

7. PRESENTATION OF TEST INSTRUMENTS PRODUCED BY METREL d.d.

There are various instruments available for the complete testing of electrical installations. The main difference between the instruments is in the list of main and auxiliary parameters (those not required by EN 61557 standard), that a specific instrument can support. Below are the main characteristics of each instrument.

1. Highly professional multimeter for the ultimate testing of electrical installations **Eurotest 61557**.
It is intended for professional engineers who are dealing with installing, maintaining, servicing and approving electrical installations at the highest level (they possess wide knowledge about the installations). The advantage of the instrument is that in addition to all of the main parameters required by the EN 61557 standard, it can also measure a wide range of auxiliary parameters such as Harmonics up to 21st component, Power, Energy, Current, Installation tracing, Continuity using low test current, Varistor protection device test etc.
2. Highly professional multimeter for the complete testing of electrical installations **Instaltest 61557**.
It is intended for all electricians, who are dealing with installing, maintaining, servicing and approving electrical installations. It offers measurements of all parameters required by the EN 61557 standard as well as some auxiliary ones such as installation tracing, Continuity using low test current, Varistor protection device test etc.
3. Highly professional multimeter for the complete testing of Earth Resistances and Insulation Resistances **Earth Insulation Tester**.
It is intended for engineers and electricians who are dealing with the installing, maintaining, servicing and approving of earthing systems and insulation on electrical installations. It measures a wide range of auxiliary measurements such as Current, Continuity of protection devices, Continuity using low-test current, Varistor protection device test etc.
4. High professional portable three-phase **Harmonic - Power analyzer**.
It is intended for high demanding measurers, who are dealing with inspection of electrical energy quality. The advantage of the instrument is that it can monitor all three phase currents and voltages on a three-phase system simultaneously. All the measurements run in real time (any period is controlled), results are recorded and can be used later for further analysis. The instrument operates autonomously (independent of the connected mains voltage) thanks to internal battery power supply.

7.1. Technical specifications Eurotest 61557

Functions

Insulation resistance

Meas. range Riso (Un ≥ 250V) ... (0,008 ÷ 1000)MΩ	Resolution (MΩ)	Accuracy*
Display range		
Riso (MΩ)		
Un ≥ 250V		
0,000 ÷ 1,999	0,001	
2,00 ÷ 19,99	0,01	±(2% of r. + 2D)
20,0 ÷ 199,9	0,1	
200 ÷ 1000	1	±(10% of r.)

Meas. range Riso (Un < 250V) ... (0,012 ÷ 199,9)MΩ	Resolution (MΩ)	Accuracy*
Display range		
Riso (MΩ)		
Un < 250V		
0,000 ÷ 1,999	0,001	
2,00 ÷ 19,99	0,01	±(5% of r. + 3D)
20,0 ÷ 199,9	0,1	

*Specified accuracy is valid if Universal test cable is used while it is valid up to 20 MΩ if Tip Commander is used

Display range	Resolution (V)	Accuracy
Test voltage (V)		
0 ÷ 1200	1	±(2% of r. + 3D)

Nom. test voltage 50, 100, 250, 500, 1000Vd.c.
Current capability of test generator
(at Utest > Un) > 1mA
Short-circuit test current < 3 mA
Automatic discharge of tested object yes

Continuity of Protection Conductors

Meas. range R	Resolution (Ω)	Accuracy
Display range		
R (Ω)		
0,00 ÷ 19,99	0,01	±(2% of r. + 2D)
20,0 ÷ 199,9	0,1	±(3% of r.)
200 ÷ 1999	1	

Open-terminal test voltage 4 - 7 Vd.c.
Short-circuit test current > 200 mA
Compensation of test leads (up to 5 Ω) yes
Sound signal yes
Automatic polarity exchange yes
Measurement mode single measurement

Continuity

Display range R (Ω)	Resolution (Ω)	Accuracy
0,0 ÷ 199,9	0,1	±(3% of r. + 3D)
200 ÷ 2000	1	

Open-terminal test voltage 4 - 7 Vd.c.
Short-circuit test current < 7 mA
Sound signal yes
Measurement mode continuous measurement

Earth Resistance, four-lead method

Meas. range RE	Resolution (Ω)	Accuracy
Display range		
(Ω)		
0,00 ÷ 19,99	0,01	
20,0 ÷ 199,9	0,1	±(2% of r. + 3D)
200 ÷ 1999	1	
2,00k ÷ 19,99k	10	±(5% of r.)

Additional spike resistance error
at Rc max. or Rp max. ±(3% of r. + 5D)
Rc max. (4kΩ + 100RE) or 50kΩ (lower value)
Rp max. (4kΩ + 100RE) or 50kΩ (lower value)
Rc = Rc1 + Rc2 (Earth Resistivity)
Rp = Rp1 + Rp2 (Earth Resistivity)
Additional error
at 20 V voltage noise (50 Hz) ±(5% of r. + 10D)
Open-terminal test voltage 40 Vac.
Test voltage shape Sine wave
Test voltage frequency 125 Hz
Short-circuit test current < 20 mA
Automatic test of current and potential test probe resistance yes
Automatic test of voltage noise yes

Earth Resistance using one clamp in combination with four-lead method

All technical data listed under four-lead method are valid, additional ones are listed below.

