



Solar Inverter

PVM-75/100/110/125-TL

User Product Manual

⚠ ATTENTION – IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions that must be followed during the installation and maintenance of the equipment.

⚠ ATTENTION – SAVE THESE INSTRUCTIONS

Keep this document in a safe place near the inverter for easy access during installation, operation and maintenance.

The installer must read this document in its entirety and scrupulously follow the instructions given in it before installing this equipment, since MA Solar Italy cannot be held responsible for damage caused to people and/or things, or the equipment, if the conditions described below are not observed.

The purpose of this document is to support the qualified technician, who has received training and/or has demonstrated skills and knowledge on the structure and operation of the unit, to install, operate and maintain the inverter. This manual covers the inverter only, and NO other equipment (photovoltaic modules, external disconnects, etc.) to which it is connected.

Warranty requirements are included in the Terms and Conditions of sale included with the inverter order.

ⓘ NOTE – Any changes made to the product or to the installation conditions that hasn't been approved by MA Solar Italy will void the warranty.

ⓘ NOTE – All pictures and illustrations shown in this user manual are indicatives and must be intended as support for installation instruction only. Actual product may vary due to product enhancement. Specifications subject to change without notice. The latest version of this document is available on the MA Solar Italy website <https://www.fimer.com>.

The products are designed to be connected and communicate information and data via a network interface. It is the user's sole responsibility to provide and continuously ensure a secure connection between the product and the user's network or any other network (as the case may be). The user shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. MA Solar Italy and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information. The data, examples and diagrams in this manual are included solely for the concept or product description and are not to be deemed as a statement of guaranteed properties.

All persons responsible for applying the equipment addressed in this manual must satisfy themselves that each intended application is suitable and acceptable, including that any applicable safety or other operational requirements are complied with. In particular, any risks in applications where a system failure and/or product failure would create a risk for harm to property or persons (including but not limited to personal injuries or death) shall be the sole responsibility of the person or entity applying the equipment, and those so responsible are hereby requested to ensure that all measures are taken to exclude or mitigate such risks. This document has been carefully checked by MA Solar Italy, but deviations cannot be completely ruled out. In case any errors are detected, the reader is kindly requested to notify the manufacturer. Other than under explicit contractual commitments, in no event shall MA Solar Italy be responsible or liable for any loss or damage resulting from the use of this manual or the application of the equipment.

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1. Safety and accident prevention

1.1 Safety information and instructions

This chapter contains the safety instructions which you must obey when you install and operate the inverter and perform maintenance operations on the inverter. Obey these safety instructions to prevent injury or death or damage to the equipment.

-  **NOTE** – The instructions provided in the manual do not replace the safety devices and technical data for installation and operation labels on the product, and they do not replace the safety regulations in force in the country of installation.
-  **READ THE MANUAL** – The operators must read and comply with the technical information and instruction provided in the manual and in any additional attached documentation.
-  **NOTE** – MA Solar Italy accepts no liability for failure to comply with the instructions for a correct installation and cannot be held responsible for any other upstream or downstream equipment.
-  **READ THE MANUAL** – Specific safety information is provided during installation, commissioning and maintenance operation instructions. Always follow the reading order of instruction exactly as described in this manual.

1.2 Symbols and signs

In the manual and/or in some cases on the equipment, the danger or hazard zones/components are indicated with signs, labels, symbols or icons.

Symbol	Description
	NOTE - General information about product
	ATTENTION- Important safety information. Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	WARNING - Indicates a potentially hazardous situation, in particular a high voltage, which, if not avoided, could result in death or serious injury. The inverter has high voltages and high energy levels.
	HOT SURFACES - Indicates a potentially hazardous situation related to hot surface, which, if not avoided, could result in serious injury. Some surfaces in the inverter will become hot during operation and must not be touched until the parts have cooled down.
	LIFTING - Risk of injury due to the weight of the equipment. Take care during lifting and transport.
	FORBIDDEN - Indicates that the area must not be accessed or that the operation described must not be carried out.
	Keep out of the reach of children.
	Indicates that it is mandatory to carry out the described operations using the clothing and/or personal protective equipment provided by the employer.
	Indicates the connection point for protective earth.
	Rated temperature range.
	Risk of electric shock. The discharge time (quantified in the figure by the number XX) of the stored energy after de-energizing of the Inverter from both DC side and AC side.



Direct Current (DC)



Alternate Current (AC)



Without isolation transformer



Positive pole of the input voltage (DC)



Negative pole of the input voltage (DC)



Protection rating of equipment



Indicates the requirement to wear PPE



Observe the documentation



The product complies with the requirements of the applicable Australian standards

1.3 Installation and maintenance safety

1.3.1 General safety information

- ⚠ WARNING** – Do not do work on the photovoltaic generator, on the inverter, on its input or output cables, when the inverter is connected to an electrical power system, or to the photovoltaic generator. Before perform any maintenance operation on the inverter, follow this step:
- Prepare the work: Carry out an on-site Risk Assessment or Job Hazard Analysis (Check for proper tools and PPE for the job; Engage the person responsible for electrical equipment or system to review single-line, schematics, switching plans; Define the appropriate work methods and initiate the permit to work process).
 - Clearly identify the work location and equipment's.
 - Disconnect all sources and secure against reconnection by means of the "Lock-out/Tag-out" procedure to ensure that any conductor cannot accidentally become live.
 - Verify the absence of operating voltage (This must be carried out by means of a proper test instrument).
 - Complete the permit to work and "Walk the Permit".
- Refer to "[Inverter total de-energization and Isolation](#)" paragraph on this manual to know all detailed necessary steps to safely operate on the inverter.
- The inverter front cover can be removed from authorized service personnel only qualified by MA Solar Italy (the users are not authorized to remove inverter front cover).

- 🚫 FORBIDDEN** – Do not proceed with installation if the integrity of the equipment is compromised. Do not use the equipment if you find any operating anomalies.
- Avoid temporary repairs. All repairs should be carried out using only genuine spare parts, which must be installed in accordance with their intended use.
 - The labels affixed on the equipment must strictly NOT be removed, damaged, defaced, hidden, etc. The technical data provided in this manual does not in any case replace that shown on the labels affixed on the equipment.

1.3.2 Environmental conditions and risks

- ⚠ ATTENTION** – This device can be installed outdoors, but only in environmental conditions that do not prevent its regular operation. These conditions are listed in the technical data and in the installation chapter.
- Do not remove the connection boxes (AC and signals) of the inverter when it is raining, or when sand or dust can blow into the unit. Infiltration of water or sand into the inverter can cause damage of the unit. It is of paramount importance to evaluate the weather conditions in the risk assessment prior any intervention on the equipment. Any intervention on the inverter can be carried out only in case of dry environment. Don't proceed in case of rain (even light) or high humidity.
 - This device is not designed to operate in environments that are particularly inflammable or explosive.
 - In the event of fire, use CO2 extinguishers and auto-extraction systems to extinguish the fire in closed environments.
 - The installer or maintenance technician must always pay attention to the work environment, ensuring that it is well-lit and there are enough escape routes.

1.3.3 Electrical and thermal safety

- ⚠ WARNING** – Obey these instructions to prevent injury or death or damage to the equipment. If you are not a qualified electrician, do not perform any electrical installation or maintenance work.
- Obey all installation safety standards. This requires, among other things, the use of personal protection equipment (PPE) such as arc-proof clothing, arc-proof masks, protective footwear, insulating and protective gloves, eye protection and hearing protection. High power inverter installations have high fault currents.
 - Before you operate on the inverter, isolate the AC line cables from the electrical power system with the AC disconnect switch of the power system transformer (downstream of inverter). Also, isolate the inverter from the photovoltaic generator with the DC disconnect switch of the generator or by other means (upstream of inverter). The internal AC disconnect switch (if present) do not isolate the AC output cables and terminals of the inverter from the electrical power system. The internal DC disconnect switches (if present) do not completely isolate the DC input cables or terminals from the DC voltage supplied by the photovoltaic generator. Refer to "[Inverter total de-energization and isolation](#)" paragraph on this manual for further details.
 - Do not work on the communication and control signal cables when power is applied to the inverter or to the external control circuits.
 - Do not perform insulation or voltage withstand tests on the inverter with exception for those indicated in this document.
 - MA Solar Italy inverters must be earthed via the connection points marked with the protective earth symbol  and using a cable with an appropriate conductor cross-section for the maximum ground fault current that the generating system might experience.

- 🔥 HOT SURFACE** – When the device has just been switched off, it may have hot parts as a result of overheating of the heated internal components (e.g.: transformers, accumulators, coils, etc.). Please pay attention to this.

1.4 Residual risks

⚠ ATTENTION – Despite the warnings and safety systems, there are still some residual risks that cannot be eliminated. These risks are listed in the following table with some suggestions to prevent them:

Risk analysis and description	Suggested remedy
Noise pollution due to installation in unsuitable environments or where individuals routinely work and/or animals' dwell most of the time.	Reassess the environment or the place of installation.
Adverse external weather conditions, water seepage, low temperatures, high humidity, etc.	Maintain ambient conditions suitable for the system.
Overheating of components (transformers, accumulators, coils, etc.) that could cause burns. Restricted cooling openings or cooling systems of the equipment.	Use suitable PPE. Wait for the parts to cool down before opening the inverter. Do not restrict cooling openings or cooling systems of the equipment (e.g. heatsinks).
Inadequate cleaning that could compromises cooling and does not allow the reading of safety labels.	Clean the equipment, labels and work environment.
Stored energy in components that could generate hazardous discharges.	Ensure that the components have discharged their energy before working on them.
Inadequate training of staff.	Ask for supplementary courses.
Installation of the equipment and/or mounting of the equipment components temporarily incomplete.	Prevent unauthorized access to the installation area. Use enough employees and PPE.
Accidental disconnections of the quick-fit connectors, with the equipment in operation, may generate electrical arcs.	Be careful about properly routing the DC inverter cables.
Mismatched brand of quick-fit connectors (if present) that may void the warranty and could cause potential damage.	Use the same brand for the counterparts of the quick-fit connectors installed on the inverter.

2. Introduction and general information

2.1 Warranty and supply conditions

The warranty conditions (available on the official MA Solar Italy website) are considered valid if the Customer adheres to all indications content in this manual; any condition deviating from those described herein must be expressly agreed in the purchase order.

NOTE – MA Solar Italy declares that the equipment complies with the provisions of law currently in force in the country of installation and has issued the corresponding declaration of conformity.

2.1.1 Not included in the supply conditions

MA Solar Italy will NOT be held liable for defects or malfunctions arising from:

- improper use of the equipment.
- deterioration resulting from transportation or specific environmental conditions.
- performing maintenance incorrectly or not at all.
- tampering or unsafe repairs.
- use or installation by unqualified persons.

MA Solar Italy is not responsible for disposal of the equipment, or part of it, which does not take place based on the regulations and laws in force in the country of installation.

ATTENTION – MA Solar Italy accepts no liability for failure to comply with the instructions for a correct installation and will not be held responsible for systems upstream or downstream of the equipment it has supplied.

FORBIDDEN – It is absolutely forbidden to modify the equipment. Any modification, manipulation, or alteration not expressly agreed with the manufacturer, concerning either hardware or software, shall result in the immediate cancellation of the warranty.

NOTE – The customer is fully responsible for any changes made to the system.

2.2 Scope and target audience

2.2.1 Purpose and document structure

This operating and maintenance manual is a useful guide that will enable you to work safely and carry out the operations necessary for keeping the equipment in good working order.

ATTENTION – If the equipment is used in a manner not specified in this manual, the protections and the certifications provided by the equipment may be impaired with the consequent loss of warranty.

NOTE – The language in which the document was originally written is ENGLISH; therefore, in the event of inconsistencies or doubts please ask the manufacturer for the original document.

2.2.2 List of appendix documents

In addition to this product manual, you can consult (and download) the product documentation by visiting <https://www.fimer.com>.

NOTE – Some component's information given in this manual is taken from the original supplier documents. Please refer to the supplier websites for the complete and updated documentation.

- In certain cases, there may be a need to separately document software functionality or attach supplementary documentation to this manual which is intended for more qualified professionals.

2.2.3 Operator and maintenance personnel skills/prerequisites

ATTENTION – Personnel in charge of using and maintaining the equipment must be skilled for the described tasks and must reliably demonstrate their capacity to correctly interpret what is described in the manual.

- For safety reasons, the installation must be performed by qualified installers and/or licensed electricians, with experience in photovoltaic systems. Installation must be in accordance with the existing regulations in the country of installation and any other local electrical codes. The local electrical utility (or authority having jurisdiction) must approve the equipment installation before it is connected to the electrical grid.
- The customer has civil liability for the qualification and mental or physical state of the personnel who interact with the equipment. They must always use the personal protective equipment (PPE) required by the laws of the country of destination and whatever provided by their employer.

FORBIDDEN – Inverter operation and maintenance performed by personnel that is NOT qualified, is intoxicated, or on narcotics, is strictly forbidden.

2.3 Application area, general conditions

MA Solar Italy shall not be liable for any damages whatsoever that may result from incorrect or careless operations.

 **FORBIDDEN** – Please, do not use this equipment for any application not mentioned in the field of use.

2.3.1 Intended or allowed use

This equipment is an inverter designed for transforming a continuous electrical current (DC) supplied by a photovoltaic generator (PV) in an alternating electrical current (AC) suitable for feeding power into the public distribution grid.

2.3.2 Limits in field of use

- This equipment can be used only with photovoltaic modules which have ground isolated input poles.
- Only a photovoltaic generator can be connected to the photovoltaic input of the inverter.
- This equipment can be only connected to the electricity grid in countries for which it has been certified/approved.
- The inverter cannot be connected to the DC side in parallel to other inverters.
- This equipment may only be used in compliance with all its technical characteristics.

2.3.3 Improper or prohibited use

-  **FORBIDDEN** – It is forbidden to install the equipment in environments subject to specific flammability risks or in adverse or non-permitted environmental conditions (temperature and humidity).
- It is forbidden to use the equipment with safety devices which are faulty or disabled.
 - It is forbidden to use the equipment or parts of the equipment by linking it to other machines or equipment, unless expressly provided for.
 - It is forbidden to modify operating parameters that are not accessible to the operator and/or parts of the equipment to vary its performance or change its isolation.
 - It is forbidden to clean with corrosive products that could corrode parts of the equipment or generate electrostatic charges.
 - It is forbidden to use or install the appliance or parts of it without having read and understood the contents of the user and maintenance manual. The equipment **MUST NOT** be used by inexperienced staff, or even experienced staff if carrying out operations on the equipment that fail to comply with the indications in this manual and enclosed documentation.
 - It is forbidden to place any heavy object, sit or stand up on the inverter.
 - It is forbidden to heat or dry rags and clothing on the parts in temperature. In addition to being hazardous, doing so would compromise component ventilation and cooling.

3. Characteristics

3.1 General conditions

A description of the equipment characteristics is provided to identify its main components and specify the technical terminology used in the manual.

This chapter contains information about the models, details of the equipment, characteristics and technical data, overall dimensions and equipment identification.

⚠ ATTENTION – The customer/Installer takes full responsibility if, when reading this manual, the chronological order of its presentation provided is not observed. All information is provided considering occasional inclusion of information in previous chapters.

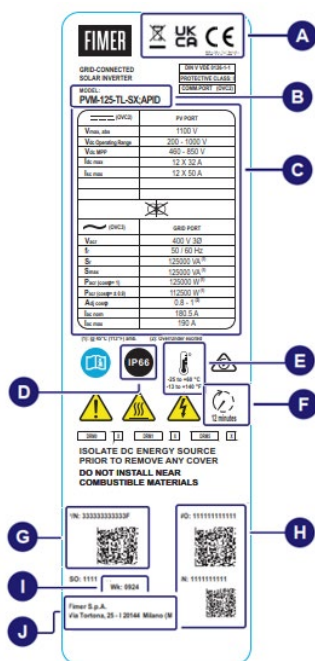
3.2 Identification of equipment and manufacturer

🚫 FORBIDDEN – The labels affixed to the equipment must NOT be removed, damaged, stained, hidden, etc., for any reason whatsoever. Do NOT hide the labels by foreign objects and parts (rags, boxes, equipment, etc.); they must be regularly cleaned and always kept in sight.

📄 NOTE – The "Technical data" provided in this manual does not substitute the data supplied on the labels affixed to the equipment.

- The labels shown below have to be intended as example only.

3.2.1 Regulatory and identification Label



A Certification marks

B Inverter model

C Main technical data

D Degrees of protection provided by enclosures (IP Code)

E Operating temperature range

F Discharge time

G Inverter Part Number

YY = Year of manufacture
 WW = Week of manufacture
 SSSSSS = Progressive number
H - Inverter access point SSID: Fimer-YYWWSSSSSS
 - "Host Name": http://Fimer-YYWWSSSSSS.local
 - It is required to register the inverter in Aurora Vision.

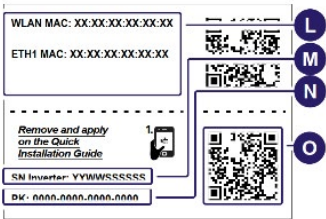
I Production date: WWYY where: WW (week) YY (year)

J Manufacturer

3.2.2 Communication Identification label

The “communication identification label” is divided in two separate parts by a dashed line; take the bottom part and apply it on the plant documentation.

NOTE – It’s recommended to create a plant map and apply the “communication identification label” on it.



L WLAN (Wi-Fi) MAC address, and
ETH1 (Ethernet) MAC address

M Inverter Serial Number (YYWWSSSSSS):
YY = Manufacturing Year
WW = Manufacturing week
SSSSSS = Progressive number

N Product Key:
To be used as Wi-Fi access point password, or to be used to access to the Web UI as username and password in case of lost credentials, and to commission the inverter using the Web UI.

O QR Code:
To be used to commission inverter using Fimer internal WEB UI.

3.3 Models and range of equipment

NOTE – The choice of the inverter model must be made by a qualified technician who knows about the installation conditions, the devices that will be installed in addition to the inverter and possible integration with an existing system.

Inverter model	Description
PVM-75-TL-SX	Grid Connected Solar Inverter - 3 phase - 75 kW • 6 independent MPPTs • DC disconnect switch • Input with 24 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-75-TL-SY	Grid Connected Solar Inverter - 3 phase - 75 kW • 6 independent MPPTs • DC disconnect switch • Input with 24 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I-II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)

Inverter model	Description
PVM-75-TL-SX;APID	Grid Connected Solar Inverter - 3 phase - 75 kW
	• 6 independent MPPTs • DC disconnect switch • Input with 24 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality
PVM-75-TL-SY;APID	Grid Connected Solar Inverter - 3 phase - 75 kW
	• 6 independent MPPTs • DC disconnect switch • Input with 24 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality
PVM-100-TL-SX	Grid Connected Solar Inverter - 3 phase - 100 kW
	• 8 independent MPPTs • DC disconnect switch • Input with 32 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-100-TL-SY	Grid Connected Solar Inverter - 3 phase - 100 kW
	• 8 independent MPPTs • DC disconnect switch • Input with 32 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-100-TL-SX;APID	Grid Connected Solar Inverter - 3 phase - 100 kW
	• 8 independent MPPTs • DC disconnect switch • Input with 32 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality

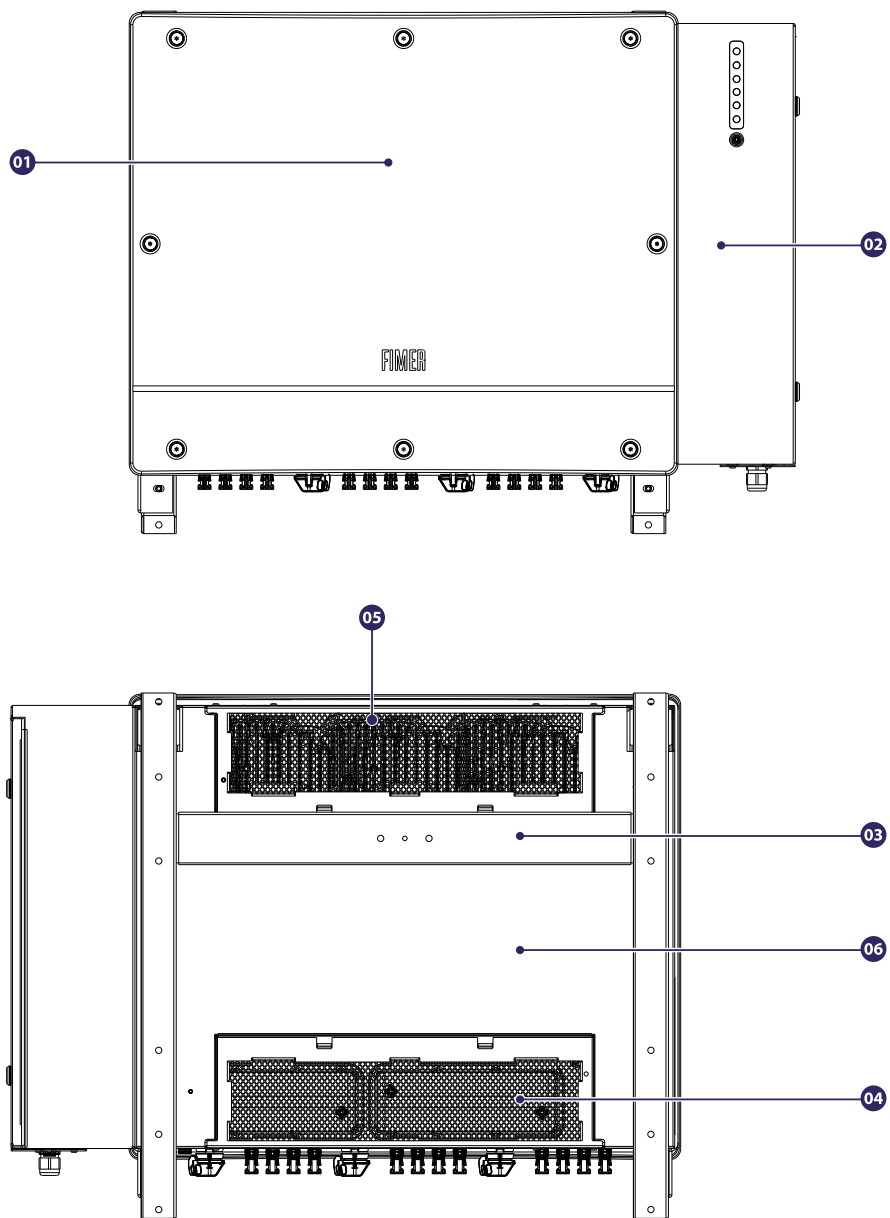
Inverter model	Description
PVM-100-TL-SY;APID	Grid Connected Solar Inverter - 3 phase - 100 kW • 8 independent MPPTs • DC disconnect switch • Input with 32 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality
PVM-110-TL-SX	Grid Connected Solar Inverter - 3 phase - 110 kW • 10 independent MPPTs • DC disconnect switch • Input with 40 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-110-TL-SY	Grid Connected Solar Inverter - 3 phase - 110 kW • 10 independent MPPTs • DC disconnect switch • Input with 40 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-110-TL-SX;APID	Grid Connected Solar Inverter - 3 phase - 110 kW • 10 independent MPPTs • DC disconnect switch • Input with 40 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality
PVM-110-TL-SY;APID	Grid Connected Solar Inverter - 3 phase - 110 kW • 10 independent MPPTs • DC disconnect switch • Input with 40 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality

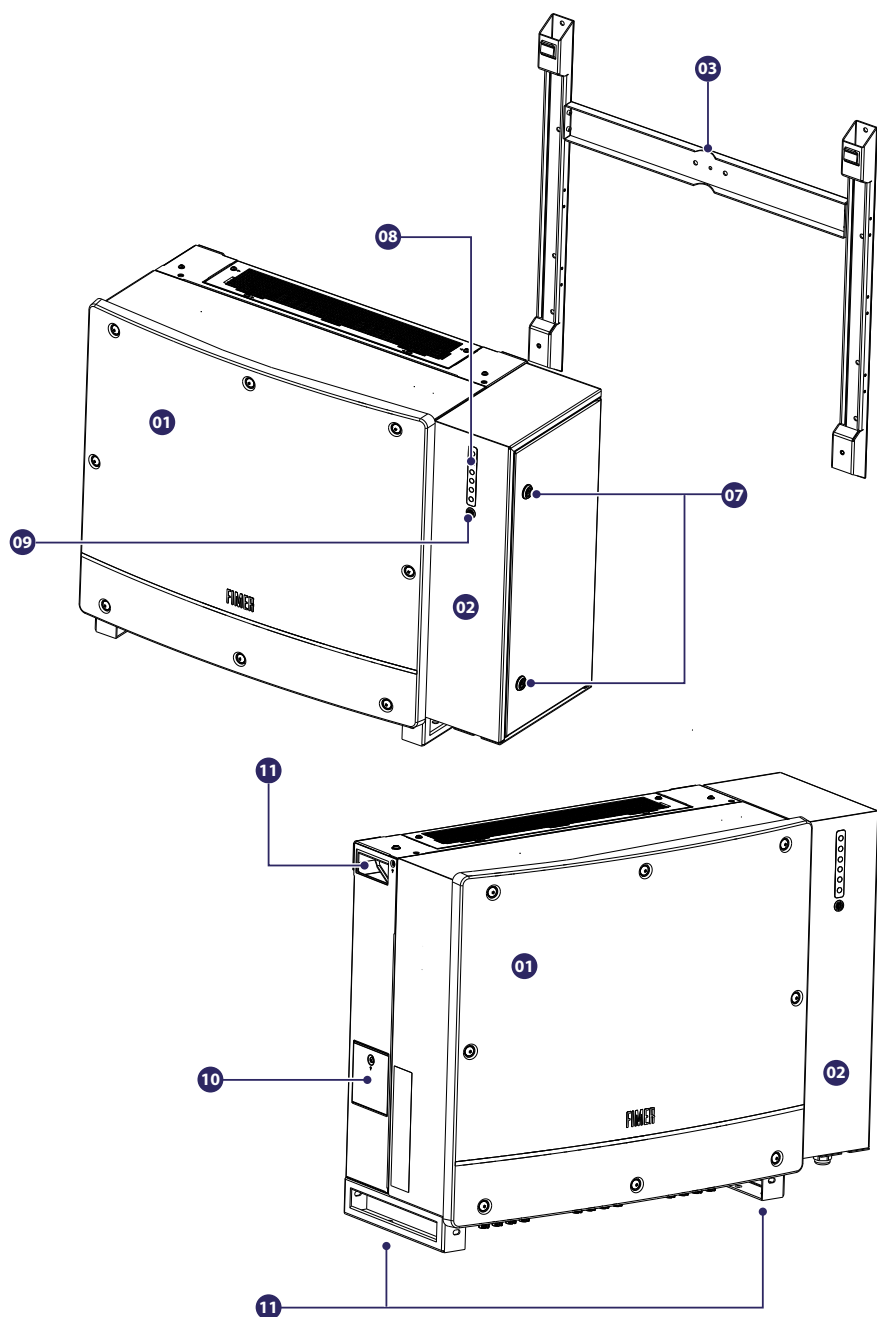
Inverter model	Description
PVM-125-TL-SX	Grid Connected Solar Inverter - 3 phase - 125 kW • 12 independent MPPTs • DC disconnect switch • Input with 48 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-125-TL-SY	Grid Connected Solar Inverter - 3 phase - 125 kW • 12 independent MPPTs • DC disconnect switch • Input with 48 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable)
PVM-125-TL-SX;APID	Grid Connected Solar Inverter - 3 phase - 125 kW • 12 independent MPPTs • DC disconnect switch • Input with 40 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality
PVM-125-TL-SY;APID	Grid Connected Solar Inverter - 3 phase - 125 kW • 12 independent MPPTs • DC disconnect switch • Input with 48 quick fit connectors (4 each MPPT) • Input Current Monitoring (String level) • DC SPD Type I+II (monitored) • Integrated AFCI (DC switch level) • 4 AC terminal blocks (3 Phases + Neutral) • AC SPD Type II (replaceable) • Integrated Anti-PID functionality
NOTE – All inverter models can be equipped with PVM-75/125 Grounding kit. This kit can be installed in the field by qualified installers and/or licensed electricians, with experience in photovoltaic systems. Refer to instruction provided together with kit for a proper installation and/or configuration.	
NOTE – All inverter models can be equipped with USB to Ethernet Board to manage communication with FIMER PVX AC Coupled ESS (Energy Storage System). This kit can be installed in the field by qualified installers and/or licensed electricians, with experience in photovoltaic systems. Refer to instruction provided together with kit for a proper installation and/or configuration.	

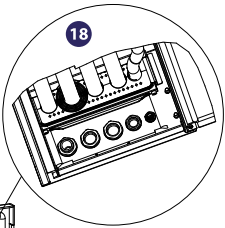
3.4 Component reference numbers

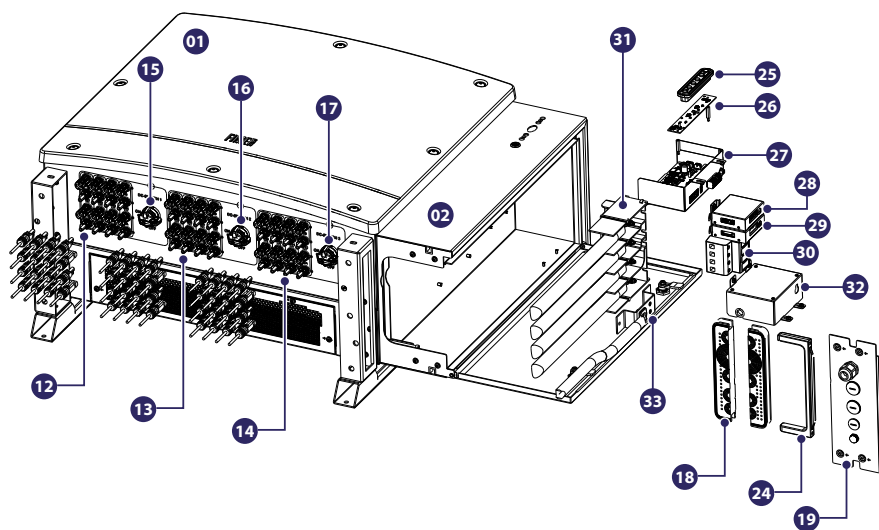
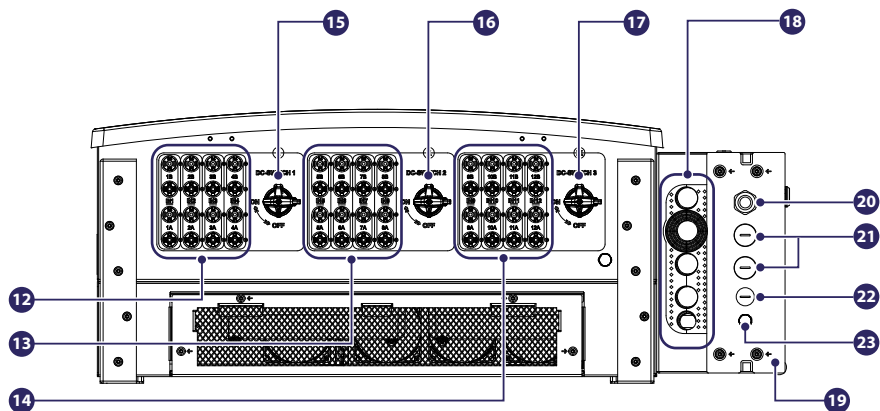
#	Description	#	Description
01	Power Box	22	PG13.5 hole cap (for additional signal cables)
02	Wiring Box	23	Anti-condensation valve
03	Mounting bracket	24	Metal flange for fixing AC power cable lock to chassis
04	Inlet air removable grating	25	Plastic LED light-guide
05	Outlet air removable grating	26	LED board
06	Rear air conveyor	27	Connectivity Board
07	Wiring Box quarter cam locks	28	USB to Ethernet Add-on (optional)
08	LEDs panel	29	Grounding Kit (optional)
09	Wi-Fi/AFCI button	30	Din-rail Type I+II AC SPD (optional)
10	Removeable fan tray	31	AC terminal block
11	Integrated handles	32	PCB assembled Type II AC SPD
12	Quick fit input connectors MPPT 1-4	33	PE cable connection
13	Quick fit input connectors MPPT 5-8	34	Ethernet connector 1 (RJ45)
14	Quick fit input connectors MPPT 9-12	35	Ethernet connector 2 (RJ45)
15	DC disconnecter MPPT 1-4	36	USB connector
16	DC disconnecter MPPT 5-8	37	Multi Signal Connector: Remote On/Off, DRM 0/1/5, configurable relay, 24V isolated power supply connector
17	DC disconnecter MPPT 9-12	38	RS-485 line terminal block
18	AC multi/single core power cable lock	39	RS-485 120 Ohm termination resistance switch
19	Removeable communication signal panel	40	Grounding kit connector
20	Connectivity cable gland M25	41	Connectivity module
21	M25 hole caps (for additional signal cables)	42	CR2032 coin battery

3.4.1 Inverter external view

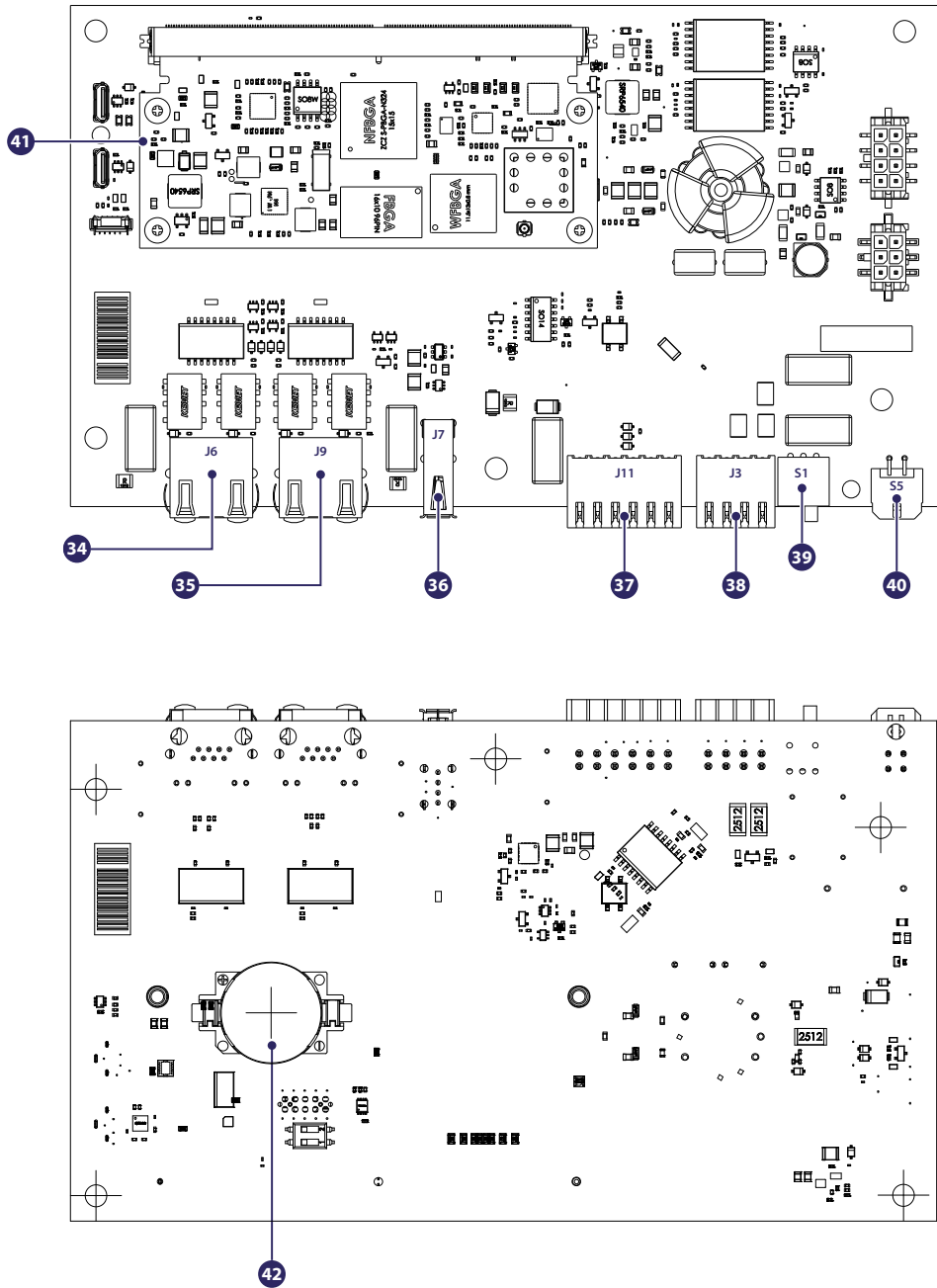








3.4.2 Communication board



3.5 Technical data

3.5.1 Technical data table

PVM-125-TL-SX/SY;APID

Input side

Absolute maximum DC voltage ($V_{max,abs}$)	1100 V
Start-up DC voltage (V_{start})	250...500 V (default 430 V)
Operating DC voltage range ($V_{dcmin}...V_{dcmax}$)	200 – 1000 V
Rated DC voltage (V_{dcr})	620 V
Rated DC power (P_{dcr})	127500 W
Recommended maximum PV array power ($P_{PV,max}$) ¹⁾	193000 Wp
Number of independent MPPT	12
Maximum DC power for each MPPT ($P_{MPPT,max}$) ¹⁾	20000 W
DC voltage range of MPPT ($V_{MPPT,min}...V_{MPPT,max}$) at P_{acr}	460 – 850 V
Maximum DC current ($I_{dc,max}$) for each MPPT ($I_{MPPT,max}$)	32 A
Maximum short circuit current for MPPT	50 A
Number of DC inputs pairs for each MPPT	2
DC connection type	Quick fit PV connector ²⁾

Input protection and function

Reverse polarity protection	Yes, from limited current source
Over voltage protection for each MPPT – varistor	SPD Type II (Type I+II optional)
Photovoltaic array isolation control	Yes, according to local standard
Arc Fault detection (AFCI)	Yes
Single string monitoring	Yes

AC Output

AC Grid connection type	Three-phase (3W + PE or 3W + N + PE)
Earthing system	TN-S, TN-C, TN-Cs, TT and IT
Rated AC power ($P_{acr}@cos\phi=1$)	125000 W
Maximum AC output power ($P_{acmax}@cos\phi=1$)	125000 W
Maximum apparent power (S_{max})	125000 VA
Maximum reactive power (Q_{max})	75000 VAR
Rated AC grid voltage (V_{acr})	380 V / 400 V
Rated Output Current at Vac 400 V (I_{acr})	180.5 A
Maximum AC current ($I_{ac,max}$)	190 A

Contributory fault current	190 A
AC output short time withstand current	2250 A, 10 ms (I_{cw}), 4500 A (I_{pk})
Rated frequency (f_r)	50 Hz / 60 Hz
Frequency range ³⁾ ($f_{min} \dots f_{max}$)	45 ... 55 Hz / 55 ... 65 Hz
Nominal power factor and adj. range	> 0.995, adj. $\pm 0.8 - 1$ (over/under excited)
Total current harmonic distortion	< 3% of $I_{ac,max}$ (typical 0.25% on sinusoidal voltage reference)
Maximum DC injection current (% of $I_{ac,r}$)	< 0.5 % * $I_{ac,r}$
AC connection type	Terminal block
Maximum AC cable	240 mm ² Copper and Aluminium
Grid connected output protection	
Anti-islanding protection	According to local standard
Minimum external AC overcurrent protection	300 A
Output overvoltage protection – replaceable surge protection device	SPD TYPE II ⁴⁾
Efficiency	
Maximum efficiency	98.8 %
Euro efficiency	98.5 %
MPPT efficiency	99.99 %
Embedded communication	
Embedded physical interface	WLAN ⁵⁾ , Dual Ethernet, RS-485
Embedded communication protocols	Modbus TCP SunSpec, Modbus RTU Sunspec
Cloud services	Aurora Vision® Plant Portfolio Manager, Rest API
User interface	LEDs, Internal Web User Interface (WEB UI)
Commissioning (Energy policy included)	Internal Web User Interface (WEB UI)
Advanced features	Export limitation control ⁶⁾ , Embedded data logger
Environmental	
Ambient temperature range	-25...+60 °C (-13...140 °F) with derating above 30 °C (86 °F)
Relative humidity	4 ... 100 % condensing
Environmental pollution degree	PD3
Acoustic noise emission level (worst case)	< 77.9 dBA @ 1 m
Maximum operating altitude	4000 m (13123 ft) with derating above 3000 m (9842 ft)
Ambient storage/transport temperature	-40 °C ... +85 °C
Humidity storage/transport	4 % + 100 %
Environmental classification	4K6 (IEC 62477-1:2022) / 4K26 (IEC 60721-3-4:2019)
Vibrations	4M1

Chemically active substances	4C2
Mechanically active substances	4S2

Physical

Inverter typology	Grid connected, Double stage, Transformerless
Environmental protection rating	IP66 (Power Box) / IP65 (Wiring Box)
Cooling	Forced air
Dimension (H x W x D)	715 x 965 x 380 mm (see paragraph 3.5.6 for further details)
Weight	93 kg
Mounting system	Mounting bracket (vertical or horizontal installation)

Safety

Isolation level	Transformerless
Protective class	Class I
Overvoltage category according to IEC 62109-1	OVC III (AC Port), OVC II (PV port)
Marking	CE, RCM
Safety and EMC standards	IEC/EN 62109-1, IEC/EN 62109-2, IEC 62477-1, EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12
Grid standards (check your sales channel for availability) ⁷⁾	CEI 0-16, CEI 0-21, DIN V VDE V 0126-1-1, VDE-AR-N 4105 / 4110 / 4120, UK G99-1, Ireland, NTS 631, AS/NZS 4777.2, C10/11, EN 50549, IEC 61727, IEC 62116, MEA, PEA

Other features

Battery ready	Yes, AC coupled BESS ⁸⁾
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Accessories

PVM-75/125 Grounding Kit	Allow to connect the negative input pole to ground ⁹⁾
PVM-75/125 String Expander/Combiner	DC Wiring box to parallel multiple independent MPPT (integrated protection fuses) ¹⁰⁾
PVM-75/125 USB to Ethernet Add-on	Accessory board to add 2 additional Ethernet ports for AC BESS management ¹¹⁾
PVM-75/125 Fan filter	Optional Fan filter for heavy dusty environmental
PVM-75/125 Central Bracket	Additional central bracket for pole mounting
PVM-75/125 Installation kit	Installation kit containing lifting eyebolts and handles and key to open the wiring box door

- 1) Value subject to derating; refer to the product documentation for further details.
- 2) Refer to the [MC4 connectors \(PV inputs\)](#) section to know the brand and the model of the quick fit connector.
- 3) The Frequency range may vary depending on specific country grid standards.
- 4) As per test defined in EN/IEC 61643-11.
- 5) As per IEEE 802.11 b/g/n standard.
- 6) Please refer to the document "Meter supported by FIMER string inverters and the VSN700-05 data logger".
- 7) Further grid standards will be added, please refer to FIMER Solar page for further details.
- 8) Compatible with FIMER PVX Energy Storage Family.
- 9) When PVM-75/125 Grounding kit is installed, Residual Current Monitoring do not fully operate. Inverter must be installed and operate in "restricted areas (access limited to qualified personnel)" according to IEC 62109-2.
- 10) For further information refer to PVM-75/125 String Expander/Combiner Manual available at www.fimer.com.
- 11) For further information refer to PVM-75/125 USB to Ethernet Add-on manual available at www.fimer.com.

