ACT

2.0

% CM

85

MAT

MADE IN GERMANY

EN

OPERATING MANUAL
MOISTURE MEASURING
DEVICE

TRT-BA-T660-TC2014-04-003-EN

> TROTEC

Table of contents

Notes regarding the operating manual

Symbols

Warning of electrical voltage
This symbol indicates dangers to the life and health of persons due to electrical voltage.

Warning
This signal word indicates a hazard with an average risk level which, if not avoided, can result in serious injury or death.

Caution
This signal word indicates a hazard with a low risk level which, if not avoided, can result in minor or moderate injury.

Note
This signal word indicates important information (e.g. material damage), but does not indicate hazards.

Info
Information marked with this symbol helps you to carry out your tasks quickly and safely.

Follow the manual
Information marked with this symbol indicates that the operating manual must be observed.

You can download the current version of the operating manual and the EU declaration of conformity via the following link:

T660

https://hub.trotec.com/?id=44145

Safety

Read this manual carefully before starting or using the device. Always store the manual in the immediate vicinity of the device or its site of use.

Warning
Read all safety warnings and all instructions.
Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury.
Save all warnings and instructions for future reference.
This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

- Do not use the device in potentially explosive rooms or areas and do not install it there.
- Do not use the device in aggressive atmosphere.
- Do not immerse the device in water. Do not allow liquids to penetrate into the device.
- The device may only be used in dry surroundings and must not be used in the rain or at a relative humidity exceeding the operating conditions.
- Protect the device from permanent direct sunlight.
- Do not expose the device to strong vibrations.
- Do not remove any safety signs, stickers or labels from the device. Keep all safety signs, stickers and labels in legible condition.
- Do not open the device.
- Observe the storage and operating conditions as given in the Technical data chapter.

Intended use

Only use the device for the moisture measurement of building materials. Observe and comply with the technical data.

To use the device for its intended use, only use accessories and spare parts which have been approved by Trotec.

Improper use

Do not use the device in potentially explosive atmospheres, for measurements in liquids or at live parts.

Any unauthorised changes, modifications or alterations to the device are forbidden.

Personnel qualifications

People who use this device must:
*   have read and understood the operating manual, especially the Safety chapter.

Residual risks

⚡ **Warning of electrical voltage**
There is a risk of a short-circuit due to liquids penetrating the housing!
Do not immerse the device and the accessories in water. Make sure that no water or other liquids can enter the housing.

⚡ **Warning of electrical voltage**
Work on the electrical components must only be carried out by an authorised specialist company!

⚠ **Warning**
Risk of suffocation!
Do not leave the packaging lying around. Children may use it as a dangerous toy.

⚠ **Warning**
The device is not a toy and does not belong in the hands of children.

⚠ **Warning**
Dangers can occur at the device when it is used by untrained people in an unprofessional or improper way! Observe the personnel qualifications!

⚠ **Caution**
Keep a sufficient distance from heat sources.

Note
To prevent damages to the device, do not expose it to extreme temperatures, extreme humidity or moisture.

Note
Do not use abrasive cleaners or solvents to clean the device.

Information about the device

Device description

The material moisture measuring device T660 is a dielectric moisture indicator, which can be used for the quick and non-destructive localization of humidity or moisture distributions.

The device enables the detection of near-surface moisture in walls or flooring. The measured values will be displayed in real time.

A minimum, maximum and average function is available for the direct analysis of the measured data. Besides, the currently measured value can be recorded via the hold function.

The device further features an alarm function. Once the preset limit value is exceeded, the device alerts the user through emitting an acoustic signal!

