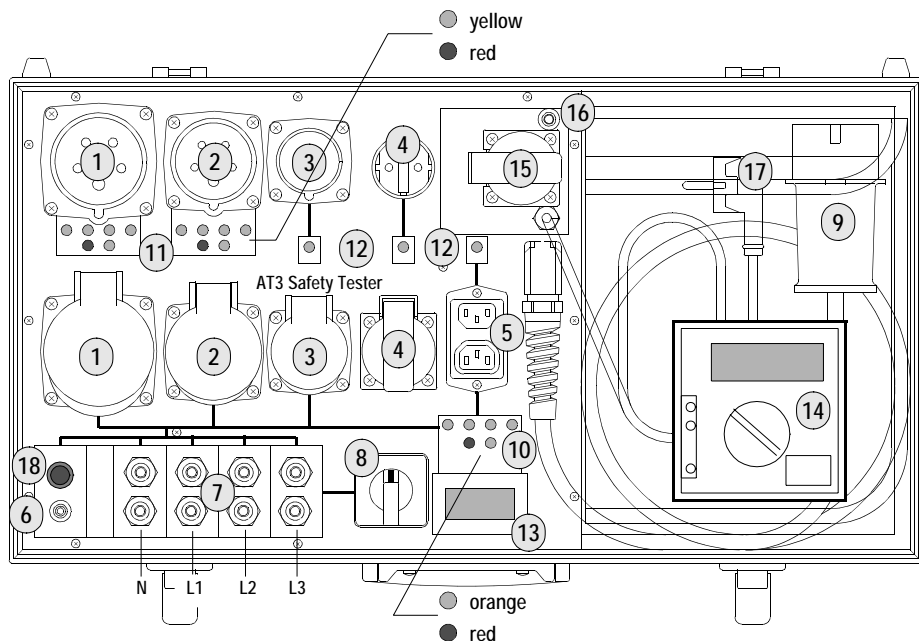


AT3 Safety Tester

– In combination with external test instruments –
for testing single and 3-phase power consumers
and extension cables

3-349-147-03
2/8.00





Plugs and Sockets for Connected Devices

- 1 CEE socket and plug
3P+N+PE 32 A 400 V
- 2 CEE socket and plug
3P+N+PE 16 A 400 V
- 3 CEE socket and plug
1P+N+PE 16 A 230 V
- 4 Earthing contact socket (blue)
and plug, 16 A 230 V
- 5 Device socket and plug

Measuring Loops

- 6 Safety socket, red
- 7 Measuring loops for N, L1, L2 and L3

AT3 Three-Phase Power Supply

- 8 MAINS-VDE switch
- 9 CEE plug for 3-phase power supply
to the safety tester
3P+N+PE 16 A 400 V

Display Elements

- 10 Mains indicator lamps L1, L2, L3 and N
for indication of power supply as well as L and R
for indication of phase sequence direction
- 11 Indicator lamps for continuity test and phase sequence
- 12 Indicator lamps for continuity test
- 13 Digital display for differential current

Test Instrument Connectors

- 14 Space for external test instrument,
e.g. METRATESTER[®] 4 or 5
- 15 Earthing contact socket (blue)
for power supply to test instrument,
16 A 230 V
- 16 Jack socket for test instrument clips
or test probe
- 17 Earthing contact plug with cable for
plugging into the test socket at the
test instrument

Self-Test

- 18 Self-test start button

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1 Applications

The mobile safety tester, which can also be permanently wall-mounted with the included frame, is used for measuring and testing electrical devices and extension cables. The included tests are required by DIN VDE 0701 after repair or modification, as well as for periodic testing in accordance with DIN VDE 0702, and must be performed by a qualified electrician with a suitable test instrument. Testing of protective conductor resistance, insulation resistance and earth leakage current, as well as differential current and contact current, is required by these regulations depending upon the device under test and its application. The measurement of power consumption at devices under test is an additional test for the substantiation of correct functioning of electrical equipment.

