

PVCHECK

MULTIFUNCTION INSTRUMENT TO CHECK SAFETY, PARAMETERS AND PERFORMANCE OF A PV PLANT

The multifunction instrument PVCHECK allows prompt and safe electrical checks required for a PV system (section DC) as well as controls on working of modules / strings in accordance with IEC/EN62446 guidelines. PVCHECK verifies the continuity of the protective conductors (and the associated connections) and executes insulation resistance measurement of the active conductors on a module, a string or a photovoltaic field in accordance with the requirements of IEC/EN62446, without the need of short-circuiting the positive and negative terminals. PVCHECK allows verification of a PV string's working in accordance with the requirements of IEC/EN62446 by measuring the open circuit voltage and short-circuit current under operating conditions and reporting the results to STC (by means of radiation measurement). It provides an immediate outcome for both absolute measurements and for measurements compared with the previously tested PV strings. PVCHECK also allows carrying out performance analysis of PV array (DC) under operating conditions (connected to the inverter) providing an indication of the power generated and the efficiency of the field as specified by IEC/EN62446.

FUNCTIONS

Safety test on PV installation

- Continuity test on protective conductors with 200mA
- Insulation test with test voltage of 250, 500, 1000VDC

DC efficiency of PV installation

- DC voltage, DC current, DC Power
- Solar irradiation [W/m²] with reference cell
- Environmental and module temperature by means of PT1000 probe
- SOLAR-02: remote unit for irradiance and temperature measurements
- Recording of PV plant parameters (DC side) with programmable IP (5s – 60m)
- Use of PDC compensation ratios according to environmental and module temperature
- Use of relationship to maximize the DC efficiency
- Outcome OK/NO

Performance of PV modules / strings

- Measurement of open circuit voltage up to 1000V DC
- Measurement of short circuit current up to 10A DC
- Measurement of temperature, automatic or by means of PT1000probe
- Measurement of solar radiation [W/m²] with reference cell
- Mechanical inclinometer for the detection of solar radiation incidence angle
- Data extrapolation to standard test conditions (1000W/m², 25°C)
- Outcome: OK / NO
- Database to manage up to 30 types of photovoltaic modules

ACCESSORIES

Code

Standard

Kit of 4 cables with 4mm banana plugs + 4 alligator clips	KITGSC4
Kit of 2 adapters with MC3 compatible connectors	KITPCMC3
Kit of 2 adapters with MC4 compatible connectors	KITPCMC4
Trasducer for DC currents 0÷10 - 0÷100A diameter 30 mm	HT4004
Windows software + optical/USB cable C2006	TOPVIEW2006
Transport bag	BORSA2051
User manual	
Calibration certificate ISO9000	

Optional

Probe PT1000 for cell temperature measurement	SOLAR-02
Reference cell for irradiation measurement	HT304N
Kit of belts for slinging the instrument over one's shoulder	SP-0400
Remote unit to record irradiation and temperature	SOLAR-02
Mechanical inclinometer	M304
Rigid transport suitcase	VA400

GENERAL CHARACTERISTICS

Display:	LCD Custom, 128x128pxl, backlight
Power supply:	6x1.5V alkaline bat. type AA LR06
Auto power off:	after 5 minutes in stand-by
Internal memory:	256kBytes
PC interface:	optoisolated optical/USB port
Safety:	IEC/EN61010-1
Meas. accessory safety:	IEC/EN61010-031
Measures:	IEC/EN 62446
Insulation:	double insulation
Pollution degree:	2
Measurement category:	CAT III 300V (to earth) Max 1000V between inputs
Dimensions:	235x165x75mm
Weight (batteries included):	1.2kg

PVCHECK
HV000PVC



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15/05/12 14:52:47			
Module: SUNPOWER210			
Vdc	548.0	V	
Irr	0	W/m2	
Tc	Auto	°C	
Voc, Isc			OK
Ri (1000V)	116	MΩ	OK
Rpe (Cal)	2.00	Ω	OK
Outcome: OK			
Selection IVCK			

