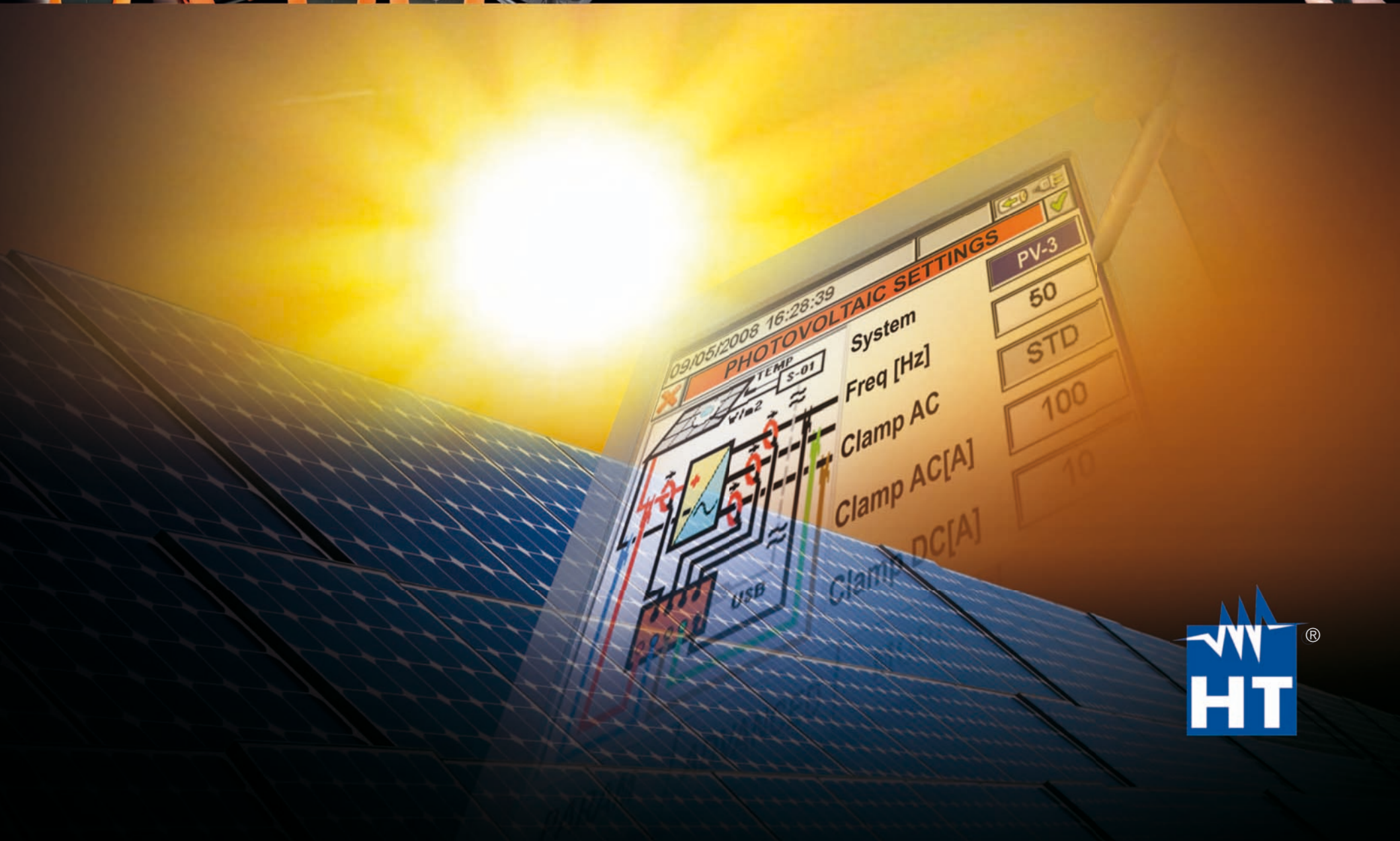
INSTRUMENTS FOR VERIFICATION ANALYSIS AND TESTING OF PHOTOVOLTAIC SYSTEMS

SOLAR200 • SOLAR300N • I-V400 • SOLAR I-V • MPP300 • THT41



HT®

Multi-string with MPP 300

see pag. 10

INSTRUMENTS FOR TESTING AND VERIFYING PHOTOVOLTAIC INSTALLATIONS	MPP 300 (NEW)	SOLAR 200	SOLAR 300N	I-V 400	SOLAR I-V (NEW)
Continuity of protective conductors with 200mA		•			
Insulation with test voltages of 50, 100, 250, 500, 1000V DC		•			
Tripping time and current of RCDs type A, AC up to 500mA		•			
Impedance Line/Loop, also with high resolution (0.1mΩ), and Ipsc calculation		•			
Total earth resistance with no RCD tripping		•			
Phase sequence		•	•		
DC/AC TRMS voltage/current on single-phase systems	•		•		•
DC/AC TRMS voltage/current on three-phase systems	•		•		
DC/AC powers on single-phase systems	•		•		•
DC/AC powers on three-phase systems	•		•		
Power factor (cos ϕ) on single-/three-phase systems			•		
Energies on single-phase and three-phase systems			•		
Recording of mains parameters with programmable IP			• (1s-60m)		• (5s-60m)
Maximum number of quantities contemporarily selectable			251		9
Harmonic analysis of voltages/currents up to the 49th order			•		
Detection of voltage anomalies (dips, peaks) in 10ms			•		
Complete analysis according to EN50160			•		
Inrush current of electric motors			•		
Voltage fast transients (spikes) with a resolution of 5µs (200kHz)			•		
Voltage unbalance (NEG%, ZERO%) and Flicker (Pst, Plt)			•		
Display of vector diagrams and waveforms of voltages/currents			•		
Indication of recording autonomy			•		
Default and customizable recordings			•		
TFT touch-screen colour display			•		
LCD custom backlit display		•		•	•
Power supply by rechargeable battery and by means of external power supplier	•		•		
Use of remote unit	•		•	•	•
Efficiency measurement/recording of single-string system	•		•		•
Efficiency measurement/recording of multi-string system up to 3 MPPTs	•		• (with MPP 300)		• (with MPP 300)
Efficiency measurement/recording of single-phase system	•		•		•
Efficiency measurement/recording of three-phase system	•		•		• (with MPP 300)
Irradiation measurement with reference solar cell			•	•	•
Temperature measurement of modules and environment			•	•	•
Detection of I-V curve of modules and strings				• (1000V, 10A)	• (1000V, 10A)
Internal database of PV modules				•	•
Measurement of modules and strings data (Voc, Vmpp, Impp, Isc, Pmax, FF, Dpmax)				•	•
Auto power off	•	•	•	•	•
Memory capacity	2 Mbyte	500 locations	1 month @ PI=15min, 251 par	> 200 curves	> 200 curves 8 days @ PI=10min
Extension of internal memory with external Compact Flash			•		
USB port for connection of external memory sticks			•		
PC interface with software for Windows		• (optical/USB)	• (USB)	• (optical/USB)	• (optical/USB)
Context-sensitive help on the display		•	•	•	•
Saving of recordings and instant values			•	•	•
Dimensions (LxWxH) (mm)	300x265x140	235x165x75	235x165x75	235x165x75	235x165x75
Weight (batteries included) (Kg)	2,3 Kg	1,2 Kg	1 Kg	1,2 Kg	1,3 Kg
Safety in compliance with IEC/EN61010-1	•	•	•	•	•

