

EN

OPERATING MANUAL
CLAMP METER



Table of contents

Notes regarding the operating manual..... 2

Safety 2

Information about the device..... 4

Transport and storage..... 7

Operation 7


Maintenance and repair 11


Errors and faults..... 12


Disposal 12

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:




BE44



<https://hub.trotec.com/?id=42352>

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.
- The device is supplied with a warning sign. Prior to initial start-up, make sure to paste the corresponding warning sign in your local language over the one present at the rear of the device as described in chapter Operation.



- 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.
- Protect the device from permanent direct sunlight.
- 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 (see Technical data).

Intended use

This device is intended for measurements in the measuring range specified in the technical data.

This device is intended for measurements in the measuring category (CAT) specified in the technical data.

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

Foreseeable misuse

Do not use the device in potentially explosive atmospheres, when wet or very humid.

Unauthorized modifications of the device are forbidden.

Personnel qualifications

People who use this device must:

- master the 5 safety rules
 - 1. De-energise
 - 2. Secure against restart
 - 3. Verify de-energised state (bipolar)
 - 4. Earth and short-circuit
 - 5. Cover neighbouring live parts
- use the voltage detector following safe working procedures.
- be aware of the dangers that occur when working with electric devices in damp areas.
- take measures to protect themselves from direct contact with live parts.
- have read and understood the operating manual, especially the Safety chapter.

Residual risks



Warning of electrical voltage

Electric shock due to insufficient insulation! Check the device for damages and proper functioning before each use.

If you detect damages, do not use the device any longer.

Do not use the device when wither the device or your hands are damp or wet!

Do not use the device when the battery compartment or the housing is open.



Warning of electrical voltage

Electric shock due to contact with live parts! Do not touch any live parts. Secure neighbouring live parts by covering them or by switching them off.



Warning of electrical voltage

When performing non-contact measurements of the current, disconnect the measuring cables from the device beforehand.



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 avoid damages to the device, make sure that the correct measuring range is selected before carrying out a measurement.

If you are unsure, select the largest measuring range.

Unplug the measuring cable before changing the measuring range.

Note

Test the device for proper functioning at a known voltage source before each measurement.

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

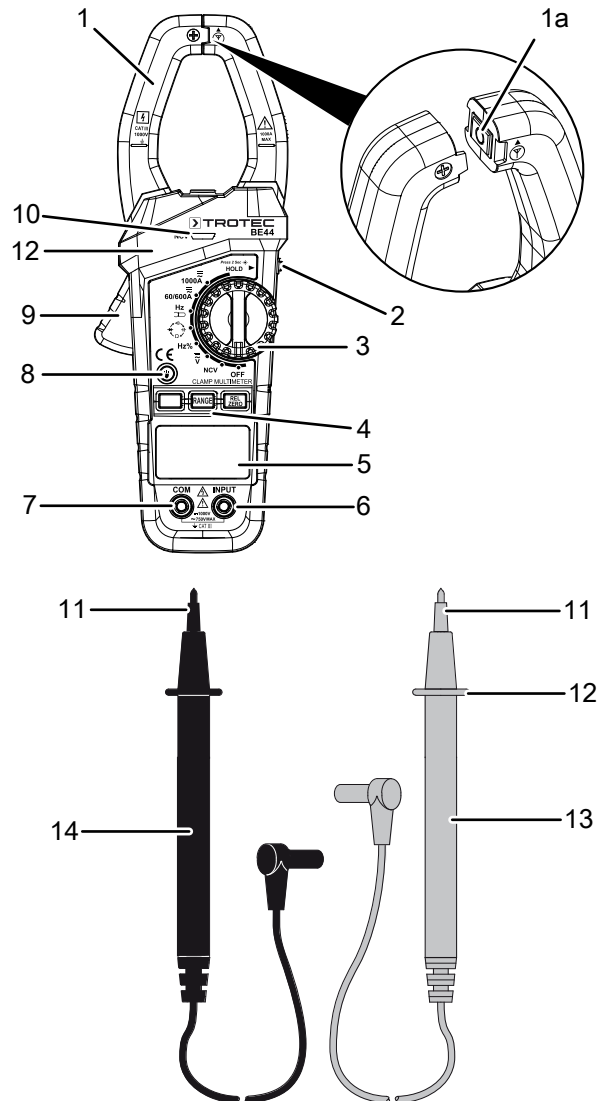
Using the clamp meter BE44 you can easily check the amperage of alternating and direct currents, AC and DC voltages, resistances, the power frequency or the continuity of circuits, fuses and contacts.

