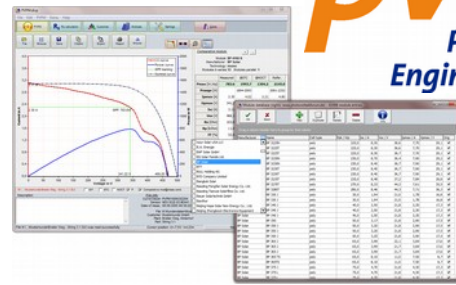


PVPM

2540C (250V - 40A)
1000C (1000V - 20A)
1040C (1000V - 40A)
1050C (1000V - 50A)



pve
Photovoltaik
Engineering

Peak Power Measuring Device and Curve Tracer for Photovoltaic Modules

The devices of type PVPM enable the measurement of the I-V-curve of photovoltaic modules as well as of strings or arrays. By a newly developed procedure the device can measure and calculate the peak power P_{pk} , the R_s and R_p directly at the installation site of the PV system. Calculation results and the diagram can be displayed on the internal LCD-display.

The peak power is the power of a module under Standard Test Conditions (STC) [1]. So far the very complex measurement of the peak power was possible only in particularly suited laboratories. By a patented procedure [2], which was developed by Professor Wagner at the University of Applied Sciences Dortmund, the measurement with the PVPM can easily be performed.

So the quality control of a PV system can be executed fast and economically. This simple and meaningful



check in practice serves the certainty of the customer and also that of the installer.

Beyond that the measured I-V-curves permit further explanations about the electrical characteristics of the verified module or string. So the PVPM is suitable as well as an instrument in research as for development purposes.

The Device

The PVPM is a mobile measuring device with integrated battery supply and charge controller in a durable metal housing. The device has its own industrial miniature PC and a high-contrast TFT touch display and thus its function is independent of other devices. However if desired a PC can be attached for data transfer and further analysis of the measured

values over a standard USB interface.

The PVPM is operated comfortably over the touch function and the on-screen menu. The functions are defined self-describing and the user is always led by the program. So no long training activities for the operating staff are necessary.

The Measurement

The PVPM automatically measures the I-V-characteristic of the generator at a capacitive load. From the measured data it calculates the effective solar cell characteristic, P_{pk} and R_s . [2], [3]. The **I-V-characteristic** can be shown directly on the LCD display. After the measurement the data are stored automatically in a non-volatile storage and so are available also later (in the office) [4]. The device internally stores the data of several thousand measurements.

The following results are displayed:

- Permanent values:
 - Peak Power P_{pk}**
 - Internal Series Resistance R_s**
 - Internal Parallel Resistance R_p**
- Current values, depending on irradiation and temperature:
 - V_{pmax} , I_{pmax} , P_{max}
 - V_{oc} , I_{sc} , FF , T_{mod} , E_{eff}
- I-V-curve diagram

[1] IEC60904-3: STC= Irradiance 1000 W/m², Spectrum AM=1.5, Cell Temperature 25°C.

[2] Wagner A.: Peak Power and Internal Series Resistance Measurement under Natural Ambient Conditions.–EuroSun Copenh. 2000.

[3] Bendel C., Wagner A.: Photovoltaic Measurement relevant to the Energy Yield. - WCPEC3 Osaka 2003

[4] Schulte K.M., Wagner A.: Die Effektive Solarzellenkennlinie. - Anwendung Teillast-Berechnung. Staffelstein. 2002

PVPM 2540C / 6020C / 1000C / 1040C / 1050C

Technical Data (subject to change)

Construction with sturdy aluminium housing (IP40), adjustable carrying handle, durable plastic foil front plate

Measurement and Evaluation Unit

Industrial class PC, Flash data storage 512MB (sufficient for several thousand measurements)

No mechanically moved parts such as fixed disks, exhaust or similar

Sampling rate max. 100kHz, resolution 12Bit

Measuring accuracy for the I-V-characteristic better 1%, for the peak performance $\pm 5\%$

Four-wire-measurement leads avoids systematic errors in voltage measurement

Measuring period single measurement 0.02 - 2 seconds (100 pairs of measured values)

Irradiation reference sensor (Phox) with integrated Pt100/Pt1000 temperature sensor

Optional additional measurement of the back surface temperature of the module under test

Other commercially available irradiance reference sensors (i.e. ISET® sensor) can be used

Measuring Range	Voltage dc	Current dc	Temperature	Irradiance
PVPM2540C	25 / 50 / 100 / 250 V	2 / 5 / 10 / 40 A	-40°C - +120°C with Pt1000	0 - 1300 W/m ² (Standard-Sensor)
PVPM1000C	25 / 100 / 500 / 1000 V	2 / 5 / 10 / 20 A		
PVPM1040C	25 / 100 / 500 / 1000 V	2 / 5 / 10 / 40 A		
PVPM1050C	25 / 100 / 500 / 1000 V	2 / 5 / 10 / 50 A		

The measuring ranges can be combined among each other.

The measuring instrument automatically selects an optimal measuring range.

The device must be used only for the test of current limited dc sources (photovoltaic generators)

Display

Bright TFT touch display with LED backlight, resolution 480 x 272 pixels, RGB

Representation coloured text on black background, thus high contrast

Operation

Menu controlled by touch panel directly at the device.

Operation and analysis alternatively with MS-Windows® application, communication via USB

Voltage Supply

Li-Ion battery 8.8Ah/96.6Wh (continuous operation ~8h), optionally Lead Acid batt. 12V/3.4Ah or 12V/7.2Ah

External power supply with wide range input 90-264Vac, 47-63Hz, UL-approved, power 40W.

Internal automatic battery charge controller with overloading protection.

Display of the charge state over control LED at the front side of the housing.

Continuous measurement possible during mains operation.

Dimensions

Width: 48cm, height: 16cm, depth: 35cm, weight: about 8,0kg (PVPM2540C), 8,5kg (PVPM1050C)

Operating Conditions

	Temperature	Dampness
Operation	0°C to 50°C	10% to 90% (non-condensing)
Storage	-10°C to 85°C	5% to 95%

Scope of Supply

- Measuring instrument in sturdy metal housing with adjustable carrying handle
- Battery supply, external power supply for battery charging and line operation
- 4-wire-lead (10 meters, more on request)
- Calibrated irradiation sensor (monocrystalline) and integrated temperature sensor Pt1000 with lead
- USB cable for linking an evaluation PC
- Control software for MS Windows® 2000, XP, Vista, 7, 8, 8.1, 10
- Printed Users Manual
- External Santon Security Switch 1000V / 32 or 40A, disconnects all wires between PVPM and generator
- Aluminium case for leads and sensors

Optionally available

- Software for MS Windows for the automatic generation of test reports
- Individually adapted test leads and extension cables
- Housing optionally as 19" rack mounting cover.

Warranty

We grant a warranty of 24 months starting from date of purchase on production and material defects as well as free updates of the evaluation software (download from Internet: www.pv-e.de)