Demonstration board

Photovoltaic

MI 3088

User Manual

Version 1.0, Code No. 20 752 118

METREL®

Distributor:

Manufacturer:

METREL d.d.
Ljubljanska cesta 77
1354 Horjul
Slovenia

web site: http://www.metrel.si
e-mail: metrel@metrel.si

CE Mark on your equipment certifies that this equipment meets the requirements of the EU (European Union) regulations concerning safety and electromagnetic compatibility.

1 Introduction

1.1 General Description

PV demonstration board simulates photovoltaic electricity generation system. The PV demonstration board is preferably intended for sales persons to demonstrate operation and application of PV test equipment. However, it could also be applied as training and educational tool. Various tests supported by different PV test instruments can be presented. It is placed into a practical plastic carrying case.

Demonstration/simulation possibilities:

- PV array d.c. output,
- Measurement of d.c. current,
- Inverter operation with measurement of a.c. output current and voltage,
- Pyranometer simulation,
- Temperature simulation
- Insulation resistance of PV array,
- Continuity of protective earthing.

Demonstration board is designed according to European safety standard EN 61010-1.

1.2 General warnings

- **If the equipment is not used in a manner specified by manufacturer, the protection provided by equipment may be impaired.**
- **Use the PV demonstration board on well-grounded supply systems only.**
- **Only qualified personnel, familiar with the board and the measuring instrument may use the PV demonstration board!**
- **Application of the PV demonstration board in a way not specified in this User Manual could damage the board.**
- **Do not use PV demonstration board in case of any damage noticed!**
- **Only an authorized person may carry out servicing of PV demonstration board!**

1.3 Applied standards

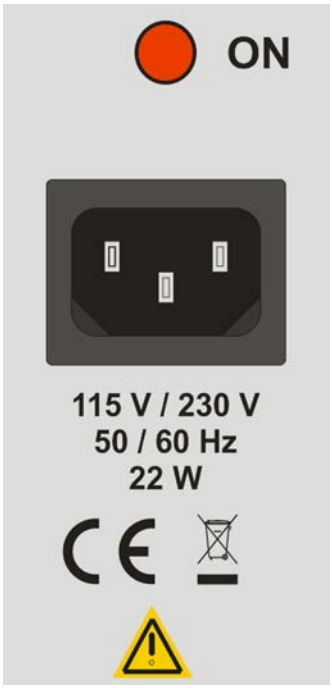
The PV demonstration board MI 3088 is manufactured and tested in accordance with the following regulations:

Electromagnetic compatibility (EMC)	
EN 61326	Electrical equipment for measurement, control and laboratory use – EMC requirements Class B (Hand-held equipment used in controlled EM environments)
Safety (LVD)	
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements
Functionality	
Reference standard for photovoltaic systems	
EN 62446	Grid connected photovoltaic systems – Minimum requirements for system documentation, commissioning tests and inspection

Note about EN and IEC standards:

Text of this manual contains references to European standards. All standards of EN 6XXXX (e.g. EN 61010) series are equivalent to IEC standards with the same number (e.g. IEC 61010) and differ only in amended parts required by European harmonization procedure.

1.4 Meaning of warning/information symbols on front panel



Indication of power supply.

Take care that demonstration board is connected only to mains voltage according to the description under the mains socket! In the opposite case the board can be damaged!

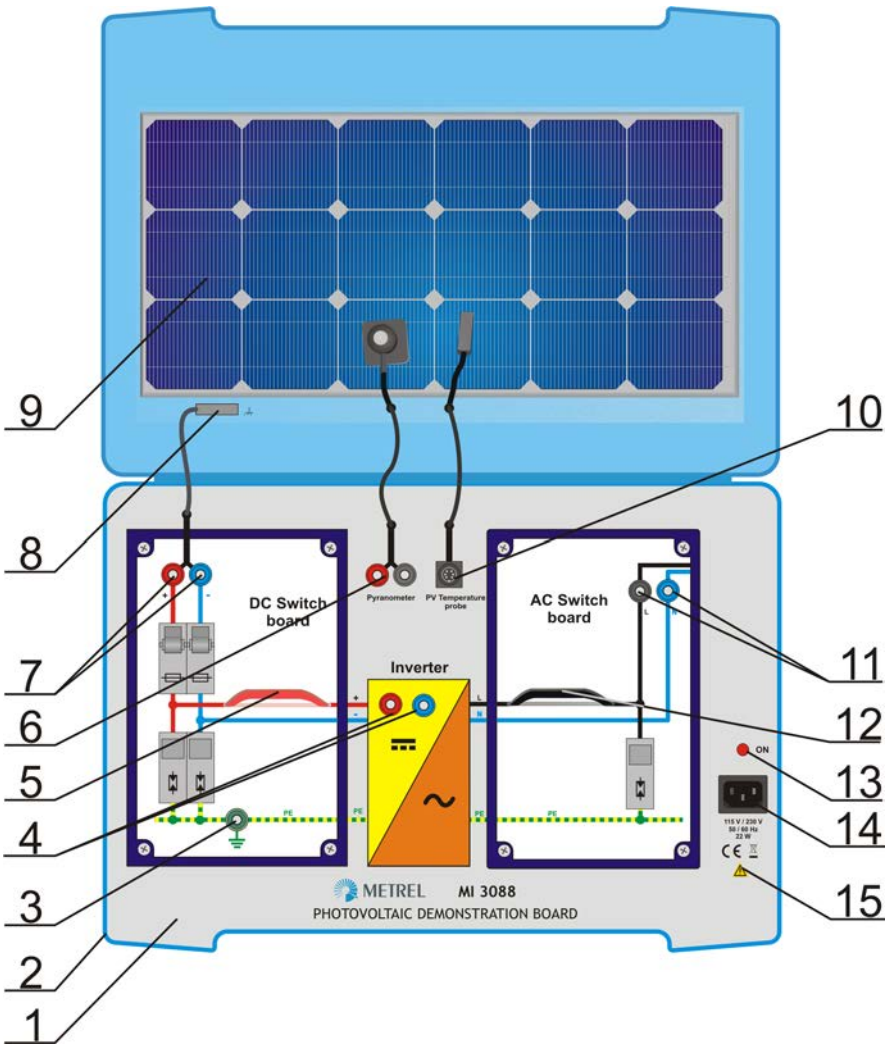
The product must undergo selective disposal for the recycling of the electric and electronic material in compliance with directive WEEE 2002/96/EC.

