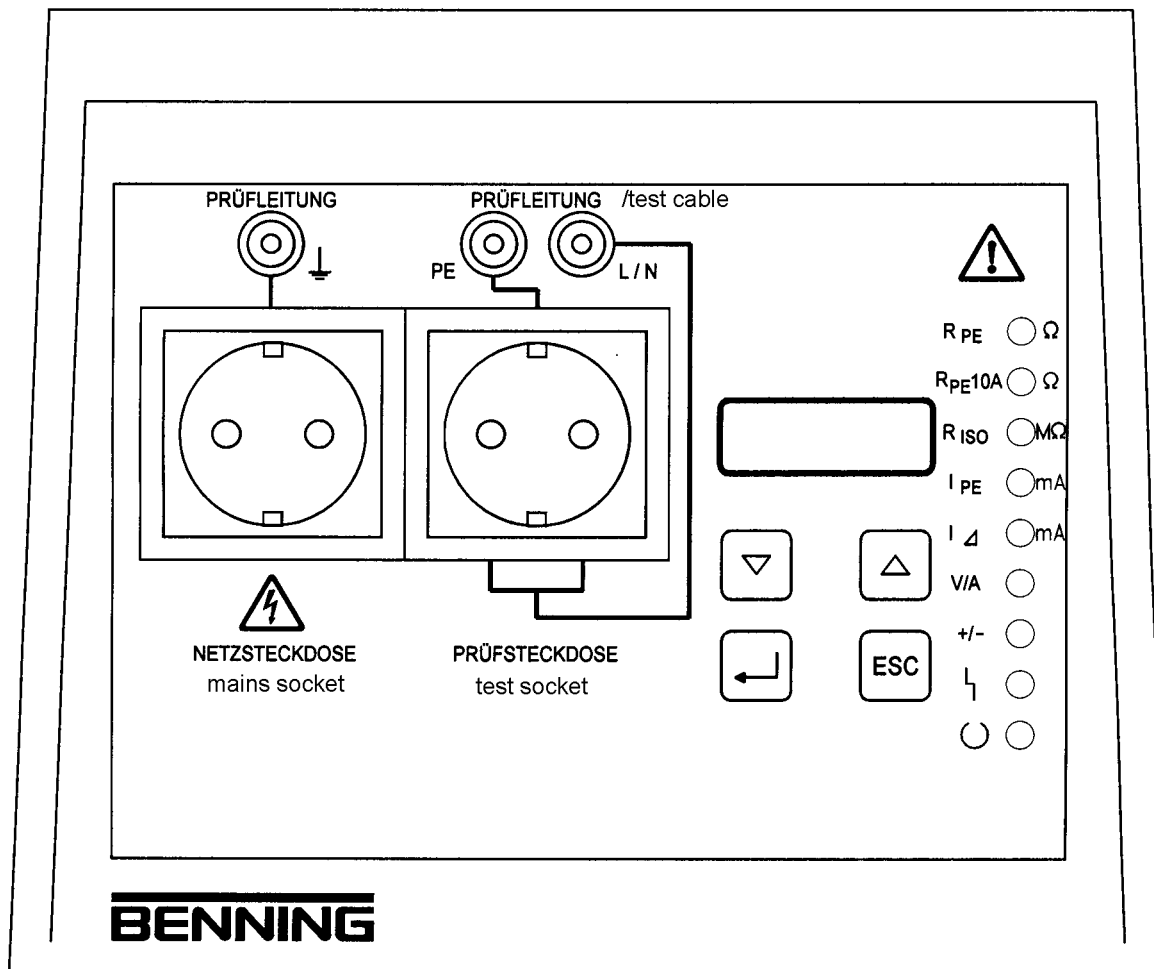


Portable appliance tester BENNING 700



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Preface

These operating instructions give essential information for the correct operation of the unit. To ensure the safe and correct operation of this unit, the user should study these instructions carefully. All the information contained therein has to be observed!

This avoids

- danger during operation
- danger to the operator
- downtime, and
- increases the reliability and life span of the portable appliance tester itself.

These instructions should be kept in a safe place for consultation!

Customer service

Should you require further information, the specialist staff of the supplier or the manufacturer will be pleased to assist you.

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1 Information for the user

1.1 Symbols marked on the unit

The international electrical symbols marked **on the portable appliance tester** have the following meanings:



Important, comply with documentation!



Warning, dangerous voltage



Earth



Operation



Switch OFF/ON



Fuse



Continuous double or reinforced insulation (protection class II)

For signs and symbols applying to the test procedure, see section 4.1

1.2 Symbols in the text

Certain **parts of the text in these instructions** are highlighted by the following symbols.



Constitutes a remark pointing out that observing it will facilitate working with the unit!



Indicates instructions which must be followed to avoid material damage.



Indicates instructions which must be followed to avoid danger to persons!

2 Safety notes

The portable appliance tester has been built and tested in accordance with the following standards:

DIN EN 61010-1 (VDE 0411 part 1)
DIN EN 61010-2-031 (VDE 0411 part 2-031)
DIN EN 61557-1 (VDE 0413 part 1)
DIN EN 61557-2 (VDE 0413 part 2)
DIN EN 61557-4 (VDE 0413 part 4)

and has left the manufacturer's plant in perfect condition with regard to safety.

To maintain this state and ensure safe operation of the portable appliance tester, the user must observe the notes and warnings given in these instructions at all times.

The unit meets category II. It may only be connected to a single-phase mains 230 V, 50Hz, series fuse 16A.



Remember that work on electrical components of all kinds is dangerous. Even low voltages of 30 V AC and 60 V DC may be dangerous to human life.

This portable appliance tester must only be used by qualified electricians or by „electrotechnically instructed persons“ supervised by a qualified electrician.

The portable appliance tester should be used only in dry interior rooms.



Before commissioning the portable appliance tester, always check it as well as all cables and wires for signs of damage.



Attention! During the insulation test, (R_{ISO}) dangerous levels of voltage may occur in the test object.

Should it appear that safe operation of the portable appliance tester is no longer possible, it should be shut down immediately and secured to prevent it being switched on accidentally.

It may be assumed that safe operation is no longer possible:

- if the portable appliance tester shows visible signs of damage,
- if the portable appliance tester no longer functions,
- after longer periods of storage under unfavourable conditions,
- after being subjected to rough transport.

The measuring voltages are monitored to protect the portable appliance tester and to test the functions. In case of a malfunction the error is indicated **Err** on the display. The measurement is interrupted. For a reset the test unit must be switched off.



To ensure that short circuits and body contacts are detected which are behind the switch elements (switch, thermostat, relay etc.), the test object must be switched on.

The portable appliance tester is not suited for measurements within electrical equipment!



Do not apply external voltage to the "test socket" and the parallel-connected sockets "PE" and "L/N" as this may cause damage to the portable appliance tester!

3 Introduction / description of function

For the safety check of electrical equipment after

- repair, change and test (DIN VDE 0701, 0701 T240)
- periodic tests on electrical equipment (DIN VDE 0702)

the test standard determines certain tests/ test methods and limit values.

DIN VDE 0702 only applies to periodic tests determining the electrical safety of electrical equipment which can be disconnected from the electrical system via a plug device.

This standard does not apply to periodic tests on electrical equipment firmly connected to the electrical system. Here the standards of the series DIN VDE 0105 (VDE 0105) apply.

Electrical equipment usually connected via a plug device, but for once firmly connected, should be tested according to the standard DIN VDE 0702.

For the test of a system it is also admissible to disconnect firmly connected units and to test these according to DIN VDE 0702.

According to the new regulation DIN VDE 0702 only a protective-conductor current measurement as a differential current measurement or direct measurement are admissible for three-phase units. For direct measurements the test object must be insulated. Since the ability to do this is limited the differential current measurement is preferred. A rotary current differential current measurement is not possible with the current configuration of the unit or can only be carried out in connection with the leakage current tongs at the present time. Then the measured results have to be recorded manually.

The tests have to be carried out by qualified electricians or electrotechnically instructed persons supervised by qualified electricians.

For tests with the warning note „High admissible earth fault current“ the test must only be performed by qualified electricians!

The necessity and intervals of periodic tests are laid down in the rules for the prevention of accidents BGV A3 (BGV A2 (VBG 4)) “Electrical Equipment and Machines”.

So § 5 BGV A3 (BGV A2 (VBG 4)) reads:

1. The operator must ensure that electrical equipment and machines are tested to ensure that they are in proper working condition:
 - prior to the initial commissioning and after each change or repair and prior to the restart by a qualified electrician or under the supervision of a qualified electrician.
 - at regular intervals. The intervals must be fixed to ensure that any anticipated deficiencies are detected in time.
2. During the test, all relevant technical regulations must be strictly observed. If required by the employee's industrial compensation association, a test log must be kept with information entered as prescribed.

Among others, the requirements specified in the cited standards apply to:

- laboratory equipment
- measuring, control and regulating equipment,
- voltage generating equipment,
- electric tools,
- electric heating appliances,
- electric motor appliances,
- lamps,
- units of the entertainment, information and communication technology,
- cable reels, extension and appliance cords

With the BENNING 700 portable appliance tester, it is possible to carry out safety and periodic tests.

The following regulations apply to these checks:

"Repair, change and testing of electrical equipment" - General Requirements	DIN/VDE 0701 Part 1
"Repair, change and testing of electrical equipment" - Safety regulations for data processing equipment and office machines...	DIN/VDE 0701 Part 240
"Repair, change and testing of electrical equipment" - Handheld electric tools	DIN/VDE 0701 Part 260 (the standard has been withdrawn since 01 September 2001!)
"Periodic tests on electrical equipment"	DIN VDE 0702

With the BENNING 700 portable appliance tester, it is possible to carry out the following measurements:

kind of measurement	to regulation
Measurement of protective conductor resistance : <ul style="list-style-type: none"> with 0.2 A DC (with automatic polarity inverter) with 10 A AC (for handheld electric tools, protection class I) 	DIN VDE 0701 Part 1 DIN VDE 0702 DIN VDE 0701 Part 260 (the standard has been withdrawn since 01 September 2001!)
Measurement of insulation resistance	DIN VDE 0701 part 1 DIN VDE 0702
Measurement of protective-conductor current : <ul style="list-style-type: none"> Measurement of protective-conductor current - substitute earth leakage test Measurement of protective-conductor current differential current measurement (with automatic polarity inverter) 	DIN VDE 0701 Part 1 DIN VDE 0702 DIN VDE 0701 Part 1 DIN VDE 0702
Measurement of contact current : <ul style="list-style-type: none"> Measurement of contact current with accessible conductive parts of protection class I which are not 	DIN VDE 0701 part 1 DIN VDE 0702

kind of measurement	to regulation
<p>connected to the protective conductor and units of protection class II using substitute earth leakage test</p> <ul style="list-style-type: none"> Measurement of contact current with accessible conductive parts of protection class I which are not connected to the protective conductor and units of protection class II using differential current measurement (with automatic polarity inverter, only for 230 V units!) 	<p>DIN VDE 0701 part 1 DIN VDE 0702</p>
<p>Test for voltage absence of accessible conductive parts - differential current measurement</p> <ul style="list-style-type: none"> Measurement of contact current with accessible conductive parts of protection class I which are not connected to the protective conductor and units of protection class II using differential current measurement (with automatic polarity inverter, only for 230 V units!) 	<p>DIN VDE 0701 part 1 DIN VDE 0701 part 240 DIN VDE 0702</p>

Using the integrated mains socket, the test object can be subjected to a function test. Here test objects which can only be switched on when connected to the mains voltage (e.g. toaster) can also be measured in accordance with the differential-current process. Measurement of the protective-conductor current, test for voltage absence and measurement of the contact current.

4 Description of appliance

The portable appliance tester BENNING 700 with accessories serves for safety and periodic tests on electrical equipment which can be disconnected from the electrical system via a plug device.

With this measuring equipment (test unit) measurements and tests can be carried out according to DIN VDE 0701 and 0702. Refer also to section 3.

