BENNING CC 4-1 / CC 4-2

5186 / 07/2021 en

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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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 equality of men and women, and endeavours 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 CC 4-1 / CC 4-2 current clamp adapter described here (in the following only referred to as “device”) is a measuring adapter for multimeters. The device enables you to perform AC measurements up to 1 000 A-AC by means of a multimeter. The BENNING CC 4-1 current clamp adapter additionally enables you to precisely measure low currents in the mA range.

In combination with the BENNING IT 200 installation tester, the BENNING CC 4-1 / CC 4-2 current clamp adapter allows further measuring applications, e. g. earth resistance measurement (earth loop resistance measurement) without using rods, power measurement, current measurement and harmonic measurement.

Further information

http://tms.benning.de/cc4-1-cc4-2

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 provide 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 7].

Trademarks

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

1.2 History

Release number	Amendments
07/2021	• 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)
- IEC / DIN EN 61010-031 (VDE 0411-031)

2.3 Symbols used

Symbols on the device

Symbol	Meaning
	Application around and removal from hazardous live conductors is permitted.
	Please observe the information provided in this operating manual in order to avoid dangers.
CAT III	Measuring category III is applicable to testing and measuring circuits connected to the distribution circuit of the low-voltage mains installation of a building.
	The device complies with EU directives.
	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.

Table 2: Symbols on the device

Symbols used in the operating manual

Symbol	Meaning
	General warning
	Warning of electric voltage!
	(AC) alternating voltage or alternating current
	Earth (voltage to earth)

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.

In particular, 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 damage is due to force majeure.
- If any prescribed services are not performed regularly or not on time according to manufacturer 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 7].

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.
- Make sure the personnel using the device is 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 in dry environments.
- Use the device only in electric circuits of overvoltage category III with a conductor for a maximum of 600 V-AC to earth.
- Do not apply any voltage to the outputs of the device.

⚠ 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 7] 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.
- Remove the device from the measuring point.
- Secure the device against unintentional operation.

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

- The device (housing, connecting cables or plug) shows visible damage or is damp/wet.
- The device does not work properly in compliance with regulations (e. g. errors during measurements).
- The device shows recognisable consequences of prolonged storage under inadmissible conditions.
- The device shows recognisable consequences of extraordinary stress due to transport.

2.5 Special types of risks

⚠ DANGER

Bare conductors or main line carriers

Danger to life or serious injury is possible due to contact with high electric voltage when working with bare conductors or main line carriers.

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

⚠ 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 CC 4-1 or BENNING CC 4-2 current clamp adapter
- 1 x operating manual

4 Device description

4.1 Device structure

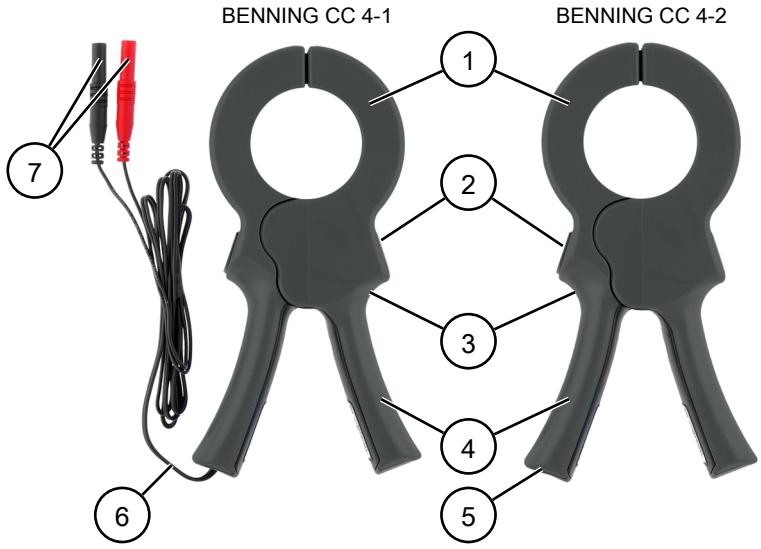

Figure 1: BENNING CC 4-1 / CC 4-2 device structure

1	Measuring clamp (for clamping the conductor)	2	Housing with labelling field
3	Current clamp bulge (protection against contact with conductor)	4	Opening lever
5	4 mm safety jacks	6	Connecting cable (firmly connected)
7	4 mm safety connectors		

4.2 Functions

In combination with a multimeter or the BENNING IT 200 installation tester, you can use the device to carry out AC current measurements.

Electrical specifications

	BENNING	
	CC 4-1	CC 4-2
AC current ranges		
Nominal current	1 000 A	
Transformation ratio	1 000:1 (1 mA / 1 A)	
Output	via 4 mm safety connectors	via 4 mm safety jacks
Electrical properties (at load R = 1 Ω)		
Measuring duration	1 000 A_{eff} (f < 1 kHz): continuous 1 200 A_{eff}: intermittent (40 minutes on, 20 minutes off)	
Load impedance	≤10 Ω	
Influence of adjacent conductors	<1 mA/A at 50 Hz	
Influence of conductor position	<0.3 % at f < 400 Hz	
Influence of load impedance	2 … 10 Ω: 1 % and 1°	
Influence of DC offset current	<2.5 % at IDC < 15 A	<2.5 % at IDC < 30 A

Table 4: Electrical specifications

Measuring accuracy

The measuring accuracy is specified as the relative part of the measured value (output current).

