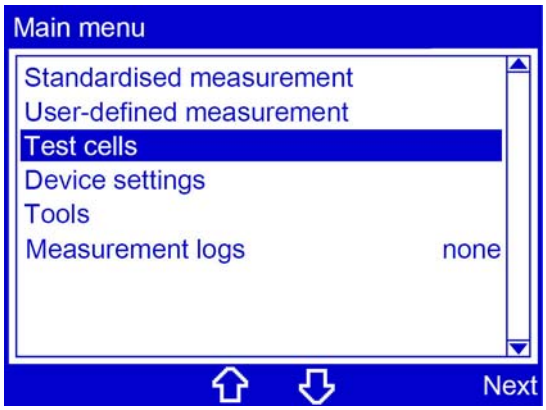


4.2 Calibrating the test cell

Some standards require calibrating an empty cell before beginning a measurement.

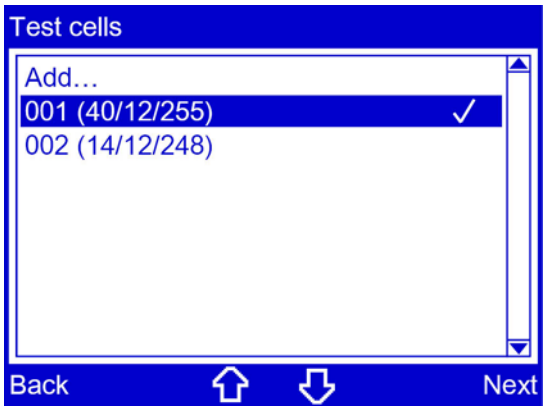
NOTE: Calibration of empty cell is recommended after every dismantling and assembly to ensure that the test cell was assembled correctly.

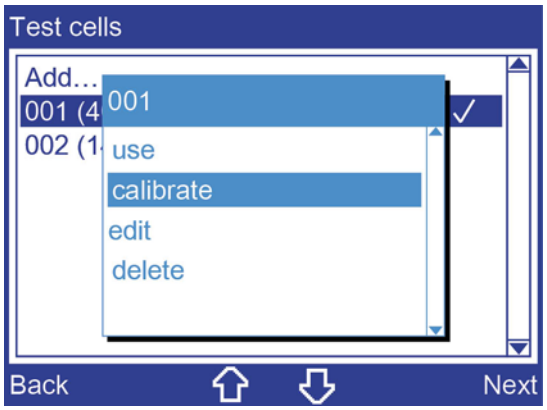
Main menu > Test cells



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The “Test cells” window opens.

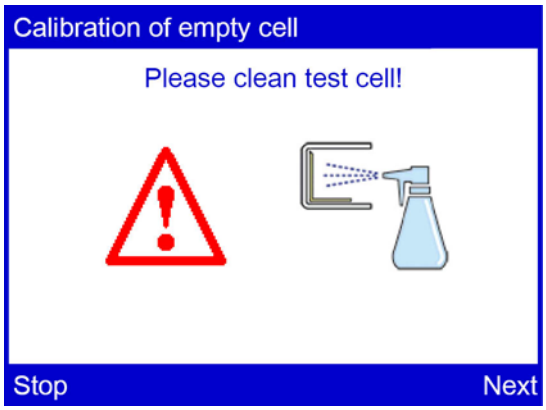




3. Select a test cell using the arrow keys.
4. Click "Next" to confirm the entry.

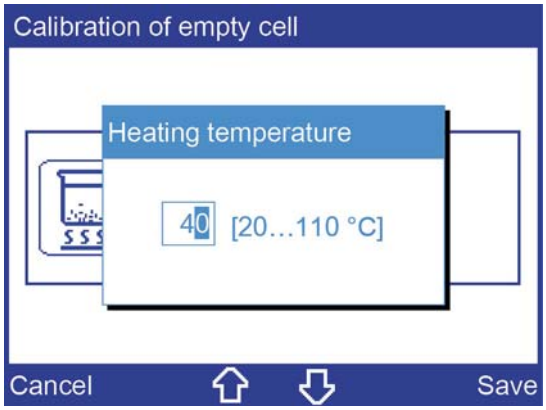
   A pop-up menu opens.
5. Select the “calibrate” from the menu using the arrow keys.
6. Click "Next" to confirm the entry.

A prompt appears telling you to clean the test cell:



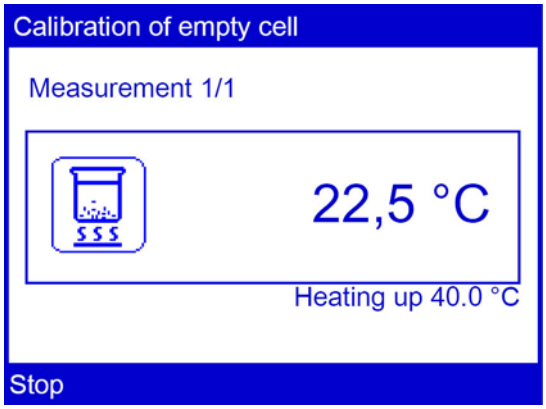
7. Clean the test cell if it has not yet been cleaned. (see "Clean the test cell" on page 19)
8. After the test cell has been cleaned, assembled (see "Assembling the test cell" on page 20) and placed in the DTL C, select “Next”.

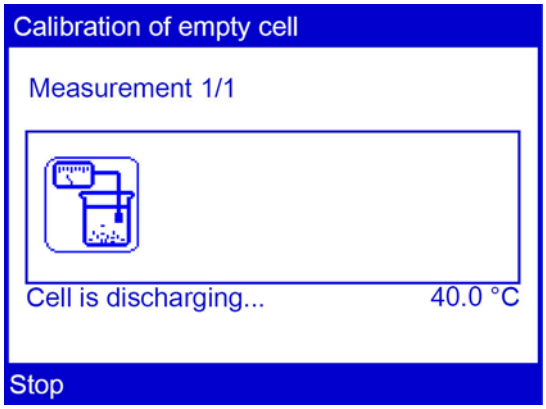
A prompt appears on the display:



9. Select the heating temperature for the empty cell calibration using the number keys on the membrane keypad.
10. Click "Save" to confirm the entry.

A new prompt appears on the display.





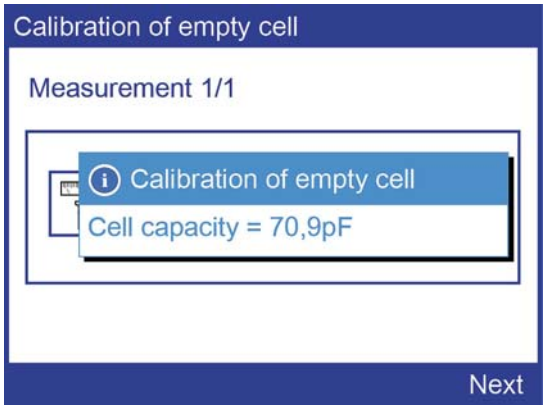
CAUTION! Risk of injury due to hot surface.

The test cell can reach a temperature of up to 110 °C.

➢ Allow the test cell to cool before touching it.

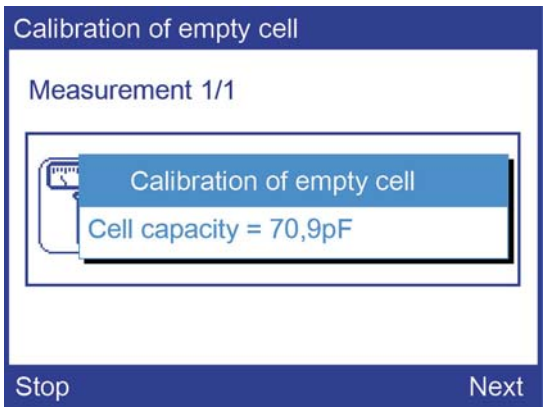
If the determined cell capacity is in the tolerance range of 67.8 to 73 pF, the calibration is successful.

The successful completion of the calibration is displayed by a message:

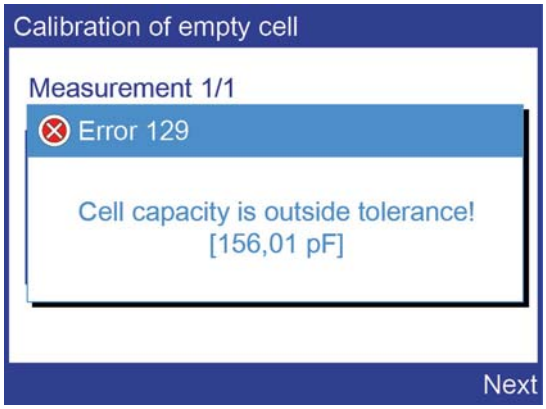


1. Select "Next".

The value of the measured cell capacity is printed automatically. Select "Stop" at the bottom left to cancel printing.



If the calibration of the empty cell was not successful, an error message is displayed:

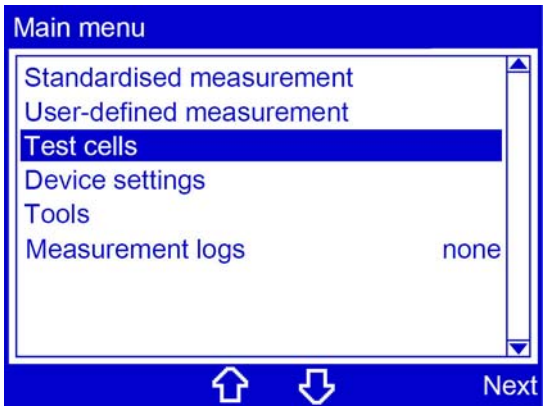


Please clean the test cell once more and repeat the calibration of the empty cell.

Ensure proper cleaning and correct assembly of the test cell.

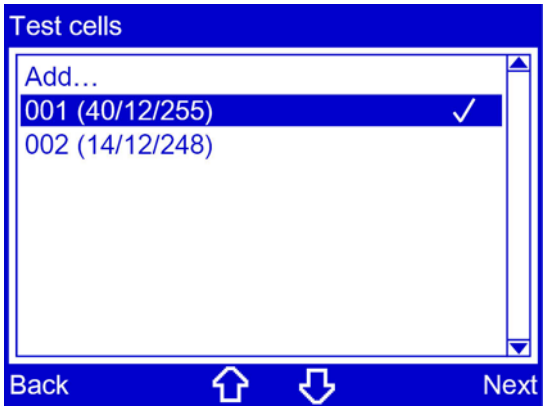
4.3 Selecting a test cell for a measurement

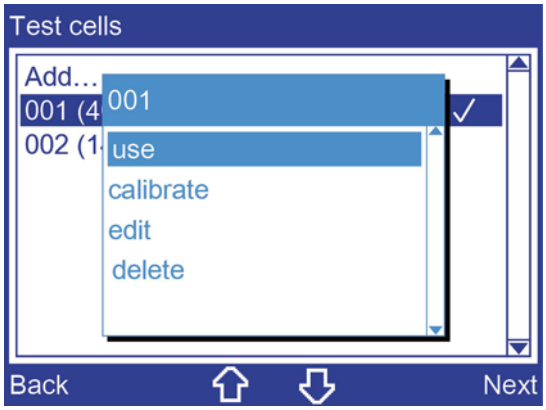
Main menu > Test cells



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The “Test cells” window opens.





3. Select a test cell using the arrow keys.
4. Click "Next" to confirm the entry.

   A pop-up menu opens.

5. Select “use” with the arrow keys.
6. Click "Next" to confirm the entry.

   The pop-up menu will close. The selected test cell is indicated by a checkmark.

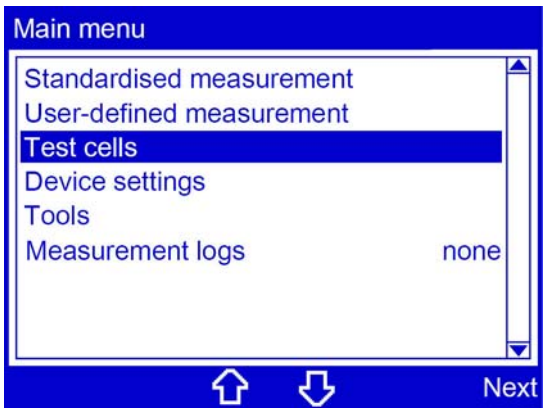
   If under Main menu > Device settings the option "Select test cell" is deactivated (see "Activating the test cell prompt" on page 60), the selected test cell is automatically taken for all measurements.

ATTENTION!

➢ Prior to each measurement, check whether the test cell used in the device is the one selected in the unit’s menu. If this is not the case, **measurement inaccuracies may result**.

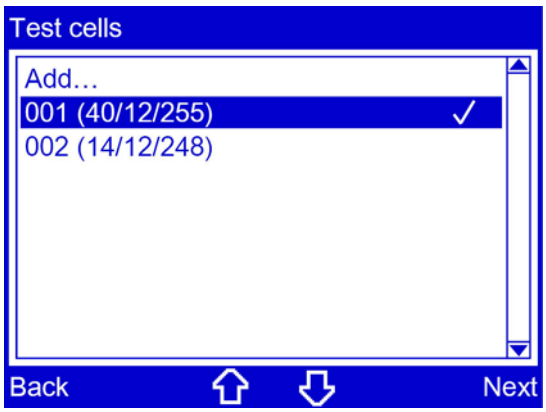
4.4 Editing the data of a test cell

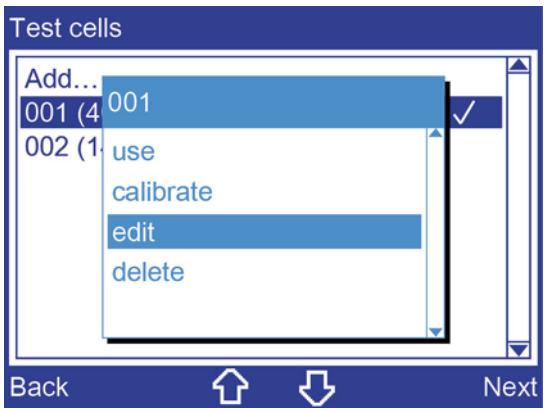
Main menu > Test cells



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The “Test cells” window opens.

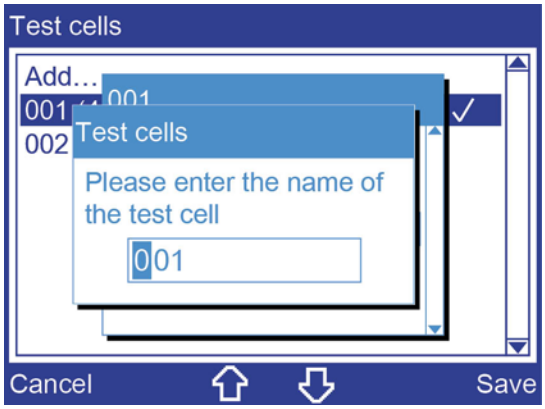




3. Select a test cell using the arrow keys.
4. Click "Next" to confirm the entry.

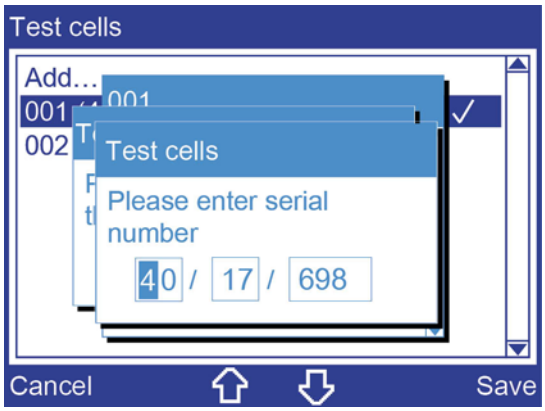
   A pop-up menu opens.
5. Select “Edit” using the arrow keys.
6. Click "Next" to confirm the entry.

A prompt to enter a cell name appears.



7. If you want to change the cell description, enter a cell description with the number keys on the membrane keypad.
8. Click "Save" to confirm the entry.

   A prompt to enter the serial number appears.

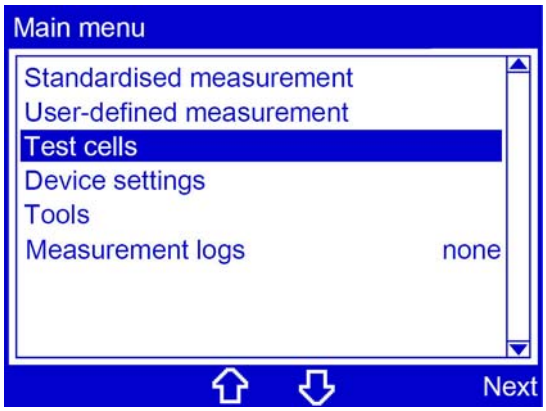


9. If you want to change the serial number, enter another serial number with the number keys on the membrane keypad. The serial number is on the side of the test cell.
10. Click "Save" to confirm the entry.

