GB

Instruction Manual
Cat. No. 9095

TELARIS 0751

Content

References marked on appliance or in instruction manual:

⚠ Warning of a potential danger, comply with instruction manual.

☞ Reference. Please use utmost attention.

⚠ Caution! Dangerous voltage. Danger of electrical shock.

⧈ Continuous double or reinforced insulation complies with Class II according IEC 61140.

Symbol for the marking of electrical and electronic equipment (WEEE Directive 2002/96/EC).

CE Conformity symbol, the appliance complies with the valid directives. It complies with the EMC Directive (89/336/EEC). It also complies with the Low Voltage Directive (73/23/EEC).

⚠ **The instruction manual contains information and references necessary for safe operation and maintenance of the appliance.** Prior to using the appliance (commissioning / assembly) the user is kindly requested to thoroughly read the instruction manual and comply with it in all sections.

⚠ Failure to read the instruction manual or to comply with the warnings and references contained herein can result in serious bodily injury or appliance damage.

1.0 Introduction

You have acquired a sophisticated appliance by Ch. BEHA GmbH allowing the operator to perform reproducible measurements over a very long time period. The company Ch. BEHA GmbH is a member of the worldwide operating BEHA group. The headquarters are located in Glottertal/Black Forest. The technological centre is also situated in Glottertal. The BEHA-Group is one of the leading companies for test and measurement appliances.

1.1 Model and Type Designation/Identification

The serial number label and the order number are located on the appliance bottom. If you have any questions, you are kindly asked to always indicate the product designation, the order number and the serial number.

1.2 Product Description

The UNITEST TELARIS 0751 is a multi-function test instrument for regular monitoring and control of electrical equipment in compliance with BGV A 2 (VBG 4), DIN VDE 0701, DIN VDE 0702, and DIN VDE 0751.
The measurements required to determine the electrical safety in compliance with DIN VDE 0701 and DIN VDE 0702 can be performed.
Furthermore, the auxiliary instrument leakage current and the auxiliary patient leakage current for medical instruments can be performed in compliance with DIN VDE 0751.

An additional external Schuko Measurement Adapter may be connected to the TELARIS 0751 to measure PE resistance currents, differential currents, and load currents. Optionally you may also connect a current clamp adapter to measure PE resistance currents.

The appliance UNITEST TELARIS 0751 is characterised by the following features:

- PE resistance measurement
- Insulation resistance measurement
- Substitute leakage curren

- Touch current measurement
- Substitute housing leakage current
- Substitute patient leakage current
- Response voltage of excess voltage protection devices (varistors)
- Connection facility for external "Schuko Measurement Adapter to measure PE resistance currents, differential currents, and load currents.
- Connection facility for external current clamp adapter to measure PE resistance currents, also for three-phase UUTs

1.3 Scope of Supply

1pc TELARIS 0751
1pc Test lead equipped with test probe (appliance mounted)
2pcs Test leads
2pcs Test probes
2pcs crocodile clamps
1pc Bag with sample labels
1pc Quick reference guide
1pc Instruction manual

1.4 Optional Accessories

(not included in the scope of supply)

Schuko Measurement Adapter	Cat. No. 1296
Current clamp adapter	Cat. No. 1245
Adapter for current clamp adapter	Cat. No. 1277
Software es control 0751	Cat. No. 1255
es control complete package	Cat. No. 1250
Protocol printer	Cat. No. 1196
Interface adapter	Cat. No. 1157

Measurement adapter (to test appliances equipped with a three-phase connection):

CEE 5 pole, 16 A	Cat. No. 1240
CEE 5 pole, 32 A	Cat. No. 1241

Measurement adapter
(to measure the PE resistance current together with the current clamp adapter):

"Schuko"-"Schuko"	Cat. No. 1233
CEE 3 pole, 16 A	Cat. No. 1234
CEE 5 pole, 16 A	Cat. No. 1235
CEE 5 pole, 32 A	Cat. No. 1236

2.0 Transport and Storage

Please keep the original packaging for later transport, e.g. for calibration. Any transport damage due to faulty packaging will be excluded from warranty claims.
In order to avoid appliance damage, we recommend that accumulators are removed when not using the appliance over a certain period of time. However, should the appliance be contaminated by leaking battery cells, you are kindly requested to return it to the factory for cleaning and inspection.
Appliances must be stored in dry and closed areas. In the case of an appliance transported in extreme temperatures, a recovery time of at least 2 hours is required prior to appliance operation.

3.0 Safety Measures

The UNITEST TELARIS 0701/0702 has been designed and checked in accordance with the safety regulations for Electronic test and Measurement Appliances EN 61010 and IEC 61010, and left our factory in a safe and perfect condition. The instruction manual contains information and references necessary for safe operation and maintenance of the appliance.

⚠ In order to avoid electrical shock, the valid safety and VDE regulations regarding excessive touch voltages must receive the utmost attention when working with voltages exceeding 120V (60V) DC or 50V (25V)rms AC. The values in brackets are valid for limited areas (as for example medicine and agriculture).

⚠ Measurements in dangerous proximity of electrical installations are only to be executed when instructed by a responsible electrical specialist, and never alone.

⚠ Prior to usage, inspect the appliance and test leads for external damage. Prior to any operation, ensure that connecting leads used and appliances are in perfect condition. The appliance may no longer be used if one or several functions fail or if the appliance does not appear to be ready to function.

⚠ Only touch test leads and test probes at handle surface provided. Never directly touch test probes.

⚠ If the operator's safety is no longer guaranteed, the appliance is to be put out of service and protected against use. The safety can no longer be guaranteed if the appliance (or leads):

- shows obvious damage
- does not carry out the desired measurements
- has been stored for too long under unfavourable conditions
- has been subjected to mechanical stress during transport.

⚠ The appliance may only be used within the operating ranges as specified in the technical data section.

☞ Avoid any heating up of the appliance by direct sunlight to ensure perfect functioning and long appliance life.

3.1 Appropriate Usage

⚠ The appliance may only be used under those conditions and for those purposes for which it was built.

⚠ The appliance may not be used for measurements in electrical distribution systems!

⚠ The appliance may only be connected to correctly wired and protected mains sockets, protected with maximum 16 A!

⚠ When modifying or changing the appliance, the operational safety is no longer guaranteed.

⚠ Any maintenance and calibration tasks may only be carried out by our repair service staff.

⚠ If the appliance is subjected to an extremely high electro-magnetic field, its functioning ability may be impaired.

4.0 Operation Elements and Display

4.1 Front Panel

Explanation of the individual operation and display elements

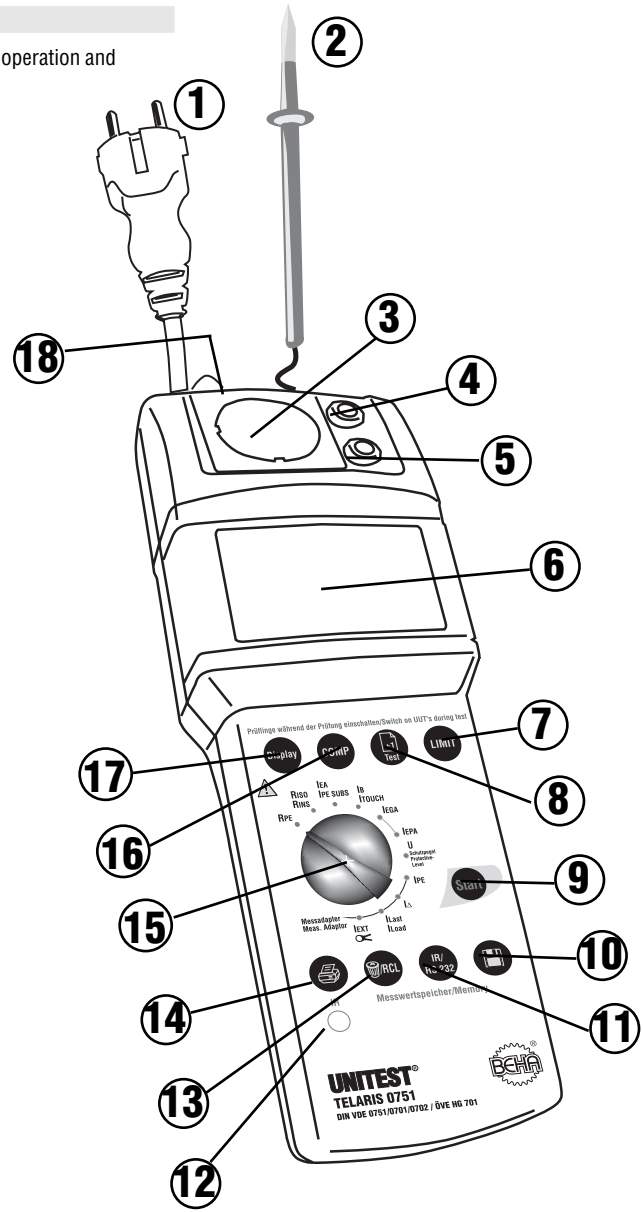

Figure 4.1: Appliance view

1. Mains connection plug, to connect the test appliance to the power supply 230 V +10%/-15%, 50 Hz. The test appliance may only be connected to a mains plug protected with a fuse of maximum 16 A!

2. Probe, fixed test lead with test probe. Test connection for PE resistance test and touch current. The test probe is used for connecting the test appliance and the UUT casing or the touchable conductive casing parts.

3. Test socket, in compliance with DIN VDE 0701/0702. To connect UUTs equipped with earthed mains sockets for the following measurement functions: PE resistance, insulation resistance, and substitute leakage current. Connections L and N are short-circuited within the test socket.

4. Socket 'L/N' (red), parallel connection to the test socket L/N, to connect UUTs not equipped with a earthed mains plug.

5. Socket 'PE' (blue), parallel connection to the test socket PE, to connect UUTs not equipped with a earthed mains plug.

6. Digital LCD, to display measurement values, pre-set limit values, stored data.

7. Key"LIMIT", to set limit values within the different measurement functions.

8. Key "NEW TEST", to connect a new UUT to which the subsequent measurements are assigned.

9. Key "Start", to start a measurement.

10. Key "Store", to save a measurement.

11. Key "Send", for data transfer of stored data to the PC via interface adapter (optional).

12. RS-232 interface (infrared).

13. Key "Clear/Recall", to delete or view the stored measurement data and created UUTs.

14. Key "Print", to print stored data via protocol printer (optional).

15. Rotary switch "Measurement function" , to select the desired measurement function. This switch directly activates the selected measurement function.

16. Key "COMP". To compensate test lead resistance.

17. Key "Display", to select the different measurement values within the function RPE and VProt.level.

18. Measurement adapter connector, to connect the external Schuko Measurement Adapter (1196) or the external current clamp adapter (1245).

4.2 LC-Display

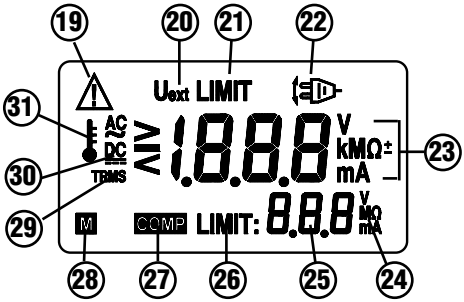

Figure 4.2: Display

19. Attention warning symbol.
20. External voltage present.
21. "Limit" symbol for limit exceeding.
22. Reference: "Turn mains plug at UUT".
23. Unit display.
24. Unit display for the small result field.
25. Measurement value display, small result field.
26. Limit value display, small result field.
27. Symbol for compensated test lead resistance.
28. Symbol for memory entry.
29. True RMS measurement (TRMS).
30. Display for AC voltage / DC voltage.
31. Over temperature, overheating of the appliance.

5.0 General Information to Perform Measurements

⚠ The test appliance may not be used for measurements in electrical distribution systems!

⚠ The maximum admissible mains input voltage amounts to 230 V +10%/-15%, 50 Hz.

⚠ The test appliance and the Schuko Measurement Adapter may only be operated on a correctly wired and earthed mains socket, protected with maximum 16 A!

⚠ The test socket, the measurement connectors in parallel to the test socket, and the PE test connector may not be connected to external voltage to avoid test appliance damage.

⚠ The probe for connecting the touch current may not be connected to an external voltage > 230 V AC/DC to avoid test appliance damage.

⚠ You may use only the original test leads supplied or the pertaining safety measurement accessories!

At differential or PE current measurement an external magnetic field can affect the measurement. Please take care to use the Schuko-Measurement Adapter as most as possible away from appliances with high magnetic fields (i.e monitors with CRT, UUT with big tranformers, welding machines, currents tracks).

⚠ At measurements with faulty appliances or appliances with high leakage currents a preceding RCD (Residual Current Device) could trip.

⚠ Prior to any use, check the test appliance and the test leads for perfect function.

⚠ The test leads and test probes may only be held at the handles provided. Imperatively avoid touching the test probes.

⚠ The measurements for checking the electrical safety must be performed in compliance with the respectively valid standards or regulations.

⚠ The measurements used to check the electrical safety must be performed in compliance with the respectively valid standards and regulations.

5.1 Explanations of Terms

Leakage Current:
The leakage current describes the current which flows via the insulation of a UUT. This happens either via the casing or via touchable, conducitve parts, via the PE, or via additional earth connections (e.g. antenna, water supply) of a UUT.

Contact surfaces:
A part of the instrument, when used appropriately:

- must come in physical (corporal) contact with the patient, if required, so that the instrument can fulfill its function, or
- can be brought in contact with the patient, or
- must be touched by the patient.

