Megger

OTD

Oil Tan Delta

User Guide

Megger Ltd reserves the right to alter the specification of its products from time to time without notice. Although every effort is made to ensure the accuracy of the information contained within this document it is not warranted or represented by Megger Ltd. to be a complete and up - to - date description.

For Patent information about this instrument refer to the following web site:

megger.com/patents

This manual supersedes all previous issues of this manual. Please ensure that you are using the most recent issue of this document. Destroy any copies that are of an older issue.

Declaration of Conformity

Hereby, Megger Instruments Limited declares that radio equipment manufactured by Megger Instruments Limited described in this user guide is in compliance with Directive 2014/53/EU. Other equipment manufactured by Megger Instruments Limited described in this user guide is in compliance with Directives 2014/30/EU and 2014/35/EU where they apply.

The full text of Megger Instruments EU declarations of conformity are available at the following internet address:

megger.com/eu-dofc

Contents

1. Safety

This section details the safety information, what are Warnings, Cautions and Notes, Measurement connections and categories for this Instrument.

1.1. Safety Information

The safety information detailed here must be read and understood before the Instrument is used, and they must be obeyed when the Instrument is in use:

- The instrument must be operated only by suitably trained and competent persons. If the instrument is not used in the manner specified protection may be impaired.
- The instrument weighs 22 kg (48.5 lbs). Care should be taken when lifting the instrument.
- The instrument must NOT be used if any part of it is damaged.
- The instrument is for indoor use only.
- The instrument must be used in a location with sufficient ventilation and clearance to allow its forced air cooling to operate effectively. DO NOT obstruct the ventilation apertures.
- The instrument must be earthed when connected to the mains supply.
- Position the instrument so that the mains supply can be easily disconnected.
- The instrument must be used only with a Megger precision Test Cell, Megger Calibration Standard or Megger Calibration Checker.
- The Test Cell may be HOT.
- The Test Chamber must be kept clean; do NOT leave objects inside the Test Chamber that are not required for test.
- The instrument must be used only for testing the properties of electrical insulating oils. There is a risk of fire if other materials are heated in the Test Cell.
- Take suitable precautions when handling oil, and use safe working practice.
- When operating the drain solenoid valve, make sure that the oil drain pipe is correctly installed and runs to a suitable outlet or container. Make sure that relevant local environmental disposal regulations are followed.
- To protect against fire, replacement fuses must be of the correct type and rating.
- There are no user-serviceable parts inside the instrument; all servicing must be referred to Megger approved service centres.
- Calibration or repair must be done only by a Megger qualified repairer.
- Do NOT insert foreign objects into any gap on the instrument.
- Periodically inspect the oil drain hose for damage, leaks and deformation.

1.1.1. See also:

Test Cell Safety Information (see Test Cell User Guide)

OTD Calibration Checker (CC) Safety Information (see OTD CC User Guide)

1.2. Measurement Connection

Only Megger supplied test leads designed for this Instrument provide the full safety rating.

Voltage

The rated measurement connection voltage is the maximum line to earth voltage at which it is safe to connect.

CAT IV : Measurement category IV: Equipment connected between the origin of the low-voltage Mains supply and the distribution panel.

CAT III : Measurement category III: Equipment connected between the distribution panel and the electrical outlets.

CAT II : Measurement category II: Equipment connected between the electrical outlets and the User's equipment.

Measurement equipment may be safely connected to circuits at the marked rating or lower. The connection rating is that of the lowest rated component in the measurement circuit.

1.3. Safety and Hazard Symbols

The Safety and Hazard symbols detail in this section are part of the Instrument's case.

Icon	Description
	HIGH VOLTAGE: risk of electrical shock
	Caution: Refer to User Guide
	Caution: Hot surface
	Caution: Flammable materials
	Equipment complies with current EU directives
	Equipment complies with current UKCA legislation
	N13117 Equipment complies with current 'C tick' requirements
	Do not dispose of to landfill, sewage systems or by fire
	AC voltage
	Earth terminal
	Fuse
	USB terminal

1.4. Warnings, Cautions and Notes

Warnings

A Warning alerts the reader to situations where a hazard to personnel can occur. They are placed before the event to which they relate and are repeated at each applicable occasion.

Cautions

A Caution alerts the reader to situations where equipment damage may result if a process is not followed. They are placed before the event to which they relate and are repeated at each applicable occasion.

Notes

Notes give additional information that aid the reader in the use or understanding of the equipment or subject, they are not used when a Warning or Caution is applicable.

They are not safety related and may be placed either before or after the associated text as required.

2. Description

This User Guide details the OTD (Oil Tan Delta) Instrument.

The OTD is an oil tester for Tan Delta (dissipation/power factor), resistivity and permittivity. It is a fully automatic, Mains powered unit, which can test a wide range of oils such as mineral, ester and silicon insulating oils.

The instrument uses a precision Test Cell, which features a minimum number of components and an oil drain facility. The Test Cell is designed to give highly accurate and repeatable results.

A Test Cell fan enables quick cooling of the Test Cell after a test with high temperatures.

The instrument comes complete with a pre-programmed library of international Tan Delta test Standards, along with the ability to create User defined tests. The Home screen shows all test information required to make sure that the correct test standard and corresponding voltage, frequency and temperature have been selected.

Test results are viewed on the display and can be printed on the internal printer, following a test. All test results are time and date stamped, and kept in the instruments memory (up to 50 test results). Test results can be downloaded, through the built-in USB port, to PowerDB.

2.1. Included Accessories

Item
OTD Test Cell
Carry case

2.2. Related Documents

- OTD Test Cell User Guide (Pt. No.: 2008-869)
- OTD-CC (Pt. No.: 2008-870)

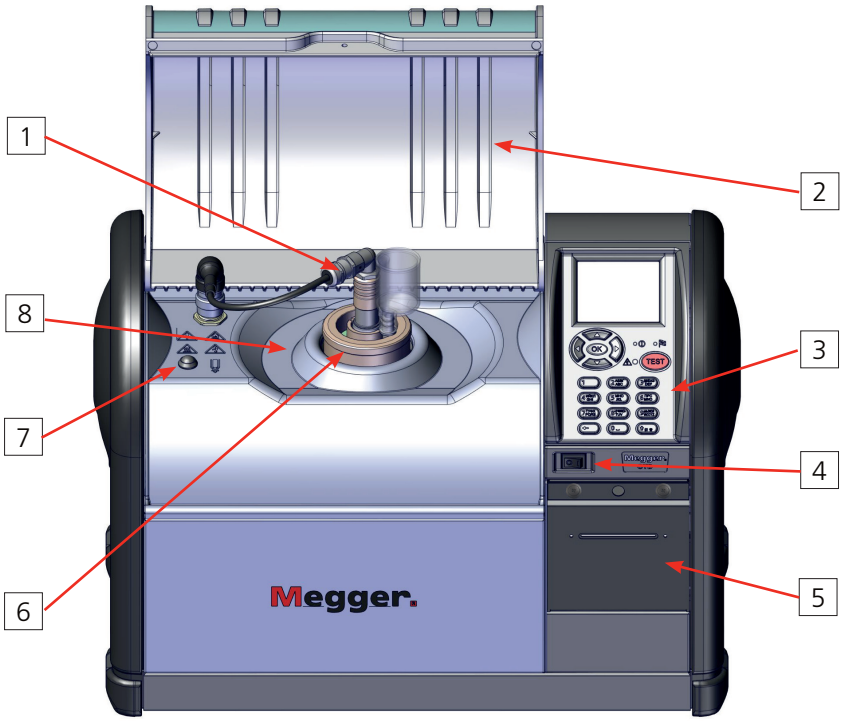
3. Overview

This section gives an overview of the Instrument and its controls.

Important: For safe operation an earth ground cable must be attached to this Instrument before a test is started.

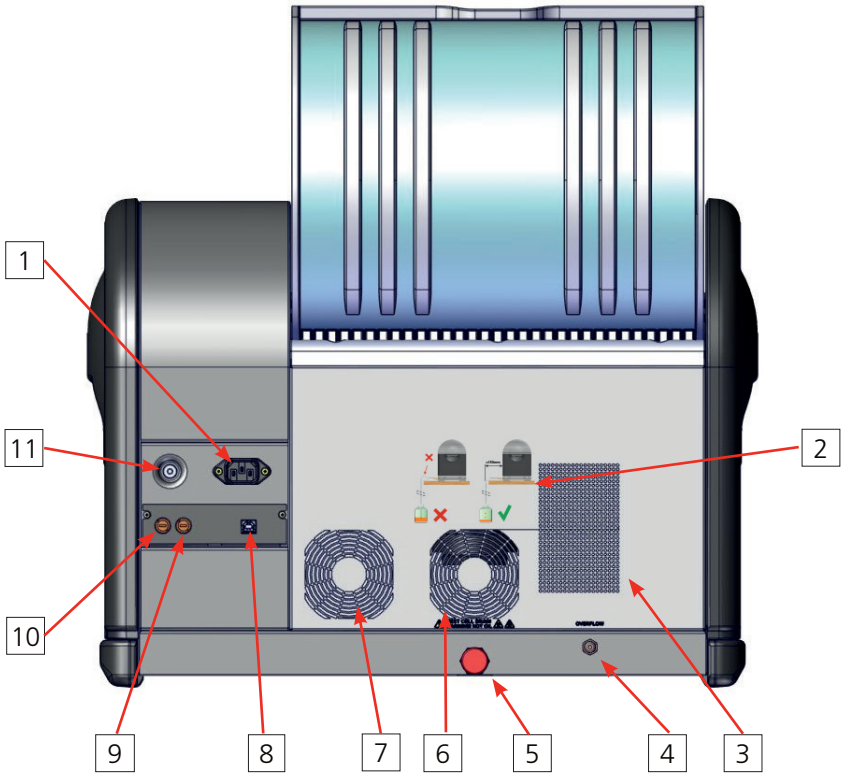
Attention must be paid to product warnings and markings, See **"1. Safety" on page 6**.

