HellermannTyton ACADEMY

Question and Answer Guide

The Testing of Electrical Installations

TOP TRONIC HellermannTyton

SABS ISO 14001 SABS ISO/TS 16949

SAFE HOUSE Suppliers you can trust

Compliance Testers

Compliance Test Kits

Description	**TCTRP** Analogue Kit	**TCTDT** Digital Kit	**TCTCDK** Digital Kit
DMM	TBM811	-	-
Clamp Meter	-	TBM3030	TBM3030
Insulation Tester	T1800	T1851	T1151
Earth Resistance	T1805	T1820	T1120
Loop Tester	T1825	T1825	T1125
ELCB Tester	TEL1TLB	TEL1TLB	TEL1TLB
Phase Rotation	T860	T887	T890
Foam	TCTRPFM	TCTDTFM	TCTCDKFM
Case	TCTCS	TCTCS	TCTCS

Refer to pages 19-24 for Technical Specifications

Compliance Combination Tester

Model T419 | T89

All the above testers featured in a single lightweight compliance combination tester

- Continuity (Low OHM)
- Insulation (50/100/250/500/1000 V)
- Loop impedance
- Earth resistance (resistivity)
- ELCB (sensitivity & time)
- RS232 Interface or USB
- Frequency/Voltage
- Phase Rotation
- 350 Memory Locations

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QUESTION 1: **WHAT IS AN ELECTRICAL INSTALLATION?**

ANSWER: The regulations published under notice R2920 in the Government Gazette 23rd October 1992, as amended in the new EIR 2009, say that an electrical installation is where any machinery is used for the transmission of electricity from a point of control to a point of consumption on any premises. Vehicle, telecommunication, and certain other equipment including that of the supply authority is excluded from the definition.

QUESTION 2: **WHO IS RESPONSIBLE FOR THE SAFETY, SAFE USE AND MAINTENANCE OF AN INSTALLATION?**

ANSWER: These same regulations state clearly that the USER/LESSOR/LESSEE is responsible for the installation. Reg 2(1) (2) (3). EIR 2009.

QUESTION 3: **HOW CAN A LAYMAN KNOW IF THE INSTALLATION IS SAFE?**

ANSWER: By ensuring that the installation is covered by a valid certificate of compliance / test report . The law requires that the USER must possess a valid certificate of compliance for the installation being used.

QUESTION 4: **WHERE CAN A CERTIFICATE OF COMPLIANCE BE OBTAINED?**

ANSWER: A certificate of compliance / test report can be obtained from a REGISTERED PERSON, who has been registered by the Chief Inspector of the Department of Labour in terms of the regulations (as an electrical contractor).

QUESTION 5: **WHAT MUST THE REGISTERED PERSON DO BEFORE ISSUING A CERTIFICATE OF COMPLIANCE TEST REPORT?**

ANSWER: The law requires that a visual inspection covering no less than 15 aspects of the installation must be carried out as well as a series of 16 electrical tests. The details are shown on page 18 at the back of the booklet.

QUESTION 6: **WHAT ELECTRICAL TESTS MUST BE CARRIED OUT?**

ANSWER: The tests required are: (see page 18)

1) Continuity of bonding
2) Resistance of earth continuity conductor
3) Continuity of ring circuits (if applicable)
4) Earth loop impedance test: at main switch
5) Prospective short-circuit current at point of control (PSCC) for sub-distribution boards
6) Elevated voltage between incoming neutral and external earth (ground)
7) Earth resistance at electrode (if required)
8) Insulation resistance
9) Voltage at main distribution board with no load for each phase to neutral
10) Voltage at main distribution board with load (as calculated for full load) for each phase to neutral
11) Voltage at available load (worst condition as calculated for full load) for each phase to neutral
12) Operation of earth leakage units
13) Operation of earth leakage test button
14) Polarity of points of consumption
15) Phase rotation at points of consumption for three-phase systems
16) All switching devices, make-and-break circuits

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QUESTION 7a: **WHAT INSTRUMENT CAN BE USED TO TEST CONTINUITY OF ALL BONDING CONDUCTORS?**

ANSWER: Any insulation tester similar to:

a) Toptronic MacroG3
b) Toptronic T1151
c) T89

QUESTION 7b: **HOW IS THE TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?**

ANSWER:

a) Set the instrument to be used on RESISTANCE. (ohms).
b) Short the instrument test leads together (including any extension leads) and make a note of the reading on the instrument.
c) To test, connect one test lead to the earth bar in the distribution panel and the other test lead to the test point (each geyser, gutter, aerial and other exposed conductive parts of the installation) and make a note of this reading (see fig. A - Pg 3).
d) Subtract previous reading (b) from this reading (c) to get the required reading.
e) This reading shall not exceed 0.2 Ω. (see note on table 8.1 on page 276 of code of practice). SANS 10142
f) All points must be tested.

Table 1 - Maximum Resistance Of Earth Continuity Conductor

1	2	
Rated current of protective device A	Maximum resistance of earth continuity path	Type of Instrument
6.3 10 16	1.7 1.1 0.70	T1132 T1800 T1832 T1151 T89 T53 T418 T419 MacroG3
20 25 32	0.55 0.53 0.41	
40 50 63	0.33 0.26 0.24	
80 100 125	0.19 0.14 0.12	
160 200 250 315	0.096 0.077 0.062 0.049	T4137

NOTE - in the case of metallic roofs, gutters, downpipes and waste pipes (See 6.13.2.4). The resistance of the earth continuity path shall not exceed 0,2Ω

QUESTION 8a: **WHAT INSTRUMENT CAN BE USED TO TEST THE RESISTANCE OF THE EARTH CONTINUITY CONDUCTORS?**

ANSWER: Only use insulation resistance testers:

a) Toptronic T1132
b) Toptronic MacroG3
c) Toptronic T1832
d) Toptronic T1151
e) T89

Fig A - Continuity of all Bonding Conductors

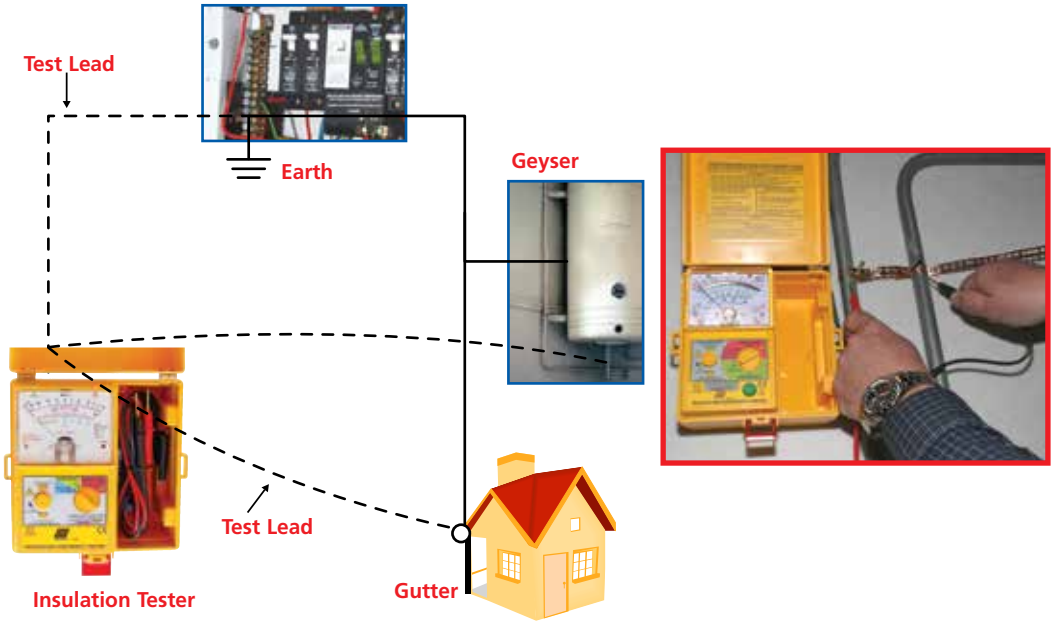
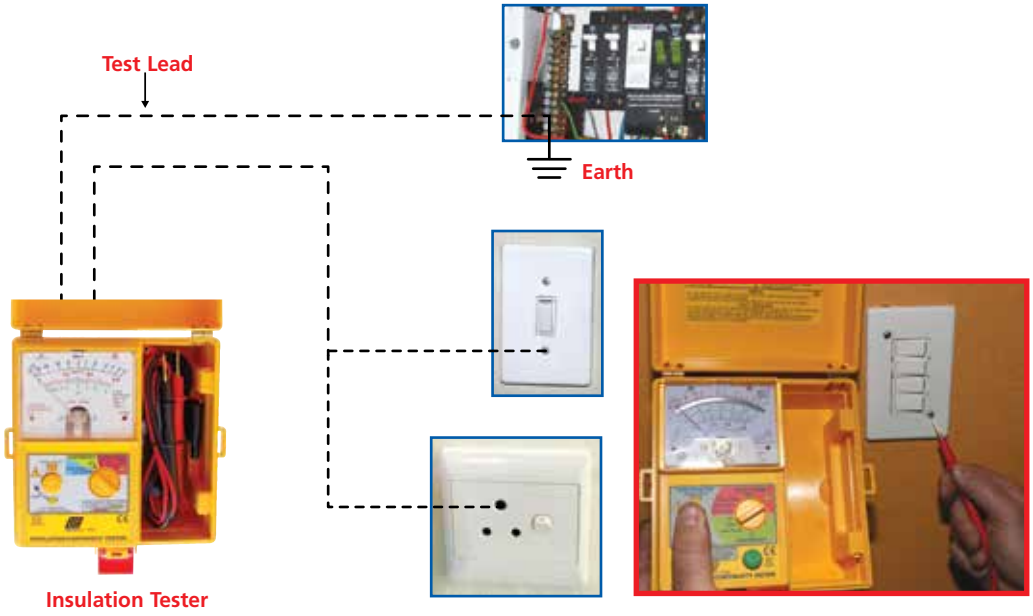


