I-V600

ADVANCED INSTRUMENT FOR I-V CURVE
MEASUREMENT UP TO 1500V/40A

METEL **HV0IV600**

I-V600

ADVANCED INSTRUMENT FOR
I-V CURVE MEASUREMENT
UP TO 1500V/40A

TOUCHSCREEN SYSTEM

1500V
40A

- **I-V Curve 1500V / 40A** of **monofacial** and **bifacial** modules (also high efficiency)
- Colour touchscreen display with **manual rotation of the screen** so that the instrument can be used when hung upside down
- Testing of Monofacial and Bifacial modules
- Complete I-V curve measurement with detection of both the Max module/string power and **"Commissioning tests"** (rapid open-circuit voltage and short-circuit current tests according to IEC 62446)
- Internal database to manage approx. 63000 PV modules
- Comparison of results with manufacturer's nominal values (@STC) and immediate outcome (OK/NO) of measurements

TECHNICAL DATA SHEET

TECHNICAL **SPECIFICATIONS**

Measurement category		CAT III 1500 VDC
Type of PV panels - all types of panels	Monofacial	●
	Bifacial	●
I-V Curve - Voltage measuring range		3.0V - 1500V DC
I-V Curve - Current measuring range		0.2A - 40A DC
Multimeter (input voltages and environmental parameters)		●
Measurement of environmental parameters via SOLAR03 (Bluetooth connection, up to 100m in free field)	Solar irradiation	●
	Module temperature	●
Commissioning test @ OPC (OPerating Conditions) with outcome (OK/NO)	Open-circuit voltage (Voc)	●
	Short-circuit current (Isc)	●
Commissioning test @ STC (Standard Test Conditions) via SOLAR03 (Bluetooth connection, up to 100m in free field) with outcome (OK/NO)	Open-circuit voltage (Voc)	●
	Short-circuit current (Isc)	●
Performance tests / Input tests @ STC (Standard Test Conditions) via SOLAR03 (Bluetooth connection, up to 100m in free field)	I-V Curve	●
	Outcome (OK/NO)	●
PV modules database		approx. 63,000
Memory		9999 tests
PC communication / data transfer port		USB-C and WiFi
Graphic colour touchscreen		800 x 480 pxl
Screen rotation		● (manual)
Help		●
Key sound		●
Battery charging		● External power supply
Internal power supply	8 x 1.5V alkaline AA or	●
	8 x 1.2V rechargeable AA NiMH	●
Protection rating		IP67 (case closed), IP40 (case open)
Auto power off		1 ÷ 10min selectable

GENERAL **SPECIFICATIONS**

Dimensions (L x W x H)	336 x 300 x 132mm
Weight (batteries included)	5.5 kg
Operating temperature	from -10°C to 50°C ; (from 14°F to 122°F)
Operating humidity	<80% RH
Battery life (0° ÷ 40°C)	approx. 8 hours

ACCESSORIES

STANDARD **ACCESSORIES**

KIT2PRO15	Set of 2 jack-jack cables 3m + 2 crocodile clips (red and black)
KITPVMC415O	Set of 2 adapters with MC4 compatible connector and 4mm banana pin, 3m (red and black)
SP-2003	Shoulder strap
CF832	32GB memory card
A0061	Battery charger power supply unit 100-440VAC/15VDC, 50/60Hz
C2010	USB-A/USB-C 1.5m connection cable
SOLAR03	Remote unit with 1 temperature input and 3 irradiation inputs (for HT305)
HT305	Photovoltaic cell for measuring solar radiation
PT305	Temperature probe PT1000
M304	Mechanical inclinometer
SP-2002	Strap with magnetic attachment for SOLAR03
YABAT0003000	Rechargeable battery NiMH, 1.2V, AA (10 pc)
BACKPACK	Professional HT backpack for measuring instrument accessories
Calibration report	for I-V600, SOLAR03 and HT305
Quick start guide	
Complete user manual and management software available online	

OPTIONAL **ACCESSORIES**

HT305	Photovoltaic cell for measuring solar radiation
KITK2TIPS15	Set of 2 Black/Red leads with MC4 termination
YABAT0004001	External battery charger

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The **I-V600** model is an **I-V Curve** and functional test verification (Voc, Isc) instrument compliant with IEC/EN60891, IECEN60904-1-2 and IEC/EN62446 guidelines. **I-V600** tests the performance and functionality of **Monofacial** and **Bifacial** PV modules/strings.

I-V CURVE TRACER (PERFORMANCE/ACCEPTANCE TEST)

I-V600 verifies the performance of PV strings in compliance with IEC/EN60891 guideline by tracking the I-V curve on installations **up to 1500VDC** and **40ADC**. Through solar irradiation and temperature measurements of the PV modules (in wireless combination with the **SOLAR03** remote unit), I-V600 extrapolates the @STC curves (**S**tandard **T**est **C**ondition: 1000W/m2, 25°C, AM 1.5) comparing them with the ratings provided by the module manufacturer. The large internal database stores up to 1000 different manufacturers and up to 1000 modules associated with each manufacturer directly, easily programmable by touch-screen display.

FUNCTIONAL TEST (IVCK)

I-V600 verifies the functionality of PV strings in accordance with IEC/EN62446 guideline by measuring, with or without solar radiation, the open circuit voltage (Voc) and the short circuit current (Isc) in operating conditions (@OPC) **up to 1500VDC and 40ADC**. By measuring solar radiation and temperature of the PV modules (in wireless combination with the **SOLAR03** remote unit), I-V600 extrapolates the values @ STC (**S**tandard **T**est **C**ondition: 1000W/m2, 25°C, AM 1.5) and compares them with the ratings provided by the module manufacturer.

