

**1. TECHNICAL SPECIFICATIONS**

Accuracy is calculated as: $\pm[\% \text{reading} + (\text{no. of digits}) * \text{resolution}]$ at 23°C, <80%RH

AC TRMS VOLTAGE

Range (V)	Resolution (V)	Accuracy
15 ÷ 460	1	$\pm(3.0\% \text{ rdg} + 2\text{dgt})$

FREQUENCY

Range (Hz)	Resolution (Hz)	Accuracy
47.50 ÷ 52.50 / 57.00 ÷ 63.00	1	$\pm(0.1\% \text{ rdg} + 1\text{dgt})$

CONTINUITY OF PROTECTION CONDUCTORS WITH 200mA

Range (Ω)	Resolution (Ω)	Accuracy
0.00 ÷ 9.99	0.01	$\pm(5.0\% \text{ rdg} + 3\text{dgt})$
10.0 ÷ 99.9	0.1	
100 ÷ 1999	1	

Test current: >200mA DC up to 5 Ω (test leads included)
 Test current generated: 1mA resolution, range 0 ÷ 250mA
 Open-circuit voltage: 4 < V₀ < 24VDC
 Safety protection: error message for input voltage >10V

INSULATION RESISTANCE

DC test voltage (V)	Range (M Ω)	Resolution (M Ω)	Accuracy
50	0.01 ÷ 9.99	0.01	$\pm(2.0\% \text{ rdg} + 2\text{dgt})$
	10.0 ÷ 49.9	0.1	$\pm(5.0\% \text{ rdg} + 2\text{dgt})$
	50.0 ÷ 99.9		
100	0.01 ÷ 9.99	0.01	$\pm(2.0\% \text{ rdg} + 2\text{dgt})$
	10.0 ÷ 99.9	0.1	$\pm(5.0\% \text{ rdg} + 2\text{dgt})$
	100 ÷ 199	1	
250	0.01 ÷ 9.99	0.01	$\pm(2.0\% \text{ rdg} + 2\text{dgt})$
	10.0 ÷ 99.9	0.1	
	100 ÷ 249	1	$\pm(5.0\% \text{ rdg} + 2\text{dgt})$
	250 ÷ 499		
500	0.01 ÷ 9.99	0.01	$\pm(2.0\% \text{ rdg} + 2\text{dgt})$
	10.0 ÷ 199.9	0.1	
	200 ÷ 499	1	$\pm(5.0\% \text{ rdg} + 2\text{dgt})$
	500 ÷ 999		
1000	0.01 ÷ 9.99	0.01	$\pm(2.0\% \text{ rdg} + 2\text{dgt})$
	10.0 ÷ 199.9	0.1	
	200 ÷ 999	1	$\pm(5.0\% \text{ rdg} + 2\text{dgt})$
	1000 ÷ 1999		

Open-circuit voltage: rated test voltage -0% +10%
 Rated measuring current: >1mA with 1k Ω x Vnom (50V, 100V, 250V, 1000V), >2.2mA with 230k Ω @ 500V
 Short-circuit current: <6.0mA for each test voltage
 Safety protection: error message for input voltage >10V

LINE/LOOP IMPEDANCE P-P, P-N, P-PE – TT/TN SYSTEMS

Range (Ω)	Resolution (Ω) (*)	Accuracy
0.01 ÷ 19.99	0.01	$\pm(5.0\% \text{ rdg} + 3\text{dgt})$
20.0 ÷ 199.9	0.1	

(*) 0.1m Ω in range 0.1 ÷ 199.9 m Ω (by using the optional accessory IMP57)

Maximum test current: 3.31A (at 265V); 5.71A (at 457V)
 P-N/P-P Test voltage: (100V ÷ 265V) / (100V ÷ 460V); 50/60Hz $\pm 5\%$
 Protection types: MCB (B, C, D, K), Fuse (aM, gG, BS882-2, BS88-3, BS3036, BS1362)

TEST ON RCD PROTECTION (MOLDED-CASE TYPE)

Differential protection type (RCD): AC () , A () , General (G), Selective (S) and B ()
Voltage range P-PE, P-N: 100V ÷ 265V RCD type A, A and B ($I_{\Delta N} \leq 100\text{mA}$), 190V ÷ 265V RCD type B ($I_{\Delta N} = 300\text{mA}$)
Voltage range N-PE: <10V
Rated tripping currents ($I_{\Delta N}$): 6mA, 10mA, 30mA, 100mA, 300mA, 500mA, 650mA, 1000mA
Frequency: 50/60Hz $\pm 5\%$

