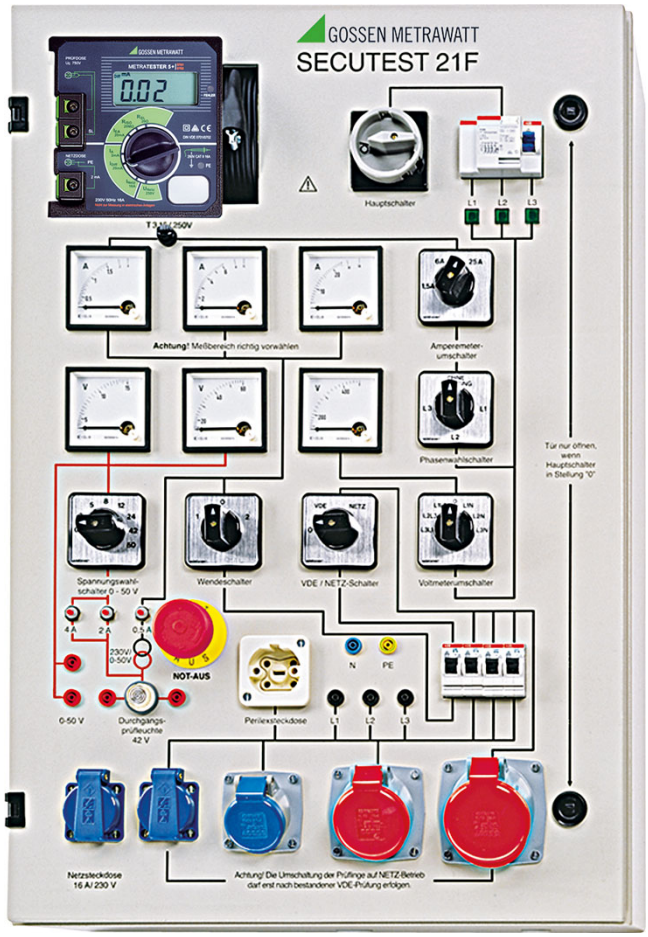
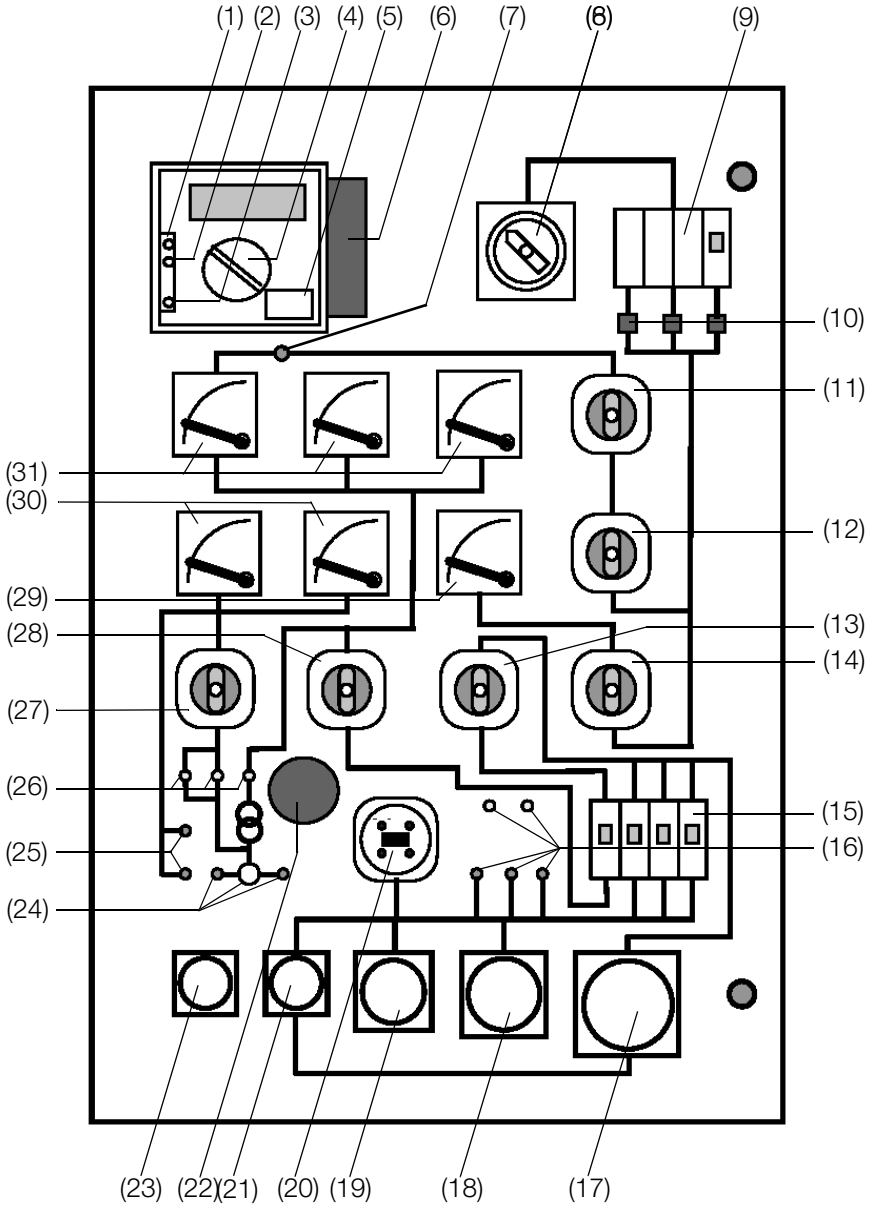
GOSSEN METRAWATT

# SECUTEST 21F

## Workshop Test Panel for Testing in Accordance with DIN VDE 0701-0702

3-349-069-03
9/9.20






(1) Connector socket/terminal for DUT phase conductor (parallel to test sockets)

(2) Connector socket/terminal for DUT protective conductor (parallel to test sockets)

(3) Connector socket/terminal for conductive parts of the DUT for testing for absence of voltage in accordance with DIN VDE 0701-0702

(4) Measuring range selector switch

(5) Contact surface for finger contact

(6) Probe cable with clip

(7) Type T3.15/250G or T3.15L250 fuse

(8) Mains switch

(9) Residual current circuit breaker (RCCB)

(10) "L1–L2–L3" signal lamps

(11) Ammeter changeover switch

(12) Phase selector switch

(13) VDE / NETZ switch

(14) Voltmeter changeover switch

(15) Circuit breakers

(16) Test jacks L1–L2–L3–N–PE (parallel to the test socket)

(17) 32 A, 5-pole CEE outlet

(18) 16 A, 5-pole CEE outlet

(19) 16 A, 3-pole CEE outlet

(20) Perilex outlet

(21) Earthing contact outlet, 16 A / 230 V

(22) Emergency stop switch

(23) Mains outlet, 16 A / 230 V

(24) Connector jacks and signal lamp for continuity test

(25) Connector jacks for safety extra-low voltage, 0 to 50 V

(26) Overcurrent trip

(27) Voltage selector switch, 0 to 50 V

(28) Reversing switch

(29) Line voltage indicator

(30) Low-voltage indicators

(31) Current indicator

### Meaning of Symbols on the Instrument

Continuous, doubled or reinforced insulation

Warning concerning a source of danger (attention: observe documentation!)

