

BENNING

Quick reference guide

Translation of the German original version

BENNING IT 130

IDNR 20752285 / 5261 / 12/2022 en



Legal notice

Notes on the quick reference guide

This printed quick reference guide is only an excerpt from the detailed operating manual of the installation tester BENNING IT 130. The latest version of the operating manual can be found on the product website of the BENNING IT 130 for free download in PDF format.

<http://tms.benning.de/it130>



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.

Manufacturer / holder of rights

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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 Start-up guide

1.1 Safety and operational considerations

The following symbols are used in the user manual and on the test equipment:



Important, danger, must comply with documentation!



Warning of electrical danger!



Protection class II



Ground (voltage to earth)



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



The device complies with EU directives.



Warnings related to safety – general information

- This document is not a supplement to the operating manual! The operating manual can be found on the product website of the BENNING IT 130 for free download in PDF format.
<http://tms.benning.de/it130>
- If the test equipment is used in a manner not specified in this user manual, the protection provided by the equipment could be impaired!
- Read this user manual carefully, otherwise the use of the instrument may be dangerous for the operator, the instrument or for the equipment under test!
- Do not use the instrument or any of the accessories if any damage is noticed!
- Consider all generally known precautions in order to avoid risk of electric shock while dealing with hazardous voltages!
- If the fuse F1 has blown, please follow the instructions of this operating manual to replace it! Only use a fuse complying with the specification (see chapter 1.9) as replacement.
If one of the fuses F2 or F3 has blown, the device must not be used anymore. In this case, the device must be sent to BENNING for inspection and repair.
- Do not use the instrument in AC supply systems with voltages higher than 550 V AC.
- Service, repairs or adjustment of instruments and accessories is only allowed to be carried out by a competent authorized personnel!
- Please use standard or optional BENNING accessories only which are available from your authorized specialty retailer!
- Consider that protection category of some accessories is lower than of the instrument. Test tips and Tip "Commander" have removable caps. If they are removed the protection falls to CAT II. Check markings on accessories!
cap off, 18 mm tip: CAT II up to 1000 V to earth
cap on, 4 mm tip: CAT II 1000 V / CAT III 600 V / CAT IV 300 V to earth
- The instrument come supplied with rechargeable NiMh battery cells. The cells should only be replaced with the same type as defined on the battery compartment label or as described in this manual. Do not use standard alkaline battery cells while the power supply adapter is connected, otherwise they may explode!

- ❑ Hazardous voltages exist inside the instrument. Disconnect all test leads, remove the power supply cable and switch off the instrument before removing battery compartment cover.
- ❑ Do not connect any voltage source on C1 input. It must be used only for connecting the current clamp adapters recommended by BENNING. Maximal input voltage is 3 V!
- ❑ All normal safety precautions must be taken in order to avoid risk of electric shock while working on electrical installations!



Warnings related to safety – measurements

Insulation resistance

- ❑ Insulation resistance measurement should only be performed on de-energized objects!
- ❑ Do not touch the test object during the measurement or before it is fully discharged! Risk of electric shock!
- ❑ When an insulation resistance measurement has been performed on a capacitive object, automatic discharge may not be done immediately! The warning message  and the actual voltage (Udisch) are displayed during discharge until voltage drops below 30 V.
- ❑ Do not connect test terminals to external voltage higher than 600 V (AC or DC) in order not to damage the test instrument!

Low-impedance resistance/continuity test

- ❑ Low-impedance resistance measurements/ continuity tests should only be performed on de-energized objects!
- ❑ Parallel loops may influence on test results.

Testing PE terminal

- ❑ If the phase voltage is detected at the protective conductor connection PE, immediately stop all measurements and ensure that the fault of the installation will be eliminated.



Warnings related to safety – batteries/ storage batteries and fuses

- ❑ Disconnect all test cables / accessories from the tester and from the installation and switch the tester off before opening the cover of the battery / fuse compartment. Dangerous voltages may be applied to the interior of the tester!
- ❑ Please make sure that the storage batteries are inserted correctly, because otherwise the tester is not ready for operation and the storage batteries will discharge.
- ❑ Do not recharge alkaline battery cells!
- ❑ The storage batteries must be charged only by means of the charger included in the scope of delivery!



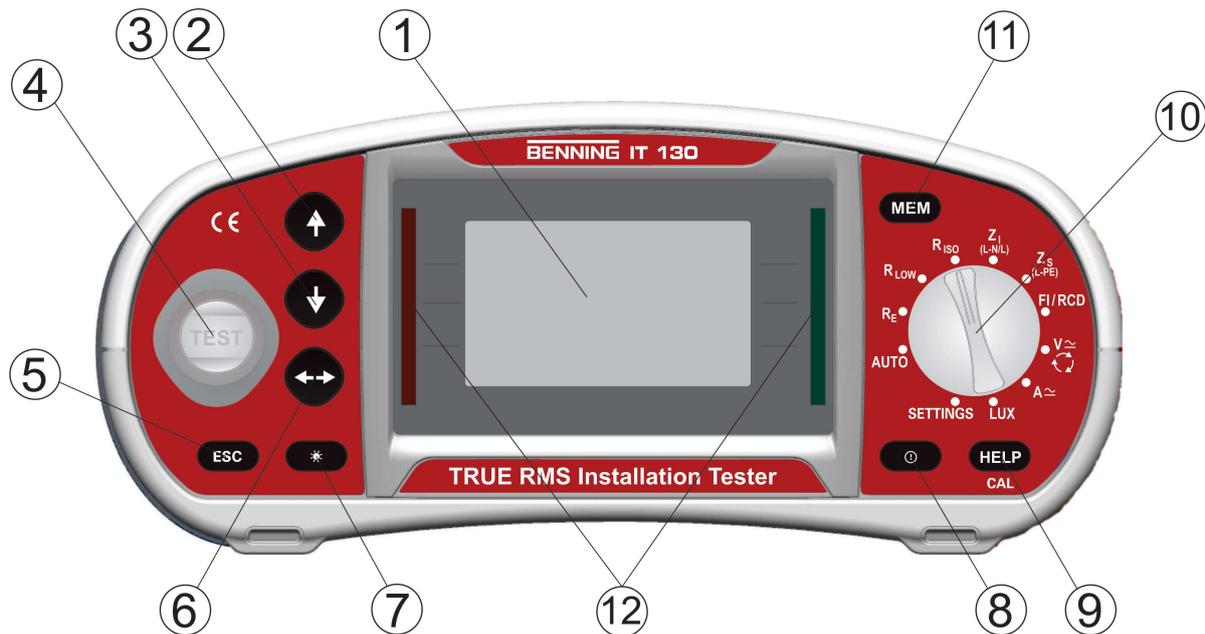
Warnings related to safety – "Commander" probe tip (included in delivery) – "Commander" test plug for shock-proof socket (optional)

