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EN

INSTRUCTION MANUAL FOR THE INSTALLER

MICRO-0.25-I-OUTD-230
MICRO-0.3-I-OUTD-230

TRANSLATION OF THE ORIGINAL INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS!

This manual must be considered as an integral part of the equipment, and must be available at all times to everyone who interacts with the equipment. The manual must always accompany the equipment, even when it is transferred to another user.

Operators are under an obligation to read this manual and strictly follow the instructions given in it, because ***Power-One*** cannot be held responsible for damage caused to people or property, or for damage to the equipment, if the conditions described below are not complied with.

The customer is under an obligation to keep the industrial secret, and therefore the following documentation and its annexes non may not be tampered with or modified, reproduced or transferred to third parties, without the authorization of ***Power-One***.

—1 - Introduction and general information

Conditions of warranty and supply

Warranty conditions **are described in an appropriate certificate supplied with the equipment**. Moreover, the warranty conditions are understood to be valid if the Client observes what is described in this manual; any conditions deviating from those described below must be explicitly agreed upon in the purchase order.

Power-one declares that the tool complies with legal provisions in force in the European Economic Community and releases statements of compliance (may be consulted on the www.power-one.com website or by sending a request to Service Power-One).

Exclusions from the supply

Power-one declines any responsibility in case standards for correct installation are not adhered to and it is not liable for systems upstream or downstream of the equipment supplied by it.
It is absolutely prohibited to make modifications to the equipment.
The Customer is entirely responsible for any modifications made to the system.

It is not possible to provide the multitudes of installations and environments in which the tool will be installed; for this it is necessary to checked for: adequate spaces, adapted to accept the tool; air noise produced as a function of the environment; any conditions of flammability**.**

Power-one CANNOT be held responsible for defects or malfunctions as a result of: improper use of the tool; alterations due to transportation or special environmental conditions; lack of or improper maintenance; tampering or poor repairs; use or installation done by non-qualified people.

Power-one CANNOT be held responsible for disposal of: displays, cables, batteries, accumulators etc. It is necessary that the Client provides, according to standards in force in the country of installation, disposal of such substances that are potentially harmful to the environment.

Contents

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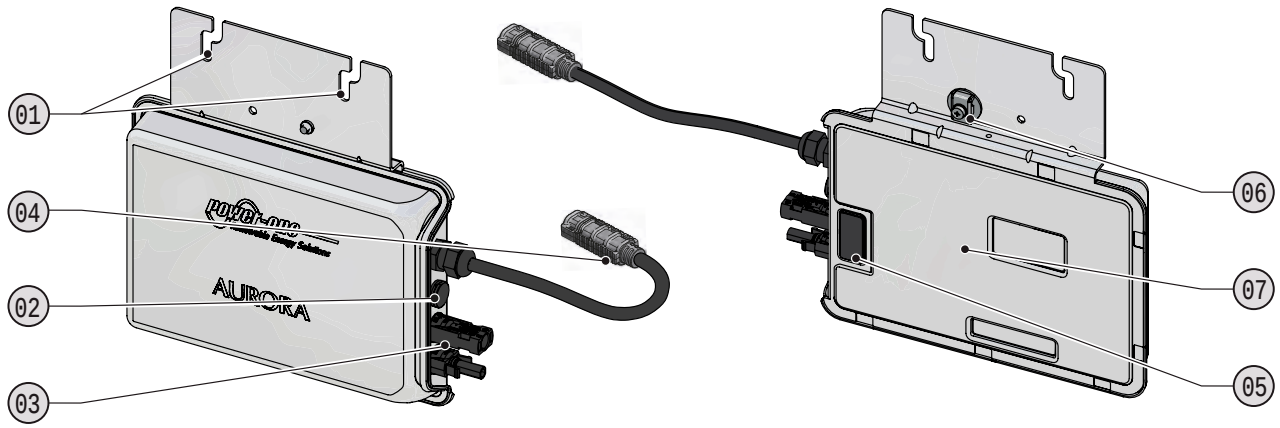
Reference number index

01, Fixing slots
02, Anti-condensation valve
03, DC Connectors
04, AC Cable
05, Radio antenna
06, Ground clamp
07, MICRO-inverter

Graphical representation of references



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The document and who it is for

Purpose and structure of the document

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

List of annexes

In addition to this operating and maintenance manual, (if applicable or on request) the following attached documentation are available:
- declaration of conformity
- quick installation guide
- warranty

WARNING: Part of the information given in this document is taken from the original documents of the suppliers. This document contains only the information considered necessary for the use and routine maintenance of the equipment.

Staff characteristics

The customer must make sure the operator has the necessary skill and training to do his/her job. Staff in charge of using and maintaining the equipment must be skilled, aware and mature for the described tasks and must have the reliability to correctly interpret what is described in the manual.

For Safety reason only a qualified electrician, who has received training and / or has demostrated skills and knowledge in construction and in operation of this unit, can install this inverter.

The installation is done by qualified installers and/or licensed electrician according to the applicable local code regulations

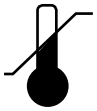
The employment of a person who is NOT qualified, is drunk or on narcotics, has a prosthetic mitral valve or a pacemaker is strictly forbidden.

The customer is civilly liable for the qualification and mental or physical condition of the persons who interact with the equipment. They must always use the personal protective equipment provided for by the laws of the country of destination and whatever is provided by their employer.

Symbols and signs

Table: Symbols

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

	This points out that it is mandatory to consult the manual or original document, which must be available for future use and must not be damaged in any way.
	**Generic hazard** - Important safety information. This points out operations or situations in which staff must be very careful.
	**Hazardous voltage** - This points out operations or situations in which staff must be very careful due to hazardous voltage.
	**Hot parts** - This points out a hazard due to the presence of heated areas or in any case areas that have hot parts (danger of burns).
	This points out that the examined area must not be entered or that the described operation must not be carried out.
	This points out that the equipment must not be worked on by anyone with a pacemaker, prosthetic mitral valve or prosthesis with electronic circuits.
	This points out that it is mandatory to carry out the described operations using the clothing and/or personal protective equipment provided by the employer.
	This indicates the degree of protection of the equipment according to IEC standard 70-1 (EN 60529 June 1997).
	Point of connection for grounding protection.
	This indicates the allowed temperature range
	This indicates the risk of electric shock. Time need to discharge stored energy: 5/10 minutes
	Respectively direct current and alternating current
	Isolating transformer present or not present
	Positive pole and negative pole of the input voltage (DC)
	This indicates the centre of gravity of the equipment.

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Field of use, general conditions

Power-One accepts no liability for damage of any kind that may arise from incorrect or careless operations.

The equipment must not be used for uses that do not fall within the intended field of use. The equipment MUST NOT be used by inexperienced staff, or by experienced staff to carry out operations on the equipment that are not in accordance with what is described in this manual and in the attached documents.

Intended or allowed use

This equipment is a MICRO-inverter designed to:
transform a direct electric current (DC)
coming from a photovoltaic module (PV)
into an alternating electric current (AC)
suitable for being fed into the national grid.

Limits of the field of use

Only one photovoltaic module can be connected to the input of the inverter (do not connect batteries or other sources of power supply)
The inverter can be connected to the electricity grid standards whereby has been designed and certified.
The inverter can be used only if all the technical characteristics are observed.

Improper or disallowed use

THE FOLLOWING ARE STRICTLY FORBIDDEN:
• Installing the equipment in environments with particular flammability conditions or in adverse or disallowed environmental conditions (temperature and humidity)..
• Using the equipment with the safety devices not working or disabled.
• Using the equipment or parts of the equipment by connecting it to other machines or equipment, unless expressly provided for.
• Modifying the operating parameters that are not accessible to the operator and/or parts of the equipment to vary the performance or change its insulations.
• Cleaning with corrosive products that may corrode parts of the equipment or generate electrostatic charges.
• Using or installing the equipment or parts of it without having read and correctly interpreted the contents of the operating and maintenance manual.

• Warming or drying rags and clothes on parts at temperature. Besides being dangerous, this would compromise the ventilation and cooling of the components.

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2 - Characteristics

General conditions

The description of the characteristics of the equipment allows its main components to be identified, to refine the technical terminology used in the manual.

The Characteristics chapter contains information about the models, the composition of the equipment, the characteristics and technical data, the overall dimensions and the identification of the equipment.

This manual should be read in chronological order as established by the manufacturer and the reader assumes responsibility for failure to do so. All the information is given considering each time that the information of the preceding chapters has been acknowledged.

In some cases, there may be a need to separately document the operation of the software or attach supplementary documentation to this manual for more qualified professional persons.

Models and range of equipment

The specific models of MICRO-inverter that this manual is about are available in two versions according to the maximum output power (0.25 kW o 0.3 kW).

- **MICRO-0.25-I-OUTD-230:** Single phase model 230V 0.25 kW
- **MICRO-0.3-I-OUTD-230:** Single phase model 230V 0.3 kW

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

Identification of the equipment and the manufacturer

The technical data shown in this manual does not in any case replace the information shown on the labels attached to the equipment.

The labels attached to the equipment must NOT be removed, damaged, dirtied, hidden, etc.

N.B. The plates must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.); if is possible they must be cleaned regularly and kept visible at all times.

power-one® CE Made in Italy DIN V VDE 0126-1-1
AURORA®
PHOTOVOLTAIC INVERTER
MODEL: MICRO-0.3-I-OUTD-230

VDC max	65 V	VAC nom	230 V 1Ø
VDC MPP	12 - 60 V	fnom	50 Hz
VDC MPP, Full Power	30 - 60 V	PAC nom (cosφ=1)	300 W @ 65 °C amb.
IDC max	10.5 A	IAC max	1.5 A
ISC max	12.5 A		

-40 to + 75 °C -40 to +167 °F | PROTECTIVE CLASS: I | IP65

MFG_ID PPPPPPPPPP SSSSSSWWYY S/N:YYWWSSSSSS
MAC ADDRESS: AA:BB:CC:DD:EE:FF:GG:HH

power-one® CE Made in Italy DIN V VDE 0126-1-1
AURORA®
PHOTOVOLTAIC INVERTER
MODEL: MICRO-0.25-I-OUTD-230

VDC max	65 V	VAC nom	230 V 1Ø
VDC MPP	12 - 60 V	fnom	50 Hz
VDC MPP, Full Power	25 - 60 V	PAC nom (cosφ=1)	250 W @ 65 °C amb.
IDC max	10.5 A	IAC max	1.3 A
ISC max	12.5 A		

-40 to + 75 °C -40 to +167 °F | PROTECTIVE CLASS: I | IP65

MFG_ID PPPPPPPPPP SSSSSSWWYY S/N:YYWWSSSSSS
MAC ADDRESS: AA:BB:CC:DD:EE:FF:GG:HH

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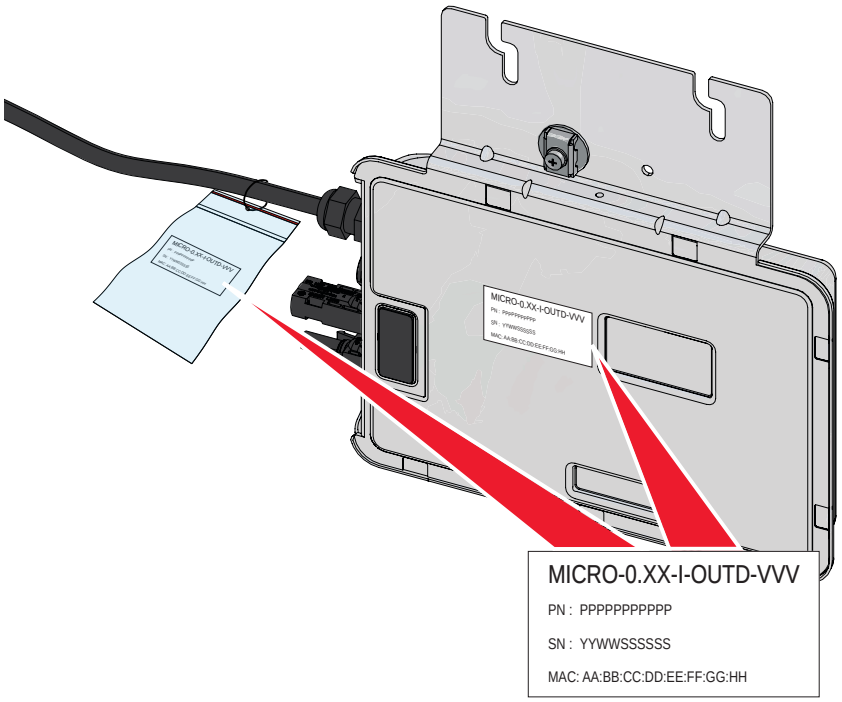
In addition to the label showing the inverter nameplate data, two identification labels are also installed, one of which is removable and must be used to fill in the “system map”:



Both labels are identical and display the following information:

Inverter model

Inverter Part Number

Inverter Serial Number
S = Inverter Serial Number
W = Week of manufacture
Y = Year of manufacture

Inverter RF MAC Address

MICRO-0.XX-I-OUTD-VVV

PN : PPPPPPPPPP

SN : YYWWSSSSSS

MAC: AA:BB:CC:DD:EE:FF:GG:HH

Characteristics and technical data

Table: Technical Data	MICRO-0.25-I-OUTD	MICRO-0.3-I-OUTD
Input Side		
Maximum DC Input Power (P_{dcmax})	265 Wp	320 Wp
Operating DC Input Voltage Range (V_{dcmin}...V_{dcmax})	12...60 V	
MPPT Input DC Voltage Range ($V_{MPPTmin}$ ... $V_{MPPTmax}$)	25...60V	30...60V
Absolute Maximum DC Input Voltage ($V_{max,abs}$)	65 V	
Maximum DC Input Current (I_{dcmax})	10.5 A	
Maximum Backfeed current (from AC to DC side)	Negligible	
Number of DC Inputs Pairs for each MPPT	1	
DC Connection Type	Tool Free PV Connector WM / MC4	
Start-up DC Input Voltage (V_{start})	25V	
Grounded input pole	Positive (1)	
Maximum Input short circuit Current (I_{sc})	12.5 A	
Output Side		
AC Grid Connection Type	Single phase (7) (8)	
Rated AC Power ($P_{ac,r}$)	250 W	300 W
Rated AC Grid Voltage ($V_{ac,r}$)	230 V	
AC Voltage Range (V_{acmin}...V_{acmax})	180...264 V (1)	
Rated AC Output Current ($I_{ac,r}$)	1.09 A	1.31 A
Maximum AC Output Current ($I_{ac,max}$)	1.3 A	1.5 A
Inrush Current	8 A (max 150ms)	
Maximum output fault current	6.3Arms	
Rated Output Frequency (f_r)	50 Hz	
Output Frequency Range (f_{min}...f_{max})	47...53 Hz (2)	
Nominal Power Factor ($Cosphi_{ac,r}$)	> 0.95	
Maximum number of units per breaker	17 (5)	
Output Protection		
Anti-Islanding Protection	According to local standard	
Output Overcurrent Protection	2.1A	
Output Overvoltage Protection - Varistor	Yes	
Prestazioni Operative		
Maximum Efficiency (η_{max})	96.5%	
Weighted Efficiency (η_{CEC})	95.4%	95.5%
Stand-by Consumption	< 50mW	
Communication		
Monitoring System (PC/Data logger)	Wireless	
Remote Monitoring	Wireless	
Environmental		
Ambient Temperature Range	-40...+75°C / -40...167°F with Derating above 65°C (149°F)	
Relative Humidity	0...100 % condensing	
Environmental pollution degree for external environment	3	
Noise Emission	< 30 db(A) @ 1 m	
Maximum Operating Altitude without Derating	2000 m / 6560 ft	

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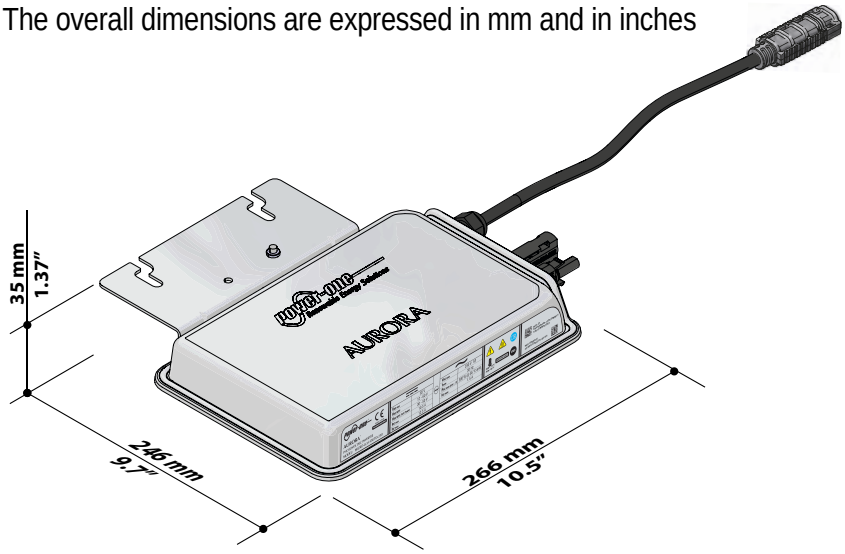
Table: Technical Data	MICRO-0.25-I-OUTD	MICRO-0.3-I-OUTD
Physical		
Environmental Protection Rating	IP 65	
Cooling	Natural	
Dimension (H x W x D)	266mm x 246mm x 35mm / 10.5" x 9.7" x 1.37"	
Weight	< 1.65 kg / 3.5 lb	
Overvoltage Category according to IEC 62109-1	II (input DC) III (output AC)	
Safety		
Isolation Level	HF Transformer Basic Insulation	
Safety class	I	
Marking	EC	
Safety and EMC Standard	ISO 9001:2008; EN 62311:2008; EN 62109-1:2010; EN 62109-2:2011; EN50178:1997; EN301489-1 V1.8.1:2008; EN301489-17 V2.1.1:2009; EN61000-6-1:2007; EN61000-6-2:2005; EN61000-6-3:2007+A1:2011; EN61000-3-2:2006+A1:2009+A2:2009; EN61000-3-3:2008; EN 300 328 V1.7.1:2006	
Grid Standard	Enel Guideline (CEI 0-21 + Allegato A70 Terna)(3), VDE 0126-1-1, VDE-AR-N 4105 (4), G83/1, RD1663, AS 4777	