Auto Test: Voc, Isc+ insulation resistance + continuity test

15/12/12 14:52:47			
RPE max	2	Ω	
Rcal	0.01	Ω	
Rpe	0.23	Ω	
Itest	210	mA	
Outcome: OK			
Selection LOWΩ			

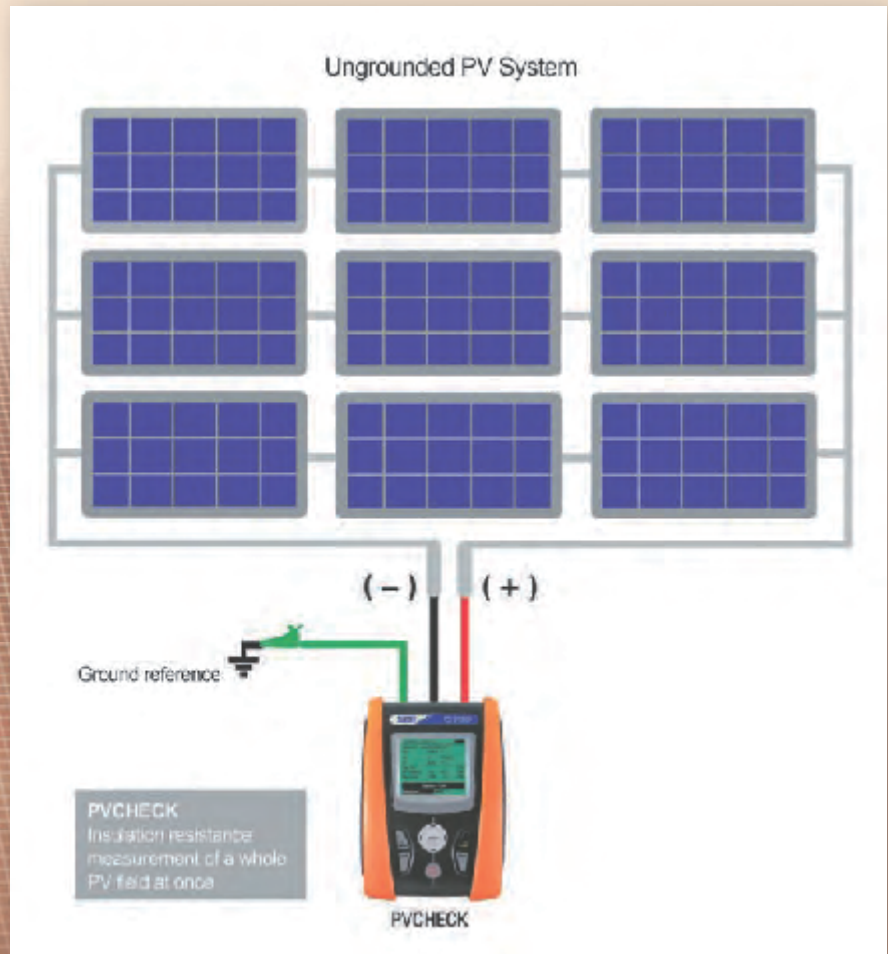
LOWΩ: 200mA continuity test

15/12/12 14:52:47			
Iso Test	1000	V	
Ri min	1.0	MΩ	
Mode	String		
Vtest	1020	V	
Rp	>100	MΩ	
Outcome: OK			
Selection MΩ			

MΩ: string mode insulation resistance measurement

15/12/12 14:52:47			
Iso Test	1000	V	
Ri min	1.0	MΩ	
Mode	Field		
Vtest	1025	V	1020
Ri (+)	>100	MΩ	
Ri (-)	>100	MΩ	
Rp	69	MΩ	
Outcome: OK			
Selection MΩ			

