

# BENNING



Installation Tester

**BENNING IT 130**

Short instructions

GB: Detailed instruction manual on enclosed CD-Rom.

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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)




Warnings related to safety – general information

- ❑ This document is not a supplement to the Instruction manual! Please find the operating manual as PDF file on the enclosed CD-ROM.
- ❑ 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!
- ❑ In case a fuse has blown follow the instructions in this manual in order to replace it! Use only fuses that are specified!
- ❑ 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 Ni-MH 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 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:

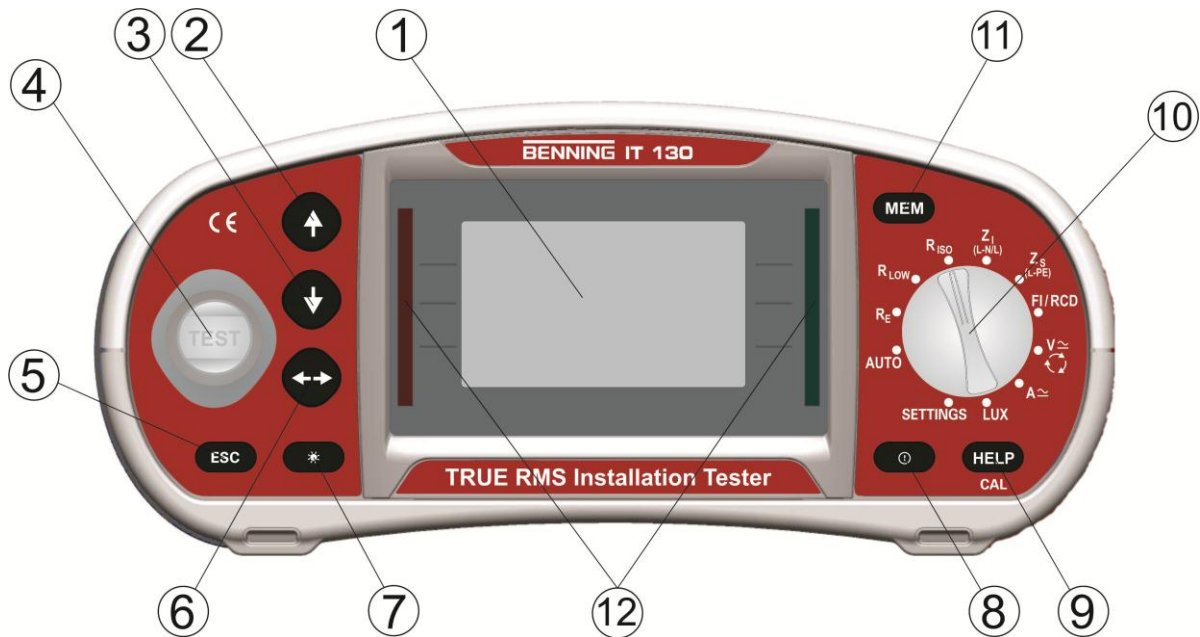
Tip "Commander" (cap off, 18 mm tip) ... CAT II 1000 V to earth