4.5 Delete test cell

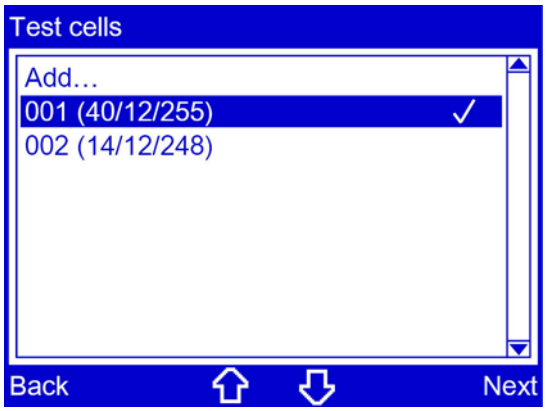
Note: If only one test cell was entered, this test cell cannot be deleted.

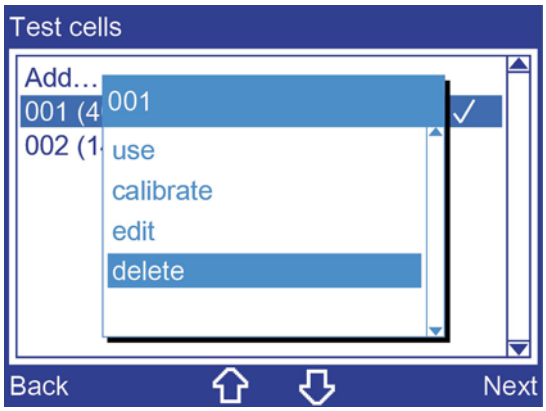
Main menu > Test cells



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The “Test cells” window opens.





3. Select the menu item by pressing the arrow keys.
4. Click "Next" to confirm the entry.
5. Select a test cell using the arrow keys.
6. Click "Next" to confirm the entry.

   A pop-up menu opens.
7. Select “delete" using the arrow keys.
8. Click "Next" to confirm the entry.

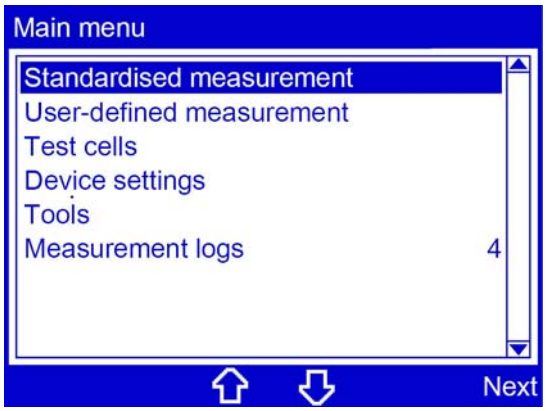
   A prompt appears to ask if you really want to delete the test cell.
9. Confirm the entry with "Yes".

5 STANDARDISED MEASUREMENT

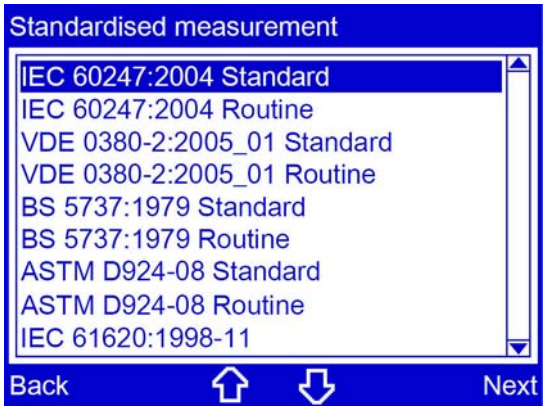
Measurement according to IEC 61620:1998-11 35

1. Ensure that the temperature probe is inserted in the temperature probe connection of the oil tester.
2. Select “Standardised measurement” in the main menu by pressing the arrow keys.

   Main menu > Standardised measurement



3. Click "Next" to confirm the entry.

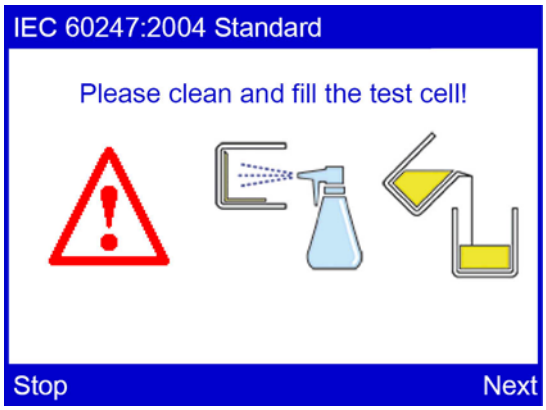


4. Choose a standard by pressing the arrow keys.

   Note: If the selected standard allows measurement of the negative specific resistance, the device can measure the positive and negative specific resistance. If the negative specific resistance is to be measured, activate the corresponding option in the menu item “Device settings (see "Measure specific resistance" on page 63)”.

5. Click "Next" to confirm the entry.

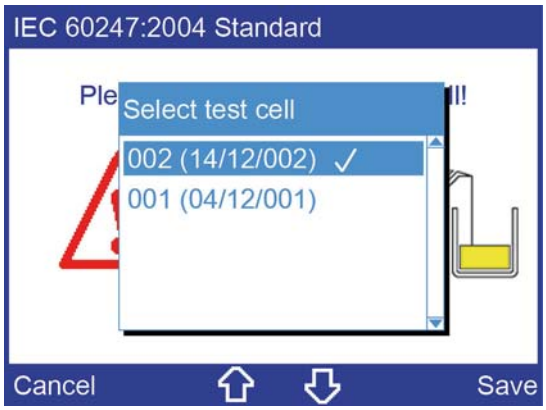
A new prompt is displayed telling you to clean and fill the test cell.



6. Open the dust cover.
7. Clean the test cell (on page 19, "Dismounting the test cell" on page 18) if it has not yet been cleaned.
8. Reassemble the test cell after cleaning and insert it in the device. (see "Assembling the test cell" on page 20)
9. Connect the hose for emptying the test cell at the oil drain. See the rear view (on page 10) for the position of the oil drain.
10. Fill the test cell until the riser view glass is filled. Use a disposable syringe for oils with high viscosity.
11. Press the discharge valve key.

    The test cell opens. You hear a soft noise briefly. The drain indicator lights up and the test cell is emptied.
12. After the test cell is emptied, press the discharge valve key once again to close the test cell.
13. To minimise the influence of interfering factors such as oil impurities on the measurement results, repeat the entire process for “Filling and emptying the test cell” three times (steps 10 - 12).
14. Fill the test cell a fourth time. The measurement is performed with this filling.
15. Close the dust cover.
16. Click "Next" to confirm the entry.

    If the **option "Select test cell"** is **enabled** (see "**Activating the test cell prompt**" on page 60), a prompt appears to select a test cell.



a. Select the test cell you use for the measurement.

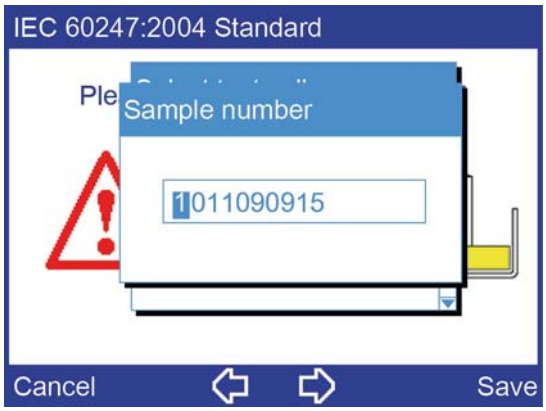
b. Click "Save" to confirm the entry.

If the **option “Select test cell" is not enabled**, the test cell selected under Main menu > Test cells will be used automatically for the current measurement. Check that you used the correct test cell.

ATTENTION!

➢ Prior to each measurement, check whether the test cell used in the device is the one selected in the unit’s menu. If this is not the case, **measurement inaccuracies may result**.

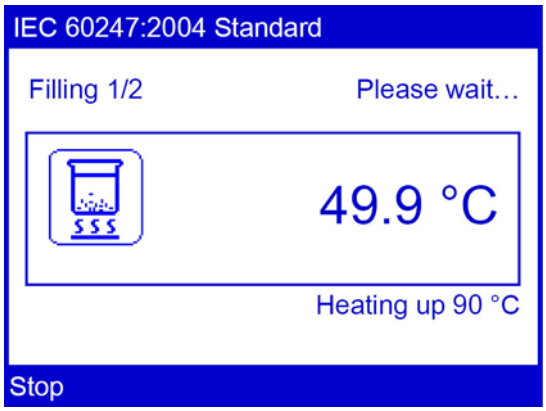
A prompt to enter a sample number appears. The device will suggest a sample number composed of the date and time in the format DDMMYYhhmm. You can extend this sample number as required.



17. If you want to expand the suggested sample number, do so or enter any sample number with the number keys on the membrane keypad.

18. Click "Save" to confirm the entry.

The measurement begins. A window displays the details of the measurement process.



CAUTION! Risk of injury due to hot surface.

The test cell can reach a temperature of up to 110 °C.

➢ Allow the test cell to cool before touching it.

5.1 Measurement according to IEC 61620:1998-11

Standard IEC 61620:1998: "Insulating liquids - Determination of the permittivity dissipation factor through measurement of the conductance and capacity test process"

With the Oil Tester DTL C it is possible to carry out measurements according to the IEC 61620 standard.

The international standard IEC 61620 describes a process for simultaneous measurement of the conductance G and the capacity C, which enables a calculation of the dielectric dissipation factor tan δ of insulating liquids. The recommended process applies both for unused insulating liquids and for insulating liquids that are used in transformers or other electric devices.

This standard can be considered insofar as a supplement for IEC 60247, as it is especially suitable for highly insulating liquids and recommends a measurement process for these liquids.

To avoid influencing the thermodynamic equilibrium, a measurement process with alternating square wave voltage, lower voltage and frequency is applied. It allows for reliable determination of low dielectric dissipation factor values up to 10^{-6} at mains frequency.

The dielectric dissipation factor is defined from the conductivity σ and the permittivity ε of the insulating oil:

$$\tan \delta = \frac{\sigma}{\varepsilon \omega}$$

σ - Conductivity of insulating oil

ε - Permittivity

$\omega = 2 \pi f$

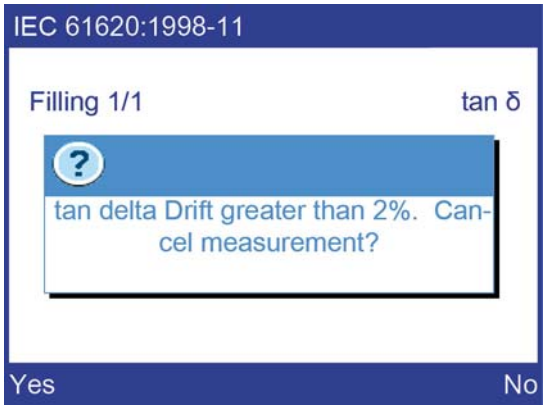
f = Frequency

5.1.1 Tan delta drift

To get convincing measuring results, it is necessary to ensure that the electric losses of the empty test cell are much lower than the electric losses of the insulating liquid that is being tested. This is guaranteed by the cleanliness of the test cell.

If the test cell is not sufficiently clean, the dissipation factor fluctuates by more than 2%. In this case, the standard recommends cleaning the test cell, refilling and repeating the measurement.

If the fluctuations of tan delta value exceed 2%, the following message is displayed:



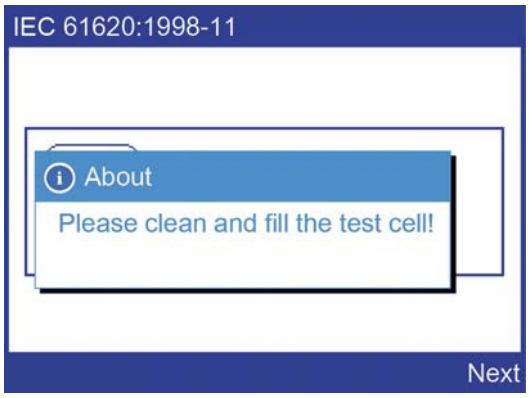
You have the following possibilities:

- Cancel measurement, clean test cell, refill and repeat measurement: This procedure corresponds to the recommendation in the standard.
- Continue measurement: In this case, the measurement does not correspond to the standard. In the test log an entry is made that the criteria are not fulfilled according to the standard.

Cancel measurement at too high tan delta drift

1. Select "Yes".

   A message is displayed on the display panel:

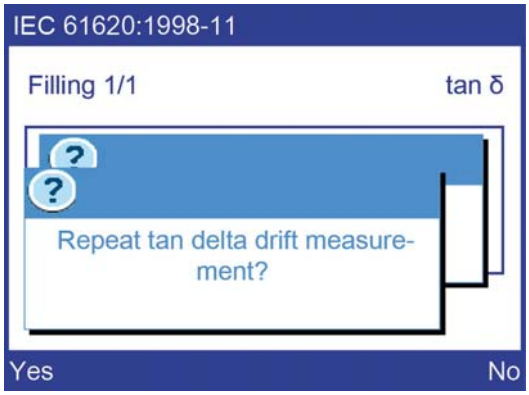


2. Clean the test cell once again.
3. Refill the test cell.
4. Repeat the measurement.

Continue measurement at too high tan delta drift

1. Select “No”.

   A question is displayed.



2. Select if you want to repeat the tan delta drift measurement or not:

   - Yes

     The tan delta drift measurement is repeated. On repeated measurement, if the tan delta drift is still too high, you have the option to cancel or to continue the measurement.

   - No

     The measurement is continued without repeating the tan delta drift measurement. In the test log an entry is made that the criteria are not fulfilled according to the standard.

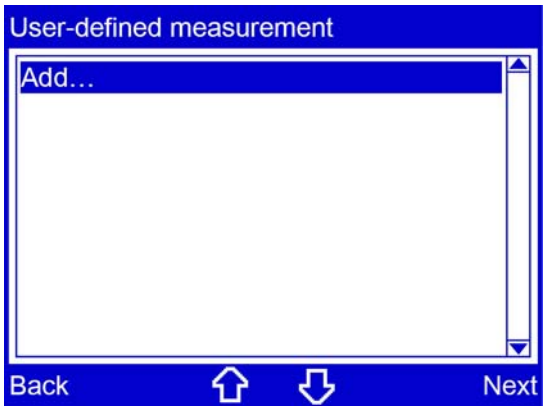
5.1.2 Measurement of conductance at different reference temperatures

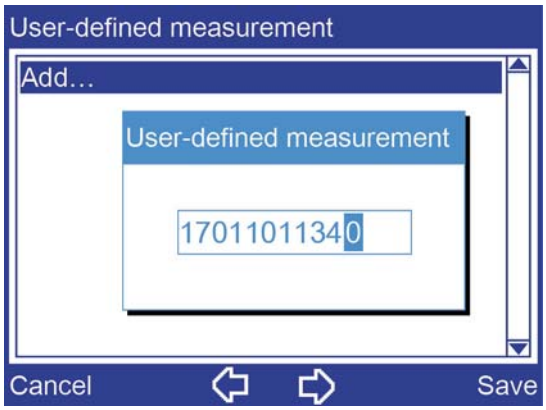
As the conductivity is showing high dependence on the temperature, with DTL C you can measure conductance values at different reference temperatures. For this, create a new user-defined measurement based on IEC 61620:1998-11 and consisting of many measurement steps with varying reference temperature.

Note: Below we have described how to create a user-defined measurement to measure the conductance values at different reference temperatures according to IEC 61620:1998-11. This is demonstrated by means of a sample measurement. The parameters of the described measurement are given as example.

Create user-defined measurement

Main menu > User-defined measurement





1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

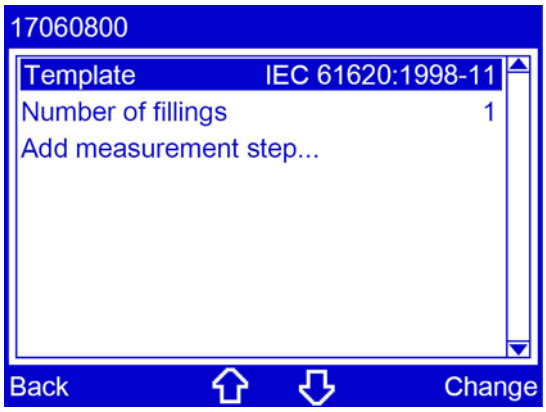
   A prompt appears to enter a name for the measurement. The device will suggest a name based on the date and time in the format DDMMYYhhmm. You can expand this name as required.
3. If you want to expand the suggested name, do so or enter any name with the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

   The menu for defining measurement parameters will open.