PVM-110-TL-SX/SY;APID

Input side

Absolute maximum DC voltage ($V_{max,abs}$)	1100 V
Start-up DC voltage (V_{start})	250...500 V (default 430 V)
Operating DC voltage range ($V_{dcmin}...V_{dcmax}$)	200 – 1000 V
Rated DC voltage (V_{dcr})	620 V
Rated DC power (P_{dcr})	112200 W
Recommended maximum PV array power ($P_{PV,max}$) ¹⁾	170500 Wp
Number of independent MPPT	10
Maximum DC power for each MPPT ($P_{MPPT,max}$) ¹⁾	20000 W
DC voltage range of MPPT ($V_{MPPT,min}...V_{MPPT,max}$) at P_{acr}	460 – 850 V
Maximum DC current ($I_{dc,max}$) for each MPPT ($I_{MPPT,max}$)	32 A
Maximum short circuit current for MPPT	50 A
Number of DC inputs pairs for each MPPT	2
DC connection type	Quick fit PV connector ²⁾

Input protection and function

Reverse polarity protection	Yes, from limited current source
Over voltage protection for each MPPT – varistor	SPD Type II (Type I+II optional)
Photovoltaic array isolation control	Yes, according to local standard
Arc Fault detection (AFCI)	Yes
Single string monitoring	Yes

AC Output

AC Grid connection type	Three-phase (3W + PE or 3W + N + PE)
Earthing system	TN-S, TN-C, TN-Cs, TT and IT
Rated AC power ($P_{acr}@cos\varphi=1$)	110000 W
Maximum AC output power ($P_{acmax}@cos\varphi=1$)	110000 W
Maximum apparent power (S_{max})	110000 VA
Maximum reactive power (Q_{max})	66000 VAR
Rated AC grid voltage ($V_{ac,r}$)	380 V / 400 V
Rated Output Current at Vac 400 V ($I_{ac,r}$)	158.8 A
Maximum AC current ($I_{ac,max}$)	167.2 A
Contributory fault current	167.2 A
AC output short time withstand current	2000 A, 10 ms (I_{cw}), 4000 A (I_{pk})

Rated frequency (f_r)	50 Hz / 60 Hz
Frequency range ³⁾ ($f_{min} \dots f_{max}$)	45 ... 55 Hz / 55 ... 65 Hz
Nominal power factor and adj. range	> 0.995, adj. $\pm 0.8 - 1$ (over/under excited)
Total current harmonic distortion	< 3% of $I_{ac,max}$ (typical 0.25% on sinusoidal voltage reference)
Maximum DC injection current (% of $I_{ac,r}$)	< 0.5 % * $I_{ac,r}$
AC connection type	Terminal block
Maximum AC cable	240 mm ² Copper and Aluminium
Grid connected output protection	
Anti-islanding protection	According to local standard
Maximum external AC overcurrent protection	260 A
Output overvoltage protection – replaceable surge protection device	SPD TYPE II ⁴⁾
Efficiency	
Maximum efficiency	98.8 %
Euro efficiency	98.5 %
MPPT efficiency	99.99 %
Embedded communication	
Embedded physical interface	WLAN ⁵⁾ , Dual Ethernet, RS-485
Embedded communication protocols	Modbus TCP SunSpec, Modbus RTU SunSpec
Cloud services	Aurora Vision® Plant Portfolio Manager, Rest API
User interface	LEDs, Internal Web User Interface (WEB UI)
Commissioning (Energy policy included)	Internal Web User Interface (WEB UI)
Advanced features	Export limitation control ⁶⁾ , Embedded data logger
Environmental	
Ambient temperature range	-25...+60 °C (-13...140 °F) with derating above 40 °C (104 °F)
Relative humidity	4 ... 100 % condensing
Environmental pollution degree	PD3
Acoustic noise emission level (worst case)	< 77.9 dBA @ 1 m
Maximum operating altitude	4000 m (13123 ft) with derating above 3000 m (9842 ft)
Ambient storage/transport temperature	-40 °C ... +85 °C
Humidity storage/transport	4 % + 100 %
Environmental classification	4K6 (IEC 62477-1:2022) / 4K26 (IEC 60721-3-4:2019)
Vibrations	4M1
Chemically active substances	4C2

Mechanically active substances	4S2
Physical	
Inverter typology	Grid connected, Double stage, Transformerless
Environmental protection rating	IP66 (Power Box) / IP65 (Wiring Box)
Cooling	Forced air
Dimension (H x W x D)	715 x 965 x 380 mm (see paragraph 3.5.6 for further details)
Weight	90 kg
Mounting system	Mounting bracket (vertical or horizontal installation)
Safety	
Isolation level	Transformerless
Protective class	Class I
Overvoltage category according to IEC 62109-1	OVC III (AC Port), OVC II (PV port)
Marking	CE, RCM
Safety and EMC standards	IEC/EN 62109-1, IEC/EN 62109-2, IEC 62477-1, EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN61000-3-12
Grid standards (check your sales channel for availability) ⁷⁾	CEI 0-16, CEI 0-21, DIN V VDE V 0126-1-1, VDE-AR-N 4105 / 4110 / 4120, UK G99-1, Ireland, NTS 631, AS/NZS 4777.2, C10/11, EN 50549, IEC 61727, IEC 62116, MEA, PEA
Other features	
Battery ready	Yes, AC coupled BESS ⁸⁾
Accessories	
PVM-75/125 Grounding Kit	Allow to connect the negative input pole to ground ⁹⁾
PVM-75/125 String Expander/Combiner	DC Wiring box to parallel multiple independent MPPT (integrated protection fuses) ¹⁰⁾
PVM-75/125 USB to Ethernet Add-on	Accessory board to add 2 additional Ethernet ports for AC BESS management ¹¹⁾
PVM-75/125 Fan filter	Optional Fan filter for heavy dusty environmental
PVM-75/125 Central Bracket	Additional central bracket for pole mounting
PVM-75/125 Installation kit	Installation kit containing lifting eyebolts and handles and key to open the wiring box door

1) Value subject to derating; refer to the product documentation for further details.

2) Refer to the [MC4 connectors \(PV inputs\)](#) section to know the brand and the model of the quick fit connector.

3) The Frequency range may vary depending on specific country grid standards.

4) As per test defined in EN/IEC 61643-11.

5) As per IEEE 802.11 b/g/n standard.

6) Please refer to the document "Meter supported by FIMER string inverters and the VSN700-05 data logger".

7) Further grid standards will be added, please refer to FIMER Solar page for further details.

8) Compatible with FIMER PVX Energy Storage Family.

9) When PVM-75/125 Grounding kit is installed, Residual Current Monitoring do not fully operate. Inverter must be installed and operate in "restricted areas (access limited to qualified personnel)" according to IEC 62109-2.

10) For further information refer to PVM-75/125 String Expander/Combiner Manual available at www.fimer.com.

11) For further information refer to PVM-75/125 USB to Ethernet Add-on manual available at www.fimer.com.

PVM-100-TL-SX/SY;APID**Input side**

Absolute maximum DC voltage ($V_{max,abs}$)	1100 V
Start-up DC voltage (V_{start})	250...500 V (default 430 V)
Operating DC voltage range ($V_{dcmin}...V_{dcmax}$)	200 – 1000 V
Rated DC voltage (V_{dcr})	620 V
Rated DC power (P_{dcr})	102000 W
Recommended maximum PV array power ($P_{PV,max}$) ¹⁾	155000 Wp
Number of independent MPPT	8
Maximum DC power for each MPPT ($P_{MPPT,max}$) ¹⁾	20000 W
DC voltage range of MPPT ($V_{MPPT,min}...V_{MPPT,max}$) at P_{acr}	460 – 850 V
Maximum DC current ($I_{dc,max}$) for each MPPT ($I_{MPPT,max}$)	32 A
Maximum short circuit current for MPPT	50 A
Number of DC inputs pairs for each MPPT	2
DC connection type	Quick fit PV connector ²⁾

Input protection and function

Reverse polarity protection	Yes, from limited current source
Over voltage protection for each MPPT – varistor	SPD Type II (Type I+II optional)
Photovoltaic array isolation control	Yes, according to local standard
Arc Fault detection (AFCI)	Yes
Single string monitoring	Yes

AC Output

AC Grid connection type	Three-phase (3W + PE or 3W + N + PE)
Earthing system	TN-S, TN-C, TN-Cs, TT and IT
Rated AC power ($P_{acr}@cos\varphi=1$)	100000 W
Maximum AC output power ($P_{acmax}@cos\varphi=1$)	100000 W
Maximum apparent power (S_{max})	100000 VA
Maximum reactive power (Q_{max})	60000 VAR
Rated AC grid voltage ($V_{ac,r}$)	380 V / 400 V
Rated Output Current at Vac 400 V ($I_{ac,r}$)	144.4 A
Maximum AC current ($I_{ac,max}$)	152 A
Contributory fault current	152 A
AC output short time withstand current	2000 A, 10 ms (I_{cw}), 4000 A (I_{pk})

Rated frequency (f_r)	50 Hz / 60 Hz
Frequency range ³⁾ ($f_{min} \dots f_{max}$)	45 ... 55 Hz / 55 ... 65 Hz
Nominal power factor and adj. range	> 0.995, adj. $\pm 0.8 - 1$ (over/under excited)
Total current harmonic distortion	< 3% of $I_{ac,max}$ (typical 0.25% on sinusoidal voltage reference)
Maximum DC injection current (% of $I_{ac,r}$)	< 0.5 % $\cdot I_{ac,r}$
AC connection type	Terminal block
Maximum AC cable	240 mm ² Copper and Aluminium
Grid connected output protection	
Anti-islanding protection	According to local standard
Maximum external AC overcurrent protection	240 A
Output overvoltage protection – replaceable surge protection device	SPD TYPE II ⁴⁾
Efficiency	
Maximum efficiency	98.8 %
Euro efficiency	98.5 %
MPPT efficiency	99.99 %
Embedded communication	
Embedded physical interface	WLAN ⁵⁾ , Dual Ethernet, RS-485
Embedded communication protocols	Modbus TCP SunSpec, Modbus RTU SunSpec
Cloud services	Aurora Vision® Plant Portfolio Manager, Rest API
User interface	LEDs, Internal Web User Interface (WEB UI)
Commissioning (Energy policy included)	Internal Web User Interface (WEB UI)
Advanced features	Export limitation control ⁶⁾ , Embedded data logger
Environmental	
Ambient temperature range	-25...+60 °C (-13...140 °F) with derating above 45 °C (113 °F)
Relative humidity	4 ... 100 % condensing
Environmental pollution degree	PD3
Acoustic noise emission level (worst case)	< 77.9 dBA @ 1 m
Maximum operating altitude	4000 m (13123 ft) with derating above 3000 m (9842 ft)
Ambient storage/transport temperature	-40 °C ... +85 °C
Humidity storage/transport	4 % + 100 %
Environmental classification	4K6 (IEC 62477-1:2022) / 4K26 (IEC 60721-3-4:2019)
Vibrations	4M1
Chemically active substances	4C2
Mechanically active substances	4S2

Physical

Inverter typology	Grid connected, Double stage, Transformerless
Environmental protection rating	IP66 (Power Box) / IP65 (Wiring Box)
Cooling	Forced air
Dimension (H x W x D)	715 x 965 x 380 mm (see paragraph 3.5.6 for further details)
Weight	87 kg
Mounting system	Mounting bracket (vertical or horizontal installation)

Safety

Isolation level	Transformerless
Protective class	Class I
Overvoltage category according to IEC 62109-1	OVC III (AC Port), OVC II (PV port)
Marking	CE, RCM
Safety and EMC standards	IEC/EN 62109-1, IEC/EN 62109-2, IEC 62477-1, EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN61000-3-12
Grid standards (check your sales channel for availability) ⁷⁾	CEI 0-16, CEI 0-21, DIN V VDE V 0126-1-1, VDE-AR-N 4105 / 4110 / 4120, UK G99-1, Ireland, NTS 631, AS/NZS 4777.2, C10/11, EN 50549, IEC 61727, IEC 62116, MEA, PEA

Other features

Battery ready	Yes, AC coupled BESS ⁸⁾
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Accessories

PVM-75/125 Grounding Kit	Allow to connect the negative input pole to ground ⁹⁾
PVM-75/125 String Expander/Combiner	DC Wiring box to parallel multiple independent MPPT (integrated protection fuses) ¹⁰⁾
PVM-75/125 USB to Ethernet Add-on	Accessory board to add 2 additional Ethernet ports for AC BESS management ¹¹⁾
PVM-75/125 Fan filter	Optional Fan filter for heavy dusty environmental
PVM-75/125 Central Bracket	Additional central bracket for pole mounting
PVM-75/125 Installation kit	Installation kit containing lifting eyebolts and handles and key to open the wiring box door

- 1) Value subject to derating; refer to the product documentation for further details.
- 2) Refer to the [MC4 connectors \(PV inputs\)](#) section to know the brand and the model of the quick fit connector.
- 3) The Frequency range may vary depending on specific country grid standards.
- 4) As per test defined in EN/IEC 61643-11.
- 5) As per IEEE 802.11 b/g/n standard.
- 6) Please refer to the document "Meter supported by FIMER string inverters and the VSN700-05 data logger".
- 7) Further grid standards will be added, please refer to FIMER Solar page for further details.
- 8) Compatible with FIMER PVX Energy Storage Family.
- 9) When PVM-75/125 Grounding kit is installed, Residual Current Monitoring do not fully operate. Inverter must be installed and operate in "restricted areas (access limited to qualified personnel)" according to IEC 62109-2.
- 10) For further information refer to PVM-75/125 String Expander/Combiner Manual available at www.fimer.com.
- 11) For further information refer to PVM-75/125 USB to Ethernet Add-on manual available at www.fimer.com.

PVM-75-TL-SX/SY; APID

Input side

Absolute maximum DC voltage ($V_{max,abs}$)	1100 V
Start-up DC voltage (V_{start})	250...500 V (default 430 V)
Operating DC voltage range ($V_{dcmin}...V_{dcmax}$)	200 – 1000 V
Rated DC voltage (V_{dcr})	620 V
Rated DC power (P_{dcr})	76500 W
Recommended maximum PV array power ($P_{PV,max}$) ¹⁾	116000 Wp
Number of independent MPPT	6
Maximum DC power for each MPPT ($P_{MPPT,max}$) ¹⁾	20000 W
DC voltage range of MPPT ($V_{MPPT,min}...V_{MPPT,max}$) at P_{acr}	460 – 850 V
Maximum DC current ($I_{dc,max}$) for each MPPT ($I_{MPPT,max}$)	32 A
Maximum short circuit current for MPPT	50 A
Number of DC inputs pairs for each MPPT	2
DC connection type	Quick fit PV connector ²⁾

Input protection and function

Reverse polarity protection	Yes, from limited current source
Over voltage protection for each MPPT – varistor	SPD Type II (Type I+II optional)
Photovoltaic array isolation control	Yes, according to local standard
Arc Fault detection (AFCI)	Yes
Single string monitoring	Yes

AC Output

AC Grid connection type	Three-phase (3W + PE or 3W + N + PE)
Earthing system	TN-S, TN-C, TN-Cs, TT and IT
Rated AC power ($P_{acr}@cos\varphi=1$)	75000 W
Maximum AC output power ($P_{ac,max}@cos\varphi=1$)	75000 W
Maximum apparent power (S_{max})	75000 VA
Maximum reactive power (Q_{max})	45000 VAR
Rated AC grid voltage ($V_{ac,r}$)	380 V / 400 V
Rated Output Current at Vac 400 V ($I_{ac,r}$)	108.3 A
Maximum AC current ($I_{ac,max}$)	114 A
Contributory fault current	114 A
AC output short time withstand current	1500 A, 10 ms (I_{sw}), 3000 A (I_{pk})
Rated frequency (f_r)	50 Hz / 60 Hz

Frequency range ³⁾ ($f_{min} \dots f_{max}$)	45 ... 55 Hz / 55 ... 65 Hz
Nominal power factor and adj. range	> 0.995, adj. $\pm 0.8 - 1$ (over/under excited)
Total current harmonic distortion	< 3% of $I_{ac,max}$ (typical 0.25% on sinusoidal voltage reference)
Maximum DC injection current (% of $I_{ac,r}$)	< 0.5 % * $I_{ac,r}$
AC connection type	Terminal block
Maximum AC cable	240 mm ² Copper and Aluminium
Grid connected output protection	
Anti-islanding protection	According to local standard
Maximum external AC overcurrent protection	180 A
Output overvoltage protection – replaceable surge protection device	SPD TYPE II ⁴⁾
Efficiency	
Maximum efficiency	98.8 %
Euro efficiency	98.5 %
MPPT efficiency	99.99 %
Embedded communication	
Embedded physical interface	WLAN ⁵⁾ , Dual Ethernet, RS-485
Embedded communication protocols	Modbus TCP SunSpec, Modbus RTU SunSpec
Cloud services	Aurora Vision® Plant Portfolio Manager, Rest API
User interface	LEDs, Internal Web User Interface (WEB UI)
Commissioning (Energy policy included)	Internal Web User Interface (WEB UI)
Advanced features	Export limitation control ⁶⁾ , Embedded data logger
Environmental	
Ambient temperature range	-25...+60 °C (-13...140 °F) with derating above 45 °C (113 °F)
Relative humidity	4 ... 100 % condensing
Environmental pollution degree	PD3
Acoustic noise emission level (worst case)	< 77.9 dBA @ 1 m
Maximum operating altitude	4000 m (13123 ft) with derating above 3000 m (9842 ft)
Ambient storage/transport temperature	-40 °C ... +85 °C
Humidity storage/transport	4 % + 100 %
Environmental classification	4K6 (IEC 62477-1:2022) / 4K26 (IEC 60721-3-4:2019)
Vibrations	4M1
Chemically active substances	4C2
Mechanically active substances	4S2

Physical

Inverter typology	Grid connected, Double stage, Transformerless
Environmental protection rating	IP66 (Power Box) / IP65 (Wiring Box)
Cooling	Forced air
Dimension (H x W x D)	715 x 965 x 380 mm (see paragraph 3.5.6 for further details)
Weight	83 kg
Mounting system	Mounting bracket (vertical or horizontal installation)

Safety

Isolation level	Transformerless
Protective class	Class I
Overvoltage category according to IEC 62109-1	OVC III (AC Port), OVC II (PV port)
Marking	CE, RCM
Safety and EMC standards	IEC/EN 62109-1, IEC/EN 62109-2, IEC 62477-1, EN 61000-6-2, EN 61000-6-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN61000-3-12
Grid standards (check your sales channel for availability) ⁷⁾	CEI 0-16, CEI 0-21, DIN V VDE V 0126-1-1, VDE-AR-N 4105 / 4110 / 4120, UK G99-1, Ireland, NTS 631, AS/NZS 4777.2, C10/11, EN 50549, IEC 61727, IEC 62116, MEA, PEA

Other features

Battery ready	Yes, AC coupled BESS ⁸⁾
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Accessories

PVM-75/125 Grounding Kit	Allow to connect the negative input pole to ground ⁹⁾
PVM-75/125 String Expander/Combiner	DC Wiring box to parallel multiple independent MPPT (integrated protection fuses) ¹⁰⁾
PVM-75/125 USB to Ethernet Add-on	Accessory board to add 2 additional Ethernet ports for AC BESS management ¹¹⁾
PVM-75/125 Fan filter	Optional Fan filter for heavy dusty environmental
PVM-75/125 Central Bracket	Additional central bracket for pole mounting
PVM-75/125 Installation kit	Installation kit containing lifting eyebolts and handles and key to open the wiring box door

- 1) Value subject to derating; refer to the product documentation for further details.
- 2) Refer to the [MC4 connectors \(PV inputs\)](#) section to know the brand and the model of the quick fit connector.
- 3) The Frequency range may vary depending on specific country grid standards.
- 4) As per test defined in EN/IEC 61643-11.
- 5) As per IEEE 802.11 b/g/n standard.
- 6) Please refer to the document "Meter supported by FIMER string inverters and the VSN700-05 data logger".
- 7) Further grid standards will be added, please refer to FIMER Solar page for further details.
- 8) Compatible with FIMER PVX Energy Storage Family.
- 9) When PVM-75/125 Grounding kit is installed, Residual Current Monitoring do not fully operate. Inverter must be installed and operate in "restricted areas (access limited to qualified personnel)" according to IEC 62109-2.
- 10) For further information refer to PVM-75/125 String Expander/Combiner Manual available at www.fimer.com.
- 11) For further information refer to PVM-75/125 USB to Ethernet Add-on manual available at www.fimer.com.

Remarks:

- **Designed and manufactured in Italy**
- **Features not specifically listed in the present data sheet are not included in the product**

3.5.2 Specific information for the Australian market

The intend use for the inverters PVM-125(110)(100)(75)-TL for Australian market is for commercial and industrial application.

3.5.2.1 DCV class of each port

Port	DVC (Decisive Voltage Class)
DC	C
AC	C
RS485	A
Ethernet	A
USB	A
Alarm Output	A ¹⁾
Remote Control	A
Wi-Fi/FCI Button	A
+24V_ISO	A

¹⁾ Configurable relay N.O. or N.C., see specific section

3.5.2.2 DC Switch (isolator) technical data

Isolating Switching Device	DVC (Decisive Voltage Class)
Rated insulation voltage (U_i)	1500 V
Rated impulse withstand voltage (U_{imp})	8000 V
Suitability for isolation (U_o)	1000 V
Rated operational current (I_o)	25 A
Utilization category and/or PV utilization category	DC-PV2
Rated short-time withstand current (I_{cw}) ¹⁾	78.0 A, 1 sec
Rated short-circuit making capacity (I_{cm}) ¹⁾	1400 A
Rated breaking capacity	100 A ²⁾

¹⁾ The definitions for I_{cw} and I_{cm} are the same as used in AS 60947-3

²⁾ The rated braking capacity is defined as $4 \times I_o$

3.5.2.3 Anti-islanding Protection

The PVM-125(110)(100)(75)-TL integrates active anti-islanding protection based on **frequency shift in combination with RoCoF technique**.

3.5.2.4 DRM functionalities

The AS/NZS 4777.2 standard contains requirements related to grid stability and remote system control by the utility.

- DRM0 (demand response mode 0): operates the disconnection from the grid upon command from the utility.
- DRM1 (demand response mode 1): reduces import from grid to zero upon command from the utility.
- DRM5 (demand response mode 5): reduces export to grid to zero upon command from the utility.

NOTE – Only one between remote ON/OFF and DRM0 functionalities can be connected to the multi-signal connector (16). The desired functionality must be enabled via the integrated web user interface.

NOTE – Currently, the DRM1 functionality is not implemented at the software level.

3.5.3 Tightening torques

Component	Torque
Connectivity cable gland (20) - M25 cable gland	7.5 Nm
AC Connection Terminal Block (31) M12 nut	20 ... 30 Nm
Protective earth (PE) internal connection point (33) - M12 screw	20 ... 30 Nm
Protective earth (PE) external connection point - M8 screw	15...20 Nm
AC Connection Terminal Block (31) M4 nut	1.0 ... 1.5 Nm
Side bracket screws	5 Nm
MC4 connectors counterpart; Staubli;	3.4 ... 3.5 Nm
Signal connector counterpart	0.25 Nm
Metal flange for fixing AC power cable lock to chassis	3.0 Nm
Removeable communication signal panel	3.0 Nm

3.5.4 Cable gland clamping range

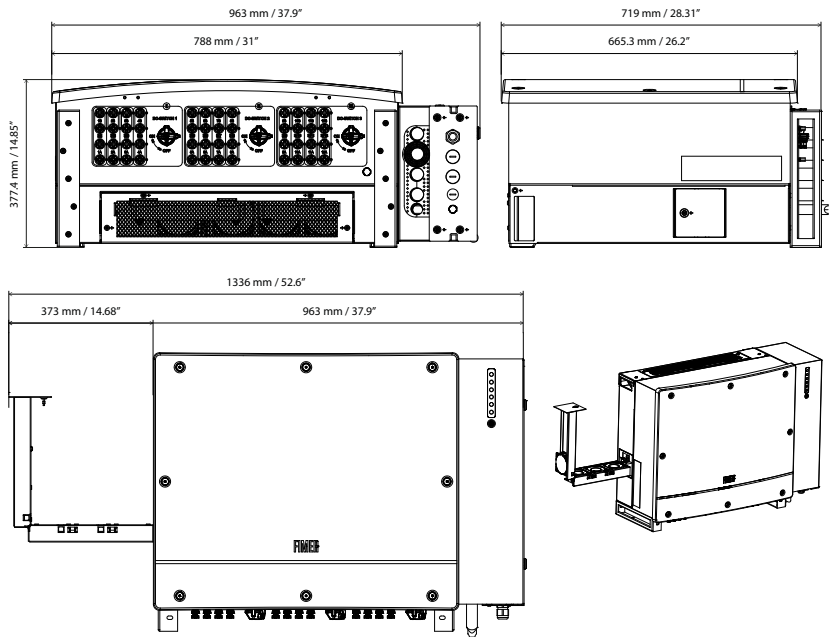
Component	mm
Single core AC Grid cable (18)	17 ...32 mm
Multi core AC cable (18)	16 ...58 mm
Internal PE cable (33)	12 ...27 mm
Connectivity cable gland (20) - M25 cable gland	10 ...17 mm
Connectivity cable gland (20) - M25 cable when gland equipped with two-holes gasket	each hole: 4 ... 6 mm
MC4 connectors counterpart; Male	5 ... 6 mm
MC4 connectors counterpart; Female	5 ... 6 mm

3.5.5 Connection cross section range

Component	mm ²
AC Grid connection (20)	70 ... 240 mm ²
PE cable connection (33)	35 ... 120 mm ²
Signal cable connection	0.25 ...1.5 mm ²
MC4 connectors Counterpart; Male	4 ... 6 mm ²
MC4 connectors counterpart; Female	4 ... 6 mm ²

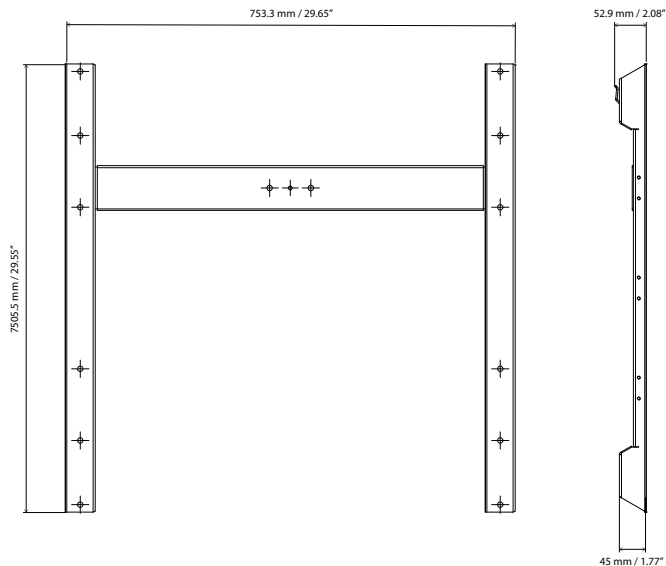
3.5.6 Overall dimensions of the inverter

The overall dimensions, including the mounting bracket (03), are expressed in millimetres / inches.



3.5.7 Overall dimensions of the mounting bracket

The dimensions of the wall mounting bracket (03) are expressed in millimetres and inches.

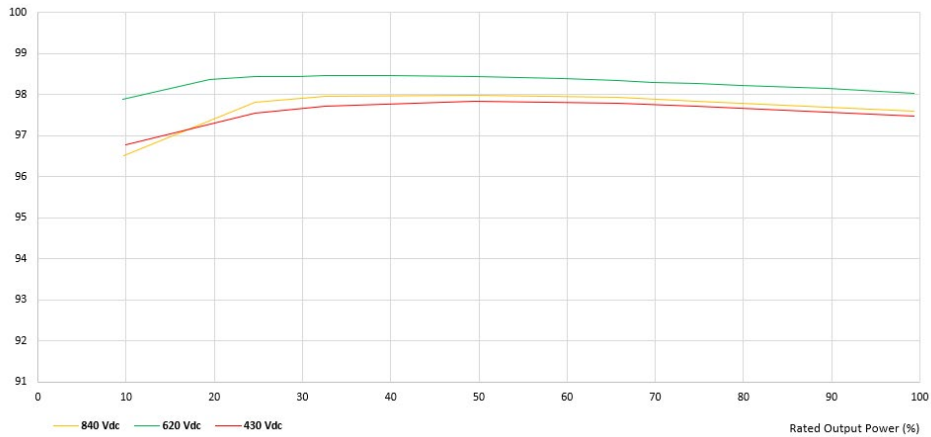


3.6 Efficiency curves

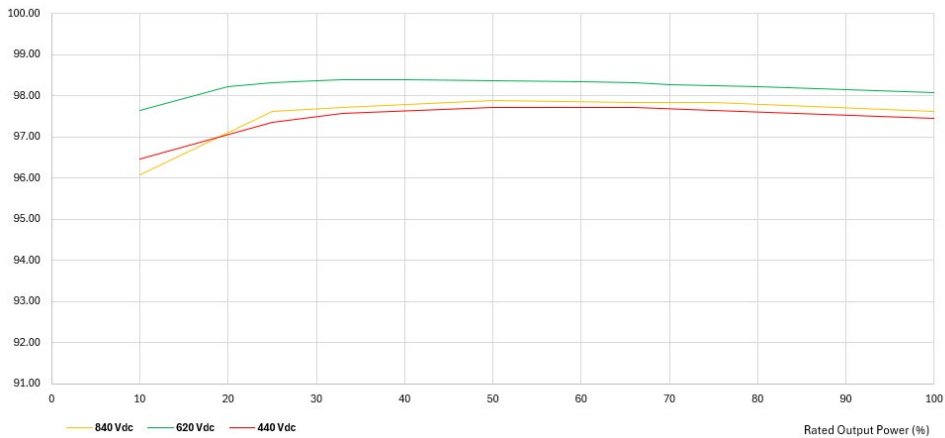
Graphs of the efficiency curves of all inverter models described in this manual are shown below.

NOTE – The efficiency curves are linked to technical parameters that are continually being developed and improved and should therefore be considered approximate

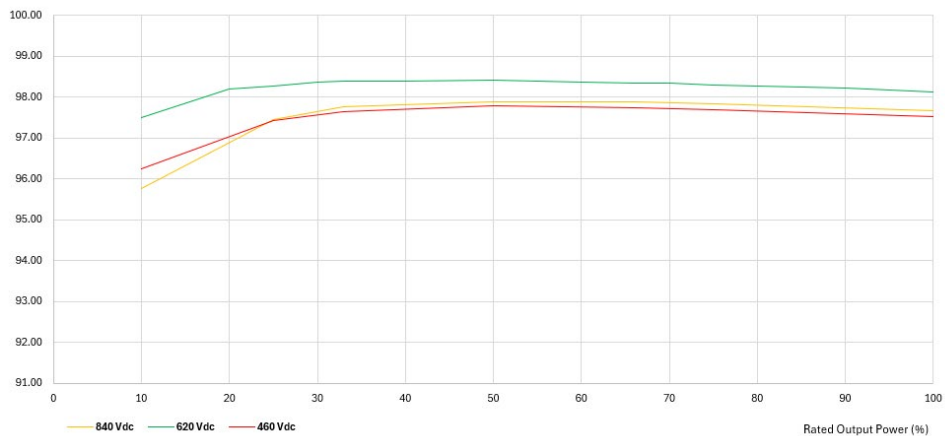
PVM-125-TL



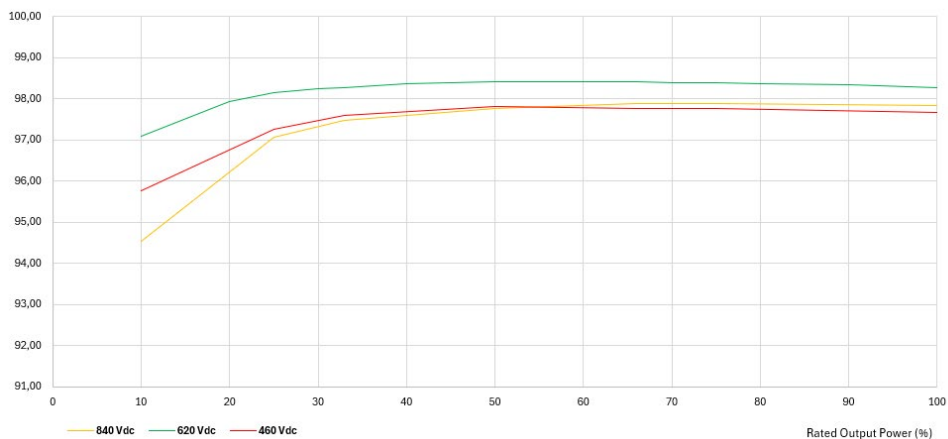
PVM-110-TL



PVM-100-TL



PVM-75-TL



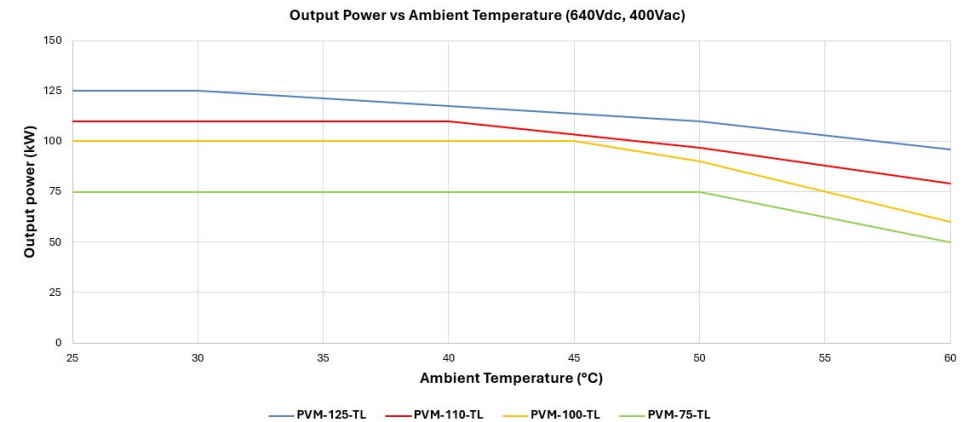
3.7 Power derating

To allow inverter operation in safe thermal and electrical conditions, the unit automatically reduces the value of the power fed into the grid. Power derating may occur due to:

- Adverse environmental conditions (thermal derating)
- Input voltage values too low / too high
- Percentage of output power (value set by the user)
- Grid voltage over frequency (mode set by user)
- Grid overvoltage $U > 10\text{min Der.}$ (enabling carried out by user)
- Anti-islanding
- Grid under voltage
- High input current values
- Fan failure

3.7.1 Power derating due to environmental conditions

The power reduction value and the inverter temperature at which it occurs depend on the ambient temperature and on many operating parameters. Example: input voltage, grid voltage and power available from the photovoltaic field.
The curves below show the de-rating of output power as a function of ambient temperature at rated DC voltage (input voltage 625 Vdc output voltage 400 Vac / 50 Hz).

