

## Safetytest 1LT User Manual



Texts, drawings and technical information were prepared with great care. However, errors may still be present. The author and the manufacturer assume no direct or indirect liability for any incorrect or incomplete descriptions or any damages that may occur.

The user manual should be read carefully and completely before using the tester.

Warning markings in the manual and on the clamp are meant to warn of risks or dangers.

Warning markings in the manual on the tester and on the accessories have to be adhered to and describe the following:



General warning, warning of a danger!  
See user manual!



Warning of hazardous electrical voltage!



Warning when exchanging fuses!



Warning of the risk of fire, e. g. when using improper fuses!

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## 1 General Safety and Warning Notes

The tester "Safetytest 1LT" was built and complies with the following safety standards.

DIN EN 61010-1 (VDE 0411 part 1),

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR  
MEASUREMENT, CONTROL, AND LABORATORY USE

DIN VDE 0404 parts 1 and 2,

"Geräte zum Prüfen, Messen oder Überwachen von Schutzmaßnahmen"

Immunity according to DIN EN 61326,

"Elektrische Betriebsmittel für Leittechnik und Laboreinsatz - EMV-Anforderungen"

In order to warrant the safe application of the tester the following warnings have to be adhered to:



All tests may only be carried out by a skilled electrician or under the supervision of a skilled electrician. The qualified person must be trained for the specific task.



The tester subject only to its intended use. The warning markings on the tester, the connecting cables and accessories have to be observed.



The tester may be used only on 230V AC main systems which are protected with max 16A circuit breakers or fuses.



Measurements may not be performed on unfused circuits.



Repairs and alterations to the tester may be carried out only by the manufacturer or by a service organization qualified by the manufacturer. Repairs on the supply leads or adapter cables may be carried out only by skilled electricians.



Only original spare parts supplied by the manufacturer may be used.



Fuses may be replaced only by the original fuses of the manufacturer.



If a safe application is not possible, e. g. due to:

- Visual defects,
- Improper storage,
- Improper transport,
- Failure of a phase control lamp,
- Failure of measurement functions,

the tester must be decommissioned! Repair may be done only by the manufacturer or a service organization authorised by the manufacturer.



Earth bond tests and touch current tests in power systems are only allowed in specific cases and when regarding the appropriate safety precautions.



Note that large voltages may appear on appliances during tests, e. g. by charged capacitors.



Only connect the appliance that is being tested to the power socket once the power system is safe!



NOTE! When connecting the appliance to mains, hazardous voltages may occur on a defective appliance or on conductive parts which are not connected to PE.

## 2 Application

The tester "SAFETYTEST 1LT" is used for testing the electrical safety of appliances.

## 3 Scope of Delivery and Accessories

### 3.1 *Scope of Delivery (Standard):*

- 1 probe lead red and black, 2 m
- 1 power cord 1,8 m (Art.-Nr.: 0004520) - IEC 60230,16 A, 1,5 m,
- 1 USB AB cable
- 1 soft carrying case
- 1 user manual (English) on CD (Art.-Nr.: 0019800)
- App-licence for 1 year
- Factory calibration certificate

### 3.2 *Accessories (optional):*

	Artikelnummer
Brush probe 4mm red	6462270
Crocodile clamp 4mm red	6462250
VLCEE16, for testing the PE continuity and insulation of appliances with a CEE16-400V connector	0003120
<b>Software</b>	
Safety-Remote (database software)	0001004
Report-Master (simple protocol software for IOS, Android, Windows)	In the shop
Test-Master (Report and database app remotely onrolling the tester, only for Android)	im Playstore

## 4 Connections, Display and Keyboard



Bild 2



1. Main connection IEC 60320 C19
2. Connection for test probes (red/black)
3. OK LED
4. FAULT LED
5. LCD-Display
6. Setup keys (dark blue)
  - Esc /Print:
    - When selecting: **Back**
    - When measuring: **Transmit the measurement value to the Test Report app**
  - Arrow keys for moving the cursor
  - Enter-key for confirming the input and exiting a measurement
7. Measurement selection keys
8. LED indicating power on the test socket
9. LED for finger contact
10. Finger contact
11. Test socket
12. USB PC connection

#### **4.1 Connection (Figure 2)**

Before connecting the tester to the mains, the appropriate warnings in chapter 1 have to be observed, as well as the warnings for connecting the leads and accessories attached. It is safe to use the instrument for its intended use only. The testing of the protective conductor potential takes place through using the finger contact after the tester is connected

#### **4.2 Mains connection, Type Schuko – IEC (Figure/1)**

Mains connection of the tester. The tester may be connected only to a power system of 230 V AC 40 – 60 Hz, protected by a circuit breaker of max 16 A!