Fig B - Resistance of Earth Continuity Conductors



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QUESTION 8b: **HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?**

ANSWER:

a) Set the instrument to be used on RESISTANCE (ohms).
b) Short the instrument test leads together (including any extension leads) and make a note of the reading on the instrument.
c) To test, connect one test lead to the earth bar in the distribution panel and the other test lead to the test point (each switch, socket outlet or other point of consumption) and make a note of this reading (see Fig. B – Pg 3).
d) Subtract previous reading (b) from this reading (c) to get the required reading.
e) Compare this reading (d) with the maximum value given in table 1 above (table 8.1 on page 276 of code of practice). SANS 10142
f) A reading lower than the listed value is acceptable.
g) All points must be tested.
h) The worst reading can then be recorded for each of the following:
lights, sockets, stove, geyser, etc. or all values measured can be written down as illustrated in addendum A below.

ADDENDUM A

Lights 10A (1.1Ω):	0.9 0.85 1.01 0.75
Sockets 20A (0.55Ω):	0.34 0.50 0.41 0.34
Geyser 40A (0.33Ω):	0.21 0.25

QUESTION 9a: **WHAT INSTRUMENT CAN BE USED TO TEST THE CONTINUITY OF THE RING CIRCUIT?**

ANSWER:

Any meter with continuity (buzzer) function similar to:
a) Toptronic TBM805
b) Toptronic T1151
c) Toptronic TBM811
d) Toptronic MacroG3

QUESTION 9b: **HOW IS THE TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?**

ANSWER:

a) Set the meter to the continuity function (no reading required).
b) Disconnect both ends of the ring from the circuit breaker. (refer Fig. C & D - Pg 5). As this is an example only the phase conductor is shown).
c) Connect the test leads of the meter to the disconnected ends of the ring circuit. (refer Fig. D)
d) If there is continuity the buzzer will sound.
e) Record the following onto the certificate: Correct or N/A.
f) Re-connect both ends of the conductors to the same terminal. Phases together and neutrals together, etc. (refer Fig. D1)

QUESTION 10a: **WHAT INSTRUMENT CAN BE USED TO TEST EARTH FAULT LOOP IMPEDANCE (Main switch)?**

ANSWER:

A digital earth loop tester like:
a) Toptronic T1125 (with electronic load).

TIMT Line Insulation Monitor Tester

FEATURES

- Testing of IT Supply Systems derived from high impedance transformers.
- Test between earth reference and phase with output connections for a multimeter.
- Test Insulation monitoring alarm by adjusting the potentiometer to verify the audio and visual indication.

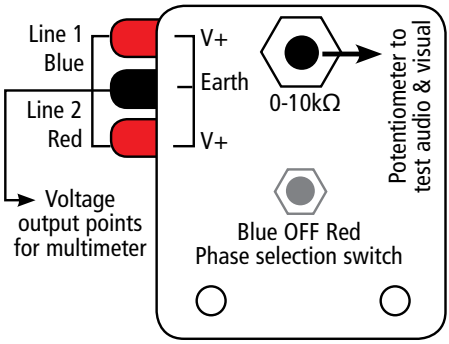
INSTRUCTION MANUAL

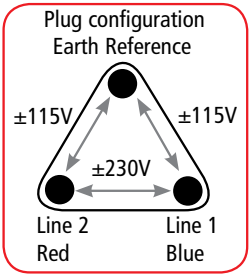
A) Multimeter voltage test:
Socket Outlet Voltage Test 1: Test between "Earth Reference" and Line 1 (Blue) Reading ± 115 Volts.
Socket Outlet Voltage Test 2: Test between "Earth Reference" and Line 2 (Red) Reading ± 115 Volts.

B) Remove "Multimeter" and set switch to blue or red phase, turn the potentiometer clockwise until the line insulation monitor indicates both audio and visual.

C) Verify operation of Line Insulation Monitor testing all socket-outlets.
These values can be captured on a ''COC'' test report.

Note: The Voltage values could fluctuate due to changes in load.





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QUESTION 10b: HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) The test needs to be performed at the distribution board.
b) Connect the leads above the earth leakage circuit breaker to avoid it from tripping (see Fig. E, F, G & H - Pg 7 & 8). Fig E, F, G & H shows typical installations that can be encountered.
c) Make use of the test leads supplied with the tester only as non standard leads may lead to erroneous readings. No extension leads should be used.
c) The earth loop impedance test will be conducted between the phase and earth conductors and the prospective short circuit current (PSC) will be between the phase and neutral conductor.
e) T1825 is autoranging and will automatically select the most suitable range.
f) Pressing the test button will momentarily inject a 16A (typical load current) test current through the circuit and a loop impedance reading will be indicated. Record this reading on the test certificate.
g) It is accepted that a circuit should carry a fault current of twice the rated circuit current.

To calculate the acceptable value of measurement proceed as per the following formula:

$$\text{Remax} = \frac{V}{2 \times I \text{ (Amps) rated}}$$

Where Remax = Maximum earth loop impedance
V = Measured Voltage
I = Rated Circuit Current

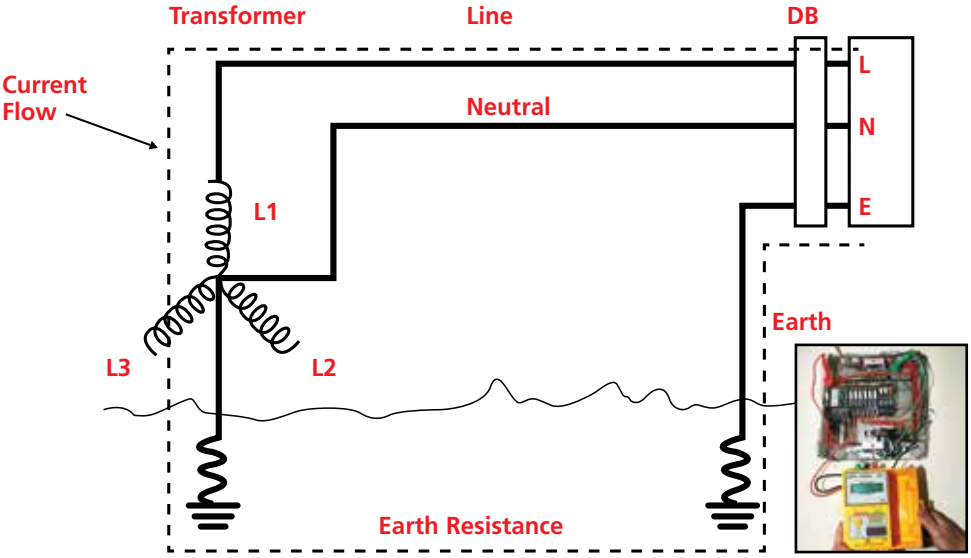
Example: 60 Amp Circuit (I)
230 VAC System (V)

$$\text{Remas} = \frac{V}{2 \times I} = \frac{230}{(2 \times 60)} = 1.92\Omega$$

Therefore the loop resistance of the circuit must be below 1.92Ω to allow a fault current of 120 amps to flow.