1. The AC voltage range may vary depending on specific country grid standard
2. The Frequency range may vary depending on specific country grid standard
3. Since their applicability dates, limited to plant power ≤ 3kW
4. Limited to plant power ≤ 3.68 kVA
5. The number of inverter which can be installed must be according to the applicable local code regulations
6. With the plug-in of the DC connectors, the positive of the PV panel will be referred to ground through the Micro-Inverter PCB
7. In case multiple inverters are installed in parallel on a three-phase system, the MICRO Inverter is not able to prevent unbalance, as each Micro Inverter will work independently of the others and supply the maximum power available from its own section of PV generator to the grid.
8. Particular requirement for Benelux: the product MICRO-0.25 (0.3)-I-OUTD-230 is applicable in systems connected to the distribution grid in low voltage

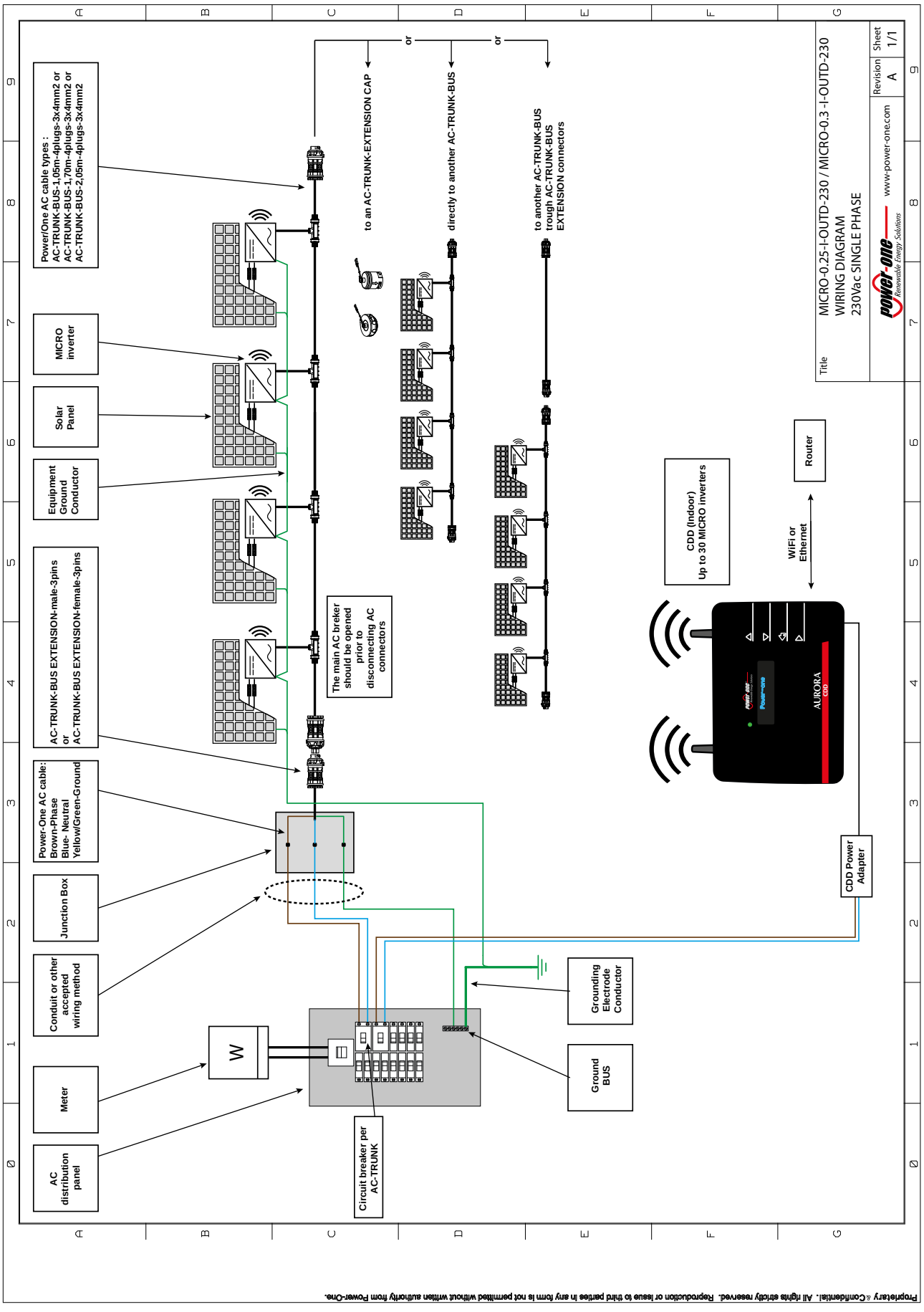
Note. Features not specifically mentioned in this data sheet are not included in the product

Overall dimensions

The overall dimensions are expressed in mm and in inches



Wiring Diagram - 230Vac Single Phase



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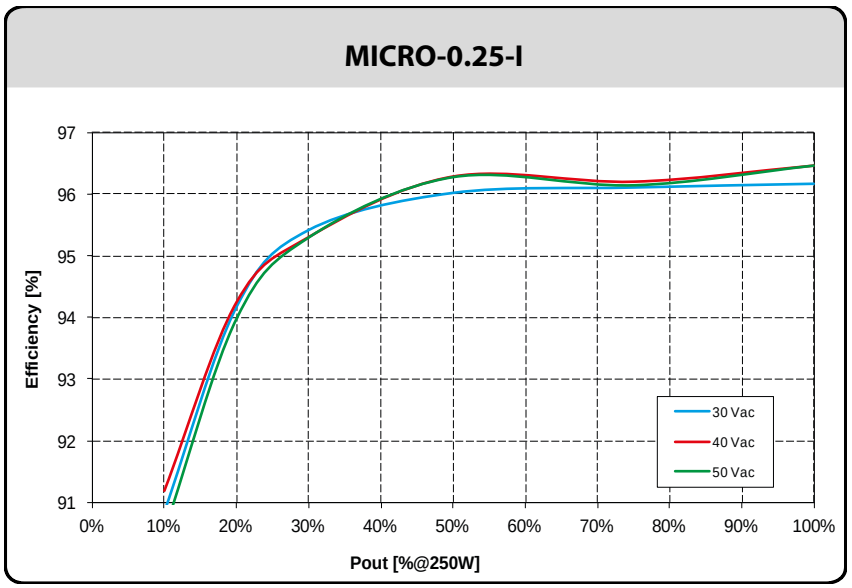
Efficiency curves

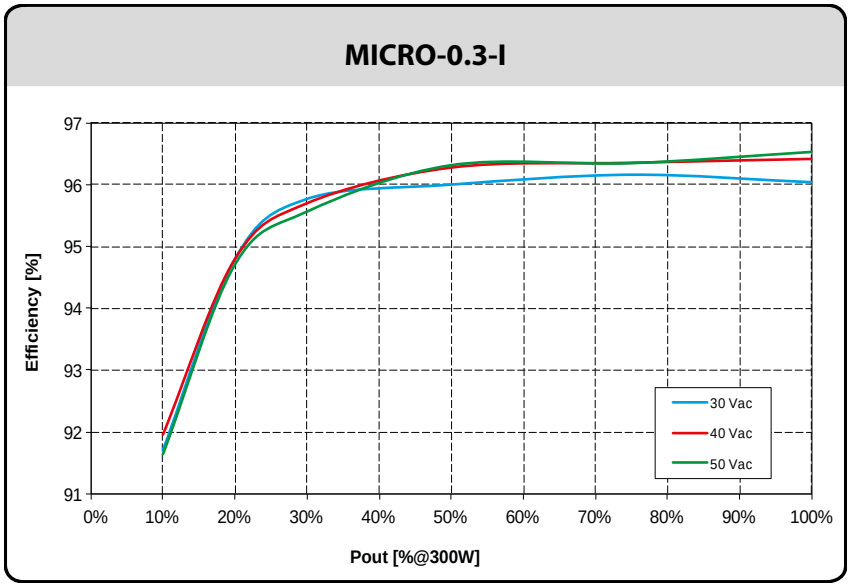
The equipment was designed in compliance with energy conservation standards, to avoid waste and unnecessary losses.
The manufacturer has taken into due consideration the current energy saving standards in Italy.
Graphs of the efficiency curves of all the models of inverter described in this manual are shown below.

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

MICRO-0.25-I-OUTD-208/240



MICRO-0.3-I-OUTD-208/240



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Power Derating

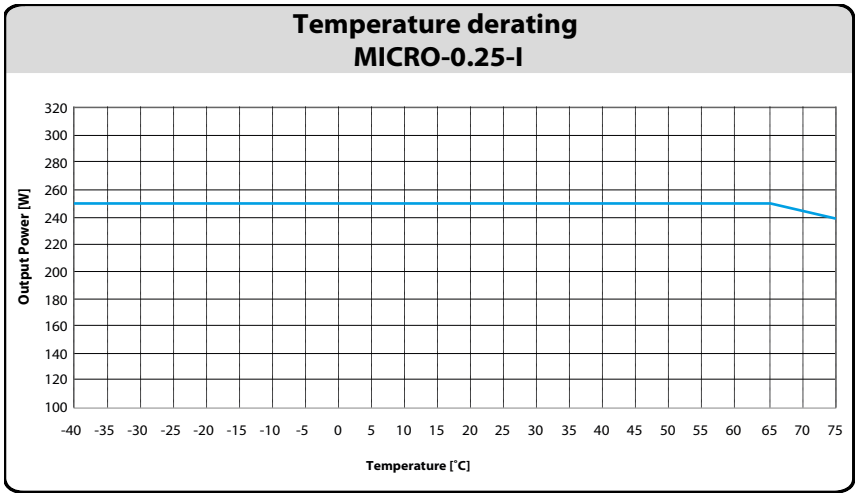
In order to allow inverter operation in safe thermal and electrical conditions, the unit automatically reduces the value of the power fed into the grid.
Power derating can take place due to adverse environmental conditions or due to unsuitable input voltage values.

The conditions for power reduction due to environmental conditions and input voltage can also occur at the same time, but the power reduction will always relate to the lower value measured.

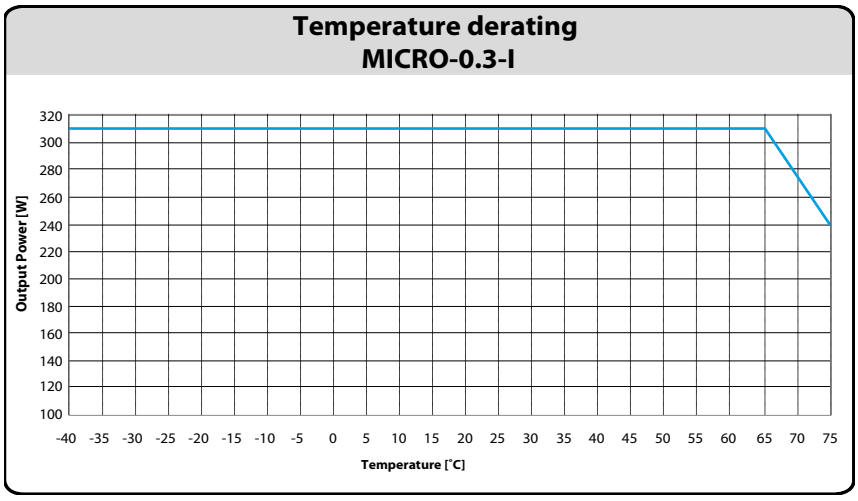
Power reduction due to environmental conditions

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 inverter can therefore reduce the power during certain periods of the day and according to the value of these parameters.
In any case, the inverter guarantees the maximum output power even at high temperatures, provided the sun is not shining directly on it.

MICRO-0.25-I-OUTD-230



MICRO-0.3-I-OUTD-230



Power reduction due to the input voltage

The graphs show the automatic reduction of supplied power when input voltage values are too high or too low.

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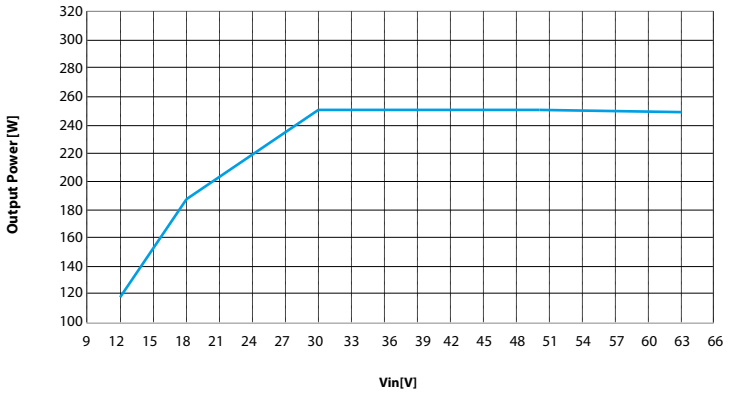
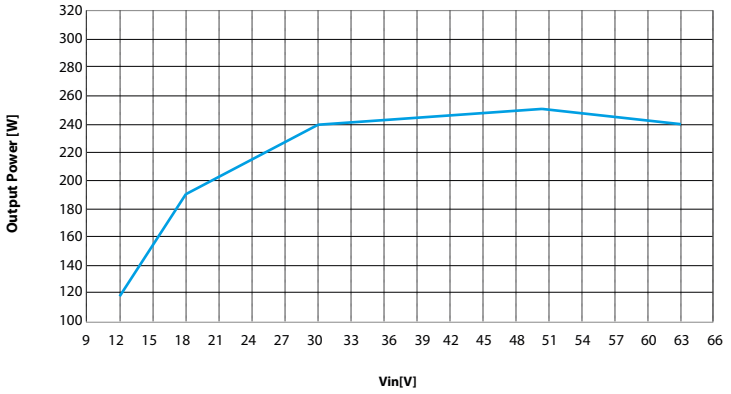
MICRO-0.25-I-OUTD-230

Output Power Vs Input voltage derating @ Tamb up to 65°C
MICRO-0.25-I



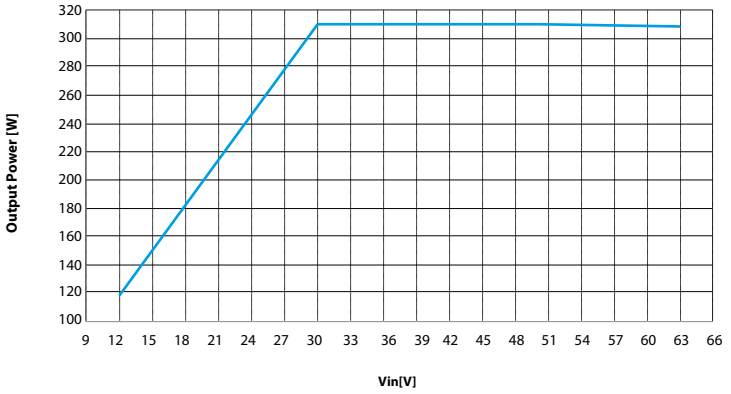
MICRO-0.25-I-OUTD-230

Output Power Vs Input voltage derating @ Tamb = 75°C
MICRO-0.25-I



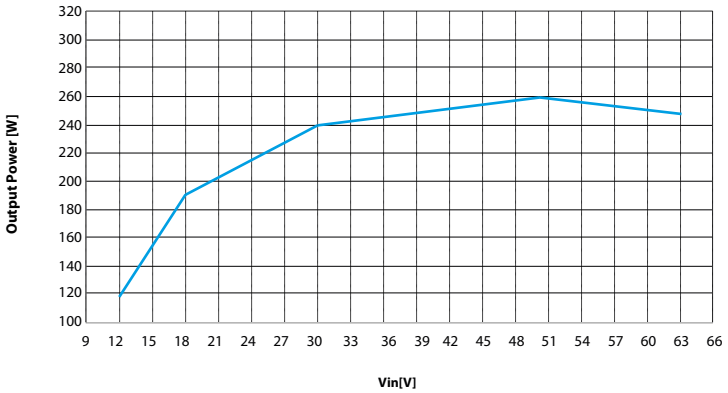
MICRO-0.3-I-OUTD-230

Output Power Vs Input voltage derating @ Tamb up to 65°C
MICRO-0.3-I



MICRO-0.3-I-OUTD-230

Output Power Vs Input voltage derating @ Tamb = 75°C
MICRO-0.3-I



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Description of the plant using MICRO-inverter

The plant is composed by a group of MICRO-inverters that convert direct electric current from a photovoltaic module into alternating electric current and feeds it into the national grid.
Photovoltaic panels transform energy from the sun into direct current (DC) electrical energy; however, to feed the grid and so that this energy can be used, it has to be transformed into alternating current (AC). This conversion, known as DC to AC inversion, is made efficiently without using rotating parts and only through static electronic devices.
In order to allow inverter operation in safe thermal and electrical conditions, in the event of adverse environmental conditions or unsuitable input voltage values, the unit automatically reduces the value of the power fed into the grid.
When used in parallel with the grid, the alternating current generated by the inverter flows directly into the domestic electrical circuit, which is in turn connected, through a load distribution panel, to the grid.
The solar energy system therefore powers all connected electrical devices, from lighting to household appliances, etc.
When the photovoltaic system is not supplying sufficient power, the power needed to ensure normal operation of the connected electrical devices is drawn from the grid. If, on the other hand, excess power is produced, this is fed directly into the grid, so becoming available to other consumers.
In accordance with local electric utility regulations, the power produced can be sold to the grid or credited towards future consumption, bringing about a saving of energy.