To assist the user, the portable appliance tester is fitted with a microprocessor which controls the processes and memory administration.

The portable appliance tester has the following characteristics:

- Automatic, semiautomatic and manual execution of measurements.
- Entry functions via the keypad.
- Indication of each test stage by LED, measurement and limit values in display.
- The manual measurement controls the start-up and stop function via the keypad (individual measuring time). Automatic safety switch-off after 10 min!
- Error indication via additional red LED when limit value exceeded.
- Limit values stored in memory alterable for measurements!
- Storing of measured values (for 199 test objects) for subsequent display or data acquisition by computer and printer. Interface RS 232-C.
- Option: software for recording, analysing and storing the measured values.
- Setpoints selection of electrical equipment (test object) by keyboard or bar-code scanner for automatic test process and portable appliance tester identification in periodic tests.
- Test socket with parallel ports as 4mm safety sockets.
- Integrated mains socket for function tests of test objects after the safety check has been passed or for tests in accordance with the differential-current process.

All the components of the portable appliance tester are contained in an impact-proof plastic housing (ABS) in the form of an operating panel.

4.1 Operating elements and terminals

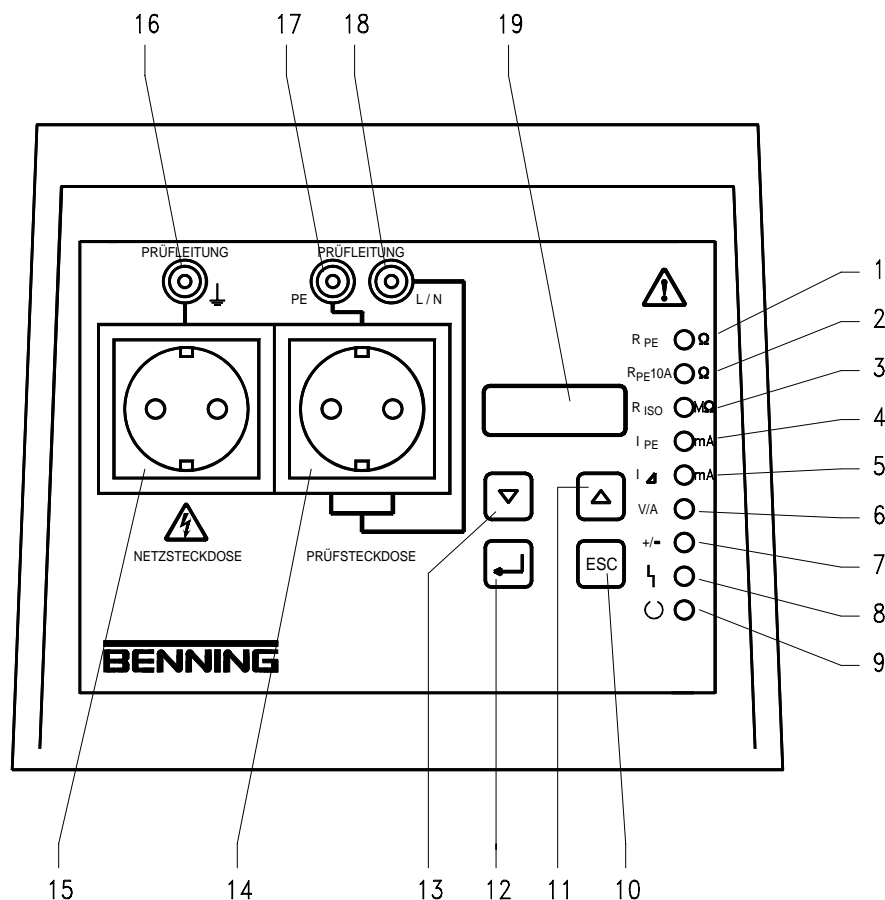


Fig. 1 Front view

- | | |
|----|--|
| 1 | LED measurement, protective conductor resistance |
| 2 | LED measurement, protective conductor resistance 10 A |
| 3 | LED measurement, insulation resistance |
| 4 | LED measurement, substitute earth leakage test |
| 5 | LED measurement, contact current / differential current |
| 6 | LED measurement, voltage or current |
| 7 | LED measurement, polarity inversion with value |
| 8 | LED measurement, error limit undershot/ exceeded |
| 9 | LED operation, operating voltage present |
| 10 | Key - Escape (Shift, return) |
| 11 | Key - Up |
| 12 | Key - Enter |
| 13 | Key - Down |
| 14 | Test socket (for test object with safety plug - L/N jumpered) |
| 15 | Mains socket (for function test after the test has been passed!) |
| 16 | Socket 4 mm, protective conductor connection |
| 17 | Socket 4 mm, "Potential earth", for connecting cable (test cable) for test objects without safety plug |
| 18 | Socket 4 mm, (L/N jumpered) for test objects without safety plug |
| 19 | Display indication (5-digit) |

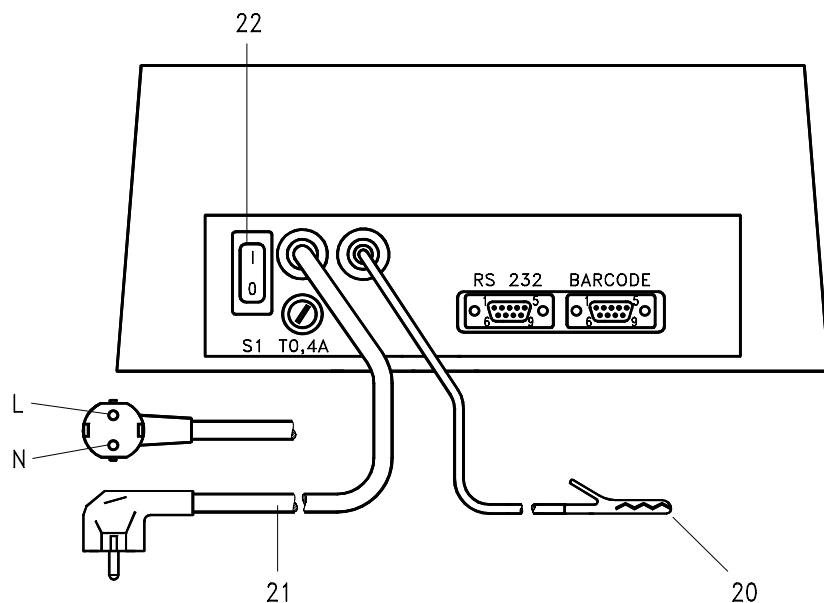


Fig. 2 Rear view

- 20 Test cable, protective-conductor test with tongs
- 21 Mains connection cable with safety plug
- 22 Mains switch

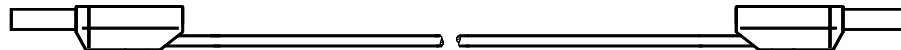


Fig. 3 Accessories
Connecting cable (test cable) with 4 mm safety plug (1 metre)



Fig. 4 Accessories
Safety test tip with 4 mm safety socket

5 Measuring procedure

5.1 Definition of terms to DIN VDE 0701 part 1 and 0702

Maintenance

Measures designed to maintain and restore the required condition or to identify and assess the actual condition of the technical equipment in a system (DIN 31 051/01.85).

Repair

Measures designed to restore the required condition of the technical equipment in a system: (DIN 31 051/01.85).

Change

Intervention on the portable appliance tester according to manufacturer's information. Otherwise the operation is carried out on the sole responsibility of the qualified electrician. Here the respective equipment standard must be taken into account.

Qualified electrician

A person able to evaluate the work he/she is instructed to carry out and to recognise possible dangers due to his/her technical training, knowledge and experience of the relevant provisions.

Electrotechnically instructed Person

A person instructed and, if required, trained by a qualified electrician for the work entrusted to him/her and the possible dangers in case of improper handling. He/She is also instructed in regard to the necessary protective installations and protective measures (DIN VDE 0105 Part 100 or DIN VDE 1000 Part 10).

Test

A test comprises measures taken to determine and assess the actual safety condition of a unit.

Periodic test

A periodic test is a test carried out at certain intervals of time for verifying the electrical safety.

Contact current

Current which may flow to the earth via the operating person when handling the unit.

Differential current

As defined by this standard the sum of the instantaneous values of all currents flowing through all active conductors at the mains side input (connection) of the unit (IEV 826-03-09 mod).

Protective-conductor current

Current flowing through the protective conductor of units of protection class I when their housings are isolated from the earth.

Leakage current

Current that would flow through the interconnected active conductors of the test object and the protective conductor or the accessible conductive parts at rated voltage and at rated frequency of the test object.

Note, the test circuits must be taken into account!

Insulation resistance

Ohmic resistance between the conductive parts separated by insulation (insulating materials).

Note, the measurement of the insulation resistance is only carried out between the active parts and the accessible conductive parts.

Protective conductor resistance

Resistance between random conductive accessible parts connected for protection purposes with the protective conductor connection and the

- earthing contact of the mains plug or
- earthing contact at the apparatus plug or
- protective conductor firmly connected to the power supply.

Electrical equipment

Unit (test object) whose condition with regard to the electrical safety has to be determined

5.2 Procedure, testing of electrical equipment

Every test begins with a thorough inspection of the test object. It must also be determined to which protection class the test object belongs and which tests (depending on type of object) have to be carried out. The correct sequence of the individual measurements must always be observed, as the procedure must be terminated if any test is not passed. The test procedure may only be recommenced from the beginning once the error or defect in question has been removed.

Sequence of individual test steps:

- Visual inspection
- Protective-conductor test (if protective conductor exists)
- Insulation resistance measurement (if technically feasible, not with IT units!)
- Substitute earth leakage test, protective conductor and /or contact current measurement

The respective test stages and kinds of measurement depend on the type of test object. Refer also to section 3; 5.5 and 6.1.

5.2.1 Visual inspection

Important parts of the unit which contribute to its safety should neither be damaged nor obviously unsuitable for the unit. This applies in particular to insulation and insulation components which become visible during repair, change or testing, as well as to housings of insulated units (protection class II).

Examples of the application of visual inspections are:

- The fuse links of fuses must comply with the parameters demanded by the manufacturer (e.g. rated current strength and melting characteristics);
- If required, air filters must be installed;
- Cooling openings must not be blocked;
- Protective covers provided by the manufacturer must be in position, in perfect condition and properly fastened;
- Cooling ribs must not be clogged;
- Markings provided by the manufacturer, especially those relating to safety (warning symbols, key data, fuse holders, switch positions on disconnecting switches etc.) must be in position and easily legible; if required, markings should be corrected following alteration work;

- Mains connection cables (including unit-connection cables supplied) should have no visible defects between the connection point on the portable appliance tester and the mains-power point;
- Pull relief and, if necessary, bend guards of the mains-supply cable must be securely attached and fully functional;
- There should be no visible signs of overloading or improper use;
- No prohibited changes or operations should have taken place;
- Contamination or corrosion which may negatively affect safety must be removed by cleaning.

5.2.2 Protective-conductor test (protective conductor resistance, R_{PE} , +/- ; R_{PE} 10A)

The protective conductor resistance R_{PE} is measured (units of protection class I). The measurement is carried out with a test current of +/- 200mA DC according to DIN VDE 0701 T1 and DIN VDE 0702 or

10A AC for handheld electric tools to DIN VDE 0701 T260.

(the standard has been withdrawn since 01 September 2001!)

The measurement is carried out by connecting the test cable with integrated tongs to touchable metal parts of the test object and the earthing contact of the mains plug. The "test socket" serves to receive the mains plug at the portable appliance tester. If necessary, the test sockets "PE" and "L/N" have to be used which are connected in parallel to the "test socket". See also section 5.5 "Test arrangement and alternative circuit diagram". During the measurement the mains connection cable has to be moved in sections along the whole length .

Note: If changes in resistance are observed when the cable is moved, it should be assumed that the protective conductor is damaged or defective at a connection point. Ensure that contact between the tongs and the metal parts is good. Observe the switch-on function of the LED in each case.

Limit values: see section 6.1 "Technical data".