#### **4.3 Measuring terminal black „GND“ (Figure 2/2)**

Connection for the negative pole for dc voltage measurements and other two probe measurements.

#### **4.4 Measuring terminal red „Probe“ (Figure 2/2)**

Connection for the probe for earth bond and touch current measurements. Check the polarity when connecting the key probe.

#### **4.5 Interface USB B (Figure 2/12)**

Connection to a USB connector to communicate with the PC via a virtual Com interface. The driver of FTDI has to be installed and is available on the CD which comes with the tester. This took place during the installation of the software.

#### **4.6 Test socket (Figure 2/11)**

Schuko Test socket up to 16 A.

The PE connector is connected only before active measurements.

#### **NOTE!!!**

When connecting a faulty appliance to the test socket a hazardous voltage may occur when mains is applied on accessible conductive parts not connected to the protective earth and on the housing if the protective earth is out of order.

**4.7 Keyboard and Display (Figure 2/6, 7)**

The keyboard allows an easy way to perform all tests and the display shows all results.

**4.8 Display (Figure 2/5)**

The display has a resolution of 320x240 pixels and is backlit. The menus, help texts, measurement functions, limits, measured values and quantities are displayed as text messages.

## **5 Functional Description**

**5.1 Power Supply**

The device is powered with mains (230V  $\pm 10\%$ ). The electronic measurements are supplied by an internal fuse

**5.2 Memory**

Measurements must be stored on the smart phone, tablet or PC. The tester hasn't internal memory.

**5.3 Interface USB**

USB: The PC is connected via a USB Type AB cable.

The FTDI is installed with the PC software.

The baud rate to the PC is 19200 baud.

The interface is galvanic isolated.

The firmware of the "SAFETYTEST 1LT" may be updated easily via the USB/COM interface. An update allows you to get the latest testing sequences and change the display language.

**5.4 Bluetooth Interface**

The tester is equipped with a Bluetooth module. The following profiles are possible:

- **SPP**=serial port protocol, please choose this for use with the bidirectional Android Apps (Test Master) or with a Windows software (Safety Remote).
- **HID**=human interface device, emulating a keyboard for use with the Protocol Master App for iOS, Android and Windows.

Please set up the interface as follows:

- Activate Bluetooth and make the interface visible
- When pairing select the tester with the serial number displayed as SSID.
- If asked for a password enter "0000" or "8888"
- Start the app and perform the measurements indicated by the app. Transmit each measurement by pressing the "Print" button.

**When using iOS devices the cursor must be placed inside the input field.**

## 6 Testing the Mains Connection

The person responsible for the electrical installation is responsible for the safety of the power system to which the tester is connected.

The test of the installation is not part of the appliance test. However, it is important to know before testing if the electrical installation is safe.

The tester does not perform a complete test as required by DIN VDE 0100.

Nevertheless a few important measurements are made giving an indication of the mains connection, as for example:

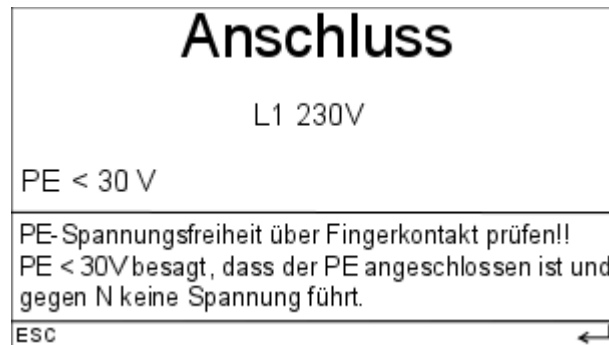
- Testing of the protective earth potential using the finger contact
- Mains PE against N voltage < 30V.
- Check if the N conductor is open circuit (the display does not light up).
- Display of the orange phase check glow lamp if mains is on (yellow light)
- Voltage measurement phase against N (range 1 to 260V AC)