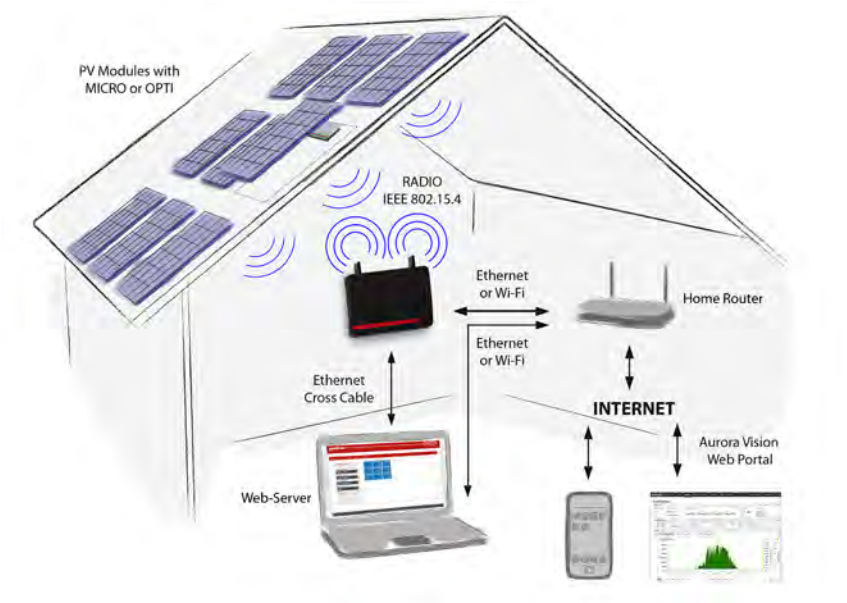
Characteristics of a system employing MICRO-inverters

Unlike systems subdivided into strings controlled by one or several inverters, plants of this sort are built for the incorporation of **a MICRO-inverter for each photovoltaic module**.
Each MICRO-inverter works independently of the others, thus its own photovoltaic module supplies the maximum power available to the grid.
This setup enables a direct control over the production of every single photovoltaic module, consequently optimizing production as much as possible.

Further there are no exposed high voltage DC wires with this system design. This enables firefighters to work safely should the need arise.

Operating diagram

The diagram for this system shows how several wireless ***Power-One*** devices are connected to the CDD device, which turns interacts via WiFi or ethernet with a PC or a router connected to the internet.
The system can be managed and monitored from a PC or Smartphone with internet access if the device is registered at the ***Power-One AURORA EASY VIEW web portal***.



Notes on the sizing of the system

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

A configuration program (stringtool.power-one.com) that can help to correctly size the photovoltaic system is available on the web site of ***Power-One*** (www.power-one.com).

Functionality of the equipment

Data transmission and control

The MICRO-inverters are monitored remotely through an advanced communications system based on a wireless connection and the CDD device. In addition to the local monitorization of the plant is possible to have a remote data visualization through an internet access to AURORA VISION web portal.

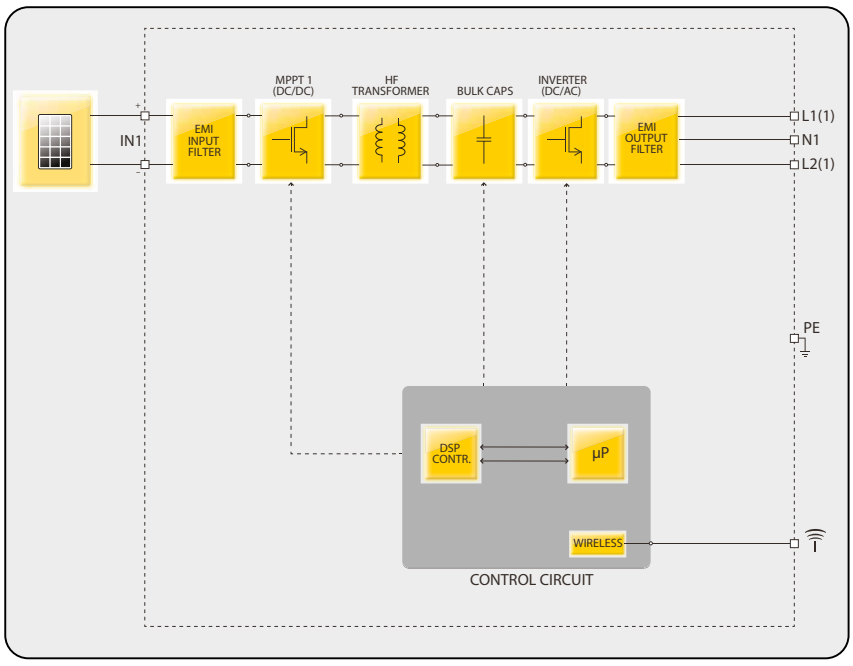
Single photovoltaic module management benefit

There are many advantages of having each MICRO-inverters monitor a single photovoltaic module:

- Possibility of viewing each module's production
- Possibility of controlling when to clean each module, as necessary
- Ease of service interventions from the possibility of singling out individual modules or inverter that are faulty
- Preservation of production even if there is a malfunctioning module or inverter in the plant

Topographic diagram of the equipment

The diagram summarises the operation of the MICRO-inverter.
The main blocks are the DC-DC input converter (called “booster”) and the DC-AC output inverter. Both, work at a high switch-over frequency, and so are small and relatively light.
The inverter is equipped with a single input converter with maximum power point tracking (MPPT) to which it is possible to connect a single photovoltaic module. This means that the modules connected to the MICRO-inverters could be installed in different positions and orientations.
This inverter is equipped with a high frequency transformer, in other words with galvanic isolation of the primary (DC side) from the secondary (AC side), while maintaining very high performance in terms of output and energy export. This type of circuit allows for the grounding of the positive input pole.
The inverter is controlled by two independent DSPs (Digital Signal Processors) and a central microprocessor. The connection to the power grid is thus kept under control by two independent monitors, in full compliance with the electric field norms both for power supply to the systems as well as security.
The wireless communication system inside the MICRO-inverter transmit the information to the CDD device that analyzes and manages all data of the plant.
All this guarantees optimal operation of the entire unit and high efficiency in all insolation and load conditions, always in full compliance with the relevant directives, standards and provisions.



Protective devices

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 safely, to ensure protection of people working on the grid, all in accordance with the relevant national standards and laws. To prevent possible islanding, the inverter is equipped with an automatic protective disconnection system called “Anti-Islanding”.

Ground fault in the photovoltaic panels

An advanced ground fault protection circuit continuously monitors the ground connection and disconnects the inverter when a ground fault is detected and comunicates this condition to CDD device.

Further protective devices

The inverter is equipped with additional protective devices to guarantee safe operation. These protective devices include:
- Continuous monitoring of the grid voltage to ensure the voltage and frequency values stay within operating limits;
- Control of internal temperatures to automatically limit the power if necessary to ensure the unit does not overheat (derating).

The numerous control devices produce a replete structure to guarantee totally safe operation.

3 - Safety and accident prevention

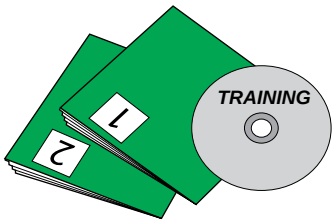
Safety instructions and general information

The equipment has been manufactured in accordance with the strictest accident-prevention regulations and supplied with safety devices suitable for the protection of components and operators.

For obvious reasons, it is not possible to anticipate the great number of installations and environments in which the equipment will be installed; it is therefore necessary for the customer to appropriately inform the manufacturer about particular installation conditions.

Power-one accepts no liability for failure to comply with the instructions for correct installation are cannot be held responsible for the systems upstream or downstream of the equipment it has supplied.

It is essential to provide operators with correct information. They must therefore read and comply with the technical information given in the manual and in the attached documentation.



The instructions given in the manual do not replace the safety devices and technical data for installation and operation stuck on the product, and they certainly do not replace the safety regulations in force in the country of installation and common sense rules.
The manufacturer is willing to train staff, at its premises or on site, in accordance with conditions to be set out in the contract.

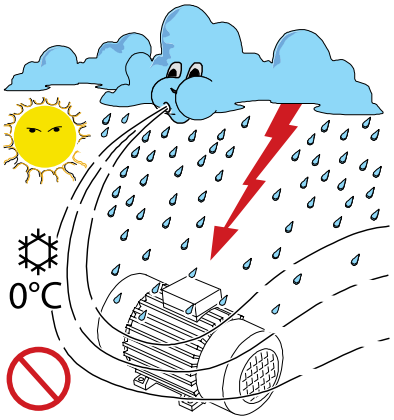
Do not use the equipment if you find any operating anomalies.

Avoid temporary repairs. All repairs should be carried out using only genuine spare parts, which must be installed in accordance with their intended use.

Liabilities arising from commercial components are delegated to the respective manufacturers.

Hazardous areas and operations

Environmental conditions and risks



The equipment can be installed outdoors, but only in environmental conditions that do not prevent its regular operation. These conditions are reported on the thecnical data and on installation chapter.

Power-One CANNOT be held responsible for disposal of the equipment: displays, cables, batteries, accumulators, etc., and therefore the customer must dispose of these substances, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.

The same precautions should be adopted for dismantling the equipment.

The equipment is not equipped to operate in environments that have particular flammability or explosive conditions.

The customer and/or installer must appropriately train operators or anyone who may come near the equipment, and highlight, if necessary with notices or other means, the hazardous areas or operations at risk if required: ***magnetic fields, hazardous voltages, high temperatures, possibility of discharges, generic hazard, etc.***

Signs and plates

The plates attached to the equipment must absolutely NOT be removed, damaged, dirtied, hidden, etc.

The plates must be cleaned regularly and kept visible at all times, that is, they must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.)
The technical data shown in this manual do not in any case replace those shown on the plates attached to the equipment.

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Clothing and protective devices for staff

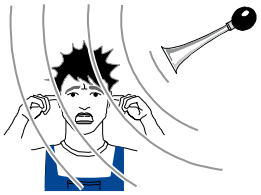
Power-One has eliminated sharp edges and corners, but in some cases it is not possible to do anything, and we therefore advise wearing the clothing and personal protective devices provided by the employer.

Staff must not wear clothes or accessories that can start fires or generate electrostatic charges or, in gener, clothing that can impede personal safety.

All operations on the equipment should be performed with suitably insulated clothes and instruments.
E.g.: Insulated gloves (class 0, category RC)

Maintenance operations must be carried out with the equipment disconnected from the grid and from the photovoltaic generator.

Staff must NOT go near the equipment with bare feet or wet hands.



The maintenance technician must in any case make sure no one else can switch on or operate the equipment during the maintenance operations, and must report any anomaly or damage due to wear or ageing so that the correct safety conditions can be restored.

The installer or maintenance technician must always pay attention to the work environment, so that it is well lit and has sufficient spaces to ensure they have an escape route.

Residual risks

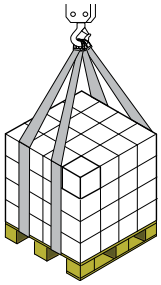
Despite the warnings and safety systems, there are still some residual risks that cannot be eliminated.
These risks are listed in the following table with some suggestions to prevent them.

Table of residual risks

RISK ANALYSIS AND DESCRIPTION	SUGGESTED REMEDY
External weather conditions, such as water seepage, low temperatures, high humidity, etc.	Maintain ambient conditions suitable for the system.
Overheating of surfaces at temperature (transformers, accumulators, coils, etc.) can cause burns. Also be careful not to block the cooling slits or systems of the equipment.	Use suitable protective equipment or wait for the parts to cool down before switching on the equipment.
Inadequate training of staff.	Ask for a supplementary course.
During installation, temporarily mounting the equipment or its components may be risky.	Be careful about and disallow access to the installation area.

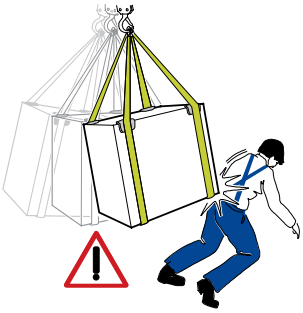
4 - Lifting and transport

General conditions



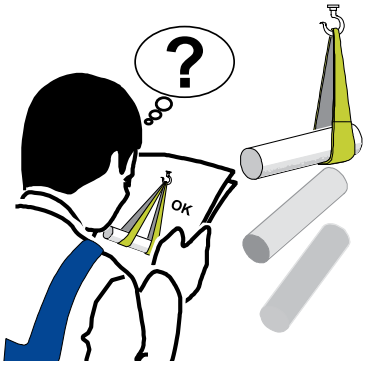
Some recommendation apply only to large size product or multiple small size packings.

Transport and handling



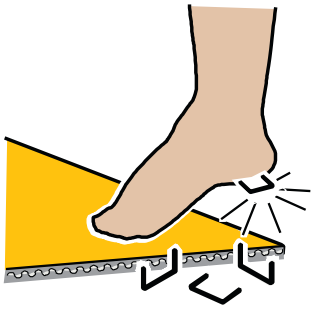
Transport of the equipment, especially by road, must be carried out with by suitable ways and means for protecting the components (in particular, the electronic components) from violent shocks, humidity, vibration, etc.
During handling, do not make any sudden or fast movements that can create dangerous swinging.

Lifting



Power-One usually stores and protects individual components by suitable means to make their transport and subsequent handling easier, but as a rule it is necessary to turn to the experience of specialized staff in change of loading and unloading the components.
Where indicated and/or where there is a provision, eyebolts or handles, which can be used as anchorage points, are inserted and/or can be inserted.
The ropes and means used for lifting must be suitable for bearing the weight of the equipment.
Do not lift several units or or parts of the equipment at the same time, unless otherwise indicated.

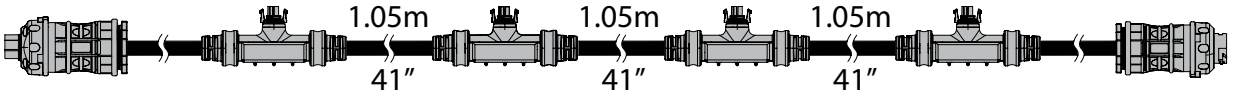
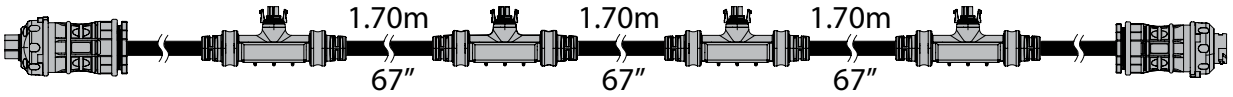
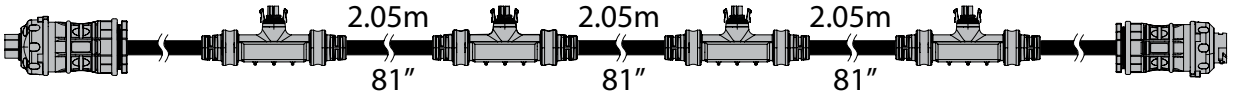
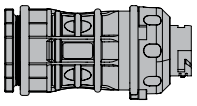
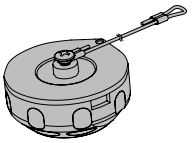
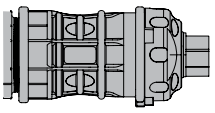
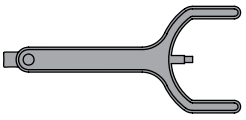
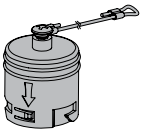
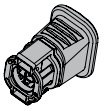
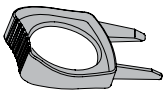
Unpacking and checking



We remind you that the packaging elements (cardboard, cellophane, staples, adhesive tape, straps, etc.) may cause cuts and/or injuries if not handled with care. They should be removed by suitable means and not left in the hands of irresponsible people (e.g., children).
The components of the packaging must be disposed on in accordance with the regulations in force in the country of installation.
When you open the package, check that the equipment is undamaged and make sure all the components are present.
If you find any defects or damage, stop unpacking and consult the carrier, and also promptly inform the ***Service Power-One***.

List of attachments

Table: European Version of Attachments

Code	Description
AC-TRUNK-BUS-1,05m-4plugs-3x4mm2	AC cable with 3 conductors (4 mm²); distance between connectors 1.05m/41" 
AC-TRUNK-BUS-1,70m-4plugs-3x4mm2	AC cable with 3 conductors (4 mm²); distance between connectors 1.70m/67" 
AC-TRUNK-BUS-2,05m-4plugs-3x4mm2	AC cable with 3 conductors (4 mm²); distance between connectors 2.05m/81" 
AC-TRUNK-BUS EXTENSION-male-3pins	Male Connector for AC Bus cable Extension 
AC-TRUNK-EXTENSION CAP-male-3pins	Insulated cap for connectors AC-TRUNK-BUS EXTENSION-male-3pins 
AC-TRUNK-BUS EXTENSION-female-3pins	Female Connector for AC Bus cable Extension  +  Tool for releasing connectors AC Bus cable Extension
AC-TRUNK-EXTENSION CAP-female-3pins	Insulated cap for connectors AC-TRUNK-BUS EXTENSION-female-3pins 
AC-TRUNK PLUG CAP	Insulated cap for AC Bus cable connectors (female) 
AC-TRUNK UNLOCK TOOL	Tool for releasing connectors 

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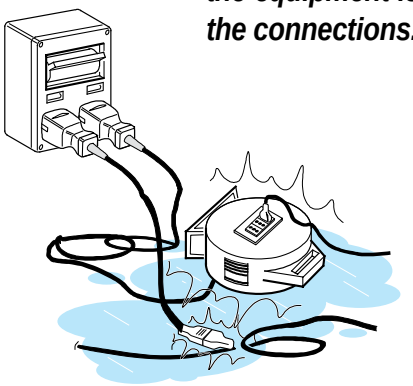
5 - Installation

General conditions

Installation of the equipment is carried out based on the system and the place in which the equipment is installed; therefore, its performance depends on the correctness of the connections.



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 operation must be carried out by specialised staff; it is in any case advisable to comply with what is written in this manual and adhere to the diagrams and attached documentation.

For Safety reason only a qualified electrician, who has received training and / or has demostrated skills and knowledge in construction and in operation of this unit, can install this inverter.