Moreover, it can be used for the non-contact detection of AC voltages in electrical fields, for testing the forward voltage of diodes and to determine the duty cycle for frequency measurements.

The current measurement is effected without contact via the electromagnetic field, which is why the electric circuit does not have to be interrupted for this method. Therefore, running systems, which cannot be switched off separately, can also be checked.

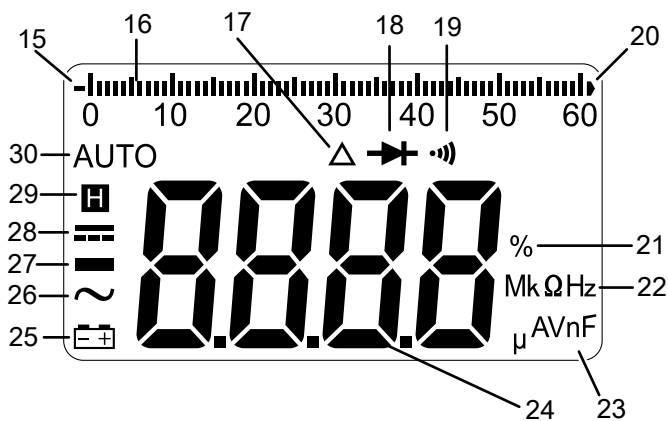
Owing to the galvanic isolation, the measuring signal is also potential-free towards the variable to be measured.

Device depiction



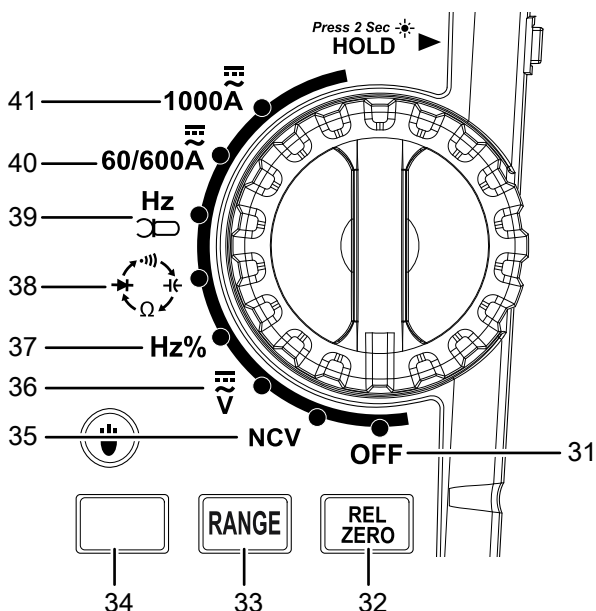
No.	Designation
1	Clamp
1a	Wear indicator for clamping jaws
2	Hold button
3	Rotary switch
4	Setting buttons
5	Display
6	Input connection for measuring cable (red)
7	COM connection for measuring cable (black)
8	Lamp ON/OFF button
9	Lever for opening the clamp
10	NCV sensor
11	Test probes
12	Protection against contact
13	Red measuring cable
14	Black measuring cable

Display



No.	Designation
15	Negative polarity indicator
16	Measuring scale
17	Compare mode indication
18	Diode testing indication
19	Continuity check indication
20	Overvoltage indicator
21	Unit per cent
22	Units for resistance and frequency
23	Units for capacitance
24	Measurement value display
25	Battery indication
26	Alternating current indication
27	Negative polarity indication
28	Direct current indication
29	Hold function indication
30	Automatic measuring range detection indication