3.1. Front Panel



Item	Description	Item	Description
1	Probe (temperature sensor and inner electrode low voltage)	5	Printer
2	Test Chamber Lid	6	Test Cell
3	Control Panel	7	Manual Oil Drain Button
4	On / Off Switch	8	Test Chamber

3.2. Rear Panel



Item	Description	Item	Description
1	IEC Mains Power Socket	**6**	Test Cell Cooling Fan
2	Attach the oil drain pipe guide	**7**	Instrument Cooling Fan
3	Instrument Ventilation	**8**	USB A-Type (not used) USB B-Type
4	Overflow Outlet (do not block)	**9**	Fuse
5	Oil Drain Outlet	**10**	Fuse
		11	Ground Connection

3.3. Control Panel

Item	Description	Item	Description
1	Display	5	High Voltage Warning LED
2	Power On LED	6	On / Off Switch
3	Test Finished LED	7	Alphanumeric keypad
4	Test Button	8	Navigation keypad

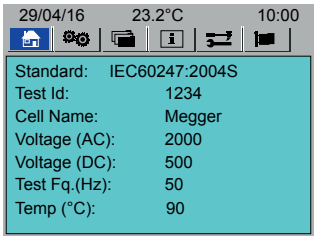
3.4. Screen Tabs

The display shows a set of six tab screens to operate and set-up the Instrument.

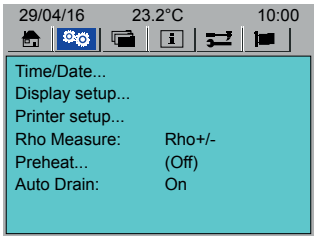
At the top of each tab is a status bar, which shows the current date, temperature and time, along with icons dependant of current tab.

Press  repeatedly to scroll through each tab.

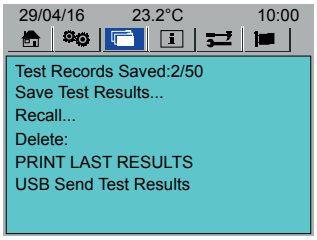
Home: Shows a summary of test settings and the test ID. This is the screen from which tests are run (see **"5. Home Screen" on page 17**).



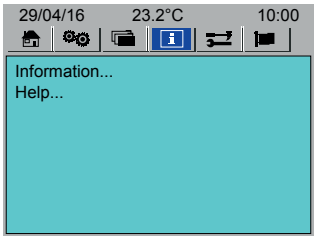
Set-up: Instrument set-up (see **"6. Instrument Set-up" on page 18**).



File: Save, recall, delete, print and download test records (see **"10. Test Records" on page 30**).

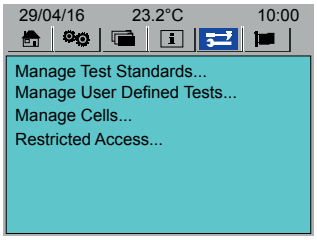


Information: Instrument software configuration and version, and Help files (see **"11. Information and Help" on page 32**).



Tools: Select favourite test Standards and create User Defined tests. Manage and calibrate Test Cells (see **"8. Test Standards" on page 24**).

Note: Restricted Access... menu is for Megger Technical personal only.



Language: Set system language (see **"6.7. Language" on page 21**).

3.5. Navigation and Character Entry

This instrument is controlled by four directional buttons, an OK button and a TEST button:

- **Left and right buttons**: Navigate through the six tabbed screens.
- **Up and down buttons:** Scroll through functions or steps.
- **OK**: Select and set options.
- **TEST**: Press to start a test. Test start is available from any top level tab screen window (start a test with the currently selected Test Standard and settings (see **"5. Home Screen" on page 17**).

3.5.1. Navigation Buttons:

3.5.2. Alphanumeric Keypad:

- Press  (Shift) to select ABC, abc, or 123

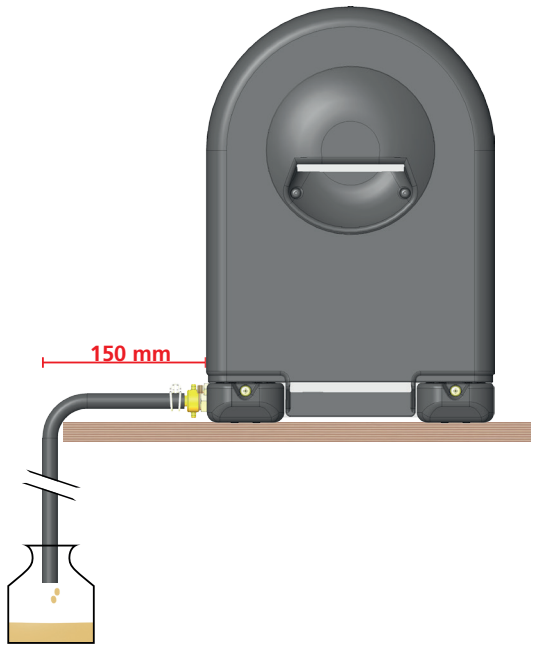
4. Preparations for Use

Important: Read this User Guide thoroughly before the Instrument is operated for the first time. The safety warnings are particularly important (see **"1. Safety" on page 6**).

4.1. Instrument Preparation

1. Unpack the instrument and the contents of the packing box.
2. Place the instrument on a solid surface or table with a sufficient work space.
3. Do not obstruct the airflow to the fans and ventilation holes at the rear of the instrument.
4. Connect a suitable low resistance earth to the ground terminal.
5. Attach the oil drain pipe. Make sure that the oil drain pipe:
   - Falls vertically within 150 mm of the rear of the instrument
   - Stays as flat as possible along the horizontal surface (the drain pipe must be lower than the outlet at all times)
   - Is connected to, or placed in, a suitable waste container

Important: The end of the oil drain pipe must never become submerged in the rising level of oil in the waste container.



6. If required, attach an oil overflow pipe (not supplied (requires 1/8" BSP female adaptor)). Make sure that the pipe is connected to, or placed in, a suitable container.
7. Connect the probe cable to the instrument. Push the connector down and turn clockwise.

Note: In normal use the probe cable connector can stay connected to the instrument. When the Test Cell is removed, pull the probe out and place on the Test Chamber.

8. Connect the mains power.
9. Set the On / Off switch to **On**.
10. Set-up the Instrument (see **"6. Instrument Set-up" on page 18**).

4.2. Test Cell Preparation

Caution: The Test Cell glass components are very fragile. Take care not to damage the glass components when the Test Cell is moved and put in or removed from the Test Chamber.

1. Clean and assemble the Test Cell as described in the OTD Test Cell User Guide.
2. Put the Test Cell in the Test Chamber.

Important: A Test Cell must be calibrated after it has been cleaned.

Note: The Test Cell can be filled with oil before or after it is put in the Test Chamber.

4.3. Instrument Operation Temperature

To make sure that the instrument gives accurate measurements, each time the instrument is set to **On**, let the instrument warm up before tests are started. A test will not start until the instrument has warmed up (20 to 30 minutes (shown on the display)).

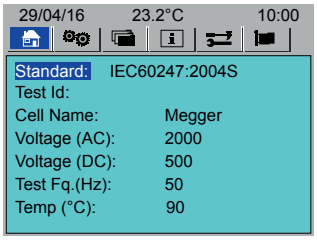
For tests on high resistivity materials, let the instrument warm up a further 20 to 30 minutes (in total 50 minutes approximately).

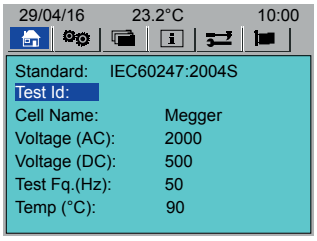
5. Home Screen

The Home screen is the main screen, where tests can be selected, modified and run (see also **"7. Test an Oil Sample" on page 22**).

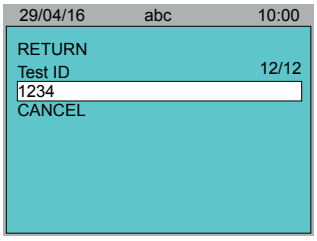
5.1. Home Tab

1. Go to  > **Standard**.
2. Press  repeatedly to select a Standard.
3. Only selected Standard favourites are shown here (see **"8.1. Select Favourite Test Standards" on page 24**).
4. Go to **Test ID**.
5. Press  .