SOLAR 300N

MULTIFUNCTION INSTRUMENT FOR TESTING SINGLE-PHASE AND THREE-PHASE PHOTOVOLTAIC SYSTEMS AND ANALYZING MAINS QUALITY IN COMPLIANCE WITH STANDARD EN50160

SOLAR 300N allows carrying out all tests required for the verification of the efficiency of single-phase and three-phase photovoltaic systems. Testing photovoltaic systems requires contemporarily measuring environmental parameters (incident irradiation of modules, temperature of environment and modules) and electric parameters (continuous power, alternating power, etc.). Typically, modules and inverter can be positioned even at several tens of meters of distance, thus forcing the operator to carry out measurements in different places far from each other at the same time. To carry out these operations, connections by means of long cables or (wireless) radio connections could be necessary, but both these solutions are not acceptable. Cables could hamper the operator's movements or be a hindrance, while radio waves would be attenuated by floors, reinforced concrete or metal structures, thus making communication impossible.In order to avoid the above-mentioned problems and to carry out measurements with the necessary contemporaneity, SOLAR 300N is provided with a remote unit, synchronized with the main unit. The remote unit is positioned next to the photovoltaic modules and it is connected to the probes for measuring environmental parameters (irradiation and temperature). SOLAR 300N is connected upstream and downstream of the inverter in order to acquire the electric parameters (continuous power and alternating power). The synchronization between the two units guarantees the necessary contemporaneity of measurements, the two separate and independent units make measurements comfortable and safe.

The instrument can be interfaced with accessory MPP300, which extends the characteristics of SOLAR 300N by enabling recordings on single-phase and three-phase, single-string and multi-string (up to three strings), single-inverter and multi-inverter photovoltaic systems (therefore also in three-phase systems provided with three single-phase inverters).

SOLAR 300N is also a powerful instrument for the complete analysis of mains quality in compliance with standard EN50160 (harmonic analysis, analysis of voltage anomalies, Flicker, unbalance, etc.). The management software TopView also provides the possibility of creating professional reports, which can be customized by adding the company's logo, the customer's data, comments, etc.

(multi-string with MPP 300 - see pag. 10)

FUNCTIONS

- DC/AC TRMS (single/three-phase) voltage measurement
- DC/AC TRMS (single/three-phase) current measurement
- DC/AC (single/three-phase) power measurement
- AC (single/three-phase) energy measurement
- Measurement of power factor (single/three-phase)
- Measurement of solar irradiation [W/m^2]
- Measurement of environmental and module temperature
- Three-phase up to three strings PV systems (with MPP300)
- Recording of voltage and current harmonics up to the 49th
- Recording of voltage anomalies (dips, peaks)
- Flicker analysis in compliance with standard EN50160
- Recording of starting currents with a resolution of 10ms
- Recording of fast voltage (spikes) with a resolution of 5µs
- Analysis of mains quality in compliance with EN50160
- Numerical and graphical display of each quantity
- Recalling results on the display
- TFT colour display with touch screen
- Power supply with rechargeable Li-ION battery
- Memory extension by means of CF card
- Data transfer to external USB memory (memory stick)
- USB port for PC connection
- Help on line on the display

GENERAL CHARACTERISTICS

Display:	TFT, 65536 colours, (320x240pxl), high contrast, touch screen
Power supply:	1x3.7V rechargeable Li-ION battery with external power supply, duration > 6h, auto power off after 5 min in stand-by
Internal memory:	15Mbyte (duration approximately 3 months @ IP = 15min and 251 parameters selected)
Memory extension:	compact flash (CF card)
PC interface:	USB 2.0
Safety:	IEC/EN61010-1
Insulation:	double insulation
Pollution degree:	2
Measurement category:	CAT IV 600V (to earth) CAT III 1000V (between inputs)
Unbalance:	IEC/EN61000-4-7
Power quality:	IEC/EN50160
Flicker:	IEC/EN61000-4-15
Electric power quality:	IEC/EN61000-4-30 Classe B
Dimensions:	235x165x75mm
Weight (with battery):	approx. 1kg

WITH TOUCH SCREEN

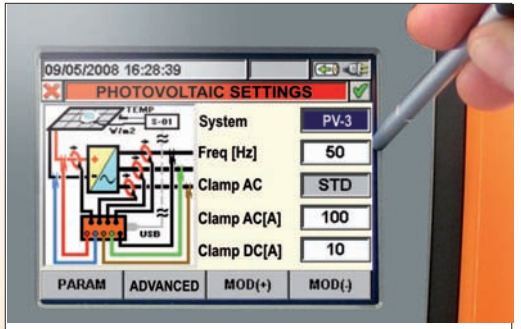
SOLAR 300N
HV00300N

Some standard accessories

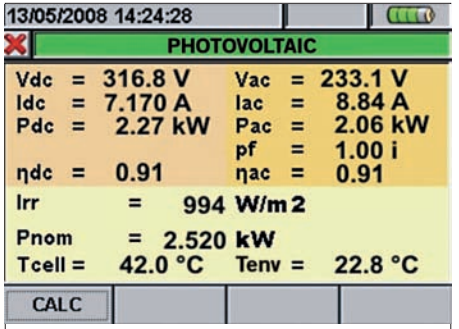
HT4004N

ACCESSORIES SUPPLIED	Code
Series accessories	
Remote unit to record irradiation and temperature	SOLAR-02
Kit of 5 cables + alligator clips for voltage measurement	KIT800
Transducer for AC 0÷200A, diameter 40mm, 3 pcs	HT4005K
Transducer for AC/DC currents 0÷10 - 0÷100A, diameter 32mm	HT4004N
Sensor for irradiation measurement	HT304
Probe PT1000 for panel temperature	PT300N
AC/DC power supply	A0055
Rechargeable 3.7V Li-ION battery	
Touch-screen pen	PT400
Widows software + USB cable	TOPVIEW2007
Rigid transport suitcase	VA400
User manual on CD-ROM	
Rapid user guide	
Calibration certificate ISO9000	
Opzional accessories	
Multi-string three-phase adaptor	MPP300
Unbatteried transducer for AC/DC currents 0÷10A, 0÷100A, max. diameter 32mm*	HT4004P
Transducer for AC currents 0÷5 - 0÷100 A, diameter 20mm	HT4005N
Rigid clamp AC 1-100-1000A/1V, diameter 54mm	HT96U
Rigid clamp AC 10-100-1000A/1V, diameter 54mm	HT97U
Rigid clamp DC 1000A/1V, diameter 50mm	HT98U
Rigid clamp AC 200-2000A/1V, diameter 70mm	HP30C2
Rigid clamp AC3000A/1V, diameter 70mm	HP30C3
Flexible clamp AC 3000A, diameter 174mm (**)	HTFLEX33D
Flexible clamp AC 3000A, diameter 274mm (**)	HTFLEX35
Interface 3x1-5A/1V for connection of external CTs	HT903
Kit of belts for slinging the instrument over one's shoulder	SP-0400
Connector with magnetic tip	606-IECN

