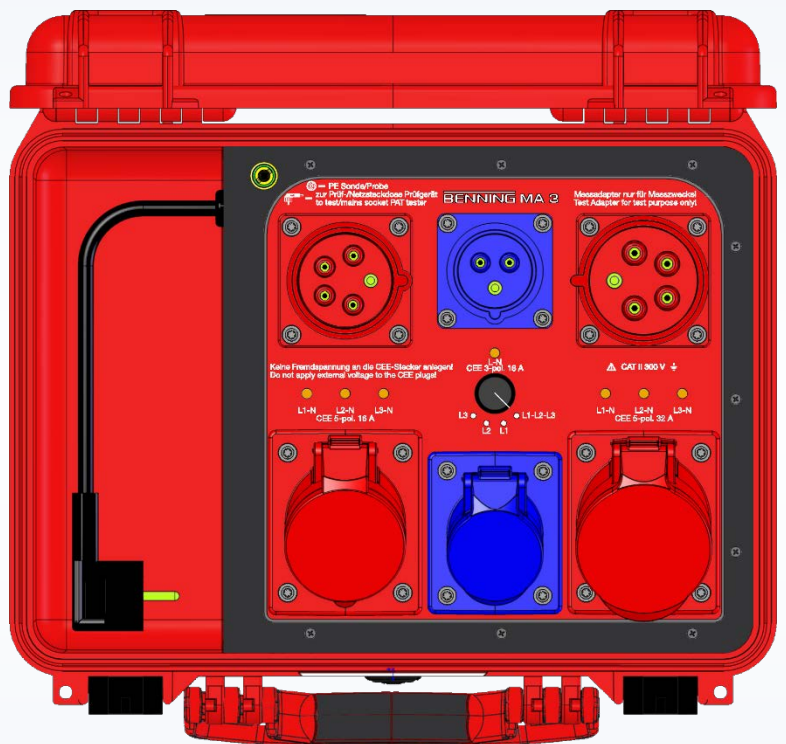


BENNING MA 3

CEE-Messadapter 5-/ 3-polig

Operating manual

Translated version (English)



5076 en
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1. Application

The **BENNING MA 3** measuring adapter helps you to test portable devices. Due to its robust design, it is particularly suited for being used in industrial environments. The **BENNING MA 3** measuring adapter is easy to use and thus allows the user to work efficiently and quickly.

You can test devices and extension cables being provided with the following connectors complying with **IEC 60309-1**. CEE connector:

- 16 A, 50 Hz to 60 Hz, 230 V, L+N+PE, 6h
- 16 A, 50 Hz to 60 Hz, 380 V to 415 V, 3L+N+PE, 6h
- 32 A, 50 Hz to 60 Hz, 380 V to 415 V, 3L+N+PE, 6h

To do this, connect the **BENNING MA 3** measuring adapter to an appliance tester for testing portable devices according to:

DIN VDE 0701-0702, DIN EN 62353 (VDE 0751-1) or DIN EN 60974-4 (VDE 0544-4).

For connection of the measuring adapter, the appliance tester must be equipped with a shock-proof socket.

The **BENNING MA 3** measuring adapter is suited to be connected to the following appliance testers:

- **BENNING ST 725**
- **BENNING ST 750/ ST 750 A**
- **BENNING ST 755 and BENNING ST 760**

The measuring adapter can be used for the following tests:

- Protective conductor resistance (**RPE**)
- Insulating resistance (**R_{Insu}**)
- Functional test and phase sequence test of cables
- Alternative leakage current:
e. g. **IPE** (protective conductor current), **I_{Cont}** (contact current), **I_{Leak}** (device leakage current), **I_{PLeak}** (patient leakage current)

The manufacturers' specifications or normative restrictions with regard to alternative leakage current testing must be adhered to.



To do this, thoroughly read the notes stated in the corresponding standard, in the manufacturers' specifications of the test sample and in the operating manual of the appliance tester.

2. Safety notes and precautions

2.1. Basic information on safety

The **BENNING MA 3** measuring adapter has been designed and tested in compliance with the safety requirements according to **IEC/ EN 61010-1/ VDE 0411-1**.

All electrically conductive parts of the housing are connected to the protective conductor system (according to **IEC 61140, protection class I**).

The measuring adapter must be used only for testing in environments of measuring category **CAT II** according to **IEC/ EN 61010-1**.

Make sure not to connect and test more than one test sample or one extension cable at a time.

In case of proper use according to the specifications, the safety of both the user and the device is ensured.

Please read the operating manual of the **BENNING MA 3** and the operating manual of the appliance tester carefully and thoroughly before using the product. Please observe all instructions of the relevant operating manuals.

The measuring adapter must not be used:

- with the housing being open,
- in case of visible external damage,
- in case of damage of the CEE connectors, CEE sockets, connecting line or connector,
- in case of strong excessive strain or if the load limits stated in the technical data have been exceeded,
- if the device has been stored under unfavourable conditions for a longer period of time (high exposure to dust, moisture or excessive temperatures).

Non-observance might involve damaging or destruction of the **BENNING MA 3** measuring adapter and/or of the connected test sample!

2.2. Symbols used



Attention! Danger! Please observe documentation!



Warning of dangerous voltage!



Note to be observed imperatively.

CAT II

Device of measuring category II (max. 300 V)



Ground (voltage against ground).



This symbol on the measuring adapter means that the measuring adapter complies with the relevant EU directives.



The device must not be disposed of via the domestic waste. Further information regarding the WEEE mark can be accessed on the Internet by entering the search term "WEEE".



Instructions

3. Inspection characteristics

All tests that can be carried out with your appliance tester for devices with shock-proof socket and that are supported by the **BENNING MA 3** measuring adapter can now be performed in an identical way for devices with CEE connector.

