Multifunction instrument for safety, functionality and performance verifications on a PV plant

The multifunction instrument PVCHECK performs prompt and safe electrical checks required for a PV system (DC section) and controls of the functionality of modules / strings in accordance with IEC/EN62446 guideline

PVCHECK: safety checks

PVCHECK verifies the continuity of the protective conductors (and associated connections) and measures the insulation resistance of the active conductors on a module, a string, or a photovoltaic field in accordance to IEC/EN62446 guideline, without the need of any external switch to short-circuit the positive and negative terminals.

PVCHECK: functionality checks

PVCHECK verifies the functionality of a PV string in accordance to the EN62446 guideline by measuring the open circuit voltage and the short-circuit current at operating conditions and extrapolating the results to the STC (by measuring the solar radiation). Finally, it displays the measurements and a comparison to the PV strings previously tested.

PVCHECK: performance checks

PVCHECK analyses the performance of a PV array (DC) under the operating conditions (connected to the inverter) displaying the generated power and the efficiency of the PV plant in accordance to the IEC/EN62446.

PVCHECK performs safety checks, functionality checks and performance checks on a PV plant

With the remote unit SOLAR-02 the irradiance and module/environment temperature measured values are shown also in “independent mode” (ideal solution during a pre-test on the installation) beside the test/recording with PVCHECK

The HT304N reference cell allows to perform solar irradiance measurements both on Monocrystalline and Polycrystalline PV modules

2. ELECTRICAL SPECIFICATIONS

Accuracy is calculated as ± [% readings + (no. of digits) * resolution] at 23°C ± 5°C, relative humidity <80%HR

2.1. PERFORMANCE TEST

DC Voltage

Range (V)	Resolution (V)	Uncertainty
5.0 ÷ 199.9	0.1	± (0.5%rdg + 2dgt)
200.0 ÷ 999.9	0.5	

DC current (by mean external clamp)

Range (mV)	Resolution (mV)	Uncertainty
-1100 ÷ -5	0.1	± (0.5%rdg + 0.6mV)
5 ÷ 1100		

DC current is always positive ;DC current zeroed if the related voltage value is < 5mV

DC Power (Vmeas > 150V)

Clamp FS (A)	Range (W])	Resolution (W)	Uncertainty
1< FS ≤ 10	0.000k ÷ 9.999k 10.00k ÷ 99.99k	0.001k 0.01k	±(0.7%rdg + 3dgt) (Imeas < 10%FS) ±(0.7%rdg) (Imeas ≥ 10%FS)
10< FS ≤ 100	0.000k ÷ 9.999k 10.00k ÷ 99.99k	0.001k 0.01k	
100< FS ≤ 1000	0.00k ÷ 99.99k 100.0k ÷ 999.9k	0.01k 0.1k	

Irradiance (by mean HT304N)

Range (mV)	Resolution (mV)	Uncertainty
1 ÷ 45.0	0.02	±(1.0%rdg + 0.1mV)

Temperature (by mean PT300N)

Range (°C)	Resolution (°C)	Uncertainty
-20.0 ÷ 100.0	0.1	± (1.0%rdg +1°C)

2.2. FUNCTIONALITY TEST

DC Voltage @ OPC

Range (V)	Resolution (V)	Uncertainty (*)
5.0 ÷ 199.9	0.1	±(1.0%rdg+2dgt)
200 ÷ 999	1	

(*) Measure starts for VDC > 15V, Uncertainty defined for VDC > 20V

DC Current @ OPC

Range (A)	Resolution (A)	Uncertainty
0.10 ÷ 10.00	0.01	±(1.0%rdg+2dgt)

DC Voltage @ STC

Range (V)	Resolution (V)	Uncertainty (*)
5.0 ÷ 199.9	0.1	±(4.0%rdg+2dgt)
200 ÷ 999	1	

(*) Measure starts for VDC > 15V, Uncertainty defined for VDC > 20V

DC Current @ STC

Range (A)	Resolution (A)	Uncertainty
0.10 ÷ 10.00	0.01	±(4.0%rdg+2dgt)

