RADIUS
String inverters

.... Installation & operation manual

Models : NEO/PVSA/APV-S-XXK-AE-TL-XMSFXXXX

RISHABH

Rishabh Manufacturing Unit
Rishabh Instruments Ltd.
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NASHIK, NASIK, MAHARASHTRA, India - 422007

Please read the safety instructions carefully before using the product. Keep the manual in a safe place and make sure it is available to engineering and installation personnel throughout the product's service life.

Rishabh Instruments Ltd has the right to modify products, data and dimensions without notice.

The data can only be used for the product description and they can not be understood as legally stated pr--operties.

Thank you for choosing this Radius product.
Please send any information that could help us improve this manual to the following address:
inverters@rishabh.co.in

Contents

1. How to use this manual

1.1 Validity

This manual describes the assembly, installation, commissioning and maintenance of the following RADIUS Industrial Inverters :

NEO/PVSA/APV-S-03K-AE-TL-1/2M..	NEO/PVSA/APV-S-04K-AE-TL-1/2M..	NEO/PVSA/APV-S-05K-AE-TL-1/2M..
NEO/PVSA/APV-S-06K-AE-TL-1/2M	NEO/PVSA/APV-S-07K-AE-TL-1/2M..	NEO/PVSA/APV-S-08K-AE-TL-1/2M..
NEO/PVSA/APV-S-09K-AE-TL-1/2M	NEO/PVSA/APV-S-10K-AE-TL-1/2M..	NEO/PVSA/APV-S-11K-AE-TL-1/2M..
NEO/PVSA/APV-S-12K-AE-TL-1/2M..	NEO/PVSA/APV-S-15K-AE-TL-2M..	NEO/PVSA/APV-S-18K-AE-TL-2M..
NEO/PVSA/APV-S-20K-AE-TL-2M..		

1.2 Target Group

Qualified personnel means people who have received training and have proven skills and knowledge of the skills construction and operation of this device.

Qualified personnel are trained to deal with the danger and hazards involved in installing electric devices.

Additional information

Further information on specific topics contact.

1.3 Firmware version

This manual applies to FW version V1.0X.0X.0X

The sw uses FreeRTOS™ (www.freertos.org).

1.4 Documentation and declaration of conformity

This technical documentation describes the procedures that must be followed in order to ensure safety during the transportation, installation, use and maintenance of the electrical equipment to which the manual refers. Store this manual so that it can be referred to whenever necessary.

Manufacturer declares that the equipment is designed to conform the current law in the country of installation & that the declaration of conformity can be consulted or requested from Radius - solar service personnel.

Inverter is designed to conform the below mentioned applicable standards :

Grid code	EN 50549-PL	VDE 0126 2006	SAGC Cat B
	EN 50549-1/2019	VDE 0126 A1/2012	SAGC Cat C
	EN 50438/2014	RD 661/2007	NRS 097-2-1
	India	IEC 61727/2004	UTEC C15-712
	India-Kerala	CEI 016	UK G83
	CEI 021	SAGC Cat A1-A2	UK G59/3 LV sys
	VDE 4105	SAGC Cat A3	UK G59/3 HV sys
Photovoltaic (PV) systems. Characteristics of the utility interface.	IEC 61727: 2004		
Electromagnetic Compatibility (EMC)	EN 61000-6-2/-3		
Procedure for measuring efficiency.	IEC 61683		
Environmental testing	IEC 60068-2-1, 60068-2-2, 60068-2-14, 60068-2-30		
Anti islanding	IEC 62116: 2008		
Safety of power converters for use in photovoltaic power systems	IEC 62109-1, 62109-2		

Note! Available certifications can be availed at Radius Solar Worldwide.

In case of any problem, you can email us at: inverters@rishabh.co.in

2. Safety Precautions

2.1 Symbols used in the manual

Warning!

Indicates a procedure, condition, or statement that, if not strictly observed, could result in personal injury or death.

Caution

Indicates a procedure, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

Indicates that the presence of electrostatic discharge could damage the appliance. When handling the boards, always wear a grounded bracelet.

Attention

Indicates a procedure, condition, or statement that should be strictly followed in order to optimize these ap - plications.

Note ! **Indicates an essential or important procedure, condition, or statement.**

2.2 Symbols used on outside labels

	Indicates that you must read the manual before doing any work.
	Indicates absence of the isolation transformer.
	Indicates risk of electrocution due to high voltage. All work on the inverter must be done ONLY by trained technicians.
 Warning Multiple power supply	Indicates risk of electric shock. Machine equipped with multiple power supply(DC and AC). Before doing any work, check that both the DC and the AC power supply have been disconnected.
 Warning Hot surface	Indicates risk of burning due to very hot surfaces. Before doing anywork, let the unit cool sufficiently ; wear personal protective equipment (for example, gloves).
  10 minutes	Indicates risk of electric shock. Before doing any work, allow all stored energy to drain for at least 10 minutes.

2.3 General warnings and safety information

Please read these instructions carefully in order to ensure your personal safety and that of others and to pro long the service life of this product and of the plant connected to it.


Caution

Operators must be instructed or skilled persons. They must have read and fully understood the operating instructions contained in this manual and those relating to the machine before having access to equipment controls. Persons who are not skilled or instructed must not be allowed to use the equipment.

The term "specially trained and competent" operator refers to the person responsible for installing and transporting the electrical equipment.

According to standard CEI EN 60204-1:

A skilled person: is a person with technical knowledge or sufficient experience to be able to avoid the dangers which electricity may create.

An instructed person: is a person adequately advised or supervised by skilled persons to be able to avoid the dangers which electricity may create(e.g.maintenance operators).

Safety Instructions


Warning!

All maintenance operations carried out on live equipment can involve serious risks. These operations must be carried out by skilled persons who are fully aware of the risks and provided with all the appropriate personal protective equipment and suitable tools.

To remove all dangerous voltage from inside the panel, disconnect all the external power connections (AC side, DC side and auxiliary voltage) and make sure these cannot be reconnected inadvertently (put up a work in progress sign).

Energy stored in the equipment's DC link capacitors can be an electric shock hazard. Even after the unit is disconnected from the grid and photovoltaic panels, there may still be high voltages in the inverter.
Do not remove the casing (terminal side) until at least 10 minutes after disconnecting all power sources.

Follow all the safety instructions in this manual.

Make sure all power supplies have been disconnected before touching any parts.

Do not modify circuits or software programs or make adjustments without the manufacturer's prior consent.
Any such modifications could pose a risk for persons or equipment.

Failure to comply with the manufacturerís instructions when using the inverter could undermine safety.

The installer is responsible for choosing the most appropriate residual current-operated circuit breaker according to the characteristics of the PV plant.


Caution

Danger of burn injuries due to hot enclosure parts!

- **Some parts of the equipment may become very hot during operation. DO NOT touch the heat sink while the inverter is working.**

Grounding the PV generator

- Comply with local requirements for grounding the PV modules and the PV generator.
- We recommend connecting the generator frame and other electrically conductive surfaces in a manner which ensures continuous conduction and grounding these in order to achieve maximum protection of the system and personnel.

2.4 Intended or permitted purpose

This device is a multistring inverter designed to:

convert direct current(DC) from a PVgenerator into alternating current(AC) suitable for connection to a 3-phase public grid.

Limits of use:

- The inverter can be used only with PV modules that do not require grounding of one of the poles.
- For PV modules that require grounding of one of the poles,use the dedicated version of the product (-P/-N depending on the grounded pole) and an external transformer (as described in the specific addendum).
- Only a PV generator can be connected to the inverter in input (DONOT connect batteries or other power sources).
- The inverter can be connected to the grid only in qualified countries.
- The inverter can be used only by respecting all of the technical characteristics.

Use the equipment ONLY for its INTENDED OR PERMITTED PURPOSE. If you need any explanations, please contact Radius Solar Service.

2.5 Improper or prohibited use

NEVER:

- Install the equipment in potentially flammable/explosive environments or in environments with adverse or prohibited conditions (temperature and humidity).
- Use the equipment with defective or disabled safety devices.
- Use the equipment or parts of the equipment by connecting it to other machines or devices (unless specifically permitted).
- Modify work parameters not accessible to the operator and/or any parts of the equipment to change its performance or insulations.
- Parallel the same string among two or more MPPTs or inverters

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3. Description/Overview of the RADIUS inverter

3.1 Introduction

The Radius model inverter is a multi string inverter designed to convert direct current (DC) from a PV generator into alternating current(AC) suitable for connection to a 3-phase public grid.

At the application level, the range of string inverters consists of main product line:

- NEO/PVSA/APV-S models

This is very extensive and flexible, intended mainly for photovoltaic roof arrays with complex tracking and irradiation features. For more information and advice on the ideal configuration for your PV plant, please contact manufacturer's pre sales service.

The main product line offers the following power levels:

AC Power	Models
03 kW	NEO/PVSA/APV-S-03K-AE-TL-1/2MSFXXXX
04 kW	NEO/PVSA/APV-S-04K-AE-TL-1/2MSFXXXX
05kW	NEO/PVSA/APV-S-05K-AE-TL-1/2MSFXXXX
06kW	NEO/PVSA/APV-S-06K-AE-TL-1/2MSFXXXX
07 kW	NEO/PVSA/APV-S-07K-AE-TL-1/2MSFXXXX
08 kW	NEO/PVSA/APV-S-08K-AE-TL-1/2MSFXXXX
09 kW	NEO/PVSA/APV-S-09K-AE-TL-1/2MSFXXXX
10 kW	NEO/PVSA/APV-S-10K-AE-TL-1/2MSFXXXX
11 kW	NEO/PVSA/APV-S-11K-AE-TL-1/2MSFXXXX
12 kW	NEO/PVSA/APV-S-12K-AE-TL-1/2MSFXXXX
15 kW	NEO/PVSA/APV-S-15K-AE-TL-2MSFXXXX
18 kW	NEO/PVSA/APV-S-18K-AE-TL-2MSFXXXX
20 kW	NEO/PVSA/APV-S-20K-AE-TL-2MSFXXXX

Depending on the model, the Radius inverters can have 1 or 2 MPPTs.