The AT3 performs the following tests in combination with DIN VDE 0701/0702 test instruments:

- Protective conductor resistance
- Insulation resistance
- Earth leakage current
- And as a stand-alone instrument: Differential current and contact current
- Conductor continuity and phase sequence at single and 3-phase devices under test

1.1 Use with SECUTEST®... Test Instruments

Testing Extension Cables

Testing of extension cables with the AT3 may only be performed at the SECUTEST®0701/0702S with the test instrument selector switch in the "SC I" position, or at the SECUTEST®0701/0702SII with the test instrument selector switch in the "T1" or "VDE0702" position. The setting "extension cable with EL1 accessory" ("AUTO" selector switch position for SECUTEST®0701/0702S) may not be used together with the AT3.

Switching Back and Forth between Test Types VDE and MAINS (data transfer to the SECUTEST®...)

With the selector switch in the "VDE" position, only the following measured values are transferred from the AT3 to the SECUTEST®... test instrument for processing :

- Protective conductor resistance
- Insulation resistance
- Earth leakage current

If "passed" is displayed at the SECUTEST®... after testing has been completed, no further tests are performed by the SECUTEST®...

The measurement of differential current and contact current, as well as conductor continuity and phase sequence testing, can be performed with the AT3 as a stand-alone instrument.

Note

If, contrary to these operating instructions (chapter 5.3), the function test is started or the connector plug (17) is inadvertently inserted into the mains socket at a 0701 test instrument and the "MAINS-VDE" switch at the AT3 is set to the "MAINS" position, the RCCB in an RCD protected circuit may be tripped.

2 Safety Precautions

The safety tester has been manufactured and tested in accordance with the following regulations: IEC 61010-1/DIN EN 61010-1/VDE 0411-1

"Safety requirements for electrical equipment for measurement, control and laboratory use, part 1: Safety measures for electronic measuring instruments"

and DIN VDE 0404

"Devices for technical safety testing of electrical equipment, parts 1 and 2".

The safety of the operator and the safety tester is only assured if the tester is used for its intended purpose in combination with a test instrument which complies with DIN VDE.

In order to maintain flawless technical safety condition, and to assure safe use, it is imperative that you read the operating instructions thoroughly and carefully before placing your safety tester into service, and that you follow all instructions contained therein.

Observe the following safety precautions:

- **Measurements in electrical systems are prohibited!**
- The 16 A CEE 3P+N+PE plug may only be used to connect the safety tester to a 220 / 380 V (230/400 V) 50 Hz system. In order to avoid undesired shutdown in the event of a short-circuit at the device under test, this circuit should be fused separately if at all possible.
- The test instrument must be connected to the safety tester before the safety tester is connected to the mains.



Attention!

The MAINS-VDE switch (8) may only be set to the "MAINS" position after devices under test with protective conductor have passed the protective conductor test in accordance with chapter 5.1 on page 6.



Note!

In the event of a faulty protective conductor (interruption/reversal), the body of the faulty DUT, the protective contacts at the test plugs (1 through 5) and the safety socket (16) may conduct mains voltage. Connected external test instruments for VDE 0701/0702 whose electric strength is insufficient for interference voltages may be damaged!

- For reasons of safety, the device under test must be switched off before setting the selector switch to the "MAINS" position in order to assure, for example, that a circular saw must be switched on intentionally.
- Be prepared for the occurrence of unexpected voltages at devices under test (e.g. due to charged capacitors).
- **Visually inspect** the device under test before connecting it to safety tester. Damaged devices under test must be repaired before test measurements are performed.
- Only extension cables which have been connected to the test socket at the safety tester may also be connected to the safety tester plugs for testing.
- Because the safety tester is designed in accordance with DIN VDE 0404, the "PE" contacts at the plug sockets may only be connected to the mains protective conductor with the MAINS-VDE switch (12) in the "MAINS" position.
- In order to assure that all technical safety requirements are fulfilled, the safety tester may only be repaired by qualified personnel, preferably by the manufacturer.
- The tester must be disconnected from the mains before the case is opened.
- If work is interrupted, the tester must be disconnected from the mains and secured by closing the case and locking the cover.
- If visible damage is apparent at the safety tester, its measuring loops or its connector cables, if it no longer functions, if it has been stored for a lengthy period of time under unfavorable conditions or if it has been subjected to excessive stress during transport, it must be assumed that hazard-free use is no longer assured.
Remove the safety tester from service in such cases and secure against inadvertent use.