MΩ: field mode insulation resistance measurement



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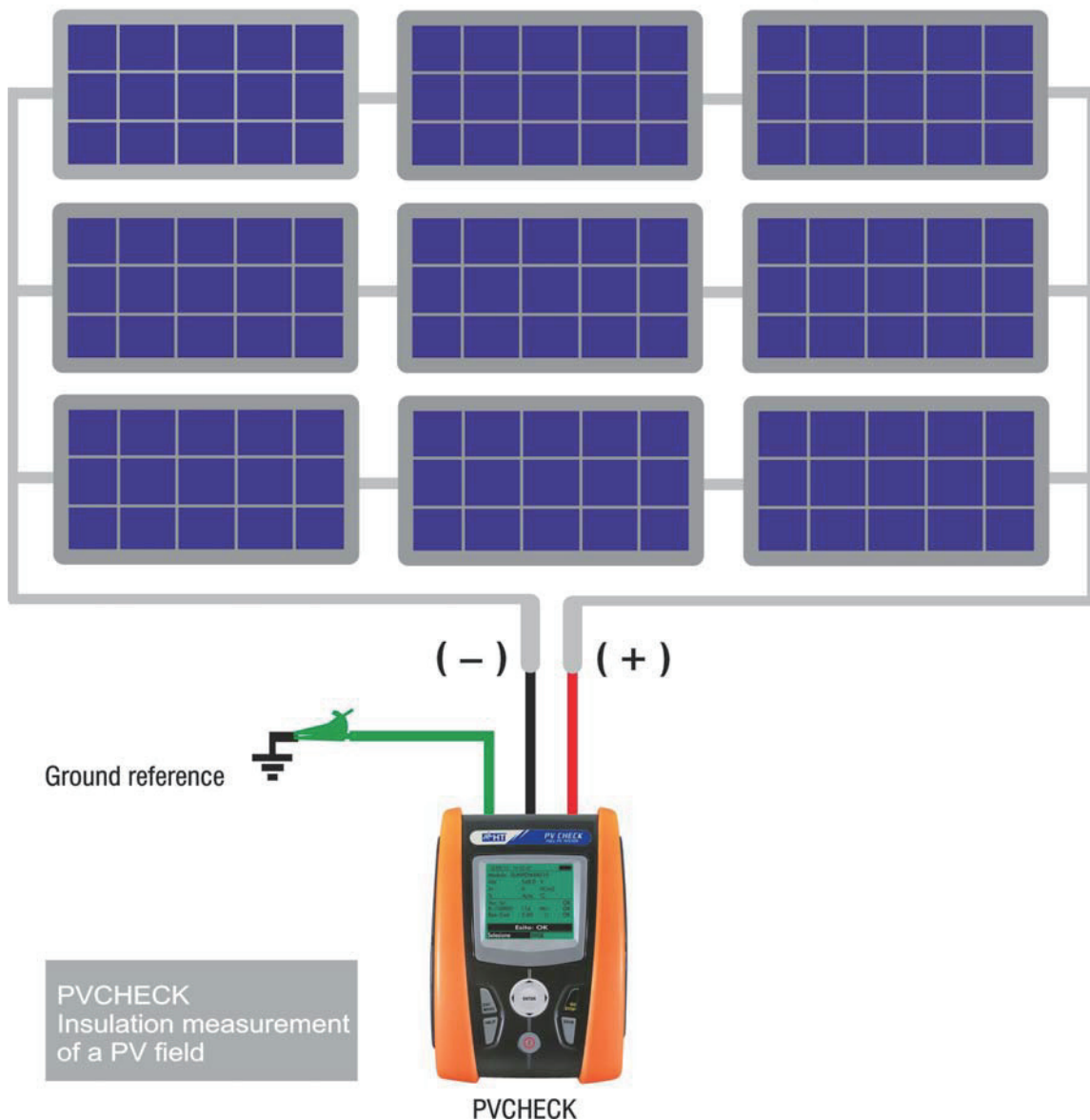
台北：三重區重新路五段609巷16號6樓之1 新竹：新竹縣竹北市台元26號4樓之10
 TEL:02-2782269 FAX:02-2782059 TEL:03-552-6779 FAX:03-552-6739
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The multifunction instrument PVCHECK performs prompt and safe electrical checks required for a PV system (DC section) and controls of the functionality 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.