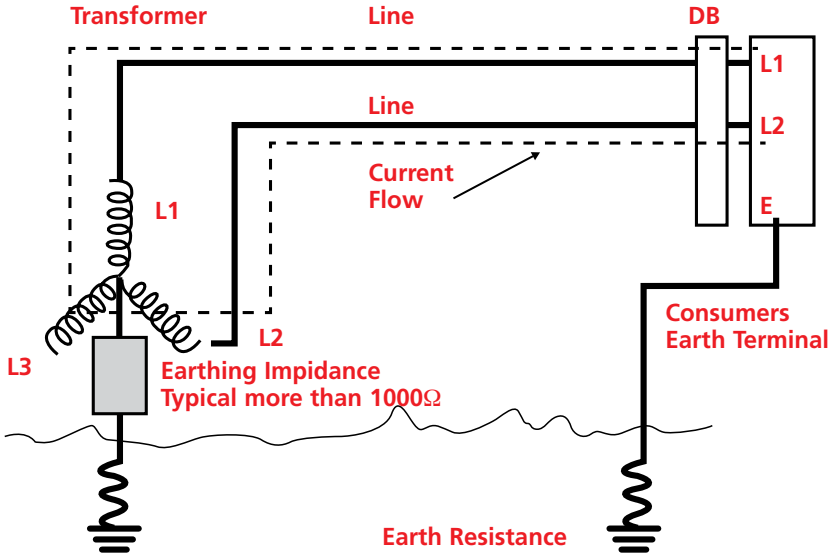
h) Set the tester on the 2000A range on the PSC scale and measure the prospective short circuit current. The result will be indicated in amps.
i) The result should be entered on the front page of the certificate of compliance / test report. An example can be found on page 282 of the SANS 10142-1:2003. (See addendum B – Pg 9).
j) In the case of supply systems rated at not more than 250 V to earth, measure the PSCC at the point of control with a commercially available instrument (fault current meter). Before any instrument is connected, confirm that the instrument is rated for the applicable current rating, in particular where the current rating at the main switch disconnector exceeds 100 A or the PSCC is expected to exceed 10 kA.
Note 1: Do not measure three-phase PSCC if the meter is not specifically designed for that purpose or for the capacity of supply (or both). In a balanced three-phase system, the three-phase value can be estimated by multiplying the single-phase value by 1.73.
Note 2: Ensure that the instrument connections do not add impedance to the circuit measured.
CAUTION: Verify the suitability and accuracy of the PSCC instrument with the manufacturer.
k) To calculate prospective short-circuit current see page 271 of the SANS 10142-1:2003 (See addendum C – Pg 11).
l) It is important to take into account the distance from the transformer and size of supply cable when inspecting and accepting the kA rating of the circuit breaker and installation.

Fig E - TT System Earthing



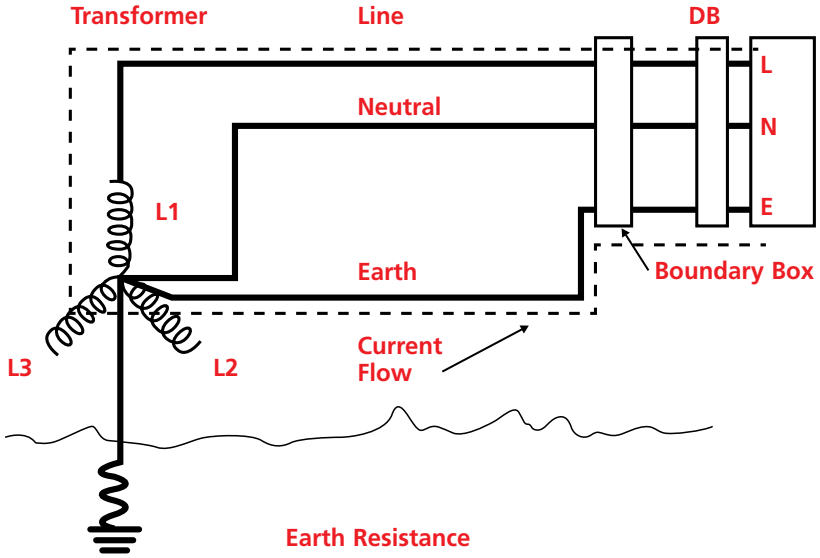
Line earth loop resistance is the sum of wiring resistance, earth resistance and resistance of transformer winding.

Fig F - IT Earthing System



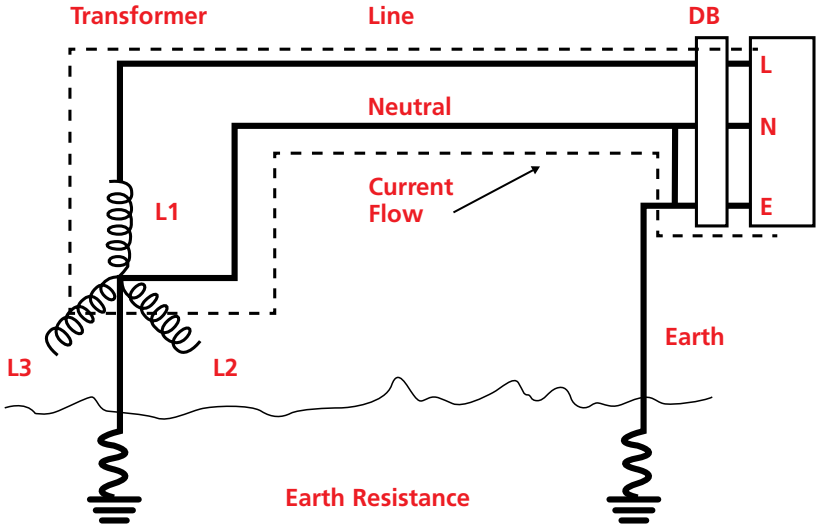
Line earth loop resistance is the sum of wiring resistance, earth resistance and resistance of transformer winding.

Fig G - TN-S Earthing System



Line earth loop resistance is the sum of wiring resistance, earth resistance and resistance of transformer winding.

Fig H - TN-C-S System Earthing



Line earth loop resistance is the sum of wiring resistance, earth resistance and resistance of transformer winding.

ADDENDUM B

THE ELECTRICAL CONTRACTORS' Association (S.A)

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TEST REPORT
for ELECTRICAL INSTALLATIONS
to SANS 10142-1

FOR USE BY ECA MEMBERS ONLY

Certificate of Compliance (CoC) No.:	
Date of Issue:	

Note 1. In terms of South African legislation, the user or lesser is responsible for the safety of the electrical installation.
Note 2. This report covers only that part of the installation described in section 3.
Note 3. This report covers the circuits for fixed appliances, but does not cover the actual appliances, for example stoves, geysers, air conditioning and refrigeration plant and lights.
Note 4. Medical and hazardous locations require additional test reports (See 8.8.2 and 8.8.3).
Note 5. Enter the required information or tick the appropriate block.

SECTION 1 - LOCATION (only required if not provided on Certificate of Compliance)

Physical address: .....

Name of building: .....

SECTION 2 - INSTALLATION

Existing Certificate ☐ No ☐ Yes Date Issued:. ..... Number: .....

☐ Existing installation ☐ Alteration / Extension ☐ New installation ☐ Temporary installation

Type of installation: ☐ Residential ☐ Commercial ☐ Industrial ☐ Common area for multiple users (Sectional title)
☐ Other Describe: .....

Type of electricity supply system: ☐ TN-S ☐ TN-C-S ☐ TN-C ☐ TT ☐ IT

Supply earth terminal provided: ☐ Yes ☐ No

Characteristics of supply:

Voltage: ☐ 230 V ☐ 400 V ☐ 525 V ☐ Other: V

Number of Phases: ☐ One ☐ Two ☐ Three Phase rotation: ☐ Clockwise ☐ Anticlockwise

Frequency: ☐ 50Hz Other: ..... ☐ d.c.

Prospective short-circuit current at point of control (PSCC):
☐ kA How determined? ☐ Calculated ☐ Measured ☐ From supplier

Main switch type: ☐ Switch disconnector (on-load isolator) ☐ Fuse switch ☐ Circuit-breaker ☐ Earth leakage circuit-breaker
☐ Earth leakage switch disconnector

Number of poles: ☐ Current rating: ☐ A Short-circuit / withstand rating: ☐ kA

Rated earth leakage tripping current / △n: ☐ 30mA ☐ Other: ..... ☐ mA

Surge protection (see 6.7.6 and Annex. L): ☐ Yes ☐ No

Is alternative power supply installed (see 7.12)?: ☐ Yes ☐ No

Is any part of the installation a specialised electrical installation?: ☐ Yes ☐ No
If yes, complete additional test reports (see 8.8.2 or 8.8.3)

Is any part of the installation at a voltage above 1 kV?: ☐ Yes ☐ No
If yes, competent person to approve design and complete additional test reports (see 8.6.3 and SANS 10142-2).