3 Connecting the Safety Tester to the Mains and Testing the Mains Connection

3.1 Connecting the Safety Tester

The following connections must be established **before connecting the safety tester to the mains:**

- a. Insert the mains plug from the test instrument into the earthing contact socket (15).
 - b. Insert the earthing contact plug (17) from the safety tester into the earthing contact socket at the test instrument which bears the designation test socket, and only into this socket.
 - c. When testing extension cables, the clip from the test instrument is connected to the jack socket (16).
- ➔ The MAINS-VDE switch (8) can then be set to the "MAINS" position.
- ➔ Connect the safety tester to the mains with the CEE plug (9).



Attention!

Indicator lamps L1, L2, L3, N and R (10) must light up. If this is not the case, the safety tester must be disconnected from the mains and the mains connection error must be corrected. Possible causes for this error include broken cables or faulty protective conductor connections.

3.2 Testing Protective Conductor Potential

If, as described in chapter 3.1, not all of the indicator lamps light up after the safety tester has been connected, and if the test instrument does not indicate any line voltage, the mains should first be tested with a mains tester, for example the PROFITEST®0100S-II.

If, for example, the PE signal lamp lights up at the utilized test instrument when the "PE" contact surface and a grounded component are probed (e.g. a water pipe), potential between the protective conductor and the mains plug is greater than 25 V, i.e. the protective conductor is carrying voltage. Immediately disconnect the safety tester from the mains in this case, and arrange to have the mains error corrected. Voltage is present at the adapter housing and at the outlet's earthing contacts in this case.



Note!

In any event, the operating instructions included with the utilized test instrument must be observed!

3.3 Measuring Line Voltage

Line voltage is measured in accordance with the operating instructions included with the test instrument (voltage between L1 and N). Line voltage must lie within the allowable range of 207 to 253 V.

4 Connecting Devices Under Test to the Safety Tester

After the DUT has passed a visual inspection, The MAINS-VDE switch must be set to the "VDE" position before connecting a device under test to the appropriate plug connectors at the safety tester, as well as before each new test.

Connect the device under test to the safety tester, and switch the DUT on in all of its functions making sure that, for example, temperature actuated switches and the like are activated as well. When testing safety class I devices, always start with the **measurement of protective conductor resistance**, because insulation resistance and earth leakage current cannot be measured if the protective conductor does not function properly.

This test is also of special importance for the subsequent **function test**, because a defective or reversed protective conductor represents a **hazard** for the **operator**.

5 Testing Devices

5.1 Measuring Protective Conductor Resistance

(does not apply to safety class II and III devices)
The clip from the test instrument must be connected to the housing of the device under test such that good contact is assured.

- ⇨ Perform testing in accordance with the instructions included with the test instrument!
- ⇨ Read the measured value and compare it to the allowable values set forth in DIN VDE 0701 and DIN VDE 0702.



Attention!

During measurement, the connector cable must be jostled, section by section, over its entire length. This only applies to permanently installed devices in as far as the connector cable is accessible during repair, modification or testing.

Compensating for Connector Cable Resistance

The resistance of the AT3's connector cable (17) is 0.07 Ω . For measurements in borderline ranges, proceed as follows for each of the listed test instruments:

METRATESTER[®] 4 or 5

- ⇨ Subtract the above mentioned resistance value, 0.07 Ω , from the measured value.

SECUTEST[®] . . .

