

# SOLAR I-Ve

Rel. 1.00 – 15/05/17

I-V curve tracer up to 15A or 1500VDC and PV efficiency logger

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## 1. ELECTRICAL SPECIFICATIONS

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

### 1.1. CERTIFIER OF SINGLE PHASE PV INSTALLATION

#### DC Voltage

Range (V)	Resolution (V)	Accuracy
15.0 $\div$ 99.9	0.1	$\pm$ (0.5%rdg + 2dgt)
100.0 $\div$ 1499.9	0.3	

#### AC TRMS Voltage

Range (V)	Resolution (V)	Accuracy
50.0 $\div$ 265.0	0.1	$\pm$ (0.5%rdg + 2dgt)

Max crest factor: 1.5

#### DC Current (by external transducer clamp)

Range (mV)	Resolution (mV)	Accuracy
-1100 $\div$ -5	0.1	$\pm$ (0.5%rdg + 0.6mV)
5 $\div$ 1100		

The value of current is ALWAYS displayed with positive sign ; The value of current transduced in voltage less then 5mV is zeroed

#### AC TRMS Current (by external transducer clamp)

Range (mV)	Resolution (mV)	Frequency (Hz)	Accuracy
1 $\div$ 1200	0.1	47.5 $\div$ 63.0	$\pm$ (0.5%rdg + 0.6mV)

Max crest factor: 2.0 ; The value of current transduced in voltage less then 5mV is zeroed

FS DC & AC clamp (A)	Resolution (A)	Minimum read value (A)	
		DC	AC
1 < FS $\leq$ 10	0.001	0.05	0.01
10 < FS $\leq$ 100	0.01	0.5	0.1
100 < FS $\leq$ 1000	0.1	5A	1

#### DC Power (Vmeas > 150V)

FS clamp (A)	Range (W)	Resolution (W)	Accuracy
1 < FS $\leq$ 10	0.000k $\div$ 9.999k	0.001k	$\pm$ (0.7%rdg+3dgt) (I <sub>meas</sub> < 10%FS)
	10.00k $\div$ 99.99k	0.01k	
10 < FS $\leq$ 100	0.000k $\div$ 9.999k	0.001k	
	10.00k $\div$ 99.99k	0.01k	
	100.0k $\div$ 999.9k	0.1k	
100 < FS $\leq$ 1000	0.00k $\div$ 99.99k	0.01k	
	100.0k $\div$ 999.9k	0.1k	
	1000k $\div$ 9999k	1k	

V<sub>meas</sub> = voltage correspondent to measured power

#### AC Single phase power (@ PF = 1, Vmeas > 200V)

FS clamp (A)	Range (W)	Resolution (W)	Accuracy
1 < FS $\leq$ 10	0.000k $\div$ 9.999k	0.001k	$\pm$ (0.7%rdg+3dgt) (I <sub>meas</sub> < 10%FS)
	10.00k $\div$ 99.99k	0.01k	
10 < FS $\leq$ 100	0.000k $\div$ 9.999k	0.001k	
	10.00k $\div$ 99.99k	0.01k	
	100.0k $\div$ 999.9k	0.1k	
100 < FS $\leq$ 1000	0.00k $\div$ 99.99k	0.01k	
	100.0k $\div$ 999.9k	0.1k	
	1000k $\div$ 9999k	1k	

V<sub>meas</sub> = voltage correspondent to measured power

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## Frequency

Range (Hz)	Resolution (Hz)	Accuracy
47.5 ÷ 63.0Hz	0.1	±(0.2%rdg+1dgt)

## Irradiance (by reference cell)

Range (mV)	Resolution (mV)	Accuracy
1.0 ÷ 65.0	0.1	±(1.0%rdg + 5dgt)

## Temperature (by external probe PT1000)

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

## 1.2. I-V CURVE and IVCK MEASUREMENTS

### I-V, IVCK: VDC Voltage @ OPC

Range (V) (*)	Resolution (V)	Accuracy (*)
15.0 ÷ 99.9	0.1	±(0.5%rdg+2dgt)
100.0 ÷ 1499.9	0.3	