The device is suited for the preliminary check of the building materials' readiness for covering for subsequent measurements according to the calcium carbide method (CM measurement). The moisture indication allows the localization of the most significant measuring spots to extract material for the CM measurement.
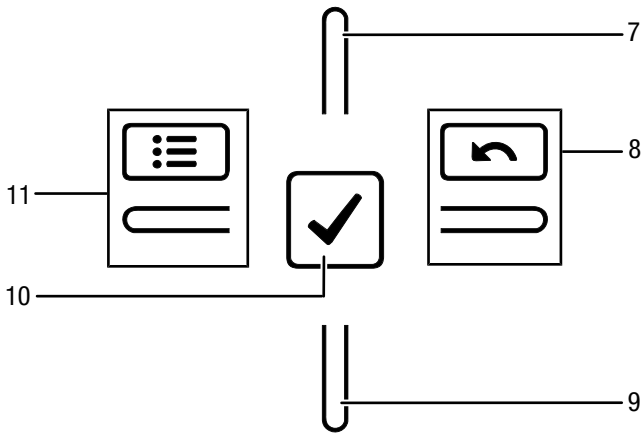
You can connect the device to a computer by using the USB cable included in the scope of delivery. Then you can extract and analyse your measured results with the optional MultiMeasure Studio software.
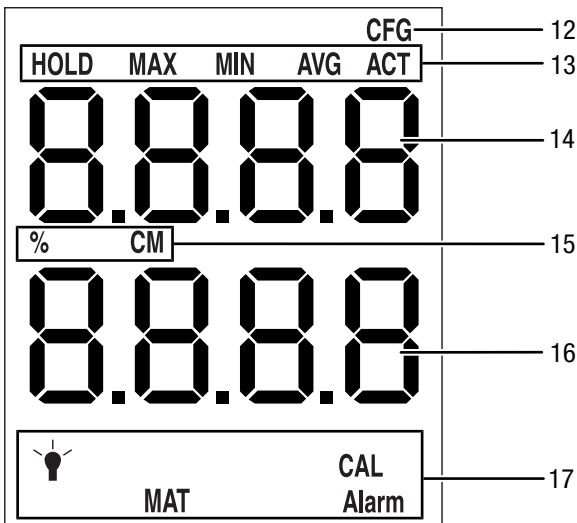
Device depiction
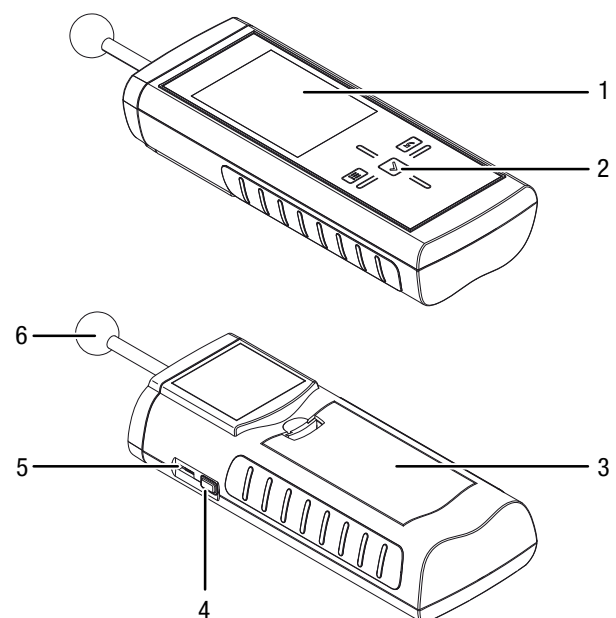
No.	Designation
1	Display
2	Cross control
3	Battery compartment with cover
4	Power button
5	USB interface
6	Measuring head

Cross control

No.	Designation
7	Up button
8	Right/back button
9	Down button
10	OK button
11	Left/menu button

Display

No.	Designation
12	*CFG* symbol (configuration mode display)
13	Measuring mode
14	Measurement value display top
15	Indication of the unit (moisture in % or *CM*)
16	Measurement value display bottom
17	Configuration mode