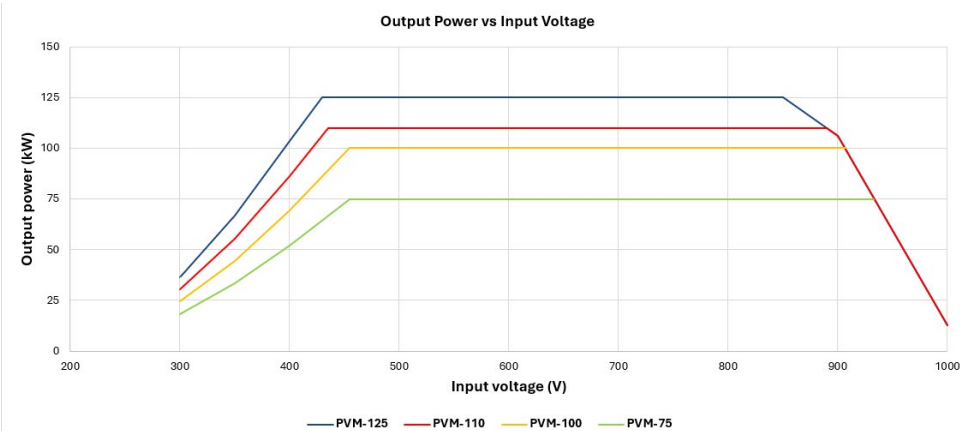


The inverter can therefore reduce the output AC power during certain periods of the day according to the value of these parameters.

3.7.2 Power derating due to the input voltage

The power reduction occurred for too high or too low DC input voltage values is adjusted automatically.

NOTE – Power reduction behaviour is guaranteed only in case of balanced input channels.



3.7.3 Power derating due to the fan failure

The power reduction can occur for the failure of one or more fans.

The rotational speed of both external and internal fans is continuously monitored in real time. Multiple operation zone and, consequently, severity levels are implemented based on the measured rotational speed of each individual fan.

In particular:

- **ZONE A – SLOWDOWN:**

Slight degradation of fan performances. In this specific condition, the inverter detects a rotational speed below than 80% of the expected nominal value; under these circumstances, a warning/alert is generated (**fan_Under-speed_1**) without triggering any power or current derating.

- **ZONE B – CRITICAL SLOWDOWN:**

Critical degradation of fan performances. In this specific condition, the inverter detects a rotational speed below than 60% of the expected nominal value; under these circumstances, a warning/alert is generated (**fan_Under-speed_2**) triggering power/current derating **reducing of 30% the maximum apparent output current**.

- **ZONE C – FAN FAULT:**

Fan failed, the rotational speed does not exceed 1000 rpm. In this specific condition, the inverter generates a FAN FAULT alarm (fan_speed_fault) triggering power/current derating **reducing of 70% the maximum apparent output current**.

- **ZONE D – OVERSPEED:**

The rotational speed is higher than expected nominal value (this condition is generally attributable to a malfunction in the fan drive circuitry, rather than to a failure of the fan itself). In this specific condition, the inverter generates a warning/alert (**fan_Over-speed_1**) without triggering any power or current derating.

3.7.4 Power derating due to altitude

⚠ WARNING – On account of the rarefaction of the air (at high altitudes), particular conditions may occur that should be considered when choosing the place of installation:

- Less efficient cooling and therefore a greater likelihood of the device going into derating because of high internal temperature.
- Reduction in the dielectric resistance of the air which, in the presence of high operating voltages (DC input), can create electric arcs (electrical discharges) that may damage the equipment.

⚠ WARNING – As the altitude increases, the failure rate of some electronic components increases exponentially because of cosmic radiation.

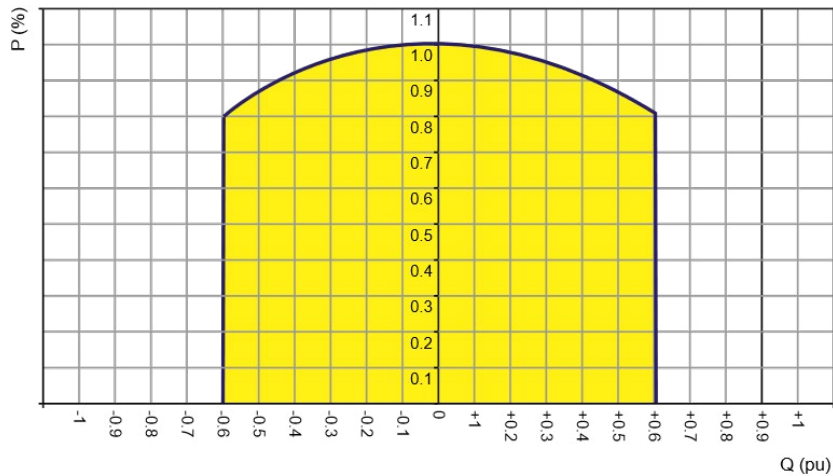
⚠ ATTENTION – All installations at altitudes of over 3000 m (9842 ft) must be assessed case by case considering the aforesaid criticalities.

3.7.5 P-Q Capability

⚠ ATTENTION – P-Q capability may be reduced to match the specific grid code requirements applicable in your country.

The following represents the maximum P-Q capability of the unit under the specified operating conditions.

	PVM-75-TL	PVM-100-TL	PVM-110-TL	PVM-125-TL
Ambient temperature	45 °C	45 °C	40 °C	30 °C
Rated output voltage (U_n)	380 V / 400 V AC			
Nominal Active Power (P_n)	75000 W	100000 W	110000 W	125000 W
Nominal Apparent Power (S_n)	75000 VA	100000 VA	110000 VA	125000 VA
Nominal Reactive Power (Q_n)	45000 VAR	60000 VA	66000 VA	75000 VA
$\cos(\varphi)$ @ S_n	-0.8 ... 1 ... +0.8 ¹⁾			
Capability with grid voltage	$1.0 \times U_n$			



3.8 Characteristics of a photovoltaic generator

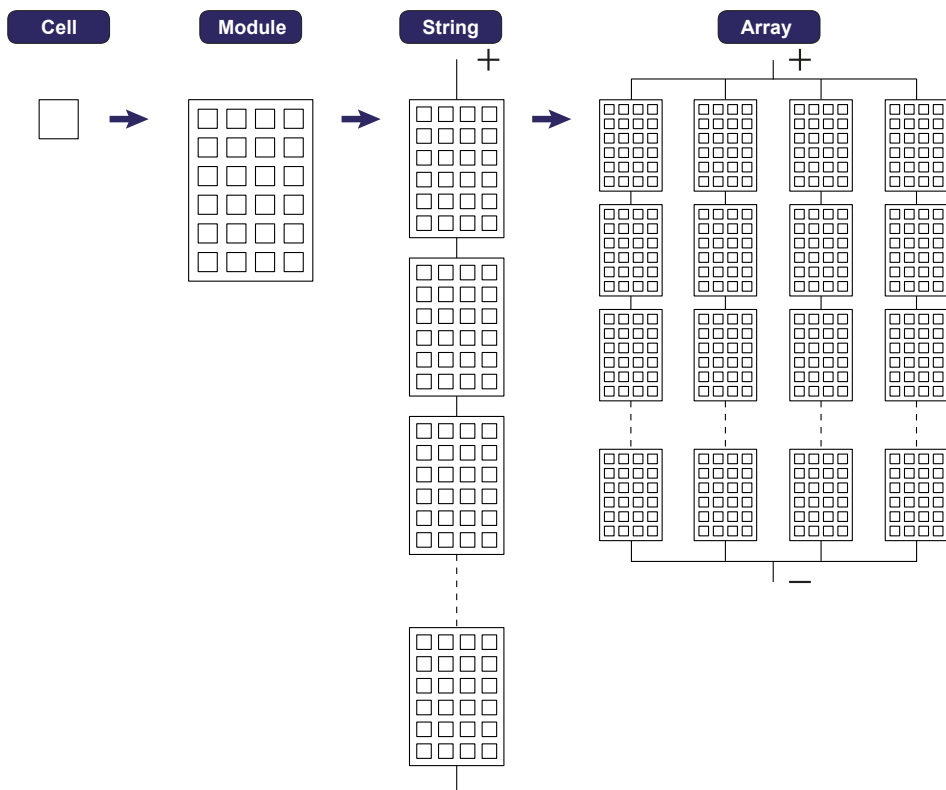
A PV generator consists of an assembly of photovoltaic modules that transform solar radiation into DC electrical energy and can be made up of:

- Strings: number (n) of PV modules connected in series
- Array: group of (m) strings connected in parallel.

The string technology was developed to significantly reduce the installation costs of a photovoltaic system that are mainly associated to wiring on the DC side of the inverter and subsequent distribution on the AC side.

- A photovoltaic panel consists of many photovoltaic cells mounted on the same support.
- A string consists of a certain number of panels connected in series.
- An array consists of two or more strings connected in parallel.
- Large photovoltaic systems can include multiple arrays connected to one or more inverters.

NOTE – The greater the number of panels in each string, the lower the cost and the less complex the wiring connections of the system.



ATTENTION – The current of each array must fall within the rating value limits of the inverter (see [Technical Data](#)).

ATTENTION – The inverters referred to in this document are **transformer-less**. This type requires the use of insulated photovoltaic panels (IEC 61730 Class A rating) and the need to keep the photovoltaic generator floating with respect to ground: no terminal of the generator must be connected to ground.

3.9 Description of the equipment

This equipment is a string inverter which converts the direct current of a photovoltaic generator into alternating current and feeds it into the public distribution grid.

Photovoltaic panels convert solar radiation into "DC" direct current electrical energy (via a photovoltaic field, also called PV generator); in order to be used from final user, it is transformed into "AC" alternate current. This conversion, known as inversion from DC to AC, is done in an efficient way by the FIMER inverters, without using any rotary elements, rather only via static electronic systems.

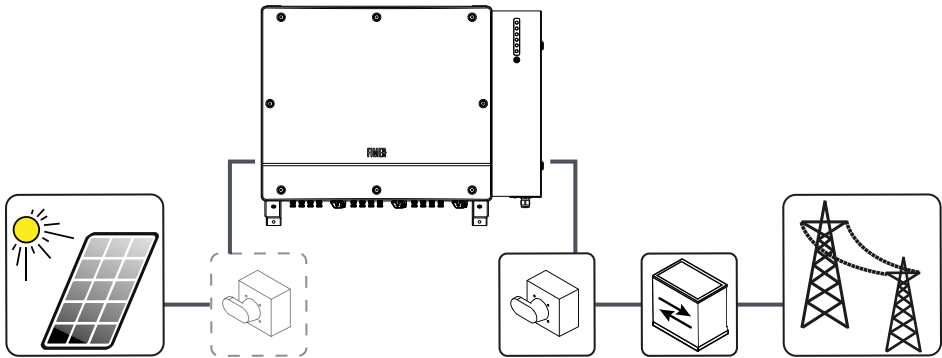
In order to allow inverter operation in safe thermal and electrical conditions, the unit automatically reduces the value of the power fed into the grid under adverse environmental conditions or unsuitable input voltage values.

When connected in parallel with the grid, the alternate current from the inverter flows directly into the domestic or industrial distribution circuit, which is in turn connected to the public distribution grid. In this way the solar energy system compensates the energy drawn from the utilities connected to the grid to which the inverter is linked.

When the photovoltaic system is not generating enough energy to ensure proper operation of connected loads, the remaining required power is taken from the public distribution grid. While if too much energy is produced, it is directly fed into the grid, thus becoming available to other users.

According to national and local standards and regulations, the produced energy can be sold to the local grid owner or credited to the user against future consumption, thus granting a great saving of money.

3.9.1 Operating diagram (example)



3.9.2 Mutual connection of multiple inverters

If the photovoltaic system exceeds the capacity of a single inverter, it is possible to connect multiple inverters to the system, each of them in turn connected on the DC side to a separate section of the photovoltaic generator, and on the AC side to the distribution grid.

Each inverter will work independently of the others, and its own photovoltaic module will supply the maximum power available to the grid.

3.9.3 Notes on the system sizing

Decisions on how to structure a photovoltaic system depend on a series of factors and considerations, such as type of panels, space availability, future location of the system, energy production goals over the long term, etc.

- NOTE** – For proper sizing of the PV system, it is recommended to use calculation software configured according to the technical parameters specified in the product documentation.
- NOTE** – When configuring DC input and during the installation it's needed to follow one basic rule to avoid possible output power derating. All MPPTs shall be populated connecting at least ONE string per each and configuration needs to be as much possible homogenous.

3.10 Functionality and components description

3.10.1 Highlights

- Up to 12 independent MPPTs in PVM-125-TL model
- Separate power module and wiring box
- Transformerless inverter
- Maximum efficiency up to 98.9%
- Double stage topology for a wide input range
- Arc Fault detection capability (at DC switch level)
- Anti-PID functionality (optional)
- Large set of specific grid codes available which can be selected directly in the field
- Both vertical and horizontal installation
- Possibility to wall or pole mounting
- Different available power sizes, 75, 100, 110 and 125 kW @ 400 Vac
- Wireless access to integrated Web User Interfaces for commissioning and monitoring purposes
- Ethernet daisy chain enabled (supports both ethernet star/ring topology)
- RS485 line acting as master or slave
- Modbus TPC/RTU SunSpec compliant
- Remote monitoring and firmware update via Aurora Vision®
- Compatible with BESS in configuration AC Coupled (with USB to Ethernet Add-on)

3.10.2 Improved commissioning and maintenance

Fimer Web User Interface (integrated)

Easy commissioning with the integrated Web User Interface.

Remote firmware update function

The firmware of the inverter can be updated both locally (via the internal Web User Interface) and remotely (Via Aurora Vision cloud products).

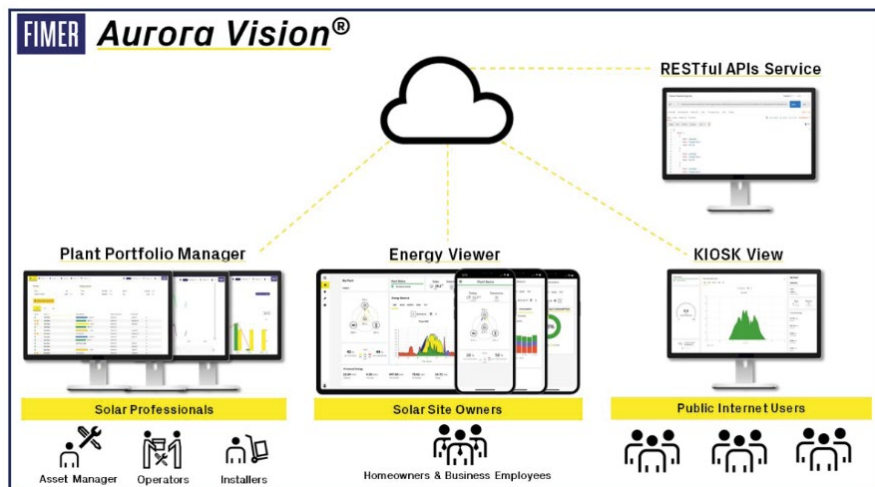
3.10.3 Aurora Vision®

Integrated logging capability allows remote monitoring of the plant without the needs of any additional external loggers.

Aurora Vision is a cloud-based platform enabling remote monitoring and asset management of FIMER devices in range of solar power application.

Aurora Vision consists of two different products, designed to meet different market needs, an APIs Service (RESTful architecture) to enabled third party data integration and a KIOSK view to show publicly solar plant benefits and performances:

- **Plant Portfolio Manager.** An advanced professional web-portal that allows stakeholders (such as installers / operators / managers) to monitor and control fleets of photovoltaic systems installed for final customers.
- **Energy Viewer.** A smart and easy-to-use mobile app for monitoring the main power generation and self-performances indicators, for owners of residential and commercial PV plants, to keep energy use and savings in check.
- **APIs Service.** Harness the power of data from FIMER photovoltaic systems to design solutions and provide opportunities.
- **KIOSK View.** A public and customizable web page based on HTML5 (self-updating and embeddable in external frames) to show the benefits and performances of a solar power plant.



NOTE – Please contact the MA Solar Italy technical support for getting your own Aurora Vision® account in order to access Plant Portfolio Manager (mainly for plant administrators). Download the Energy Viewer App ([App Store](https://www.apple.com/itunes/section/1175000000) or [Google Play Store](https://www.google.com/playstore/section/1175000000)) or visit <https://www.auroravision.net/> and click on “Sign-Up” to get your Aurora Vision account and Self-Register your plant (mainly for site owners).

3.10.4 Remote ON/OFF

This command can be used to switch off/switch on the inverter via an external (remote) command by means the Remote ON/OFF terminal block (37).

This functionality must be enabled in the integrated web user interface.

When the functionality is active the switching on of the inverter, besides being dictated by the presence of normal parameters which allow the inverter to be connected to the grid, also depends on the external control for switching on/off.

3.10.5 DRM0/1/5 functionalities (AS/NZS 4777.2 standard)

The AS/NZS 4777.2 standard contains requirements related to grid stability and remote system control by the utility.

- DRM0 (demand response mode 0): operates the disconnection from the grid upon command from the utility.
- DRM1 (demand response mode 1): reduces import from grid to zero upon command from the utility.
- DRM5 (demand response mode 5): reduces export to grid to zero upon command from the utility.

3.10.6 Reactive power production

This inverter can generate reactive power and feed it into the grid via the power factor setting. Power feeding modes vary by country and local grid regulations.

3.10.7 Active power limitation

This inverter can limit the active power fed into the grid to a desired, adjustable value.

3.10.8 Overvoltage surge arrester monitoring

The inverter monitors the status of the overvoltage DC and AC surge arresters and generates a warning in the event of a fault (viewable via monitoring system, web user interface).

3.10.9 DC Series Arc Fault Detection Interrupter

The inverter is factory-equipped with arc-fault detection functionality. The functionality is implemented at the DC switch level (up to 3 in the most complete configuration) allowing the identification of the system section eventually affected by arching.

The AFD performs a self-test when the system is started:

- If the self-test results are OK, the inverter will continue to AC grid connection.
- If a potential problem on the AFD circuitry is detected, the self-test will result in error **E053** error code (“arc_fault_detector_self_test_failed”).

During normal operation the input current is continually measured and analyzed. If a DC arc fault is detected during operation, the inverter disconnects from AC grid and generates an **E050** error code (“arc_fault_detector_arc”), which can be viewed through internal

Webserver. If Arc fault protection is triggered, the inverter will disconnect from AC grid and, after 5 minutes, enter the recovery mode to attempt reconnection. After 5 arc fault events, the inverter will latch, and the error can be manually cleared by pressing the Smart button or automatically resets itself with the day change.

Based on the above conditions, the LEDs behaviour is described in the table below:

Symbol	Description
	POWER Indicates that the inverter is functioning correctly. When the unit is commissioned, while the grid is checked, this icon blinks. If a valid grid voltage is detected, the icon remains continuously lit, if there is sufficient sunlight to activate the unit. Otherwise, the icon will continue to blink until the sunlight is sufficient for activation.
	WLAN/LAN Indicates the status of the Wi-Fi or Ethernet communication lines.
	METER Communication status with external meter (if present).
	BATTERY Communication status with external battery (if present).
	ALARM Indicates that the inverter has detected an anomaly. This type of problem is highlighted in the Web User Interface.
	GFI The "GFI" (ground fault) indicates that the inverter has detected a ground fault in the DC side photovoltaic generator. When this fault is detected, the inverter immediately disconnects from the grid.

			
Arc Fault Tripping (Not Latched)	OFF	ON	OFF
Arc Fault Tripping (Latched)	OFF	OFF	Blinking
Self-test failed	OFF	ON	OFF

Press and hold the Smart button **(09)** on the AC wiring box for 10 seconds. This will clear the **E050** error and restart the self-test. If self-test results are OK, the inverter will reconnect to the AC grid; if the DC arc fault is still present, the inverter will result in **E050** error code.

NOTE – The AFD self-test can be manually initiated at any time using the following procedure:

1. Turn off the inverter (switching off both DC and AC switches).
2. Wait for the unit to shut down completely (indicated by the LEDs stopping their blinking).
3. Turn on both the DC and AC switches and wait for self-test result.
4. The self-test does not provide success notification but only reports any errors to the UI.

If the AFD trips frequently, it means arcs are occurring. Turn the inverter OFF and request service to do complete check of the system wiring, including all connections and junction boxes, to locate the problem.

NOTE – Arc fault can be enabled or disabled through Web UI or other interfaces

3.10.10 ANTI-PID recovery functionality (optional)

Anti-PID function is provided as an additional function only for dedicated inverter models (;**APID** suffix). The optional Anti-PID board eventually integrated in the PVM family is based on a recovery method.

When installed since the initial commissioning of the system, the proposed solution can effectively prevent the build-up of any PID (Potential Induced Degradation) phenomena for solar panels and associated yield losses. In this way it is possible to avoid solar panel efficiency degradation.

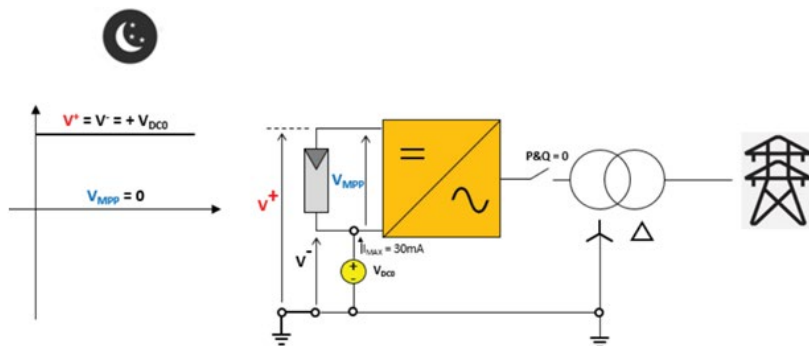
Below main aspects of the Anti-PID board and principle of operation briefly described.

Scope:

Polarization of the PV array terminals to an adjustable and regulated positive potential with respect to ground when the inverter is off-line (not connected to the AC grid), ensuring that maximum system voltage (i.e. 1100 Vdc) is not exceeded on any part of the PV array.

Main functions:

- String polarization through the application of a limited current source voltage bias (< 30mA) adjustable in pre-defined steps up to 750Vdc.
- Continuous measurement of the potential of the positive and negative terminal of the arrays with respect to ground.
- Run-time monitoring of all relevant parameters and Anti-PID board operating status, including dedicated alarms generated by the board.
- Possibility to enable and disable the Anti-PID function « On demand » by external commands or by dedicated Web User Interface (UI).



In the figure PVM's array terminal voltages with respect to ground during night-time operation of the Anti-PID board, inverter is off-line.

Adjustable functions (via WebUI):

- Enabling and disabling the PID recovery function.
- Reference voltage
Settable voltage range between 500Vdc and 750Vdc (default value 650Vdc).
- **Lock-in** and **Lock-out** voltages.
The PID recovery function starts operating when input open circuit voltage (Voc) drops below selected activation (Lock-in) voltage, while it stops operating when Voc rise above selected de-activation (Lock-out) voltage.
The Lock-in and Lock-out voltages can be regulated as % of minimum Vstart set for the independent input channels, MIN(Vstart).
Lock-in/Lock-out voltage:
 - **Lock-in Gain:** default value = 35%, settable range = 20-40%
 - **Lock-out Gain:** default value = 45%, settable range = 40-50%
- Starting delay (default = 5 minutes)
Example with default setting $0.3/0.4 \cdot \text{MIN}(V_{start})$ (Lock-in/Lock-out voltage): the PID recovery is activated when the input open circuit voltage (Voc) drops below $0.3 \cdot \text{MIN}(V_{start})$ for at least 5 minutes continuously, while de-activation is triggered immediately when input open circuit voltage (Voc) exceeds $0.4 \cdot \text{MIN}(V_{start})$.

WARNING – Not operate on the DC switch when PID recovery is operating (this condition is clearly identified by simultaneous blinking of green and yellow led).

WARNING – When Anti-PID board is installed, before any intervention on the DC side, disconnect the AC grid and refer to [Inverter Total Isolation and Safety Measures procedure](#) paragraph on this manual to know all the necessary steps to safely operate on the inverter.

3.10.11 DC link pre-charge

DC Link pre-charge circuit function is an additional integrated function available for any PVM models.

Pre-charge circuitry allows to charge PVM internal bulk capacitors from AC grid side: so doing, inverter is able to connect to the grid even during night-time when no DC voltage is available from PV panels side. The main advantage related to this feature is the possibility to realize night reactive power production when it is desired, i.e. night-reactive power on-demand. Most common examples of night-reactive power on-demand are:

1. Night-time reactive power demand after inverter disconnection.
2. Recovery from AC grid disconnection during night-reactive power.
3. Round scheme night-reactive power.

Inverters with pre-charge capability are also able to satisfy immediately to request of night reactive power that arrives during the night with the AC grid interface protection opened, since it provides the capability to restore the grid connection.

Pre-charge circuitry can also provide the possibility to re-establish normal operation when a grid fault provokes disconnection of the inverter. For example, during night-time, when inverter is in night reactive power mode, if AC voltage dip occurs, inverter disconnects from the grid. For inverter with pre-charge capability, night reactive power can be re-established also after grid dips.

⚠ WARNING – Risk of electric shock. Hazardous DC voltages are supplied to the photovoltaic array during the night.

⚠ WARNING – By external commands or by dedicated Web User Interface (UI), night-time reactive (Q-fix Mode or Volt/Var Mode) power can be enabled or disabled and night-reactive power mode and set-point can be modified.

3.10.12 PVM-75/125 Grounding kit

Grounding of the negative input pole is provided as an additional capability for this inverter family. It can be added to any inverter models as an additional kit (PVM-75/125 Grounding Kit).

The Grounding Kit allows to connect the negative input pole of the PV array to ground (where is required by technical data of the PV modules).

To enable the PVM-75/125 Grounding kit entering in the Web UI using the Admin Plus privileges (see "7.4 Internal Web User Interface (WEB UI)").

Enter the Menu "Setting/Additional Function" and:

- Set as ENABLED the Grounding Kit with the proper selector.
- Set the "Max Vneg-gnd for Grounding Kit" (range: 0...250V); recommended value: 200V.

This parameter identifies the threshold voltage between negative pole and ground, which triggers the inverter disconnection for Grounding kit ground fault (E037).

⚠ WARNING – If this accessory is installed, this inverter must be installed and operated in restricted areas (restricted area: room or location for electrical equipment to which access is restricted to skilled or instructed persons by the opening of a door or the removal of a barrier by the use of a key or tool and which is clearly marked by appropriate warning signs). Access is limited to qualified personnel (qualified personnel: person having appropriate technical training and experience necessary to be aware of hazards to which that person may be exposed in performing a task and of measures to minimize the risks to that person or other persons).

3.10.13 Energy Save Mode

Energy Save Mode function is provided as an additional function in all the inverter models. This is an operation mode that minimizes the power consumption of the inverter during the night.

It is possible to enable or disable Energy Save Mode through Web UI. Anyway, when other functions like "night reactive power" or "Anti-PID" are enabled, inverter will not enter the Energy Save Mode.

Inverter can operate in this mode when there are no other requests during the night minimizing the power consumption. For any other requests that arrive, inverter is able to wake up from the energy save mode and enter in night reactive power mode, Anti-PID, FW upgrade or other desired functionalities.

Following sections show how to manage this feature through Web UI and typical use cases.

3.10.14 Data transmission and control

The inverter features embedded multi-communication interfaces (Wi-Fi and Ethernet) and supports the SunSpec-compliant Modbus TCP protocol, enabling easy integration with third-party monitoring and control systems that support the same SunSpec standard.

📄 NOTE – The Modbus TCP register map is the same for all communication interfaces (Ethernet and Wi-Fi) of the inverter. Please consult (and download) the product documentation by visiting <https://www.fimer.com>.

3.11 Communication interfaces

The integrated Ethernet and Wi-Fi board enables local or remote connection to the inverter. The inverter provides the following integrated communication interfaces:

3.11.1 Wi-Fi (IEEE 802.11 b/g/n@2.4GHz)

Wi-Fi is recommended for local connection to the inverter's WEB UI using any WLAN standard device (tablet, smartphone) for commissioning and parameter settings.

Additionally, a second radio channel is also available for connection to a Wi-Fi router.

3.11.2 Ethernet

By default, the **two** Ethernet port (**34, 35**) is pre-configured to enable communication over daisy chain layout.

Once the ethernet port of the inverter is physically connected, no specific settings are required.

After powering on for the first time, the inverter automatically obtains the necessary network parameters if a DHCP server is present.

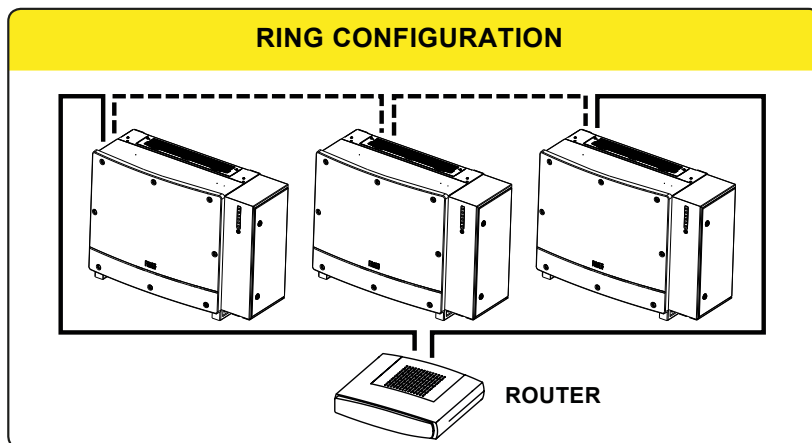
If there is no DHCP server the inverter configures itself with an IPv4 link-local address, which allows communication with other inverters on the same network. However, it still doesn't allow communication with Aurora Vision services. Configure a static IP address in this case if you want to access AV services.

If an internet connection is available, the inverter will automatically configure itself to transmit telemetry data to Aurora Vision Cloud, without the need for additional devices (logging capabilities are integrated into the inverter by default).

NOTE – Aurora Vision® is the FIMER cloud solution allowing customer to remotely monitor and manage its own solar plants. Please refer to <https://www.fimer.com> or contact MA Solar Italy technical support for further information on how getting an Aurora Vision account.

With the inverters connected via Ethernet and an available internet connection, remote firmware upgrades are always possible through Aurora Vision® Cloud.

In order to improve the communication services and allow reaching of all the inverters in the chain, also in presence of fault, it is recommended to create a ring shape layout by connecting both the first and the last inverters of the chain to the local Ethernet switch (as shown in the picture). Recommended maximum number of inverters is **40 units**.



3.11.3 RS-485 communication line

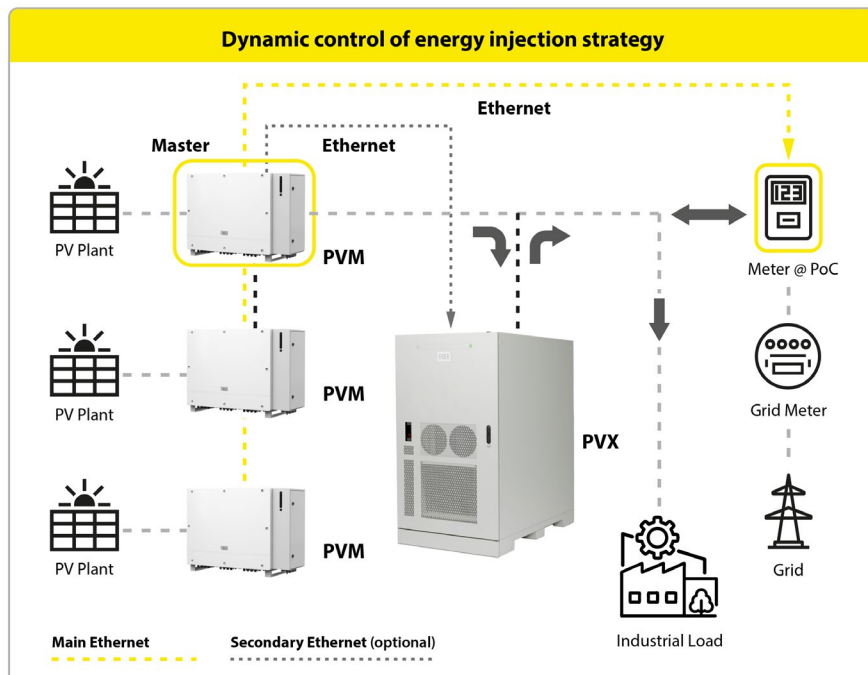
The port enables daisy chain connection of the inverters over the serial line (slave mode). The port can either be used for connecting supported accessories (like weather station, meter...): in this case data from accessories will be logged and transferred to the cloud by inverter itself (master mode).

3.11.4 USB to Ethernet Add-on (Optional)

The PVM-125(110)(100)(75)-TL is a grid-tied inverter designed to meet the technical requirements for high-power C&I segment, including the management of storage system in configuration AC-Coupled (for additional information refer to FIMER C&I BESS solution <https://www.fimer.com/bess-solutions/pvx-storage-solution>).

The USB to Ethernet add-on (28) is an additional accessory which can be integrated into the Wiring Box (2) and provides two additional Ethernet ports for monitoring and controlling of AC-coupled storage systems and, consequently, implementation of any energy policy.

The PVM family inverter permits smart energy management (Self Consumption, Export Limitation, Peak Shaving etc. etc.) without external controller and through a direct monitoring of the meter installed at PoC (Point of Connection).



3.12 Topographic diagram of the equipment

The diagram summarises the internal structure of the inverter.

The internal circuitry is with double stage conversion and therefore consists of:

- DC/DC input converter (booster)
- DC/AC output inverter

The DC-DC converter and the DC-AC inverter both work at a high switching frequency and are therefore small and relatively light related to output power.

The input converter is dedicated to multiple PV arrays with a maximum power point tracking (MPPT) function in order to maximize the energy harvesting from the photovoltaic generator.

This inverter version is without insulation transformer, that it means that it does not have a galvanic insulation between the input and the output. This allows ultimately an increase in conversion efficiency. The inverter is already equipped with all the protections required for safe operation and to be in compliance with the safety standards, even without the insulation transformer.

The operation and the protection management of the inverter is controlled by three independent DSPs (Digital Signal Processors) and a central microprocessor.

A dedicate microprocessor is used for user communication interfaces.

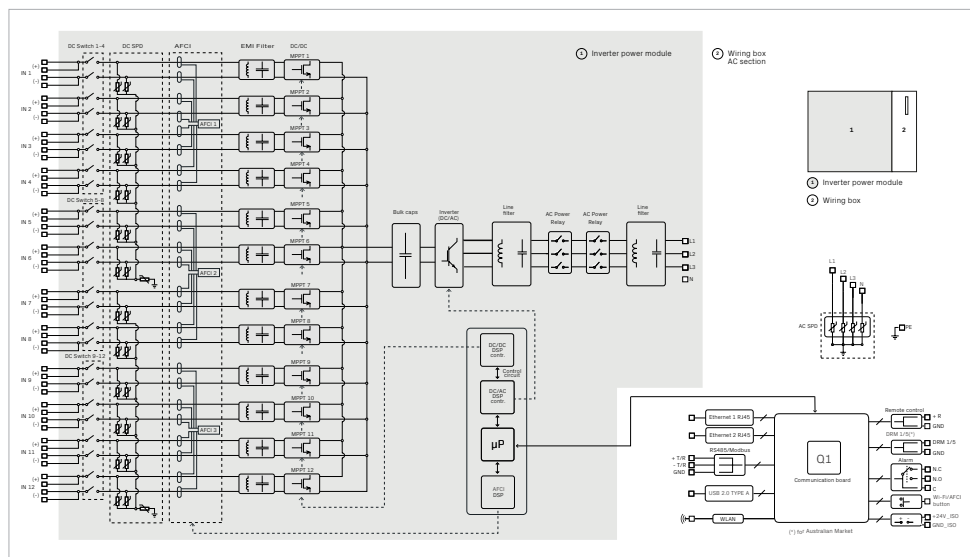
The connection to the distribution grid is thus kept under control by three independent DSPs, in full compliance with the electric safety standards both for power supply to the systems as well as security.

The operating system carries out the task of communicate with its components in order to carry out data analysis.