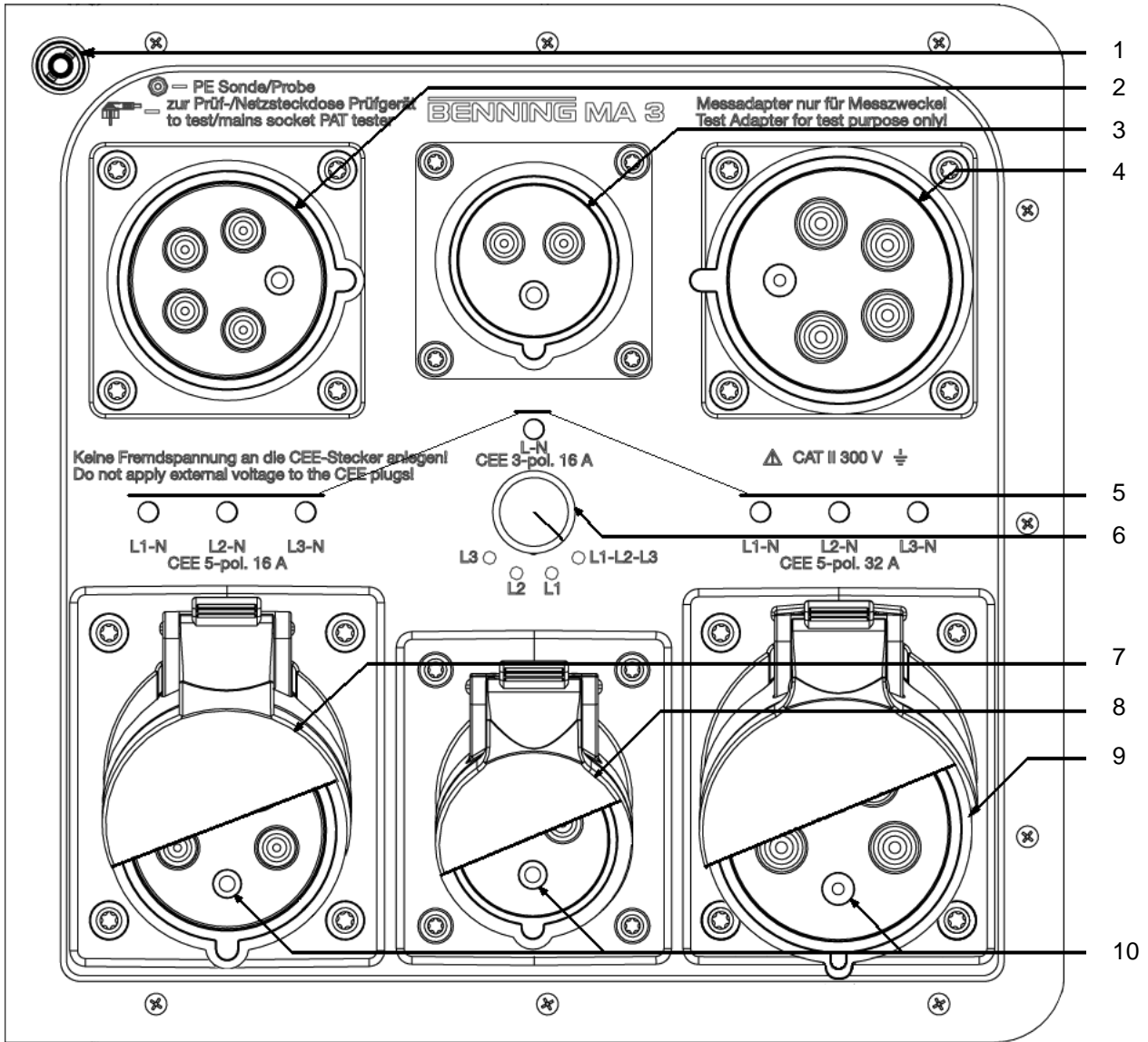
Please observe the following aspects during tests using your appliance tester:

- When testing the protective conductor resistance, the value of the measured protective conductor resistance increases by the share caused by the protective conductor line of the **BENNING MA 3** measuring adapter.

In case of measuring results near the admissible limiting value, measure the protective conductor resistance of the measuring adapter at the PE connection of its CEE socket and subtract it from the total measuring value of the system.

- During insulating resistance or alternative leakage current tests, the three phases L1, L2, L3 and the neutral conductor N of the test sample are shorted.

4. Operating elements



Meaning	Pos.
PE socket for PE test probe (for RPE cable test)	1
CEE connector: 16 A, 50 Hz to 60 Hz, 380 V to 415 V, 3L+N+PE, 6h	2
CEE connector: 16 A, 50 Hz to 60 Hz, 230 V, L+N+PE, 6h	3
CEE connector: 32 A, 50 Hz to 60 Hz, 380 V to 415 V, 3L+N+PE; 6h	4
Status LED indications: CEE connector (3-pin/5-pin)	5
Rotary switch (for RIInsu test, alternative leakage current test, functional test and phase sequence test of cables)	6
CEE socket: 16 A, 50 Hz to 60 Hz, 380 V to 415 V, 3L+N+PE, 6h	7
CEE socket: 16 A, 50 Hz to 60 Hz, 230 V, L+N+PE, 6h	8
CEE socket: 32 A, 50 Hz to 60 Hz, 380 V to 415 V, 3L+N+PE; 6h	9
PE contacts, CEE socket	10

5. Connecting the BENNING MA 3

The **BENNING MA 3** measuring adapter is equipped with a PTC thermistor as short-circuit protection.



As the PTC thermistor limits the maximum current, it is not possible to carry out functional tests according to **VDE 0701-0702** with the **BENNING MA 3** measuring adapter.

Use the **BENNING MA 3** measuring adapter only for the intended tests described in this manual.

The manufacturers' specifications or normative restrictions with regard to all tests involved must be adhered to.



To do this, thoroughly read the notes stated in the corresponding standard, in the manufacturers' specifications of the test sample and in the operating manual of the appliance tester.

