BENNING

Operating manual

Translation of the German original version

BENNING EV 3-3

5335 / 09/2024 en

Legal notice

Notes concerning the documentation

Ensure that the applicable documentation is used for this product. For safe handling, knowledge that is provided in these instructions is required.

The product may only be handled while following this documentation, particularly the safety instructions and warnings it contains. The personnel must be qualified for the respective task and have the capability to recognise risks and prevent possible dangers.

Manufacturer and holder of rights

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Copyright

Disclaimer

The contents of the documentation has been checked to ensure that it corresponds to the hardware and software described. Nevertheless, deviations cannot be ruled out, so Benning cannot guarantee complete correspondence. The contents of this documentation are checked at regular intervals, and any corrections that are needed are contained in the versions that follow.

General non-discrimination

Benning is aware of the importance of language with regard to the gender equality and endeavors to take this into account at all times. To improve readability, we have refrained from consistently using differentiating formulations.

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1 Introduction

The BENNING EV 3-3 measuring adapter described here (in the following only referred to as “device”) is intended to carry out safety and functional tests on charging stations for electric vehicles (EVSE, electric vehicle supply equipment) in compliance with DIN VDE 0100-600 (IEC 60364-6) and DIN VDE 0105-100 (EN 50110). You can use the BENNING EV 3-3 measuring adapter to carry out simple functional tests. In combination with one of the BENNING IT 130 or BENNING IT 200 installation testers, the BENNING EV 3-3 measuring adapter enables you to carry out detailed safety and functional tests.

The device is intended for testing charging stations according to DIN EN / IEC 61851-1 (VDE 0122-1) of charging mode “Mode 3” and is provided with a Type 2 connector according to IEC / EN 62196. The “Mode 3” charging mode is used for single-phase and three-phase charging with alternating current (AC) at permanently installed charging stations (so called “wallboxes”).

The device establishes safe contact with the BENNING installation tester and triggers the charging process of the charging station by simulating an electric vehicle (EV).

Further information

http://tms.benning.de/ev3-3

On the Internet, you will find the following additional information directly at the specified link or at www.benning.de (product search):

1.1 General notes

Target group

This operating manual is intended for the following groups of people:

- Qualified electricians and qualified technical personnel

Required basic knowledge

To understand these operating manual, you will need general knowledge of testing and measuring equipment. Moreover, you will need basic knowledge of the following issues:

- General electrical engineering

Purpose of the operating manual

This operating manual describes the device and provides you information about how to handle it.

Keep this operating manual in a safe place for later use. Read this operating manual before handling the device and follow the instructions.

NOTE

Disclaimer of liability

Please make sure that any person using the device has read and understood the instructions of this operating manual before handling the device and that the instructions are adhered to in all points. Non-observance of this operating manual might result in product damage, property damage and/or personal injury.

Benning assumes no liability for damage and malfunctions resulting from the failure to observe the instructions in this operating manual.

The devices are subject to continuous further development. Benning reserves the right to make changes to the device's design, configuration and technology. The information in this operating manual corresponds to the state of technical knowledge at the time of printing. For this reason, no claims for certain device characteristics can be derived from the contents of this operating manual.

Information in this operating manual can be changed at any time without prior notice. Benning is not obligated to make amendments to this operating manual or to keep it up to date.

Direct any technical questions to Technical Support [page 9].

Trademarks

All trademarks used are the property of their respective owners, even if they are not separately marked as such.

1.2 History

Release number	Amendments
09/2024	• Initial release

Table 1: History

1.3 Service & support

Please contact your specialty retailer or the BENNING Service Center for any repair or service work that might be required.

Technical Support

Please contact our Technical support for technical questions on handling the device.

Phone:	+49 2871 93-555
Fax:	+49 2871 93-6555
E-Mail:	helpdesk@benning.de
Internet:	www.benning.de

Returns management

Easily and conveniently use the BENNING returns portal for a quick and smooth returns processing:

https://www.benning.de/service-de/retourenabwicklung.html

Phone:	+49 2871 93-554
E-Mail:	returns@benning.de

Return address

BENNING Elektrotechnik und Elektronik GmbH & Co. KG
Retourenmanagement
Robert-Bosch-Str. 20
D - 46397 Bocholt

2 Safety

2.1 Warning system

This operating manual contains notes that must be taken into consideration for your personal safety and in order to avoid injuries and damage to property. Warnings about your personal safety and to prevent personal injuries are marked with a warning triangle. Warnings on sole prevention of material damage are shown without a warning triangle. The warnings are shown in descending order depending on the hazard level as follows.