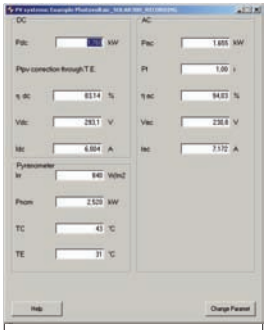
(*) to be used with MPP300 only (**) only for using the instrument as mains analyzer



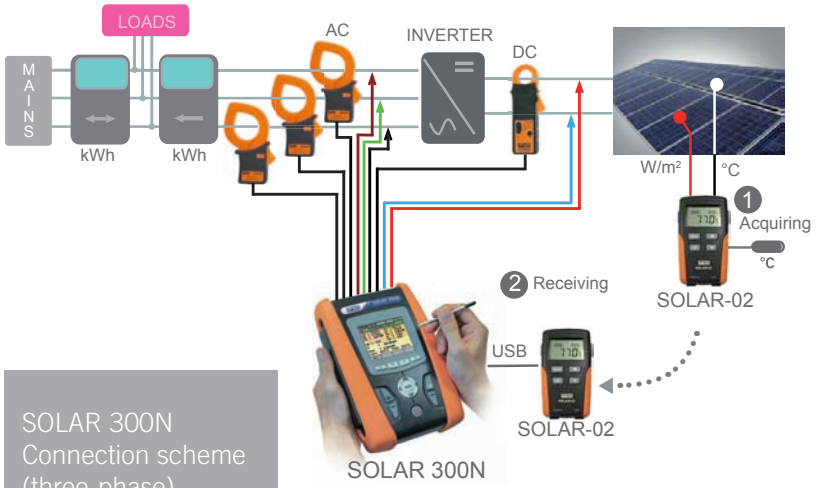
Graphical touch-screen display



Testing result on the display of SOLAR 300N



Testing result on TopView software



SOLAR 300N
Connection scheme
(three-phase)

Professional transport suitcase

HT4005K (3 pcs)

SOLAR-02

HT304

I-V 400

MULTIFUNCTION INSTRUMENT FOR VERIFICATION OF I-V CHARACTERISTIC OF PHOTOVOLTAIC STRINGS AND MODULES

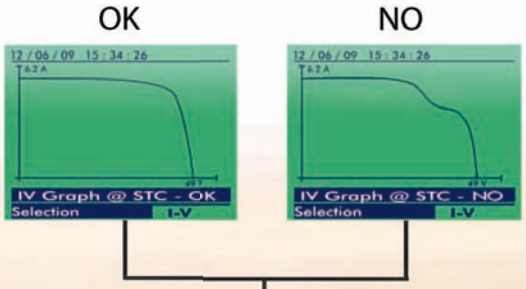
I-V 400 is the ideal solution for the ordinary and scheduled maintenance of photovoltaic systems. With I-V 400, searching for possible failures and problems in systems is extremely rapid, efficient and intuitive. I-V 400 carries out the field measurement of the I-V characteristic and of the main characteristic parameters both of a single module and of module strings. The instrument measures, together with the I-V characteristic of the device being tested, also the values of its temperature and incident irradiation. The acquired data are then processed to extrapolate the I-V characteristic at standard test conditions (STC) in order to proceed with the comparison with the nominal data declared by the modules' manufacturer, thus immediately determining whether or not the string or the module being tested respects the characteristics declared by the manufacturer.

In some PV installations, such as roof-top installations, it may be difficult to access the module output cables. An access to the cables at the combiner box or at the inverter's inputs may be the only chance. In this case the measurement of I-V characteristics can be achieved by measuring the environmental parameters (irradiation and temperature) through the remote optional unit SOLAR-02. The remote unit is positioned next to the photovoltaic modules and it is connected to the probes for measuring environmental parameters. The synchronization between the two units guarantees the necessary contemporaneity of measurements making possible the extrapolation of the I-V curve at STC without using long extension cords cable.

Output current or voltage from the module or string is measured with the 4-terminal method, which allows extending the measurement cables without requiring any compensation for their resistance, thus always providing accurate and precise measurements. In its internal memory, I-V 400 manages a database of photovoltaic modules, which can be updated at any time both via the management software and directly on the instrument. Together with the measurement of the I-V characteristic and the extrapolation of the characteristic at standard test conditions, I-V 400 compares the obtained values with the values declared by the manufacturer, immediately providing the OK / NO result of the test. The operator must not do any calculation, nor any difficult operation. The instrument carries out the comparison rapidly and automatically.

FUNCTIONS

- Meas. of output voltage from module/string up to 1000V DC
- Meas. of output current from module/string up to 10A DC
- Measurement of solar irradiation [W/m2] with reference cell
- Measurement of module temperature, automatic or by means of external probe
- Meas. of output DC and nominal power of module/string
- Synchronization with remote unit SOLAR-02
- Numerical and graphical display of I-V characteristic
- Measurement of the resistance of photovoltaic module series
- Mechanical inclinometer for the detection of the incidence angle of solar irradiation
- 4-terminal measuring method
- Extrapolation to standard test conditions (STC)
- Evaluation of testing result: OK / NO
- Management of up to 30 types of photovoltaic modules in the internal database
- Internal memory for data saving
- Recalling results on the display
- Optical/USB port for PC connection
- Help on line on the display