Is this installation one of five or more on the same new supply?: ☐ Yes ☐ No
If yes, name of the competent person who supervised the installation (see 8.2.3).

QUESTION 11a: **WHAT INSTRUMENT CAN BE USED TO TEST THE ELEVATED VOLTAGE ON THE NEUTRAL?**

ANSWER:

Any meter with a voltage function similar to:

a) Toptronic TBM811 DMM
b) TBM3030
c) TBM251

QUESTION 11b: **HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?**

ANSWER:

a) Switch off the main switch.
b) Measure the voltage between the supplier neutral and the external earth of the installation (ie. earth spike) and record on certificate of compliance / test report.
c) The reading should not exceed 25V.
d) If the reading exceeds 25V notify the supply authority by completing Annex K (see addendum D – Pg 16).
e) If the reading exceeds 50V disconnect the supply and notify the supply authority as above.

QUESTION 12a: **WHAT INSTRUMENT SHOULD BE USED TO TEST THE EARTH ELECTRODE RESISTANCE?**

ANSWER:

Any 3 terminal earth resistance tester similar to:

a) Toptronic T1105
b) Toptronic T416 (Earth Resistivity)
c) Toptronic T1120
d) Toptronic T2000
e) Toptronic MacroG3

QUESTION 12b: **HOW IS THE TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTED?**

ANSWER:

a) Connect the Toptronic T1805 as shown in the diagram (figure 1 – Pg 12). Ensure that the cables are not touching or twisted as this will affect the measurement due to induction.
b) Make sure to insert the auxiliary earth bars in the moist part of the earth.
c) Spikes must be inserted in a straight line (minimum spacing is 2m).
d) If the ground is dry or sandy moisten with water (Test spikes only).
e) Where it is not possible to insert the auxiliary earth bars due to a hard surface like concrete or stony ground lay the earth bars in a suitable position and cover them with wet cloths (preferably with salt added to the water).
f) Please note, this is not possible on tarred, tiled or painted surfaces.
g) To check for earth voltage, depress the AC voltage button. If the reading is less than 10 volts proceed with the earth resistance test but if the reading is higher do not proceed. First rectify the problem as this can affect the reading.
h) Now test for the correct wiring connection between the E, P and C terminals and earthspikes by depressing the battery check button. If the OK light is lit up, proceed with the earth resistance measurement.
i) Select the appropriate ohm scale. The meter will now indicate the earth resistance.
j) It is accepted that a circuit should carry a fault current of twice the rated circuit current. To calculate what the maximum acceptable value of measurement proceed as per the following formula:

$$\text{Remax} = \frac{V}{2 \times I} \qquad \frac{V}{2 \times I \text{ (Amps) rated}}$$

Where Remax = Maximum earth electrode resistance
V = Measured Voltage
I = Rated Circuit Current

Example: 60 Amp Circuit (I)
230 VAC System (V)

$$\text{Remax} = \frac{V}{\frac{2 \times I}{230}} = \frac{(2 \times 60)}{1.92\Omega}$$

Therefore the earth electrode resistance must be below 1.92Ω to allow a fault current of 120 amps to flow.

*Note: When the supplier provides an earth terminal, then this text is optional.

8.5 PROSPECTIVE SHORT CIRCUIT CURRENT (SEE SECTION 2 OF THE CERTIFICATE OF COMPLIANCE / TEST REPORT)

8.5.1 Obtain the estimated prospective short-circuit current (PSCC) at the point of supply from the supplier of electric.

8.5.2 In the case of supply systems rated at not more than 250V to earth, measure the PSCC at the point of control with a commercially available instrument (fault current meter). Before any instrument is connected, confirm that the instrument is rated for the applicable current rating, in particular where the current rating at the main switch disconnector exceeds 100 A or the PSCC is expected to exceed 10 kA.

Note 1: Do not measure three-phase PSCC if the meter is not specifically designed for that purpose or for the capacity supply (or both). In a balanced three-phase system, the three-phase value can be estimated by multiplying the single-phase value by 1.73.

Note 2: Ensure that the instrument connections do not add impedance to the circuit measured.

CAUTION: Verify the suitability and accuracy of the PSCC instrument with the manufacturer.

8.5.3 Information on three-phase PSCC can also be obtained from graphs, tables and computer programs, suppliers of equipment, or can be calculated using the following formula:

$$\frac{V}{\sqrt{3} \times Z_{total}}$$

Where V = the phase-to-phase voltage, in volts;

Z_{total} = the total impedance of the upstream network in ohms, including, for example, the source transformer impedance and the impedance of a phase conductor.

8.5.4 The source transformer impedance can be calculated using the following formula:

$$Z_{transformer} = \frac{V^2}{P \times 10^3} \times \frac{Z_{\%}}{100}$$

Where $Z_{transformer}$ = the source transformer impedance;

P = the power of the transformer, in kilovolt amperes;

$Z_{\%}$ = the rated short-circuit impedance voltage of the transformer expressed as a percentage

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EXAMPLE TO WORK OUT PSC

TRF = 500 Kva
I = 650 Amp
SCC = 4.5%

Supply cable to M-DB

Size = 4 Core Cu x 630mm^2
L = 55 meters

NB: Get the rated current first, this could be determined in the SANS 10142-1 Table 6.8 Pg 114

NB: Resistance (R) & Reactance (X)
These values could be obtained in the SANS 10142-1 Table E.1 Pg 307

A Z (TRF) = $\frac{V^2}{PX10^3}$ x $\frac{Z\%}{100\%}$ Ω

❖ V = 400 volts (declared voltage)
P = Transformer Power in KVa
Z% = Transformer Impedance from rating plate
Z = Transformer Impedance in Ohm (Ω)

❖ Z (TRF) = $\frac{400^2}{P \times 10^3}$ x $\frac{4.5\%}{100\%}$

= $\frac{400 \times 400}{500 \times 10^3}$ x 0,045

= $\frac{160\,000}{500\,000}$ x 0,045

Z (TRF) = 0,0144 Ω →

B Z conductor = $\frac{L\sqrt{r^2+x^2}}{10^3}$ Ω

❖ Z conductor = Cable impedance in Ohm
L = The length of cable in meters
See table E.1 Page 307 SANS 10142-2 = Conductor Resistance in Ohm/Km

❖ Z (TRF) = $\frac{55\sqrt{0,043^2+0,069^2}}{10^3}$

= $\frac{55\sqrt{6,61^2\ 10^{-3}}}{10^3}$

= $\frac{55 \times 0,0813019}{10^3}$

Z conductor = $.4,4716049 \times 10^{-3}$
Z conductor = 0,0044716049 Ω →

C The PSCC of complete system

A + B = Z (TRF) + Z (conductor) = Z Total →

❖ Isc = $\frac{V}{\sqrt{3} \times Z\ Total}$ = A

= $\frac{400}{\sqrt{3} \times (0,0144 + 0,0044716049)}$

Isc = $\frac{400}{0,0326882}$

Isc = 12 136.829 A

Isc = 12,36829 kA →

The circuit breaker for this system must be the next size:

15 kA will be OK! →

Earth Resistance Measurement
Press a desired range switch button first and then "MEAS" button

On a concrete floor (not asphalt) where auxilary earth bars cannot be driven, lay the earth bars and make them moist with water before proceeding with measurement.