5.2.3 Insulation measurement (insulation resistance, R_{ISO})

The insulation resistance R_{ISO} is measured. Measurement is carried out with 500V DC voltage, 1mA test current according to DIN VDE 0701 T1 and DIN VDE 0702.

The measurement is taken between the protective conductor (touchable metal parts connected with the protective conductor, protection class I) and the active conductors. The test object must be free of external voltage (disconnected from the mains). The contacts of switches, relays and control devices in active conductors must be closed (monitoring of the entire test object and not only supply cable). The “test socket” serves to receive the mains plug at the portable appliance tester. If necessary, the test sockets “PE” and “L/N” have to be used which are connected in parallel to the “test socket”.

For test objects of protection classes II and III with accessible conductive parts, an additional connecting cable (test cable) with safety test tip should be used. The cable is plugged into the socket "PE" (blue) and all conductive parts of the test object are tested with the safety test tip.

If the limit value of 0.3 MOhm is not achieved for protection class I units, with a total connected load exceeding 3.5 kW and heating elements, a protective-conductor measurement has to be carried out as a differential current measurement or a direct measurement! The admissible protective-conductor current (1mA/kW) must not be exceeded.

If it is technically impossible to measure the insulation resistance because controller contacts or relays are only active when mains voltage is applied, the protective-conductor current should be measured with this portable appliance tester using the differential-current process. See also section 5.5 “Test arrangement and alternative circuit diagram”. Limit values: see section 6.1 “Technical data”.

Before and after a series of measurements an „insulation test“ must be performed with short-circuited safety sockets PE – L/N (both above the test socket) using the enclosed connecting cable. A functioning portable appliance tester must indicate the result „Error“.

5.2.4 Measurement of earth leakage current

The substitute earth leakage current I_{PE} or the differential or contact current I_{Δ} is measured in accordance with the differential-current process.

5.2.4.1 Measurement of substitute earth leakage current (I_{PE})

In most cases, "genuine" measurement of earth leakage current is not possible because the portable appliance testers are either tested in the insulated state, or have to be connected to a voltage source insulated from the earth. For this reason, a substitute earth leakage test is carried out.

The measurement is carried out with approx. 25V AC according to DIN VDE 0701 T1 and DIN VDE 0702

The measurement is carried out between the protective conductor and the active conductors. The test object must be free of external voltage (disconnected from the mains). The contacts of switches, relays and control devices in active conductors must be closed (monitoring of the entire test object and not only supply cable). The "test socket" serves to receive the mains plug at the portable appliance tester. If necessary, the test sockets "PE" and "L/N" have to be used which are connected in parallel to the "test socket".

Measurements of substitute earth leakage currents are carried out as protective-conductor current and contact current measurements.

Note, measurements of substitute earth leakage currents are only admissible, if the previous insulation test has been passed!

5.2.4.2 Measurement of protective-conductor current; Measurement of contact current; test for voltage absence in accordance with differential-current process(I_{Δ})


Measurement of protective-conductor current

With units of protection class I, where it cannot be determined whether all the parts subjected to mains voltage are included in the measurement of insulation resistance, or where the insulation resistance cannot be measured, the measurement of the protective-conductor current may be performed as a differential current measurement (DIN VDE 0701 T1 and DIN VDE 702).

During measurement, the test object should be operated at rated voltage and then with reversed polarity. The mains socket of the portable appliance tester can be used to supply the power necessary (230 V 16 A). During the automatic test process (I_{Δ}), the polarity of the mains voltage is reversed automatically (display with LED +/-).

Measurement of contact current/ test for voltage absence

In the case of units of protection class II with accessible conductive parts, where a measurement of the insulation resistance is not considered advisable e.g. with information-technology units and other electronic equipment, or if the operation cannot be interrupted, the measurement of the contact current may be performed as a differential-current process (DIN VDE 0701 T1, DIN VDE 0701 T240 and DIN VDE 0702). This applies also to units of protection class I with accessible conductive parts which are not connected with the protective conductor.

During measurement, the test object should be operated at rated voltage and then with reversed polarity. The mains socket of the portable appliance tester can be used to supply the power necessary (230 V 16 A). During the automatic test process (I_Δ), the polarity of the mains voltage is reversed automatically (display with LED +/-). All the accessible conductive parts should be tested with the safety test tip during the measurement. To do this, the test cable is first plugged into the yellow socket “”. See also section 5.5 “Test arrangement and alternative circuit diagram”. Limit values: see section 6.1 “Technical data”.

Attention, the default limit values of the differential current measurement (measurement of the protective-conductor current/ measurement of the contact current/ test for voltage absence depend on the selection of the protection class. These are with:

protection class I = 3.5 mA

protection class II and protection class I for parts not connected to the protective conductor = 0.5 mA

To data processing equipment according to DIN VDE 0701 T240 (test for voltage absence) applies a value of = 0.25 mA

Due to the low value please select a setting for the test for voltage absence in connection with „protection class II“!

References to differential current measurement

Measuring errors may occur for the following test objects:

frequency-controlled drive units, units with power controller (phase control), units with collectors and developing commutator sparking.


5.3 General notes on manual / automatic measurement

5.3.1 Operation



Familiarise yourself thoroughly with the portable appliance tester BENNING 700. Make sure you understand the test and measurement processes and the changes in measurement options and limit values.

5.3.2 LED display

When a certain memory location or unit identification number is selected (see section 5.4.4) measured values already stored are indicated by flashing LEDs.

If the value is above or below the limit, the LED "Error" / "" flashes synchronously with the LED for the kind of measurement in question

5.3.3 Display

If a measured value is not yet stored "Space" is shown alternating with the limit value. Example:  (no measured value),  (limit value). If a measured value is already stored, this value and the limit value alternate in the display.

5.3.4 Storage of the measured values

Measured values already stored are replaced by those of the next measurement (deletion of measured values per memory location by "Clear", see section 5.4.5.4 or deletion of measured values by "C-ALL", see section 5.4.5.2)

5.3.5 Factory setting

The following limit values are set by the manufacturer:
(reset of altered limit values with "Reset", see section 5.4.5.2)

Measurement option	Protection class I	Protection class II	Protection class III
R_{PE} (protective conductor resistance)	0.3 Ω		
R_{ISO} (insulation resistance)	1 M Ω	2 M Ω	0.25 M Ω
I_{PE} (substitute earth leakage test) protective-conductor current contact current	3.5 mA	0.5 mA	0.5 mA
I_{Δ} (contact / differential current)	0701 T240 0.25 mA 0702 T1; 0702 3.5 mA	0.5 mA	0.5 mA

Note! For units with the software status up to V1.09 the operating instructions no. 3270 apply up to revision status 02 May 2002.

As of software status V1.10 the operating instructions no. 3270 have been completely revised, revision status as of 04 February 2005.

The following automatic test procedure is set by the manufacturer:

R_{PE} , $R_{PE} \pm$, R_{ISO} , I_{PE} .

The memory location (no. 1 - 199) is assigned to the unit identification no. "0" by the manufacturer.

The unit identification number (ID) can be individually selected between 00000... 65535 and serves for identification of a test object.

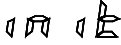


5.4 Manual / automatic measurement without computer program (example)

Commissioning:



Insert the mains plug into the protective socket (appropriate series fuse 16 A!). Please observe phase connection (see Fig. 2)!

Switch portable appliance tester on at the switch on the rear side.



"Init" and all the segments are shown alternately for approx. 2 secs. The LED "operation"/"⊙" lights up. All the other LEDs flash. The software version appears for 1 second. **Standard operation** then begins.

Display:   

Software version V1.04 (example)

  (no. of memory location, select 0...199)

The portable appliance testers contains memory locations 0...199.

Using the buttons   the memory locations can be selected.

Memory location no. "0" is for manual or automatic measurement. Measured values are only stored as long as memory location (measurement position) "0" remains set and mains voltage is supplying the portable appliance tester.

Note! Measurement results of memory location no. "0" cannot be displayed by computer.

To set the limit values and options, see section 5.4.5.5 and 5.4.5.1.

Exemplary measurement:

The measurement described here refers to the default values set by the manufacturer (protection class I; protective conductor resistance 0.3 Ohm; insulation resistance 1.0 MOhm; substitute earth leakage test 3.5 mA). The instructions during the measurement (see section 5.2) must also be observed.

Test object: protection class I with mains-connection cable and safety plug.
Test arrangement and alternative circuit diagram, see fig. 5, fig. 9, fig. 13.

Note! The test arrangement for the tests described here (3) can be retained. Exception: function test after test passed. For this, the mains connection cable of the test object should be changed to the mains socket.


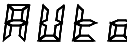


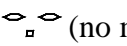








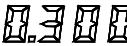

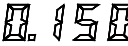
5.4.1 Manual measurement (basic setting, standard operation)

The manual measurement allows to select, start and exit individual test stages. Only with a manual measurement it is possible to affect the measuring time individually (start-stop function)!

Measurement of protective conductor resistance:


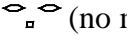



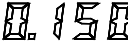

Insert the safety plug of the test object (protection class I) into the "test socket" of the portable appliance tester BENNING 700. Using a tong, clamp the test cable to a conductive part of the unit to be tested.




For explanation of symbols, see section 4.1

Button:	Function:	Display:	Display LED
	Start/ select		 , R _{PE} , R _{ISO} V/ A, +/- flashes
	Selection	 (no measured value)	 ; R _{PE} flashes
	Prot. cond. resist.	 (limit value)	
	Start, measurement	 (measured value)	 ; R _{PE}
	Stop, measurement	 (measured value)	 ; R _{PE}
	Measurement closed	 (limit value)	 ; R _{PE} flashes
		 (measured value)	

Note, the highest measured value is stored during the measurement and displayed after the manual stop!




Measurement of protective conductor resistance with polarity inversion:

	Selection	 (no measured value)	 ; R _{PE} , +/- flashes
	Prot. cond. resist. with polarity inversion	 (limit value)	
	Start, measurement	 (measurement)	 ; R _{PE} , +/-

	Stop, measurement	0.150 (measured value)	 ; R _{PE}
	Measurement closed	0.300 (limit value)	 ; R _{PE} , +/- flashes
		0.150 (measured value)	









Note, the highest measured value is stored during the measurement and displayed after the manual stop!

Measurement of protective conductor resistance with 10 A:

	Selection	 (no measured value)	 ; R _{PE} 10A flashes
	(not required)	0.300 (limit value)	









Note, due to the thermal protection a manual shutdown (stop function) is not intended here!

Measurement of insulation resistance:



Button:	Function:	Display:	Display LED:
	Selection	 (no measured value)	 ; R _{ISO} flashes
	Insulation resistance	1.000 (limit value)	
	Start, measurement	0.1 (measurement)	 ; R _{ISO}
	Stop, measurement	0.1 (measurement)	 ; R _{ISO}
	Measurement closed	1.000 (limit value)	 ; R _{ISO} flashes
		0.1 (overflow, >1.0 MOhm)	

Note, the lowest measured value is stored during the measurement and displayed after the manual stop!


Measurement of substitute earth leakage current

	Selection	 (no measured value)	 ; I _{PE} flashes
	substitute earth leakage test	3.500 (limit value)	
	Start, measurement	0.025 (measurement)	 ; I _{PE}
	Stop, measurement	0.025 (measurement)	 ; I _{PE}
	Measurement closed	3.500 (limit value)	 ; I _{PE} flashes
		0.025 (measured value)	

Note, the highest measured value is stored during the measurement and displayed after the manual stop!



Selecting with the buttons   it is possible to display measured values already stored in the memory. The flashing LED indicates the kind of measurement selected.

To return to the initial position (standard operation) press the button .

If the value is above or below the specified limit (Error), the measured value or O.L. with the limit value and the LED "Error" /  are shown alternately flashing.

When an incomplete measurement is cancelled (without polarity inversion +/-) an error message is also given.





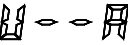




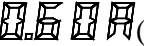


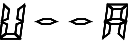

For a description of the function test of test object via "mains socket", see section 5.4.2.

