

EN

OPERATING MANUAL
MULTIMETER



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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:




BE47




<https://hub.trotec.com/?id=43017>


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.

 **WARNING**

 **HAZARDOUS VOLTAGE!**

 **REMOVE TEST LEADS BEFORE**

 **OPENING THE BATTERY COVER**

- 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 as given in the Technical data chapter.

Intended use

Only use the multimeter for measuring voltage, current or resistance whilst adhering to 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, 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 measuring device in accordance with 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

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

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

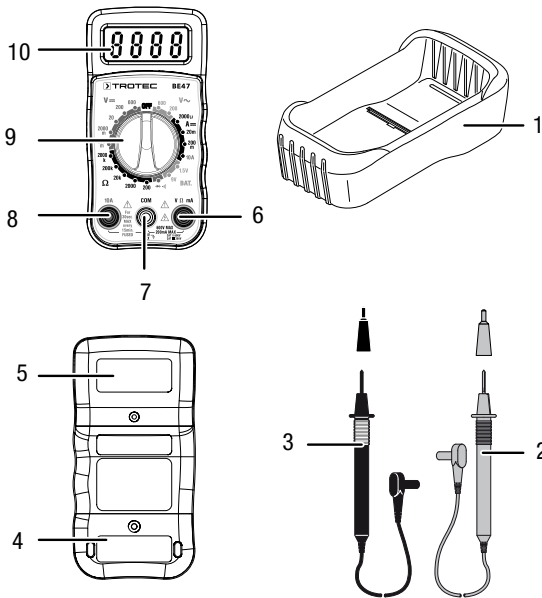
Device description

The multimeter is a battery-powered, mobile hand-held measuring device with an extensive range of measurement possibilities.

It features the following functional properties and equipment:

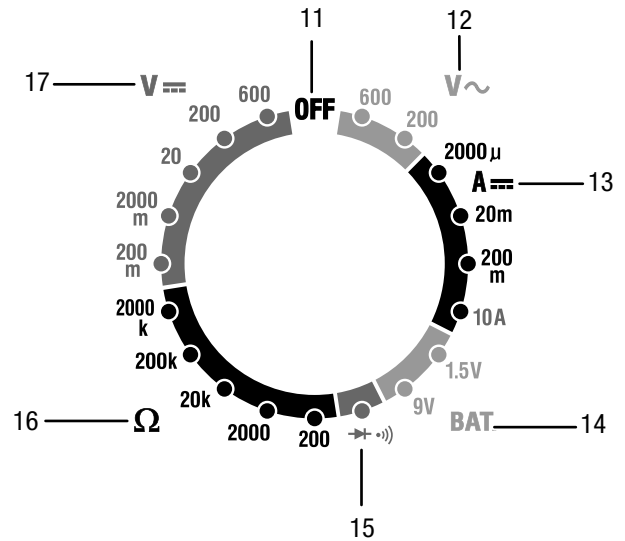
- Manual range selection
- 2000 count LC display
- Safety category CAT II 600 V / CAT III 300 V
- AC and DC voltage measurement
- Direct current measurement
- Resistance measurement
- Diode testing function
- Acoustic continuity testing

Device depiction



No.	Designation
1	Protective cover
2	Red measuring probe
3	Black measuring probe
4	Fuses
5	Battery compartment
6	V/Ω/mA connection socket
7	COM socket
8	10 A socket
9	Rotary switch
10	LC display

Rotary switch



No.	Position	Description
11	OFF	The device is switched off.
12	VAC	AC voltage: up to 600 V AC up to 200 V AC
13	ADC	Direct current: up to 2000 μA up to 20 mA up to 200 mA up to 10 A
14	BAT.	Battery voltage: up to 1.5 V up to 9 V
15	➔	Diode test / continuity measurement
16	Ω	Resistance measurement: up to 200 Ω up to 2000 Ω up to 20 kΩ up to 200 kΩ up to 2000 kΩ
17	VDC	DC voltage: up to 200 mV DC up to 2000 mV DC up to 20 V DC up to 200 V DC up to 600 V DC