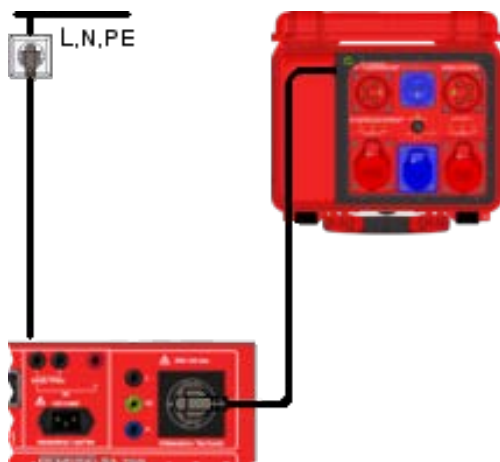
Before you can start testing, you have to connect the **BENNING MA 3** measuring adapter to your appliance tester.

To do this, proceed as follows:

- Make sure that the appliance tester you are using is ready for operation.
- Connect the shock-proof plug of the **BENNING MA 3** measuring adapter to the test socket of your appliance tester.

Connecting the BENNING MA 3

Connecting the BENNING MA 3 to the appliance tester



Connection diagram

6. Testing with the BENNING MA 3

6.1. Testing of three-phase devices



It is possible to test single-phase devices in the same way.

6.1.1. RPE – Protective conductor resistance

Before testing



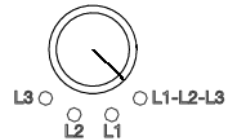
Disconnect the test sample from the mains supply!



The maximum testing current for RPE measurement is **10 A!**



The rotary switch of the **BENNING MA 3** can be used for RPE measurement in any locking position.



Before starting the test, determine the internal RPE resistance of the measuring adapter.

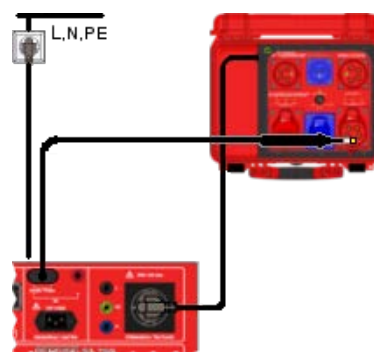
Internal RPE resistance of the measuring adapter

RPE – BENNING MA 3

- Start the RPE measurement on your appliance tester.
- Contact the test probe of the appliance tester with the PE contact (pos. 10, chapter 4 “Operating elements”) of the corresponding CEE socket (see figure below “RPE-BENNING MA 3”).
- Write down the measured RPE value.
- Follow the test procedure **Class I, RPE** for “portable test samples”.

RPE – BENNING MA 3 (e. g. CEE 5-pin, 32 A)

Setup for measuring the internal RPE resistance of the MA 3



Connection diagram



Detailed view

Test procedure VDE 0701-0702

Class I; RPE

Portable test sample

- Connect the CEE connector of the test sample to the corresponding CEE socket of the **BENNING MA 3** measuring adapter.
- Start the **RPE** measurement on your appliance tester.
- Use the test probe to scan all accessible conductive parts of the test sample that are connected to the protective conductor.
- Read the **RPE** measuring result shown on the display of the appliance tester.
- Subtract the measured **RPE** value of the **BENNING MA 3** from the **RPE** measuring result of the test sample.

As a result, you will obtain the measured **RPE** value of the test sample.

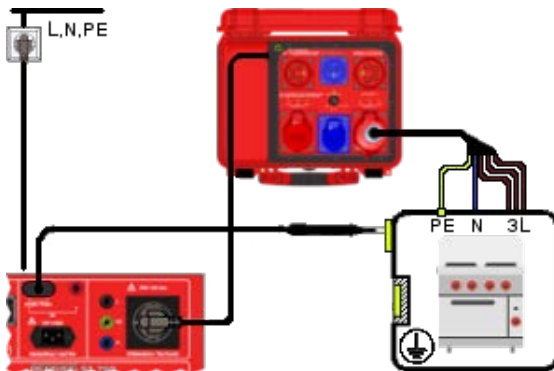
- Edit the measured **RPE** value in the appliance tester according to the calculated measuring value.

*The manufacturer recommends to write down the known measured **RPE** values of all CEE connections of the **BENNING MA 3** for future measurements and add them to the measuring adapter.*

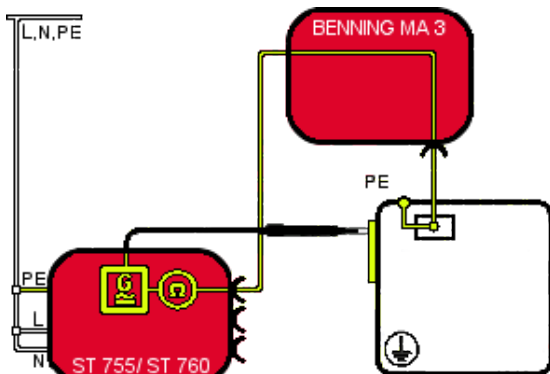
Application

Class I; RPE

Portable test sample



Connection diagram



Circuit diagram

6.1.2. Rlnsu – Insulating resistance

Before testing



Disconnect the test sample from the mains supply.



Switch the rotary switch of the **BENNING MA 3** to the locking position “**L1-L2-L3**”.



○ L1-L2-L3

Test procedure VDE 0701-0702

Class I; Rlnsu

Portable test sample

- Connect the CEE connector of the test sample to the CEE socket of the **BENNING MA 3**.
- Start the **Rlnsu** measurement on your appliance tester.
- Contact the test probe(s) of the appliance tester with all necessary measuring points (depending on the **Rlnsu** test sample).

As a result, you will obtain the measured **Rlnsu** value of the test sample.