- ⇨ Set the limit value for the R-PE socket to 0.400 Ω (see SECUTEST[®] . . . operating instructions).
- ⇨ If the SECUTEST[®] . . . will be used later without the AT3 safety tester, the limit value must be reset in accordance with DIN VDE.

Testing of extension cables with the SECUTEST[®] 0701/0702S is performed exclusively with the selector switch in the "safety class I" setting, and in the "T1" or "VDE0702" setting with the SECUTEST[®] 0701/0702SII.

5.1.1 Testing Extension Cables

Firstly, the clip from the test instrument must be connected to the jack socket (16) at the safety tester (see Figure 3 on page 10). In order to test extension cables, connect the plugs and sockets from the cables to the appropriate plugs and sockets (1 through 5) at the safety tester. Test in accordance with chapter 5.1.

5.2 Measuring Insulation Resistance



Note!

If doubts exist concerning a given insulation resistance measurement, e.g. for electronic devices, or if it cannot be assured for safety class I devices that all components subjected to mains voltage are covered by the measurement, a differential current or a contact current measurement can be performed in accordance with chapter 5.4.



Attention!

Always check to make sure that the device under test is switched on if a test instrument with automatic error messaging is used, because messages of this type cannot be processed by the safety tester!

L1, L2, L3 and N are measured against PE for insulation testing in accordance with DIN VDE 0701/0702.

- ⇨ Perform the test in accordance with the operating instructions included with the test instrument.
- ⇨ Read the measured value and compare it to the allowable values set forth in DIN VDE 0701/0702.
Values in accordance with DIN VDE 0701:
- For safety class I devices 0.5 M Ω (2 M Ω range)
- For safety class II devices 2.0 M Ω (20 M Ω range)
- For safety class III devices 250 k Ω



Attention!

If a value of 0.5 M Ω is fallen short of for safety class I devices which include heating elements, an equivalent leakage current measurement must be performed, and it must be passed.

Batteries in battery powered devices must be disconnected during measurement.

5.2.1 Testing Extension Cables

- ⇨ Connect cables and clip to the safety tester as described in chapter 5.1.1.

An insulation test is then performed. Resulting values should not be substantially less than 2 M Ω . VDE cable testing is complete after this step.

5.3 Measuring Equivalent Leakage Current

This test must be performed for safety class I devices:

- to which interference suppression capacitors have been installed during the course of repair or modification.
 - which are equipped with heating elements, and for which insulation resistance values of less than 0.5 M Ω have been measured.
- ⇒ Perform this test in accordance with the operating instructions included with the test instrument.
- ⇒ Read the value and compare it to the allowable values set forth by DIN VDE. In accordance with these values, displayed current for devices with heating power of less than 6 kW may not exceed 7 mA, or 15 mA for devices with heating power of greater than 6 kW.



Note!

Leakage current measurement in accordance with respective device regulations is usually not possible, because the devices have to be set up or operated in an isolated fashion to this end. Equivalent leakage current measurement is performed for this reason. Values determined in this way are not directly comparable to the leakage current values set forth in the device regulations.



Attention!

Tests in accordance with chapter 5.1 through chapter 5.3 are performed with the help of test instruments. The test sequence is ended after this step, even for test instruments which allow for single-phase function testing under mains conditions by reversing the plug, or with a switch.

The AT3 safety test is used alone for function tests in accordance with chapter 5.4 through chapter 5.7.

5.4 Measuring Differential Current and Contact Current



Attention!

For this test type, the device under test is connected to the mains by turning the MAINS-VDE switch (8) to the "MAINS" position.

This measurement may only be performed for **safety class I devices** after the protective conductor resistance test has been passed in accordance with chapter 5.1.

- Turn the device under test off.
- Set the MAINS-VDE switch (8) to the "MAINS" position.
- Mains signal lamps L1, L2, L3 and N (10) indicate the presence of line voltage.
- Intentionally place the device under test into service by switching it on (see chapter 2).