The CE marking guarantees conformity with European directives and with regulations covering EMC.

1.5 List of measurements that can be demonstrated

- PV string insulation resistance,
- Bonding resistance of PV panel metallic support to protective earthing,
- PV string U/I characteristics,
- PV string d.c. current,
- PV string d.c. power,
- Irradiance,
- Temperature on PV panels,
- Inverter output a.c. current,
- Inverter output a.c. voltage,
- Inverter output a.c. power,
- Inverter and PV system efficiency.

2 Front panel description

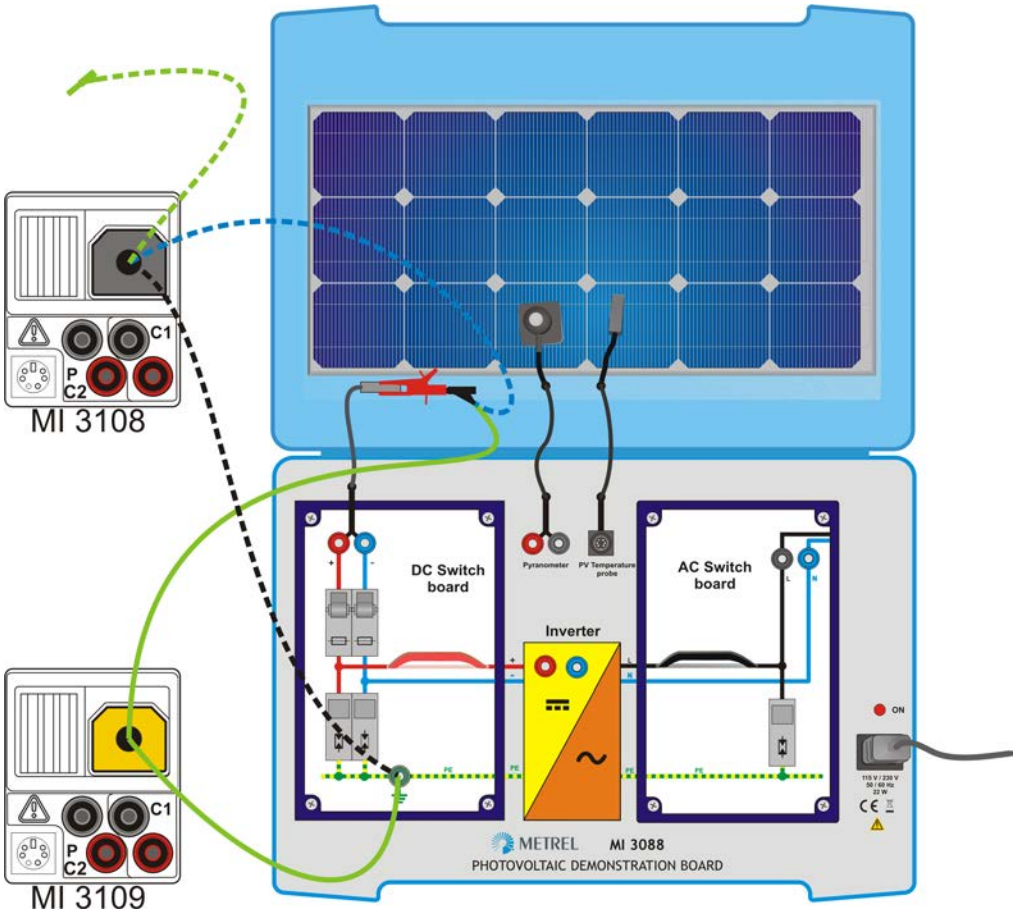


1	Front panel	Presents typical components required in PV power utility.
2	Case	Plastic case of PV demonstration board with handle.
3	PE connection	For testing purposes only!
4	Inverter d.c. input voltage	Sockets for measurement of inverter d.c. input voltage (from PV array).
5	Inverter d.c. input current	For applying d.c. current clamps.
6	Pyranomter output	Output for demonstration of irradiance measurement.
7	PV array output	Output representing PV array I/U characteristics.
8	Connection to metallic construction	Intended for continuity measurement of grounding system.
9	Case cover with label	Label representing PV panel.
10	Temperature probe output	Output representing PV array temperature.
11	Inverter a.c. output voltage	Sockets for measurement of inverter output a.c. voltage.
12	Inverter a.c. output current	For applying a.c. current clamps.
13	Supply indicator	Indicates proper supply of the PV demonstration board.
14	Supply entry	IEC appliance coupler for supplying the PV demonstration board, universal power supply input 115 V / 230 V
15	Warning symbol	To pay attention for right connection to proper mains power supply.