Technical data

Parameter	Value
Model	T660
Material moisture	
Measuring range	1 to 200 digits or 0 % to 7.6 %
Accuracy	0.1 digits or ± 0.1 %
Resolution	0.1 digits
Penetration depth (non-destructive)	max. 40 mm
General technical data	
Measuring method	Capacitive
Display	LCD
Interface	USB
Operating conditions	0 °C to 50 °C with < 95 % RH (non-condensing)
Storage conditions	-10 °C to 60 °C with < 95 % RH (non-condensing)
Power supply	4 x 1.5 V, AA batteries
Weight	approx. 285 g
Dimensions (length x width x height)	209 mm x 63 mm x 35 mm

Scope of delivery

- 1 x Device T660
- 4 x 1.5 V batteries, type AA
- 1 x Factory test certificate
- 1 x Quick guide
- 1 x Display protection film
- 1 x USB cable

Transport and storage

Note

If you store or transport the device improperly, the device may be damaged.
Note the information regarding transport and storage of the device.

Transport

When transporting the device, ensure dry conditions and and protect the device from external influences e.g. by using a suitable bag.

Storage

When the device is not being used, observe the following storage conditions:

- dry and protected from frost and heat
- protected from dust and direct sunlight
- The storage temperature is the same as the range given in the Technical data chapter.
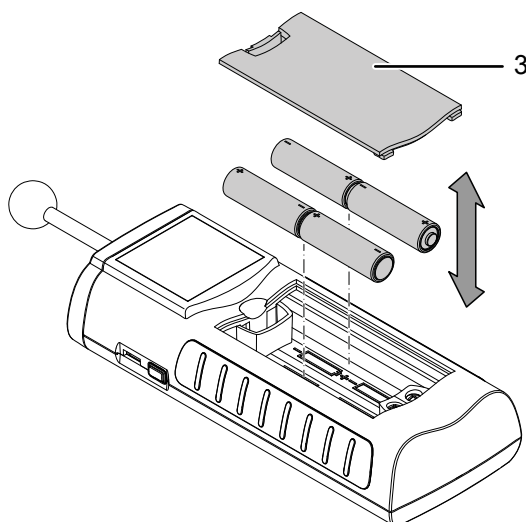- Remove the batteries from the device.

Operation

Inserting the batteries

Insert the supplied batteries before first use.

⚠ **Caution**
Make sure that the surface of the device is dry and the device is switched off.

1. Remove the battery compartment cover (3).
2. Insert the batteries with correct polarity.
3. Insert the battery compartment cover (3).
   ⇨ The device can now be switched on.

Switch-on

Note:

The cross control is very sensitive. Therefore, avoid dirt on the control panel, because it could be misinterpreted by the device as keystroke.

Before use make sure that the touchscreen control panel is dirt-free.

If required clean the touchscreen control panel according to chapter *Cleaning the device*.

1. Hold the device pointing into clear space.
   – The device should point away from the body and not at or near material surfaces. When failing to observe the above instructions, the following calibration will be corrupt.
2. Press the On/Off button (4) until a beep is emitted.
   ⇨ The device performs a short self-test.
   ⇨ The device name and firmware version is shown on the display.
   ⇨ The battery charge is indicated on the display.
3. The device carries out an automatic calibration. During calibration the display indicates the lettering CAL. These flashing characters are accompanied by brief acoustic signals. An extended acoustic signal indicates that the calibration has been completed.
   ⇨ The device is ready for operation.

Carrying out a measurement

Note:

Note that moving from a cold area to a warm area can lead to condensation forming on the device's circuit board. This physical and unavoidable effect can falsify the measurement. In this case, the display shows either no measured values or they are incorrect. Wait a few minutes until the device has become adjusted to the changed conditions before carrying out a measurement.