RCD tripping current (for General RCDs only)

Type RCD	$I_{\Delta N}$	Range $I_{\Delta N}$ (mA)	Resolution (mA)	Accuracy
A, AC, B	6mA, 10mA	$(0.2 \div 1.1) I_{\Delta N}$	$0.1 I_{\Delta N}$	- 0%, +10% $I_{\Delta N}$
A, AC, B	$30\text{mA} \leq I_{\Delta N} \leq 300\text{mA}$			- 0%, +5% $I_{\Delta N}$
AC, A	$500\text{mA} \leq I_{\Delta N} \leq 650\text{mA}$			

Measurement RCD tripping time – TT/TN systems

	x 1/2			x 1		x 5		AUTO				AUTO+ 	
	\	G	S	G	S	G	S	G	S	G	S	G	S
6mA	AC	999	999	999	999	50	150	✓	✓	310		✓	
	A	999	999	999	999	50	150	✓	✓	310		✓	
	B	999	999	999	999					310			
10mA	AC	999	999	999	999	50	150	✓	✓	310		✓	
	A	999	999	999	999	50	150	✓	✓	310		✓	
	B	999	999	999	999					310			
30mA	AC	999	999	999	999	50	150	✓	✓	310		✓	
	A	999	999	999	999	50	150	✓	✓	310		✓	
	B	999	999	999	999					310			
100mA	AC	999	999	999	999	50	150	✓	✓	310			
	A	999	999	999	999	50	150	✓	✓	310			
	B	999	999	999	999					310			
300mA	AC	999	999	999	999	50	150	✓	✓	310			
	A	999	999	999	999	50	150	✓	✓	310			
	B	999	999	999	999					310			
500mA 650mA	AC	999	999	999	999	50	150	✓	✓	310			
	A	999	999	999	999					310			
	B												
1000mA	AC	999	999	999									
	A	999	999	999									
	B												

Table with duration of tripping time measurement [ms] - Resolution: 1ms, Accuracy: $\pm(2.0\% \text{reading} + 2 \text{digits})$

Measurement RCD tripping time – IT systems

	x 1/2			x 1		x 5		AUTO				AUTO+ 	
	\	G	S	G	S	G	S	G	S	G	S	G	S
6mA 10mA 30mA	AC	999	999	999	999	50	150	✓	✓	310		✓	
	A	999	999	999	999	50	150	✓	✓	310		✓	
	B	999	999	999	999					310			
100mA 300mA	AC	999	999	999	999	50	150	✓	✓	310			
	A	999	999	999	999	50	150	✓	✓	310			
	B	999	999	999	999					310			
500mA 650mA	AC	999	999	999	999	50	150	✓		310			
	A	999	999	999	999			✓		310			
	B												
1000mA	AC	999	999	999	999								
	A	999	999	999	999								
	B												

Table with duration of tripping time measurement [ms] - Resolution: 1ms, Accuracy: $\pm(2.0\% \text{reading} + 2 \text{digits})$

**FIRST FAULT CURRENT – IT SYSTEMS**

Range (mA)	Resolution (mA)	Accuracy
0.1 ÷ 0.9	0.1	±(5.0% rdg + 1dgt)
1 ÷ 999	1	±(5.0% rdg + 3dgt)

Limit contact voltage (ULIM) : 25V, 50V

OVERALL EARTH RESISTANCE WITHOUT RCD TRIPPING

Voltage range P-PE, P-N: 100V ÷ 265V
Voltage range N-PE: <10V
Frequency: 50/60Hz ± 5%

Overall earth resistance in systems with Neutral (3-wire) – (30mA or higher RCD)

Range (Ω)	Resolution (Ω)	Accuracy
0.05 ÷ 9.99	0.01	± (5.0% rdg + 8dgt)
10.0 ÷ 199.9	0.1	

Overall earth resistance in systems with Neutral (3-wire) – (6mA and 10mA RCD)

Range (Ω)	Resolution (Ω)	Accuracy
0.05 ÷ 9.99	0.01	± (5.0% rdg + 30dgt)
10.0 ÷ 199.9	0.1	

Overall earth resistance in systems without Neutral (2-wire) – (30mA or higher RCD)