3.2 Appearance Overview

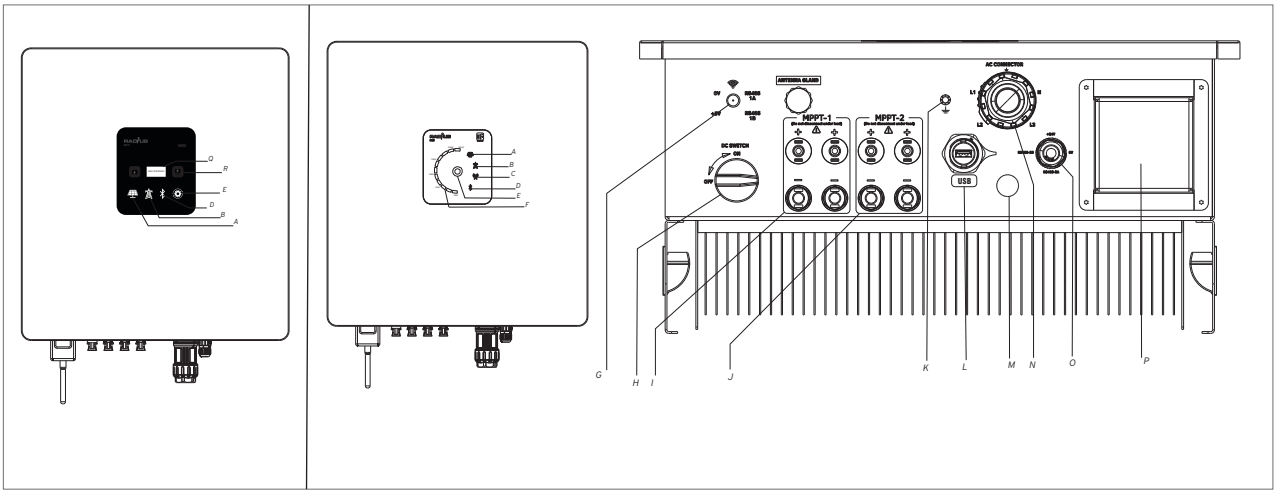

Figure 1 :Overview - NEO/PVSA/APV-S

NEO/PVSA/APV-S-XXK-AE-TL-XX

The details of the appearance overview is as follows:

Designator	Description
A	PV status: Green: Indicates PV voltage is healthy
B	Grid Status: Green: Indicates Grid voltage is healthy
C	Remote Monitoring Status: Green: Indicates device is communicating
D	Bluetooth Connection Status: Green: Indicates bluetooth is connected

Designator	Description
E	Inverter status: Stable Green: Indicates Inverter is feeding power into the grid Flashing Yellow: Indicates Inverter is in a warning state Blue: Indicates Inverter is in a initializing state Red: Indicates Inverter is in an Alarm state
F	Bar graph: Filled Green: Indicates the power level being fed in to the grid
G	WiFI/GPRS/4G Connection port
H	DC Switch
I	DC Connection port for MPPT1
J	DC Connection port for MPPT2
K	PE Terminal - Housing/ M5 Stud
L	Type B USB port
M	Protective Vent
N	5 Pole (L,L2,L3,N,E) Circular AC connection Port
O	Communication(RS485)/Sensor port
P	Type II: AC SPD Box.
Q	OLED Display
R	Touch Key

3.3 Block diagram of the inverter

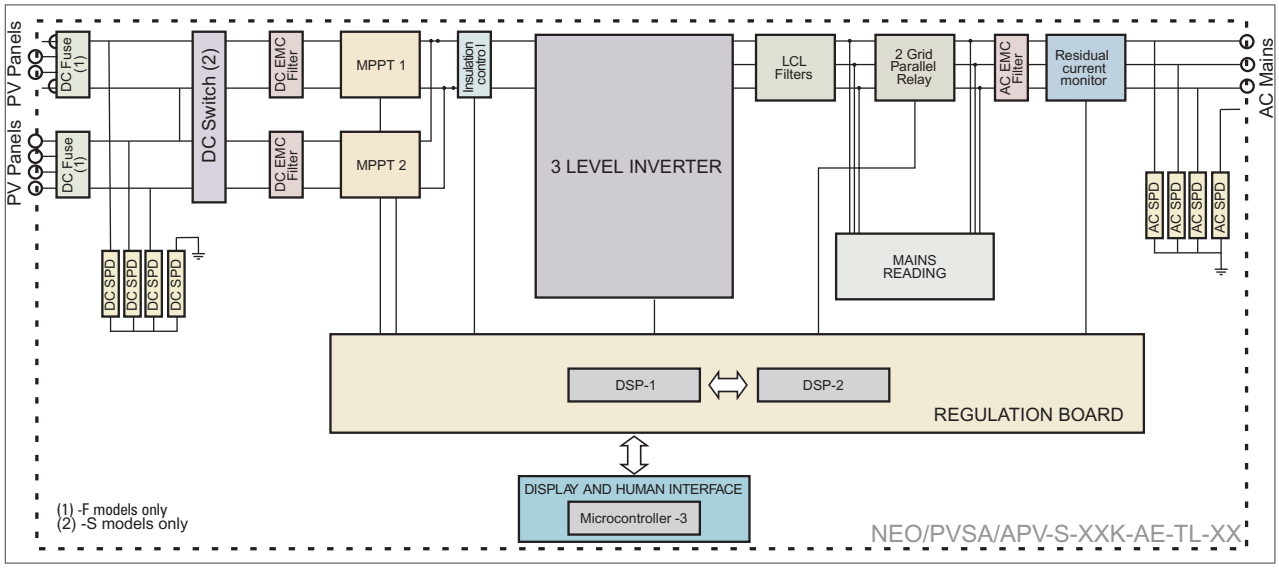

Figure 2 : Block diagrams - NEO/PVSA/APV-S

Note! **The unit is equipped with an circuit breaker conforming to the safety requirements specified in VDE0126-1-1.**

The block diagram are shown for 20kW model. See section 11 for the number of strings for each MPPT channel and the number of MPPTs for each model.

3.4 Device identification

3.4.1 Data plate

The data plate with details of the specific model is attached to the left side of the inverter.

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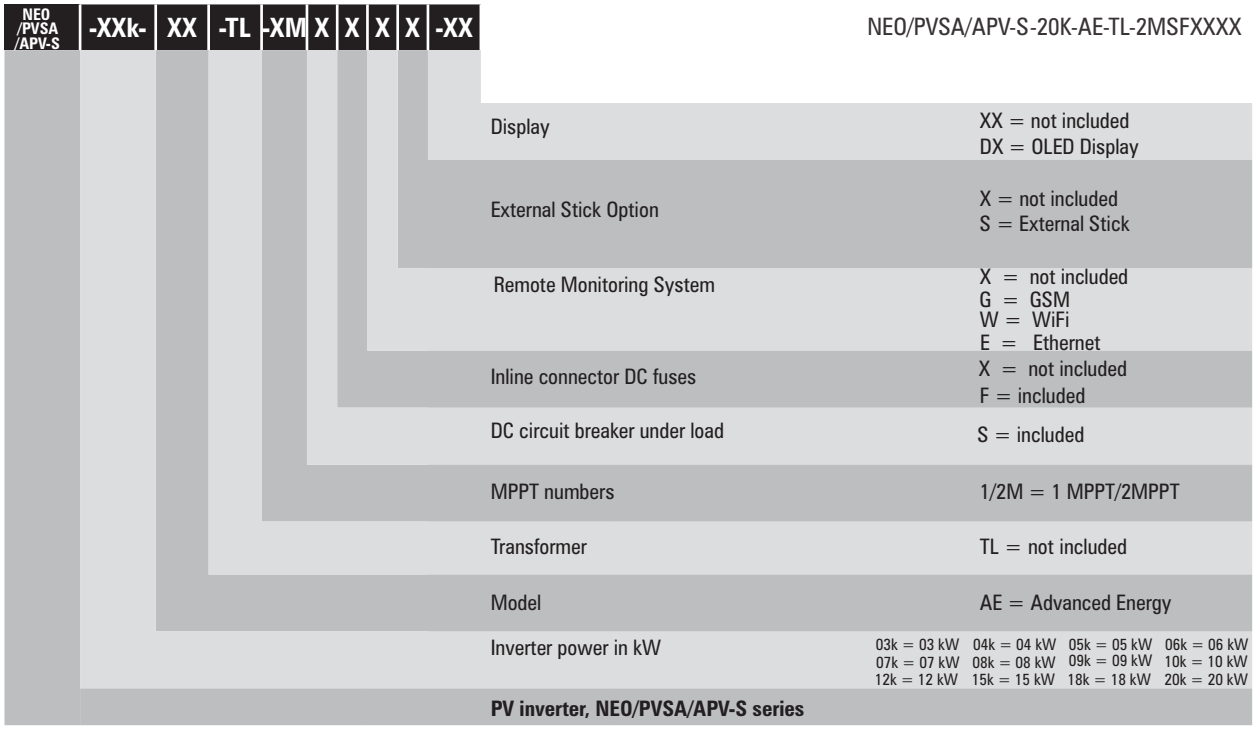
Model Name	NEO/PVSA/APV-S-20K-AE-TL-2MSFXXXX
Version	01.03.02.02
U DC max	1100V
I DC max	2*25A
Isc max	2*32A
U DC range	175-950V
V AC nom	3/N/PE 239V/415V
f AC nom	50/60Hz
P AC nom/max	22kW/22kVA
Power factor	0.8 cap. - 0.8 ind.
I AC nom	27.8Arms
I AC max	32.0Arms
Protection Degree	Ip66
Protection Class	1
Ambient Temperature	-25°C..... +60°C

BRAND NAME : Rishabh RADIUS
PART NUMBER : RNEO-020K2MTFBGXXX
SERIAL NUMBER: RI-2210000001 CE

3.4.2 Model identification (Type)



4. Transportation – Handling - Storage

Caution

All transportation, handling and storage operations must only be performed by specially trained and competent operators.

4.1 Handling packed equipment

The equipment can easily be transported using a lift truck, or fork crane with adequate load capacity,

Dimensions and weights are specified in chapter "12.Dimensions and weight" .

Correct methods of transportation, storage, installation and assembly, as well as appropriate use and mainted nance, are essential for ensuring the proper and safe operation of this equipment.

Protect the equipment against shocks and vibrations during transportation.

Make sure it is also protected against water(rain),humidity and extreme temperatures.

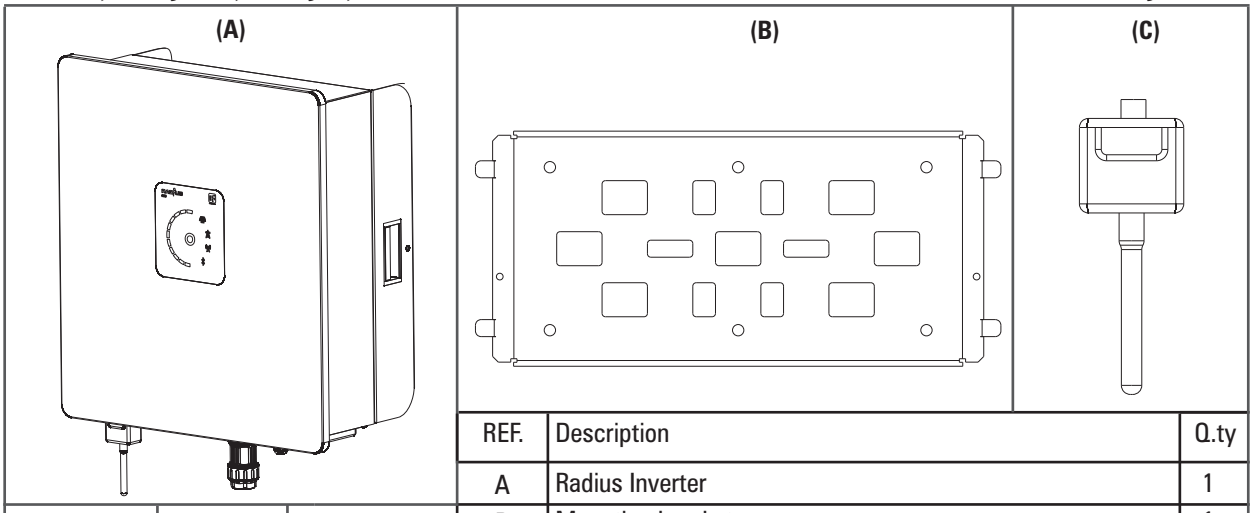
4.2 Packaging and unpacking

The packaging consists of a 7 Ply corrugated box placed over wooden pallet. The inverter is protected from external impact by placing foam protectors around the inverter .Corrugated box dimensions for 3-20kW model are: 618X536 X310 mm.