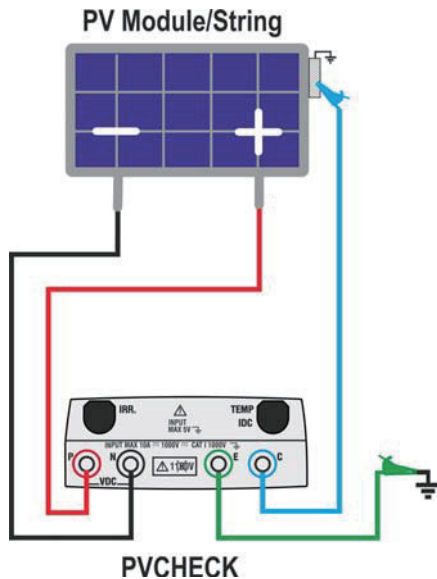
PV field not connected to ground



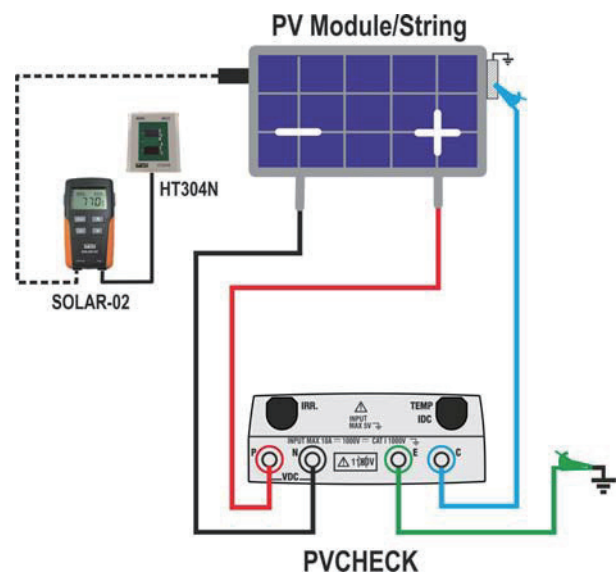
Direct measurement of insulation resistance of a PV Field not connected to ground

PVCHECK: functionality checks

PVCHECK verifies the functionality of a PV string in accordance to the IEC/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.



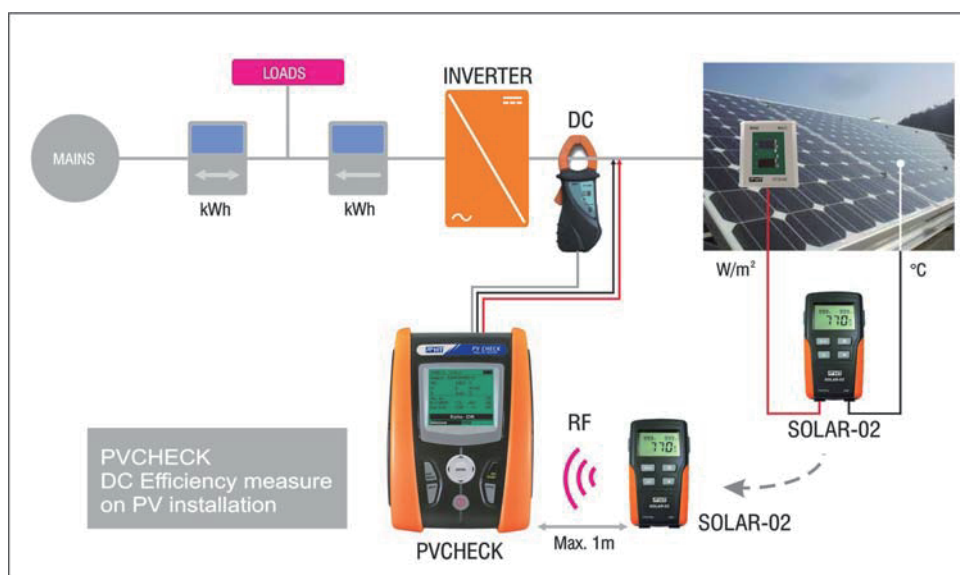
Test IVCK – Automatic measurement of Voc, Isc + Insulation + Continuity on a PV Module/String without irradiance measurement