Additional error at 3A noise current generated by mains voltage (50 Hz) ±(5% of r. + 10D)
Additional error
of resistance ratio Rpartial/Rtotal 1%
Rpartial = resistance measured with clamp
Rtotal = resistance of total earthing system

Indication in case of low clamp current < 0.5 mA
Automatic test of noise current yes
Additional clamp error is to be considered yes

Earth Resistance using two clamps

Meas. range RE	(0,08 - 100)Ω	
Display range RE (Ω)	Resolution (Ω)	Accuracy*
0,00 ÷ 19,99	0,01	±(10% of r + 2D)
20,0 ÷ 100,0	0,1	±(20% of r)

* distance between test clamps > 25 cm

Additional error at 3A noise current generated by mains voltage (50 Hz) ±(10% of r + 10D)
Automatic test of noise current yes
Additional clamp error is to be considered

Specific Earth Resistance (resistivity)

All technical data listed under four-lead method are valid, except display range table, see below

Display range ρ (Ωm)	Resolution (Ωm)	Accuracy
0,00 ÷ 19,99	0,01	Consider accuracy of RE Measurement
20,0 ÷ 199,9	0,1	
200 ÷ 1999	1	
2,00k ÷ 19,99k	10	
20,0k ÷ 199,9k	0,1k	ρ = 2πrRE
200k ÷ 2000k	1k	

Distance between test rods 1 up to 30 m

RCD – General data

Nominal differential currents 10, 30, 100, 300, 500, 1000 mA
Accuracy of actual differential currents: -0 / +0, ±1 IΔn IΔn = IΔn, 2 IΔn, 5 IΔn -0,1 IΔn / +0; IΔ = 0,5 IΔn
Test current shape sine wave
Test current start at 0° or 180°
RCD type Standard or Selective
Nominal input voltage 230/115V/45 - 65 Hz

RCD – Contact Voltage Uc

Meas. range Uc	(10 - 100)V	
Display range Uc (V)	Resolution (V)	Accuracy*
0,00 ÷ 9,99	0,01	(-0 / +10)% of r ± 0,2V
10,0 ÷ 100,0	0,1	(-0 / +10)% of r

*The accuracy is valid if
Mains voltage is stable during the meas
PE terminal is free of interfering voltages

Measurement principle with or without aux probe
Test current < 0,5 IΔn
Limit contact voltage 25 or 50 V
The Contact Voltage is calculated to IΔn (Standard type) or to 2IΔn (selective type)

RCD – Earth (Fault Loop) Resistance RE/RL

Display range RE (Ω)	Resolution (Ω)	Accuracy
0,00 ÷ 19,99	0,01	Consider acc. of Uc meas
20,0 ÷ 199,9	0,1	
200 ÷ 1999	1	
2,00k ÷ 10,00k	0,01k	

Calculation RE (RL) = Uc / IΔn
Measurement principle with auxiliary probe (RE) without auxiliary probe (RL)
Test current < 0,5 IΔn

RCD – Trip out time

Test current 0,5 IΔn, IΔn, 2 IΔn, 5 IΔn (multiplier 5 is not available if IΔn = 1000mA)

Meas. range t (S type) (ms)	Resolution (ms)	Accuracy
0 ÷ 300 (1/2 IΔn, IΔn)	1	±3ms
0 ÷ 150 (2 IΔn)	1	
0 ÷ 40 (5 IΔn)	1	
0 ÷ 300 (1/2 IΔn, IΔn)	1	

Meas. range t (S type) (ms)	Resolution (ms)	Accuracy
0 ÷ 500 (1/2 IΔn, IΔn)	1	±3ms
0 ÷ 200 (2 IΔn)	1	
0 ÷ 150 (5 IΔn)	1	

RCD – Tripping current

Meas. range IΔn	(0,2 - 1) IΔn	
Display range IΔn	Resolution	Accuracy
0,2 IΔn ÷ 1,1 IΔn	0,05 IΔn	±0,1 IΔn

Meas. range IΔn (0 ÷ 300)ms

Line Impedance and Prospective Short-circuit current

Meas. range ZL-N, R, XI	(0,11 - 1999)Ω	
Display range ZL-N, R, XI (Ω)	Resolution (Ω)	Accuracy
0,00 ÷ 19,99	0,01	±(2% of r + 3D)
20,0 ÷ 199,9	0,1	
200 ÷ 2000	1	

Display range Ipsc (A)	Resolution (A)	Accuracy
0,06 ÷ 19,99	0,01	Consider acc of ZL-N
20,0 ÷ 199,9	0,1	
200 ÷ 1999	1	
2,00k ÷ 19,99k	10	
20,0k ÷ 42,4k	100	