Tip "Commander" (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

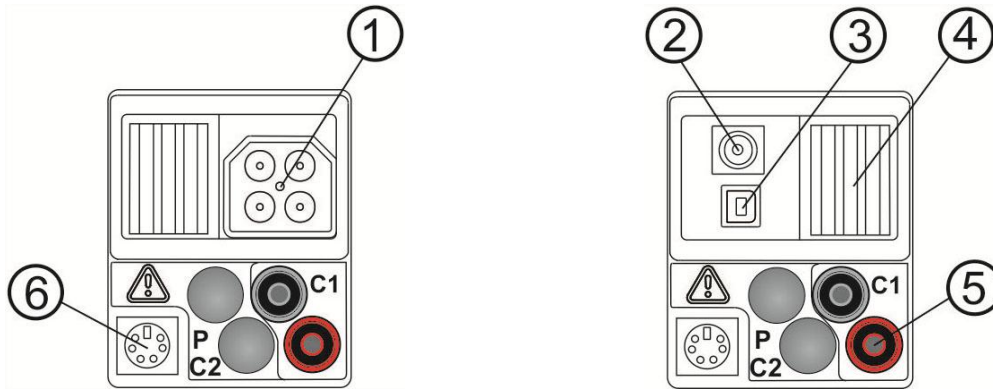
- ❑ Measuring category of commanders can be lower than protection category of the instrument.
- ❑ If dangerous voltage is detected on the tested PE terminal, immediately stop all measurements, find and remove the fault!
- ❑ Disconnect the "Commander" from the tester and from the installation and switch 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	<b>LCD</b>	□ 128 x 64 dots matrix display with backlight.
2	<b>UP</b>	□ Modifies selected parameter.
3	<b>DOWN</b>	
4	<b>TEST</b>	□ Starts measurements. □ Acts also as the PE touching electrode.
5	<b>ESC</b>	□ Goes one level back.
6	<b>TAB</b>	□ Selects the parameters in selected function.
7	<b>Backlight, Contrast</b>	□ Changes backlight level and contrast.
8	<b>ON/OFF</b>	□ Switches the instrument power on or off. The instrument automatically turns off 15 minutes after the last key was pressed.
9	<b>HELP/CAL</b>	□ Help function with connection diagrams (press for approx. 2 seconds for R LOW and ΔU) □ For calibrating the test cables in the R LOW and CONTINUITY function □ Starts the Z <sub>REF</sub> measurement in the sub-function ΔU voltage drop
10	<b>Function selector switch</b>	□ Selects test function.
11	<b>MEM</b>	□ Stores / recalls memory of instrument. □ Stores the settings of the current clamp adapter
12	<b>Green LEDs Red LEDs</b>	□ Indicates PASS / FAIL of result.



Legend:

1	<b>Test connector</b>	Measuring inputs / outputs.
2	<b>Charger socket</b>	For charging the rechargeable Ni-MH storage batteries
3	<b>USB connector</b>	USB interface for PC connection
4	<b>Protection cover</b>	
5	<b>C1</b>	Measuring input for optional current clamp adapter BENNING CC 1 / BENNING CC 2 / BENNING CC 3
6	<b>PS/2 connector</b>	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
- ❑ 1 x "Commander" probe tip (switchable by means of TEST key)
- ❑ 1 x test cable with shock-proof plug
- ❑ 1 x universal three-wire test cable (black, blue, green)
- ❑ 1 x set of probe tips (black, blue, green)
- ❑ 1 x set of alligator clips (black, blue, green)
- ❑ 1 x carrying strap
- ❑ 1 x RS 232-PS/2 interface cable
- ❑ 1 x USB interface cable
- ❑ 6 x rechargeable NiMH storage batteries of size AA
- ❑ 2 x batteries of size AAA
- ❑ 1 x charger
- ❑ 1 x CD-ROM with BENNING PC-WIN IT 130 logging software and detailed operating manual in PDF format
- ❑ 1 x printed brief operating manual
- ❑ 1 x calibration certificate






## 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.
	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.
	Result(s) can be stored.
	High electrical noise was detected during measurement. Results may be impaired.
	L and N are changed.
	<b>Warning!</b> High voltage is applied to the test terminals.
	<b>Warning!</b> 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.
	The test cable resistance for the low-impedance measurement / continuity test has 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 is broken.


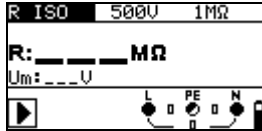




**Sound warnings**

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**

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

## 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 (10105455) 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 2 (044110), 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 sate/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 PC software BENNING PC-Win IT 130 (included in the delivery) 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 Ni-MH 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 Ni-MH 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*