(\*) The I-V curve measurements start for VDC > 15V and the accuracy is defined for VDC > 20V

### I-V, IVCK: IDC Current @ OPC

Range (A) (*)	Resolution (A)	Accuracy
0.10 ÷ 15.00	0.01	±(1.0%rdg+2dgt)

(\*) Maximum allowed current = 15A for Voc≤1000V; Maximum allowed current = 10A for Voc>1000V

### I-V: DC Power @ OPC (Vmpp >30V, Impp >2A)

Range (W) (*)	Resolution (W)	Accuracy
50 ÷ 99999	1	±(1.0%rdg+6dgt)

Vmpp = Maximum power voltage, Impp = Maximum Power Current

(\*) Max measurable value of Power must include FF value(~ 0.7) → Pmax = 1000V x 15A x 0.7 = 10500W

→ Pmax = 1500V x 15A x 0.7 = 10500W

### I-V, IVCK: VDC Voltage (@ STC)

Range (V)	Resolution (V)	Accuracy (*, **)
5.0 ÷ 999.9	0.1	±(4.0%rdg+2dgt)

### I-V: IDC Current (@ STC)

Range (A)	Resolution (A)	Accuracy (**)
0.10 ÷ 99.00	0.01	±(4.0%rdg+2dgt)

### I-V: DC Power @ STC (Vmpp >30V, Impp >2A)

Range (W) (*, **)	Resolution (W)	Accuracy (**)
50 ÷ 99999	1	±(5.0%rdg+1dgt)

Vmpp = Maximum power voltage, Impp = Maximum Power Current

(\*) Measurements start for VDC > 15V and the accuracy is defined for VDC > 20V

(\*\*) Test conditions:

> Test cond.: Steady Irrad.≥700W/m<sup>2</sup>, spectrum AM 1.5, solar incidence vs perpendicular. ≤ ± 25°, Cells Temp. [15..65°C]

> Accuracy include contribute of solar sensor and its measuring circuit

### Irradiance (with reference cell)

Range (mV)	Resolution (mV)	Accuracy
1.0 ÷ 100.0	0.1	±(1.0%rdg+5dgt)

### Temperature of module (with auxiliary PT1000 probe)

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

## 2. GENERAL SPECIFICATIONS

### DISPLAY AND MEMORY:

Features:	128x128pxl custom LCD with backlight
Memory capacity:	256kbytes
Saved data:	max 99 yield test ; 249 curves (I-V curve test), 999 IVCK

### POWER SUPPLY:

Internal power supply:	6x1.5V alkaline batteries type AA, LR06
Battery life:	> 249 curve (I-V curve test), 999 IVCK test approx 120 hours (yield test)
SOLAR-02 power supply:	4x1.5V alkaline batteries type AAA LR03
SOLAR-02 max recording time (@ IP=5s):	approx 1.5h
Auto Power OFF:	after 5 min of idleness

### OUTPUT INTERFACE

PC communication port:	optical/USB and WiFi
Interface with SOLAR-02 :	wireless RF communication (max distance 1m)

### MECHANICAL FEATURES

Dimensions (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 (batt. not included):	-10 ÷ 60°C
Storage humidity:	<80%HR

### GENERAL REFERENCE STANDARDS:

Safety:	IEC/EN61010-1
EMC:	IEC/EN61326-1
Safety of measurement accessories:	IEC/EN61010-031
I-V curve measurement:	IEC/EN60891 (I-V curve test) IEC/EN60904-5 (Temperature measurement)
Insulation:	double insulation
Pollution degree:	2
Overvoltage category:	CAT II 1000V DC, CAT III 300V AC to ground Max 1500V among inputs P1, P2, C1, c2
Max altitude of use:	2000m

**This instrument complies with the requirements of the European Low Voltage Directives 2014/35/EU (LVD) and EMC 2014/30/EU**

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