

**PVM-1020**



**IP65**

**CAT IV**

**300 V**

**CAT III**

**600 V**

**CAT II**

**1000 V DC**



**LoRa**



**BLUETOOTH**

**IRM-1**



**IP65**



**LoRa**



**LI-ION  
BATTERY**



## Probably the world's most handy meters for photovoltaic systems

### Features

#### PVM-1020

- It can be used for category 1 measurements according to IEC 62446-1.
- **AUTO mode** for performing a sequence of measurements after one press of the **START** button.
- It converts measured parameters into STC conditions according to IEC 60891 by cooperation with the IRM-1 solar radiation and temperature meter.
- The built-in LoRa radio interface ensures cooperation with the IRM-1 meter over long distances.
- Built-in Bluetooth module for communication with a computer.
- Large measurement memory: 100 objects with 40 cells each.
- Backlit display and buttons.

#### IRM-1

- Measurement of solar radiation and temperature.
- The LoRa interface for communication with the PVM-1020 meter - offers a larger range than the Bluetooth technology!
- Automatic data synchronization with the PVM-1020 meter.
- Built-in compass and inclination sensor.
- Built-in recorder that can be used to record solar radiation before constructing PV systems, as well as to measure the shading of existing systems.
- Large measurement memory: 999 cache memory cells and 5000 recorder records available (one-time recording) with the option of overwriting them (continuous recording).



## Measured parameters

### PVM-1020

- The open circuit voltage of the PV panel or a chain of panels, up to 1000V DC.
- RMS voltage of the AC network up to 600 V with frequency measurement.
- Short circuit current of a PV panel or chain of panels - up to 20 A DC.
- Insulation resistance of PV panels - measuring voltage of 250, 500 or 1000 V, simultaneous measurement of two values:  $R_{ISO+}$  and  $R_{ISO-}$ .
- Insulation resistance of AC circuits - measuring voltage 250, 500 or 1000 V.
- Resistance of protective conductors and equipotential bonding with  $\pm 200$  mA current. Low-current resistance measurement, audible and visual signalling.
- Measurement of PV panels operating current and AC current - all with external clamp.
- AC/DC power Measurement.
- Diode test with 200 mA current, automatic polarity detection. Test of blocking diodes with 1000V DC voltage.

### IRM-1

- Solar radiation intensity (irradiance) in  $W/m^2$  or  $BTU/ft^2h$ .
- PV panel temperature in  $^{\circ}C$  or  $^{\circ}F$ .
- Ambient temperature in  $^{\circ}C$  or  $^{\circ}F$ .
- Inclination angle of panels
- Orientation of the panels with the built-in compass.



## PVM-1020: great capabilities in a small casing

PVM-1020 meter is probably the world's smallest photovoltaic system meter with such a substantial number of measurement functions. The functions are selected with a rotary switch. Additional parameters are set with buttons located on the housing. All buttons and the graphic display are backlit, which greatly facilitates operation in shaded places, e.g. when taking measurements under ground-mounted PV systems. Large memory significantly shortens preparation of documents after the measurement.

## IRM-1: simple and compact

IRM-1, small, but indispensable for testing PV systems. By measuring solar radiation values, as well as panel and ambient temperatures, it provides the necessary data to convert the results into STC conditions. A built-in recorder with a memory of 5000 records enables the instrument to be used as a tool in the PV plant design process, as well as to diagnose panel shading problems.

## Tightness and durability

Light meters perform well in harsh environmental conditions. Protection against the ingress of dust and water is provided by the housing rated at **IP65**. This is especially important for measurements on photovoltaic systems, which are outdoor installations.



## Communication and software

Measurement data from the IRM-1 can be transferred to a computer via the USB port. In addition, the device has a built-in wireless **LoRa interface** (Long Range) for automatic data exchange with the PVM-1020 meter - even over long distances.

Measurement data from the PVM-1020 can be transferred to a computer via Bluetooth wireless communication. Saving the downloaded data to popular formats and printing ensured by **Sonel Reader**. In order to generate a report on electric shock protection use the optional software: **Sonel Reports PLUS**.