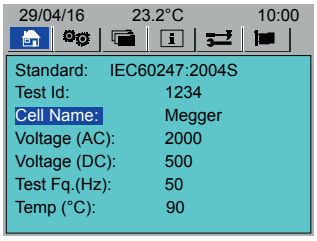




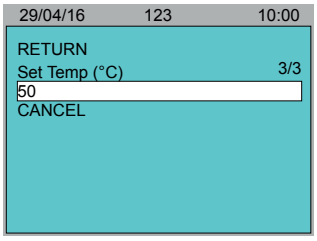
6. Enter a test ID.
7. Press  .



8. Go to **Cell Name**.
9. Press  repeatedly to select a Test Cell for a test.
10. Only selected Test Cell favourites are shown here (see **"9.4. Select Test Cells" on page 28**).



11. If required each test parameters can be modified.
12. Go to each test parameter, in turn, and set as required:
    - **Voltage (AC)**
    - **Voltage (DC)**
    - **Test Fq. (Hz)**
    - **Temp (°C)**



Note: The test parameters in a User Defined test can not be edited (see **"8.2. Create a User Defined Test" on page 24**.

6. Instrument Set-up

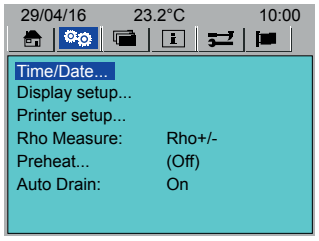
This section details the instrument set-up.

Before an oil test is done it is advisable to at least set these parameters:

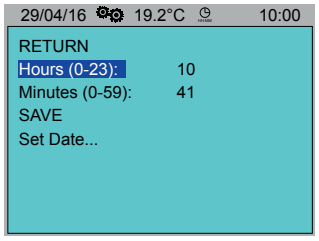
- Time and date (see **"6.1. Time / Date Set-up" on page 18**)
- Display back-light (see **"6.2. Display" on page 19**)
- Set the Printer (see **"6.3. Printer Set-up" on page 19**):
  - Auto-print (automatic end of a test print): On / Off
  - Print Test Notes: On / Off
  - Do a test print test
- Set Resistivity (Rho) Measure (see **"6.4. Resistivity Measure" on page 20**)
- Set Preheat to pre heat the Test Cell (see **"6.5. Pre Heat" on page 20**)
- Set Auto Drain to automatically drain at the end of a test (see **"6.6. Auto Drain" on page 21**)

6.1. Time / Date Set-up

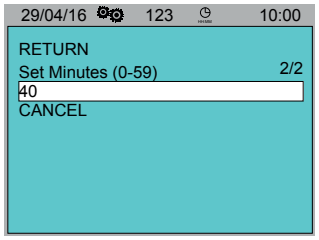
1. Go to  > **Time/Date....**
2. Press  **.**



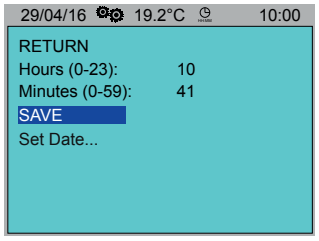
3. Go to **Hours (0-23)** and **Minutes (0-59)**, in turn.
4. Press  .



5. Enter the correct hour or minutes.
6. Press  .

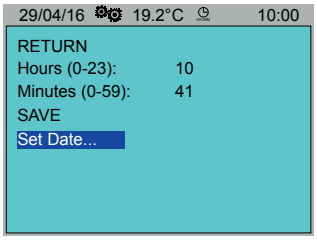


7. Go to **Save**.
8. Press  .



9. Go to **Set Date...**
10. Press 

.

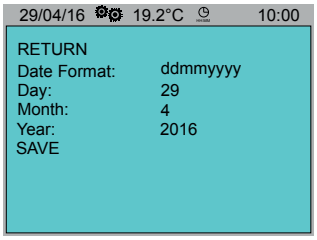


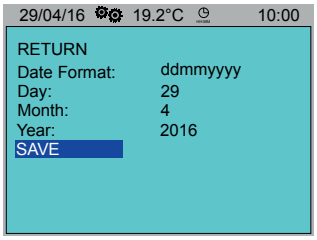
11. Go to **Date Format**.
12. Press 

to toggle the date format.
Go to **Day**, **Month**, and **Year**, in turn.
13. Press 

for each and enter the correct data.
14. Go to **Save**.
15. Press 

.

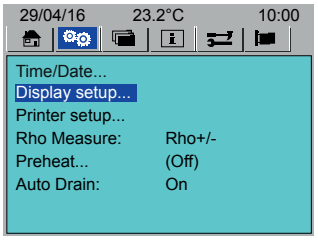




6.2. Display

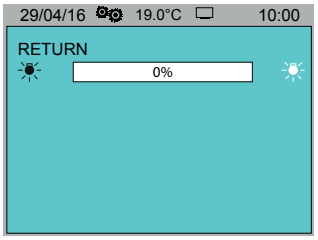
1. Go to  > **Display setup...**
2. Press 

.



3. Press 

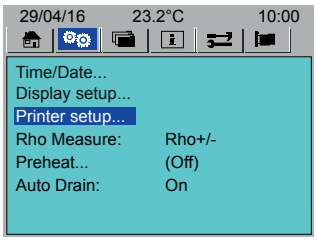
to increase or decrease the display brightness.



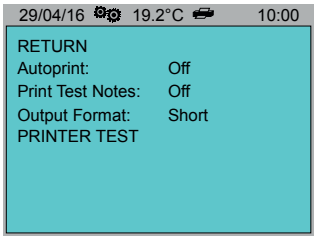
6.3. Printer Set-up

1. Go to  > **Printer Setup...**
2. Press 

.

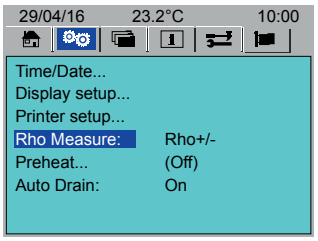


3. Go to each parameter, in turn.
4. Press  to toggle:
   - **Autoprint**: On / Off
   - **Print Test Notes**: On / Off
   - **Output Format**: Full / Short
5. To test the printer, go to **Printer Test**.



6.4. Resistivity Measure

1. Go to  > **Rho Measure**.
2. Press  repeatedly to select between:
   - **Rho +/-**
   - **Rho +**
   - **None Selected**

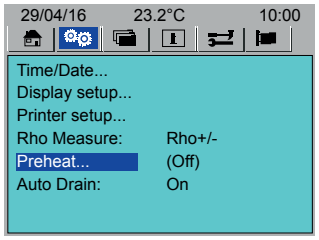


6.5. Pre Heat

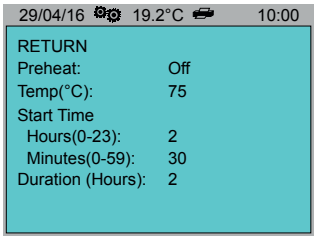
Test Cell pre heat operates only when the lid is in the down position.

Note: Pre heat overrides manual **"9.5. Test Cell Fan Control" on page 29**.

1. Go to  > **PreHeat...** > **PreHeat**.
2. Press  repeatedly to select between:
   - **On**
   - **Continuous**
   - **Off**



3. Go to **Temp (°C)**.



4. Press 

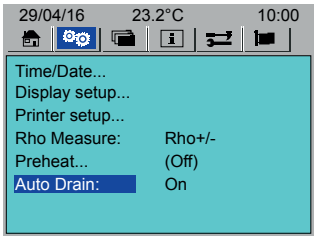
.
5. Enter the required temperature.
6. Go to each parameter, in turn:
   - **Hours (0-23)**
   - **Minutes (0-60)**
   - **Duration (Hours)**
7. Press 

for each parameter and enter the required data.
8. Press 

.

6.6. Auto Drain

1. Go to  > **Auto Drain**.

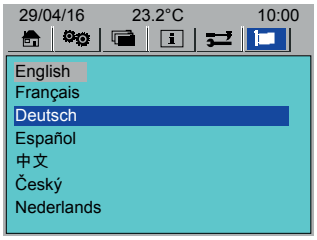


2. Press 

to toggle **Auto Drain** On / Off.
3. Auto Drain **On**: The Oil Drain Valve opens and closes automatically when required.
4. Auto drain **Off**: Use the Oil Drain button to open and close the Oil Drain Valve (prompted on the display).

6.7. Language

1. Go to 
2. Go to the required language.



3. Press 

to select (selected language is greyed out).
4. Press either 

to set the language.

7. Test an Oil Sample

This section details how to set-up and do an oil test.

7.1. Install the Test Cell

1. The Test Cell must be filled with the oil to be tested. Either fill the Test Cell while it is on its stand or when it has been put in the Test Chamber.
   - Pour the oil to be tested into the glass funnel
   - When the oil shows in the sight glass the Test Cell has the required amount of oil for test
2. Put the Test Cell in the Test Chamber.
3. Take care not to knock the Test Cell against the Test Chamber.
4. Install the probe. Push down until it clicks in place.