The sequence of the individual measurements can be freely selected with the buttons  .

5.4.2 Function test of test object in "mains socket" (basic setting, standard operation)


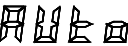


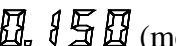

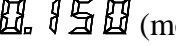







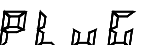
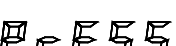

The function of the test object should only be tested when the test is passed.

Switch the test object off beforehand to prevent it from starting accidentally when mains voltage is applied to the mains socket. Plug the safety plug of the test object into the mains socket of the portable appliance tester.


Button:	Function:	Display:	Display LED:
	Start/ select	 ;
 	Selection		 ; V/A flashes
	Start,	 (meas. value V)	 ; V/A
	Function test	 (meas. value A)	
		display alternating	
 or 	function test close		 ; V/A flashes




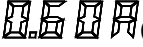


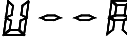

5.4.3 Automatic measurement (basic setting, standard operation - option I_{PE} on)



The portable appliance tester measures in sequence automatically depending on the specified measuring options and at the fixed limit values.

Button:	Function:	Display:	Display LED:
	Start/ select		 ; R _{PE} , R _{ISO} , I _{PE} , V/A, +/- flashes
	Start, measurement	 (measurement)	 ; R _{PE}
		 (measurement)	 ; R _{PE} , +/-
		 (measurement)	 ; R _{ISO}
		 (measurement)	 ; I _{PE}
	alternating		 ; I _{PE}
	Display!		
			
			


Request (after test passed) to switch the mains-connection cable of the test object to the mains socket for a function test.

In case a function test is not intended, the measurement can be finished using the  button.

	Start,	 (meas. value V)	 V/A
	Function test	 (meas. value A)	
 or 	function test close		 V/A fl.

Selecting with the buttons   it is possible to display measured values already stored in the memory. The flashing LED indicates the kind of measurement selected.

To return to the initial position (standard operation) press the button .

If the value is above or below the specified limit (Error), the measured value or O.L. with the limit value and the LED "Error" /  are shown alternately flashing.


The automatic measurement process is interrupted simultaneously. A second (alternative) measurement may be carried out.

When an incomplete measurement is cancelled (without polarity inversion +/-) an error message is also given.





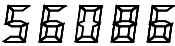
5.4.4 Menu test-object selection

Selection of memory location / unit identification by barcode (ID)



In standard operation, the number of the memory location or the barcode / unit identification number (ID) is shown.

Use the button  to switch between display "memory location no." and "unit ident. no. (ID)"

Example:

Memory location no.	Unit ident. no. (ID)
 	 
	 } (display alternating)


Note! After every memory location no. an individual 5-digit unit-identification number (ID) between **00000...65535** can be stated.

Using the buttons  , the number of the desired memory location or unit-identification number (ID) is selected.




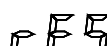


For allocation of memory location no. to unit-identification number (ID), see section 5.4.5.6.

5.4.5 Storing / resetting system data (basic setting, standard operation)

If necessary, select memory location no. / unit identification no. (ID)!

The program memory is opened by pressing the button  for >3 secs. The following actions can be carried out (**per memory location or all locations - please note!**).

Continue with buttons   :

	Setting of the individual measurement options (per memory location)
	Resetting measurement options and limit values to the factory setting (all locations)
	Delete all stored measured values (Memory location 1...199)
	Reset, resetting measurement options and limit values to the factory setting per memory location
 tion	Deleting the measured values stored per memory location
	Allocation of a unit identification no. (ID) per memory location



















Fixing of individual limit values per memory location



Return to standard operation by pressing the button .

5.4.5.1 Setting individual measurement options (example)

Select with    

Per memory location (test object) the measurement options can be set as follows.


Button:	Function:	Display:	Selection by:/VDE Regulation:
	Select protection class (1...3) Cl. I=1; Cl. II=2; Cl. III=3	5H 1	 
	10A protective-conductor measurement (yes = I, no = 0) alternating disp.	10A .0 1.260.0	  701 T260
	Data processing device (yes = I, no = 0) alternating disp.	11 .0 1.240.0	  701 T240
	Insulation test (yes = I, no = 0) alternating disp.	50 .1 702.1.1	  702
	Rated voltage 400V instead of 230V (yes = I, no = 0)	4000.0	 
	Storage of new options	- 0H - 0P	







Note! Press the button  to return to the level above  at any time. The numbers displayed alternatively indicate the appropriate VDE standard and the section in question (see information in column). The last part of the display (yes = I, no = 0) is for selection. The option selected is shown by the appropriate LED (if applicable).


When certain types of unit (test objects) are selected, the limit values are changed accordingly.

5.4.5.2 Resetting measurement options and limit values to the factory setting (all locations)

Select with     


Press key  to reset the measurement options and limit values of all memory locations (0...199) to the factory setting and delete the stored measured values.







Button:	Function:	Display:
	Deleting of all stored values	    


Note! By pressing the button , it is possible to return without deleting.

5.4.5.3 Deleting all stored measured values (all locations)

Select with     

If the measured values of all memory locations 0...199 are to be deleted, use the button .


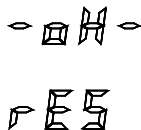
Button:	Function:	Display:
	Deleting of all stored measured values	    


Note! By pressing the button , it is possible to return without deleting.

5.4.5.4 Reset measurement options and limit values to the factory setting per memory location

Select with   


Per memory location (test object) the measurement options and limit value are reset to manufacturer's setting. Simultaneously the stored measured values of the respective memory location are deleted.



Button:	Function:	Display:
	Deleting the individual measurement options and limit values	


Note! By pressing the button  , it is possible to return without deleting.

5.4.5.5 Deleting the measured values stored per memory location

Select with    

Per memory location (test object) the stored measured values are deleted. Existing measured values are indicated by the appropriate LED flashing. If these measured values are to be deleted, use the button 

Button:	Function:	Display:
	Deleting the measured values	



Note! By pressing the button  , it is possible to return without deleting.



5.4.5.6 Allocation of a unit identification no. (ID) per memory location (example)

Select with   




For every memory location number, an individual 5-digit unit identification number (ID) can be assigned. Choice of number from 00000...65535!






	Start, assign no.	
---	-------------------	--


By pressing the buttons   you can move upwards or downwards in single steps. When the buttons are held down, the first ten figures are counted individually and thereafter in tens.

By holding either the  or the  down and pressing the other button, the figure is filled up from right to left. The button held down determines the

direction of counting, upwards or downwards. Counting continues automatically in single steps after the set position.

Button:	Function:	Display:
		55006
	Storage of identification no.	-  H - 






Note! In case an ID no. has already been assigned to another memory location,     instead of -  H - is displayed and the ID no. cannot be assigned a second time.



By pressing the button , it is possible to return without storing.

5.4.5.7 Establishing individual limit values per memory location (example)



Select with     



Per memory location (test object) the limit values can be adapted individually.

Button:	Function:	Display:	Display LED:
	Start, change limit value	   0.300	 , R _{PE}

Using the buttons  , select the measuring function of the limit value to be changed. Display by LED (R_{PE}; R_{PE10A}; R_{ISO}; I_{PE}; I_Δ)

	Change limit value	0.300	 , R _{PE}
---	--------------------	-------	---

By pressing the buttons   you can move upwards or downwards in single steps. When the buttons are held down, the first ten figures are counted individually and thereafter in tens.

By holding either the  or the  down and pressing the other button, the figure is filled up from right to left. The button held down determines the direction of counting, upwards or downwards. Counting continues automatically in single steps after the set position.

	New value		, R _{PE}
	Store new value		, R _{PE}
			} alternatively

Change next limit value or return by pressing the button .

Note: when measurement options (5.4.5.1) are selected and certain types of unit selected (test object), the appropriate limit values are adapted simultaneously. For this reason, it is advisable to set the measurement options beforehand.

5.5 Test arrangement and alternative circuit diagram (connecting the test object to the portable appliance tester BENNING 700)

The test object should be connected to the portable appliance tester according to one of the following circuits (test arrangement and alternative circuit diagram).

Observe the type of test (measurement), protective class of test object and the appropriate VDE standard.

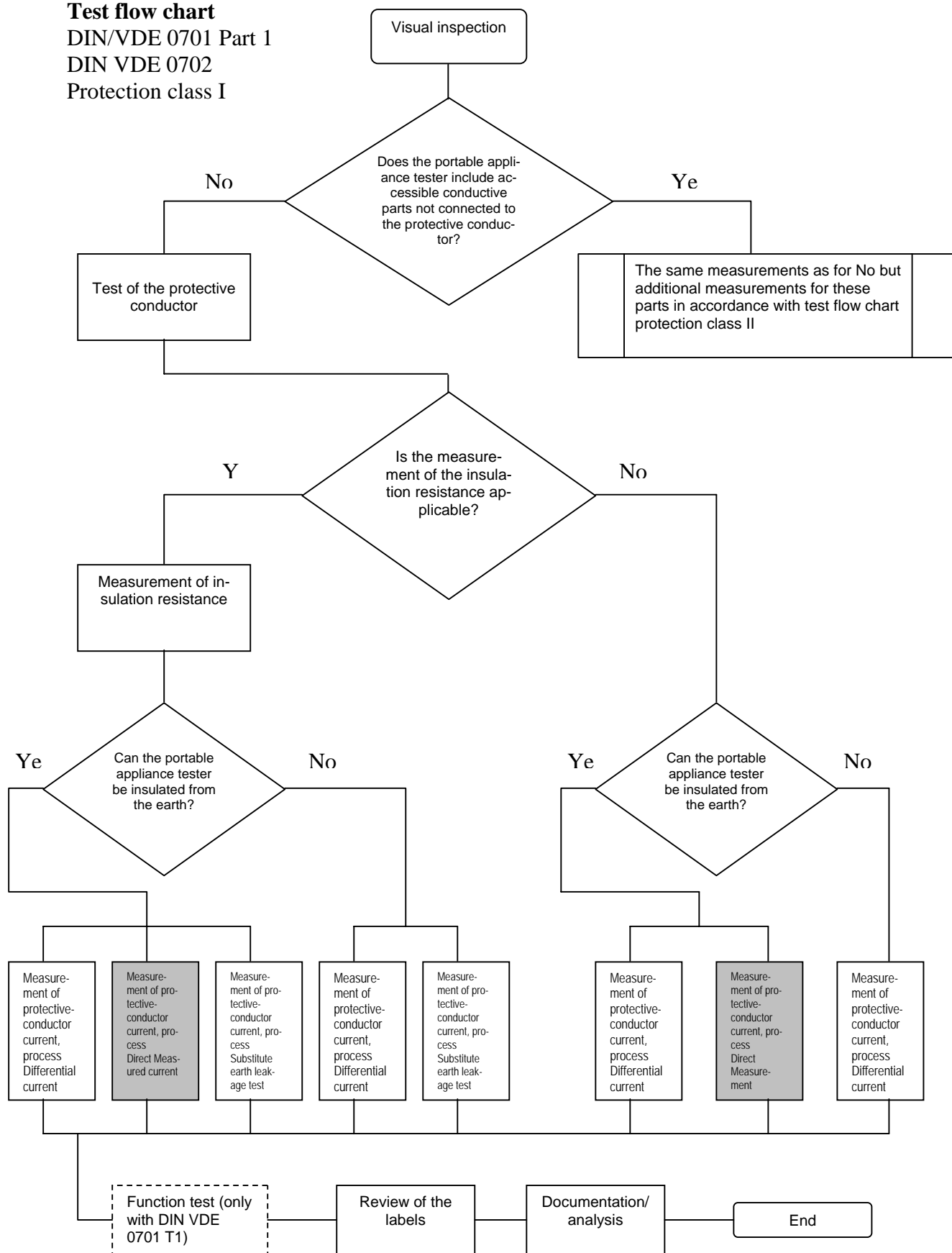
The sections 3 and 6.1. as well as the following flow charts are there for support.