Technical data

General characteristics

Parameter	Value
Diode test	Max. testing current of 1 mA, open-circuit voltage of 2.8 V DC (typically)
Continuity test	Acoustic signal is emitted if the resistance is less than 30 Ω
Battery testing current	9 V (6 mA); 1.5 V (100 mA)
Input impedance	>1 MΩ
V AC range	45 Hz to 450 Hz
A DC voltage drop	200 mV
LC display	3 ½ digits, 2000 count LCD, 0.5 inch digits
Overload	OL will be displayed
Polarity	Automatic (no indication for positive); minus (-) sign for negative
Measuring speed	2 x per second, nominal
Battery indicator	BAT is indicated if the battery voltage drops below the operating voltage threshold
Battery	9 V monobloc battery
Fuses	mA, μA range: 0.5 A/600 V (fast acting) A range: 10 A/600 V (fast acting)
Operating temperature	0 °C to 50 °C (32 °F to 122 °F)
Storage temperature	-20 °C to 60 °C (-4 °F to 140 °F)
Relative humidity	Operation: <70 % Storage: <80 %
Operating height above sea level	Maximum 2000 m (7000 ft)
Weight	260 g (9.17 oz.)
Dimensions	121.5 x 60.6 x 40 mm (4.78" x 2.38" x 1.57")
Safety	This measuring device is designed for indoor use and complies with overvoltage category CAT II 600 V / CAT III 300 V, pollution level 2.

Measuring ranges

Function	Measuring range	Resolution	Accuracy
DC voltage (V DC)	200 mV	0.1 mV	± (0.5 % + 2 digits)
	2000 mV	1 mV	
	20 V	0.01 V	± (1.0 % + 2 digits)
	200 V	0.1 V	
	600 V	1 V	
AC voltage (V AC, 50 / 60 Hz)	200 V	0.1 V	± (1.2 % + 2 digits)
	600 V	1 V	
Direct current (A DC)	2000 μA	1 μA	± (1.0 % + 2 digits)
	20 mA	10 μA	
	200 mA	100 μA	± (1.2 % + 2 digits)
	10 A	10 mA	
Resistance (Ω)	200 Ω	0.1 Ω	± (0.8 % + 2 digits)
	2000 Ω	1 Ω	
	20 kΩ	0.01 kΩ	
	200 kΩ	0.1 kΩ	± (1.0 % + 2 digits)
	2000 kΩ	1 kΩ	
Battery test	9 V	10 mV	± (1.0 % + 2 digits)
	1.5 V	1.0 mV	

Note:

The accuracy is based on an ambient temperature of 18 °C to 28 °C and a relative humidity of less than 75 %.

The accuracy specification consists of two values:

- % value referring to read value: Corresponds to the accuracy of the structure to be measured.
- + digits: Corresponds to the accuracy referring to the analogue to digital converter.

Scope of delivery

- 1 x Multimeter
- 1 x Safety measuring lines with test probes
- 1 x 9 V monobloc battery
- 1 x Getting started guide

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 a suitable bag to protect it 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
- The storage temperature is the same as the range given in the Technical data chapter.
- Remove the batteries from the device.

Operation

Inserting the battery

Insert the battery before first use.



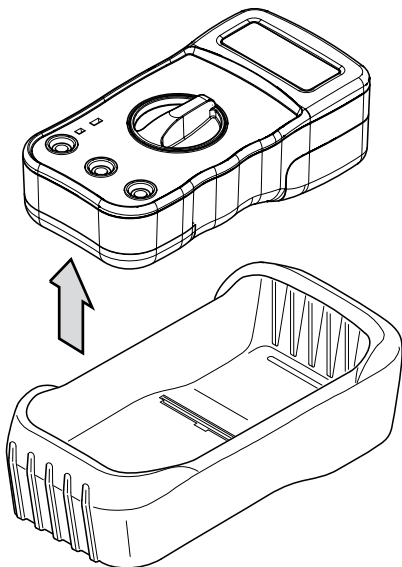
Danger

Disconnect the measuring probes from the device before opening the battery compartment.

Note

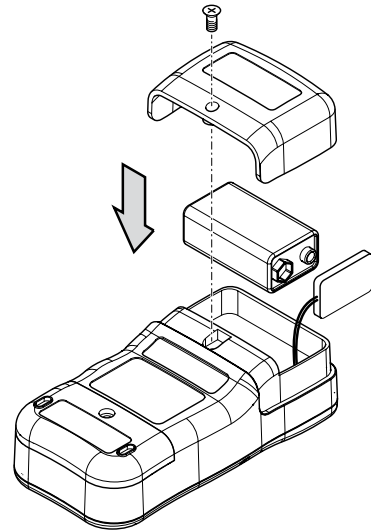
Make sure that the surface of the device is dry and the device is switched off.

