



## 1. ELECTRICAL SPECIFICATIONS

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

### 1.1. CERTIFIER OF SINGLE PHASE PV INSTALLATION

#### DC Voltage

| Range (V)      | Resolution (V) | Accuracy                                |
|----------------|----------------|-----------------------------------------|
| 15.0 ÷ 99.9    | 0.1            | $\pm (0.5\% \text{rdg} + 2 \text{dgt})$ |
| 100.0 ÷ 1499.9 | 0.3            |                                         |

#### AC TRMS Voltage

| Range (V)    | Resolution (V) | Accuracy                                |
|--------------|----------------|-----------------------------------------|
| 50.0 ÷ 265.0 | 0.1            | $\pm (0.5\% \text{rdg} + 2 \text{dgt})$ |

Max crest factor: 1.5

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

| Range (mV) | Resolution (mV) | Accuracy                                 |
|------------|-----------------|------------------------------------------|
| -1100 ÷ -5 | 0.1             | $\pm (0.5\% \text{rdg} + 0.6 \text{mV})$ |
| 5 ÷ 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 ÷ 1200   | 0.1             | 47.5 ÷ 63.0    | $\pm (0.5\% \text{rdg} + 0.6 \text{mV})$ |

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   |
| $1 < \text{FS} \leq 10$     | 0.001          | 0.05                   | 0.01 |
| $10 < \text{FS} \leq 100$   | 0.01           | 0.5                    | 0.1  |
| $100 < \text{FS} \leq 1000$ | 0.1            | 5A                     | 1    |

#### DC Power ( $V_{\text{meas}} > 150\text{V}$ )

| FS clamp (A)                | Range (W)       | Resolution (W) | Accuracy                                                                          |
|-----------------------------|-----------------|----------------|-----------------------------------------------------------------------------------|
| $1 < \text{FS} \leq 10$     | 0.000k ÷ 9.999k | 0.001k         | $\pm (0.7\% \text{rdg} + 3 \text{dgt})$<br>( $I_{\text{meas}} < 10\% \text{FS}$ ) |
|                             | 10.00k ÷ 99.99k | 0.01k          |                                                                                   |
| $10 < \text{FS} \leq 100$   | 0.000k ÷ 9.999k | 0.001k         | $\pm 0.7\% \text{rdg}$<br>( $I_{\text{meas}} \geq 10\% \text{FS}$ )               |
|                             | 10.00k ÷ 99.99k | 0.01k          |                                                                                   |
|                             | 100.0k ÷ 999.9k | 0.1k           |                                                                                   |
| $100 < \text{FS} \leq 1000$ | 0.00k ÷ 99.99k  | 0.01k          |                                                                                   |
|                             | 100.0k ÷ 999.9k | 0.1k           |                                                                                   |
|                             | 1000k ÷ 9999k   | 1k             |                                                                                   |

$V_{\text{meas}}$  = voltage correspondent to measured power

#### AC Single phase power (@ PF = 1, $V_{\text{meas}} > 200\text{V}$ )

| FS clamp (A)                | Range (W)       | Resolution (W) | Accuracy                                                                          |
|-----------------------------|-----------------|----------------|-----------------------------------------------------------------------------------|
| $1 < \text{FS} \leq 10$     | 0.000k ÷ 9.999k | 0.001k         | $\pm (0.7\% \text{rdg} + 3 \text{dgt})$<br>( $I_{\text{meas}} < 10\% \text{FS}$ ) |
|                             | 10.00k ÷ 99.99k | 0.01k          |                                                                                   |
| $10 < \text{FS} \leq 100$   | 0.000k ÷ 9.999k | 0.001k         | $\pm 0.7\% \text{rdg}$<br>( $I_{\text{meas}} \geq 10\% \text{FS}$ )               |
|                             | 10.00k ÷ 99.99k | 0.01k          |                                                                                   |
|                             | 100.0k ÷ 999.9k | 0.1k           |                                                                                   |
| $100 < \text{FS} \leq 1000$ | 0.00k ÷ 99.99k  | 0.01k          |                                                                                   |
|                             | 100.0k ÷ 999.9k | 0.1k           |                                                                                   |
|                             | 1000k ÷ 9999k   | 1k             |                                                                                   |

$V_{\text{meas}}$  = voltage correspondent to measured power



# 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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## Frequency

| Range (Hz)    | Resolution (Hz) | Accuracy             |
|---------------|-----------------|----------------------|
| 47.5 ÷ 63.0Hz | 0.1             | $\pm(0.2\%rdg+1dgt)$ |

## Irradiance (by reference cell)

| Range (mV) | Resolution (mV) | Accuracy               |
|------------|-----------------|------------------------|
| 1.0 ÷ 65.0 | 0.1             | $\pm(1.0\%rdg + 5dgt)$ |

## Temperature (by external probe PT1000)

| Range (°C)    | Resolution (°C) | Accuracy                      |
|---------------|-----------------|-------------------------------|
| -20.0 ÷ 100.0 | 0.1             | $\pm (1.0\%rdg + 1^{\circ}C)$ |

**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<br>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)<br>IEC/EN60904-5 (Temperature measurement)             |
| Insulation:                        | double insulation                                                                   |
| Pollution degree:                  | 2                                                                                   |
| Overvoltage category:              | CAT II 1000V DC, CAT III 300V AC to ground<br>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**