Note

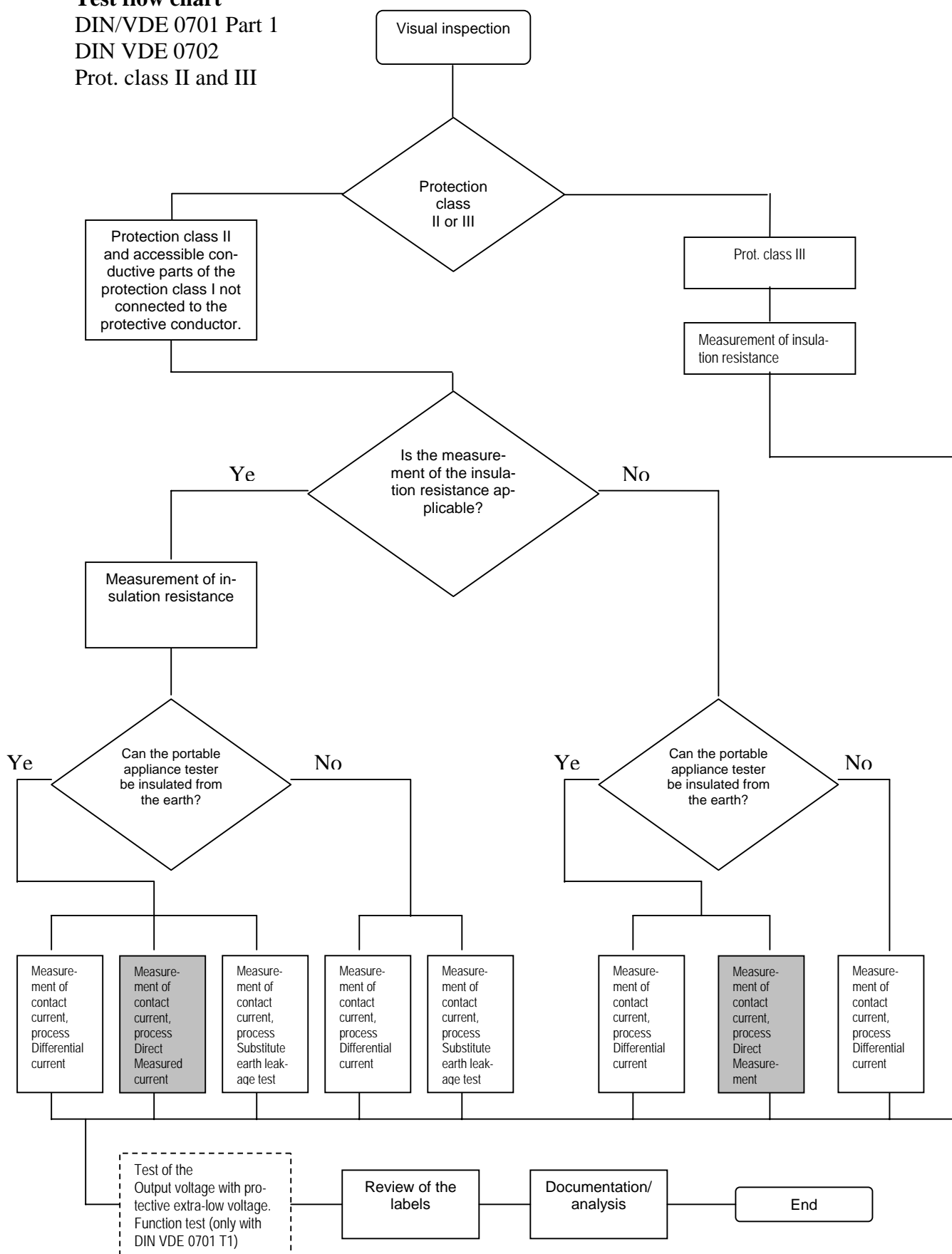
The kinds of measurement coloured dark in the flow charts cannot be carried out with the portable appliance tester BENNING 700.

A rotary current differential current measurement is not possible with the current configuration of the unit or can only be carried out in connection with the leakage current tongs at the present time. Then the measured results have to be recorded manually.

Test flow chart
DIN/VDE 0701 Part 1
DIN VDE 0702
Protection class I



Test flow chart
DIN/VDE 0701 Part 1
DIN VDE 0702
Prot. class II and III



Measurement of protective conductor resistance (DIN VDE 0701 T1 and DIN VDE 0702)

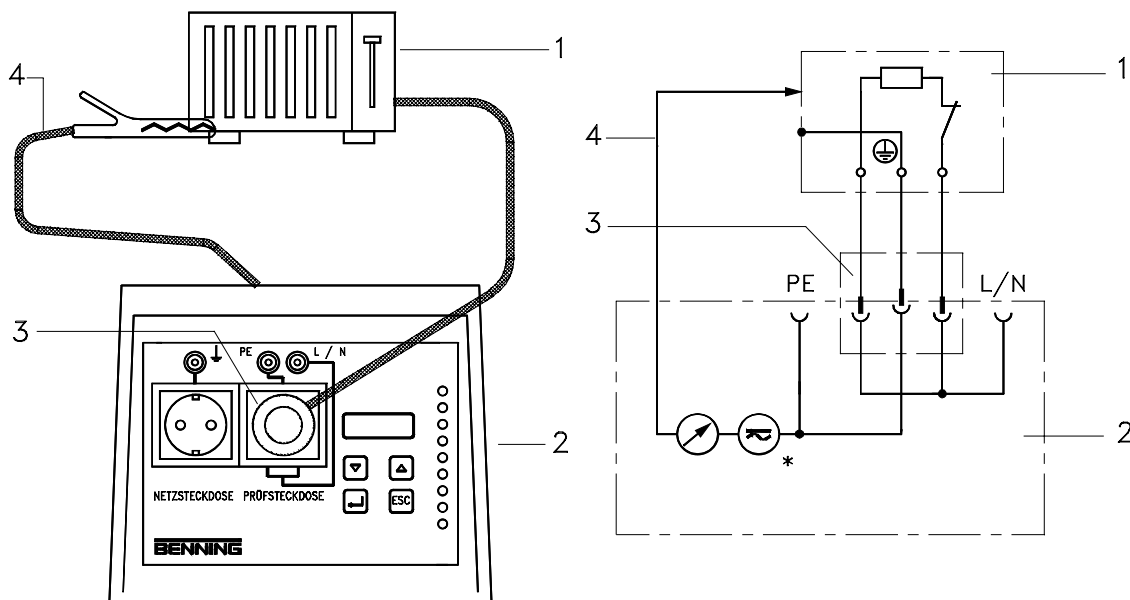


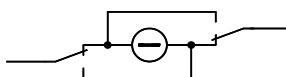
Fig. 5 Test arrangement

Alternative circuit diagram

- 1 Test object with mains connection cable and safety plug (protection class I)
- 2 Measuring equipment (test unit)
- 3 Test socket
- 4 Test cable with tongs (available at the portable appliance tester).
Connection between portable appliance tester and conductive parts of unit being tested

* Note:

Test to DIN VDE - 0701 T1, - 0701 T240 and - 0702 with 200 mA DC current and automatic polarity inversion.



Test to DIN VDE 0701 T260 with 10 A AC current



Measurement of the protective conductor resistance with multiphase units with 3-phase current adapter (DIN VDE 0701 T1 and DIN VDE 0702)

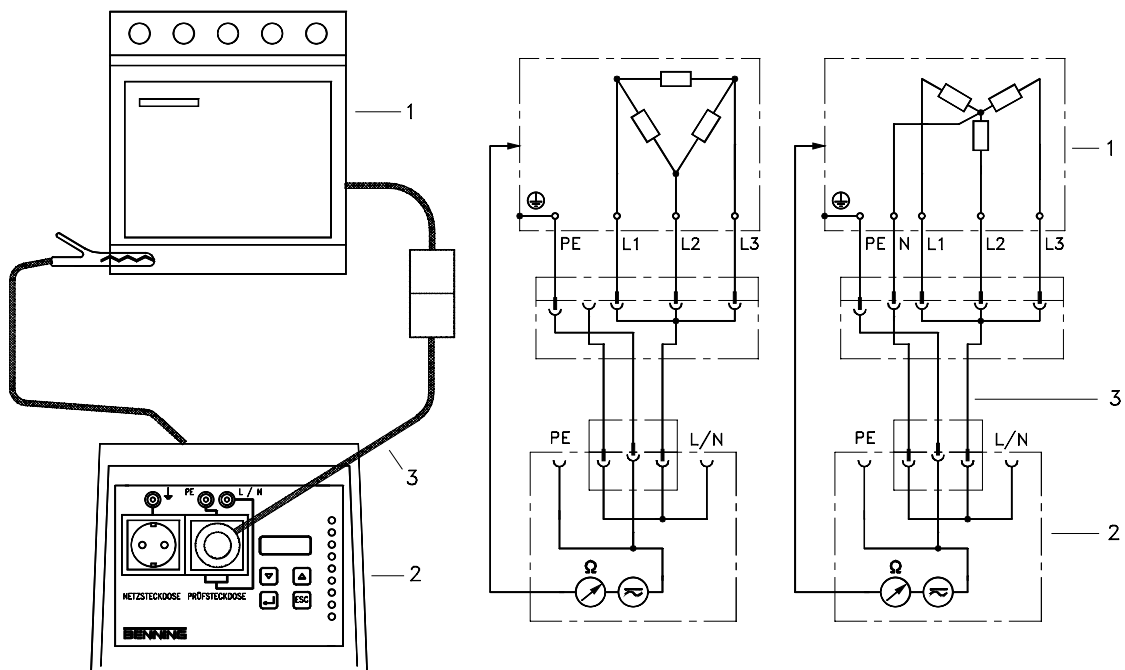


Fig. 6 Test arrangement Alternative circuit diagram

- 1 Test object (3-phase current unit, protection class I)
- 2 Measuring equipment (test unit)
- 3 3-phase current adapter (in test socket) for plugs with test cables and safety plug
e.g. BENNING TN 044122 (16 A) or TN 044123 (32 A)

Attention!

Switch, temperature controller etc. must be closed!

Measurement of insulation resistance (DIN VDE 0701 T1 and DIN VDE 0702)

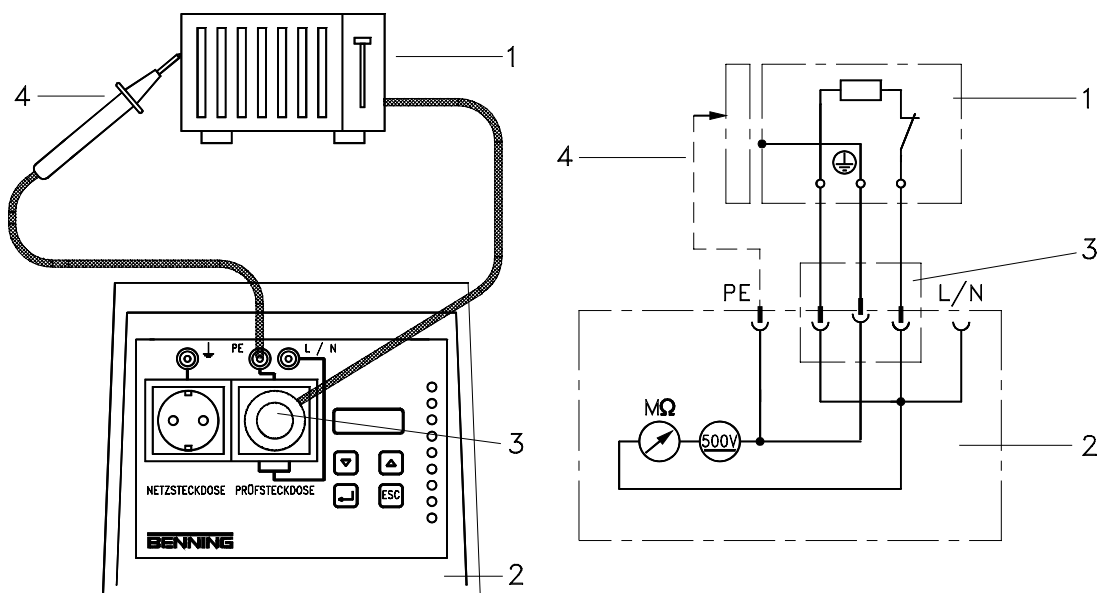


Fig. 7 Test arrangement

Alternative circuit diagram

- 1 Test object (protection class I)
- 2 Measuring equipment (test unit)
- 3 Test socket
- 4 Measuring circuit between the measuring equipment and the test object.