## PVM-1020 | Specifications

| Parameter  | Measurement range                        | Display range     | Resolution  | Accuracy<br>±(% m.v. + digits) |
|--|--|-------------------|-------------|--------------------------------|
| <b>Voltage</b>   |  |                   |             |                                |
| AC voltage   | 0.0 V...600.0 V                          | 0.0 V...600.0 V   | 0.1 V       | ±(2% m.v. + 2 digits)          |
| DC voltage   | 0.0 V...1000.0 V                         | 0.0 V...1000.0 V  | 0.1 V       | ±(0.5% m.v. + 2 digits)        |
| <b>Short circuit current I<sub>sc</sub></b>  | 0.0...20.0 A                             | 0.0...20.0 A      | 0.1 A       | ±(1% m.v. + 2 digits)          |
| <b>Insulation resistance</b>   |  |                   |             |                                |
| Insulation resistance at AC side   |  |                   |             |                                |
| Measuring voltage 250 V  | 250 kΩ...2.000 GΩ<br>acc. to IEC 61557-2 | 0.0 kΩ...2.000 GΩ | from 0.1 kΩ | ±(3% m.v. + 8 digits)          |
| Measuring voltage 500 V  | 250 kΩ...5.000 GΩ<br>acc. to IEC 61557-2 | 0.0 kΩ...5.000 GΩ | from 0.1 kΩ | ±(3% m.v. + 8 digits)          |
| Measuring voltage 1000 V   | 500 kΩ...9.999 GΩ<br>acc. to IEC 61557-2 | 0.0 kΩ...9.999 GΩ | from 0.1 kΩ | ±(3% m.v. + 8 digits)          |
| Insulation resistance at DC side   |  |                   |             |                                |
| Measuring voltage 250 V / 500 V / 1000 V   | 250 kΩ...1.000 GΩ<br>acc. to IEC 61557-2 | 0.0 kΩ...1.000 GΩ | from 0.1 kΩ | ±(3% m.v. + 8 digits)          |
| <b>Resistance of protective conductors and equipotential bondings</b>                              |  |                   |             |                                |
| Measurement of resistance of protective conductors and equipotential bondings with ±200 mA current | 0.10 Ω...1999 Ω<br>acc. to IEC 61557-4   | 0.00 Ω...1999 Ω   | from 0.01 Ω | ±(2% m.v. + 3 digits)          |
| Measurement of resistance with low current   | 0.0 Ω...1999 Ω                           | 0.0 Ω...1999 Ω    | from 0.1 Ω  | ±(3% m.v. + 3 digits)          |
| <b>Current measurement</b>   | 0.0 A...400.0 A                          | 0.0 A...400.0 A   | from 0.1 A  | ±(5% m.v. + 2 digits)          |
| <b>Power measurement</b>   | 0.0 kW...100.0 kW                        | 0.0 kW...100.0 kW | 0.1 kW      | ±(6% m.v. + 5 digits)          |

## IRM-1 | Specifications

| Parameter                            | Measurement range                                   | Display range                                       | Resolution              | Accuracy<br>±(% m.v. + digits) |
|--------------------------------------|---|---|-------------------------|--------------------------------|
| <b>Irradiance</b>                    |   |   |                         |                                |
| Measurement in W/m <sup>2</sup>      | 0 W/m <sup>2</sup> ...1400 W/m <sup>2</sup>         | 0 W/m <sup>2</sup> ...1400 W/m <sup>2</sup>         | 1 W/m <sup>2</sup>      | ±(5% m.v. + 2 digits)          |
| Measurement in BTU/ft <sup>2</sup> h | 0 BTU/ft <sup>2</sup> h...444 BTU/ft <sup>2</sup> h | 0 BTU/ft <sup>2</sup> h...444 BTU/ft <sup>2</sup> h | 1 BTU/ft <sup>2</sup> h | ±(5% m.v. + 2 digits)          |
| <b>PV and ambient temperature</b>    |   |   |                         |                                |
| Measurement in °C                    | -20.0°C...100.0°C                                   | -20.0°C...100.0°C                                   | 0.1°C                   | ±(1% m.v. + 5 digits)          |
| Measurement in °F                    | -4.0°F...212.0°F                                    | -4.0°F...212.0°F                                    | 0.1°F                   | ±(1% m.v. + 5 digits)          |
| <b>Inclination angle</b>             | -90°...+90°   | -90°...+90°   | 1°                      | ±2°                            |
| <b>Position direction - compass</b>  | 0°...360°   | 0°...360°   | 1°                      | ±5°                            |

"m.v." – measured value

## PVM-1020 | Other technical data

### Safety and work conditions

|  |   |
|--|---|
| Measuring category according to EN 61010                 | IV 300 V, III 600 V, II 1000 V DC                             |
| Ingress protection                                       | IP65  |
| Type of insulation according to EN 61010-1 and IEC 61557 | double  |
| Power supply   | 4x Ni-MH AA 1.2 V rechargeable battery<br>4x AA 1.5 V battery |
| Dimensions   | 220 x 98 x 58 mm  |
| Weight   | ca. 1.0 kg  |
| Operating temperature                                    | -10...+40°C   |
| Storage temperature                                      | -20...+60°C   |
| Humidity   | 20...80%  |
| Nominal temperature                                      | 23 ± 2°C  |
| Reference humidity                                       | 40%...60%   |

