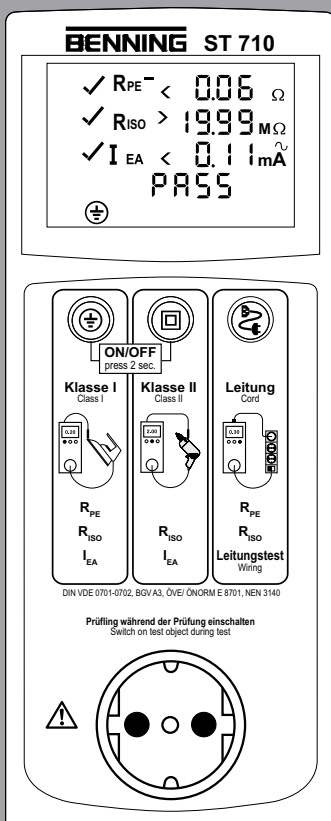


# BENNING

- (D) Bedienungsanleitung
- (GB) Operating manual
- (F) Notice d'emploi
- (CZ) Návod k obsluze
- (I) Istruzioni d'uso
- (NL) Gebruiksaanwijzing
- (PL) Instrukcja obsługi
- (S) Användarhandbok

BENNING ST 710



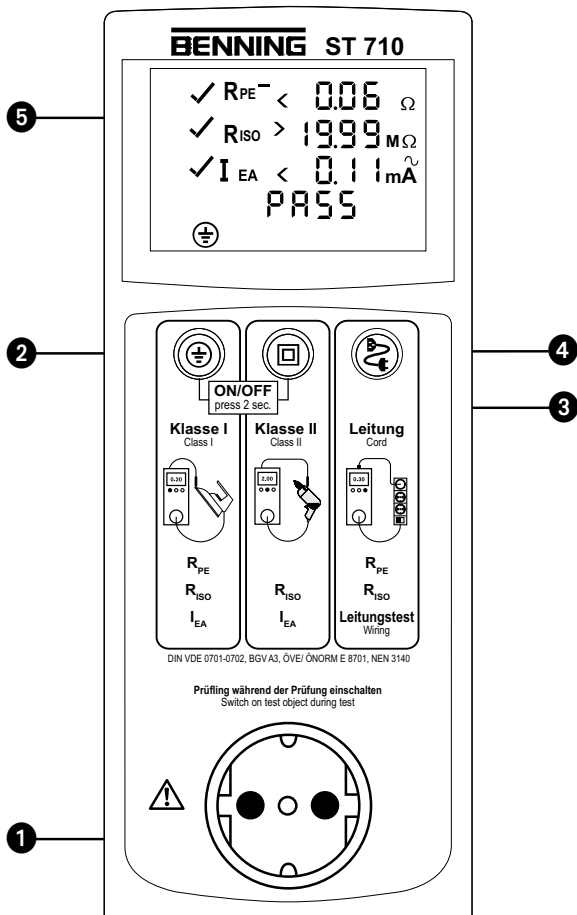


Bild 1: Gerätefrontseite  
 Fig. 1: Appliance front face  
 Fig. 1: Partie avant de l'appareil  
 Obr. 1: Přední strana přístroje

Figura 1: Lato anteriore strumento  
 Fig. 1: Voorzijde van het apparaat  
 Rys. 1: Panel przedni przyrządu  
 Bild 1: Framsida

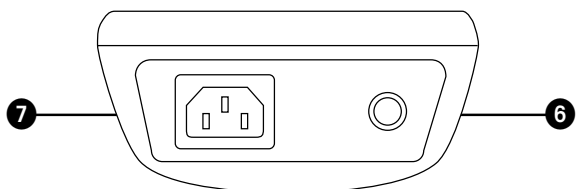
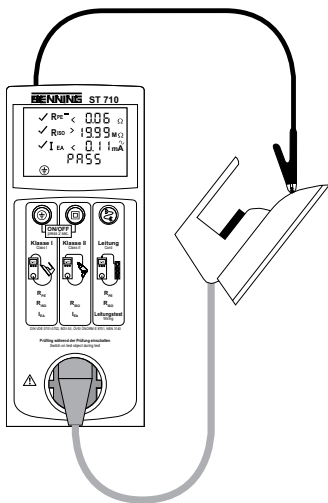


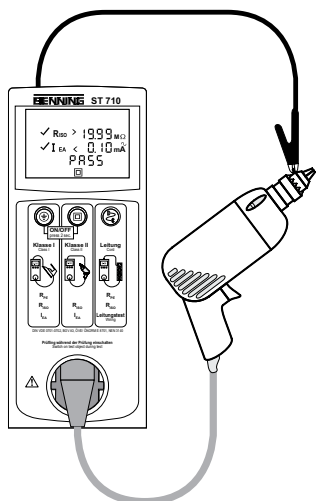
Bild 2: Geräteoberseite  
 Fig. 2: Top side of the device  
 Fig. 2: Face supérieure de l'appareil  
 Obr. 2: Horní strana přístroje