Ipsc calculation
UN = 115 V (100 V ≤ UL-N < 160 V)
UN = 230 V (160 V ≤ UL-N ≤ 264 V)
UN = 400 V (264 V ≤ UL-N ≤ 440 V)
Max test current (at 400 V) 40 A (10ms)
Nominal input voltage 400/230/115 V/ 45 - 65 Hz

Resistance of N-PE Loop and Prospective Short-circuit Current

Meas. range RN-PE	(0,11 - 1999)Ω	
Display range RN-PE (Ω)	Resolution (Ω)	Accuracy
0,00 ÷ 19,99	0,01	±(2% of r + 3D)
20,0 ÷ 199,9	0,1	
200 ÷ 1999	1	

Display range Ipsc (A)	Resolution (A)	Accuracy
0,06 ÷ 19,99	0,01	Consider acc. of RL-PE
20,0 ÷ 199,9	0,1	
200 ÷ 1999	1	
2,00k ÷ 19,99k	10	
20,0k ÷ 24,4k	100	

Ipsc calculation Ipsc = UN·1,06 / ZL-PE
UN = 115 V; (100 V ≤ UL-PE < 160 V)
UN = 230 V; (160 V ≤ UL-PE ≤ 264 V)
Technical data for generator, see under Earth Resistance, four-lead method.

Phase rotation

Nominal mains voltage range 100 ÷ 440V
Result displayed 1, 2, 3 or 2, 1, 3

Voltage (except in harmonic function)

Display range U (V)	Resolution (V)	Accuracy
0 - 440	1	±(2% of r. + 2D)

Nominal frequency range 45 - 65 Hz

Imposing (voltage free installation)

Us < 7V pulsed
Is = 3600 Hz
Isc < 50mA pulsed

Power

Display range (W/VAr/VA)	Resolution (W/VAr/VA)	Accuracy*
0,00 ÷ 9,99	0,01	
10,0 ÷ 99,9	0,1	
100 ÷ 999	1	±(7% of r. + 1D)
1,00k ÷ 9,99k	0,01k	
10,0k ÷ 88,0k	0,1k	

* (U, 10 ÷ 440V, I 10mA + 200A)

Principle..... single-phase, clamp current
Power type..... W, VAR, VA
Nominal input voltage..... 400/230/115 V / 50/60 Hz
Display range (cos φ)..... 0,00 - 1,00
Additional clamp error is to be considered.

Display range THD (%)	Resolution (%)	Accuracy
0,0 ÷ 100,0	0,1	±(5% of r. + 5D)

Display of result..... in % of total effective value
Nominal frequency..... 50/60 Hz
Clamp error is to be considered additionally.

Display range Harmonics up to 21-th (%)	Resolution (%)	Accuracy
0,0 ÷ 100,0	0,1	±(5% of r. + 5D)

Current (True RMS)

Display range I (A)	Resolution (A)	Accuracy
0,0m - 99,9m	0,1m	±(5% of r. + 3D)
100m - 999m	1m	
1,00 - 9,99	0,01	±(5% of r.)
10,0 - 99,9	0,1	
100 - 200	1	

Input resistance..... 10Ω/Vmax.
Measurement principle..... current clamp 1A/1mA
Nominal frequency..... 50/60 Hz
Additional clamp error is to be considered.

Peak Current

Display range I (A)	Resolution (A)	Accuracy
5 ÷ 280	1	±(5% of r.)

Sampling rate..... 2 measurements / ms
Measurement principle..... current clamp
Nominal frequency..... 50/60 Hz
Additional clamp error is to be considered.

Varistor Overvoltage Protection Devices (Breakdown voltage)

Display range U (V)	Resolution (V)	Accuracy
0 - 1000	1	±(5% of r. + 10V)

Measurement principle..... d.c. voltage ramp
Test voltage slope..... 500 V/s
Threshold current..... 1 mA

Fault/Fuse/Conductor locator

Principle..... Line loading or Imposing of test signal
Loading (mains voltage range 30-264V/45-65Hz)
Is < 1A pulsed
Is = 3600 Hz

General characteristics Eurotest 61557

Power supply..... 6Vd.c (4 x 1,5V battery IEC LR14)
Automatic comparison of test result with set high and low limit value..... yes
Visual and sound warnings..... yes
Dimensions (w x h x d)..... 26,5 x 11 x 18,5 cm
Weight (without accessories, with batteries)..... 2,1 kg
Display..... matrix LCD with backlight, 128 x 64 bits
Memories..... 2000 measurements
Computer connection..... RS 232
Protection classification..... double insulation
Overvoltage cat..... CATIII/300V or CATII/600V
Pollution degree..... 2
Degree of protection..... IP 44
Working temp. range..... 0 - 40 °C
Nominal (reference) temp. range..... 10 - 30 °C
Max. humidity..... 85 % RH (0 - 40°C)
Nominal (reference) hum. range..... 40 - 60 % RH
Auto power off..... yes

