

## PV measurement unit PVMU 114

The PV measurement unit measures the IV curve of PV modules or small arrays, which comply with its maximum voltage, current and power limits. For that a passive DC electronic load with separate voltage sense inputs (4-wire connection) is provided. Besides the IV scan it features several analogue inputs for external irradiance and/or temperature sensors. Additionally a socket for digital temperature sensors is provided, where several digital temperature sensors can be connected to acquire temperatures from one or more modules under test. All analog signals are adequately amplified and acquired by a 24 bit  $\Sigma$ - $\Delta$  A/D converter with a sampling speed of 2 kHz. Such a design guaranties ultra-wide dynamic range of analog inputs without the need to adjust the measurement ranges. The PV measurement unit is controlled by a PC via a RS-485 and/or USB communication.



- Operating ambient temperature range ..... from -20 to +55 °C
- Minimum input resistance of PV current input ..... 100 m $\Omega$
- Input resistance of PV voltage input ..... 100 k $\Omega$
- Maximal number of acquired IV points ..... 250
- Single IV point acquisition time ..... 1.2 ms
- Delay time between adjacent measurement points ..... adjustable (100  $\mu$ s default)

Analog input	Range	Max offset	Accuracy
PV current	10 A	$\pm 0.6$ mA*	0.2%
PV voltage	100 V	$\pm 1.5$ mV	0.07%
Reference cell	200 mV	$\pm 30$ $\mu$ V	0.24%
Temperature	-55 $\div$ +125 °C	$\pm 1$ °C	1 %

\* Calibrated prior each IV curve scan

### Digital temperature sensors

Digital temperature sensors are connected by three-wire bus, capable of connecting typically more at least 30 sensors. The bus extensions are possible by user request allowing practically unlimited number of temperature sensors.

- Measurement range ..... -55 °C to +125 °C
- Accuracy .....  $\pm 0.5$  °C (-10°C to +85 °C),  $\pm 2$  °C (-55°C to +125 °C)
- Resolution .....  $\pm 0.0625$  °C
- Measurement time ..... 0.75 s

## 16 channel switch matrix PVSM 16

The switch matrix is capable of connecting one of the up to 16 PV modules by 4-wire connections to the PV measurement unit. The switch matrix is computer controlled via RS-485 bus that enables fully automatic control of the measurement system.

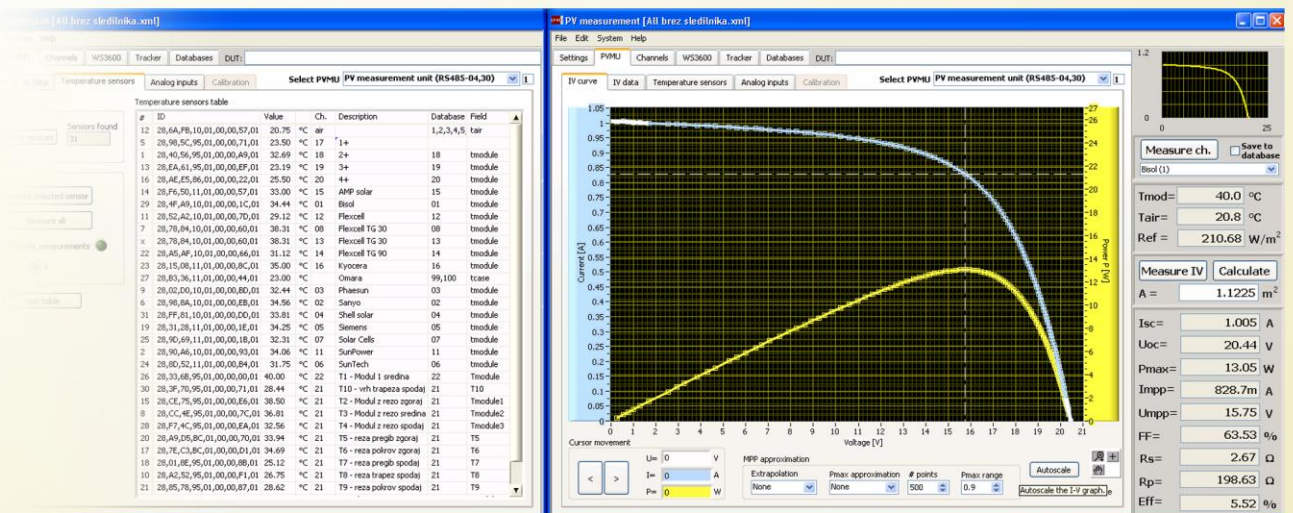
Maximal current of each channel..... 10 A

Contact resistance ..... < 100 mΩ



## PV control and measurement software

Windows XP software that controls the switch matrix, initiates IV scans and acquires all measurement data from pyranometers, temperature sensors, wind speed and direction sensors. From acquired IV curves it automatically calculates parameters of PV modules and stores them to SQL database. Measurements can be initiated asynchronously or on regular time basis.



## Ordering and more info:

Faculty of Electrical Engineering  
 Laboratory of Photovoltaics and Optoelectronics  
 Tržaška 25, POB 2999  
 1001 Ljubljana, Slovenia

Phone: +386 1 476 84 70  
 Fax: +386 1 476 82 76  
[info@lpvo.fe.uni-lj.si](mailto:info@lpvo.fe.uni-lj.si)  
<http://lpvo.fe.uni-lj.si/pvms>