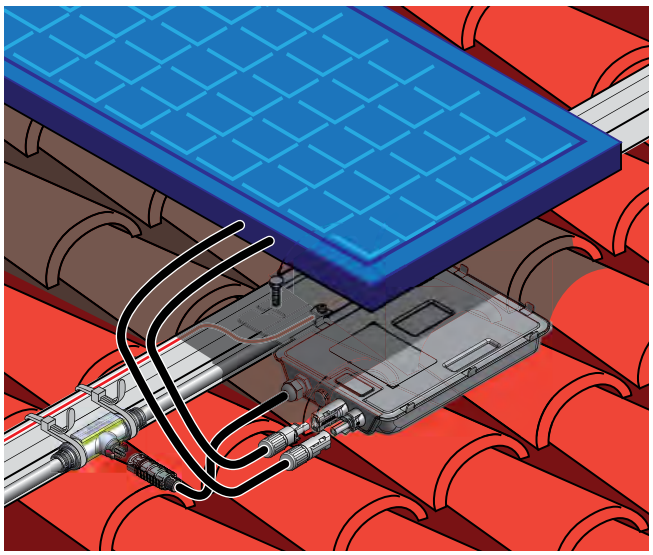
The installation is done by qualified installers and/or licensed electrician according to the applicable local code regulations

The connection of an inverter energy system to an electrical installation connected to the electricity distribution network shall be approved by the appropriate electrical distributor.

The installation must be carried out with the equipment disconnected from the grid and from the photovoltaic generator.

The installation must be carried out with the equipment disconnected from the grid (power disconnect switch open) and with the photovoltaic panels shaded or isolated.

Environmental checks



• Consult the technical data to check the environmental parameters to be observed (degree of protection, temperature, humidity, altitude, etc.)
• Do not expose to direct sunlight to avoid unwanted power derating due to an increase in the internal temperature of the inverter.
• To avoid overheating, always make sure the flow of air around the inverter is not blocked.
• Do not install in places where gases or flammable substances may be present.
• Avoid electromagnetic interference that can compromise the correct operation of electronic equipment, with consequent situations of danger.

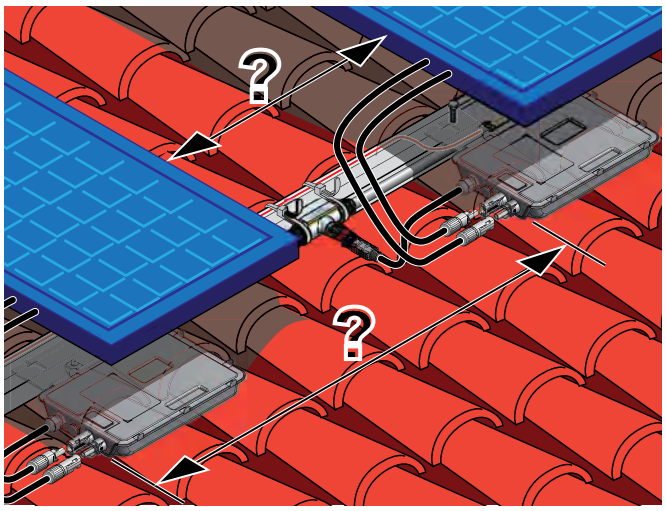
Installations above 2000 metres

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 temperatures.
• Reduction in the dielectric resistance of the air that, in the presence of high operating voltages (DC input), can create electric arcs (discharges) that can reach the point of damaging the inverter.
As the altitude increases, the failure rate of some electronic components increases exponentially because of cosmic radiation.

All installations at altitudes of over 2000 metres must be assessed case by case considering the aforesaid criticalities.

Installation position



When choosing the place of installation, comply with the following conditions:

• Install only on structures specifically conceived for photovoltaic modules (supplied by installation technician).

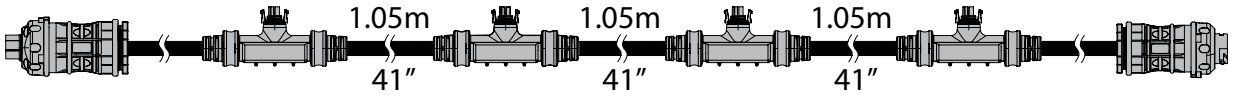
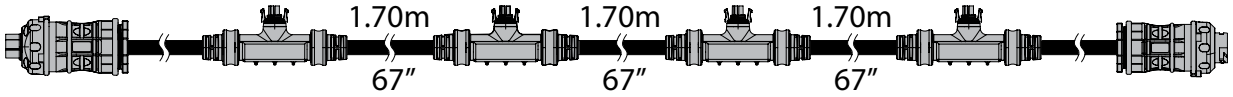
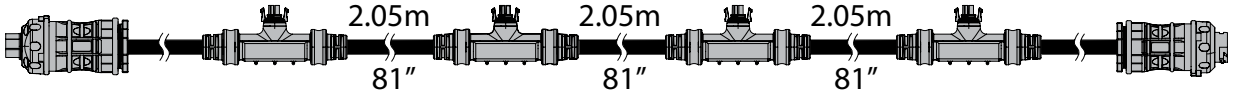
• Install MICRO-inverter underneath the photovoltaic modules so that they work in the shade. If this condition cannot be met, the inverter could likely undergo derating.

• Any maintenance or replacement of the device could require the technician to dismount the photovoltaic module mounted on top of the MICRO-inverter.
This condition must be accounted for during installation, ensuring that the safety distances are correct for normal control and maintenance operations.

• The distance between MICRO-inverters installed on the same system array depends on the type of photovoltaic modules and their orientation (Landscape or Portrait). Choose the best solution to employ during the project planning stage, bearing in mind that the selected configuration will influence the correct type of AC cable interwoven among the connectors.

Choice of AC cable (Power-One)

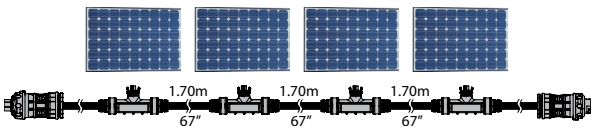
The AC cable is shipped in sections with 4 premounted connectors for attaching the MICRO inverters.
The available spacing between connectors are:

Code	Description
AC-TRUNK-BUS-1,05m-4plugs-3x4mm2	AC cable with 3 conductors (4 mm²); distance between connectors 1.05m/41”
	
AC-TRUNK-BUS-1,70m-4plugs-3x4mm2	AC cable with 3 conductors (4 mm²) ; distance between connectors 1.70m/67”
	
AC-TRUNK-BUS-2,05m-4plugs-3x4mm2	AC cable with 3 conductors (4 mm²) ; distance between connectors 2.05m/81”
	

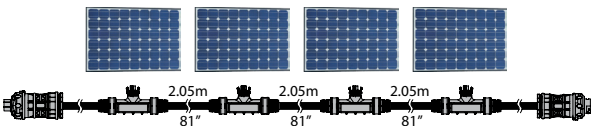
The installation technician is responsible for choosing the AC cable model with the correct spacing on the basis of the orientation and type of photovoltaic modules.

Observe the pertinent regulations in the country of installation concerning the maximum number of MICRO-inverters permitted for installation at each cable section!

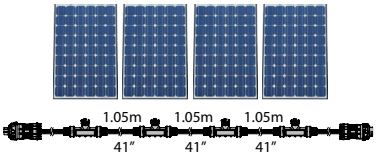
Choice of cable with Landscape Orientation of the modules



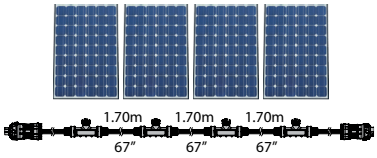
Power-One Cable Item	Power-One Cable Item
AC-TRUNK-BUS-1,70m-4plugs-3x4mm2	AC-TRUNK-BUS-2,05m-4plugs-3x4mm2
Usable with modules (cells n°)	**Usable with modules (cells n°)**
60 96	60 72 96



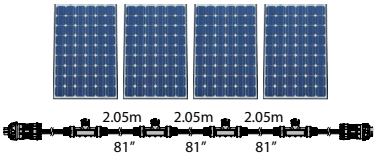
Choice of cable with Portrait Orientation of the modules



Power-One Cable Item
AC-TRUNK-BUS-1,05m-4plugs-3x4mm2
Usable with modules (cells n°)
60 72 96
Verify the compatibility for 96 cells modules



Power-One Cable Item
AC-TRUNK-BUS-1,70m-4plugs-3x4mm2
Usable with modules (cells n°)
60 72 96



Power-One Cable Item
AC-TRUNK-BUS-2,05m-4plugs-3x4mm2
Usable with modules (cells n°)
60 72 96

Choice of Load protection switch (AC disconnect switch)

To protect each AC connection line of the MICRO-inverter, we recommend installing a device for protection against over current :

It is the installer's responsibility to adequately size the overcurrent protection, based on micro-inverter number and types in the system (see table). The maximum thermal-magnetic circuit breaker current rating is 20A for each AC line.

Protection breaker rating (A)	6				10				16				20			
Number of MICRO-0.25 that can be installed	4				7				12				12			
Number of MICRO-0.3 that can be installed	4				6				10				12			
AC line cross section (sq mm)	2.5	4	6	10	2.5	4	6	10	2.5	4	6	10	2.5	4	6	10
Line maximum length (m) Allowable voltage loss (<1.5%)	30	48	72	120	20	32	48	80	11	18	27	45	9	15	22	36
Line maximum length (m) Allowable power loss (<1%)	20	33	50	80	13	21	32	53	7	12	18	30	6	10	15	25

Choice of differential protection downstream of the inverter

Based on the current **CEI 64-8** Norms and Variant 4 (V4) of September 2006, which in Section 712: "Solar photovoltaic power systems (PV)" addresses photovoltaic applications, with particular reference to paragraph **712.413**: "Protection against indirect contact", the following may be noted: **712.413.1.1.1.2** When an electric system includes a PV power supply system without at least a simple separation between the AC side and the DC side, the differential device installed to provide protection against indirect contact by automatic disconnection of the power supply must be of the B type in accordance with **IEC 60755/A 2**.

When the PV inverter is not in terms of its construction such as to put continuous ground fault current (cc) into the electrical system, a differential switch of type B is not required according to IEC 60755/A 2..

Note: The first section of the article, in reference to the "simple separation between the AC side and the DC side", considers isolation transformers that operate at low frequency (grid frequency).

Aurora Power-One inverters with a high frequency transformer are equipped with an isolation transformer for each of the DC/DC converters which operates at high frequency (switch-over frequency of the converter). This transformer allows for high frequency galvanic isolation between the DC and AC side of the system. In addition to this the inverters include protection mechanisms so that they cannot input ground fault currents.

Power-One Italy S.p.A. declares that the Power-One Aurora high-frequency isolated inverters are in terms of their construction continuous ground fault currents and therefore, in accordance with Article 712.413.1.1.1.2 of Section 712 of CEI 64-8/7 Norms there is no requirement that the differential installed downstream of the inverter is type B in accordance with IEC 60755 / A 2.

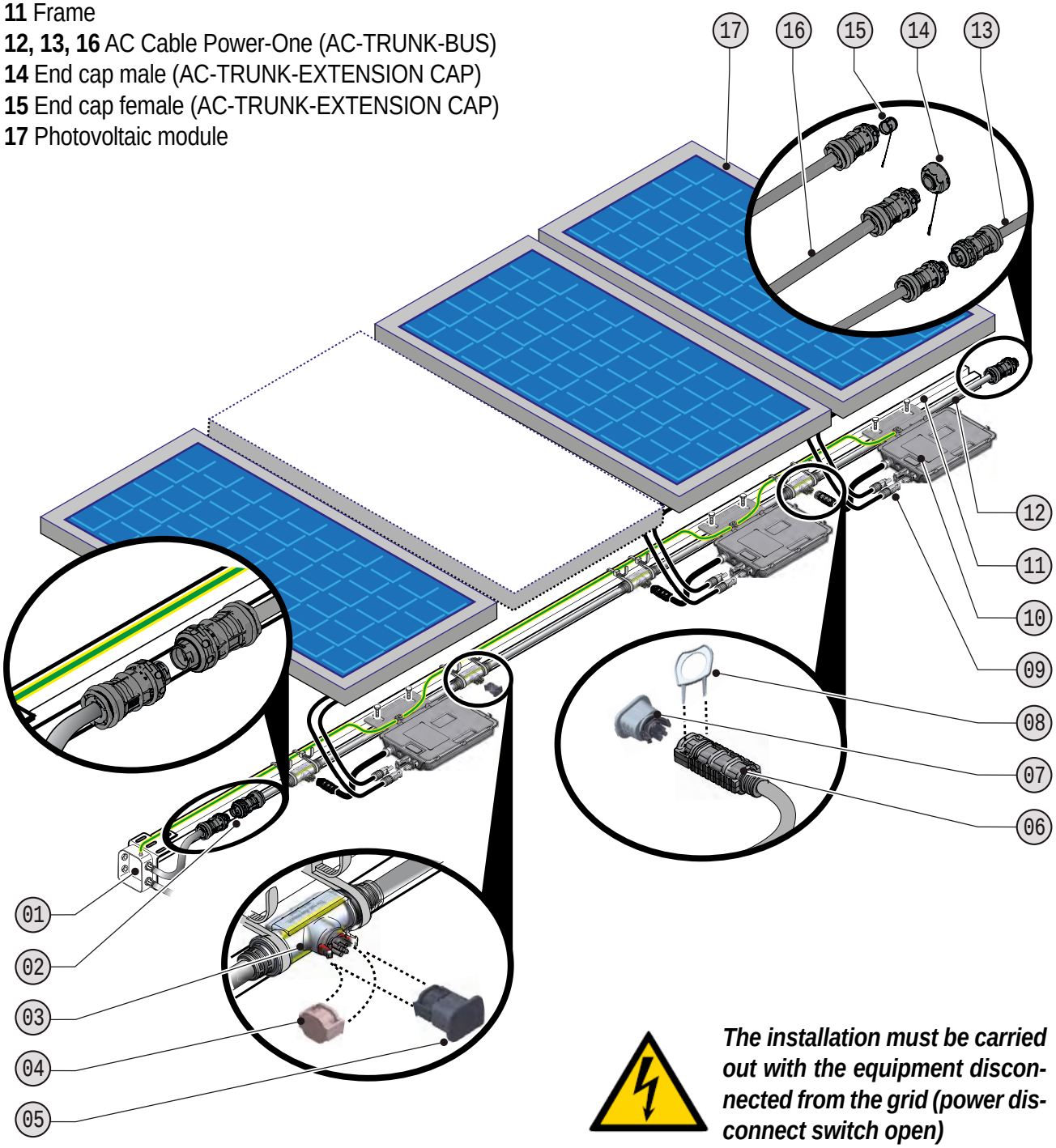
Power-One recommends the use of a switch with type A or AC differential magneto-thermal protection with IΔn=30mA sensitivity.

Choosing the interface protection system and device downstream of the inverter

The inverter does not include any electromechanical devices (relays, contactors, etc.) for automatic disconnection from the power grid.
The system must therefore be provided with external protection for the physical disconnection of the MICRO inverters from the grid, in compliance with the applicable regulations and with the requirements of the installation country's power distributor.
Such protection is typically composed of an interface protection system that analyses and controls the grid parameters and, if necessary, sends commands to the interface device, in charge of physically disconnecting the PV installation MICRO inverters line.

Assembly Diagram

01 Junction box
02 Bus Extension Connectors (AC-TRUNK-BUS EXTENSION)
03 AC Connector
04 Temporary cap
05 Insulated AC cap (AC-TRUNK PLUG CAP)
06 MICRO-inverter AC cable
07 MICRO-inverter AC cable cup (AC-MICRO DROP CABLE CAP)
08 Unlock tool (AC-TRUNK UNLOCK TOOL)
09 DC Connectors
10 MICRO-inverter
11 Frame
12, 13, 16 AC Cable Power-One (AC-TRUNK-BUS)
14 End cap male (AC-TRUNK-EXTENSION CAP)
15 End cap female (AC-TRUNK-EXTENSION CAP)
17 Photovoltaic module



The installation must be carried out with the equipment disconnected from the grid (power disconnect switch open)

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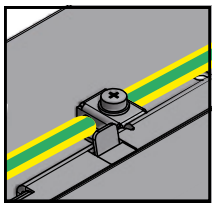
Assembly Instructions

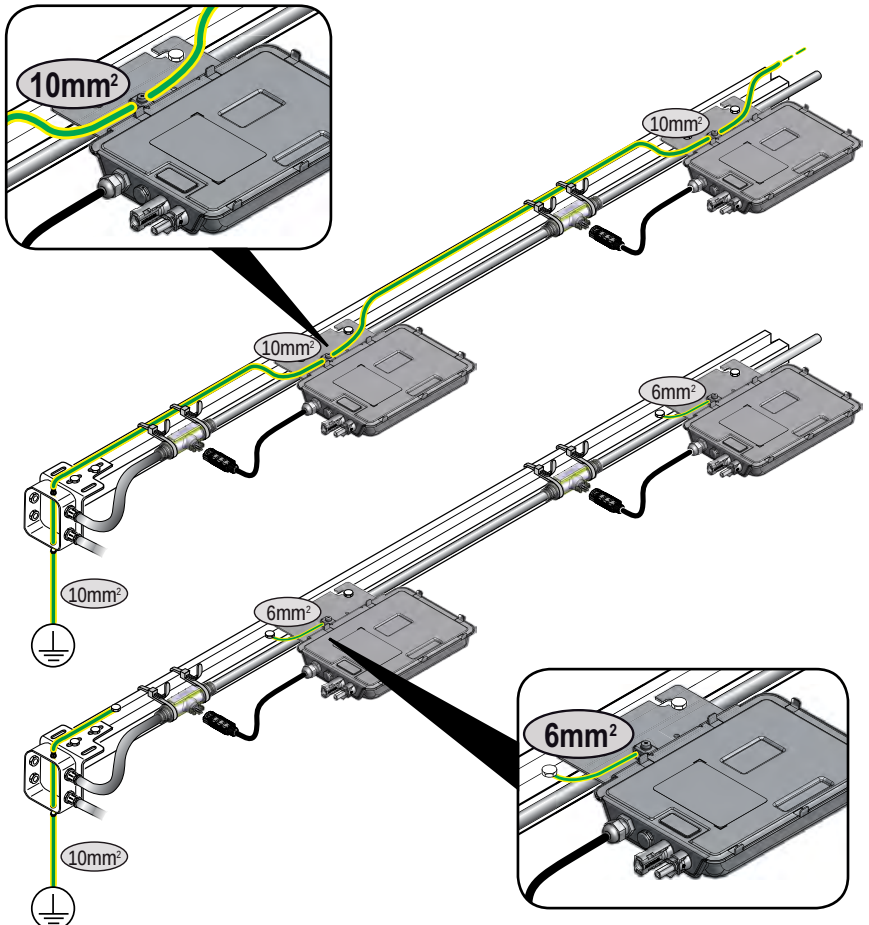
1. Run the AC cable along the frame structure provided for installing the photovoltaic modules.