Read the differential current value in mA at the display (13). This value **may not exceed 3.5 mA**. Contact current is determined by measuring differential current for **safety class II devices**, or for safety class I devices with accessible, conductive components which are not connected to the protective conductor. A test cable is connected to the jack socket (6) to this end, with which all accessible, conductive components are probed.



Note!

Make sure that the probed components are not accidentally grounded.

Read the contact current value in mA from the display (13). This value **may not exceed 0.5 mA**.

If the mains plug can be reversed, these tests must be performed with the plug in both positions. The larger of the two resulting measured values applies.

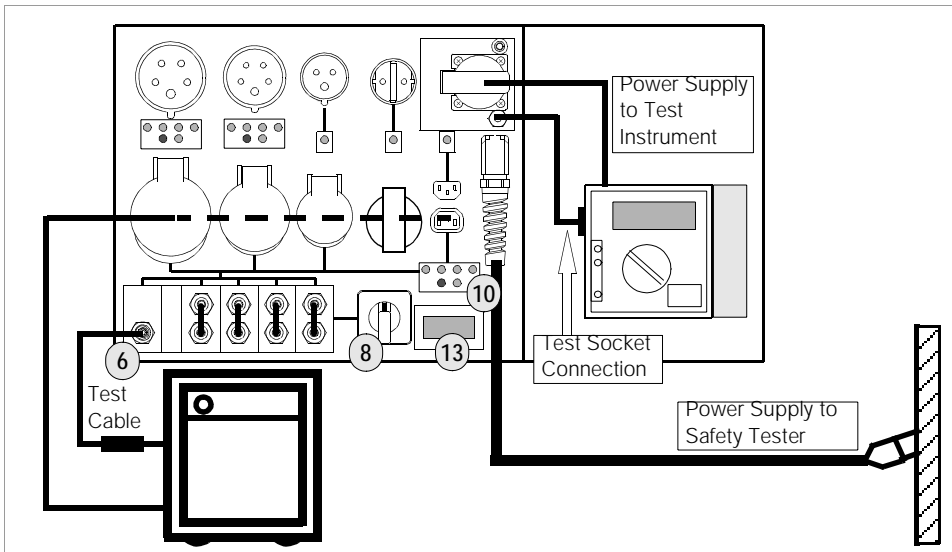


Figure 1 Measuring Differential Current and Contact Current



Note!

If no device under test is connected, random numbers appear at the digital display. These have no significance and do not correspond to measured values.

Short-Circuit to a Voltage Carrying Conductor

If a short-circuit to a voltage carrying conductor exists when the accessible, conductive components are probed, overload "I" appears at the display, which then settles in at a value of greater than 3 mA after about 5 seconds. Faulty devices under test of this sort must be removed from service and repaired. The AT3 safety tester should be allowed to cool for 5 minutes before further operation.

6 Function Test with Measurement of Current Consumption at the Device Under Test



Attention!

For this test type, the device under test is connected to the mains by turning the MAINS-VDE switch to the "MAINS" position.

This measurement may only be performed for safety class I devices after the protective conductor resistance test has been passed in accordance with chapter 5.1.

- After the VDE test has been passed, switch the device under test off.

- Set the MAINS-VDE switch (8) to the "MAINS" position.
- Mains signal lamps L1, L2, L3, N and R (10) indicate the presence of line voltage and a clockwise phase sequence at the device under test.
- Intentionally place the device under test into service by switching it on (see chapter 2)! Operating current for the device under test can be measured with a clip-on meter or a multimeter at the respective measuring loops N, L1, L2 and L3 (7).