Measuring category of commanders:

"Commander" probe tip (cap off, 18 mm tip)	CAT II 1000 V to earth
"Commander" probe tip (cap on, 4 mm tip)	CAT II 1000 V / CAT III 600 V / CAT IV 300 V to earth
"Commander" test plug for shock-proof socket	CAT II 300 V to earth

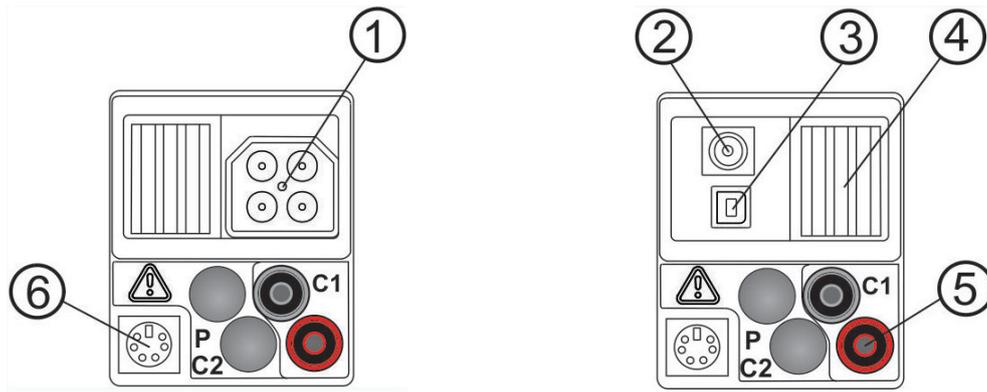
- ❑ Measuring category of commanders can be lower than protection category of the instrument.
- ❑ If dangerous voltage is detected on the tested PE terminal, immediately stop all measurements, find and remove the fault!
- ❑ Disconnect the "Commander" from the tester and from the installation and switch the "Commander" off before opening the cover of the battery compartment. Dangerous voltages might occur inside the "Commander"!

1.2 Front and connector panel



Legend:

1	LCD	<input type="checkbox"/>	128 x 64 dots matrix display with backlight.
2	UP	<input type="checkbox"/>	Modifies selected parameter.
3	DOWN	<input type="checkbox"/>	Starts measurements.
4	TEST	<input type="checkbox"/>	Acts also as the PE touching electrode.
5	ESC	<input type="checkbox"/>	Goes one level back.
6	TAB	<input type="checkbox"/>	Selects the parameters in selected function.
7	Backlight, Contrast	<input type="checkbox"/>	Changes backlight level and contrast.
8	ON/OFF	<input type="checkbox"/>	Switches the instrument power on or off. The instrument automatically turns off 15 minutes after the last key was pressed.
9	HELP/CAL	<input type="checkbox"/>	Help function with connection diagrams (press for approx. 2 seconds for R LOW and ΔU)
		<input type="checkbox"/>	For calibrating the test cables in the R LOW and CONTINUITY function
		<input type="checkbox"/>	Starts the Z _{REF} measurement in the sub-function ΔU voltage drop
10	Function selector switch	<input type="checkbox"/>	Selects test function.
11	MEM	<input type="checkbox"/>	Stores / recalls memory of instrument.
		<input type="checkbox"/>	Stores the settings of the current clamp adapter
12	Green LEDs Red LEDs	<input type="checkbox"/>	Indicates PASS / FAIL of result.



Legend:

1	Test connector	Measuring inputs / outputs.
2	Charger socket	For charging the rechargeable NiMh storage batteries
3	USB connector	USB interface for PC connection
4	Protection cover	
5	C1	Measuring input for optional current clamp adapter BENNING CC 1 / BENNING CC 3
6	PS/2 connector	Serial RS-232 interface for PC connection Connection for optional measuring adapters, e.g. BENNING luxmeter type B Connection for optional barcode scanner

1.3 Standard scope of delivery

- 1 x BENNING IT 130 installation tester
- 1 x padded carrying case (item no. 10008291)
- 1 x "Commander" test probe (switchable by means of "TEST" key) (item no. 044155)
- 1 x test cable with shock-proof plug (item no. 10008295)
- 1 x universal three-wire test cable (black, blue, green) (item no. 10008296)
- 1 x set of test probes (black, blue, green) (item no. 10008304 - 10008306)
- 1 x set of alligator clips (black, blue, green) (item no. 10008301 - 10008303)
- 1 x carrying strap (item no. 10008290)
- 1 x RS 232-PS/2 interface cable (item no. 10008313)
- 1 x USB interface cable (item no. 10008312)
- 6 x rechargeable NiMh storage batteries of size AA
- 2 x batteries of size AAA
- 1 x charger (item no. 10008308)
- 1 x quick reference guide
- 1 x calibration certificate



The logging software BENNING PC-Win IT 130-200 and the operating manual (PDF file) can be found on the product website of the BENNING IT 130 for free download.

1.4 Indications and meaning of symbols

Terminal voltage monitor

The terminal voltage monitor displays on-line the voltages on the test terminals and information about active test terminals in the AC installation measuring mode.