The cable must be compatible with the expected installation conditions, particularly concerning the number of panels and their orientation (Portrait or Landscape). Legislation in force in the country of installation and the installed power will determine the maximum number of MICRO-inverters permitted for installation at each AC cable section. Do NOT exceed the maximum number of MICRO-inverters permitted for installation!

2. Secure the MICRO-inverter to the photovoltaic module frame with the logo side facing downwards.
In order to facilitate positioning, it could be useful to mark the approximate centre of each photovoltaic module on the frame.



3. The inverter and photovoltaic panels must be connected to an equipment grounding conductor in accordance with the pertinent legislation in force in the country of installation
The inverter can be earthed using the correct clamp secured to the chassis and an adequately-sized conductor.
There are **two possible configurations** for earthing the inverters:



• Single earth conductor coupling all the MICRO-inverters:
The conductor must have a minimum cross section of 10mm²

• Individual earth conductors for each MICRO-inverter:
The conductor linking the structure to the earthing distribution structure must have a minimum cross section 10mm².
The conductor bonding the MICRO-inverter to the structure must have a minimum cross section of 6 mm² (maximum length 1m).
Ensure that the quality of the bond made between the conductor and the structure is secure.
Only a racking system that is certified for use as a grounding structure is permitted to use this method.

Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic interference.
Make sure that grounding conductors are adequately sized as required by safety regulations.

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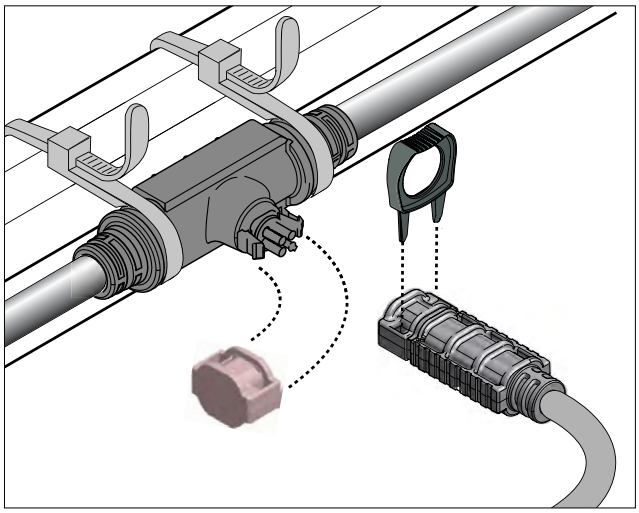
4. Fasten the AC cable to the frame with cable ties.
Each connector is provided with two guides for ideal fastening.

Be mindful to keep the connectors in a position accessible to the AC cable coming from the MICRO-inverter.

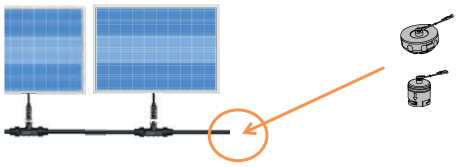
5. Remove the temporary cap from AC cable connectors and then connect the MICRO-inverters.
The connectors are coupled correctly when two clicks are heard.



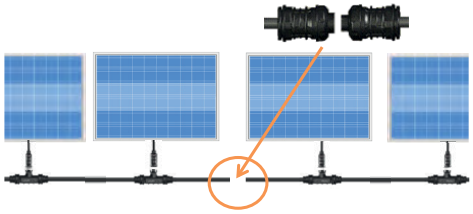
Protect any unused connectors by fitting the appropriate protective caps on them to keep them watertight. The temporary caps are only fitted for shipping and provide no seal whatsoever!

6. The AC Cable Power-One has a connector on each end. Depending on the plant, the connector can be:

- Ended with specific insulated end cap.

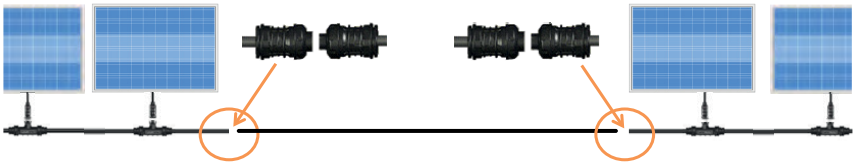


- Extended with another AC cable



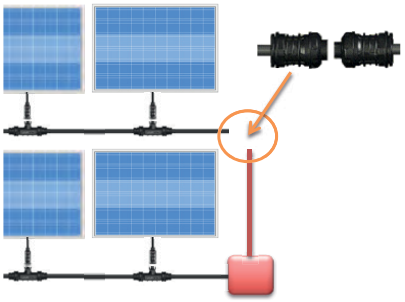
In this case do not exceed the maximum power supported by the cable and always observe the pertinent regulations in the country of installation concerning the maximum allowed number of MICRO-inverters installable!

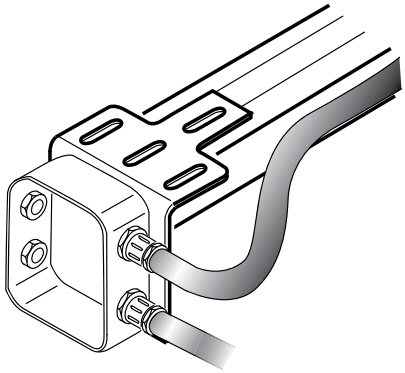
- Extended with the specific extension connectors to reach another AC Cable



In this case do not exceed the maximum power supported by the cable and always observe the pertinent regulations in the country of installation concerning the maximum allowed number of MICRO-inverters installable!

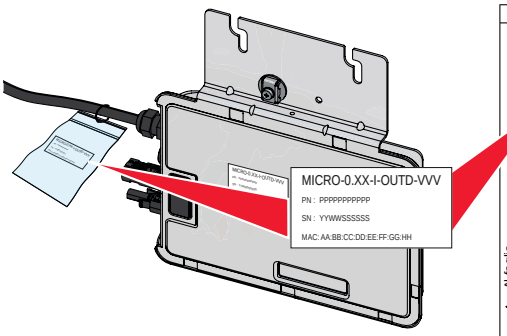
- Extended with the specific extension connectors to reach the junction box or the AC distribution panel.

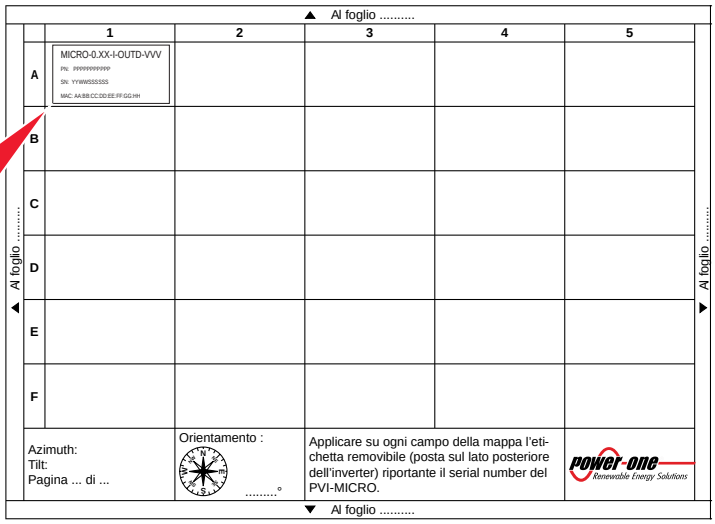


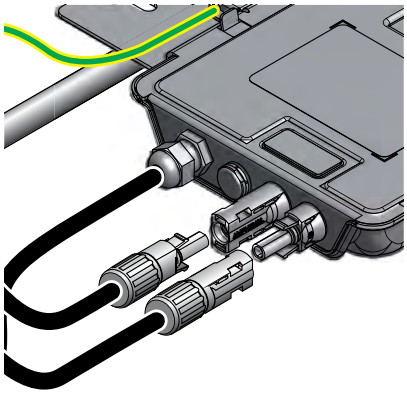


7. Connect the cable/s coming from the MICRO-inverters to the junction box or to the AC distribution panel

8. Draw the map of the system, affixing the labels peeled off each inverter on the appropriate position on the diagram (contained in this manual).







9. Plug the DC cables into the corresponding inputs on the micro-inverters and install the photovoltaic modules.

The recommended installation entails keeping the MICRO-inverters underneath the photovoltaic modules and thus having them operate in the shade. Direct sunlight could cause elevated temperatures and, consequently, derating.

Each panel must be connected to the MICRO-Inverter with a DC cable having a length of less than 3 m (118").

10. The inverter will not begin to feed energy into the distribution grid until the association procedure for the CDD device has been completed.

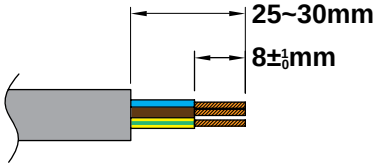
Fitting AC-TRUNK-BUS EXTENSION connectors

The extension connectors can be used to connect a standard cable without connectors to the Power-One AC cable, or to connect together AC cable sections with installed MICRO-inverters.

In any case, never exceed the cable maximum power rating and always observe the applicable regulation in the country of installation for the maximum number of micro-inverters that can be installed!

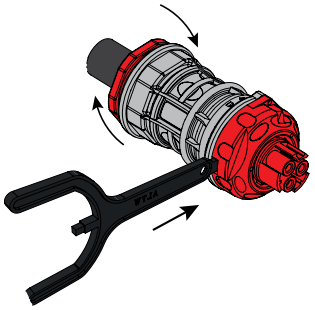
Two extension connectors (male and female) are available for installation, each on one of the cable sections to be connected. Once installed on the cable, both connectors will be connected together by a locking system.

Fitting AC-TRUNK-BUS EXTENSION-female-3pins

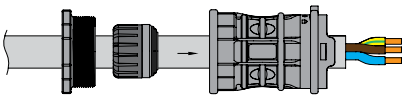


The connector must be fitted as follows:

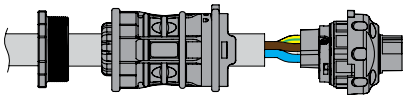
- Peel off 25-30 mm of the external sheath and separate each conductor, then peel off 8 mm of the sheath on each of them



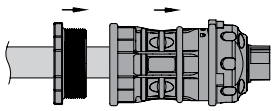
- Disassemble the connector removing the cable gland ring nut and the connector head.
In order to disassemble the connector head, the retaining side clips must be released using the special unlock tool or a flathead screwdriver.



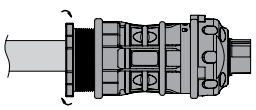
- Feed the cable through the cable gland ring nut, the gasket and the connector body. All conductors must come out of the opposite end of the body.



- Unscrew the connector head set screws and insert the conductors in the respective recesses (L, N and) marked next to the terminals.
Secure the conductors by tightening the screws to 3 Nm torque



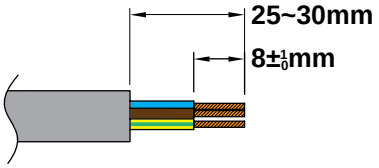
- Fit the connector head to the body by pressing it until the two side grooves click (2 clicks will be heard)..



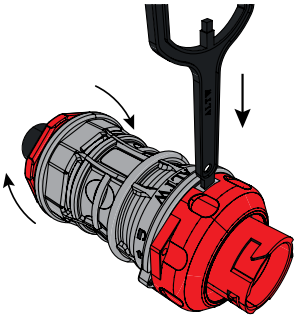
- Tighten the cable gland ring nut against the gasket (max 2.45 Nm).

Fitting AC-TRUNK-BUS EXTENSION-male-3pins

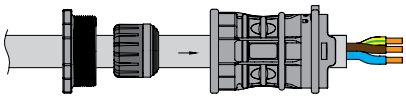
The connector must be fitted as follows:



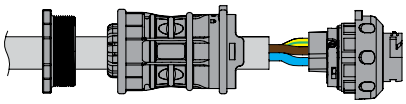
- Peel off 25-30 mm of the external sheath and separate each conductor, then peel off 8 mm of the sheath on each of them



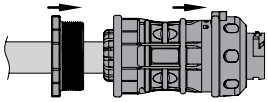
- Disassemble the connector removing the cable gland ring nut and the connector head.
In order to disassemble the connector head, the retaining side clips must be released using the special unlock tool or a flathead screwdriver.



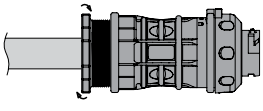
- Feed the cable through the cable gland ring nut, the gasket and the connector body. All conductors must come out of the opposite end of the body



- Unscrew the connector head set screws and insert the conductors in the respective recesses (L, N and) marked next to the terminals.
Secure the conductors by tightening the screws to 3 Nm torque



- Fit the connector head to the body by pressing it until the two side grooves click (2 clicks will be heard). Rotate the ring nut on the connector head into locking position (marked by a padlock symbol on the connector)



- Tighten the cable gland ring nut against the gasket (max 2.45 Nm).

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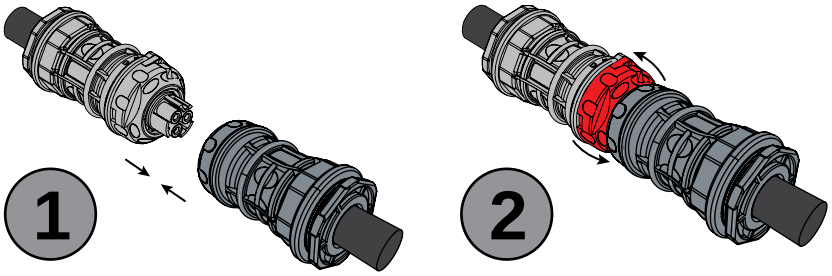
Connection of the extension connectors

The AC-TRUNK-BUS EXTENSION-female-3pins and AC-TRUNKBUS EXTENSION-male-3pins connectors (also included in the 3 AC-TRUNK-BUS cable types) are connected together in two simple steps:

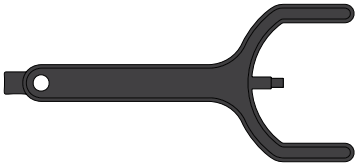
1. Join the two connectors (male and female).
In order to avoid wrong connections, the correct joining position is marked on the connectors.

2. Rotate the AC-TRUNK-BUS EXTENSION-female-3pins connector ring nut anti-clockwise until blocked. The two connectors are coupled so as to prevent accidental disconnection



Once the connection is completed, verify the two connectors are secured.

Disconnection of the extension connectors

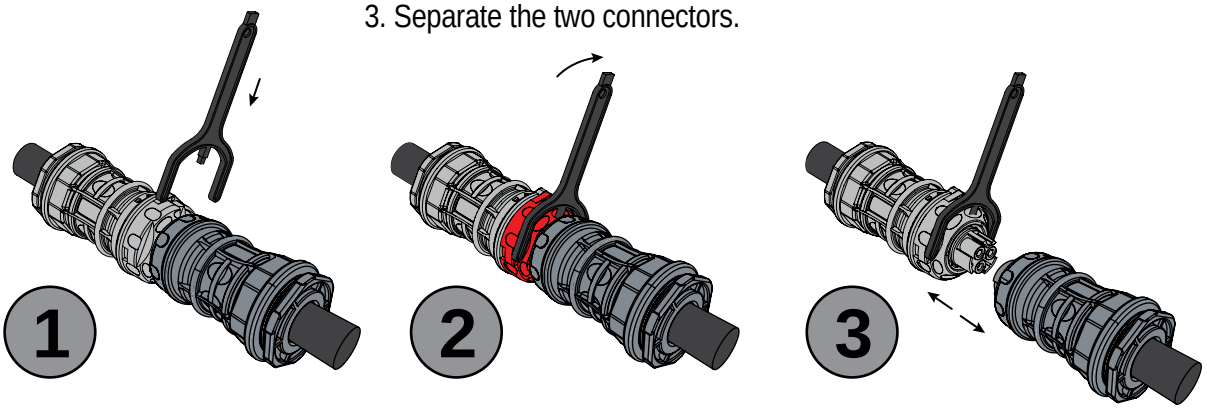


If necessary, the special unlock tool must be used to disconnect the ACTRUNK-BUS EXTENSION-female-3pins and AC-TRUNK-BUS EXTENSION-male-3pins extension connectors. Disconnection of the two connectors is performed in 3 simple steps:

1. Insert the unlock tool in the special slot of the AC-TRUNK-BUS EXTENSION-female-3pins connector

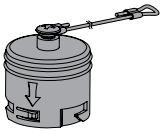
2. Rotate the connector ring nut clockwise with the unlock tool.

3. Separate the two connectors.

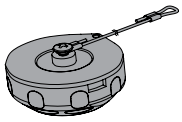


Fitting of the end caps

The AC cable can be terminated using the special watertight seal caps. Two different cap types are available, depending on the connector to be terminated:



- **AC-TRUNK-EXTENSION CAP-female-3pins. Plug cap for AC-TRUNK-BUS EXTENSION-female-3pins connectors**

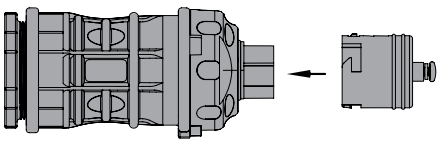


- **AC-TRUNK-EXTENSION CAP-male-3pins. Plug cap for AC-TRUNK-BUS EXTENSION-male-3pins connectors**

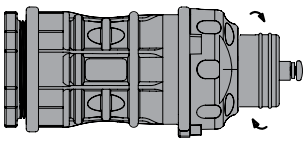
An incorrectly fitted cap will not guarantee a watertight seal on the connector. This can create safety and functionality risks for the installation.