Please observe the information regarding the measurement principle.
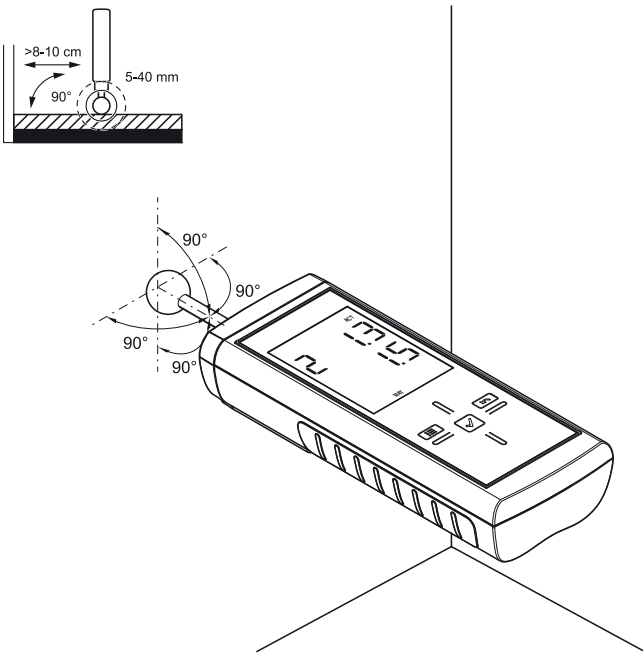
1. Hold the measuring device at the black rubber surfaces and maintain this position, for otherwise the measurement results might be falsified.
2. Firmly place the measuring head in a vertical position on the good to be measured.
3. Observe a minimum distance of 8 to 10 cm to corners.
4. Read the measured value from the display.

Carrying out a comparative measurement

1. Look for a preferably dry spot at the component.
2. Perform a measurement as previously described.
   ⇨ The thus determined measured value will be the reference value for *dry*.
3. Look for a preferably damp or wet spot at the component, if any.
4. Perform a measurement as previously described.
   ⇨ With regard to the present conditions, the thus determined measured value will be the reference value for *damp/wet*.
5. Carry out further measurements at the component.

Higher measured values usually signify a higher moisture content in the near-surface area of the material to be measured.

Key lock

1. Briefly press the On/Off key (4) during operation.
   ⇨ The device emits a short beep.
   ⇨ *LoC on* is indicated on the display.
   ⇨ Key lock is activated.
2. Press the On/Off key (4) again.
   ⇨ The device emits a short beep.
   ⇨ *LoC oFF* is indicated on the display.
   ⇨ Key lock is no longer activated.

Configuration mode

1. Press the Left/menu key (11) for approx. 2 seconds.
   ⇨ The device emits a short beep.
   ⇨ The *CFG* symbol (12) is displayed in the upper right corner.
2. Use the buttons on the cross control (2) to select the desired option.
3. Confirm the selection by pressing the OK button (10).
   ⇨ The selected symbol will be illuminated.
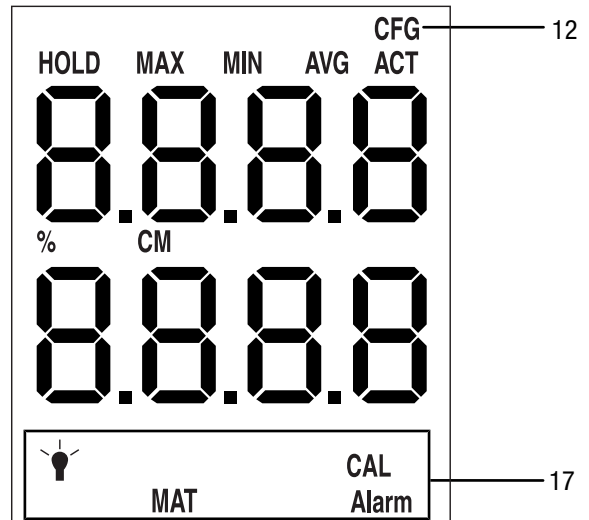
Configuration mode	Description
ALARM	Setting the threshold value for the alarm
Lamp	Adjusting the display illumination
CAL	Setting the offset value.
MAT	Material settings

Setting the alarm limit value

Here you can determine the limit value for the alarm function. Upon exceeding this value, the device emits an acoustic signal and the indication *ALARM* flashes in the configuration mode (17). The alarm function draws on the current measured value.

The limit value can be determined within a range of 0 to 200.