Figura 2: Lato superiore strumento  
 Fig. 2: Bovenkant van het apparaat  
 Rys. 2: Górna strona urządzenia  
 Bild 2: Ovansida

- Bild 3: Prüfung von Geräten der Schutzklasse I (Geräte mit Schutzleiter und berührbaren leitfähigen Teilen die am Schutzleiter angeschlossen sind)
- Fig. 3: Testing of devices of protection class I (devices with protective conductor and accessible conductive parts which are connected to the protective conductor)
- Fig. 3: Contrôle des appareils de la classe de protection I (les appareils avec conducteur de protection et avec des pièces touchables conductrices qui sont connectées au conducteur de protection)
- Obr. 3: Zkoušení zařízení třídy ochrany I (zařízení s ochranným vodičem a vodivými díly nechráněnými proti doteku, připojenými k ochrannému vodiči)
- Figura 3: Collaudo di dispositivi di classe di protezione I (i dispositivi con conduttori di protezione e parti conduttrici esposte sono collegati al conduttore di protezione)
- Fig. 3: Testen van apparaten van beschermklasse I (apparaten met aardegeleider en aanraakbare geleidende onderdelen die op de aardegeleider zijn aangesloten)
- Rys. 3: Testy urządzeń klasy ochronnej I (urządzenia z przewodami ochronnymi i dotykającymi się i przewodzącymi częściami, które są podłączone do kabla ochronnego)
- Bild 3: Test av utrustning med skyddsklass I (utrustning med skyddsledare och åtkomstbara ledande delar anslutna till skyddsledaren)

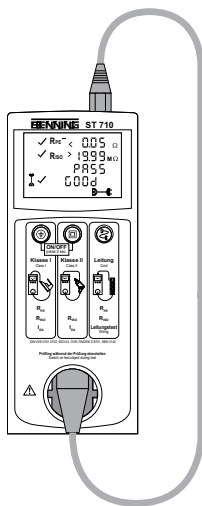


- Bild 4: Prüfung von Geräten der Schutzklasse II (Schutzisolierte Geräte ohne Schutzleiter und mit berührbaren leitfähigen Teilen) bzw. Prüfung von Geräten der Schutzklasse III (Schutzkleinspannung)
- Fig. 4: Testing of devices of protection class II (shock-proof devices without protective conductor and with accessible conductive parts) and testing of devices of protection class III (safety extra-low voltage)
- Fig. 4: Contrôle des appareils de la classe de protection II (appareils à double isolation sans conducteur de protection et avec des pièces touchables conductrices) et contrôle des appareils de la classe de protection III (basse tension de protection)
- Obr. 4: Zkoušení zařízení třídy ochrany II (zařízení s ochrannou izolací bez ochranného vodiče a s vodivými díly nechráněnými proti doteku) nebo zkoušení zařízení třídy ochrany III (malé bezpečné napětí)
- Figura 4: Test di dispositivi di classe di protezione II (dispositivi isolati senza conduttore di protezione e con parti conduttrici esposte) ovvero test di dispositivi della classe di protezione III (bassa tensione)
- Fig. 4: Testen van apparaten van beschermklasse II (apparaten met randaarding zonder aardegeleider en met aanraakbare geleidende onderdelen) resp. testen van apparaten van beschermklasse III (veiligheidslaagspanning)
- Rys. 4: Testowanie urządzeń II klasy ochronnej (urządzenia z izolacją ochronną bez kabla ochronnego i z dotykającymi się i przewodzącymi częściami) lub testowanie urządzeń III klasy ochronnej (małe napięcie ochronne)
- Bild 4: Test av utrustning med skyddsklass II (skyddsisolerad utrustning utan skyddsledare och med åtkomstbara ledande delar) resp. test av utrustning med skyddsklass III (skyddsklenspanning)

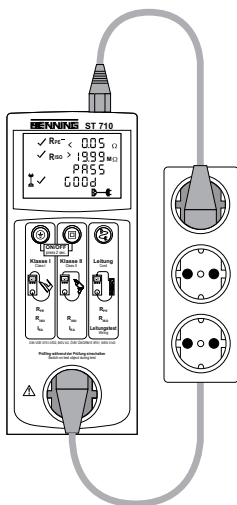


- Bild 5a: Prüfung von Geräteanschlussleitungen mit Kaltgerätestecker  
 Fig. 5a: Testing of device connecting cables with IEC connector  
 Fig. 5a: Contrôle des câbles de connexion d'appareil avec fiche mâle CEI  
 Obr. 5a: Zkouška připojovacích kabelů zařízení s připojovací zástrčkou  
 Figura 5a: Test dei cavi di allacciamento del dispositivo con connettore IEC  
 Fig. 5a: Testen van netvoedingskabels met apparaatstekker  
 Rys. 5a: Test kabli przyłączeniowych urządzeń z wtyczkami zimnych urządzeń.