Fitting AC-TRUNK-EXTENSION CAP-female-3pins

Fitting must be performed as follows:
- Insert the cap on the connector pressing until snug

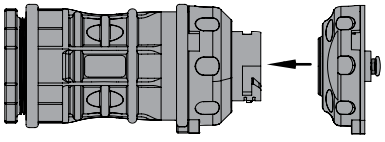


- At the same time, rotate it anti-clockwise

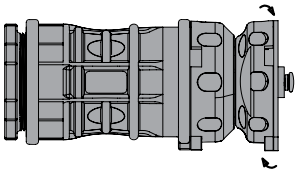


Fitting AC-TRUNK-EXTENSION CAP-male-3pins

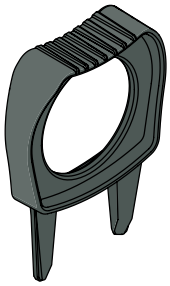
Fitting must be performed as follows:
- Insert the cap on the connector pressing until snug



- At the same time, rotate it anti-clockwise



Use of the AC-TRUNK UNLOCK TOOL



The AC-TRUNK UNLOCK TOOL must be used for the disconnection of the AC connector from the MICRO-inverter or for the removal of the AC-TRUNK PLUG CAP from the connectors on the 3 types of AC cable **(AC-TRUNK-BUS).**

The tool is used to release the two retaining clips on the connectors installed on the 3 AC cable types (**AC-TRUNK-BUS**)

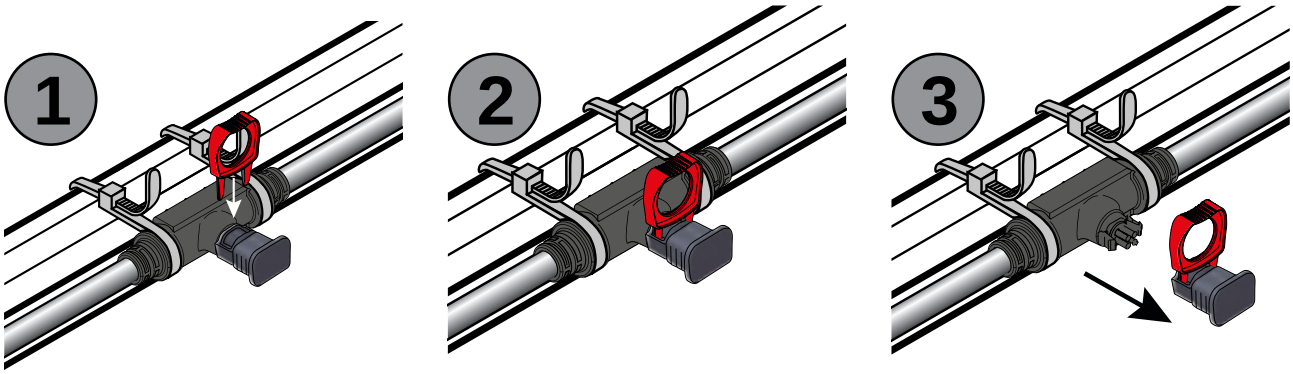
The cap removal or the disconnection of the MICRO-inverter AC cable can be performed in 3 simple steps:

1. Insert the AC-TRUNK UNLOCK TOOL in the 2 holes on the cap or connector.

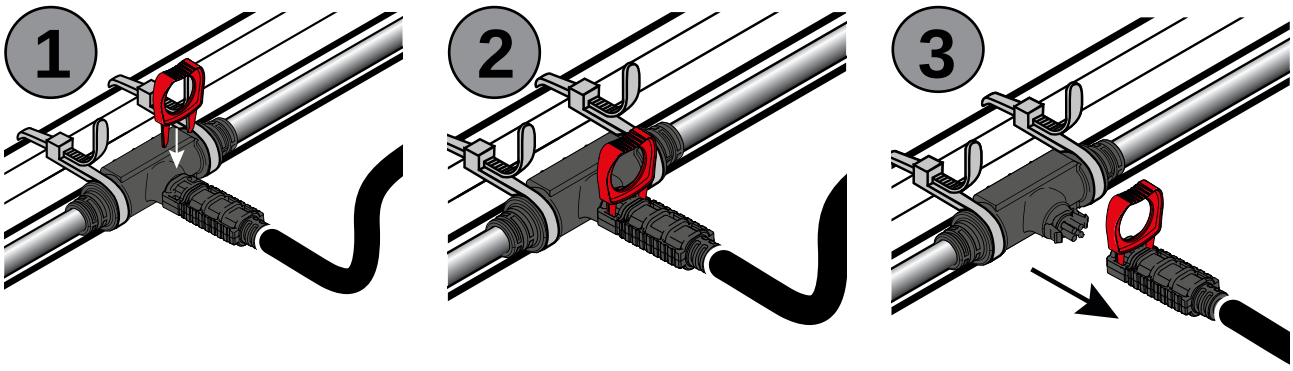
2. Press to release the retaining clips.

3. Remove the cap or the connector.

Removing the AC-TRUNK PLUG CAP

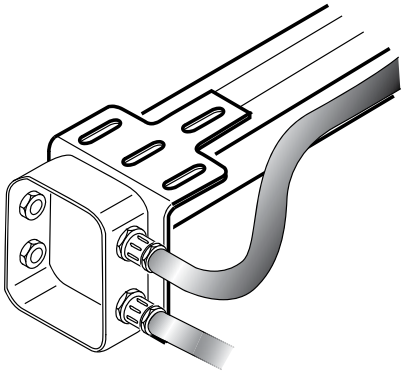


Disconnection of the MICRO-inverter AC cable



Connection to the AC distribution grid (AC side)

To prevent electrocution hazards, all the connection operations must be carried out with the disconnect switch downstream of the inverter (grid side) open and locked.



When connecting to the grid, all the Power-One AC cables coming from MICRO-inverters must be joined inside a insulated junction box (IP65). From the junction box must exit the line cable (or more than one) connected to the load distribution panel (containing protection devices) which is connected to the distribution grid.

Be particularly mindful of the dimensions of the line cable (not supplied from Power-One).

All the external connections to the insulated junction box (caps, adapters, etc.) must be made with securely-sealed Power-One components.

The inverter is not provided of automatic disconnection devices from the distribution grid. This means that an external protection able to physically disconnect the MICRO-inverters from the grid has to be expected in accordance with the regulations in force and with the requirements of the electricity distributor in the country of installation.

Characteristics and sizing of the line cable

The line cable is not supplied from Power-One and is the one between the junction box and the load distribution panel
The cross-section of the AC line conductor must be sized in order to prevent unwanted disconnections of the inverter from the grid due to high impedance of the line that connects the inverter to the load distribution panel; In fact, if the impedance is too high, it causes an increase in the AC voltage that, on reaching the limit set by the country of installation, causes the inverter to switch off.

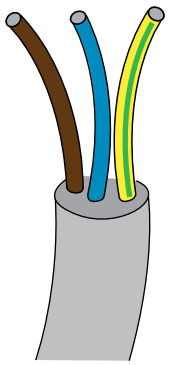
The installation technician is responsible for selecting a cable of the appropriate length and cross section. In case of any doubt as to dimensions, refer to the technical characteristics.

Wiring of AC cable

The installation must be carried out with the equipment disconnected from the grid (power disconnect switch open)

Power-One AC cables from the MICRO-inverters have 3 conductors with different colours to identify the function of each conductor.

Table: Wiring of AC cable

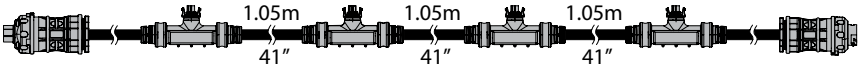


Phase
brown

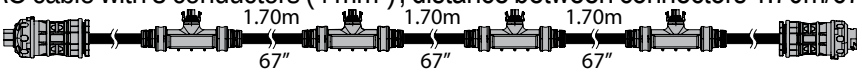
Neutral
blue

Ground
yellow/green

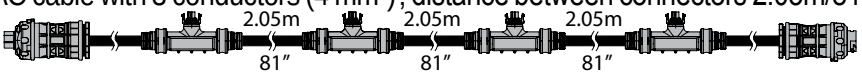
AC-TRUNK-BUS-1,05m-4plugs-3x4mm2
AC cable with 3 conductors (4 mm²); distance between connectors 1.05m/41”



AC-TRUNK-BUS-1,70m-4plugs-3x4mm2
AC cable with 3 conductors (4 mm²) ; distance between connectors 1.70m/67”



AC-TRUNK-BUS-2,05m-4plugs-3x4mm2
AC cable with 3 conductors (4 mm²) ; distance between connectors 2.05m/81”



Pay special attention and ensure you do not reverse the phase with the neutral!
The installation technician is responsible for selecting a junction box with the appropriate dimensions and insulation.

Having made the junction, close the junction box correctly, ensuring that the seal is tight.

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Map of MICRO-inverter installed

▲ To sheet .....

	A	B	C	D	E	F
1						Azimuth: Tilt: Page ... of ...
2						Orientation:  ..... °
3						Affix the detachable label to each field on the map (located on the rear side of the inverter) bearing the serial number of the PVI-MICRO.
4						
5						power-one Renewable Energy Solutions

▲ To sheet .....

◀ To sheet .....

▼ To sheet .....

The map must be printed in A4 or letter format

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6 - Instruments

General conditions

One of the first rules for preventing damage to the equipment and to the operator is to have a thorough knowledge of the INSTRUMENTS. We therefore advise you to read this manual carefully. If you are not sure about anything or there is discrepancy in information, please ask for more detailed information.

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.

Power-One cannot be held responsible for damage to the equipment or the operator if it is the result of incompetence, insufficient qualifications or lack of training.

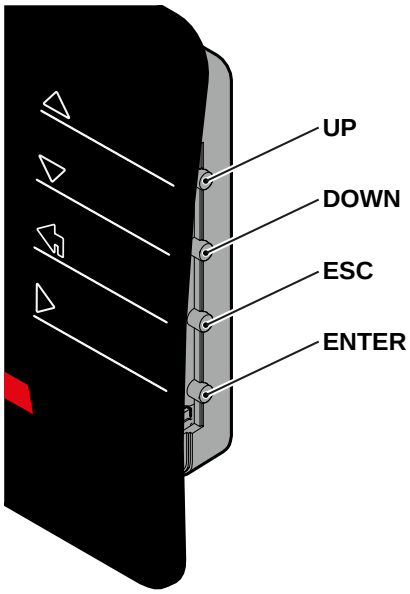
Display and keypad

The ***Power-One*** devices (MICRO-inverters) associated with the CDD are controlled and monitored.

Description of display

The display for the CDD device permits simultaneous monitoring of all the devices associated to it.
During operation, the display behaves dynamically, which allows some information to be displayed cyclically.
The following information can be viewed by navigating in the menu:
• Operating status of each MICRO-inverter and statistics
• Operating status of the connection to the internet/local network
• Alarm messages and fault indicators
The graph view offers user friendly and intuitive use with the option of navigating through the various menus by means of buttons on the side of the CDD.

Description of the keypad



On the right side of CDD device are located 4 buttons to control the various functionalities visualized on the display.

• The **UP** and **DOWN** buttons are used to move around inside a menu or to increase/decrease the settable values.

• The **ESC** button returns the user to the previous sub-menu when navigating.

• The **ENTER** button is pressed to bring the user to the desired submenu or to confirm a entered value/parameter.

• The **UP** and **DOWN** buttons pushed together will open the main menus for STATISTICS, DATA DISPLAY and DEFAULT SETTINGS.

• Pressing any of these buttons during normal operation (when the display reads GENERAL DATA) will open the **screen displaying information on the CDD**.

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7 - Operation

General conditions

Before checking the operation of the equipment, it is necessary to have a thorough knowledge of the INSTRUMENTS chapter and the functions that have been enabled in the installation.
The equipment operates automatically without the aid of an operator; operating state is controlled through the instruments.

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

The incoming voltage must not exceed the maximum values shown in the technical data in order to avoid damaging the equipment.
Consult the technical data for further details.

Even during operation, check that the environmental and logistic conditions are correct (see installation chapter).
Make sure that the said conditions have not changed over time and that the equipment is not exposed to adverse weather conditions and has not been isolated with foreign bodies.

Commissioning

Preliminary checks

• When conducting the checks, ensure that the main AC disconnector (downstream from the system) and any other possible isolator switches are disarmed
• Ensure that all conductors and protective grounding points are connected
• Check the position of all connection cables and the tightness of all nuts and terminals.
• Ensure that all electrical safeguards have been correctly installed

Sequence of operations

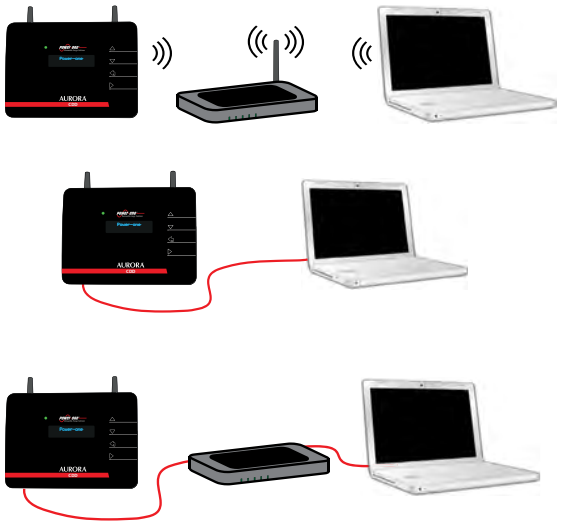
Start up the system as follows:

• Ensure that the MICRO-inverters and photovoltaic modules have been correctly installed

• Arm the main AC disconnector (downstream from the system) and any other possible isolator switches

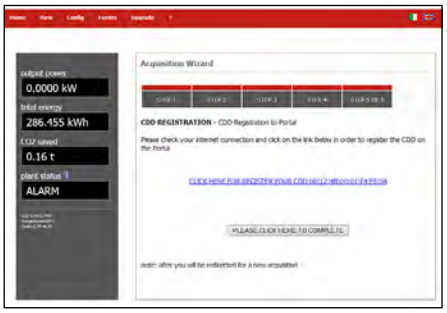
• Select the CDD installation site to carry out WiFi network configuration MICRO inverter acquisition. At this stage, we recommend not securing the CDD to the wall because the final installation position might need to be reevaluated based on the strength of the signal.

• Configuration of the Wi-Fi connection for the CDD device (through the display on the CDD). Alternatively, connect the CDD a computer using the ethernet port.

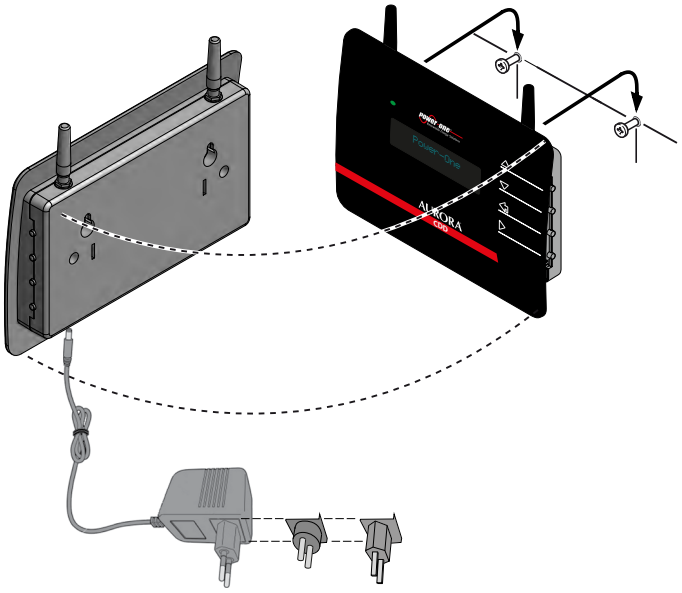


• Association of the MICRO-inverters installed with the CDD device (through the internal web server of the CDD)

• Registering at the *Power-One portal* "***AURORA VISION***"



• Mounting the CDD device onto the wall



The steps to take for configuring the CDD device, acquiring the MICRO-inverters in the system and registering at the "AURORA VISION" portal are described in the corresponding procedures in the manual for the CDD device.

8 - Maintenance

General conditions

Checking and maintenance operations must be carried out by specialized staff assigned to carry out this work.

Maintenance operations must be performed with the apparatus disconnected from the grid (power switch open) and the photovoltaic panels obscured or isolated, unless otherwise indicated.

For cleaning, DO NOT use rags made of filamentary material or corrosive products that may corrode parts of the equipment or generate electrostatic charges.
Avoid temporary repairs. All repairs should be carried out using only genuine spare parts.
The maintenance technician is under an obligation to promptly report any anomalies.

DO NOT allow the equipment to be used if problems of any kind are found, and restore the normal conditions correctly or otherwise make sure that this is done.

Always use the personal protective equipment provided by the employer and comply with the safety conditions of the Accident prevention chapter.

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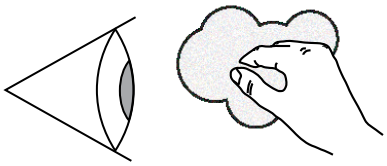
Routine Maintenance

Routine maintenance, although not mandatory, is recommended to maintain efficient operation of the PV installation.

It is recommended that maintenance operations be only performed by qualified personnel or Power-One personnel (under a servicing contract).

The maintenance schedule may vary depending on the environmental conditions of the installation site

Table: routine maintenance

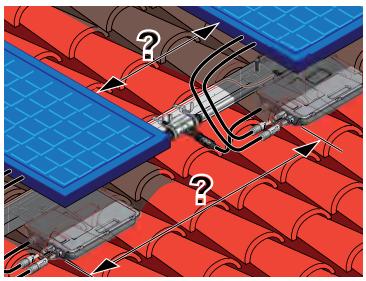
Annual cleaning 	Conduct an annual visual inspection (where possible) on the various components (DC cables, MICRO-inverters and AC cables) to check for dust, dirt, moisture and water seepage. Clean the equipment if necessary. Clean using compressed air, a vacuum cleaner or special brushes, if possible.
Annual operations 	Check that there has been no drastic change in the installation conditions that might have a negative influence on radio communication with the micro-inverters.