7.2. Technical specifications Instaltest 61557

Functions

Insulation resistance

Meas. range Riso ($U_n \geq 250V$) (0.008 - 1000)M Ω

Display range Riso (M Ω)	Resolution (M Ω)	Accuracy*
$U_n \geq 250V$	0.001	$\pm(2\% \text{ of } r + 2D)$
0.000 - 1.999	0.001	$\pm(10\% \text{ of } r)$
2.00 - 19.99	0.01	
20.0 - 199.9	0.1	
200 - 1000	1	

Meas. range Riso ($U_n < 250V$) (0.012 - 199.9)M Ω

Display range Riso (M Ω)	Resolution (M Ω)	Accuracy*
$U_n < 250V$	0.001	$\pm(5\% \text{ of } r + 3D)$
0.000 - 1.999	0.001	
2.00 - 19.99	0.01	
20.0 - 199.9	0.1	

*Specified accuracy is valid if Universal test cable is used while it is valid up to 20 M Ω if Trip Commander is used

Display range Test voltage (V)	Resolution (V)	Accuracy
0 - 1200	1	$\pm(2\% \text{ of } r + 3D)$

Nom. test voltage ... 50 - 1000V d.c. in steps of 10V
 Current capability of test generator (at $U_{test} > U_n$) >1mA
 Short-circuit test current <3 mA
 Automatic discharge of tested object yes

Continuity of protection conductors

Meas. range R (0.00 - 1999) Ω

Display range R (Ω)	Resolution (Ω)	Accuracy
0.00 - 19.99	0.01	$\pm(2\% \text{ of } r + 2D)$
20.0 - 199.9	0.1	$\pm(3\% \text{ of } r)$
200 - 1999	1	

Open-terminal test voltage 4 - 7 Vd.c.
 Short-circuit test current > 200 mA
 Compensation of test leads (up to 5 Ω) yes
 Sound signal yes
 Automatic polarity exchange yes
 Measurement mode single measurement

Calculation $R_L = U_c / I_{\Delta N}$
 Measurement principle without auxiliary probe
 Test current < 0.5 I ΔN

RCD - Trip out time

Test current 0.5 I ΔN , I ΔN , 2 I ΔN , 5 I ΔN
 (multiplier 5 is not available if I ΔN = 1000mA)

Meas. range t (G type) (0ms - upper disp. value)

Display range t (ms)	Resolution (ms)	Accuracy
0 - 300	1	
0 - 150 (2 I ΔN)	1	$\pm 3ms$
0 - 40 (5 I ΔN)	1	

Meas. range t (S type) (0ms - upper disp. value)

Display range t (ms)	Resolution (ms)	Accuracy
0 - 500	1	
0 - 200 (2 I ΔN)	1	$\pm 3ms$
0 - 150 (5 I ΔN)	1	

RCD - Tripping current

Meas. range I Δ (0.2 - 1.1) I ΔN

Display range I Δ	Resolution	Accuracy
0.2 I ΔN - 1.1 I ΔN	0.05 I ΔN	$\pm 0.1 I_{\Delta N}$

Meas. range I Δ (10 - 300)ms

Display range I Δ (ms)	Resolution (ms)	Accuracy
0 - 300	1	$\pm 3ms$

Meas. range Uci (10 - 100)V

Display range Uci (V)	Resolution (V)	Accuracy*
0.00 - 9.99	0.01	$(-0/+10)\% \text{ of } r$ $\pm 0.2V$
10.0 - 100.0	0.1	$(-0/+10)\% \text{ of } r$

*The accuracy is valid if:
 Mains voltage is stable during the meas.
 PE terminal is free of interfering voltage
 Uci voltage is calculated to Tripping current I Δ

Fault Loop Resistance and Prospective Short-circuit Current

Meas. range RL-PE (0.20 - 1999) Ω

Display range RL-PE (Ω)	Resolution (Ω)	Accuracy
0.00 - 19.99	0.01	
20.0 - 199.9	0.1	$\pm(5\% \text{ of } r + 5D)$
200 - 1999	1	

Display range Ipsc (A)	Resolution (A)	Accuracy
0.06 - 19.99	0.01	
20.0 - 199.9	0.1	Consider accuracy of RL-PE
200 - 1999	1	
2.00k - 19.99k	10	
20.0k - 24.4k	100	

Ipsc calculation: $Ipsc = U_n \cdot 1.06 / R_{L-PE}$
 $U_n = 115V$ (100 V $\leq U_{L-PE} < 160V$)
 $U_n = 230V$ (160 V $\leq U_{L-PE} \leq 264V$)
 Max. test current (at 230 V) 2.5 A
 Nominal voltage range 100 - 264V / 45 - 65 Hz

Line Resistance and Prospective short-circuit current

Meas. range RL-N (0.20 - 1999) Ω

Display range RL-N (Ω)	Resolution (Ω)	Accuracy
0.00 - 19.99	0.01	
20.0 - 199.9	0.1	$\pm(5\% \text{ of } r + 5D)$
200 - 1999	1	

Display range Ipsc (A)	Resolution (A)	Accuracy
0.06 - 19.99	0.01	
20.0 - 199.9	0.1	Consider accuracy of RL-N
200 - 1999	1	
2.00k - 19.99k	10	
20.0k - 24.4k	100	