Note ! **These materials must be disposed of in accordance with local regulations.**

As soon as the equipment is delivered check that:

- there is no visible damage to packaging,
- the details in the delivery note correspond to the order.
- after opening the package, please check the contents of the box. It should contain the following:



REF.	Description	Q.ty
A	Radius Inverter	1
B	Mounting bracket	1
C	Wifi/GSM Dongle	1
D	Mc4 Connectors (Male & Female) - Cable End	4
E	AC 5P Connector - Cable End	1
F	EP Series 4pin Female Cable End	1

Figure 3 : Packaging contents - 3- 20kW model

Open the packaging carefully and make sure that:

- no parts of the equipment have been damaged during transportation,
- the equipment is that actually ordered.

Please notify the local sales office if you notice any damage or if the equipment supplied is incomplete or not what was ordered.

Open the box and remove the accessories as well. Now proceed as described below.

Removal of the inverter from the box can be carried out as shown in the figure. Using hands on the given on right and left bracket and using bottom stand the inverter can be taken out of the box.

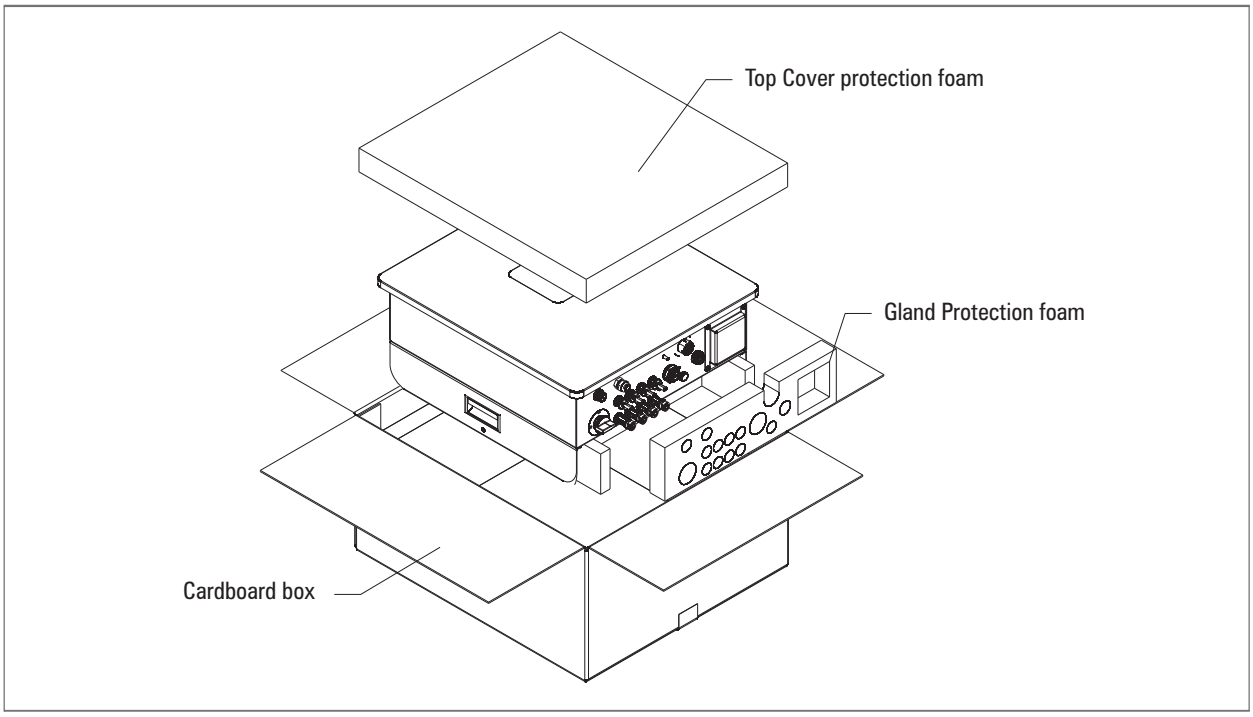


Figure 4 : Exploded view of Inverter Packing

4.3 Storage

This equipment must be stored in a dry place within the specified temperature range,see chąpter "11. Specifications

4	If the crate is stored correctly it can be stacked for a maximum of 3 crates. Do not stack other products or materials on top of it.

Caution

Changes in temperature may lead to the formation of condensation inside the equipment. This is acceptable in certain conditions but not when the equipment is in use. Therefore it is always important to ensure that there is no condensa--tion in the equipment before connecting it to the power supply!

4.4 Disposal of the device

This inverer can be disposed of as an electronics waste according to national regulation in force for the disposal of electronic components.

5. Installation

5.1 Safety instructions

Warning!

A) Do not remove the upper casing. The inverter contains no user-service able parts. All servicing must be performed by qualified service personnel. All wiring and electrical installation should be performed by qualified service personnel and must meet national requirements.

B) Both AC and DC voltage sources are terminated inside the inverter. Please disconnect these circuits before servicing.

C) When a photovoltaic panel is exposed to light, it generates a DC voltage. When connected to this equipment, a photovoltaic panel will charge the DC link capacitors.

D) Energy stored in the equipment's DC link capacitors can be an electric shock hazard. Even after the unit is disconnected from the grid and photovoltaic panels, there may still be high voltages in the inverter.
Do not remove the casing (terminal side) until at least 10 minutes after disconnecting all power sources.

E) This unit is designed to feed power to the public power grid (utility) only. Do not connect this unit to an AC source or generator. Connecting the inverter to external devices could result in serious damage to your equipment.

F) Although designed to meet all safety requirements, some parts and surfaces of the inverter are still hot during operation. To reduce the risk of injury, do not touch the heat sink at the back of the inverter or near by surfaces while the inverter is operating.

5.2 Selecting the Installation site

Warning!

- Do not install the inverter on structures made of flammable or thermolabile materials.
- The mounting location and method must be suitable for the weight and dimensions of the inverter. Choose a wall or solid vertical surface that can support the inverter.
- DO NOT install the inverter in locations at risk of explosion or near easily inflammable materials.

Caution

- Never install the inverter in an environment with little or no air flow or in a dusty environment. This could under mine the effciency of the inverter.
- Radius inverter are suitable for installations in outdoor and wet locations, however avoid installing the inverter in location under extreme wetness and avoid direct exposure to sunlight.
- Mount on a solid surface, the mounting location must be accessible at all times.
- Mount the inverter in a vertical position or with a maximum backward tilt of 15°°. The connection area must point downwards. Never install the device with a sideways tilt. Do not install horizontally. (See figure below).

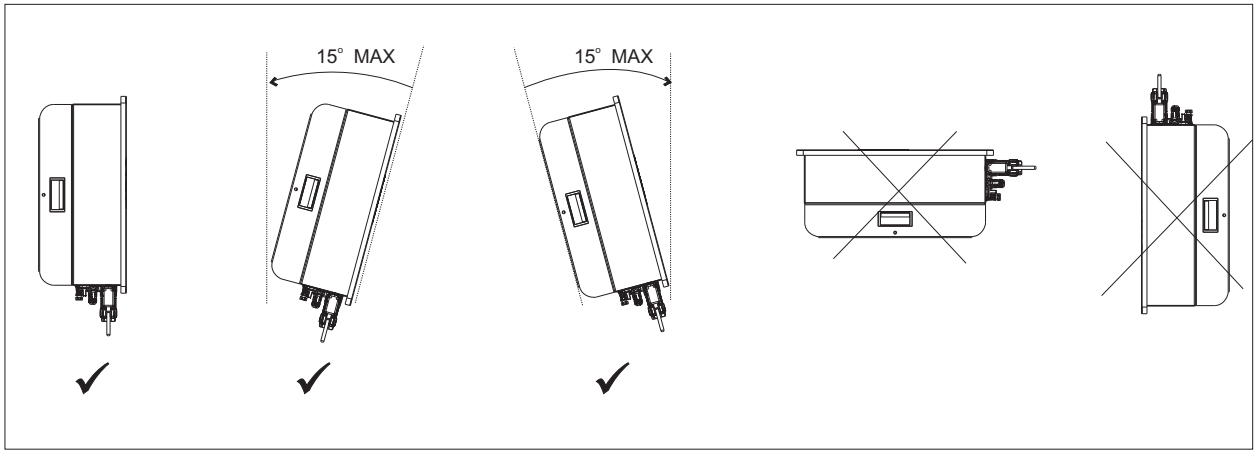


Figure 5 : Installation warning

- The ambient temperature should be -25 ... +50°C to ensure optimal operation. Temp derating curves on pg. 54.
- Do not expose the inverter to direct sunlight to avoid any reduction in power due to excessive heating.
- Do not install the inverter in living areas, the noise caused by the machine could affect daily life.

- Be careful not to obstruct the slits or the equipment cooling systems.
- DO NOT place anything on the inverter while it is working.

5.3 Mounting

The inverters must be positioned so as to ensure free movement of ventilation air around them and facilitate wiring and maintenance operations.

- Maximum permissible inclination : 15°with respect to the vertical
- Minimum upper and lower distance : 400 mm and 620 mm
- Minimum distance between inverters : 500 mm