Note:

- Through touching the finger contact, it is possible to determine whether the protective conductor is connected. This is not the case, if after touching the finger contact the red LED lights up.
- If the mains connection is faulty a message "PE>30V!!" is displayed on the display. Further, the tester makes a loud beep sound. Further tests may only be performed after the power system has been repaired.
- If N/PE are exchanged the RCD of the installation switches off
- If no display appears PE may be hazardous live. Test this using the finger contact. Disconnect tester from the mains and check on another mains socket. If the tester now works, get a specialist to check the faulty mains socket.

Around an IT-network, the protective conductor is not on PE potential. If "PE>30V" appears. If the tester is connected through an isolation transformer, the PE is missing. "PE>30V" appears.

## 7 Connection Display



In the first connection menu the mains voltage and the voltage between N and PE is displayed.

### 7.1 AC Connection

NOTE!!!

- If the voltage  $L1 < 207\text{ V}$  or  $L1 > 253\text{ V}$  no proper measurements can be made. If the message "PE>30" appears it is most probable that the PE conductor is not connected to the mains power socket. It may also happen that the PE conductor is connected but that it is hazardous live (test using the finger contact)! For checking the PE conductor refer to the chapter "Mains Connection" above.

## 8 Display and Menu Structure

The display allows a comfortable menu based testing sequence, shows all measuring functions, limits and values. The menu structure is documented in a separate document "SAFETYTEST 1LT-Menu Structure". It is kept up to date together with the software.

## 9 Taking the Tester into Operation

### 9.1 Visual check

- Observe the safety precautions of chapter 1.
- Check the mains connection, tester and accessories
- Observe all warning markings on the tester mains cord and accessories!

### 9.2 Connecting the tester to the mains system

The tester is supplied from the mains input.

### 9.3 Starting the test

All measurements may be started using the function keys. Optionally tests can be performed using:

1. **Report-Master** with guided measurements
2. **Test-Master** controlling the tester remotely with an Android App
3. **Safety-Remote** controlling the tester remotely with a Windows program.

## 10 Testing Electrical Appliances

The tests required by the standards have been realised by the internal testing sequences.

Before starting a test, the appliance has to be classified in the profile menu.

After repair, modification and after repetitive testing electrical appliances have to provide a degree of safety to the user which is comparable of that of brand new appliances. Whether the safety is given can be tested according to the applicable standard. The following tests are to be performed in the given order. Each test step must have been passed before proceeding to the following step:

- Visual inspection
- Earth bond test
- For class I appliances test of the insulation resistance and or the earth leakage current or the substitute leakage current.
- For class II equipment as well as for accessible conductive parts not connected to PE of class I equipment, the insulation resistance and the touch current or the substitute leakage current.
- Functional Test

### Notes:

Before performing a leakage test on class I appliances the earth bond test has to be passed. Before performing a leakage current test on class II or III (except for IT appliances) an insulation resistance test of 500 V DC has to be passed. Accessible connections and generated SELV voltages have to be checked according to the SELV specifications.

### 10.1 *Qualification*

High requirements are set to the qualification of the skilled electrician. All tests have to be performed by a skilled electrician or under his supervision. The skilled electrician must follow the rules and standards required for his work. Also it is not allowed to omit any steps which would ensure a correct and safe use of the appliance. The liability of the skilled person responsible for testing is especially important if no complete test is possible (e. g. due to permanently installed equipment). If a complete test is impossible the responsible electrician assumes the liability and has to document this on the test report.

### 10.2 *Mains connection*

According to law the person responsible for the installation of the power system is responsible for the mains connection, not the manufacturer of the equipment to be connected.

The required tests on permanently installed equipment are often not possible due to technical reasons or due to the local conditions. If the equipment is not accessible the mains connections (L1, L2, L3, N and PE) have to be disconnected from mains. Therefore the connection should be refitted to a plug and socket connection according to IEC 60309-1 or a coupling should be inserted according to IEC 60309-1. The installation costs can be amortized do to a faster safety test.