Ipsc calculation: $Ipsc = U_n \cdot 1.06 / R_{L-N}$
 $U_n = 115V$; (100 V $\leq U_{L-N} < 160V$)
 $U_n = 230V$; (160 V $\leq U_{L-N} \leq 264V$)
 Max. test current (at 230 V) 2.5 A
 Nominal voltage range 100 - 264V / 45 - 65 Hz

Phase rotation

Nominal mains voltage range 100 - 440V
 Result displayed 1 2 3 or 2 1 3

Voltage

Display range U (V)	Resolution (V)	Accuracy
0 - 264	1	$\pm(2\% \text{ of } r + 2D)$

Nominal frequency range 45 - 65 Hz

7.2. Technical specifications Instaltest 61557

Functions

Insulation resistance

Meas. range Riso ($U_n \geq 250V$) (0.008 - 1000)M Ω

Display range Riso (M Ω)	Resolution (M Ω)	Accuracy*
$U_n \geq 250V$	0.001	$\pm(2\% \text{ of } r + 2D)$
0.000 - 1.999	0.001	$\pm(10\% \text{ of } r)$
2.00 - 19.99	0.01	
20.0 - 199.9	0.1	
200 - 1000	1	

Meas. range Riso ($U_n < 250V$) (0.012 - 199.9)M Ω

Display range Riso (M Ω)	Resolution (M Ω)	Accuracy*
$U_n < 250V$	0.001	$\pm(5\% \text{ of } r + 3D)$
0.000 - 1.999	0.001	
2.00 - 19.99	0.01	
20.0 - 199.9	0.1	

*Specified accuracy is valid if Universal test cable is used while it is valid up to 20 M Ω if Trip Commander is used

Display range Test voltage (V)	Resolution (V)	Accuracy
0 - 1200	1	$\pm(2\% \text{ of } r + 3D)$

Nom. test voltage ... 50 - 1000Vd.c. in steps of 10V
 Current capability of test generator (at $U_{test} > U_n$) >1mA
 Short-circuit test current <3 mA
 Automatic discharge of tested object yes

Continuity of protection conductors

Meas. range R (0.00 - 1999) Ω

Display range R (Ω)	Resolution (Ω)	Accuracy
0.00 - 19.99	0.01	$\pm(2\% \text{ of } r + 2D)$
20.0 - 199.9	0.1	$\pm(3\% \text{ of } r)$
200 - 1999	1	

Open-terminal test voltage 4 - 7 Vd.c.
 Short-circuit test current > 200 mA
 Compensation of test leads (up to 5 Ω) yes
 Sound signal yes
 Automatic polarity exchange yes
 Measurement mode single measurement

Continuity

Display range R (Ω)	Resolution (Ω)	Accuracy
0.0 - 199.9	0.1	$\pm(3\% \text{ of } r + 3D)$
200 - 2000	1	

Open-terminal test voltage 4 - 7 Vd.c.
 Short-circuit test current < 7 mA
 Sound signal yes
 Measurement mode continuous measurement

RCD - general data

Nominal differential currents 10, 30, 100, 300, 500, 1000 mA
 Accuracy of actual differential currents -0 / +0, 1 I Δ , I Δ = I ΔN , 2 I ΔN , 5 I ΔN
 Accuracy of actual diff. currents -0.1 I ΔN / +0, I Δ = 0.5 I ΔN
 Test current shape sine wave
 Test current start at 0° or 180°
 RCD type Standard or Selective

RCD - Contact Voltage Uc

Meas. range Uc (10 - 100)V

Display range Uc (V)	Resolution (V)	Accuracy*
0.00 - 9.99	0.01	$(-0 / + 10)\% \text{ of } r$ $\pm 0.2V$
10.0 - 100.0	0.1	$(-0 / + 10)\% \text{ of } r$

*The accuracy is valid if:
 Mains voltage is stable during the meas.
 PE terminal is free of interfering voltage

Measurement principle without aux. probe
 Test current < 0.5 I ΔN
 Limit contact voltage 25 or 50 V
 The Contact Voltage is calculated to I ΔN (standard type) or to 2 I ΔN (selective type)

RCD - Fault Loop Resistance RL

Display range RL (Ω)	Resolution (Ω)	Accuracy
0.00 - 19.99	0.01	Consider acc. of Uc and I ΔN
20.0 - 199.9	0.1	
200 - 1999	1	
2.00k - 10.00k	0.01k	$R_L = U_c / I_{\Delta N}$

Frequency

Display range f (Hz)	Resolution (Hz)	Accuracy
45.0 ÷ 65.0	0.1	±(0.1% of r + 1D)

Nominal voltage range 10 - 440V

Fault/Fuse/Conductor locator

Principle Line loading or imposing of test signal
 Loading (mains voltage range 30-264V/45-65Hz)
 Is < 1A pulsed
 fs = 3600 Hz

Imposing (voltage free installation)
 Us < 7V pulsed
 Is = 3600 Hz
 Isc < 50mA pulsed