⚠ DANGER

Extremely dangerous situation for humans

If you do not pay attention to this warning, irreversible or deadly injuries will occur.

⚠ WARNING

Hazard to humans

If you do not pay attention to this warning, irreversible or deadly injuries could occur.

⚠ CAUTION

Minor hazard to humans

If you do not pay attention to this warning, minor or moderate injuries could occur.

NOTICE

Danger to property, not to persons

If you do not pay attention to this warning, material damage could occur.

If multiple hazard levels occur, the warning for the highest respective hazard level will be used. In addition, a warning about personal injuries can also include a warning about material damage.

2.2 Standards applied

The device has been built and tested in compliance with the following standards and has left the factory in perfectly safe condition.

- IEC / DIN EN 61010-1 (VDE 0411-1)
- IEC / DIN EN 61010-2-030 (VDE 0411-2-030)

2.3 Symbols used

Symbols on the device

Symbol	Meaning
	Please observe the information provided in this operating manual in order to avoid dangers.
CAT II	Measuring category II is applicable to testing and measuring circuits which are directly connected to user connections (e. g. sockets) of the low-voltage mains installation.
	The device complies with EU directives.
	The device complies with directives applicable in Great Britain.
	At the end of product life, dispose of the unserviceable device via appropriate collecting facilities provided in your community.
	The device is provided with protective insulation (protection class II).
	Please observe the operating manual.
	This symbol indicates the inserted batteries.
	This symbol indicates a built-in fuse.
	(AC) alternating voltage or alternating current
	Earth (voltage to earth)

Table 2: Symbols on the device

Symbols used in the operating manual

Symbol	Meaning
	General warning
	Warning of electric voltage!

Table 3: Symbols used in the operating manual

2.4 Intended use

Only use the device within the framework of the corresponding technical data. Any operating conditions that deviate from this shall be considered as improper use. Solely the user of the device shall be liable for any resulting damage.

Please note the following:

- In case of improper use, the liability and warranty claims become void. Solely the user of the device shall be liable for any damage resulting from improper use. Uses not complying with the intended use include e. g.:
  - Use of components, accessories, spare or replacement parts that have not been released and approved for the respective application by Benning
  - Non-observance, manipulation, changes or misuse of the operating manual or the instructions and notes contained therein

  - Any form of misuse of the device
  - Any use other than or beyond that described in this operating manual
- Warranty and liability claims are generally excluded if the damage is the result of force majeure.
- If any prescribed services are not performed regularly or not on time, according to the manufacturer's specifications during the warranty period, a decision about a warranty claim can only be made once the findings are available.

Direct any questions to Technical Support [page 9].

Using the device

- The device may only be used in a technically perfect and safe condition. Always check the device for damages before using it.
- The test socket and the 4 mm test sockets are intended only for testing purposes and connection to BENNING IT 130 or IT 200 installation testers.
- Do not connect any measuring devices other than the BENNING installation tester.
- The device is intended for short-time use only (continuous operation is not permitted). The maximum load time is 10 ms and the maximum degree of utilisation is 10 %. Disconnect the device from the test object after use.
- Use the device only in electric circuits of overvoltage category II with a conductor for a maximum of 300 V to earth.
- Even without any of the LEDs lighting, the 4 mm test sockets might be live.

⚠ WARNING

Opening the device

Danger to life or serious injury is possible due to contact with high electric voltage when opening the device. The device might get damaged.

- Do not open the device.
- Please contact your specialty retailer or the returns management [page 9] for any repairs.

Securing the device

If the device is not in a technically perfect and operationally safe condition, safe operation is no longer guaranteed. Make sure that the following measures are taken:

- Switch off the device.

The following characteristics indicate that safe operation is no longer guaranteed:

- The device (housing, test cable or plug) shows visible damage or is damp/wet.
- The device does not work properly in compliance with regulations (e. g. errors during measurements).

2.5 Special types of risks

⚠ WARNING

Dangerous voltage

Danger to life or serious injury is possible due to contact with high electric voltage when working on live components or equipment. Even low voltages from 30 V-AC and 60 V-DC on can be dangerous to human life!

- Please observe relevant regulations on occupational safety and health.
- If necessary, use appropriate protective equipment.