Warning: All outputs are intended for demonstration of possible PV testing only!

3 Measurements

3.1 Continuity of earthing system

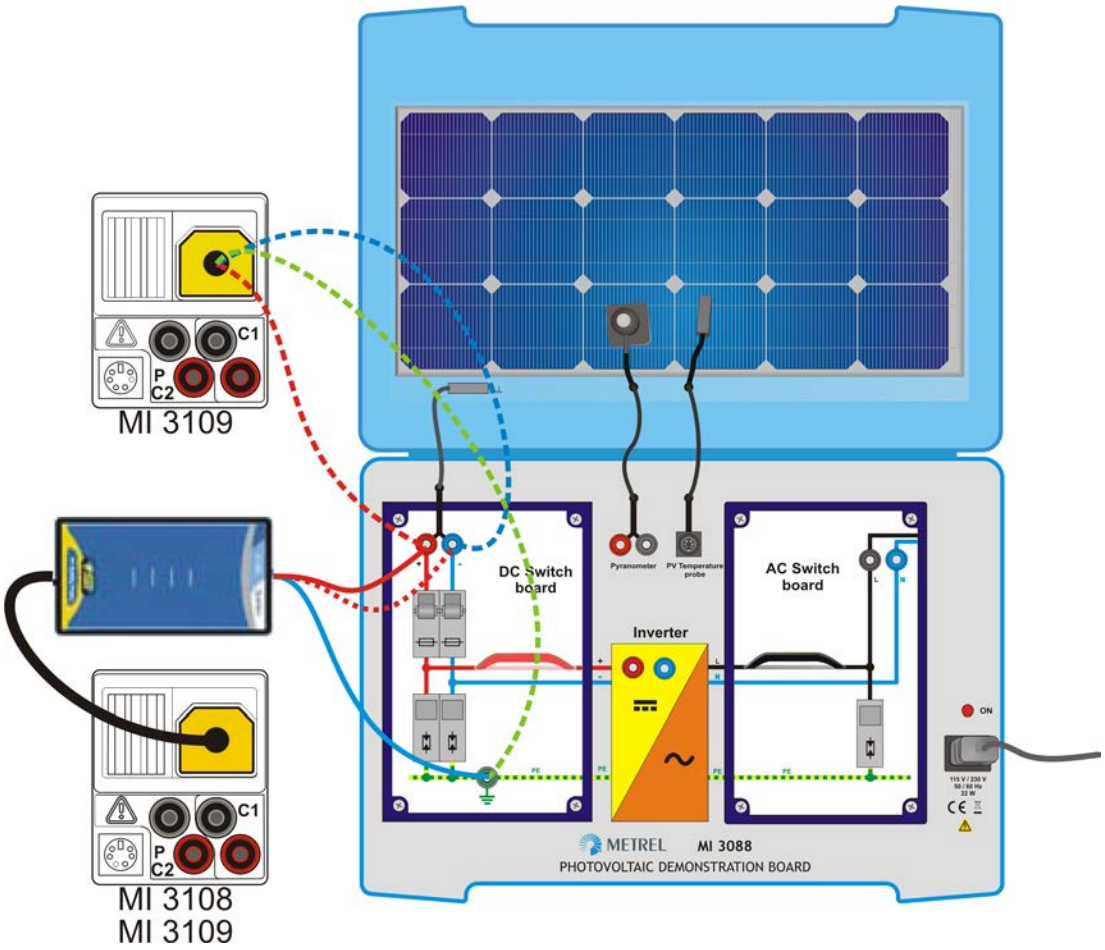


Measurement location	Nominal value
Connection to metallic construction – PE connection	0.1 Ω

Applied instruments and functions

Instruments	Functions
MI 3108	**R LOWΩ**; 200 mA resistance measurement (INSTALLATION menu)
MI 3109	**R LOWΩ**; 200 mA resistance measurement (SOLAR menu)