### Fuses

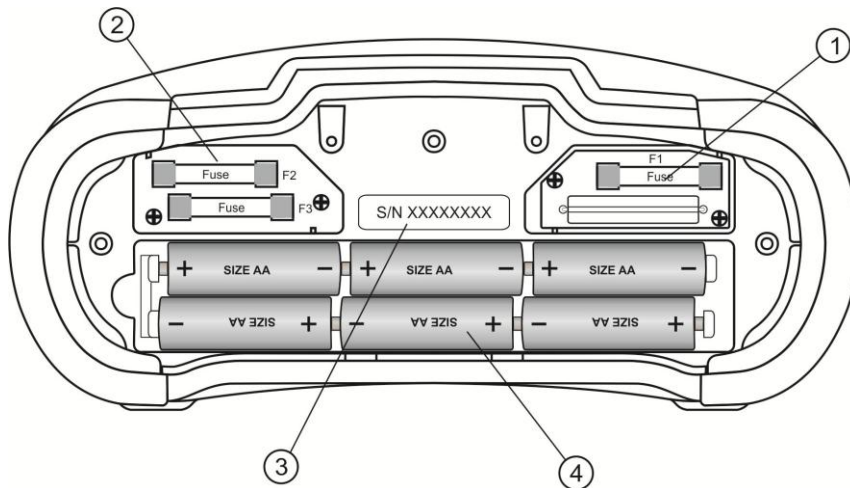
#### Warning:



- ❑ 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!
- ❑ Replace the fuses removed with new fuses of exactly the same fuse type. An incorrect fuse might affect the safety of the user and / or damage the tester.

There are three fuses under back cover of the BENNING IT 130 instrument.

- ❑ **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.
- ❑ **F2, F3**  
F 4 A / 500 V, 32×6,3 mm (breaking capacity: 50 kA)  
General input protection fuses of test terminals L/L1 and N/L2.



Legend:

1	<b>Fuse F1</b>	M 315 mA / 250 V
2	<b>Fuses F2 and F3</b>	F 4 A / 500 V (breaking capacity 50 kA)
3	<b>Serial number label</b>	
4	<b>Storage batteries/ batteries</b>	Size AA, rechargeable NiMH / alkaline quantity: 6 pieces

## 1.10 Calibration and Service

### Calibration








To maintain accuracy of the measuring results, the device must be recalibrated in regular intervals by our factory service. We recommend recalibrating the device once a year. In case of need, please contact our service.

### Service

Please do not hesitate to contact our specialists for any further information.  
 BENNING Elektrotechnik & Elektronik GmbH & Co KG  
 Robert-Bosch-Str. 20  
 D - 46397 Bocholt  
 Internet: [www.benning.de](http://www.benning.de)

BENNING Helpdesk phone no.: +49 (0) 2871 - 93 - 555

### 1.11 Optional accessories

<p><b>Earthing set</b>                  Earthing set consisting of 2 earth rods and 3 test cables                  2 x L = 20 m, 1 x L = 4.5 m                  item no.: 044113</p>	
<p><b>Current clamp adapter</b>  <b>BENNING CC 1</b>, 1 A - 400 A AC                  output: 1 mV per 1 A                  item no.: 044037  <b>BENNING CC 2</b>, 0.5 A - 20 A AC                  output: 1 mA per 1 A                  item no.: 044110  <b>BENNING CC 3</b>, 0.2 A - 300 A AC/DC                  output: 1 mV/10 mV per 1 A                  item no.: 044038</p>	
<p><b>Luminous intensity sensor</b>  <b>BENNING luxmeter type B</b>                  item no.: 044111                  For the planning and installation of interior and exterior lighting</p>	
<p><b>"Commander" test plug</b>                  For shock-proof socket, switchable with "TEST" and "MEM" keys, with "PASS" / "FAIL" indication by means of green/red LED, PE contact electrode for detecting a phase voltage at the protective conductor connection (PE)                  item no.: 044149</p>	
<p><b>CEE measuring adapter</b>                  16 A, 5-pin, for measuring the voltage and phase sequence (rotary field) at 16 A CEE sockets                  item no.: 044148</p>	
<p><b>40 m Measurement cable</b>                  40 m measurement cable with winder and strap, for the measurement of protective conductors                  item no.: 044039</p>	
<p><b>Barcode scanner</b>                  Barcode scanner with PS/2 interface for identifying the measuring point and renaming the storage location                  item no.: 009371</p>	

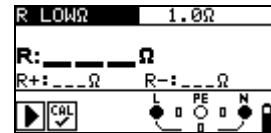
## 2 Measurements

### 2.1 Null balance (compensation) of the test cables

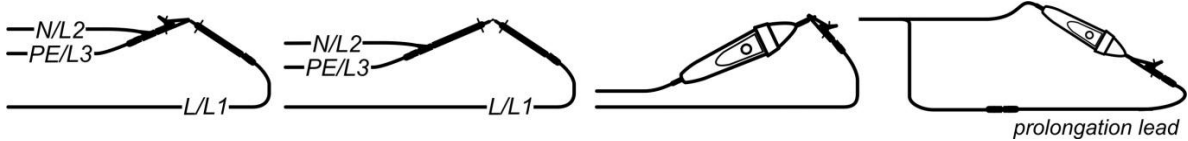
#### 1. Set function



Select R LOW  $\Omega$  or CONTINUITY.