3 Scope of delivery

The scope of delivery of the device includes the following components:

- 1 x BENNING EV 3-3 measuring adapter
- 1 x protective pouch
- 1 x quick reference guide

4 Device description

4.1 Device structure

Figure 1: BENNING EV 3-3 device structure

1	Test cable
2	Type 2 connector (male) for connection to the charging station (EVSE)
3	PE test • LED • Contact electrode
4	“PP-Status/State”
5	“CP-Status/State”
6	Operating keys • “ON/OFF Funktion/Function” • “RCD Test Weiter/Next” • “Error Simulation CP sh” • “Error Simulation PE op”
7	Display
8	LEDs for phase indication L1, L2 and L3 (output voltage of the charging station / EVSE)
9	4 mm test sockets (N, PE, L1, L2, L3) for connection to the BENNING installation tester

Pin assignment

Figure 2: Assignment of the Type 2 connector for connection to the charging station (EVSE)

Back of the device

The battery and fuse compartment is located on the back of the device.

4.2 Functions

The device offers the following functions:

- Simulating an electric vehicle (EV) for the charging station
- Providing safe contacting for the installation tester
- Measuring the output voltages (L1, L2, L3) of the charging station
- Testing the phase sequence at the output of the charging station
- Analysing the CP signal (CP state, CP-PWM, CP voltage, CP frequency)
- Analysing the PP signal (maximum charging current)
- Tripping the 6 mA DC residual current protection device with time measurement
- Tripping the 30 mA AC residual current protection device with time measurement

The simulation of the charging cable and electric vehicle used is done via the rotary switches “PP-Status/State” and “CP-Status/State” of the device.

Rotary switch “CP-Status/State” for vehicle simulation

With the rotary switch “CP-Status/State” you can simulate different vehicle states. By means of the switch position, different resistance values and a diode are switched in the device between the CP and PE contacts.

The communication signal (CP signal) is intended to control the charging process between the charging station and the vehicle (EV). For this purpose, the charging station applies a square-wave signal of 1 kHz to the CP contact of the charging connector. Depending on the operating status, the PWM (pulse width modulation) signal is loaded differently by the vehicle and its amplitude is changed.

Switch position	Simulation	Description	Resistance (CP-PE)	PWM voltage at CP contact
A	No vehicle (EV) connected.	No power supply from charging station.	Open	±12 V, 1 kHz
B	Vehicle (EV) connected but not ready for charging.	Charging station detects vehicle, but no power is provided.	2 740 Ω	+9 / -12 V, 1 kHz

Switch position	Simulation	Description	Resistance (CP-PE)	PWM voltage at CP contact
C	Vehicle (EV) connected and ready for charging. Ventilation of the charging area is not required.	Charging station provides power supply for vehicle.	882 Ω	+6 / -12 V, 1 kHz
D	Vehicle (EV) connected and ready for charging. Ventilation of the charging area is required.	Charging station provides power supply when ventilation of the charging area is given.	246 Ω	+3 / -12 V, 1 kHz

Table 4: Switch positions of the “CP-Status/State” rotary switch

Rotary switch “PP-Status/State” for cable simulation

With the rotary switch “PP-Status/State” you can simulate different codings of the charging cables. The coding describes the maximum permissible current carrying capacity of the charging cable. By means of the switch position, different resistance values are switched in the device between the PP and PE contacts.

Switch position	Simulation	Resistance (PP-PE)
N.C.	No charging cable connected or error.	Open (∞)
13 A	Coding of the charging cable or maximum charging current	1 500 Ω
20 A		680 Ω
32 A		220 Ω
63 A		100 Ω

Table 5: Switch positions of the “PP-Status/State” rotary switch

Keys

Key	Function	Result
“ON/OFF Funktion/ Function”	Switching the device ON/OFF Navigating through the functions Selecting a parameter	-
“RCD Test Weiter/Next”	Tripping the residual current protection device Selecting the fault current Navigating through parameters	-
“Error Simulation PE op”	Simulating a disconnected protective conductor	Cancelling the charging process Switch-off time ≤ 100 ms
“Error Simulation CP sh”	Simulating a short-circuit	Cancelling the charging process Switch-off time ≤ 3000 ms

Table 6: Functions of the keys

Contact electrode

Contact electrode	Function
PE test	PE test by means of a contact electrode and LED indication, warns of a dangerous contact voltage (> 50 V) being applied to the PE connection.