Contact surface of type B:
A contact surface ensuring a protection against electrical shock, in compliance with the requirements stipulated within VDE 0750/IEC 60601-1, in particular when observing the admissible leakage current. It is characterised by the symbol .

NOTE: Contact surfaces of type B are not appropriate for direct applications to the heart.

Contact surface of type BF:
A contact surface of type F allowing a superior protection against electrical shock in compliance with the requirements stipulated in DIN VDE 0750/IEC 60601-1 than contact surfaces of type B and characterised by the symbol

NOTE: Contact surfaces of type BF are not appropriate for direct application to the heart.

Touch Current:
Here, a current measurement towards earth at touchable, conductive parts of a UUT is performed. The limit value in compliance with DIN VDE 0701/0702 amounts to 0.5 mA. The measurement may be performed either directly or applying the differential current procedure. The touch current measurement will be performed for appliances of protection class II, containing touchable, conductive parts or for appliances of protection class I, which are equipped with touchable parts not connected with the PE. The measurement must be performed for both positions of mains plug.

☞ The appliance UNITEST TELARIS 0701/0702 easy and the appliance UNITEST TELARIS 0701/0702 use the direct measurement procedure for touch current measurement

Differential Current:
In compliance with DIN VDE 0701/0702, this is a measurement procedure to determine the PE current or the touch current, performing a summation current measurement for all active conductors (L - N) of an UUT. Thus, the total leakage current for a UUT can be determined.
The measurement must be applied if the UUT is equipped with additional earth connections or if an insulated UUT installation is not possible.

☞ The Schuko Measurement Adapter (Option) of the appliance UNITEST TELARIS 0701/0702 allows to perform the measurement using with the differential current procedure.

Electrical Safety:
Condition of instruments for which the repercussions of electrical current on patients, users, or third parties are limited, in compliance with DIN EN 60601-1 (VDE 0750 Part 1).

Earth leakage current:
Current flowing from the power supply through or via the insulation to the protective earth.

Substitute Leakage Current:
In compliance with DIN VDE 0701, this is an alternative measurement procedure to determine the PE resistance current or the touch current.
In compliance with DIN VDE 0702, this measurement is a substitute measurement for the insulation measurement which can be performed if appliances equipped with heating of protection class I do not match the required insulation values.
This measurement procedure determines without mains voltage the leakage current conducted via the PE resistance, or a touchable part.

Auxiliary instrument leakage current:
Current flowing when connecting the instrument in compliance with Figure 6.21 or Figure 6.22 and using the measurement circuit MD (in compliance with DIN VDE 0750 Part 1, En 60601-1) at which the nominal value or mains voltage and the nominal value of the mains frequency are present.

Auxiliary patient leakage current:
Current flowing when connecting the instrument in compliance with Figure 6.25 or Figure 6.26 using a measurement circuit MD in compliance with Figure C.1 at which the nominal value of mains voltage and the nomimal value of the mains frequency are present.

Fixed instruments:
Instrument connected to the mains by means of fixed connections which can only be removed using tools.

Casing leakage current:
Current flowing from the casing or casing parts, excluding contact surfaces, which can be touched by the patients during appropriate usage, whereby it is deviated via another external conductible connection than the protective earth to the ground or to another part of the casing.

Instrument leakage current:
Current flowing from the power supply via the insulation of the casing and/or the contact surface to the protective earth (PE), if a conductible connection is realised between the contact surfaces and the casing.

Insulation Measurement:
A measurement of the insulation resistance is performed between the active parts (L1-L2-L3-N) and the protection earth conductor (PE) within a system, an appliance, or a machine. For this purpose, a test voltage of 500 V DC is used, in compliance with DIN VDE 0701/0702.

Medical, electrical instrument
Electrical instrument equipped with only one connector for a certain supply network destined for diagnosis, treatment, or patient observation under medical supervision and being in corporal or electrical contact with the patient and/or transmits energy to or from the patient and/or indicates such a transfer of energy to or from the patient.

Medical, electrical system:
Combination of several instruments of which at least one instrument is a medical, electrical instrument and which are inter-connected via functional connection or portable multiple sockets.

Patient leakage current:
Current flowing from the contact surface via the patient to the ground, or current which is generated at the patient by an unforeseeable external voltage and which is flowing to the ground either via the patient or a contact surface of type F.

Patient connection:
Every individual part of the contact surface via which current may flow either in normal condition or in condition of the first occuring error between the patient and the instrument.

Test to make sure that the system is not live:
Also called "Leakage current during operation". This leakage current is determined by current measurement on touchable, conductible part of a UUT towards ground, in compliance with DIN VDE 0701, Part 240. According to DIN VDE 0701, Part 240, the limit value is 0.25 mA. This measurement is similar to the contact voltage measurement.

Protection Class I :
appliances of protection class I are UUTs provided with a basic insulation between active (live) parts and the casing. The metal casing or metal casing parts must be appropriately connected to the protection earth conductor. The mains plug of appliances of protection class I are equipped with an earth connector.

Protection Class II :
Appliances of protection class II are equipped with a continuously reinforced or supplementary insulation between the active (live) parts and the casing. Such appliances may, however, have touchable, metal parts. The mains plug of UUTs to protection class II are not equipped with an earth connector.

Protection Class III :
Appliances of protection class III are made either for connection to safety extra low voltage (SELV) current circuits or are only supplied with SELV via an internal power supply.

Earth leakage current (PE current):
This is a part of the UUT leakage current, flowing in the PE (protection earth conductor). According to DIN VDE 0701/0702, the limit value amounts to 3.5 mA. The protection earth conductor current is either determined by direct current measurement within the UUT PE or by applying the differential current measurement. The direct measurement is performed if the UUT is not equipped with an additional earth connection or if the insulation of the UUT against earth is possible. The measurement has to be performed in both positions of the mains plug.
In compliance with DIN VDE 0701:2000-09, the PE current measurement represents an additional measurement to determine the insulation capacitance for appliances of protection class I.
In compliance with DIN VDE 0702, this measurement is a substitute for the insulation measurement for appliances of protection class I and for which the insulation measurement cannot or may not be performed.

☞ The Schuko Measurement Adapter (option) of the appliance UNITEST TELARIS 0701/0702 allows the PE resistance current measurement in compliance with the direct measurement procedure and the differential current procedure.

PE resistance (earth bond):
We are dealing with the PE resistance of the mains connection point (earth connector of the mains plug) to all touchable, metal UUT casing parts which have to be connected to the PE resistance. During PE or resistance measurement, the connecting lead has to be moved over the total lengths in sections. This measurement can only be performed for appliances of protection class I.

Visual Check:
Here, you must make sure that the appliance parts contributing to the electrical safety are undamaged and appropriate. The following must be checked:

- Casing, protection covers
- Connecting leads and plugs
- Condition of insulations
- Strain relief, antikink protection, and arrangement of wiring
- Signs for overload or inappropriate use
- Forbidden interventions or modifications
- Fuse holders and fuses, accessible for the user
- Cooling openings and air filters
- Protection covers
- Overpressure valves
- Fixtures
- Contamination or corrosion which might impair the safety
- Safety labelling

5.2 Performing the Tests

The accident prevention prescriptions (German Unvallverhütungsvorschrift BGV A 2 for "Electrical Systems and Equipment", issued by the professional associations (German Berufsgenossenschaft) defines the conditions for testing electrical appliances:

- Prior to first commissioning and after any modification, after repair, prior to repeated commissioning, as well as in regular TIME INTERVALS.

- For portable appliances, these TIME INTERVALS generally amount to 6 months (for use on building sites reduced to 3 months).

☞ Depending on the use, this interval is flexible, provided the appliance safety is ensured. The test interval can be extended to maximum 12 months for building sites and to maximum 24 months for the use in offices.

☞ The DIN VDE regulations of the series DIN VDE 0701 and DIN VDE 0702 define the test procedure and the limit values.

5.3 Performing Tests in compliance with DIN VDE 0701, Part 1 (issue 2000-09)

DIN VDE 0701 defines the requirements regarding the electrical safety for electrical appliances. It contains the tests and limit values for repaired or modified appliances. After repair or modification, it must be ensured that there will be no risk of danger for the user if the appliance is used appropriately.
The test order is as follows:

1.) Visual Check

2.) Test of PE resistance (for appliances of protection class I)
The limit value amounts to:
0.3 Ω for appliances equipped with mains leads up to 5 m, plus 0.1 Ω for every further 7.5 m, however, maximum 1.0 Ω.

3.) Insulation resistance measurement (if applicable) **The limit value amounts to:**
1 MΩ for appliances of protection class I
2 MΩ for appliances of protection class II* Remark 1
0.25 MΩ for appliances of protection class III
0.3 MΩ for appliances of protection class I with switched on heating elements * Remark 2

Remark 1: This is also applicable for conductive parts of class I appliances which are NOT connected to PE.

Remark 2: For appliances of class I (with heating elements) at which the required limit values for insulation resistance is not fulfilled, the appliance test could be considered as passed, if the PE current is within the limits.

4a.) Measurement of PE resistance Current (for appliances of protection class I)
The limit value amounts to 3.5 mA.
-at appliances with heating elements and a rated power of > 3.5 kW the PE current may not exceed 1 mA/1 kW.
-for ovens/cooking facilities, etc. up to 6 kW 7 mA, more than 6 kW 15 mA.

The PE resistance current may be measured either directly via the substitute leakage current method or via the differential current method

4b.) Measurement of the touch current (for appliances of protection class II)
The limit value amounts to 0.5 mA
The touch current may be measured directly either via the substitute leakage current method or via the differential current method.

☞ These measurements must also be carried out for appliances of protection class I equipped with touchable, conductive parts.

5.) Functional Test

6.) Test of Markings

5.4 Performing tests in compliance with DIN VDE 0702, Part 1 (issue 1995-11)

DIN VDE 0702 defines the test procedures and limit values for repeat tests. A repeat test is defined as a test performed in regular time intervals used as proof for the electrical safety on electrical appliances. It must be ensured that the protection is effective against direct and indirect touch. DIN VDE 0702 is valid for all electrical appliances which can be disconnected from an electrical system by means of a plug-in system.

The test order is as follows:

1.) Inspection, visual check

2.) Measuring the PE resistance (for appliances of protection class I)
The limit value amounts to:
0.3 Ω for appliances equipped with mains leads up to 5 m, plus 0.1 Ω for every further 7.5 m.

3.) Insulation resistance measurement
The limit value amounts to:
0.5 MΩ for appliances of protection class I
2 MΩ for appliances of protection class II
0.25 MΩ for appliances of protection class III.

☞ If the insulation measurement does not test all active UUT parts, a PE resistance current or touch current may be performed as a substitute measurement. These measurements may also be carried out as substitute measurements for appliances for which the performance of an insulation measurement gives reasons to reservations.

4.) Measurement of substitute leakage current
The limit value amounts to:
7 mA for appliances of protection class I with a heating capacity of < 6 kW,
15 mA for appliances of protection class I with a heating capacity of > 6 kW

☞ A substitute leakage current measurement must be performed for appliances of protection class I equipped with heating elements and for which the requested insulation resistance is not obtained,

5.) Measurement of the PE resistance current (for appliances of protection class I)
The limit value amounts to 3.5 mA.

This is a substitute measurement to the insulation measurement for appliances of protection class I.

6.) Touch current measurement (for appliances of protection class II)
The limit value amounts to 0.5 mA.

This is a substitute measurement to the insulation measurement for appliances of protection class II or for appliances of protection class I equipped with touchable, conductive parts.

5.5 Performing Tests in compliance with DIN VDE 0751, Part 1 (Edition 2001-10)

DIN VDE 0751 stipulates the requirements for the electrical safety on medical, electrical instruments or systems. Mention is made here regarding tests and limit value for tests prior to commissioning, during repair, changes, modifications, or repetition tests on medical instruments.

When performing measurements prior to commissioning, the first measured values must be determined and documented whilst indicating the measurement procedure. This documentation will be used as reference for future measurements (source: translated from DIN VDE 0751, Part 1:2001-10, Section 4.2).

When performing measurements for repetition tests, the measured values must be documented whilst indicating the measurement procedure. The values must then be evaluated. If the leakage current measurement values exceed factor 0.9 of the admissible values, the first measurement values are to be taken as reference for evaluation (please refer to DIN VDE 0751, Part 1:2001-10, Section 4.3).

The test sequence is as follows:

1.) Inspection
- fuse insert parts, accessible from outside, for current values and characteristics
- inscriptions
- does the mechanical condition allow further and safe use
- no safety-impairing damages or pollutions
- also check and assess accessories used (e.g. mains cable) or one-off parts (patient cable, tubes)
- required documentation availabe and complete

2.) - Measurement of protective earth conductor resistance (for instruments pertaining to protection class I)

The limit value is:
- 0.3 Ω for instruments with fixed mains connection (or for instruments with removable mains connection cable at the instrument, together with the mains connection cable)
- 0.2 Ω for instruments with removable mains connection cable (between the protective earth contact of the instrument plug and the conductible and touchable parts).
- 0,1 Ω only for the removable mains connection cable.

3) - Measurement of leakage currents

⚠ The leakage current measurement for instruments pertaining to protection class I, may only be performed once the protective earth conductor test has been successful.

Measurement has to be made of instrument and patient leakage currents, whereby the following measurement procedures may be used:
- Measurement of the auxiliary leakage current
- Direct measurement of the leakage current
- Measurement of the leakage current in compliance with the differential current procedure

3a.) Measurement of the auxiliary instrument leakage current in compliance with Figure 6.21 and Figure 6.22 (or Figure C4 of DIN VDE 0751).