Rotary switch



No.	Designation	Meaning
31	Switch position OFF	For switching the device off
32	Compare / reset button	For enabling / disabling compare mode When measuring direct current, the measurement value display can be set back to zero.
33	Measuring range button	For choosing between manual and automatic setting of the measuring range Also for choosing the individual measuring ranges in the manual setting
34	Function button	For selecting the desired measuring mode: Amperage for alternating current or direct current Voltage for alternating current or direct current For measuring resistance or capacitance / diode testing / continuity check For measuring frequency or duty cycle
35	NCV measurement	Activates the NCV measurement (for the non-contact detection of alternating voltages).
36	AC / DC voltage	Activates the measurement of AC or DC voltages.
37	Frequency / duty cycle	For measuring frequency or duty cycle
38	Resistance / diode test / continuity / capacitance	For measuring resistance or capacitance / diode testing / continuity check
39	Frequency measurement with clamp	Frequency measurement with the clamp
40	Amperage 60/600 A	For non-contact measurements of the amperage of direct current or alternating current in the range 60–600 A
41	Amperage 1000 A	For non-contact measurements of the amperage of direct current or alternating current in the range of up to 1000 A

Technical data

Parameter	Value
Model	BE44
Weight	372 g (incl. batteries)
Dimensions (height x width x depth)	243 x 87 x 44 mm
Max. diameter of conductor	Approx. 38 mm
Measuring rate	3 per second
Input resistance (VAC and VDC)	10 M Ω
Frequency range alternating current	50/60 Hz (AAC)
Frequency range AC voltage	40–400 Hz (VAC)
Ambient conditions	0 °C to 40 °C with up to 75 % RH
Storage conditions	-30 °C to 60 °C with up to 85 % RH
Type of protection	IP20
Batteries	3 x 1.5 V AAA
Overvoltage protection	Category III 1000 V

Measuring ranges

Measuring range	Resolution	Accuracy	Measuring range exceeded
AC voltage (V/AC)(**)			
6 V	1 mV	\pm (0.8 % + 5 digits)	OL will be indicated on the display.
60 V	10 mV		
600 V	0.1 V	\pm (1.2 % + 5 digits)	- (*)
750 V	1 V		
DC voltage (V/DC)(**)			
6 V	1 mV	\pm (0.8 % + 5 digits)	OL will be indicated on the display.
60 V	10 mV		
600 V	0.1 V	\pm (1.0 % + 5 digits)	
1000 V	1 V		
Alternating current (A/AC)			
60 A	0.01 A	\pm (2.5 % + 6 digits)	OL will be indicated on the display.
600 A	0.1 A		OL will be indicated on the display.
1000 A	1 A		- (*)
Direct current (A/DC)			
60 A	0.01 A	\pm (3.0 % + 10 digits)	OL will be indicated on the display.
600 A	0.1 A	\pm (3.0 % + 6 digits)	
1000 A	1 A		

Measuring range	Resolution	Accuracy	Measuring range exceeded
Resistance (Ω)(***)			
600 Ω	0.1 Ω	\pm (1.0 % + 5 digits)	OL will be indicated on the display.
6 k Ω	1 Ω		
60 k Ω	10 Ω		
600 k Ω	100 Ω	\pm (1.5 % + 5 digits)	
6 M Ω	1 k Ω		
60 M Ω	10 k Ω	\pm (3.0 % + 10 digits)	

Frequency using measuring cables (Hz)(****)			
9.999 Hz	0.001 Hz	\pm (1.0 % + 5 digits)	The measuring range is set automatically.
99.99 Hz	0.01 Hz		
999.9 Hz	0.1 Hz		
9.999 kHz	1 Hz	10 Hz	
99.99 kHz	10 Hz		
999.9 kHz	100 Hz	100 Hz	
9.999 MHz	1 kHz		Not specified

Frequency using clamp (Hz)(****)			
40 Hz - 99.99 Hz	0.01 Hz	\pm (1.0 % + 5 digits)	Not specified
100 Hz - 999.9 Hz	0.1 Hz		

Duty cycle (*****)			
5 % ~ 95 %	0.1 %	\pm (2.0 % + 7 digits)	The measuring range is set automatically.

Capacitance (C)			
40 nF	10 pF	\pm (5.0 % + 5 digits)	The measuring range is set automatically. If a capacitance of more than 4000 μ F is measured, OL will be indicated on the display.
400 nF	100 pF		
4 μ F	1 nF		
40 μ F	10 nF	100 nF	
400 μ F	100 nF		
4000 μ F	1 μ F	Not specified	

Function	Range
Diode measurement	Test voltage: approx. 2.5 V Test current: approx. 0.6 mA
Continuity check	Acoustic signal at \leq 20 Ω Acoustic signal possible at 20 Ω – 150 Ω No acoustic signal at $>$ 150 Ω