CE marking

This device may not be disposed of with the trash. Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term "WEEE".

# Table of Contents



## 1 Application

The permanently mounted SECUTEST 21F test panel is intended for use by electricians as workshop equipment. It's used to measure and test electrical devices after repair or modification, as well as for periodic testing in accordance with DIN VDE 0701-0702.

According to these regulations, protective conductor resistance, insulation resistance and equivalent leakage current must be measured, and testing must be conducted for the absence of voltage at user accessible conductive parts at data processing equipment and office machines.

The measurement of operating voltage and current consumption at devices under test, as well as testing for conductor continuity, represent further applications for the substantiation of correct functioning of electrical equipment. Beyond this, the protective conductor at the mains connection can be tested for the absence of voltage and line voltage can be measured.

## 2 Safety Precautions

The test panel is equipped with a test instrument, and has been manufactured and tested in accordance with the following regulations:

| | |
|---|---|
| **IEC/EN 61010-1/ VDE 0411-1** | Safety requirements for electrical equipment for measurement, control and laboratory use; general requirements |
| **DIN VDE 0404** | Testing and measuring equipment for testing the electrical safety of electrical devices, part 1; General requirements, and part 2: Devices for periodic testing |

When used for its intended purpose, the safety of the user, the test instrument and the device under test (electrical equipment) is assured.

**Read the operating instructions carefully and completely before placing your test instrument into service. Follow all instructions contained therein. Make sure that the operating instructions are available to all users of the instrument.**

Tests may only be performed under the supervision of a qualified electrician. The user must be instructed by a qualified electrician concerning performance and evaluation of the test.

**Observe the following safety precautions:**

- The test panel may only be connected to a 220/380 V or 230/400 V mains system with 50 Hz and three 32 A fuses.
- Measurements within electrical systems are prohibited.
- The outlet at the bottom left-hand corner of the test panel with the designation "Netzsteckdose 16 A/230 V" (mains outlet) (23) is always live with line voltage, regardless of any selected switch positions, as soon as the test panel is connected to the mains.
  The "Netzsteckdose" corresponds to the "Functional mains outlet" at the METRATESTER.
  All other outlets on the test panel (17 through 21) are live with line voltage when the VDE / NETZ switch (13) is in the "NETZ" position. These outlets (17 through 21) correspond to the test socket at the METRATESTER.
- Be prepared for the occurrence of unexpected voltages at devices under test. For example, capacitors may be dangerously charged.
- Before connecting the device under test to the test panel, subject it to a thorough visual inspection first. Devices under test with visibly damaged insulation must be repaired before metrological testing is performed.
- If the test panel demonstrates visible damage, no longer functions, has been stored for a lengthy period of time under unfavorable conditions or has been subject to excessive stress during transport, it must be assumed that hazard-free operation is no longer possible. If this is the case, remove the test panel from service and secure it against inadvertent use.

**Attention!**
The VDE / NETZ switch (13) may only be set to the “NETZ” (mains) position after the device under test has passed safety testing in accordance with DIN VDE 0701-0702.

– In order to assure compliance with technical safety requirements, the test panel may only be repaired by a qualified electrician, who is preferably employed by the manufacturer.
– Disconnect the test panel from the mains whenever work is interrupted, or for the purpose of repair, and secure it against unauthorized use.

# 3 Installation

The SECUTEST 21F test panel is mounted to the wall with the included mounting components, and is connected to the mains with a permanently laid cable with three 32 A fuses. One of the two threaded blanking caps (on the top and the bottom of the test panel) is replaced with the included cable conduit fitting in order to feed the connector cable to the inside of the test panel. The cable must be laid to the connector terminals inside the test panel with the designations L1, L2, L3, N and PE without crossing over any other wiring, and must be secured with the included cable binders.

An external emergency stop button can be connected to terminals X19 and X20, in which case the jumper between these two terminals must be removed.

After installation, the test panel is locked with the included key.

# 4 Initial Start-Up

➪ After installation, switch mains supply power on.

➪ Set the mains switch (8) to the “I” position (on).
When line voltage is applied to the three phase conductors, L1, L2 and L3, the three signal lamps (10) light up green, indicating that the test panel is ready for use.
The test panel is protected with a 3-pole automatic circuit breaker (3 x 25 A, can only be set internally) and a downstream residual current circuit breaker (RCCB) with 4 x 25 / 0.03 A (9).

**Attention!**
The mains switch (8) must be turned to the “0” setting before opening the test panel. The mains switch may be damaged if this is disregarded, or if force is used.

## 4.1 Testing Protective Conductor Potential

➪ Set the switches on the test panel as follows:
– Turn the VDE / NETZ switch to the “NETZ” (mains) setting
– Turn the range selector switch at the METRATESTER 5-F-E (4)
to the “250 V $U_{Netz}$” setting
– Turn the reversing switch (28) to the “1” or the “2” setting.

➪ Touch the contact surface (12) with your finger, and touch a grounded object at the same time (e.g. a water pipe).

The PE signal lamp at the METRATESTER 5-F-E may not light up! If this is the case, potential between the protective conductor at the mains connection and the contact surface (5) is ≤ 100 V.

**Note**
The PE signal lamp also remains unlit as long as no line voltage is detected between L1, L2 or L3 and N at the mains plug, or if a phase conductor L and PE have been reversed during mains connection.
If, after starting up the test panel in accordance with section 4, the L1 or L2 and L3 signal lamps do not light up and if no numbers are displayed at LCD on the METRATESTER 5-F-E the mains installation should first be tested, for example with the **PROFITEST** MASTER test instrument.

If the PE signal lamp lights up when you touch the contact surface (5), potential between the mains protective conductor and the contact surface (5) is ≥ 25 V, i.e. the protective conductor is conducting voltage or is not connected.

**Note**
Depending upon handling, potential transfer may occur which causes the PE signal lamp to light up. For example, this could be the case if you hold a device under test in your hand which is connected to the jacks (16) or an outlet (17 through 21), thus creating a capacitive voltage divider.

**Attention!**
If, while testing protective conductor potential, you determine that the mains protective conductor is conducting voltage, no measurements may be performed with the test panel. If this is the case, potentially dangerous voltage is also present at the accessible earthing contacts of the outlets (17 through 21) and the PE jack (16). Immediately disconnect the test panel from the mains and arrange to have the faulty mains connection corrected.
Voltage in the mains protective conductor also results in incorrect measured values when testing for the absence of voltage (see section 6.4.1 on page 10).