Table 7: Functions of the contact electrode

Automatic switch-off (“APO” – “Auto Power-off”)

If you do not press any keys of the device for 5 minutes, the device switches off automatically.

The function is disabled during a test.

5 Getting started

5.1 Switching the device ON/OFF

To switch the device on or off, press the “ON/OFF | Funktion/Function” key for approx. 2 seconds.

5.2 Setting the language

You can set the display language of the device.

Requirements

- The device is switched off.

Procedure

1. Open the language selection. To do this, press and hold the “ON/OFF | Funktion/Function” and “RCD Test | Weiter/Next” keys for 2 seconds.
2. Select a language. To do this, press the “RCD Test | Weiter/Next” key.
3. Confirm your language selection. To do this, press the “ON/OFF | Funktion/Function” key.

6 Operation

You can use the device to carry out the following tests:

- PE test
- Measuring the output voltage (L1, L2, L3)
- Testing the phase sequence
- Vehicle simulation (CP states A, B, C, D)

  PP signal analysis (simulating the current carrying capacity of the cable (PP state))

  CP signal analysis
- Tripping the residual current protection device (RCD)

6.1 Requirements for tests and measurements

Please observe the following basic requirements for tests and measurements:

- Only use approved safety measuring lines.
- Disconnect any safety measuring lines not required for the respective test or measurement from the device.
- Please consider sources of interference that might be present. Strong sources of interference in the vicinity of the device might involve unstable readings and measuring errors.

6.2 PE test (testing the protective conductor)

In case of new or modified installations, it might happen that the protective conductor (PE) and the external conductor L (phase) have been accidentally reversed. This is an extremely dangerous situation! For this reason, it is important to check whether a dangerous phase voltage is applied to the protective conductor connection. A phase voltage at the PE conductor can be detected by touching the “PE Test” contact electrode of the device. Please note that a phase voltage at the protective conductor (PE) will not be detected if the operator's body is completely insulated from the floor or the walls!

Requirements

- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [page 20].

Procedure

1. Select the desired positions of the rotary switches.
   – “PP-Status/State”: switch position “OPEN”
   – “CP-Status/State”: switch position “A”
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Switch on the device.
4. Simulate a vehicle being charged. To do this, set the rotary switches to the following positions:
   – “PP-Status/State”: switch position according to the maximum charging current from 13 to 63 A
   – “CP-Status/State”: switch position “C” or “D”

5. Touch the contact electrode with your bare fingers.
6. Read the test result.
7. Before disconnecting the device from the charging station (EVSE), set the rotary switch “CP-Status/State” to switch position “A”.

Result

LED OFF:
The test object has passed the PE test.

LED ON:
The test object has not passed the PE test. A dangerous contact voltage (> 50 V) is applied to the protective conductor. Immediately stop all measurements and make sure that the error will be eliminated.

6.3 Testing the output voltage

Requirements

- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [page 20].

Procedure

1. Select the desired positions of the rotary switches.
   – “PP-Status/State”: switch position “OPEN”
   – “CP-Status/State”: switch position “A”
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Switch on the device.
4. Simulate a vehicle being charged. To do this, set the rotary switches to the following positions:
   – “PP-Status/State”: switch position according to the maximum charging current from 13 to 63 A
   – “CP-Status/State”: switch position “C” or “D”
5. Read the test result. To read the voltage values, press the “ON/OFF | Funktion/Function” key.
6. Before disconnecting the device from the charging station (EVSE), set the rotary switch “CP-Status/State” to switch position “A”.

Result

The message “OK” is displayed:
The test object has passed the test.

The message “Error” is displayed:
The test object has not passed the test. Make sure that the error will be eliminated.

Display of voltage values

Outside CP state C or D, the voltage must always be less than 15 V.

Single-phase testing:
If the voltage at V_{L1N} is in the range from 207 V-AC to 253 V-AC and V_{L2N}, V_{L3N} and V_{NPE} are less than 15 V, the test has been passed.

Three-phase testing:
If the voltage of V_{L1L2}, V_{L2L3} and V_{L3L1} is in the range of 360 V-AC to 440 V-AC and V_{NPE} is less than 15 V, the test has been passed.

6.4 Testing the phase sequence

Requirements

- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [page 20].