- ^(*): When exceeding the measuring range, the measured value might be displayed nonetheless. Please observe the measuring range and the overvoltage protection! Measurements above the given measuring range are not permitted!
- OL = outside limits
- ^(**): internal resistance: 10 MΩ
- ^(***): open-circuit voltage < 0.7 V
- ^(****): input sensitivity 1 Vrms to 20 Vrms
- ^(*****): input current ≥ 8 A
- ^(*****): input voltage: 4 ~ 10 Vp-p, frequency range: 4 Hz ~ 1 kHz

Scope of delivery

- 1 x Device
- 1 x Red measuring cable
- 1 x Black measuring cable
- 1 x Label with safety information
- 3 x 1.5 V battery AAA
- 1 x Manual

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

For transporting the device, use the bag included in the scope of delivery in order to protect the device from external influences.

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
- with a cover to protect it from invasive dust if necessary
- the storage temperature complies with the values specified in the Technical data
- Remove the batteries from the device.

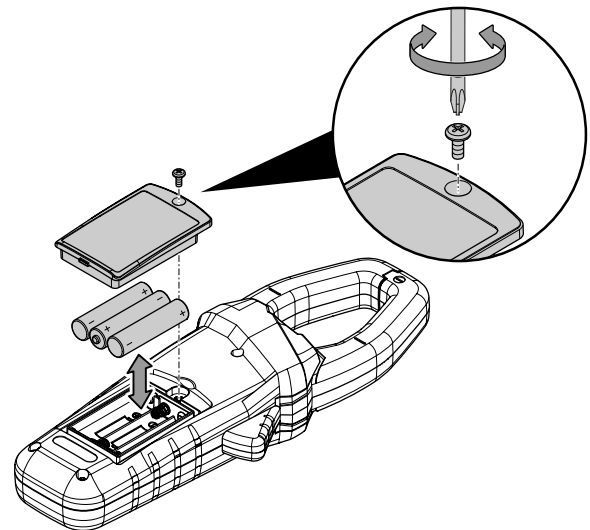
Operation

Inserting the batteries

Insert the batteries contained in the scope of delivery (3 x 1.5 V AAA) before first use.

Note

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



Please proceed as follows to insert the batteries into the device:

1. Loosen the screw and open the cover of the battery compartment.
2. Insert the batteries into the battery compartment with correct polarity.
3. Close the battery compartment and fasten the cover in place.

Attaching the warning sign

Prior to initial start-up, check whether the warning sign at the rear of the device is in your local language, if not, paste the proper one over it. A warning sign in your native language is supplied along with the device. Please proceed as follows to attach the warning sign to the rear of the device:

1. Remove the label in your local language from the supplied film.
2. Stick the label on the intended position at the rear of the device.

Voltage measurement

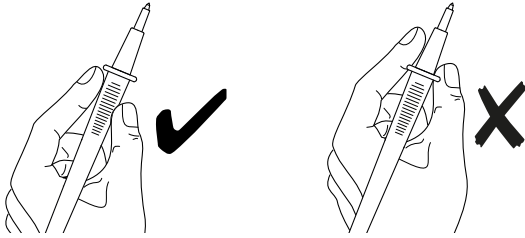


Warning of electrical voltage

Risk of electric shock and risk of injury!

- Make sure to observe the device's nominal voltage specified in the technical data during the measurement.
- Check the measuring lines for damaged insulation before each measurement.
- Test the device for proper functioning at a known voltage source before each measurement.

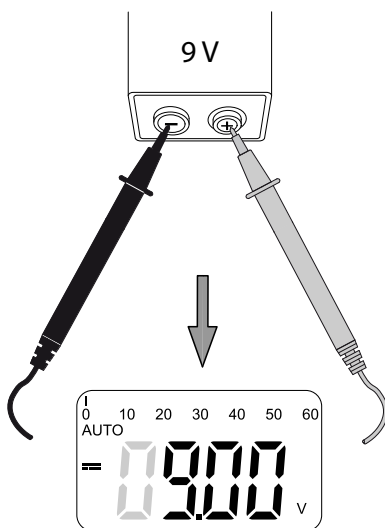
- Do not use the device if the wear indicator for the clamping jaws (1a) is no longer visible.
- When holding onto the measuring cables, make sure not to reach behind the protection against contact (12):



Please proceed as follows to measure the DC voltage:

1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
2. Turn the rotary switch (3) to position 36.
 - ⇒ The direct current icon is displayed in the direct current indication (28) on the display.
3. Repeatedly press the measuring range button (33) to select the desired measuring range.
 - ⇒ The resolution in the measurement value display (24) will change accordingly.
4. Tap the desired measuring points of the electric circuit with the test probes (11) at the measuring cables with correct polarity.
 - ⇒ The measured value will be displayed in the measurement value display (24).

