

BENNING

Operating manual

Translation of the German original version



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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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.

Table of contents

1	Introduction.....	6
1.1	General notes.....	6
1.2	History	7
1.3	Service & support.....	8
2	Safety	9
2.1	Warning system	9
2.2	Standards applied	9
2.3	Symbols used.....	10
2.4	Intended use	10
2.5	Special types of risks	12
3	Scope of delivery	13
4	Device description.....	14
4.1	Device structure	14
4.2	Functions.....	16
5	Operation.....	17
5.1	Requirements for tests and measurements	17
5.2	Checking the charging station (EVSE) for correct functioning	17
5.3	Testing with an installation tester	18
6	Maintenance.....	19
6.1	Maintenance schedule	19
6.2	Cleaning the device.....	19
7	Technical data.....	20
8	Disposal and environmental protection	21
	Index	22

Table of figures

Figure 1	EV 3-1	14
Figure 2	Test socket assignment	15
Figure 3	Assignment of the Type 2 connector for connection to the charging station (EVSE)	15

List of tables

Table 1	History	7
Table 2	Symbols on the device.....	10
Table 3	Symbols used in the operating manual.....	10
Table 4	“CP mode” switch positions	16
Table 5	Maintenance schedule	19
Table 6	Technical data	20

1 Introduction

The BENNING EV 3-1 wallbox tester and measuring adapter described here (in the following referred to as “device”) is intended for simple functional testing of charging stations (wallboxes). The testing can be carried out both on charging stations with a charging socket and on charging stations with a permanently connected charging cable.

Additionally, via the 4 mm test sockets, safety and functional tests can be carried out 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) using the BENNING IT 130 or IT 200 installation testers.

Further information



<http://tms.benning.de/ev3-1>

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

- Operating manual of the device in several languages
- Further information depending on the device (e. g. brochures, technical reports, FAQs)

1.1 General notes

Target group

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

- Qualified electricians and electrotechnically trained 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 8](#)].

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
03/2025	• 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 61010-031 (VDE 0411-031)

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).

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 8].

**⚠ 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 8] 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 sockets or plugs) shows visible damage or is damp/wet.
- The device does not work properly in compliance with regulations (e. g. errors during measurements).

Using the device

Please observe the following basic obligations when 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 personnel must be qualified for the respective task.
- Observe relevant regulations on occupational safety and health as well as those on environmental protection.
- The device may only be used inside buildings and in dry environments.
- Do not use the device in potentially explosive environments.
- Use suitable (approved) safety measuring lines.
- Use suitable (approved) safety measuring accessories.
- 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). 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.
- Carry out the insulating resistance measurement only between the active conductors L1/L2/L3/N and PE. A measurement against N might damage the device and involve a failure of the LED phase indication.



⚠ WARNING

Dangerous voltage

Danger to life or serious injury is possible due to contact with high electric voltage in case of incorrect operation.

- Do not touch the bare measuring probe tips of the safety measuring lines or the bare contacts of the optional alligator clips, Only touch the safety measuring lines in the area intended for your hands.
- Please note that dangerous testing voltages might be present at the device during insulating resistance measurement. These might also be applied to the measuring circuit if safety measuring lines are contacted.
- Connect the safety measuring lines to the correspondingly marked measuring jacks of the device and check them for tight fit.
- Only use approved safety measuring lines.
- Attach the protective caps to the contact tips of the safety measuring lines (circuits of overvoltage category CAT III or IV).
- When disconnecting the measuring circuit, first remove the live safety measuring line (phase) and then the neutral safety measuring line from the measuring point.

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 3-1 measuring adapter
- 1 x operating manual

4 Device description

4.1 Device structure



Figure 1: EV 3-1

1	Type 2 connector	2	LEDs for phase indication L1, L2, L3 and states of charge B and C
3	Sliding switch for CP mode	4	4 mm test sockets for L1, L2, L3, N, PE, CP, PP

Test socket assignment



Figure 2: Test socket assignment

Colour coding	
L1	Brown
L2	Black
L3	White
N	Blue
PE	Green/yellow
CP signal	Red

Pin assignment



Figure 3: Assignment of the Type 2 connector for connection to the charging station (EVSE)

4.2 Functions

The device offers the following functions:

- Simulating an electric vehicle (EV)
- Functional testing of the charging station with:
 - LEDs for phase indication L1, L2 and L3 (output voltages of the charging station)
 - LEDs for indicating the states of charge B and C
 - Simulation of error E (short-circuit CP-PE via an internal resistor)
- Providing safe contacting for the installation tester. The electric vehicle is simulated using the sliding switch “CP Mode” of the device.

“CP Mode” switch for vehicle simulation

You can use the “CP Mode” switch to 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 supply is provided.	2 740 Ω	+9 / -12 V, 1 kHz
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
E	Error, short-circuit CP-PE via an internal resistor	Charging station stops the power supply and unlocks the charging cable within 30 s.	0 Ω	0 V

Table 4: “CP mode” switch positions

PP mode for cable simulation

For charging stations (wallboxes) with charging socket, the device simulates a charging cable with a fixed coding of 32 A. The coding describes the maximum permissible current carrying capacity of the charging cable. The resistance (PP-PE) of the device is approx. 220 Ohm.