	The voltage applied is displayed by means of the testing terminal symbol. All three testing terminals L, N and PE are used for the selected measurement.
	The voltage applied is displayed by means of the testing terminal symbol. The testing terminals L and N are used for the selected measurement.
	The testing terminals L and PE are active testing terminals. The testing terminal N should be connected as well in order to have a correct input voltage.
	The polarity of the testing voltage applied (R LOW, R ISO) is displayed at the output terminals L and N.

Battery indication

	Battery capacity indication.
	Low battery. The storage battery charge condition is too low to ensure correct measuring results. Recharge the storage batteries or replace the batteries.
	Charging in progress (if power supply adapter is connected).

Messages

	Measurement is running, consider displayed warnings.
	Conditions on the input terminals allow starting the measurement; consider other displayed warnings and messages.
DC VOLTAGE! Warning! Too high DC voltage (> 50 V DC) applied to the testing terminals!	
	Conditions on the input terminals do not allow starting the measurement, consider displayed warnings and messages.
	RCD tripped-out during the measurement (in RCD functions).
	Portable RCD selected (PRCD).
	Instrument is overheated. The measurement is prohibited until the temperature decreases under the allowed limit.
	RCD of type EV (Electric Vehicle)
	RCD of type MI (Mobile Installation)
	Result(s) can be stored.
	High electrical noise was detected during measurement. Results may be impaired.
	L and N are changed.

	Warning! High voltage is applied to the test terminals.
	Warning! Dangerous voltage on the PE terminal! Stop the activity immediately and eliminate the fault / connection problem before proceeding with any activity!
	The test cable resistance for the low-impedance measurement / continuity test has not been compensated.
	High resistance to earth of test probes. Results may be impaired.
	The current is too low for the accuracy specified. This might result in incorrect measuring results. Please check in the current clamp settings whether the accuracy of the current clamp can be increased.
	Measured signal is out of range (clipped). Results are impaired.
	Simple error in the IT network.
	Fuse F1, F2 or F3 is defective. If one of the fuses F2 or F3 has blown, the device must not be used anymore. In this case, the device must be sent to BENNING for inspection and repair.

Sound warnings

Continuous sound	Warning! Dangerous voltage on the PE terminal is detected.
------------------	---

Evaluation of the measuring result

	Measurement result is inside pre-set limits (green LEDs).
	Measurement result is out of pre-set limits (red LEDs).
	Measurement is aborted. Consider displayed warnings and messages.

1.5 Selecting measuring functions

	<p>Rotary switch for selecting the measuring function</p>	
	<p>Selects sub-function Selects value of parameter / limit</p>	
	<p>Selects parameter / limits</p>	
	<p>Starts measurement</p>	

1.6 Switch position „AUTO“

Turn the rotary selector switch to the "AUTO" position in order to select the measuring function by means of the "Commander" probe tip (044155) or by means of the optional "Commander" test plug (044149).

The following functions can be selected by means of the "Commander":

- selection of the measuring function (only in the "AUTO" switch position)
- start of measurement
- storage of measuring results
- LC display illumination ON/OFF
- measuring point illumination ON/OFF

1.7 Settings

Turn the rotary selector switch to the "SETTINGS" position in order to make the following settings at the tester:

- MEMORY (request data, delete data, delete entire memory)
- SELECT LANGUAGE (GB, D, E, F, NL)
- SET DATE/TIME
- EARTHING SYSTEM (TN/TT or IT network)
- RCD TESTING (according to EN 61008/EN 61009, IEC 60364-4-41, BS 7671, AS/NZS 3017)
- SET ISC FACTOR setting (0.20 - 3.00)
- SELECT COMMANDER (ON/OFF)
- INITIAL SETTINGS
- CLAMP SETTINGS (BENNING CC 1 (044037) , BENNING CC 3 (044038))

1.8 Measured value memory

The internal memory of the tester allows to store up to 1800 measuring results including parameters, limiting values and date/time of the measurement.

The measuring results can be stored in a memory structure comprising 4 levels:

Memory structure:

- ❑ [OBJ] OBJECT 001
- ❑ [BLO] BLOCK 001
- ❑ [FUS] FUSE 001
- ❑ [CON] MEASURING POINT 001

Example of installation structure:

customer Meyer
distributor of ground floor
F1 kitchen
socket 1
Measurement: no.: 1/3 RCD I: 22.5 mA
no.: 2/3 R ISO: >999 MΩ
no.: 3/3 R LOW: 0.17 Ω

The logging software BENNING PC-Win IT 130-200 serves to read the memory of measured values of the tester (download) and to transmit installation structures that have already been created on the PC to the tester (upload).

1.9 Batteries and fuses

Batteries

Warning:



- ❑ Disconnect all test cables / accessories from the tester and from the installation and switch the tester off before opening the cover of the battery / fuse compartment. Dangerous voltages might occur inside the tester!
- ❑ Use alkaline batteries or rechargeable NiMh batteries (storage batteries) of the size AA only! Do not recharge alkaline batteries!
- ❑ Please make sure that the batteries / storage batteries are inserted with correct polarity, because otherwise the tester cannot be operated and the batteries / storage batteries will discharge.
- ❑ If the tester will not be used for a longer period of time, remove all batteries / storage batteries from the battery compartment in order to protect the tester against leakage of the batteries / storage batteries.

The rechargeable NiMh batteries (storage batteries) will be recharged automatically as soon as the charger is connected to the charging socket. An integrated protective circuit controls the charging process.