Test IVCK – Automatic measurement of Voc, Isc + Insulation + Continuity on a PV Module/String with irradiance measurement with optional accessories SOLAR-02 and HT304N

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





2. ELECTRICAL SPECIFICATIONS

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

2.1. PERFORMANCE TEST

DC Voltage

Range (V)	Resolution (V)	Uncertainty
5.0 ÷ 199.9	0.1	\pm (1.0%rdg + 2dgt)
200.0 ÷ 999.9	0.5	

DC current (by mean external clamp)

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

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

FS DC clamp [A]	Resolution [A]	Minimum read value [A]
1 < FS \leq 10	0.001	0.05
10 < FS \leq 100	0.01	0.5
100 < FS \leq 1000	0.1	5

DC Power (Vmeas > 150V)

Clamp FS (A)	Range (W)	Resolution (W)	Uncertainty
1 < FS \leq 10	0.000k ÷ 9.999k	0.001k	\pm (1.5%rdg + 3dgt) (Imeas < 10%FS) \pm (1.5%rdg) (Imeas \geq 10%FS)
10 < FS \leq 100	0.00k ÷ 99.99k	0.01k	
100 < FS \leq 1000	0.0k ÷ 999.9k	0.1k	

Irradiance (by mean HT304N)

Range (mV)	Resolution (mV)	Uncertainty
1 ÷ 40.0	0.02	\pm (1.0%rdg + 0.1mV)

Temperature (by mean PT300N)

Range (°C)	Resolution (°C)	Uncertainty
-20.0 ÷ 100.0	0.1	\pm (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	

Minimum VPV voltage to start the test: 15V

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	

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 ÷ 40.0	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_o < 10V

Insulation Test (MΩ) – Mode TIMER

Test voltage [V]	Range [MΩ]	Resolution [MΩ]	Uncertainty
250, 500, 1000	0.01 ÷ 1.99	0.01	±(5.0%rdg+ 5dgt)
	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) @ R_{mis}> 0.5% FS
 Test current: > 1mA with load = 1kΩ x V_{nom}

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	

(*) For FIELD mode if VPN >1V the minimum voltage VEP and VEN for the calculation of Ri(+) and Ri(-) is 1V
 (**) For STRING mode minimum VPN voltage to start the test: 15V
 Open voltage <1.25 x nominal test voltage
 Short circuit current < 15mA (peak) for each test voltage
 Generated voltage resolution 1V, accuracy ±(5.0%reading + 5digits) @ R_{mis}> 0.5% FS
 Rated current measured > 1mA with 1kΩ @ V_{nom}

(***) For FIELD mode: add 5 dgts to the accuracy if $\frac{\max\{R^+, R^-\}}{\min\{R^+, R^-\}} \geq 100$



3. GENERAL SPECIFICATIONS

DISPLAY AND MEMORY:

Features: 128x128pxl custom LCD with backlight
Memory: max 999 test

POWER SUPPLY:

PVCHECK internal power supply: 6x1.5V alkaline batteries type LR6, AA, AM3, MN 1500
Battery life: approx. 120 hours (DC efficiency 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 DC 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