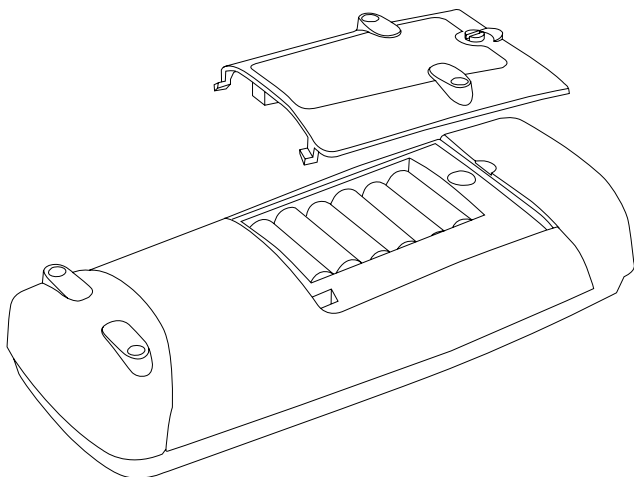
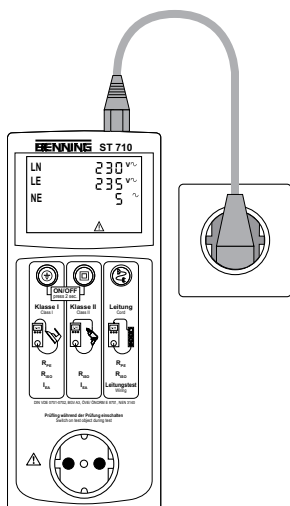
Bild 5a: Test av nätkablar med IEC-kontakt



- Bild 5b: Prüfung von Leitungen, Mehrfachverteilern und Leitungsroller  
 Fig. 5b: Testing of lines, multiple distributors and cable reels  
 Fig. 5b: Contrôle de câbles, de câbles de distribution multiple et d'enrouleurs de câble  
 Obr. 5b: Zkoušení kabelů, vícenásobných rozvaděčů a kabelových cívek  
 Figura 5b: Controllo di linee, distributori multipli ed avvolgicavo  
 Fig. 5b: Testen van kabels, verdeeldozen en kabelhaspels  
 Rys. 5b: Testowanie kabli, rozdzielnic wielokrotnych i bębnow kablowych  
 Bild 5b: Test av kablar, flerfördelare och kabeltrummor



- Bild 6: Spannungsmessung an externer Schutzkontaktsteckdose  
 Fig. 6: Voltage measurement on external shock-proof socket  
 Fig. 6: Mesure de tension sur une prise de courant de sécurité externe  
 Obr. 6: Měření napětí na externí zásuvce s ochranným kontaktem  
 Figura 6: Misura della tensione sulla presa con contatto di terra esterna  
 Fig. 6: Spanningsmeting aan externe veiligheidswandcontactdoos  
 Rys. 6: Pomiar napięcia na zewnętrznym gniazdku wtykowym z zestykiem ochronnym  
 Bild 6: Spänningsmätning på externa uttag



- Bild 7: Batteriewechsel  
 Fig. 7: Battery replacement  
 Fig. 7: Remplacement des piles  
 Obr. 7: Výměna baterií  
 Figura 7: Sostituzione batterie  
 Fig. 7: Vervanging van de batterij.  
 Rys. 7: Wymiana baterii  
 Bild 7: Batterbyte

# Operating instructions

## BENNING ST 710

Appliance tester for safety-related testing of portable electrical devices and equipment

- testing according to DIN VDE 0701-0702, ÖVE/ ÖNORM E 8701
- testing of cable reels, multiple distributors and IEC power cords
- voltage measurement on external shock-proof socket

### Table of contents

1. User notes
2. Safety note
3. Scope of delivery
4. Unit description
5. General information
6. Ambient conditions
7. Electrical specifications
8. Measuring with the BENNING ST 710
9. Maintenance
10. Environmental note

### 1. User notes

These operating instructions are intended for

- qualified electricians, competent persons and
- electrotechnically trained persons

The BENNING ST 710 is intended for making measurements in dry environment. It must not be used in power circuits with a nominal voltage higher than 300 V AC (More details in Section 6. "Ambient conditions").

The following symbols are used in these operating instructions and on the BENNING ST 710:



Application around and removal from HAZARDOUS LIVE conductors is permitted.



Warning of electrical danger!

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



Important, comply with the documentation!

The symbol indicates that the information provided in the operating instructions must be complied with in order to avoid risks.