Range (Ω)	Resolution (Ω)	Accuracy
0.05 ÷ 9.99	0.01	± (5.0% rdg + 8dgt)
10.0 ÷ 99.9	0.1	
100 ÷ 1999	1	

Overall earth resistance in systems without Neutral (2-wire) – (6mA and 10mA RCD)

Range (Ω)	Resolution (Ω)	Accuracy
0.05 ÷ 9.99	0.01	± (5.0% rdg + 30dgt)
10.0 ÷ 99.9	0.1	
100 ÷ 1999	1	

Contact voltage

Range [V]	Resolution [V]	Accuracy
0 ÷ U _t LIM	0.1	-0%, +(5.0%rdg + 3V)

PHASE ROTATION WITH 1 TEST LEAD

Voltage range P-N, P-PE[V]	Frequency range
100 ÷ 265	50Hz/60Hz ± 5%

Measurement is only carried out by direct contact with metal live parts (not on insulation sheath)

VOLTAGE DROP ON LINES (ΔV%)

Range [%]	Resolution [%]	Accuracy
0.0 ÷ 100.0	0.1	±(10.0%rdg + 4dgt)

ENVIRONMENTAL PARAMETERS (AUX)

Parameters	Range	Resolution	Accuracy
°C (Air)	-20.0°C ÷ 60.0°C	0.1 °C	±(2.0%rdg+2dgt)
°F (Air)	-4.0°F ÷ 140.0°F	0.1 °F	
Relative humidity [%RH]	0.0% ÷ 100.0%RH	0.1%HR	
DC Voltage	-1999.9mV ÷ -1.0mV 1.0mV ÷ 1999.9mV	0.1mV	
illuminance [Lux]	0.01Lux ÷ 20.00 Lux	0.01Lux	
	1Lux ÷ 2kLux	1Lux	
	1.00kLux ÷ 20.00kLux	0.01kLux	

Values lower to ±1mVDC are zeroed; Values lower to 0.1mVAC are zeroed



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DC CURRENT WITH TRANSDUCER CLAMP (IN1 INPUT – STD CLAMP)

Range [mV]	Resolution [mV]	Accuracy
-1999.9 ÷ -1.0	0.1	±(5.0%rdg + 2dgt)
1.0 ÷ 1999.9		

Values lower to ±1mVDC are zeroed

AC TRMS CURRENT WITH TRANSDUCER CLAMP (IN1 INPUT – STD CLAMP)

Range [mV]	Frequenza [Hz]	Resolution [mV]	Accuracy
1.0 ÷ 2999.9	50/60Hz ±5%	0.1	±(5.0%rdg + 2dgt)

Values lower to 1mVAC are zeroed ; Max crest factor: 3

DC/AC TRMS current with transducer clamp (In1 input – STD clamp)

FS clamp / Output ratio	Measurement range	Resolution
1A/1V AC	0.1mA ÷ 999.9mA AC	0.1mA AC
5A/1V AC	0.001A ÷ 4.999A AC	0.001A AC
10A/1V AC/DC	0.001A ÷ 9.999A AC/DC	0.001A AC/DC
30A/3V AC	0.01A ÷ 29.99A AC	0.01A AC
40A/400mV AC/DC	0.01A ÷ 39.99A AC/DC	0.01A AC/DC
100A/1V AC/DC	0.01A ÷ 99.99A AC/DC	0.01A AC/DC
200A/1V AC	0.01A ÷ 199.99A AC	0.01A AC
300A/3V AC	0.01A ÷ 299.99A AC	0.01A AC
400A/400mV AC/DC	0.1A ÷ 399.9A AC/DC	0.1A AC/DC
1000A/1V AC/DC	0.1A ÷ 999.9A AC/DC	0.1A AC/DC
2000A/1V AC	0.1A ÷ 1999.9A AC	0.1A AC
3000A/3V AC	0.1A ÷ 2999.9A AC	0.1A AC



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MEASUREMENT OF NETWORK PARAMETERS AND HARMONICS (PQA)

DC Voltage

Range [V]	Resolution [V]	Accuracy
15.0 ÷ 265.0	0.1V	$\pm(1.0\%rdg + 1dgt)$

Values lower 15V are zeroed

AC TRMS Voltage

Range [V]	Resolution [V]	Accuracy
15.0 ÷ 459.9	0.1V	$\pm(1.0\%rdg + 1dgt)$

Values lower 15V are zeroed; Max crest factor: 1.5

Frequency

Range [Hz]	Resolution [Hz]	Accuracy
47.5 ÷ 63.0	0.01	$\pm(2.0\%rdg + 2dgt)$

Allowed voltage range: 5.0 ÷ 459.9V ; Allowed current range: $\geq 5mVAC$

DC Current with transducer clamp (in1 input – std clamp)