Insulation faults



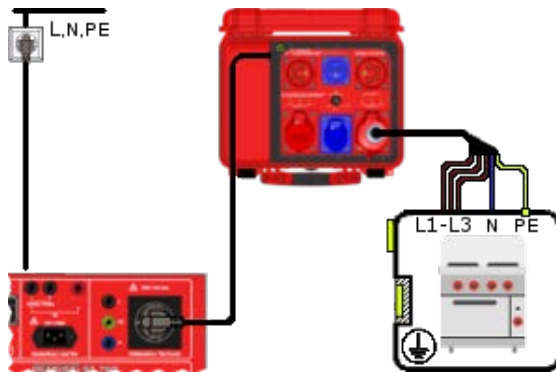
In case of an insulation fault, i. e. if the value falls below the admissible insulation resistance, you can determine the external conductor at which the insulation fault occurs by changing the position of the rotary switch.

- To do this, successively turn the rotary switch to the positions “**L1**”, “**L2**” and “**L3**” while observing the measured values displayed on the appliance tester.
 1. If the measured insulating resistance is within the admissible limits, the selected external conductor is not defective.
 2. If the measured insulating resistance is outside the admissible limits, the selected external conductor or neutral conductor is defective.
 3. If a fault occurs in every locking position of the rotary switch, the neutral conductor is affected.