This symbol on the BENNING ST 710 means that the BENNING ST 710 is totally insulated (protection class II).



This symbol on the BENNING ST 710 means that the BENNING ST 710 complies with the EU directives.



This symbol appears on the display to indicate a discharged battery.



(AC) Alternating voltage or current.



Ground (Voltage against ground).

## 2. Safety note

The instrument is built and tested in accordance with  
DIN VDE 0404 part 1 and 2  
DIN VDE 0411 part 1/ EN 61010 part 1  
DIN VDE 0413 part 1/ EN 61557 part 1, 2, 4 and 10  
and has left the factory in perfectly safe technical state.

To maintain this state and ensure safe operation of the appliance tester, the user must observe the notes and warnings given in these instructions at all times. Improper handling and non-observance of the warnings might involve severe **injuries** or **danger to life**.



**WARNING! Be careful when working with bare conductors or main line carrier!  
Contact with live conductors will cause an electric shock!**



**The BENNING ST 710 may be used only in power circuits within the overvoltage category II with a conductor for 300 V AC max. to earth.  
Remember that work on electrical components of all kinds is dangerous. Even low voltages of 30 V AC and 60 V DC may be dangerous to human life.**



**Before starting the appliance tester up, always check it for signs of damage.**

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

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

- if the instrument show visible signs of damage
- if the appliance tester no longer functions
- after long periods of storage under unfavourable conditions
- after being subjected to rough transport
- the device is exposed to moisture.



**In order to prevent danger**

- do not touch the bare measuring probe tips of the measuring leads,
- plug the leads into the correspondingly marked jacks at the measuring instrument



**Maintenance:**

**Do not open the tester, because it contains no components which can be repaired by the user. Repair and service must be carried out by qualified personnel only!**



**Cleaning:**

**Regularly wipe the housing by means of a dry cloth and cleaning agent. Do not use any polishing agents or solvents!**

## 3. Scope of delivery

The scope of delivery for the BENNING ST 710 comprises:

- 3.1 One BENNING ST 710,
- 3.2 One test lead with alligator clip,
- 3.3 One IEC power cord (IEC adapter cable)
- 3.4 One compact protective pouch,
- 3.5 Six 1.5-V-batteries/ type AA (IEC LR6) fitted in the unit as initial equipment,
- 3.4 One operating manual

Parts subject to wear:

- The BENNING ST 710 is supplied by six 1.5 V batteries/ type AA (IEC LR6).

Note on optional accessories:

- Test badges "next test date", 300 pieces
- Measuring adapter for three-phase loads  
for  $R_{PE}$ ,  $R_{ISO}$  (insulating resistance) and  $I_{EA}$  (alternative leakage current) measurements:
  - 16 A CEE coupling - 16 A shock-proof plug (044122)
  - 32 A CEE coupling - 16 A shock-proof plug (044123)

As an alternative:

- BENNING CM 9 leakage current clamp for measuring the differential current, protective conductor current and load current of single-phase and three-phase loads (044065)
- Measuring adapter for BENNING CM 9 leakage current clamp, conductors led through individually, with double insulation:
  - 16 A shock-proof coupling - 16 A shock-proof plug (044131)
  - 16 A CEE coupling - CEE plug (044127)

- 32 A CEE coupling - CEE plug (044128)
- Test certificate forms for "Testing of electrical devices" are available for download free of charge at [www.benning.de](http://www.benning.de)

#### 4. Unit description

See figure 1: Appliance front face

See figure 2: Top side of the device

The display and operator control elements specified in Fig. 1 and 2 are designated as follows:

- 1 **test socket**, for connecting the device to be tested,
- 2 **⊕-key**, testing of devices of protection class I (devices with protective conductor and accessible conductive parts which are connected to the protective conductor),
- 3 **□-symbol key**, testing of devices of protection class II (shock-proof devices without protective conductor and with accessible conductive parts) and testing of devices of protection class III (safety extra-low voltage),
- 4 **⚡-symbol key**, testing of lines, multiple distributors and device connecting cables with IEC connector
- 5 **LC display**, indicates the test progress and individual measuring results,
- 6 **4 mm test socket**, for connecting the test lead with alligator clip
- 7 **IEC connector**, for connecting the IEC power cord

#### 5. General information

The BENNING ST 710 is intended for electrical safety tests according to DIN VDE 0701-0702, BGV A3, ÖVE/ ÖNORM E8701 and NEN 3140.

Automatically, the BENNING ST 710 verifies the type of the connected test object and informs the user in case of incorrect selection of the testing procedure [2...4]: preset limiting values and measuring results with "pass/ fail" information make it easier to evaluate the test.