5 Operation

You can use the device to carry out a simple functional test [► page 17] of the charging station (wallbox) or tests in combination with an installation tester [► page 18].

5.1 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.
- Please observe applicable regulations from the current VDE / EN standard.
- Please observe the manufacturer's specifications in the accompanying documents of the test sample before starting a test as well as during the test.
- Carry out the insulating resistance measurement only between the active conductors L1/L2/L3/N and PE. A measurement against N might damage the device and involve a failure of the LED phase indication.

5.2 Checking the charging station (EVSE) for correct functioning

Requirements

- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [► page 17].

Procedure

1. Set the sliding switch "CP Mode" of the device to position "A".
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Simulate a vehicle being charged. To do this, set the "CP Mode" sliding switch to the following positions:
 - Switch position "B": LED B lights and the charging socket of the charging station locks the appliance.
 - Switch position "C": LED C and the LEDs for phase indication L1, L2 and L3 (output voltages of the charging station) light.
 - Optionally: (spring-loaded) switch position "E": simulation of the error "short-circuit CP-PE". The charging station stops the power supply and unlocks the charging cable within 30 s.
4. Read the test result.
5. Before disconnecting the device from the charging station (EVSE), set the sliding switch "CP Mode" to switch position "A".

Checking the CP signal with an oscilloscope

You can measure the CP signal of the charging station (EVSE) with an oscilloscope via the CP and PE sockets of the device.

Via the duty cycle, the charging station (EVSE) provides the electric vehicle (EV) with information about the available current of the charging station.

For further information, refer to Table A7 of DIN EN 61851-1 (VDE 0122-1).

Formula:

Available current [A] = D [%] x 0.6 A

- D: duty cycle
- T: period duration 1 ms (1 kHz)

5.3 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
- Insulating resistance (L1/ L2/ L3/ N - PE)
- 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 mode A, B, C)
- Error simulation (CP mode E)

Simulating a short-circuit CP-PE via the internal resistor

Requirements

- Installation tester BENNING IT 130, BENNING IT 200
- Charging station (EVSE) is compatible with the device
- Please observe the requirements for measuring [► page 17].
- Approved safety measuring lines

Procedure

1. Connect the installation tester to the device via the 4 mm test sockets.
2. Connect the device to the output of the charging station (EVSE) via the Type 2 connector.
3. Set the sliding switch "CP Mode" of the device to position "A".
4. Use the installation tester to perform the prescribed safety tests in a voltage-free condition at the output of the charging station (EVSE).
5. Simulate the respective state of charge using the "CP Mode" rotary switch.
6. Set the sliding switch "CP Mode" of the device to position "C".
7. Use the installation tester to perform the prescribed safety tests at the output of the charging station (EVSE) with the mains voltage being applied.
8. Before disconnecting the device from the charging station (EVSE), set the sliding switch "CP Mode" to switch position "A".

6 Maintenance

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.

- Do not open the device.
- Please contact your specialty retailer or the returns management [▶ page 8] for any repairs.

6.1 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
As needed / every 6 months	• Charging the battery
Every 12 months	• Calibrating the device

Table 5: Maintenance schedule

6.2 Cleaning the device

Clean the device regularly and as the need arises.

Requirements

- A clean and dry cloth or special cleaning cloth



NOTICE

Wrong cleaning agents

Using the wrong cleaning agents can damage the device.

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

Procedure

Clean the exterior of the device with a clean and dry cloth or a special cleaning cloth.

7 Technical data

Input voltage	Single-phase: up to 250 V Three-phase: up to 430 V
Frequency	50 Hz, 60 Hz
Max. load current	10 A
PP simulation	Up to 32 A
Protection class	II (double insulation)
Contamination level	2
Protection category (DIN VDE 0470-1, IEC / EN 60529)	IP40 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)	200 mm x 140 mm x 55 mm
Weight	0.270 kg
Charging connector	IEC 62196 type 2 male
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 ... 50 °C
Max. relative air humidity	80 % RH (-10 ... 50 °C)

Table 6: Technical data

8 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.

Index

B		S	
Basic knowledge	6	Scope of delivery	13
C		Securing	11
Cleaning	19	Service & Support	
Copyright	2	Technical Support	8
CP Mode	16	Standards applied	9
D		Symbols	
Device		Device	10
Cleaning	19	Operating manual	10
Securing	11	T	
Disclaimer	2, 10	Target group	6
Disposal	21	Technical data	20
Documentation	2	Technical Support	8
E		Test	
Environmental protection	21	Installation tester	18
F		Requirements	17
Further information	6	Trademarks	7
H		W	
History	7	Warning system	9
Holder of rights	2	Warranty	10
I			
Intended use	10		
M			
Maintenance	19		
Maintenance schedule	19		
Manufacturer	2		
Measurement			
Requirements	17		
N			
Non-discrimination	2		
P			
Pin assignment	15		
Purpose of the operating manual	7		
R			
Return address	8		
Returns management	8		



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