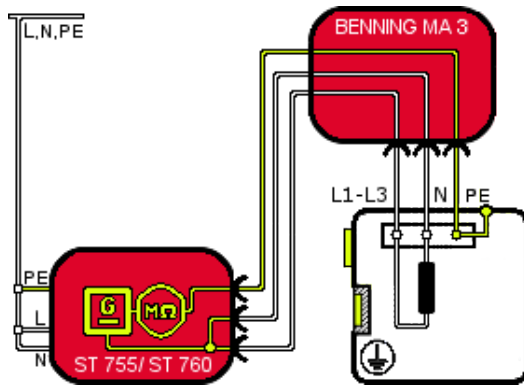
Application

Class I; Rlnsu; LN to PE

Portable test sample



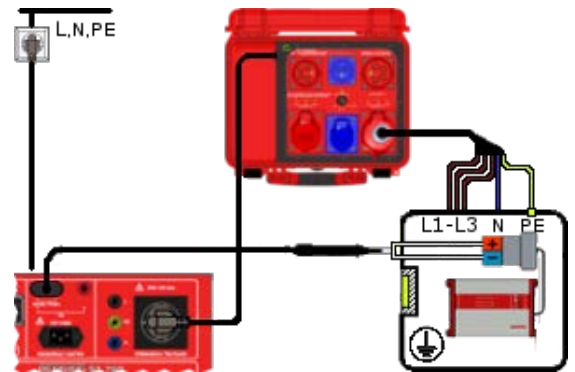
Connection diagram



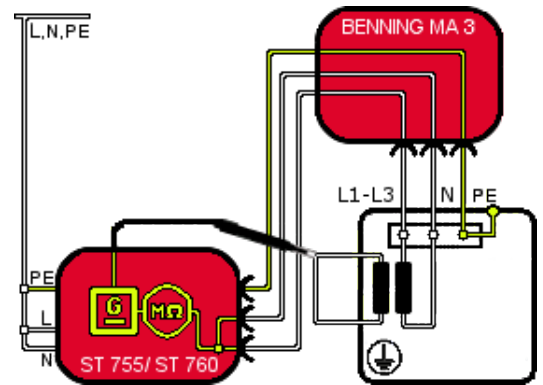
Circuit diagram

Class I; Rlnsu; LN to secondary

Portable test sample



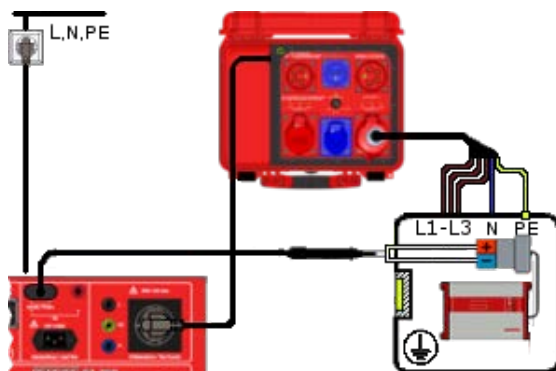
Connection diagram



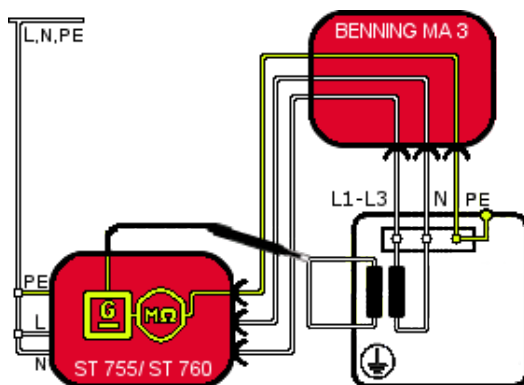
Circuit diagram

Class I; Rlnsu; secondary to PE

Portable test sample



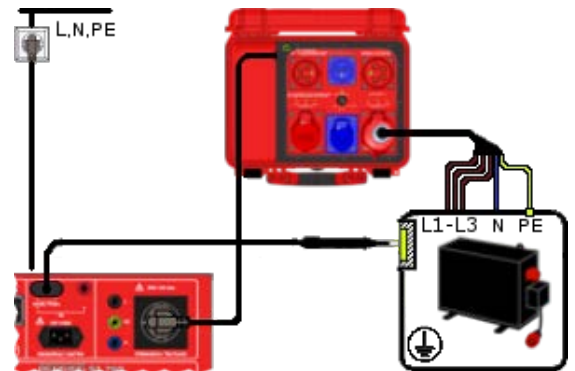
Connection diagram



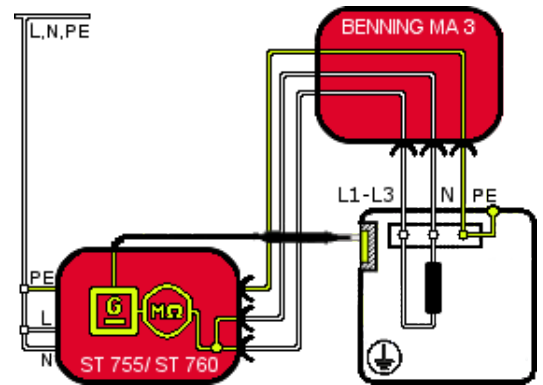
Circuit diagram

Class I; Rlnsu; LN to accessible conductive parts without PE

Portable test sample



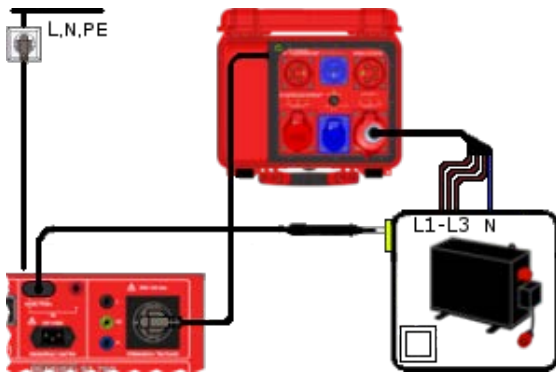
Connection diagram



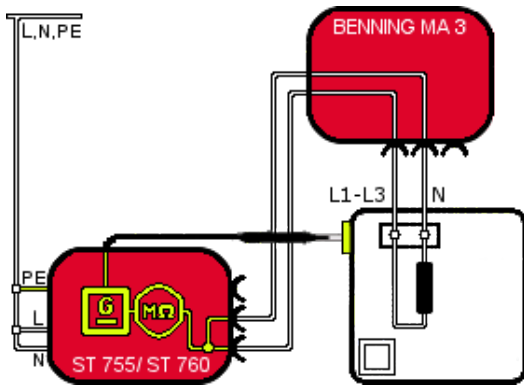
Circuit diagram

Class II; RInsu; LN to bodies

Portable test sample



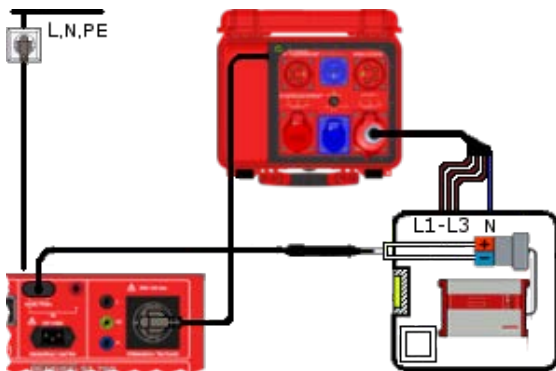
Connection diagram



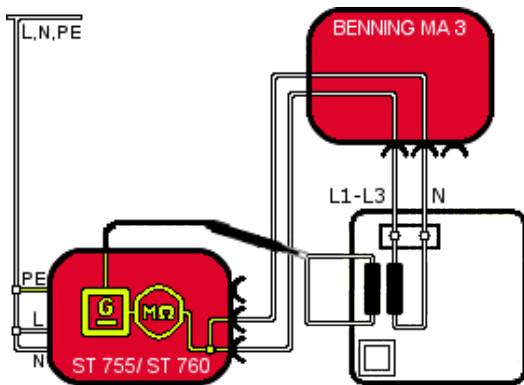
Circuit diagram

Class II; RInsu; LN to secondary

Portable test sample



Connection diagram



Circuit diagram

6.1.3. Alternative leakage current measurements

The **BENNING MA 3** can be used for measuring the following leakage or fault currents by means of the alternative leakage current measurement method, provided that the test is supported by the connected appliance tester:

- **IPE** – protective conductor current
- **ICont** – contact current
- **ILeak** – device leakage current
- **IPLeak** – patient leakage current

Before testing



Disconnect the test sample from the mains supply.



Switch the rotary switch of the **BENNING MA 3** to the locking position "L1-L2-L3".



○ L1-L2-L3

Test procedure VDE 0701-0702

Class I; IPE

Portable test sample

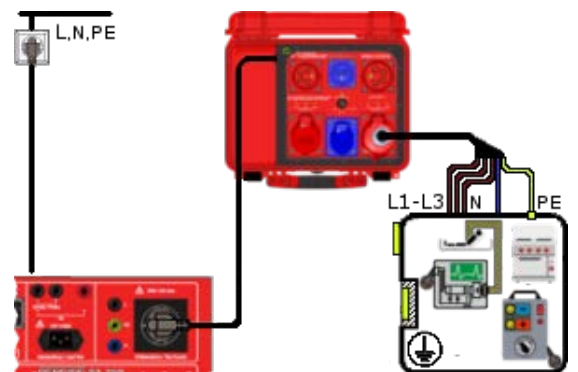
- Connect the CEE connector of the test sample to the CEE socket of the **BENNING MA 3**.
- Start the **IPE** measurement on your appliance tester.

As a result, you will obtain the measured **IPE** value of the test sample.

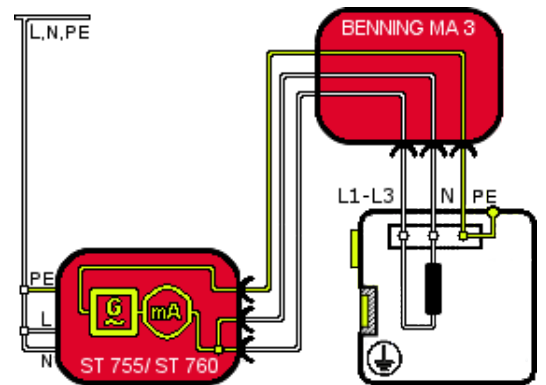
Application

Class I; IPE – protective conductor current

Portable test sample



Connection diagram



Circuit diagram

Test procedure VDE 0701-0702

Class I; ICont – contact current

Portable test sample

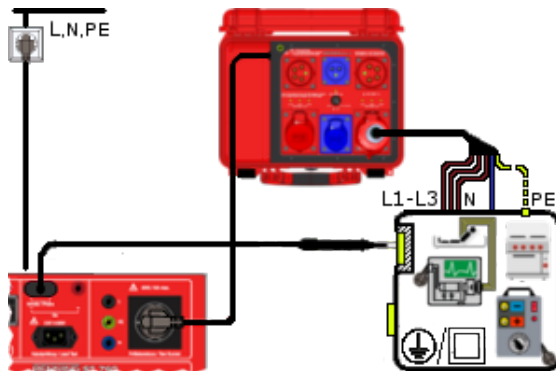
- Connect the CEE connector of the test sample to the CEE socket of the **BENNING MA 3**.
- Start the **ICont** measurement on your appliance tester.
- Contact the test probe(s) of the appliance tester with all necessary measuring points