Range [mV]	Resolution [mV]	Accuracy
-1999.9 ÷ -1.0	0.1	$\pm(5.0\%rdg + 2dgt)$
1.0 ÷ 1999.9		

Values lower to $\pm 1mVDC$ are zeroed

AC TRMS Current with transducer clamp (in1 input – std clamp)

Range [mV]	Frequency [Hz]	Resolution [mV]	Accuracy
1.0 ÷ 2999.9	50/60Hz $\pm 5\%$	0.1	$\pm(5.0\%rdg + 2dgt)$

Values lower to 1mVAC are zeroed ; Max crest factor: 3

DC/AC TRMS current with transducer clamp (In1 input – STD clamp)

FS clamp / Output ratio	Measurement range	Resolution
1A/1V AC	0.1mA ÷ 999.9mA AC	0.1mA AC
5A/1V AC	0.001A ÷ 4.999A AC	0.001A AC
10A/1V AC/DC	0.001A ÷ 9.999A AC/DC	0.001A AC/DC
30A/3V AC	0.01A ÷ 29.99A AC	0.01A AC
40A/400mV AC/DC	0.01A ÷ 39.99A AC/DC	0.01A AC/DC
100A/1V AC/DC	0.01A ÷ 99.99A AC/DC	0.01A AC/DC
200A/1V AC	0.01A ÷ 199.99A AC	0.01A AC
300A/3V AC	0.01A ÷ 299.99A AC	0.01A AC
400A/400mV AC/DC	0.1A ÷ 399.9A AC/DC	0.1A AC/DC
1000A/1V AC/DC	0.1A ÷ 999.9A AC/DC	0.1A AC/DC
2000A/1V AC	0.1A ÷ 1999.9A AC	0.1A AC
3000A/3V AC	0.1A ÷ 2999.9A AC	0.1A AC

DC Power

FS clamp	Range [kW]	Resolution [kW]	Accuracy
$\leq 10A$	0.015 ÷ 2.650k	0.001	$\pm(2.0\%rdg + 5dgt)$
$10A \leq FS \leq 40$	0.15 ÷ 10.60k	0.01	
$40A \leq FS \leq 100$	0.15 ÷ 26.50k	0.1	
$100A \leq FS \leq 1000$	1.5 ÷ 265.0k	1	



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Active Power (@ 230V 1Ph systems, $\cos\phi=1$, $f=50/60\text{Hz}$)

FS clamp	Range [kW]	Resolution [kW]	Accuracy
$\leq 10\text{A}$	0.000 ÷ 9.999	0.001	$\pm(2.0\%\text{rdg} + 5 \text{ dgt})$
$10\text{A} \leq \text{FS} \leq 200$	0.00 ÷ 999.99	0.01	
$200\text{A} \leq \text{FS} \leq 1000$	0.0 ÷ 999.9	0.1	
$1000\text{A} \leq \text{FS} \leq 3000$	0 ÷ 9999	1	

Reactive Power (@ 230V 1Ph systems, $\cos\phi=0$, $f=50/60\text{Hz}$)

FS clamp	Range [kVAr]	Resolution [kVAr]	Accuracy
$\leq 10\text{A}$	0.000 ÷ 9.999	0.001	$\pm(2.0\%\text{rdg} + 5 \text{ dgt})$
$10\text{A} \leq \text{FS} \leq 200$	0.00 ÷ 999.99	0.01	
$200\text{A} \leq \text{FS} \leq 1000$	0.0 ÷ 999.9	0.1	
$1000\text{A} \leq \text{FS} \leq 3000$	0 ÷ 9999	1	

Apparent Power (@ 230V 1Ph systems, $\cos\phi=0$, $f=50/60\text{Hz}$)

FS clamp	Range [kVA]	Resolution [kVA]	Accuracy
$\leq 10\text{A}$	0.000 ÷ 9.999	0.001	$\pm(2.0\%\text{rdg} + 5 \text{ dgt})$
$10\text{A} \leq \text{FS} \leq 200$	0.00 ÷ 999.99	0.01	
$200\text{A} \leq \text{FS} \leq 1000$	0.0 ÷ 999.9	0.1	
$1000\text{A} \leq \text{FS} \leq 3000$	0 ÷ 9999	1	

