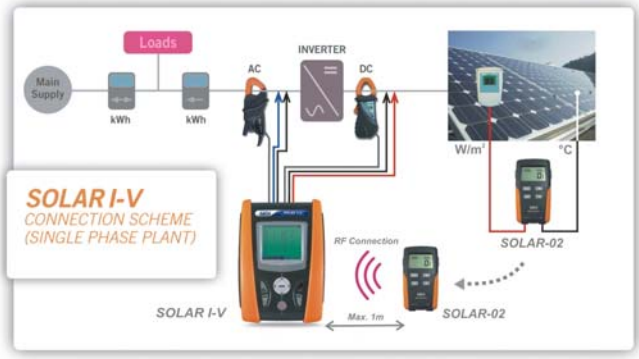
# 1. SOLAR I-V MAIN FEATURES

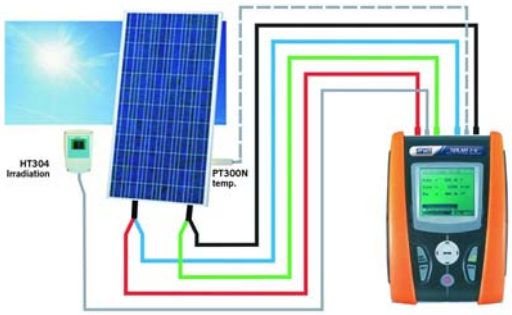



## SOLAR I-V: use as PV certifier

**SOLAR I-V** performs all tests on Single phase PV plants by using of SOLAR-02 remote unit which, after a preliminary synchronisation, save in independent way the values of irradiance and temperature. Only at the end of test the remote unit should be connected via wireless RF with the master to download the recorded data

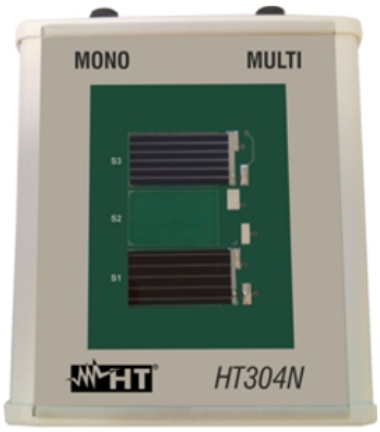
## SOLAR I-V: use as I-V curve checker

**SOLAR I-V** allows the on field measurement of I-V curve as well as of the main parameters of a single module and of a whole photovoltaic system up to a maximum of 1000V and 10A





With SOLAR-02 remote unit the irradiance and temperature measured values are shown at display also in independent mode (ideal solution during a pre-test on installation) besides test/recording with SOLAR I-V




The HT304N reference cell permits to performs solar irradiance measurements both on PV modules in Monocrystalline and Polycrystalline silicon material

# 2. ELECTRICAL SPECIFICATIONS

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

## 2.1. CERTIFIER OF SINGLE PHASE PV INSTALLATION

### DC Voltage

| Range (V) | Resolution (V) | Accuracy |
|---|---|---|
| 15.0 ÷ 999.9 | 0.1 | ± (0.5%rdg + 2dgt) |

### AC TRMS Voltage

| Range (V) | Resolution (V) | Accuracy |
|---|---|---|
| 50.0 ÷ 265.0 | 0.1 | ± (0.5%rdg + 2dgt) |

Max crest factor: 1.5

### DC Current (by external transducer clamp)

| Range (mV) | Resolution (mV) | Accuracy |
|---|---|---|
| -1100 ÷ -5 | 0.1 | ± (0.5%rdg + 0.6mV) |
| 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 | ± (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 ≤ 10 | 0.001 | 0.05 | 0.01 |
| 10< FS ≤ 100 | 0.01 | 0.5 | 0.1 |
| 100< FS ≤ 1000 | 0.1 | 5A | 1 |

### DC Power (Vmeas > 150V)

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

Vmeas = voltage correspondent to measured power

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

| FS clamp (A) | Range (W) | Resolution (W) | Accuracy |
|---|---|---|---|
| 1< FS ≤ 10 | 0.000k ÷ 9.999k<br>10.00k ÷ 99.99k | 0.001k<br>0.01k | ± (0.7%rdg+3dgt)<br>(Imeas < 10%FS) |
| 10< FS ≤ 100 | 0.000k ÷ 9.999k<br>10.00k ÷ 99.99k | 0.001k<br>0.01k | |
| 100< FS ≤ 1000 | 0.00k ÷ 99.99k<br>100.0k ÷ 999.9k | 0.01k<br>0.1k | ±0.7%rdg<br>(Imeas ≥10%FS) |

Vmeas = voltage correspondent to measured power

## 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 ÷ 100.0 | 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) |

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## 2.2. I-V CURVE and IVCK MEASUREMENTS

### VDC Voltage @ OPC

| Range (V) (***) | Resolution (V) | Accuracy |
|---|---|---|
| 5.0 ÷ 999.9 | 0.1 | ±(1.0%rdg+2dgt) |

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

### IDC Current @ OPC

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

### Max Power @ OPC (Vmpp >30V, Impp >2A)

| Range (W) (*, **) | Resolution (W) | Accuracy |
|---|---|---|
| 50 ÷ 9999 | 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 10A x 0.7 = 7000W
(**) Test is stopped and the message "Thermal instability" occurs if the instrument detects Voltage > 700V and Current I >3A, I > -0.038*V + 37.24 - 0.5

### VDC Voltage (@ STC and OPC), IVCK

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

### IDC Current (@ STC and OPC), IVCK

| Range (A) | Resolution (A) | Accuracy (**) |
|---|---|---|
| 0.10 ÷ 10.00 | 0.01 | ±(4.0%rdg+2dgt) |

### Max Power @ STC (Vmpp >30V, Impp >2A)

| Range (W) (*, **) | Resolution (W) | Global accuracy (**) |
|---|---|---|
| 50 ÷ 9999 | 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$^2$ , spectrum AM 1.5,solar incidence vs perpendicular. ≤ ± 25°, Cells Temp. [15..65°C]
- Global 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) |

# 3. 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:** | |
| SOLAR I-V internal power supply: | 6x1.5V alkaline batteries type LR6, AA, AM3, MN 1500 |
| Autonomy of SOLAR I-V: | > 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 |
| **OUTPUT INTERFACE** | |
| PC communication port: | optical/USB |
| Interface with SOLAR-02 : | wireless RF comunication (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 |
| 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 1000V among inputs P1, P2, C1, c2 |
| Max altitude of use: | 2000m |

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