3b.) Measurement of the auxiliary patient leakage current in compliance with Figure 6.25 and Figure 6.26 (or Figure C7, C8, and C9 of DIN VDE 0751).

3c.) Measurement of the instrument leakage current during instrument operation (measurement in compliance with Figure C5, C6 of DIN VDE 0751).

3d.) Measurement of the patient leakage current during instrument operation (measurement in compliance with Figure C8, C10 of DIN VDE 0751).

Table 1: Limit values for leakage currents

Leakage current	in mA	in mA
Contact surface	TYP B	TYP BF
Instrument leakage current, in general	0.5	0.5
Instrument leakage current for instruments in compliance		
with remarks 1 and 3	2.5	2,5
Instrument leakage current for instruments in compliance with remark 2	5.0	5,0
Instrument leakage current for instruments pertaining to protection class II and for instruments with conductible, touchable parts which are not connected to the protective earth conductor, pertaining to protection class I	0.1	0.1
Auxiliary instrument leakage current		
- within protective earth conductor or parts connected to the protective earth	1.0	1,0
- Instruments with mineral insulation and instruments in compliance with remark 1	5,0	5,0
- in compliance with remark 2	10.0	10-0
Mobile X-ray instruments with additional protective earth	5.0	5.0
Mobile X-ray instruments without additional protective earth	2.0	2.0
Patient leakage current		
DC current	0.01	0.01
AC current	0.1	0.1
Auxiliary patient leakage current Mains voltage on contact surface	-	5.0
Auxiliary patient leakage current	-	5.0

REMARK 1: instrument systems which are not equipped with the touchable parts that are not connected with the protective earth conductor and which are in compliance with the requirements for instrument leakage current, and, if applicable, for the patient leakage current.
Example: Electronic data processing devices with shielded power supply.

REMARK 2: Instruments destined for fixed connection and which are equipped with a protective earth conductor being connected in such a way or being mechanically secured in a certain place that it can only be removed using tools.
Examples for such instruments are:
- the main components of an x-ray system such as the x-ray generator, the table for medical examination.
- Instruments equipped with mineral-insulated heating elements.
- Instruments showing superior ground leakage current values than the admissible values in "Ground Leakage Current, in general" due to the requirement to meet radio protection conditions.

REMARK 3: Mobile x-ray instruments and mobile instruments with mineral insulation.

Source: Table F.1 off DIN VDE 0751 TPart 1:2001-10

4.) Measurement of the insulation resistance

☞ Only for old generation medical devices, please refer to DIN VDE 0751 Part 1, Appendix E.

In case of doubt regarding the perfect condition of the quality of the instrument insulation, an insulation resistance measurement can be performed.

The limit value is:

2 MΩ for instruments pertaining to protection class I

7 MΩ for instruments pertaining to protection class II.

5.) Function test

Afterwards, a specialised person in electrotechnics and medical device technology with particular knowledge in the respective instrument must perform a safety evaluation.

The tests must be documented.

6) –Evaluation of the Documentation and Tests

6.1) Evaluation

The safety evaluation of INSTRUMENTS/SYSTEMS must be performed by a specialised person in electrotechnics and medical device technology with particular knowledge in the respective instrumnet.. If the safety of the INSTRUMENT/SYSTEM is not guaranteed, e.g. by failing the acceptance test in compliance with section 5, the INSTRUMENT/SYSTEM must be marked accordingly and the USER must be informed in writing about the DANGERS emanating from the INSTRUMENT/SYSTEM.

6.2) Documentation

The tests are to be documented. The documentation must fulfill the following minimum requirements:

a) –Designation of the executing site (e.g. company, department);

b) Name of tester and evaluating person;

c) Designation of the INSTRUMENT/SYSTEM (e.g. type, manufacture number, inventory number) and the respective accessories in compliance with section 4.1. The assignment of test documentation to the INSTRUMENT/SYSTEM must be unambigous.

d) –Tests and measurements:
- Date, type scope, and results of the visual inspections.
- Measurement (measurement procedure, measurement equipment, measurement values),
- Function checks.

e) Total evaluation.

f) Date and signature of the evaluating person, when using data processing, indicate the personal coding.

6.0 Performing Individual Tests

6.1 Measuring the PE Resistance (Earth Bond)

6.1.1 General Information regarding the PE resistance Measurement

⚠ Before any PE resistance measurement it must be ensured that the UUT is not connected to live voltages.

☞ During the measurement, the mains lead must be moved across the total length in sections, whereby no measurement result fluctuation must occur. A fluctuating measurement result indicates an error.

☞ For appliances equipped with additional metal connections, such as e.g.
- water connection (e.g. washing machine)
- gas connection (e.g. warm water heating unit)

or
- antenna connection (e.g. SAT-Receiver) the measurement result might be falsified due to the additional connection to the PE resistance. The PE resistance connection via an additional connection must be removed when performing the measurement.

☞ For the appliance UNITEST TELARIS 0751 the test current is an AC current. The key "Display" (17) is used to display the measurement values for both polarities during active measurement. Measurement results showing high differences for the two polarities indicate an insufficient PE connection. Thus, corroded connections to the PE resistance can be determined.

☞ In compliance with DIN VDE 0701, Part 1 and DIN VDE 0702, Part 1, the minimum test current is 200 mA.

☞ For appliances equipped with mains lines of up to 5 m, the limit value amounts to 0.3 Ω in compliance with DIN VDE 0701/0702 0,3 Ω, i.e. for active limit value display 'LIMIT 0.3 Ω' the symbols ⚠ and 'LIMIT' may not be displayed! When dealing with longer connection cables, the limit value is to be defined in accordance with the standard applied.

☞ According to DIN VDE 0751 the limit value is 0,3 Ω, i.e., if the limit value indicator is switched on 'LIMIT 0,3 Ω' the symbols and 'LIMIT' must not appear! If the connection lines are of a certain length, the limit value must be defined in accordance with the respective standard applied.

6.1.2 PE Resistance Measurement (RPE)

Performing the measurement:

Before performing the PE resistance measurement, the user may proceed with the compensation of the test lead resistance (please refer to chapter 6.1.4).

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'RPE'.
- Set the limit for the PE resistance using the key "LIMIT" (7).
- Plug the UUT mains plug into the test socket (3).
- Connect the PE test connector 'Probe' (2) to touchable, conductive appliance parts of the UUT, in compliance with Figure 6.1. Ensure a good contact with the surface of the casing parts.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). If the limit value display is active, the symbol 'LIMIT' (21) indicates that the limit value has been exceeded.

☞ The appliances displays the AC resistance of the PE resistance. The key "Display" (17) is used to subsequently display the measurement values for the positive and negative test current during the measurement (display symbol Ω+ and Ω-).

☞ Measurement results showing high differences for the two polarities indicate an insufficient PE resistance. Thus, corroded connections to the PE resistance can be determined.

☞ Continue with the PE resistance test for all other touchable, conductive parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For any references regarding saving of measurement values, please refer to sections 7.1 and 7.2.

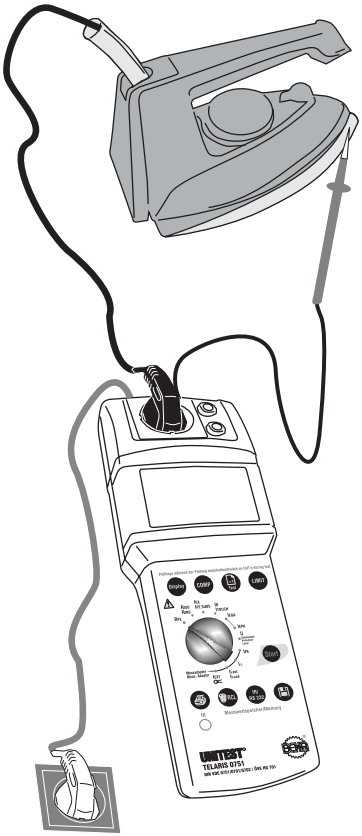

Figure 6.1: Measurement of the PE resistance

6.1.3 Measurement of the PE resistance (RPE) for fix installed appliances not equipped with a Mains Plug

Performing the measurement:

Before performing the PE resistance measurement, the user should proceed with the compensation of the resistance for the additional test lead (connection of the PE (5) socket to the protection earth conductor connection of the UUT), please refer to chapter 6.1.4.

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'RPE'.
- Set the limit for the PE resistance using the key LIMIT(7).
- For fixed installed appliances, connect the PE connection of a neighbouring socket with the blue 'PE' socket (5), please refer to Figure 6.2.
- For appliances not equipped with a mains plug, connect the PE connection of the UUT to the blue 'PE' socket (5), please refer to Figure 6.3.
- Connect the PE test connection 'Probe' (2) to touchable, conductive appliance parts of the UUT, in compliance with Figures 6.2 or 6.3. Ensure a good contact with the surface of the casing parts.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). If the limit value display is active, the symbol 'LIMIT' (21) indicates that the limit value has been exceeded.

☞ The appliances displays the AC resistance of the PE resistance connection. The key "Display" (17) is used to subsequently display the measurement values for the positive and negative test current during the measurement (display symbol Ω+ and Ω-).

☞ Measurement results showing high differences for the two polarities indicate an insufficient PE resistance. Thus, corroded connections to the PE resistance can be determined.

☞ Continue with the PE resistance test for all other touchable, conductive parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For any references regarding saving of measurement values, please refer to sections 7.1 and 7.2.

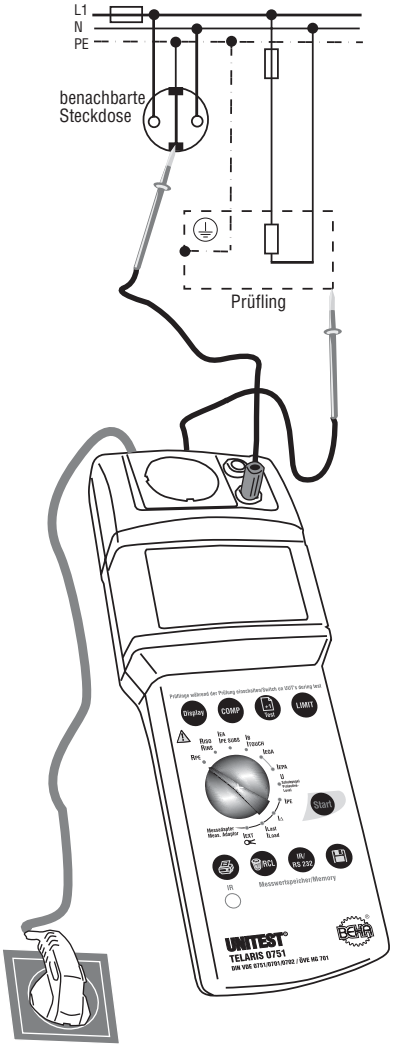

Figure 6.2: Measurement of the PE resistance for fixed installed appliances

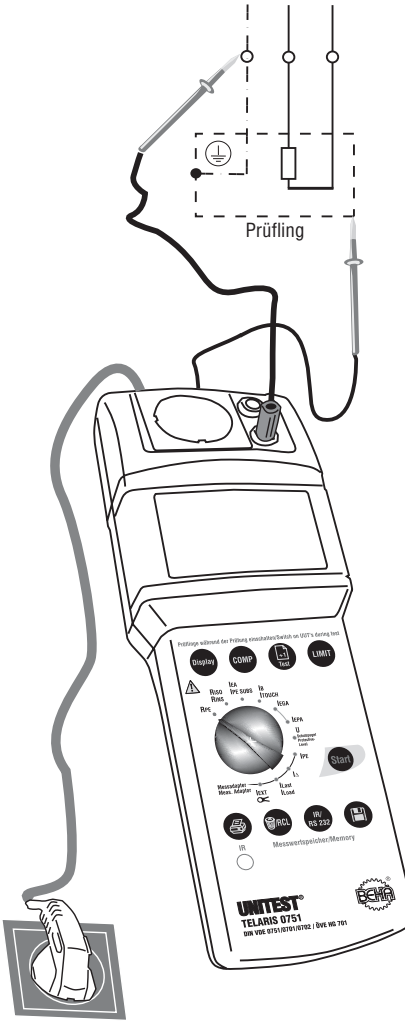

Figure 6.3: Measurement of the PE resistance for appliances not equipped with a mains plug

6.1.4 Compensation of the Test Lead Resistance

The appliance TELARIS 0751 allows to compensate the test lead resistance and the resistance of test accessories resistance up to a value of 1,00 Ω. For compensation, please proceed as follows:

- Connect the PE test connection 'Probe' (2) or the blue 'PE' socket (5) to the additional test lead and test accessories.
- Short-circuit the connected test leads in compliance with Figure 6.4, or connect the probe (2) to the PE of the test socket (3) in compliance with Figure 6.4. Ensure a good contact.
- Turn the 'Measurement function' selection switch (15) to position 'RPE'.
- Press the key "COMP" (16).
- Now, the measurement is started. The resistance of the test lead is measured and compensated. The "COMP" symbol (27) is displayed on the LCD. 0,00 is displayed and a signal is audible.

☞ If the test lead and test accessory resistance is higher than 1,00 Ω, no test lead compensation is performed. Instead "- - -" is displayed on the LCD.

☞ The compensation value is deleted when switching off the appliance.

☞ To delete the compensation value, press again the key "COMP" (16). The 'COMP' symbol is no longer displayed on the screen.