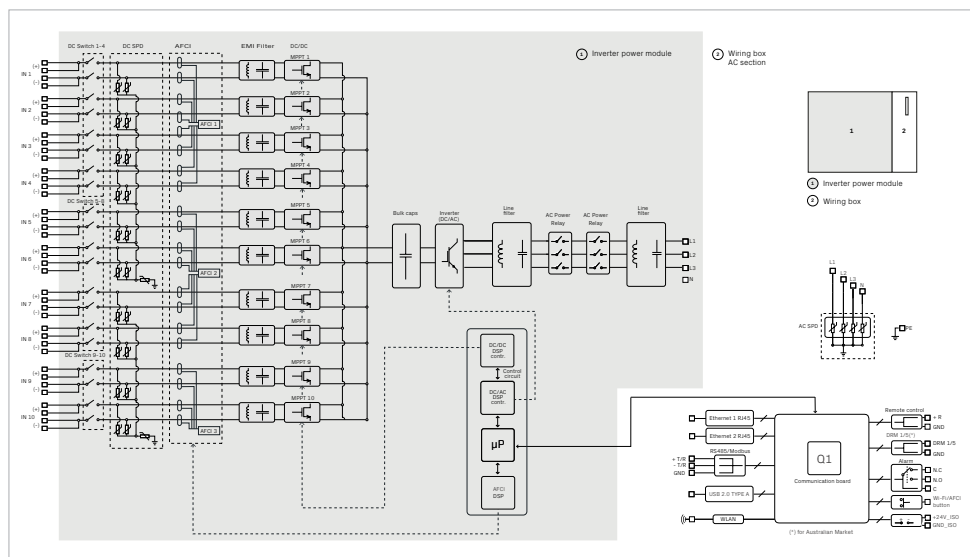
In doing all this, it's guaranteed the optimal operation of the whole assembly and a high performance in all irradiation conditions, and it is always ensured a full compliance with the relevant directives, standards and regulations.

3.12.1 Block diagram

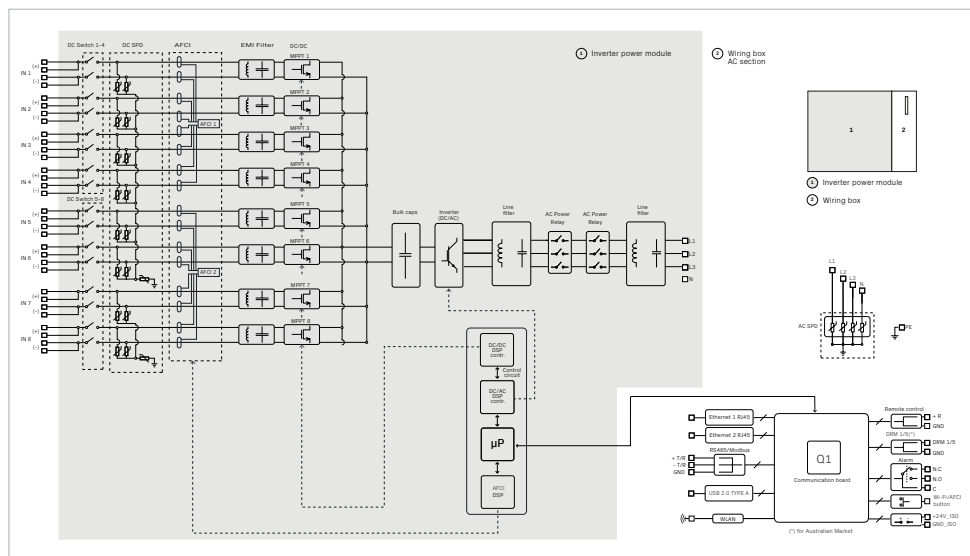
Schematic diagram of PVM-125-TL in configuration 12 independent MPPTs



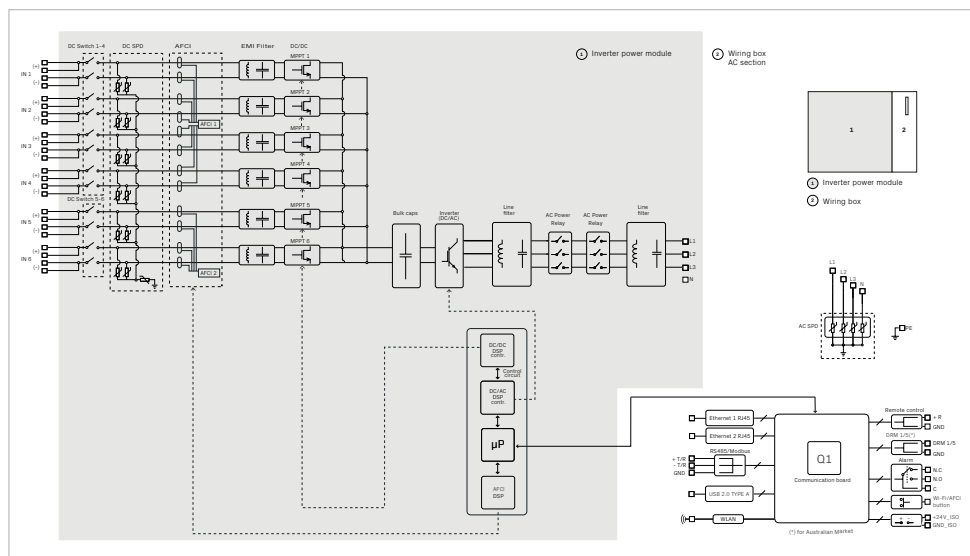
Schematic diagram of PVM-110-TL in configuration 10 independent MPPTs



Schematic diagram of PVM-100-TL in configuration 8 independent MPPTs



Schematic diagram of PVM-75-TL in configuration 6 independent MPPTs



3.13 Safety devices

3.13.1 Anti-Islanding

In the event of a local grid outage by the electricity company, or when the equipment is switched off for maintenance operations, the inverter must be physically disconnected to ensure the protection of the people working on the grid, in accordance with the relevant national laws and regulations. To prevent possible islanding, the inverter is equipped with an automatic safety disconnection system called "Anti-Islanding".

 **NOTE** – The method used to ensure an active anti-islanding protection is active frequency drift in combination with **RoCoF** (Rate of Change of Frequency) techniques.

 **NOTE** – Anti-islanding protection mechanisms are different depending on the grid standards, even if they all have the same purpose.

3.13.2 Ground fault of the photovoltaic panels

 **ATTENTION** – Use this inverter with panels connected in "floating" mode, i.e. with no earth connections on the positive and negative terminals.

An advanced ground fault protection circuit continuously monitors the ground connection and disconnects the inverter when a ground fault indicating the fault condition by means of the red "GFI" LED on the LED strip **(08)**.

3.13.3 Arc Fault Detection functionality

The Inverter provides protection from arc faults. The dedicated circuitry detects arcing conditions on DC side and in case of such event allows the disconnection from AC grid. For more details refer to the [3.10.9 section](#).

3.13.4 Overvoltage surge arresters

As an additional protection to prevent damage caused by the discharges from lightning and electrostatic induction phenomena, this inverter is equipped with DC and AC over-voltage surge arresters.

3.13.5 Other safeguards

This inverter is equipped with additional protective devices to ensure safe operation in any circumstance. These protections include:

- Constant monitoring of the grid voltage to ensure that voltage and frequency values remain within operating limits.
- Internal temperature control to automatically limit the power (if necessary) to prevent overheating of the unit (derating).

4. Lifting and transport

4.1 Transport and handling

Transport of the equipment, especially by road, must be carried out with means for protecting the components (in particular, the electronic components) from violent shocks, humidity, vibration, etc.

During handling, do not make any sudden or fast movements that could create dangerous swinging.

4.2 Equipment weight

Device	Weight
PVM-125-TL	93 kg / 205 lbs
PVM-110-TL	90 kg / 198.5 lbs
PVM-100-TL	87 kg / 192 lbs
PVM-75-TL	83 kg / 183 lbs

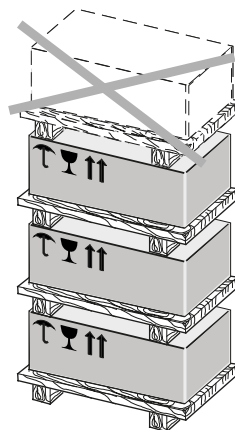
4.3 Storage

⚠ ATTENTION – DO NOT store the equipment (also valid for spare parts units) in a location exposed to severe weather conditions (e.g. rain, snow or a high level of humidity). Always comply with storage temperature indicated in [Technical data](#) paragraph in this manual.

If the package is stored correctly, it can withstand a **maximum load of 3 stacked units**.

⚠ ATTENTION – DO NOT stack the package with equipment or products other than those indicated.

⚠ ATTENTION – Accessory components that come in separate packages can be stacked separately.



4.3.1 Unpacking and checking

⚠ ATTENTION – Packaging elements (cardboard, cellophane, staples, adhesive tape, straps, etc.) may cause cuts and/or injuries if not handled with care. They should be removed with the proper equipment.

📄 NOTE – The components of the packaging must be disposed of in accordance with the regulations in force in the country of installation.

When you open an equipment package, check that the equipment is undamaged and make sure all the components are present.

📄 NOTE – If any defects or damage are found, stop unpacking and consult the carrier, and promptly inform FIMER customer support.

4.3.2 Lifting

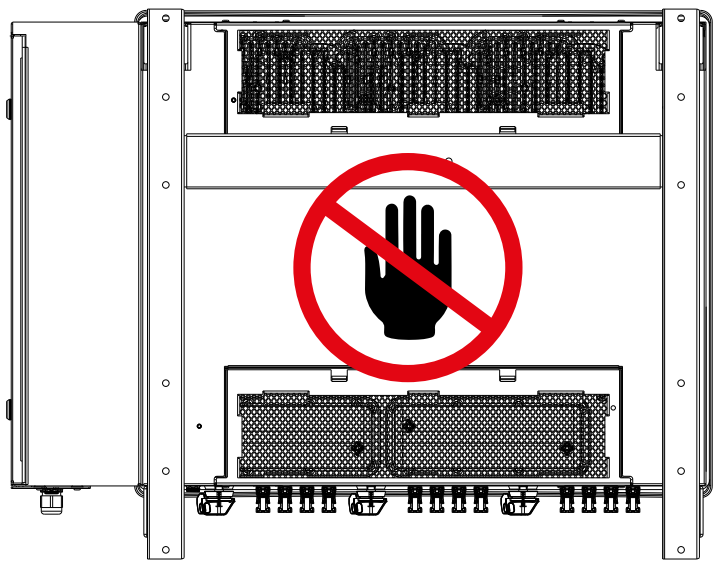
LIFTING – Risk of injury due to the heavy weight of the equipment!

MA Solar Italy usually stores and protects individual components by suitable means to make their transport and subsequent handling easier. Nonetheless, as a rule, it is necessary to turn to the experience of specialised staff to take charge of loading and unloading components. The Inverter must be lifted using the integrated and assembly handles or alternatively using suitable lifting equipment.

- ATTENTION** – In case of manual lifting the number of required operators necessary to lift the equipment must be in accordance with local regulations relating lifting limits per operator.
- ATTENTION** – Do not lift several units or parts of the equipment at the same time, unless otherwise indicated.

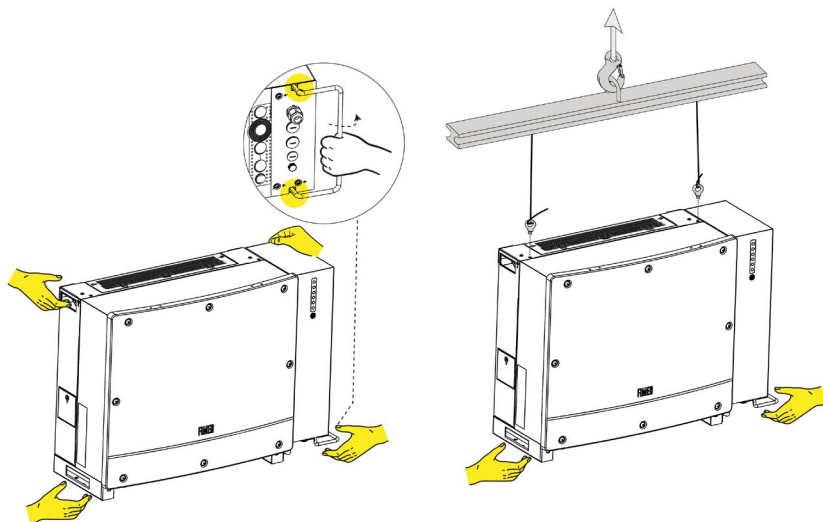
It is required to use one of the following lifting methods to move the equipment during installation or maintenance phases:

- ATTENTION** – DO NOT grab the equipment from the rear flange! Risk of injury due to cutting surfaces and risk of equipment damage. Always use proper lifting equipment!

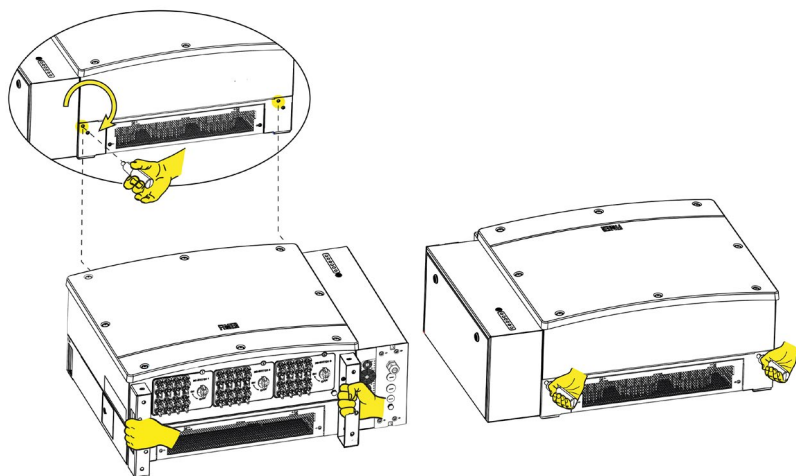


⚠ ATTENTION – Handling and installation operations shall be performed only by using the special tools and accessories provided with "PVM-75/125 Installation kit" that have to be ordered separately. The use of this equipment are mandatory to safely install the inverter. Refer to "[Kit of recommended spare parts](#)" paragraph for further information.

Vertical lifting

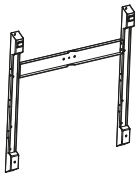
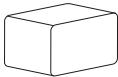
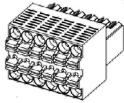
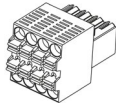


Horizontal lifting

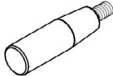
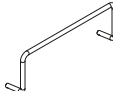
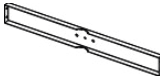


4.4 List of supplied components

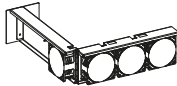
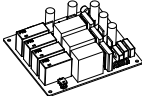
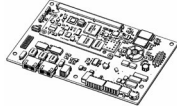
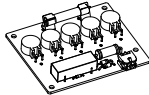
The table below shown the available component in the inverter package (common for all models):

Component	Description	Quantity
	Mounting bracket (03)	1
	Sealing Cable kit	1
	AC multi/single core power cable lock (18)	1
	Terminal block, plug screwless, 12 poles	1
	Terminal block, plug screwless, 8 poles	1
	M12 screw + M12 split spring lock washers + M12 flat washer + M12 serrated washer to clamp the protective earth cable (PE) on the terminal block (33)	1 + 1 + 1 +1
	M8 screw + M8 split spring lock washers + M8 flat washer + M8 serrated washer to clamp the protective earth cable (PE) on the external point.	1 + 1 + 1 +1
	Sout Africa network standard label	1
	Quick installation guide	1
	RAEE disposal of waste leaflet	1

4.5 Kit of recommended installation spare parts

Component		Quantity
	Eyebolts for lifting	2
	Key tool for wiring box quarter cam-lock (07)	1
	M8 handles	2
	Assembly handle	1
	Central Bracket for pole mounting	1

4.6 Kit of spare parts

Component		Quantity
	External FAN Kit (10)	1
	Type 2 AC Surge arrester	1
	Type 1+2 AC Surge arrester	1
	Connectivity Board	1
	PVM-75/125 Grounding Kit	1

5. Installation

5.1 Installation safety instruction

- ⚠ WARNING** – The inverter front cover can be removed from authorized service personnel only (the users are not authorized to remove inverter front cover).
- When the photovoltaic panels are exposed to sunlight they provide continuous DC voltage to the inverter. Before installation may begin, photovoltaic panels must be shaded or isolated.
 - The installation must be carried out with the equipment disconnected from any voltage sources. Refer to paragraph [8.2 Inverter total de energization and isolation](#) on this manual to know all the necessary step to safely operate on the inverter.
- ⚠ ATTENTION** – This device is intended to be installed in a suitable plant for its use and its purpose. All the installation instruction described in this chapter must be followed considering the plant structure where the device is intended to be installed. Its performance therefore depends on the correctness of the installation.
- It is mandatory to adhere to the indications provided in this manual, the diagrams and the enclosed documentation, paying attention to follow the installation sequence exactly as described in this manual.
 - Staff authorised to carry out the installation must be specialised and experienced in this job. They must also have received suitable training on equipment of this type. The installation must be performed by qualified installers and/or licensed electricians in accordance with the existing regulations in the country of installation.
 - The local electrical utility (or authority having jurisdiction) must approve the equipment installation before it is connected to the electrical grid.

5.2 Installation site and position

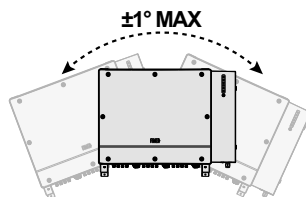
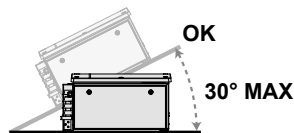
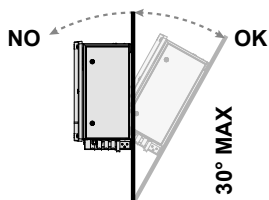
5.2.1 General recommendation on installation position

- ⚠ ATTENTION** – Please refer to the warranty terms and conditions to evaluate any possible warranty exclusions due to improper installation.
- Refer to [Technical data](#) paragraph to check the required environmental conditions (protection rating, temperature, humidity, altitude, etc.).
 - The installation location shall be easily accessible.
 - Installation of the unit in a location exposed to direct sunlight is NOT acceptable. Add an awning in case of direct sunlight installation.
 - Final installation of the device must not compromise access to any disconnection devices that may be located externally.
 - Do not install in small, closed rooms where air cannot circulate freely.
 - Always ensure that the flow of air around the inverter is not blocked to prevent overheating.
 - Do not install in locations where flammable substances or gases may be present (minimum distance 3 meters).
 - Do not install on wooden walls or other flammable supports.
 - Install on a wall, pole or strong structure suitable to bear the weight.
 - Do not install the unit at a place within children's reach.
 - Do not install in rooms where people live or where the prolonged presence of people or animals is expected, because of the noise that the inverter produces during operation. The level of the sound emission is heavily influenced by where the appliance is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply.
 - Do not install the inverter in a place where personnel are easy to encounter its enclosure and heat sinks, because these parts can be hot during operation.
 - Installations of the inverter over 3000 m (9842 ft) must be valued taking in consideration the derating due to altitude.

5.2.2 Tilting admittance

The unit must be installed in vertical and horizontal position with a maximum inclination as indicated in the figures below.

⚠ ATTENTION – In case of horizontal installation in outdoor environment consider an installation with a minimum tilt of 5° to avoid any water stagnation.

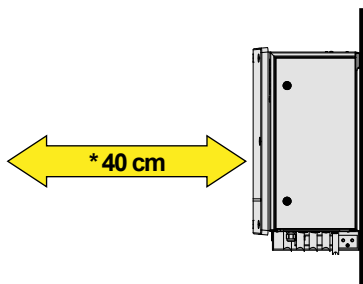


5.2.3 Distances

Maintenance operations from MA Solar Italy service could entails removing the front cover. Always observe the required installation safety distances to allow routine check and maintenance operations.

⚠ ATTENTION – Installation position shall not prevent access to the disconnection means.

Provide a sufficient working space in front of the inverter that allows to remove the front cover (MA Solar Italy service only) and to allow wiring connections.



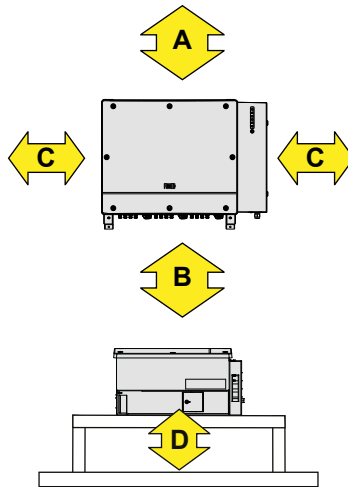
(*) minimum free space to operate with the inverter

Install at a height which takes into consideration the weight of the unit and in a position which is suitable for servicing, unless suitable means will be provided to carry out these mentioned operations.

If possible, install it at eye-level so to allow to easily check the LED strip **(08)**.

Do not install any object (e.g. AC or DC cables) that could be damaged by overheating from outgoing hot air flow coming from top side. In case of this kind of installation needs, please evaluate the installation of a proper air deflector. Always respect the minimum distances required.

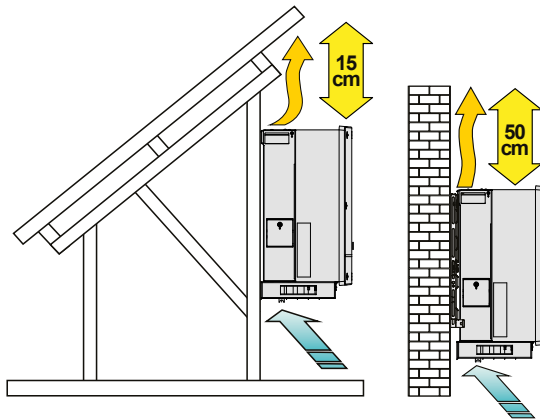
Respect the minimum distances from surrounding objects that could prevent the inverter installation and restrict or block the air flow. The minimum clearance distances depend on multiple factors.



1. Ventilation flow on the rear side of the inverter.

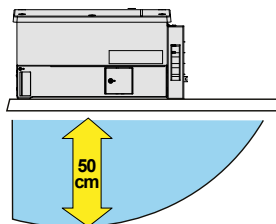
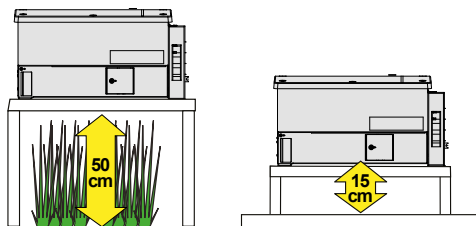
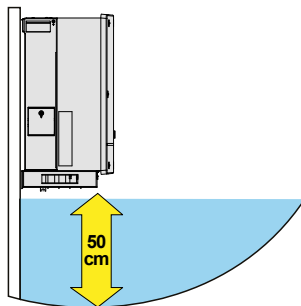
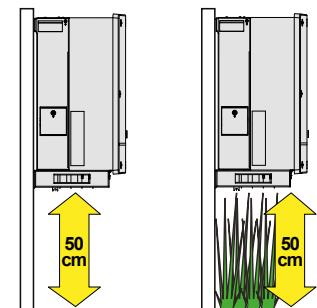
Depending on the support where the inverter is installed it changes the upper (A) required free space: if the inverter is installed on a support without any openings (e.g. a wall), the heat flow will be entirely directed to the top of the inverter; for this reason, the upper (A) minimum required free space must be **50 cm / 19"**.

Otherwise in case of the inverter is installed on a support with openings (e.g. frame installation) the heat can freely flow on the rear side of the inverter; so, the upper (A) minimum required free space can be reduced to **15 cm / 6"**.



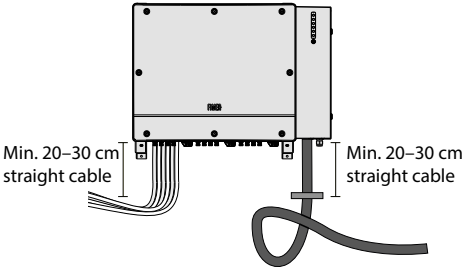
2. Possible flooding or damage during grass cutting operation.

It changes the bottom (B) or the rear (D) - only in case of horizontal installation - required free space: If the inverter is installed in a place where there are concrete risk of flooding or grass cutting evenience, the bottom (B) or the rear (D) - only in case of horizontal installation - minimum recommended free space is **50 cm / 19"**; otherwise in case of the inverter is installed in a place where there aren't risk of flooding or grass cutting evenience, the bottom (B) and rear (D) - only for horizontal installation - minimum required free space must be **15 cm / 6"**.



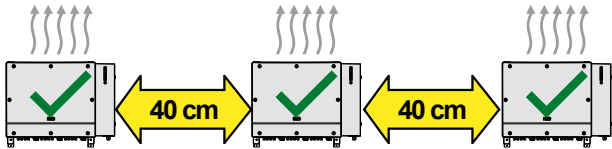
3. Cables bending radius

The bottom (B) minimum required free space may depend on cable type (cable dimension, bending radius, etc.). This evaluation must be done by the installer during the plant design phase.

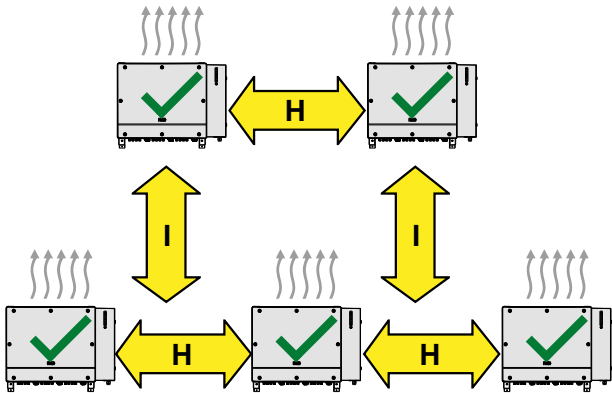


5.2.4 Installation of multiple units

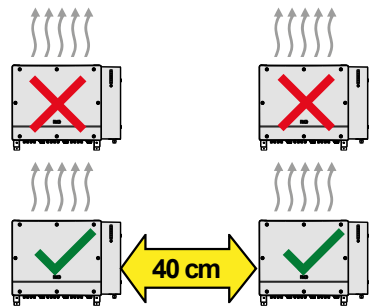
In case of installation of multiple units in the same place, position the inverter side by side paying attention to keep the minimum clearance distance of **40 cm / 15.75"** to allow extraction and maintenance of external FAN tray (10).



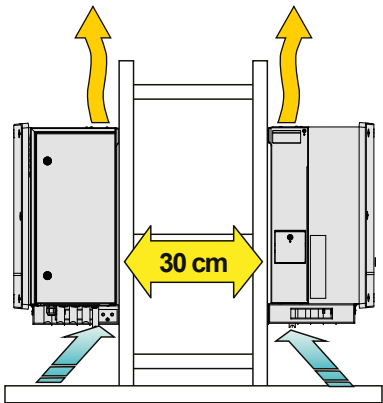
If the space available does not allow this arrangement, position the inverters in a staggered arrangement so that heat dissipation is not affected by other inverters below. Respect the following minimum clearance distances H of **150 cm / 59"** and (I) of **50 cm / 19"** (measured from the outer edge of units).



The stacked installation is not recommended because heat dissipation of the inverters positioned at the top is affected by other inverters below.



The installation of two inverters positioned back to back is also permitted on a structure which must be composed of a 2 or 3 frame supports (refer to "Bracket assembly" paragraph). In this case the minimum recommended clearance distance between the units in order to avoid the use of an air deflector is **30cm / 12"**.



5.2.5 Wi-Fi signal environmental checks

The inverter can be commissioned and monitored using the Wi-Fi communication channel. The Wi-Fi board of the inverter uses radio waves to transmit and receive data. It is therefore important to assess this factor to have an optimal installation.

Walls made in reinforced concrete and surfaces covered with metal (doors, shutters, etc.) might significantly reduce the reach of the device which, even in optimal conditions, is approximately 40 meters in free space.

Before installing the inverter, it is therefore recommended to check the strength of Wi-Fi signal by means a mobile device (smartphone, tablet or notebook) by connecting it to the Wi-Fi router from a position which is close to the intended installation position of the inverter.

1. Find a new position for the router considering the different types of materials which the radio signal will have to pass through.

Material	Relative signal reduction
Open field	0% (strength of approximately 40 metres)
Wood / Glass	From 0 to 10%
Stone / Plywood	From 10 to 40%
Reinforced concrete	From 60 to 90%
Metal	Up to 100%

2. Install a Wi-Fi signal repeater and place it in an area between the inverter and the router, trying in this way to skip the most critical obstacles.

5.2.6 Installations at high altitudes

Due to the rarefaction of the air (at high altitudes), particular conditions may occur, and it should be considered when choosing the place of installation.

Less efficient cooling and therefore a greater likelihood of a device power reduction (derating) occur due to high internal temperatures.

Reduction in the dielectric resistance of the air which, in the presence of high operating voltages (DC input), can create electric arcs (electrical discharges) that may damage the device.

When the altitude increases, the failure rate of some electronic components increases exponentially due to cosmic radiation.

NOTE – Installations over 3000 m (9842 ft) must be valued taking in consideration the derating reported in [Power derating due to altitude](#).

5.2.7 Installations with a high level of humidity

- ATTENTION** – Never open the inverter in the case of rain, snow or a level of humidity >95%.
- Always carefully seal all unused openings.
 - Do not install on floating systems or where the inverter might be exposed to direct water splashes.

Even though the device is equipped with an anti-condensation valve, air with extremely high levels of humidity can lead to the creation of condensation inside the inverter. As the inverter is almost completely insulated from the outside, condensation can also form after installation in certain weather conditions.

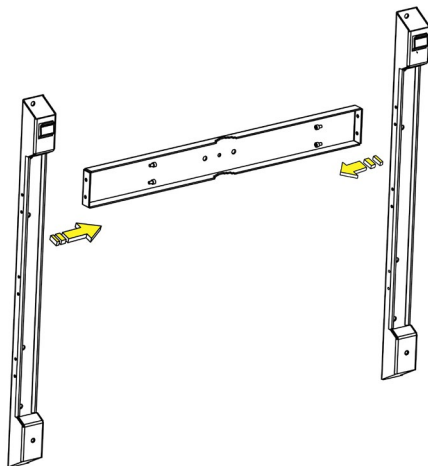
5.3 Mounting Instructions

- ATTENTION** – The installation operations must be carried out by qualified personnel, and it is mandatory to adhere to the indications provided in this manual, the diagrams and the enclosed documentation, paying attention to follow the installation sequence exactly as described in this manual.
- Staff authorized to carry out the installation must be specialized and experienced in PV plant installation and specifically PV inverters installation. MA Solar Italy can provide training on the product to provide suitable knowledge for the installation.
 - The installation must be performed by qualified installers and/or licensed electricians in accordance with the existing regulations in the country of installation.
 - The installation must be carried out with the equipment disconnected from any voltage sources. Refer to "[Inverter total de-energization and isolation](#)" paragraph on the product manual to know all the necessary step to safely operate on the inverter.

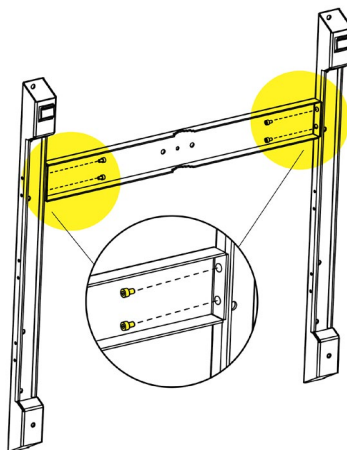
5.3.1 Bracket installation

The mounting bracket (03) can be used to install the inverter on a vertical support.

Assembly the two side bracket pieces together with the central bracket, by sliding it as shown in the picture and paying attention to the orientation of the pieces.



Slide the central bracket in order to match the two holes with the centring pins of the side brackets.
Use the four M5 screws with flat and spring washers (supplied) to fix the pieces of the bracket together.

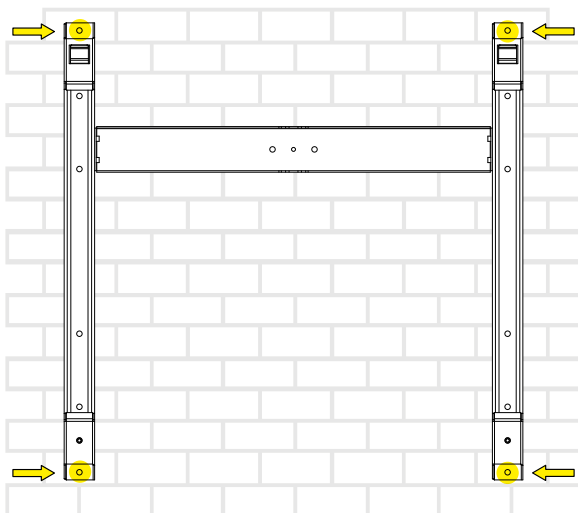


Position the mounting bracket **(03)** perfectly level. Use the bracket as drilling template (consider the inverter overall dimensions).

It is the installer's responsibility to choose an appropriate number and distribution of attachment points. The choice must be based on the type of support (wall, frame or other support), the type of anchors to be used, and their ability to support 4 times the inverter's weight ($4 \times 93 \text{ kg} / 205 \text{ lbs} = 372 \text{ kg} / 820 \text{ lbs}$ in the worst case, PVM-125-TL).

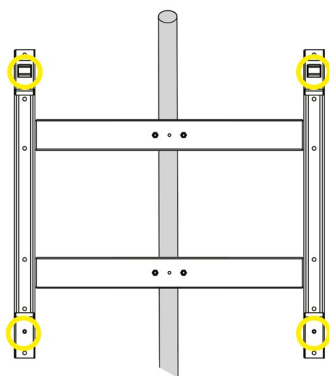
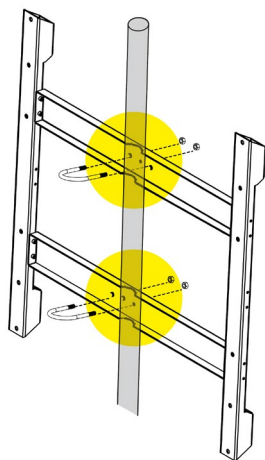
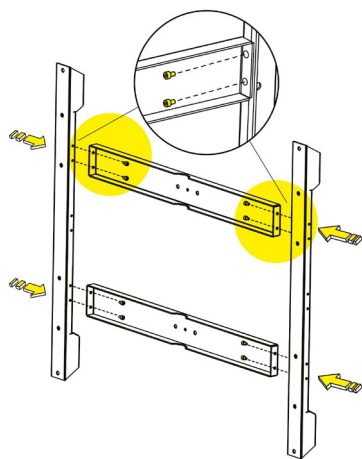
Depending on the type of anchor chosen, drill the required holes to mount the bracket. The pictures shown the recommended minimum fixing point depending to the type of support.

Attach the bracket **(03)** to the support with at least 4 attachment screws (shown in YELLOW).



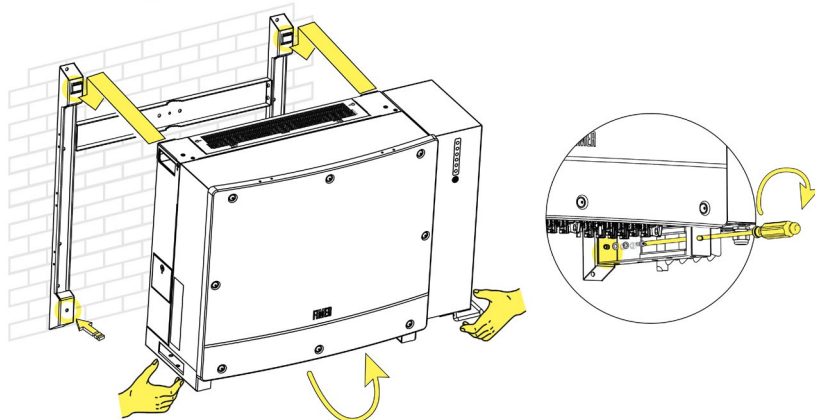
In case of use of "frame fixing brackets" it will be possible to fix the bracket to the frame structure without drill any holes.

PVM family bracket also allows for pole mounting, however additional central brackets are required to ensure a stable hold with "frame fixing brackets"



5.3.2 Assembly the Inverter to the bracket

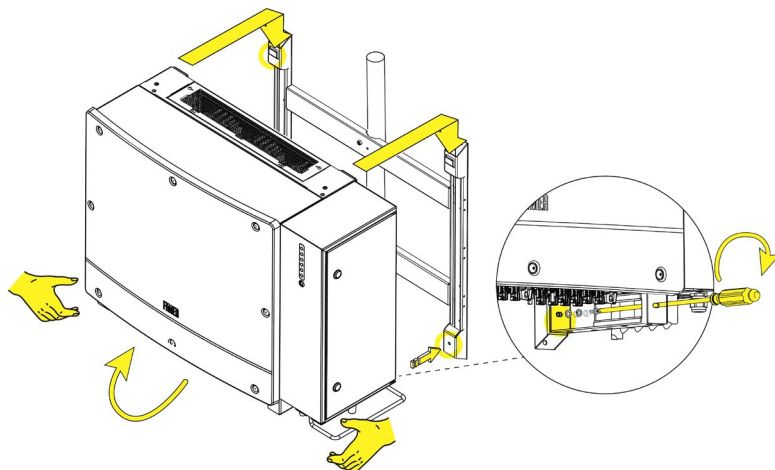
- ⚠ ATTENTION** – Risk of injury due to the heavy weight of the equipment. Always consider the centre of gravity of the enclosures while lifting.
- Handling and installation operations shall be performed only by using the tools and accessories provided with "PVM-75/125 Installation Kit" or suggested additional kit which can be ordered separately. The use of this equipment is mandatory to safely install the inverter.



Lift the inverter (**01**) up to the bracket (**03**) (using the product handles (**11**) or M8 eyebolts) and insert the two sides anchor points (placed on the inverter back side) into the two slots on the bracket. Check that the anchor points have been correctly inserted in the slots before releasing the inverter.

Remove eventually the M6 eyebolts.

Tighten the supplied two side bracket screws.