Irradiance (by mean HT304N)

Range (mV)	Resolution (mV)	Uncertainty
1 ÷ 45.0	0.02	±(1.0%rdg + 0.1mV)

Temperature (by mean PT300N)

Range (°C)	Resolution (°C)	Uncertainty
-20.0 ÷ 100.0	0.1	± (1.0%rdg +1°C)

2.3. SAFETY TEST

Continuity Test (LOWΩ)

Range [Ω]	Resolution [Ω]	Uncertainty
0.00 ÷ 1.99	0.01	±(2.0%rdg + 2dgt)
2.0 ÷ 19.9	0.1	
20 ÷ 199	1	

Test current >200mA DC up to 2Ω (test leads included), Resolution 1mA, Uncertainty ±(5.0%rdg + 5dgt)
Open loop voltage $4 < V_0 < 10V$

Insulation Test (MΩ) – Mode TIMER

Test voltage [V]	Range [MΩ]	Resolution [MΩ]	Uncertainty
250	0.01 ÷ 1.99	0.01	±(5.0%rdg+ 5dgt)
	2.0 ÷ 19.9	0.1	
	20 ÷ 199	1	
500	0.01 ÷ 1.99	0.01	
	2.0 ÷ 19.9	0.1	
	20 ÷ 199	1	
1000	0.01 ÷ 1.99	0.01	
	2.0 ÷ 19.9	0.1	
	20 ÷ 199	1	

Open voltage: < 1.25 * nominal test voltage
Short circuit current: <15mA (peak) for all test voltages
Generated voltage Resolution 1V, uncertainty ±(5.0%rdg + 5dgt) @ Rmis> 0.5% FS
Test current > 1mA with load = 1kΩ x Vnom

Insulation Test (MΩ) – Mode FIELD, STRING

Test voltage [V]	Range [MΩ]	Resolution [MΩ]	Uncertainty
250	0.1 ÷ 1.9	0.1	±(20.0%rdg+ 5dgt)
	2 ÷ 99	1	
500	0.1 ÷ 1.9	0.1	
	2 ÷ 99	1	
1000	0.1 ÷ 1.9	0.1	
	2 ÷ 99	1	

Open voltage: < 1.25 * nominal test voltage
Short circuit current: <15mA (peak) for all test voltages
Generated voltage Resolution 1V, uncertainty ±(5.0%rdg + 5dgt) @ Rmis> 0.5% FS
Test current > 1mA with load = 1kΩ x Vnom

3. GENERAL SPECIFICATIONS

DISPLAY AND MEMORY:	
Features:	128x128pxl custom LCD with backlight
Memory:	max 999 test
POWER SUPPLY:	
PV CHECK internal power supply:	6x1.5V alkaline batteries type LR6, AA, AM3, MN 1500
Number of Test :	> 999 test
SOLAR-02 power supply:	4x1.5V alkaline batteries type AAA LR03
SOLAR-02 max recording time (@ IP=5s):	approx. 1.5h
OUTPUT INTERFACE	
PC communication port:	optical/USB
Interface with SOLAR-02:	wireless RF communication (max distance 1m)
MECHANICAL FEATURES	
Size (L x W x H):	235 x 165 x 75mm
Weight (batteries included):	1.2kg
ENVIRONMENTAL CONDITIONS:	
Reference temperature:	23°C ± 5°C
Working temperature:	0° ÷ 40°C
Working humidity:	<80%HR
Storage temperature (remove the batteries):	-10 ÷ 60°C
Storage humidity:	<80%HR
GENERAL REFERENCE STANDARDS:	
Safety:	IEC/EN61010-1
Safety of measurement accessories:	IEC/EN61010-031
Measurements:	IEC/EN62446 (PV performance, IVCK) IEC/EN 61557-1, 2, -4 (LOWΩ, MΩ))
Insulation:	double insulation
Pollution degree:	2
Overvoltage category:	CAT III 300V to ground Max 1000V among inputs P, N, E, C
Max height of use:	2000m

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