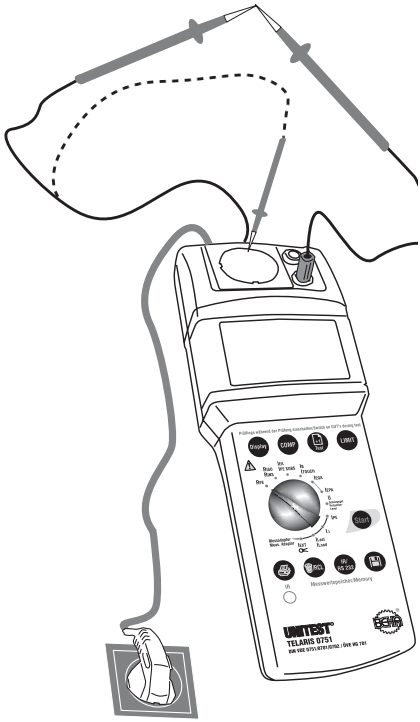

Figure 6.4: Compensation of the test lead resistance

6.2 Measuring the Insulation Resistance

6.2.1 General Information regarding the Measurement of the Insulation Resistance

⚠ The insulation resistance may only be performed after successful PE resistance test.

⚠ Before any insulation measurement, ensure that the UUT is not connected to live voltage.

⚠ During insulation measurement, all switches of the UUT must be switched on to ensure that all circuits inside are considered when performing the measurement.

⚠ Do not touch the UUT during active measurement, danger of electrical shock!

⚠ The insulation measurement may cause a charging of capacitive UUTs, due to the measurement voltage.

6.2.2 Measuring the Insulation Resistance (RINS)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correctly wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'RINS'.
- Set the limit for the insulation resistance using the key LIMIT(7); for the limit values, please refer to table 1.
- Plug the mains plug of the UUT into the test socket (3), please refer to Figure 6.5.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). If the limit value display is active, the symbol 'LIMIT' (21) indicates that the measurement value has fallen below the limit value.

Table 1: Limit values of the insulation resistance

UUT description	DIN VDE 0701	DIN VDE 0702	DIN VDE 0751
UUT of protection class I	1 MΩ	0,5 MΩ	2 MΩ
UUT of protection class II	2 MΩ	2 MΩ	7 MΩ
UUT of protection class III	0,25 MΩ	0,25 MΩ	-
UUT of protection class I with heating element	0,3 MΩ	-	-

* only for old generation medical instruments, please refer to DIN VDE 0751 Part 1 Appendix E

☞ For appliances of protection class II or III connect, in addition, the 'PE' socket (5) to all touchable, conductive casing parts of the UUT, please refer to Figure 6.6.This is also applicable for conductive parts of class I appliances which are NOT connected to PE.

▸ Continue the insulation test for all other touchable, conductive casing parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

☞ The measurement can be started and stopped manually. After approx. 2 minutes, the measurement is automatically completed.

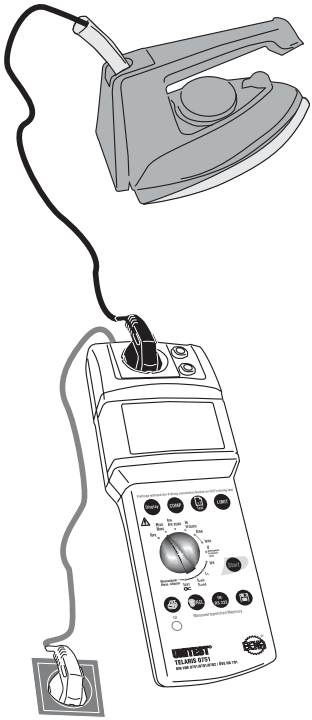

Figure 6.5: Insulation resistance measurement for appliances of protection class I

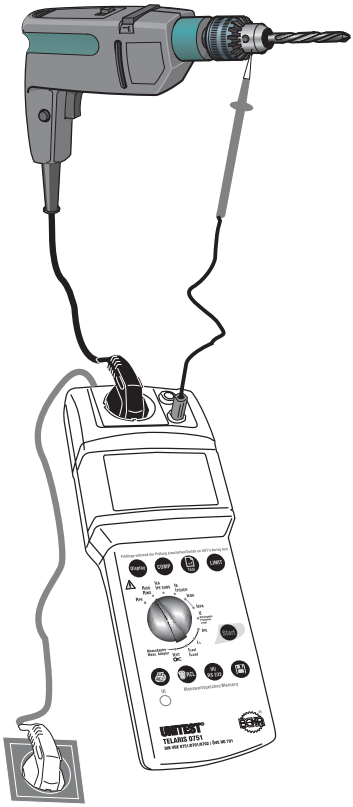

Figure 6.6: Insulation resistance measurement for appliances of protection class II

6.2.3 Insulation Resistance Measurement (RINS) for fix installed appliances or appliances not equipped with a mains plug

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'RINS'.
- Set the limit for the insulation resistance using the key LIMIT(7); for the limit values, please refer to table 1.
- Switch on the UUT.
- Connect the UUT PE connection to the blue 'PE' socket (5), in compliance with C in Figure 6.7.

☞ For appliances of protection class I or II, additionally connect the 'PE' socket (5) to all touchable, conductive casing parts of the UUT, in compliance with D, E in Figure 6.7. This is also applicable for conductive parts of class I appliances which are NOT connected to PE.

- Connect the socket 'L/N' (4) to all active connectors of the UUT, in compliance with A, B in Figure 6.7.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). If the limit value display is active, the symbol 'LIMIT' (21) indicates that the measurement value has fall below the limit value.
- Continue the insulation test for all other touchable, conductive casing parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

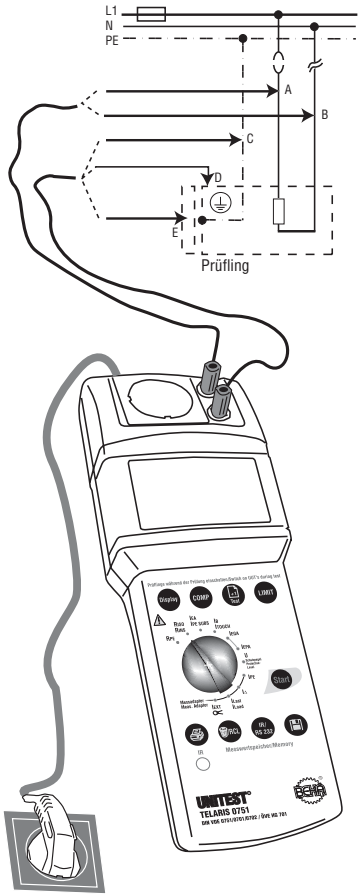

Figure 6.7: Insulation resistance measurement for fixed installed appliances or appliances not equipped with a mains plug.

6.3 Measuring the Substitute Leakage Current

6.3.1 General Information regarding the Substitute Leakage Current

☞ In compliance with DIN VDE 0701:2000-09, the substitute leakage current measurement is an alternative measurement procedure to determine the PE resistance or touch current. According to DIN VDE 0702, this is a substitute measurement for the insulation measurement when dealing with UUTs equipped with heating elements.

⚠ Before any substitute leakage current measurement, ensure that the UUT is not connected to live voltage.

⚠ During the substitute leakage current measurement, all switches of the UUT must be switched on to ensure that the all circuits inside are be considered when performing the measurement.

6.3.2 Measuring the Substitute Leakage Current (IPE SUBS)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'IPE SUBS'.
- Set the limit for the insulation resistance using the key LIMIT(7); for the limit values, please refer to table 2.
- Plug the UUT mains plug into the test socket (3), please refer to Figure 6.8.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). If the limit value display is active, the symbol 'LIMIT' (21) indicates that the limit value has been exceeded.

☞ For appliances of protection class II or III, additionally connect the 'PE' socket (5) to all touchable, conductive parts of the UUT; please refer to Figure 6.9. This is also applicable for conductive parts of class I appliances which are NOT connected to PE.

- Continue the substitute leakage current measurement for all other touchable, conductive casing parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

Table 2: Limit value of the substitute leakage current

Description of the UUTs	according to DIN VDE 0701	according to DIN VDE 0702
UUT of protection class I	3,5 mA	
UUT of protection class II	0,5 mA	
UUT of protection class I with heating element >3,5 kW	1 mA/kW	
UUT of protection class I with heating element up to 6 kW	7 mA (see appendix G)	7 mA
UUT of protection class I with heating element > 6 kW	15 mA (see appendix G)	15 mA

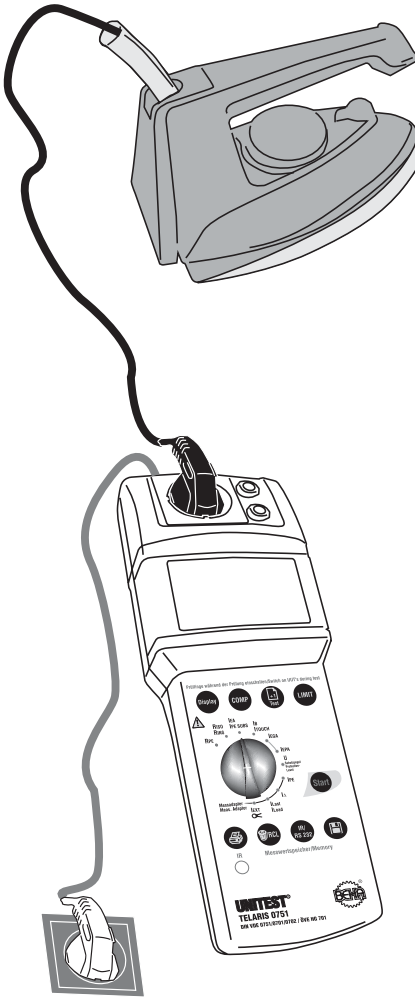

Figure 6.8: Measuring the substitute leakage current for appliances of protection class I

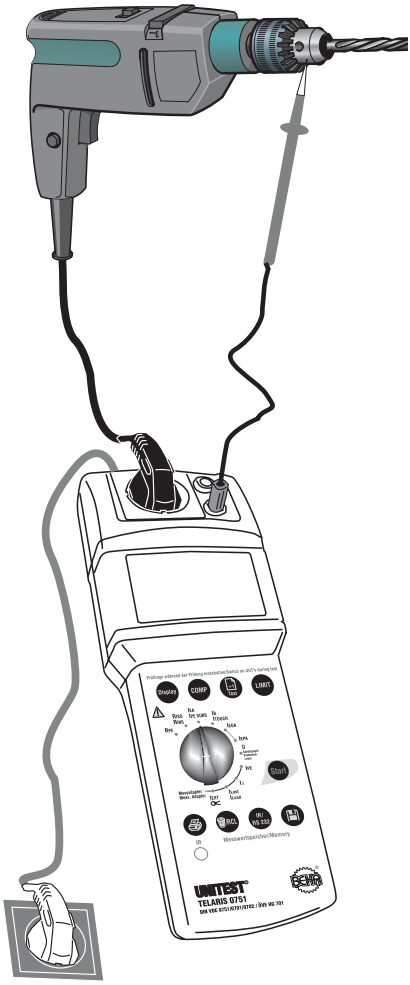

Figure 6.9: Measuring the substitute leakage current for appliances of protection class II

6.3.3 Measuring the Substitute Leakage Current (IPE SUBS) for fixed installed appliances or appliances not equipped with a mains plug

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correctly wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'IPE SUBS'.
- Set the limit for the substitute leakage current using the key LIMIT(7); for the limit values, please refer to table 2.
- Switch on the UUT.
- Connect the UUT PE connection to the blue 'PE' socket (5), in compliance with C in Figure 6.10.

☞ For appliances of protection class II or III, additionally connect the 'PE' socket (5) to all touchable, conductive casing parts of the UUT, in compliance with D, E in Figure 6.10.

- Connect the 'L/N' socket (4) to all active connectors of the UUT, in compliance with A, B in Figure 6.10.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). If the limit value display is active, the symbol 'LIMIT' (21) indicates that the limit value has been exceeded.
- Continue the substitute leakage current test for all other touchable, conductive casing parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

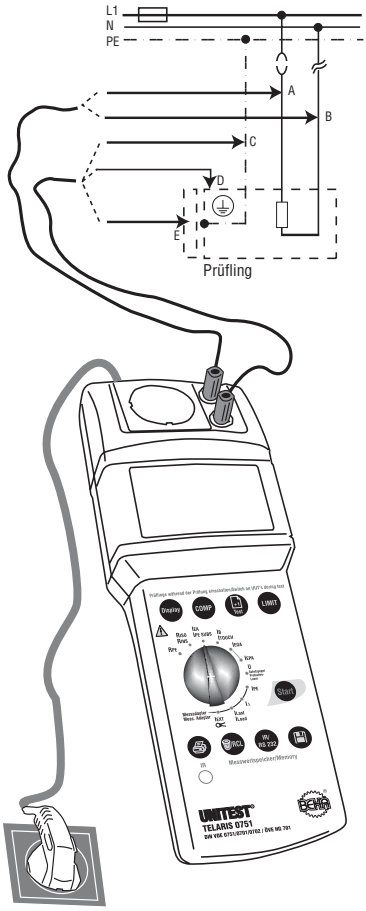

Figure 6.10: Measuring the substitute leakage current for fixed installed appliances or appliances not equipped with a mains plug.

6.4 Measuring the Touch Current

6.4.1 General Information regarding the Touch Current

⚠ The touch current measurement for appliances of protection class I may only be performed after successful PE resistance test.

⚠ The UUT is put into operation during this test, i.e. the UUT will be supplied with mains voltage. Therefore, the UUT must be switched on. UUTs equipped with motor drives or with heating units may present a danger to the controller (please observe the instruction manual of the UUT!).