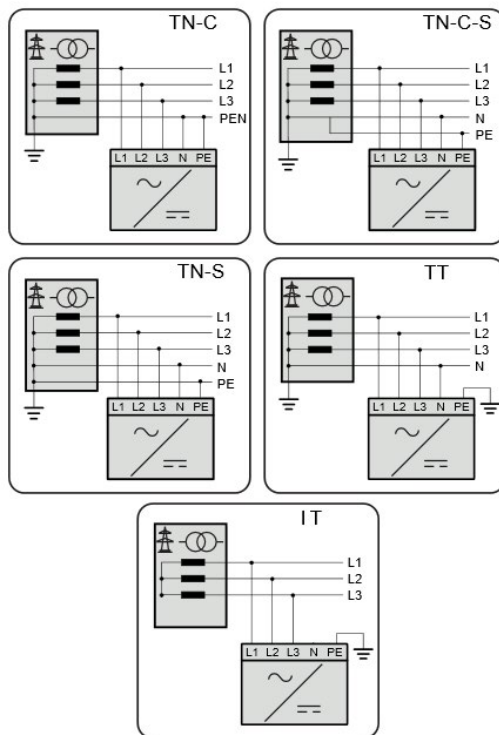
5.4 AC GRID connection

WARNING – To avoid risks of electrical shock, all wiring operations must be carried out with the disconnect switch downstream of the inverter (grid side) opened and applying LOTO procedure on it. Be careful not to mistakenly exchange the phases with neutral!

- The installation must be performed by qualified installers and/or licensed electricians in accordance with the existing regulations in the country of installation and in accordance with all safety rules for performing electrical works. The customer has civil liability for the qualification and mental or physical state of the personnel who interact with the equipment. They must always use the personal protective equipment (PPE) required by the laws of the country of destination and whatever is provided by their employer.

5.4.1 Three-phase grid system

The inverter must be connected to a three-phase system: TN-C, TN-C-S, TN-S, TT, IT:



NOTE – The connection of the neutral (N) on the inverter is optional (dashed line on the above schematics); the inverter will automatically detect the presence or absence of the connection without any setting by the user.

ATTENTION – When IT connection is implemented, PVM-75/125 Grounding kit must be installed. In this scenario, Residual Current Monitoring do not fully operate. Inverter must be installed and operate in "restricted areas (access limited to qualified personnel)" according to IEC 62109-2.

The connection of the inverter to the grid could be done using a cable:

- **3W + PE** (3 phases without neutral **N** wire)
- **3W + N + PE** (3 phases with neutral **N** wire).

ATTENTION – In any case, the inverter's earth (**PE**) connection is mandatory.

5.4.2 Load protection breaker (AC disconnect switch)

To protect the AC GRID connection line of the inverter, an overcurrent protection device with the following features must be installed (these are the characteristic of a load protection switch referred to a single inverter installation):

Load protection breaker		
Type	Automatic circuit breaker with thermal-magnetic protection	
Voltage/current rating	PVM-125-TL	400Vac / min 250A (*)
	PVM-110-TL	400Vac / min 200A (*)
	PVM-100-TL	400Vac / min 200A (*)
	PVM-75-TL	400Vac / min 150A (*)
Magnetic protection characteristic	Magnetic curve B/C	
Number of poles	3W (3 phases without neutral wire)	
	4W (3 phases with neutral wire)	
(*) NOTE – (*) please consider thermal and other derating factors when selecting the current rating of the protective equipment for your application.		

5.4.3 Differential protection downstream of the inverter

The solar inverters of the PVM family are equipped with a device for protection against ground faults in accordance with the safety standard **IEC 62109-2** (please refer to sections § 4.8.2 and § 4.8.3 of the standard). MA Solar Italy inverters are equipped with a reading redundancy for the ground leakage current sensitive to all components of both direct and alternating current. In fact, the measurement of the ground leakage current is carried out simultaneously and independently by 2 different processors: it is sufficient for either of them to detect an anomaly to trip the protection, with consequent disconnection from the grid and to stop the conversion process.

Furthermore, there are other three tripping levels with limit set respectively at 30 mA, 60 mA and 150 mA to cover the “rapid” changes in fault current induced by accidental contact with leaking live parts. The max. tripping times are progressively shortened as the speed of change in the fault current increases and starting from the 300 msec/max for the 30-mA change, they are reduced respectively to 150 msec and 40 msec for 60 mA and 150 mA changes.

The external residual current protection device must meet the following characteristics to prevent nuisance tripping due to capacitive leakage current of photovoltaic modules

In case of installation of a residual current protection device, this shall meet the following characteristics to prevent nuisance tripping due to capacitive leakage current of photovoltaic modules:

Residual current protection device requirements		
Type	A / AC	
Sensitivity	PVM-125-TL	1250 mA
	PVM-110-TL	1100 mA
	PVM-100-TL	1000 mA
	PVM-75-TL	750 mA
NOTE – For protection of the AC line, based on the information above about the differential protection integrated in MA Solar Italy inverters, it is not necessary to install a type B ground fault switch.		
– In accordance with article 712.413.1.1.2 of Section 712 of IEC Standard 64-8/7, we hereby declare that, because of their construction, MA Solar Italy inverters do not inject ground fault direct currents.		
– In the case of systems which consist of several inverters connected to a single switch with differential protection, it is recommended to install a device which allows the adjustment of the tripping value and the tripping time.		
– AC Type RCD is not allowed to be installed in Australia		

5.4.4 Characteristics and sizing of the protective earthing cable

MA Solar Italy inverters must be earthed via the connection points marked with the protective earth symbol  and using a cable with an appropriate conductor cross-section for the maximum ground fault current that the generating system might experience

ATTENTION – Any failure of the inverter when it is not connected to earth through the appropriate connection point is not covered by the warranty.

In compliance with the standards **IEC 62109-1 / IEC 62109-2**, if the external Protective earthing conductor cross-section area is S/2, where S is the cross-section of the phase conductor, no further calculation is needed to demonstrate that the cross-section is enough to sustain the fault current. Otherwise, the protective earthing conductor cross-section shall be determined by calculation according to IEC 60364-5-54 or must fulfil the requirement of local standard.

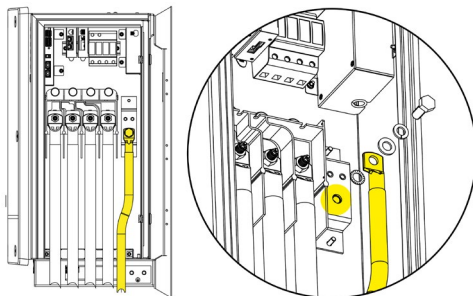
Protective Earthing Cable

Characteristics of the cable

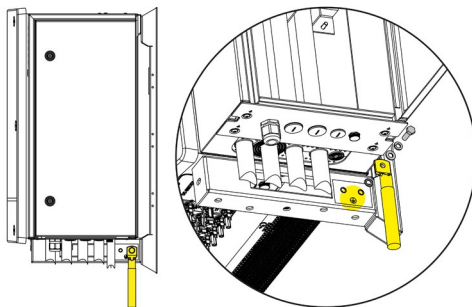
Cable diameter range	12 ... 27 mm
Conductor cross section	35 ... 120 mm ² (copper)

The earth connection can be made through the internal Protective Earth Point (33), external Protective Earth Point or both (this is required by regulations in force in certain countries of installation).

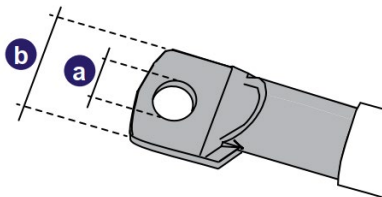
- Internal Protective earthing (PE) cable connection.



- External Protective earthing (PE) cable connection.



The sizing of the ground cable depends on the choice of the protective earth point (internal (33) or external):



Internal Protective Earth

M12
a = 12.5 mm (min)
b = 34 mm (max)

External Protective Earth

M8
a = 8.4 mm (min)
b = 22 mm (max)

⚠ ATTENTION – For cord-connected equipment, provisions shall be made so that the external protective earthing conductor in the cord shall, in the case of failure of the strain-relief mechanism, be the last conductor to be interrupted. **The earthing connection cable must be longer than AC grid ones.**

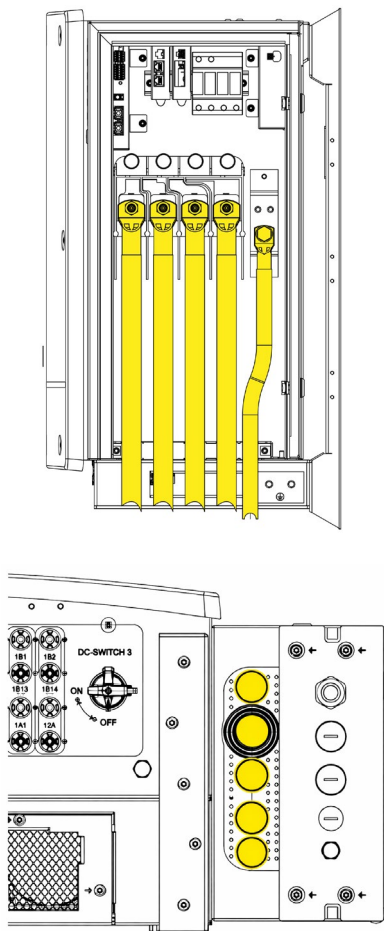
5.4.5 Characteristics and sizing of the AC GRID line cable

The cross-section of the AC line conductor cables must be sized to prevent unwanted disconnections of the inverter from the grid due to the high impedance of the line connecting the inverter to the power supply.

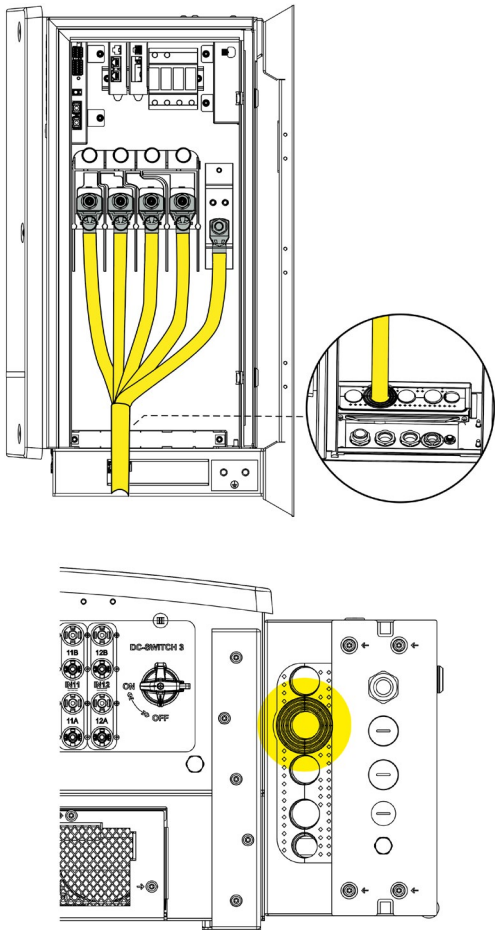
⚠ WARNING – If the impedance is too high it causes an increase in the AC voltage which, on reaching the limit set by the standards in the country of installation, causes the inverter to switch off.

The AC cables must be connected to the AC terminal block (31) and the product allows the using of single conductor cables or multipolar cable:

- Single Core Configuration.



• Multi Core Configuration.



AC Connection

Single Conductor Cable

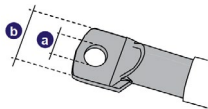
Multipolar Cable

Cable diameter range

17 ... 32 mm

16 ... 58 mm

Cable lug size



for M12 stud
a = 12.5 mm (min)
b = 34 mm (max)

Conductor cross section

70 ... 240 mm²

Conductor material

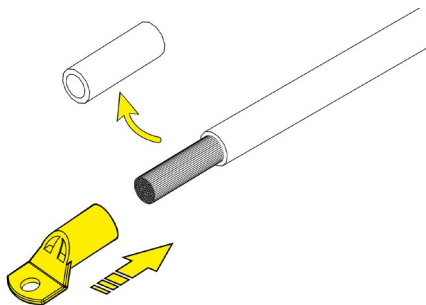
copper or aluminium

5.4.6 Protective earthing (PE) cable connection

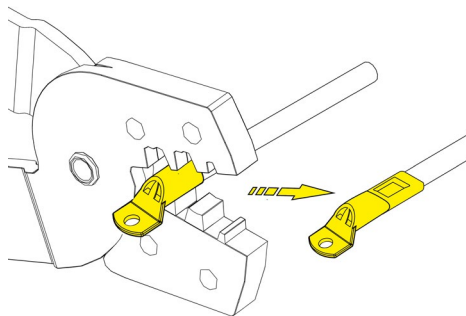
Depending on the ground connection method internal or external follow the procedures described below.

5.4.6.1 Internal ground connection

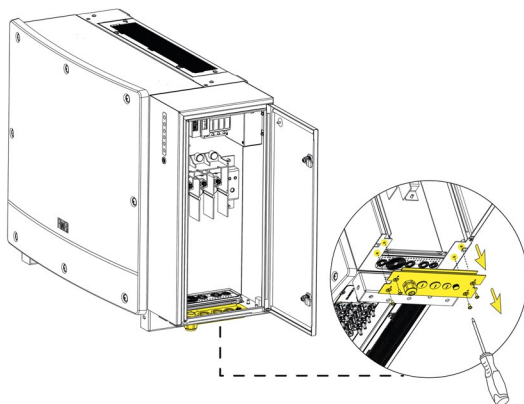
- Strip the earth cable.



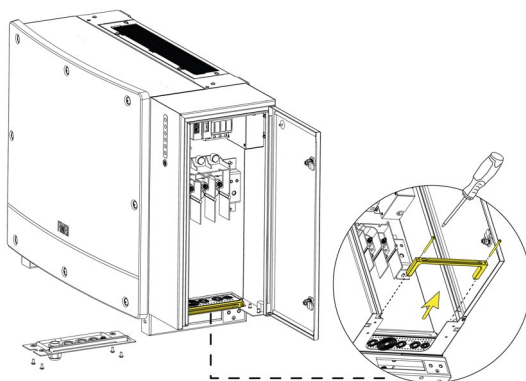
- Install an eyelet cable lug on the earth cable.



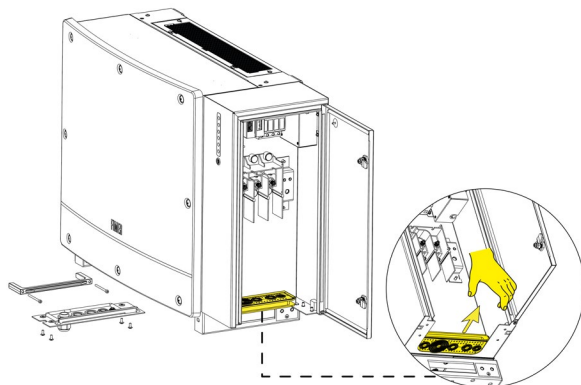
- Open the wiring box door by means of the 2 quarter cam locks (7) and remove the communication signal panel (19) through 4 M5 torx screws.



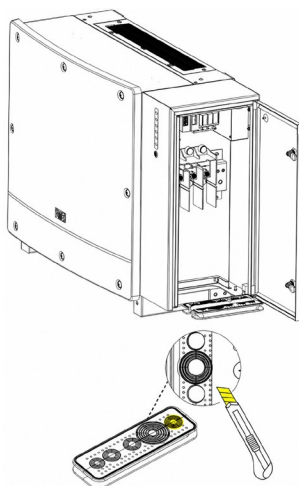
- Remove metal flange for fixing AC power cable lock (24) to chassis through 2 x M6 hex screws.



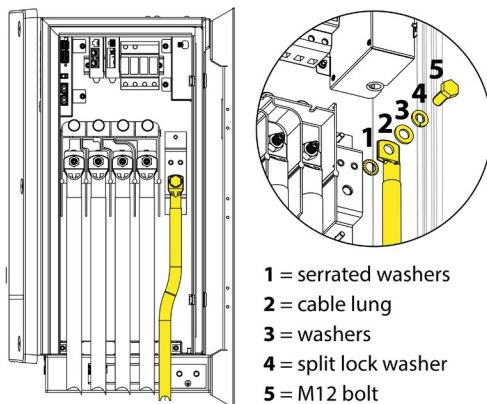
- Remove AC multi/single core power cable lock (18).



- The silicone cable lock shall be cut according to the cable diameter. **Selecting a sealing ring with a diameter 1–2 mm smaller than the ground cable is mandatory to ensure effective water ingress protection.**



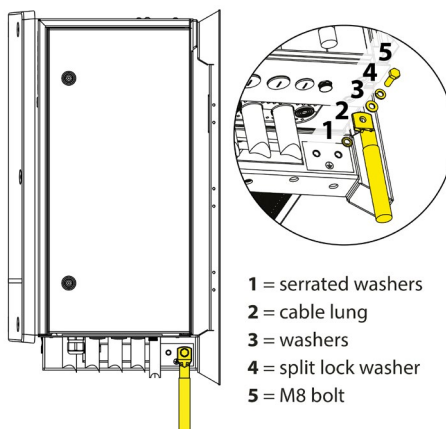
- Pass the protective earth cable through the proper hole on AC multi/single core power cable lock (18).
- Fix the protective earth cable lug to the internal protection earth connection point M12 screw + M12 flat spring lock washers + M12 serrated washer to clamp the earth cable on the Protective earth (PE) on the terminal block (33), as shown in the following diagram:



⚠ ATTENTION – The cable lug must be installed with a tightening torque between 20 and 30 Nm.

5.4.6.2 External ground connection

- Fix the protective earth cable lug to the external protection earth connection point using the washers and M8 bolt provided in the wiring box component kit, as shown in the following diagram:



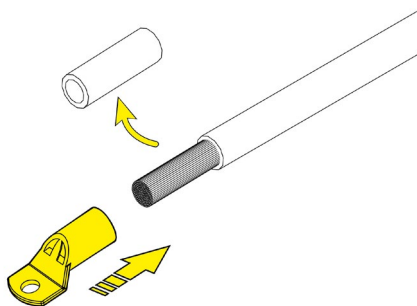
⚠ ATTENTION – The cable lug must be installed with a tightening torque between 10 and 20 Nm.

- Before connecting the inverter to AC or DC sources use a suitable multimeter to test the conductivity of the earth connections between the protection earth connection point (ext.) and other inverter accessible parts.

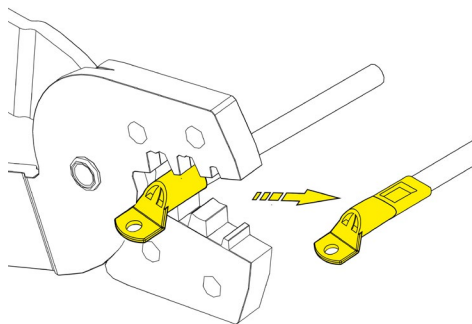
5.4.7 AC GRID cables connection

⚠ ATTENTION – A power supply cord for connection to the AC mains shall comply with all of the following, as appropriate: if rubber insulated, be of synthetic rubber and not of a lighter grade than ordinary tough rubber sheathed flexible cord according to IEC 60245-1 (designation 60245 IEC 53); and if PVC insulated: be not of a lighter grade than light PVC sheathed flexible cord according to IEC 60227-1 (designation 60227 IEC 52).

- Strip the AC cables.



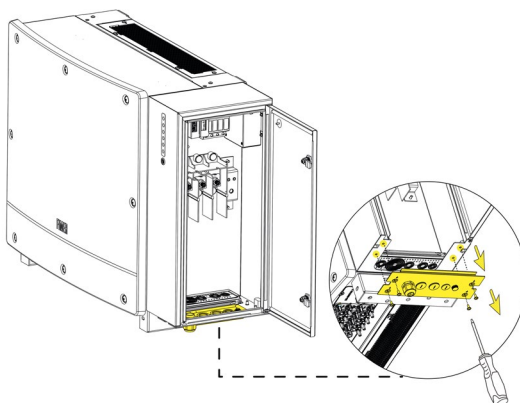
- Install an eyelet cable lug on the earth cable.



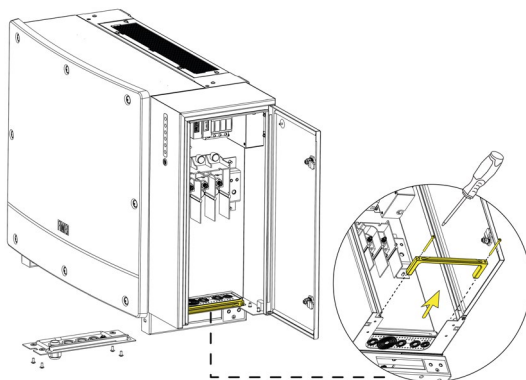
If internal ground connection (33) is used, the communication signal panel (19), the metal flange for fixing AC power cable lock (24) are already removed (see [Internal ground connection](#) section).

Differently, if external ground connection is used the following additional three steps must be performed:

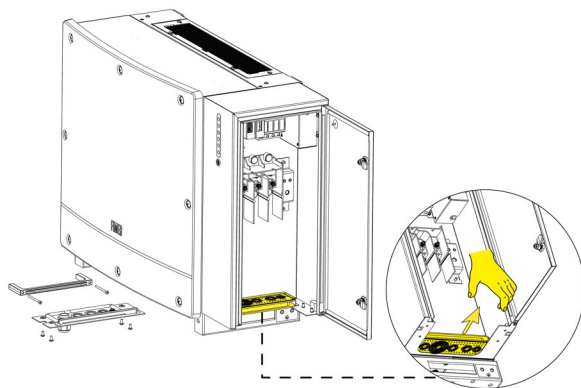
- Open the wiring box door by means of the 2 quarter cam locks (7) and remove the communication signal panel (19) through 4 x M12 torx screws.



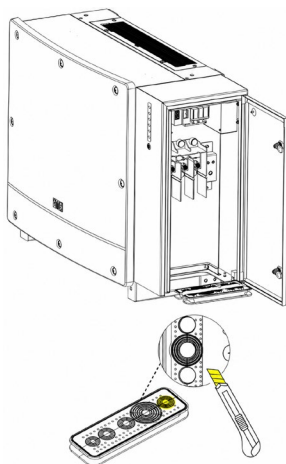
- Remove metal flange for fixing AC power cable lock (24) to chassis through 2 x M6 hex screws.



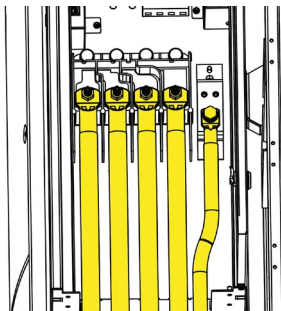
- Remove AC multi/single core power cable lock (18).



- As for grounding connection, the silicone cable lock shall be cut according to the cable diameter. **Selecting a sealing ring with a diameter 1–2 mm smaller than the ground cable is mandatory to ensure effective water ingress protection.**

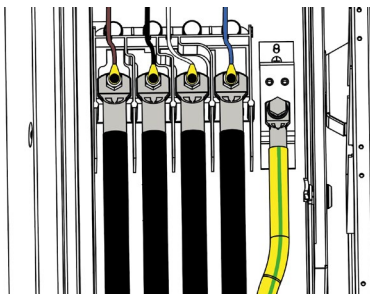


- Pass the AC cables through the single core or multicore cable through the proper hole on AC multi/single core power cable lock (18). The length of phase cables on the internal side of wiring box need to be about **350 mm** (cable lug included).
- Fix the phases and neutral (if required) cable lugs to the AC connection terminal block (31), paying attention to the correspondence of the phases with the labels, using the washers and the M12 nuts pre-installed on the stud as shown in the following diagram:



- ⚠ ATTENTION** – In case of a wrong phase sequence the inverter will not connect to the grid and it will provide an error state (E079 - Grid Wrong Sequence)
- The cable lugs must be installed with a tightening torque between 20-30 Nm.

- Re-install the AC overvoltage protection device (32) by using the M4 nuts previously removed with a tightening torque of 1.5-2 Nm.



- Apply the **sealing putty** around each AC and grounding cable as well.



- ⚠ ATTENTION** – Make sure the cable glands are properly sealed to ensure IP65 protection degree.
- ⚠ ATTENTION** – **Application of sealing putty around each AC cables is mandatory.** Fill the gap between cables with the sealing putty. After sealing the cable holes, check the cable holes carefully to ensure that they are securely sealed with the sealing putty.

5.5 DC Input connection

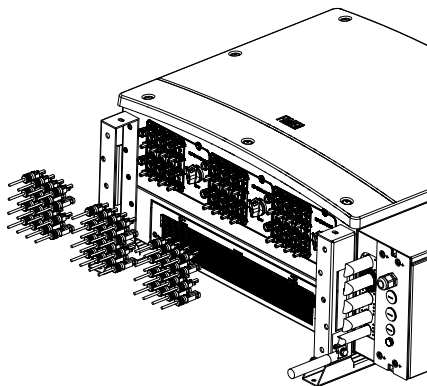
WARNING – Check absence of any leakage to ground in the PV generator.

- The input strings connected to an input channel must have the same installation conditions (number of panel sets, panel type, orientation and tilt).
- When the photovoltaic panels are exposed to sunlight they provide continuous DC voltage to the inverter. To avoid risks of electrical shock, all wiring operations must be carried out with the DC disconnect switches (internal (15) (16) (17) and external to the inverter) and external AC disconnect switches OFF.
- The inverters referred to in this document are **WITHOUT AN ISOLATION TRANSFORMER** (transformer less). This topology implies the use of isolated PV panels (IEC 61730 Class A rating) and the need to keep the PV array floating with respect to ground: no terminal of the PV array must be connected to ground.
- Comply with the maximum input current relating to the quick-fit connectors as indicated in the technical data.
- The reverse polarity can cause severe damage and electric arc hazards! In case of reverse input strings do not disconnect them while under load and do not turn the DC disconnect switches (08) to OFF position. Wait until input current are below 0.5A (when solar irradiance declines at night) and turn the DC disconnect switches (15) (16) (17) to OFF position, disconnect the DC input MC4 connectors (12) (13) (14) and correct the wrong polarity of the string.

For the string connections it is necessary to use the quick fit input connectors for MPPTs (12) (13) (14), located on the bottom side of the inverter.

For each channel are available respect the Maximum DC input power for each MPPT as follow:

INPUT RATING			
PVM-125-TL	32 A – 12 MPPTs	2 connector pairs for each MPPT	
PVM-110-TL	32 A – 10 MPPTs	2 connector pairs for each MPPT	
PVM-100-TL	32 A – 8 MPPTs	2 connector pairs for each MPPT	
PVM-75-TL	32 A – 6 MPPTs	2 connector pairs for each MPPT	



In case of a single-string installation or retrofit, the MPPTs can be connected in parallel outside the inverter using an external wiring box equipped with properly protection string fuses or our PVM-75/125 String Expander/Combiner (for more detail refer to specific manual product available on <https://www.fimer.com>)

NOTE – The parallel configuration must be set through the Web UI during the commissioning process.

NOTE – Generally, the parallel connection of the two or more input channels is used when the generator consists of a single array with a power output higher than the maximum allowed for one channel. In this case, the power (current) is distributed between the two or more input channels. To avoid mismatch losses, when the array is made up of parallel strings, these must be homogeneous, meaning they should consist of modules with the same specifications, the same number of modules in series and parallel, and similar orientation.

5.5.1 Preliminary operations to the connection of the PV generator

⚠ WARNING – To safely perform the preliminary operations before the connection to the PV generator, the connection of the ground protection cable to the inverter is mandatory.

⚠ ATTENTION – The installation must be performed by qualified installers and/or licensed electricians in accordance with the existing regulations in the country of installation and in accordance with all safety rules for performing electrical works. This activity is allowed **ONLY** with the appropriate PPE for carrying out this check (overall resistant to electric arc, dielectric helmet with visor, insulating gloves class 0, Protective over glove in leather EN420 – EN388, Safety shoes).

Checking the correct polarity of the strings

Using a voltmeter, check that the voltage of each string observes the correct polarity.

The reverse polarity can cause severe damage.

⚠ WARNING – The reverse polarity can cause severe damage and electric arc hazards! In case of reverse input strings do not disconnect them while under load and do not turn the DC disconnect switches **(15) (16) (17)** to OFF position. Wait until input current are below 0.5A (when solar irradiance declines at night) and turn the DC disconnect switches **(15) (16) (17)** to OFF position, disconnect the DC input quick fit connectors **(12) (13) (14)** and correct the wrong polarity of the string.

Checking of leakage to ground of the photovoltaic generator:

Measure the voltage present between positive and negative pole of each string with respect to ground.

If a voltage is measured between an input pole and ground, it may be that there is a low isolation resistance of the photovoltaic generator, and the installer will have to carry out a check to solve the problem.

Do not connect the strings if a leakage to ground has been detected, as the inverter might not connect to the grid.

Refer to "Verification of ground leakage" paragraph on this manual to know how to verify the leakage to ground of the photovoltaic generator.

Checking of strings voltage:

Measure the voltage present between positive and negative pole of each string.

If the open circuit voltage of the string is near the maximum value accepted by the inverter, consider that low ambient temperatures cause an increase in the string voltage (different according to the photovoltaic module used). In this case it is necessary to carry out a check of the sizing of the system and/or a check on the connections of the modules of the system (e.g.: number of modules in series higher than the design number).

Verify that the string voltage is the same in all the strings that are connecting to the same input channel. Voltage differences (of the strings connected in parallel) could reduce performance.

Input voltages higher than the maximum value accepted by the inverter (see technical data table) may occur the damage of the inverter.

5.5.2 Installation procedure for quick-fit connectors

The model of connectors installed on your inverter must be matched by the same model of the respective corresponding parts to be used.

According to IEC 62548 (Photovoltaic (PV) arrays – Design requirements), connectors mated together in a PV system shall be of the same type from the same manufacturer, i.e. a plug from one manufacturer and a socket from another manufacturer or vice versa shall not be used to make a connection. Refer to document "String inverters - Product manual appendix" available on the website to find out the manufacturer and model of quick fit connector used on the inverter.

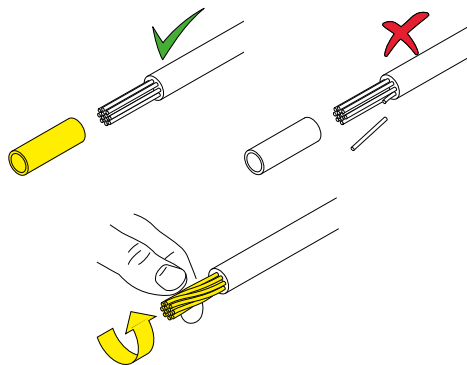
Using mating parts that are not compliant with the quick fit connector models on the inverter could cause serious damage to the unit and lead to invalidation of the warranty.

Complete assembly instructions and specification of quick-fit connectors could be found on manufacturer website.

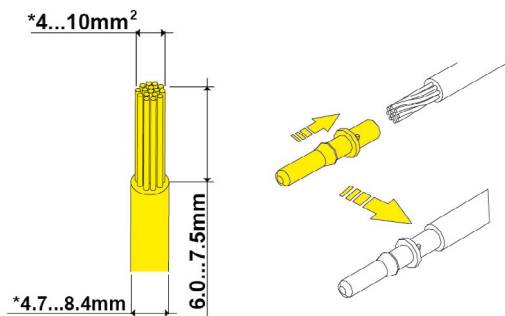
Input cables must meet the connector requirements and depends on connector models (see "3.5.3 Cable gland clamping range" and "3.5.4 Connectors cross section range").

Assembly procedure:

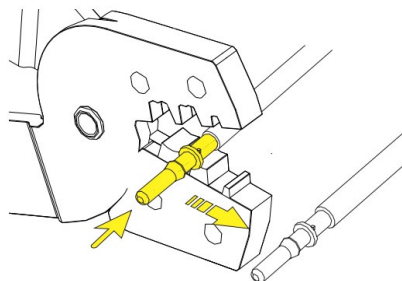
Strip the cable over a length of 6,0 to 7,5mm using suitable equipment.



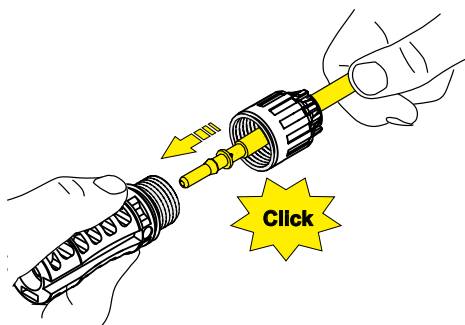
Crimp the terminal to the conductor using the designated pliers.



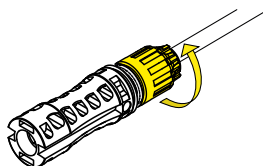
⚠ WARNING – To avoid damage to the equipment, when crimping cables to the connectors, pay particular attention to polarity.



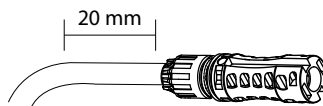
Insert the crimped terminal contact into the insulator body of the connector, until you hear the click indicating that the terminal is engaged inside the connector.



Firmly tighten the cable gland using the relevant tool to finish the operation (3.4...3.5Nm).

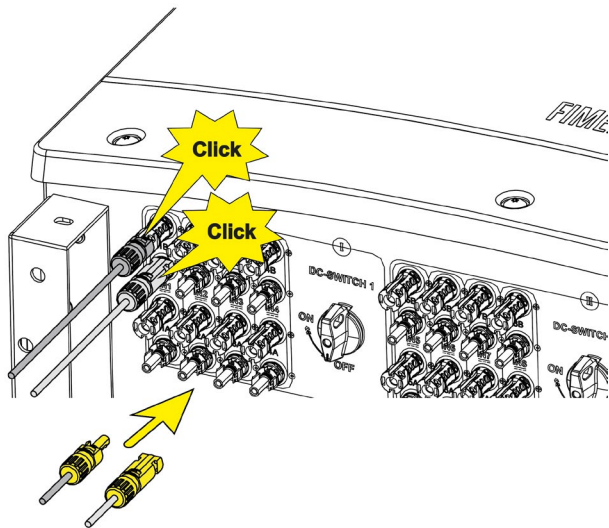


The cable routing has to be done to avoid damage at the connector and to ensure IP65 protection degree (minimum 20 mm of straight cable).



5.5.3 Connection of DC inputs

Connect all the strings required by the system by pushing the MC4 connectors in the right position.



-  **WARNING** – Check that protective caps are installed on unused connectors. This is necessary for the inverter seal and to avoid any damage to the unused connectors which may be used later.
-  **WARNING** – The MC4 connectors must be properly installed. After the installation make sure the connectors are correctly locked through the clips.

 **NOTE** – For proper sizing of the PV system, it is recommended to use calculation software configured according to the technical parameters specified in the product documentation.

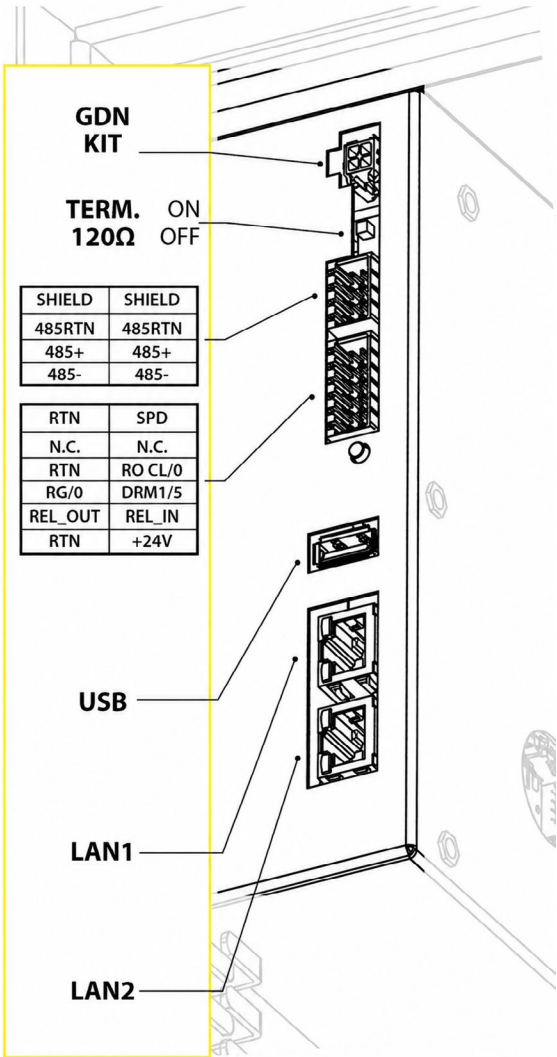
5.5.4 MC4 connectors (PV inputs)

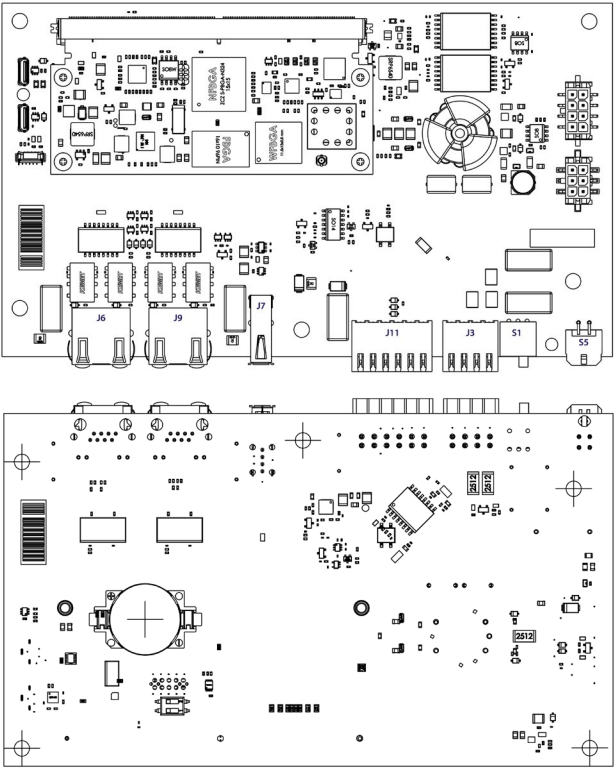
The product is equipped with the following MC4 connectors:

Description	Polarity	Brand	Series	Article	Ratings	Image
Female MC4 cable connector	(+) IN1 IN2 ... IN12	Staubli	MC4-Evo2	32.0022P2000-UR PV-ADB4-EVO 2/6-UR	1500 Vdc 42 A (4.0 mm² / 12 AWG) 47 A (6.0 mm² / 10 AWG)	
Male MC4 cable connector	(-) IN1 IN2 ... IN12	Staubli	MC4-Evo2	32.0023P2000-UR PV-ADS4-EVO 2/6-UR	1500 Vdc 42 A (4.0 mm² / 12 AWG) 47 A (6.0 mm² / 10 AWG)	

5.6 Communication and control signals connection

The communication and control signals cables must be connected to the communication and monitoring board (27) inside the wiring box (02).