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  $\Omega$  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

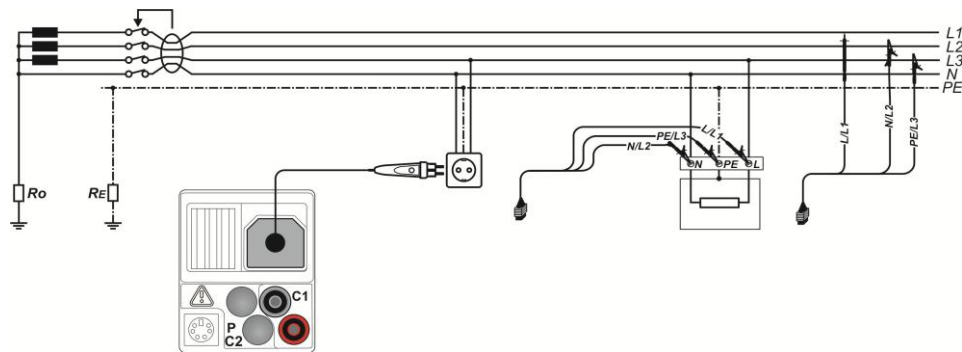
Resistance of the test cables after compensation

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

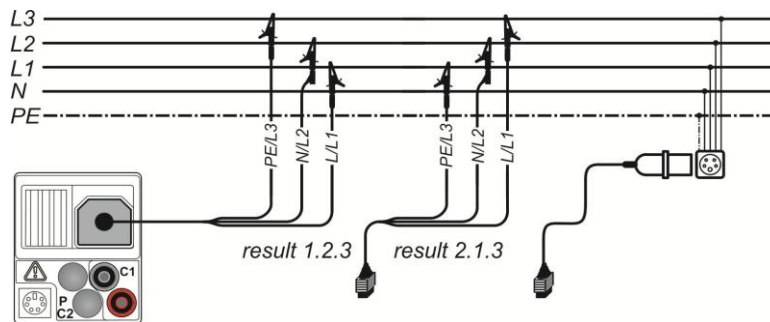
### 1. Set function



### 2. Connection diagrams

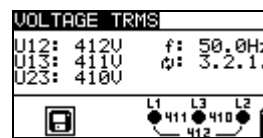
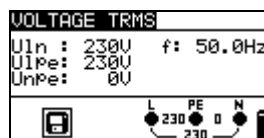


Connection of plug "Commander" (optional) and 3-wire test lead in single-phase system



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



#### 2. Set parameters and limits.

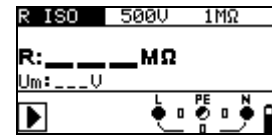


##### Test voltage

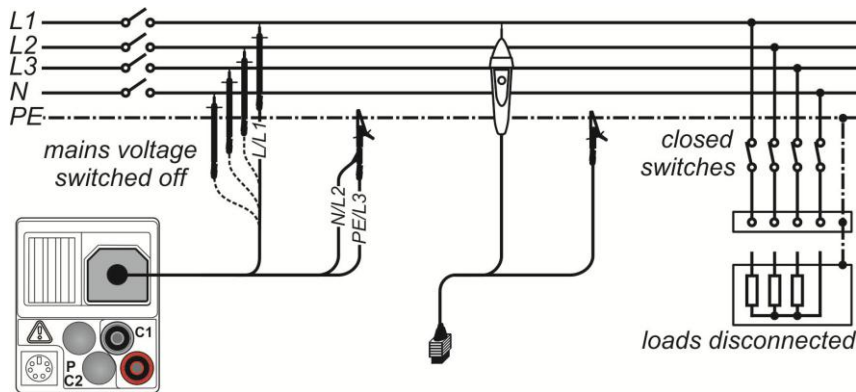
[50 V, 100 V, 250 V, 500 V, 1000 V]

##### Minimum limiting value

[without (---), 0.01 MΩ ÷ 200 MΩ]



#### 3. Connection diagrams



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

#### 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.



R .....Insulation resistance

Um .....Test voltage (actual value)



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

### 1. Set function



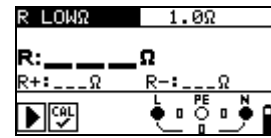
### 2. Set sub-function and limit.