## 4.2 Measuring Line Voltage

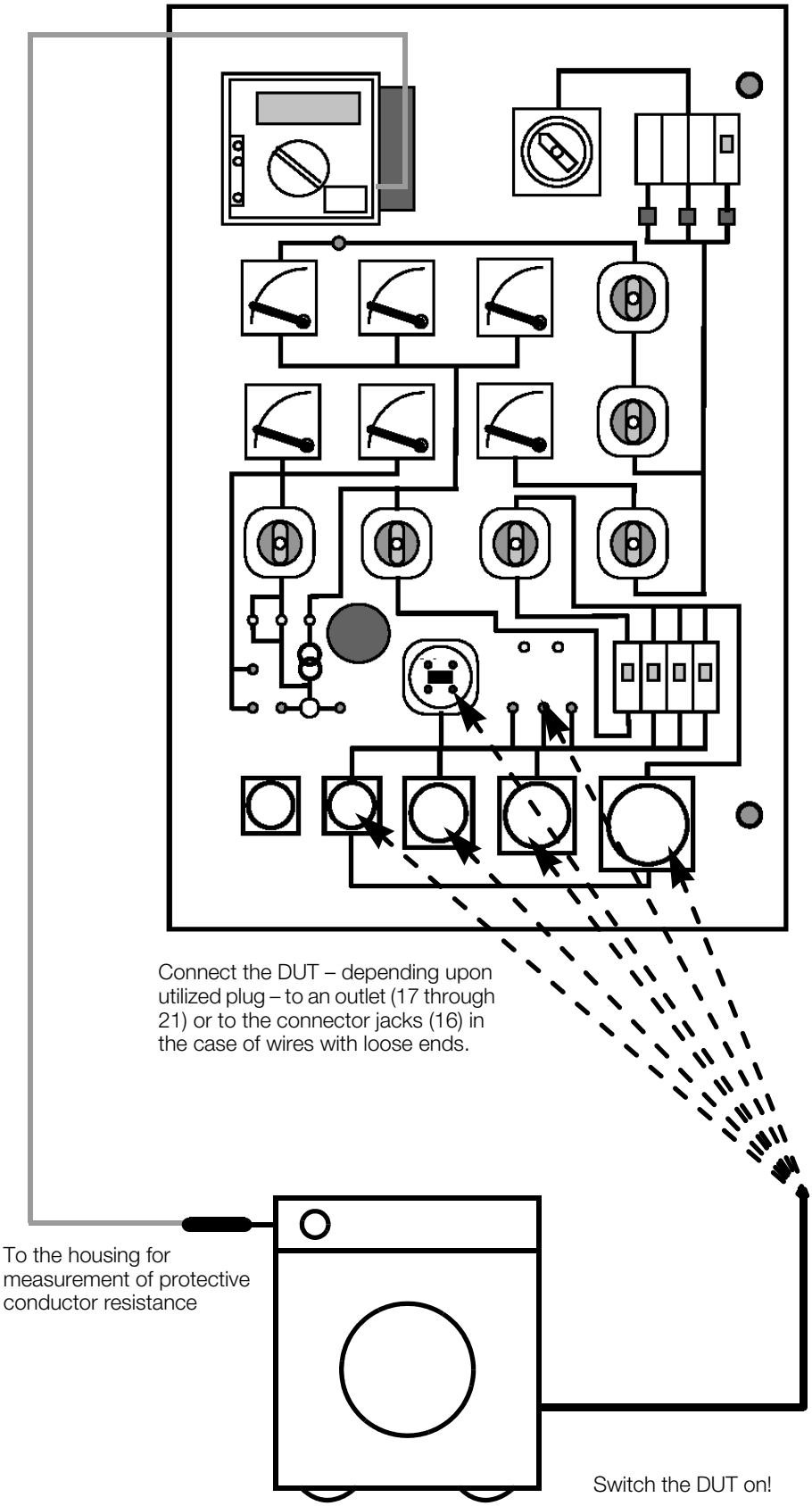
Depending on the setting at the voltmeter changeover switch (14), voltage between two phase conductors (L1, L2, L3) or voltage between one phase conductor and the neutral conductor (N) is displayed at the line voltage indicator (29).

With the measuring range selector switch (4) set to “250 V $U_{Netz}$”, line voltage between the phase selected with the reversing switch (28) and the neutral conductor is displayed at the LCD panel at the METRATESTER 5-F-E. For testing in accordance with DIN VDE 0701-0702, line voltage must always lie within the permissible range of 207 to 253 V.

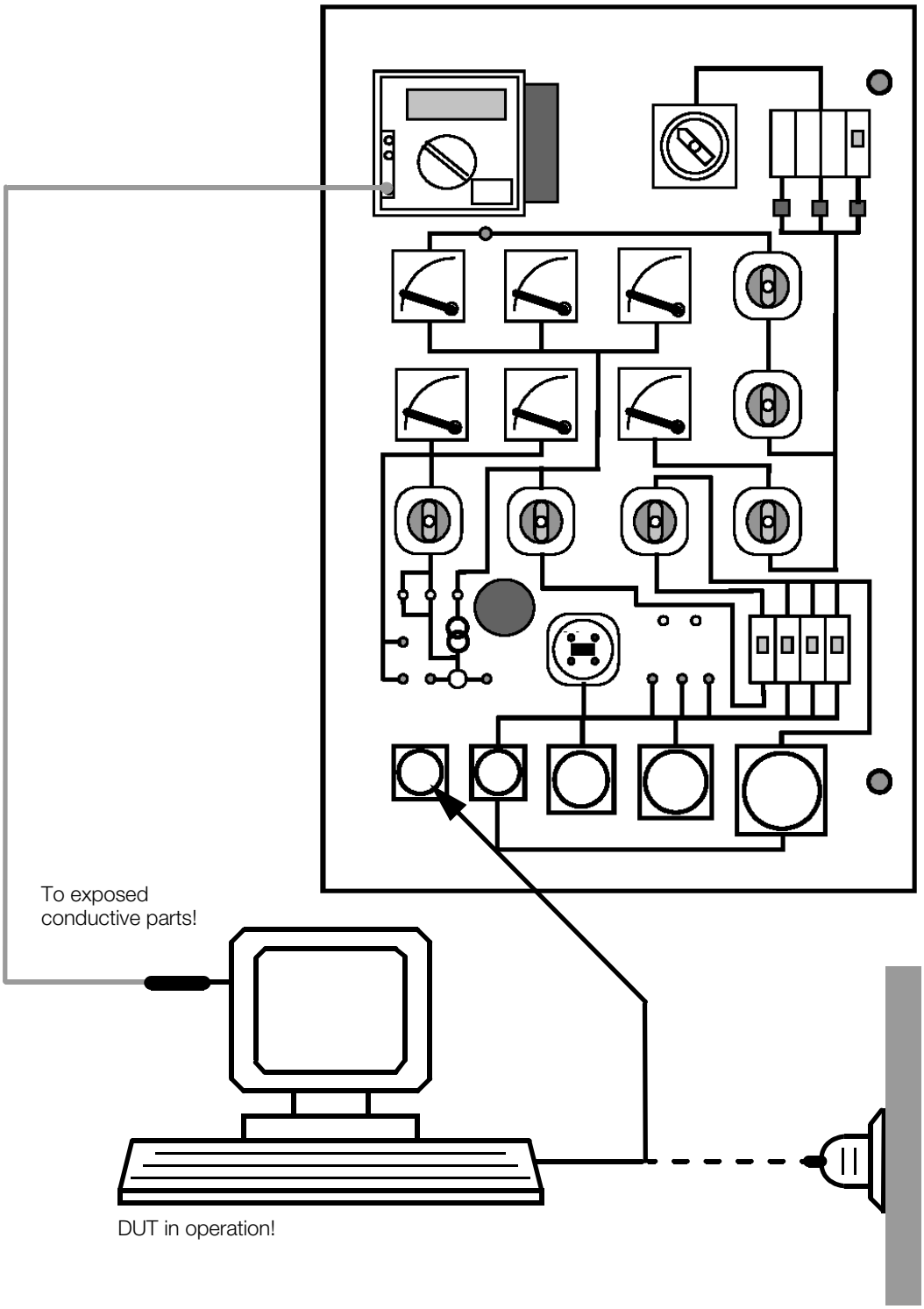
**Note**
If line voltage is present, values are displayed at the LCD panel with the measuring range selector switch (4) in each of its respective positions, even if no device under test has been connected. In addition to the L1, L2 and L3 signal lamps (10), the display of such numbers indicates that line voltage is present, regardless of the position to which the measuring range selector switch (4) has been set. If the measuring range selector switch has been set to “250 V $U_{Netz}$”, these numbers represent the actual line voltage value. In all other detented switch positions – if no device under test has been connected – these numbers do not represent actual measured values.