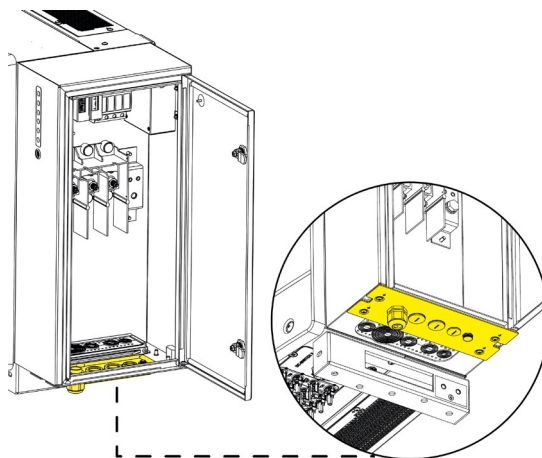




Terminal Name	Terminal Reference	Description
J6-J9	34-35	Ethernet ports
J7	36	USB Connector
J11	37	Multi signal connector: Remote On/Off, DRM 0/1/5, configurable relay, 24V isolated power supply connector
J3	38	RS-485 line terminal block
S1	39	RS-485 120 Ohm termination resistance switch
J5	40	Grounding kit connector
-	42	CR2032 coin battery

To reach the board, on the top side of the wiring box, there is a removeable communication signal panel (19), factory equipped with M25 cable gland (cable range accepted 10-17mm).

Additional 2 x M25 (21) and 1 x PG13.5 (22) cable glands can be installed (not included in the boxing).



⚠ ATTENTION – The connection of the communication and control signal cables should be done with no over-length of the above-mentioned cables. Moreover, the communication and control signal connection cables should not be in contact with live parts.

– Please ensure that all unused signal cable holes are properly sealed by the IP66 plastic cap (pre-installed on removeable communication signal panel).

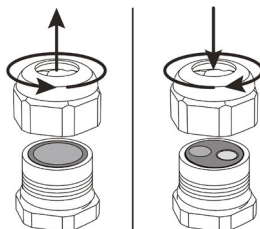
• Connectivity cable gland M25

This M25 cable gland is equipped with a two-holes gasket. Each hole can accept a cable with a diameter with a suggested diameter in the range of **3.5 to 5.5 mm**

If a hole is not used, it is necessary to install a plug (supplied plastic cylinder) to ensure the inverter's sealing.



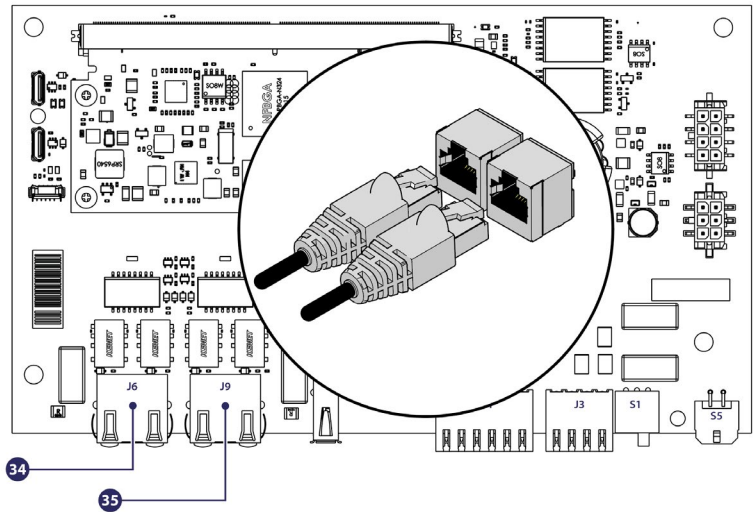
Check the tightness of the signal cable glands (tightening torque 7.5 Nm) at the end of wiring operations.



5.6.1 Ethernet connection

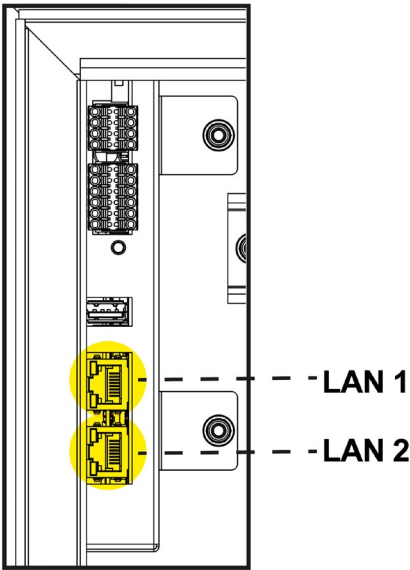
The Ethernet connection allows a direct data transfer to the FIMER server for monitoring purpose. When the inverter will be powered on, network parameters are automatically set, and the inverter starts the transmission of telemetry data to the Aurora Vision® CLOUD platform.

The connection of the ethernet communication cable must be made on the specific connectors (34) (35) located on the Communication and monitoring board.



The two RJ45 connectors LAN1 and LAN2 are equivalent to each other and can be used for the input or for the output of the line connecting multiple inverters in a daisy-chain.

Ethernet port



5.6.1.1 Ethernet cable specification

The cable should be compliant to the following specification:

Ethernet cable specification	
Cable category	CAT5, CAT5e or CAT6 (or higher) ⁽¹⁾ UV-resistant if used outdoor
Cable shielding	- SF/UTP total braid and foil shield, no shielding of the twisted pair. - SF/FTP total braid and foil shield, with twisted pair shields (preferable)
Type of plug	Metallic shielded RJ45 plug (especially for outdoor application and/or in presence of strong electromagnetic sources)
Maximum cable length	100 m
Shield Grounding	Proper grounding requires to connect the Ethernet cable's shield to inverter chassis on both sides. This is done adopting shielded cables with metallic shielded RJ45 plugs. ⁽²⁾

1. Max line length between two network nodes, depends on what type of cable is used:

- 100m using rigid cables.
- 50m using patch cables.

2. Ensuring a proper metallic continuity between cable and plug shields for the best performance.

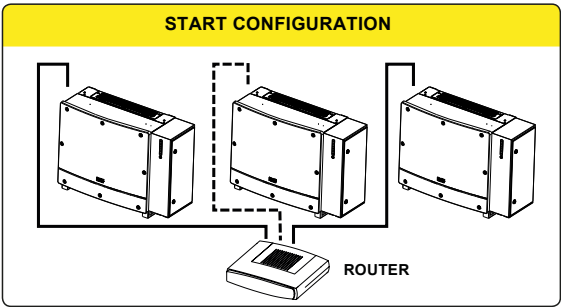
It is always recommended not to let ethernet cables pass by the power cords to avoid interference with data transmission.

For outdoor application and/or in presence of adverse weather/strong electromagnetic events it is advisable to use additional overvoltage protective devices.

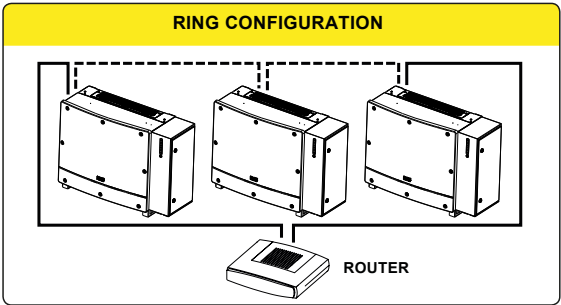
⚠ ATTENTION – To avoid earth loop (that could create communication issues) the shield of any Ethernet cable must be connected to the RJ45 plug in only one side; the other side of the shield should be leaved floating. This could be guaranteed by crimping the shield or the screen of the ethernet cable to the RJ45 connectors only at one end of each cable.

5.6.1.2 Ethernet system configuration

Star configuration: the ethernet cable, of one or more inverters, could be connected directly to a router or a switch.

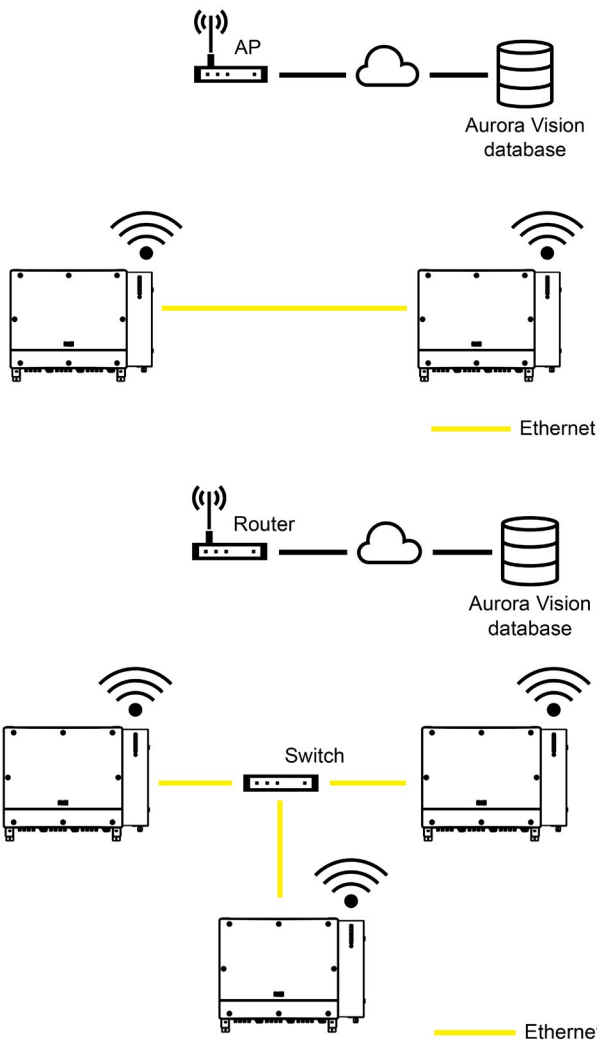


Ring configuration: inverters connected to each other via ethernet in daisy chain, and the first and last one is connected to router.



Maximum number of inverters connected to over one single daisy chain is 40.

Mixed configuration (multi-inverter): inverters connected to each other via ethernet and to a router via Wi-Fi.



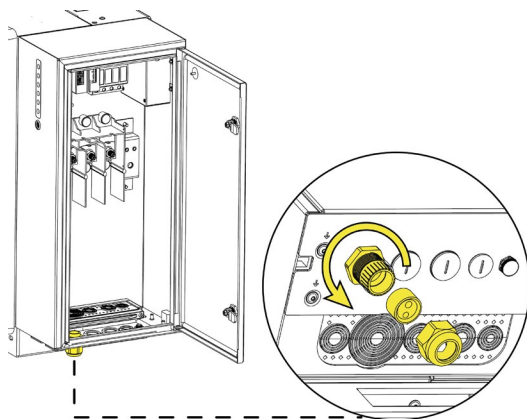
⚠ ATTENTION – On each configuration the maximum length of the cable must be 100m between inverter – inverter and inverter – switch.

📖 NOTE – For further information on the Ethernet connection refer to the Local Area Network standard IEEE802.3

- No initial setup is required to start data transmission to Aurora Vision.
- Internet connection is required to use all the Aurora Vision remote functionalities.
- Please refer to Aurora Vision documents available on FIMER website for further information how to get an Aurora Vision account for remotely monitoring and managing the installed solar assets.

5.6.2 Ethernet cable connection procedure:

Unscrew and remove the connectivity cable gland M25 (20) ring.

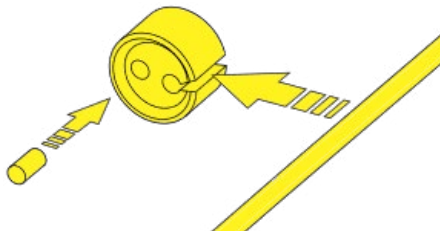


Remove the two-holes gasket from the gland.

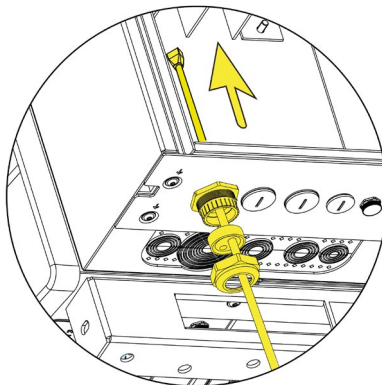
Remove one plug (plastic cylinder) from the two-holes gasket.

Insert the cable through the connectivity cable gland M25 ring. If the cable used already has a connector installed, it is necessary to make a cut in the gasket corresponding to the hole chosen for the cable passage.

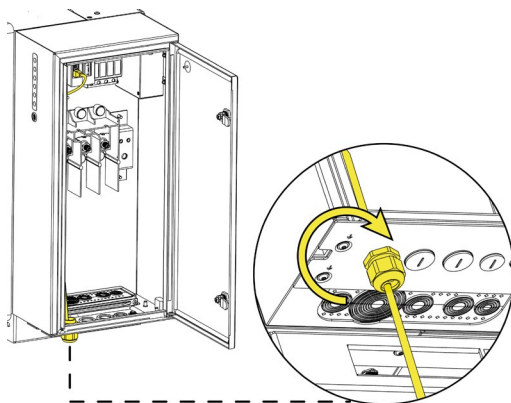
Check that in any unused hole of the gasket is installed the plastic plug (supplied)



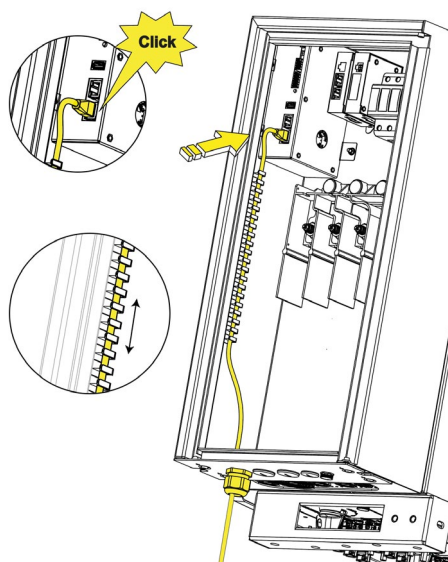
Route the ethernet cable through the two-holes gasket and reinstall it inside the cable gland.



Reinstall the cable gland ring without firmly tighten it.



Connect the cable on the ethernet connector **(34)** **(35)**.



Check the tightness of the signal cable glands **(20)** (tightening torque 7.5 Nm) at the end of wiring operations.

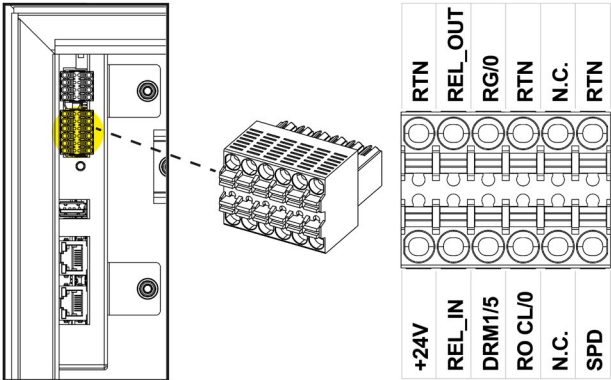
5.6.3 Multi-signal Connector

The multi-signal connector (37) can be used for the connection of:

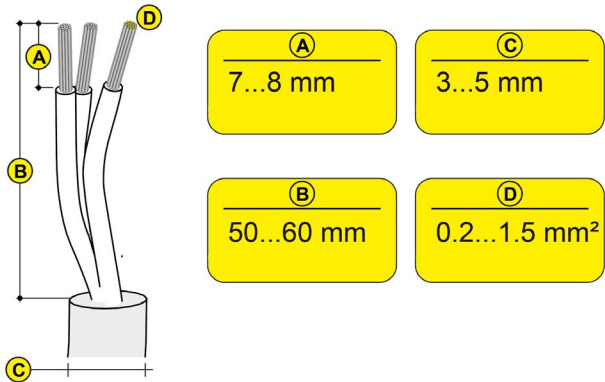
- DRM0 or Remote ON/OFF
- DRM 1/5
- Configurable Relay
- 24V Isolated power supply

NOTE – The enabling or setting of the functionality connected must be set via the WEB UI.

The connection of the cable must be made on the specific multi-signal connector (37).

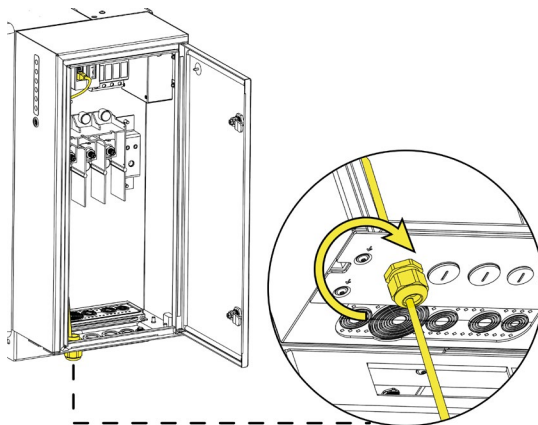


Since these are digital inputs, there are no requirements to be observed as regards cable cross-section (it only needs to comply with the sizing requirement for passing cables through the connectivity cable gland M25 (20) (21) or PG13.5 (22) and the terminal connector).



5.6.3.1 Multifunction cable connection procedure:

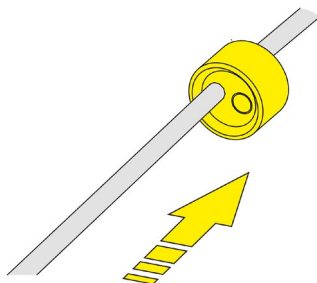
Unscrew and remove the connectivity cable gland M25 (20) ring.



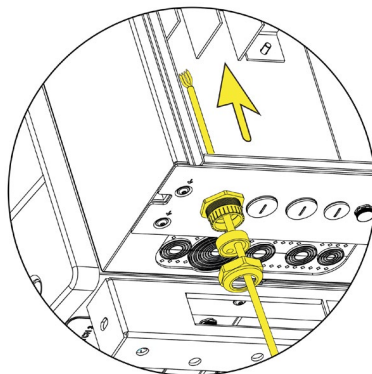
Remove the two-holes gasket from the gland.

Remove one plug (plastic cylinder) from the two-holes gasket.

Insert the cable through the connectivity cable gland M25 (20) ring.

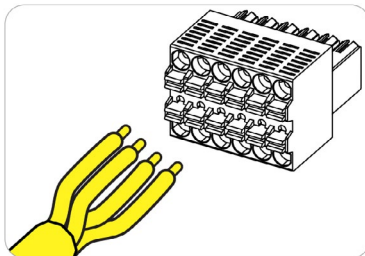


Route the multifunction cable through the two-holes gasket and reinstall it inside the cable gland

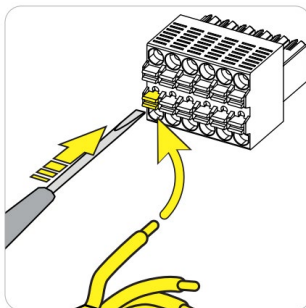


Check that in any unused hole of the gasket is installed the plastic plug (supplied).

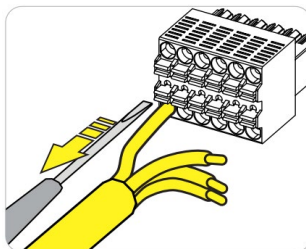
- Install the wires on the 12 poles terminal block (supplied).



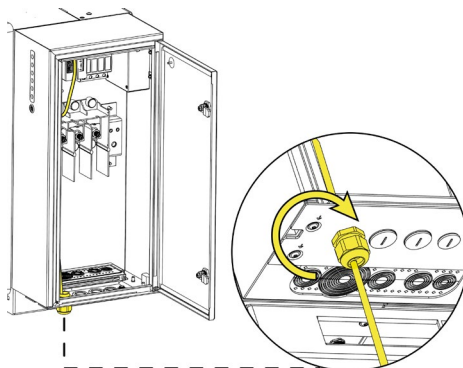
- Open the internal spring by pressing on the clip with a flat screwdriver and insert the wire.

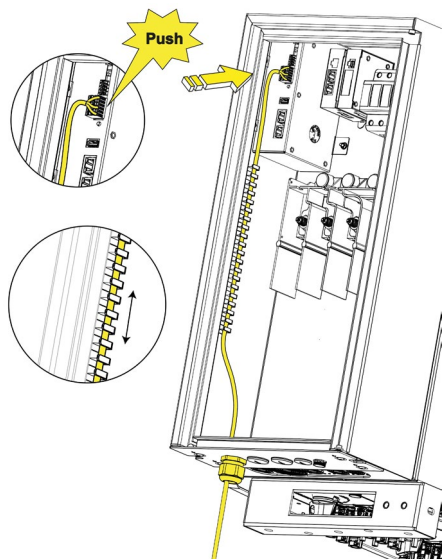


- Remove the flat screwdriver to close the internal spring and install the wire.



Connect the wired 12 poles terminal block to the multi-signal connector (37).
Firmly tighten the connectivity cable gland M25 ring (20).



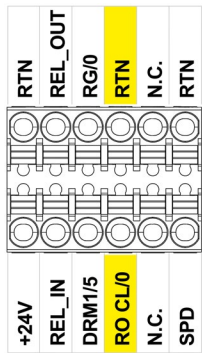


5.6.3.2 Remote ON/OFF

The remote ON/OFF functionality is useful to manage remotely the connection and disconnection of the inverter from the grid. The function must be enabled via the WEB UI and:

- If the remote-control function is disabled, the inverter switching on is dictated by the presence of the normal parameters that allow the connection to the grid.
- If the remote-control function is ON, besides being dictated by the presence of the normal parameters that allow the connection to the grid, the inverter switching on also depends on the state of the R1 and RTN / CL0 terminals of Multi-signal Connector (37).

NOTE – The remote ON/OFF function is enabled by default.



When RO and RTN terminals are brought to the same potential (i.e. by using a switch to make a short circuit between the two terminals), the inverter disconnects from the grid.

NOTE – The external switch used for Remote ON/OFF should be rated for DC low voltage, low current application (the minimum switching current capability should be 1mA or lower).

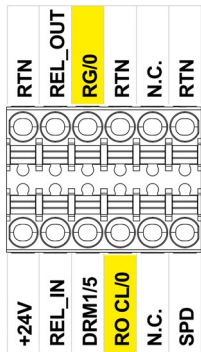
- The remote ON/OFF and the CL/0 (DRM0 for Australian market) command use the same connection terminals and therefore can be used alternatively. The desired function must be set via the WEB UI

5.6.3.3 Demand Response (AS/NZS 4777.2)

The Demand Response (DRM0/1/5) functionality could be requested by the AS/NZS 4777.2 standard.

DRM0

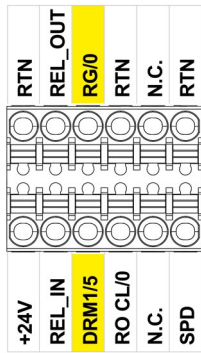
This functionality operates the disconnection of the inverter to the grid.
Connect the command signal between CL/0 and RG/0 terminals of multi-signal connector (37).



- NOTE** – The DRM0 command and the remote ON / OFF use the same connection terminals and therefore can be used alternatively. The desired function must be set via the WEB UI
- ATTENTION** – In case of the DRM0 function is activated without the proper wiring of the remote terminal block (37), the inverter will no longer be able to connect to the grid. For further information regarding the DRM0 function refer to the AS/NZS 4777 standard.

DRM1

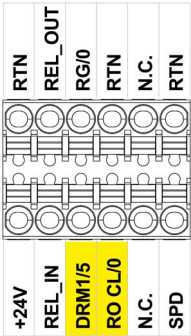
This functionality forces the inverter to not consume power from the grid.
Connect the command signal between DRM1/5 and RG/0 terminals of multi-signal connector (37).



- NOTE** – The DRM1 functionality is not implemented at the software level and is reserved for future use.

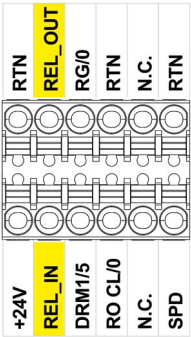
DRM5

This functionality forces the inverter to not inject power to the grid.
Connect the command signal between DRM1/5 and RO / CL/0 terminals of multi-signal connector (37).



5.6.3.4 Configurable Relay (Clean Contact)

The inverter is equipped with configurable relay (clean contact) on the multi-signal connector (37).



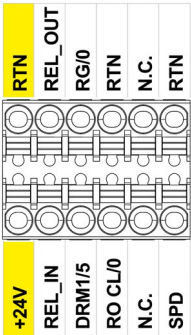
It is normally open contact; however it can be configured so that it can be activated (closed) in correspondence with a specific alarm or inverter state.
Different types of devices (light, sound, etc.) can be connected to the relay, provided they comply with the following requirements:

Configurable Relay Ratings	
Voltage	48 Vdc (max)
Current	900 mA (max)
Cable Requirements	0.2...1.5 mm ²

NOTE – For additional information about relay configurability refer to [Internal Web User Interface \(WEB UI\)](#) section.

5.6.3.5 Isolated power supply (24Vdc, 200mA)

The inverter is equipped with additional isolated power supply on the multi-signal connector (37).



Isolated Power Supply Ratings	
Voltage	24 Vdc (maximum)
Current	200 mA (max)
Cable Requirements	0.2...1.5 mm²

5.6.4 Serial Communication line

5.6.4.1 RS485 – Master Mode (Device Acquisition)

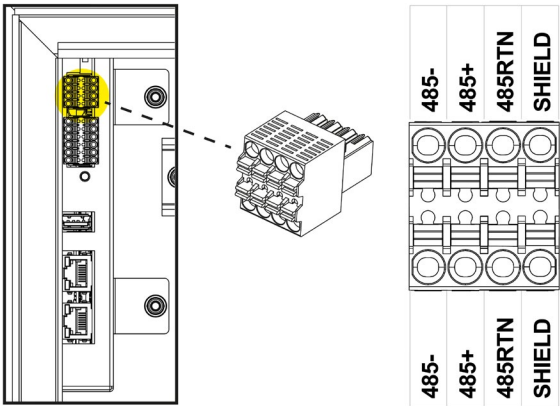
NOTE – Please note that automatic settings of network parameters at turning on, embedded logging capability, automatic logger-free transferring of data to Aurora Vision Cloud and remote firmware update are provided over TCP/IP (Ethernet and/or Wi-fi) bus only.

The RS485 port can either be used for connecting supported accessories (like meters or weather station): in this case data from accessories will be logged and transferred to the cloud by inverter itself (master mode). This will allow the inverter to serve as a logger for Fimer accessories.

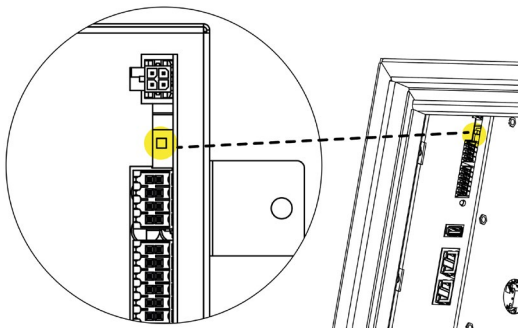
NOTE – When an accessory is connected to the RS-485 line it must be added and configured into the “Connectivity → Additional devices” menu on the WEB UI.

- For more information on connecting the accessories to the RS485 terminal block, refer to the accessory product manual or contact Fimer customer support.

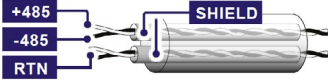
Connection of the R485 communication line is made using the terminal block connectors (38) (485+, 485-, RTN).



Set the switch S1 of the termination resistance (39) to "ON" position.



NOTE – Use a shielded twisted pair cable with characteristic impedance of $Z_0 = 120\Omega$ in case of long-distance connection.

Signal		Symbol
	Positive data	485+
	Negative data	485-
	Reference	RTN
	SHIELD	SHIELD

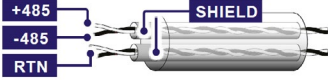
5.6.4.2 RS485 – Slave Mode (Modbus Server)

NOTE – RS485 line supports Modbus/RTU SUNSPEC compliant Modbus protocol.

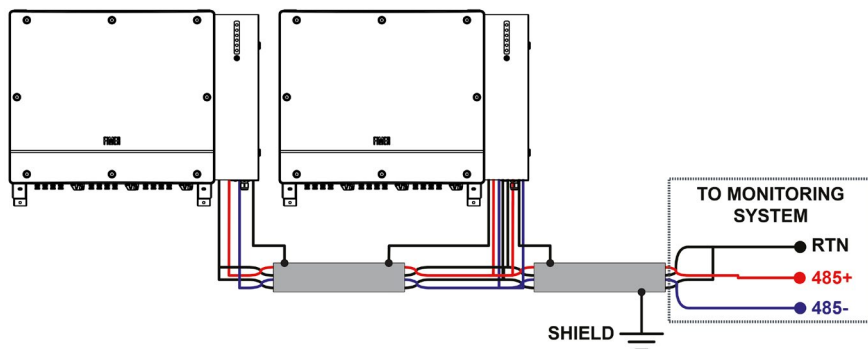
- The use of the inverters over the RS485 line is recommended in case of monitoring and controlling by using third party RS485 control systems.
- By default the RS485 port (38) is set as Master mode (Device Acquisition) . In case the port was set as Slave Mode (Modbus Server) it must be configured through the [Web user Interface](#) to use the RS485 as a serial communication line.

The RS-485 port can be used to set up a line of communication which, when connected to a monitoring device, enables the operation of the photovoltaic system to be kept under control. Depending on the device used, monitoring can be local or remote. The RS-485 serial communication line is available on the communication and monitoring board with terminal block (38) (485+, 485-, RTN). For each serial line signal (485+, 485-, RTN) can be made a daisy-chain connection ("in-out") of multiple inverters.

NOTE – Use a shielded twisted pair cable with characteristic impedance of $Z_0 = 120\Omega$ in case of long-distance connection.

Signal		Symbol
	Positive data	485+
	Negative data	485-
	Reference	RTN
	SHIELD	SHIELD

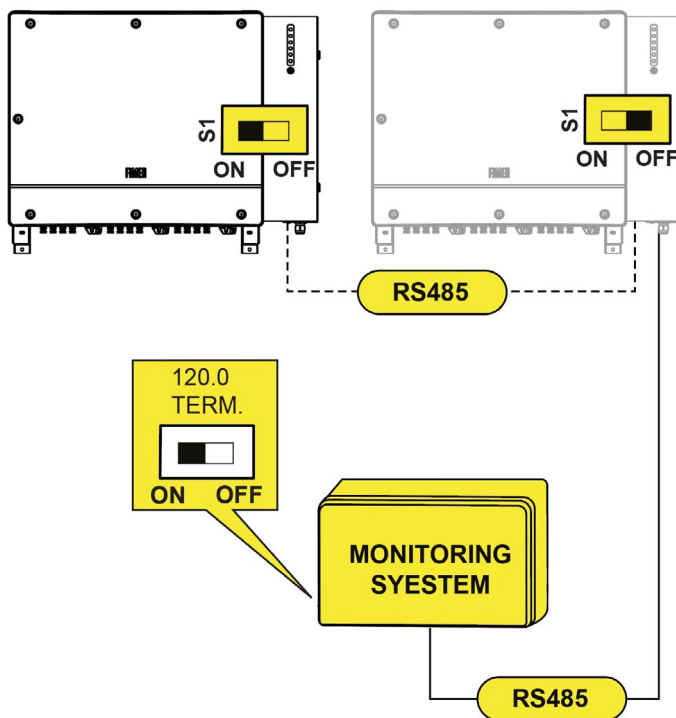
ATTENTION – Shield continuity must be provided along the communication line and must be grounded in a single point.



NOTE – It is the installer's responsibility to evaluate the use of an additional overvoltage protective devices on the communication line.

- For information on installation, compatibility and use of monitoring system, please refer to the specific documentation on the accessory components.

Connect all the units of the RS485 chain in accordance with the daisy-chain model observing the correspondence between the signals and activate the termination resistance of the communication line of the final element of the chain by switching the switch S1 (39) to the ON position.



NOTE – The communication line must also be terminated on the first element of the chain which normally corresponds to the monitoring device.

- It is recommended not to exceed a length of 1000m for the communication line.
- The maximum number of inverters that can be connected to the same RS485 line is 62.
- In case of longer communication line and/or in case of a large number of connected inverters to the same line it could be necessary to add a RS485 amplifier to guarantee the performance of the communication line.

5.6.5 USB port connection

The type A USB port (36) can be used for the connection of accessory devices.

Visit <https://www.fimer.com> for availability of accessory device.

The connection cable of the accessory device must be passed through the connectivity cable glands (20) (21) (22) of the removable communication signal panel (19):

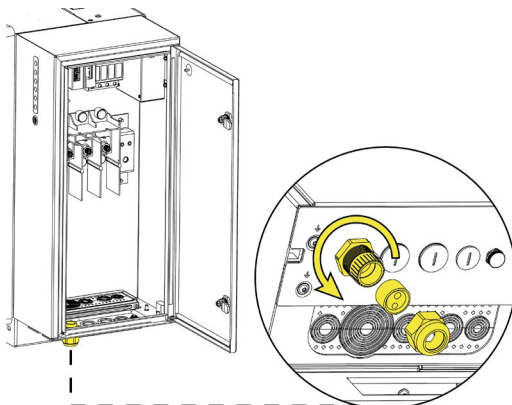
5.6.5.1 USB port cable connection procedure:

Unscrew and remove the connectivity cable gland M25 (20) ring.

Remove the two-holes gasket from the gland.

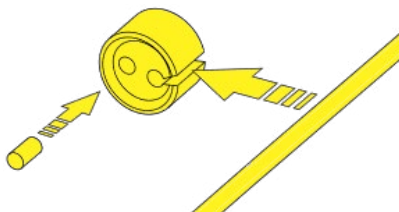
Remove one plug (plastic cylinder) from the two-holes gasket.

Insert the cable through the connectivity cable gland M25 (20) ring.

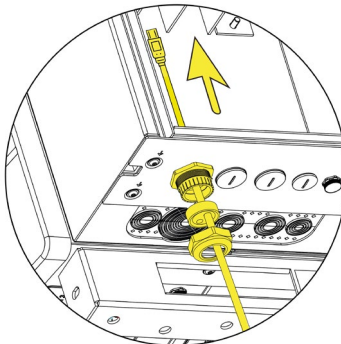


Route the multi-signal cable through the two-holes gasket and reinstall it inside the cable gland.

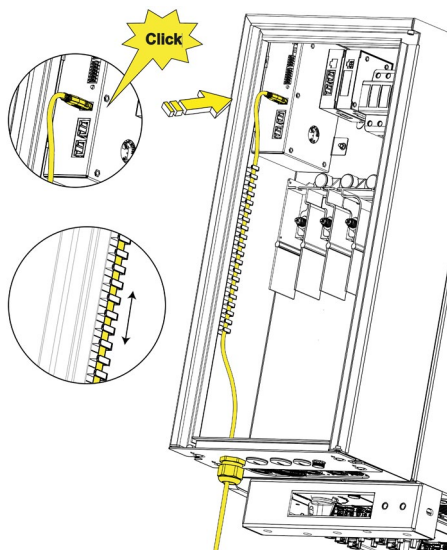
Check that in any unused hole of the gasket is installed the plastic plug (supplied).



Reinstall the cable gland ring without firmly tighten it.



Connect the cable on the USB plug (36).



Firmly tighten the connectivity cable gland M25 (25) ring (see paragraph 3.5.2).

6. Instruments

6.1 General conditions

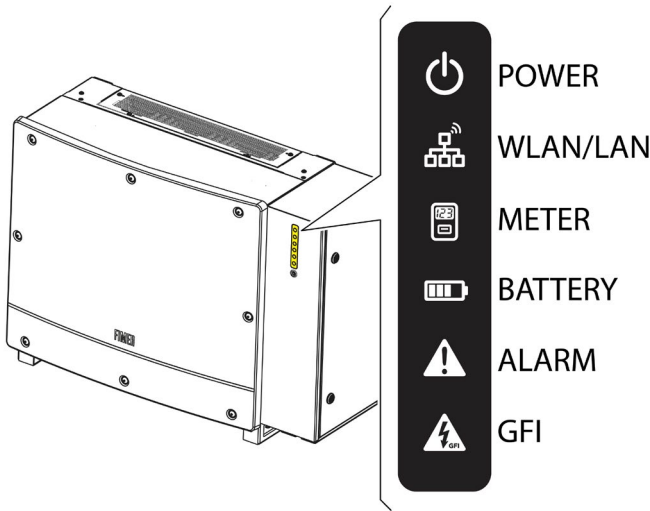
The first rule to prevent damage to the equipment and ensure operator safety is to have a thorough understanding of the instruments. Therefore, we recommend that you read this manual carefully. If you have any doubts about the information provided, please contact MA Solar Italy Service for further clarification.

Do not use the equipment if:

- You do not have suitable qualifications to work on this equipment or similar products.
- You are unable to understand how it works.
- You are not sure what will happen when the buttons or switches are operated.
- You notice any operating anomalies.
- There are doubts or contradictions between your experience, the manual and/or other operators.

MA Solar Italy cannot be held responsible for any damage to the equipment or to the operator resulting from lack of knowledge, insufficient qualifications, or inadequate training.

6.2 Description of LED strip



Symbol	Description
	POWER Indicates that the inverter is functioning correctly. When the unit is commissioned, while the grid is checked, this icon blinks. If a valid grid voltage is detected, the icon remains continuously lit, if there is sufficient sunlight to activate the unit. Otherwise, the icon will continue to blink until the sunlight is sufficient for activation.
	WLAN/LAN Indicates the status of the Wi-Fi or Ethernet communication lines.
	METER Communication status with external meter (if present).

**BATTERY**

Communication status with external battery (if present).

**ALARM**

Indicates that the inverter has detected an anomaly. This type of problem is highlighted in the Web User Interface.