Photograph not to scale

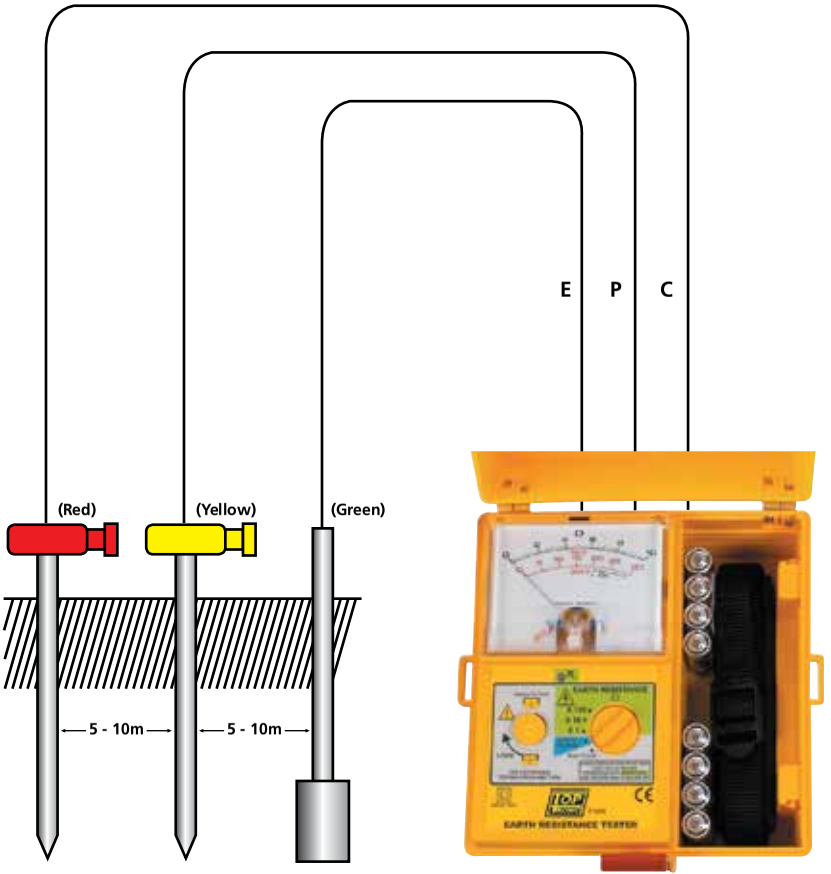

Fig I - Earth Resistance Measurement (Toptronic T1805)

k) Avoid backfilled areas as the ground has not been compacted and rubble might influence the reading.
l) The above test should only be performed if an earth is provided. (Earth at the installation).

QUESTION 13a: WHAT INSTRUMENT CAN BE USED TO TEST INSULATION RESISTANCE?

ANSWER:

An installation tester like the:
a) Toptronic MacroG3
b) Toptronic T1132
c) Toptronic T419
d) Toptronic T1151

QUESTION 13b: HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) Set the test voltage on the insulation tester to twice that of the system voltage (500 volts for a normal 230VAC system).
b) Disconnect the power to the installation, the earth leakage circuit breaker and other electrical/electronic devices which could be damaged during the test.
c) All switches and circuit breakers must be in the on position.
d) Set the insulation tester to 500V and connect the test leads as required (For example: phase to phase, phase to neutral, phase to earth, etc).
e) Depress the "push-on" button and note the insulation resistance reading indicated by the instrument.
f) Infinity is preferred but a minimum of 1M ohm will be accepted.

QUESTION 14a: WHAT INSTRUMENT CAN BE USED TO TEST THE VOLTAGE (MAIN DB) WITH NO LOAD?

ANSWER:

Any meter with voltage function similar to:
a) Toptronic TBM811
b) Toptronic TBM251
c) Toptronic TBM3030

QUESTION 14b: HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) Switch off all loads and measure the voltage at the point of control (the distribution board).
b) If the voltage is out of regulatory limits notify the supplier by completing Annexure K (see Addendum D - Pg 16).
c) The regulatory limit of the supply voltage is 230 VAC ±10%.

QUESTION 15a: WHAT INSTRUMENT CAN BE USED TO TEST THE VOLTAGE (MAIN DB) WITH THE LOADS SWITCHED ON?

ANSWER:

Any meter with a voltage function similar to:
a) Toptronic TBM811
b) Toptronic TBM251
c) Toptronic TBM3030

QUESTION 15b: HOW IS THE TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) Switch on the maximum loads available and measure the voltage at the point of control (distribution board).
b) The stove and geyser could be used as loads if available.
c) If the voltage measured is out of regulatory limits notify the supplier by completing Annexure K (see Addendum D – Pg 16).
d) The regulatory limit of the supply voltage is 230 VAC ±10%.

QUESTION 16a: WHAT INSTRUMENT CAN BE USED TO TEST THE VOLTAGE AT THE AVAILABLE LOAD (WORST CONDITION)?

ANSWER:

Any meter with a voltage function similar to:
a) Toptronic TBM811
b) Toptronic TBM3030

c) Toptronic TBM251
d) Toptronic TBM195

QUESTION 16b: HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) This is a volt drop test and should be carried out on the furthest point of consumption. This could be a socket outlet or terminals of an appliance, etc.
b) With no load connected to the point of consumption, measure the phase/neutral voltage.
c) Another measurement must now be taken with a load connected to the point of consumption. A typical load is 3kW and could be in the form of an element, heater, etc.
d) The difference between the two readings gives the volt drop through the circuit. Calculate the percentage difference (error).
e) The volt drop should not exceed 5%.
f) Using the stove and geyser is not acceptable unless they are the furthest point of consumption.
g) Keep the time between taking measurements b and c as short as possible as a fluctuation of suppliers voltage could result in erroneous results.
h) Also note that the starting voltage is not important as the percentage change will be the same.

QUESTION 17a: WHAT INSTRUMENT CAN BE USED TO TEST THE EARTH LEAKAGE PROTECTION UNITS?

ANSWER:

Any ELCB tester similar to:
a) Toptronic TEL1TLB
b) Toptronic T419

QUESTION 17b: HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) Ensure ALL leads are disconnected (all appliances unplugged, stove and geyser off).
b) Plug the ELCB tester (TEL1TLB) into any convenient socket outlet and switch on the socket.
c) Test at various points of outlet.
d) Increase the milliamps from 0 until the circuit breaker trips.
e) Note and record the value when tripping occurs. The earth leakage circuit breaker should trip between 15 and 30 mA. Ideally the unit should trip at 30 mA. The difference between the actual value and 30 mA is the "standing leakage" of the installation. If this is less than around 15 mA spurious tripping may occur.

QUESTION 18a: WHAT INSTRUMENT CAN BE USED TO TEST THE OPERATION OF THE EARTH LEAKAGE TEST BUTTON?

ANSWER:

a) No tester required

QUESTION 18b: HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?

ANSWER:

a) Press the test button on the earth leakage circuit breaker (ELCB) installed in the distribution board.
b) The earth leakage circuit breaker (ELCB) should trip.
c) No value is required as this is to verify the operation and not the sensitivity.
d) The only result must be correct. (The ELCB tripped).

QUESTION 19a: WHAT INSTRUMENT CAN BE USED TO TEST THE POLARITY OF THE POINTS OF CONSUMPTION?

ANSWER:

Any socket / ELCB Tester similar to:
a) Toptronic TEL1TLB
b) Toptronic TEL2SC
c) T1825 (loop / PSC tester)
d) Toptronic MacroG3

Annex K
(informative)

Notification of a potential danger
(See 8.7.6 and 8.7.10)

To: . . . . . .

. . . . . (The supplier)

. . . . . .

. . . . . .

From: . . . . . .

. . . . . .

. . . . . (The registered person)

. . . . . .

During an inspection in terms of SANS 10142. The wiring of premises, performed at stand

No. . . . . .

situated at . . . . . .

. . . . . .

I, ... , Registration No. . . . . .,

I found the following potential danger:

I ☐ elevated voltage of neutral V

I ☐ voltage not within limits V

I ☐ other . . . . . .

SIGNED: . . . . . Date: . . . . . .

QUESTION 19b: **HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?**

ANSWER:

a) Test that the polarity on all switches, sockets, appliance terminals and points of consumption are correct.
b) Insert the TEL1TLB into all sockets, switch on and confirm polarity. Adaptors could be used when terminals are open.
c) The correct wiring will be indicated by 3 lights. All must be on for correct status.
d) If any of the lights remain off, the table on the instrument will indicate the fault condition.
e) To test at a light switch, remove the cover, confirm visually that the phase conductor (Red) has been used. A non-contact voltage detector can be used to verify polarity as this will only function with the magnetic field of a live / phase conductor.
f) A phase rotation test must also be carried out if it is a 3 phase installation. This is not applicable on a single phase. Results should then also be recorded on the front of the certificate of compliance / test report (page 282 of SANS 10142-1:2003) as illustrated in Addendum B – Pg 9.
g) The results can only be correct, if a fault is detected it must be rectified immediately.

QUESTION 20a: **WHAT INSTRUMENT CAN BE USED TO TEST ALL THE SWITCHING DEVICES AND MAKE AND BREAK CIRCUITS?**

ANSWER:

Any tester similar to:
a) Toptronic TBM811
b) Toptronic T1132
c) Toptronic T1151

QUESTION 20b: **HOW IS THIS TEST DONE AND WHAT VALUE OF MEASUREMENT IS ACCEPTABLE?**

ANSWER:

a) All switching devices for example light switches, circuit breakers, isolators, etc should be tested.
b) Switches must be switched on and off. The circuit must be interrupted as intended.
c) Any defect must be rectified before the results can be recorded on the certificate of compliance / test report.
d) The answer can only be correct.