**R LOW**  $\Omega$  low-impedance resistance (testing current > 200 mA) or **CONTINUITY** (testing current < 8.5 mA)

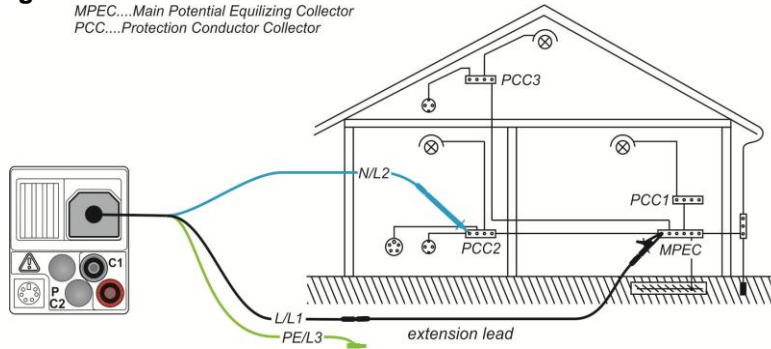
**Maximum limiting value**  
[without (---), 0.1  $\Omega$  ÷ 20.0  $\Omega$ ]

**Buzzer** [ON/OFF] only for CONTINUITY function

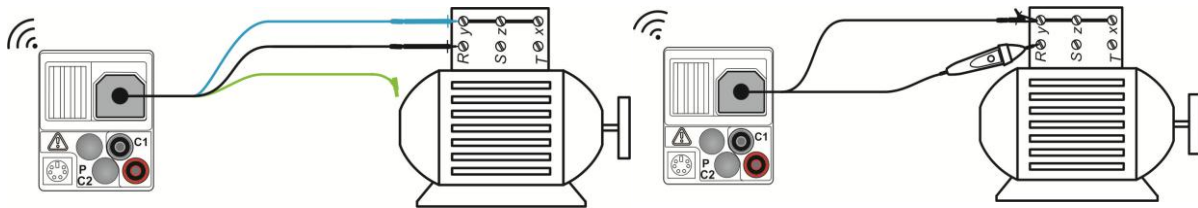


### 3. Connection diagrams

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 tip "Commander"

### 4.a R LOW $\Omega$ low impedance



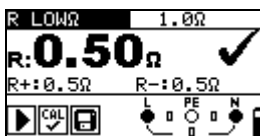
Press the key **TEST**.

### 4.b CONTINUITY:

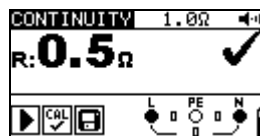


Press the key **TEST** to begin performing a continuous measurement.  
Press the key **TEST** again to stop measurement.

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



R ..... R LOW  $\Omega$   
R+ ..... Result at positive polarity  
R- ..... Result at negative polarity