Power supply socket polarity

Note:

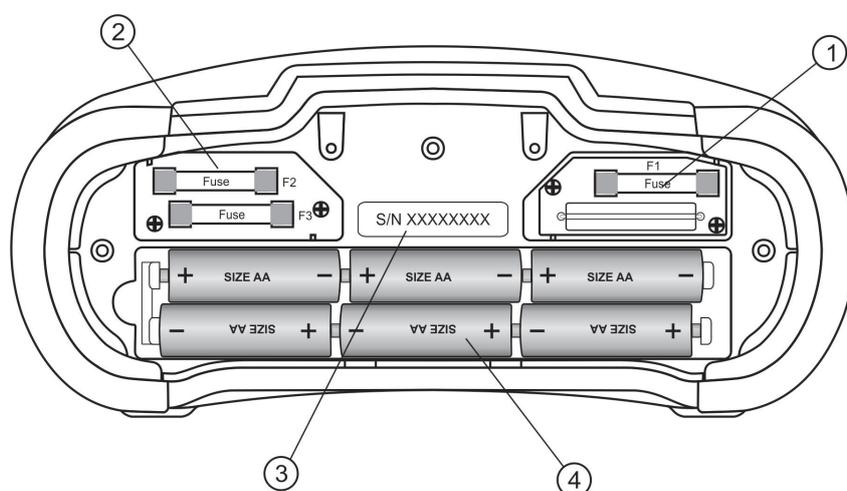
- ❑ Before the first use! Insert the storage batteries into the battery compartment and charge the storage batteries for at least 16 hours.

Fuses

Warning:



- ❑ Disconnect all test cables / accessories from the tester and from the installation and switch the tester off before opening the cover of the battery / fuse compartment. Dangerous voltages may be applied to the interior of the tester!
- ❑ Three fuses are located behind the rear cover of the installation tester. Only the fuse F1 can be replaced.
If one of the fuses F2 or F3 has blown, the device must not be used anymore. In this case, the device must be sent to BENNING for inspection and repair.
- ❑ **F1**
M 0,315 A / 250 V, 20×5 mm
This fuse is intended to protect the internal switching circuits for low-impedance measurement/ continuity test, if during measurement the probe tips are accidentally connected to the mains voltage.



Legend:

1	Fuse F1	M 315 mA / 250 V
2	Fuses F2 and F3	If one of the fuses F2 or F3 has blown, the device must not be used anymore. In this case, the device must be sent to BENNING for inspection and repair.
3	Serial number label	
4	Storage batteries/ batteries	Size AA, rechargeable NiMh / alkaline quantity: 6 pieces

1.10 Calibration

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 (chapter 1.11 Service & support).

As part of the calibration, the device is provided with the latest firmware update and thus always remains up to date.

<http://calibration.benning.de>



1.11 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

Additional product information can be found on our website. www.benning.de

1.12 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.

40 m Measurement cable

40 m measurement cable with winder and strap, for the measurement of protective conductors

item no.: 044039

**Barcode scanner**

Barcode scanner with PS/2 interface for identifying the measuring point and renaming the storage location

item no.: 009371



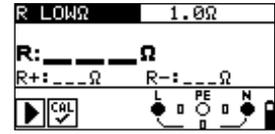
2 Measurements

2.1 Null balance (compensation) of the test cables

1. Set function

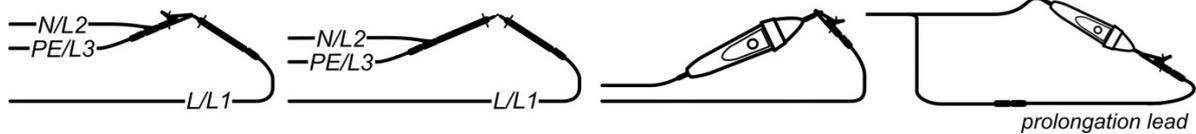


Select R LOW Ω or CONTINUITY.



R LOW

Short-circuit the test cables.



Shorted test leads

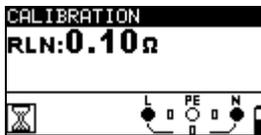
3. Press the key



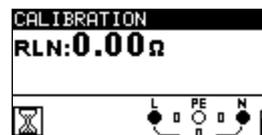
4. Press the key CAL (HELP).

After performing test leads compensation first measured value and then 0.00 Ω is displayed.

Successful compensation is displayed by means of the  symbol in the "R LOW" and "CONTINUITY" function.



Resistance of the test cable before compensation



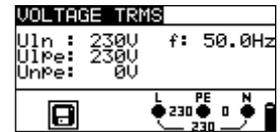
Resistance of the test cables after compensation