1. Select *ALARM* whilst in configuration mode (17).
2. Press the OK button (10) to confirm.
   ⇨ The upper measurement value display (14) flashes.
3. Press the Up (7) or Down (9) button to activate or deactivate the alarm.
   ⇨ *On* or *Off* will be indicated in the upper measurement value display (14).
4. Press the Right/back button (8).
   ⇨ Depending on the selection, the alarm is either activated or deactivated.
   ⇨ The lower measurement value display (16) flashes.
5. Press the buttons Right/back (8) or Left/menu (11) to select a digit.
   ⇨ The selected digit flashes.
6. Press the Up (7) or Down (9) button to change the value of the selected digit.
7. Repeat the steps 5. and 6. until the value is set as desired.
8. Press the OK button (10) for approx. 2 seconds.
   ⇨ The alarm was set based on your choice.
   ⇨ The device switches to measuring mode.
   ⇨ With activated alarm function the indication *ALARM* continues to be displayed in the configuration mode (17).

Adjusting the display illumination

The display illumination can be adjusted within a range of 20 to 100 %. Another available setting is *AL.on* (always on). AL.on features a brightness of 100 % and deactivates the automatic switch-off function.

1. Select the lamp (18) whilst in configuration mode.
2. Press the OK button (10) to confirm.
3. Select the desired value by use of the Up (7) or Down (9) button.
4. Press the OK button (10) for approx. 2 seconds.
   ⇨ The set value will be adopted.
   ⇨ The device switches to measuring mode.

Material settings

Here you can select the construction material for the measurement. The following options are available:

- *0 no*: No material selected.
- *1 An*: The selected material is anhydrite screed.
- *2 CE*: The selected material is cementitious screed.

Please note that in case of the settings 1 and 2 an additional value will be indicated in the upper measurement value display (14).
It is a combination of the material (1 or 2) and the calculated percentage.

Example: 2_7.5 (7.5 % with cementitious screed).

1. Select *MAT* whilst in configuration mode (17).
2. Press the OK button (10).
3. Select the desired value by use of the Up (7) or Down (9) button.
4. Press the OK button (10) for approx. 2 seconds.
   ⇨ The device switches to measuring mode.
   ⇨ With either setting 1 or 2 the indication *MAT* continues to be displayed in configuration mode (17).

Setting the offset

By use of *CAL* a single-point calibration can be carried out for the selected sensor indications. All sensors are already factory-calibrated and have a corresponding characteristic calibration curve. By stating a calibration value (offset) a global shift of the calibration curve, which has an effect on the entire measuring range, is performed for the single-point calibration! The offset value to be entered is that value by which the calibration curve will be shifted.

Example:

The displayed value is always "5" too high => change the offset value for this measurement channel to "-5".
The offset value's default setting is 0.0.

☞ **Note**
   Please note that changing the offset value brings about an automatic reset of the measured values.

1. Select *CAL* whilst in configuration mode (17).
2. Press the OK button (10).
3. Use the buttons Left or Right to select a digit.
   ⇨ The selected digit flashes.
4. Press the Up (7) or Down (9) button to change the value of the selected digit.
5. Repeat the steps 3. and 4. until the value is set as desired.
6. Press the OK button (10) for approx. 2 seconds.
   ⇨ The offset is set.
   ⇨ The device switches to measuring mode.
   ⇨ With set offset value the indication *CAL* continues to be displayed whilst in configuration mode (17).

Exiting configuration mode

Configuration mode will automatically be terminated after 8 seconds without entry.

You can quit configuration mode yourself anytime. Please note that in such an event no changes made to the settings will be adopted.