Troubleshooting

To understand and address warning (Wxxx) or error (Exxx) messages generated by the MICRO-inverters in the installation and displayed on the CDD display, refer to the table shown in the next section.

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

Do not attempt to dismantle the equipment or make any internal repairs!
With a view to preserving the integrity of their safety and insulation, micro-inverters are not designed to allow internal repairs.
The AC output wiring harness (AC cord) cannot be replaced. If the cord is damaged the equipment should be scrapped



Any maintenance or replacement of the device could require dismounting the photovoltaic module mounted on top of the micro-inverter. This condition must be accounted for during installation, ensuring that the safety distances are correct for normal control and maintenance operations.

Alarm Messages generated by the MICRO-inverter

The equipment is capable of communicating errors/warnings via radio to the associated CDD device.

Any messages received and related codes can be checked on the display for the CDD device.

Alarm Messages	Code displayed	Cause	Solution
Input OC	E001	The error appears when the inverter input current exceeds the set overcurrent threshold. This may be caused by: a) sudden irradiation changes that may generate input current surges into the MICRO inverter b) PV module incompatible with the MICRO-inverter input characteristics c) Faulty MICRO-inverter	a) The error occurs sporadically and no action is required as the MICRO-inverter will automatically reset to normal operation b) It is necessary to verify that the photovoltaic panel specifications are compatible with the inverter. c) If conditions a) and b) have been verified and the error persists, the malfunction may be caused by an internal inverter fault
Vbulk OV	E004	The error is generated when the voltage at the ends of the bulk capacitors exceeds the Over Voltage threshold. This may be caused by: a) Grid voltage too high b) Internal inverter fault	a) Check that the grid voltage is compatible with the MICRO-inverter specifications. In the event of highly abnormal grid voltage, please contact your grid operator to address the problem. b) If no problems are found when checking the grid voltage, the alarm may be caused by internal inverter faults.
Output OC	E006	The error appears when the inverter output current exceeds the internal inverter alarm threshold. This may be caused by: a) High impedance grid with significant voltage variations, even with small loads. b) Internal inverter fault	a) Check that the grid voltage is stable, mainly upon: - loading with high current peak loads. - maximum power generation of the PV system If the grid voltage is unstable, verify the appropriate sizing of the line cable/s, and, if correct, please contact your grid operator to address the problem. b) If no problems are found when checking the grid voltage, the alarm may be caused by internal inverter faults
OverTemp	E014	High internal temperature recorded by the inverter. This parameter depends in part on the power that the inverter must supply, as the internal inverter temperature is affected by the heat dissipated internally by its components. This may be caused by: a) Failure to observe the installation conditions b) Internal inverter fault	a) Verify the installation conditions (exposure to sunlight) and check that air flow to the MICRO inverter is not obstructed, so as to permit cooling of the device. Check that the ambient temperature measured around the MICRO inverter does not exceed the limits set in the technical data. b) Verify the MICRO-inverter temperature readings (see the Internal Web Serversection in the CDD manual). If one of the temperatures remains at a value which is not compatible with the environmental conditions (e.g. -40°C internal temp. reading with 20°C effective ambient temperature), the alarm may be due to internal inverter causes.

Ground fault	E018	The error is generated when a ground leakage current is detected in the DC section of the system. This may be caused by: a) PV module ground leakage b) Internal inverter fault	See the “Verification of ground leakage” and “Measuring the insulation resistance” sections for information on how to perform checks and measurements. a) If the measured insulation resistance value is less than 1KΩ, the PV module has a ground leakage that prevents the grid connection of the inverter. In this case the PV module must be replaced. b) If the measured value exceeds 1KΩ, try connecting the MICRO-inverter to a different PV module. If the error persists, the alarm may be caused by internal inverter faults. To perform this test, the MICRO-inverter Ground Fault condition must be reset via the Web Server.
DC Injection	E023	The error is generated if the DC component of the current supplied to the grid exceeds the threshold set by the country of installation’s applicable regulation. In any case, the inverter will automatically try to reconnect to the grid. This may be caused by: a) Sporadic recurrence of this error is a sign of large grid distortions or sudden changes in irradiation. b) Systematic recurrence of this error may be due to an inverter fault.	a) Verify the grid parameters and, if the grid voltage is strongly distorted, please contact your grid operator to address the problem If the grid voltage is stable, the error may also be due to sudden irradiation variations. In this case, the inverter will automatically try to reconnect to the grid and no actions are required to solve the problem. b) If the grid voltage is stable, yet the error systematically persists, the malfunction may be caused by an internal inverter fault
Internal Error	E024	a) The alarm may occur during inverter initialization and is caused by the initialization of communication between the CDD and the MICRO inverters. b) Systematic occurrence of this error may be due to an inverter fault.	a) The alarm will automatically reset upon connection of the inverter to the grid, and no actions are required to solve the problem. b) If the error systematically persists, the malfunction may be caused by an internal inverter fault
Country Mismatch	E050	The alarm is generated when the grid standard (selected on the CDD during installation) has not been correctly set on the MICRO inverters. This may be caused by: a) communication problems while setting the grid standard for the MICRO-inverter from the CDD: b) poor irradiation while setting the grid standard for the MICRO-inverter from the CDD: MICRO-inverters are directly supplied by the voltage generated at the panel, and poor irradiation may cause inverter shut-downs	a) verify on the Internal Web Server (as described in the CDD manual), the radio communication quality on each MICRO-inverter (values above 60% indicate good reception). If the quality of the received signal is good re-configure the installation, otherwise consider installing the CDD device in a different position to ensure better radio signal quality. b) system configuration must be carried out in good irradiation conditions, in order to guarantee the correct operation of the MICRO-inverter and to prevent the risk of shut-downs due to insufficient input voltage generated by the PV module.
Country Not Comp	E051	The set grid standard is not compatible with the firmware installed on the MICROinverter. This condition may be generated if a MICRO-inverter is replaced.	The firmware in the MICRO-inverter/s in the installation must be updated to a compatible version. Firmware updates are performed via the Internal Web Server (see the CDD manual), with the software package obtained from Power-One Service
Vpanel Problem	W001	This alarm is displayed when the input voltage generated at the PV generator is outside the allowed range given in the technical data. This may be caused by: a) Poor irradiation b) Possible shadows that may darken the module during part of the day. b) PV module incompatible with the MICRO-inverter input parameters d) Internal inverter fault	a) Wait for appropriate irradiation to guarantee correct operation of the inverter b) Verify that no shadows are present on the PV module when the error is generated c) Verify that the PV panel voltage characteristics are compatible with the inverter input specifications. d) If the above checks have yielded positive results, yet the error persists, the malfunction may be caused bythe MICRO-inverter.

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Grid Fail	W003	This alarm is generated when one or more grid parameters lies outside the permitted range set by the country of installation's grid standard. The error code will be followed by a suffix in brackets indicating the grid parameter out of range: (UV) Grid voltage below the set lower limit (OV) Grid voltage above the set upper limit (UF) Grid frequency below the set lower limit (OF) Grid frequency above the set upper limit	If the error is generated only on one of the installation MICRO-inverters, this may be due to an inverter fault. If the alarm is generated at multiple inverters in the installation, check the grid voltage for instabilities in any of the 4 parameters monitored by the inverter. If anomalous values are detected, verify the sizing of the AC line conductors. In case of correct sizing, please contact your grid operator to address the problem.
Vbulk UV	W011	Internal fault of the booster circuit inverter	Contact Power-One Service.
Comm warning	W025	The alarm is generated when the CDD device does not receive messages from the MICRO-inverter for more than 5 minutes. This may be caused by non-optimal positioning of the CDD.	Consider a new installation position that ensures better communication between the CDD device and the MICRO-inverters. Use the CDD Internal Web Server to verify the signal quality (refer to the CDD manual for information on the Internal Web Server)
Comm fault	W005	The alarm is generated when the CDD device does not receive messages from the MICRO-inverter for more than 15 minutes. This may be caused by non-optimal positioning of the CDD.	Consider a new installation position that ensures better communication between the CDD device and the MICRO-inverters. Use the CDD Internal Web Server to verify the signal quality (refer to the CDD manual for information on the Internal Web Server)
Remote Off	E035	The alarm is generated when an external shutdown command has been sent to the MICRO-inverter.	Disable the Remote Off command.

Verification of ground leakage

In the presence of anomalies or report of ground fault, there may be a ground leakage from the photovoltaic module.

To check this, measure the voltage between the positive pole and ground and between the negative pole and ground using a voltmeter.

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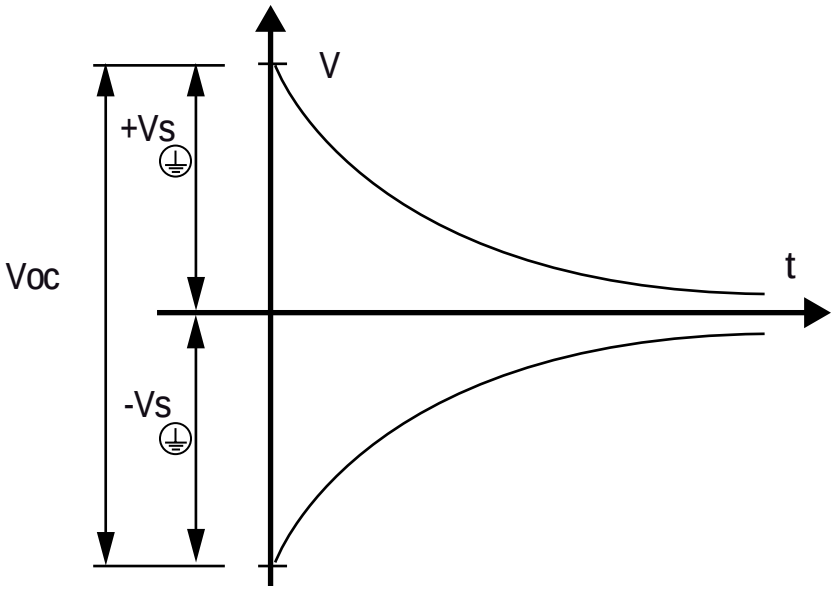
Behaviour of a system without leakage

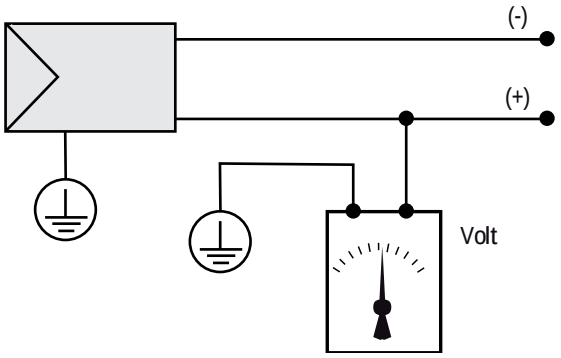
Due to the capacitive effect of the photovoltaic module, during the first moments that the voltmeter is connected between one of the two poles and ground, it will measure a voltage of about Voc/2, which will tend to stabilize to around 0V if there is no ground leakage, as shown in the graph below:

The internal resistance of the voltmeter tends to zero the voltage present on the PV generator due to the capacitive effect.

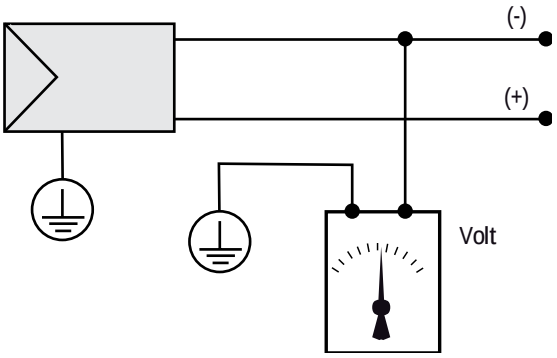


How to make the measurement:

Positive pole Vs Ground



Negative pole Vs Ground



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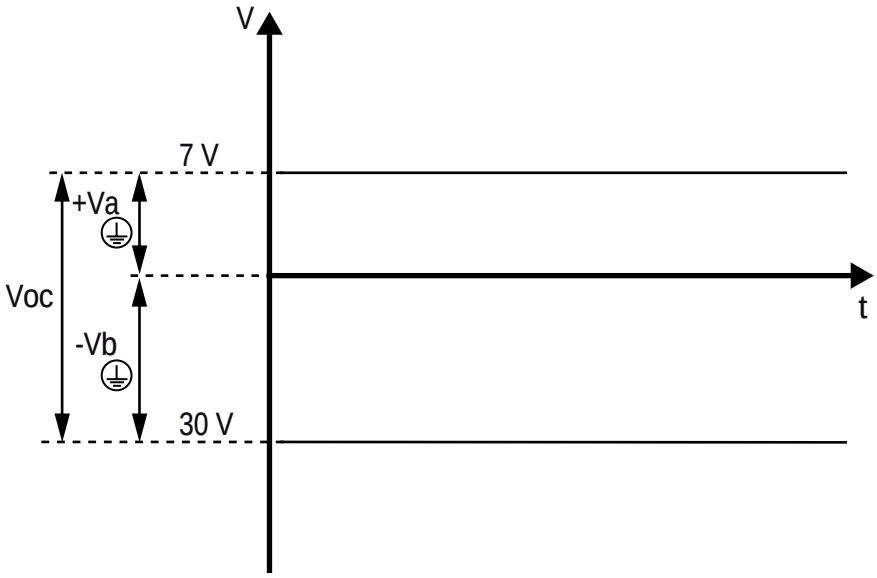
Behaviour of a system with leakage

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 photovoltaic module.

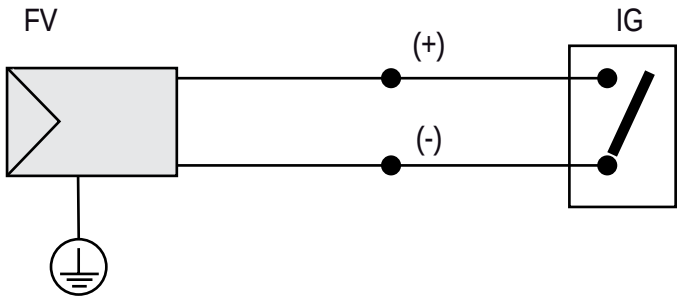
Example: When the measurement is made between positive pole and ground, on a photovoltaic module with Voc=37V, a voltage of 7V is measured.



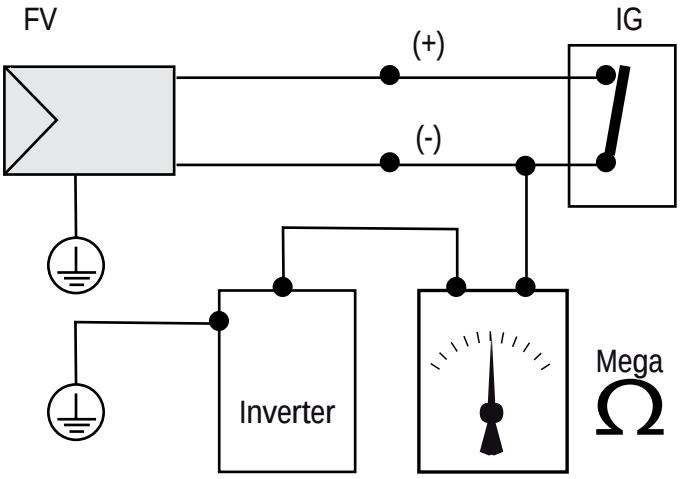
Va = voltage measured between + pole and ⏚ = 7V
Vb = voltage measured between - pole and ⏚ = 30V
In all measurements with ⏚, the ground of the inverter is indicated.

Measuring the insulation resistance of photovoltaic module

To measure the insulation resistance of the photovoltaic module compared to ground ⏚, the two poles of the PV generator must be short-circuited (using a suitably sized switch) and verify that the chassis of the module itself is referred to ground (of the inverter).



Once the short-circuit has been made, measure the insulation resistance (Riso) using a megohmmeter positioned between the two shorted poles and ground (of the inverter).



If the measured insulation resistance is less than 1Kohm the inverter does not connect to the grid due to a low insulation of photovoltaic module respect to ground.

The insulation resistance is affected by the environmental conditions the photovoltic module is in (E.g.: photovoltaic module wet from dump or rain) , and therefore the measurement must be made immediately after the anomaly

Storage and dismantling

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 ***Power-One*** for storage instructions.
The equipment must be stored in well-ventilated indoor areas that do not have characteristics that might 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.

Dismantling, decommissioning and disposal

Power-One CANNOT be held responsible for disposal of the equipment: displays, cables, batteries, accumulators, etc., and therefore the customer must dispose of these substances, which are potentially harmful to the environment, in accordance with the regulations in force in the country of installation.

If the equipment is dismantled, in order to dispose of the products that it is composed of, you must adhere to the regulations in force in the country of destination and in any case avoid causing any kind of pollution.

Dispose of the various types of materials that the parts of the equipment consist of in dumps that are suitable for the purpose.