#### 6. Ambient conditions

- The BENNING ST 710 is intended for making measurements in dry environment.
- Maximum barometric elevation for making measurements: 2000 m,
- Over voltage category/ setting category: IEC 61010-1 → 300 V category II,
- Contamination class: 2,
- Protection class: IP 40 (DIN VDE 0470-1 IEC/ EN 60529)  
IP 40 means: Protection against access to dangerous parts and protection against solid impurities of a diameter > 1 mm, (4 - first index). No protection against water, (0 - second index).
- EMC: EN 61326-1
- Operating temperatures and relative humidity:  
For operating temperatures from 0 °C to 30 °C: relative humidity less than 80 %  
For operating temperatures from 31 °C to 40 °C: relative humidity less than 75 %
- Storage temperature: The BENNING ST 710 can be stored at any temperature within the range of - 25 °C to + 65 °C (relative humidity from 0 to 80 %). The battery should be removed from the instrument for storage.

#### 7. Electrical specifications

Note: The measuring accuracy is specified as the sum of

- a relative fraction of the measured value and
- a number of digits (i.e. counting steps of the last digit).

This specified measuring accuracy is valid for temperatures within the range of 18 °C to 28 °C and relative humidity lower than 80 %.

##### 7.1 Protective conductor resistance:

Measuring range	Resolution	Measuring accuracy
0.05 Ω - 20 Ω	0.01 Ω	5 % ± 2 digits
Testing current:	> 200 mA (2□ Ω)	
open-circuit voltage:	> 4 V nominal	

##### 7.2 Insulating resistance

Measuring range	Resolution	Measuring accuracy
0.5 MΩ - 20 MΩ	0.01 MΩ	5 % ± 2 digits
0.1 MΩ - 0.49 MΩ	0.01 MΩ	10 % ± 2 digits
Testing voltage:	500 V <sub>DC</sub> @ 1 mA nominal, + 20 %, - 0 %	
Testing current:	> 1 mA at 500 kΩ, < 2 mA at 2 kΩ	

### 7.3 Protective conductor current and contact current by means of alternative leakage current measurement method

Measuring range	Resolution	Measuring accuracy
0.10 mA - 20 mA	0.01 mA	5 % ± 2 digits
Testing voltage:	40 V <sub>AC</sub> , 50 Hz	
Testing current:	< 5 mA at 2 kΩ	

### 7.4 Cord test

- measurement of the protective conductor resistance according to 7.1
- measurement of the insulating resistance according to 7.2
- line break testing of the external conductor (L) and the neutral conductor (N)
- short-circuit testing of the external conductor (L) and the neutral conductor (N)

### 7.5 Voltage measuring on external shock-proof socket

Measuring range	Resolution	Measuring accuracy	Overload protection
50 V - 270 V <sub>AC</sub>	1 V	< 5 % of the upper measuring range value	300 V

Display:

- voltage between the external conductor (L) and the neutral conductor (N)
- voltage between the external conductor (L) and the ground conductor (PE)
- voltage between the neutral conductor (N) and the ground conductor (PE)

### 7.6 Limiting values according to DIN VDE 0701-0702 and ÖVE/ ÖNORM E 8701-1

Note:

	Protection class I	Protection class II, III	Line test
<b>Protective conductor resistance</b> $R_{PE}$	for cords with rated current ≤ 16 A: ≤ 0.3 Ω up to a length of 5 m, per further 7.5 m: additional 0.1 Ω, max. 1 Ω, For cords with higher rated currents the calculated ohmic resistance value applies.		≤ 0.3 Ω (see protection class I)
<b>Insulating resistance</b> $R_{ISO}$	≥ 1 MΩ ≥ 2 MΩ for proving safe disconnection (transformer) ≥ 0.3 MΩ for devices with heating element	≥ 2 MΩ (protection class II), ≥ 0.25 MΩ (protection class III),	≥ 1 MΩ
<b>Protective conductor current</b> $I_{EA}$	≤ 3.5 mA on conductive parts with PE connection  1 mA/ kW for devices with heating elements P > 3.5 kW		
<b>Contact current</b> $I_{EA}$	≤ 0.5 mA on conductive parts without PE connection	≤ 0.5 mA on conductive parts without PE connection	

## 8. Measuring with the BENNING ST 710

### 8.1 Preparations for measuring

Operate and store the BENNING ST 710 only at the specified storage and operating temperatures conditions. Do not permanently expose the device to sunlight.

- Check rated voltage and rated current details specified on the safety measuring leads.
- Strong sources of interference in the vicinity of the BENNING ST 710 might lead to unstable readings and measuring errors.



**Before starting the BENNING ST 710, always check the device, the lines and the test object for damages.**



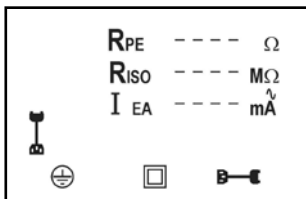
**Before starting the test, switch the test object on (mains switch ON).**



At the beginning of the test it has to be checked whether the selected testing procedure complies with the protection class of the connected test object.