2.2 TRMS voltage (V AC/DC), frequency and phase sequence (rotary field)

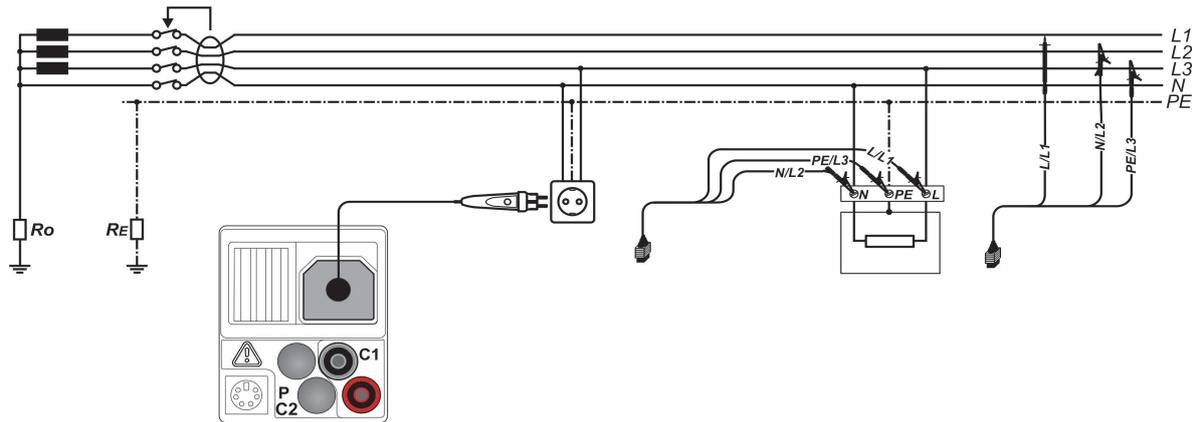
1. Set function



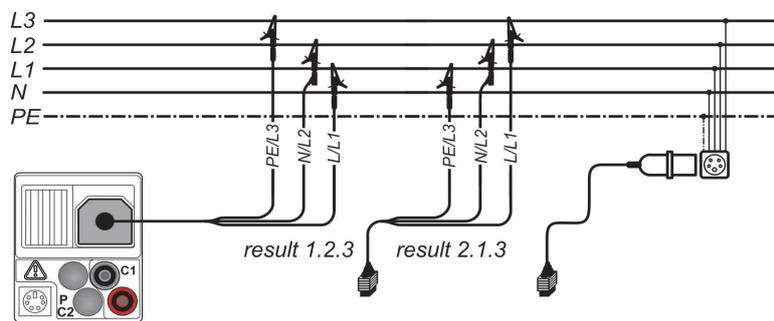
V



2. Connection diagrams

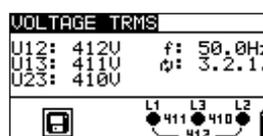
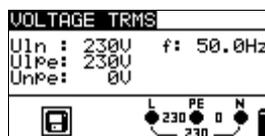


Connection of "Commander" test plug (optional) and 3-wire test lead in single-phase system



Connection of the three-wire test cable and of the three-phase adapter (optional) in a three-phase system

3. The measuring result can be stored by means of the "MEM" key.



Uln Voltage between phase (L) and neutral conductors (N)
Uipe ... Voltage between phase (L) and protective conductors (PE)
Unpe .. Voltage between neutral (N) and protective conductors (PE)
f Frequency

U12 Voltage between phases L1 and L2
U13 Voltage between phases L1 and L3
U23 Voltage between phases L2 and L3
1.2.3 ... Clockwise phase sequence: OK
3.2.1 ... Counter-clockwise phase sequence: not OK
f Frequency

2.3 Insulation Resistance (R_{ISO})

1. Set function

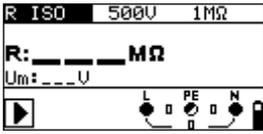
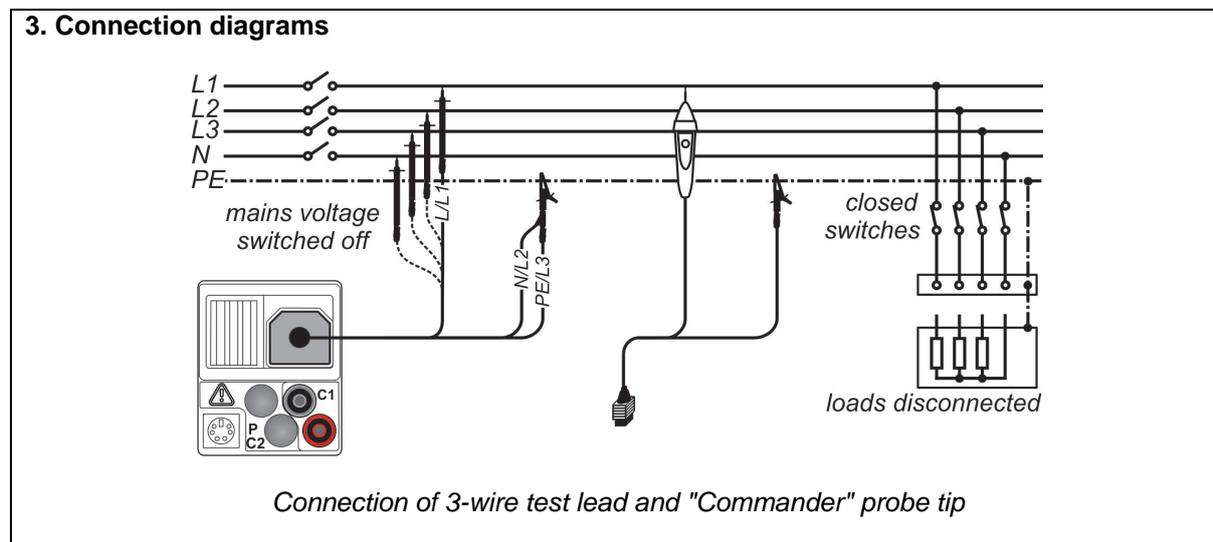


R ISO

2. Set parameters and limits.



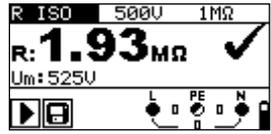
Test voltage
[50 V, 100 V, 250 V, 500 V, 1000 V]
Minimum limiting value
[without (---), 0.01 MΩ ÷ 200 MΩ]

4. Press and hold the key  until result is stabilized.

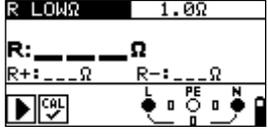
Double-click  to start continuous measurement.

5. The measuring result can be stored by means of the "MEM" key.



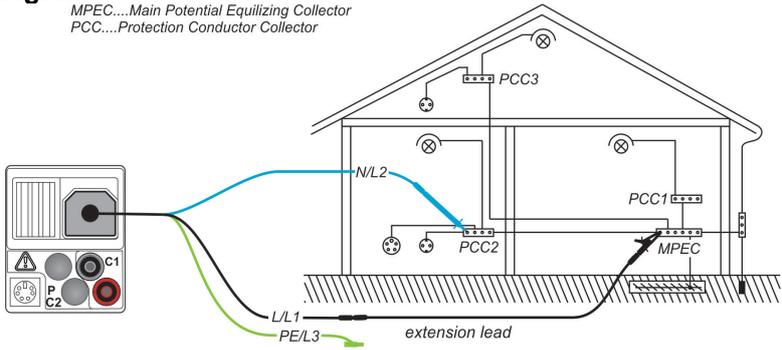
RInsulation resistance
UmTest voltage (actual value)