Example:

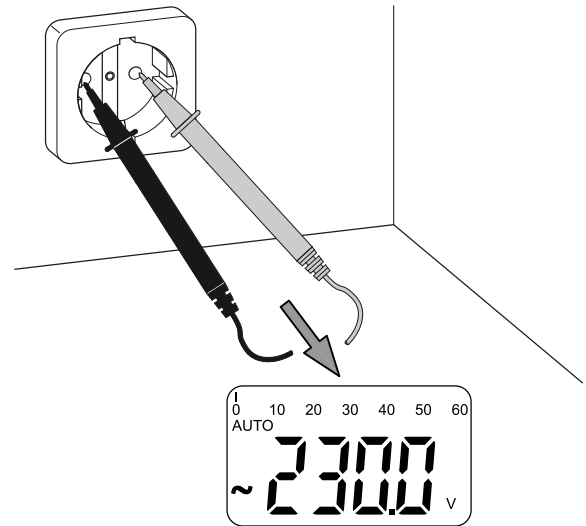


Please proceed as follows to measure the AC voltage:

1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
2. Turn the rotary switch (3) to position 36.
3. Press the function button (34).
 - ⇒ The alternating current icon is displayed in the alternating current indication (26) on the display.

4. Repeatedly press the measuring range button (33) to select the desired measuring range.
 - ⇒ The resolution in the measurement value display (24) will change accordingly.
5. Tap the desired measuring points of the electric circuit with the test probes (11) at the measuring cables.
 - ⇒ The measured value will be displayed in the measurement value display (24).

Example:



Non-contact voltage detection



Info

Observe the specifications in the technical data. Even if the device does not show any response, there might still be a voltage outside the device's measuring range.

Without contact the device detects whether alternating voltage is present.

To do so, please proceed as follows:

1. Turn the rotary switch (3) to the NCV measurement position (35).
 - ⇒ The NCV sensor flashes briefly and the device emits an acoustic signal.
2. Move the device clamp toward the object to be tested.
 - ⇒ If the device detects an electrical field combined with an alternating voltage, an acoustic signal will be emitted repeatedly and the NCV sensor (10) flashes.
 - ⇒ The stronger the measured electrical field, the more frequently will the acoustic signal be emitted.
 - ⇒ Depending on the strength of the measured electrical field one to four segments will appear in the measurement value display (24).

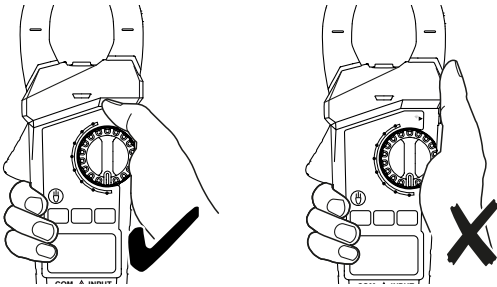
Current measurement



Warning of electrical voltage

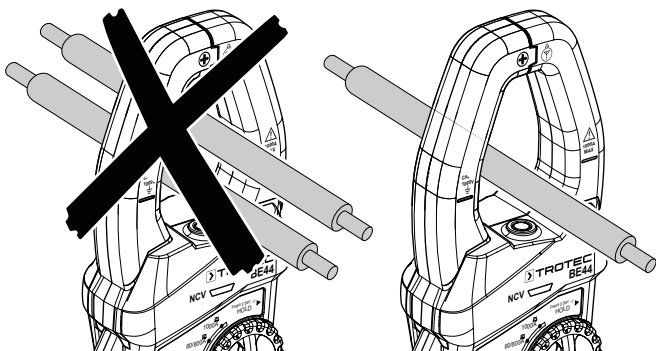
Risk of electric shock and risk of injury!