1. Press the Right/back key (8) for approx. 2 seconds.
   ⇨ Configuration mode will be terminated.

Measuring mode

1. Press the keys Right/back (8) or Left/menu (11) until the desired measuring mode is displayed.
2. The selected measuring mode (13) will be indicated on the display (1)
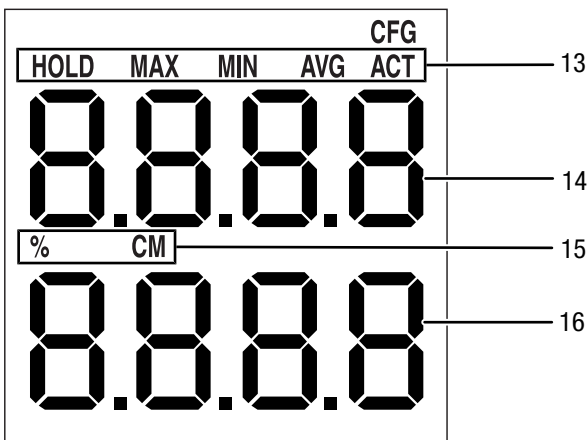
The device comes with the following measuring modes:

Measuring mode	Description
ACT	Measured value in real time
AVG	Average value of measurements since switch-on
Min	Minimum measured value
Max	Maximum measured value
HOLD	Measured value will be held

Holding the measured value

1. Set the measuring mode to *HOLD*.
   ⇨ The current measured value will be held and displayed.
   ⇨ The device will hold this value until the measured values are set back or the device is switched off.

Resetting the measured values

1. Press the OK button (10) for approx. 2 seconds.
   ⇨ All previously stored measured values of the measuring modes *AVG, MIN, MAX* and *HOLD* will be set back.
   ⇨ All previously stored measured values of the measuring modes *AVG, MIN, MAX* and *HOLD* will be set back.

Measured value storage

Please note that measured values cannot be saved on the device itself. In order to save measured values, the device has to be connected to a PC via a USB cable using the MultiMeasure Studio software.

1. Briefly press the OK button (10).
   ⇨ The displayed measured value will be saved in the software.

Checking current settings

1. Press the Right/back key (8) for approx. 2 seconds.
   ⇨ The selected settings are indicated in the two measurement value displays (14, 16).

USB interface

The device can be connected to a PC via the USB interface (5). See chapter *PC software*.
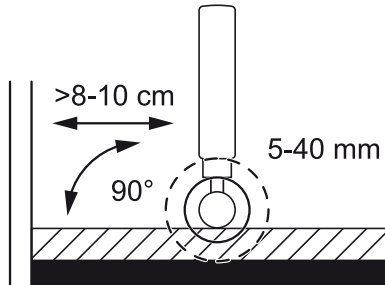
Switch-off

1. Press and hold the On/Off button (4) for approx. 3 seconds until a beep is emitted.
   ⇨ The device is switched off.

Measuring principle

The measurement is effected according to the dielectric measuring principle.

Notes regarding the measurement principle

- The measurement results are only to be used as reference for a rough orientation.
- An important variable influencing the measured value is the bulk density of the good to be measured. The higher the bulk density, the higher the measured value.
- Before measuring, the measuring point is to be cleared of any impurities (e.g. paint residues, dust).
- If the material to be measured contains metal (e.g. nails, screws, lines, pipes, etc.) and is situated within the sensor's measuring field, the measured value skyrockets. In that event the measurement is not conclusive.
- When the ball head is held to corners (e.g. window frames), the measured value is generally higher, because there is more matter in the measuring head's stray field. Toward a corner a distance of more than 8 to 10 cm has to be observed.
- During the measurement always hold the measuring head (6) in a vertical position to the measured material, press it to the surface and do not tilt it.
- Rough surfaces will always result in a too low measured value.
- Depending on the material's bulk density, the device's impact depth amounts to 20 to 40 mm. Conclusions regarding zones located at a lower level cannot be drawn.
- With material thicknesses of less than 20 mm there is a danger of humidity values from adjacent material layers affecting the measured value.
- The dielectric measurement method's main area of use consists in comparative measurements at the same construction material or similar components. Therefore, this method is well suited for the examination of water damage, leak detection and the localization of moisture zones for the purpose of marking the measuring spot for CM measurements.