Table: disposal of components

COMPONENT	MATERIAL OF CONSTRUCTION
Frame, brackets, supports	Arc-welded steel FE37
Casing or covers	ABS, plastic
Paint and	RAL .....
Gaskets and seals	Rubber / Teflon / Viton
Electrical cables	Copper / Rubber
Polyethylene / Nylon	Conduits
Back-up battery	Nickel / Lead/ Lithium

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9 - Enclosed documentation

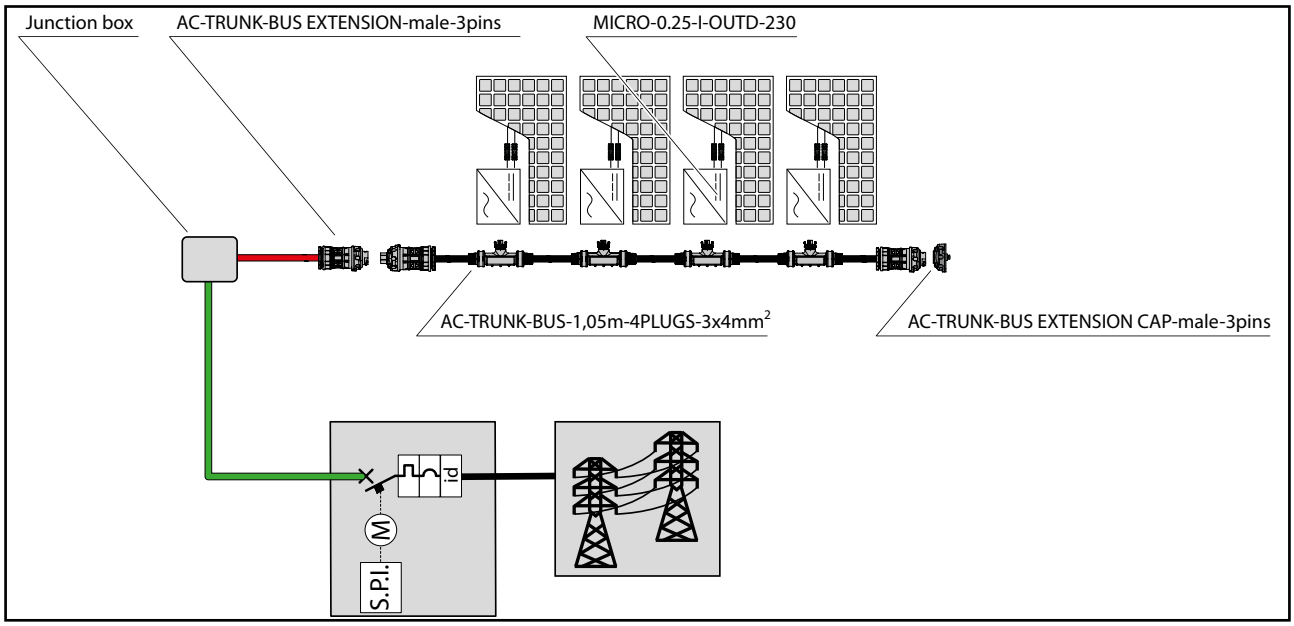
General conditions

This chapter contains supplementary documentation, usually aimed at qualified professionals, that provides or complements the information given in the manual

The instructions given in the manual do not replace the safety instructions and technical data for installation and operation displayed on the product, nor do they replace the safety regulations in force in the country of installation or common sense.
The manufacturer is willing to train staff, at its premises or on site, in accordance with conditions to be set out in the contract.

Installation example 1 and creation of material and accessory lists

1kW installation over a single AC-TRUNK-BUS.



List of the required components for the installation provided by the installer:

Component	Quantity
Interface protection system	1
Magneto-thermal protection circuit breaker (powered in order to serve as interface device)	1
Differential relay	1
Junction box	1
Line and ground cables	/

List of Power-One accessories required for the installation:

Accessory code	Quantity
MICRO-0.25-I-OUTD-230	4
CDD	1
AC-TRUNK-BUS-1,05m-4PLUGS-3x4mm²	1
AC-TRUNK-BUS EXTENSION-male-3PINS	1
AC-TRUNK-EXTENSION CAP-male-3PINS	1
AC-TRUNK UNLOCK TOOL	1

The line sections highlighted in red (provided by the installer) require cables with 3 x 4 mm2 conductors (3x4mm2). The length of the two sections must be as short as possible so as to minimise power loss.

The green highlighted line section (provided by the installer) must be sized following the indications in the section "Choosing the load protection switch (AC disconnect switch) and sizing the line cable".

The sizing of the grounding cable for the MICRO-inverter are described under "Assembly Instructions" in the "Installation" chapter

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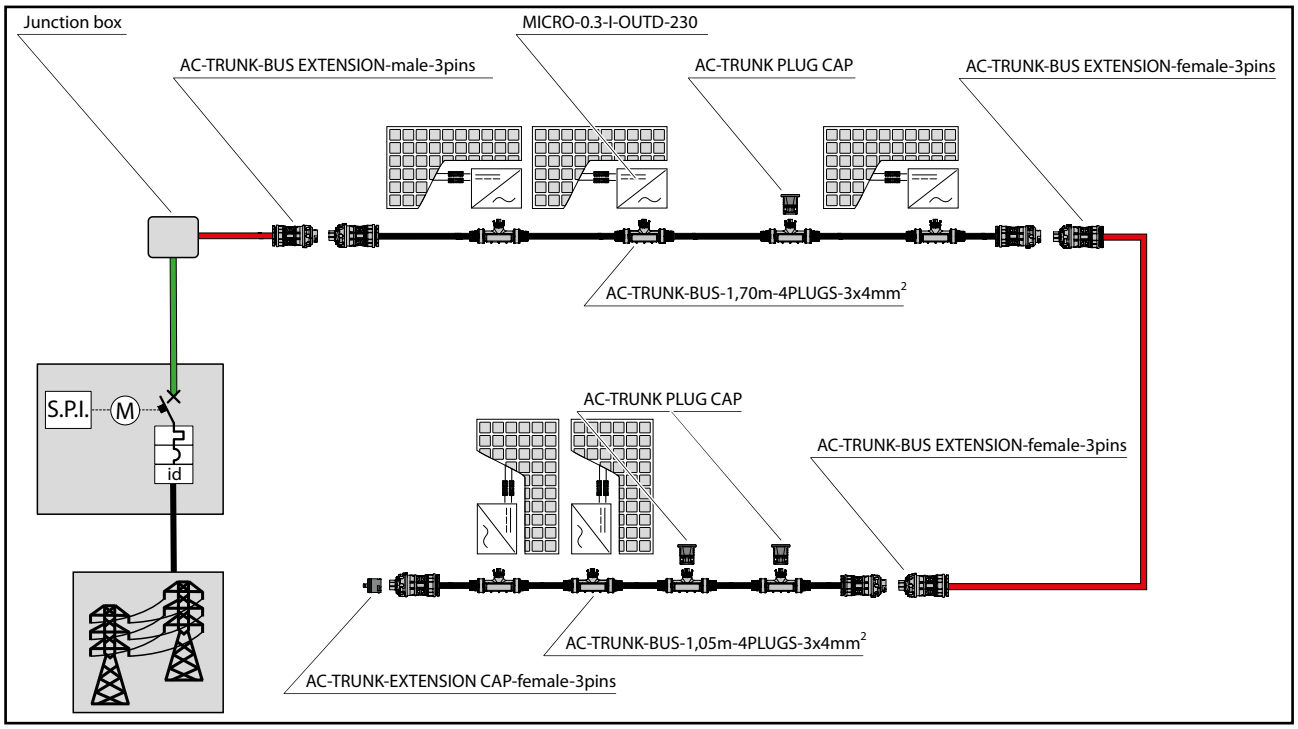
Installation example 2 and creation of material and accessory lists

1.5kW installation over two AC-TRUNK-BUS units connected together via an extension cable to form a single connection line.



List of the required components for the installation provided by the installer:

Component	Quantity
Interface protection system	1
Magneto-thermal protection circuit breaker (powered in order to serve as interface device)	1
Differential relay	1
Junction box	1
Line and ground cables	/

List of Power-One accessories required for the installation:

Accessory code	Quantity
MICRO-0.3-I-OUTD-230	5
CDD	1
AC-TRUNK-BUS-1,05m-4PLUGS-3x4mm²	1
AC-TRUNK-BUS-1,70m-4PLUGS-3x4mm²	1
AC-TRUNK-BUS EXTENSION-male-3PINS	1
AC-TRUNK-BUS EXTENSION-female-3PINS & AC-BUS-EXTENSION UNLOCK TOOL	2
AC-TRUNK-EXTENSION CAP-female-3PINS	1
AC-TRUNK-PLUG CAP	3
AC-TRUNK UNLOCK TOOL	1

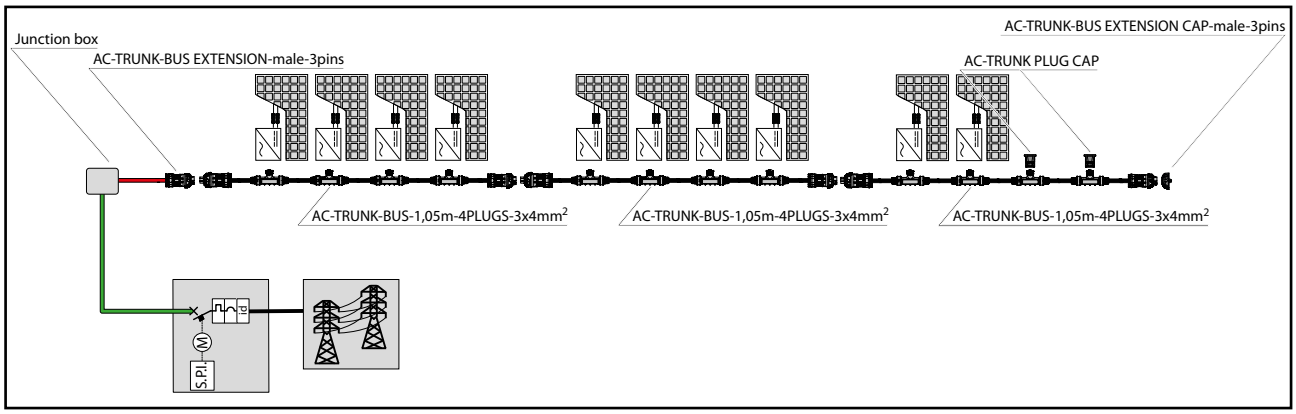
The line sections highlighted in red (provided by the installer) require cables with 3 x 4 mm2 conductors (3x4mm2). The length of the two sections must be as short as possible so as to minimise power loss.

The green highlighted line section (provided by the installer) must be sized following the indications in the section "Choosing the load protection switch (AC disconnect switch) and sizing the line cable".

The sizing of the grounding cable for the MICRO-inverter are described under "Assembly Instructions" in the "Installation" chapter

Installation example 3 and creation of material and accessory lists

3kW installation over 3 AC-TRUNK-BUS units connected together to form a single connection line.



List of the required components for the installation provided by the installer:

Component	Quantity
Interface protection system	1
Magneto-thermal protection circuit breaker (powered in order to serve as interface device)	1
Differential relay	1
Junction box	1
Line and ground cables	/

List of Power-One accessories required for the installation:

Accessory code	Quantity
MICRO-0.3-I-OUTD-230	10
CDD	1
AC-TRUNK-BUS-1,05m-4PLUGS-3x4mm²	3
AC-TRUNK-BUS EXTENSION-male-3PINS	1
AC-TRUNK-EXTENSION CAP-male-3PINS	1
AC-TRUNK-PLUG CAP	2
AC-TRUNK UNLOCK TOOL	1

The line sections highlighted in red (provided by the installer) require cables with 3 x 4 mm2 conductors (3x4mm2). The length of the two sections must be as short as possible so as to minimise power loss.

The green highlighted line section (provided by the installer) must be sized following the indications in the section "Choosing the load protection switch (AC disconnect switch) and sizing the line cable".

The sizing of the grounding cable for the MICRO-inverter are described under "Assembly Instructions" in the "Installation" chapter

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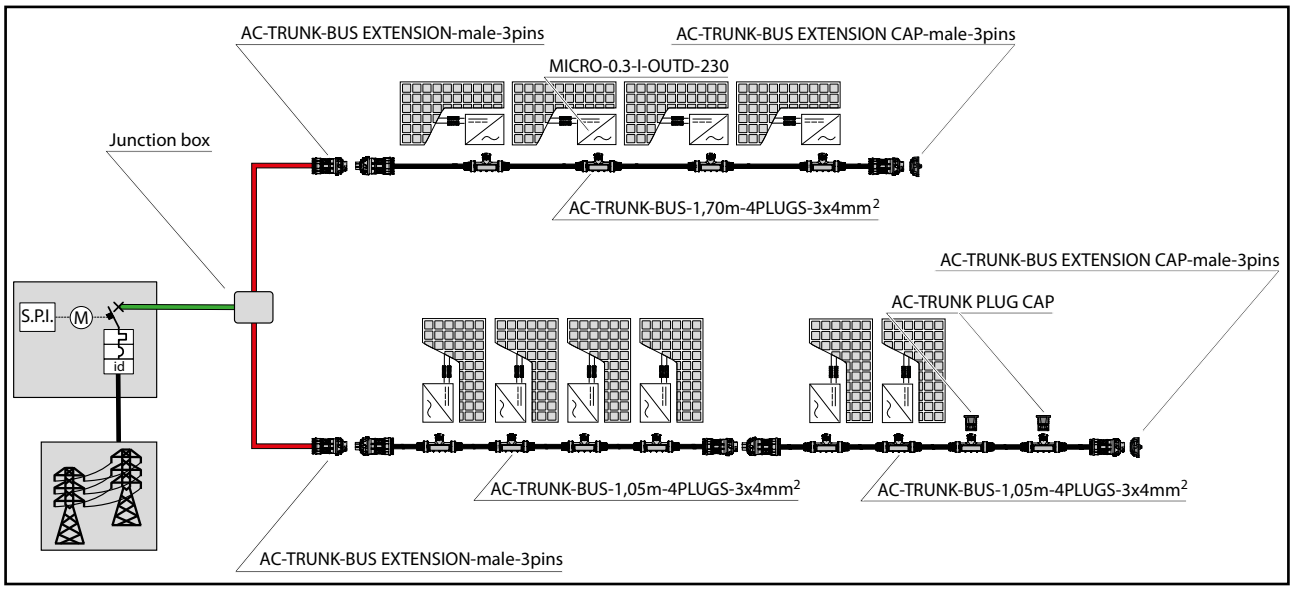
Installation example 4 and creation of material and accessory lists

3kW installation over 2 connection lines. Both lines are protected by devices internal to the AC panel.



List of the required components for the installation provided by the installer:

Component	Quantity
Interface protection system	1
Magneto-thermal protection circuit breaker (powered in order to serve as interface device)	1
Differential relay	1
Junction box	1
Line and ground cables	/

List of Power-One accessories required for the installation:

Accessory code	Quantity
MICRO-0.3-I-OUTD-230	10
CDD	1
AC-TRUNK-BUS-1,05m-4PLUGS-3x4mm²	2
AC-TRUNK-BUS-1,7m-4PLUGS-3x4mm²	1
AC-TRUNK-BUS EXTENSION-male-3PINS	2
AC-TRUNK-EXTENSION CAP-male-3PINS	2
AC-TRUNK-PLUG CAP	2
AC-TRUNK UNLOCK TOOL	1

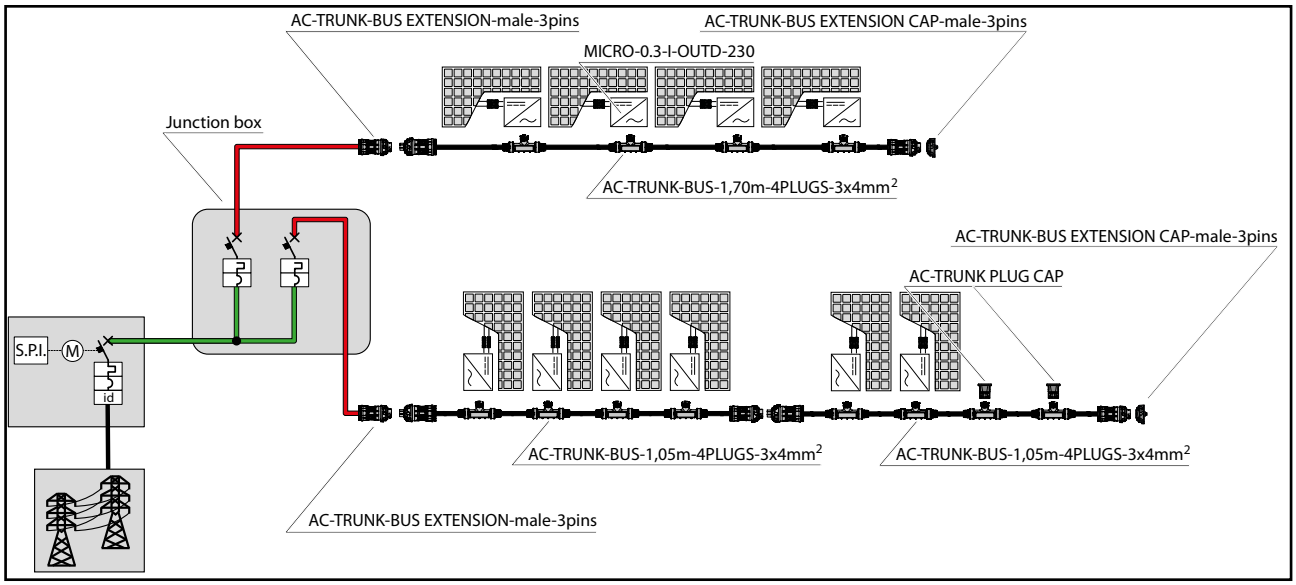
The line sections highlighted in red (provided by the installer) require cables with 3 x 4 mm2 conductors (3x4mm2). The length of the two sections must be as short as possible so as to minimise power loss.

The green highlighted line section (provided by the installer) must be sized following the indications in the section "Choosing the load protection switch (AC disconnect switch) and sizing the line cable".

The sizing of the grounding cable for the MICRO-inverter are described under "Assembly Instructions" in the "Installation" chapter

Installation example 5 and creation of material and accessory lists

3kW installation over 2 connection lines Each line is protected by devices internal to the Junction Box and by an only Interface protection system (devices internal to the AC panel.).



List of the required components for the installation provided by the installer:

Component	Quantity
Interface protection system	1
Magneto-thermal protection circuit breaker (powered in order to serve as interface device)	1
Magneto-thermal protection circuit breaker	2
Differential relay	1
Junction box	1
Line and ground cables	/

List of Power-One accessories required for the installation:

Accessory code	Quantity
MICRO-0.3-I-OUTD-230	10
CDD	1
AC-TRUNK-BUS-1,05m-4PLUGS-3x4mm²	2
AC-TRUNK-BUS-1,7m-4PLUGS-3x4mm²	1
AC-TRUNK-BUS EXTENSION-male-3PINS	2
AC-TRUNK-EXTENSION CAP-male-3PINS	2
AC-TRUNK-PLUG CAP	2
AC-TRUNK UNLOCK TOOL	1

The line sections highlighted in red (provided by the installer) require cables with 3 x 4 mm2 conductors (3x4mm2). The length of the two sections must be as short as possible so as to minimise power loss.

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