- For current measurements align the conductor to be tested in the centre of the clamp.
- When performing non-contact measurements, disconnect the measuring cables from the device.
- When holding onto the clamp meter, make sure not to reach behind the protection against contact (12):



Info

Only measure one conductor at a time to ensure an unambiguous measurement result.



Please proceed as follows to measure the amperage of alternating or direct currents:

1. Depending on the desired measuring range turn the rotary switch (3) to the amperage 60/600 A position (40) or to the amperage 1000 A position (41).
2. Repeatedly press the function button (35) to set the device to the desired measurement of alternating or direct current.
3. Squeeze the lever (9) to open the clamp (1) and insert the conductor to be measured centrally in the clamp.
4. Use the clamping jaws' alignment marks on the clamp (1) as guidance to properly centre the conductor.
 - ⇒ The measured value will be displayed in the measurement value display (24).

Resistance measurement



Warning of electrical voltage

Risk of electric shock and risk of injury when measuring the resistance!

Make sure that the power of the electric circuit is switched off and all capacitors are completely discharged.

- When holding onto the measuring cables, make sure not to reach behind the protection against contact (12).

Please proceed as follows to measure the resistance:

- ✓ The circuit to be measured is switched off and de-energized.
 - ✓ All capacitors are completely discharged.
1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
 2. Turn the rotary switch (3) to the resistance position (38).
 3. Repeatedly press the function button (34) until a unit for the resistance is indicated in the respective section of the display (22).
 4. Tap the desired measuring points of the electric circuit with the test probes (11) at the measuring cables.
 - ⇒ The measured value will be displayed in the measurement value display (24).

Continuity testing



Warning of electrical voltage

Risk of electric shock and risk of injury when checking the continuity!

Make sure that the power of the electric circuit is switched off and all capacitors are completely discharged.

- When holding onto the measuring cables, make sure not to reach behind the protection against contact (12).
- Do not use the device if the wear indicator in the jaw opening is no longer visible.

Please proceed as follows to check the continuity of the circuit to be tested:

- ✓ The electrical circuit is deactivated.
 - ✓ All capacitors are completely discharged.
1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
 2. Turn the rotary switch (3) to the continuity position (38).
 3. Repeatedly press the function button (34) until the icon for continuity testing is displayed via the continuity check indication (19).

4. Tap the desired measuring points of the electric circuit with the test probes (11) at the measuring cables.
 - ⇒ The device will emit an acoustic signal if the measured resistance amounts to less than 20 Ω.
 - ⇒ The device will **not** emit an acoustic signal if the measured resistance amounts to more than 150 Ω.
 - ⇒ The device may emit an acoustic signal if the measured resistance ranges between 20 Ω and 150 Ω.

Frequency measurement



Info

You can measure the frequency using the clamp (1) or the measuring cables.

Please proceed as follows to measure the frequency with the measuring cables:

1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
2. Turn the rotary switch (3) to the frequency position (37).
3. Repeatedly press the function button (34) until the unit for the frequency is indicated in the respective section of the display (22).
4. Connect the test probes (11) of the measuring cables to the object to be measured.
 - ⇒ The measured value will be displayed in the measurement value display (24).

Please proceed as follows to measure the frequency with the clamp:

- When holding onto the clamp meter, make sure not to reach behind the protection against contact (12).
1. Turn the rotary switch (3) to the frequency position (37).
 2. Squeeze the lever (9) to open the clamp (1) and insert the conductor to be measured centrally in the clamp.
 3. Use the clamping jaws' alignment marks on the clamp (1) as guidance to properly centre the conductor.
 - ⇒ The measured value will be displayed in the measurement value display (24).

Duty cycle measurement



Info

The input voltage should range between 4 V_{p-p}* and 10 V_{p-p}.

*p-p = peak-to-peak value (peak amplitude value MIN to MAX)
 Proceed as follows to determine the duty cycle of a frequency measurement:

1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
2. Turn the rotary switch (3) to the duty cycle position (38).

3. Repeatedly press the function button (34) until the unit per cent is indicated in the respective section of the display (21).
4. Connect the test probes (11) of the measuring cables to the object to be measured.
 - ⇒ The measured value will be displayed in the measurement value display (24).
5. Press the function button twice to reset the measurement value display (24).

Capacitance measurement



Warning of electrical voltage

Risk of electric shock and risk of injury when measuring the capacitance!