Measured value assessment for wood

The measurement result is either in the dry or the saturated area.

Saturated means that in addition to the water bound within the wood there is further liquid. If there is, hence, a measured value of more than 80, the wood is most like soaked.

| Display [digit]	Wood moisture zone
< 50 digits	dry
> 80 digits	limit to the saturated range

Since the measurement value displays of the dielectric measurement method – depending on marginal conditions – are subject to great fluctuations, a resistance measurement is always preferable, in particular for the determination of wood moisture.

Measured value assessment for building material

For building materials the measurement results of the dielectric measuring method can only be used as reference for a rough orientation. Conclusions with respect to absolute humidity in mass % (M%) can only be drawn for measurements, performed with the exact same marginal conditions and compositions of the building material as indicated for the test set-up in the chart below.

This graph was created in collaboration with the Institute of Building Materials Research of the RWTH Aachen (IBAC) and illustrates the correlation between the measured value and the mass-related moisture content of the examined building materials.
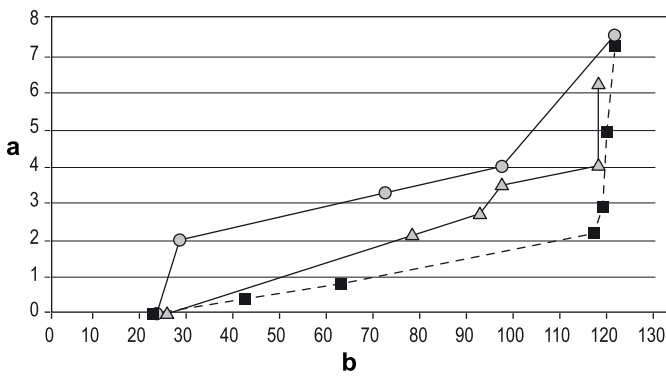
Key	
a	Moisture content (M%)
b	Measured value (digits)
..■..	Anhydrite floating screed (conversion: M% = CM%)
—○—	Cementitious screed (conversion: CM% = M% -1.5 to 2)
—△—	C 30/37 concrete (conversion not possible)

The spread of the achieved measurement results for the dielectric measuring method is clearly higher than for the resistance measuring method. The dielectric measuring method is not suited for the quantitative, but only for the qualitative moisture measurement in near-surface areas.

The indicated measured values are not the result of a qualified moisture measurement as per VOB (German Construction Contract Procedures) or relevant specialist regulations.

The measured values are only to be interpreted as indicators (dry, damp, wet).

For building materials the measurement results of the dielectric measuring method can only be used as reference for a rough orientation.

Display [digit]	Building moisture zone
< 40 digits	dry
40 – 80 digits	damp
> 80 digits	wet

PC software

Use the MultiMeasure Studio Standard PC software (free standard version) or MultiMeasure Studio Professional (paid professional version, dongle required) to carry out a detailed analysis and visualisation of your measured results. You can only use all configuration, visualisation and functional options of the device when using this PC software and a TROTEC® USB dongle (professional).

Installation requirements

Ensure that the following minimum requirements for installing the MultiMeasure Studio Standard or MultiMeasure Studio Professional PC software are fulfilled:

- Supported operating systems (32 or 64 bit version):
  – Windows XP from service pack 3
  – Windows Vista
  – Windows 7
  – Windows 8
  – Windows 10

- Software requirements:
  – Microsoft Excel (to display stored Excel files)
  – Microsoft .NET Framework 3.5 SP1 (is automatically installed during software installation, where applicable)

- Hardware requirements:
  – Processor speed: 1.0 GHz, minimum
  – USB connection
  – Internet connection
  – 512 MB RAM, minimum
  1 GB hard disk space, minimum
  optional: TROTEC® USB dongle (Professional) for using the professional version of the PC software

Installing the PC software

1. Download the current PC software from the Internet. To do so, visit the website www.trotec.de. First click on products and services, then on services and downloads. Then select Software in the category menu. Select the MultiMeasure Studio Standard software from the list. If you want to use the optionally available professional version of the PC software "MultiMeasure Studio Professional" (dongle), then get in touch with your TROTEC® customer service.
2. Double-click on the downloaded file to start the installation.
3. Follow the instructions of the installation wizard.