1. Remove the protective cover (1) from the device.



2. Loosen the screw at the battery compartment (5).
3. Open the battery compartment.

4. Connect the battery to the battery clip with correct polarity.

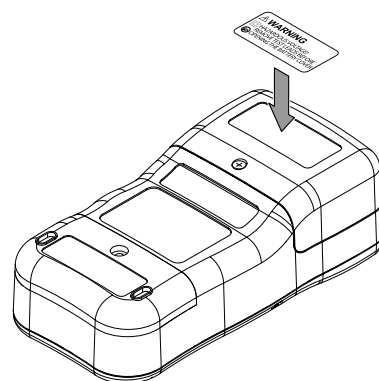


5. Insert the battery with the battery clip into the battery compartment.
6. Close the battery compartment and retighten the screw.
7. Place the device back into the protective cover.

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.



Undefined displays

If measuring inputs are open or touched by hand, this can lead to undefined displays. This is not a malfunction but a reaction of the sensitive measuring input to existing interference voltages.

Normally, when there is no high interference level at the workplace, and in case of a short circuit at the measuring input, zero is displayed immediately. If the measuring object is connected, the exact measured value is displayed. Fluctuations in the displayed value by some digits are systemic and within the tolerance.

If the resistance measuring range, the continuity testing range or the diode test was selected and the measuring input is open, the overflow indicator will appear.

Measuring DC voltage



Warning of electrical voltage

Improper handling of the measuring device entails a risk of electric shock!

Before carrying out voltage measurements, observe the following:

- Never apply a voltage exceeding the rated nominal voltage of the measuring device between the connections or between the connections and earth (see imprint on the housing).
 - Check the measuring tips for damaged insulation and for continuity. Replace damaged measuring tips.
 - Check the insulation of the measuring device sockets.
 - Before using the measuring device, check its functionality by carrying out measurements with a known voltage.
 - First connect the measuring tip connected to earth and afterwards the live measuring tip. When disconnecting the measuring tips, proceed in reverse order, i.e. disconnect the live measuring tip first.
 - Prior to every voltage measurement make sure that the measuring device is not set to the current measuring range.
 - If the device indicates an exceedance of the measuring range (*OL*) immediately after being connected to the measuring object, first switch off the circuit at the measuring object, then immediately remove the measuring tips from the measuring object.
 - Do not switch any motors in the measuring circuit on or off during a measurement. Voltage peaks caused by a switch-on or switch-off can damage the measuring device.
1. Select the largest V DC voltage measuring range using the rotary switch.
 2. Insert the plug of the black measuring line into the COM measuring socket and the plug of the red measuring line into the V/ Ω /mA measuring socket.

3. Connect both measuring tips to the measuring object with correct polarity (black to minus, red to plus).
 - ⇒ If the input voltage is negative, a minus (-) will appear in front of the measured value on the display.
 - ⇒ The measured value is shown on the display.
4. Turn the rotary switch to the position that is the closest to the indicated value but does not fall below it.
 - ⇒ The measured value is shown on the display.

Measuring AC voltage



Warning of electrical voltage

Improper handling of the measuring device entails a risk of electric shock!

Before carrying out voltage measurements, observe the following:

- Never apply a voltage exceeding the rated nominal voltage of the measuring device between the connections or between the connections and earth (see imprint on the housing).
 - Check the measuring tips for damaged insulation and for continuity. Replace damaged measuring tips.
 - Check the insulation of the measuring device sockets.
 - Before using the measuring device, check its functionality by carrying out measurements with a known voltage.
 - First connect the measuring tip connected to earth and afterwards the live measuring tip. When disconnecting the measuring tips, proceed in reverse order, i.e. disconnect the live measuring tip first.
 - Prior to every voltage measurement make sure that the measuring device is not set to the current measuring range.
 - If the device indicates an exceedance of the measuring range (*OL*) immediately after being connected to the measuring object, first switch off the circuit at the measuring object, then immediately remove the measuring tips from the measuring object.
 - Do not switch any motors in the measuring circuit on or off during a measurement. Voltage peaks caused by a switch-on or switch-off can damage the measuring device.
1. Select the desired V AC voltage measuring range using the rotary switch.
 2. Insert the plug of the black measuring line into the COM measuring socket and the plug of the red measuring line into the V/ Ω /mA measuring socket.
 3. Connect both measuring tips to the measuring object with correct polarity (black to minus, red to plus).
 - ⇒ If the input voltage is negative, a minus (-) will appear in front of the measured value on the display.
 - ⇒ The measured value is shown on the display.
 4. Turn the rotary switch to the position that is the closest to the indicated value but does not fall below it.
 - ⇒ The measured value is shown on the display.