QUESTION 21: **WHY SHOULD ANYONE BOTHER WITH THESE TESTS WHEN VALUES CAN JUST BE FILLED IN ON THE FORMS?**

ANSWER:

You are an ACCREDITED PERSON and have clear responsibilities spelt out by the law. Furthermore, the law provides stiff penalties for failure to comply with the requirements of the regulations, and / or for contravention of the law. These include fines and / or imprisonment.

DO THE TEST CORRECTLY, HOLD YOUR HEAD HIGH,
AND BE PROUD OF YOUR WORK

HELLERMANNTYTON WILL BE HAPPY TO ASSIST WITH MORE INFORMATION AND DETAILS. CONTACT US AT THE NEAREST OFFICE.

Johannesburg (011) 879-6620 **Durban** (031) 569-9900 **Cape Town** (021) 594-7100 **Port Elizabeth** (041) 408-2400

Section 4 - Inspection and Tests (New and existing installations)

Additional tests added ☐ Yes ☐ No ☐ N/A

Inspection *Note: Answer "Yes" or "N/A". The report shall not be issued if any "No" answers appear.*	Existing Installation	New / Altered / Temporary Installation
1. Accessible components are correctly selected		
2. All protective devices are of correct rating		
3. All protective devices are capable of withstanding the prospective fault level		
4. Conductors are of the correct rating and current-carrying capacity for the protective devices and connected load		
5. Components have been correctly installed		
6. Disconnecting devices are correctly located and all switchgear switches the phase conductors		
7. Different circuits are separated electrically		
8. Connection of conductors and earthing and bonding are mechanically sound		
9. Connection of conductors and earthing and bonding are electrically continuos		
10. Circuits, fuses, switches, terminals, earth leakage units, circuit breakers, distribution boards are correctly and permanently marked or labelled		
11. Where an electrical circuit passes through a fire barrier, the integrity of the fire barrier has been maintained		
12. Safety and emergency lighting and signs are functioning correctly		
13. (a) in the case of new installations or additions or alterations to existing installations, the new, added or altered installation complies with this part of SANS 10142; or (b) in the case of installations which existed prior to the publication of this edition of SANS 10142, the installation complies with the general safety requirements in this edition of this part of SANS 10142 and is reasonably safe *Note 1: Indicate (a) or (b) or (a) and (b) on the test report.* *Note 2: Indicate N/A in the case of (a) or (b), where applicable*		
14. Where an alternative supply is installed, it complies with the requirements in respect of connections, change-over switch and indicator		
15. Is the position of the readily accessible earthing terminal for earth connections of other services by installers of such services (see 6.11.5) indicated on the distribution board (see 6.6.1.21 (e))?		

Tests Carry out all the tests for the main distribution board. Also conduct all tests and complete copies of the tests for each distribution board and for each supply (normal and alternative supplies), and attach as annexures to this report.	Units	Instrument	Reading / Results Existing installation	New / Altered / Temporary Installation
1. Continuity of bonding	Ω			
2. Resistance of earth continuity conductor	Ω			
3. Continuity of ring circuits (if applicable)	—			
4. Earth loop impedance test: at main switch	Ω			
5. Prospective short-circuit current at point (PSCC) for sub-distribution boards. Indicate: ☐ KA ☐ Calculated ☐ Measured ☐ From supplier				
6. Elevate voltage between incoming neutral and external earth (ground)	V			
7. Earth resistance at electrode (if required)	Ω			
8. Insulation resistance	M Ω			
9. Voltage at main distribution board with no load for each phase to neutral	V		R Y B	R Y B
10. Voltage at main distribution board with load (as calculated for full load) for each phase to neutral	V		R Y B	R Y B
11. Voltage at available load (worst condition as calculated for full load) for each phase to neutral	V		R Y B	R Y B
12. Operation of earth leakage units	mA			
13. Operation of earth leakage test button	—		correct	correct
14. Polarity of points of consumption	—		correct	correct
15. Phase rotation at points of consumption for three-phase systems	—		correct	correct
16. All switching devices, make-and-break circuits	—		correct	correct

Comments: .....

.....

Comments on parts of the installation not covered by this report: .....

.....

TBM805 General Purpose DMM

- Splash proof
- Beep guard
- Rugged construction
- Diode
- Continuity
- Data hold
- Min/max
- Relative zero

CAT III 600V IEC61010-1 · LISTED UL · Meter Supplied With Certificate of Conformance

Technical Specification

AC/DC Voltage	400m,4,40,400,1000V
AC/DC Current	400µ,4000µ,40m,400m,4,10A
Resistance	400,4K,40K,400K,4M,40MΩ
Frequency	50,500,5K,50K,500K,1MHz
Capacitance	500n,5µ,50µ,500µ,3000µF
Accuracy	
DC Voltage	±1,0%+4 Digit
AC Voltage	4 -400V ± 1,5% + 5 Digit 1000V ± 4,0% + 5 Digit
DC Current	±1,2% + 3 Digit
AC Current	±1,8% + 4 Digit
Resistance	±2,0% + 4 Digit
Frequency	±0,5% + 4 Digit
Capacitance	±3,5% + 6 Digit
Protection	
AC/DC Voltage	1050Vrms,1450V Peak
AC/DC Current	0,5A/250V FUSED 15A/250V FUSED
Resistance	600V DC/AC RMS
Input Warning	✓
Transient	6.5KV LIGHTNING SURGE
Protection	(1.2/50 µs) FUSE

TBM251 General Purpose DMM

- Bar graph
- Beep guard
- USB Interface
- Rugged construction
- Diode
- Continuity
- Separate battery compartment

CAT III 600V IEC61010-1 · LISTED UL · Meter Supplied With Certificate of Conformance

Technical Specification

AC/DC Voltage	60m,600m,6,60,600,1000V
AC/DC Current	600µ,6000µ,60m,600m,6,8A
Resistance	600,6K,60K,600K,6M,60MΩ
Frequency	5Hz - 1MHz
Accuracy	
DC Voltage	±0,2% + 3 Digit
AC Voltage	60mV - 600mV - 1% + 5 Digit 1V - 1000V - 1,4% + 5 Digit
DC Current	±0,5% + 3 Digit
AC Current	±1,0% + 3 Digit
Resistance	±1,2% + 4 Digit
Frequency	±0,003% + 2 Digit
Protection	
AC/DC Voltage	1050Vrms,1450V Peak
AC/DC Current	0,63A/500V FUSED 10A/600V FUSED
Resistance	0.45V DC Typical
Input Warning	✓
Transient	6.5KV LIGHTNING SURGE
Protection	(1.2/50 µs) SURGE

TBM811 General Purpose DMM

- Splash/Drop Proof
- 1000 VAC/DC
- USB Interface
- Dual display
- Back light

Meter Supplied With Certificate of Conformance · CAT III 600V IEC61010-1 · LISTED UL

UNCONDITIONAL LIFETIME WARRANTY

Technical Specification

DC/AC Voltage	60m,600m,6,600,1000V
DC/AC Current	600µ,6000µ,60m,600m, 6,10A
Resistance	0.1Ω - 60MΩ
Frequency	5Hz - 1MHz
Capacitance	60n,600n,6µ,60µ,600µ,20mF
Accuracy	
DC Voltage	0.08% + 2 Digit
AC Voltage	2.0% + 3 Digit
DC Current	0.2% + 4 Digit
AC Current	1.0% + 4 Digit
Resistance	1.5% + 5 Digit
Frequency	0.004% + 4 Digit
Capacitance	5.0% + 5 Digit
Protection	
DC/AC Voltage	1050Vrms,1450V PEAK
AC/DC Current	0.44A/1000V Fuse (IR10kA) 11A/1000V Fuse (IR20kA)
Resistance	1.2V DC OPEN CIRCUIT
Input Warning	✓
Transient	12kV SURGE
Protection	(1.2/50 µs) SURGE

TBM3030 600A AC Clamp Meter

- Jaw size 26mm
- Large LCD display
- Diode
- Continuity
- Relative zero
- Data hold
- Thinner jaws

CAT III 600V IEC61010-1 · LISTED UL · Meter Supplied With Certificate of Conformance