# 5 Connecting the DUT to the Test Panel

## 5.1 Protection Class I Devices

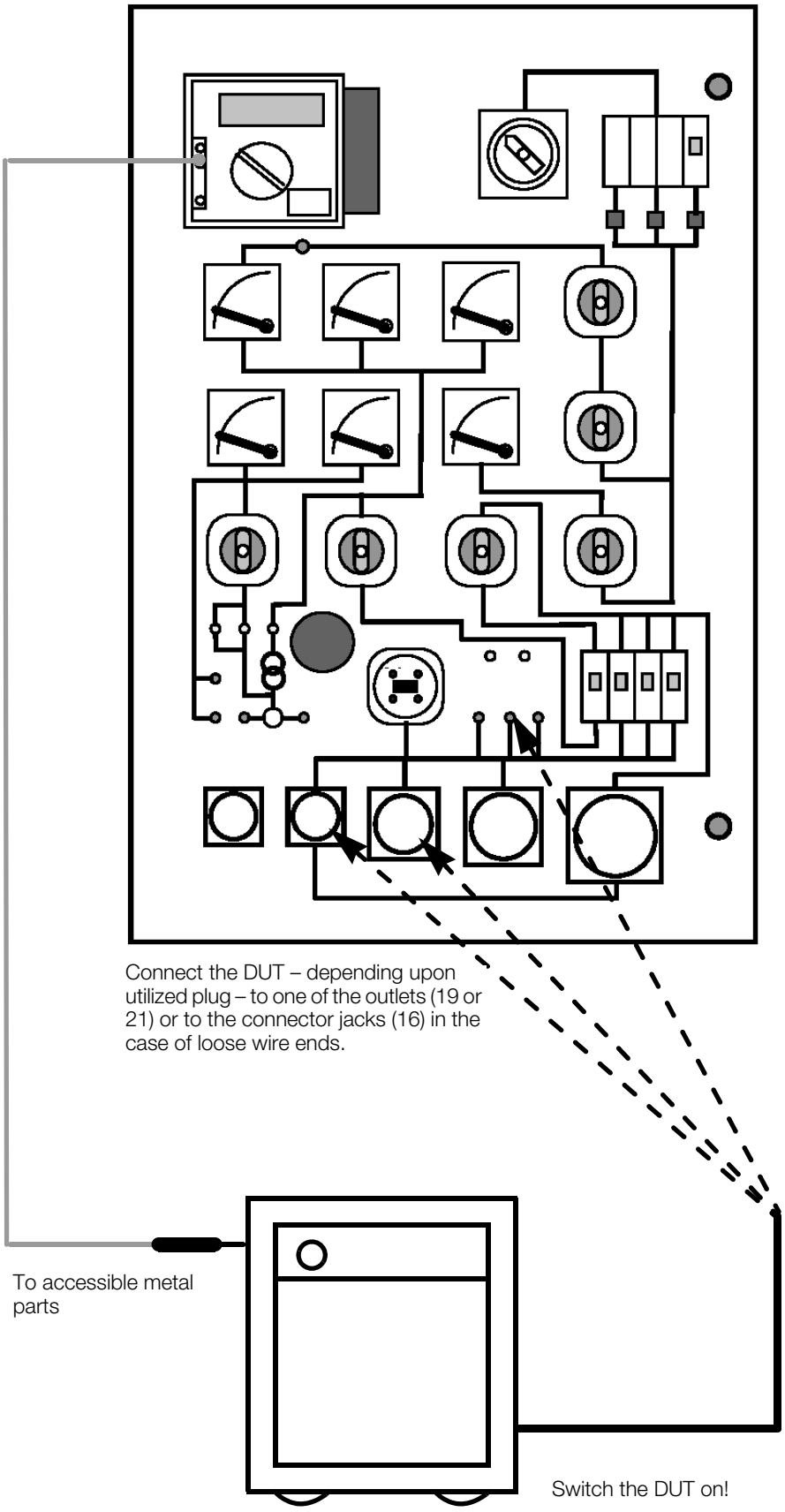


**Exception for Permanently Installed Protection Class I Devices (e.g. data processing systems)**

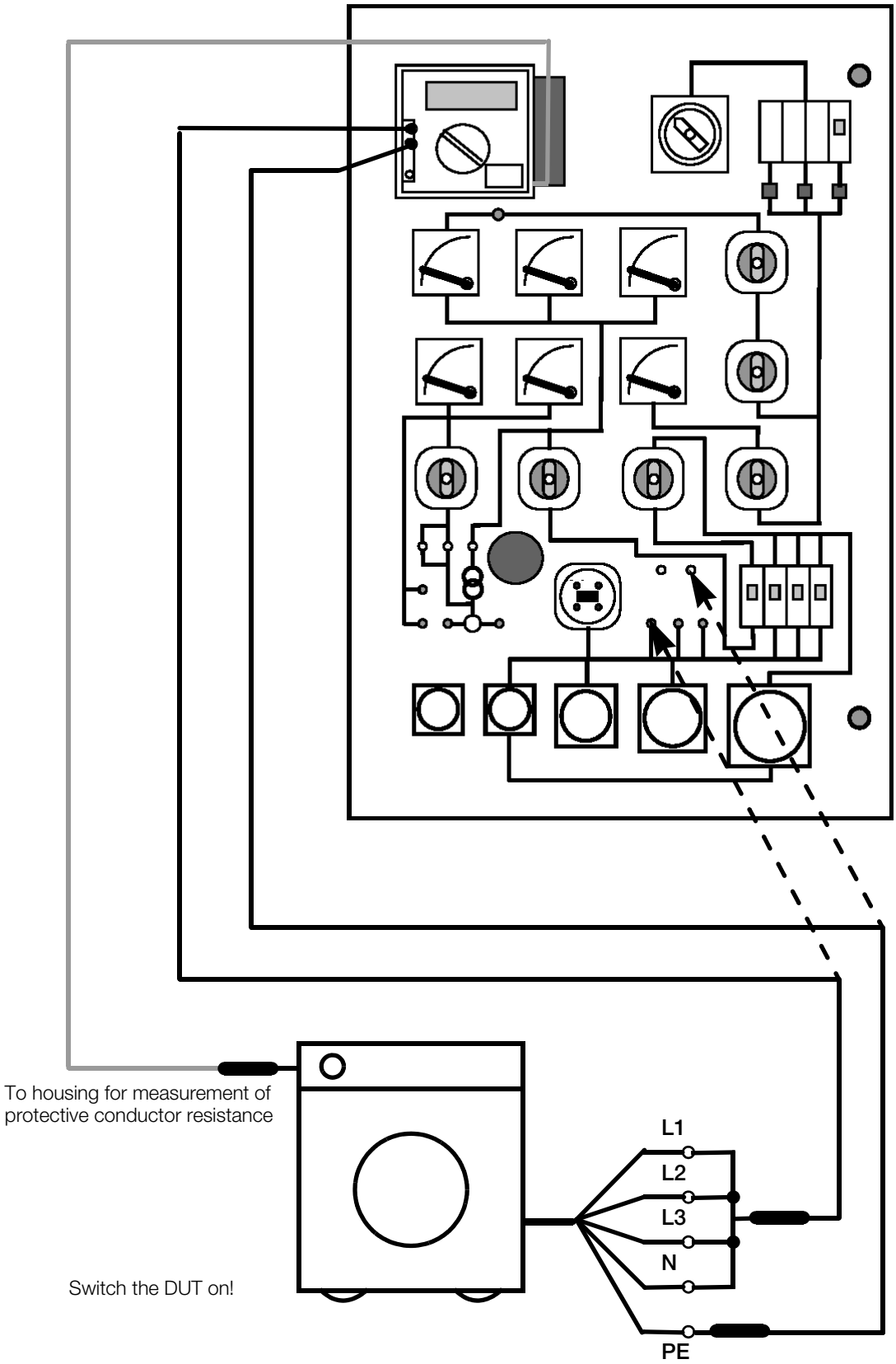



**Attention!**
Testing for the absence of voltage with the mains plug poled in both directions necessitates an interruption of supply power to the affected data processing equipment or office machine. The mains plug may only be disconnected with the consent of the operator!
If the DUT is defective, the electrical system's RCCB may be tripped during testing which would also result in interruption of supply power to the affected equipment or office machine.
**The manufacturer of the test panel assumes no liability for loss of data or other damage which results from its use.**

**Note**
Make sure that the parts to be contacted are not grounded.


Connect the DUT – depending upon utilized plug – to one of the outlets (19 or 21) or to the connector jacks (16) in the case of loose wire ends.
To accessible metal parts
Switch the DUT on!

## 5.3 Devices with Single or Multi-Phase Connection Without Plug




## 5.4 Setting the Switches at the Test Panel

Mains switch (8) and RCCB (9): ..... "On" position

VDE / NETZ switch (13): ..... "VDE" position

Measuring range switch at the METRATESTER 5-F-E (4):.. "$I_{EA}$ 20 mA" position

Reversing switch (28):..... "1" or "2" position

## 5.5 Setting the Switches at the Device Under Test

- Connect the device under test to the test panel.
- Switch all DUT functions on and make sure, for example, that thermostat contacts and the like are closed.

# 6 Testing Devices in Accordance with DIN VDE 0701-0702

Always measure protective conductor resistance first for protective class I devices under test. Measurement of insulation resistance and equivalent leakage current is not possible without a properly functioning protective conductor.

**Note**
Please note that the display indicates overloading when measuring protective conductor resistance and insulation resistance, if the terminals are open or if the upper range limit is exceeded. Only the left-hand digit (1) appears at the display in this case.

## 6.1 Measuring Protective Conductor Resistance

- Connect the probe cable with clip (6) to the housing of the DUT. Assure good contact.
- Set the measuring range selector switch to the "$R_{SL}$ 20 Ω" range.
- Read the measured value, indicated in "Ω", from the LCD. A measured value of 0.3 Ω may not be exceeded for devices under test with cable lengths of up to 5 meters. In the case of mains connector cables with lengths of greater than 5 meters a value of 0.1 Ω applies, to which the cable's inherent resistance is added.

**Attention!**
The connector cable must be shaken back and forth, section by section over its entire length, during measurement (for permanently installed devices only in so far as the connector cable is accessible during repair, modification or testing). If a change in resistance occurs during the manual test step of the continuity test, it must be assumed that the protective conductor is damaged, or that one of the connector contacts is no longer in flawless condition.