Selecting a template

Load the standard IEC 61620:1998-11 as template for the measurement.

Main menu > User-defined measurement > ...> Template

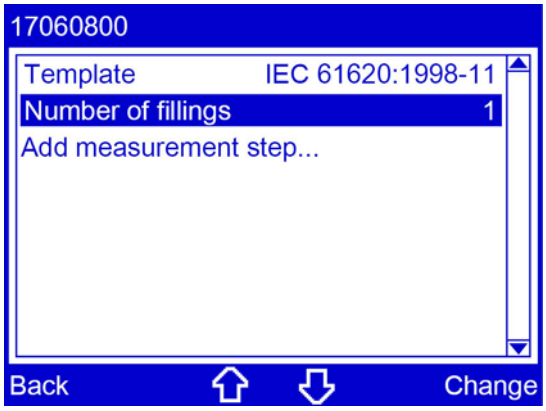


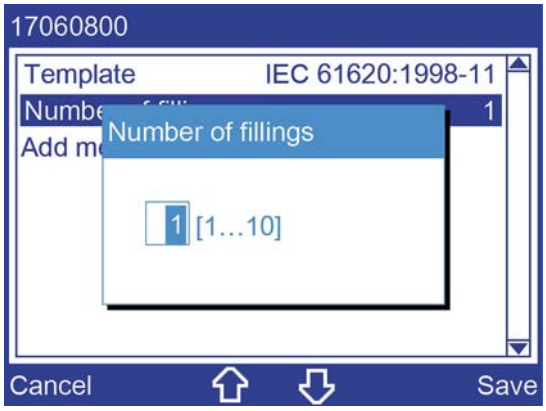
1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select IEC 61620:1998-11 by pressing the arrow keys.
4. Press "Load" to confirm the entry.

Select number of fillings

Select a filling according to the standard.

Main menu > User-defined measurement > ... > Number of fillings





1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select 1 filling using the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

Configuring measurement steps

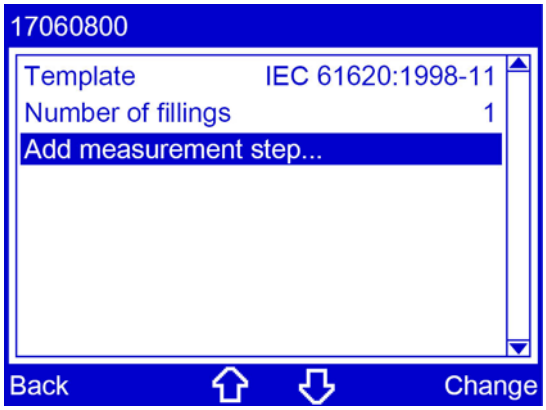
Create as many measurement steps as the many conductance values you want to measure at varying reference temperatures. The number of measurement steps in the following description is given as example.

Define the parameters for the measurement steps according to the specifications of IEC 61620:1998-11.

Note: The “test voltage” parameter is fixed at 100 V and cannot be changed. The test temperature and frequency values listed below are examples and can be defined separately.

Configuring the first measurement step

Main menu > User-defined measurement



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.

The parameters for the first measurement step are defined as follows, for example:

Measurement parameter: tan δ

Test voltage: 100 V (constant value)

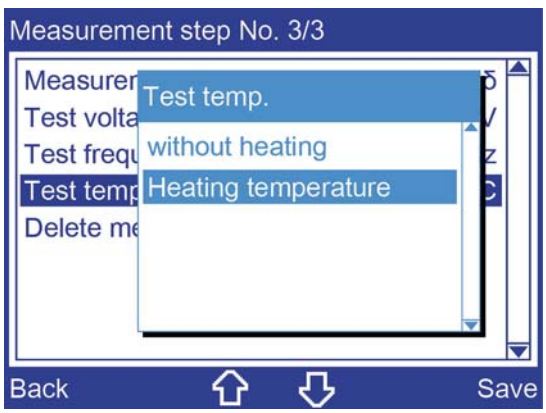
Frequency: 50 Hz

Test temperature: 40 °C

Measurement parameter / 1 measurement step

Main menu > User-defined measurement > ... > Measurement step no. 1/1

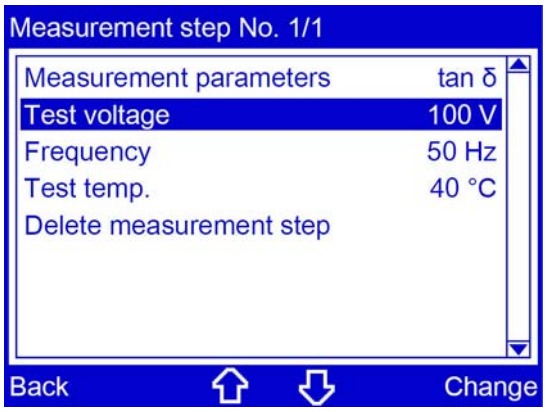
The measurement parameter is set to “tan δ” and cannot be changed.



Test voltage / 1 measurement step

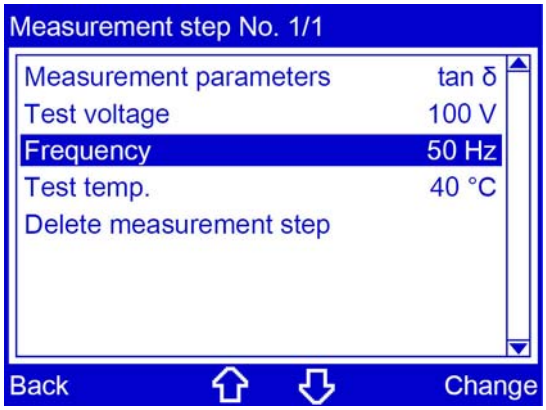
Main menu > User-defined measurement > ... > Measurement step no. 1/1

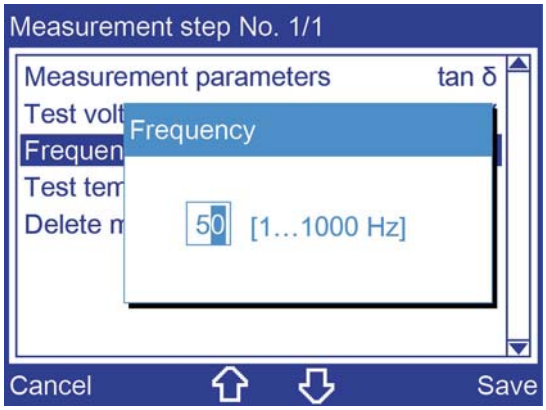
The “test voltage” parameter is set to 100 V and cannot be changed.



Defining frequency / 1 measurement step

Main menu > User-defined measurement > ... > Measurement step no. 1/1



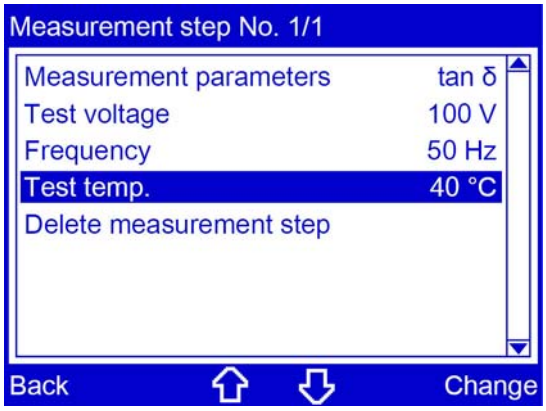


1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select the frequency with the arrow keys or the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

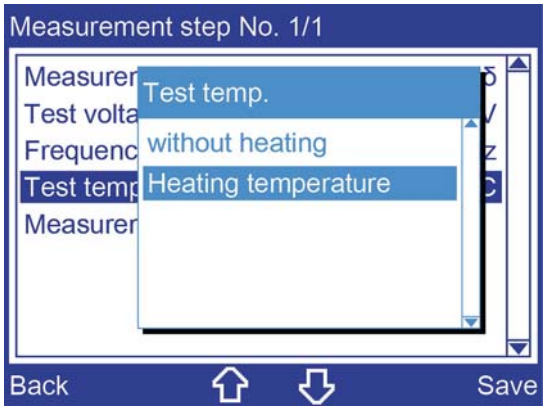
Defining test temperature / 1 measurement step

Here select the test temperature at which you want to determine the first conductance. The test temperature values given here are only examples.

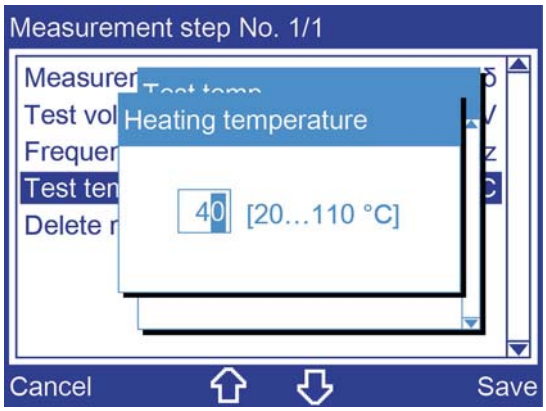
Main menu > User-defined measurement > ... > Measurement step no. 1/1



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.



3. Select “Heating temperature” by pressing the arrow keys.
4. Click "Save" to confirm the entry.



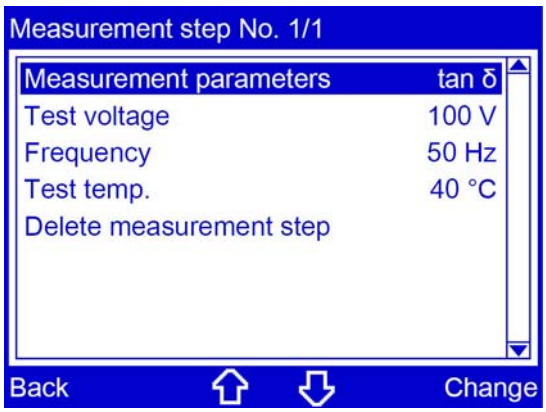
5. Select the heating temperature with the number keys on the membrane keypad.

   Note: You can leave the heating temperature the same from one step to the next or increase it. It is not possible to reduce the heating temperature from one step to the next. If you reduce the heating temperature subsequently in a measurement step, the reduced heating temperature is applied automatically to all the measurement steps which follow.

In this case a message appears indicating that the measurement parameter was adjusted.

6. Click “Save” to confirm the entry.

   The devices switches to the "Measurement step no." menu.



7. Select “Back”.

   A prompt appears asking if you want to save the changes.

8. Confirm with “Yes”.

Configuring the second and third measurement steps

➢ Define the parameters for the other measurement steps. Proceed exactly as for the configuration of the first measurement step (see "Configuring the first measurement step" on page 39). Define at what frequency and reference temperatures you want to determine the conductance.

Example: The parameters for the second and third measurement of the example measurement show here are determined as follows:

Measurement parameter: tan δ

Test voltage: 100 V

Frequency: 50 Hz

Test temperature: 50° C and 60° C.

5.1.3 Save measurement

➢ After the parameters for the user-defined measurement have been defined, save this measurement (see "Saving user-defined measurements" on page 51).

5.1.4 Carry out measurement

➢ Carry out the saved measurement (see "Run user-defined measurement" on page 52).

6 USER-DEFINED MEASUREMENT

Create user-defined measurement....44
Select template....45
Select number of fillings....45
Add measurement step....46
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Saving user-defined measurements....51
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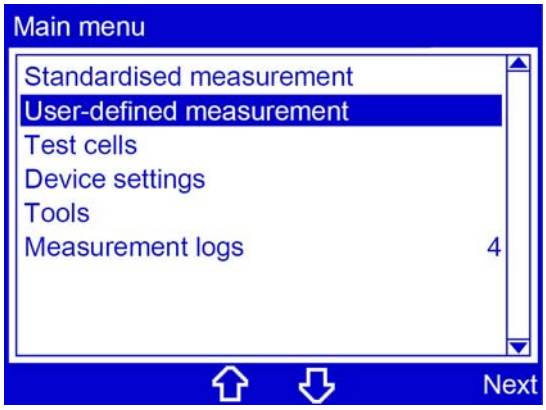
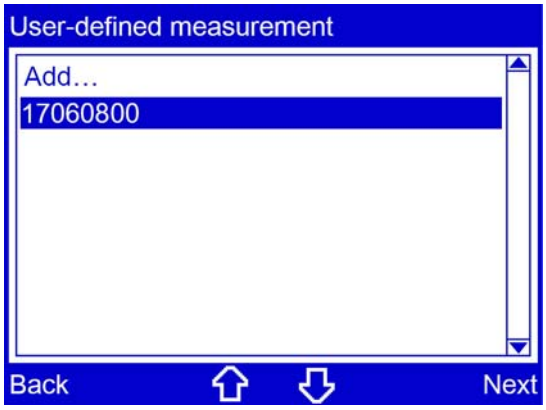
Editing or deleting a user-defined measurement....54

Main menu > User-defined measurement



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The “User-defined measurement” menu opens.

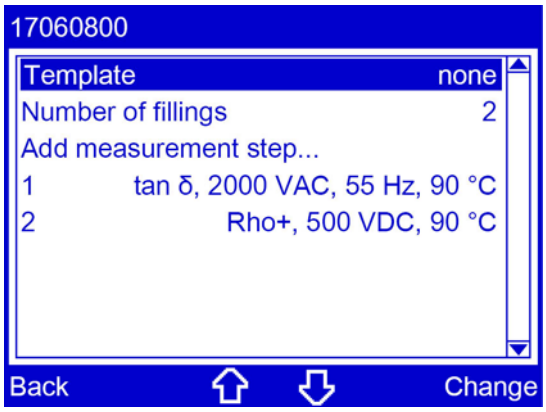


3. You have the following options:

   - Add a new measurement. (see "Create user-defined measurement" on page 37)

- Select an existing measurement. (see "Run user-defined measurement" on page 52, "Editing or deleting a user-defined measurement" on page 54)

Menu for editing the parameters of a user-defined measurement



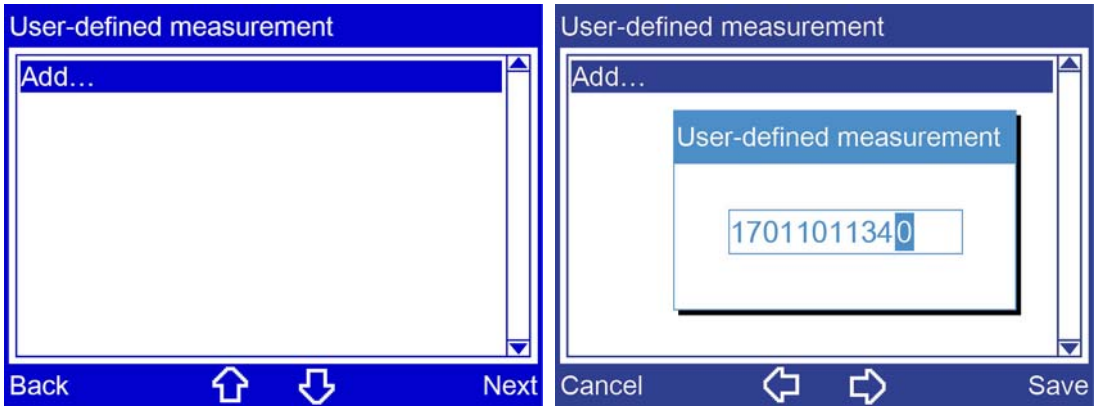
You can view and edit all the parameters of a measurement and define a new user-defined measurement in this menu.

It contains the following elements and information:

Template:	shows which standard was selected as a template for the measurement. The template can be changed under this menu item.
Number of fillings:	indicates how many fillings were selected for the measurement. The number of fillings can be changed under this menu item.
Add measurement step:	is for adding new measurement steps. A total of 10 measurement steps can be defined for a measurement.
Measurement steps (1, 2, etc.):	Defined measurement steps are shown with all their parameters.

6.1 Create user-defined measurement

Main menu > User-defined measurement



1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   A prompt appears to enter a name for the measurement. The device will suggest a name

based on the date and time in the format DDMMYYhhmm. You can expand this name as required.