2.4 Low-impedance resistance (R_{LOW})/ continuity test

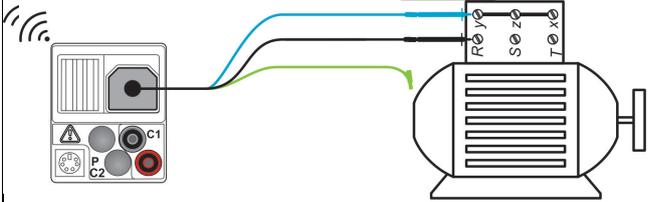
<p>1. Set function</p>  <p>R LOW</p>	<p>2. Set sub-function and limit.</p>  <p>R LOWΩ low-impedance resistance (testing current > 200 mA) or CONTINUITY (testing current < 8.5 mA) Maximum limiting value [without (---), 0.1 Ω ÷ 20.0 Ω] Buzzer [ON/OFF] only for CONTINUITY function</p> 
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3. Connection diagrams

MPEC...Main Potential Equilizing Collector
PCC...Protection Conductor Collector



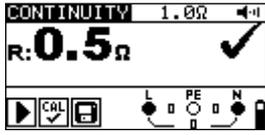
Connection of the three-wire test cable and of the optional measuring line BENNING TA 5 (044039)



Connection of 3-wire test lead and "Commander" probe tip

<p>4.a R LOWΩ low impedance</p> <p>Press the key  .</p>	<p>4.b CONTINUITY:</p> <p>Press the key  to begin performing a continuous measurement.</p> <p>Press the key  again to stop measurement.</p>
---	--

5. The measuring result can be stored by means of the "MEM" key.

	
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RR LOW Ω
R+Result at positive polarity
R-Result at negative polarity

R CONTINUITY resistance

2.6 Loop impedance ($Z_{s\ L-PE}$)

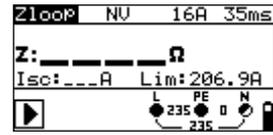
1. Set function



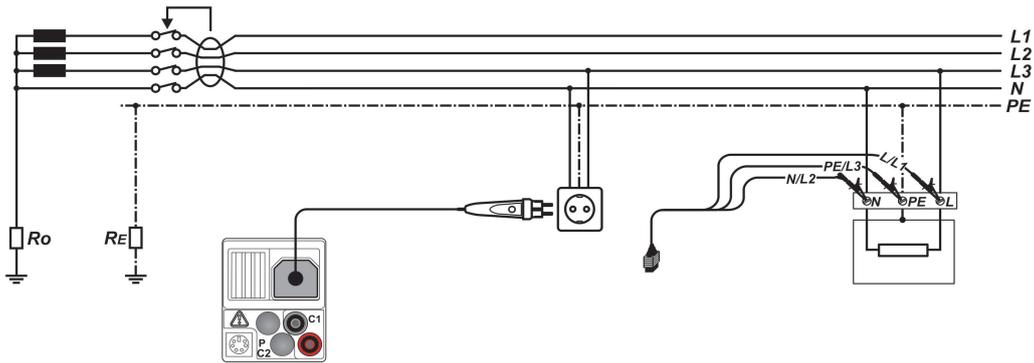
2. Set sub-function, parameters and limits.



Loop impedance:
Zs (for systems without RCD)
Zs rcd (for systems with RCD)
Testing current [Std, Low] (standard, low)
Fuse type
 [---, NV, gG, B, C, K, D, Z, L, U]
Nominal current of the fuse
Tripping time of the fuse



3. Connection diagrams



Connecting the "Commander" test plug (044149) and the 3-wire test lead

4. Press the key



5. The measuring result can be stored by means of the "MEM" key.



Zs.....Loop impedance (L-PE)

Isc.....prospective short-circuit current (fault current)

Lim ...lower limiting value of the prospective short-circuit current

2.7 Line impedance ($Z_{I\ L-N/L}$)

1. Set function



ZL

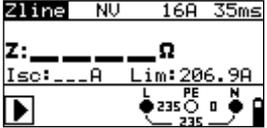
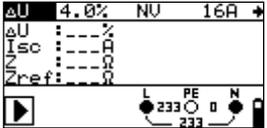
2. Set sub-function, parameters and limits.