### NOTE!!!

Electrical appliances with a nominal current above 16A must be connected to all pole circuit breakers according to IEC 60947. These should be mounted at a height of approx 1.7 m. Plugs and sockets of equipment rated above 16A may not be connected or disconnected under load. Always open the circuit breaker first. Equipment rated below 16A does not require a separate circuit breaker.

### **10.3      *Visual inspection***

The appliances are checked for externally visible damages, and, if possible, the suitability of the surrounding for their use e. g.:

- Damages to the housing
- Suitable place of installation
- Damages to the power cord
- Deficiencies on the strain relief
- Indications of overload or improper use
- Inappropriate alterations
- Missing protective covers
- Dirt and corrosion affecting safety
- Presence of required ventilators
- Open air vents
- Tightness
- Legibility of markings

**Note:**

Visible damages which might impel the mechanical or electrical safe use or which might lead to fire must be repaired immediately.

### **10.4      *Measurements***

See menu system

### **10.5      *Functional Test***

After performing the electrical test a functional test is required. A short test may be sufficient.

### **10.6      *Checking the Markings***

The presence of safety required markings must be checked and if necessary renewed or completed.

### **10.7      *Documentation of the test***

The passed test has to be documented. If an appliance is unsafe, this must be marked clearly on the appliance and the responsible body to be notified in writing. The measurement values and alterations performed are to be documented. The appliance should be marked by a sticker that for example states the following: "Tested according to VDE 0701-0702 and DGUV Standards 3".

## 11 Connections, Pictures, Examples

### 11.1 *Earth bond test of AC appliances*



**Protective conductor:** Use the protective conductor probe to scan the housing parts and move the connection cord.

### 11.2 *Earth bond test of permanently connected equipment*

For permanently connected equipment connect the tester to a neighbouring socket outlet.

Automatic testing sequence using **Test-Master** and **Safety-Remote**,

guided testing sequence using **Report-Master**:

Sequence „Permanent connection“. Probe all conductive parts connected to PE.

The PE resistance is measured as a loop via the installation to the tester.

The limit value is higher than a direct measurement.

### 11.3 *Earth bond test of three phase equipment using two test leads*

Automatic sequence with the Test-Master App or Safety-Remote:

„CII with Insulation resistance test“.

Connect a probe between the black terminal of the tester and the PE parts of the appliance.

Probe the conductive PE parts using a probe connected to the red socket.



**11.4      *Earth bond test of three phase equipment using the extension lead adapter***

Automatic testing sequence using Test-Master and Safety-Remote,  
guided testing sequence using Report-Master:  
„SKI with Insulation Resistance Measurement“.  
Connect the extension lead adapter to the tester and the appliance to the adapter.  
Probe all conductive parts connected to PE.

**11.5      *Accessible conductive parts not connected to PE***

**Testing conductive parts not connected to PE:** Use the probe to test these parts. If there are rotating or moving parts test these in motion. The best way is to use the optional brass brush probe. Use protective glasses.





### 11.6 *Insulation Resistance LN-PE*

Insulation resistance LN-PE, Equivalent leakage test LN-PE:  
Connect the appliance to the tester. The test is performed without powering up the appliance.

### 11.7 *Insulation resistance test LN-PE of three phase equipment using the extension lead adapter*



Automatic testing sequence using **Test-Master and Safety-Remote**,  
guided testing sequence using **Report-Master**:  
„CII with insulation resistance measurement“.  
Connect the extension lead adapter to the tester.  
Connect the appliance to the adapter, Turn on the appliance

### 11.8 *Earth leakage test of AC appliances with plug*

**Earth leakage test, functional test:** Connect the appliance to the test socket.

## 12 Error messages, Removing Faults

### 12.1 *The display remains dark*

Note: Possibly there is no N connection on the mains socket. Possibly one of the fuses of the tester has blown.

### 12.2 *Touch current display is 0,000 mA*

This is no error but the safe condition.

### 12.3 *Contact current measurement larger than 0,5 mA*

#### **Note!**

Do not touch the appliance under test; there is a hazardous voltage on the accessible parts!!!

Disconnect the appliance from mains!!!