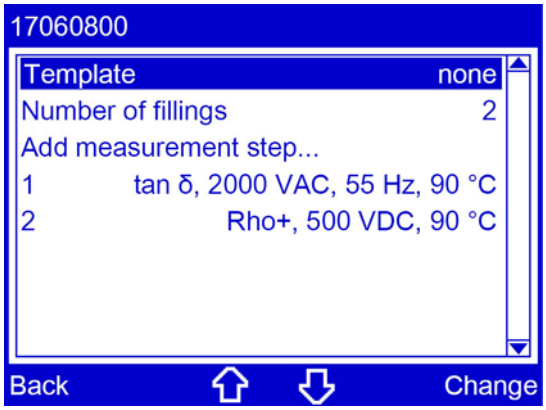
3. If you want to expand the suggested name, do so or enter any name with the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

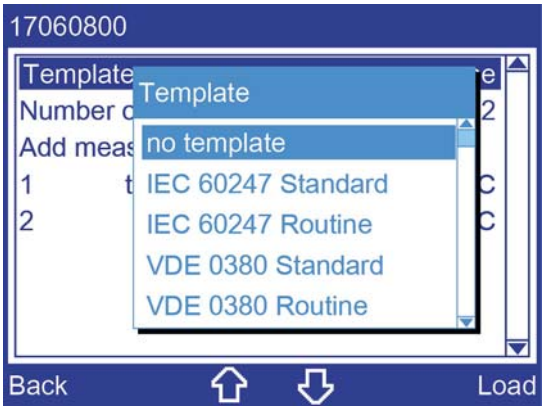
   The menu for defining measurement parameters will open.

6.2 Select template

If your measurement is similar to a standardised measurement, you can load the settings from a standard and change them in the further menu items.

Main menu > User-defined measurement > ... > Template





1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Choose a standard by pressing the arrow keys.

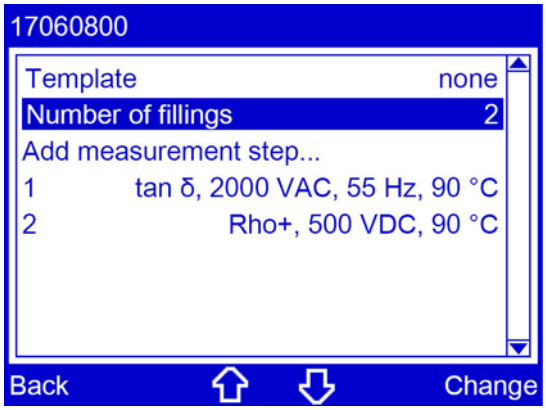
   The standard selected will be specified as a template in the measurement log.
4. Press "Load" to confirm the entry.

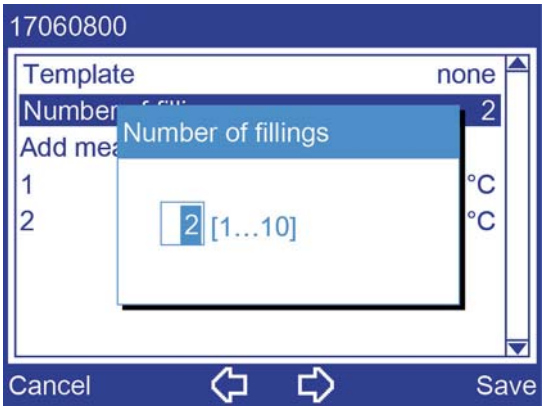
Note: If you define additional settings for the measurement which deviate from the selected standard, a message appears stating that the settings cannot be changed for this template. If you apply the different setting despite this, the selected template will be deactivated.

6.3 Select number of fillings

Refer to the number of fillings from the respective standard.

Main menu > User-defined measurement > ... > Number of fillings



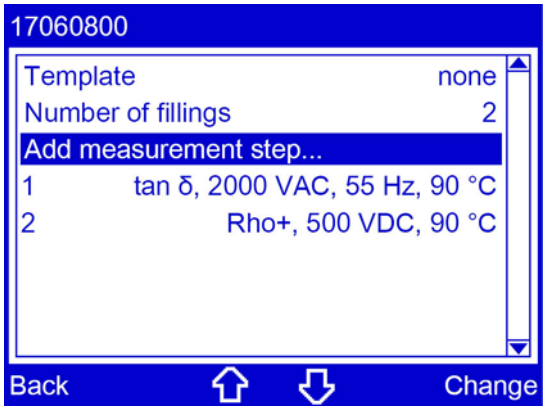


1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Choose the number of fillings with the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

6.4 Add measurement step

You can enter a total of 10 measurement steps for a measurement.

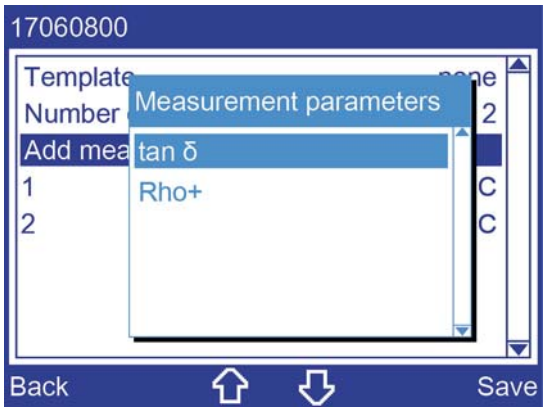
Main menu > User-defined measurement



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.

   The dialog for selecting the measurement parameters for the new measurement step opens.

6.4.1 Define measurement parameters



1. Select one of the following options by pressing the arrow keys:

   - tan δ

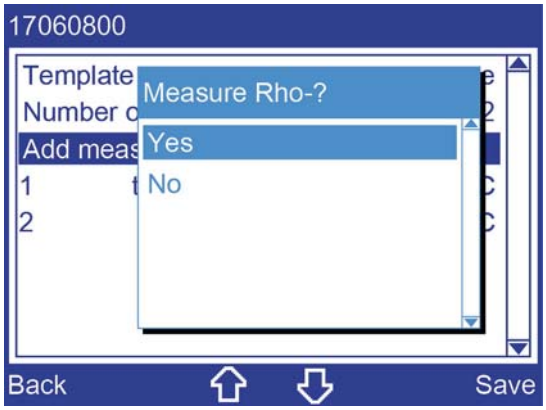
     The device determines the tan delta and epsilon value.

   - Rho+

     The device determines the positive specific resistance ρ (rho).

2. Click "Save" to confirm the entry.

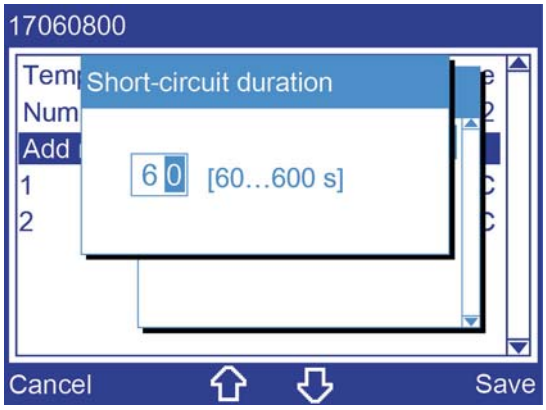
3. If you activate the “Rho+” option, you are asked if you want to measure the negative specific resistance:



Select one of the following options by pressing the arrow keys:

- No
  The device measures the positive specific resistance ρ (rho).
- Yes
  The device measures the positive and negative specific resistance ρ (rho).

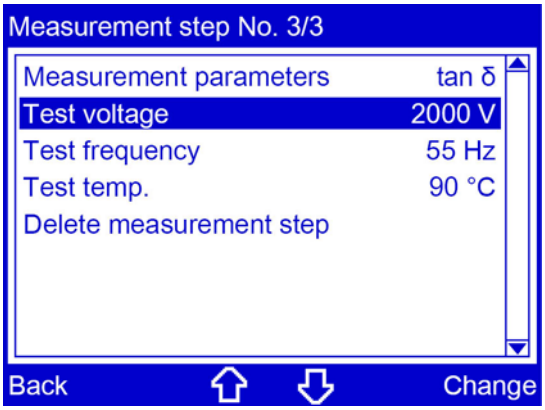
4. If you activate the “Rho-” option, you are asked to enter the short-circuit duration. This is the duration of the short-circuit in the test cell between the positive and negative resistance measurement.

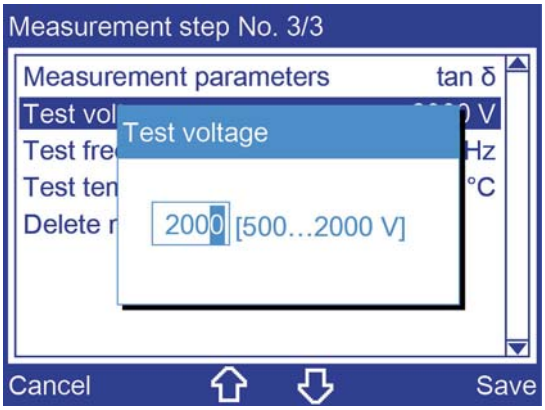


Select the short-circuit duration by pressing the arrow keys or the number keys on the membrane keypad and confirm with “Save”.

6.4.2 Setting the test voltage

Main menu > User-defined measurement > ... > Measurement step No.

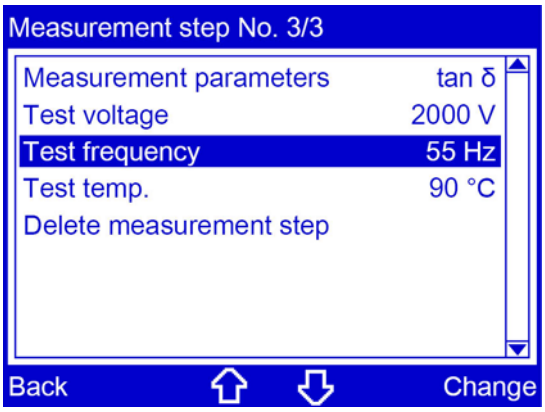


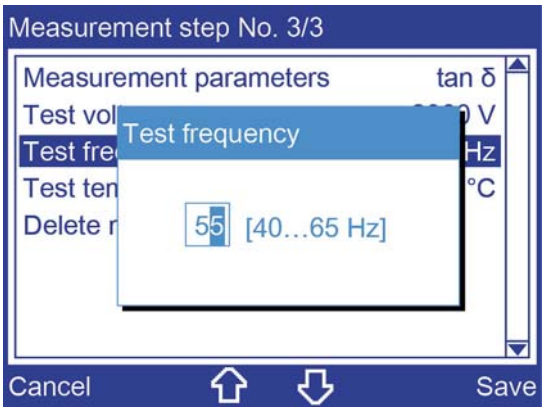


1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select the test voltage by pressing the arrow keys or the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

6.4.3 Setting the test frequency

Main menu > User-defined measurement > ... > Measurement step No.

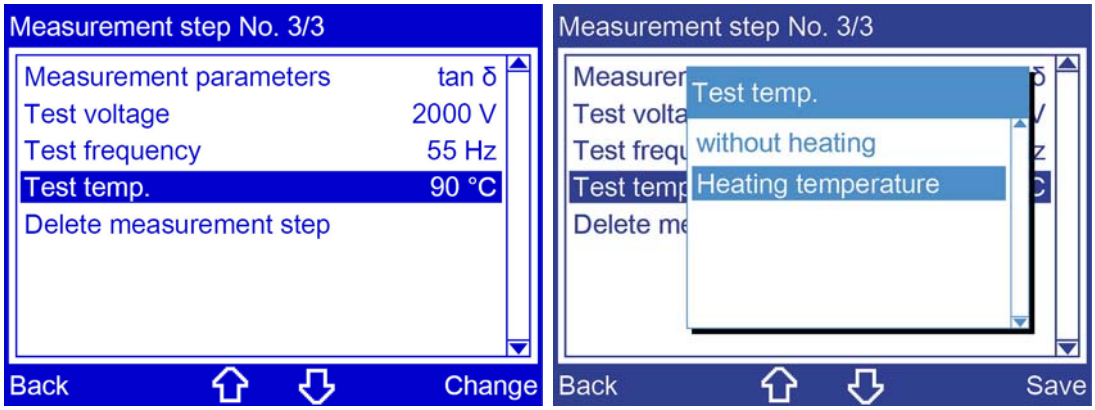




1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select the test frequency with the arrow keys or the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

6.4.4 Setting the test temperature

Main menu > User-defined measurement > ... > Measurement step No.



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.

   In the device settings if you activated the test temperature in °F (see "Activate display of the test temperature in °F" on page 62), when defining the test temperature for the first measurement step, you are asked if you want to display the test temperature in Fahrenheit or in Celsius.

   If you didn't activate the display of the test temperature in °F, the test temperature is specified in Celsius. In this case, go to step 5.
3. Select one of the following options by pressing the arrow keys:

   - Without heating

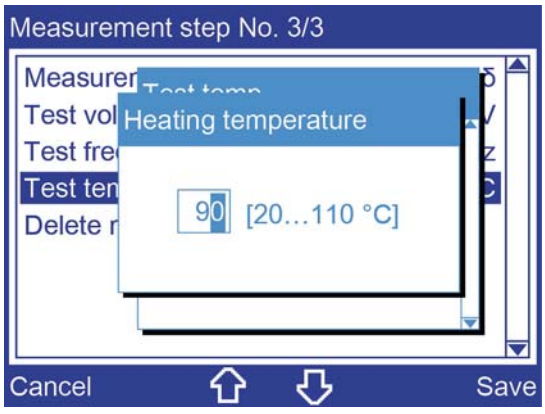
     The device starts the measurement without heating the oil.

     Note: You can activate the option "without heating" only in the first step or if the previous step is also performed without heating.

   - Heating temperature

     The device heats the oil and carries out the measurement at the set temperature.
4. Click "Save" to confirm the entry.

   When selecting the heating temperature:



5. Select the heating temperature with the number keys on the membrane keypad.

Note: If the measurement consists of multiple steps, you can leave the heating temperature the same from one step to the next or increase it. It is not possible to reduce the heating temperature from one step to the next. If you reduce the heating temperature subsequently in a measurement step, the reduced heating temperature is applied automatically to all the measurement steps which follow. In this case a message appears indicating that the measurement parameter was adjusted.

6. Click "Save" to confirm the entry.

   The device switches to the “Measurement step no.” menu

7. Select “Back”.

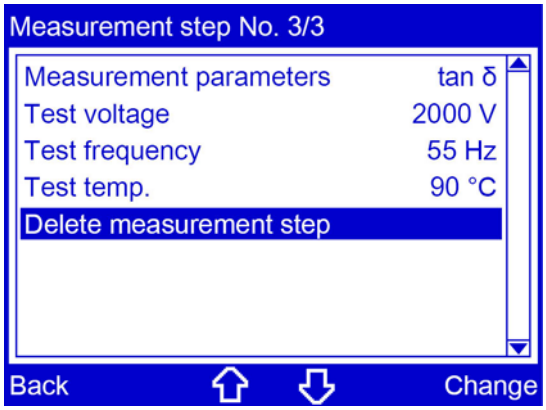
   A prompt appears asking if you want to save the changes.

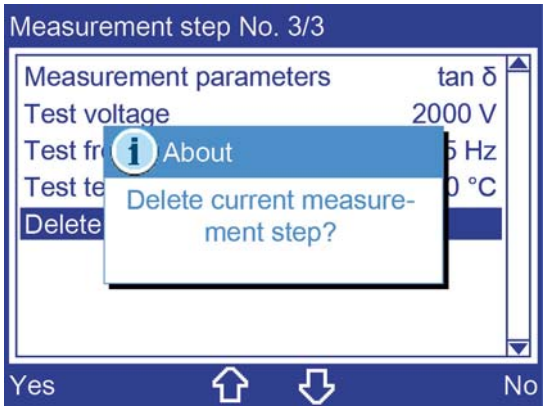
8. Confirm with “Yes”.

   The device switches to the “User-defined measurement” menu.

6.5 Deleting a measurement step

Main menu > User-defined measurement > Measurement step no.





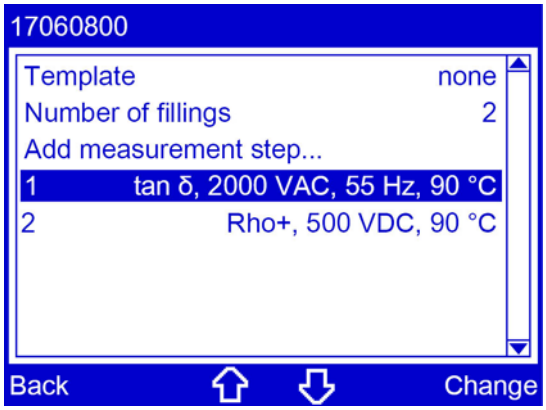
1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.