**Note**
Measurement of protective conductor resistance is of course impossible for devices which are not equipped with a protective conductor (e.g. devices for 3-phase connection without protective conductor or protection class II and III devices).

## 6.2 Insulation Resistance Measurement

L1, L2 and L3 are measured against PE during insulation testing.

- Set the measuring range selector switch to the "$R_{ISO}$ 20 MΩ" range.
- Read the measured value in "MΩ" from the LCD panel.

Insulation Resistance Limit Values which May Not be Fallen Short Of

| Device Type | Limit Value | Minimum Display Value |
|---|---|---|
| Protection class I devices | 1 MΩ | 1.15 MΩ |
| Protection class I devices with heating elements | 0.3 MΩ | 0.38 MΩ |
| Protection class II devices | 2.0 MΩ | 2.25 MΩ |
| Protection class III and battery powered devices | 1000 Ω/V and 250 kΩ | |

**Note**: "OL" at the display means the measured value is > 20 MΩ.

**Attention!**
If the measured value is less than 0.3 MΩ for protection class I devices which include a heating element, equivalent leakage current must be measured as described in section 6.3.1, and this test must be passed. All exposed, conductive parts must be contacted with the test probe connected to the socket (2) and insulation resistance must be measured for protection class II and III devices, as well as for battery powered devices. Measurement of insulation resistance is omitted for protection class III devices, and battery powered devices which fulfill the following conditions:
– Nominal power: ≤ 20 VA
– Nominal voltage: ≤ 42 V
Batteries must be disconnected during testing of battery powered devices.

**Attention!**
In the event of long-term short-circuiting in the 20 MΩ range, measuring current is reduced after approximately 10 minutes. This overtemperature status is indicated at the LCD panel by means of blinking "$R_{ISO}$" and "MΩ" segments. In this case, a nominal current of 1 mA as specified by DIN VDE 0413 and DIN VDE 0701-0702 is no longer assured. After the short-circuit has been eliminated and a brief cool-down period has elapsed, indication stops and measurements once again comply with VDE conditions.

### Evaluation of Measured Values

Test panel measuring error must be taken into consideration in order to make absolutely sure that the limit values for insulation resistance have not been fallen short of. The following table allows for calculation of the required minimum value for insulation resistance which must be displayed at the test panel in consideration of maximum measuring error (under nominal conditions of use) in order to assure that the required limit values are not fallen short of (DIN VDE 0413, part 1). Intermediate values can be interpolated.

| Limit Value, MΩ | Minimum Display Value at METRATESTER 5-F-E |
|---|---|
| 0.5 | 0.33 |
| 0.3 | 0.38 |
| 0.5 | 0.60 |
| 1.0 | 1.15 |
| 2.0 | 2.25 |
| 7.0 | 7.75 |
| 10.0 | 11.05 |

## 6.3 Measuring Protective Conductor Resistance

### 6.3.1 Equivalent Leakage Current

Equivalent leakage current measurements must be performed for protection class I devices:

– For which radio interference suppression capacitors have been installed or replaced during the course of repair or modification

or

– For which an insulation resistance of less than 0.3 MΩ has been measured (see section 6.2).