☞ In compliance with DIN VDE 0701:2000-09, the touch current measurement represents an additional measurement to determine the insulation properties for appliances of protection class I and II. In compliance with DIN VDE 0702, this represents a substitute measurement to the insulation measurement for appliances of protection class II, for which the insulation measurement may not or cannot be performed.

☞ The touch current measurement is performed for appliances of protection class II with touchable, conductive parts or for appliances of protection class I, equipped with touchable, conductive parts, not connected to the PE.

☞ The measurement has to be performed for both positions of the mains plug . The higher of both values has to be considered. The UNITEST TELARIS 0751 displays the  symbol (22) as a reference.

☞ The touch current measurement using the UNITEST TELARIS 0751 is performed by means of the direct measurement procedure in compliance with DIN VDE 0701/0702. The UNITEST TELARIS 0751 measures the current, flowing from the probe (2) to the PE connector of the mains plug (1).

☞ The limit value for the touch current in compliance with DIN VDE 0701/0702 amounts to 0.5 mA. In compliance with DIN VDE 0701, Part 240, the limit value amounts to 0,25 mA. The measurement has to be performed for both positions of the mains plug.

⚠ At measurements with faulty appliances or appliances with high leakage currents a preceding RCD (Residual Current Device) could trip.

TaTable 3 Limit Values	
Touch current in compliance with DIN VDE 0701/0702, Part 1	0,5 mA
Touch current in compliance with DIN VDE 0701/0702, Part 240	0,25 mA

⚠ For this measurement, the test probe (2)is connected via the internal resistor (approx. 2 kΩ) to the blue "PE" socket (5). The blue "PE" socket (5) is during the measurement directly connected to the PE resistance of the mains plug (1).

⚠ During this measurement, no test leads may be connected to the measurement sockets "PE" (5) or L/N" (4).

⚠ The appliance TELARIS 0751 automatically stops the measurement function, if a current of more than approx. 1.99 mA is flowing via the "Probe" test lead (2) during the test.

⚠ If a part is touched during test, which is connected directly to mains voltage, a leakage current is flowing which could trip a preceding RCD (Residual Current Device).

⚠ The warning symbol at the appliance for an external voltage is only present during measurements in order to avoid erroneous displays caused by the high input impedance of the probe when deactivated.

6.4.2 Measuring the Touch Current (ILEAK)

Performing the measurement:

Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correctly wired and grounded mains socket.

- Turn the 'Measurement function" selection switch (15) to position 'IB'.
- Set the limit for the insulation resistance using the key LIMIT(7); for the limit values, please refer to table 3.
- Plug in the mains plug of the UUT into a functional and correctly wired and grounded mains socket.
- Switch on the UUT.
- Connect the 'Probe' test socket (2) to the touchable conductive casing parts of the UUT, in compliance with Figure 6.11.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.

- Read the measurement value from the LC display (6). If the limit value display is active, the symbol ‘LIMIT’ (21) indicates that the limit value has been exceeded.
- Continue the touch current test for all other touchable, conductive casing parts of the UUT.
- Turn the mains plug of the UUT and repeat the measurement.
- Read the measurement value from the LC display (6). The highest measured value is the value to be recorded.

☞ The measurement results can be saved by pressing the key “Store” (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

Figure 6.11: Measuring the touch current

6.5 Measuring the Protection Level of Overvoltage Protection Devices (varistors)

6.5.1 General Information for Measuring the Protection Level

The protection level or the response voltage of overvoltage protection devices can be measured using the TELARIS 0751 (Cat. No. 9091).
This is a method to check and measure overvoltage protection devices at the UUT mains input, which have generated a measurement result too low during insulation measurement.

☞ The measurement is performed using a DC voltage, to obtain a overvoltage protection devices response. The DC value displayed during the measurement corresponds to the actually measured DC voltage.

☞ The AC voltage value may be displayed during the measurement using the key "Display" (17). This value corresponds to the AC voltage value to which the checked overvoltage protection devices may be connected.

When calculating the maximum AC voltage, a safety factor of approx. 14 % will be considered, resulting into the following formula: UAC = UDC/1,6.

⚠ This measurement may only be performed on UUTs which are not connected to live voltage!

6.5.2 Measuring the Protection Level

Carrying out measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position VProt level".
- When dealing with UUTs at which the overvoltage protection devices are connected between L and N, connect the phase (L) of the mains input to the red "L/N" socket (4) and the neutral conductor (N) to the blue socket (5), please refer to Figure 6.12.
- When dealing with UUTs with the overvoltage protection devices between L towards PE or N towards PE, connect the blue socket (5) with the PE and the red socket (4) to L or N of the UUT, please refer to Figure 6.13.
- If the overvoltage protection devices is installed after the mains switch, you must switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). The appliance displays the DC voltage value of the response voltage.

☞ The key "Display" (17) is used to display the AC voltage value during the active measurement.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

☞ The measurement may be started and stopped manually. After approx. 15 seconds, the measurement is automatically terminated to avoid any overload of the tested overvoltage protection devices.

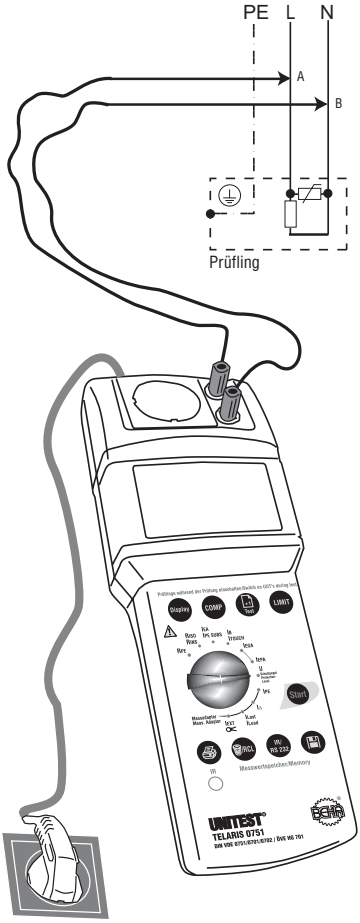

Figure 6.12: Measuring the protection level for UUTs with overvoltage protection devices between L and N

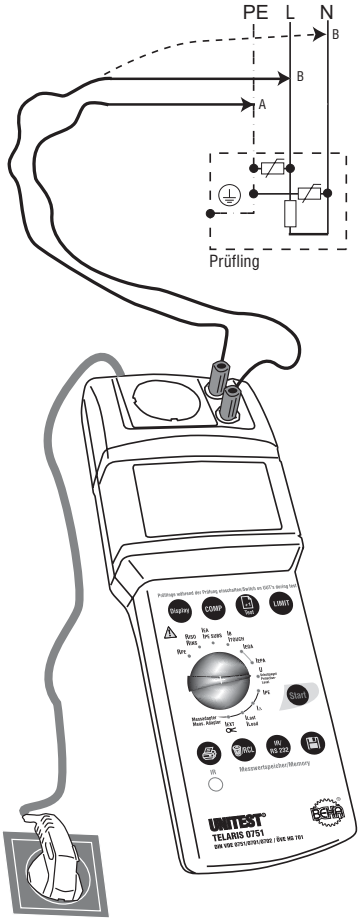

Figure 6.13: Measuring the protection level for UUTs with overvoltage protection devices L towards PE or N towards PE

6.6 Measuring the PE earth leakage current (PE current) and the Differential Current with Schuko Measurement Adapter (Option)

6.6.1 General Information regarding the PE earth leakage current and Differential Current

In compliance with DIN VDE 0701:2000-09, the PE resistance measurement is considered as an additional measurement to determine the insulation capacity for appliances of protection class I.
According to DIN VDE 0702, this is a substitute measurement for the insulation measurement regarding appliances of protection class I, for which no insulation measurement may or can be performed.

The PE current may be determined either via direct current measurement within the PE resistance of a UUT or via the differential current procedure. The direct measurement may be applied, if the UUT is not equipped with additional earth connections or if an insulated UUT installation is possible. The measurement must be performed for both mains plug positions.

In compliance with DIN VDE 0701/0702, the differential current measurement is a measurement principle to determine the PE resistance current or the touch current. The result is obtained by performing a summation current measurement of all active conductors (L-N) pertaining to a UUT. Thus, the total leakage current of a UUT can be picked up.
The differential current measurement must be applied if the UUT is equipped with additional earth connections of if an insulated UUT installation is not possible. This measurement must also be performed for both positions of the mains plug.

An external Schuko Measurement Adapter must be connected to the TELARIS 0751 (Cat. No. 9091) to measure the PE resistance current, the differential current, and the load current. This Schuko Measurement Adapter allows the measurement of the PE current in compliance with the direct measurement principle and the differential current procedure.

⚠ The PE resistance current measurement may only be performed after successful PE resistance test.

⚠ The UUT is put into operation for this test, i.e. it will be supplied with mains voltage. For this, the UUT must be switched on. Motor driven UUTs or UUTs equipped with heating units may cause a danger for the controller (observe the UUT instruction manual!).

⚠ Observe that mains voltage is already present when plugging in the mains plug of the Schuko Measurement Adapter! UUTs that are already switched on are put into operation immediately after the plug-in!

⚠ The Schuko Measurement Adapter is not equipped with built-in fuses. Observe that over current and short-circuit protection must be ensured by the supplying mains system. Therefore, the Schuko Measurement Adapter may only be connected to a functional and correctly wired and grounded mains socket, protected at maximum 16 A!

⚠ The maximum output current for the mains socket of the Schuko Measurement Adapter amounts to 16A! The test appliance may not be used for permanent measurements.

⚠ At measurements with faulty appliances or appliances with high leakage currents a preceding RCD (Residual Current Device) could trip.

☞ The measurement must be performed for both positions of the mains plug. The higher of both values have to be considered. As a reference, the UNITEST TELARIS 0751 displays the symbol  (22).

☞ The limit value for the PE current DIN VDE 0701/0702 amounts to 3.5 mA.

☞ There is an additional possibility to measure the actual leakage current. Using a highly sensitive AC current clamp, surround all active conductors of the mains feeding lines of a UUT. For single-phase appliances, these are L1 and N, for three-phase appliances, these are L1, L2, L3, and N. Now, in compliance with Kirchhoff, the cumulating of the currents must equal zero. If a current is measured, we are dealing with a "true" leakage current, flowing either via the PE resistance and/or via the casing or possible gas or water pipes, etc. connected to the casing. Consequently, the differential current is measured. This type of current clamp is also available within the UNITEST range. The leakage current clamp CHB 3, Cat. No. 93481, offers a resolution of 10 µA. This method allows the fast, simple, and safe measurement of the "true" leakage current.

6.6.2 Measuring the PE Current (IPE)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correctly wired and grounded mains socket.
- Connect the Schuko Measurement Adapter via the mains plug to a function and correctly wired and grounded mains socket. This socket may be protected at maximum 16 A!
- Connect the Schuko Measurement Adapter to the measurement adapter connector (18) of the UNITEST TELARIS 0751.
- Turn the 'Measurement function" selection switch (15) to position "IPE".
- Set the limit value for PE resistance current using the key LIMIT(7). In compliance with DIN VDE 0701/0702 the limit value amounts to 3.5 mA.
- Connect the UUT mains plug to the mains socket of the Schuko Measurement Adapter.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). The symbol 'LIMIT' (21) indicates an exceeding of the limit values, if the limit value display is switched on.
- Turn the UUT mains plug and repeat the measurement.
- Read the second value from the LC display (16). The higher measurement value of both measurement values has to be considered and recorded.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

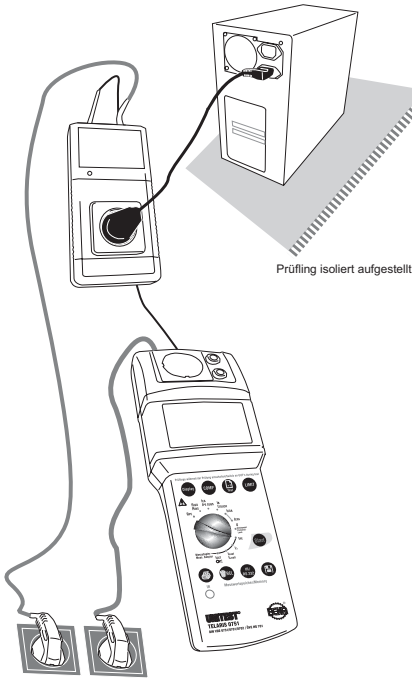

Figure 6.14: Measuring the PE current using Schuko Measurement Adapter (option)

6.6.3 Measuring the Differential Current (IΔ)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correctly wired and grounded mains socket.
- Connect the Schuko Measurement Adapter via the mains plug to a function and correctly wired and grounded mains socket. This socket may be protected at maximum 16 A!
- Connect the Schuko Measurement Adapter to the measurement adapter connector (18) of the UNITEST TELARIS 0751.
- Turn the 'Measurement function" selection switch (15) to position 'IΔ'.
- Set the limit value for PE current using the key LIMIIT (7). In compliance with DIN VDE 0701/0702 the limit value amounts to 3.5 mA.
- Connect the UUT mains plug to the mains socket of the Schuko Measurement Adapter.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). The symbol 'LIMIT' (21) indicates an exceeding of the limit values, if the limit value display is switched on.
- Turn the UUT mains plug and repeat the measurement.
- Read the second value from the LC display (16). The higher measurement value of both measurement values has to be considered and recorded.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2

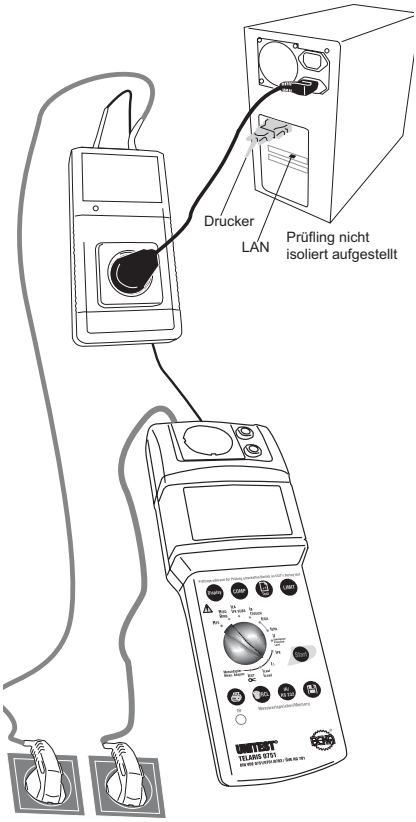

Figure 6.15: Measuring the differential current using Schuko Measurement Adapter (option)

6.7 Function Test, Measurement of the Load Current with Schuko Measurement Adapter (Option)

6.7.1 General Information regarding the Function Test

To complete a test procedure, the appliance UNITEST TELARIS 0751 offers the function test facility. This test checks the UUT function and measures the load current consumption.