   A prompt appears, asking if you really want to delete the measurement step.

3. Confirm the entry with "Yes".

6.6 Changing a measurement step

Main menu > User-defined measurement



1. Select the menu item by pressing the arrow keys.

2. Click "Change" to confirm the entry.

   The dialog for selecting the measurement parameters appears.

3. Change the selected measurement step. To do this, proceed as you would when defining a new measurement step (see "Define measurement parameters" on page 46).

6.7 Saving user-defined measurements

After you have defined the parameters for a user-defined measurement, you can save this measurement.

1. To do this, go to the menu for the selected measurement (see the screen shot below) if you are not already in that menu. You have the following options to access the menu:

   Do the following if you are in the “Measurement step no. N” menu:

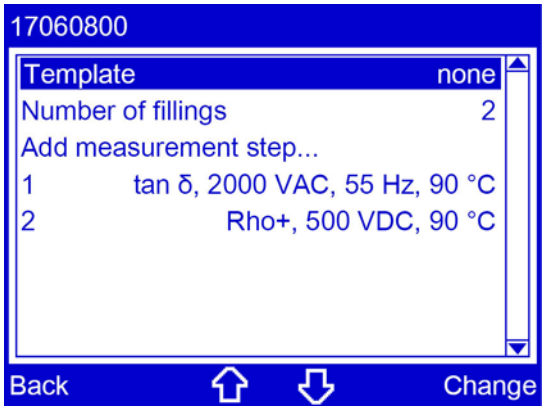
   a. Select “Back”.

      A prompt appears asking if you want to save the changes.

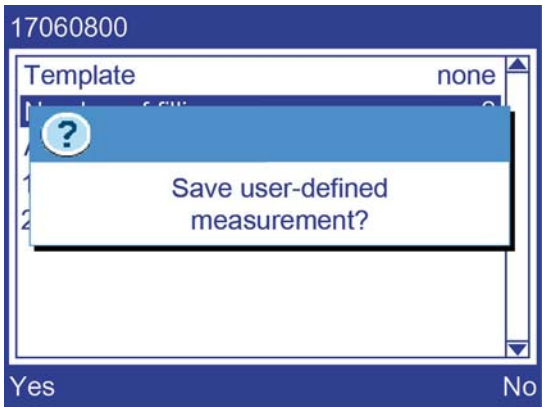
   b. Confirm with “Yes”.

   If you are in the “Template” or “Number of fillings” menu: Select a template or the number of fillings and confirm the entry with “Save” (see "Select template" on page 45, "Select number of fillings" on page 45).

   Main menu > User-defined measurement > Selected measurement



2. Select “Back”.
   You will be asked if you want to save the measurement with modified parameters.

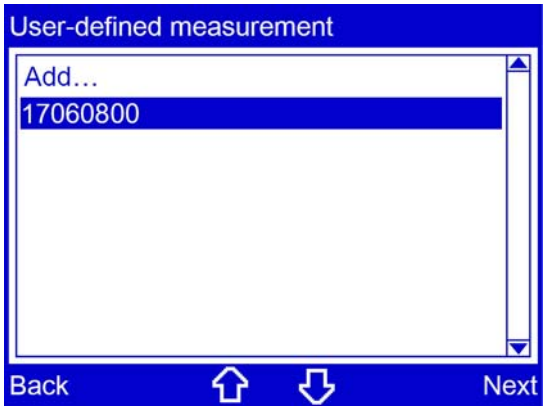


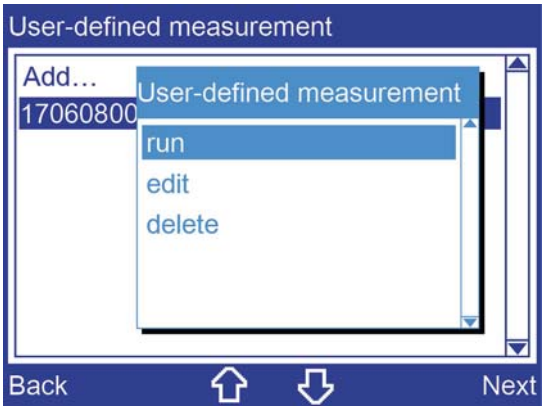
3. Select "Yes”.
   The measurement will be saved.

6.8 Run user-defined measurement

1. Ensure that the temperature probe is inserted in the temperature probe connection of the oil tester.
2. In the “User-defined measurement” menu, select a saved measurement by pressing the arrow keys.

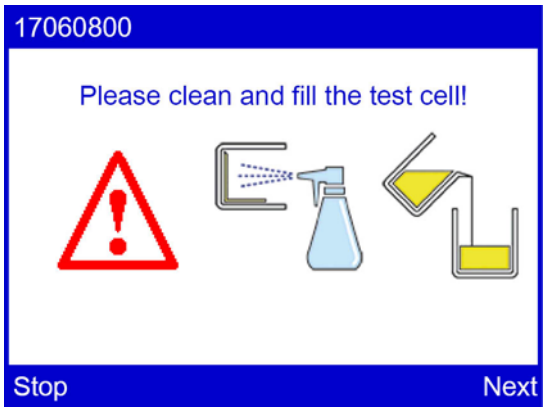
Main menu > User-defined measurement





3. Click "Next" to confirm the entry.
4. Select “run”.
5. Click "Next" to confirm the entry.

   A new prompt appears telling you to clean and fill the test cell.

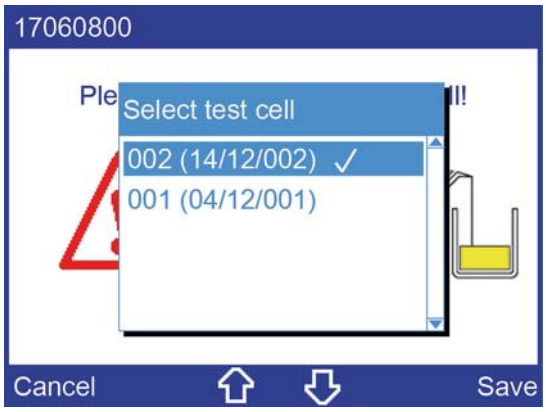


6. Open the dust cover.
7. Clean the test cell (on page 19, "Dismounting the test cell" on page 18) if it has not yet been cleaned.
8. Reassemble the test cell after cleaning and insert it in the device.
9. Connect the hose for emptying the test cell at the oil drain. See the rear view (on page 10) for the position of the oil drain.
10. Fill the test cell until the riser view glass is filled. Use a disposable syringe for oils with high viscosity.
11. Press the discharge valve key.

    The test cell opens. A soft noise is heard briefly. The drain indicator lights up and the test cell is emptied.
12. After the test cell is emptied, press the discharge valve key once again to close the test cell.

13. To minimise the influence of interfering factors such as oil impurities on the measurement results, repeat the entire process for “Filling and emptying the test cell” three times (steps 10 - 12).
14. Fill the test cell a fourth time. The measurement is performed with this filling.
15. Close the dust cover.
16. Click "Next" to confirm the entry.

    If the **option "Select test cell"** is **enabled** (see "**Activating the test cell prompt**" on page 60), a prompt appears to select a test cell.



    a. Select the test cell you use for the measurement.

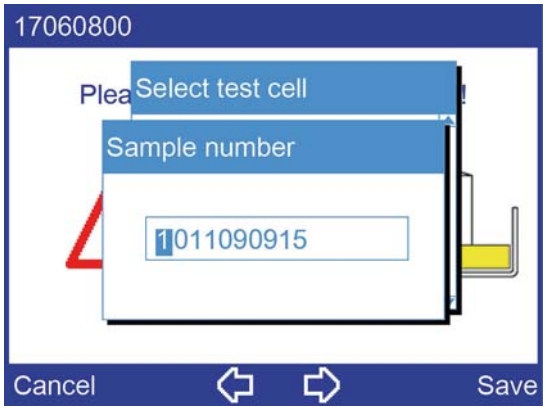
    b. Click “Save” to confirm the entry.

    If the **option “Select test cell" is not enabled**, the test cell selected under Main menu > Test cells will be used automatically for the current measurement. Check that you used the correct test cell.

ATTENTION!

- Prior to each measurement, check whether the test cell used in the device is the one selected in the unit’s menu. If this is not the case, **measurement inaccuracies may result**.

    A prompt to enter a sample number appears. The device will suggest a sample number composed of the date and time in the format DDMMYYhhmm. You can extend this sample number as required.



17. If you want to expand the suggested sample number, do so or enter any sample number with the number keys on the membrane keypad.

18. Click “Save” to confirm the entry.

    The measurement begins. A window displays the details of the measurement process.

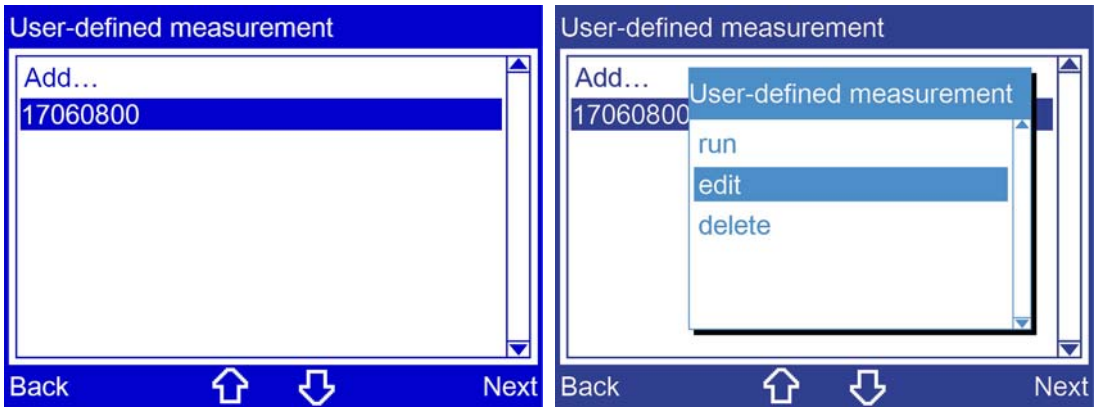
CAUTION! Risk of injury due to hot surface.

The test cell can reach a temperature of up to 110 °C.

➢ Allow the test cell to cool before touching it.

6.9 Editing or deleting a user-defined measurement

Main menu > User-defined measurement



1. Select a saved measurement by pressing the arrow keys.
2. Click "Next" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:

   - edit

     This will take you to the menu for editing the parameters of the selected measurement where you can edit (see "Select template" on page 45, "Add measurement step" on page 46, "Select number of fillings" on page 45) the settings.

   - delete

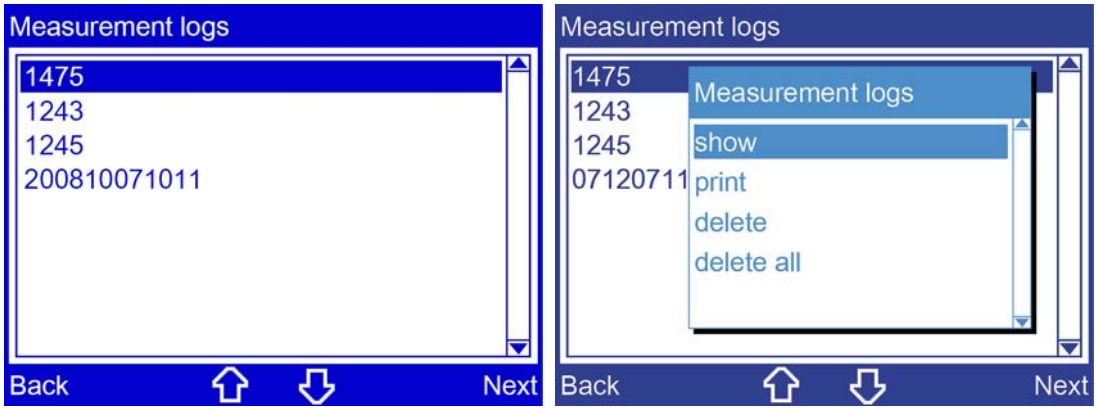
     The device deletes the selected measurement.

4. Click "Next" to confirm the entry.

7 DISPLAY OF MEASUREMENT RESULTS

Measurement log on the display 56
Measurement log as printout 56

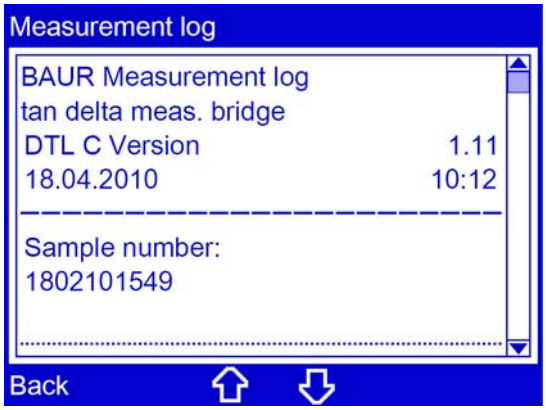
Main menu > Measurement logs



1. Select “Measurement logs” in the main menu by pressing the arrow keys.
2. Click "Next" to confirm the entry.
3. Choose a measurement log by pressing the arrow keys.
4. Click "Next" to confirm the entry.
5. Select one of the following options by pressing the arrow keys:
   - Show
     The selected measurement log is displayed.
   - Print
     The selected measurement log is printed.
   - Delete
     The selected measurement log is deleted.
   - Delete all
     All measurement logs are deleted.
6. Click "Next" to confirm the entry.

7.1 Measurement log on the display

Main menu > Measurement logs > Show



➢ Use the arrow keys to scroll through the text.

7.2 Measurement log as printout

Main menu > Measurement logs > Print

BAUR measurement log
Dissipation factor, measuring bridge
DTL C Version VX.XX
19 Feb 2010 10:12

Sample number:
xxxxxxxxxx
. . . . . .
Measurement:
IEC 60247:2004 Routine
Cell description:
IEC60247 Fig.3 (70.9pF)
(40/17/296)
---
19 Feb 2010 10:13
Epsilon: 2.45
tan delta:
at 50 Hz: 0.000765
at 60 Hz: 0.000638
Test voltage: 1999.6 VAC
999.8 VAC/mm
Test frequency: 55.0 Hz
Test temperature: 90.2 °C

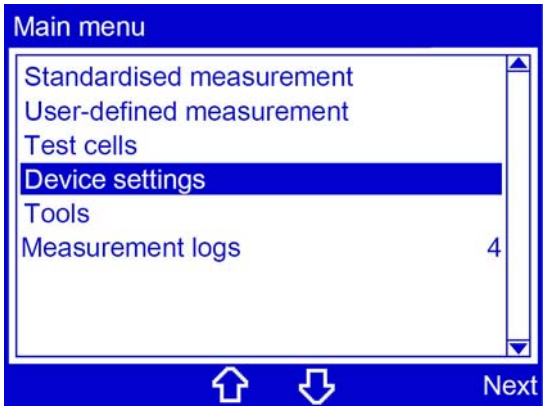
Rho+: 2.17E+12 Ωm
Rho-: 1.98E+12 Ωm
Test voltage: 500.0 VDC
250.0 VDC/mm
Test temperature: 22.6 °C

Test performed
by:
. . . . . .

8 DEVICE SETTINGS

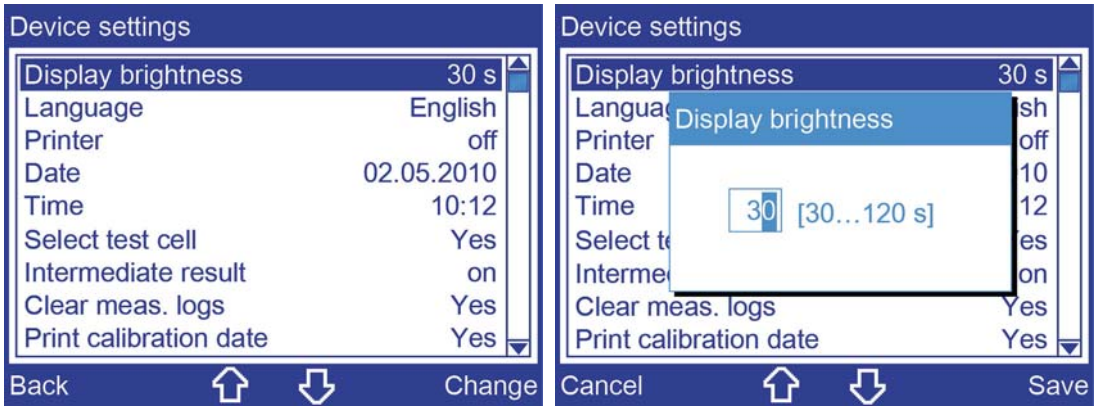
Set display brightness 58
Select language 58
Switch on/off printer 59
Set date 59
Set time 60
Activating the test cell prompt 60
Display intermediate result 61
Overwrite measurement logs 61
Print calibration date 62
Activate display of the test temperature in °F 62
Measure specific resistance 63
Define preheating temperature 64

Device settings are made from the corresponding main menu item.