Some standard accessories

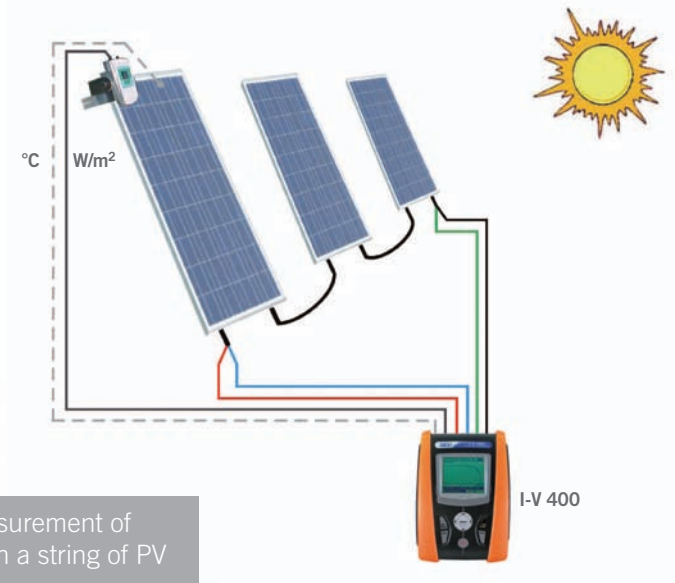
HT304

M304

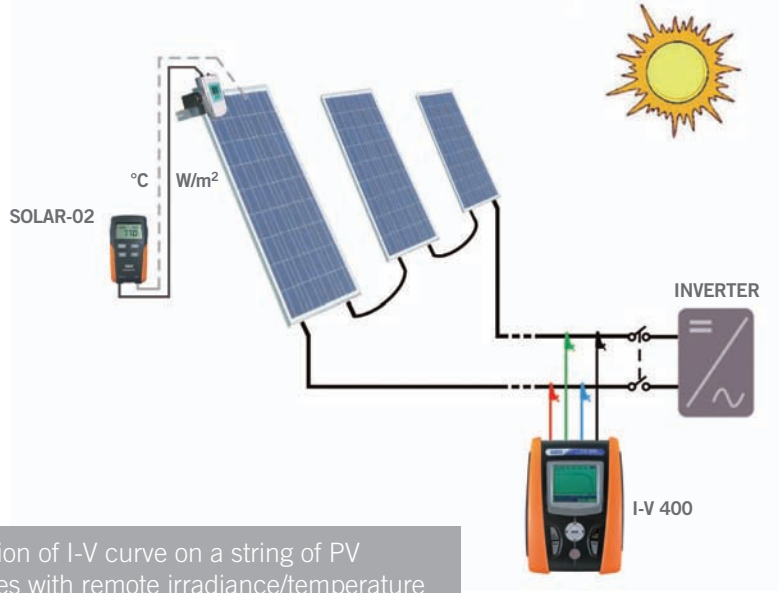
I-V 400
HV00400V

GENERAL CHARACTERISTICS	
Display:	LCD Custom, 128x128pxl, backlit
Power supply:	6x1.5V alkaline bat. type AA LR06
Auto power off:	after 5 minutes in stand-by
Internal memory:	256kBytes
Curves which can saved:	> 200
PC interface:	optoisolated optical/USB port
Safety:	IEC/EN61010-1
Measuring accessory safety:	IEC/EN61010-031, IEC/EN10-032
Measures:	IEC/EN 60891
Insulation:	double insulation
Pollution degree:	2
Measurement category:	CAT II 1000V, CAT III 300V (to earth) Max 1000V between inputs
Dimensions:	235x165x75mm
Weight (batteries included):	1.2kg

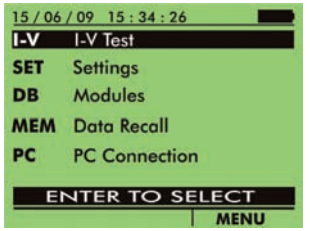
ACCESSORIES SUPPLIED	Code
Series accessories	
Kit of 4 cables with 4mm banana plugs + 4 alligator clips	KITGSC4
Kit of 2 adapters with MC3 compatible connectors	KITPVMC3
Kit of 2 adapters with MC4 compatible connectors	KITPVMC4
Reference cell for irradiation measurement	HT304
Mechanical inclinometer	M304
Windows software + optical/USB cable C2006	TOPVIEW2006
Transport bag	BORSA2051
User manual	
Calibration certificate ISO9000	
Opzional accessories	
Probe PT1000 for cell temperature measurement	PT300N
Kit of belts for slinging the instrument over one's shoulder	SP-0400
Remote unit to record irradiation and temperature	SOLAR-02
KIt of 2 cables banana 4mm, green/black, 25m	KITPVEXT25M
Rigid transport suitcase	VA400



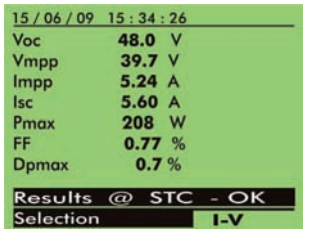
Direct measurement of I-V curve on a string of PV modules



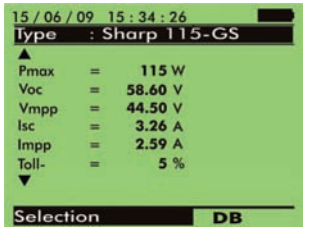
Detection of I-V curve on a string of PV modules with remote irradiance/temperature measurements



Simple and intuitive user interface



Numerical display of results with OK result



Creation of a cutomizable database of photovoltaic modules

SOLAR I-V

MULTIFUNCTION INSTRUMENT FOR TESTING AND VERYFYING SINGLE-PHASE PHOTOVOLTAIC INSTALLATIONS

SOLAR I-V has been designed to meet any requirement of photovoltaic installation specialists. Further to providing the possibility of measuring and recording the efficiency of single-string and single-phase photovoltaic systems, SOLAR I-V also measures the I-V characteristic both of a single module and of module strings.Thanks to SOLAR I-V, the operator can test the photovoltaic system and, should it give a negative result, immediately identify the problems of the system in order to promptly solve them. SOLAR I-V is provided with the remote unit SOLAR-02 which permits the remote measuring of irradiation and temperature with preliminary automatic synchronization between main unit and remote unit. SOLAR-02 is positioned next to the photovoltaic modules and it is connected to the probes for measuring environmental parameters. The synchronization between the two units guarantees the necessary contemporaneity of measurements. In the case of PV efficiency recordings, this grants the right efficiency calculation. For I-V curve measurements, the synchronization permits to extrapolate the I-V curve at STC without using long extension cords cable. SOLAR I-V allows carrying out efficiency recordings over time with programmable integration period from 5 seconds to 60 minutes. Each value is automatically saved in the internal memory and can be downloaded onto the PC for subsequent analyses. The measured I-V characteristic is not affected by the resistance of the measurement cables, as the measurement is carried out with the 4-terminal measuring method. SOLAR I-V also manages a database of photovoltaic modules, which can be updated at any time. The measured values, correctly reported at standard test conditions, are immediately compared with the values declared by the manufacturer to give the OK / NO result of the test. The operator must not do any calculation, the instrument carries out the comparison rapidly and automatically.
The instrument can be interfaced with accessory MPP300, which extends the characteristics of SOLAR I-V by enabling recordings on single-phase and three-phase, single-string and multi-string (up to three strings), single-inverter and multi-inverter photovoltaic systems (therefore also in three-phase systems provided with three single-phase inverters).

(multi-string with MPP 300 - see pag. 10)

FUNCTIONS

Photovoltaic installation testing
- Measurement of DC/AC TRMS voltage and current
- Measurement of DC/AC powers on single-phase systems
- Measurement of solar irradiation [W/m²] with reference cell
- Measurement of environmental and module temperature by means of external probe
- Synchronization with remote unit SOLAR-02
- Display of real-time irradiation and temperature
- Use of PDC compensation ratios according to environmental and module temperature
- Three-phase up to three strings PV systems (with MPP300)
- Recording of parameters with programmable IP (5s – 60min)

I-V characteristic measurement
- Meas. of output voltage from module/string up to 1000V DC
- Meas. of output current from module/string up to 10A DC
- Measurement of solar irradiation [W/m²] with reference cell
- Measurement of module temperature, automatic or by means of external probe
- Meas. of output DC and nominal power from module/string
- Synchronization with remote unit SOLAR-02
- Numerical and graphical display of I-V characteristic
- Measurement of the resistance of photovoltaic module series
- Mechanical inclinometer for the detection of the incidence angle of solar irradiation
- 4-terminal measuring method
- Extrapolation to standard test conditions (STC)
- Evaluation of testing result: OK / NO
- Management of up to 30 types of photovoltaic modules in the internal database

Common characteristics
- Internal memory for data saving
- Recalling results on the display
- Optical/USB port for PC connection
- Help on line on the display