Measurement also on accessible conductive parts of units of protection class I, when these are not connected to the protective conductor.

Attention!

Switch, temperature controller etc. must be closed!

Note!

If the test tongs (protective conductor resistance) are still connected, they can remain connected. For insulation-resistance measurement, this connection is automatically disconnected.

Measurement of the insulation resistance with multiphase units with 3-phase current adapter (DIN VDE 0701 T1 and DIN VDE 0702)

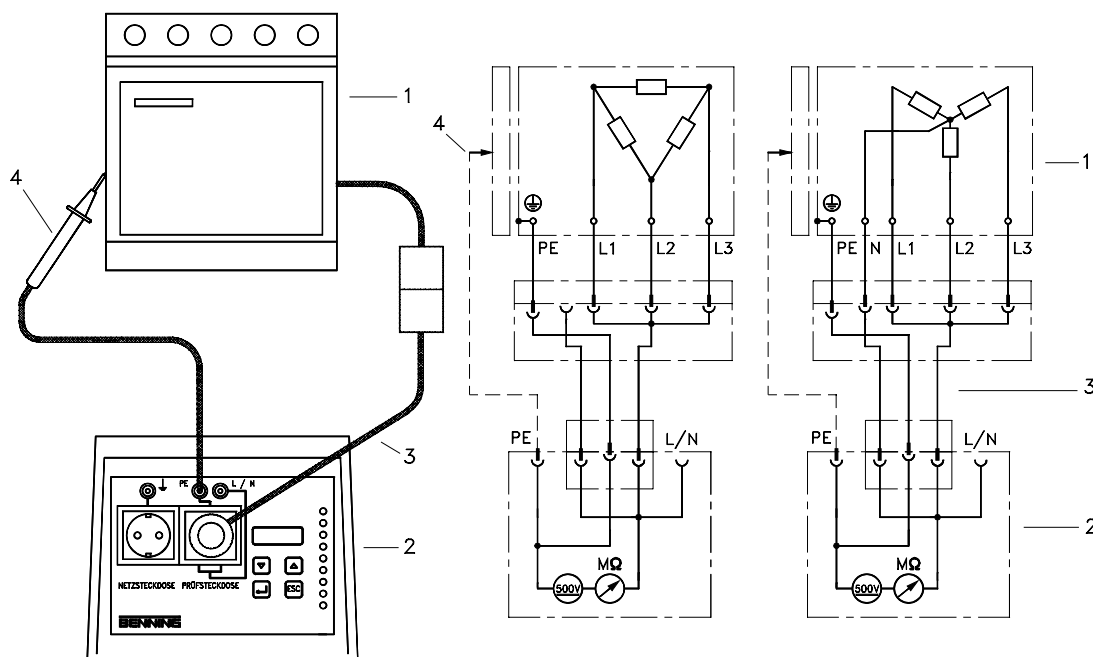


Fig. 8 Test arrangement Alternative circuit diagram

- 1 Test object (3-phase current unit, protection class I)
- 2 Measuring equipment (test unit)
- 3 3-phase current adapter (in test socket) for plugs with test cables and safety plug
e.g. BENNING TN 044122 (16 A) or TN 044123 (32 A)
- 4 Measuring circuit between the measuring equipment and the test object.

Measurement also on accessible conductive parts of units of protection class I, when these are not connected to the protective conductor.

Attention!

Switch, temperature controller etc. must be closed!

Measurement of insulation resistance with units of protection classes II and III
(DIN VDE 0701 T1 and DIN VDE 0702)

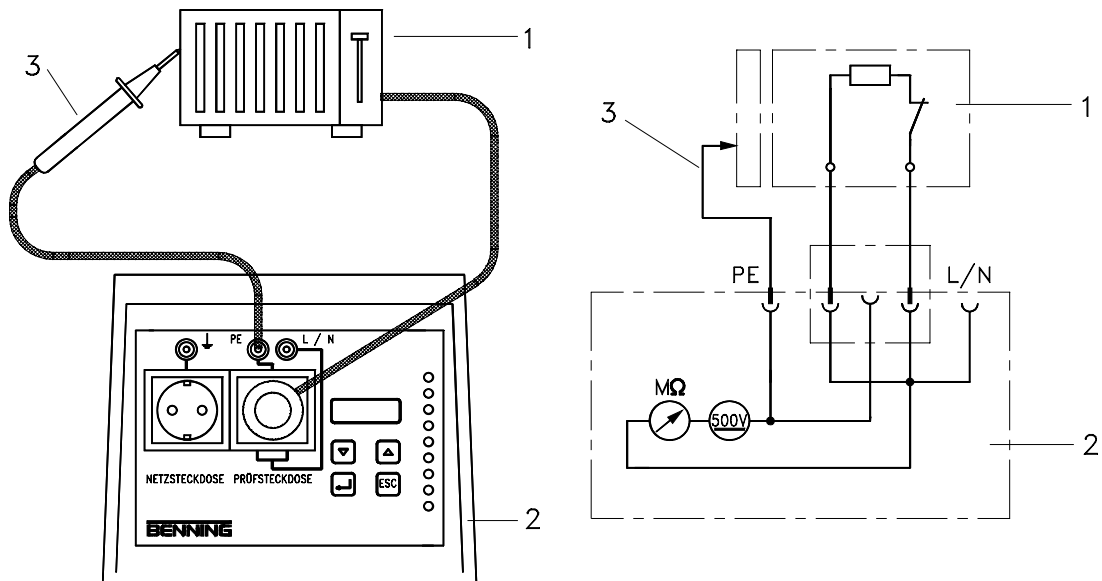


Fig. 9 Test arrangement

Alternative circuit diagram

- 1 Test object (protection classes II or III)
- 2 Measuring equipment (test unit)
- 3 Measuring circuit between the measuring equipment and the test object at the available accessible conductive parts.

Measurement of the insulation resistance with multiphase units of protection classes II and III with 3-phase current adapter
(DIN VDE 0701 T1 and DIN VDE 0702)

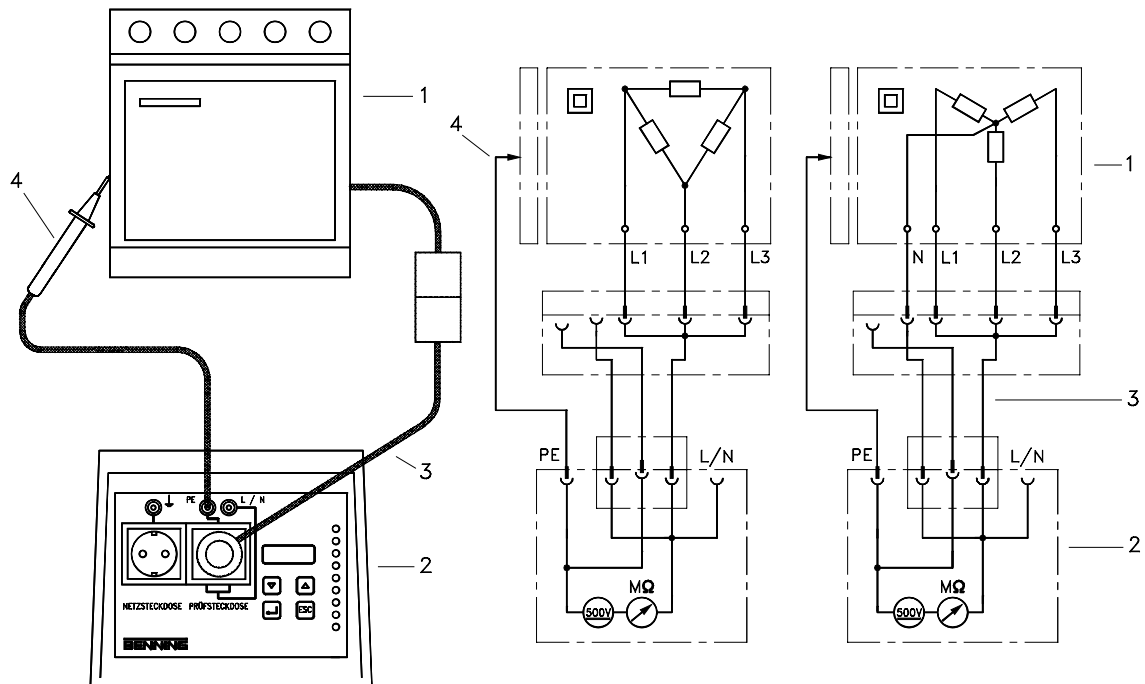


Fig. 10 Test arrangement Alternative circuit diagram

- 1 Test object (3-phase current unit, protection classes II and III)
- 2 Measuring equipment (test unit)
- 3 3-phase current adapter (in test socket) for plugs with test cable and safety plug
e.g. BENNING TN 044122 (16 A) or TN 044123 (32 A)
- 4 Measuring circuit between the measuring equipment and the available accessible conductive parts.

Attention!

Switch, temperature controller etc. must be closed!

Measurement of the protective-conductor current - substitute earth leakage test on units of protection class I (DIN VDE 0701 T1 and DIN VDE 0702)

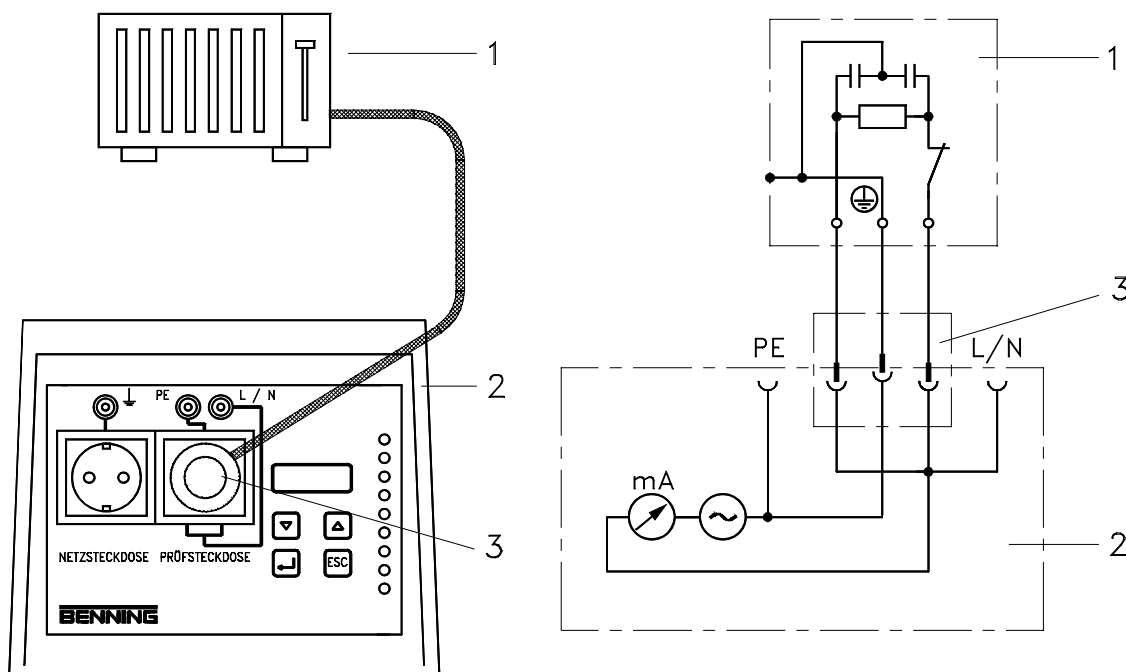


Fig. 11 Test arrangement

Alternative circuit diagram

- 1 Test object (protection class I)
- 2 Measuring equipment (test unit)
- 3 Test socket