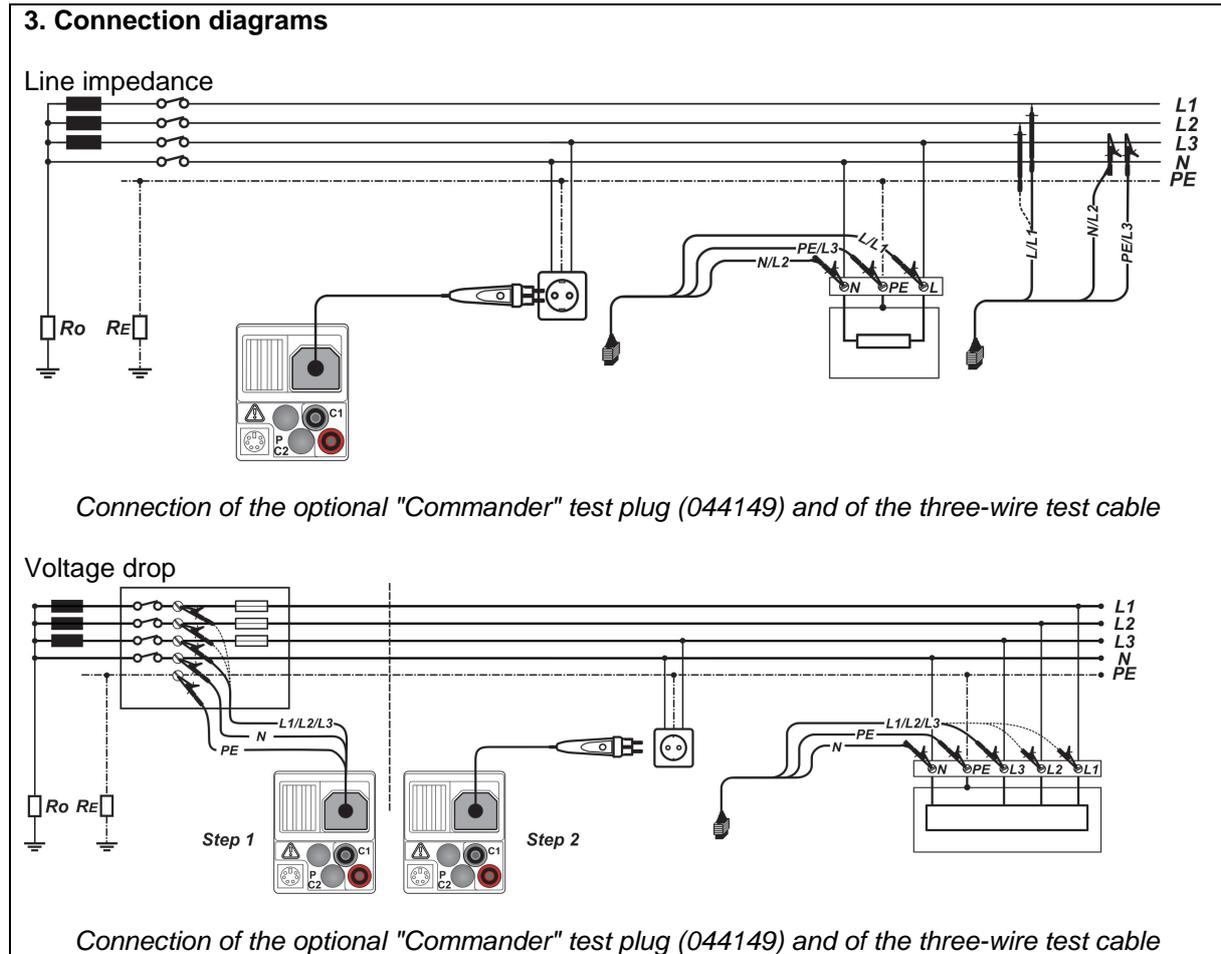




Z Line Line impedance
 ΔU Voltage drop

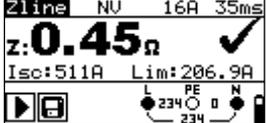
Fuse type
 [---, NV, gG, B, C, K, D, Z, L, U]
Nominal current of the fuse
Turn-off time of the fuse
Maximum voltage drop [3.0 % ÷ 9.0 %]

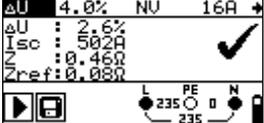


4. Press the key 

5. The measuring result can be stored by means of the "MEM" key.



Z:Line impedance
Isc.....Prospective short-circuit current
Lim ...Lower limiting value of the prospective short-circuit current



ΔU ... Voltage drop
Isc.... Prospective short-circuit current
Z Line impedance at the measuring point
Zref.. Line impedance of the reference point

2.8 Earth resistance (R_E)

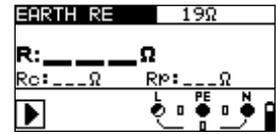
1. Set function



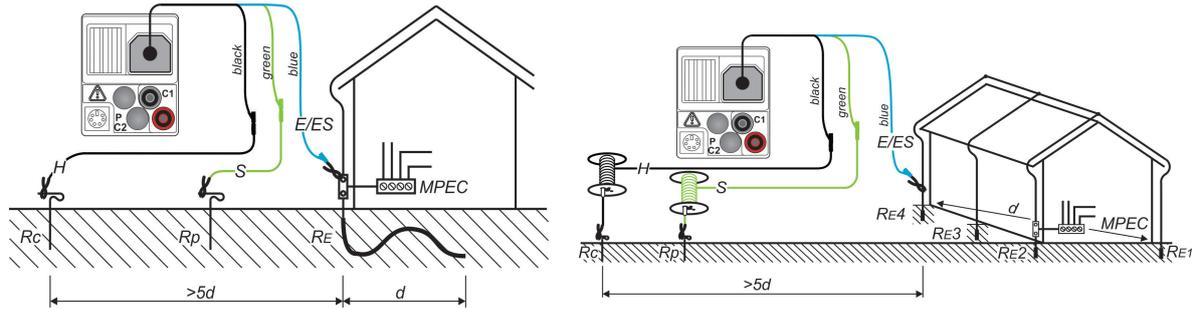
2. Set limits.



EARTH RE Earth resistance
Maximum limiting value
 [without (---), 1 Ω ÷ 5 kΩ]



3. Connection diagrams



Connection of the optional earthing set (044113)

4. Press the key



5. The measuring result can be stored by means of the "MEM" key.



REarth resistance

R_pProbe resistance of the S probe (potential)

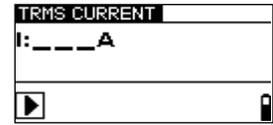
R_cAuxiliary earth electrode resistance of the H probe (current)

2.9 TRMS Current (A AC/DC)

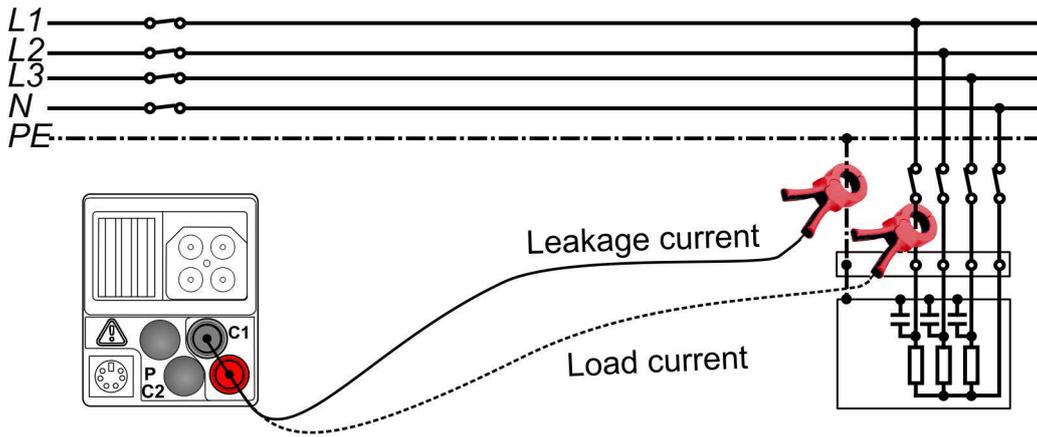
1. Set function



Note:
Please set the current clamp adapter used under "SETTINGS".