Technical Specification

AC Current	40,600A
DC Voltage	400m,4,40,400,600V
AC Voltage	4,40,400,600V
Resistance	400,4K,40K,400K,4M,40MΩ
Frequency	5Hz to 100KHz
Capacitance	500n,5µ,50µ,500µ,3000µF
Accuracy	
AC Current	±1,9%+ 8 Digit
DC Voltage	±1,0%+ 4 Digit
AC Voltage	4,40,400V ±1,5% + 5 Digit 600V ±2,0% + 5 Digit
Resistance	4K,40K,400KΩ ± 0,6%+4 Digit 4MΩ ± 1,0% + 4 Digit 40MΩ ± 2,0% + 4 Digit
Frequency	± 0,5% + 4 Digit
Capacitance	± 3,5% + 6 Digit
Protection	
AC/DC Voltage	600V DC/AC RMS
Current	400A RMS CONTINUOUS
Transient Protection	6.5KV LIGHTNING SURGE (1.2/50 µs)

T2600 200A AC Open Jaw Clamp Meter

- Open jaw 12mm
- Backlight
- Duty cycle
- Capacitance
- Frequency
- Diode
- Continuity
- Relative zero
- Data hold

CAT II 600V IEC61010-1

Technical Specification

AC Current	200A
DC Voltage	4,40,400,1000v
AC Voltage	4,40,400,700v
Resistance	400,4k,40k,400k,4m,40mω
Frequency	40,400,4k,40k,100khz
Capacitance	40n,400n,4µ,40µf
Accuracy	
AC Current	±3,0% + 3 Digit
DC Voltage	±0,8% + 3 Digit
AC Voltage	±1,0% + 10 Digit
Resistance	±2,0% + 3 Digit
Frequency	±2,0% + 1 Digit
Capacitance	±4,0% + 10 Digit

T98 1000A AC Clamp Meter

- Jaw size 42mm
- Backlight
- Continuity
- Data hold

CAT II 600V IEC61010-1

Technical Specification

AC Current	20,200,1000A
DC Voltage	1000V
AC Voltage	750V
Resistance	200,2000Ω
Temperature	-40°C to 750°C
Accuracy	
AC Current	±2,0% + 5 Digit
DC Voltage	±1,0% + 2 Digit
AC Voltage	±1,0% + 5 Digit
Resistance	±1,0% + 3 Digit
Temperature	±1,0% + 5 Digit

TBM195 2000A AC/DC (CAT IV)

CAT IV 1000V IEC61010-1

- Jaw Size 55mm
- Large display
- Dual display
- Non contact EF detection
- VFD (Variable frequency drives)
- Relative zero
- Autocheck
- Diode

Meter Supplied With Certificate of Conformance

3 -5/6 Digits 6000 Counts

Technical Specification

AC/DC Current	100, 200,500,1000,2000A
AC Voltage	6,60,600,1000V
DC Voltage	6,60,600,1000V
Resistance	600,6K,60K,6M,40MΩ
Capacitance	60n,6µ,60µ,600µ,2000µF
Accuracy	
AC/DC Current	± 2 % + 5 Digit
AC Voltage	± 1.2 % + 5 Digit
DC Voltage	± 0.5 % + 5 Digit
Resistance	± 0.5 % + 5 Digit
Capacitance	± 2.0 % + 5 Digit

Model Specification

Accessories	Carry Pouch
Dimensions (mm)	264(L) x 97(W) x 43(H)
Power Source	2 x 1.5V AAA Batteries
Weight	608g

TBM061 400A AC/DC Clamp Meter

- Jaw size 30mm
- Large LCD display
- Diode
- Continuity
- Relative zero
- Data hold
- Auto power off

CAT III 600V IEC61010-1

LISTED UL

Meter Supplied With Certificate of Conformence

Model Specification

Accessories	Carry Pouch
Dimensions (mm)	188(L) x 63(W) x 40(H)
Power Source	2 x AAA Batteries
Weight	218g

Technical Specification

AC/DC Current	0,01,400A
DC Voltage	400m,4,40,400,600V
AC Voltage	4,40,400,600V
Resistance	400,4K,40K,400K,4M,40MΩ
Frequency	1KHz to 100KHz
Capacitance	500n,5µ,50µ,500µ,3000µF
Accuracy	
AC/DC Current	±2,5% + 5 Digit
DC Voltage	±1,0% + 4 Digit
AC Voltage	4,40,400V ±1,0% + 4 Digit 600V ±2,0% + 4 Digit
Resistance	4K,40K,400KΩ ± 0,6%+4 Digit 4MΩ ± 1,0% + 4 Digit 40MΩ ± 2,0% + 4 Digit
Frequency	± 2,0% + 4 Digit
Capacitance	± 3,5% + 6 Digit
Protection	
AC/DC Voltage	600V DC/AC RMS
Current	400A RMS CONTINUOUS
Transient Protection	6.5KV LIGHTNING SURGE (1.2/50 µs)

T1132 1000V Analogue Insulation Tester

- Safety Voltmeter protection
- Live Circuit indication
- Auto Discharge
- AC Voltage measurement
- Zero adjustment knob

Meter Supplied With Certificate of Conformance

COMPACT DESIGN

Technical Specification

Insulation Test Voltage	250,500,1000V
Insulation Resistance	250V (100MΩ) 500V (200MΩ) 1000V (400MΩ)
AC Voltage	0 to 600V
Ohm meter	3 to 500Ω
Test Current	205mA

Model Specification

Dimensions (mm)	175(L) x 85(W) x 75(H)
Power Source	8 x 1.5V AA Batteries
Weight	655g

T1151 1000V Digital Insulation Tester

- Safety Voltmeter protection
- Live Circuit indication
- Auto Discharge
- AC Voltage measurement

Meter Supplied With Certificate of Conformance

COMPACT DESIGN

Technical Specification

Insulation Test Voltage	250,500,1000V
Insulation Resistance	250V (2k-2GΩ) 500V (4k-4GΩ) 1000V (8k-8GΩ)
AC Voltage	0 to 700V
Ohm meter	0,01 to 1999Ω
Test Current	>5H220mA

Model Specification

Dimensions (mm)	175(L) x 85(W) x 75(H)
Power Source	8 x 1.5V AA Batteries
Weight	655g

TIN6A 5KV-10KV Insulation Tester

- Live circuit warning
- Auto discharge
- Battery life indication
- Heavy duty carry case
- Silicon test leads

Meter Supplied With Certificate of Conformance

Technical Specification

Insulation test voltage	5000V	10000V
Insulation Resistance	0-200GΩ	0-400GΩ
Accuracy	±3% reading + 2 digit	
Output Current Limit	50μA to 100μA	
Live Warning	>500 volts	
Operating Temp (°C)	0-40	
Humidity %	85	

T1125 Loop/PSC/Load

- Load/no load tester
- PSC (Prospective short circuit current)
- Safety voltmeter protection
- Microprocessor controlled
- Test up to 100A (6kA) circuit breakers
- Each phase tested separately on a 3 phase system

Meter Supplied With Certificate of Conformance

COMPACT DESIGN

CAT II 600V IEC61010-1

Technical Specification

Measuring	:Loop	0 ~ 2000Ω
	:Psc	0 ~ 6ka @230v (L-n)
Operating Voltage (VAC)		50 ~275vac 50 or 60Hz
TEST CURRENT Loop/PSC/Load		12A (Load Voltage shown as @ 16A
Resolution (ohm)		0.01 (Loop)
Thermal Protection		Electronic
Accuracy Voltages		±1% (210 ~ 250V)
Accuracy Loop		±2% (0.05 ~ 50Ω) ±3% (500Ω) ±15% (above 500Ω)
Operating Temperature		0 ~ 40°C
Humidity		85%

Model Specification

Dimensions (mm)	175(L) x 85(W) x 75(H)
Power Source	8 x 1.5V AA Batteries
Weight	655g

T1105 Analogue Earth Resistance Tester

- Safety voltage protection
- Compact design

COMPACT DESIGN

Meter Supplied With Certificate of Conformance

Model Specification

Accessories	Test Leads, Earth Spikes Shoulder Belt
Dimensions (mm)	175(L) x 85(W) x 75(H)
Power Source	8 x 1.5V AA Batteries
Weight	600g

Test Leads Lengths

Red -	1,2 & 15 meters
Yellow -	10 meters
Green -	5 meters

Technical Specification

Measuring Ranges	Resistance: 0-12Ω, 0-120Ω, 0-1200Ω
Earth Voltage	30V AC (5KΩ/V)
Measuring System	Earth Resistance by Constant current inverter 820Hz approx, 2mA square signal
Accuracy	
Resistance	±3% of full scale
Voltage	±2.5% of full scale

T2000 Earth Resistance Clamp Meter

- Resistance measurement on earth probes by means of ground loop method
- Direct measurement on earth probes without any cable breaking
- Measurement of leakage current on earth installations
- Setting of alarm thresholds on measurements
- Storage of measurement results
- Detection of current noise on measurements
- Data HOLD function
- Backlight
- Auto Power OFF