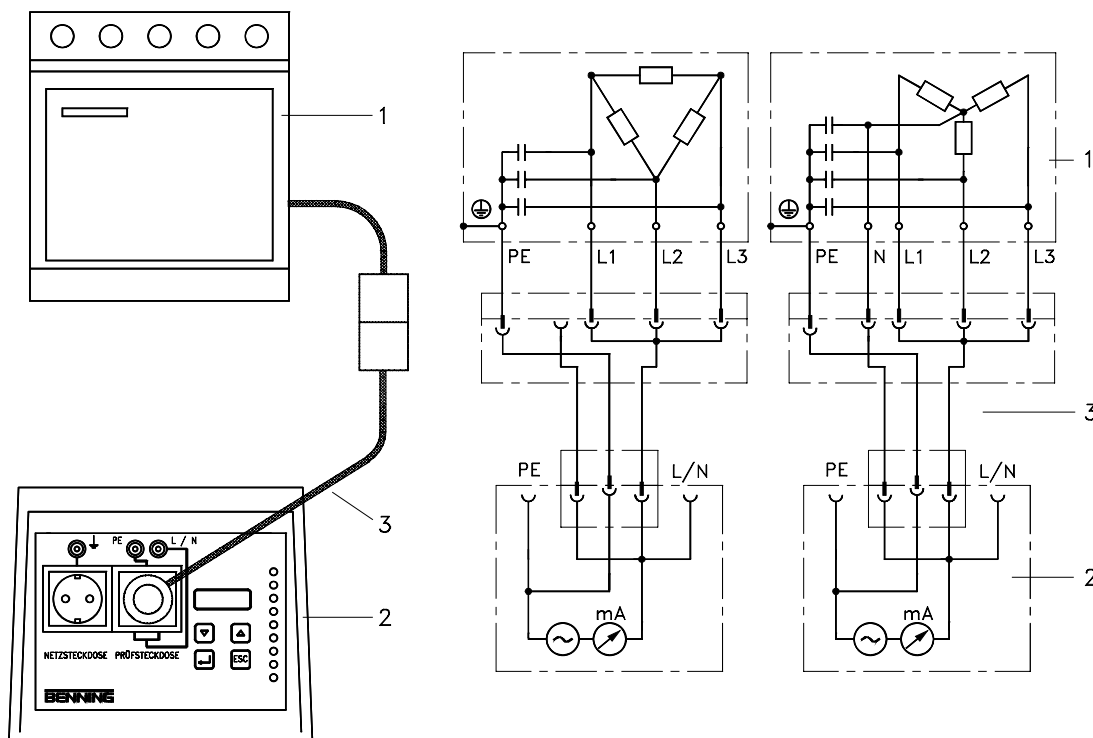
Attention!

Switch, temperature controller etc. must be closed!

Note!

If the test tongs (protective conductor resistance) are still connected, they can remain connected. For the measurement of the substitute earth leakage current this connection is automatically switched off.

Measurement of the protective-conductor current - substitute earth leakage test on multiphase units of protection class I with 3-phase current adapter (DIN VDE 0701 T1 and DIN VDE 0702)



Attention, not a test approved by VDE for the measurement of the protective-conductor current!

Fig. 12 Test arrangement Alternative circuit diagram

- 1 Test object (3-phase current unit, protection class I)
- 2 Measuring equipment (test unit)
- 3 3-phase current adapter (in test socket) for plugs with test cable and safety plug
e.g. BENNING TN 044122 (16 A) or TN 044123 (32 A)

Alternative, clip connection via test sockets!

Note, with this process considerably higher values can be determined compared to the direct or the differential-current process (here earth leakage capacitors are connected in parallel)!

Attention!

Switch, temperature controller etc. must be closed.

Measurement of protective-conductor current by differential-current process with units of protection class I (DIN VDE 0701 T1 and DIN VDE 0702)

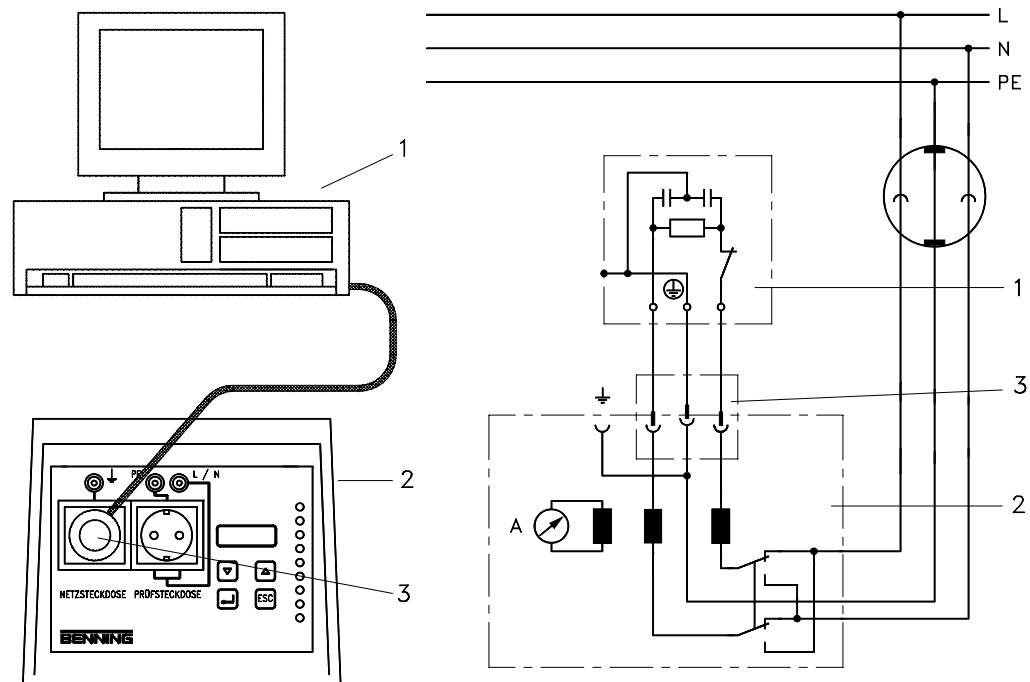


Fig. 13 Test arrangement

Alternative circuit diagram

- 1 Test object (protection class I)
- 2 Measuring equipment (test unit)
- 3 Mains socket

Measurement of contact current - substitute earth leakage test on units of protection class I (DIN VDE 0701 T1 and DIN VDE 0702)

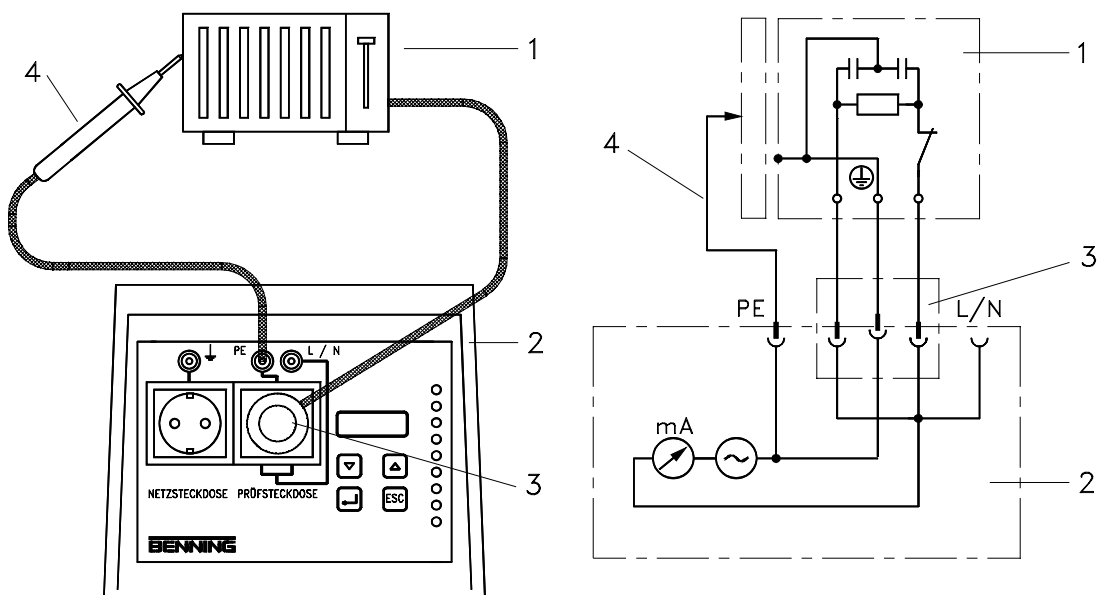


Fig. 14 Test arrangement

Alternative circuit diagram

- 1 Test object (protection class I)
- 2 Measuring equipment (test unit)
- 3 Test socket
- 4 Measuring circuit between the measuring equipment and the test object.

Measurement also on accessible conductive parts of units of protection class I, when these are not connected to the protective conductor.

Attention!

Switch, temperature controller etc. must be closed!

Note!

If the test tongs (protective conductor resistance) are still connected, they can remain connected. For the measurement of the substitute earth leakage current this connection is automatically switched off.

Measurement of contact current - substitute earth leakage test on units of protection class II (DIN VDE 0701 T1 and DIN VDE 0702)

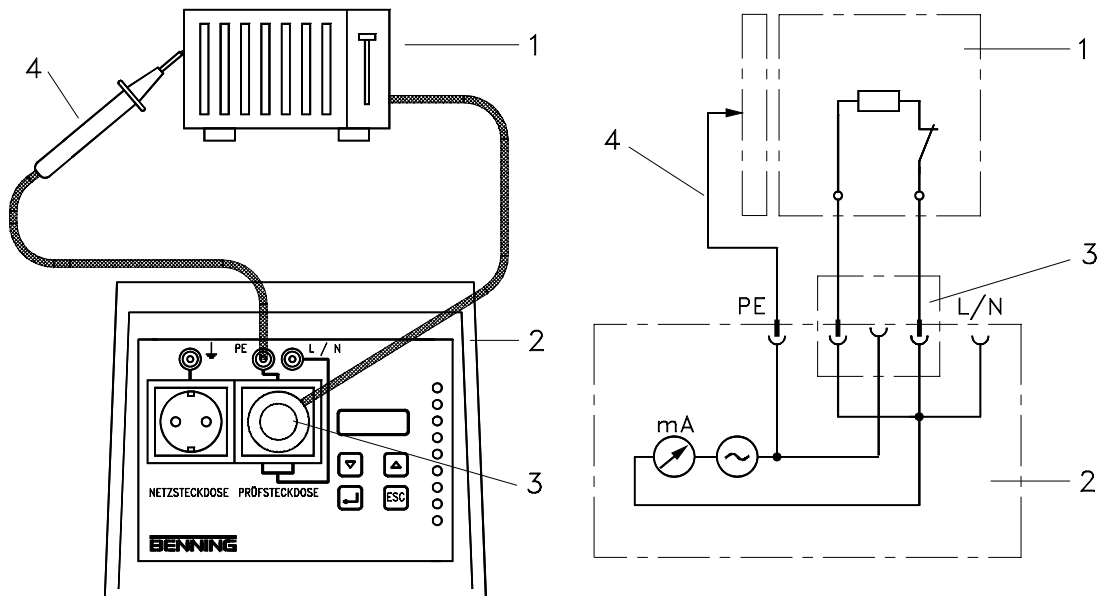


Fig. 15 Test arrangement

Alternative circuit diagram

- 1 Test object (protection class II)
- 2 Measuring equipment (test unit)
- 3 Test socket
- 4 Measuring circuit between the measuring equipment and the test object at the available accessible conductive part.

Attention!

Switch, temperature controller etc. must be closed!