Some standard accessories


HT4004N


HT4005K


SOLAR-02


HT304


M304

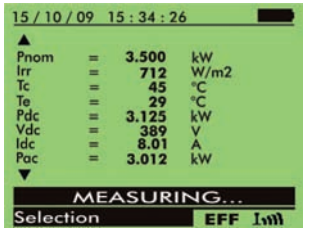
GENERAL CHARACTERISTICS

Display:	LCD custom, 128x128pxl, backlit
Power supply:	6x1.5V alkaline bat. type AA LR06
Auto power off:	after 5 minutes in stand-by
PV testing duration:	1.5 hours (@IP=5s); 8 days (@IP=10min)
Curves which can be saved:	> 200 curves
PC interface:	optoisolated optical/USB port
Safety:	IEC/EN61010-1
Measuring accessory safety:	IEC/EN61010-031, IEC/EN61010-032
Measures on PV modules:	IEC/EN60891
Insulation	double insulation
Pollution degree:	2
Measurement category:	CAT II 1000V DC, CAT III 300V (to earth) Max 1000V between inputs
Dimensions:	235x165x75mm
Weight (batteries included):	1.3kg

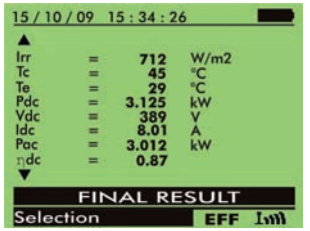
NEW

SOLAR I-V
HV0000IV

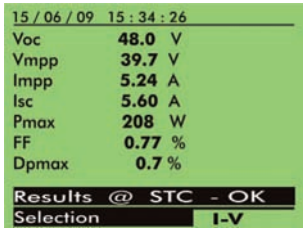
ACCESSORIES SUPPLIED	Code
Series accessories	
Remote unit to record irradiation and temperature	SOLAR-02
Kit of 4 cables with 4mm banana plugs + 4 alligator clips	KITGSC4
Kit of 2 adapters with MC3 compatible connectors	KITPVMC3
Kit of 2 adapters with MC4 compatible connectors	KITPVMC4
Transducer for AC 0÷200A, diameter 40mm	HT4005K
Transducer for AC/DC currents 0÷10 - 0÷100A, diameter 32mm	HT4004N
Reference cell for irradiation measurement	HT304
Probe PT1000 for environmental and module temperature	PT300N
Mechanical inclinometer	M304
Windows software + optical/USB cable C2006	TOPVIEW2006
Transport bag	BORSA2051
User manual on CD-ROM	
Calibration certificate ISO9000	
Rapid user guide	
Opzional accessories	
Multi-string three-phase adaptor	MPP300
Unbatteried transducer for AC/DC currents 0÷10A, 0÷100A, max. diameter 32mm*	HT4004P
Transducer for AC currents 0÷5 - 0÷100 A, diameter 20mm	HT4005N
Rigid clamp AC 1-100-1000A/1V, diameter 54mm	HT96U
Rigid clamp AC 10-100-1000A/1V, diameter 54mm	HT97U
Rigid clamp DC 1000A/1V, diameter 50mm	HT98U
Kit of belts for slinging the instrument over one's shoulder	SP-0400
KIt of 2 cables banana 4mm, green/black, 25m	KITPVEXT25M
Rigid transport suitcase	VA400
Connector with magnetic tip	606-IECN
(*) to be used with MPP 300 only	



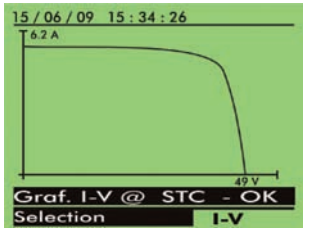
Testing / Recording in progress



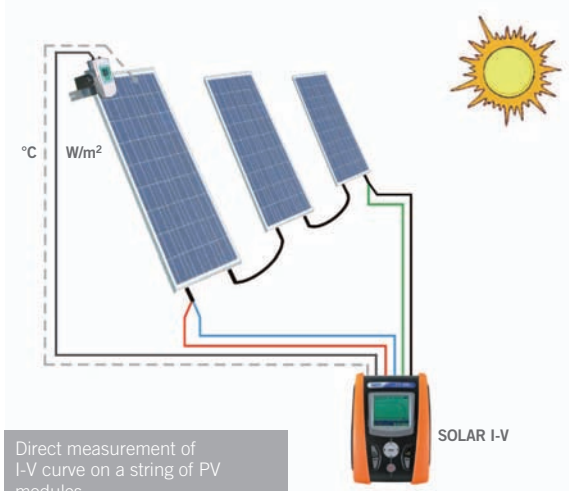
Testing result of photovoltaic system



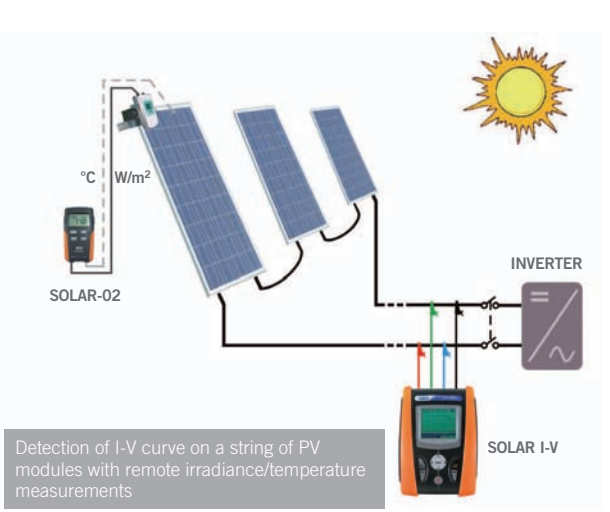
Numerical display of results with OK result



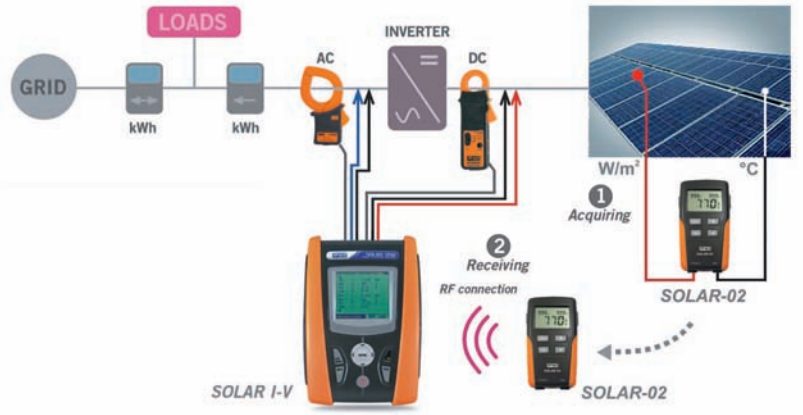
Graphical display of an I-V curve with OK result



Direct measurement of I-V curve on a string of PV modules



Detection of I-V curve on a string of PV modules with remote irradiance/temperature measurements



Connection scheme (single-phase plant)