As a result, you will obtain the measured **ICont** value of the test sample.

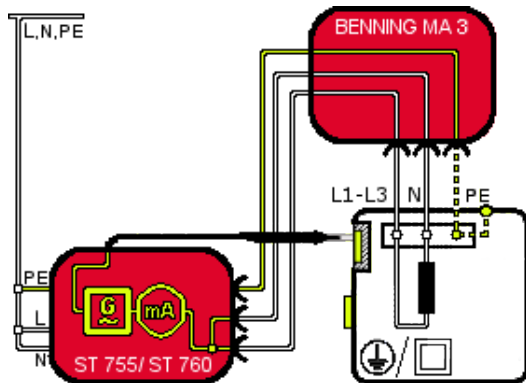
Application

Class I; ICont – contact current

Portable test sample



Connection diagram



Circuit diagram

The contact current is determined for devices of **protection class II** that raise concerns as to an **RInsu** measurement. Moreover, it is checked to prove the proper insulation capacity under mains voltage. This also applies to devices of **protection class I** with accessible conductive parts which are not connected to the protective conductor.

Test procedure VDE 0751-1

Class I; ILeak – device leakage current

Portable test sample

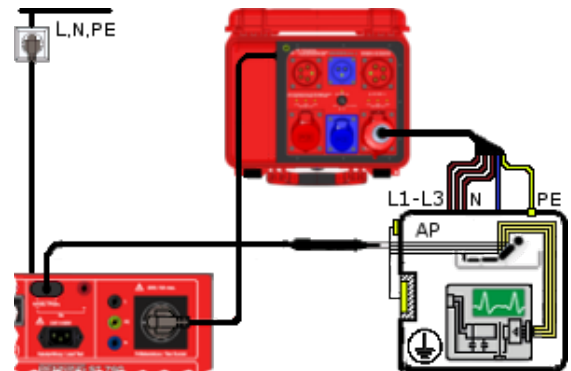
- Connect the CEE connector of the test sample to the CEE socket of the **BENNING MA 3**.
- Start the **ILeak** measurement on your appliance tester.
- Contact the test probe(s) of the appliance tester with all necessary measuring points

As a result, you will obtain the measured **ILeak** value of the test sample.

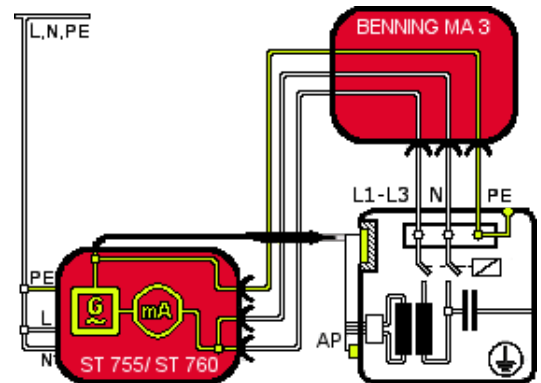
Application

Class I; ILeak – device leakage current

Portable test sample



Connection diagram



Circuit diagram

Test procedure VDE 0751-1

Class I; IPLeak – patient leakage current

Portable test sample

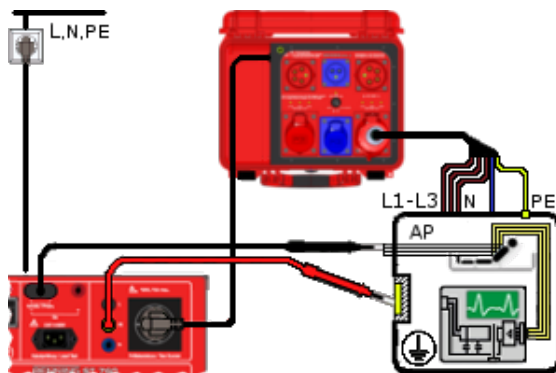
- Connect the CEE connector of the test sample to the CEE socket of the **BENNING MA 3**.
- Start the **IPLeak** measurement on your appliance tester.
- Contact the test probe(s) of the appliance tester with all necessary measuring points

As a result, you will obtain the measured **IPLeak** value of the test sample.

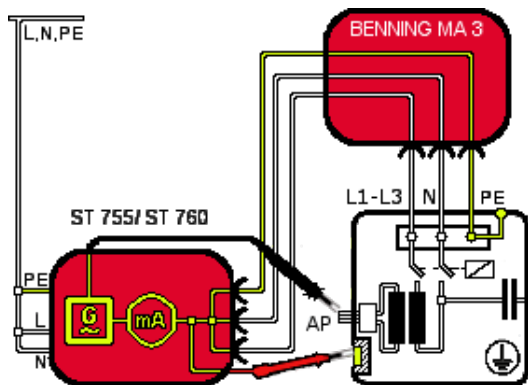
Application

Class I; IPLeak – patient leakage current

Portable test sample



Connection diagram



Circuit diagram

Test procedure VDE 0751-1

Class II; IPLeak – patient leakage current

Portable test sample

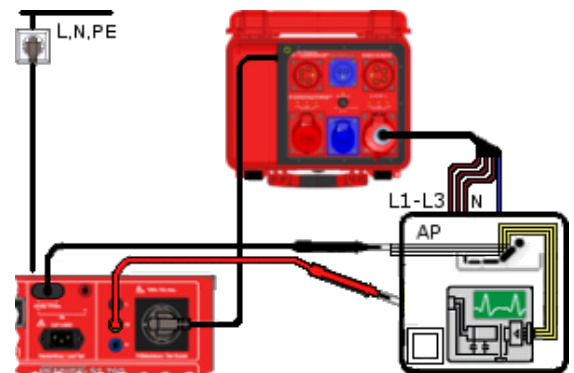
- Connect the CEE connector of the test sample to the CEE socket of the **BENNING MA 3**.
- Start the **IPLeak** measurement on your appliance tester.
- Contact the test probe(s) of the appliance tester with all necessary measuring points

