SOLAR 200

MULTIFUNCTION INSTRUMENT FOR SAFETY VERIFICATION OF SINGLE-PHASE AND THREE-PHASE PHOTOVOLTAIC SYSTEMS

SOLAR200 is an innovative instrument designed for carrying out electrical safety verifications on photovoltaic systems in compliance with the relevant safety requirements. The instrument is very easy to use and has a wide range of functions which can be selected by means of the simple multi-language menu. Measurements can be started both by pressing the button located on the instrument body and by pressing the button located on the remote probe (optional accessory PR400) which makes carrying out more measurements in sequence very simple. The help on line, which can be selected by the user and is active for any function, is a valid support for the connection of the instrument to the system to be tested. SOLAR200 is provided with an internal memory and an optical/USB interface for PC connection and for transferring measured data, which can be analyzed with the dedicated software.

FUNCTIONS
Continuity of protective conductors with 200mA
Insulation with test voltages of 50, 100, 250, 500, 1000VDC
Tripping time of RCDs type A, AC, general and selective, with nominal current up to 500mA
Tripping current of RCDs type A, AC, general and selective, with nominal current up to 500mA
Impedance of Loop/Line P-N, P-P, P-PE, also with high resolution (0,1mΩ with optional accessory IMP57), and Ipsc calculation.
Total earth resistance with no RCD tripping
Contact voltage
Phase sequence
Activation of measurements with optional remote probe PR400
Help on line on the display
Saving of results
Optical/USB interface for PC connection

GENERAL CHARACTERISTICS	
Display:	LCD custom, backlit
Power supply:	6x1.5V alkaline bat. type AA IEC LR06
Internal memory:	500 locations
PC interface:	optoisolated optical connector
Safety:	IEC/EN61010-1
Insulation:	double insulation
Pollution degree:	2
Measurement category:	CAT III 240V (to earth), CAT III 415V (between inputs)
Reference standards:	IEC/EN61557-1
Dimensions:	235x165x75mm
Weight (bat. included):	approx. 1.25kg

IMP57
Accessory for measuring loop impedance with high resolution

PR400
Remote probe

ACCESSORIES	Code
Standard	
Cable with three-pin shuko plug	C2033X
Kit of 3 cables + 3 alligator clips + 1 probe	UNIVERSALKIT
Transport bag	BORSA75
User manua	
Calibration certificate ISO9000	
Optional	
Windows software for PC + optical/USB cable	TOPVIEW2006
Remote probe for test activation	PR400
Accessory for measuring loop impedance with high resolution	IMP57
Kit of belts for slinging the instrument over one's shoulder	SP-0400

SOLAR200
HV000200

1. ELECTRICAL SPECIFICATIONS

Continuity test on protective conductors

Range (Ω)	Resolution (Ω)	Uncertainty (*)	Category of measure
0.00 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 99.9	0.1		

(*) after cable calibration which eliminates the cable resistance
Test current: >200mA DC per R≤5Ω (calibration included)
current measurement resolution: 1mA
Open leads voltage: $4 < V_0 < 24V$

RCDs tripping time

Range (ms)		Resolution (ms)	Uncertainty	Category of measure
½ $I_{\Delta N}$, $I_{\Delta N}$	1 ÷ 999	1	±(2.0%rdg + 2 dgt)	CAT III 240V to Ground CAT III 415V between inputs
2 $I_{\Delta N}$	1÷200 general			
	1÷250 selective			
5 $I_{\Delta N}$ RCD	1÷ 50 general			
	1÷160 selective			

Nominal tripping current: 10mA, 30mA, 100mA, 300mA, 500mA
RCD type: AC, A, general and selective
Phase-ground voltage: (110V ÷ 240V) ±10%
Frequency: 50Hz ± 0.5Hz, 60Hz ± 0.5Hz
Voltage contact limits: 25V or 50V

RCDs tripping current (general, AC and A types)

RCD's type	IΔN	Range IΔN (mA)	Resolution (mA)	Uncertainty	Category of measure
AC	IΔN ≤ 10mA	(0.5 ÷ 1.4) $I_{\Delta N}$	0.1 $I_{\Delta N}$	0%,+10%rdg	CAT III 240V to Ground CAT III 415V between inputs
A		(0.5 ÷ 2) $I_{\Delta N}$			
AC	IΔN > 10mA	(0.5 ÷ 1.4) $I_{\Delta N}$			
A		(0.5 ÷ 2) $I_{\Delta N}$			

Insulation resistance (DC voltage)

Test voltage (V)	Range (MΩ)	Resolution (MΩ)	Uncertainty	Category of measure
50	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	CAT III 240V to Ground CAT III 415V between inputs
	10.0 ÷ 49.9	0.1		
	50.0 ÷ 99.9		±(5.0%rdg + 2dgt)	
100	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 199	1	±(5.0%rdg + 2dgt)	
250	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 249	1		
	250 ÷ 499		±(5.0%rdg + 2dgt)	
500	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 499	1		
	500 ÷ 999		±(5.0%rdg + 2dgt)	
1000	0.01 ÷ 9.99	0.01	±(2.0%rdg + 2dgt)	
	10.0 ÷ 99.9	0.1		
	100 ÷ 999	1		
	1000 ÷ 1999		±(5.0%rdg + 2dgt)	