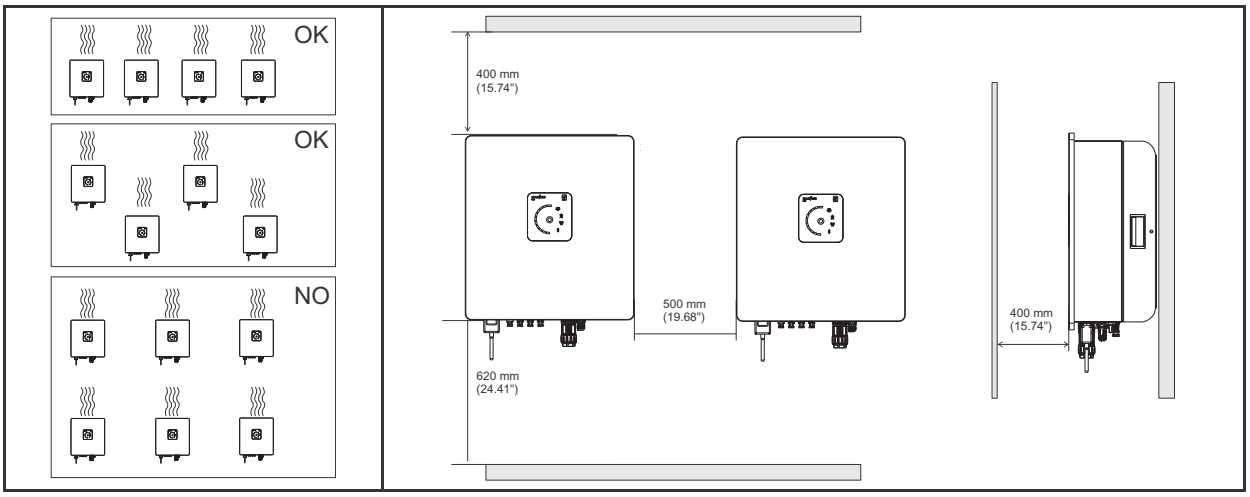


Figure 6 : Free movement of ventilation air and Minimum distances

5.3.1 Mounting the device on a wall

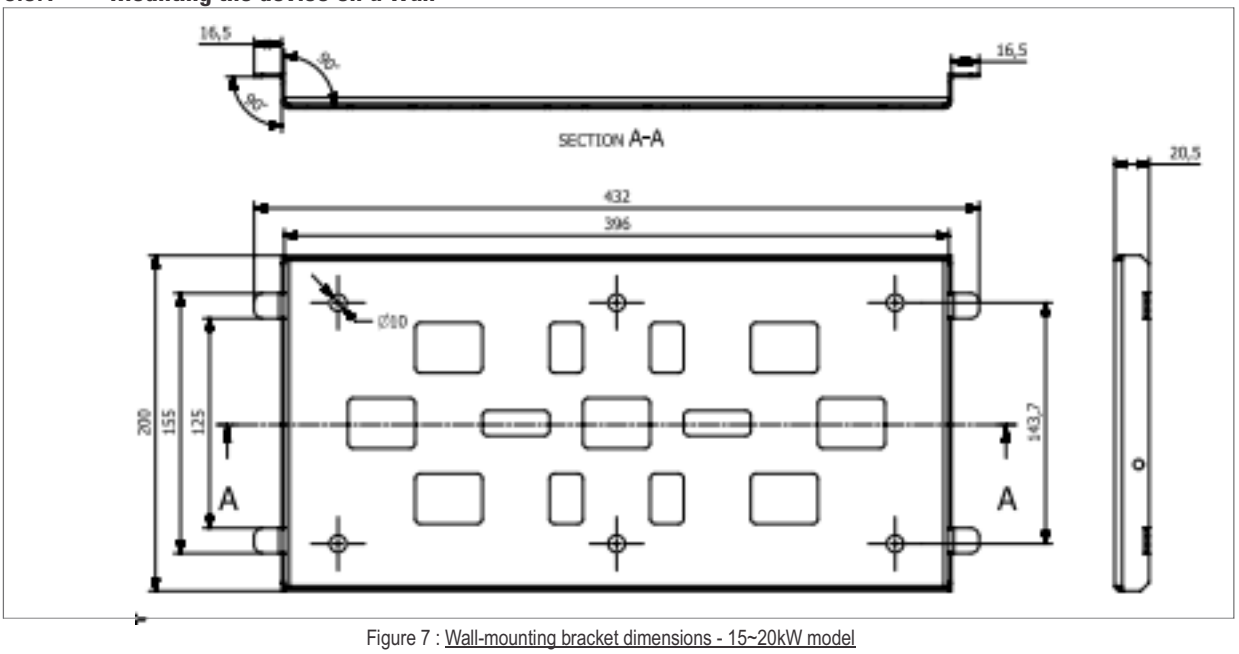


Figure 7 : Wall-mounting bracket dimensions - 15~20kW model

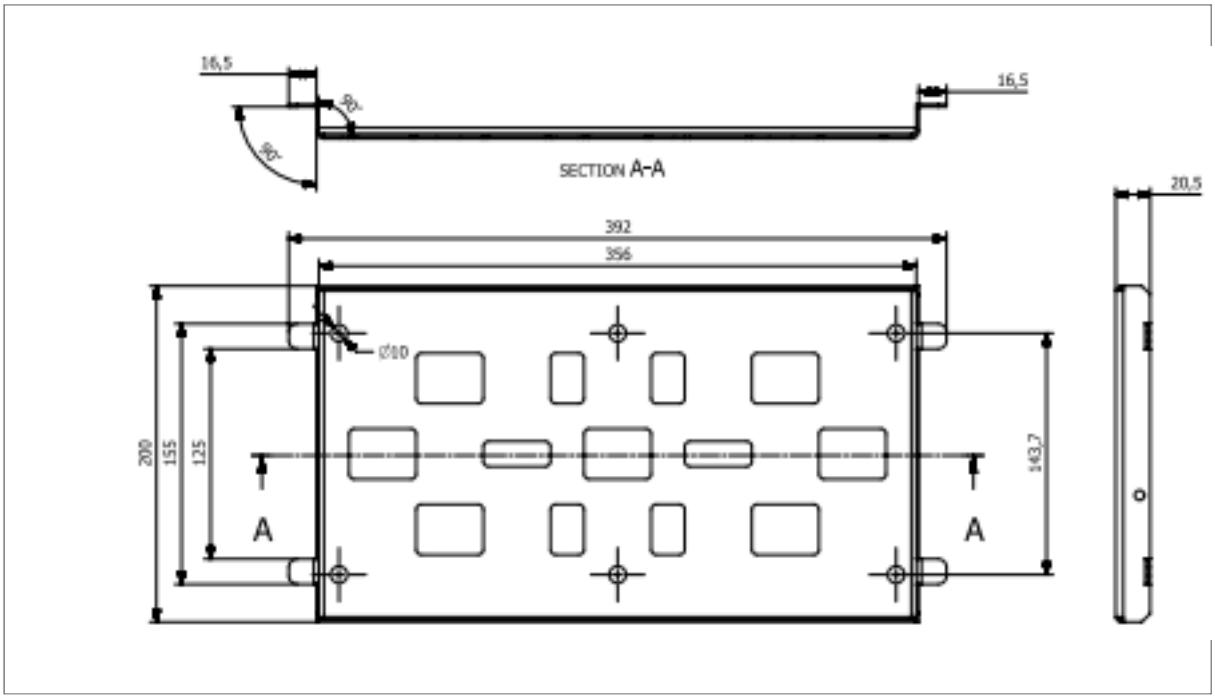


Figure 8 : Wall-mounting bracket dimensions (3-12kW) models

(1) Use the mounting bracket as a template or use the cardboard template which is supplied with the inverter, ensure it is positioned horizontally. Drill 6 holes in the wall in correspondence with the holes on the bracket shown in the figure. Attach the bracket to the wall with 6, M10 screws (not supplied).

Caution

The size of the holes depends on the wall material and the anchorage system used(e.g. expansion plugs).

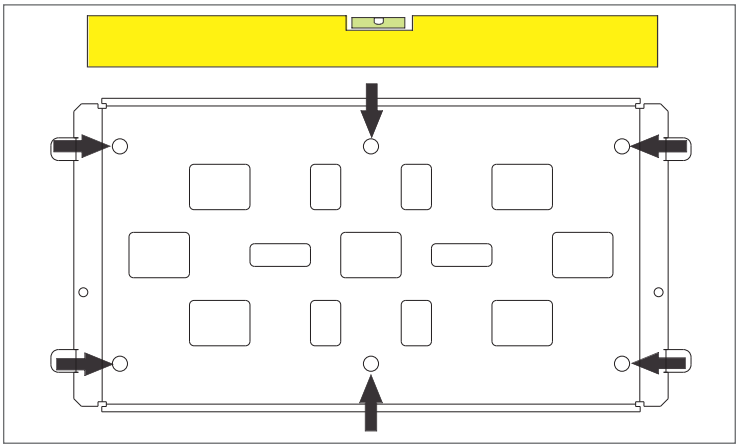


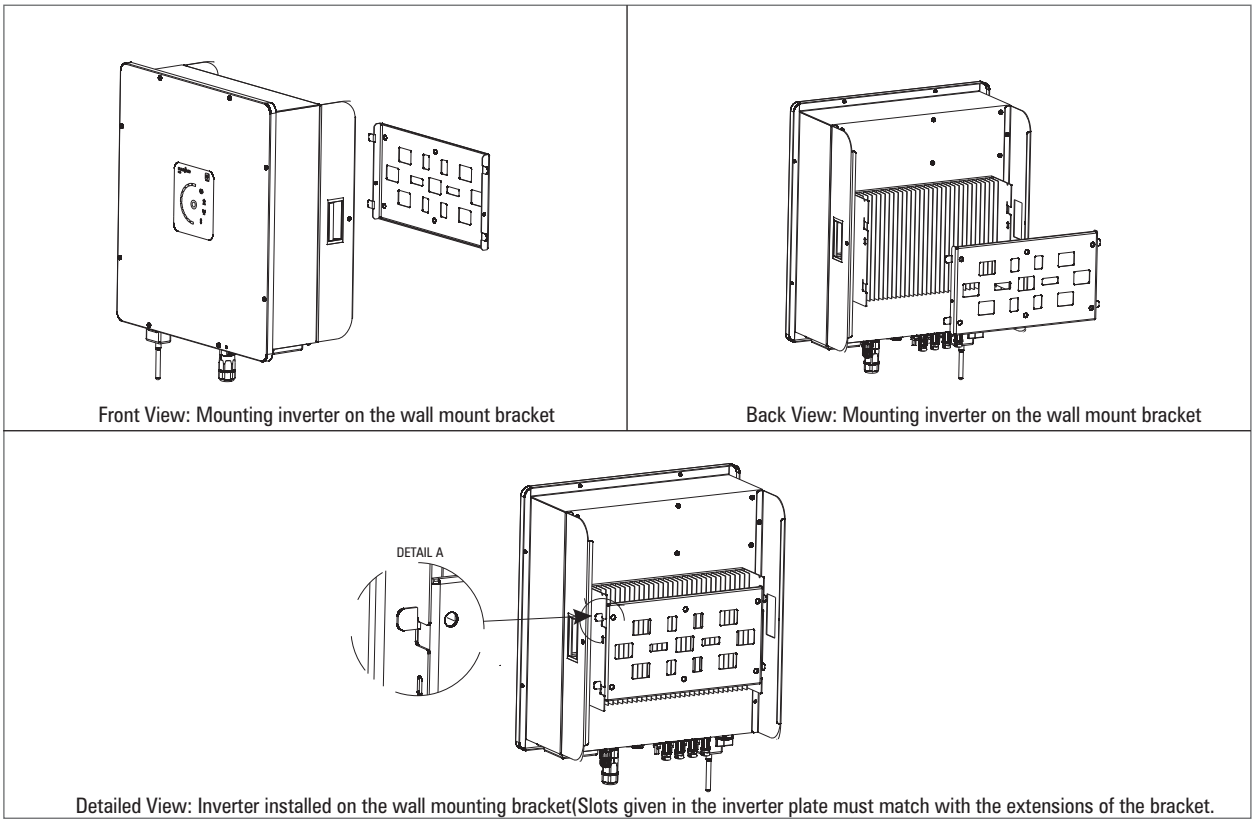
Figure 9 : Mounting bracket fixing

5.3.2 Mounting the inverter on the bracket

(2) Lift the inverter and hang it on the mounting bracket at the top, then rest it on the wall.

Caution

Ensure that the installation of the inverter is stable by trying to lift it from the bottom. The inverter must remain securely in place.



Front View: Mounting inverter on the wall mount bracket

Back View: Mounting inverter on the wall mount bracket

Detailed View: Inverter installed on the wall mounting bracket(Slots given in the inverter plate must match with the extensions of the bracket.

Figure 10 : Fixing the inverter on the bracket

5.3.3 System Diagram with Inverter and Electrical connection

- PV Panel: Supplies DC power to the inverter
- Inverter : Converts DC (Direct Current) power from the PV panel(s) to AC (Alternating Current) power. The inverter will always try to convert the maximum power from your PV panel(s).
- Utility : Referred to as the "grid" in this manual, this is the way your electricity company provides power to your place.