**Note**
Leakage current measurement in accordance with the respective device regulations is usually not possible, because the device would have to be set up in an electrically isolated fashion, or connected to an earth isolated power supply to this end. Equivalent leakage current is measured for this reason. Resultant measured values are not directly comparable with the leakage current values set forth in the device regulations.

- Set the measuring range selector switch to the "$I_{EA}$ 20 mA" range.
- Read the measured value in "mA" from the LCD panel.

In accordance with DIN VDE 0701-0702, the displayed current value between parts to which voltage is applied during operation and exposed metal parts may not exceed 3.5 mA, or 1 mA per kW for devices with ≥ 3.5 kW heating power.

### 6.3.2 Differential Current Measurement for Protective Class I Devices

**Note**
If any doubts exist about measuring insulation resistance, for example in the case of electronic devices, or if it cannot be assured that all components of protection class I devices to which voltage is applied will be tested by means of insulation measurement, differential current measurement or contact current measurement can be performed instead.
The device under test must be plugged into the mains outlet (23) for the measurements described in section 6.3.2 and section 6.4.1.

Single-phase differential current (fault current) is measured between phase L1, or L1, L2 or L3, and neutral conductor N of the device under test in this case. This measurement may not be performed until after the protective conductor test has been passed (see section 6.1 on page 9).

- Turn off the device under test.
- Set the VDE / NETZ switch (13) to "NETZ" (mains).
- Signal lamps L1, L2 and L3 indicate the presence of line voltage.
- Place the device under test into service by switching it on.
- Set the measuring range selector switch at the METRATESTER 5-F-E test instrument to the "$I_{Diff}$ 20 mA" position and read the differential current value in mA from the display at the test instrument.
  **This value may not exceed 3.5 mA**.

Measurements must be performed with the mains plug in both positions (if the plug is reversible). The larger of the two measured values is deemed valid.

**Note**
If no device under test has been connected, numbers appear at the digital display which do not represent any actual measured value.

## 6.4 Measuring Contact Current

### 6.4.1 Contact Current Measurement – Differential Current

Contact current is measured by means of residual current measurement for protection class II devices and protection class I devices with accessible conductive parts which are not connected to the protective conductor.

- Turn off the device under test.
- Set the VDE / NETZ switch (13) to "NETZ" (mains).
- Signal lamps L1, L2 and L3 indicate the presence of line voltage.
- Place the device under test into service by switching it on.
- Connect a lead with a test probe to the "2 mA" jack at the METRATESTER 5-F-E and contact all accessible conductive parts at the device under test with the test probe. In the case of protection class I devices under test, contact all conductive parts which are not connected to the protective conductor.
- Set the measuring range selector switch at the METRATESTER 5-F-E test instrument to the "$I_{Diff}$ 20 mA" position and read the contact current value in mA from the display at the test instrument.
  **This value may not exceed 0.5 mA.**

Measurements must be performed with the mains plug in both positions (if the plug is reversible). The larger of the two measured values is deemed valid.

**Note**
If no device under test has been connected, numbers appear at the digital display which do not represent any actual measured value.

### 6.4.2 Testing in Accordance with the Direct Method

A direct measuring method is utilized for measuring contact current at devices of this type. Parts to be contacted must not be inadvertently grounded. The test panel and the device under test must be connected to the same protective conductor potential for this test.

- Connect a lead with a test probe to the "2 mA" jack at the METRATESTER 5-F-E and contact all accessible conductive parts at the device under test with the test probe. In the case of protection class I devices under test, contact all conductive parts which are not connected to the protective conductor.
- Set the measuring range selector switch at the METRATESTER 5-F-E test instrument to the "$I_A$ 2 m" position and read the contact current value in mA from the display at the test instrument.
  **This value may not exceed 0.5 mA.**

# 7 Measuring Load Current and Voltage at the Consumer

**Attention!**
Power consumers may only be connected to the mains after passing safety testing in accordance with DIN VDE 0701-0702.

## 7.1 Consumer Current via Outlets (17 through 21)

Consumer current measured at the outlets (17 through 21) can be displayed at the integrated indicators (31).

- ➪ Set the phase selector switch (12):
  – To “L3” for measurements at outlet 20 or 21
  – To the phase whose current will be measured for measurements at outlets 17 through 20.
- ➪ Set the ammeter changeover switch (11) to the measuring range (1.5 A, 6 A or 25 A) which results in best possible indication at the indicators (31).

The indicator for the 1.5 A range is additionally protected with a T3.15/250G or T3.15L250 fuse.

## 7.2 Load Current via the Mains Outlet (23)

- ➪ Set the VDE / NETZ switch (13) to the “NETZ” (mains) position and the reversing switch (28) to the “1” or “2” position.
- ➪ Set the measuring range selector switch (4) at the METRATESTER 5-F-E to “16 A $I_{NETZ}$”.
- ➪ Connect the power consumer to the mains outlet (23).
- ➪ The measurement results appear at the LCD panel.

## 7.3 Voltage at the Consumer

See section 4.2, “Measuring Line Voltage”, on page 4.

# 8 Measuring and Testing with Safety Extra-Low Voltage

- ➪ Safety low voltages with values of 3, 5, 8, 12, 24, 42, and 50 V AC can be selected with the voltage selector switch (27), which are available at the connector jacks (25) with a maximum current value of 4 A. The selected voltage is indicated at one of the two indicators (30).
  The transformer is protected against overloading by the overcurrent trip (26).
- ➪ Objects can be tested for continuity up to a resistance value of approximately 500 Ω with the help of the indicator lamp for continuity testing (24). Connect the DUT to the two connector sockets (24) to this end. Testing is performed with a safety extra-low voltage of 42 V AC.

# 9 Display and Indicators at the METRATESTER 5-F-E Test Instruments

### PE Indicator Lamp

Indicates whether or not voltage is present.

### Error Lamp

The red error lamp indicates exceeded limit values when measuring protective conductor current, insulation resistance, equivalent leakage current, contact current, leakage current and differential current.

### Piezo Buzzer

In the event that the error lamp lights up in order to indicate that the respective critical limit value has been exceeded, the buzzer also generates an acoustic signal.