Make sure that the electric circuit to be tested is switched off and de-energized.



Info

When measuring capacitances of more than 10 μF, it might take up to about 30 seconds until the device displays a stable measurement result.



Info

Due to the stray capacitance of the test probes and the consequent input circuit of the measuring device the displayed value might not be equal to zero before the test contacts have been connected to the capacitor to be tested. This is perfectly normal and the displayed measured value has to be subtracted from the following measured values.

- When holding onto the measuring cables, make sure not to reach behind the protection against contact (12).

Please proceed as follows to measure the capacitance:

- ✓ The electrical circuit is deactivated.
 - ✓ All capacitors are completely discharged.
1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
 2. Turn the rotary switch (3) to the capacitance position (38).
 3. Repeatedly press the function button (34) until the unit for the capacitance is indicated in the respective section of the display (23).
 4. Connect the test probes (11) of the measuring cables to the object to be measured.
 - ⇒ The measured value will be displayed in the measurement value display (24).
 - ⇒ If necessary, wait until the measurement result has stabilized.

Diode test



Warning of electrical voltage

Risk of electric shock and risk of injury when testing diodes!

Make sure that the electric circuit to be tested is switched off and de-energized.

- When holding onto the measuring cables, make sure not to reach behind the protection against contact (12).

Please proceed as follows to test the forward voltage of a diode:

- ✓ The electrical circuit is deactivated.
 - ✓ All capacitors are completely discharged.
1. Connect the black measuring cable (14) to the COM connection (7) and the red measuring cable (13) to the Input connection (6).
 2. Turn the rotary switch (3) to the diode test position (38).
 3. Repeatedly press the function button (34) until the icon for diode testing is displayed via the diode testing indication (18).
 4. Connect the test probe (11) of the red measuring cable (13) to the diode's anode.
 5. Connect the test probe (11) of the black measuring cable (14) to the diode's cathode.
 - ⇒ The diode's approximate forward voltage will be displayed in the measurement value display (24).
 - ⇒ If OL is indicated on the display, the test probes are not positioned correctly.

Using the compare mode

The compare mode can be used for other measuring functions. When compare mode is activated, the device saves the currently measured result as reference value for subsequent measurements.

Proceed as follows to activate compare mode:

1. Carry out a measurement.
2. Press the compare button (32).
 - ⇒ The compare mode icon will be indicated in the respective section of the display (17).
 - ⇒ The current measurement result will be saved as reference value.
3. Carry out another measurement.
 - ⇒ The difference between the current measurement and the reference value is now indicated on the measurement value display (24).
4. Press the compare button (32) to exit compare mode.

Freezing the displayed measured value

The hold function allows you to freeze the currently measured result in the measurement value display (24). To do so, please proceed as follows:

1. Carry out a measurement.
2. Press the hold button (2).
 - ⇒ An acoustic signal is emitted.
 - ⇒ The current measured value is frozen in the measurement value display (24).
 - ⇒ The hold icon is displayed in the hold function indication (29).
3. Press the hold button again to deactivate the hold function.

Switch-off

The device switches off automatically after 15 minutes of non-use.

1. Turn the rotary switch (3) to the switch position OFF (31).
 - ⇒ The device switches off.

Maintenance and repair

Battery change

A battery change is required when a battery indication (25) lights up on the display (5) or the device can no longer be switched on. See chapter Operation.



Info

In case of a low battery the displayed values may be inaccurate or incorrect! If so, stop using the measuring device and exchange the batteries immediately.

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.

For repairs or device testing, contact the manufacturer.

Display segments are only faintly visible or flicker:

- The battery voltage is too low. Exchange the batteries immediately.

The device displays implausible measured values:

- The battery voltage is too low. Exchange the batteries immediately.
- The opening of the current clamp is dirty. Clean the device as described in the Cleaning chapter.
- The wear indicator for the clamping jaws (1a) is worn out excessively. Please contact the manufacturer.

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. You can also find out about other return options that apply for many EU countries on the website <https://hub.trotec.com/?id=45090>. Otherwise, please contact an official recycling centre for electronic and electrical equipment authorised for your country.

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.

Trotec GmbH

Grebbener Str. 7
D-52525 Heinsberg

☎ +49 2452 962-400

☎ +49 2452 962-200

✉ info@trotec.com

www.trotec.com