R ..... CONTINUITY resistance



## 2.6 Loop impedance ( $Z_{S L-PE}$ )

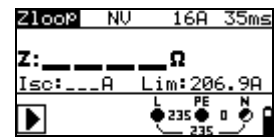
### 1. Set function



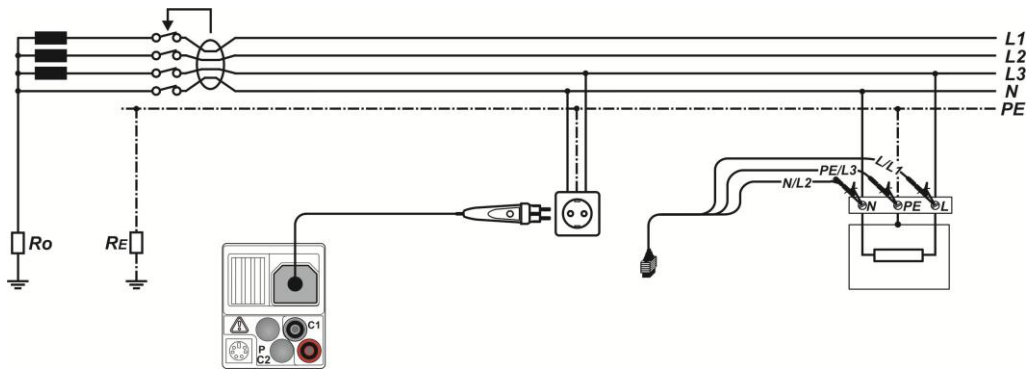
### 2. Set sub-function, parameters and limits.



Loop impedance:  
**Zs** (for systems without RCD)  
**Zs rcd** (for systems with RCD)  
**Fuse type** [---, gL/gG, gG, B, C, K, D]  
**Nominal current** of the fuse  
**Tripping time** of the fuse



### 3. Connection diagrams

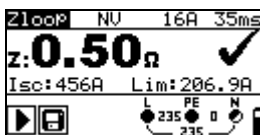


Connecting the plug "Commander" (044149) and the 3-wire test lead

### 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 ( $Z_{L-N/L}$ )

**1. Set function**



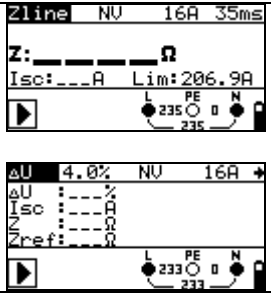
**Z<sub>L</sub>**

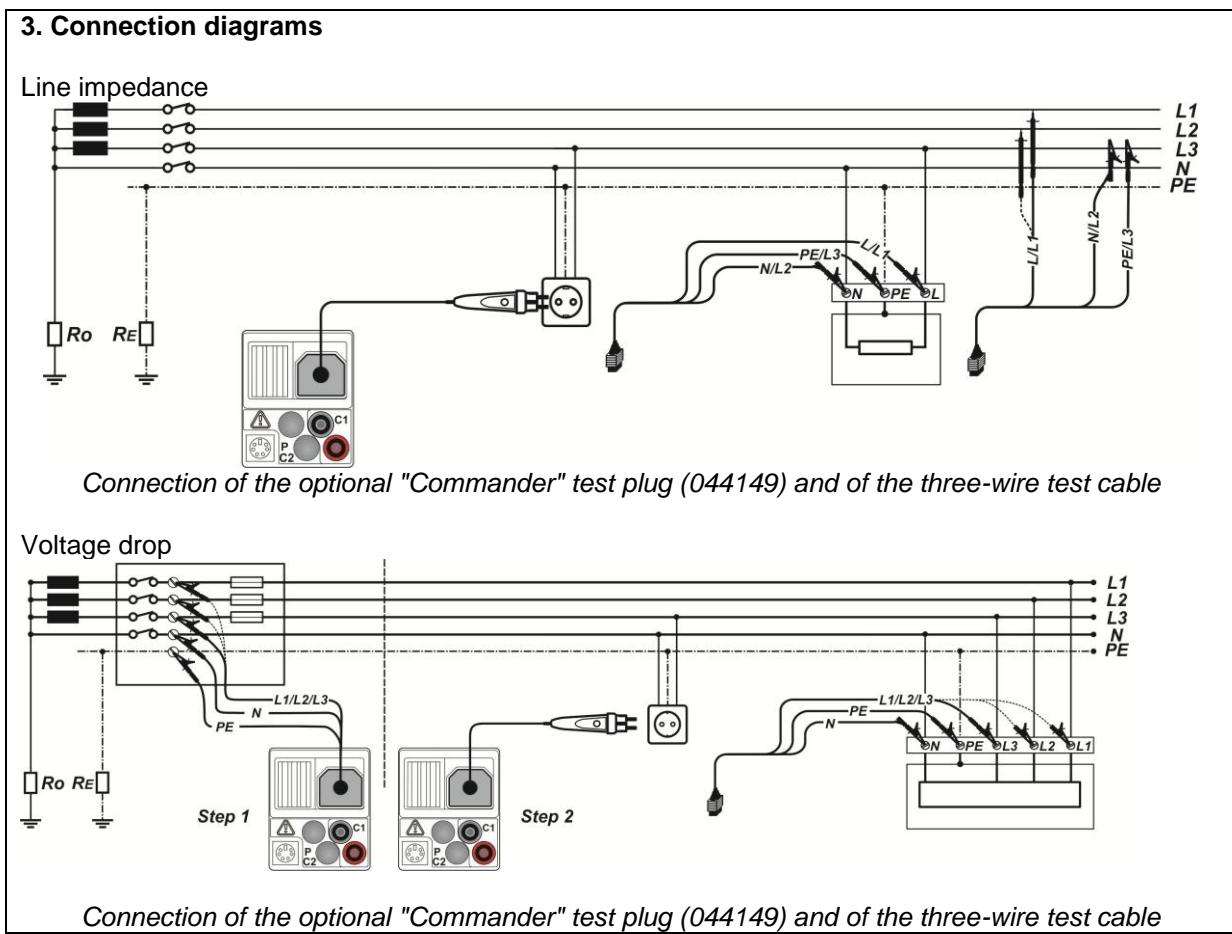
**2. Set sub-function, parameters and limits.**