Voltage Logging

Final result Uavg, Umax/Nmax, Umin/Nmin
 Input voltage range 0-440V
 Sampling once per 1s-99s in steps of 1s
 Total number of samples 1-1999

Varistor Overvoltage Protection Devires (Breakdown voltage)

Display range U (V)	Resolution (V)	Accuracy
0 - 1000	1	±(5% of r + 10V)

Measurement principle d.c. voltage ramp
 Test voltage slope 500 V/s
 Threshold current 1 mA

General characteristics Instaltest 61557

Power supply ... 6Vd.c. (4 x 1.5V battery IEC LR14)
 Automatic comparison of test result with set high and low limit value yes
 Visual and sound warnings yes
 Dimensions (w x h x d) 26,5 x 11 x 18,5 cm
 Weight (without accessories, with batteries) 1.8 kg
 Display LCD with backlight
 Memories 1000 measurements
 Computer connection RS 232

Protection classification double insulation
 Overvoltage cat. CAT III/300V or CAT II/600V
 Pollution degree 2
 Degree of protection IP 44
 Working temp. range 0 ÷ 40 °C
 Nominal (reference) temp. range 10 ÷ 30 °C
 Max. humidity 85 % RH (0 ÷ 40°C)
 Nominal (reference) hum. range 40 ÷ 60 % RH
 Auto power off yes

7.3. Technical specifications Earth Insulation Tester

Functions

Insulation Resistance

Display range Riso (Ω)	Resolution (MΩ)	Accuracy*
Un ≥ 250V	0.001	
0.000M ÷ 1.999M	0.001	
2.00M ÷ 19.99M	0.01	±(2% of r + 2D)
20.0M ÷ 199.9M	0.1	
2.00M ÷ 1999M	1	
2.00G ÷ 19.99G	10	±(10% of r)
20.0G ÷ 29.9G	100	

Meas. range Riso (Un < 250V) (0.012 ÷ 199.9)MΩ
 Display range
 Riso (Ω)
 Un < 250V
 0.000M ÷ 1.999M
 2.00M ÷ 19.99M
 20.0M ÷ 199.9M
 2.00M ÷ 1999M
 *Specified accuracy is valid if **Universal test** cable is used while it is valid up to 20 MΩ if Tip Commander is used.

Display range Test voltage (V)	Resolution (V)	Accuracy
0 - 1200	1	±(2% of r + 3D)

Nom. test voltage ... 50 ÷ 1000Vd.c. in steps of 10 V
 Current capability of test generator (at Utest > Un) >1mA
 Short-circuit test current <3 mA
 Automatic discharge of tested object yes

Continuity of protection conductors

Display range R (Ω)	Resolution (Ω)	Accuracy
0.00 ÷ 19.99	0.01	±(2% of r + 2D)
20.0 ÷ 199.9	0.1	±(3% of r)
200 ÷ 1999	1	

Open-terminal test voltage 4 - 7 Vd.c.
 Short-circuit test current > 200 mA
 Compensation of test leads (up to 5 Ω) yes
 Sound signal yes
 Automatic polarity exchange yes
 Measurement mode single measurement

Continuity

Display range R (Ω)	Resolution (Ω)	Accuracy
0.0 ÷ 199.9	0.1	±(3% of r + 3D)
200 - 1999	1	

Open-terminal test voltage 4 - 7 Vd.c.
 Short-circuit test current < 7 mA
 Sound signal (R > 20Ω) yes
 Measurement mode continuous measurement

Earth Resistance four - lead method

Display range (Ω)	Resolution (Ω)	Accuracy
0.00 ÷ 19.99	0.01	
20.0 ÷ 199.9	0.1	±(2% of r + 3D)
200 - 999	1	
1.000 - 1.999	1	
2.00k - 19.99k	10	±(5% of r)

Meas. range RE (0.11 - 19.99)kΩ
 Additional spike resistance error at Rc max. or Rp max. ±(3% of r + 5D) (4kΩ + 100RE) or 50kΩ (whichever is lower)
 Rp max. 50kΩ (whichever is lower)

Additional error
 at 20 V voltage noise (50 Hz) ±(5% of r + 10D)
 Open-terminal test voltage 40 Va.c.
 Test voltage shape sine wave
 Test voltage frequency 125/150 Hz
 Short-circuit test current < 20 mA
 Automatic test of current and potential test probe resistance yes
 Automatic test of voltage noise yes

Earth Resistance using one clamp in combination with four - lead method

All technical data listed under four-lead method are valid, except display and meas. ranges, see adapted ones below

Display range (Ω)	Resolution (Ω)	Accuracy (0.11 - 1.99k) Ω
0.00 - 19.99	0.01	Consider accuracy of RE measurement $p = 2 \cdot raRE$
20.0 - 199.9	0.1	
200 - 999	1	
1.00k - 1.99k	10	

Additional specification

Additional error at 3A noise current generated by mains voltage (50 Hz) $\pm(5\% \text{ of } r + 10D)$
Noise current indication $>2.4A$