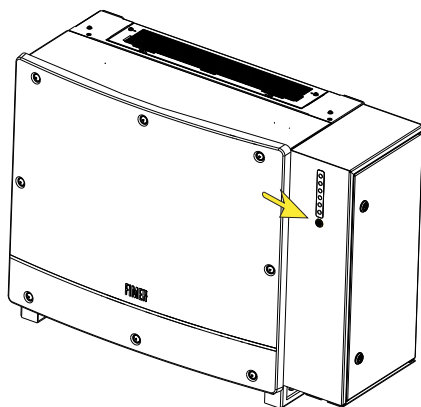
**GFI**

The "GFI" (ground fault) indicates that the inverter has detected a ground fault in the DC side photovoltaic generator. When this fault is detected, the inverter immediately disconnects from the grid.

The icons, in various multiple available combinations, can signal multiple conditions other than the original single condition; see the various descriptions explained in the "**LEDs behaviour**" paragraphs on this manual.

6.3 Wi-Fi/AFCl button

The Wi-Fi/AFCl button is paced on the bottom side of the inverter.



This button allows the user (installer or homeowner) to:

- Enable the Wi-Fi access point by pressing it for 1 second (it remains active if already enabled).
- Reset the ARC fault error by pressing it for 5 seconds.

6.4 User interface

6.4.1 FIMER WEB UI

The FIMER WEB UI provides a comprehensive platform for managing your inverter, offering the following key functionalities:

1. Inverter Commissioning:

- Streamlined setup process to configure your inverter according to specific requirements.
- Step-by-step guidance for efficient and error-free commissioning.
- Accessible interface for adjusting parameters and settings to optimize performance.

2. Firmware Updates:

- Seamlessly update the inverter firmware to ensure compatibility with the latest features and enhancements.
- Simple interface for initiating and monitoring firmware update processes, minimizing downtime.

Experience intuitive control and efficient management of your inverter system through the versatile features of the FIMER WEB UI.

6.4.2 Aurora Vision®

Integrated logging capability allows remote monitoring of the plant without the needs of any additional external loggers.

Aurora Vision is a cloud-based platform enabling remote monitoring and asset management of MA Solar Italy devices in range of solar power application.

Aurora Vision consists of two different products, designed to meet different market needs, an APIs Service (RESTful architecture) to enabled third party data integration and a KIOSK view to show publicly solar plant benefits and performances:

- Plant Portfolio Manager. An advanced professional web-portal that allows stakeholders (such as installers/operators/managers) to monitor and control fleets of photovoltaic systems installed for final customers.
- Energy Viewer. A smart and easy-to-use mobile app for monitoring the main power generation and self-performances indicators, for owners of residential and commercial PV plants, to keep energy use and savings in check.
- APIs Service. Harness the power of data from MA Solar Italy photovoltaic systems to design solutions and provide opportunities.
- KIOSK View. A public and customizable web page based on HTML5 (self-updating and embeddable in external frames) to show the benefits and performances of a solar power plant.

6.5 Measurement tolerance

The data supplied by the inverter may differ from measurements taken by certified measuring instruments (e.g. output meters, mustimeters and grid analysers); since the inverter is not a measuring instrument it has wider tolerances for the measurements it makes.

The tolerances are generally:

- $\pm 5\%$ for real-time measurements with output power below 20%
- $\pm 3\%$ for real-time measurements with output power above 20%
- $\pm 4\%$ for all statistical data.

7. Operation

7.1 General conditions

Before performing any operation on the equipment, it is essential to thoroughly understand the “**Instruments**” chapter and the functions that may have been enabled during the installation process. The equipment operates automatically without the need for an operator; its operating state should be monitored through the equipment's instrumentation.

⚠ ATTENTION – The interpretation or variation of some data is reserved exclusively for specialized and qualified staff.

During operation, ensure that environmental and storage conditions have remained constant over time and that the equipment is not exposed to adverse weather conditions (refer to the “Installation” chapter)

7.2 Commissioning (Via internal Web User Interface)

⚠ WARNING – Qualified person required.

Inverter commissioning is the process of configuring and starting up the inverter after installation to ensure it runs correctly according to specifications. It involves checking connections, configuring parameters, and performing tests to ensure the inverter runs efficiently and safely.

⚠ ATTENTION – Inverter operations cannot start without commissioning it.

Commissioning is preferably done via a wireless connection to the inverter's internal web interface, using a smartphone or a notebook. The configuration wizard has 5 simple steps, 2 optional.

⚠ WARNING – Do not place objects of any kind on the inverter during operation! Do not touch the heat sink while the inverter is operating! Some parts may be very hot and could cause burns.

- Before proceeding with commissioning, ensure that all checks and verifications outlined in the section on preliminary checks have been completed.

After completing installation and checks, switch ON in order:

- **The inverter DC switch.**
- **The inverter line AC circuit breaker.**

⚠ ATTENTION – With DC supply, make sure that the irradiation is stable and adequate for the inverter commissioning procedure to be completed

Once supplied, the inverter may take a few minutes to be ready. The LED STRIP shows that the inverter is ready; in the pre-commissioned state the led are as follow:

📌 NOTE – In the pre-commissioning phase:
The **Alarm YELLOW** LED flashes rapidly.

7.2.1 Pre-commissioning phase 1 - Connection to the local Wi-Fi network



NOTE – The “Communication Identification Label” is located on the side of the inverter; this part of the label can be detached and placed in a more accessible location for later use, such as on the front cover of the quick installation guide.

Device used TABLET/SMARTPHONE:

- Once the inverter is powered, launch a QR reader for mobile and SCAN the QR code [C] marked with [1] symbol content on the “Wireless Identification Label”.
- Connect to inverter network (tap connect). The name of the wireless network created by the system that the connection should be established with will be: **Fimer-YYWWSSSSSS**, where YYWWSSSSSS is the 10-digit inverter SN that can be found on the “Communication Identification Label”.
- After this step wait 10 seconds to allow the WLAN connection.

Device used LAPTOP:

- Enable the wireless connection on the laptop which is being used for the board setup and connect it to the Access Point created by the inverter system: The name of the wireless network created by the system that the connection should be established with will be: **Fimer-YYWWSSSSSS**, where YYWWSSSSSS is the 10-digit inverter SN that can be found on the “Communication Identification Label”.
- When prompted, type the “product key” [B] (including the dashes. Example: 1234-1234-1234-1234) as the network password to access the inverter’s access point (AP). The product key is printed on the “Wireless Identification Label”.

7.2.2 Pre-commissioning phase 2 – Internal WEB UI access

Device used TABLET/SMARTPHONE:

- SCAN the following QR code (it is also reported in the Quick installation guide and in the pre-commissioning flyer inside the box of the inverter):

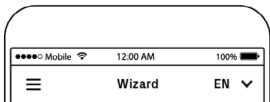


Device used LAPTOP:

- Open an internet browser (recommended browser: Chrome versions from v.55, Firefox versions from v.50) and enter the pre-set IP address 192.168.117.1 to access the setup pages (web user interface).

7.2.3 Step by step commissioning wizard

The language of the wizard could be changed by clicking on the upper status bar.



7.2.3.1 Step 1 (Optional) – Network connection

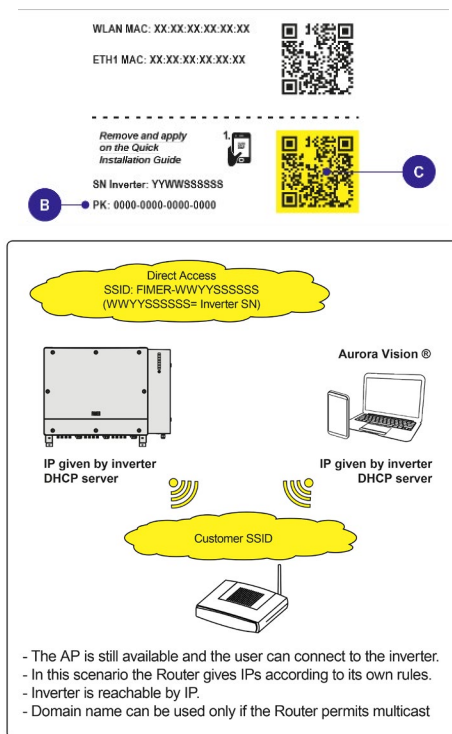
In this first step, you can configure the inverter's network interfaces.

NOTE – This step can be skipped and performed later via the web user interface (WEB UI).

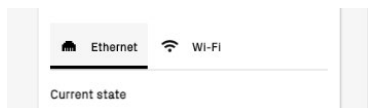
The inverter is equipped with an Ethernet LAN port and a Wi-Fi module that operates in two modes through two channels: "Station Mode" or "Access Point Mode" (also known as "AP Mode").

NOTE – By selecting the "Skip" button the second radio channel will be kept off and you will need to use a wired Ethernet daisy chain bus to allow the inverters to communicate with Aurora Vision.

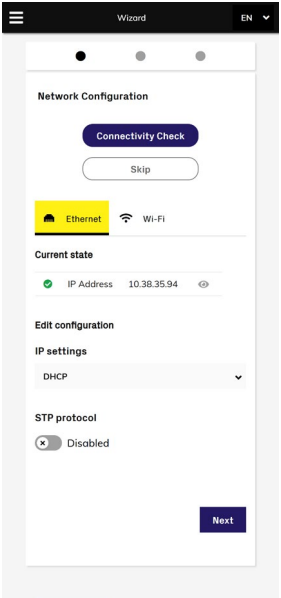
The label containing the connectivity information is described in section 3.2.2 and is provided here for convenience.



Choose the connection type (Ethernet or Wi-Fi) and set the related parameters.



Ethernet connection (TAB):



The Ethernet tab allows you to configure the LAN port. Select DHCP mode if there is a DHCP server present. Choose STATIC mode if you wish to assign a static IP address to the interface. In DHCP mode, if the Ethernet cable is connected will be showed the related IP Address and settings:

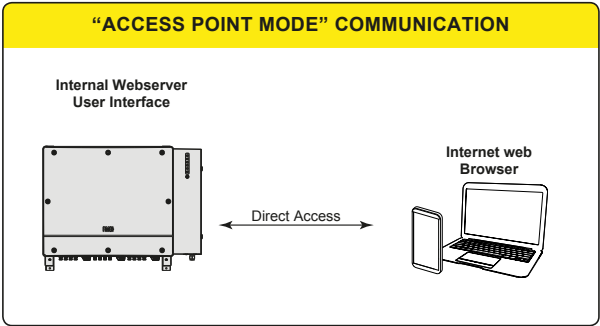
The parameters relating to the home wireless network (set on the router) that must be known and set during this step are:

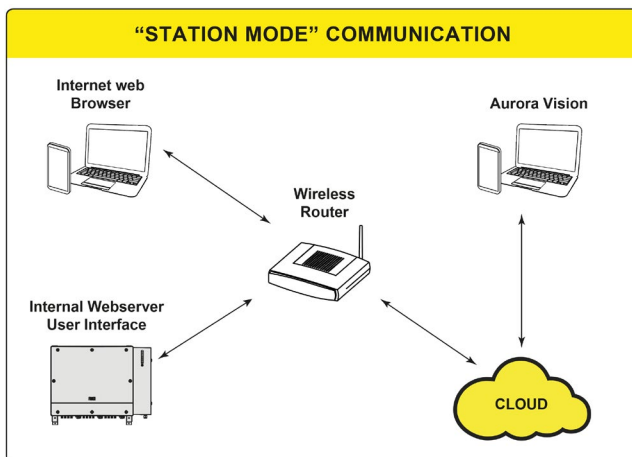
- IP Settings: **DHCP** or **STATIC**:
 - If you select the DHCP function (default setup) the router will automatically assign a dynamic IP address to the inverter whenever it tries to connect to the user network.
 - If you choose the Static option, you can assign a fixed IP address to the system. The fields required for IP static address assignment will appear. Complete the additional fields at the bottom of the screen (all fields are mandatory except for the secondary DNS server).

Wi-Fi connection (TAB):

The inverter WLAN board can operate in two different operating modes:

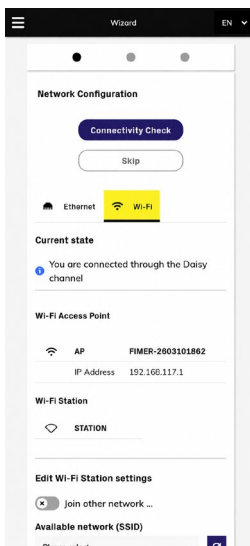
1. "AP mode": Only local communication is enabled in this mode; In particular, the WLAN board acts like an «access point» generating a wireless network to which the user can connect locally, to monitor or configure the inverter / photovoltaic system, using the direct access to the Internal Web user interface integrated in the WLAN board
2. "Station Mode": In this operating mode, not only local but also remote monitoring is enabled through access to the LAN connection or through the Aurora Vision® CLOUD platform.





NOTE – Where possible, connecting the inverter in “Station Mode” is always preferable. Thanks to the internet connection, this mode ensures better operation.

This setup stage relates to connecting the inverter to your residential wireless network. If it is not possible to connect the inverter to the wireless network, or you do not wish to do so, select the “**Skip this step**” button. In this situation, communication between the inverter and the tablet/smartphone/PC can only be performed with a point-to-point (“AP Mode”) connection.



To configure STATION mode, fill in the following fields:

- **Available networks (SSID):** Identify and select your own (home) wireless network from all those shown in the SSID field (you can carry out a new search of the networks that can be detected with the Update button). Once the network has been selected, confirm.
- **Password:** Wireless network password: Enter the password for the destination network (if necessary) and start the connection attempt (it will take a few seconds).
- Click on “Connect” button to connect the inverter to the home wireless network.
- Click on “Next” button to continue the configuration wizard.

Wizard EN

Wi-Fi Access Point

AP FIMER-2603101862

IP Address 192.168.117.1

Wi-Fi Station

STATION

Edit Wi-Fi Station settings

Join other network ...

Available network (SSID)

Please select

Required

Password

Password

Required

IP settings

Please select

Required

Save

7.2.3.2 Step 2 Date, Time and Time zone.

- Set the Date, Time, and Time Zone. The inverter will automatically populate these fields when the time protocol is available. If the inverter is unable to detect the time protocol, these fields must be entered manually.
- Click on "Next" button to continue the configuration wizard

Wizard EN

AM

06:25

May 11, 2026

Etc/UCT

NTP

Date and Time

A NTP server has been detected and it will be used to keep the system clock synchronized.

Date

11/05/2026

Time

06:25

Time zone

Etc/UCT

Back Next

7.2.3.3 Step 4 - Inverter configuration

- Country Standard** (selection of grid standard): Set the grid standard of the country in which the inverter is installed.

Wizard EN

Inverter configuration

Country standard

To apply Country Standards not listed in the drop-down menu, please refer to the application note Setting Deviation available on FIMER website.

Select the country standard (grid code)

Please select

Required

- PV Input Channels Configuration:** Choose the number of independent MPPTs.

Wizard EN

Input mode

PV Input Channels Configuration

Please select

Required

MPPT Configuration

Available input

You can manually drag inputs into the MPPT boxes or assign them automatically with the button.

Input 1 Input 2 Input 3 Input 4

Input 5 Input 6 Input 7 Input 8

Input 9 Input 10 Input 11 Input 12

MPPT Assignment

Auto

To continue, assign all inputs to their respective MPPTs in the section below.

- The standard configuration of the PVM family includes 12 independent input channels; therefore, 12 must be selected in the PV Input Channel Configuration.
- Check that automatic channel assignment is correct.

Input mode

PV Input Channels Configuration

12 MPPT

MPPT Configuration

Available input

You can edit the configuration by manually dragging the inputs into the MPPT boxes, or click "Reset" to start over and reconfigure.

All channels have been assigned. You can review the current configuration or press Reset to start over.

MPPT Assignment **Auto** **Reset**

MPPT 1
Input 1

MPPT 2
Input 2

MPPT 3
Input 3

Input mode

PV Input Channels Configuration

12 MPPT

MPPT Configuration

Available input

You can edit the configuration by manually dragging the inputs into the MPPT boxes, or click "Reset" to start over and reconfigure.

All channels have been assigned. You can review the current configuration or press Reset to start over.

MPPT Assignment **Auto** **Reset**

MPPT 7
Input 7

MPPT 8
Input 8

MPPT 9
Input 9

Input mode

PV Input Channels Configuration

12 MPPT

MPPT Configuration

Available input

You can edit the configuration by manually dragging the inputs into the MPPT boxes, or click "Reset" to start over and reconfigure.

All channels have been assigned. You can review the current configuration or press Reset to start over.

MPPT Assignment **Auto** **Reset**

MPPT 4
Input 4

MPPT 5
Input 5

MPPT 6
Input 6

MPPT Configuration

Available input

You can edit the configuration by manually dragging the inputs into the MPPT boxes, or click "Reset" to start over and reconfigure.

All channels have been assigned. You can review the current configuration or press Reset to start over.

MPPT Assignment **Auto** **Reset**

MPPT 9
Input 9

MPPT 10
Input 10

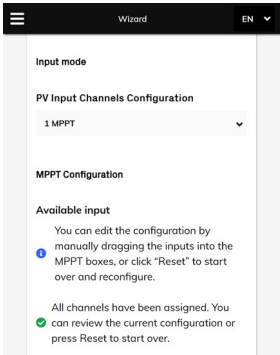
MPPT 11
Input 11

MPPT 12
Input 12

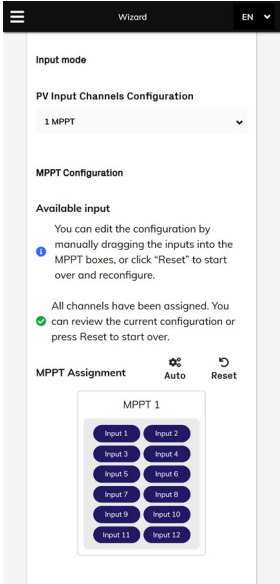
However, the product allows a certain degree of flexibility in configuring the parallel connection capability of the individual input channels.

In the following, some input settings are reported in which an equivalent single channel (all 12 input channels connected in parallel) and 2 independent channel configurations (2 groups of 6 channels connected in parallel) are selected.

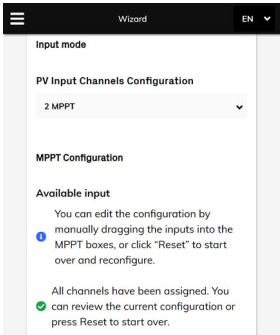
- if all input channels are connected in parallel, choose 1 MPPT in PV Input Channels Configuration.



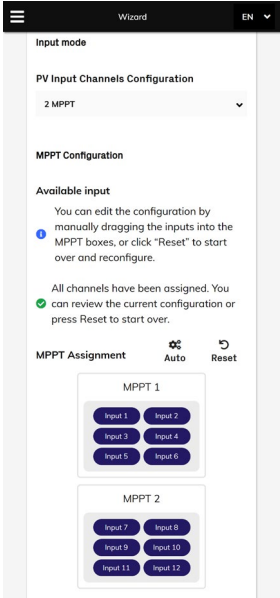
- Check that automatic channel assignment is correct.



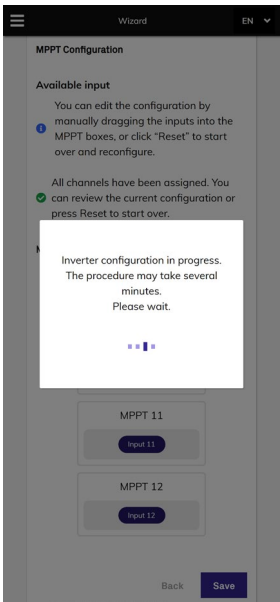
- For two equivalent independent channels, choose 2 MPPT in PV Input Channels Configuration.



- Check that automatic channel assignment is correct.

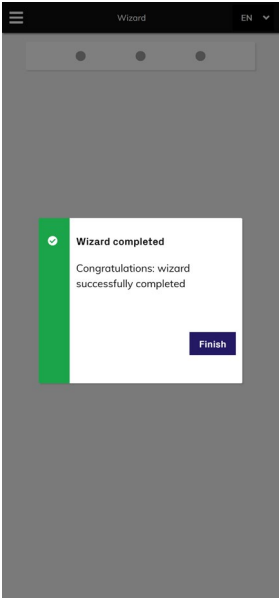


- Click on "Save" button to complete the Inverter configuration step.



ATTENTION – At the end of the inverter configuration wizard, the inverter will store the settings and reboot to apply the configuration. This process will take a few minutes. Do not turn off the inverter and wait for the operation to complete.

NOTE – After the reboot, the inverter is ready for operation and may connect to the electrical grid, regardless of whether the next configuration step involving the addition of additional devices has been completed.



7.2.3.4 Step 5 – METER

- In this final step, if the installation includes a METER dedicated to managing energy policies, you must select the type of meter installed from the available options in the drop-down menu.

Add Meter

Skip

Select Device

Sotec EM133

☐ Edit settings

Name

MyMeterName

Select Protocol

RTU

Meter Phase

Please select

Required

RS485 address

1

Baud Rate

B19200

Parity

E

Position

Please select

Required

Save

Add Meter

Skip

Select Device

Sotec EM133

☐ Edit settings

Name

MyMeterName

Select Protocol

TCP

Meter Phase

Please select

Required

IP Address

0.0.0.0

Required

Port

502

Node address

1

Position

Please select

Required

Save

- To edit the disabled fields, check the **"Edit settings"** box.
- Click on **"Next"** button to complete the configuration wizard.

7.2.3.5 Wizard finalization

- A notification will confirm that the wizard is completed.
- Depending on the supply source used to complete the installation wizard steps, close the disconnect switch of any missing voltage sources.
- If the input voltage is sufficient to allow the connection to the inverter will perform preliminary checks of the AC and parameters and performs other auto-diagnostic checks.
- If the outcome of the preliminary checks to grid synchronization are positive, the inverter connects to the grid and starts to export power.

✓

Wizard completed

Congratulations: wizard successfully completed

Finish

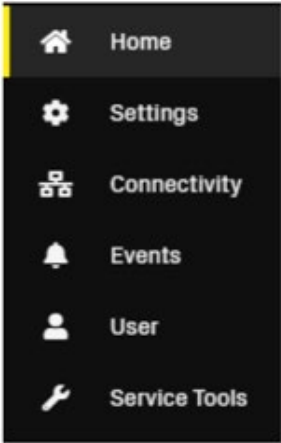
NOTE – To address any issues that may arise during the initial stages of system operation and to ensure the inverter remains fully functional, it is recommended to check for firmware updates in the "SERVICE TOOLS" section of the web user interface.

7.2.3.6 Configure Pid Recovery

NOTE – By logging in as "Admin" and obtaining the token (on the <https://registration.solar.fimer.com> site and following the procedure "7.4.6.1" in this document) it is possible to obtain the "Admin Plus" access level which allows advanced configuration of the inverter parameters.

- If the Password is lost click on "Forgot your password?" to obtain the access to the Web User Interface (and it will be possible to change the password) by entering the PRODUCT KEY (printed on the "Communication Identification label" and applied during the commissioning phase to the plant documentation).To enable PID Recovery (for more detail refer to section 3.10 ANTI-PID recovery functionality (optional)) "Admin Plus" access level is mandatory.

- Click on **Settings** tab



- Select **Pid Recovery**

Adjustable functions (via WebUI):

- Enabling and disabling the PID recovery function.
- Reference voltage
Settable voltage range between 500Vdc and 750Vdc (default value 650Vdc).
- **Lock-in** and **Lock-out** voltages.
The PID recovery function starts operating when input open circuit voltage (Voc) drops below selected activation (Lock-in) voltage, while it stops operating when Voc rise above selected de-activation (Lock-out) voltage.
The Lock-in and Lock-out voltages can be regulated as %* of minimum Vstart set for the independent input channels, MIN(Vstart).
Lock-in/Lock-out voltage:
- **Lock-in Gain:** default value = 35%, settable range = 20-40%
- **Lock-out Gain:** default value = 45%, settable range = 40-50%
- Starting delay (default = 5 minutes)
Example with default setting 0.3/0.4*MIN(Vstart) (Lock-in/ Lock-out voltage): the PID recovery is activated when the input open circuit voltage (Voc) drops below 0.3*MIN(Vstart) for at least 5 minutes continuously, while de-activation is triggered immediately when input open circuit voltage (Voc) exceeds 0.4*MIN(Vstart).

⚠ WARNING – Not operate on the DC switch when PID recovery is operating (this condition is clearly identified by simultaneous blinking of green and yellow led).

⚠ WARNING – When Anti-PID board is installed, before any intervention on the DC side, disconnect the AC grid and refer to [Inverter Isolation and Safety Measures procedure](#) paragraph on this manual to know all the necessary steps to safely operate on the inverter.

7.2.3.7 Arc Fault Detection (AFD)

The AFD (Arc Fault Detection) performs a self-test when the system is started.

- If the self-test is successful, the inverter will proceed with connecting to the AC grid.
- If a potential issue with the AFD board is detected, the self-test will result in an E053 error code ("arc_fault_detector_self_test_failed"). During normal operation, the input current is continuously monitored and analysed.
- If a DC arc fault is detected during operation, the inverter will disconnect from the AC grid and generate an E050 error code ("arc_fault_detector_arc"), which can be viewed through the internal WEB UI. If Arc Fault Protection is triggered, the inverter will disconnect from the AC grid and, after 5 minutes, enter the recovery mode to attempt reconnection. After 5 arc fault events, the inverter will latch, and the error can only be cleared by pressing the Smart button for 5 seconds.

The AFD self-test can be manually initiated at any time using the following procedure:

1. Turn off the inverter by switching off both the DC switch and the external AC switch.
2. Wait for the unit to shut down completely (indicated by the LEDs stopping their blinking).
3. Turn on both the DC and AC switches and wait for the self-test result; The self-test does not provide success notifications; it only reports any errors to the UI.

Enabling and disabling of this feature can be addressed using the WEB UI.

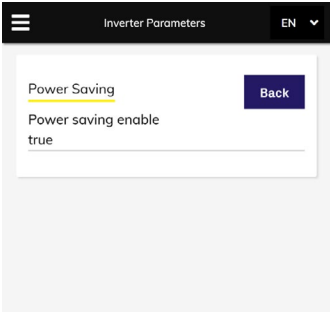
7.2.3.8 Energy Save Mode Enabling

Energy Save Mode function is provided as an additional function in all the inverter models. This is an operation mode that minimizes the power consumption of the inverter during the night.

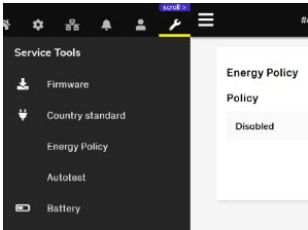
It is possible to enable or disable Energy Save Mode through Web UI. Anyhow, when other functions like “night reactive power” or “Anti-PID” are enabled, inverter will not enter the Energy Save Mode.

Inverter can operate in this mode when there are no other requests during the night minimizing the power consumption. For any other requests that arrive, inverter is able to wake up from the energy save mode and enter in night reactive power mode, Anti-PID, FW upgrade or other desired functionalities.

- Select **Inverter Parameter >> Power Saving**
- Set **Power saving enabled** to true



7.2.3.9 Configuring the energy policy

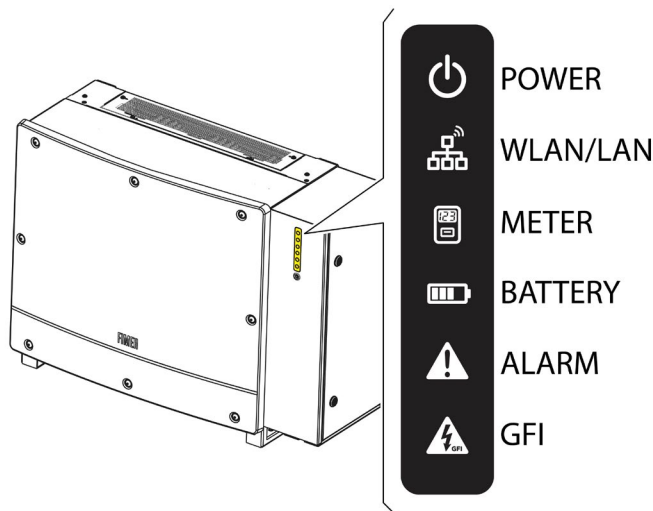


NOTE – If a meter is installed, after completing the wizard, access the WEB User Interface as ADMIN (default password is **0010**) to configure the chosen policy. The available options are Self-consumption or Export-limitation. You can download the “Power platform Energy Policy overview” application note from the FIMER website.

7.2.3.10 Updating the firmware

NOTE – To address any issues that may arise in the initial stages of system operation, and to keep the inverter running at its best with the latest features and improvements, check for firmware updates in the “SERVICE TOOLS” section of the web user interface.

7.3 LEDs behaviour



Symbol	Description
	POWER Indicates that the inverter is functioning correctly. When the unit is commissioned, while the grid is checked, this icon blinks. If a valid grid voltage is detected, the icon remains continuously lit, if there is sufficient sunlight to activate the unit. Otherwise, the icon will continue to blink until the sunlight is sufficient for activation.
	WLAN/LAN Indicates the status of the Wi-Fi or Ethernet communication lines.
	METER Communication status with external meter (if present).
	BATTERY Communication status with external battery (if present).
	ALARM Indicates that the inverter has detected an anomaly. This type of problem is highlighted in the Web User Interface.
	GFI The "GFI" (ground fault) indicates that the inverter has detected a ground fault in the DC side photovoltaic generator. When this fault is detected, the inverter immediately disconnects from the grid.

The following table shows the possible activation combinations of "Power" "Alarm" and "GFI" LED icons on the Synoptic (03) according to the operating status of the inverter.

Each LED icon could behave in one of the following ways:

	ON	
	Flashing slow	(2 seconds on / 2 seconds off)
	Flashing fast	(0.2 seconds on / 0.2 seconds off)
	OFF	
	Any one of the conditions described above	

LED icon status		Operating state
POWER: ALARM: GFI:	  	Firmware programming The inverter firmware is being programmed (never turn off the inverter during this phase).
POWER: ALARM: GFI:	  	Nighttime The inverter is in nighttime switch-off mode (input voltage less than 70% of the set start-up voltage and AC grid is missing)
POWER: ALARM: GFI:	  	Inverter initialization / Waiting Sun This is a transitional state due to verification of the operating conditions. During this stage the inverter checks that the conditions for connecting to the grid are met.
POWER: ALARM: GFI:	  	The inverter is connected and is feeding power into the grid Normal operation. During this stage, the inverter automatically tracks and analyses the photovoltaic generator's maximum power point (MPP).
POWER: ALARM: GFI:	  	Missing grid Indicates lack of grid voltage. This condition does not allow the inverter to connect to the grid.
POWER: ALARM: GFI:	  	Backup mode In backup mode, the green and yellow LEDs remain steadily on, regardless of the presence of input voltage.
POWER: ALARM: GFI:	  	Alert or Alarm indication Indicates that the inverter control system has detected an alert or alarm. It is possible to identify the type of problem generated in the dedicated section of integrated Web User Interface ("Event" section). Indicates missing of connections in case of external meter.
POWER: ALARM: GFI:	  	Temperature protection trip Indicates that the trip relating to internal temperatures (insufficient or excessive temperature) may have been activated.

POWER: ALARM: GFI:	  	Ventilation anomaly Indicates anomaly in the operation of the internal ventilation system that could limit output power at high ambient temperatures.
		Overvoltage surge arresters triggered (where fitted) Indicates that any class II overvoltage surge arresters installed on the AC or DC side have been triggered
		Internal statistics memory anomaly Indicates an operating anomaly in the internal memory on which the inverter statistics are stored
POWER: ALARM: GFI:	  	Buffer battery discharged The buffer battery is low, and the inverter does not maintain the time setting
		Pre-commissioning phase (first start-up of inverter) The commissioning of the inverter must be completed through the Installation wizard steps using the internal Web UI.
		Initial configuration failure The inverter is in locked state due to a failure in the initial configuration of the equipment, such as the standard network setting for the country of installation
POWER: ALARM: GFI:	  	Incompatibility of the device firmware versions The firmware versions of the various devices comprising the equipment are incompatible and are being updated (this is an automatic operation)
		Temperature sensor anomaly detected
		Remote OFF activated The Remote Off command has been activated. The unit will not connect to the network until the remote ON command has been activated
POWER: ALARM: GFI:	  	Anomaly in the insulation system of the photovoltaic generator Indicates that a leakage to earth from the PV generator has been detected, causing the inverter to disconnect from the grid.
		Arc fault Trip During the reset procedure (via dedicated button or external command), the LED becomes fixed for 10 seconds. After this time, the LED switch OFF (which means reset done) or start to blink again.

The following table shows all the possible status of "WLAN/LAN" LED on the Synoptic (06) according to the operating status of the Wi-Fi or ethernet communication lines.

LED icon status	Operating state	
WLAN/LAN		Wi-Fi not configured or/and ethernet cable not connected.
WLAN/LAN		Scanning for available Wi-Fi networks.
WLAN/LAN		Trying to reconnect to the Wi-Fi network (after pressing the smart button for 1 second).
WLAN/LAN		Wi-Fi or ethernet network is connected to the inverter and IP address is obtained.

7.4 Internal Web User Interface (WEB UI)

The inverter is equipped with an advanced integrated Web User Interface that allows full access to all configuration and commissioning parameters from any electronic device, including laptops, tablets, and smartphones.

7.4.1 Connection in “AP Mode”

- Enable the Wi-Fi connection on the device (tablet, smartphone or laptop)
- Connect to inverter network (tap connect). The name of the wireless network created by the system that the connection should be established with will be: **Fimer-YYWWSSSSSS**, where YYWWSSSSSS is the 10-digit inverter SN that can be found on the “Communication Identification Label”.
- When prompted, type the “**product key**” (including the dashes. Example: 1234-1234-1234-1234) as the network password to access the inverter’s access point (AP). The product key is printed on the “**Communication Identification label**”.
- Open an internet browser (recommended browser: Chrome versions from v.55, Firefox versions from v.50) and enter the pre-set IP address 192.168.117.1 to access the login page.

NOTE – It’s required to digit the dash “-” characters of the Product Key in the password field as well.

NOTE – In case of need, product key can be recovered by Aurora Vision Cloud or by calling the MA Solar Italy technical support.

7.4.2 Connection in “Wi-Fi Station Mode”

- Enable the Wi-Fi connection on the device (tablet, smartphone or laptop) and connect it to the same Wi-Fi network to which the inverter is connected.
- Open an internet browser (recommended browser: Chrome versions from v.55, Firefox versions from v.50) and enter the IP Address assigned to the inverter or the “Host Name” `http://Fimer-YYWWSSSSSS.local` (where YYWWSSSSSS is the SN of the inverter).

NOTE – The IP address assigned may vary for reasons connected to the Wi-Fi router setup (for example, a very brief DHCP lease time). If verification of the address is required, it is usually possible to obtain the client list (and the corresponding IP addresses) from the external Wi-Fi router administration panel.

NOTE – In order to use the “Host Name” the Wi-Fi router to which the inverter is connected (when operating in “Station Mode”) must provide the Domain Name System (DNS) service (contact the network administrator for further information regarding the presence or absence of the DNS service in the Wi-Fi router or how to enable it). In this way, even if the IP address assigned to the inverter should change over time (dynamic IP), it will always be possible to use the same “Host Name” which will remain unchanged over time.

7.4.3 WEB UI login page

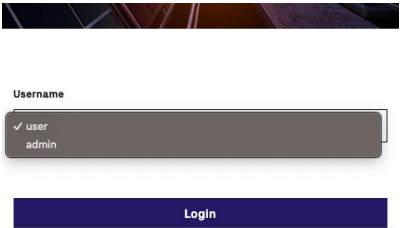
Open the WEB UI

NOTE – The access method depends on the channel used. If the inverter is connected to a STATION Wi-Fi network or LAN, enter the IP address assigned to the inverter in the browser’s address bar. If you choose to use the Wi-Fi Access Point (AP) channel, follow the instructions provided in sections 7.4.1 and 7.4.2.

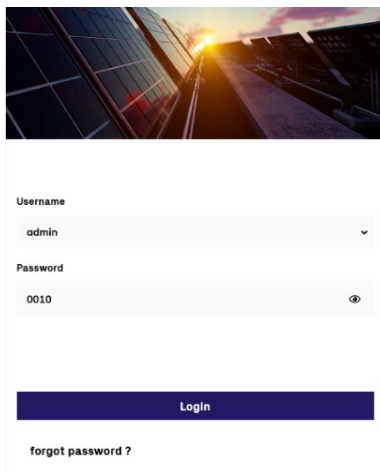


Two types of access are available:

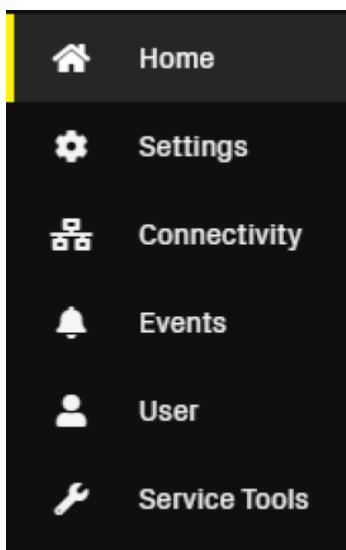
1. **User** (without password); grants basic access to the settings and visualization of the WEB UI parameters.
2. **Admin** (password: **0010**); Installer access to the settings and visualization of the WEB UI parameters.



- NOTE** – By logging in as “Admin” and obtaining the token (on the <https://registration.solar.fimer.com> site and following the procedure “7.4.6.1” in this document) it is possible to obtain the “Admin Plus” access level which allows advanced configuration of the inverter parameters.
- If the Password is lost click on “Forgot your password?” to obtain the access to the Web User Interface (and it will be possible to change the password) by entering the PRODUCT KEY (printed on the “Communication Identification label” and applied during the commissioning phase to the plant documentation).
 - The language of the wizard could be changed by clicking on the upper status bar.



7.4.4 WEB UI app main menus



HOME: Visualization of information related of inverter status, production and inverter parameters.

SETTINGS: Section dedicated to inverter parameters configurations.

CONNECTIVITY: Section dedicated to inverter communication settings and configurations.

EVENTS: Section dedicated to event log.

USER: Section dedicated to Admin Plus privileges and Password management.

SERVICE TOOLS: Section dedicated to Inverter configuration and Update Firmware.