Procedure

1. Select the desired positions of the rotary switches.
   – “PP-Status/State”: switch position “OPEN”
   – “CP-Status/State”: switch position “A”
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Switch on the device.
4. Simulate a vehicle being charged. To do this, set the rotary switches to the following positions:
   – “PP-Status/State”: switch position according to the maximum charging current from 13 to 63 A
   – “CP-Status/State”: switch position “C” or “D”
5. Read the test result.
6. Before disconnecting the device from the charging station (EVSE), set the rotary switch “CP-Status/State” to switch position “A”.

Result

If the phase sequence is correct, the message “OK” will be displayed below the voltage values.

If the test cannot be performed or the phase sequence is not correct, the message “Error” will be displayed.

6.5 Testing the PP/CP signals

Requirements

- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [page 20].

Procedure

1. Select the desired positions of the rotary switches.
   – “PP-Status/State”: switch position “OPEN”
   – “CP-Status/State”: switch position “A”
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Switch on the device.
4. Select the “CP-Status/State” function. To do this, press the “ON/OFF | Funktion/ Function” key twice.

5. Simulate the states of charge one after the other. To do this, set the rotary switches to the following positions:
   – “PP-Status/State”: switch position according to the maximum charging current from 13 to 63 A
   – “CP-Status/State”: switch position "B" and "C" or "B" and "D”
6. Read the test result.
7. Before disconnecting the device from the charging station (EVSE), set the rotary switch “CP-Status/State” to switch position “A”.

Result

The following measured values are shown on the display:

- CP state [page 16] (state of charge A, B, C or D, E)
  CP state is faulty if the voltage is ≤ -12V DC or > 13 V-DC.
- I_{max} (maximum charging current PP state [page 17])
- CP-PWM (duty cycle of the square-wave signal in state B, C or D)
- V_{CP} (CP voltage)
- fcp (CP frequency)

6.6 RCD test

Requirements

- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [page 20].

Procedure

1. Select the desired positions of the rotary switches.
   – “PP-Status/State”: switch position “OPEN”
   – “CP-Status/State”: switch position “A”
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Switch on the device.
4. Select the “RCD Test” function. To do this, press the “ON/OFF | Funktion/Function” key three times.
5. Simulate a vehicle being charged. To do this, set the rotary switches to the following positions:
   – “PP-Status/State”: switch position according to the maximum charging current from 13 to 63 A
   – “CP-Status/State”: switch position “C” or “D”
6. Use the “RCD Test | Weiter/Next” key to select one of the following testing currents.
   – DC 6 mA
   – AC 30 mA / 0°
   – AC 30 mA / 180°
7. Start the RCD test. To do this, press and hold the “RCD Test | Weiter/Next” key for 2 seconds.
8. Check the test result.

9. Before disconnecting the device from the charging station (EVSE), set the rotary switch “CP-Status/State” to switch position “A”.

Result

The test has been passed if the charging station has switched off and the indicative tripping time of the RCD is shown in milliseconds on the display of the device.

6.7 Testing with an installation tester

You can use the device in combination with the installation tester to carry out the following tests:

- Protective conductor resistance
- PE test
- Insulating resistance
- Loop/line impedance
- Measuring the output voltage (L1, L2, L3)
- Testing the phase sequence
- Testing the residual current protection device RCD (tripping time/tripping current 30 mA for AC, 6 mA for DC)
- Vehicle simulation (CP states A, B, C, D)

  PP signal analysis (simulating the current carrying capacity of the cable (PP state))

  CP signal analysis
- Error simulation

  “Error Simulation” “PE op” (simulating a disconnected protective conductor)

  “Error Simulation” “CP sh” (simulating a short-circuit)

Requirements

- Installation tester BENNING IT 130, BENNING IT 200
- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [page 20].
- Approved safety measuring lines

Procedure

1. Connect the installation tester to the device via the 4 mm test sockets.
2. Select the desired positions of the rotary switches.
   – “PP-Status/State”: switch position “OPEN”
   – “CP-Status/State”: switch position “A”
3. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
4. Switch on the device.
5. Select the function for testing with an installation tester. To do this, press the “ON/OFF | Funktion/Function” key four times. The message “Voltage is not indicated in this mode!” is displayed.
6. Follow the instructions on the display of the device. To do this, connect the installation tester to the device.
7. Carry out the prescribed safety and functional tests [page 24] by means of the installation tester.