Note: The glass funnel and sight glass are fragile. Take care not to damage them when the Test Cell is put in or removed from the Test Chamber.

7.2. Oil Test

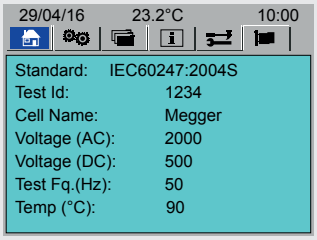
Caution: The instrument must not be moved once a Test Cell has been put into the Test Chamber. Any movement could damage the Test Cell glass components.

Before an oil test is started make sure that:

- The Instrument has been set-up as required (see **"6. Instrument Set-up" on page 18**).
- The instrument has completely warmed up (see **"4.3. Instrument Operation Temperature" on page 16**).

To Test an Oil

1. Set the instrument to **On**.
2. Check that the oil drain valve is closed (LED off).
3. Make sure a Test Cell, with the oil to be tested, is correctly installed in the Test Chamber.
4. Go to the Home Screen (see **"5. Home Screen" on page 17**):



- Select a Test **Standard** (if required, modify a Standard)
- Enter a **Test ID**
- Select a **Test Cell**

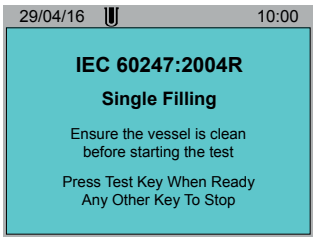
5. Make sure that the instrument has completely warmed up (see **"4.3. Instrument Operation Temperature" on page 16**).
6. Press TEST .
7. Follow the instructions on the display.

7.2.1. Oil Drain

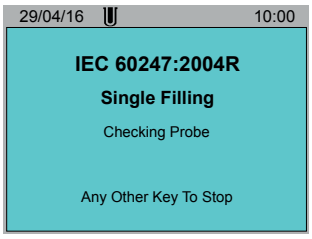
- Auto drain **On**: The Oil Drain Valve automatically opens after a test and closes automatically after 120 seconds (if required, press the Oil Drain button to close sooner)
- Auto drain **Off**: Use the Oil Drain button to open (green LED on) and close the Oil Drain Valve (prompted on the display)

7.3. Typical Oil Test Sequence

1. Oil Test Start Screen.

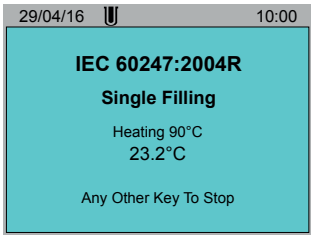


2. Probe checked.

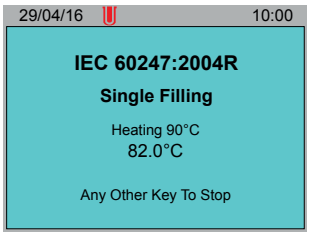


3. Oil Heated.

Test Cell below 50 °C (122 °F).

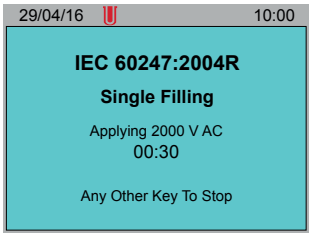


Test Cell above 50 °C (122 °F).

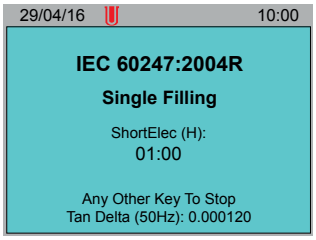


Warning: Do not handle the Test Cell if its temperature is at or over 50 °C (122 °F)

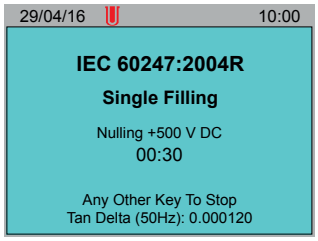
4. AC Voltage Applied.



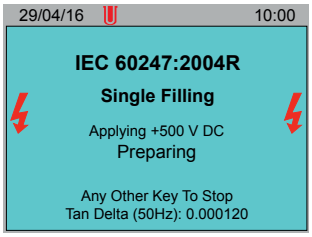
5. Voltage Discharged.

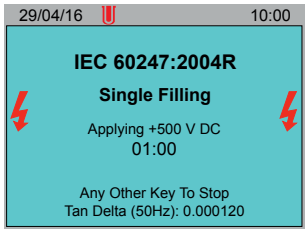


6. System Nulled.

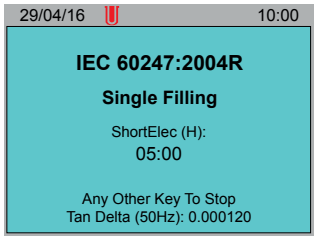


7. Positive DC Voltage Applied (if requested).

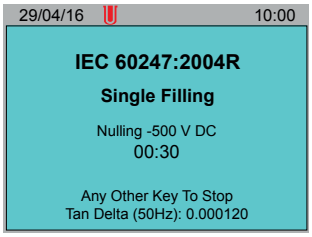




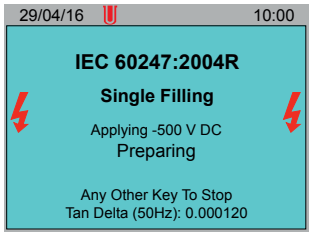
8. Voltage Discharged.

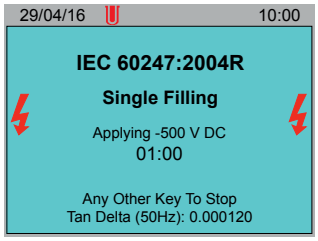


9. System Nulled.

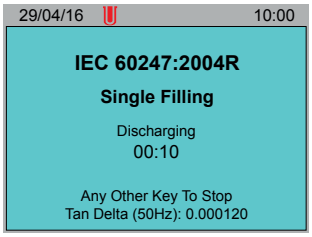


10. Negative DC Voltage Applied.





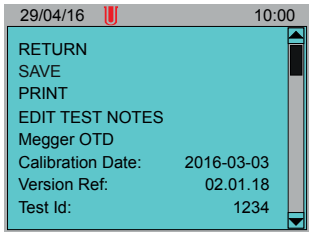
11. Discharge Time.



12. If selected the Instrument will prompt for another filling.

Otherwise the test is finished.

13. Test Results.



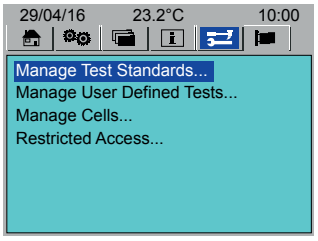
8. Test Standards

This sections details how to select Test Standards and User defined tests as a favourites in the Home screen. It also details how to create, modify and delete User Defined tests.

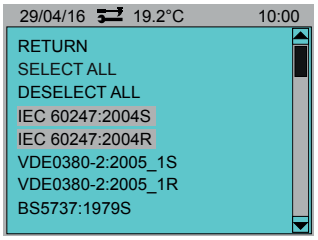
8.1. Select Favourite Test Standards

From the Tools Tab create a list of favourite Oil Test Standards and User Defined Tests, which will show in the Home tab under **Standards** (see **"5. Home Screen" on page 17**).

1. Go to  > **Manage Test Standards...**
2. Press  .

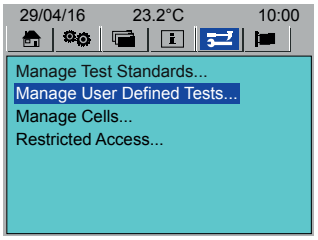


3. Scroll through the Standard list.
4. Press  to select or deselect a Standard.
5. Selected test Standards are in grey.
6. Also use **Select All** or **Deselect All**.
7. Go to **Return**.
8. Press  .

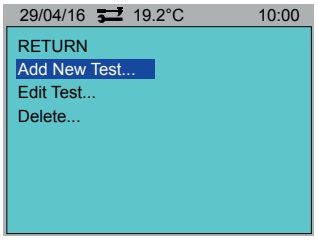


8.2. Create a User Defined Test

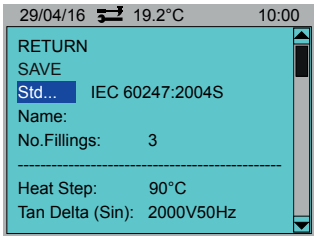
1. Go to  > **Manage User Defined Tests...**
2. Press  .



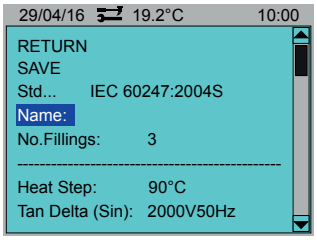
3. Go to **Add New Test...**
4. Press  .



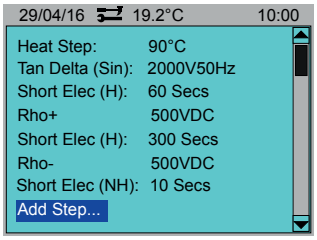
Tip: To create a test from a defined Standard, go to **Std...** Press  repeatedly to select a Standard, and modify as required.