Starting the PC software

1. Connect the device to your PC via the USB connection cable provided in the scope of delivery.
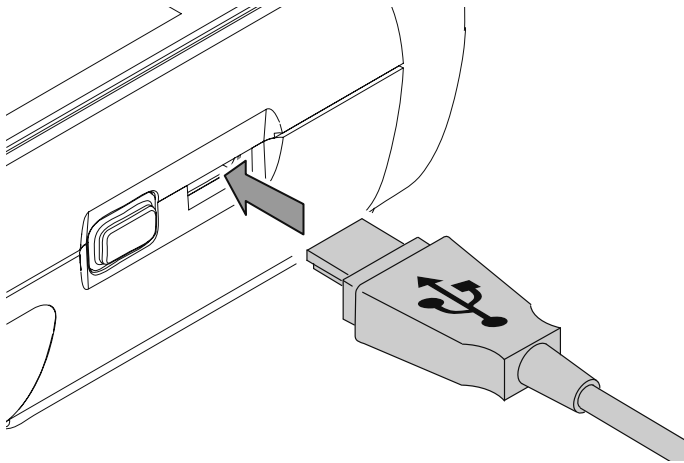
Note

Step 2 only needs to be performed, when using the Professional software functions.
If you only use the Standard software functions, please proceed to step 3.

2. In order to enable the Professional functions, connect the TROTEC® USB dongle to a free USB port on your PC.
The TROTEC® USB dongle (Professional) is automatically detected by the operating system.
If you only connect the TROTEC® USB dongle (Professional) to your PC after starting the PC software, click the "Parameters" menu item in the PC software. Afterwards, click the USB symbol (dongle check) to read the connected TROTEC® USB dongle (Professional).

3. Switch the device on (see chapter *Switch-on and measurements*).

4. Start the MultiMeasure Studio software. Depending on the activation process you will be asked to insert the access code that has been previously assigned to you. Only then the dongle for releasing the according Professional tools of the software will be activated.

Note

Information regarding the use of the MultiMeasure Studio software is provided in the help text of the software.

Maintenance and repair

Battery change

Change the batteries when the message *Batt lo* is displayed upon switch-on or the device can no longer be switched on.

See chapter Operation *Inserting the batteries*.

Cleaning

Clean the device with a soft, damp and lint-free cloth. Make sure that no moisture enters the housing. Do not use any sprays, solvents, alcohol-based cleaning agents or abrasive cleaners, but only clean water to moisten the cloth.

Repair

Do not modify the device or install any spare parts. For repairs or device testing, contact the manufacturer.

Errors and faults

The device has been checked for proper functioning several times during production. If malfunctions occur nonetheless, check the device according to the following list.

The device does not switch on:
- Check the charging status of the batteries. Change the batteries when the message *Batt lo* is displayed upon switch-on.
- Check that the batteries are properly positioned. Check the polarity is correct.
- Never carry out an electrical check yourself; instead, contact your TROTEC® customer service.

TROTEC

Disposal

The icon with the crossed-out waste bin on waste electrical or electronic equipment stipulates that this equipment must not be disposed of with the household waste at the end of its life. You will find collection points for free return of waste electrical and electronic equipment in your vicinity. The addresses can be obtained from your municipality or local administration. For further return options provided by us please refer to our website https://de.trotec.com/shop/.

The separate collection of waste electrical and electronic equipment aims to enable the re-use, recycling and other forms of recovery of waste equipment as well as to prevent negative effects for the environment and human health caused by the disposal of hazardous substances potentially contained in the equipment.

In the European Union, batteries and accumulators must not be treated as domestic waste, but must be disposed of professionally in accordance with Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators. Please dispose of batteries and accumulators according to the relevant legal requirements.