### 8.1.1 Switching the BENNING ST 710 ON/ OFF

Press and hold the keys ② and ③ for approx. 3 seconds to switch the BENNING ST 710 on. 2 acoustic signals confirm that the device is switched on. Press the keys again to switch the device off.



After approx. 3 minutes, the BENNING ST 710 switches off automatically (APO, Auto Power-Off). It switches on again when the keys ② and ③ are pressed. An acoustic signal indicates that the device has switched off automatically. During voltage measurement on an external shock-proof socket, the automatic switch-off is deactivated.

### 8.1.2 Testing procedure

The BENNING ST 710 is intended for electrical safety tests according to DIN VDE 0701-0702 and ÖVE/ ÖNORM E 8701. Please refer to the current version of the standards for detailed information concerning the tests and limiting values.

Automatically, the BENNING ST 710 verifies the type of the connected test object and informs the user in case of incorrect preselection of the testing procedure [②...④]

## 8.2 Testing of electrical devices / equipment according to DIN VDE 0701-0702 and ÖVE/ ÖNORM E 8701



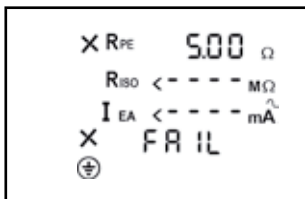
Prior to test, a visual inspection of the test object has to be carried out. In case of possible damages, the test must be stopped.

### 8.2.1 Testing of devices of protection class I (⊕)

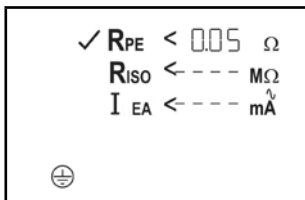
- Testing of devices with protective conductor and accessible conductive parts which are connected to the protective conductor
- Connect the test object to the test socket ① of the BENNING ST 710.
- Plug the 4 mm safety plug of the test lead with alligator clip into the 4 mm safety socket ⑥ and establish a connection with a metal part of the test object.
- Switch the test object on.
- Press the key ② to start the automatic testing procedure.
- The test starts with measuring the protective conductor resistance  $R_{PE}$ . If  $R_{PE} > \sim 100 \Omega$ , the measurement is stopped without a measuring result and a cross is shown next to the  $R_{PE}$  symbol. "FAIL" appears on the display to confirm that the measurement has been stopped.



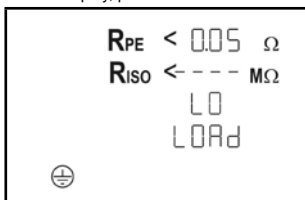
- If  $R_{PE} < 20 \Omega$  (but higher than the maximum admissible limiting value), the measured value of  $R_{PE}$  is shown on the display. A  $\times$  next to the  $R_{PE}$  symbol confirms that the limiting value has been exceeded.



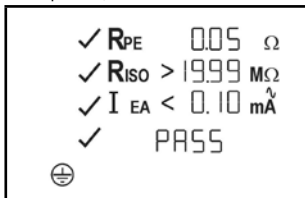
- If  $R_{PE}$  is lower than the admissible limiting value, the measured value of  $R_{PE}$  is shown and a ✓ appears next to the  $R_{PE}$  symbol. Now, the  $R_{PE}$  measurement is carried out again with reversed polarity. After the  $R_{PE}$  test has been passed, the test of the insulating resistance is started.



- If "Lo LOAD" is shown on the display, please check whether the test object is switched on.



- Press the key ② to continue the testing procedure in case of the load being too low ( $R_{L-N} < 100 \text{ k}\Omega$ ).
- If the insulating resistance  $R_{ISO}$  is higher than the admissible limiting value, a ✓ appears next to the  $R_{ISO}$  symbol.
- Similarly, a ✓ is shown next to the  $I_{EA}$  symbol, if the protective conductor current  $I_{EA}$  is lower than the admissible limiting value.
- The test is considered to be passed, if "PASS" is shown on the display.



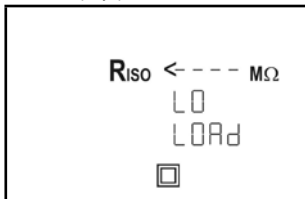
See figure 3: Testing of devices of protection class I (devices with protective conductor and accessible conductive parts which are connected to the protective conductor)

#### Note on measuring the protective conductor resistance:

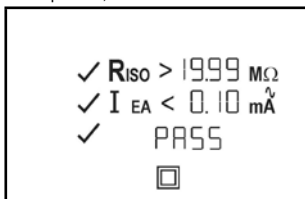
- Alternatively, the measurement of the protective conductor resistance  $R_{PE}$  can be carried out as permanent measurement (max. 3 minutes). For this purpose press the key ② for approx. > 5 sec. until the  $\Delta$  symbol appears on the display. Check the connecting line of the test object by bending it over the entire length in order to detect weak points or a break of the protective conductor. The BENNING ST 710 continuously records the current measured value on the display and stores the maximum value in the memory. By pressing the key ② again, the measurement is carried out with reversed polarity. Press the key again to indicate the maximum value of  $R_{PE}$  on the display and to continue the testing procedure as described in section 8.2.1.