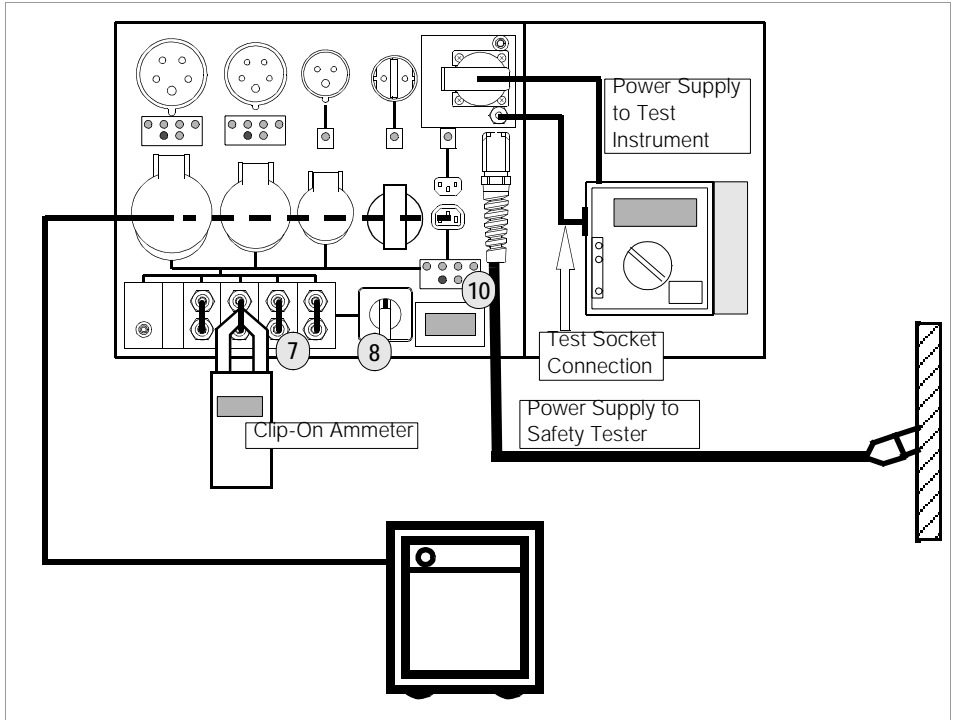


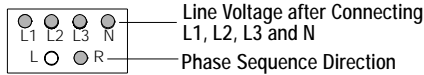
Figure 2 Function Test and Measurement of Current Consumption

7 Function Tests for Extension Cables

- After the VDE test has been passed, set the MAINS-VDE switch (8) to the "MAINS" position.

Mains signal lamps L1, L2, L3 and N (10) indicate the presence of line voltage and signal lamp R indicates clockwise phase sequence at the 3P+N+PE mains outlet if connection is correct.

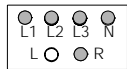
Mains Signal Lamps (10)



7.1 Cable Continuity Test

7.1.1 AC Power Cables (continuity, L1-N)

Mains Signal Lamps (10) Continuity Test Signal Lamp (12)

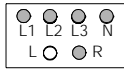
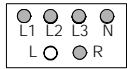


If correctly connected, the mains signal lamp (12) for the plug (3, 4 or 5) by means of which the extension cable is connected lights up.

7.1.2 Three-Phase Cables

(continuity for L1, L2, L3 and N)

Mains Signal Lamps (10) Continuity Test Signal Lamps (11)



If correctly connected, mains signal lamps (11) L1, L2, L3 and N for the CEE plug (1 or 2) by means of which the extension cable is connected light up.

7.2 Testing Phase Sequence Direction

Mains Signal Lamps (10) Continuity Test Signal Lamps (11)



If connected correctly, single lamp R (clockwise phase sequence) lights up for the socket (10) by means of which the extension cable is connected, as does signal lamp R for the CEE plug (1 or 2) by means of which the extension cable is connected. If phase sequence at the CEE socket is counterclockwise, both L (counterclockwise) signal lamps must light up.