Model Specification

Memory Capacity	99 Locations
Dimensions (mm)	293(L) x 90(W) x 66(H)
Max conduct size	32mm
Weight	1320g

Technical Specification

Resistance	0.01Ω~0.999Ω	±(1,0%+0.01Ω)	0.001Ω
	0.10Ω~0.99Ω	±(1,0%+0.01	0.01Ω
	1Ω~49.9Ω	±(1,5%+0.1Ω)	0.1Ω
	50.0Ω~99.9Ω	±(2.0%+0.3Ω)	0.5Ω
	100Ω~199.9Ω	±(3.0%+1Ω)	1Ω
	200Ω~395Ω	±(6.0%+5Ω)	5Ω
	400Ω~590Ω	±(10%+10Ω)	10Ω
	600Ω~1000Ω	±(20%+20Ω)	20Ω
Current	0.00A~80mA	±(2.5%+1mA)	0.05mA
	80~650mA	±(2.5%+2mA)	0.5mA
	650~999.5mA	±(2.5%+0.003A)	1.5A
	1.000~3.995mA	±(2.5%+0.01A)	0.005A
	4.00~20.00mA	±(2.5%+0.05A)	0.01A

T416 Earth Resistance and Resistivity

- 350 Memory locations
- RS232 interface
- Resistivity
- Refer to instrument catalogue for more technical information

CAT III 265V IEC61010-1

Meter Supplied With Calibration Certificate

Technical Specification

Earth Resistance Measurement	
Range Re (Ω)	0.0 - 1999
Resolution (Ω)	0.01 - 1
Accuracy	± (2% Reading + 3 digits)
Measuring Frequency	125Hz / 75Hz/41.66Hz
Test Current	± 1Hz
Open Circuit Voltage	≤ 10mA
Wave form of test voltage	≤ 30V
	Sinusoidal

T89 Compliance / Power Analyser

- Insulation (50,100,250,500,1000V)
- Loop resistance • Line impedance
- Global earth • Phase rotation
- 350 Memory locations • Power
- Voltage anomalies • Harmonics
- Power factor • Single phase
- Refer to instrument catalogue for more technical information

CAT III 265V IEC61010-1

Meter Supplied With Calibration Certificate

Technical Specification

Continuity	✔
Insulation Test	250, 500, 1000V
Loop / PSC Testing	✔
Earth Resistance	2, 3 & 4 Terminal
ELCB	Sensitivity & Time
RS232 Interface	✔
Frequency & Voltage	✔
Fase Rotation	✔
Measuring & Recording of	AV, kW, KVAR, Cosι THD, Harmonics
Dimensions	(220x229x86)mm

T4137 Digital Milliohm Meter

- Four terminal measurement
- 12V DC battery powered with O-ring seal
- Large LCD display
- Robust lightweight case

Technical Specification

Resistance Ranges	Range	Accuracy
	0 to 200Ω in steps of 100μΩ	
	0 to 2000mΩ in steps of 1Ω	±0,5% of
	0 to 20Ω in steps of 10Ω	reading
	0 to 200Ω in steps of 100mΩ	±2 digits
	0 to 2000Ω in steps of 1Ω	
Test Current	1mA = 2000Ω range 10mA = 200Ω range 100mA = 2000mΩ range	
Maximum Output Voltage	20V rms	
Test Current Accuracy	±0,1%	

Meter Supplied With Certificate of Conformence

T890 Safety 3 phase Detector (Non contact)

- Clamps over wire insulation without contact on conductor
- Auto off
- Non contact sensor clips
- Open phase and phase sequence
- Magnets on back of unit to mount on metal surfaces

CAT III 1000V IEC61010-1

Meter Supplied With Certificate of Conformance

Technical Specification

Operating Voltage	150 to 1000VAC
Operating Frequency	45 to 65Hz
Circuit Structure	Electronic
Operating Temp	-10°C to 50°C
Humidity	80%
Power Source	4 x 1.5 AA Batteries
Current consumption	15mA
Cable Length	Approx 800mm

Model Specification

Accessories	Carry Pouch
Dimensions (mm)	118(L) x 69(W) x 38(H)
Weight	370g

T860 3 phase & Motor Rotation indicator

- Determine rotation of unconnected motors
- Heavy duty alligator clips
- Open phase identification

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Technical Specification

Operating Voltage	100 to 600VAC
Operating Frequency	45 to 75Hz
Circuit Structure	Electronic
Operating Temp	0°C to 50°C at 90° &
Humidity	Max relative Humidity
Power Consumption (Correct)	± 14mA for motor rotation field test
	±7mA for Phase rotation field indication

TEL1TLB SOCKET/ELCB TESTER/POLARITY

- Live on earth indication (LCD Display)
- Polarity indication • Identifies 6 wiring conditions
- Earth tripping function • TEL13L (British Type 13A)
- Floating earth detection • Ready-board compatible
- If wiring is incorrect and brass knob is touched, LCD will display a floating earth

Technical Specification

Rated Tripping Current	10,15,20,25,30,35mA
Resolution	5mA
Operation Voltage	220V

MACROG3

CAT III 265V IEC61010-1

Meter Supplied With Calibration Certificate

- Continuity with 200mA
- Insulation resistance
- Line/Loop Impedance (L-L, L-N, L-PE)
- Earth reistance and ground resistivity
- RCD tripping time and current
- Non-trip earth loop impedance
- 1 Terminal phase sequence

Model Specification

Optional Accessories	Software & USB cable (TOPVIEW)
Standard Accessories	4 Cables, alligator clips, test leads and earth rods. Carry case English instruction manual Calibration certificate ISO9000
Dimensions (mm)	225(L) x 165(W) x 75(H)
Power Source	6 x 1,5 AA Batteries
Weight	1200g

TEL28 Industrial ELCB

- Micro-processor controlled
- Fully programmable
- Direct readout of Time/Current
- Voltage measurement during test
- Suitable for Industrial, Mining and Domestic environments
- Each phase tested separately on a 3 phase system

Meter Supplied With Certificate of Conformence

Technical Specification

Rated tripping current at 317 Volts	0 to 1000mA
Resolution	1mA
Operating voltage	100 to 450V AC
Maximum trip time	100 secs
Resolution	1m sec
Accuracy	
Rated trip current	1% (1mA)
Voltage measurement	1% (1V)
Rated trip time	1ms
Operating temperature	0°C to 40°C
Humidity (%)	80
Phase angle setting	0 & 180° selectable

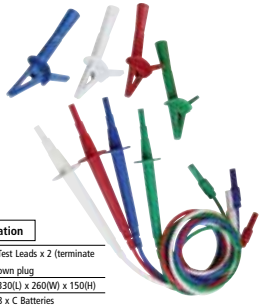
TEL11 ELCB/Phase Rotation Tester

- Indicates phase presence
- Indicates phase rotation
- TEST for disconnection sensitivity
- TEST for disconnection time
- Select one of 3 phase to test ELCB
- Measure voltage phase to Earth
- Over temperature protection
- Phase polarity trip indicator

Meter Supplied With Certificate of Conformence

Technical Specification

Current Settings	999mAac/50Hz
Current Selection	Knob
Phase-start-selection	0° & 180°
Operation Voltage (L-e)	60Vac to 317Vac (525V System)
Timer Resolution	1mS (Max Time = 99.99s)
Current Resolution	1mA
Voltmeter Resolution	1V
Accuracy	
Earth Leakage Constant Current Iac	5 to 999 (mA) @50Hz
Ramping Current	5 to 999 (mA)
Sensitivity Disconnection Check	5 to 999 (mA)
Time Delay Disconnection Check(s)	0.001 - 99.999
Maximum Current Consumption	10mA
ELCB Voltage Measurement L-E (Vac)	10 to 330V
ELCB Tester Voltage Present (VELCB)	LED
ELCB Fuse (Slow Blow)	1.5A
Protection	
OverVoltage CLASS III	450V
Over Load between all terminals	550V
Battery OK goes off when battery voltage	<9Vdc



Model Specification

Accessories	Test Leads x 2 (terminate own plug
Dimensions (mm)	330(L) x 260(W) x 150(H)
Power Source	8 x C Batteries
Weight	2.0kg

WIBRE1000 1000V CATIV

- IEC61243-3
- LED lights
- DIN / VDE 0682-401
- AC/DC Voltage 110,230,380,690,1000V
- Polarity
- Oil resistant
- No batteries

NEW

CAT IV 1000V IEC61010-1

http://www.hellermanntyton.co.za/Test_Equipment_(3).html

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