## 9.1 Indication of Errors and Limit Values

| Error Message | Condition | PE Indicator Lamp |
|---|---|---|
| Mains protective conductor potential | $U_B \geq 25$ V | When the contact surface is touched |

**The following limit values are indicated:**

| Measurement | Fault Condition per Standard | Indication of Exceeded Limit Value at the Tester | | |
|---|---|---|---|---|
| | | Continuously Lit Red Error Lamp | Limit Value Display | Continuous Beeping |
| Protective conductor resistance | $R_{SL} > 0.3\ \Omega$ [1] | • | $> 0.3\ \Omega$ | — |
| | $R_{SL} > 1\ \Omega$ [2] | • | $> 1\ \Omega$ | • |
| Insulation resistance | Heater [3]: $R_{ISO} < 0.3$ MΩ | • | $< 0.5$ MΩ | • |
| | PC I: $R_{ISO} < 1.0$ MΩ | • | $< 2.0$ MΩ | — |
| | PC II: $R_{ISO} < 2.0$ MΩ | — | $< 2.0$ MΩ | — |
| Equivalent leakage current | $I_{EA} > 3.5$ mA | • | — | — |
| | | • | $> 7.0$ mA [4] | • |
| Leakage/contact current (verification of absence of voltage) | Part 240: $I_A > 0.25$ mA | • | $> 0.25$ mA | — |
| | $I_A > 0.5$ mA | • | $> 0.5$ mA | • |
| Differential current | $I_{Diff} \geq 3.5$ mA | • | — | • |

[1] Resistance between housing and mains plug for connector cables up to 5 meters long
[2] 0.1 Ω is added for each additional 7.5 meters of length, up to a maximum of 1 Ω.
[3] For protection class I devices with activated heating elements (if heating power is > 3 kW and $R_{ISO}$ is < 0.3 MΩ: leakage current measurement is required)
[4] This limit value refers to all-pole switches (corresponds to doubling the limit value or cutting actual measuring current in half).

### Exceeded Limit Values with Differential Current

The METRATESTER 5-F-E is equipped with **switch-independent differential current monitoring**. If the red lamp lights up, regardless of the switch setting, and no indication of a limit value violation appears at the display, differential current at the mains outlet is dangerously high. If this is the case, the exact differential current value should be measured by turning the switch to the “$I_{DIFF}$” position.
The numeric display should be used in **evaluating differential current** with the switch in the “$I_{DIFF}$” position. The error lamp can be triggered by differential current monitoring at a value of as low as approximately 3.2 mA. The error lamp lights up reliably as of a value of 3.5 mA.

# 10 Characteristic Values

## 10.1 Test Panel

| | |
|---|---|
| Nominal line voltage | 230/400 V AC |
| Protection class | I |
| RCD | 4-pole, $I_N$=25 A, $I_\Delta N$=0.03 A |
| Protection | IP 40 per DIN 40050<br>Connectors: IP 20 |

Table Excerpt Regarding Significance of IP Codes

| IP XY (1st digit X) | Protection Against Foreign Object Entry | IP XY (2nd digit Y) | Protection Against Penetration by Water |
|---|---|---|---|
| 0 | Not protected | 0 | Not protected |
| 1 | ≥ 50.0 mm dia. | 1 | Vertically falling droplets |
| 2 | ≥ 12.5 mm dia. | 2 | Dripping (at angle of 15°) |
| 3 | ≥ 2.5 mm dia. | 3 | Spraying water |
| 4 | ≥ 1.0 mm dia. | 4 | Splashing water |
| 5 | Dust protected | 5 | Jet-water |
| 6 | Dust-proof | 6 | Powerful water jets |

| | |
|---|---|
| Dimensions | 532 x 792 x 179 mm |
| Weight | Approx. 24 kg |

## 10.2 METRATESTER 5-F-E

| Measured Quantity | Measuring Range | Reso-lution | $U_{no\text{-}load}$ | $R_i$ | $I_K$ | $I_N$ |
|---|---|---|---|---|---|---|
| Protective conductor resistance | 0 … 19.99 Ω | 10 mΩ | < 20 V – | — | | > 200 mA |
| Insulation resistance | 0.05…19.99 MΩ | 10 kΩ | 600 V – | Ap-prox. 100 kΩ | < 10 mA | > 1 mA |
| Equivalent leakage current | 0 … 19.99 mA ~ | 10 µA | 28 V ~ | 2 kΩ | < 20 mA | — |
| Verification of absence of voltage by means of current measurement (contact/leak-age current) | 0 … 1.999 mA ~ | 1 µA | | 2 kΩ | | |
| Differential current | 0.01 … 19.99 mA ~ | 10 µA | | | | |

### Measurements During Operation

| Measured Quantity | Measuring Range | Resolution |
|---|---|---|
| Line voltage | 207 ... 253 V ~ | 1 V |
| Load current via mains outlet | 0 ... 16.00 A ~ | 10 mA |

### Overload Capacity

| | |
|---|---|
| **Load current via mains outlet** | 19 A, 5 min. |
| **All other measured quantities** | 250 V continuous |

### Intrinsic Error and Measuring Error

| Measured Quantity | Intrinsic Uncertainty | Measuring Uncertainty |
|---|---|---|
| Protective conductor resistance | ± (2.5% rdg. + 2 d) | ± (10% + 5 d) |
| Insulation resistance 0 ... 19.99 MΩ | ± (2.5% rdg. + 2 d) | ± (10% rdg. + 5 d) |
| Equivalent leakage current | ± (2.5% rdg. + 2 d) | ± (10% rdg. + 5 d) |
| Verification of absence of voltage by means of current measurement (contact current) | ± (2.5% rdg. + 2 d) | ± (10% rdg. + 5 d) |
| Differential current | ± (4% rdg. + 5 d) | ± (10% rdg. + 5 d) |
| Line voltage | ± (2.5% rdg. + 2 d) | ± (10% rdg. + 5 d) |
| Load current via mains outlet | ± (2.5% rdg. + 2 d) | ± (10% rdg. + 5 d) |

### Reference Conditions

| | |
|---|---|
| Ambient temperature | +23° C ±2 K |
| Relative humidity | 40% ... 60% |
| Line voltage | 230 V ±1% |
| Meas. quantity frequency | 50 Hz ±0.2% |
| Meas. quantity waveform | Sine (deviation between effective and rectified value: ±0.5%) |

### Influencing Quantities and Influence Error

| Influencing Quantity / Sphere of Influence | Desig-nation, DIN VDE 0404 | Influence Error ± … % rdg. |
|---|---|---|
| **Change of position** | E1 | — |
| **Change to test equipment supply voltage** | E2 | 2.5 |
| **Temperature fluctuation**<br>0 … 21° C and 25 … 40° C | E3 | Specified influence error valid starting with temperature changes as of 10 K:<br>1 for protective conductor resistance<br>0.5 for all other measuring ranges |
| **Amount of current at DUT** | E4 | 2.5 |
| **Low frequency magnetic fields** | E5 | 2.5 |
| **DUT impedance** | E6 | 2.5 |
| **Capacitance during insulation measurement** | E7 | 2.5 |
| **Waveshape of measured current** | E8 | |
| 49 … 51 Hz | | 2 with capacitive load (for equivalent leakage current) |
| 45 … 100 Hz | | 1 (for contact current) |
| | | 2.5 for all other measuring ranges |

### Display and Indicating Devices

LCD

| | |
|---|---|
| Display range | 0 ... 1999 digits, 3½ places |
| Character height | 17 mm and special characters |
| Overflow | Indicated by displaying “OL” |
| Overtemperature | In case of long-term short-circuit: “$R_{ISO}$” and “MW” segments blink |

PE Indicator Lamp

Indicates whether or not voltage is present.

Error lamp

The red error lamp indicates exceeded limit values when measuring protective conductor current, insulation resistance, equivalent leakage current, contact current, leakage current and differential current.

Piezo Buzzer

In the event that the error lamp lights up in order to indicate that the respective, critical limit value has been exceeded, the buzzer also generates an acoustic signal.