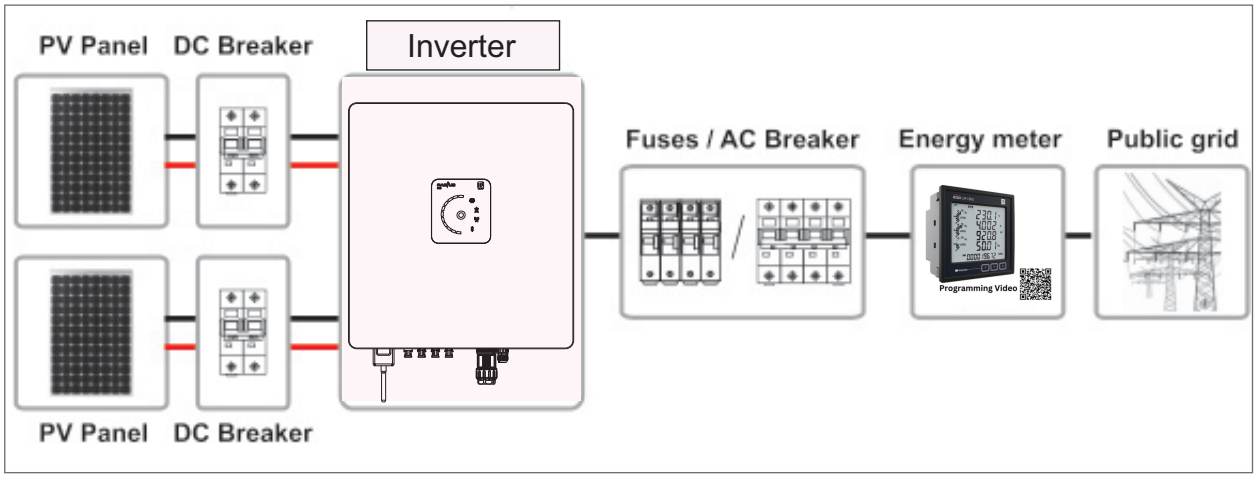


Figure 11 : Schematic diagram of the system

Note!

The system configuration depends on many factors (module type, production target, AC connection, installation site, current regulations, etc.) and must therefore be designed, built, and decided by a qualified technician.

6.1 Safety

Connect the ground connector to the terminal (PE) and Housing Earth terminal of the inverter.
The ground conductor must be the first to be connected
If replacing the inverter, the ground connector must be the last to be disconnected.
High voltages exist when the PV panel is exposed to the sun. To reduce the risk of electric shock, avoid touching live components and treat connection terminals carefully.
The DC cable must be disconnected before disconnecting the AC cable.
The inbuilt DC circuit breaker can operate under load.
Operation to be performed by specially trained personnel.
Risk of electric shock. If the PV field is illuminated, voltage is present on the DC side.
There is voltage on the input terminals even if the DC circuit breaker (see Figure 17 on page 25) is in position OFF.

6.2 Connecting to the grid (utility grid), ground cable (PE)

- Measure grid(utility) voltage and frequency (See "11. Specifications" on page 59).
- Open the circuit breaker and/or fuses between the inverter and the utility grid.
- Use insulated cables with minimum working temperature of 90°C.
- Follow color codes for wiring L1,L2, L3, N as per the local regulations, grounding cable should be yellow-green.
- The grounding cable should also be connected to the housing terminal. The size of the cable should be same as given below for PE cable.
- The set of 5 wires(L1,L2, L3, N, PE) to be connected to the inverter side connector should be passed through shield before passing it through the cable seal of the AC connector. Follow the AC connection steps as given in the following section.

Cable requirements for maximum length of 30 meters:

Model	Terminals	Recommended section		Maximum section		Cable OD
		(mm^2)	AWG no.	(mm^2)	N. AWG	
NEO/PVSA/APV-S-03K....	L1-L2-L3-N-PE	4	12	6	10	16
NEO/PVSA/APV-S-04K....	L1-L2-L3-N-PE	4	12	6	10	16
NEO/PVSA/APV-S-05K....	L1-L2-L3-N-PE	4	12	6	10	16
NEO/PVSA/APV-S-06K...	L1-L2-L3-N-PE	6	10	6	10	16
NEO/PVSA/APV-S-07K....	L1-L2-L3-N-PE	6	10	6	10	16
NEO/PVSA/APV-S-08K....	L1-L2-L3-N-PE	6	10	6	10	16
NEO/PVSA/APV-S-09K....	L1-L2-L3-N-PE	8	10	6	10	16
NEO/PVSA/APV-S-10K....	L1-L2-L3-N-PE	8	8	10	8	23
NEO/PVSA/APV-S-12K....	L1-L2-L3-N-PE	8	8	10	8	23
NEO/PVSA/APV-S-15K....	L1-L2-L3-N-PE	10	8	10	8	23
NEO/PVSA/APV-S-18K....	L1-L2-L3-N-PE	10	8	10	8	23
NEO/PVSA/APV-S-20K....	L1-L2-L3-N-PE	10	8	10	8	23

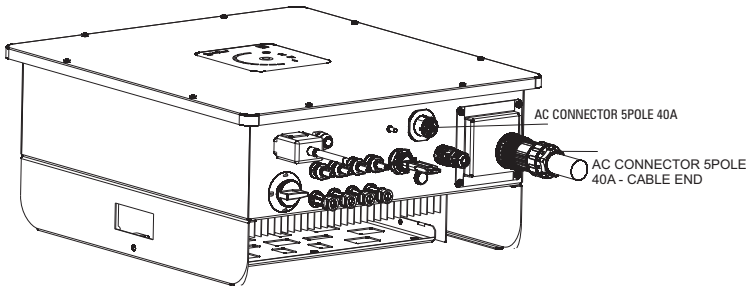
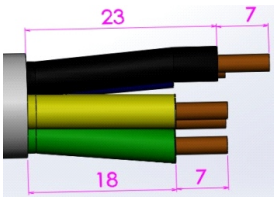
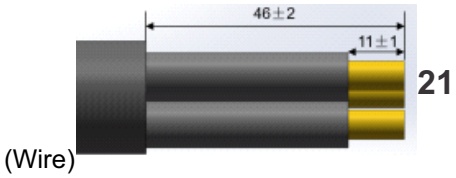
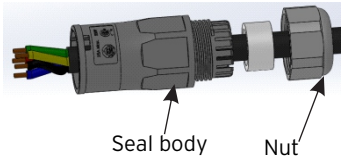
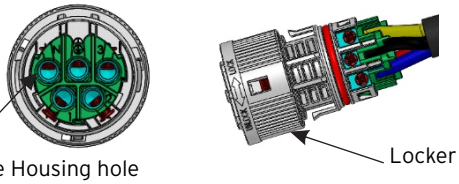
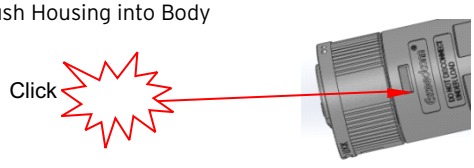
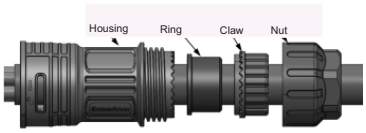
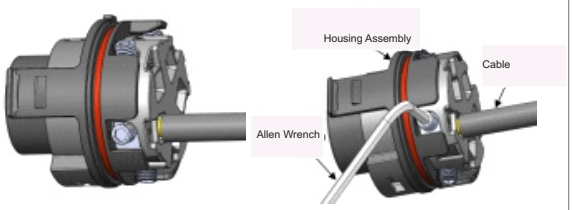


Figure 12 : AC connection (20kW model)

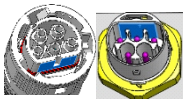
Installation instructions for 25A, 5 core connectors	Installation instructions for 40A, 5 core connectors
Tools : a. Wire striper b. Cross screwdriver No.1 c. Solid wrench or monkey wrench	**Tools :** a. Wire striper b. Allen wrench or monkey wrench
1. Wire Stripping Use only multistrand copper wire, length of the earth wire should be 5 mm longer than the live wire and zero wire. (Wire gauge) : 4.0~6.0mm²/18~10AWG, follow recommended cross section as given in the table. (Cable OD) : 16~18mm 	**1. Wire Stripping** Use only multistrand copper wire, length of the earth wire should be 5 mm longer than the live wire and zero wire. (Wire gauge) : 5~10.0mm²/10~8AWG, follow recommended cross section as given in the table. (Cable OD) : 20~23mm 
2. Installation of cable end connector a. Set the parts on the cable  b. Crimp wires, screw twisting torque 0.8+/-0.1N·m.  c. Push Housing into Body 	**2. Installation of cable end connector** a. Set the parts on the cable  b.Wire crimping cord end terminal can be inserted into the housing quickly according to the sign, torque 1.0 +/- 0.1N·m.  c.The housing is inserted into socket, then the unlock key is inserted into socket);

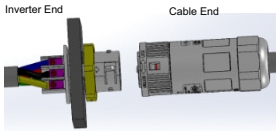
d. Seal into long body ,then tighten the nut , torque 2.5±0.5N·m.

3. Mating plug and Inverter socket:

Push the locker onto the socket housing completely, then rotate the locker according to the direction instructed by the marks on the locker.

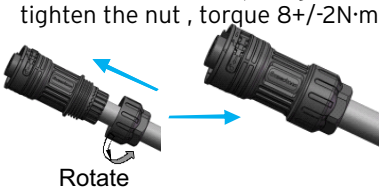
Matched position



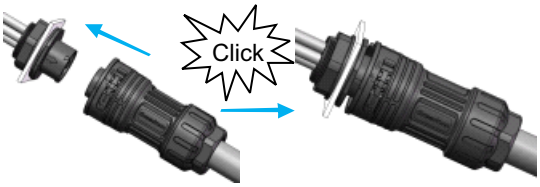


Waning : hold the body !

d. Insert Seal and Clamp Finger into socket ,then tighten the nut , torque 8+/-2N·m

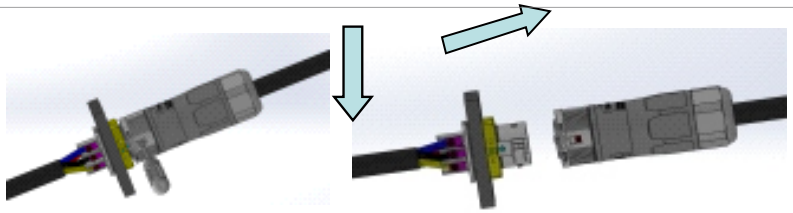


4. Male female connection



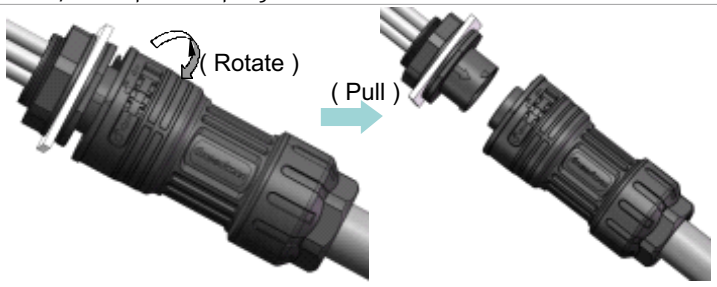
To disassemble the cable end connector(5P, 25A) form the inverter end connector, follow the below procedure:

a. Separate the male and female connector, rotate the locker according to the direction instructed by the marks on the locker



To disassemble the cable end connector(5P, 40A) form the inverter end connector, follow the below procedure:

a. Unmating the plug and the socket
rotate the unlock key ,then pull the plug



6.3 Connecting to the PV panel (DC input)

Caution

- **Before connecting the PV panels to the DC terminals, please make sure the polarity is correct. Incorrect polarity connection could permanently damage the unit.**
- **Before connecting the PV panels to the DC terminals, check that the maximum PV string current is below the maximum current allowed by the model (see chapter 11). On models with fuses (-F), check that the current is below the size of the installed string fuse.**
- **Check that poles pertaining to different mppt are not connected under the same MPPT.**
- **Make the DC side connections without voltage by isolating the PV field circuit.**
- **In case of non-insulated installations, the string inverter must be used only with PV generators that comply with insulation class II in conformity with application class A of IEC 61730.**

Warning!