Additional error of resistance ratio. $R_{\text{partial}}/R_{\text{total}} 1\%$
 R_{partial} = resistance measured with clamp
 R_{total} = resistance of earthing system
Indication in case of low clamp current $< 0.5 \text{ mA}$
Automatic test of noise current yes
Additional clamp error is to be considered

Earth Resistance using two clamps

Display range RE (Ω)	Resolution (Ω)	Accuracy* (0.08 - 100) Ω
0.00 - 19.99	0.01	Consider accuracy of RE measurement $p = 2 \cdot raRE$
20.0 - 100.0	0.1	

*Distance between test clamps $>30 \text{ cm}$

Additional error at 3A current noise generated by mains voltage (50 Hz) $\pm(10\% \text{ of } r + 10D)$
Automatic test of noise current yes
Additional clamp error is to be considered

Specific Earth Resistance (resistivity)

All technical data listed under four-lead method are valid, except display range table, see below.

Display range ρ (Ωm)	Resolution (Ωm)	Accuracy
0.00 - 19.99	0.01	Consider accuracy of RE measurement $p = 2 \cdot raRE$
20.0 - 199.9	0.1	
200 - 1999	1	
2.00k - 19.99k	10	
20.0k - 199.9k	0.1k	
200k - 999k ($a < 8m$)		1k
200k - 1999k ($a \geq 8m$)		

General characteristics

Power supply .. 6 Vd.c. (4 x 1.5V battery IEC LR14)
Automatic comparison of test result with set high and low limit value yes
Visual and sound warnings yes
Dimensions (w x h x d) 26.5 x 11 x 18.5 cm
Weight (without accessories, with batteries) .. 1.7kg
Display LCD with backlight
Memories 1000 measurements
Computer connection RS 232

Protection classification double insulation
Overvoltage cat CAT III/300V or CAT III/600 V
Pollution degree IP 44
Degree of protection
Working temp range 0 - 40 °C
Nominal (reference) temp range 10 - 30 °C
Max humidity 85 % RH (0 - 40°C)
Nominal (reference) hum range 40 - 60 % RH
Auto power off yes

Distance between test rods 1 up to 30 m or 1 up to 60 ft

Voltage a.c./d.c.

Display range U (V)	Resolution (V)	Accuracy
0 - 600	1	$\pm(2\% \text{ of } r + 2D)$

Nominal frequency range 45 - 65 Hz. d.c

Current (True RMS)

Display range I (A)	Resolution (A)	Accuracy
0.0m - 99.9m	0.1m	$\pm(5\% \text{ of } r + 3D)$
100m - 999m	1m	
1.00 - 9.99	0.01	$\pm(5\% \text{ of } r)$
10.0 - 99.9	0.1	
100 - 200	1	

Input resistance 10 Ω /1W
Measurement principle current clamp 1A/1mA
Nominal frequency 50/60 Hz
Additional clamp error is to be considered.

Varistor overvoltage protection devices - Breakdown voltage

Display range U (V)	Resolution (V)	Accuracy
0 - 1000	1	$\pm(5\% \text{ of } r + 10V)$

Measurement principle d.c voltage ramp
Test voltage slope 500 V/s
Threshold current 1 mA

PATENTS

METREL have registered and used the following patents when developing their latest family of test instruments:

- ❖ Patent for measurement of earth resistance in presence of noise signals.
- ❖ Patent for measurement of contact voltage.
- ❖ Patent for generation of test current when testing FI protection devices.
- ❖ Patent on how to prevent double connection of test cables and communication cable.
- ❖ Patent for measurement of line and loop impedance and prospective short-circuit current.