Open leads voltage: 1.25 x nominal test voltage; Voltage measurement resolution:1V
Short circuit current: <15mA (peak) for each test voltage
Nominal current: >2.2mA with 230kΩ @, 500V; 1mA with 1MΩ @ other test voltage

Contact voltage Ut

Range (V)	Resolution (V)	Uncertainty	Category of measure
0 ÷ 2Utlim	0.1	-0%, +(2.0%rdg + 2dgt)	CAT III 240V to Ground CAT III 415V between inputs

Utlim (Ul): 25V , 50V

Loop impedance P-P, P-N, P-PE TT/TN systems

Range (Ω)	Resolution (Ω) (*)	Uncertainty	Category of measure
0.01 ÷ 9.99	0.01	±(5.0%rdg + 3dgt)	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 199.9	0.1		
200 ÷ 1999 (only P-PE)	1		

(*) 0.1mΩ in 0.0 ÷ 199.9 mΩ range (with option accessory IMP57)

Maximum peak current: 3A @ 127V, 6A @ 230V, 10A @ 400V
Test voltage: (110÷240V) ±10% (P-N, P-PE) ; 50Hz ± 0.5Hz, 60Hz ± 0.5Hz
(110÷415V) ±10% (P-P); 50Hz ± 0.5Hz, 60Hz ± 0.5Hz

Loop impedance P-P, P-N, P-PE IT systems

Range (mA)	Resolution (mA)	Uncertainty	Category of measure
5 ÷ 999	1	±(5.0%rdg + 3dgt)	CAT III 240V to Ground CAT III 415V between inputs

Utlim (Ul): 25V , 50V

Global Earth Resistance R_A without RCD's tripping

Range (Ω)	Resolution (Ω)	Uncertainty	Category of measure
0.01 ÷ 9.99	0.01	±(5.0%rdg+ 1.0Ω)	CAT III 240V to Ground CAT III 415V between inputs
10.0 ÷ 199.9	0.1		
200 ÷ 1999 (solo F-PE)	1		

Test current @ 265V: <15 mA
Test voltage: (110÷240V) ±10% (phase-neutral/PE); 50Hz ± 0.5Hz, 60Hz ± 0.5Hz
Utlim (Ul): 25V , 50V

Phase sequence with 1 or 2 wires

Range (V)	Results displayed	Category of measure
(100 ÷ 240) ±10%	"123" → correct phase sequence "132" → wrong phase sequence "11-" → phase coincidence	CAT III 240V to Ground CAT III 415V between inputs

The instrument detects the phase sequence by touching the hot wire. The detection is not performed on insulated cables.
Frequency: 50Hz ± 0.5Hz, 60Hz ± 0.5Hz

2. GENERAL SPECIFICATIONS

MECHANICAL FEATURES	
Dimensions:	235 (L)x165(W)x75(H)mm
Weight (batteries included):	about 1.2kg
Protection degree:	IP50
MEMORY AND SERIAL INTERFACE	
Each measurement can be stored	
Memory:	>600 locations
PC communication port:	optical / USB
DISPLAY:	
Features:	graphic LCD with backlight
POWER SUPPLY:	
Batteries:	6x 1.5V type LR6, AA, AM3, MN 1500
Battery life:	> 600 measurements (without using the timer)
ENVIRONMENTAL CONDITIONS:	
Reference temperature of calibration:	23°C ± 5°C
Working temperature:	0° ÷ 40°C
Working humidity:	< 80%HR
Storage temperature (batteries not included):	-10 ÷ 60°C
Storage humidity:	< 80%HR
GENERAL REFERENCE STANDARDS:	
Safety:	IEC / EN61010-1, IEC / EN61557-1, -2, -3, -4, -6, -7
Technical literature:	IEC/EN61187
Safety of accessories:	IEC / EN61010-031 IEC / EN61010-2-032
LOWΩ (200mA):	CEI 64-8 612.2, IEC / EN61557-4
MΩ:	CEI 64-8 612.3, IEC / EN61557-2
RCD:	CEI 64-8 612.9 e app. D, IEC / EN61557-6
LOOP P-P, P-N, P-PE:	CEI 64-8 612.6.3, IEC / EN61557-3
Ra 15_{mA}	CEI 64-8 612.6.3, IEC / EN61557-3
123:	IEC 61557-7
Insulation:	double insulation
Pollution degree:	2
Max altitude:	2000m
Overvoltage category:	CAT III 240V to ground, max 415V among inputs

This instrument complies with the requirements of the European Low Voltage Directives 2006/95/EEC (LVD) and EMC 2004/108/EEC