MPP 300

ACCESSORY FOR MEASURING AND RECORDING THE EFFICIENCY OF SINGLE-PHASE AND THREE-PHASE MULTI-STRING SYSTEMS

The innovative accessory MPP300, used together with SOLAR300N or SOLAR I-V, allows measuring and recording the main parameters which characterize single-phase and three-phase, single-string and multi-string (up to three strings) photovoltaic systems. MPP300 is perfect for use in systems with three-MPPT three-phase inverter and in three-phase systems provided with three single-phase inverters.
MPP300 is provided with a practical anti-shock "field" case, lightweight and small in size. The front panel carries the LEDs for operating information and the DC and AC inputs for upstream and downstream connection of the inverter(s). MPP300 interfaces with SOLAR300N via USB connection and SOLAR I-V via wireless connection. SOLAR300N and SOLAR I-V are used for MPP300 settings, to start/stop recording electrical and environmental parameters and to enable the download of the recorded values.
The distance between the photovoltaic modules and the inverter is often considerable, and this forces the operator to carry out measurements in different places at the same time. Therefore, it would be necessary to lay long connection cables between the environmental probes and the instrument. These cables could hamper the operator's movements, be a hindrance, etc. This kind of connection is therefore not acceptable. In case of photovoltaic installations on buildings, the so-called photovoltaic roofs, in addition to the problem of the distance between modules and inverter, the presence of floors, of reinforced concrete or metal structures, etc. must be taken into consideration. These structures would make a possible (wireless) radio connection between the environmental probes and the instrument impossible, because of signal attenuation.
In order to avoid the above-mentioned problems and to carry out measurements with the necessary contemporaneity, MPP300 is synchronized with the remote unit SOLAR-02 (provided as standard accessory of master instrument SOLAR300N or SOLAR I-V). The remote unit SOLAR-02 is positioned next to the photovoltaic modules and it is connected to the probes for measuring environmental parameters (irradiation and temperature). MPP300 is connected upstream and downstream of the inverter in order to acquire the electric parameters (continuous power and alternating power).
The synchronization between the two units guarantees the necessary contemporaneity of measurements, the two separate and independent units make measurements comfortable and safe.

The master instrument SOLAR300N or SOLAR I-V is only used in the initial and final phase of recording, and it does not play any active role while recording electrical and environmental parameters. Therefore, while MPP300 and SOLAR-02 respectively record the electrical and environmental parameters of the system being measured, it is possible to use the master instrument SOLAR300N or SOLAR I-V for carrying out other measurements. For example, with SOLAR I-V it is possible to measure the I-V characteristics of strings and modules.

FUNCTIONS

- DC/AC TRMS voltage meas. (single-phase and three-phase)
- DC/AC TRMS current meas. (single-phase and three-phase)
- DC/AC power measurement (single-phase and three-phase)
- Power factor measurement (single-phase and three-phase)
- Simultaneous measurements up to 3 strings (max 3 MPPT)
- Connection with master unit SOLAR300N and SOLAR I-V
- Power supply with rechargeable Li-ION battery
- LED operating indications
- USB port for connection to unit SOLAR300N
- RF connection for connection to SOLAR-02 and SOLAR I-V
- Internal memory for saving recordings

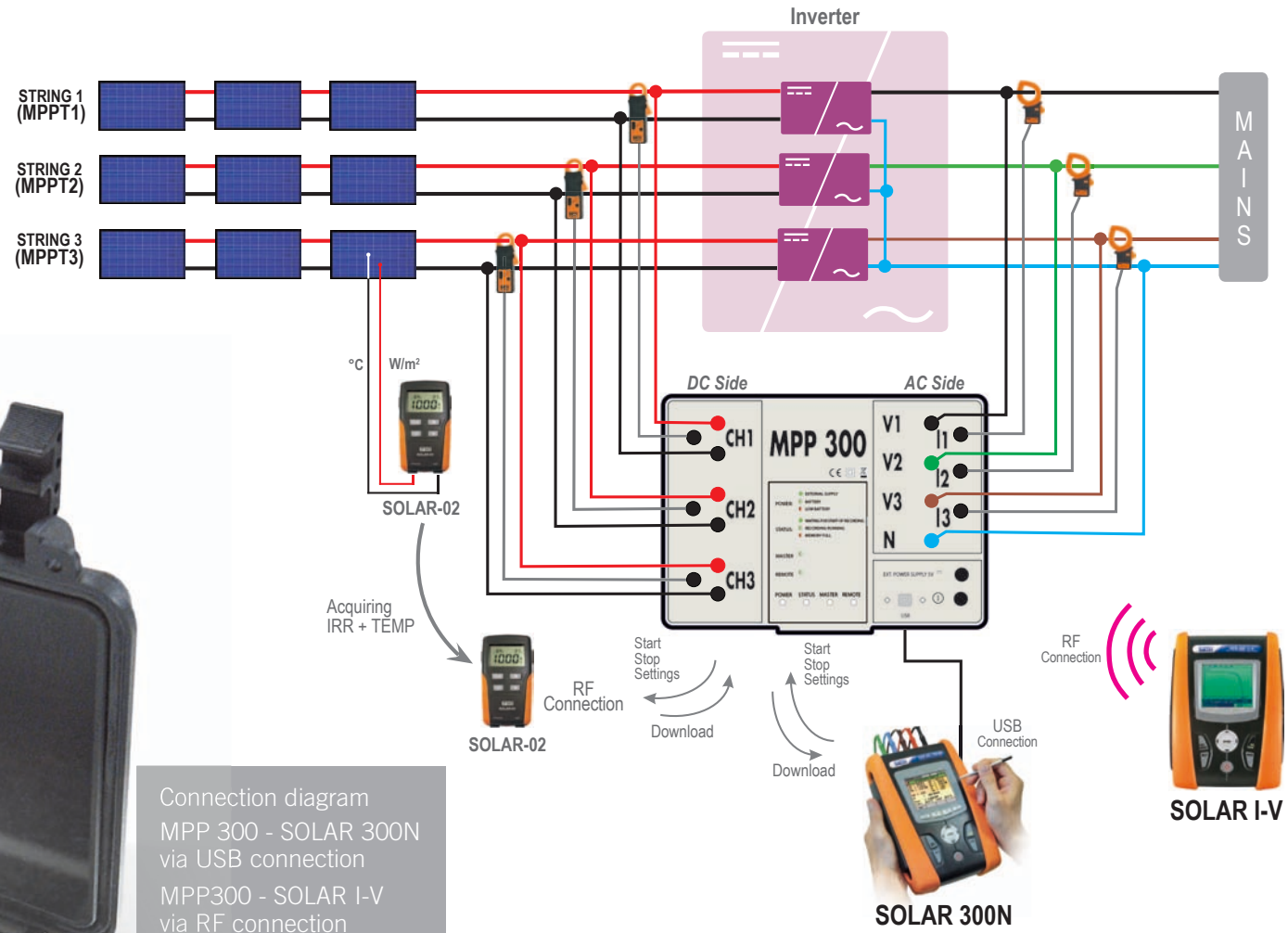
GENERAL CHARACTERISTICS

Inputs:	3 DC voltage channels (CH1, CH2, CH3), 3 DC current inputs (CH1, CH2, CH3), 4 AC voltage inputs (L1, L2, L3, N), 3 AC current inputs (L1, L2, L3)
Front panel:	4 two-colour LEDs (green, red)
Power supply:	Rechargeable Li-ION battery. Duration > 3 hours
Internal memory:	2 MBytes
External interface:	USB + RF
Safety:	IEC/EN61010-1
Insulation:	double insulation
Pollution level:	2
Mechanical protection:	IP40 (open), IP65 (closed)
Measurement category:	CAT IV 300 V AC (to earth), 600 V AC (between inputs) CAT III 1000 V DC (to earth), 1000 V DC (between inputs)
Size:	300 x 265 x 140 mm
Weight (battery included):	2.3 kg