### Power Supply

| | |
|---|---|
| Line voltage | 230 V / 50 Hz |
| Throughput rating | Max. 3700 VA, depending upon load at the mains outlet |

## Electrical Safety

| | |
|---|---|
| Protection class | II |
| Nominal line voltage | 230 V |
| Test voltage | Mains + PE (mains) + 2 mA socket for testing for absence of voltage at test socket, connector sockets for phase and protective conductors, as well as clip: 3 kV~ mains to PE (mains) + 2 mA socket 1.5 kV~ |
| Measuring category | II |
| Pollution degree | 2 |
| Safety shutdown | If test instrument overheats |

## Electromagnetic Compatibility (EMC)

Product standard EN 61326-1: 1997
EN 61326: 1997/A1: 1998

| **Interference Emission** | | Class |
|---|---|---|
| EN 55022 | | A |
| **Interference Immunity** | Test Value | Feature |
| EN 61000-4-2 | Contact / atmospheric – 4 kV / 8 kV | B |
| EN 61000-4-3 | 10 V/m | B |
| EN 61000-4-4 | Mains connection – 2 kV | B |
| EN 61000-4-5 | Mains connection – 1 kV | A |
| EN 61000-4-6 | Mains connection – 3 V | B |
| EN 61000-4-11 | 0.5 period / 100 % | A |

## Ambient Conditions

| | |
|---|---|
| Operation | – 10 ... + 55° C |
| Storage | – 25 ... + 70° C |
| Humidity | Max. 75%, no condensation allowed |
| Elevation | To 2000 m |
| Application | Indoors only |

## Mechanical Design

| | |
|---|---|
| Protection | Housing: IP 40, connections: IP 20 |
| Dimensions | W x H x D: 190 x 140 x 95 mm |
| Weight | 1.3 kg |

# 11 Maintenance

## 11.1 Periodic Self-Test of the Test Panel Connection for Protective Conductor Continuity

➪ Connect the clip (6) to a grounding contact which has been previously tested for absence of voltage (e.g. at an electrical outlet), and which is connected to the protective conductor in the connector cable, and set the VDE / NETZ switch to “NETZ”. Measure protective conductor resistance as described in section 6.1 on page 9.
If an excessively high protective conductor resistance value is displayed at the LCD panel or overloading is indicated (only the left hand digit, “1”, appears), protective conductor resistance is too high or the protective conductor is interrupted. Eliminate the interruption (in the cable or at the VDE / NETZ switch).

## 11.2 Testing the Integrated RCD

➪ The integrated RCD can be tested by pressing the test key. Breaking current value and time can be measured with test instruments for DIN VDE 0413, part 6.

## 11.3 Fuse Replacement

➪ All fuses can be accessed from outside. Only fuses with the breaking characteristics and rated current values specified on the front panel may be used.

## 11.4 Housing Maintenance

Use a dry or slightly dampened cloth to clean the housing. Avoid the use of cleansers, abrasives or solvents. No liquids may be allowed to penetrate into the housing!

### Opening of Equipment* / Repair

The equipment may be opened only by authorized service personnel to ensure the safe and correct operation of the equipment and to keep the warranty valid.

Even original spare parts may be installed only by authorized service personnel.

In case the equipment was opened by unauthorized personnel, no warranty regarding personal safety, measurement accuracy, conformity with applicable safety measures or any consequential damage is granted by the manufacturer.

* applies to workshop test panel and tester METRATESTER 5-F-E

### Return and environmentally sound disposal

The instrument is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German electrical and electronic device law). This device is subject to the WEEE directive. Furthermore, we make reference to the fact that the current status in this regard can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

We identify our electrical and electronic devices in accordance with WEEE 2012/19/EU and ElektroG using the symbol shown at the right per DIN EN 50419.

These devices may not be disposed of with the trash.

Please contact our service department regarding the return of old devices (see address in section 12).

If you use **batteries** or **rechargeable batteries** in your instrument or accessories which no longer function properly, they must be duly disposed of in compliance with the applicable national regulations.
Batteries or rechargeable batteries may contain harmful substances or heavy metal such as lead (PB), cadmium (CD) or mercury (Hg).

They symbol shown to the right indicates that batteries or rechargeable batteries may not be disposed of with the trash, but must be delivered to collection points specially provided for this purpose.


## 11.5 Recalibration

The respective measuring task and the stress to which your measuring instrument is subjected affect the ageing of the components and may result in deviations from the guaranteed accuracy.

If high measuring accuracy is required and the instrument is frequently used in field applications, combined with transport stress and great temperature fluctuations, we recommend a relatively short calibration interval of 1 year. If your measuring instrument is mainly used in the laboratory and indoors without being exposed to any major climatic or mechanical stress, a calibration interval of 2-3 years is usually sufficient.

During recalibration* in an accredited calibration laboratory (DIN EN ISO/IEC 17025) the deviations of your instrument in relation to traceable standards are measured and documented. The deviations determined in the process are used for correction of the readings during subsequent application.

We are pleased to perform DAkkS or factory calibrations for you in our calibration laboratory. Please visit our website at www.gossenmetrawatt.com

By having your measuring instrument calibrated regularly, you fulfill the requirements of a quality management system per DIN EN ISO 9001.

Standards DIN VDE 0701-0702 and IEC 63353 (VDE 0751) stipulate that only measuring instruments which are regularly tested and calibrated may be used for testing.

* Verification of specifications or adjustment services are not part of the calibration. For products from our factory, however, any necessary adjustment is frequently performed and the observance of the relevant specification is confirmed.

## 12 Repair and Replacement Parts Service Calibration Center* and Rental Instrument Service

If required please contact:

GMC-I Service GmbH
**Service Center**
Beuthener Straße 41
90471 Nürnberg · Germany
Phone: +49 911 817718-0
Fax: +49 911 817718-253
E-mail: service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany. Please contact our representatives or subsidiaries for service in other countries.

* **DAkkS** Calibration laboratory for measured electrical quantities, D-K-15080-01-01, accredited in accordance with DIN EN ISO/IEC 17025

Accredited quantities: direct voltage, direct current value, direct current resistance, alternating voltage, alternating current value, AC active power, AC apparent power, DC power, capacitance, frequency, temperature

### Competent Partner

Gossen Metrawatt GmbH is certified in accordance with DIN EN ISO 9001.

Our DAkkS calibration laboratory is accredited by the Deutscher Kalibrierdienst (German Calibration Service) under registration number D-K-15080-01-01 in accordance with DIN EN ISO/ IEC 17025.

We offer a complete range of expertise in the field of metrology: from **test reports** and **proprietary calibration certificates** right on up to **DAkkS calibration certificates**.

Our spectrum of offerings is rounded out with free **test equipment management**.

An on-site **DAkkS calibration station** is an integral part of our service department. If errors are discovered during calibration, our specialized personnel are capable of completing repairs using original replacement parts.

As a full service calibration laboratory, we can calibrate instruments from other manufacturers as well.

## 13 Product Support

If required please contact:

Gossen Metrawatt GmbH
**Product Support Hotline**
Phone, +49 911 8602-0
Fax: +49 911 8602-709
E-mail: support@gossenmetrawatt.com

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