**Z** Line Line impedance  
**ΔU** Voltage drop


**Fuse type**  
 [---, gL/gG, gG, B, C, K, D]  
**Nominal current of the fuse**  
**Turn-off time of the fuse**  
**Maximum voltage drop** [3,0 % ÷ 9,0 %]



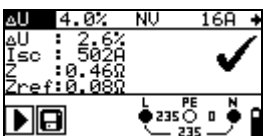


**4. Press the key** 

**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 ( $R_E$ )

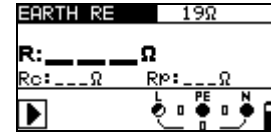
### 1. Set function



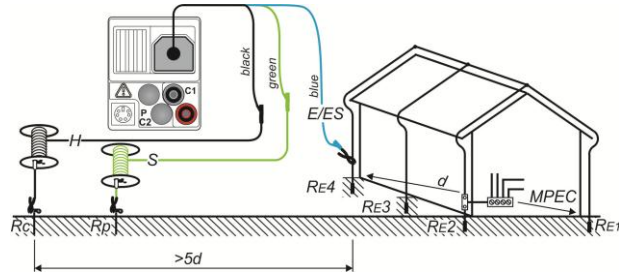
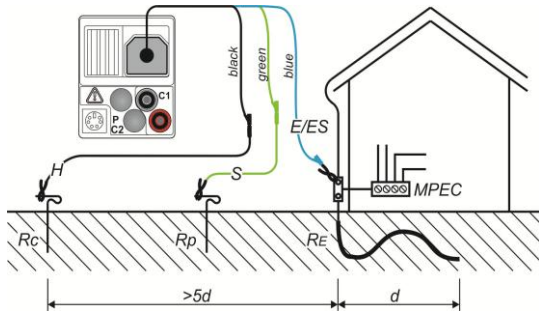
### 2. Set limits.



**ERDE RE Earth resistance**  
**Maximum limiting value**  
 [without,  $1 \Omega \div 5 \text{ k}\Omega$ ]



### 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.



**R** ..... Earth resistance

**Rp** .... Probe resistance of the S probe (potential)

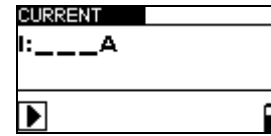
**Rc** .... Auxiliary earth electrode resistance of the H probe (current)