8.1 Set display brightness

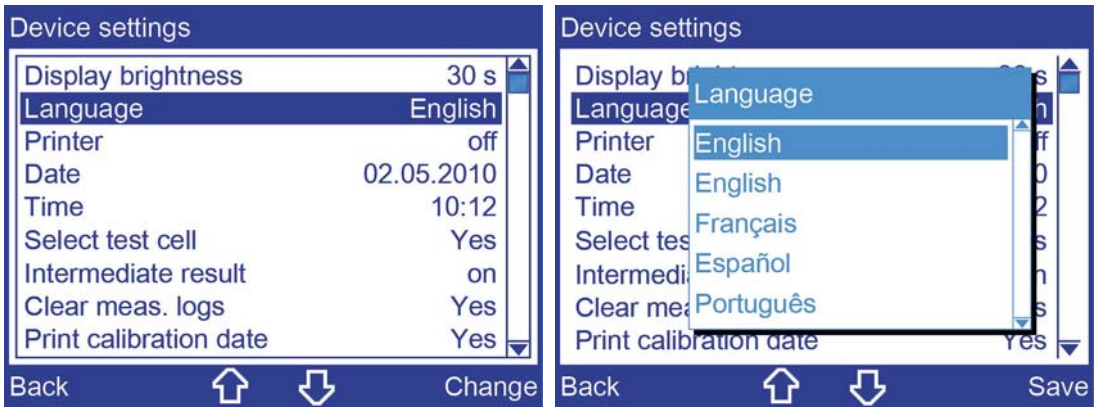
Main menu > Device settings > Display brightness



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select the time after which the light automatically decreases if the device is inactive. Use the number keys on the keypad to make entries.
4. Click "Save" to confirm the entry.

8.2 Select language

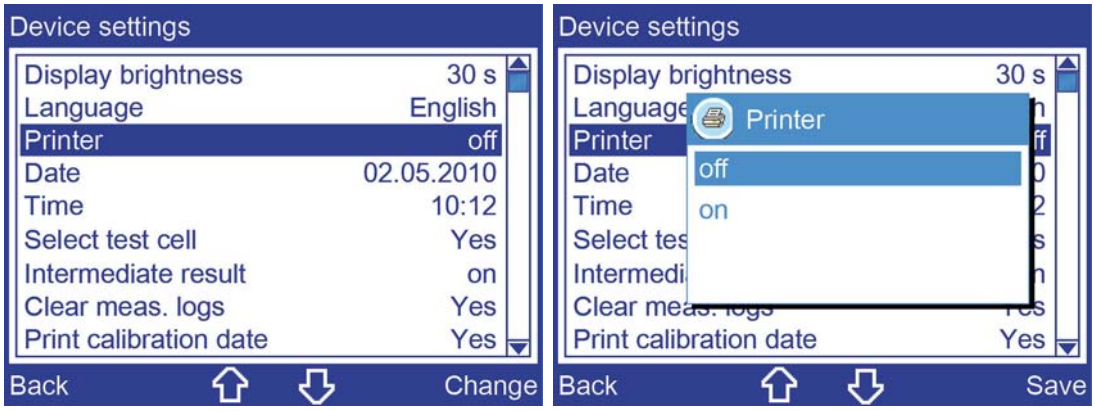
Main menu > Device settings > Language



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Choose a language by pressing the arrow keys.
4. Click "Save" to confirm the entry.

8.3 Switch on/off printer

Main menu > Device settings > Printer



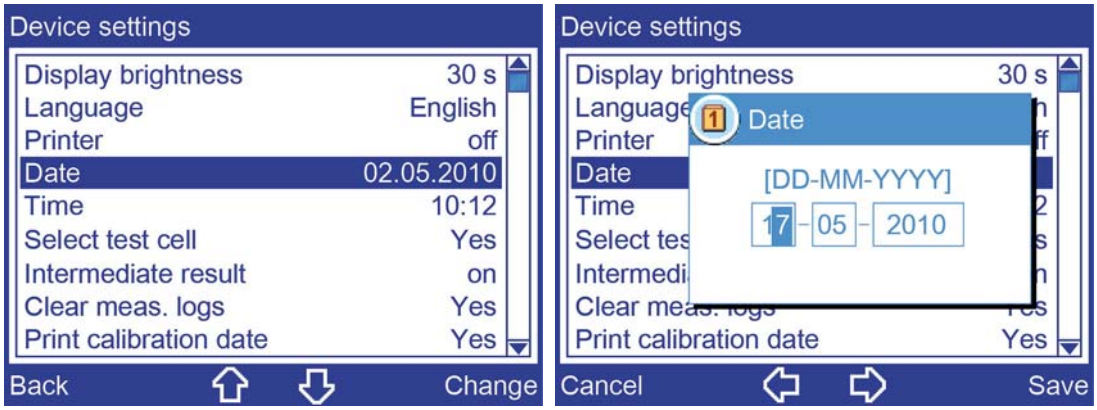
1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:
   - Off

     The printer is switched off. Measurement logs are displayed only on the display (see "Measurement log on the display" on page 56).
   - On

     The printer is switched on. Measurement logs are displayed and printed on the display (see "Measurement log as printout" on page 56).
4. Click "Save" to confirm the entry.

8.4 Set date

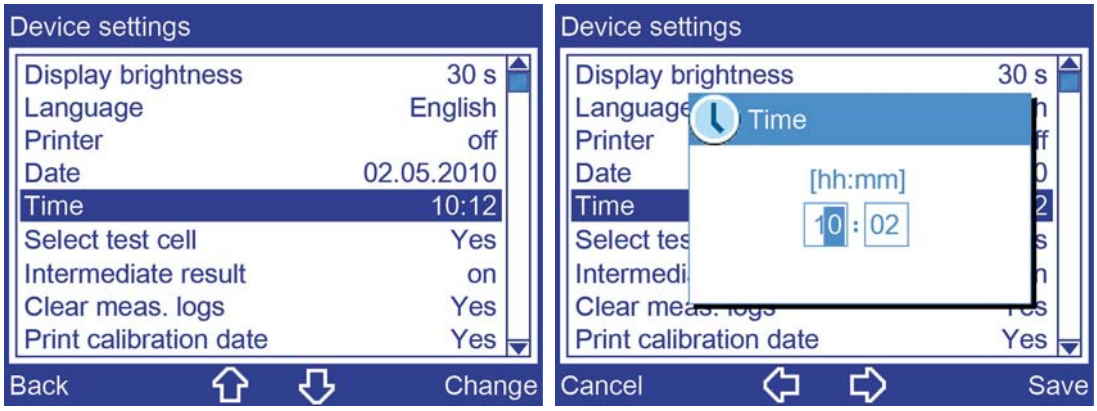
Main menu > Device settings > Date



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Change the date with the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

8.5 Set time

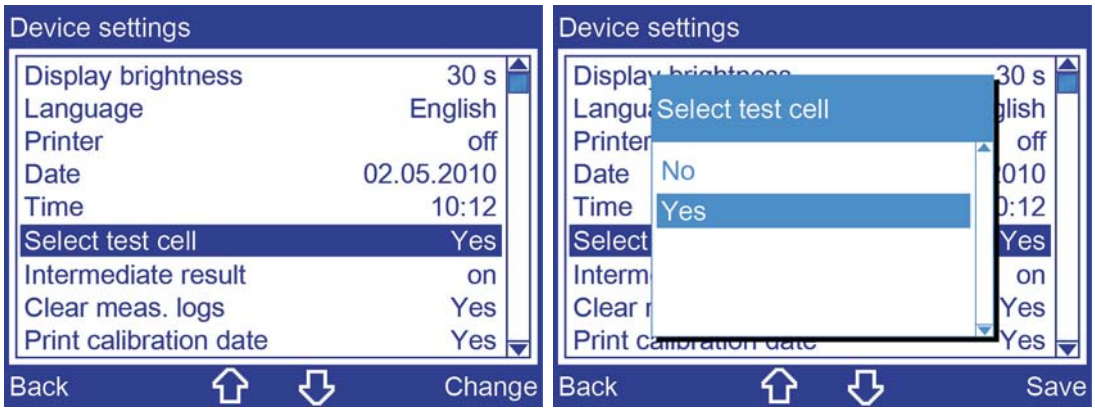
Main menu > Device settings > Time



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Change the time with the number keys on the membrane keypad.
4. Click "Save" to confirm the entry.

8.6 Activating the test cell prompt

Main menu > Device settings > Select test cell



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:

   - No

     The test cell selected under Main menu > Test cells will be used automatically for all measurements.

   - Yes

     A prompt appears before each measurement asking which test cell to use for the current measurement.

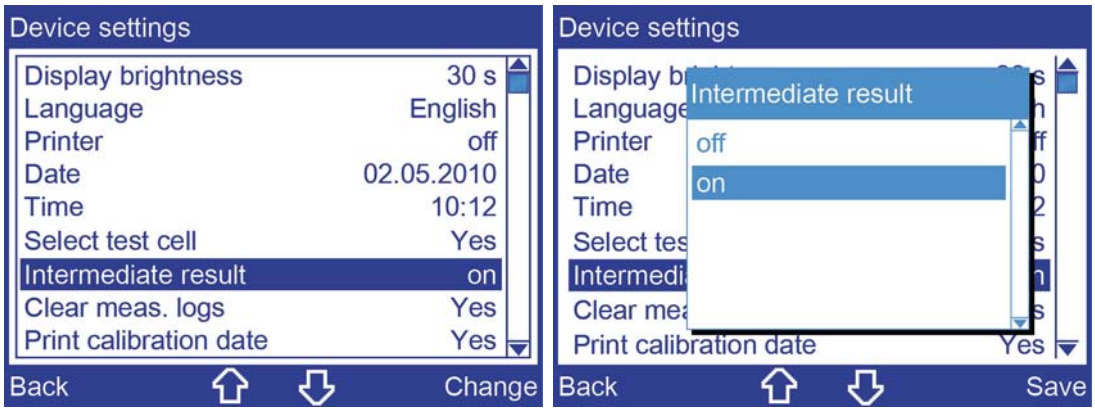
     Note: This setting is appropriate if you perform measurements with various test cells.

4. Click "Save" to confirm the entry.

8.7 Display intermediate result

An intermediate result can be displayed after each measurement step.

Main menu > Device settings > Intermediate result

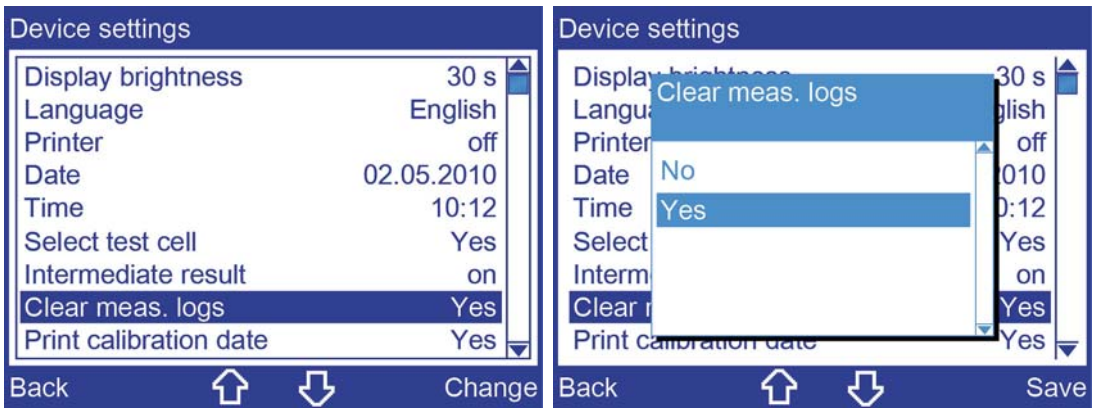


1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:
   - Off
     No intermediate result is displayed.
   - On
     After each measurement, the intermediate result is displayed for approx. 20 seconds.
4. Click "Save" to confirm the entry.

8.8 Overwrite measurement logs

The device can store up to ten measurement logs. When the measurement log memory is full, old measurement logs must be deleted before you can save new ones. Under "Clear meas. logs" you can define how to proceed when the measurement log memory is full and a new measurement is to be performed.

Main menu > Device settings > Clear meas. logs



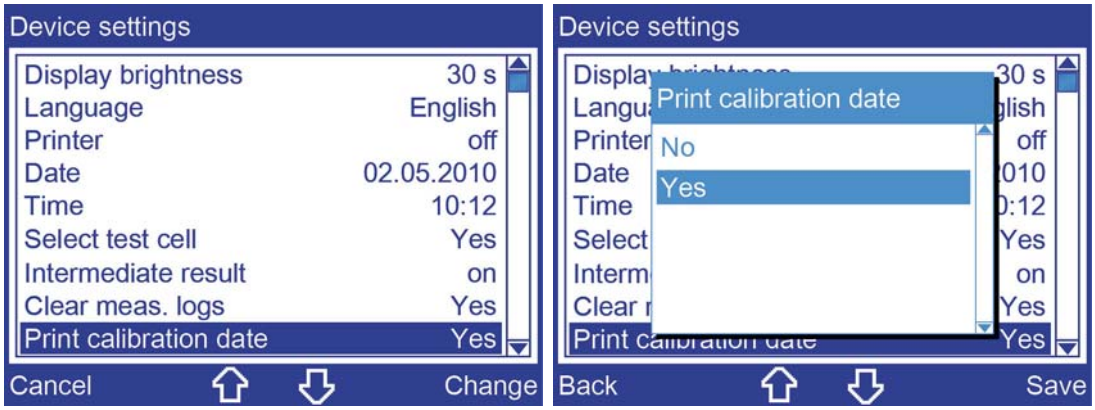
1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.

3. Select one of the following options by pressing the arrow keys:
   - No
     Before starting the next measurement log, a saved measurement log must be deleted (see "Display of measurement results" on page 55) manually.
   - Yes
     When you start the next measurement log, the oldest measurement log is automatically deleted.
4. Click "Save" to confirm the entry.

8.9 Print calibration date

Select whether the calibration date will be printed on the measurement log.

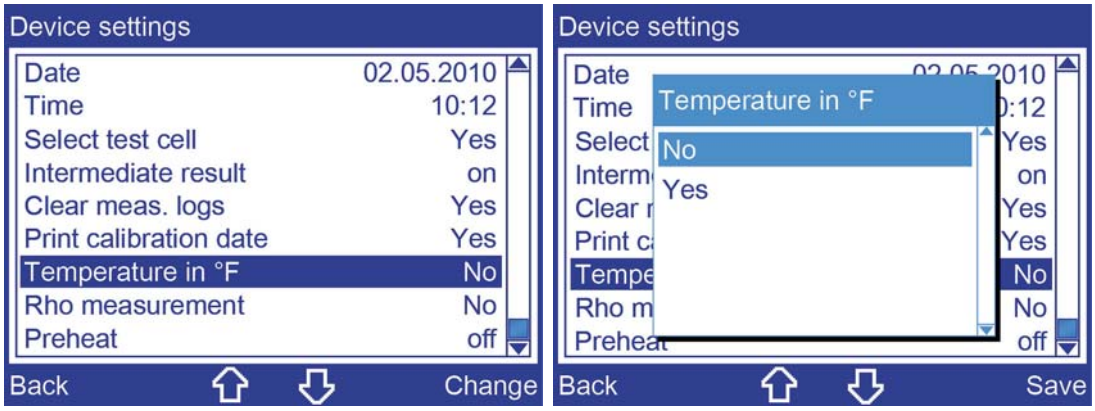
Main menu > Device settings > Print calibration date



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:
   - No
     The calibration date is not printed on the measurement log.
   - Yes
     The calibration date is printed on the measurement log.