3.2 PV array insulation resistance

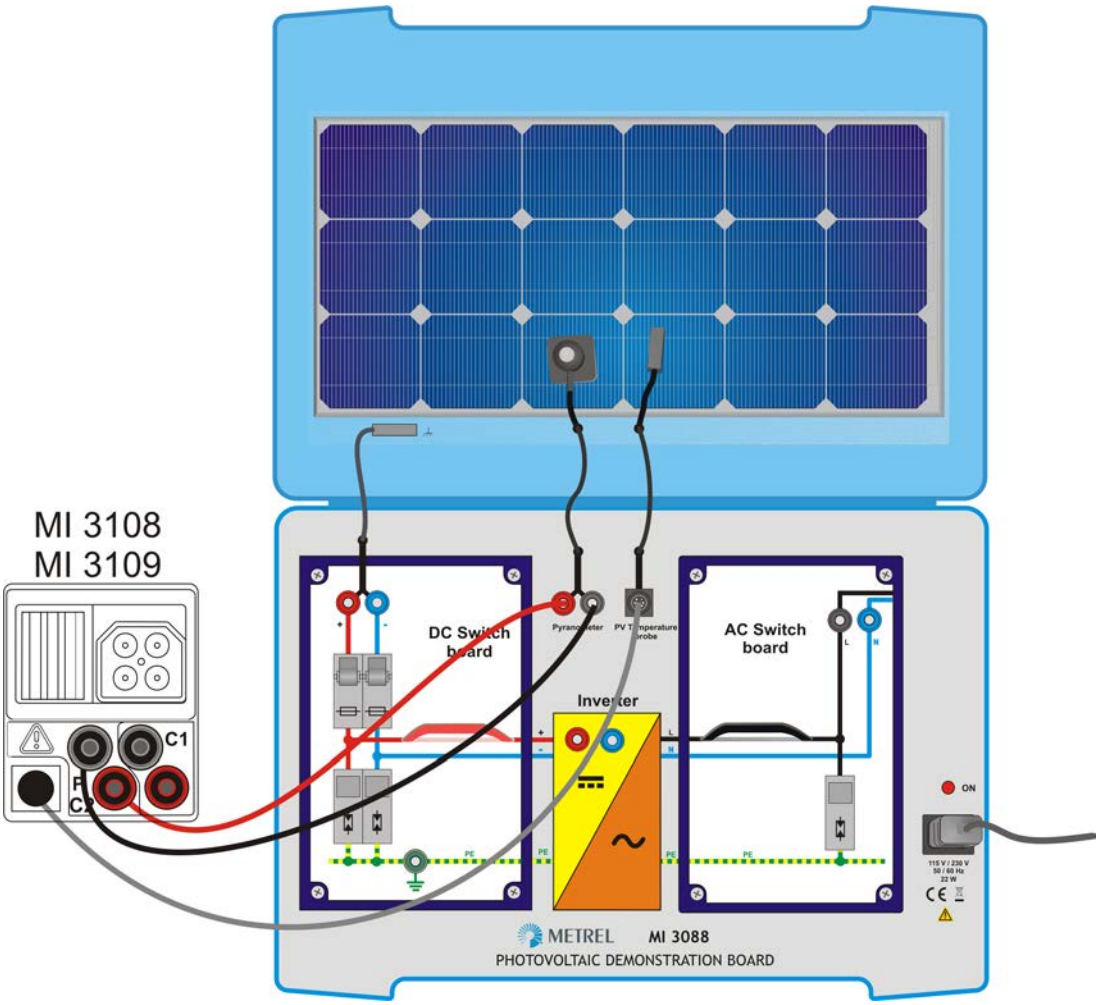


Measurement location	Nominal value
PE connection – DC switch board + socket	96 MΩ
PE connection – DC switch board - socket	92 MΩ

Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**RISO +**; Insulation resistance measurement between panel / array / string positive and earth
	RISO -; Insulation resistance measurement between panel / array / string negative and earth

3.3 Measurement of irradiation and temperature



Pyranometer

Measurement location	Nominal value
Pyranometer sockets	780 W/m^2

Temperature

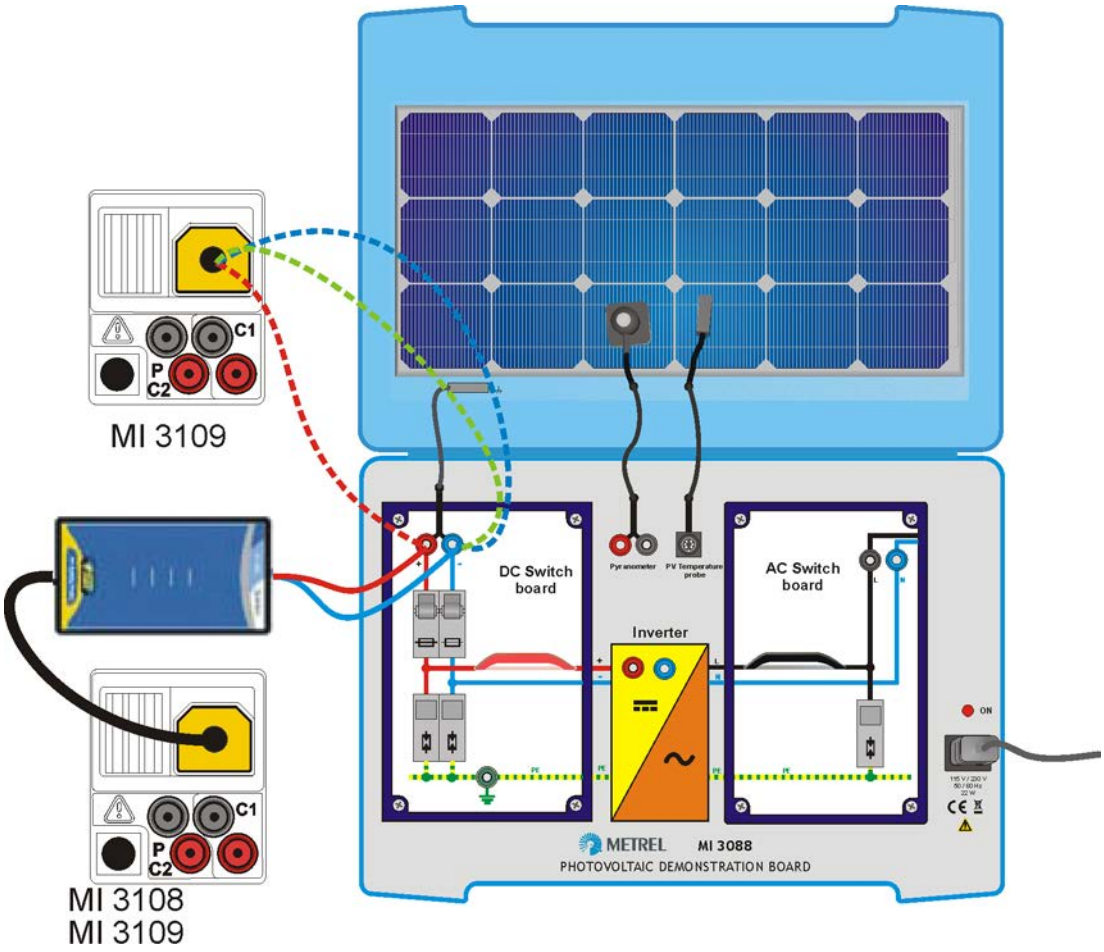
Measurement location	Nominal value
Temperature probe connector	25 °C *

* Depends on real ambient temperature and internal heating.

Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**ENV.: MEAS**; Measurement of environmental parameters (Irradiance, temperature)

3.4 Uoc, Isc test and I/V characteristic measurement



Measurement location	Measured value		STC value	
DC switch board + socket – DC switch board - socket	Isc	48.2	Isc	49
	Uoc	3.1	Uoc	4.1
	Umpp	44.8V	Umpp	45.2 V
	Impp	2.4 A	Impp	3.1 A
	Pmpp	107 W	Pmpp	140 W

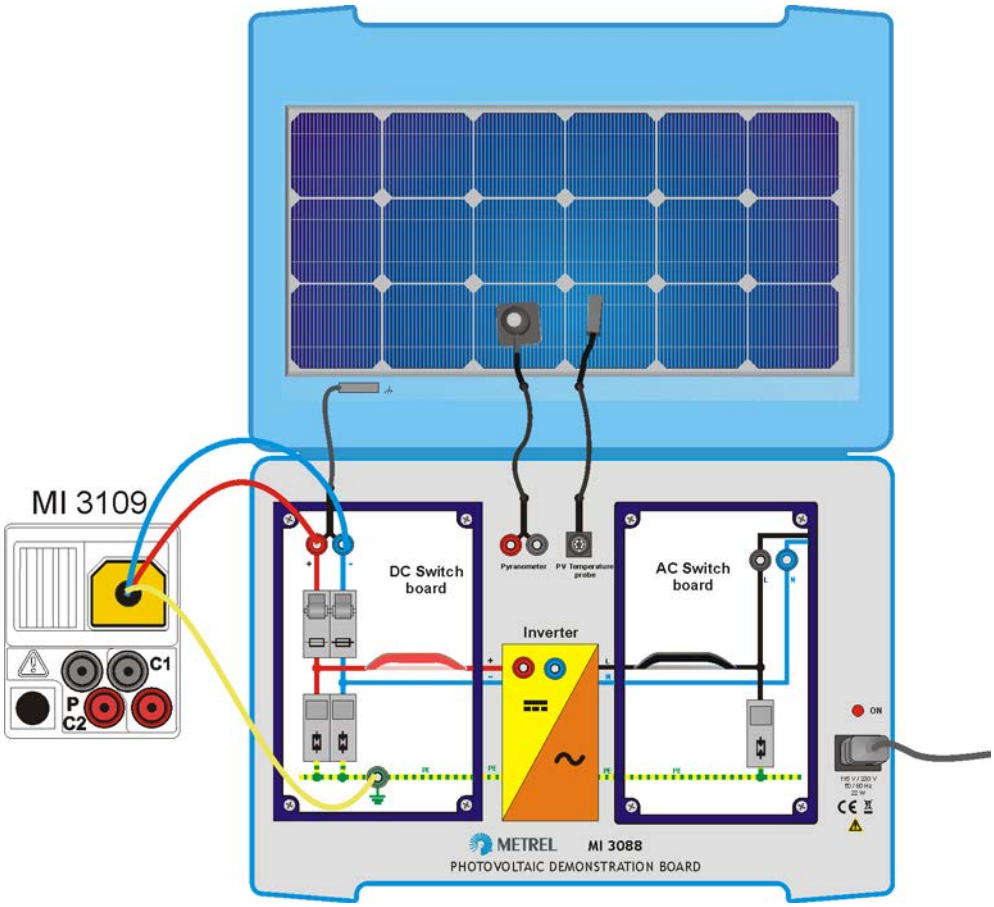
Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**Uoc/Isc**; Open circuit voltage and short circuit current measurement, **I/V**; current/voltage and current/power characteristics measurement

Note:

- STC values are displayed if irradiance and temperature are measured before.
  See chapter *3.3 Measurement of irradiation and temperature*.

3.5 Automatic test sequence



Measurement location	Measured value	STC value
PE connection – DC switch board + socket – DC switch board - socket	96 MΩ	
	92 MΩ	
	48.2	49 V
	3.1	4.1 A