An external Schuko Measurement Adapter to measure the PE current, the differential current, and the load current must be connected to the TELARIS 0751 (Cat. No. 9095).

☞ In compliance with DIN VDE 0701, the function test must be performed after completion of the safety test after repair or modification of an electrical apliance. For repeat tests in compliance with DIN VDE 0702 no function test is required.

⚠ The function test may only be performed after successful safety test.

⚠ The UUT is put into operation for this test, i.e. it will be supplied with mains voltage. For this, the UUT must be switched on. Motor driven UUTs or UUTs equipped with heating units may cause a danger for the controller (observe the UUT instruction manual!).

⚠ Observe that mains voltage is already present when plugging in the mains plug of the Schuko Measurement Adapter! UUTs that are already switched on are put into operation immediately after the plug-in!

⚠ The Schuko Measurement Adapter is not equipped with built-in fuses. Observe that overcurrent and short-circuit protection must be ensured by the supplying mains system. Therefore, the Schuko Measurement Adapter may only be connected to a functional and correctly wired and grounded mains socket, protected at maximum 16 A!

⚠ The maximum output current of the mains socket of the Schuko Measurement Adapter amounts to 16A! The Schuko Measurement Adapter may not be used for continuous measurements.

6.7.2 Function Test including Measurement of the Load Current (ILOAD)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correctly wired and grounded mains socket.
- Connect the Schuko Measurement Adapter via the mains plug to a functional and correctly wired and grounded mains socket. This socket may be protected at maximum 16 A!
- Connect the Schuko Measurement Adapter to the measurement adapter socket (18) of the UNITEST TELARIS 0751.
- Turn the 'Measurement function" selection switch (15) to position 'ILOAD'.
- Connect the UUT mains plug to the mains socket of the Schuko Measurement Adapter.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6).

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

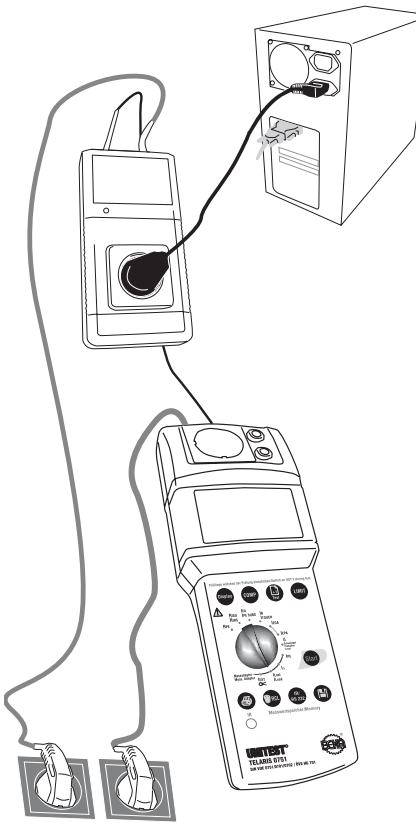

Figure 6.16: Measuring the load current

6.8 Current Measurement using external Current Clamp Adapters, Current Clamp Adapter (Option)

6.8.1 General Information regarding the Current Measurement using Current Clamp Adapters

An external current clamp adapter to measure currents up to 19.99 mA may be connected to the TELARIS 0751 (Cat. No. 9095). This current adapter allows the measurement of PE currents and leakage currents for installed UUTs or UUTs in a three-phase system. To perform this measurement, surround the PE resistance of the UUT with the current clamp adapter. For appliances of which the PE resistance is not individually accessible, Beha offers appropriate measurement adapters (Schuko, CEE 16 A and 32 A), please refer to section 1.4 Accessories.

☞ When using current clamp adapters for the current measurement, the measurement result may be falsified by interfering magnetic fields, which can be generated by the UUT load current or by other magnetic fields (motors, transformers, etc.). Therefore, when measuring the PE resistance current, it must be imperatively ensured that the measurement is performed at a location leaving the maximum distance to the active or other live conductors, or other magnetic fields.

6.8.2 Measuring the PE Current using a Current Clamp Adapter (IEXT)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Connect the Schuko Measurement Adapter to the measurement adapter connector (18) of the UNITEST TELARIS 0751.
- Turn the ‘Measurement function” selection switch (15) to position ‘IEXT’.
- Connect the mains plug of the UUT to a functional and correctly wired and grounded mains socket.
- Switch on the UUT.
- To perform the measurement, surround the PE resistance of the UUT with the current clamp adapter, please refer to Figure 6.17.
- Press the key “Start” (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6).
- Turn the UUT mains plug and repeat the measurement.
- Read the second value from the LC display. (16). The higher measurement value of both measurement values has to be considered and recorded.

☞ The measurement results can be saved by pressing the key “Store” (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

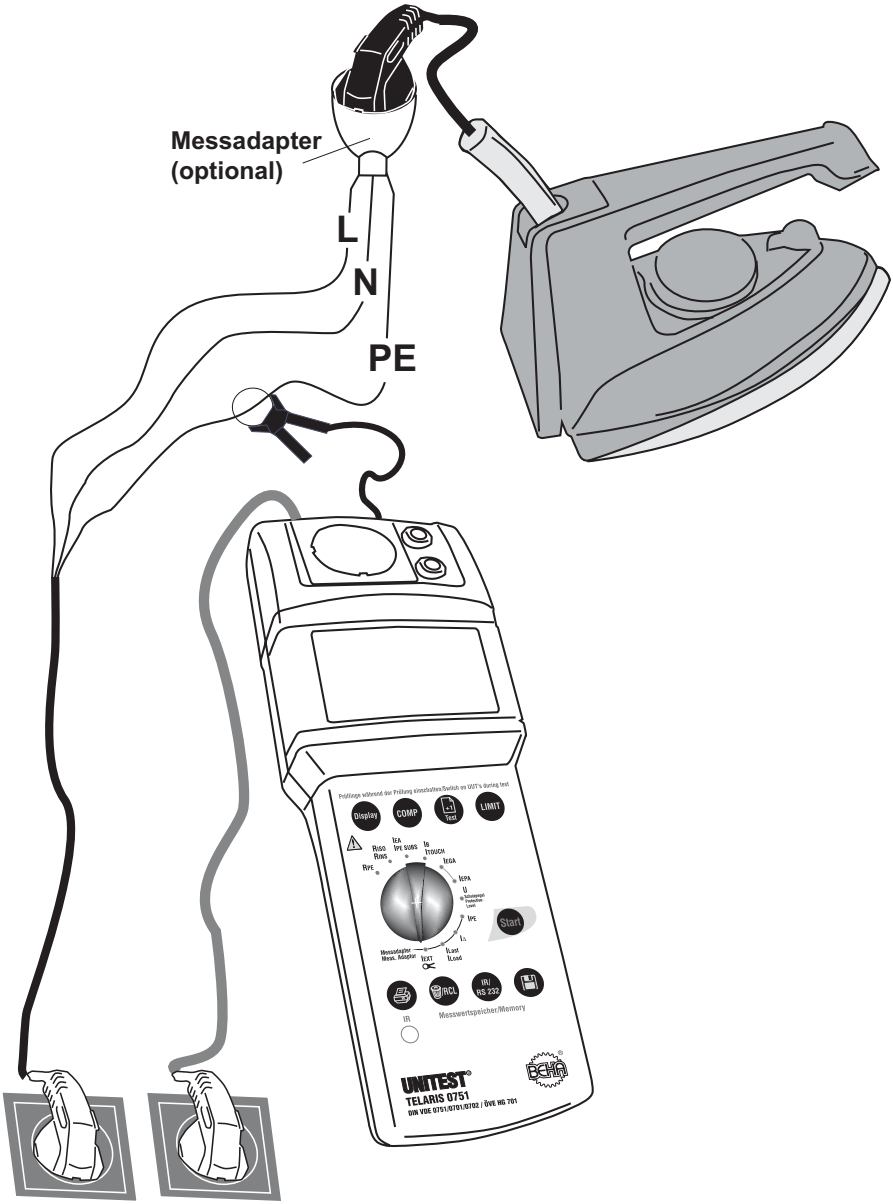

Figure 6.17: Measuring the PE current using a current clamp adapter

6.9 UUTs equipped with Three-phase Connection

In compliance with DIN VDE 0701/0702, UUTs not equipped with a "Schuko" plug can be connected to the sockets 'L/N' (4) and 'PE' (5), connected in parallel to the test socket.
The following measurements may be performed:

- PE resistance
- Insulation resistance
- Substitute leakage current

☞ Measurements of the touch current PE current, the differential current or the function test cannot be performed.

By using the three phase measurement adapter (Cat.No. 1235, 1236) and the current clamp adapter (Cat.No. 1245) also on three phase appliances the PE current could be measured.

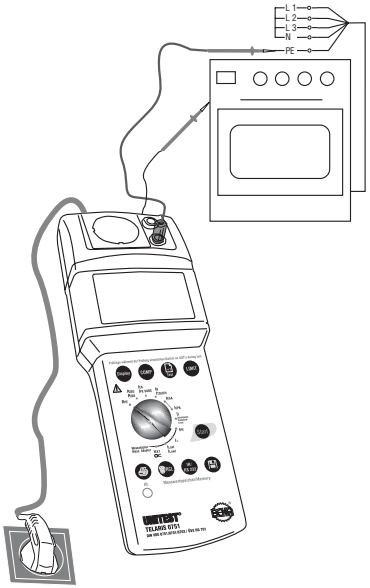

Figure 6.18: Measuring the PE resistance for UUTs equipped with three-phase connection.

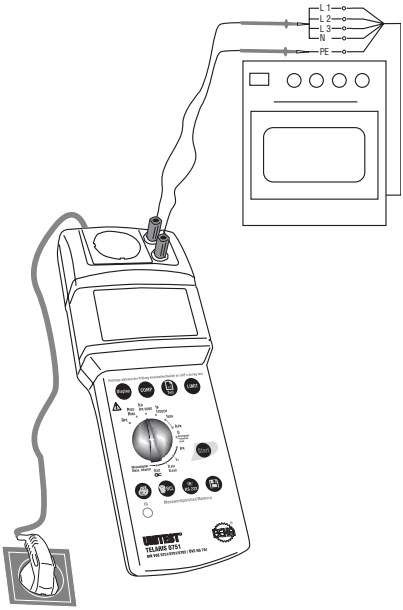

Figure 6.19: Measuring the insulation resistance or the substitute leakage current for UUTs equipped with three-phase connection

The optional UNITEST Three-phase adapters 1240 and 1241 allow the direct connection of three-phase appliances to the UNITEST TELARIS 0751 test socket.

Figure 6.20: Three-phase adapter 16 A (Cat. No. 1240) and three-phase adapter 32 A (Cat. No. 1241)

6.10 Measurement of the Auxiliary Instrument Leakage Current

6.10.1 General Information regarding the Measurement of the Auxiliary Instrument Leakage Current

According to DIN VDE 0751, Part 1:2001-10, the measurement of the auxiliary instrument leakage current is an alternative measurement procedure to determine the leakage current.

Measurement is made of the auxiliary leakage current between short-circuited mains connectors (L/N) of the UUT and the PE conductor or touchable and conductible UUT parts. Patient connectors are also short-circuited and connected to the PE conductor, please refer to Figures 6.21 and 6.22.

⚠ During the measurement of the auxiliary instrument leakage current, all switches of the UUT must be switched on, so that the complete current circuit and all insulations can be sampled during the measurement.

⚠ Prior to performing any auxiliary instrument leakage current measurement, ensure that the UUT is not live.