8.10 Activate display of the test temperature in °F

Main menu > Device settings > Temperature in ° F



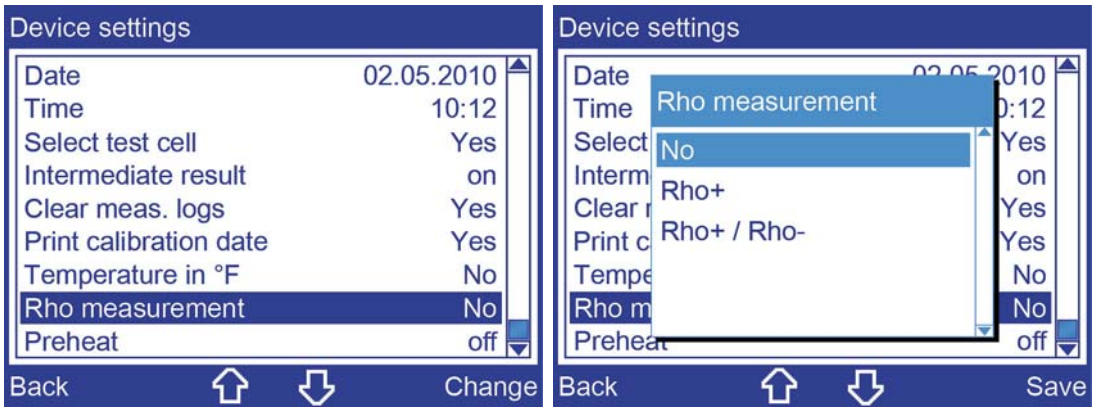
1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:
   - No

     When defining the test temperature for a user-defined measurement, you can enter and display the test temperature only in Celsius.
   - Yes

     When defining the test temperature for a user-defined measurement, you have the option to enter and display the test temperature in Fahrenheit or in Celsius.
4. Click "Save" to confirm the entry.

8.11 Measure specific resistance

Main menu > Device settings > Rho measurement



1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.
3. Select one of the following options by pressing the arrow keys:
   - No

     The device does not measure the specific resistance ρ (rho).

     Note: If the standard selected envisions only a measurement of the specific resistance, the “No” setting is ignored automatically.
   - Rho+

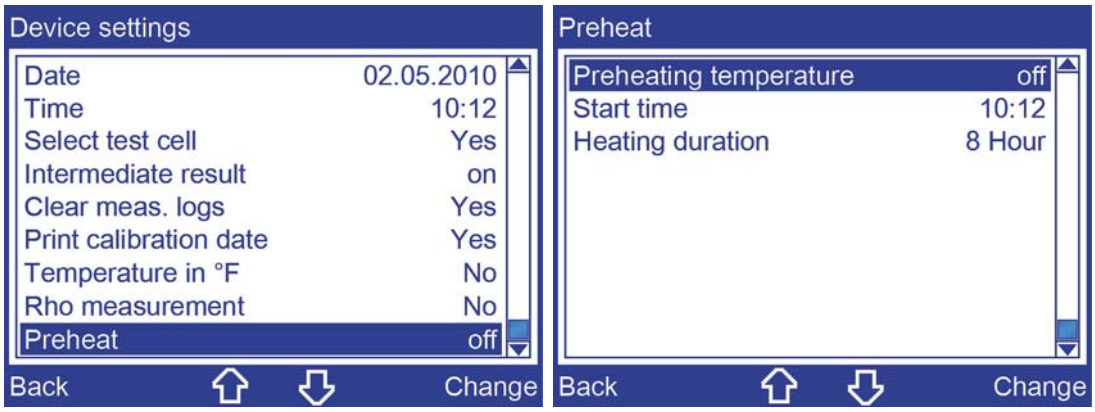
     The device measures the positive specific resistance ρ (rho) for all measurements. Prerequisite: The standard selected envisions the measurement of the specific resistance ρ (rho).
   - Rho+ / Rho -

     The device measures the positive specific resistance ρ (rho) and the negative specific resistance ρ (rho) for all measurements. Prerequisite: The standard selected envisions the measurement of the specific resistance ρ (rho).
4. Click "Save" to confirm the entry.

8.12 Define preheating temperature

With the "Preheat" option you can preheat the device to a defined temperature (15 to 65 °C) before use. This reduces the heating time of the device immediately before the measurement. Consequently, the device is available much quicker. The starting point of the preheating phase, the preheating temperature and the heating duration can be set separately.

Main menu > Device settings > Preheat

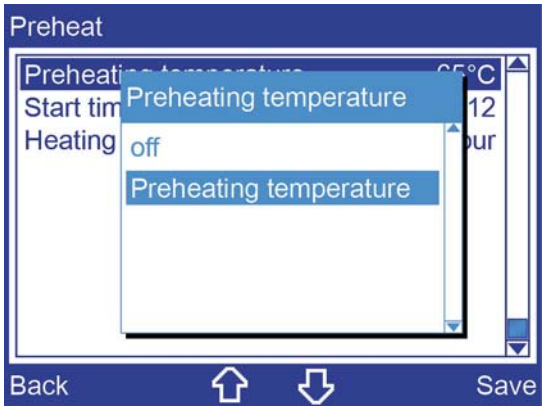


1. Select the menu item by pressing the arrow keys.
2. Click "Change" to confirm the entry.

   The “Preheat” menu opens. Here you can define the parameters for the preheating or deactivate this option.

   Note: To deactivate the preheating of the device, under “Preheating temperature” select the entry “Off”.
3. Select the “Preheating temperature” menu item by pressing the arrow keys.
4. Click "Change" to confirm the entry.

   The “Preheating temperature” window opens.



5. Select one of the following options by pressing the arrow keys:

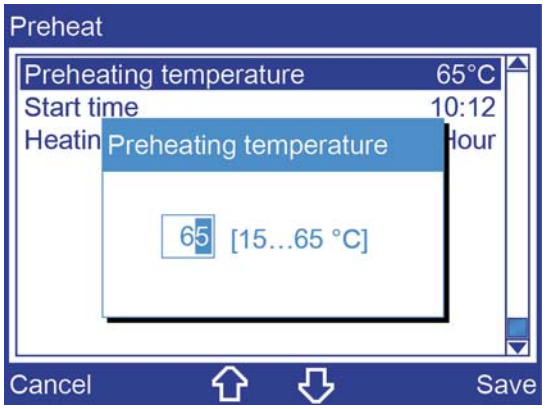
   - Off

     The device is not preheated.

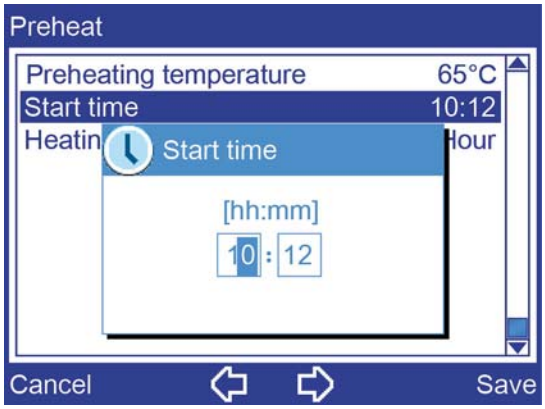
   - Preheating temperature

     The device is preheated to a set temperature (15 to 65°C).
6. Click "Save" to confirm the entry.

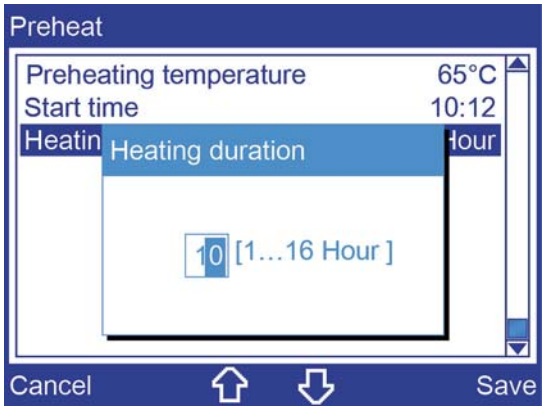
When selecting the preheating temperature:



7. Select the preheating temperature with the number keys on the membrane keypad.
8. Click "Save" to confirm the entry.
9. Select the start time for preheating the device.

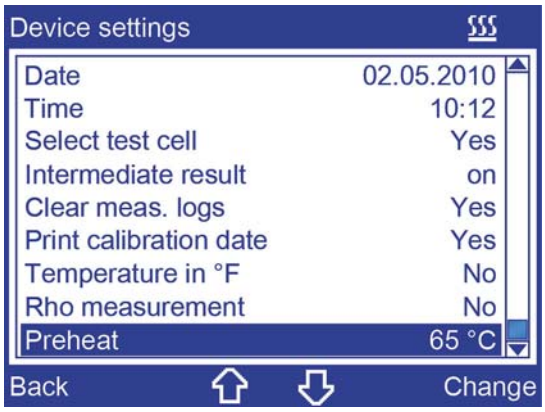


10. Click "Save" to confirm the entry.
11. Select the heating time with the number keys on the membrane keypad.



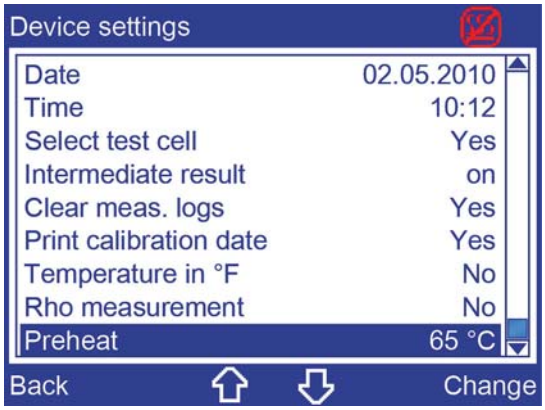
12. Click "Save" to confirm the entry.

The flashing symbol in the “Device setting” window above right displays that the “Preheat” option is activated.



Note:

- Preheating is cancelled when you open the safety hood or start a measurement.
- If the temperature probe is not inserted in the temperature probe connection or the test cell is not used, the error symbol flashes:



9 INFORMATION ON THE DEVICE AND USB INTERFACE

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Information on the device, test cell and USB interface is given under the following menu items:

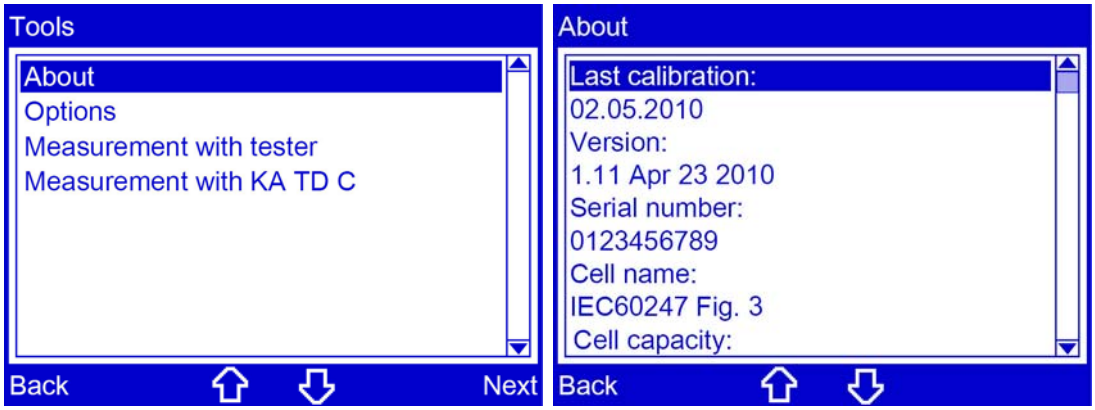
- Main menu > Tools > About
- Main menu > Device settings > USB interface

9.1 Info on device

Under Main menu > Tools > About, you will find the following information on the device:

- Date of last device calibration
- Device serial number
- Firmware versions
- Cell name
- Cell capacity

Main menu > Tools > About

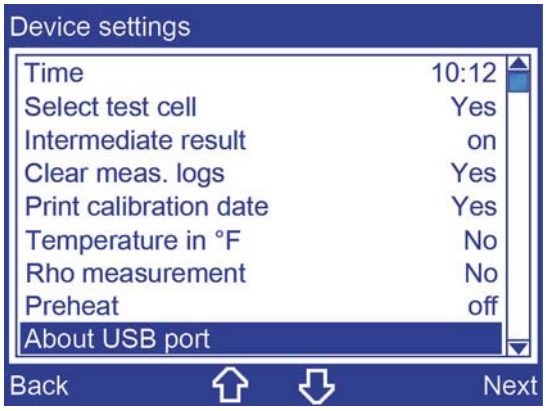


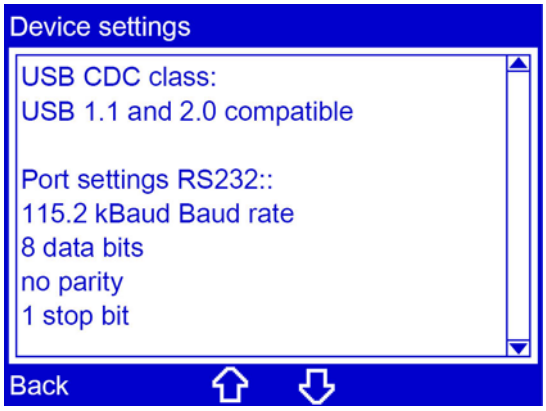
1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   Information is displayed about the device and test cell. Use the arrow keys to scroll through the text.

9.2 About USB port

Main menu > Device settings > About USB port



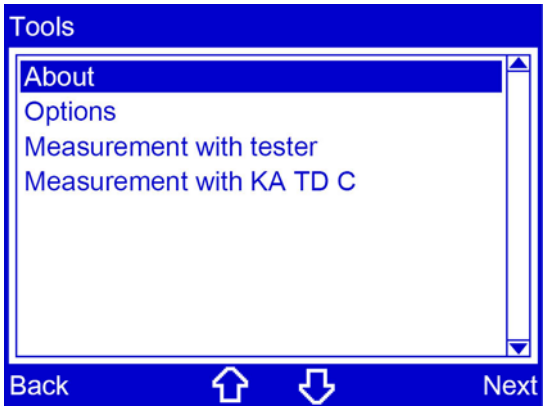


1. Select the menu item by pressing the arrow keys.
2. Click "Next" to confirm the entry.

   The version and technical data of the USB port are displayed.

10 CHECKING THE ACCURACY OF THE DISSIPATION FACTOR (OPTION)

The precision of the dissipation factor measurement system can be checked under the “Tools” menu item:



- Main menu > Tools > Measurement with tester

  With the TE C tester, the dissipation factor tan δ can be checked with a measurement precision of 3%.

  Specific information is available in the user manual for the TE C tester.

- Main menu > Tools > Measurement with KA TD C:

  The following measurement variables can be checked with a KA TD C calibrator:

  a. Dissipation factor (tan delta) with a measurement precision of 0.5%;

  b. Permittivity ε (epsilon) with a measurement precision of 0.5%

  c. Specific resistance ρ (rho) with a measurement precision of 1.0%.

  Specific information is available in the user manual for the KA TD C calibrator.