The specified measuring accuracy applies at a temperature of 23 °C ±5 °C and a relative air humidity lower than 75 %. In case of deviating temperatures, observe the temperature coefficient by adding the following value to the specified measuring accuracy:

0.2 [1/°C] x specified measuring accuracy x difference to reference temperature range [°C]

Measuring accuracy at load R = 1 Ω (BENNING CC 4-1)

Measuring range: 1 mA … 1 200 A

Output signal: 1 µA … 1 200 mA

Measured value	Output	Measuring accuracy[1)]	Phase error
1 … 100 mA	1 … 100 µA	±3.0 %	Not specified
0.1 … 1 A	0.1 … 1 mA	±2.0 %	Not specified
1 … 10 A	1 … 10 mA	±1.2 %	±2.2°
10 … 100 A	10 … 100 mA	±1.0 %	±1.0°
100 … 1 200 A	100 … 1 200 mA	±0.5 %	±0.7°

Table 5: Measuring accuracy (BENNING CC 4-1)

1) Within the frequency range from 40 Hz to 5 kHz The measuring accuracy is specified for a sinusoidal curve.

Measuring accuracy at load R = 1 Ω (BENNING CC 4-2)

Measuring range: 0.2 … 1 200 A

Output signal: 0.2 … 1 200 mA

Measured value	Output	Measuring accuracy[1)]	Phase error
0.2 … 10 A	0.2 … 10 mA	±2.5 %	Not specified
10 … 50 A	10 … 50 mA	±2.0 %	±3.0°
50 … 200 A	50 … 200 mA	±1.5 %	±1.7°
200 … 1 000 A	200 … 1 000 mA	±0.9 %	±0.9°
1 000 … 1 200 A	1 000 … 1 200 mA	±0.7 %	±0.7°

Table 6: Measuring accuracy (BENNING CC 4-2)

1) Within the frequency range from 40 Hz to 5 kHz The measuring accuracy is specified for a sinusoidal curve.

5 Operation

You can carry out measurements using a multimeter [▷ page 17] or the BENNING IT 200 installation tester [▷ page 17] .

5.1 Requirements for measuring

- Please observe the operating manual of the multimeter or installation tester used (especially the safety instructions and warnings contained therein).
- Do not clamp the conductor with the device until you have connected the device to a multimeter or a BENNING IT 200 installation tester.
- Please observe the information regarding measuring accuracy [▷ page 14].
- 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.

⚠ DANGER

Maximum admissible voltage

Danger to life or serious injury is possible due to contact with high electric voltage.

- Use the device only in electric circuits of overvoltage category III with a conductor for a maximum of 600 V-AC to earth.

5.2 Measuring with a multimeter

Requirements

- Please observe the requirements for measuring [page 16].

Procedure

1. Set the multimeter to the AC measurement function (mA-AC or A-AC).
2. Select an appropriate measuring range.
3. Connect the device to the multimeter:
   - BENNING CC 4-1:

     Connect the black 4 mm safety connector of the device to the COM jack of the multimeter.

     Connect the black 4 mm safety connector of the device to the COM jack of the multimeter for the current input (mA or A).
   - BENNING CC 4-2:

     Connect the device by means of suitable safety measuring lines via the two 4 mm safety jacks to the multimeter (COM jack and jack for current input (mA or A)).
4. Operate the opening lever and clamp the live conductor with the measuring clamp.
5. Read the current value on the multimeter.
6. Convert the read value to the actually measured current value taking into account the conversion factor.
   - Conversion factor: 1 mA-AC = 1 A-AC
   - Example: A current value of 155 mA-AC displayed on the multimeter corresponds to an actually measured current value of 155 A-AC.
7. Disconnect the device from the measuring object after having completed the measurement.

5.3 Measuring with the BENNING IT 200 installation tester

In combination with the BENNING IT 200 installation tester, the BENNING CC 4-1 / CC 4-2 current clamp adapter additionally supports e. g. earth resistance measurement (earth loop resistance measurement) without using rods, power measurement, current measurement and harmonic measurement.

Requirements

- Please observe the requirements for measuring [page 16].

Procedure

Carry out the measurement according to the operating manual of the BENNING IT 200 installation tester.

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 7] 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 [page 18]
Every 12 months	• Calibrating the device [page 18]

Table 7: 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.

6.3 Calibrating the device

Benning guarantees compliance with this technical and accuracy specifications stated in this operating manual for the first 12 months after the delivery date.

To maintain accuracy of the measuring results, make sure that the device is recalibrated in annual intervals by the BENNING Service [page 7] .

7 Technical data

	BENNING	
	CC 4-1	**CC 4-2**
Protection class	II (double insulation)	
Contamination level	2	
Protection category (DIN VDE 0470-1, IEC / EN 60529)	IP 40 1st digit: 4 = protection against granular foreign objects 2nd digit: 0 = no protection against water	
Overvoltage category	CAT III 600 V to earth	
Housing dimensions (length x width x height)	220 mm x 120 mm x 48 mm	
Max. clamp opening	52 mm	
Max. conductor diameter	50 mm	
Weight	approx. 0.6 kg	
Outputs	4 mm safety connectors	4 mm safety jacks
Length of connecting cable	1.5 m	-
Operation		
Max. barometric altitude	2 000 m	
Operating temperature	-10 … 50 °C (Do not permanently expose the device to sunlight.)	
Max. relative air humidity	85 % RH (0 … 35 °C), non-condensing, linearly decreasing for T > 35 °C	
Storage		
Ambient temperature	-30 … 70 °C (Do not permanently expose the device to sunlight.)	
Max. relative air humidity	85 % RH (0 … 35 °C), non-condensing, linearly decreasing for T > 35 °C	

Table 8: Technical data

8 Disposal and environmental protection

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

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