### 8.2.2 Testing of devices of protection class II (shock-proof) and of devices of protection class III (safety extra-low voltage)

- Testing of devices without protective conductor and with accessible conductive parts
- Connect the test object to the test socket ❶ of the BENNING ST 710.
- Establish a connection between the 4 mm test socket ❷ and a metal part of the test object by means of the test lead with alligator clip.
- Switch the test object on.
- Press the key ❸ to start the automatic testing procedure.
- If "Lo LOAD" is shown on the display, please check whether the test object is switched on.



- Press the key ❸ to continue the testing procedure in case of the load being too low ( $R_{L-N} > 100 \text{ k}\Omega$ ).
- If the insulating resistance  $R_{ISO}$  is higher than the admissible limiting value, a ✓ appears next to the  $R_{ISO}$  symbol.
- Similarly, a ✓ is shown next to the  $I_{EA}$  symbol, if the contact current  $I_{EA}$  is lower than the admissible limiting value.
- The test is considered to be passed, if "PASS" is shown on the display.



#### Note on measuring the insulating resistance for test objects of protection class III:

- Due to the preset limiting value of 2 MΩ for test objects of protection class II, for the testing of test objects of protection class III it has to be observed that measured values between the limiting values of 2 MΩ (protection class II) and up to 0.25 MΩ (protection class III) are indicated with a ✗ next to the  $R_{ISO}$  symbol.

See figure 4: Testing of devices of protection class II (shock-proof devices without protective conductor and with accessible conductive parts) and testing of devices of protection class III (safety extra-low voltage)

### 8.2.3 Cord test

The cord test can be used both for the testing of IEC power cords (device connecting cables with IEC coupler) and for the testing of cable reels, multiple distributors and extension cables.

#### 8.2.3.1 Testing of IEC power cords (IEC adapter cables)

- Connect the IEC power cord to be tested to the BENNING ST 710 by means of the IEC connector ❶ and the test socket ❶.
- Press the key ❹ to start the automatic testing procedure.
- The test starts with measuring the protective conductor resistance  $R_{PE}$ .
- Depending on whether the value is higher or lower than the limiting value, a ✗ or a ✓ is indicated next to the  $R_{PE}$  symbol.




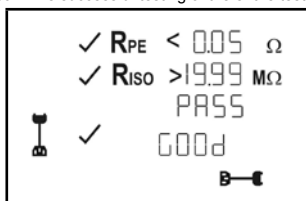
The protective conductor resistance depends on the length and cross-section of the line to be tested. It is possible that the measuring result is acceptable although the BENNING ST 710 indicates a ✗ next to the  $R_{PE}$  symbol.

- Please refer to Table 1 for typical resistance values of lines.

Length	Cross-section		
	1.0 mm <sup>2</sup>	1.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>
5 m	0.1 Ω	0.06 Ω	0.04 Ω
10 m	0.2 Ω	0.12 Ω	0.08 Ω
25 m	0.5 Ω	0.3 Ω	0.2 Ω
50 m	1.0 Ω	0.6 Ω	0.4 Ω

Table 1: Resistance values of the protective conductor depending on length and cross-section

- After the  $R_{PE}$  test has been passed, the measurement of the insulating resistance is carried out automatically.
- Depending on whether the value is higher or lower than the limiting value, a ✓ or a ✗ is indicated next to the  $R_{ISO}$  symbol.
- After the  $R_{ISO}$  test has been passed, the external conductor (L) and the neutral conductor (N) are checked for line breaks and short-circuits. A passed test regarding line breaks and short-circuits is indicated by a ✓ next to the  and the "GOOD" symbol.
- The "PASS" symbol confirms successful testing of the entire testing procedure.



- If the test regarding line breaks and short-circuits has failed, one of the following symbols is indicated instead of the "GOOD" symbol:
  - "OPEN" symbol: confirms a line break of the external conductor (L) or neutral conductor (N)
  - "Short" symbol: confirms a short-circuit between the external conductor (L) and the neutral conductor (N)

See figure 5a: Testing of device connecting cables with IEC connector

#### Note on measuring the protective conductor resistance:

- Alternatively, the measurement of the protective conductor resistance  $R_{PE}$  can be carried out as permanent measurement (max. 3 minutes). For this purpose press the key ② for approx. > 5 sec. until the  $\Delta$  symbol appears on the display. Check the connecting line of the test object by bending it over the entire length in order to detect weak points or a break of the protective conductor. The BENNING ST 710 continuously records the current measured value on the display and stores the maximum value in the memory. By pressing the key ④ again, the measurement is carried out with reversed polarity. Press the key ④ again to indicate the maximum value of  $R_{PE}$  on the display and to continue the testing procedure as described in section 8.2.3.1.