Measuring direct current**Warning of electrical voltage**

Improper handling of the measuring device entails a risk of electric shock!

Observe the following prior to every current measurement:

- Before connecting a measuring device to an electric circuit, cut off the circuit current. Discharge the capacitors.
 - For measuring the current, interrupt the circuit to be checked and connect the measuring device in series with the consumer in this circuit.
 - Never connect a voltage source to the multimeter's measuring sockets when a current measuring range is selected. The device can be damaged.
 - The voltage in the measuring circuit must not be higher than 600 V (CAT III) to ground.
 - When measuring stronger currents from 400 mA in the 10 A range, the duration of a measurement must not exceed 30 s. Otherwise, the device may be damaged due to excessive heating.
1. Depending on the expected measuring current, select the μ A, mA or 10 A range using the rotary switch.
 2. Insert the plug of the black measuring line into the COM measuring socket and the plug of the red measuring line into the mA or 10 A measuring socket, depending on the selected range.
 3. Switch off the voltage supply at the measuring object and connect the measuring tips to the measuring object with correct polarity (in series; red to plus, black to minus).
 4. Switch the measuring circuit back on and read the measured value from the display.

Note:

If you have selected the 10 A range for safety's sake, but the measuring current is less than 400 mA, switch the measuring circuit off again. Plug the red measuring line into the mA socket and select a measuring range in the mA range. Switch the measuring circuit back on.

Measuring resistance**Warning of electrical voltage**

Before carrying out resistance, continuity or diode measurements, switch off the current of the electric circuit and discharge all capacitors.

1. Select the largest resistance measuring range (Ω) using the rotary switch.
2. Insert the plug of the red measuring line into the V/ Ω /mA measuring socket and the plug of the black measuring line into the COM measuring socket.
3. Connect the measuring lines to the measuring object. When measuring in the highest measuring range, the measuring device may take some time to display a stable value. This is due to the measuring principle and not a malfunction.
 - ⇒ The measured value is shown on the display.
4. Turn the rotary switch to the position that is the closest to the indicated value but does not fall below it.
 - ⇒ The measured value is shown on the display.

Continuity test**Warning of electrical voltage**

Before carrying out resistance, continuity or diode measurements, switch off the current of the electric circuit and discharge all capacitors.

1. Set the rotary switch to position $\rightarrow \text{diode}$.
2. Insert the plug of the red measuring line into the V/ Ω /mA measuring socket and the plug of the black measuring line into the COM measuring socket.
3. Connect the measuring lines to the circuit to be tested.
 - ⇒ When the circuit is closed and the resistance is smaller than 30 Ω , an acoustic signal is emitted.
 - ⇒ When the circuit is open, OL is displayed.

Diode test

This function allows to check semiconductor paths for continuity and blocking function.

1. Set the rotary switch to position $\rightarrow \text{diode}$.
2. Insert the plug of the red measuring line into the V/ Ω /mA measuring socket and the plug of the black measuring line into the COM measuring socket.
3. Connect the measuring lines to the diode.
 - ⇒ A measured value between 400 mV and 700 mV indicates a forward direction of the diode.
 - ⇒ If the measured value is 1, the diode is blocking.
 - ⇒ If OL is displayed with both polarities, the circuit is not closed.
 - ⇒ Measured values near 0 V indicate a short circuit in the circuit.

Battery test



Danger

Do not test batteries while they are installed in the devices. The batteries must be removed before tests can be carried out.

1. Turn the function switch to 1.5 V or 9 V BAT. Use the 1.5 V position for "AAA", "AA", "C", "D" and other 1.5 V batteries. Use the 9 V position for rectangular 9 V monobloc batteries.
2. Insert the plug of the red measuring line into the V/Ω/mA measuring socket and the plug of the black measuring line into the COM measuring socket.
3. Apply the black test probe to the negative side of the battery. Apply the red test probe to the positive side of the battery.

⇒ The measured value is shown on the display.

Battery type	Good	Low	Poor
1.5 V battery	>1.35 V	1.22 to 1.35 V	<1.22 V
9 V battery	>8.2 V	7.2 to 8.2 V	<7.2 V

Maintenance and repair

Battery change

A battery change is required when the battery status indication flashes or the device can no longer be switched on (see chapter 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.

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.

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.

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