Test for voltage absence by measuring the current
(DIN VDE 0701 T240)

Measurement of contact current in accordance with differential-current process on units of protection class II (I)
(DIN VDE 0701 T1 and DIN VDE 0702)

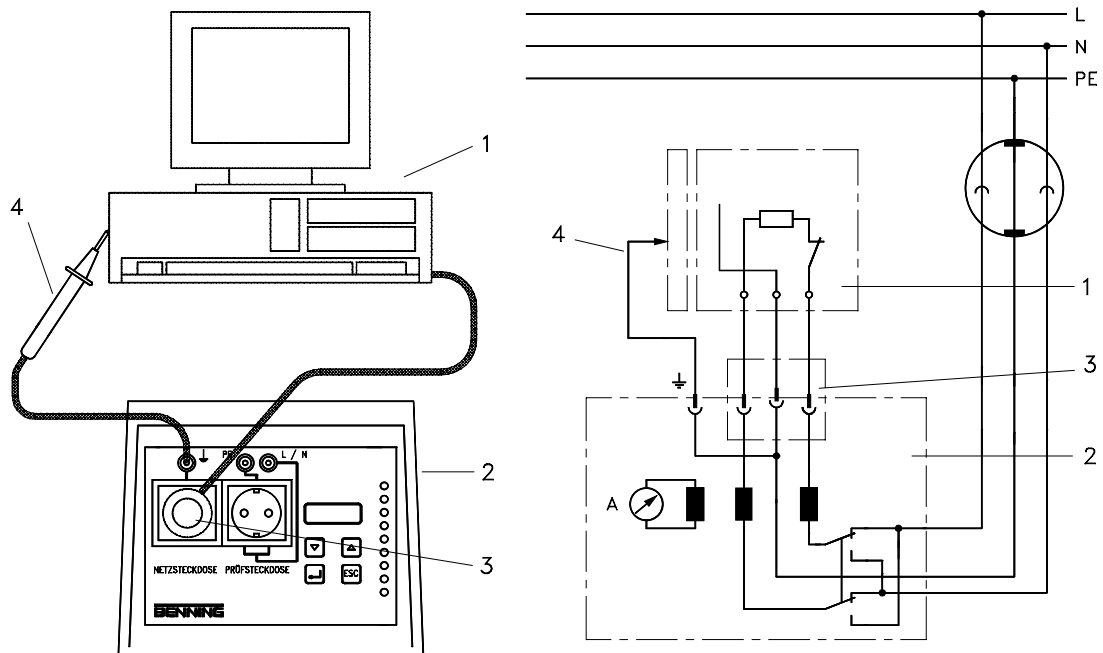


Fig. 16 Test arrangement

Alternative circuit diagram

- 1 Test object
- 2 Measuring equipment (test unit)
- 3 Mains socket
- 4 Measuring circuit between the measuring equipment and the test object at the available accessible conductive part.

Attention!

Switch, temperature controller etc. must be closed!

6 Technical data

Mains connection:	230 V \pm 10 %, 50 - 60 Hz
Current consumption portable appliance tester	
- without mains socket:	0.3 A
- with mains socket:	16 A
Maximum current load of mains socket:	16 A
Maximum fuse size:	16 A
Protection class:	II (for mains socket, protective conductor is looped through)
Protective class:	IP 30
Overvoltage category:	II
Contamination class:	2
LCD-display:	5 digit, 20 mm high, max. display 99999
Environmental conditions:	Height up to 2000 m NN
- Temperature range:	5 to 40 °C (operating temperature) -20 to 60 °C (storage temperature)
- Maximum relative humidity:	80 % up to 30 °C linear decrease 60 % to 40 °C
Temperature range for accuracy data:	18 to 28 °C
Standards:	DIN VDE 0404 part 1 DIN VDE 0404 part 2 DIN VDE 0411 part 1, EN 61010 DIN VDE 0413 part 1 DIN VDE 0413 part 2 DIN VDE 0413 part 4
Dimensions (without case):	Height x Width x Depth 110 x 260 x 210 mm
Weight (without case):	2.7 kg

Technical data on individual measurement functions

Measurement	To standard / limit value	Measuring instrument according to regulation
Measurement of protective conductor resistance with ± 200 mA (earth continuity test) Test current: ± 200 mA DC current during measurement with automatic polarity inversion! Measuring range: 0 ... 65.535 Ohm Resolution: 0.01 Ohm Accuracy: ± 10 % +8 digits Rated measuring voltage: ± 15 V DC Limit values: 0.3 Ohm; 1 Ohm Output has no external electric strength!	DIN VDE 0701 part 1 DIN VDE 0701 part 240 DIN VDE 0702 Protection class I 0701 T1 0.3 Ohm 0702 T1 0.3 Ohm up to 5 m length + 0.1 Ohm/ 7.5m additional connection length up to max. 1 Ohm! 0701 T240 1 Ohm	DIN EN 61010-1 (VDE 0411-T1) DIN EN 61557-1 (VDE 0413 T1) DIN EN 61557-4 (VDE 0413 T4) DIN VDE 0404-1 DIN VDE 0404-2 Output but not suited for continuous operation! Automatic safety switch-off after 10 min!
Measurement of protective conductor resistance with 10 A AC current (earth bond test) Test current: 10 A AC current Measuring range: 0 ... 6.54 Ohm Resolution: 0.01 Ohm Accuracy: ± 20 % +8 digits Rated measuring voltage: approx. 2.5 V AC Limit values: 0.3 Ohm Output has no external electric strength!	DIN/VDE 0701 Part 260 0.3 Ohm with connection up to 5 m in length + 0.1 Ohm/ 7.5m additional connection length, up to max. 1 Ohm!	DIN VDE 0413 Part 4 (alt)
Measurement of insulation resistance Test voltage: 500 V DC + 50 -0 % Test current: > 1 mA < 7.5 mA Measuring range: 0 ... 65.535 MOhm Resolution: 0.001 MOhm Accuracy: ± 10 % +8 digits Limit values: 0.25; 0.3; 1; 2 MOhm Output has no external electric strength!	DIN VDE 0701 part 1 DIN VDE 0702 Protection class I with heating elements 0.3 MOhm Protection class I 1.0 MOhm Protection class II 2.0 MOhm Protection class III 0.25 MOhm	DIN EN 61010-1 (VDE 0411-T1) DIN EN 61557-1 (VDE 0413 T1) DIN EN 61557-2 (VDE 0413 T2) DIN VDE 0404-1 DIN VDE 0404-2

Measurement	To standard / limit value	Measuring instrument according to regulation
Measurement of substitute earth leakage current, as a protective-conductor current and contact current Test voltage: approx. 40 V AC Test current: max. 3.5 mA Measuring range: 0 ... 65.535 mA Resolution: 0.001 mA Accuracy: ±10 % +8 digits Limit values: 0.5; 3.5; mA Output has no external electric strength!	DIN VDE 0701 Part 1 DIN VDE 0702 protective-conductor current, protection class I DIN VDE 0701 T1 and 0702 3.5mA Heating elements up to 3.5 kW 3.5mA at > 3.5 kW 1mA/kW Contact current Class I and II 0.5mA	DIN EN 61010-1 (VDE 0411-T1) DIN EN 61557-1 (VDE 0413 T1) DIN VDE 0404-1 DIN VDE 0404-2
Test for voltage absence Measurement according to differential current process. Internal resistance Measuring equipment:< 2 kOhm Measuring range: 0 ... 65.00 mA Resolution: 0.01 mA Accuracy: ±20 % +8 digits with correct connection of the phases (see Fig. 2) With polarity inverted mains connection the measured result cannot be used! Limit values: 0.25 mA during the measurement with automatic polarity inversion! Output has no external electric strength!	DIN/VDE 0701 Part 240 DIN VDE 0701 T240 0.25mA	DIN EN 61010-1 (VDE 0411-T1) DIN EN 61557-1 (VDE 0413 T1) DIN VDE 0404-1 DIN VDE 0404-2
Measurement of protective-conductor current on units of protection class I Measurement according to differential current process. Measuring range: 0 ... 65.00 mA Resolution: 0.01 mA Accuracy: ±20 % +8 digits with correct connection of the phases (see fig. 2) With polarity inverted mains connection the measured result cannot be used! Limit values: 3.5 mA during measurement with automatic polarity inversion!	DIN VDE 0701 part 1 DIN VDE 0702 Prot. cl. I 3.5 mA Heating elements up to 3.5 kW 3.5mA at > 3.5 kW 1mA/kW	DIN EN 61010-1 (VDE 0411-T1) DIN EN 61557-1 (VDE 0413 T1) DIN VDE 0404-1 DIN VDE 0404-2
Output has no external electric strength! 10.11.05 - TB-Fr/Obs 53/56		3270 en

Measurement	To standard / limit value	Measuring instrument according to regulation
<p>Measurement of contact current with units of protection classes I and II</p> <p>measurement of contact current with accessible conductive parts of protection class II and accessible conductive parts of protection class I, which are not connected to the protective conductor, in accordance with the differential current process</p> <p>Measuring range: 0 ... 65.00 mA</p> <p>Resolution: 0.01 mA</p> <p>Accuracy: $\pm 20\%$ +8 digits with the correct connection of the phases (see fig. 2); With polarity inverted mains connection the measured result cannot be used!</p> <p>Limit values: 0.5 mA during the measurement with automatic polarity inversion!</p> <p>Output has no external electric strength!</p>	<p>DIN VDE 0701 part 1 DIN VDE 0702</p>	<p>DIN EN 61010-1 (VDE 0411-T1) DIN EN 61557-1 (VDE 0413 T1) DIN VDE 0404-1 DIN VDE 0404-2</p>
<p>Mains socket (for function test after safety test passed!)</p> <p>supply cable with protective conductor looped through!</p> <p>Load voltage: 230 V $\pm 10\%$ (as mains feeding) max. 16 A</p> <p>Measuring range: 200 - 260 V AC (50 - 60 Hz)</p> <p>Resolution: 1 V</p> <p>Measuring range: 0 - 16 A AC (50 - 60 Hz)</p> <p>Resolution: 0.01 A</p> <p>Accuracy I (A): $\pm 10\%$ +8 digits Accuracy U (V): $\pm 5\%$ +8 digits</p> <p>Output has no external electric strength!</p>		

Note, with manual measurements the measuring times are individually switched by the operator via the keypad (start and stop function)!
Automatic safety switch-off after 10 min!

The measuring voltages are monitored to protect the portable appliance tester and to test the functions. In case of a malfunction the error is indicated **ERR** on the display. The measurement is interrupted. For a reset the test unit must be switched off.

7 Maintenance

The portable appliance tester requires no special maintenance.

To clean, use only a slightly damp cloth with a mild cleaning agent. Do not use solvents or abrasives to clean.



Environmental notice!

At the end of the product's useful life, please dispose of it at appropriate collection points provided in your country.

7.1 Calibration

Have the portable appliance tester calibrated once per year to assure its correct function and ability to retain data.

8 Scope of delivery

- portable appliance tester BENNING 700,
- high-grade nylon service bag,
- Safety test tip with 4 mm safety socket,
- 1 m connecting cable with 4 mm safety plug,
- Operating instructions

Art. no.: 050305

Optional accessories:

Software:

BENNING PC WIN 700 on CD-ROM,
including 9 pole RS 232 cable

Art. no.: 047000

Barcode scanner

Part no.:009368

Barcode labels (no. circuit 10000-10319)
Other sequence of no. circuit on request!

Art. no.: 756061

Inspection sticker (set with 300 labels)

Art. no.: 756175

3-phase current adapter 16A (L1-2-3 jumped)
(CEE coupling 16 A, 5 pole with safety plug)

Art. no.: 044122

3-phase current adapter 32A (L1-2-3 jumped)
(CEE coupling 32 A, 5 pole with safety plug)

Art. no.: 044123

Leakage current tongs BENNING CM 8

Art. no.: 044060

3-phase current adapter 16A for leakage current tongs
(CEE coupling and plug 5 pole)

Art. no.: 044127

3-phase current adapter 32A for leakage current tongs
(CEE coupling and plug 5 pole)

Art. no.: 044128