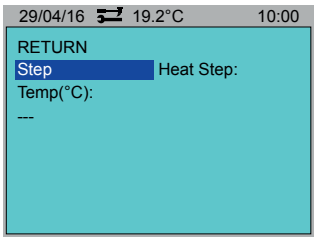
5. Go to **Name**.
6. Give the new test a name.
7. Go to **No. Fillings**.
8. Enter the number of fillings
9. Go to each test parameter, in turn, and set as required.



10. If required go to **Add Step** > **Step**.
11. Press  repeatedly to select a step.
12. To return and not add a step, select **None selected**.

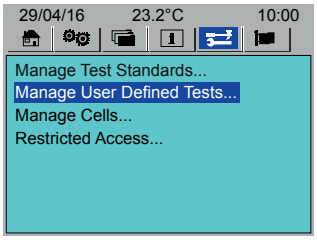


13. Scroll through the new parameters. Edit as required.
14. Go to **SAVE**.
15. Press  .

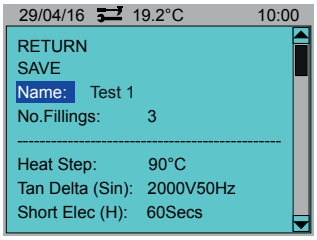


8.3. Edit a User Defined Test

1. Go to  > **Manage User Defined Tests...**
2. Press  .
3. Go to **Edit Test...**

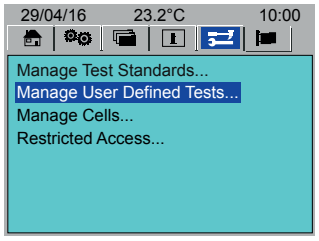


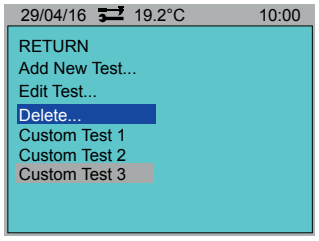
4. Go to **Name**.
5. Press  repeatedly to select a test.
6. Scroll through the test parameters. Edit as required.
7. Go to **SAVE**.
8. Press  .



8.4. Delete a User Defined Test

1. Go to  > **Manage User Defined Tests...**
2. Press  .
3. Go to **Delete**.
4. Press  .
5. Scroll through the test list.
6. Press  to select or deselect a test.
7. Selected tests are in grey.
8. Also use **Select All** or **Deselect All**.
9. Go to **Delete**.
10. Press  .



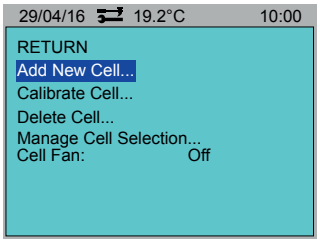


9. Test Cells

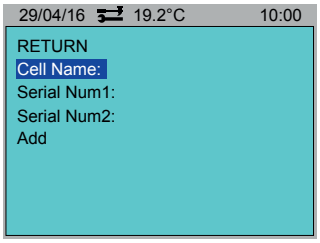
This section details how to add, calibrate, delete and select Test Cells as favourites.

9.1. Add a Test Cell

1. Go to > **Manage Cells...** > **Add New Cell...**
2. Press .

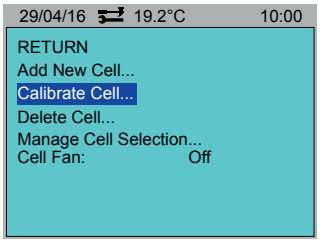


3. Go to each parameter and add information as required:
   - **Cell Name**
   - **Serial Num1**
   - **Serial Num2**
4. Go to **Add**.
5. Press .

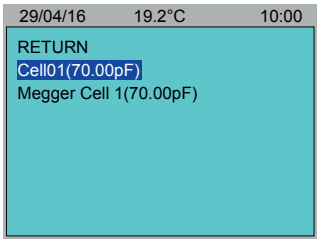


9.2. Calibrate a Test Cell

1. Go to > **Manage Cells...** > **Calibrate Cell...**
2. Press .

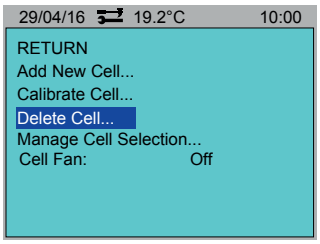


3. Select a Test Cell for calibration.
4. Go to **Temp (°C)**.
5. Set a temperature for the Test Cell calibration.
6. If no temperature is entered, Test Cell calibration will be at room temperature.
7. Go to **OK**.
8. Press .
9. Follow the on screen instructions.

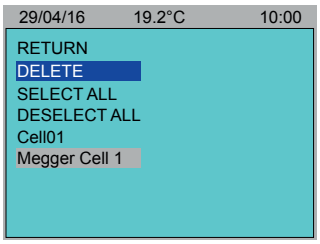


9.3. Delete a Test Cell

1. Go to  > **Manage Cells...** > **Delete Cell...**
2. Scroll through the Test Cell list.



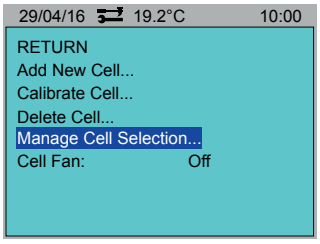
3. Press  to select or deselect a Test Cell.
4. Selected Test Cells are in grey.
5. Also use **Select All** or **Deselect All**
6. Go to **Delete**.
7. Press  .



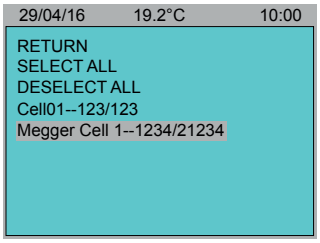
9.4. Select Test Cells

Select which Test Cells are available for an oil test. These Test Cells will show in the Home tab (see **"5. Home Screen" on page 17**).

1. Go to  > **Manage Cells...** > **Manage Cell Selection...**
2. Press  .
3. Scroll through the Test Cell list.



4. Press  to select or deselect a Test Cell.
5. Selected Test Cells are in Grey.
6. Also use **Select All** or **Deselect All**.
7. Go to **Return**.
8. Press  .



9.5. Test Cell Fan Control

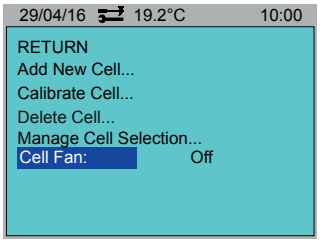
Manual activation of a fan to cool the Test Cell down to ambient air temperature.

Warning: If the Test Cell temperature (in the Menu header) shows red the Test Cell temperature is at or above 50 °C (122 °F) and must not be handled.

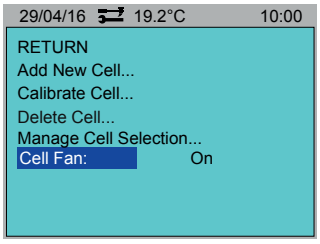
To cool the Test Cell set the Fan Control to **On**. The fan will continue until:

- It is set to **Off**
- A test is started
- Pre-heat overrides the temperature control (to cool or heat) (see **"6.5. Pre Heat" on page 20**)

1. Go to  > **Manage Cells...**
2. Press  .
3. Go to **Cell Fan**



4. Press  to select **On** or **Off**.
5. Go to **Return**.
6. Press  .



10. Test Records

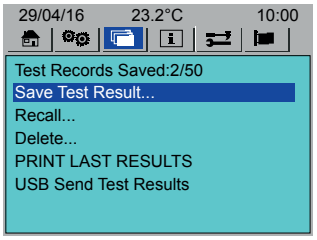
The Instrument can save and store up to 50 test results. Test results can also be downloaded to PowerDB.

10.1. Save a Test Result

1. Go to  > **Save Test Result...**

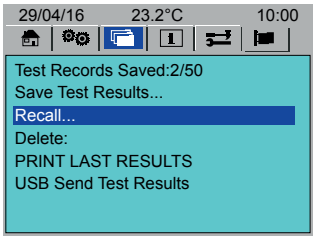
   Note: If the result has previously been saved, the message 'No New Test Data Available' will show.

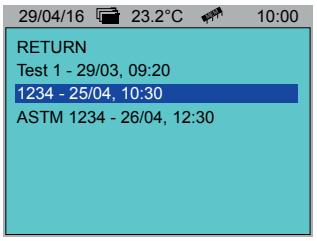
2. Press  .



10.2. Recall a Test Result

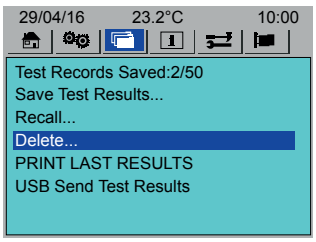
1. Go to  > **Recall...**
2. Press  .
3. A list of test results show.
4. Select a test result to view.
5. Press  .
6. The test result will show.
7. If required select **Print**.
8. Press  .