1. ELECTRICAL SPECIFICATIONS

Accuracy calculated as ±[%reading + (number dgts*resolution)] at 23°C ± 5°C, <80%RH

DMM – Multimeter function – DC Voltage

Range [V]	Resolution [V]	Accuracy
3 ÷ 1500	1	± (1.0%reading + 2dgt)

I-V CURVE TEST

DC Voltage @ OPC

Range [V]	Resolution [V]	Accuracy (*)
15.0 ÷ 1500.0	0.1	±(0.2%Voc)

(*) In compliance with IEC/EN60904-1; The measurement starts if VDC > 15V and module capacitance <30µF

DC Current @ OPC

Range [A]	Resolution [A]	Accuracy (*)
0.20 ÷ 40.00	0.01	±(0.2%isc)

(*) In compliance with IEC/EN60904-1; Iscmin = 0.2A and module capacitance <30µF

DC Power @ OPC (VDC > 30V)

Range [W]	Resolution [W]	Accuracy
50 ÷ 9999	1	±(1.0%reading+6dgt)
10.00k ÷ 59.99k	0.01k	

VDC Voltage ≥ 30V and module capacitance <30µF

DC Voltage @ STC

Range [V]	Resolution [V]	Accuracy
3.0 ÷ 1500.0	0.1	±(4.0%reading+2dgt)

DC Current @ STC

Range [A]	Resolution [A]	Accuracy
0.20 ÷ 40.00	0.01	±(4.0%reading+2dgt)

DC Power @ STC (referred @ 1 module)

Range [W]	Resolution [W]	Accuracy
50 ÷ 9999	1	±(4.0%reading+2dgt)

CAUTION

The instrument performs I-V Curve measurements and IVCK tests **even on PV modules with efficiency >19%**

FUNCTIONAL TEST (IVCK)

DC Voltage @ OPC

Range [V]	Resolution [V]	Accuracy (*)
15.0 ÷ 1500.0	0.1	±(0.2%Voc)

(*) In compliance with IEC/EN60904-1; The measurement starts if VDC > 15V and module capacitance <30µF

DC Current @ OPC

Range [A]	Resolution [A]	Accuracy (*)
0.20 ÷ 40.00	0.01	±(0.2%isc)

(*) In compliance with IEC/EN60904-1; Iscmin = 0.2A and module capacitance <30µF

DC Voltage @ STC

Range [V]	Resolution [V]	Accuracy
3.0 ÷ 1500.0	0.1	±(4.0%reading+2dgts)

DC Current @ STC

Range [A]	Resolution [A]	Accuracy
0.20 ÷ 40.00	0.01	±(4.0%reading+2dgts)

CAUTION

The instrument performs I-V Curve measurements and IVCK tests **even on PV modules with efficiency >19%**

2. GENERAL SPECIFICATIONS

DISPLAY AND MEMORY	
Characteristics:	Color TFT, capacitive touch screen, 7”, 800x480pxl
Type of memory:	Memory card, max 32GB (not expandable)
Module database:	ca. 63,000 saved modules
Storable data:	9999 test IVCK or I-V curve
POWER SUPPLY:	
Internal power supply:	8x1.5V alkaline battery type LR6, AA or 8x1.2V rechargeable battery NiMH type LR6, AA
External power supply:	100-440VAC/15VDC, 50/60Hz CAT IV 300V (**use only HT adapter)**
Consumption:	8W
Low battery indication:	“ “ symbol shown on the display
Charging time:	approx. 4 hours
Battery life (@ 0°C ÷ 40°C):	8 hours in the following conditions: ➢ Battery capacity: 2000mAh ➢ PV string voltage: 800V ➢ Work cycles: 80 measurements/hour ➢ Instrument connected to the modules for 30s/measurement ➢ Instrument disconnected for 15s/measurement
Auto Power OFF:	1 ÷ 10min selectable (disabling)
MEASUREMENT THROUGHPUT	
I-V curve measurements:	6.5MWh/hour (@Voc=1500V,Isc=40A) – approx. 108 tests/hour, no cooling required, regardless ambient temperature
OUTPUT INTERFACE	
PC interface:	USB-C and WiFi
Interface with SOLAR03:	Bluetooth connection (up to 100m in free space)
MECHANICAL CHARACTERISTICS	
Dimensions (L x W x H):	336 x 300 x 132mm (13 x 12 x 5in)
Weight (included batteries):	5.5kg (11lv)
Mechanical protection:	IP40 (open case), IP67 (closed case)
ENVIRONMENTAL CONDITIONS OF USE	
Reference temperature:	23°C ± 5°C (73°F ± 41°F)
Operating temperature:	-10°C ÷ 50°C (14°F ÷ 122°F)
Operating humidity:	<80%RH
Storage temperature:	-20°C ÷ 60°C (-4°F ÷ 140°F)
Storage humidity:	<80%RH
Max. height of use:	2000m (6562ft)
REFERENCE GUIDELINES	
Safety:	IEC/EN61010-1, IEC/EN61010-2-030,
EMC:	IEC/EN61326-1
Safety measurement accessories:	IEC/EN61010-031
I-V Test:	IEC/EN60891, IECEN60904-1-2
IVCK Test:	IEC/EN62446, IECEN60904-1-2
Insulation:	double insulation
Pollution degree:	2
Radio:	ETSI EN300328, ETSIEN301489-1, ETSIEN301489-17
Measurement category:	CAT III 1500VDC, max 1500VDC between inputs

This instrument complies with the requirements of the European Low Voltage Directive 2014/35/EU (LVD), the Directive 2014/30/EU (EMC) and the RED regulation 2014/53/EU
This instrument complies with the requirements of the European Directive 2011/65/EU (RoHS) and the European Directive 2012/19/EU (WEEE)