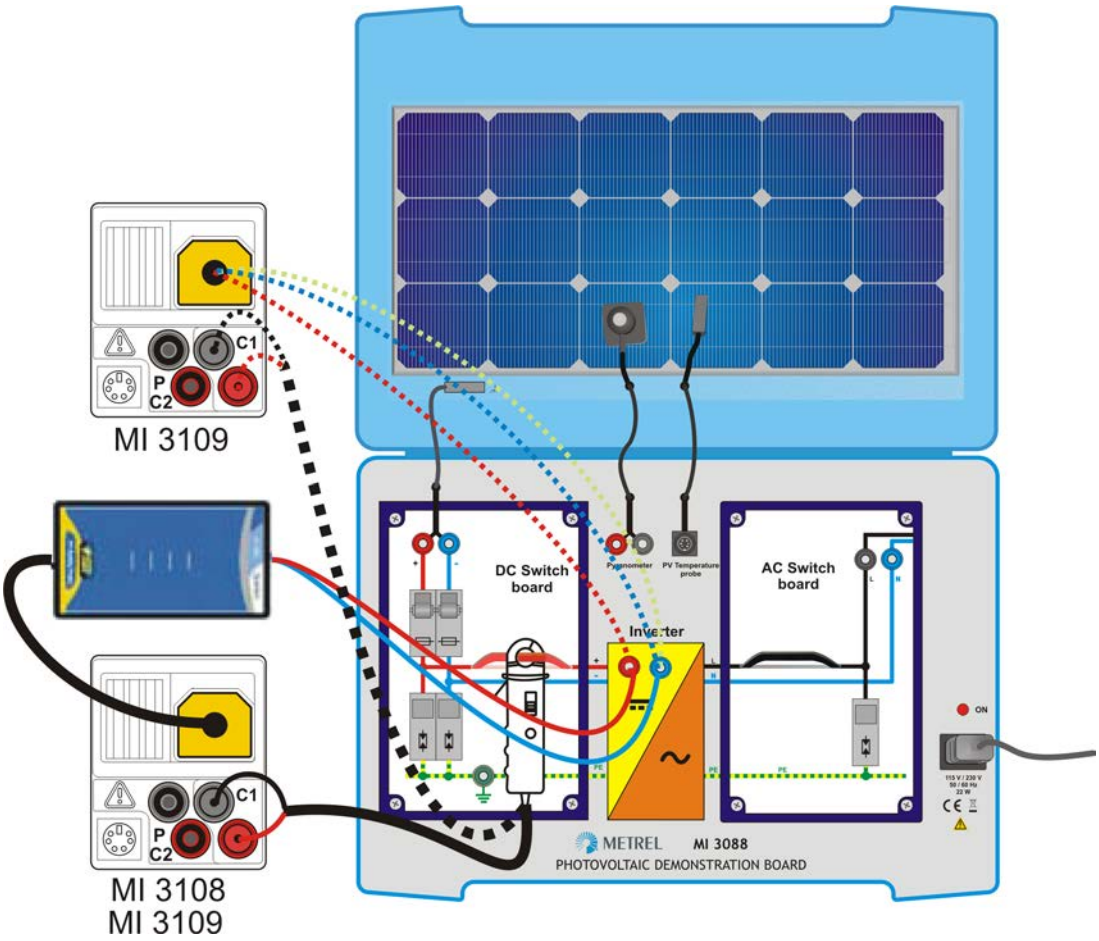
Applied instruments and functions

Instruments	Functions
MI 3109	**AUTOTEST**; Automatic measurement of insulation resistance and Uoc/Isc of PV panel / array / string.

Notes:

- Applicable only on MI 3109.
- STC values are displayed if irradiance and temperature are measured before. See chapter *3.3 Measurement of irradiation and temperature*.

3.6 PV panel test



Measurement location	Measured value		STC value	
DC switch board + socket – DC switch board - socket				
	Umpp	48.2 V	Umpp	48.5 V
	Impp	3.1 A	Impp	4.1 A
	Pmpp	151 W	Pmpp	200 W

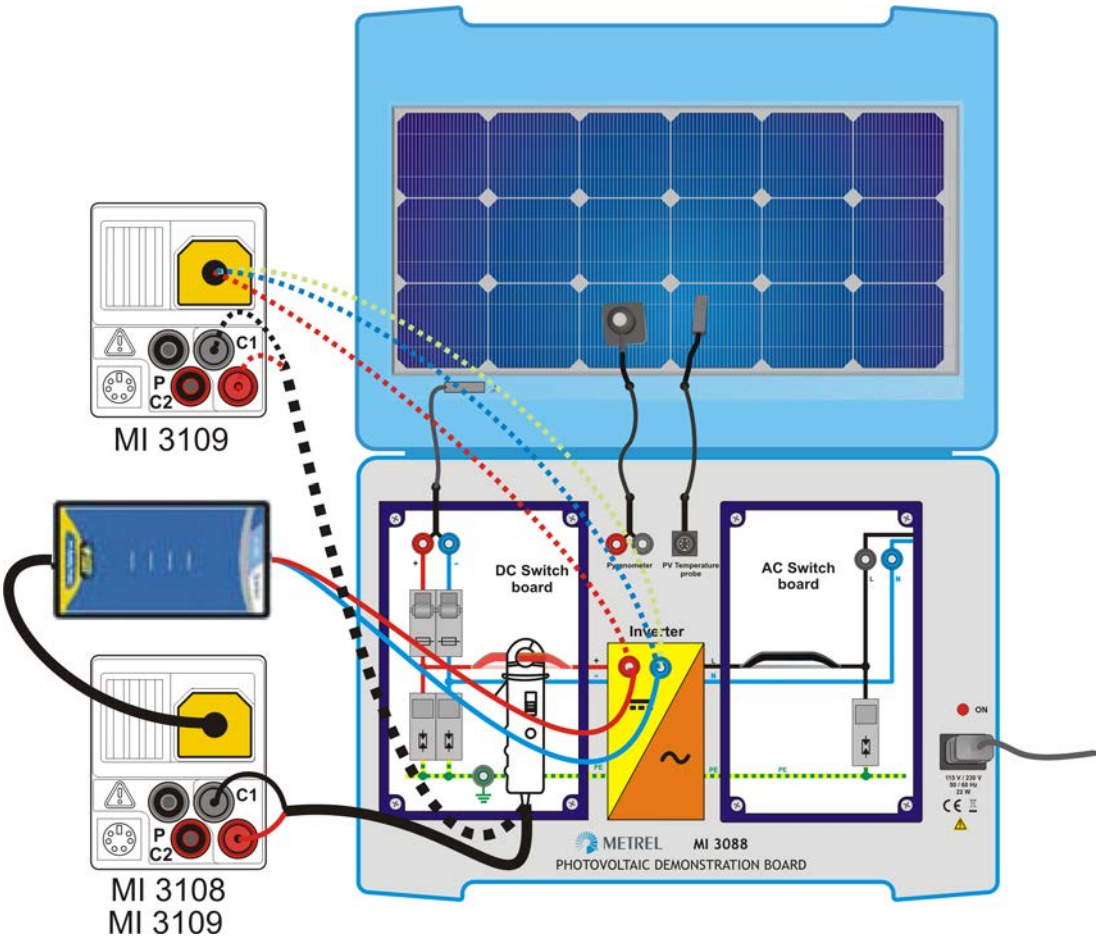
Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**PANEL**; Current, voltage inverter working point