Under all conditions, always make sure the maximum open circuit voltage(Voc) of each PV string is less than 1100Vdc. Avoid paralleling of the MPPT i.e different MPPTs on the inverter input should not be energi -ed on the same PV input.

Cable requirements

Terminals	Section (mm^2)	AWG no.	Note
+,-	2.5 ... 6	13 ... 10	• The section depends on the string current. • Mc4 connectors for DC connections

1. Crimp the positive and negative wires from the panels appropriately, following the steps given on the page 23
2. Connect the positive and negative terminals from the PV panel to the positive(+) terminals and negative(-) terminals on the Inverter.

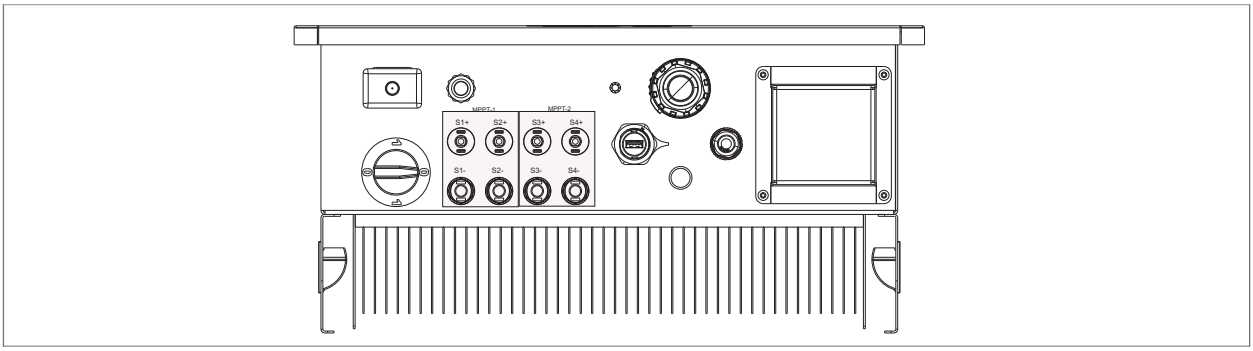


Figure 13 :Connecting to the PV panel 1/2MPPT model

(3 Refer to the tables and diagrams below for recommended connections to the photovoltaic field for 15 ~20kW -2MPPT Model.

Terminals			Description
S1	+	-	String 1 current input MPPT1
S2	+	-	String 2 current input MPPT1
S3	+	-	String 3 current input MPPT2
S4	+	-	String 4current input MPPT2

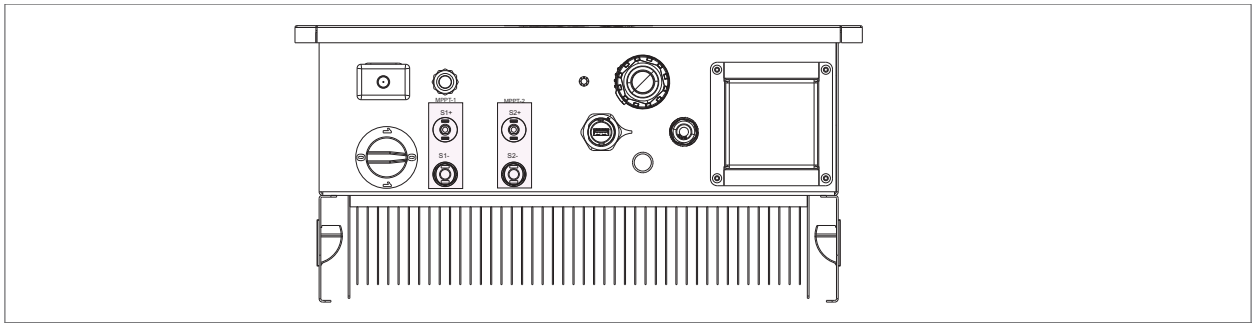


Figure 14 :Connecting to the PV panel 10 ~12kW -2MPPT model

(3 Refer to the tables and diagrams below for recommended connections to the photovoltaic field for 5 ~12kW -2MPPT Model.

Terminals			Description
S1	+	-	String 1 current input MPPT1
S2	+	-	String 2 current input MPPT2

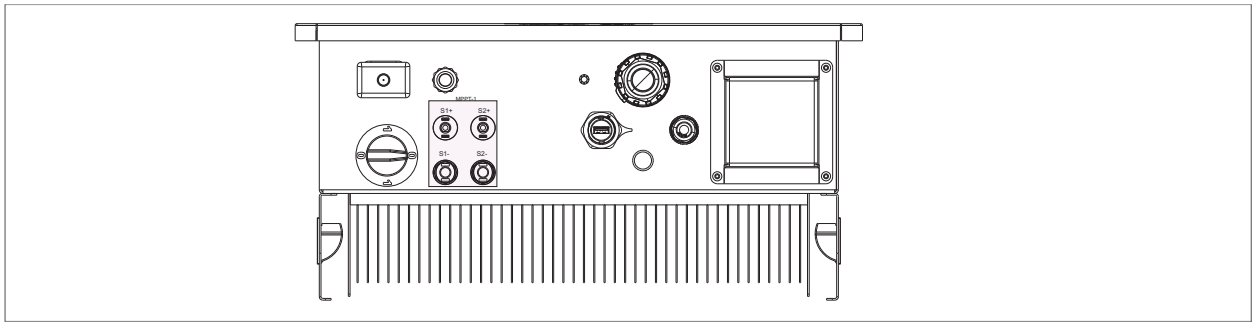


Figure 15 :Connecting to the PV panel 10 ~12kW -2MPPT model

(3 Refer to the tables and diagrams below for recommended connections to the photovoltaic field for 8 ~12kW -1MPPT Model.

Terminals			Description
S1	+	-	String 1 current input MPPT1
S2	+	-	String 2 current input MPPT1

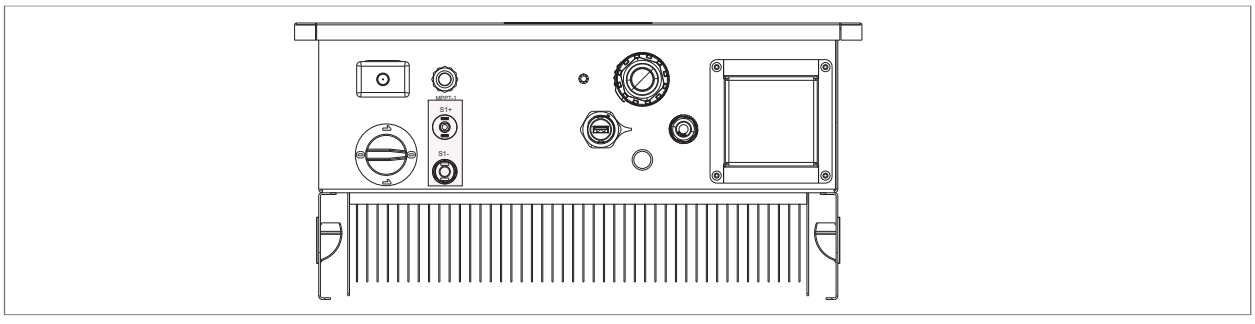
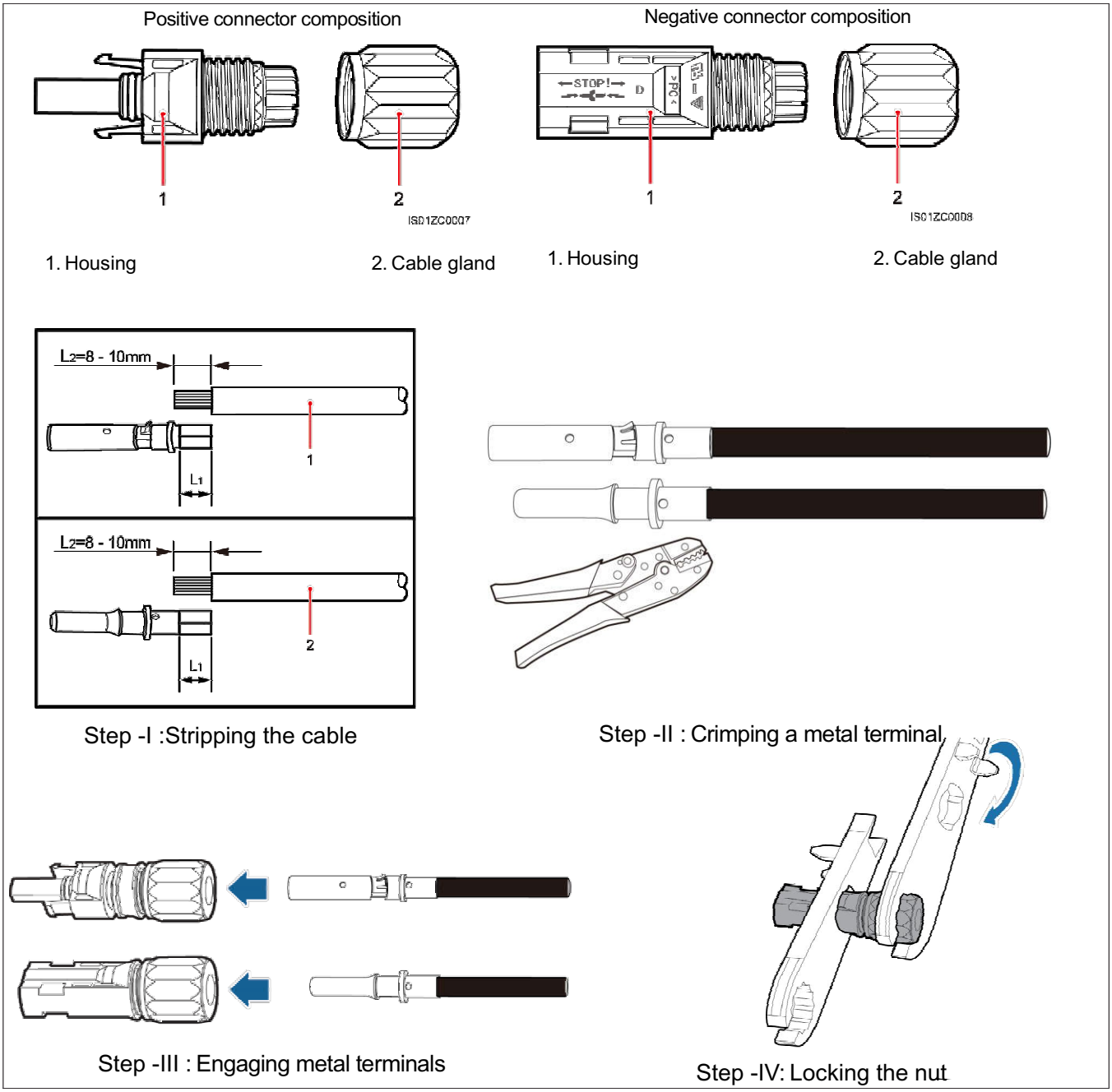


Figure 16 :Connecting to the PV panel 3~7kW -1MPPT model

(3 Refer to the tables and diagrams below for recommended connections to the photovoltaic field for 8 ~12kW -1MPPT Model.