2. Connection diagrams

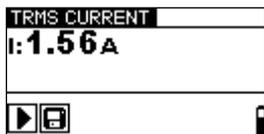


Connection of the optional current clamp adapter BENNING CC 1 (044037), BENNING CC 3 (044038)

4. Press the key



5. The measuring result can be stored by means of the "MEM" key.



I.....Current

2.10 Luminous intensity (LUX)

1. Set function

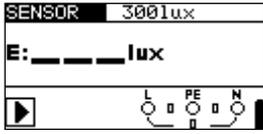


LUX

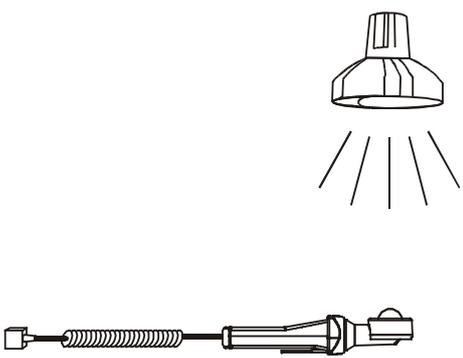
2. Set limit.



Minimum illumination
[OFF (---), 0.1 lux ÷ 20 klux]



3. Connection diagrams



Positioning of the luminous intensity sensor BENNING luxmeter type B (044111)

4. Press the key  .

5. The measuring result can be stored by means of the "MEM" key.



ELuminous intensity

2.11 First fault current (R_{iso}) in IT supply system (ISFL)

1. Set function



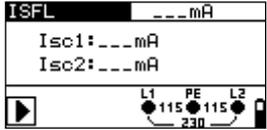
R_{iso}

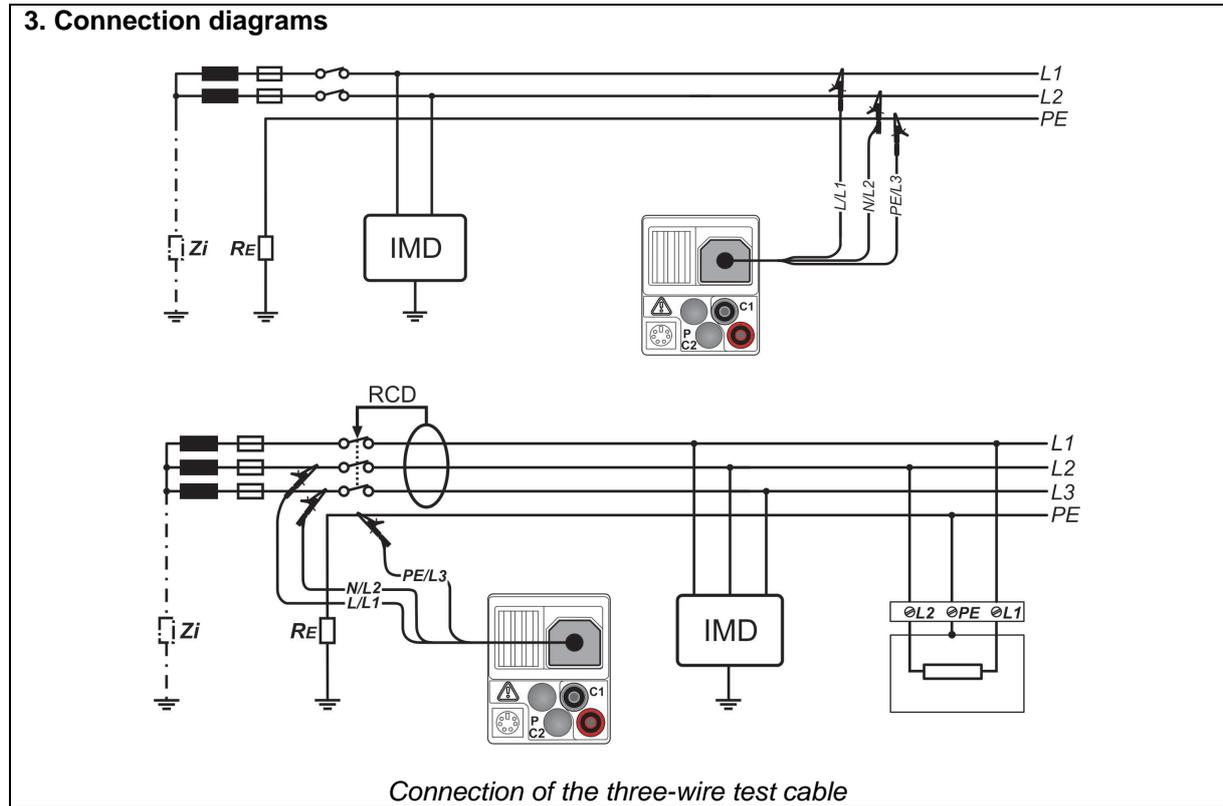
2. Set sub-function and limit.





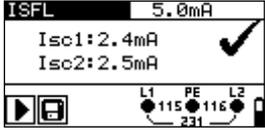
ISFL Single-fault leakage current
(only in IT networks)
Maximum limiting value
[without (---), 3.0 mA ÷ 20.0 mA]





4. Press the key 

5. The measuring result can be stored by means of the "MEM" key.



Isc1 ...Single-fault current between L1 and PE
Isc2 ...Single-fault current between L2 and PE

BENNING

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