### Memory and communication

|                               |               |
|-------------------------------|---------------|
| Memory of measurement results | 4 059 records |
| Data transmission             | Bluetooth     |
| Communication with IRM-1      | LoRa          |

### Other information

|   |                              |
|---|------------------------------|
| The product meets the EMC (emission for industrial environment) requirements according to standards | IEC 61326-1<br>IEC 61326-2-2 |
|---|------------------------------|

## IRM-1 | Other technical data

### Safety and work conditions

|                       |  |
|-----------------------|--|
| Ingress protection    | IP65                                     |
| Power supply          | Li-Ion 3.7 V 1.3 Ah rechargeable battery |
| Dimensions            | 134 x 79 x 28 mm                         |
| Weight                | ca. 0.5 kg                               |
| Operating temperature | -10...+50°C                              |
| Storage temperature   | -20...+60°C                              |
| Humidity              | 20...80%                                 |
| Nominal temperature   | 23 ± 2°C                                 |
| Reference humidity    | 40%...60%                                |

### Memory and communication

|                               |  |
|-------------------------------|--|
| Memory of measurement results | user measurement memory: 999 records<br>recorder: 5000 records |
| Data transmission             | USB  |
| Communication with PVM-1020   | LoRa   |

### Other information

|   |             |
|---|-------------|
| Quality standard – development, design and production   | IEC 61010-1 |
| The product meets the EMC (emission for industrial environment) requirements according to standards | IEC 61326-1 |

# PVM-1020 KIT | Standard accessories



**PVM-1020**  
photovoltaic meter



**IRM-1** solar  
radiation and  
temperature meter



**Solar radiation  
meter mounting  
kit for PV panels**  
WAPOZUCHPV



**Test lead 1.2 m  
(banana plugs) black  
/ blue / yellow**  
WAPRZ1X2BLBB  
WAPRZ1X2REBB  
WAPRZ1X2YEBB



**Crocodile clip  
1 kV 20 A black  
/ red / yellow**  
WAKROBL20K01  
WAKRORE20K02  
WAKROYE20K02



**Pin probe 1 kV  
(banana socket) red**  
WASONREOGB1



**MC4-banana  
sockets adapter  
(set of 2 pcs.)**  
WAADAMC4



**C-PV clamp**  
WACEGCPVOKR



**Probe for measuring  
the temperature of  
PV panels and the  
ambient temperature**  
WASONTPV



**5 V power supply  
with USB 2.0 output  
and a detachable  
micro-USB cable**  
WAZASZ24



**M1 hanging straps**  
WAPOZSZE4



**L4 carrying case**  
WAFUTL4



**4x AA 1.5 V battery**  
**2x AAA 1.5 V battery**



**Calibration certi-  
cate - PVM-1020**



**Calibration certi-  
cate - IRM-1**



## PVM-1020 | Standard accessories



**Test lead 1.2 m (banana plugs) black / blue / yellow**

WAPRZ1X2BLBB  
WAPRZ1X2REBB  
WAPRZ1X2YEBB



**Crocodile clip 1 kV 20 A black / red / yellow**

WAKROBL20K01  
WAKRORE20K02  
WAKROYE20K02



**Pin probe 1 kV (banana socket) red**

WASONREOGB1



**MC4-banana sockets adapter (set of 2 pcs.)**

WAADAMC4



**C-PV clamp**

WACEGCPVOKR



**M1 hanging straps**

WAPOZSZE4



**M6 carrying case**

WAFUTM6



**4x AA 1.5 V battery**

**2x AAA 1.5 V battery**



**Calibration certificate**

## IRM-1 | Standard accessories



**Solar radiation meter mounting kit for PV panels**

WAPOZUCHPV



**Probe for measuring the temperature of PV panels and the ambient temperature**

WASONTPV



**5 V power supply with USB 2.0 output and a detachable micro-USB cable**

WAZASZ24



**M14 carrying case**

WAFUTM14



**Calibration certificate**

## PVM-1020 KIT • PVM-1020 | Optional accessories



**MC4 splitter for power measurement in PV systems (set of 2 pcs.)**

WAADAMC4SKPL



**M1 hanging hook straps for PVM-1020**

WAPOZUCH1



**Pin probe 1 kV (banana socket) black / yellow**

WASONBLOGB1  
WASONYEOGB1



**Three-phase socket adapter 16 A / 32 A**

WAADAAGT16P  
WAADAAGT32P



**Three-phase socket adapter 63 A**

WAADAAGT63P



**Sonel Reports PLUS software**

WAPROSONPE6