Terminals			Description
S1	+	-	String 1 current input MPPT1

Follow the steps given in the below figure to connect the PV strings to the Mc4 connectors



6.4 DC side fuses and string current monitoring

6.4.1 DC side fuses (Inline Fuses -F models)

The DC side fuses are very useful because in case of a malfunction or short-circuit of a string module or cable they trip and eliminate the defective string. This prevents the currents from all of the other strings in parallel from contributing to the short-circuit.
This reduces risks of fire or damage to the PV array.

Warning!

Operation to be performed by specially trained personnel.

ELECTROCUTION RISK!

Even with the inverter switched off circuit breaker(*) in position 0, there could still be dangerous voltage from the photovoltaic field.

Warning!

The string cable terminals are live! Cut voltage from the DC side (open the up-line isolator (if present) or shade the PV panels or disconnect the last PV panel of each string) and from the AC side.

The string fuses may have to be replaced in case of:
1) change off use rating based on type of PV panel used
2) damaged fuse.

To replace the fuses it is necessary to:
1) disconnect voltage from the AC and DC side
2) disconnect all cables from the DC terminals
3) identify and replace the blown fuse inside the inline connector(see table below), then replace the panels and connections.

(*) 16A is the standard fuse size installed in the factory. Other fuse sizes (type gpV / 1100Vcc) can be installed according to the instructions of the PV module manufacturer. These fuses can be ordered on request.

6.4.2 String current monitoring

This function is pre included in all the models.

By current sensors in series with each string, the current in each string is monitored (see section 'Input data" on page 39) and any anomalies or faults are signalled.

6.5 AC side fuses/AC side Circuit breaker

These fuses/breaker are not supplied with the equipment but are available on request.

In compliance with IEC 62109, the AC output must be protected with fuses or a circuit breaker.

The following is a table of recommended fuses/breaker rating:

Model	Fuses/breaker
NEO/PVSA/APV-S-03K....	gR /15A/300V
NEO/PVSA/APV-S-04K....	gR /15A/300V
NEO/PVSA/APV-S-05K....	gR /15A/300V
NEO/PVSA/APV-S-06K...	gR /25A/300V
NEO/PVSA/APV-S-07K....	gR /25A/300V
NEO/PVSA/APV-S-08K....	gR /25A/300V
NEO/PVSA/APV-S-09K....	gR /30A/300V
NEO/PVSA/APV-S-10K....	gR /30A/300V
NEO/PVSA/APV-S-12K....	gR /30A/300V
NEO/PVSA/APV-S-15K....	gR /40A/300V
NEO/PVSA/APV-S-18K....	gR /40A/300V
NEO/PVSA/APV-S-20K....	gR /40A/300V

6.6 Choice of leakage breaker on AC side

The string inverters are equipped with a protection against ground faults in conformity to German safety standard VDE0126-1-1.Specifically, they are equipped with a redundancy reading of leakage current to ground applicable to all current components (both DC and AC).

Leakage current to ground is measured simultaneously and independently by two different processors. The protection trips if one (or both) of them detects a fault, with consequent disconnection from the grid and stop of the generation process.

There is an absolute limit of 300 mA(3~20kW) of total AC+DC leakage current with tripping of the protection within 300msec.

There are also three other trip limits to protect against fault currents caused by accidental contact with leaking liveparts; these limits are 30mA with trip in 0.3sec, 60mA with trip in 0.15sec, and150mA in 0.04 sec.

The integrated device protects the system only against ground faults occurring up-line of the inverter (toward the DC side). Any leaks in the section on the AC side between the grid and the inverter are not detected and require an external protection.

Therefore, a type A leakage breaker have to be installed to protect the AC line.

When multiple leakage protection switches are installed in the system, it is forbidden to share the neutral line, otherwise the leakage protection function may be triggered by mistake and cause the switch to trip.

It is advisable to use a breaker with trip current of at least 300 mA to avoid false faults due primarily to capaci tive leakage of the PV modules.

6.7 DC circuit breaker

The DC circuit breaker galvanically disconnects the DC source on the AC side.
Breaking is done simultaneously on the positive and negative poles of all MPPT present.

Warning!

Warning: the DC circuit breaker DOES NOT switch off the AC side.

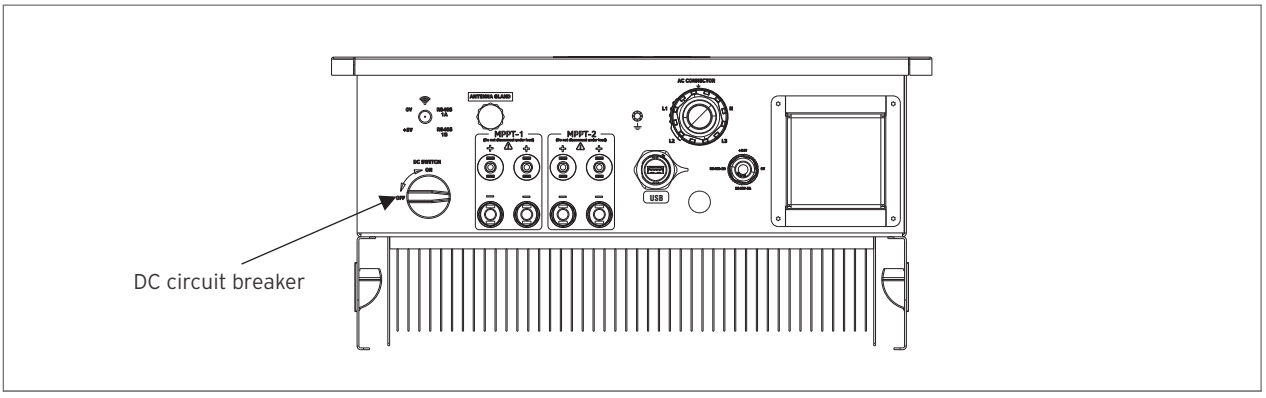


Figure 17 : DC circuit breaker

Position 0 = Open (OFF), switches off the inverter completely.

Position 1 = Closed (ON)

Model	Circuit breaker type and characteristics
NEO/PVSA/APV-S-03K1/2....	1100V 15A(for each MPPT)
NEO/PVSA/APV-S-04K1/2....	1100V 15A(for each MPPT)
NEO/PVSA/APV-S-05K1/2....	1100V 15A(for each MPPT)
NEO/PVSA/APV-S-06K1/2...	1100V 15A(for each MPPT)
NEO/PVSA/APV-S-07K1/2....	1100V 15A(for 2MPPT model)/1100V 25A (for 1MPPT model)
NEO/PVSA/APV-S-08K1/2....	1100V 15A(for 2MPPT model)/1100V 25A (for 1MPPT model)
NEO/PVSA/APV-S-09K1/2....	1100V 15A(for 2MPPT model)/1100V 25A (for 1MPPT model)
NEO/PVSA/APV-S-10K1/2....	1100V 15A(for 2MPPT model)/1100V 25A (for 1MPPT model)
NEO/PVSA/APV-S-12K1/2....	1100V 15A(for 2MPPT model)/1100V 25A (for 1MPPT model)
NEO/PVSA/APV-S-15K2....	1100V 32A (for each MPPT)
NEO/PVSA/APV-S-18K2....	1100V 32A (for each MPPT)
NEO/PVSA/APV-S-20K2....	1100V 32A (for each MPPT)

6.8 Other connections

The inverter features many other connections which includes communication port, Type B USB and connection port for WiFi/GSM /4G dongle.

6.8.1 Signal connector

The inverter has a 4 pin signal connector. The pin configuration of the signal connector is as shown below.

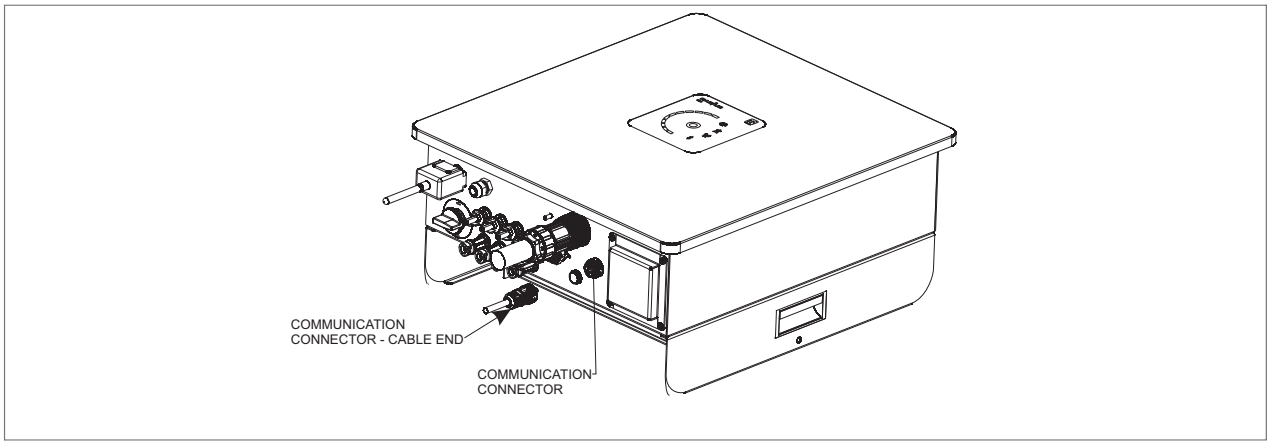
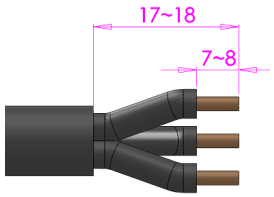


Figure 18 : Signal Connector

To install the cable end connector, follow the installation procedure as given below.