7.4.5 WEB UI menu structure

The structure of the menus changes according to the type of access. The table shows the structure of the user interface and explicitly specifies access rights for reading and writing (U = User, A = Admin, AP = Admin Plus). The menu structure of the WEB UI is available in the [downloads section of String Inverters PVM-75/125-TL page](#) on <https://www.fimer.com>.

7.4.6 Inverter features detail

7.4.6.1 Admin Plus level access

In the WEB UI, to obtain the security token needed for "Admin Plus" privileges, it is necessary to go through the two following stages:

1 ADMIN PLUS

Please insert the Token to enable the Admin Plus Mode.

Contact FIMER support to obtain it.

Token

token

Close

Login

Stage 1 - Collection of information relating to the inverter

Collect the inverter serial number (SN) and its week of production.

NOTE – This information can be found on the "Communication Identification label".
The serial number consists of 10 digits (YYWWSSSSSS):

- YY = Year of manufacture
- WW = Week of manufacture
- SSSSSS = Progressive number Firmware update

Stage 2 - Registration on <https://registration.solar.fimer.com>

- Open registration site <https://registration.solar.fimer.com>
- Set the desired language
- Go to "Sign Up" or "Login" and insert the requested data.

ATTENTION – In case of new user an email will be sent to the email address used with a link to complete the registration process. Once the registration process is over, a further email will be sent with the password to access the website.

Welcome to the registration page!

Sign up to receive a password which will allow you to enter the reserved area where you can download the advanced configuration SW and inverter FW updating. This password will also allow you to enter the configuration SW of Inverters as "Installer".

From "Installer" interface you can modify the internal parameters of inverters in accordance with the law in force. To log in as "Installer" you have to enter your advanced access password and the data used for the registration. You will have to reenter the password and your registration data only in case of SW version updating.

Entering the reserved area also allows you to have a password to access the service menu of inverter display in order to easily adjust the settings (activation/deactivation of protections, change the protections operation threshold).

To receive the password you have to enter the S/N (serial number), the WK (production week) and the Update version for which you need the password. Necessary information are available on the inverter display (INFORMATION menu → S/N and INFORMATION → Firmware) and, on the Inverter label and Inverter shipping box.

The entering password for the service menu has a time limit: it does not last longer than 14 days from its calculation.

Not registered?

Go to the registration page, enter your details and you will receive an email with the password to access to all services.

Sign Up!

Enter your parameters to access to the services reserved for you

Username:

Password:

Login

Have you forgotten your password?

Enter your details and we will send you an email with your password

Remember me

Stage 3 - Admin Plus token request

Access the section dedicated to requesting the security token.

Language: English ▼

Requests history Request password Inverter Download User options Logout

In order to request the service password you have to insert the model of the inverter (which can be selected in the pull-down list), the S/N (serial number), the WKYR (week/year of production of the inverter) and the Update Ver. This information is available on the display of the inverter: S/N and WKYR in the menu "INFORMATION - Serial Number", the Update Ver. in the menu "INFORMATION - Firmware - Update Ver". The S/N of the inverter must be composed by 6 digits, WK (week/year of production) must be inserted in the WKYR format, without the interposition of any digit, Update Ver. must be composed by 5 digits, as it appears in the display of the inverter.

About the value to insert in the Update Ver. field, the following rules must be observed:

1. In case on the display the information Update Ver. is not present or it is "NONE", leave the field blank.
2. In case on the display the information Update Ver. is composed only of numbers:
 - if the year of production is 12 (2012) or lower, the information is mandatory for the password calculation and the field must be filled with the information as shown on the display.
 - if the year of production is 13 (2013) or higher, the information is not mandatory and the field can be left blank.
3. In case on the display the information Update Ver. includes a letter:
 - if the year of production is 12 (2012) or lower, leave the field blank taking care to insert as week/year of production 0113.
 - if the year of production is 13 (2013) or higher, leave the field blank taking care to insert week/year as shown on the inverter display

Inverter model:	Update Ver.:	S/N Inverter:	Week / year of production:	Note
PVI-XXX-0(-TL) - 55kW/67kW module				
PVI-2000(-OUTD)-XX				

NOTE – Choose the inverter model from the drop-down list and insert Serial Number and Week of Production of the inverter (see Stage 1).

Requests history Request password Inverter Download User options Logout

In order to request the service password you have to insert the model of the inverter (which can be selected in the pull-down list), the S/N (serial number), the WKYR (week/year of production of the inverter) and the Update Ver. This information is available on the display of the inverter: S/N and WKYR in the menu "INFORMATION - Serial Number", the Update Ver. in the menu "INFORMATION - Firmware - Update Ver". The S/N of the inverter must be composed by 6 digits, WK (week/year of production) must be inserted in the WKYR format, without the interposition of any digit, Update Ver. must be composed by 5 digits, as it appears in the display of the inverter.

About the value to insert in the Update Ver. field, the following rules must be observed:

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 - if the year of production is 12 (2012) or lower, the information is mandatory for the password calculation and the field must be filled with the information as shown on the display.
 - if the year of production is 13 (2013) or higher, the information is not mandatory and the field can be left blank.
3. In case on the display the information Update Ver. includes a letter:
 - if the year of production is 12 (2012) or lower, leave the field blank taking care to insert as week/year of production 0113.
 - if the year of production is 13 (2013) or higher, leave the field blank taking care to insert week/year as shown on the inverter display

Inverter model:	Update Ver.:	S/N Inverter:	Week / year of production:	Note
PVI-XXX-0(-TL) - 55kW/67kW module				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				

Click on "Do request".

NOTE – If there is an error in entering data, the fields containing the error will be highlighted in red. If, on the other hand, the data are correct, the passwords will be shown in a new window and at the same time sent to the email address used for registration.

Inverter model:	Update Ver.:	S/N Inverter:	Week / year of production:	Note
PVI-XXX-0(-TL) - 55kW/67kW module		123456	1117	
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				
PVI-2000(-OUTD)-XX				

Add other 10 rows

Do request

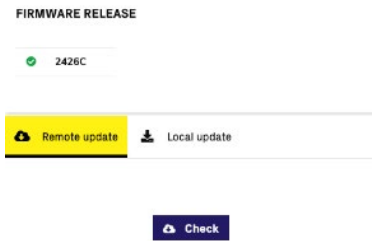
NOTE – The security token enables the "Admin Plus" privileges which allows the inverter's sensitive parameters to be changed. Proceed to changing the parameters only if necessary.

7.4.6.2 Firmware update

Is recommended to check the availability of new firmware in the dedicated section “Service Tools > Firmware”.

Remote firmware update:

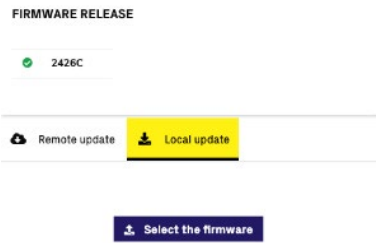
Inverter connected to Aurora Vision®. New firmware availability is displayed in the section “Remote Updates” and is necessary to authorize it.



⚠ ATTENTION – Do not perform any action while the update of the firmware is running. An interruption of updating process could damage the inverter!

Local firmware update:

Inverter not connected to Aurora Vision®. The firmware have to be selected and uploaded from local folder if the used devices to access to the web server.



⚠ ATTENTION – The latest firmware version is available from the download area of the website <https://www.fimer.com> or from <https://registration.solar.fimer.com>

- Click on "Select the firmware" and select the firmware.
- Click on "UPDATE" button to start with the updating process.

⚠ ATTENTION – Do not perform any action while the update of the firmware is running. An interruption of updating process could damage the inverter!

8. Maintenance

8.1 General conditions

PVM inverter family has been designed and built to avoid the need for additional maintenance. However, we recommend that the maintenance personnel perform the operations described in paragraph **"Routine Maintenance"** at least annually.

All the maintenance operations must only be carried out by specialized staff with the knowledge required to perform these tasks. The operators must be skilled or trained in accordance with safety standards EN 50110-1 and EN 50110-2 (CENELEC/CEN) or equivalent standards.

- ⚠ WARNING** – Some inverter parts may be subject to hazardous voltages for the operator. Before performing any work on the inverter, refer to [Inverter Isolation and Safety Measures](#) procedure paragraph on this manual to know all the necessary steps to safely operate on the inverter.
 - Avoid temporary repairs. All repairs should be carried out using only genuine spare parts.
 - The maintenance technician is to promptly report any anomalies.
 - Always use personal protective equipment (PPE) provided by the employer and comply with local safety regulations.
- 🚫 FORBIDDEN** – For cleaning, DO NOT use rags made of filamentary material or corrosive products that may corrode the equipment or generate electrostatic charges.
- 🚫 FORBIDDEN** – DO NOT allow the equipment to be used if problems of any kind are found.

8.2 Inverter total de-energization and Isolation

The purpose of this document is to provide instructions for de-energization and isolation of the PVM three-phase inverter. The replacement of the inverter must follow the ["Inverter total de-energization and isolation"](#) procedure.

- ⚠ ATTENTION** – This procedure does not allow the access to active parts inside the inverter

The procedure describes the steps to perform a total isolation and thus includes operations on devices that are located outside the inverter. The approach considers the disconnection from any possible voltage source to which the inverter may be connected.

This procedure is intended exclusively to be used by skilled or trained persons in accordance with safety standards EN 50110-1 and EN 50110-2 (CENELEC/CEN) or equivalent standards. Furthermore, only these skilled or trained persons are permitted to carry out the procedure.

8.2.1 Operator and maintenance personnel skills/prerequisites

- ⚠ WARNING** – The customer has civil liability for the qualification and mental or physical state of the personnel who interact with the equipment. They must always use the personal protective equipment (PPE) required by the laws of the country of destination and whatever is provided by their employer.
- ⚠ ATTENTION** – Personnel in charge of using and maintaining the equipment must be skilled for the described tasks and must reliably demonstrate their capacity to correctly interpret what is described in the manual.
 - For safety reasons, the installation must be performed by qualified installers and/or licensed electricians in accordance with the existing regulations in the country of installation and in accordance of all safety rules for performing electrical works. The installers must have demonstrated skills and knowledge of the inverter's structure and operation.
- 🚫 FORBIDDEN** – Maintenance operation carried out by a person who is NOT qualified, is intoxicated, or on narcotics, is strictly forbidden.

The following job requirements and qualifications are required to operate on the inverter:

- Compliance with all legal standard in force in the installation country to perform the electrical work described on this procedure.

8.2.2 Clothing and protection of personnel

The following Personal Protective Equipment (PPE) are required to perform any intervention on the inverter:

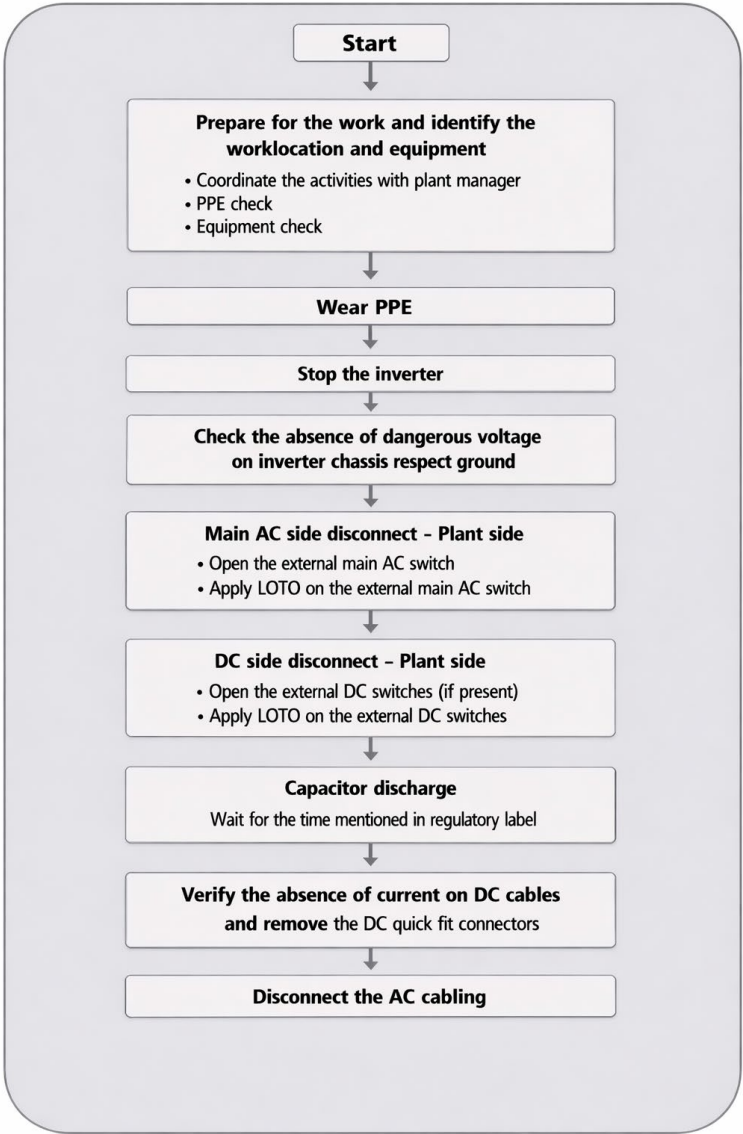
- Arc-flash IEC Class 2 (40 cal/cm²) rated head protection (arc hood) with helmet included.
- Insulating composite gloves class 0 EN60903 (1000Vac-1500Vdc) resistant to electric arc class 2 (7kA) EN61482-1-2 in combination with protective over glove in leather EN420 – EN388.
- IEC Class 1 (8 cal/cm²) basic arc-flash protection wear, combined with IEC Class 2 (25 cal/cm²) overall arc-flash protection.
- Safety shoes ISO 20345:2011.

8.2.3 Safety equipment and tools

The following equipment and tools are required to perform any intervention on the inverter:

- DC current clamp.
- Multi-meter (only to test the absence of short circuits).
- Safety tags "work in progress, do not operate".
- Padlocks.

8.2.4 Inverter Total Isolation and Safety Measures procedure



- ⚠ WARNING** – Some inverter parts may be subject to hazardous voltages for the operator. Before performing any work on the inverter, follow this procedure for safely isolate the inverter. The only permissible actions on the inverter are the installation and the connection of the power and signal cables. Under no circumstances is it allowed to remove the cover.
- ⚠ HOT SURFACE** – When the device has just been switched off, it may have hot parts because of overheating of the heated components (e.g.: transformers, accumulators, coils, etc.) so be careful where you touch. After switching off, wait at least **30 minutes** before touching the aluminium cover and heatsink.

8.2.4.1 PRELIMINARY CHECKS

Weather conditions:

It is of paramount importance to evaluate the weather conditions in the risk assessment prior any intervention on the equipment. This procedure can be applied only in case of dry environment. Don't proceed in case of rain (even light) or high humidity.

PPE Check:

Verify the integrity of the PPE that is going to be used to perform the operations.

Equipment checks:

Check the voltage tester is working correctly:

- Perform a general integrity check of the instrument; examine the test terminals, its integrity and make sure they are properly fixed; make sure the batteries level is enough high or replace them (don't use the instrument in case the message "LOW BATTERY" is present).
- Perform test of the instrument using an energized AC socket and a DC voltage source (example: battery in the service car) with known voltage level; in case the instrument is provided with a self-test feature, follow the instructions provided in the instrument manual to carry out the self-test.
- Check the voltage tester is working correctly:
- Check the DC current probe is properly working, make sure to perform the "ZERO-OFFSET" procedure and to select suitable DC measurement range.

8.2.4.2 PPE

⚠ ATTENTION – All the following activities (till the completion of the procedure) must be performed wearing the PPE.

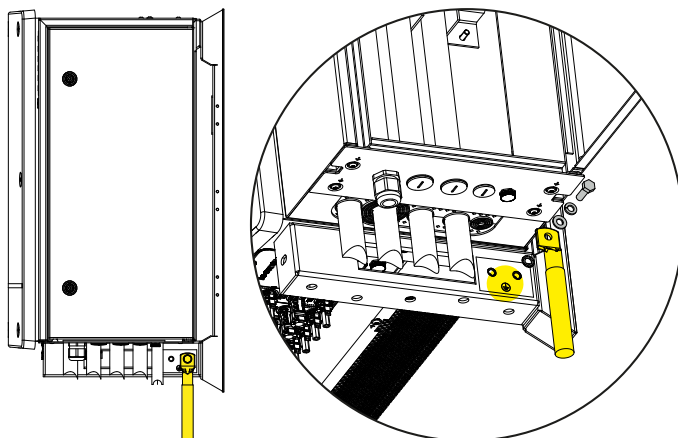
Wear the appropriate PPE for carrying out the operations (overall resistant to electric arc, dielectric helmet with visor, insulating gloves).

8.2.4.3 Preliminary Operation

Disconnect the inverter from the grid using the Remote off functionality.

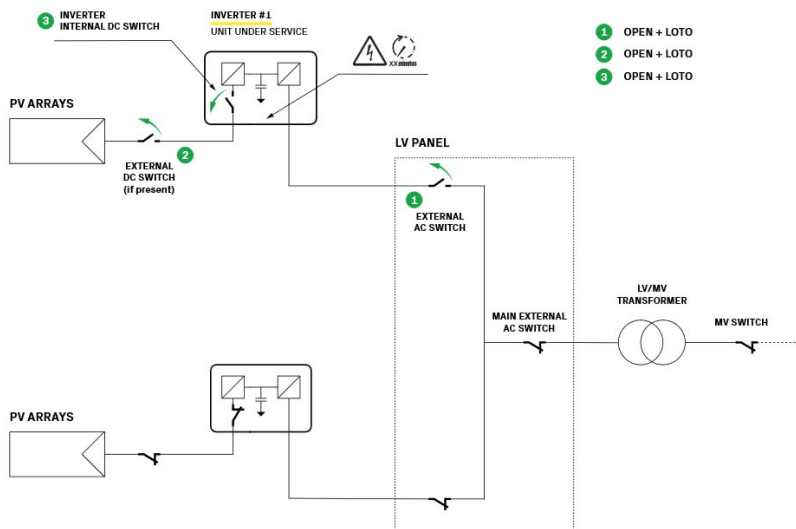
8.2.4.4 Check the absence of dangerous voltages on inverter enclosure respect ground

Check the absence of dangerous voltage on the inverter chassis. The measurement point is between inverter chassis not-painted part and the Protective earth (PE) external connection point outside the inverter.



8.2.4.5 Operations on external AC switches

The diagram below represents a possible arrangement of the PV plant. Depending on the design choices made by the developer of the plant some of the devices could not be present. Identify the external AC switch(es) in the plant with the support of the plant manager.



- Open the external AC disconnect switch or the main external AC disconnect switch outside the inverter (IEC 60364-7-712.536.2.2). In case none of the LV AC switches are present, the MV switch must be opened.
- Affix designated lock preventing operation onto any external AC disconnect device, affixing designated tags (LOTO procedure).

NOTE – Identification of the external switch may require the cooperation of the plant manager and it must be included in the switching plan defined during the preparation of the work.

- Check the LED behaviour on the LED strip (06):
 - In case Back-up function is active: Power LED fixed ON (GREEN).
 - In case Back-up function is not active: Power LED blinking (GREEN).

8.2.4.6 Operations on external DC switches (if present)

NOTE – In case of absence of External DC disconnect device skip this step.

- Open the external DC disconnect switch (blue in previous picture) outside the inverter (IEC 60364-7-712.536.2.2)
- Affix designated lock preventing operation onto any external DC disconnect device, affixing designated tags (LOTO procedure).

NOTE – Identification of the external switch may require the cooperation of the plant manager and it must be included in the switching plan defined during the preparation of the work.

8.2.4.7 Operations on Internal DC disconnect switches (15)(16)(17)

Open the internal DC switches (15)(16)(17).

- Affix designated lock preventing operation onto all DC disconnect switches (15)(16)(17), affixing designated tags (LOTO procedure).

8.2.4.8 Discharge of the capacitor

Wait the internal capacitors to be discharged.

WARNING – The discharge time of the stored energy is indicated on the regulatory label.

8.2.4.9 DC MC4 connectors disconnection

- Check with the current probe the absence of current on the string cables.
- Remove all quick fit DC connector (PV Connector) from the Inverter using the proper tool. To avoid mechanical interferences, use a cable tie to collect the disconnected cables.

NOTE – It is highly recommended to put labels on the cables in order to easily reconnect them to the correct connectors once completed the service activities.

8.2.4.10 Disconnect the AC and AC backup cabling

- Remove the AC grid connectors from the inverter

8.2.4.11 Check list to be filled prior the access to the inverter

The purpose of checklist is to verify that all the operations mentioned in the procedure have been carried out. The checklist below must be attached to the intervention report.

Check	STATUS (✓ or X)
Prepare for the work and identify the work location and equipment	
PPE and Equipment Check	
PPE wearing	
OPERATIONS AT PLANT LEVEL ¹⁾	
Check the absence of dangerous voltages on inverter chassis respect ground	
Operations in External AC switch	
Operations in External DC Switch (If present)	
OPERATIONS AT INVERTER	
DC disconnects – Inverter Side (opening and LOTO of DC switch)	
Wait the discharge of the internal capacitor	
Verify the absence of absence of current on DC cables and remove the DC quick fit connector	
Disconnect the AC grid and AC backup cabling	
ISSUE WORK PERMIT	
Issue work permit and "Walk the permit" – Check list filling	
ONLY if all checks are POSITIVE (✓) the ACCESS IS ALLOWED	
Issue work permit and "Walk the permit" – Check list filling	

¹⁾ Identification of the external switch may require the cooperation of the plant manager, and it must be included in the switching plan defined during the preparation of the work.

8.3 Routine Maintenance

PVM inverter family has been designed and built to avoid the need for additional maintenance. However, to preserve long term proper operation of the inverter, we recommend that the maintenance personnel perform the operations listed in this paragraph at least annually.

Routine Maintenance

Visual inspection



- Check that the inverter is operating properly, without any alarm signals.
- Ensure all labels and safety symbols are visible.
- Check the integrity of the cables, connectors and cable glands outside the inverter.
- Check that the environmental conditions have not changed dramatically from those on installation.
- Check there are no obstacles (animals, insects, leaves or anything which could reduce the heat exchanging capacity of the heat sink) at the top, at the bottom.

Operations



- Check the tightening of the cable glands and of the screw on the external PE connection point (see paragraph 3.5.2).
- If there is no monitoring system, check the record of alarms and errors to verify recent notification of recent malfunctions.

Cleaning



⚠ HOT SURFACE – After switching off, **wait at least 30 minutes** before touching the aluminium cover and heatsink.

📌 NOTE – Clean the equipment with a **damp cloth**. Avoid using cleaning agents, abrasive materials, solvents, or similar substances to clean the inverter.

8.4 Troubleshooting

⚠ ATTENTION – Operations on the inverter to identify and address any faults may only be performed by the installer or by qualified personnel.

8.4.1 Inverter troubleshooting

The events that could occur are classified by severity as follows:

- **Alarm**

Alarm or "supervised alarm" is an event causing stop of product operation (i.e. disconnection of the power converter from electrical grid). Only one alarm condition can be pending at a time.

- **Alert**

Alert is an event not causing stop of product operation but signalling an abnormal and potentially harmful condition (e.g. fault on auxiliary device like cooling fan). Multiple alert conditions can be pending at a time.

- **Info**

Info is an event not associated to abnormal product condition but just signalling relevant status change (e.g. operating mode change for specific control). Info events could be furthermore used for helping failure analysis together with alarms/alerts.

More details about the events can be found by accessing the Events menu of the Web UI.

8.4.2 Web User Interface and Wi-Fi communication troubleshooting

The following table gives a list of main and most common errors or problems relating to the Wi-Fi communication between inverter and user devices.

Problem	Possible cause	Solution
The Web User Interface cannot be accessed.	ADMIN password forgotten.	Reset the passwords by clicking on "Forgot your password"; The passwords can be reset after having entered the "Product Key" code that can be found on the "Communication Identification Label".
		Modify the position of the Wi-Fi antenna, the inverter or the router.
The inverter can identify a Wi-Fi network but is unable to connect to it.	The signal between the inverter and the Wi-Fi router to which the board wants to connect is too weak.	Make sure that the inverter has not been installed near obstacles which could affect the communication with the Wi-Fi router (for example: metal cages or walls, walls in reinforced concrete, electromagnetic fields).
		Move the router as close as possible to the inverter.
		Install a Wi-Fi signal repeater to extend the network to which the inverter is to be connected; then connect the inverter to the repeater.
The inverter can identify a Wi-Fi network but is unable to connect to it.	The Wi-Fi network to which the inverter is to be connected, could require the user to enter a username and password to allow navigation (for example, with a public Wi-Fi network or a hotel).	Unfortunately, the inverter cannot be connected to these types of Wi-Fi networks. Connect the inverter to an alternative Wi-Fi network.
	The Wi-Fi network to which the Inverter is to be connected, is set so as not to be identified (hidden network).	The Inverter is not able to connect to a hidden network. Set the Wi-Fi network to which the inverter is to be connected (visible network), then identify and connect the Inverter to the Wi-Fi network as normal.
		Modify the position of the Wi-Fi antenna, the inverter or the router.
The Inverter has not identified the Wi-Fi network to which connection is required.	The signal between the inverter and the Wi-Fi router to which the board wants to connect is too weak.	Make sure that the inverter has not been installed near obstacles which could affect the communication with the Wi-Fi router (for example: metal cages or walls, walls in reinforced concrete, electromagnetic fields).
		Move the router as close as possible to the inverter.
		Install a Wi-Fi signal repeater in order to extend the network to which the inverter is to be connected; then connect the inverter to the repeater.

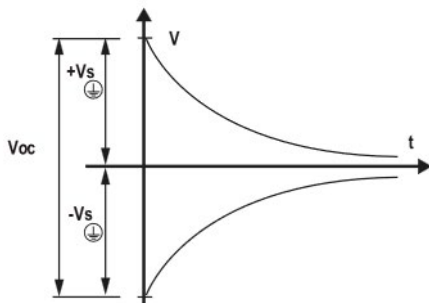
	The inverter might not be correctly powered.	Access to the Web User Interface only when the inverter is correctly powered.
Alternating difficulties in the local connection to the Wi-Fi.	The Wi-Fi connection signal between the router and the inverter, may not have sufficient power or it may be disturbed by obstacles which affect the communication.	Make sure that the signal between the inverter and the router is sufficiently high and that any obstacles such as metal cages or walls, walls in reinforced concrete or strong electromagnetic fields do not affect communication.
When working in "Access Point Mode", it's not possible to connect to the inverter using the WEB UI.	The Wi-Fi of the inverter could be damaged. Wrong Inverter Date/Time settings.	Request a service intervention to check that the inverter Wi-Fi board is working correctly. Check if Date/Time has correctly set on the inverter; correct it if necessary.
Although the Inverter has been configured correctly in "Station Mode" and works correctly on the local network, no data has been transmitted to the Aurora Vision®.	The MAC address used to register the inverter on the Aurora Vision® platform is not the same as the actual address associated with the inverter. The Wi-Fi network to which the Inverter is connected, could be protected by a Firewall which prevents the remote exchange of data with the Aurora Vision® platform.	Make sure that the MAC address registered on the Aurora Vision® platform is the one associated with the inverter. If it is not, modify the registered MAC address. Contact the network administrator to have the Firewall configured so that the remote exchange of data between the Inverter and the Aurora Vision® platform is allowed.
It is not possible to access the Web User Interface using the IP address when the inverter is operating in "Station Mode – DHCP".	An incorrect dynamic IP address is being used to access the Web User Interface or the IP address could have been modified by the Wi-Fi router to which the inverter is connected. The IP Address used to access the Web User Interface was lost. The Wi-Fi router doesn't allow the connection to local IP address. Typically, this happens on company networks. The device doesn't allow the connection to local IP address. Typically, this happens with company devices.	Access the Web User Interface using via "AP Mode" (refer to " Connection in "AP Mode" " paragraph to know how to connect via "AP Mode") and read the current IP Address in "CONNECTIVITY > Wi-Fi" section ("CONNECTIVITY menu"). Access the Web User Interface using the "Host Name" that could be obtained writing this URL http://ABB-XX-XX-XX-XX-XX-XX.local replacing the "X" with the hex digits of the MAC address of the inverter (it can be found on the "Communication Identification Label" placed on the side of the inverter or applied during the commissioning phase to the plant documentation). The DNS or multicast service must be enabled on router. Note: This connection method doesn't work on Android devices. If possible, access the pages of the Wi-Fi router web server to which the inverter is connected and read the new dynamic IP address assigned to the Inverter. Contact the network administrator to allow the Wi-Fi router to connect to local IP address. Contact the system administrator to allow the device to connect to local IP address.
Using an Android devices, a notification advise that internet connection is missing when trying to connect to the Access Point Wi-Fi network created by the inverter and ask for connection confirmation.	Known behaviour of Android devices. Android OS always check if internet connection is available and ask for confirmation if it's not present.	Confirm the connection request in the notification of Android devices by clicking "Yes".

8.5 Verification of ground leakage

In the presence of anomalies or report of ground fault (where provided), there may be a ground leakage from the PV generator (DC side). To check this, measure the voltage between the positive pole and ground and between the negative pole (of the PV generator) and ground using a voltmeter whose input accepts a voltage sufficient for the dimensions of the photovoltaic generator.

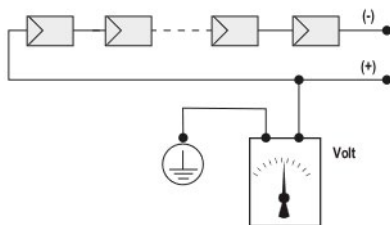
8.5.1 Behaviour of a system without leakage

Due to the capacitive effect of the PV generator, during the first moments that the voltmeter is connected between one of the two poles and ground, it will measure a voltage of about $V_{oc}/2$, which will tend to stabilize to around 0V if there is no ground leakage, as shown in the graph below:



NOTE – The internal impedance of the voltmeter tends to discharge the voltage due to the capacitive effect of the PV generator.

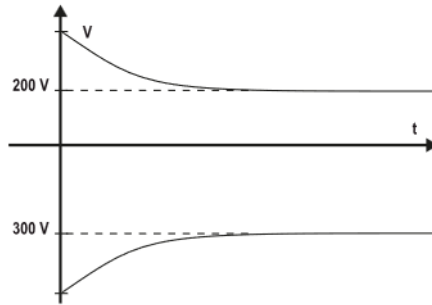
How to make the measurement:



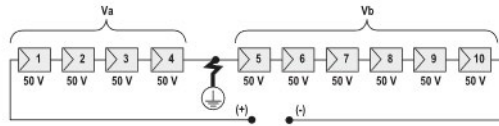
8.5.2 Behaviour of a system with leakage

If the voltage measured between one of the two poles and ground does not tend to 0V and stabilizes on a value, there is a ground leakage from the PV generator.

Example: When the measurement is made between positive pole and ground, a voltage of 200V is measured.



This means that if the system is made up of 10 modules in series and each one supplies 50V, the leakage can be located between the 4th and 5th PV module.



V_a = voltage measured between + pole and $\oplus = 200V$

V_b = voltage measured between - pole and $\oplus = 300V$

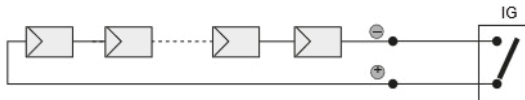
In all measurements with $\oplus$, the ground of the inverter is indicated.

8.6 Measuring the isolation resistance of the PV generator

⚠ WARNING – The operator must always use the personal protective equipment (PPE) required by the laws of the country of destination and whatever is provided by their employer.

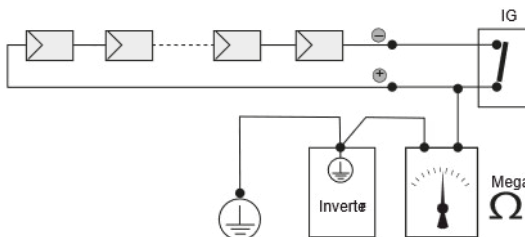
⚠ WARNING – There is a risk of shock hazard if the total minimum resistance requirement is not met.

To measure the isolation resistance of the PV generator compared to ground, the two poles of the PV generator must be short-circuited (using a suitable sized switch).



⚠ WARNING – Use of unappropriated sized switch could cause risk of fire or electric arc! Use only at least 1100V rated switch!

Once the short-circuit has been made, measure the isolation resistance (R_{iso}) using a megohmmeter positioned between the two shorted poles and ground (of the inverter).



If the measured isolation resistance (R_{iso}) is less than **36.667 kΩ**, (minimum value **33.334 kΩ**) the inverter may not connect to the grid because of low isolation of the PV generator to ground.

⚠ ATTENTION – The isolation resistance can be affected by the environmental conditions the PV generator is in (e.g.: PV modules wet from damp or rain), and therefore the measurement must be made immediately after the anomaly is detected.

8.7 Storage and dismantling

8.7.1 Storage of the equipment or prolonged stop

If the equipment is not used immediately or is stored for long periods, check that it is correctly packed and contact MA Solar Italy for storage instructions. The equipment must be stored in well-ventilated indoor areas having no characteristics that could damage the components of the equipment. Restarting after a long or prolonged stop requires a check and, in some cases, the removal of oxidation and dust that will also have settled inside the equipment if not suitably protected.

8.7.2 Dismantling, decommissioning and disposal

MA Solar Italy is not responsible for disposal of the equipment, or part of it, which does not take place based on the regulations and laws in force in the country of installation.



The symbol of the cancelled bin (where present) indicates that the product must not be disposed with domestic waste at the end of its useful life. This product must be delivered to the waste collection point of the local community for recycling. For further information, refer to the public body responsible for waste disposal in the country.

Inappropriate disposal of waste can have a negative impact on the environment and human health owing to potentially dangerous substances. By cooperating in the correct disposal of this product, you contribute to the reuse, recycling and recovery of the product, and the protection of our environment. Dispose of the various types of materials that the parts of the equipment consist of in dumps that are suitable for the purpose.

COMPONENT	MATERIAL OF CONSTRUCTION
Frame, brackets, supports	Arc-welded steel FE37, aluminium
Casing or covers	ABS, plastic
Paint	RAL
Gaskets and seals	Rubber / Teflon / Viton
Electrical cables	Copper / Rubber
Cable trays	Polyethylene / Nylon
Batteries	Nickel / Lead/ Lithium

8.7.3 Procedure for dismantling the equipment

⚠ WARNING – The dismantling operations must be carried out with the equipment disconnected from any voltage sources. Refer to "Inverter total de-energization and Isolation" paragraph on this manual to know all the necessary step to safely operate on the inverter.

⚠ ATTENTION – Never open the lower connection box in the case of rain, snow or a level of humidity >95%. Always carefully seal all unused openings.

Even though the device is equipped with an anti-condensation valve, air with extremely high levels of humidity can lead to the creation of condensation inside the inverter.

As the inverter is almost completely insulated from the outside, condensation can also form after maintenance interventions in certain weather conditions.

⚠ ATTENTION – During dismantling always protect the inverter parts that are installed and exposed to the weather elements!
– Staff authorised to carry out the dismantling operations must be specialised and experienced in this job. They must also have received suitable training on equipment of this type.

To dismantling and disassemble the inverter **(01)** follow these steps:

- Isolate the equipment referring to the "Inverter total de-energization and Isolation" paragraph.
- Disconnect any external voltage sources
- Lift and remove the inverter following the indications for the mounting procedure in the "Assembly the Inverter to the bracket" paragraph in the reverse order and the indication for lifting methods in "Lifting" paragraph.

To dismantling and disassemble the mounting bracket **(03)** follow the indications for the mounting procedure in the "Bracket installation" paragraph in the reverse order.

9. Attachments

9.1 Port and network services used by the inverter

9.1.1 IP Network Services

Any network connected to the inverter must allow traffic to pass on the following ports. Network firewall rules (if present) must allow responses to the inverter over existing TCP connections.

Direction	Service/Port	Protocol	Description
In	ssh/22	TCP	For local debugging by MA Solar Italy service personnel, the inverter utilizes encrypted SSH. To allow service personnel local access to the inverter.
Out	domain/53	TCP/UDP	The inverter must be able to resolve domain names, to ensure scalability and dynamic changes on the Internet (DNS). (required)
Out	https/443	TCP	As an HTTP client, the inverter uses SSL/TLS protocol connections to Aurora Vision® servers for secure communication. The inverter uses this port for all services, including data transmission, firmware upgrade, configuration management, and remote command transmission. (required)
Out	dhcp/67, dhcp/68	UDP	If DHCP service is not available, static network information must be assigned to the inverter (preferred)
Out	ntp/123	UDP	The inverter uses this port for network time services (NTP). (preferred)
In	modbus/502	TCP	The inverter offers a Modbus TCP server connection on this port.
Out	dns-sd/5353	UDP	The inverter uses this protocol to resolve the local IP address.
Out	http/80	TCP	Inverter uses this http client only with host 151.22.100.235 for firmware update

9.1.2 Network Hosts

The inverter will connect to the following hosts. Some servers owned by MA Solar Italy, and others are customer or ISP servers. Servers listed as owned by "Customer IT/ISP" must be configured in the inverter using either DHCP or as static network information.

Host	Purpose	Port	Owner/Manager
platform.auroravision.net auroravision.net static.auroravision.net	Data, configuration	TCP:443	MA Solar Italy
apt.fatspaniel.net	VSN700 Logger fw update	TCP:443	MA Solar Italy
update.auroravision.net	Inverter firmware update	TCP:443 (https)	MA Solar Italy
151.22.100.235	Inverter legacy fw update	TCP:80 (http)	MA Solar Italy
remote-tunnel.auroravision.net	Remote Service	TCP:8022, TCP:8043, TCP:8044	MA Solar Italy
Site dependent	DHCP (optional)	UDP:67, UDP:68	Customer IT/ISP
Site dependent	DNS	UDP:53, TCP:53	Customer IT/ISP

9.1.3 Inverter network configuration

The inverter requires a valid network configuration to operate. This information can either be provided by a DHCP server provided by the customers network (the default), or the inverter can be configured with static network information. Regardless of how the inverter is configured, the following information is required.

Configuration	Purpose
IP Address	Allows the inverter to take part in the local network. This does not need to be a public IP address. In most cases this is a private IP address.
Subnet mask	Used to determine if two computers are on the same network.
Gateway	The IP address of the computer which will forward network traffic from the local network to an external network
DNS Server	The IP address(es) of the computer(s) which resolve domain names.



For more information
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your local MA Solar Italy
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