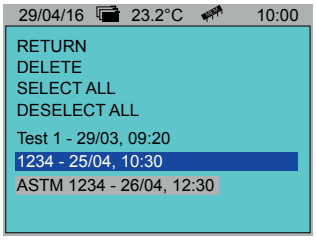


10.3. Delete a Test Result

1. Go to  > **Delete...**
2. Press  .



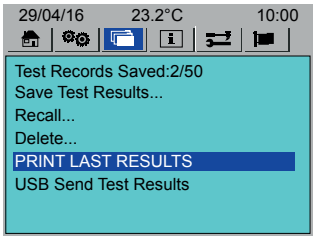
3. Press  to select or deselect a test result.
4. Selected test results are in Grey.
5. Also use **Select All** or **Deselect All**.
6. Go to **DELETE**.
7. Press  .



10.4. Print Last Test Results

The last recorded test can be printed:

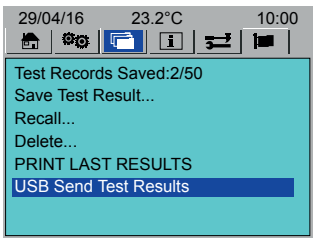
1. Go to  > **Print Last Results**.
2. Press  .



10.5. Download Test Result Records

1. Connect the instrument to the computer (USB cable).
2. On the instrument go to **USB Send Test Results**.
3. Do not press  .
4. Open PowerDB.
5. Click on the required Instrument.
6. In the **Instrument configuration** window, make sure the communication parameters are correct.
7. Click **OK**. The Oil Tan Delta Test form opens.
8. Click **Download OTD Data**.

9. Go to the instrument (**USB Send Test Results**).
10. Press  (within 10 seconds).
11. Data transfer begins.



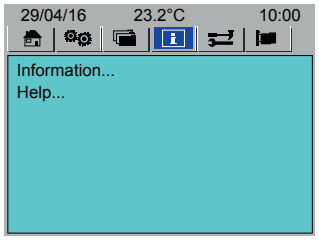
12. In PowerDB select the required test results (Shift+Click).
13. Click **OK** to import the selected test results into the Oil Tan Delta Test form.
14. Amend the Oil Tan Delta Test form as required (see PowerDB help (F1)).

11. Information and Help

11.1. Information

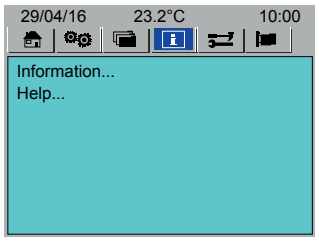
1. Go to  > **Information...**
2. Press  .

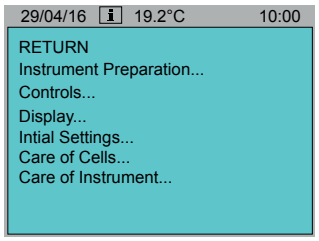
Shows build versions, dates and Serial number.



11.2. Help

1. Go to  > **Help...**
2. Press  .
3. Select a menu option for help on the subject.





11.3. Information and Error Messages

Message	Meaning
Test Cell Is Shorted	The Test Cell has been assembled incorrectly (inner and outer electrodes are touching).
Measurement Exception	The measurement engine has returned an unrecognised error message.
OTD is not Calibrated	The Instrument appears not to be calibrated (the calibration date is not set).
Communications Timeout	The measurement engine has not responded in time.
Measurement Failed	The measurement engine has not returned a result.
Test Standard / Cell Not Selected	Either (or both) a test Standard or a Test Cell has not been selected.
Temp Probe Error	The temperature probe does not appear to be inserted in the Test Cell.
No New Test Data Available	The User has asked to save the last test result, when no test has been done.
Data Store Corrupted	Data corruption detected on power up, the instrument attempts to rebuild its database.
Drain Valve Is Open	A test cannot be started with the oil drain valve open.
Option Not Available when Printing	Not possible to do certain tasks when the printer is active (for example, a test can not start while the printer is printing).
OTD Temperature not Stable	A test is requested before the measurement engine's temperature has stabilised (it has to remain within 0.5 °C for two minutes).
No Test Cell Fitted	A test can not start without a Test Cell installed, there is a mechanical switch that operates when the Test Cell is installed.
Relay Check Failed	An electrical safety test is done on the high voltage relays when the lid is opened and closed, this checks the safe operation of the interlock circuit on the lid.
Stuck Temperature	The temperature measurements from the probe are not changing, suspect hardware fault.
Probe Thermometer Fault	The temperature sensor in the probe is not communicating, it could be that the probe is disconnected.
Induction Heater Fault	Induction heater has indicated a fault (possibly overheated).
No Sensors Detected	No internal temperature sensors have been detected.
Cell Is Not Heating Up	Induction heater is not returning a fault, however the Test Cell has not heated up when it should have done so.
Low Battery	Real time clock lithium battery needs to be renewed (not user replaceable).
Open and Close Lid to begin	Safety check is done on the lid interlock switches each time the unit is powered up, the lid must be opened and closed before a test can be started.

12. Maintenance

12.1. General

- The Instrument is not User serviceable.
- Before use make sure that the Instrument lid is not cracked or distorted.
- The only internal part of the Instrument that is accessible to the User is the printer paper housing, which gives access to install new printer paper and ribbon when required (see **"12.6. Printer Maintenance" on page 35**).
- It is strictly forbidden to open the Instrument. If opened it constitutes a breach of warranty.

12.2. Calibration

The Instrument is calibrated in the factory before delivery and there is no need to calibrate the instrument on first set-up.

An Instrument Calibration Checker (OTD CC) is available (see **"14. Accessories" on page 40**), which can be used to check the Instrument calibration as and when required. Periodic checks with the OTD CC is recommended.

A Test Cell must be calibrated after it has been cleaned.

12.3. Transportation and Storage

12.3.1. Instrument

Caution: The instrument must not be moved with a Test Cell in the Test Chamber. Any movement could damage the Test Cell glass components.

The instrument is a precision instrument and must be transported and stored carefully.

Before this instrument is moved make sure that the instrument and the oil drain pipe (oil overflow pipe, if installed) has been cleaned of any oil or oil residue.

The unit should be stored in a room or area where the environment is within its storage temperature and humidity (see Environmental Specifications – **"13.2. Instrument" on page 38**).

12.3.2. Test Cell

Caution: If the Test Cell is stored in the instrument the Test Cell must be removed before the instrument is moved.

Store the Test Cell in the instrument or in the Test Cell dedicated transport box.

The Test Cell must only be transported in its dedicated transport case.

12.4. Instrument Maintenance

- Always keep the instrument clean and free from dust and fibrous material.
- Cleanliness of the Test Cell is extremely important.

12.4.1. Cleaning

To Clean the Instrument Outer Surfaces

Caution: Do not use any cleaning chemicals that are used to clean the Test Cell (refer to the relevant Test Standard). Chemicals other than specified in this procedure can damage the instrument casing and, or parts.

1. Disconnect from Mains power.
2. Wipe the Instrument with a clean cloth dampened with Isopropyl Alcohol (IPA).

To Clean the Test Chamber

- Make sure that the Test Chamber is always kept clean, particularly before a test
- Wipe away any spilt oil in the Test Chamber or on the outside of the Test Cell with a lint free cloth
- If a lot of oil has been spilt in the Test Chamber use the manual Oil Drain to drain off excess oil

12.5. Test Cell Maintenance

Refer to the Test Cell User Guide for disassembly and assembly instructions.

- The Test Cell supplied with the Instrument may show signs of deposits built up from insulating oil testing. If left they will oxidise and appear dull
- Grease residue can damage the Test Cell electrodes. Always wear gloves when the Test Cell electrodes are handled
- The Test Cell assembly includes parts made of glass. These parts can be easily damaged if knocked
- Incorrect Test Cell assembly can damage components and cause incorrect readings
- The Test Cell must always be cleaned before use
- After a test the Test Cell can still be hot. Always let the Test Cell cool before it is handled

12.5.1. Cleaning

Clean a Test Cell as detailed in the relevant Test Standard.

Important: A Test Cell must be calibrated after it has been cleaned.

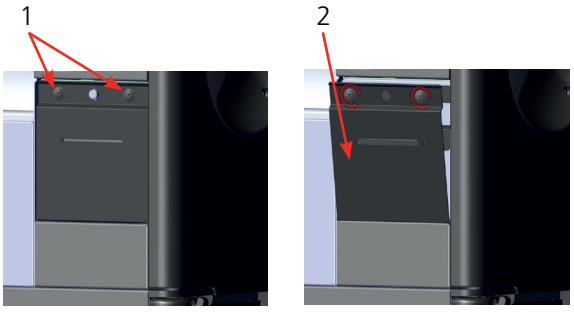
12.6. Printer Maintenance

12.6.1. Printer Panel

The printer panel has two lock studs and a central form feed button.

To Remove the Printer Panel

1. Unscrew two lock studs (1) with a posidrive screwdriver.
2. Remove the printer panel (2).



To Install the Printer Panel

1. Place the bottom of the printer panel into its slot.
2. Feed the printer paper through the form feed slot Use the printer feed button if required).
3. Bring the printer panel up to the two lock studs.
4. Screw the lock studs until tight.