Note:

- STC values are displayed if irradiance and temperature are measured before. See chapter *3.3 Measurement of irradiation and temperature*.

3.7 Measurement of inverter input – DC side

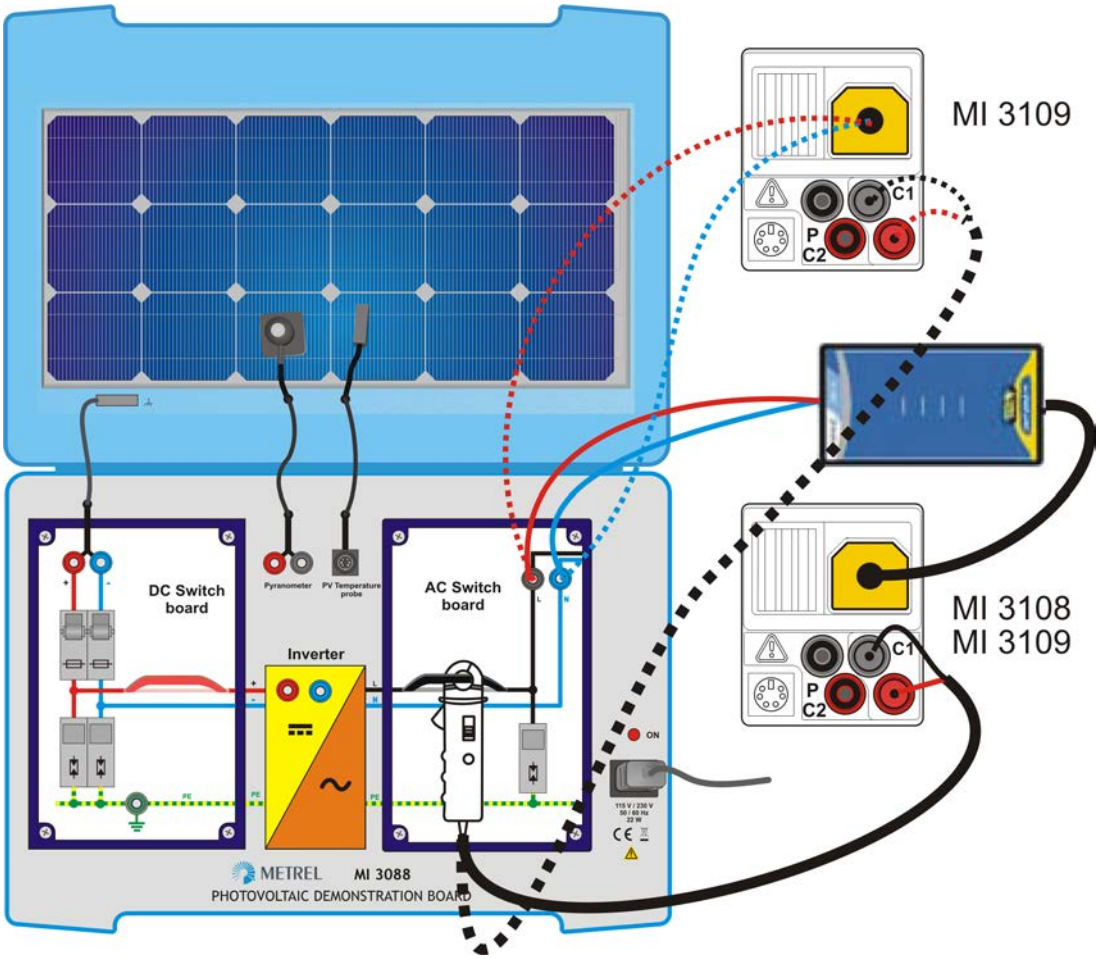


Measurement location	Measured value	
Inverter input + socket – Inverter input – socket Embraced red current loop using A 1391 current clamp	U_{DC}	48.2 V
	I_{DC}	3.1 A
	P_{DC}	151 W

Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**INVERTER: DC**; Measurements at DC side of inverter