Perform an insulation resistance measurement between the accessible conductive parts and mains of the unit under test. While performing the insulation resistance measurement all switches and contactors have to be closed or bridged in order to test all parts of the isolation. The measurement value should exceed 2 MΩ. After the insulation resistance measurement perform a substitute leakage measurement. Then do a touch current measurement. The current must be less than 0.5 mA.

### 12.4 *Leakage current measurement shows "F" as a result*

The tester regards the heating power when performing the test. A value of 1 mA/kW is established as the limit. Check the measurement value to the allowed limits.

If it exceeds the value, disconnect the unit under test from mains.

Do an insulation resistance measurement LN-PE.

All switches have to be closed, internal contactors bridged.

Also measure the capacitance between LN and PE.

Check the mains voltages with a Multimeter.

If the tester display is incorrect send it in for servicing.

### 12.5 *Bluetooth-Communication*

-The tester is not found:

Incorrect Bluetooth profile setting compare „5.4 Bluetooth Interface“

The tester is still paired with a different mobile device (smart phone, tablet PC or PC).

Unpair and retry, if still no success, restart the tester.

-Bluetooth Connection unstable:

Make sure that the energy saving for the interface is disable on the mobile device.

The distance to the mobile device must be less than 10 meters. Ensure that there are no sources of EMC disturbance nearby (e. g. inverters, contactors)

-The HID interface does not work:

Check the settings for the hardware keyboard on the mobile device.

## 13 Spare Parts

### **ACHTUNG!!!**

Observe the warnings of chapter 1!

Use only spare parts supplied by the manufacturer, see chapter 1!

The tester may be serviced only by the manufacturer or by a service shop authorised by the manufacturer.

## 14 Technical Data

**Mains connection:**

AC 230V +/- 10%.

Switching current: Mains Integrated relay 16A.

**Temperature:**

0°C – 40°C.

Measurements (Error max. 1% of +5% of measured value):

**PE conductivity (probe-PE, probe PE mains, probe-probe):**

0,000 Ohm ...4,000 Ohm. OC voltage 10V, Current 200mA DC.

**Insulation resistance measurement:** 0,00MOhm...20,00MOhm

Open. circuit voltages 250V, 500V, Short circuit current 1,2 mA.

**Equivalent leakage current:** 0,00mA ...20,00 mA, Open circuit voltage approx. ca. 85 V.

**Differential current:** 0,00mA...20,00mA. Filter characteristic according to DIN VDE 0404 for correct evaluation of the harmonic currents.

**Contact current:** 0,000mA ... 4,000mA

**Voltage measurement probe-probe:** 0,0V ... 440V AC/DC

**Phase voltage:** 0,0V...260,0V

**Phase current:** 0,00A ... 20,00 A

**Power:** 0W ... 4 kW. Evaluation up to the 15th harmonic.

Power standby: 0,000W...9,999W, Current max. 50 mA

**PE monitor:** Voltage N-PE> 30V.

**Integrated leakage current power off:** Differential current > approx. 20 mA.

**Differential current** 0,00 ... 20,00 mA

**Line current:** 0...20,00 A

**Test sequences:**

Automatic Test sequence with the Test Master app and the Safety-Remote PC software

Guided test sequence with the Report Master App.

**Sequences:**

SKI active or passive (with and without mains)

SKII

SKIII

Fixed connection

Extension leads with optional adapters

**Interface:** USB Type B for PC, Can be remote controlled.

## 15 Disposal

The disposal of a decommissioned tester must be carried out by the customer according to the national regulations.

## 16 Warranty

The tester "SAFETYTEST 1LT" is subject to a strict quality assurance system.

A calibration certificate with the documentation of the test results is delivered together with the tester.

This certificate should always be available.

The guarantee period is for 12 months after delivery. Manufacturing defects and material defects are covered by the guarantee.

Transport costs to the manufacturer are born by the sender. For normal transports within Germany to the customer the manufacturer pays. Special transport costs, e. g. express delivery have to be borne by the customer.

The warranty is excluded in the following cases:

- Incorrect use, or use with an incompatible other device.
- After performing modifications to the tester without the explicit permission of the manufacturer.
- After opening the tester without the explicit permission of the manufacturer.
- When using the tester in applications which it was not intended for or which have not been described in the manual.
- Damages due to mechanical shock or dropping or due to water or chemicals.