12.6.2. Printer Ribbon

Tip: The printer ribbon can be 'moved on' if required. Remove the printer panel and rotate ribbon winder in the direction shown on the ribbon case.

To Remove and Install a New Printer Ribbon

1. Remove the printer panel.
2. Firmly press the ribbon assembly where it says **PUSH**.
3. Remove the old ribbon.
4. Feed the printer paper through the new printer ribbon.
5. Press the new printer ribbon in to place.
6. Install the printer panel.

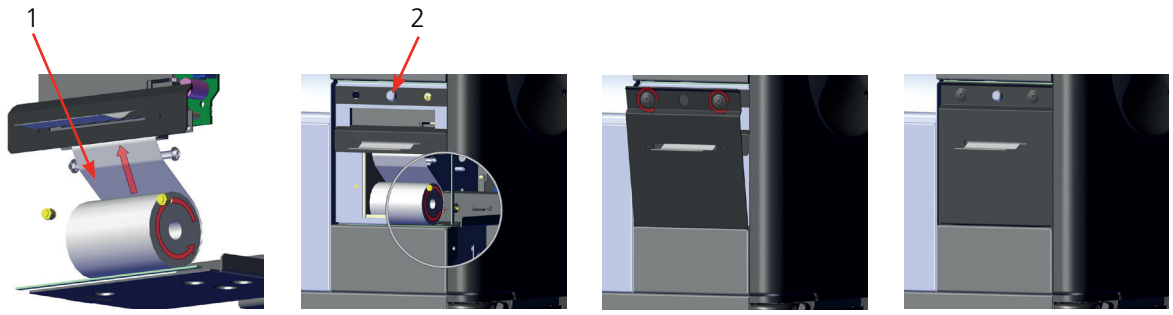
12.6.3. Printer Paper

To Remove / Install a Printer Paper Roll

Make sure that the paper end is neatly cut and not curled up at the end.

1. Hold the end of the paper roll.
2. Insert the paper roll into its holder. Make sure that the paper goes into its holder correctly (1).
3. Feed the paper end up into the printer.

Tip: Remove the printer ribbon for better access.



4. Press the print feed button (2) until the paper end is just visible through the printer mechanism.
5. If removed, install the printer ribbon.
6. Install the printer front panel.
7. Make sure that the printer paper feeds through the front panel paper slot.

12.7. Technical Support

For technical support go to the Megger® technical support site (**uk.megger.com/support**). See the exhaustive FAQs, technical support documents and information about After Sales support.

Alternatively:

- Call +44 (0) 1304 502101 (After Sales support), or
- Submit a completed After Sales Support form (see **uk.megger.com/support/after-sales-support**)

13. Specifications

13.1. Test Accuracy

Accuracy at 23 °C (73.4 °F) ambient and oil temperature	
Tan Delta	
Range	$1x10^{-6}$ - 4
Resolution	$1x10^{-6}$
Accuracy	± 1% reading ± 1×10^{-5}
Relative Permittivity	
Range	1 - 30
Resolution	0.01
Accuracy	± 0.5%
Resistivity Measurement	
Range	2.5 MΩm up to 100 TΩm
Resolution	0.01
Accuracy	2%

Accuracy between 18 - 28 °C (64.4 - 82.4 °F)	
Tan Delta	
Range	1×10^{-6} - 4
Resolution	1×10^{-6}
Accuracy	± 3% reading ± 1×10^{-5}
Relative Permittivity	
Range	1 - 30
Resolution	0.01
Accuracy	± 1%
Resistivity Measurement	
Range	2.5 MΩm up to 100 TΩm
Resolution	0.01
Accuracy	2%

Accuracy between 0 - 50 °C (32 - 122 °F)	
Tan Delta	
Range	1×10^{-6} - 4
Resolution	1×10^{-6}
Accuracy	± 15% reading ± 15×10^{-6}
Relative Permittivity	
Range	1 - 30
Resolution	0.01
Accuracy	± 1%
Resistivity Measurement	
Range	2.5 MΩm - 100 TΩm
Resolution	0.01
Accuracy	2%

Specifications

13.2. Instrument

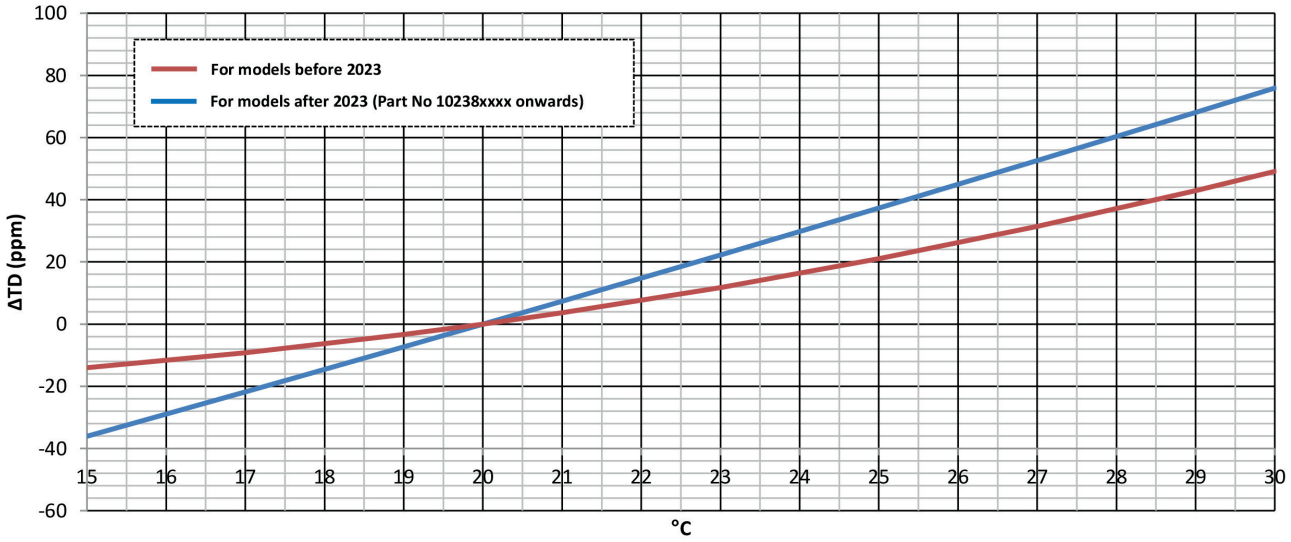
Item	Parameter
Test Temperature	
Range	10 - 110 °C (50 - 230 °F)
Resolution	0.1 °C (0.18 °F)
Test Voltage	
AC Range	500 - 2000 V 55 Hz Tan D (500 - 2000 V)
Result Frequency	tan ∂ (Sin) 40 Hz - 65 Hz Quasi 100 V 0.3 Hz
DC Range	125 - 500 V Rho +/- (125 - 500 V)
Quasi Rectangular Square Wave	100 V 0.3 Hz
Resolution	1 V
Accuracy	±2% ±1 V
Power Supply	100 - 240 V 50 - 60 Hz 300 VA
Fuse	(x2) 4 A (T)
Environmental Specifications	
Operating Temperature Range	0 - 50 °C (32 - 122 °F)
Storage Temperature Range	-20 - 55 °C (4 - 131 °F)
Humidity	95% non-condensing
Maximum Altitude	2000 m (6561.68 ft)
Dimensions	580 x 420 x 290 mm (22.8 x 16.5 x 11.5 in)
Weight (Instrument)	22 kg (48.5 lb)
Interface	USB Type B
IP Rating	IP30 (with all covers installed)
EMC	IEC 61326
Safety	IEC 61010 CAT II 300 V

13.3. Test Cell

Item	Parameter
Capacitance Range	70 pf (± 3 pf)
Weight	2.7 kg (5.9 lb)
Material	316L Stainless Steel / Quartz Glass

13.4. OTD Calibration Checker

Resistor	Resistivity C_0 = 70 pF	Nominal Tan Delta (T.D.) εr (70 pf) = 2.86		
		50 Hz	55 Hz	60 Hz
5 GΩ	39.55 GΩm	0.003183	0.002894	0.002653
500 MΩ	3.955 GΩm	0.031831	0.028937	0.026526
50 MΩ	395.5 MΩm	0.318310	0.289373	0.265258
5 MΩ	39.55 MΩm	3.183099	2.893726	2.652582



Item	Parameter
Capacitance	200 pF ±10%
Tan Delta Accuracy	±2% from calibrated value
Resistivity Accuracy	±1% from calibrated value
Operating Temperature Range	15 - 30 °C (59 - 86 °F)
Storage Temperature Range	-20 - 50 °C (-4 - 122 °F)
Humidity	< 60% RH
Dimensions	190 x 120 x 250 mm (7.5 x 4.7 x 10.0 in)
Weight	1.5 kg (3.3 lb)
Maximum altitude	2000 m (6561.68 ft)
Safety	IEC61010