3.8 Measurement of inverter output – AC side

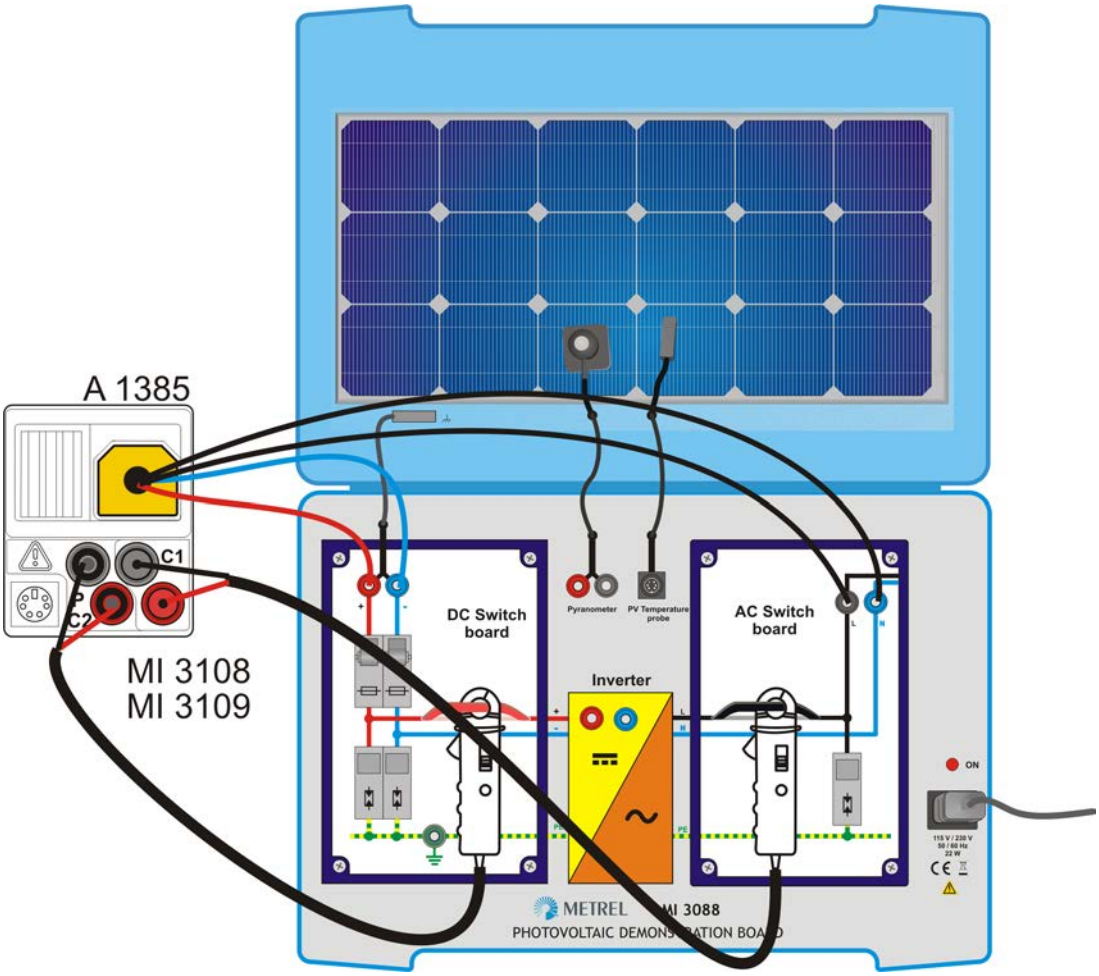


Measurement location	Nominal value	
AC switch board L – AC switch board N Embraced black current loop using A 1391 current clamp	U_{AC}	227 V
	I_{AC}	0.60 A
	P_{AC}	135 W

Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**INVERTER: AC**; Measurements at AC side of inverter

3.9 Inverter efficiency



Measurement location	Nominal value	
Inverter + socket – Inverter - socket AC switch board L – AC switch board N Embraced red and black current loops using A 1391 current clamps	U_{DC}	48.2 V
	I_{DC}	3.1 A
	P_{DC}	151 W
	U_{AC}	227 V
	I_{AC}	0.60 A
	P_{AC}	135 W
	η	90 %

Applied instruments and functions

Instruments	Functions
MI 3108, MI 3109	**INVERTER: AC/DC**; Measurement of efficiency of inverter

4 Technical data

Nominal mains voltage	115 V/ 230 V, 50 Hz / 60 Hz
Power consumption	200 W
Mains cord	single-phase
Dimensions (width × length × height)	450 × 330 × 110 mm
Weight	4.47 kg
Protection class	I (protective earth conductor)
Over voltage category	CAT II 300 V
Pollution degree	2

Reference conditions

Reference temperature range	10 °C ÷ 30 °C
Reference humidity range	40 %RH ÷ 70 %RH

Operation conditions

Working temperature range	0 °C ÷ 40 °C
Maximum relative humidity	95 %RH (0 °C ÷ 40 °C), non-condensing

Storage conditions

Temperature range	-10 °C ÷ 70 °C
Maximum relative humidity	90 %RH (-10 °C ÷ 40 °C), 80 %RH (40 °C ÷ 70 °C),

5 Maintenance

5.1 Cleaning

Use a soft cloth slightly moistened with soapy water or alcohol to clean the surface of the board and then leave the board to dry totally before use.

Do not use liquids based on petrol!
Do not spill liquids over the board!

5.2 Service

In case of unusual response of Demonstration board or if there is any damage noticed, the product has to be taken to an authorized service. Consult the producer or your dealer for further information.
The product has no internal user serviceable parts (fuses, etc).

Producer's address:

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Ljubljanska 77
1354 Horjul
Slovenia

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Fax.: +386 (0)1 7549 095 or +386 (0)1 7549 226

6 Standard set

Upon receipt of Demonstration board it is advisable to check the content of the delivery. The following items have to be included:

- Demonstration board
- Mains cable
- PS2 male / male adapter
- Test lead 1.5 m, black
- Test lead 1.5 m, red
- User manual