11 MAINTENANCE

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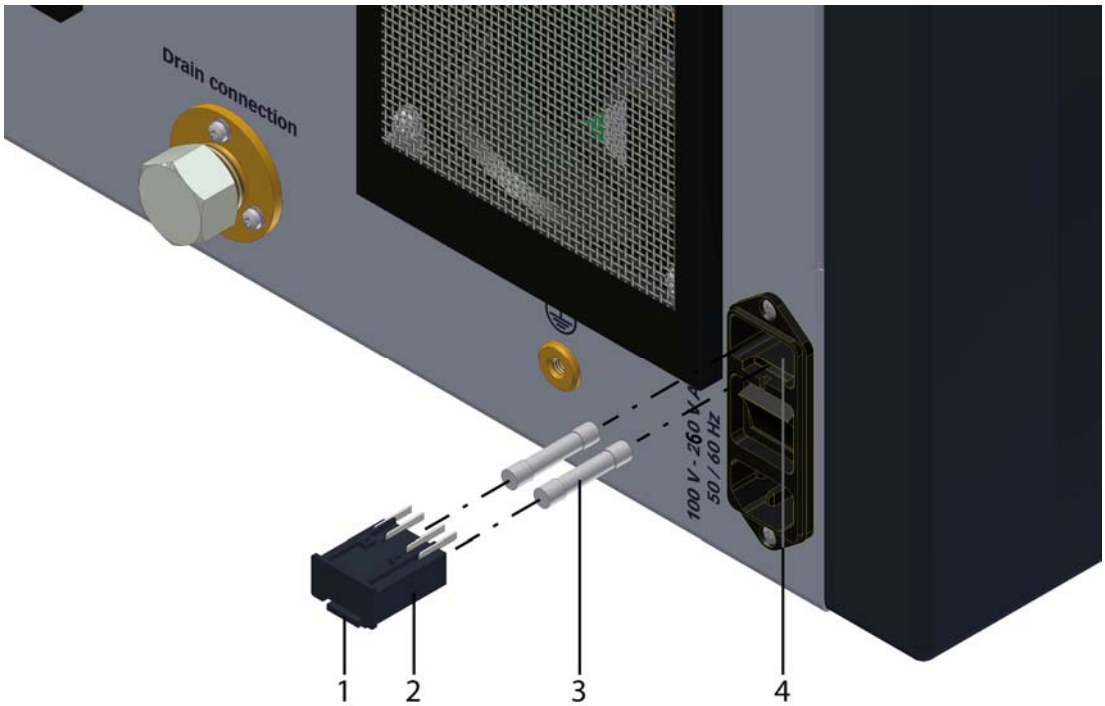
Replacing printer paper roll 71
Replacing the printer ink ribbon 73
Cleaning 74
Calibration 74

11.1 Replacing mains fuse

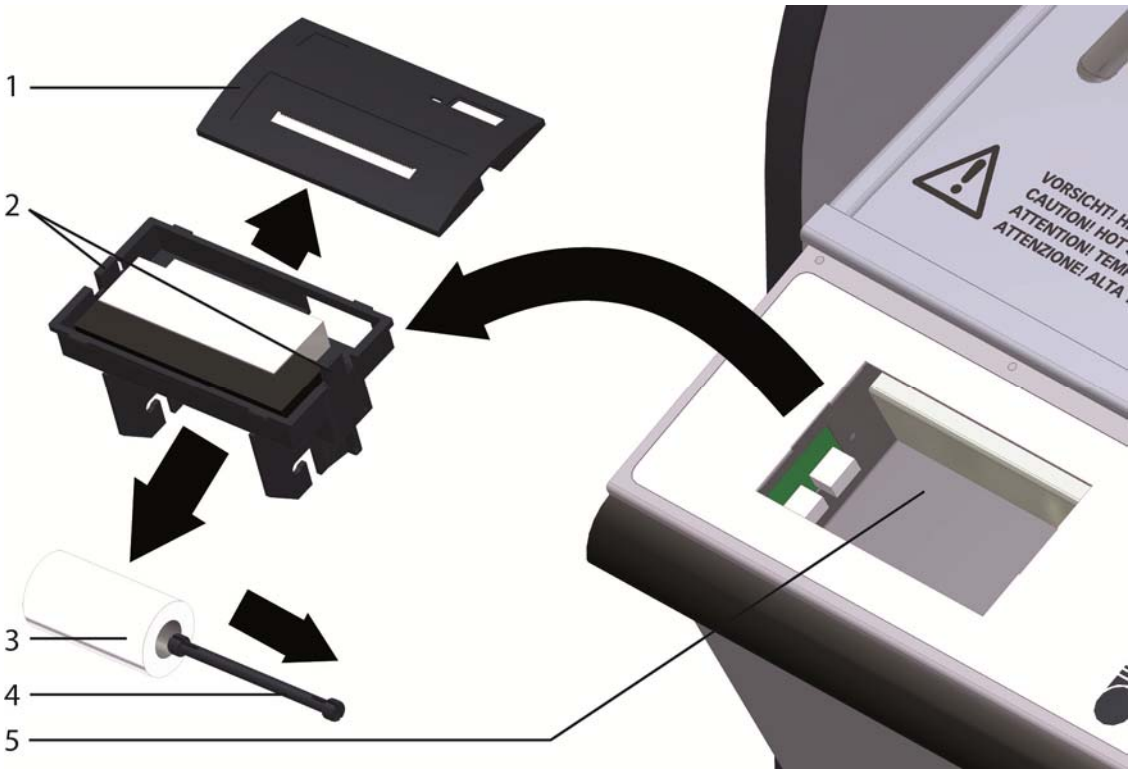


1. Latch
2. Fuse cartridge
3. Fuses
4. Groove

Fuses: 250V - 10A time-lag

1. Press the latch (1) upwards and remove the fuse cartridge (2).
2. Replace the fuses (3).
3. Place the fuse cartridge in the groove (4) so that it snaps in.

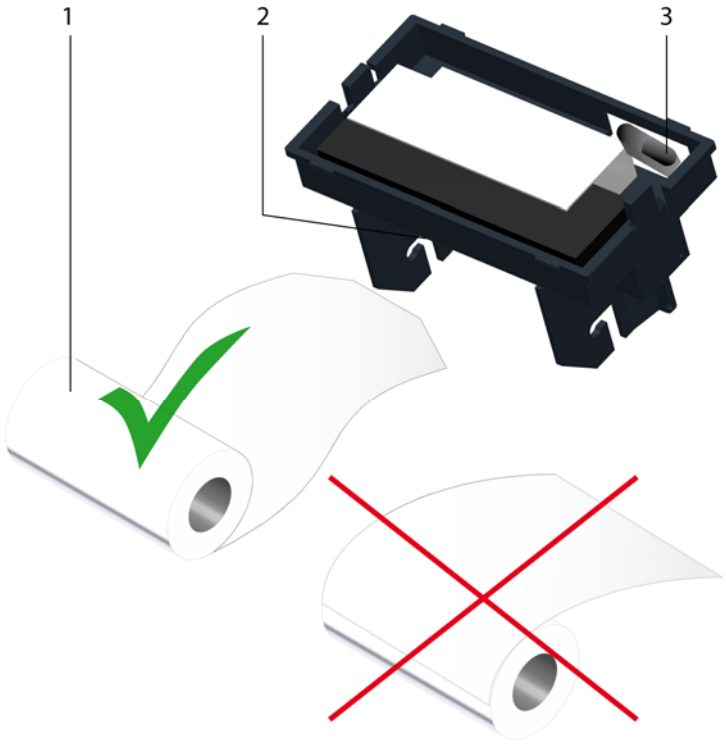
11.2 Replacing printer paper roll



1. Screen
2. Latches
3. Paper roll
4. Paper roll holder
5. Groove

1. Remove the screen (1) from the printer.
2. Press both latches (2) inwards and remove the printer.
3. Remove the paper roll holder (4).
4. Remove the empty paper roll (3).
5. Use scissors to cut the end of the new paper roll in the shape of a trapezoid.

6. Put the paper roll holder (4) with the new paper roll into the printer.



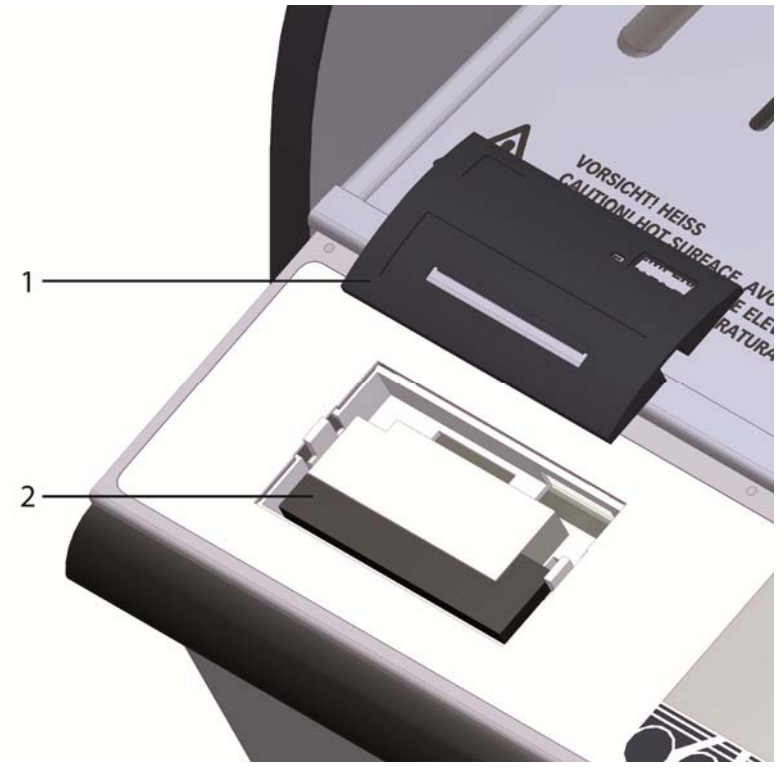
1. Paper roll
2. Paper feed
3. Paper feed button

7. Guide the end of the new paper roll into the paper feed (2).

   Make sure that the paper is bent in such a way that the printer can pull it in easily.

8. Press the paper feed button (3) until the paper end juts out by a few centimetres on the top side of the printer.
9. Tighten the paper roll (1) slightly.
10. Place the printer in the groove so that it snaps in.
11. Place the screen on the printer.

11.3 Replacing the printer ink ribbon



1. Screen
2. Printer ink ribbon

1. Remove the screen (1) from the printer.
2. Replace the printer ink ribbon (2).
3. Place the screen (1) on the printer.

11.4 Cleaning

DANGER! Risk of electric shock!

- Disconnect the unit from the mains before cleaning.

ATTENTION! Device damage due to wrong cleaning agents.

- Do not use any abrasive, corrosive cleaning materials and pungent solvents.
- Ensure material compatibility.
- Do not clean the product with acetone or cellulose thinner.

ATTENTION! Damage to device due to leaking fluids.

- Do not allow liquids to infiltrate the product.

Display

- Clean the display with a dry or slightly damp lint-free cloth.

Housing

- Clean the housing with mild cleaning agents.

11.5 Calibration

The product functions have been inspected, adjusted and calibrated before delivery. The customer receives a test and calibration log. If required, a test and calibration log can be delivered with the proof of traceability of the calibration to national and international standards.

BAUR Prüf- und Messtechnik GmbH recommends calibrating the product once a year to guarantee high accuracy levels.

One year after the last calibration, a reminder message is displayed on the device that the calibration interval has lapsed. It is recommended to calibrate the device. Confirm this message. After confirmation, it does not appear again.

In case of questions, please contact BAUR Prüf- und Messtechnik GmbH or your local BAUR representative (http://www.baur.at/worldwide/).

12 ERROR MESSAGES

When an error message appears, proceed as follows:

1. Check the power voltage and connecting and earthing cables.
2. Write down the error text and the procedure that caused the error to occur.
3. Contact your nearest BAUR representative (http://www.baur.at/worldwide/).

13 TRANSPORTATION AND STORAGE

Transportation 76
Storage 76

13.1 Transportation

If you are sending the Oil Tester to BAUR Prüf- und Messtechnik GmbH, Baur representative or to the Technical Service for repairs, observe the following:

ATTENTION! Damage to device due to leaking fluids.

- Do not allow liquids to infiltrate the product.

- Store Oil Tester only in vertical position.
- Protect Oil Tester against strong vibrations.
- Transport Oil Tester protected against water.

Transportation of test cell

- Replace the small glass ring (441-155) with the plastic ring (441-216). (see "Assembling the test cell" on page 20)

13.2 Storage

- Store Oil Tester only in vertical position.
  Storage temperature: -20 °C to +55 °C
- Protect from moisture.
- Protect against access by unauthorised persons.

14 TECHNICAL DATA

Measurements	Range	Resolution
Loss factor measurement	4…1x10^{-6}	1x10^{-6}
Relative permittivity	1 to 30	1x10^{-2}
Specific resistance measurement	2.5 MΩm…100 TΩm	1x10^{-2} (complete range)
Temperature measurement	11…110 °C	0.1 °C

General information	
Power supply	90 ... 264 V (50/60 Hz)
Max. power consumption	500 VA
Display	LCD colour display (320x240)
Languages	German, English, French, Spanish, Italian, Portuguese, Dutch, Polish, Russian, Chinese (Cn), Chinese (Tw), Czech
Pre-programmed standards	IEC 60247:2004 Standard, IEC 60247:2004 Routine, VDE 0380-2:2005_01 Standard, VDE 0380-2:2005_01 Routine, BS 5737:1979 Standard, BS 5737:1979 Routine, ASTM D924-08 Standard, ASTM D924-08 Routine, ASTM-D1169:2002 Standard, ASTM-D1169:2002 Routine, IEC 61620: 1998-11, JIS C2101:1999
Programmable test sequences	10
Interface	USB 2.0
Printer	Matrix printer, 24 characters, 57mm plain paper
Ambient temperature	-10…+45 °C
Storage temperature	-20…+55 °C
Relative humidity	Non-condensing
Dimensions (W x H x D)	545 x 458 x 384 mm (closed) 545 x 770 x 465 mm (open)
Weight	28 kg
Degree of protection	IP 32
Designed and manufactured according to the following standards	IEC 61010-1, EN 61010-1, VDE 0411 Part 1

Test cell IEC 60247 Fig. 3	
Content	45 ml
Idle capacity tolerance	67.8 to 73 pF
Electric strength in air	2000 V_{eff}
Oil viscosity	<150 mm^2/s at 20 °C

15 DELIVERY INCLUDES AND OPTIONS

Standard delivery includes

- DTL C oil tester incl. Printer
- Hose for emptying the test cell
- Test cell IEC 60247 Fig. 3 with transport case
- Temperature sensor
- Mains connection cable
- Dust cover
- User Manual

Options

- Transport case
- BAUR Software ITS Lite for efficient measuring data management
- TE C tester
- KA TD C calibrator

16 DECLARATION OF CONFORMITY

We,

BAUR Prüf- und Messtechnik GmbH
Raiffeisenstrasse 8
A-6832 Sulz / Austria
headoffice@baur.at
www.baur.at

declare, under our sole responsibility, that the product

BAUR Oil Tester DTL C

to which this declaration refers conforms to the following standards or standard documents:

- Low voltage guideline 2006/95/EG
- EN 61010-1:2001 including Corrections 1 and 2

- EMC Guideline 2004/108/EG
- EN 55011:2007 + A2:2007
- EN 61000-4-2:2001 + A1:1998 + A2:2001
- EN 61000-4-4:2004
- EN 61000-4-5:2006
- EN 61000-4-11:2004

Signed: Dr. Christian Hoffmann, Technical Director
Dr. Eberhard Paulus, Director QM/QS

Sulz, 9 December 2009

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1 APPENDIX – NEW FUNCTIONS (FROM FIRMWARE VERSION 1.18)

This description of the new functions applies to devices with a firmware version from 1.18.

1.1 Automatic oil drainage

From firmware version 1.18, it is possible to automatically empty the tested insulating liquid after a measurement.

Automatic oil drainage is disabled by the manufacturer.

1.1.1 Enabling and setting automatic oil drainage

1. In the main menu, select the menu item ***Device settings*** by pressing the arrow keys.
2. Confirm the entry with ***Next***.
3. In the ***Device settings*** menu, select the menu item ***Automatic oil drainage*** by pressing the arrow keys.
4. Confirm the entry with ***Change***.
   The ***Automatic oil drainage*** window opens.
5. Select the menu item ***on*** to enable automatic oil drainage.
   The window to set the opening duration of the drain valve opens.
6. Set the duration for which the drain valve is open during automatic oil drainage. Use the number keys on the membrane keypad to make entries.
   Possible opening duration: 30 – 600 s
7. Confirm the entry with ***Save***.
   The set opening duration is displayed in the ***Device settings*** menu next to the menu item ***Automatic oil drainage***.
   When automatic oil drainage is enabled:
   - The key LED flashes green.
   - The message ***Automatic oil drainage is activated*** appears for 15 seconds after starting a measurement.

Note: Before filling again, wait until automatic oil drainage has been completed in full and the drain valve is closed. The drain valve can also be closed manually by pressing the key. During oil drainage, the key LED lights up green. When automatic oil drainage is complete, the LED starts flashing green.

▸ Further information about the correct handling of insulating liquid samples is given in the BAUR *Oil sampling* video and in the video tutorial for DTL C.

1.1.2 Disabling automatic oil drainage

1. In the main menu, select the menu item ***Device settings*** by pressing the arrow keys.
2. Confirm the entry with ***Next***.
3. In the ***Device settings*** menu, select the menu item ***Automatic oil drainage*** by pressing the arrow keys.
4. Confirm the entry with ***Change***.
   The ***Automatic oil drainage*** window opens.
5. Select the menu item ***off*** to disable automatic oil drainage.
6. Confirm the entry with ***Save***.

1.1.3 Cancelling automatic oil drainage

- To cancel automatic oil drainage, press the key.
  The drain valve is closed. The key LED starts flashing.

1.1.4 LED display of the drain valve key

LED display		Description
	LED is not illuminated	The drain valve is closed.
	LED flashes green	Automatic oil drainage is enabled.
	LED lights up green	The drain valve is open.

1.2 Automatic hold time before measurement with second filling

For standardised measurements with two fillings, a hold time of 5 min is automatically observed before the measurement is performed with the second filling. The hold time improves the stability of the measured values in the case of dissipation factor measurements.

Standardised measurements with two fillings are indicated in the firmware with the additional text *Standard*.

Further information: Chapter *Standardised measurement*

1.3 Extended preheating temperature range

The temperature range for the preheating temperature has been extended to 15 – 90°C (previously up to 65°C).

Further information: Chapter *Define preheating temperature*

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