ACCESSORIES PROVIDED	Code
Series accessories	
Set of 2 cables, 2m, for DC voltage measurement, 3pcs	KITMPPDCW
Set of 2 alligator clips for DC voltage measurement, 3pcs	KITMPPDCC
Set of 4 cables, 2m, for AC voltage measurement	KITMPPACW
Set of 4 alligator clips for AC voltage measurement	KITMPPACC
Rechargeable Li-ION battery	
AC/DC battery charger power supply	A0055
USB cable	C2007
Carrying bag for accessories	BORSA2051
User manual on CD-ROM	
Quick guide for use	
ISO9000 calibration certificate	
Opzional accessories	
Transducer for AC 0÷200A, diameter 40mm	HT4005K
Unbatteried transducer for AC/DC currents 0÷10A, 0÷100A, max. diameter 32mm	HT4004P
Rigid clamp AC 1-100-1000A/1V, diameter 54mm	HT96U
Rigid clamp AC 10-100-1000A/1V, diameter 54mm	HT97U
Rigid clamp DC 1000A/1V, diameter 50mm	HT98U
Rigid clamp AC 200-2000A/1V, diameter 70mm	HP30C2
Rigid clamp AC3000A/1V, diameter 70mm	HP30C3
Flexible clamp AC 3000A, diameter 174mm	HTFLEX33D
Flexible clamp AC 3000A, diameter 274mm	HTFLEX35
Connector with magnetic tip	606-IECN

Useful carrying case for transport

Multi-string PV plant tested by means of MPP 300



Connection diagram
MPP 300 - SOLAR 300N via USB connection
MPP300 - SOLAR I-V via RF connection

NEW

MPP 300
HVMPP300

SOLAR 200

MULTIFUNCTION INSTRUMENT FOR SAFETY VERIFICATION OF SINGLE-PHASE AND THREE-PHASE PHOTOVOLTAIC SYSTEMS

SOLAR200 is an innovative instrument designed for carrying out electrical safety verifications on photovoltaic systems in compliance with the relevant safety requirements. The instrument is very easy to use and has a wide range of functions which can be selected by means of the simple multi-language menu. Measurements can be started both by pressing the button located on the instrument body and by pressing the button located on the remote probe (optional accessory PR400) which makes carrying out more measurements in sequence very simple. The help on line, which can be selected by the user and is active for any function, is a valid support for the connection of the instrument to the system to be tested. SOLAR200 is provided with an internal memory and an optical/USB interface for PC connection and for transferring measured data, which can be analyzed with the dedicated software.

FUNCTIONS

- Continuity of protective conductors with 200mA
- Insulation with test voltages of 50, 100, 250, 500, 1000VDC
- Tripping time of RCDs type A, AC, general and selective, with nominal current up to 500mA
- Tripping current of RCDs type A, AC, general and selective, with nominal current up to 500mA
- Impedance of Loop/Line P-N, P-P, P-PE, also with high resolution (0,1mΩ with optional accessory IMP57), and Ipsc calculation.
- Total earth resistance with no RCD tripping
- Contact voltage
- Phase sequence
- Activation of measurements with optional remote probe PR400
- Help on line on the display
- Saving of results
- Optical/USB interface for PC connection

GENERAL CHARACTERISTICS

Display:	LCD custom, backlit
Power supply:	6x1.5V alkaline bat. type AA IEC LR06
Internal memory:	500 locations
PC interface:	optoisolated optical connector
Safety:	IEC/EN61010-1
Insulation:	double insulation
Pollution degree:	2
Measurement category:	CAT III 240V (to earth), CAT III 415V (between inputs)
Reference standards:	IEC/EN61557-1
Dimensions:	235x165x75mm
Weight (bat. included):	approx. 1.25kg

ACCESSORIES SUPPLIED	Code
Series accessories	
Cable with three-pin shuko plug	C2033X
Kit of 3 cables + 3 alligator clips + 1 probe	UNIVERSALKIT
Transport bag	BORSA75
User manual	
Calibration certificate ISO9000	
Optional accessories	
Windows software for PC + optical/USB cable	TOPVIEW2006
Remote probe for test activation	PR400
Accessory for measuring loop impedance with high resolution	IMP57
Kit of belts for slinging the instrument over one's shoulder	SP-0400

SOLAR200
HV000200

IMP57
Accessory for measuring loop impedance with high resolution

PR400
Remote probe

THT41

INFRARED THERMAL CAMERA FOR PROFESSIONAL USE

THT41 is a hand-held infrared camera developed to quickly become the technician's best friend. In a rugged and ergonomic design, THT41 is robust and shock-resistant for any working environment. The instrument has a colour LCD display, saves the images on SD-card in standard JPG format. It also allows transferring the data onto the PC via USB interface. THT41 is specifically designed for products predictive maintenance, electrical inspections, non-destructive testing, process control applications, quarantine inspection. security monitoring solutions, firefighting finding and rescue, building energy testing and diagnostics, veterinarian helper, etc.

ACCESSORIES	Code
Standard accessories	
11mm lens and protection cover	
2GB SD card and card reader	
12 AA rechargeable batteries	
AC adapter	
USB extension cable	
USB driver	
Wirst strap	
Windows ThermoVIewPRO software	
User manual	
ISO9000 calibration certificate	
Safety case	
Optional accessories	
Sun shield	SSHIELD49
Universal tripod adapter	TRIPO49

GENERAL CHARACTERISTICS	
Measuring range:	-20°C ÷ 250°C
Thermal sensitivity:	0.1°C @ 30°C
Field of view (FOV):	21°x16° (11mm lens)
Precision:	±2%reading or ±2°C
IR sensor resolution:	160x120pxl
TFT colour display:	LCD, 3.6"
Focusing:	manual
Image frequency:	50Hz
Emissivity correction:	0.01 ÷ 1.00
Measuring cursors:	hot / cold point
Measuring functions:	correction according to distance, reflected temperature, relative humidity
Storage of images:	SD Card 2GBytes
Image format:	standard JPG
Saved images:	> 1000
Power supply:	6x1.2V NiMH batteries type AA
Duration:	> 2 hours
Mechanical protection:	IP54
Size (LxWxH):	240 x 111 x 124mm
Weight (batteries included):	0.73kg

Complete set for transport of accessories

Thermal image of defective PV modules

NEW

THT41
HN000041

Q1

UNIVERSAL CRIMP TOOL

Special tool for cabling photovoltaic systems. It has the following characteristics:
- in hardened and tempered chrome-vanadium steel
- handles in non-slip material, two components
- interchangeable dies and locators allow working with different types of connectors with a single tool

The high-precision crimp tool Q1 has been designed to guarantee professional connections with a single manual tool. The tightening force is multiplied thanks to an internal system of levers which allows a 30% reduction of the force normally necessary. Q1 is provided with a practical case in anti-shock resin without dies and without locators, with:
- crimp tool Q1
- L wrench for die assembly
- adjustable wrench