As a result, you will obtain the measured **IPLeak** value of the test sample.

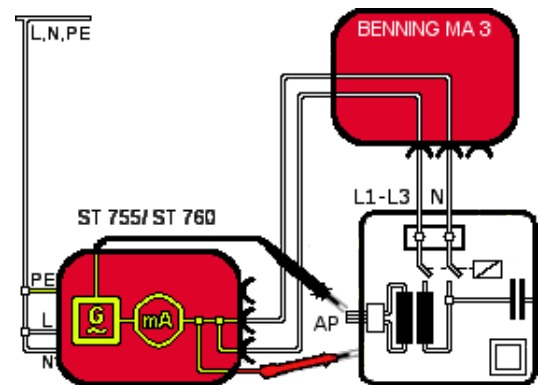
Application

Class II; IPLeak – patient leakage current

Portable test sample



Connection diagram



Circuit diagram

6.2. Testing of extension cables

6.2.1. RPE – Protective conductor resistance

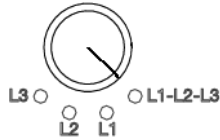
Before testing



The maximum testing current for RPE measurement is **10 A!**



The rotary switch of the **BENNING MA 3** can be used for **RPE** measurement in any locking position.



Before starting the test, determine the internal **RPE** resistance of the measuring adapter.

Internal RPE resistance of the measuring adapter

RPE – BENNING MA 3

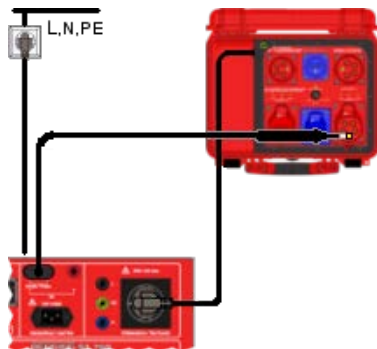
- Start the **RPE** measurement on your appliance tester.
- Contact the test probe of the appliance tester with the PE contact of the corresponding CEE socket (see figure “**RPE – BENNING MA 3**”).
- Write down the measured **RPE** value.
- Follow the test procedure **Class I, RPE** for “portable test samples”.



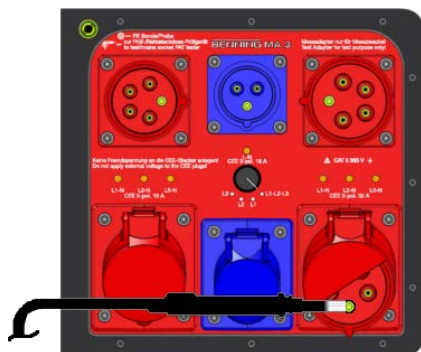
The manufacturer recommends to write down the known measured **RPE** values of all CEE connections of the **BENNING MA 3** for future measurements and add them to the measuring adapter.

RPE – BENNING MA 3 (e. g. CEE 5-pin, 32 A)

Setup for measuring the internal RPE resistance of the MA 3



Connection diagram



Detailed view

Test procedure VDE 0701-0702

Class I; RPE (e. g. CEE 5-pin, 32 A)

Cable test

- Connect both cable connections to the corresponding CEE sockets of the **BENNING MA 3**.
- Connect the test probe of your appliance tester to the PE socket (see pos. 1, chapter 4) of the **BENNING MA 3**.
- Start the **RPE** measurement on your appliance tester.
- Read the **RPE** measuring result shown on the display of the appliance tester.
- Subtract the measured **RPE** value of the **BENNING MA 3** from the **RPE** measuring result of the test sample.

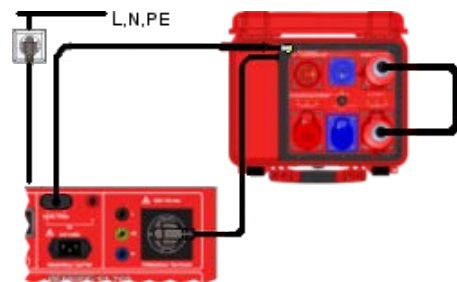
As a result, you will obtain the measured **RPE** value of the test sample.

- Edit the measured **RPE** value in the appliance tester according to the calculated measuring value.

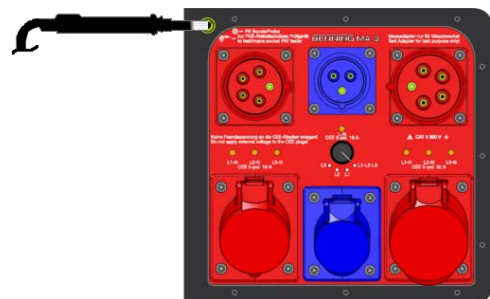
Application

Class I; RPE (e. g. CEE 5-pin, 32 A)

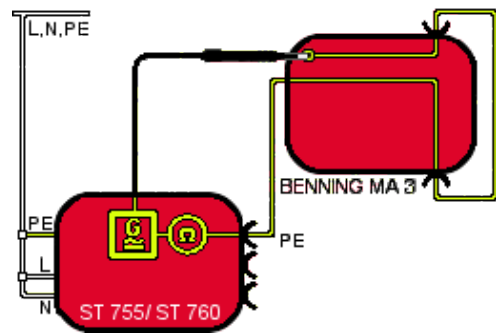
Cable test



Connection diagram



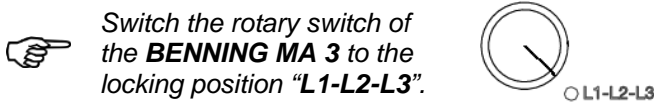
Detailed view



Circuit diagram

6.2.2. Rlnsu – Insulating resistance

Before testing



Test procedure VDE 0701-0702

Class I; Rlnsu

Cable test

- Connect both cable connections to the corresponding CEE connectors of the **BENNING MA 3**.
- Start the **Rlnsu** measurement on your appliance tester.