## 2.9 Current (A AC/DC)

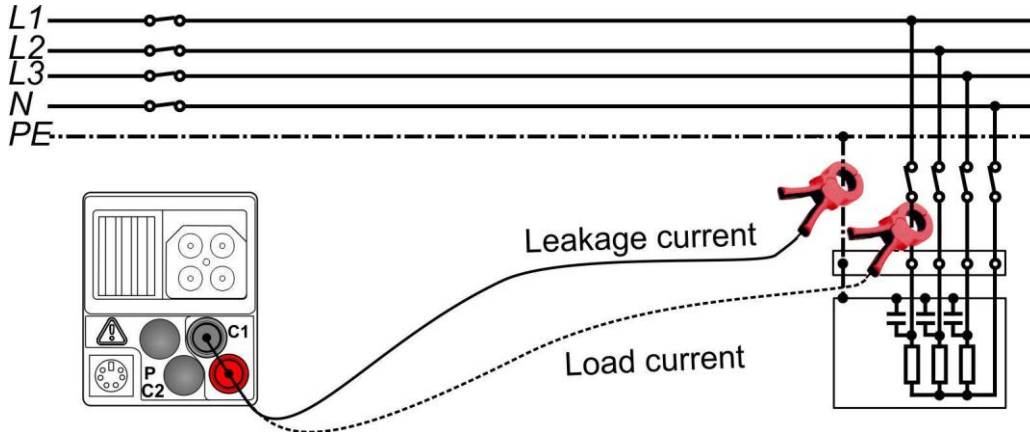
### 1. Set function



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



### 2. Connection diagrams

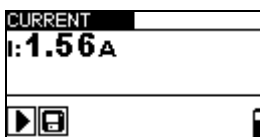


Connection of the optional current clamp adapter BENNING CC 1 (044037), BENNING CC 2 (044110), BENNING CC 3 (044038)

### 4. Press the key



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



I..... Current

## 2.10 Luminous intensity (LUX)

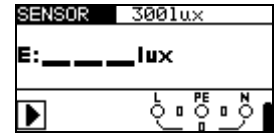
### 1. Set function



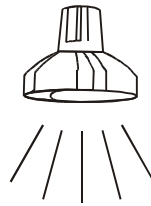
### 2. Set limit.



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.



E ..... Luminous intensity

## 2.11 First fault current ( $R_{ISO}$ ) in IT supply system (ISFL)

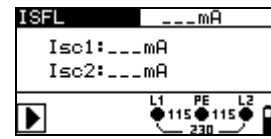
### 1. Set function



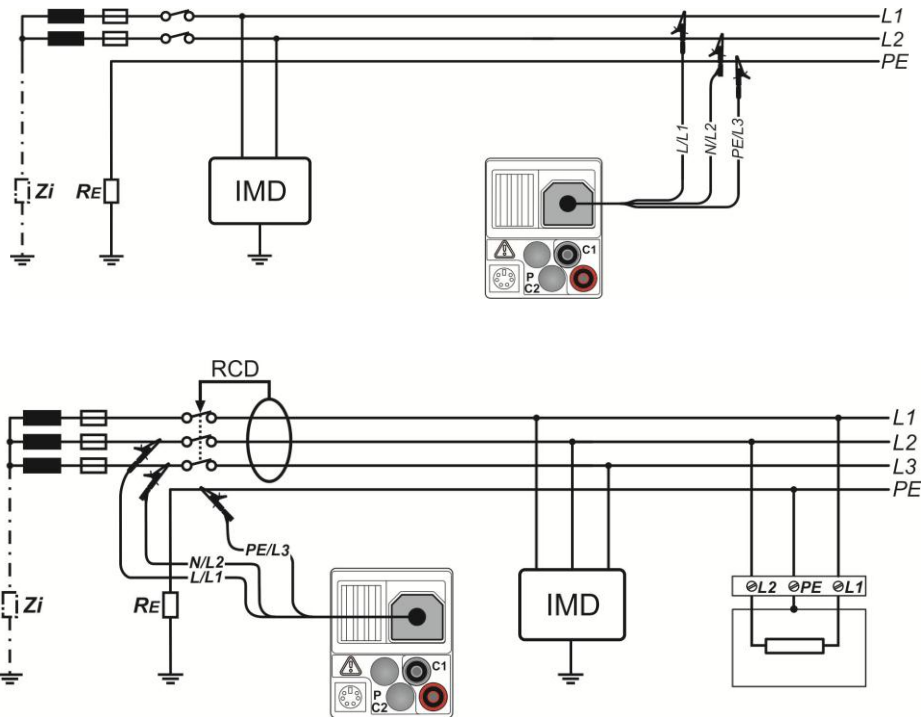
### 2. Set sub-function and limit.



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



### 3. Connection diagrams

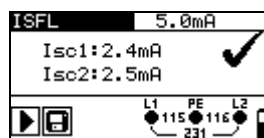


Connection of the three-wire test cable

### 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