Cross-reference of important parameters on instruments produced by METREL

Parameter	Eurotest 61557	Instafest 61557	Earth – Insul. Tester
Insulation resistance	✓	✓	✓
Display range	0,001 – 1000 MΩ	0,001 – 1000 MΩ	0,001M – 30GΩ
Test voltage 50 V	✓	✓	✓
Test voltage 100 V	✓	✓	✓
Test voltage 250 V	✓	✓	✓
Test voltage 500 V	✓	✓	✓
Test voltage 1000 V	✓	✓	✓
Optional test voltage (50 – 1000 V)	✓	✓	✓
Test of varistor over-voltage protection devices	✓	✓	✓
Test range (continuously)	0 – 1000 V	0 – 1000 V	0 – 1000 V
Continuity of protection conductors	✓	✓	✓
Display range	0,01 – 2000 Ω	0,01 – 2000 Ω	0,01 – 2000 Ω
Automatic polarity exchange	✓	✓	✓
Compensation of test leads	✓	✓	✓
Possible test of inductive loads	✓	✓	✓
Acoustic signal	✓	✓	✓
Low resistances (continuous measurement)	✓	✓	✓
Display range	0,01 – 2000 Ω	0,01 – 2000 Ω	0,01 – 2000 Ω
Acoustic signal	✓	✓	✓
Earth resistance (internal source)	✓	✓	✓
Display range	0,01 Ω – 20 kΩ	✓	0,01 Ω – 20 kΩ
Measurement principle	4 ter., 2 probes	✓	4 ter., 2 probes
Shape of test voltage	sine wave	✓	sine wave
Measurement using one test clamp	✓	✓	✓
Measurement using two test clamps	✓	✓	✓
Automatic test of R _c and R _p	✓	✓	✓
High immunity against noise signal	✓ (patent)	✓	✓ (patent)
Earth resistivity (specific earth resist.)	✓	✓	✓
Display range	0 – 2,5 MΩm	✓	0 – 1999 kΩm
Measurement principle	4 ter., 4 probes	✓	4 ter., 4 probes
Distance between test rods	1 – 30 m	✓	1 – 30 m
RCD protection switches - General	✓	✓	✓
Nominal differential currents	0,01; 0,03; 0,1; 0,3; 0,5; 1A	✓	✓
Type of protection switches	AC	AC	✓
Standard and selective switches	✓	✓	✓
Automatic evaluation of test result	✓	✓	✓
Contact voltage (patent)	✓	✓	✓
Display range	0 – 100 V	0 – 100 V	✓
Measurement current	< 0,5 I _{in}	< 0,5 I _{in}	✓
Measurement without auxiliary test probe	✓	✓	✓
Measurement with auxiliary test probe	✓	✓	✓
Automatic recognition of connected auxiliary test probe	✓	✓	✓
Limit contact voltage	25 or 50 V	25 or 50 V	✓
Trip out time	✓	✓	✓

Display range	0 – 300 ms	0 – 300 ms	✓
Test current	(1/2, 1, 2, 5) × I _{Δn}	(1/2, 1, 2, 5) × I _{Δn}	✓
Tripping current	✓	✓	✓
Display range	0,2 I _{Δn} – 1,1 I _{Δn}	0,2 I _{Δn} – 1,1 I _{Δn}	✓
Rising current	in steps of 0,05 I _{Δn}	in steps of 0,05 I _{Δn}	✓
Earth resistance (external source)	✓	✓	✓
Display range	0,01 Ω – 2 kΩ	0,01 Ω – 2 kΩ	✓
Measurement current	< 0,5 I _{Δn}	< 0,5 I _{Δn}	✓
Measurement without auxiliary test probe	✓	✓	✓
Measurement with auxiliary test probe	✓	✓	✓
Automatic recognition of connected auxiliary test probe	✓	✓	✓
Automatic test of RCD	✓	✓	✓
Fault loop impedance	✓	(Resistance)	✓
Display range	0,01 Ω – 2 kΩ	0,01 Ω – 2 kΩ	✓
Test current	23 A, 2,3 A	2,5 A	✓
Automatic evaluation of test result	✓	✓	✓
Measurement of contact voltage at prospective short-circuit current, using auxiliary test probe	✓	✓	✓
Prosp. short-circuit fault loop curr.	✓	✓	✓
Display range	0 – 23 kA	0 – 23 kA	✓
Line impedance	✓	(Resistance)	✓
Display range	0,01 Ω – 2 kΩ	0,01 Ω – 2 kΩ	✓
Z _{L-N} (230 V)	✓	✓	✓
Z _{L-L} (400 V)	✓	✓	✓
Prospect. short-circuit line current	✓	✓	✓
Display range	0 – 40 kA	0 – 40 kA	✓
Resistance of N - PE loop (without trip out RCD protection switch)	✓	✓	✓
Display range	0,01 – 2000 Ω	✓	✓
Phase rotation	✓	✓	✓
Current (with clamp)	✓	✓	✓
Display range (two ranges)	1 mA – 200 A	1 mA – 200 A	✓
Voltage	✓	✓	✓
Display range	1 V – 440 V	1 V – 440 V	✓
Voltage recording	✓	✓	✓
Frequency	✓	✓	✓
Display range	45 – 65 Hz	✓	✓
Installation tracing	✓	✓	✓
Installation under voltage	✓	✓	✓
Voltage-free installation	✓	✓	✓
Active power	✓	✓	✓
Display range	0 – 88 kW	✓	✓
Reactive power	✓	✓	✓
Display range	0 – 88 kW	✓	✓
Apparent power	✓	✓	✓
Display range	0 – 88 kW	✓	✓
Energy	✓	✓	✓
Display range	0 – 1999 kWh	✓	✓
Harmonic analysis	✓	✓	✓
Display range	up to n = 21 st	✓	✓

General	✓	✓	✓
RS 232 communication	✓	✓	✓
Memories	✓	✓	✓
Display	graphic LCD	LCD	LCD
	75 x 42 mm	75 x 42 mm	75 x 42 mm
Display backlight	✓	✓	✓
Acoustic warnings	✓	✓	✓
Automatic power OFF	✓	✓	✓
PE – test electrode	✓	✓	✓
Possible SW upgrade by means of Internet	✓	✓	✓
Windows compatible SW	✓	✓	✓



METREL®

Questions, advice, suggestions, remarks.... In connection with measurements on electrical installations and measurement equipment produced by

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