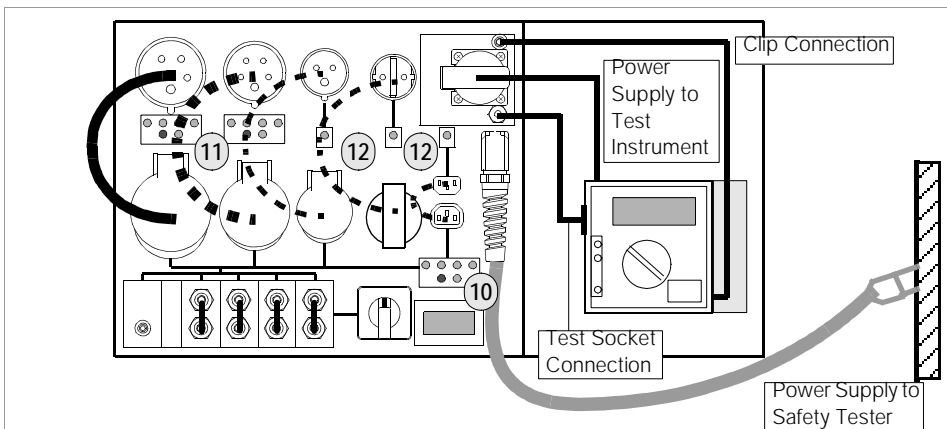


Figure 3 Testing Extension Cables

8 DI Self-Test

The DI self-test function has been integrated into the safety tester in order to allow for testing of the differential current / contact current component at any time.

Starting the DI Self-Test

- Remove the device under test (device or extension cable).
- Set the MAINS-VDE switch (8) to the "MAINS" position.
- Activate the DI self-test button located above the jack socket (6).

Depending upon line voltage, values within the following allowable range must appear at the digital display: 1.0 to 1.25 mA.



Attention!

If the measured values are not within the allowable range, the following measurements cannot be performed:

- Differential current and contact current
- Insulation current and equivalent current

The safety tester must be removed from service in this case. The error in the system (interrupted protective conductor), or at the safety tester must be identified and eliminated by a qualified electrician. Defective safety testers are best repaired by the manufacturer.

9 Technical Data

Nominal Line Voltage	230/400 V AC
Safety Class	I
Overvoltage Category	II
Protection	Case: IP 40 per DIN VDE 0470 part 1 Terminals: IP 20
Dimensions:	580 mm x 300 mm x 190 mm (with lid)
Weight	approx. 8 kg

Differential Current Measuring Ranges

Differential Current	0 ... 19.99 mA AC ± 2.5% of reading
Operating Error	±(10% of reading + 5 d) as of 10 d

10 Maintenance

Due to the fact that handling is so convenient, a protective conductor continuity test should be performed before each use of the safety tester to assure correct functioning of the connector cable.

- Connect the clip from the test instrument to an earthing contact which has previously been tested for the absence of voltage, e.g. at an electrical outlet which is connected to the protective conductor of the connector cable.
- Turn the MAINS-VDE switch (8) to the "MAINS" position and set the test instrument to the protective conductor test range. Measure protective conductor resistance as described in chapter 5.1.

If the displayed value is too high, or if interruption is indicated, the protective conductor is interrupted either within the connector cable, or at the MAINS-VDE (8) switch.

The safety tester must be disconnected from the mains in this case, and the error in the system, or at the safety tester, must be eliminated.



Note!

In accordance with DIN VDE 0702 (see chapter 5 on page 6), measuring instruments used for periodic testing must be tested and calibrated at regular intervals in accordance with the manufacturer's specifications. Depending upon how it is used, the manufacturer recommends an interval of 1 to 3 years for the safety tester.

11 Repair and Replacement Parts Service DKD Calibration Lab and Rental Instrument Service

When you need service, please contact:
GOSEN-METRAWATT GMBH
Service-Center
Thomas-Mann-Strasse 20
90471 Nürnberg, Germany
Phone +49 911 86 02 - 410 / 256
Fax +49 911 86 02 - 2 53
e-mail fr1.info@gmc-instruments.com

This address is only valid in Germany.

Please contact our representatives or subsidiaries for service in other countries.

12 Product Support

When you need support, please contact:

GOSEN-METRAWATT GMBH
Product Support Hotline
Phone +49 911 86 02 - 112
Fax +49 911 86 02 - 709