Insulation faults

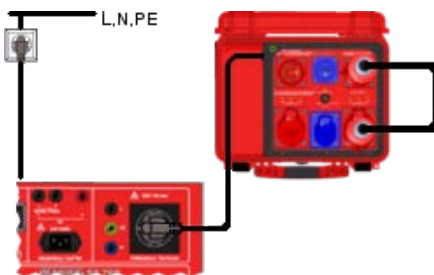
In case of an insulation fault, i. e. if the value falls below the admissible insulation resistance, you can determine the external conductor at which the insulation fault occurs by changing the position of the rotary switch.

- To do this, successively turn the rotary switch to the positions “L1”, “L2” and “L3” while observing the **Rlnsu** values displayed on the appliance tester.
1. If the measured insulating resistance is within the admissible limits, the selected external conductor is not defective.
 2. If the measured insulating resistance is outside the admissible limits, the selected external conductor or the neutral conductor is defective.
 3. If a fault occurs in every locking position of the rotary switch, the neutral conductor is affected.

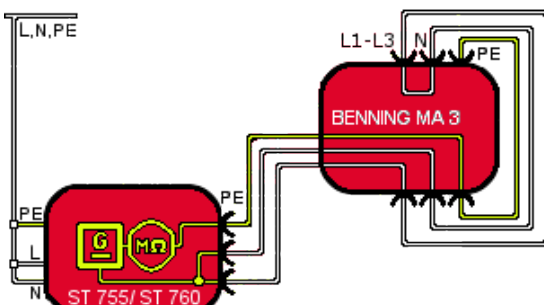
Application

Class I; Rlnsu; LN to PE

Cable test



Connection diagram



Circuit diagram

6.2.3. Functional test and phase sequence test of cables

Before testing

The functional test and phase sequence test of cables can be applied to CEE connecting cables and extension cables.

The **BENNING MA 3** measuring adapter is supplied with mains voltage.

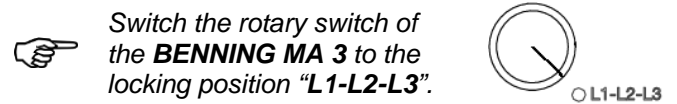
The functional test and phase sequence test of cables may only be carried out after the **RPE** and **Rlnsu** tests have been passed.

For single-phase connecting cables or extension cables (CEE socket, 3-pin), the rotary switch must be set to the locking position “L1” or “L1-L2-L3”.

Test procedure

Class I; functional test and phase sequence test of cables

Cable test



- Connect both cable connections to the corresponding CEE sockets of the **BENNING MA 3**.
- Switch the mains voltage to the test socket of the appliance tester.
- Observe the status LED display of the corresponding CEE socket.
- Compare the displayed LED status with the function table in chapter 8.
- Successively turn the rotary switch to the positions “L1”, “L2” and “L3”.
- Compare the respectively displayed LED status with the function table in chapter 8.

The LED display must show the status “pass” in any rotary switch position.

7. Function table

Rotary switch position	L1-N	L2-N	L3-N	Result
L1, L2, L3				L1, L2, L3 pass
				LN shorted or N interrupted
				L1 interrupted
				L2 interrupted
				L3 interrupted
L1				L1 pass
				L1-N shorted <u>or</u> L1 or N interrupted
				L1-L2 shorted
				L1-L3 shorted
L2				L2 pass
				L2-N shorted <u>or</u> L2 or N interrupted
				L1-L2 shorted
				L2-L3 shorted
L3				L3 pass
				L3-N shorted <u>or</u> L3 or N interrupted
				L1-L3 shorted
				L2-L3 shorted

Remarks concerning the function table



LED status = switched on



LED status = switched off

8. Technical data

Nominal voltage:	230 V ± 15 %; 50 Hz to 60 Hz
Protection class	Class I acc. to: IEC/ EN 61010-1
Measuring category	CAT II
Ambient conditions:	Height up to 2000 m above sea level
Temperature range:	
Operating temperature	0.0 °C to 35.0 °C
Storage temperature	-20.0 °C to 60.0 °C
Max. relative humidity:	
linearly decreasing	80.0 % at 30.0 °C
non-condensing	60.0 % at 40.0 °C
Protection category	IP 40 with the case being open IP 67 with the case being closed
Dimensions	W x D x H: 170 mm x 410 mm x 350 mm
Weight	4.2 kg

9. Maintenance

The **BENNING MA 3** measuring adapter does not require any special maintenance. Please make sure that the surface near the connector contacts is clean and dry. For cleaning, use a slightly moistened cloth. Do not use any cleaning agents, abrasives or solvents.

10. Warranty terms

The **BENNING MA 3** measuring adapter is subject to strict quality control. In case of faults with regard to correct functioning, we grant a manufacturer's warranty of 24 months. Manufacturing faults or material defects shall be eliminated by us free of charge as far as the device shows malfunction without external influence and is returned to us without having been opened. Damages caused by falls or incorrect use are excluded from warranty.

11. Service contacts

Spare parts management

Phone: +49 2871 93-553

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General service requests

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BENNING

Support / helpdesk

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