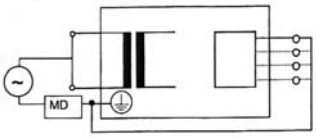

Figure 6.21: Measurement of the auxiliary instrument leakage current for instruments pertaining to protection class I, block diagram

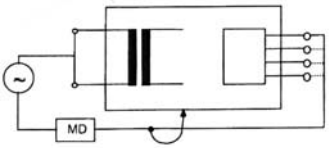

Figure 6.22: Measurement of the auxiliary instrument leakage current for instruments pertaining to protection class II, block diagram

Remarks: MD is a measurement layout in compliance with DIN VDE 0750, Part 1, EN 60601-1

6.10.2 Measurement of the Auxiliary Instrument Leakage Current Measurement (IEGA)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'IEGA'.
- Set the limit for the insulation resistance using the key LIMIT(7); for the limit values, please refer to table 35, page 49.
- Plug the UUT mains plug into the test socket (3), please refer to Figure 6.23.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). The symbol 'LIMIT' (21) indicates an exceeding of the limit values, if the limit value display is switched on.
- When performing measurements on instruments pertaining to protection class II or III and for touchable, conductible parts of instruments pertaining to protection class I not being connected with the PE conductor, please additionally connect the "PE" socket (5) to all touchable, conductible casing parts of the UUT, please refer to Figure 6.24.
- Continue the auxiliary leakage current measurement of the instrument on all touchable, conductible casing parts of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

Figure 6.23: Measurement of the auxiliary instrument leakage current for instruments pertaining to protection class I

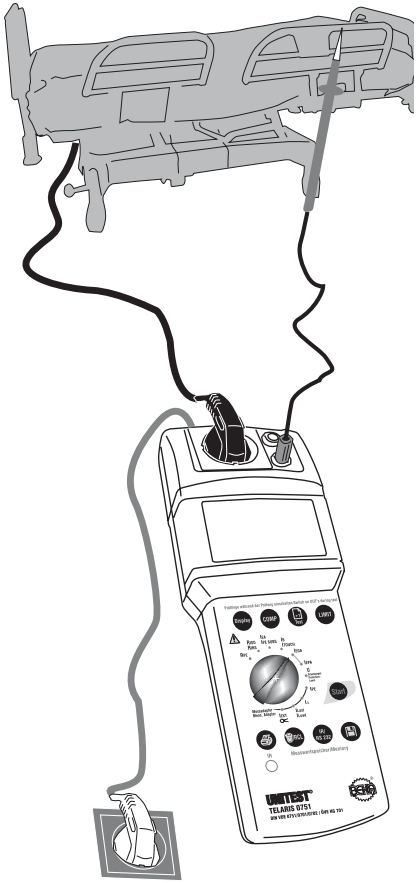

Figure 6.24: Measurement of the auxiliary instrument leakage current for instruments pertaining to protection class II *

* The measurement is only performed if contact surfaces of type F are available. For this, observe equipment designation.

6.11 Measurement of the Auxiliary Patient Leakage Current

6.11.1 General Information regarding the Auxiliary Patient Leakage Current

According to DIN VDE 0751, Part 1:2001-10, the measurement of the auxiliary patient leakage current is an alternative measurement procedure to determine the leakage current.

Measurement is made of the auxiliary leakage current between short-circuited mains connectors (L/N) and the patient connectors of the respective contact surface. For instruments pertaining to protection class I, the PE connector is connected to the mains input, in addition. Please refer to Figure 6.25.

For instruments equipped with an internal power supply, the auxiliary patient leakage current is measured between the casing (or touchable, conductibe parts) and the patient connectors of the respective contact surface, please refer to Figure Bild 6.26.

⚠ During the measurement of the auxiliary patient leakage current, all switches of the UUT must be switched on, so that the complete current circuit and all insulations can be sampled during the measurement.

⚠ Prior to performing any auxiliary patient leakage current measurement, ensure that the UUT is not live.

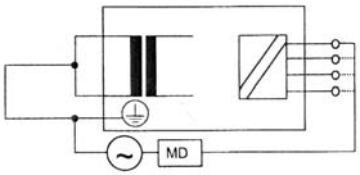

Figure 6.25: Measurement of the auxiliary patient leakage current, block diagram

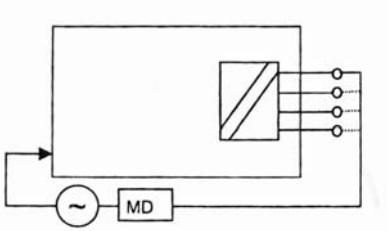

Figure 6.26: Measurement of the auxiliary patient leakage current for instruments equipped with an internal power supply, block diagram

Remarks: MD is a measurement layout in compliance with DIN VDE 0750, Part 1, EN 60601-1

6.11.2 Measurement of the Auxiliary Patient Leakage Current (IEPA)

Performing the measurement:

- Connect the UNITEST TELARIS 0751 via the mains plug (1) to a functional and correct wired and grounded mains socket.
- Turn the 'Measurement function" selection switch (15) to position 'IEPA'.
- Set the limit for the insulation resistance using the key LIMIT(7); for the limit values, please refer to table 35, page 49.
- Plug the UUT mains plug into the test socket (3), please refer to Figure 6.23.
- Switch on the UUT.
- Press the key "Start" (9). The unit symbol which is blinking on the display is an indication for the active measurement procedure.
- Read the measurement value from the LC display (6). The symbol 'LIMIT' (21) indicates an exceeding of the limit values, if the limit value display is switched on.
- Continue the test of the auxiliary patient leakage current connectors of the UUT.

☞ The measurement results can be saved by pressing the key "Store" (10). For references regarding the saving of measurement values, please refer to section 7.1 and 7.2.

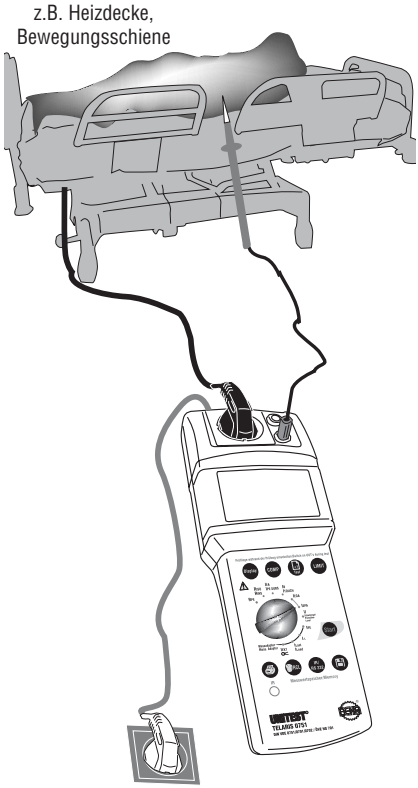

Figure 6.27: Measurement of the auxiliary patient leakage current

Table 5: Limit values for the auxiliary leakage current
Source: Table F.1 of DIN VDE 0751, Part 1:2001-10

Leakage current	in mA	in mA
Contact surface	TYP B	TYP BF
Auxiliary instrument leakage current - within protective earth conductor or parts connected to the protective earth	1.0	1,0
- Instruments with mineral insulation and instruments in compliance with remark 1	5,0	5,0
- in compliance with remark 2	10.0	10-0
Mobile X-ray instruments with additional protective earth	5.0	5.0
Mobile X-ray instruments without additional protective earth	2.0	2.0
Auxiliary patient leakage current	-	5.0

REMARK 1: instrument systems which are not equipped with the touchable parts that are not connected with the protective earth conductor and which are in compliance with the requirements for instrument leakage current, and, if applicable, for the patient leakage current.
Example: Electronic data processing devices with shielded power supply.

REMARK 2: Instruments destined for fixed connection and which are equipped with a protective earth conductor being connected in such a way or being mechanically secured in a certain place that it can only be removed using tools.
Examples for such instruments are:
- the main components of an x-ray system such as the x-ray generator, the table for medical examination.
- Instruments equipped with mineral-insulated heating elements.
- Instruments showing superior ground leakage current values than the admissible values in Ground Leakage Current, in general" due to the requirement to meet radio protection conditions.

REMARK 3: Mobile x-ray instruments and mobile instruments with mineral insulation.

7.0 Storing, Printing and Data Transfer

After every completed measurement, the user has the possibility to save the measurement result by pressing the key “Store” (10). Altogether, 600 individual measurement results (deducting the entered UUT numbers) may be saved. This equals approximately 150 appliance measurements.

After the saving process, it is possible to view the last saved measurement result and to print a report containing the measurement results using the protocol printer (option Cat. No. 1196).

If desired, the data may be transferred via a serial interface to a PC for the reporting using the software es control 0701/0702 (option Cat. No. 1252).

7.1 Entering the UUT Number

The key “ NEW TEST”(8) is used to create a new UUT number. All following measurements are assigned to the new UUT. Every UUT number occupies also one memory location.

- Briefly pressing the key “NEW TEST” (8) displays the current UUT number. This number is set to 001 after having deleted the memory or at appliances.

- When pressing the key " NEW TEST” (8) for a longer time, a new UUT is created. The UUT number is increased by one(002, 003...).

☞ If no measurement data has been saved since the last UUT number entry, the entry of a new UUT number is ignored. No new UUT number will be created. It is impossible to save two subsequent UUT numbers without having performed any tests.

7.2 Saving Measurement Data

To save the measurement data, please proceed as follows:

- Perform a measurement.
- Store the measurement result by pressing the key “Store” (10). This is also possible during active measurement, whereby the measurement will not be interrupted.
- After successful saving, a brief signal is audible and the symbol "M” (28) is displayed, followed by the brief display of the continuous memory location number.

If the memory is full and the key “Store” (10) is pressed, the symbol "M" (10) is briefly displayed and an error signal is audible.

☞ The saved data is kept in the memory even when the appliance is switched off.

It is not possible to save a measurement value twice!

☞ **Under certain unfavourable conditions, data may be lost or modified with any electronic memory. The company CH. BEHA GmbH will not be held responsible, neither for financial nor for any other losses caused by data loss, incorrect handling, or any other reason.**

☞ **We highly recommend to perform a daily measurement data transfer to a PC and to save the data. The measurement data within the measurement appliance might be lost by unforeseeable and exterior influences (drop, electro-magnetic influence, etc.).**

7.3 Viewing Measurement Data

Respectively, the last measurement value can be displayed.

To view measurement data, please proceed as follows:

- Briefly press the key “Clear/Recall” (13). The last memory location number is displayed.
- After this, the measurement data and the preselected limit values are displayed for approx. 3 seconds.
- If a number (e.g. 12) is displayed in lieu of a measurement value, this indicates that a UUT number has been stored at the last memory location and no measurement has been stored hereafter.

☞ Attention, extended pressing (longer than 2s) of the key “Clear/Recall” (13) causes the last measurement value to be deleted.

7.4 Printing Measurement Data

After having saved the measurement result, it is possible to print a report containing the measurement results. For this, the UNITEST Protocol Printer (Cat. No. 1196) and the Interface Adapter (Cat. No. 1157) are required (option).

As desired, the saved measurement data for the last UUT or for all UUTs may be printed.

To print the measurement data, please proceed as follows:

- Perform the desired measurements and save these measurements by pressing the key “Store” (10), please refer to section 7.1 and 7.2.
- Apply the TELARIS Interface Adapter (Cat. No. 1157) onto the TELARIS 0751.
- Connect the serial connection cable with the protocol printer.
- Switch on the printer and set the interface parameter on the protocol printer in compliance with the TELARIS 0751 (9600 Baud, 8 data bit, 1 Stopbit, no parity).
- To print out the s**aved measurement values of the last UUT**, briefly press the key “Print” (14). "Prt” is displayed on the screen. The data is transferred to the protocol printer. During the printing process, the number of the memory locations remaining for printing is indicated as countdown.
- To print **all saved measurement values**, press the key “Print” (14) slightly longer (approx. 2 seconds). "Prt” is displayed and the data is transferred to the protocol printer. During the printing process, the number of the memory locations remaining for printing is indicated as countdown.

☞ The printing of more than 10 data records can be cancelled by pressing the key “Print” (14).

- For this, press the key “Print” (14) after the printout of the 10th data record. Leave the key depressed until the printout is cancelled.

☞ Imperatively observe the interface settings of the protocol printer and accordingly set the interface parameter of the TELARIS 0751 (9600 Baud, no parity, 8 data bit, 1 stop bit, please refer to the technical data section). Please refer to the instruction manual supplied with the protocol printer (Cat. No. 1196) for printer parameter setting.

7.5 Deleting Saved Measurement Data/View the Memory Location Number

It is possible to delete the last measurement value or all measurement values by pressing the key "Clear/Recall" (13). Furthermore, it is possible to display the memory location number of all saved measurement values and UUT numbers:

7.5.1 Display of Memory Location Number (total number of saved measurement data and UUT numbers):

- Briefly press the key “Clear/Recall” (13). An acoustic signal is audible.
- The last memory location number is briefly displayed, followed by the display of the saved measurement results and limit values.

7.5.2 Delete Last Saved Measurement Value:

- Press the key “Clear/Recall” (13) and keep it depressed.
- An acoustic signal is audible and the last memory location number is briefly displayed. Afterwards, the measurement value or the UUT number saved at this memory location is displayed
- Press the key “Clear/Recall” (13) further until "Clr" is displayed on the screen and the displayed memory location number is reduced by one. A further acoustic signal is simultaneously audible.
- Now release the key “Clear/Recall” (13) to avoid deletion of the complete memory.

☞ Deleting the last saved measurement value or last entered UUT number can be repeated as desired, i.e. as long as data is available within the memory.

7.5.3 Delete all Saved Measurement Values:

- Press the key “Clear/Recall” (13) and keep it depressed.
- An acoustic signal is audible and the last memory location number is briefly displayed. Afterwards, the measurement value or the UUT number saved at this memory location is displayed
- A beep signal is audible after 2 sec. and the last stored value is deleted.
- A beep signal is audible after 2 sec. and all stored values are deleted.
- “0“ appears on the LC-display. The memory is completely deleted, the „M" symbol in the display disappears.

7.6 Infrared Interface, send Measurement Data

Additionally, all stored measurement data may be transferred to the PC (for reporting) by the Infrared Interface. For this purpose, the interface adapter and the Software "es control 0701/0702" (Cat. No. 1252) and Interface (Cat. No. 1157), available as an optional feature, are required.