14. Accessories

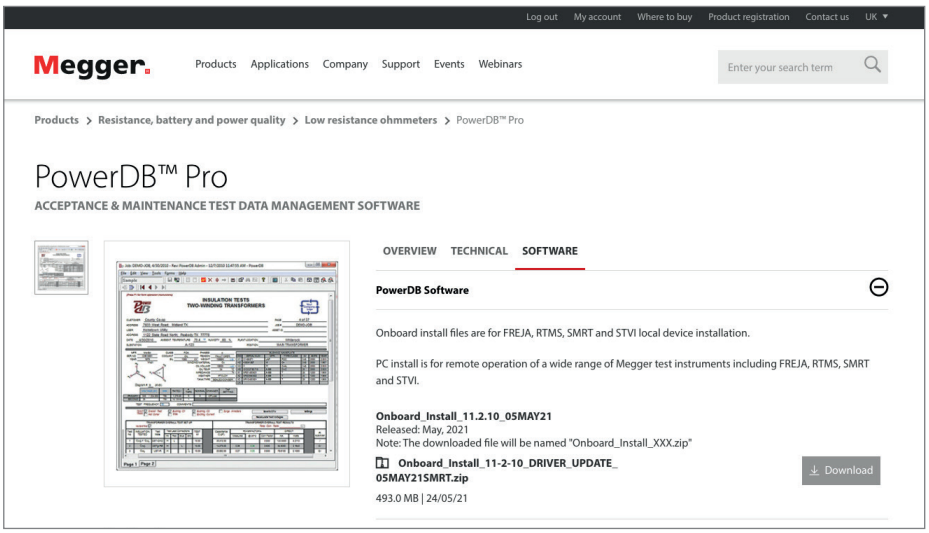
14.1. Optional Accessories

Item	Order No.
OTD Test Cell with carry case	1008-293
OTD Calibration Checker	1008-291
Printer Paper Rolls (57.5 mm wide) (20 rolls)	1008-030
Printer ribbon cassette	25995-002

14.2. Download PowerDB

You can now download direct from the Megger website to ensure that you have the most recent version available.

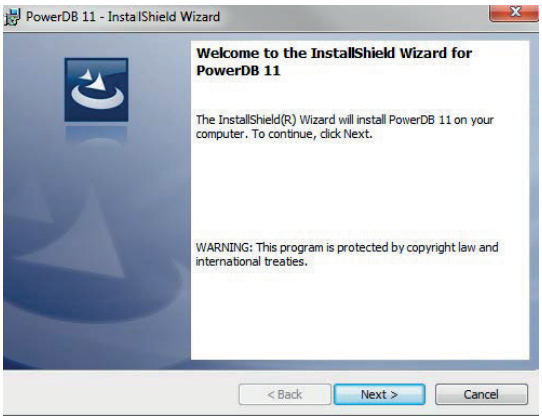
Visit **megger.com/powerdb**



The latest edition will be at the top. Click the "download" button beside the file.

This will ask if you want to open or save the file. By clicking "Save" you will begin to download the installation package.

Then just follow the onscreen instructions to complete installation.



15. Repair and Warranty

If the protection of an Instrument has been impaired it should not be used, but sent for repair by suitably trained and qualified personnel. The protection is likely to be impaired if, for example, the Instrument shows visible damage, fails to perform the intended measurements, has been subjected to prolonged storage under unfavourable conditions, or has been exposed to severe transport stresses.

New Instruments are covered by a two year warranty from the date of purchase by the User, the second year being conditional on the free registration of the product on **www.megger.com**. You will need to log in, or first register and then login to register your product. The second year warranty covers faults, but not recalibration of the Instrument which is only warranted for one year. Any unauthorised prior repair or adjustment will automatically invalidate the warranty.

These products contain no User repairable parts and if defective should be returned to your supplier in original packaging or packed so that it is protected from damage during transit. Damage in transit is not covered by this warranty and replacement/repair is chargeable.

Megger warrants this Instrument to be free from defects in materials and workmanship, where the equipment is used for its proper purpose. The warranty is limited to making good this Instrument (which shall be returned intact, carriage paid, and on examination shall disclose to their satisfaction to have been defective as claimed). Any unauthorised prior repair or adjustment will invalidate the warranty. Misuse of the Instrument, from connection to excessive voltages, fitting incorrect fuses, or by other misuse is excluded from the warranty. The Instrument calibration is warranted for one year.

This Warranty does not affect your statutory rights under any applicable law in force, or your contractual rights arising from a sale and purchase contract for the product. You may assert your rights at your sole discretion.

15.1. Calibration, Service and Spare Parts

For Megger Instruments service requirements contact Megger, your Local Distributor or an Authorised Repair Centre.

Megger operates fully traceable calibration and repair facilities, to make sure your Instrument continues to provide the high standard of performance and workmanship you expect. These facilities are complemented by a worldwide network of approved repair and calibration companies to offer excellent in-service care for your Megger products.

Refer to Megger contact details.

To find your local Authorised Service Centre email Megger (**ukrepairs@megger.com)** and give details of your location.

16. End of Life

16.1. WEEE Directive

The crossed out wheeled bin symbol placed on Megger products is a reminder not to dispose of the product at the end of its life with general waste.

Megger is registered in the UK as a Producer of Electrical and Electronic Equipment. The Registration No is WEE/HE0146QT.

For further information about disposal of the product consult your local Megger company or distributor or visit your local Megger website.

17. Worldwide Sales Offices

Sales Office	Telephone	Email
UK	T. +44 (0)1 304 502101	E. UKsales@megger.com
USA – Dallas	T. +1 214 333 3201	E. USsales@megger.com
USA – Valley Forge	T. +1 214 333 3201	E. USsales@megger.com
USA – Dallas	T. +1 214 333 3201	E. USsales@megger.com
DEUTSCHLAND – Aachen	T. +49 (0) 241 91380 500	E. info@megger.de
SVERIGE	T. +46 08 510 195 00	E. seinfo@megger.com
AUSTRALIA	T. +	E. AUsales@megger.com
中国	T. +86 512 6556 7262	E. meggerchina@megger.com
中国 - 香港	T. +852 26189964	E. meggerchina@megger.com
ČESKÁ REPUBLIKA	T. +420 222 520 508	E. info.cz@megger.com
AMÉRICA LATINA	T. +1 214 330 3293	E. csasales@megger.com
ESPAÑA	T. +34 916 16 54 96	E. info.es@megger.com
SUOMI	T. +358 08 510 195 00	E. seinfo@megger.com
LA FRANCE	T. +01 30 16 08 90	E. infos@megger.com
ΕΛΛΑΔΑ	T. +49 (0) 9544 68 0	E. sales@sebakmt.com
MAGYARORSZÁG	T. +36 1 214-2512	E. info@megger.hu
ITALIA	T. +49 (0) 9544 68 0	E. sales@sebakmt.com
日本	T. +44 (0)1 304 502101	E. UKsales@megger.com
한국	T. +1-800-723-2861	E. sales@megger.com
العربية الرياض	T. +966 55 111 6836	E. MEsales@megger.com
مملكة البحرين	T. +973 17440620	E. MEsales@megger.com
NEDERLAND	T. +46 08 510 195 00	E. seinfo@megger.com
NORGE	T. +46 08 510 195 00	E. seinfo@megger.com
POLSKA	T. +48 22 2809 808	E. info.pl@megger.com
PORTUGAL	T. +34 916 16 54 96	E. info.es@megger.com
ROMÂNIA	T. +40 21 2309138	E. info.ro@megger.com
РОССИЯ	T. +7 495 2 34 91 61	E. sebaso@sebaspectrum.ru
SLOVENSKO	T. +421 2 554 23 958	E. info.sk@megger.com
SOUTH AFRICA	T. + 27 (031) 576 0360	E. sales.rsa@megger.com
TÜRKIYE	T. +46 08 510 195 00	E. seinfo@megger.com

Megger

Local Sales office

Megger Limited
Archcliffe Road
Dover
Kent
CT17 9EN
ENGLAND
T. +44 (0)1 304 502101
F. +44 (0)1 304 207342

Manufacturing sites

Megger Limited
Archcliffe Road
Dover
Kent
CT17 9EN
ENGLAND
T. +44 (0)1 304 502101
F. +44 (0)1 304 207342

Megger GmbH
Weststraße 59
52074 Aachen
GERMANY
T. +49 (0) 241 91380 500
E. info@megger.de

Megger Valley Forge
400 Opportunity Way
Phoenixville,
PA 19460
USA
T. +1 610 676 8500
F. +1 610 676 8610

Megger USA - Dallas
4545 West Davis Street
Dallas TX 75237
USA
T. 800 723 2861 (USA only)
T. +1 214 333 3201
F. +1 214 331 7399
E. USsales@megger.com

Megger AB
Rinkebyvägen 19, Box 724,
SE-182 17 Danderyd
SWEDEN
T. +46 08 510 195 00
E. seinfo@megger.com

Megger USA - Fort Collins
4812 McMurry Avenue
Suite 100
Fort Collins CO 80525
USA
T. +1 970 282 1200

This instrument is manufactured in the United Kingdom.

The company reserves the right to change the specification or design without prior notice.

Megger is a registered trademark

The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc., and is used under licence.

OTD_UG_en_V11 09 2023