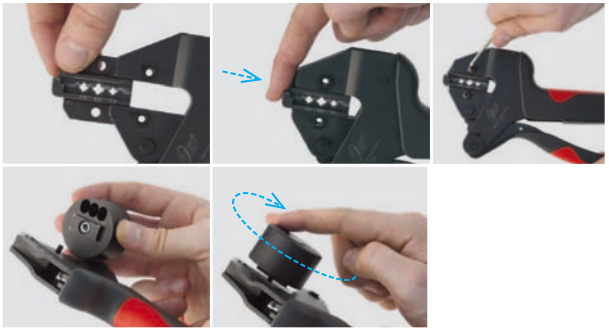
Customization according to requirements with the available dies and locators (special dies available on demand)

Interchangeable dies and locators

Thanks to the locator, the terminal is always crimped in the correct position, thus simplifying the operation, without the need to use “three hands” for crimping. A wide range of dies is available, in order to satisfy the requirements of most modern connectors.

DIES					
Type of connector	MC3	MC4	Tyco	Huber & Shuner	Huber & Shuner
Metel code	HU000664	HU000662	HU000660	HU000692	HU000671
Diameter (mm^2)	2,5/4,0/6,0	2,5/4,0/6,0	1,5/2,5/4,0/6,0	2,5/4,0	4,0/6,0

LOCATORS			
Type	MC3	MC4	Tyco
Metel code	HU000663	HU000661	HU000559



Q1
HU000676

Q2

SPECIAL TOOL FOR MC3 ASSEMBLY (inserting the rubber connector onto the crimped cable)

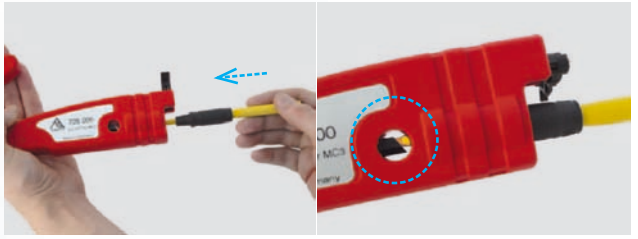
Q2 is a practical clamp for mounting connector MC3 once the terminal has been crimped to the cable. The 3 thimbles provided allow assembly on cables with different diameters (from 2.5 to 10 mm2). Thanks to its small size (325 mm) and its weight (460 g), this tool can be used directly on site and even on a roof. Lightweight and portable, it is made of anti-shock plastic.

Mounting examples of MC3 with Q2

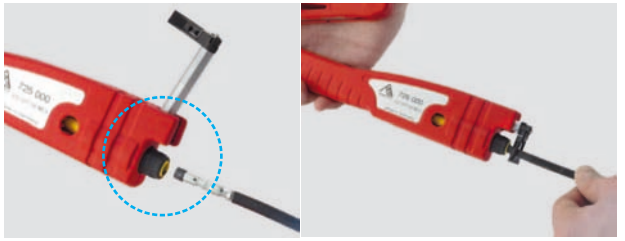
Prepare crimped connector MC3 and the insulating connector (male or female)

Choose the thimble according to cable diameter

With the right hand, completely insert the MC3 connector into the thimble



Insert the thimble with the connector into the appropriate housing for the cable



Press the clamp until the thimble is completely inserted in the connector and insert the crimped cable, and fasten it with the relevant cable holder.

Continue pressing the tool until no resistance is felt. Then remove the cable by extracting the relevant cable holder. By using this innovative tool, it is possible to cable systems directly on site, thus saving installation times and costs.

NEW

TOP QUALITY MADE IN GERMANY

MOUNTING OF MC3 INNOVATIVE AND SIMPLY

Built-in thimbles

Inspection window

Cable housing and holder

Safety closure

Q2
HU000675

GEF PROFESSIONAL TOOLS

Photovoltaic installations are becoming more and more popular

Why to use a reference cell

Photovoltaic modules partially convert solar radiation into electric power. The efficiency of photovoltaic modules is strongly affected by several factors such as:
- operating temperature of modules;
- manufacturing technology of modules;
- angles at which solar radiation hits the modules' surface;
- spectral composition of solar radiation; etc.
It is obvious that, to properly evaluate the performance of the photovoltaic modules under test, it is necessary to measure the solar radiation which they are subject to by means of a transducer with features similar to the modules' ones. Using a sensor with a different manufacturing technology could lead to inconsistent measurements of solar radiation, and consequently to incorrect measurements of the modules under test. For this reason HT photovoltaic testers are provided with the reference cell HT304 as standard accessory.
HT304 is featured as follows:
- it is provided with a built-in temperature sensor allowing compensation of the measured values;
- it is provided with two sensors made of monocrystalline and polycrystalline silicon respectively to better suit the manufacturing technology of the modules to be tested;
- it better reflects the close correlation of the modules under test with the solar radiation incidence angle as well as with its spectrum composition;
- it grants a quick response the same as the photovoltaic modules.
This last feature is crucial in case of measurements taken under conditions of variable cloudiness.

While the costs of components are decreasing and their performance is significantly booming up, the photovoltaic installations are very common either on buildings' roofs or installed on the ground.

The problems involved in the installation of photovoltaic systems, however, are to be solved in terms of safety, testing and maintenance requiring specific solutions.

SAFETY WITH SOLAR 200

The photovoltaic installation is an electrical system under all respects and its safety must be certified in compliance with the regulations in force.
As the photovoltaic modules are installed outdoors and directly irradiated by the sun, they are subject to extreme environmental conditions such as hot weather in summer, frost in winter, rain and hail etc.

All this makes safety testing even more necessary.

Safety is not to be neglected in the assembly and maintenance of a photovoltaic installation.
The regulations in force state that quality marks and certification on components are not enough and that an instrumental measurement is required.

TESTING WITH SOLAR 300N AND SOLAR I-V

To apply for special tariffs the electricity user needs to provide a test certificate along with sundry documents. This document certifies that the installation ensures a minimum efficiency level. It is therefore necessary to employ measuring instruments bringing about significant practical problems.

In a typical building installation modules are usually placed on the roof and the inverter is often in the basement.

Such a condition is critical because, to test the equipment both electrical and environmental parameters are to be measured simultaneously even though very far from each other. Only the use of suitable equipment can grant correct measurements carried out in a suitable, fast and convenient way.

MAINTENANCE I-V400 AND SOLAR I-V

The outdoor installation, with consequent exposure to extreme environmental conditions, can lead to a rapid deterioration of the modules as well as a sharp decrease in the performance of the whole photovoltaic installation.

The energy produced and the consequent economic benefit can be reduced considerably. It should be advisable therefore to periodically check the installation comparing the performance of the modules as specified by their manufacturer. By measuring the module I-V feature and comparing it with the rating you can assess whether they are granting adequate performances, whether any decrease falls within the natural performance decay, or whether one or more modules are faulty.

In this case you can pinpoint the damaged modules and promptly replace them.

CONCEPT: "CAMPOVISIVO" - FAENZA ITALY STAMPA: "LABANTI & NANNI BO 03-2011

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