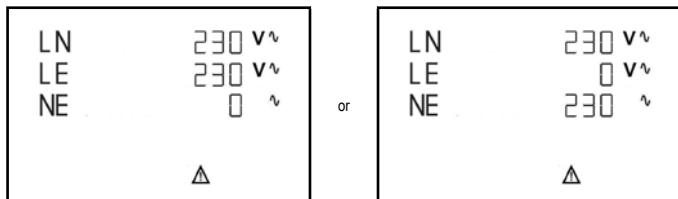
#### 8.2.3.2 Testing of cable reels, multiple distributors and extension cables

- Connect the IEC power cord (IEC adapter cable) included in the scope of delivery to the IEC connector ⑦ of the BENNING ST 710.
- Connect the line to be tested to the test socket ① and to the shock-proof socket of the IEC power cord.
- Press the key ④ to start the automatic testing procedure.
- The further testing procedure corresponds to the testing procedure described in section 8.2.3.1.

See figure 5b: Testing of lines, multiple distributors and cable reels

#### 8.3 Voltage measurement on external shock-proof socket

- Connect the IEC power cord (IEC adapter cable) to the IEC connector ⑦ of the BENNING ST 710.
- Connect the shock-proof plug to the shock-proof socket to be tested. With the mains voltage being applied, the voltage measurement will start automatically.
- Depending on the external conductor position (right or left) of the shock-proof socket, the voltage potentials between the connecting terminals L, N and PE are indicated.



**Only the voltage potentials between the individual connections L, N and PE are measured. The measurement does not provide any information on the proper installation of the shock-proof socket. There will be no warning in case of a dangerous contact voltage of the PE conductor!**

See figure 6: Voltage measurement on external shock-proof socket

## 9. Maintenance

**Before opening the BENNING ST 710, make sure that it is free of voltage! Electrical danger!**

Work on the opened BENNING ST 710 under voltage must be carried out **by skilled electricians with special precautions for the prevention of accidents only.**

Make sure that the BENNING ST 710 is free of voltage as described below before opening the instrument:

- Switch the tester off.
- Remove all connecting cables from the object.

### 9.1 Securing the instrument

Under certain circumstances safe operation of the BENNING ST 710 is no longer ensured, for example in the case of:

- Visible damage of the casing.
- Incorrect measurement results.
- Recognisable consequences of prolonged storage under improper conditions.
- Recognisable consequences of extraordinary transportation stress.

In such cases the BENNING ST 710 must be switched off immediately, disconnected from the measuring points and secured to prevent further utilisation.

### 9.2 Cleaning

Clean the exterior of the housing with a clean dry cloth (exception: special cleaning wipers). Avoid using solvents and/ or scouring agents for cleaning the instrument. It is important to make sure that the battery compartment and battery contacts are not contaminated by leaking electrolyte.

If electrolyte contamination or white deposits occur in the area of the batteries or battery compartment, clean them too with a dry cloth.

### 9.3 Battery replacement

**Before opening the BENNING ST 710, make sure that it is free of voltage! Electrical danger!**

The BENNING ST 710 is supplied by means of six 1.5 V batteries/ type AA (IEC LR6).

A battery replacement (see Figure 7) is required, if the battery symbol appears on the display unit ⑤.

Proceed as follows to replace the batteries:

- Switch the BENNING ST 710 off.
- Put the BENNING ST 710 face down and unscrew the screw of the battery compartment cover.
- Lift off the battery compartment cover (in the area of the housing slots) from the bottom part of the battery compartment.
- Remove the discharged batteries from the battery compartment.
- Then, insert the new batteries into the battery compartment at the provided places (please observe correct polarity of the batteries).
- Lock the battery compartment cover into place on the bottom part and tighten the screw.

See figure 7: Battery replacement



**Make your contribution to environmental protection! Do not dispose of discharged batteries in the household garbage. Instead, take them to a collecting point for discharged batteries and special waste material. Please inform yourself in your community.**

#### 9.4 Calibration

To maintain the specified precision of the measurement results, the instrument must be recalibrated at regular intervals by our factory service. We recommend a recalibration interval of one year. Send the appliance to the following address:

BENNING Elektrotechnik & Elektronik GmbH & Co. KG  
Service Centre  
Robert-Bosch-Str. 20  
D - 46397 Bocholt

#### 10. Environmental note



At the end of the product's useful life, please dispose of the device at collection points provided in your community.