The data transfer procedure is fairly easy:

- Carry out measurements and save theses by pressing key "Store" (10), see also section 7.1 and 7.2
- Apply the Interface adapter (Cat. No. 1157) to TELARIS 0751.
- Connect interface cable via 9pole D-sub connector to serial interface of PC (ie COM 1).
- Call the "es control 0701/0702" Software (please refer to user manual "es control 0751").

☞ Data transfer is carried out. After a succesfull data transfer all stored data is available for further processing in the PC.

8.0 Maintenance

When using the appliance in compliance with the instruction manual, no special maintenance is required.

8.1 Cleaning

If the appliance is dirty after daily usage, it is advised to clean it by using a damp cloth and a mild household detergent.

9.0 Internal fuses

The internal fuses protects the appliance from overload or wrong operation/use.

The fuses are inside the appliance, the instrument must be opened for the exchange.

☞ The fuses can only be replaced by returning the appliance to the factory or to an authorized sales repair service.

⚠ Exclusively use fuse of the same voltage, current and breaking capacity values in compliance with the technical data section.

9.1 Display after Fuse Blown

If the appliance TELARIS 0751 displays the measurement values described below during the measurement, the respective fuse has blown.

☞ The fuse must be replaced and the instrument must be checked afterwards. For this, return the measurement appliance to the factory.

No function and display of the appliance when plugging into a functional mains socket:
- Fuse F1 has blown.

For the "RPE" Function:
Display >20.0 Ohm in spite of direct connection between "Probe" (2) and the PE of the test socket (3) or the blue socket "PE" (5):
- Fuse F2 has blown.

For the "IPE SUBS" function:
Display <0.20 mA in spite of direct short-circuit of the blue socket "PE" (5) and the red socket "L/N" (4):
- Fuse F2 has blown.

9.2 Description of the built-in Fuses

Fuse F1 (built-in)
Type F 0.1 A/250 V, 5 x 20 mm
Mains input fuse

Fuse F2 (in fuse housing within the appliance rear)
Type F 0.5 A/250 V, 6.3 x 32 mm.
Input fuse for the measurement circuits RPE (PE resistance) and IPE SUBS (substitute leakage current)

10.0 Calibration Interval

We suggest a calibration interval of one year. If the instrument is used very often or if it is used under rough conditions we recommend shorter intervals. If the instrument is used few times only the calibration interval can be extended on to 3 years.

11.0 Technical Data

Function PE resistance (RPE)
according to EN 61557-4, DIN VDE 0413, Part 4,

Display range:.....0.05 Ω... 19.99 Ω
Measurement range:.....0.1 Ω ... 1.99 Ω
Resolution: .....0.01 Ω
Accuracy: .....± (10% rdg. + 3 Digits)
Limit value:.....0.3 Ω and 1.0 Ω
Test current: .....≥ 200 mA AC/50 Hz, at 2 Ω
Test voltage: .....approx. 19.0 V AC
Measurement time:.....continous

Function Insulation resistance (RINS)
according to EN 61557-2, DIN VDE 0413, Part 2

Display range:.....0.1 MΩ ... 250 MΩ
Measurement range:.....0.1 MΩ ... 199.9 MΩ
Resolution: .....0.01 MΩ/ 0.1 MΩ/1 MΩ
Accuracy: .....± (10% rdg. + 3 Digits)
Limit value:.....0.25/0.3/0.5/1.0 and 2.0 MΩ
Test voltage: .....500 V DC (DC)
.....+ 50 % / – 0 % (according to EN 61557-2)
Nominal current:.....> 1 mA at 500 kΩ Load resistance
Short circuit current:.....approx. < 4 mA
Measurement time .....approx. 2 Min.

Function Leakage Current IPE SUBS
according to DIN VDE 0701/0702, Part 1

Display range:.....0.20 mA ... 19.99 mA
Measurement range:.....0.25 mA ... 19.00 mA
Resolution: .....0.01 mA
Accuracy: .....± (10% rdg. + 3 Digits)
Limit value:.....0.5/ 3.5/7 and 15 mA
Test voltage: .....< 50 V AC. 50 Hz
Short circuit current:.....< 3.5 mA
Measurement time:.....continous

The display values are according DIN VDE 0702:1995-11 refering to a mains voltage of 230 V +6%, (244 V).

Function Touch current ILEAK
according to DIN VDE 0701/0702, Part 1
Display range:.....0.01 mA … 1.999 mA
Measurement range:.....0.1 mA … 1.99 mA
Resolution: .....0.001 mA
Accuracy: .....± (10% rdg. + 3 Digits)
Limit value:.....0.25 and 0.5 mA
Internal resistance: .....approx. 2 kΩ
Crestfactor:.....< 4
Frequency range: .....0...100 kHz
Frequence response:.....according circuit A1, EN 61010-1

Substitute housing leakage current (IEGA)
according DIN VDE 0751, Part 1

Display range:.....0,20 mA ... 19,99 mA
Measurement range .....0,25 mA ... 19,00 mA
Resolution: .....0,01 mA
Accuracy: .....± (10% v.M. + 3 Digits)
Limit value:.....1,0/ 2,0/5,0 und 10 mA
Test Voltage: .....< 50 V AC, 50 Hz
Short Circuit Current: .....< 3,5 mA
Measurement Time.....continous
The display values are according DIN VDE0751 2001-10 refering to a mains voltage of 230 V.

Substitute patient leakage current (IEPA)
according DIN VDE 0751, Part 1

Display range .....0,20 mA ... 19,99 mA
Measurement range .....0,25 mA ... 19,00 mA
Resolution: .....0,01 mA
Accuracy: .....± (10% v.M. + 3 Digits)
Limit value:.....5,0 mA
Test Voltage: .....< 50 V AC, 50 Hz
Short Circuit Current: .....< 3,5 mA
Measurement Time.....continous
The display values are according DIN VDE0751 2001-10 refering to a mains voltage of 230 V.

Function Protection Level of overvoltage devices (VProt Level)

Display rangee: .....50 ... 500 V (DC)
.....31 ... 312 V (AC)
Calculation: .....UAC=UDC/1.6
Measurement range: .....50 ... 500 V DC
Resolution: .....1 V
Accuracy: .....± (10% rdg. + 3 Digits)
Test voltage: .....approx. 500 V DC
Test current: .....> 1 mA
Measurement time: .....approx. 15 Seconds

Function PE resistance Current IPE and Differential Current IΔ
according to DIN VDE 0701/0702, Part 1
with Schuko Measurement Adapter (option)

Display range: .....0.1 mA … 19.99 mA
Measurement range: .....0.25 mA … 19.00 mA
Resolution: .....0.01 mA
Accuracy: .....± (5% rdg. + 3 Digits)
Limit value: .....3.5 mA
Frequency range: .....40 Hz...100 kHz
Crestfaktor: .....< 4

Function Load Current ILoad
with Schuko Measurement Adapter (option)

Display range: .....0.1 A … 16.00 A
Measurement range: .....0.1 A … 16.00 A
Resolution: .....0.01 A
Accuracy: .....± (5% rdg. + 3 Digits)
Frequency range: .....45 Hz...65 Hz
Crestfaktor: .....< 4

Function External Current Measurement (IEXT)
with Current Clamp Adapter (option)
(Technical data refering to measurement input only)

Display range: .....0.25 mA … 19.99 mA
Measurement range: .....0.25 mA … 19.00 mA
Resolution: .....0.01 mA
Accuracy: .....± (5 % rdg. + 3 Digits)
Limit value: .....3.5 mA
Frequency range: .....45 Hz...65 Hz
Crestfaktor: .....< 4

Technical Data

General Technical Data

Display:.....31/2-digit. LC-Display
Temperature Ranges
Reference Temperature Range: .....+23 °C (± 2 °C), 40...60 % rel. humidity
Working Temperature: .....0 °C ... + 40 °C, max. 85 % rel. humidity (not condensing)
Storage Temperature: .....–20 °C ... + 60 °C, max. 85 % rel. humidity (not condensing)
Memory: .....600 values, approx. 150 tests
(at 3 measurements each EUT)
Interace: .....Infrared RS 232
Parameter: .....9600 Baud, 8 data bit, 1 stop bit, no parity
Protection degree: IP40
Protection Class:.....II
Built according to:.....DIN VDE 0411, Part 1, EN 61010-1,
.....DIN VDE 0404, Part 1, 2
.....DIN VDE 0413, Part 1,2,4
.....DIN VDE 0701/0702
External Voltage withstanding: .....300 V AC/DC (continous)
.....600 V AC/DC (1 min at Insulation measurement)
Over Voltage Category: .....CAT II/300 V
Pollution Degree: 2
Power Supply: .....230 V +10 % - 15 %, 50 Hz (± 1%)
Power Consumption: .....max. 15 VA
Built in fuses: .....F1: Type F 0.1 A/250 V. 5 x 20 mm
.....F2: Type F 0.5 A/250 V, 6.3 x 32 mm

Dimensions: .....300 x 105 x 75 mm (W x H x D)
Weight: .....approx. 1.3 kg

Schuko-Measurement Adapter (Option)

Measurement Functions: Earth Current, Differential Current, Load Current
Output: 0...1 V AC

Function Earth Current and Differential Current

Display Range: .....0.25 mA … 19.00 mA
Measurement range:.....0.25 mA … 19.00 A
Accuracy: .....± (5% rdg. + 50 µA)
Frequency Range:.....40 Hz...100 kHz
Frequency response:.....according. circuit A1, IEC610010-1

Function Load Current

Display range:.....0.1 A … 19.99 A
Measurement range:.....0.1 A … 16.00 A
Accuracy: .....± (5% rdg. + 0,03 A)
Frequency Range:.....45...65 kHz
Output Current:.....max. 16 A
Switch on time:.....max. 30 min (at 16 A)

General Technical Data

Reference Temperature Range:.....+23 °C (± 2 °C), 40...60 % rel. humidity
Working Temperature: .....0 °C ... + 40 °C, max. 85 % rel. humidity (not condensing)
Storage Temperature: .....–20 °C ... + 60 °C, max. 85 % rel. humidity (not condensing)
Protection degree: IP40
Protection class:.....II
Built according to:.....EN 61010-1, DIN VDE 0411, Part 1, DIN VDE 0404, Parts 1, 2
.....DIN VDE 0701/0702
Over Voltage Category: .....CAT II/300 V
Pollution degeree:.....2
Power Supply: .....230 V +10 % - 15 %, 50 Hz (± 1%)
Power Consumption: .....max. 5 VA
Built in fuses: .....F1: Type T 0,2 A/250 V, 5 x 20 mm

Dimensions: .....200 x 100 x 50 mm (W x H x D)
Weight:.....approx. 600 g

24 Month Warranty

Qualitätszertifikat • Certificate of Quality
Certificat de Qualité • Certificado de calidad

(D)

Die BEHA-Gruppe bestätigt hiermit, dass das erworbene Produkt gemäß den festgelegten Beha Prüfanweisungen während des Fertigungsprozesses kalibriert wurde. Alle innerhalb der Beha-Gruppe durchgeführten, qualitätsrelevanten Tätigkeiten und Prozesse werden permanent durch ein Qualitätsmanagementsystem nach ISO 9000 überwacht.

Die BEHA-Gruppe bestätigt weiterhin, daß die während der Kalibrierung verwendeten Prüfeinrichtungen und Instrumente einer permanenten Prüfmittelüberwachung unterliegen. Die Prüfmittel und Instrumente werden in festgelegten Abständen mit Normalen kalibriert, deren Kalibrierung auf nationale und internationale Standards rückführbar ist.

(GB)

The BEHA Group confirms herein that the unit you have purchased has been calibrated, during the manufacturing process, in compliance with the test procedures defined by BEHA. All BEHA procedures and quality controls are monitored on a permanent basis in compliance with the ISO 9000 Quality Management Standards.

In addition, the BEHA Group confirms that all test equipment and instruments used during the calibration process are subject to constant control. All test equipment and instruments used are calibrated at determined intervals, using reference equipment which has also been calibrated in compliance with (and traceable to) the calibration standards of national and international laboratories.

(F)

Le groupe BEHA déclare que l´appareil auquel ce document fait référence a été calibré au cours de sa fabrication selon les procédures de contrôle définies par BEHA. Toutes ces procédures et contrôles de qualité sont régis par le système de gestion ISO 9000.

Le groupe BEHA déclare par ailleurs que les équipements de contrôle et les instruments utilisés au cours du processus de calibrage sont eux-mêmes soumis à un contrôle technique permanent.

Ces mêmes équipements de contrôle sont calibrés régulièrement à l´aide d´appareils de référence calibrés selon les directives et normes en vigueur dans les laboratoires de recherche nationaux et internationaux.

(E)

El grupo BEHA declara que el producto adquirido ha sido calibrado durante la producción de acuerdo a las instrucciones de test BEHA. Todos los procesos y actividades llevados a cabo dentro del grupo BEHA en relación con la calidad del producto son supervisados permanentemente por el sistema ISO 9000 de control de calidad.

Adicionalmente, el grupo BEHA constata que los equipos e instrumentos de prueba utilizados para la calibración también son sometidos a un permanente control. Estos equipos e instrumentos de prueba son a su vez calibrados en intervalos regulares valiéndose de equipos de referencia calibrados de acuerdo a directivas de laboratorios nacionales e internacionales.

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24 month Warranty

UNITEST appliances are subject to strict quality control. However, should the appliance function improperly during daily use, you are protected by our 24 months warranty (valid only with invoice).
We will repair free of charge any defects in workmanship or material, provided the appliance is returned unopened and untampered with, i.e. with undamaged warranty label.
Any damage due to dropping or incorrect handling are not covered by the warranty.
If the appliance shows failure following expiration of warranty, our service department can offer you a quick and economical repair.

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