Power factor (@ 230V 1Ph systems, $f=50.0\text{Hz}$, current $\geq \text{FS}$)

Range	Resolution	Accuracy
0.70c ÷ 1.00 ÷ 0.70i	0.01	$\pm(2.0\%\text{rdg} + 3\text{dgt})$

$\cos\phi$ (@ 230V 1Ph systems, $f=50.0\text{Hz}$, current $\geq \text{FS}$)

Range	Resolution	Accuracy
0.70c ÷ 1.00 ÷ 0.70i	0.01	$\pm(2.0\%\text{rdg} + 3\text{dgt})$

Voltage harmonics (@ 230V 1Ph systems, $f=50.0\text{Hz}$)

Range [%]	Resolution [%]	Order	Accuracy
0.1 ÷ 100.0	0.1	00, 02 ÷ 25	$\pm(5.0\%\text{rdg} + 5\text{dgt})$

Fundamental frequency: 50/60Hz $\pm 5\%$

Harmonics are zeroed in the followed conditions:

- DC : if the DC value < 0.5% fundamental value or if the DC value < 1.0V
- 1° harmonic: if the value of 1°harmonic < 15V (not displayed)
- 2nd ÷ 25th harmonics: if harmonic value < 0.5% fundamental value or if the value < 1.0V

Current harmonics ($f=50/60\text{Hz}$)

Range [%]	Resolution [%]	Order	Accuracy
0.1 ÷ 100.0	0.1	00, 02 ÷ 25	$\pm(5.0\%\text{rdg} + 5\text{dgt})$

Harmonics are zeroed in the followed conditions:

- DC : if the DC value < 0.5% fundamental value or if the DC value < 5mV
- 1° harmonic: if the value of 1°harmonic < 5mV (not displayed)
- 2nd ÷ 25th harmonics: if harmonic value < 0.5% fundamental value or if the value < 5mV



2. GENERAL SPECIFICATIONS

MECHANICAL CHARACTERISTICS

Dimensions (L x W x H):	225 x 165 x 75mm (9 x 6 x 3in)
Weight (batteries included):	1.2kg (42 ounces)
Mechanical protection:	IP40

MEMORY AND PC CONNECTIONS

Memory:	999 locations, 3 mark levels
PC connection:	optical/USB port

DISPLAY

Characteristics:	COG Black/white graphic LCD, 320x240pxl
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POWER SUPPLY

Battery type:	6x1.5V alkaline batteries type AA IEC LR06 or 6 x1.2V rechargeable NiMH type AA
Battery life:	> 500 tests for each function
Auto Power OFF:	after 5 minutes' idling (if activated)

ENVIRONMENTAL CONDITIONS FOR USE

Reference temperature:	23°C ± 5°C (73°F ± 41°F)
Operating temperature:	0°C ÷ 40°C (32°F ÷ 104°F)
Allowable relative humidity:	<80%RH
Storage temperature:	-10°C ÷ 60°C (14°F ÷ 140°F)
Storage humidity:	<80%RH
Max. operating altitude:	2000m (6562ft)

REFERENCE GUIDELINES

Safety:	IEC/EN61010-1, IEC/EN61010-2-030, IEC/EN61010-2-033 IEC/EN61010-2-034, IEC/EN61557-1
EMC :	IEC/EN61326-1
Technical documentation:	IEC/EN61187
Safety of accessories:	IEC/EN61010-031
Insulation:	double insulation
Pollution level:	2
Measurement category:	CAT IV 300V to earth, maximum 415V between inputs
RPE:	IEC/EN61557-4, BS7671 17th ed., AS/NZS3000/3017
MΩ:	IEC/EN61557-2, BS7671 17th ed., AS/NZS3000/3017
RCD:	IEC/EN61557-6 (only on Phase-Neutral-Earth systems)
LOOP P-P, P-N, P-PE:	IEC/EN61557-3, BS7671 17th ed., AS/NZS3000/3017
Multifunction:	IEC/EN61557-10, BS7671 17th ed., AS/NZS3000/3017
Short-circuit current:	EN60909-0

This instrument satisfies the requirements of Low Voltage Directive 2014/35/EU (LVD) and of EMC Directive 2014/35/EU

This instrument satisfies the requirements of European Directive 2011/65/EU (RoHS) and 2012/19/EU (WEEE)