8. Select the maximum charging current of the charging cable using the "PP-Status/State" rotary switch.
9. Simulate the respective state of charge using the "CP-Status/State" rotary switch.
10. Before disconnecting the device from the charging station (EVSE), set the rotary switch “CP-Status/State” to switch position “A”.

7 Maintenance

The battery compartment may be opened for maintenance work. Apart from that, there are no components in the device that you can replace.

⚠ WARNING

Opening the device

Danger to life or serious injury is possible due to contact with high electric voltage when opening the device. The device might get damaged.

- Make sure that the device is free of voltage before opening the battery compartment.
- Do not open the device (except for the battery compartment).
- Please contact your specialty retailer or the returns management for any repairs [page 9].

7.1 Maintenance schedule

The following table provides an overview of all maintenance and servicing work that you must carry out permanently or at regular intervals.

Interval	Measures
Regularly, as needed	• Cleaning the device [page 26]
As needed	• Replacing the batteries [page 27]
Every 12 months	• Calibrating the device

Table 8: Maintenance schedule

7.2 Cleaning the device

Clean the device regularly and as the need arises. Make sure that the battery compartment and the battery contacts are not contaminated by leaking battery electrolyte.

Requirements

- A clean and dry cloth or special cleaning cloth
- Voltage-free device

NOTICE

Wrong cleaning agents

Using the wrong cleaning agents can damage the device.

- Do not use any solvents, abrasives or polishing agents.

Procedure

1. Clean the exterior of the device with a clean and dry cloth or a special cleaning cloth.
2. Check the battery compartment. To open and close the battery compartment, follow the procedure given in the chapter “Replacing the batteries” [page 27].
3. In case of electrolyte contamination or white deposits in the area of the battery or the battery compartment, clean the batteries and these areas by means of a clean and dry cloth. Replace the batteries, if necessary [page 27].

7.3 Replacing the batteries

The device is powered by batteries. Replace the batteries as soon as they are discharged.

Requirements

- Discharged batteries inside the device (all segments of the battery symbol on the digital display have disappeared).
- Voltage-free device
- Suitable slotted screwdriver
- 4 new 1.5 V batteries of type AAA

Procedure

1. Place the device face down (onto an anti-slip surface).
2. Unscrew the screw of the battery compartment cover.
3. Lift the battery compartment cover off the device.
4. Remove the discharged batteries from the battery compartment and dispose of them properly [page 29].
5. Insert the new batteries into the battery compartment observing the correct polarity.
6. Place the battery compartment cover back onto the device and tighten the screw.

7.4 Replacing the fuse

The device is protected against overload by means of a fuse. Replace the fuse if it is defective.

Requirements

- Defective fuse inside the device

  If the device does not measure an output voltage during a test, check whether the fuse is defective.
- Open battery compartment cover (for this, see the procedure for replacing the batteries [page 27])
- New fuse of the type FS 100 mA, 700 V, 1 kA or better, d = 6.3 mm, l = 32 mm
- Voltage-free device
- Suitable slotted screwdriver

Procedure

1. Laterally lift one end of the defective fuse off the fuse holder by means of a slotted screwdriver.
2. Remove the defective fuse from the fuse holder and dispose of it properly [page 29].
3. Insert the new fuse and position it centrally in the fuse holder.
4. Place the battery compartment cover back onto the device and tighten the screw.

8 Technical data

Input voltage	Single-phase: up to 300 V Three-phase: up to 510 V
Frequency	50 Hz, 60 Hz
Max. testing current	10 A
Protection class	II (double insulation)
Contamination level	2
Protection category (DIN VDE 0470-1, IEC / EN 60529)	IP 40 1st digit: 4 = protection against solid impurities of a diameter >1.0 mm 2nd digit: 0 = no protection against water
Overvoltage category	CAT II 300 V to earth
Housing dimensions (length x width x height)	170 mm x 100 mm x 45 mm
Length of test cable	0.25 m
Weight	0.860 kg
Operation	
Operating duration	Short-term use (no continuous operation)
Max. barometric altitude	2 000 m
Operating temperature	0 … 40 °C
Max. relative air humidity	95 % RH (0 … 40 °C), non-condensing
Storage	
Ambient temperature	(-10 … 40 °C)
Max. relative air humidity	85 % RH (0 … 40 °C)

Table 9: Technical data

9 Disposal and environmental protection

	At the end of product life, dispose of the unserviceable device and the batteries via appropriate collecting facilities provided in your community.

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