— (Wire Stripping And Riveting Terminal)

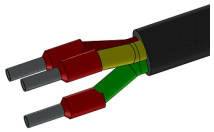


Only apply to multistrand copper wire
Stripping requirements a. Stripping sheath 17~18mm ;
b. Core stripping wire 7~8mm
Cable Gauge: a) 0.5~2.5mm+Or 20~12AWG ;
b) Apply to outdoor, OD:5.4~12.5mm
Tools : Wire stripper, Riveting pressure pliers
Torque screwdriver, Torque wrench,

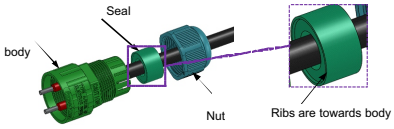
— (installation of cable end connector)

a. (Riveting terminal)

Terminal



b. (Set the parts on the cable)



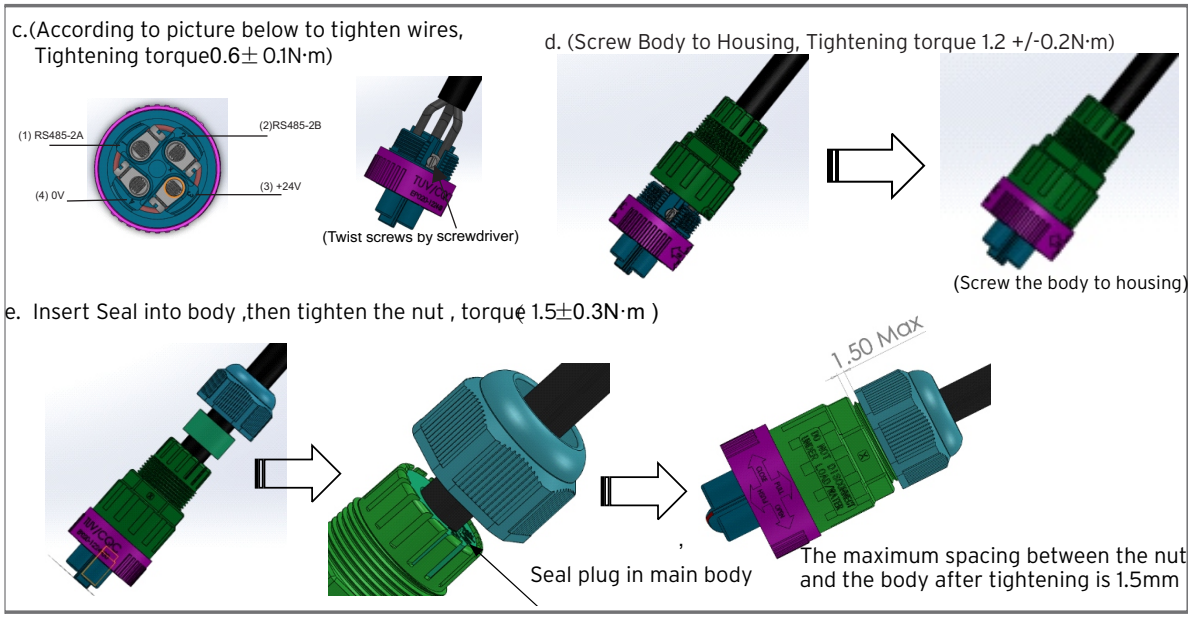


Figure 19 : Installation instruction for Signal Connector

6.8.2 WiFi Dongle functions use

Warning!

Operation to be performed by specially trained personnel.

In order to monitor the inverter data remotely, the users can connect the WiFi dongle to the RMU port of the inverter. To connect the WiFi dongle to the cloud, follow the instructions given along with the dongle.

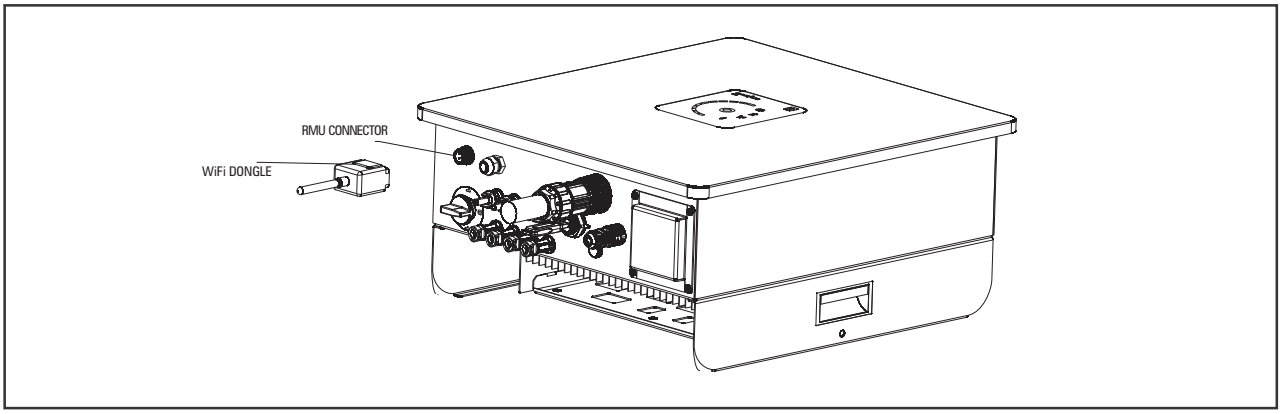


Figure 20 : RMU Port

6.8.3 USB functions use

Warning!

Operation to be performed by specially trained personnel.

To access the USB port remove the dust cap from the USB port.

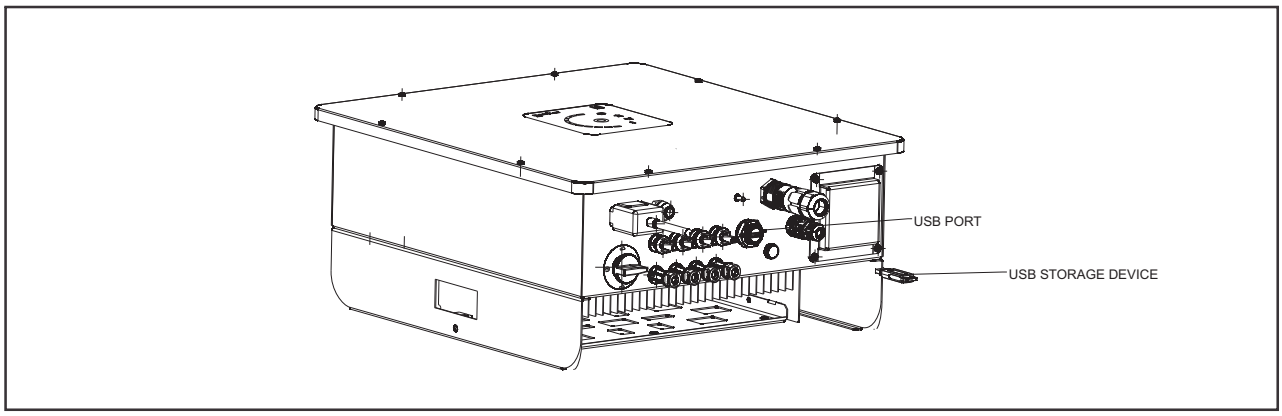


Figure 21 : USB Port

Note! **The USB memory used must be of a standard type (format FAT32 with single partition)**

You can use the USB port of the inverter for the following features:

a) Insert the USB key and wait until the Parameter 510 is showing Ready.

1) PRODUCTION LOGS DOWNLOAD ON A USB MEMORY

You can save on a USB memory key main production and operation data saved on the inverter internal memory.

b) Enter the parameter 584 and confirm the selection ON. The Par 510 will change from Ready to Busy.

Note! **Production and operation data are saved in CSV format and can be visualized via laptop/PC.**

2) ALARM LOGS DOWNLOAD ON A USB MEMORY

You can save on a USB memory key the alarm history saved on the inverter internal memory. Follow the procedure below:

b) Enter the parameter 584 and confirm the selection ON. The Par 510 will change from Ready to Busy.

Note! **Alarm history is saved in CSV format and can be visualized on a PC/laptop.**

3) PARAMETERS SET DOWNLOAD ON USB MEMORY

You can save on a USB memory device the inverter parameters set. This feature allows you to restore the saved parameters set on the same inverter or replicate the same on other inverters.

b) Enter parameter 598, select and then confirm the desired memory slot to store the configuration parameters.

Memory slots identify the position in which are stored the various parameters sets. There are 256 memory slots, this means that up to 256 different parameters sets can be saved.

Note! **It is recommended to keep clear track or the various parameters sets saved for later reuse**

4) DOWNLOAD ON THE INVERTER OF THE PARAMETERS SET SAVED ON A USB MEMORY

You can save on the inverter a parameters set previously saved on a USB memory device. This feature can only be done with access profile Expert.

b) Enter parameter 598, select and then confirm the desired memory slot.

c) Enter parameter 587 and confirm the selection ON. The symbol U will be replaced by the symbol B.

When the operation is completed the symbol B will again be replaced by the symbol U. You can then remove the USB stick.

7. Display and Bluetooth App Interface

7.1 Advanced Display

The inverter features one of the simplest yet new and intuitive display for the users. There are two variants of the displays available for the users to choose from. The details of both the displays are as given below:

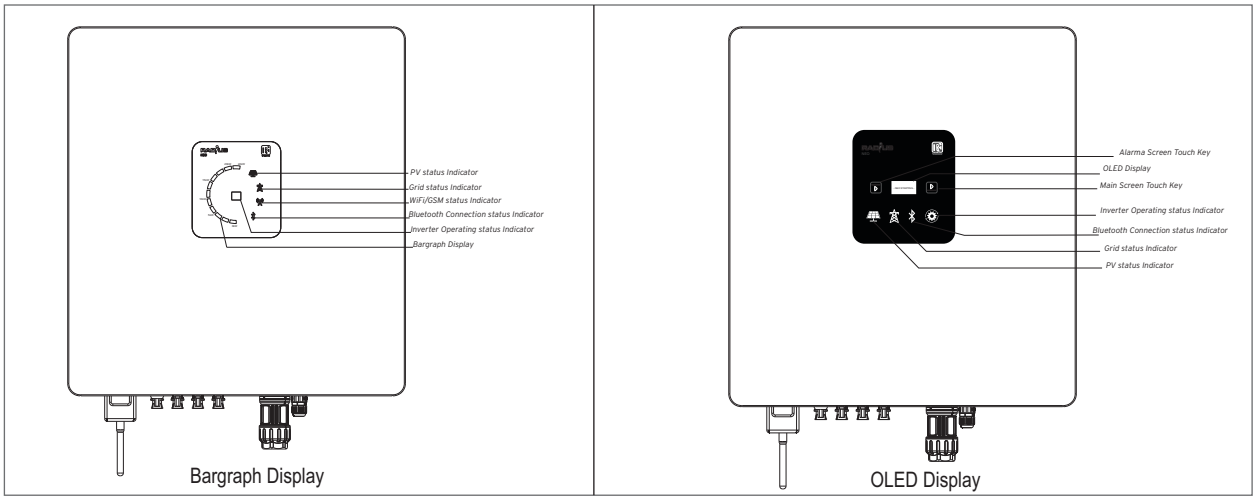


Figure 22 : Inverter Display

OLED Display & Touch Keys

The 2.5inch OLED display is used to show the critical parameters like output power, grid voltages, input voltages, input current, output current, Eday, Etotal and alarms etc. Touch key can be used to scroll through the alarms and main screen parameters. A long press on alarm touch key can be used to clear the alarms instantaneously. Similarly a long press on other touch key will hold the present screen on the display.

PV status Indicator

OFF: Indicates the MPPT voltage is not healthy. Ensure each MPPT voltage meets the minimum and maximum voltage limits.

GREEN: Indicates the MPPT voltage is healthy.

Grid status Indicator

OFF: Indicates the Grid voltage is not healthy. Ensure each phase voltage is as per the Grid connection codes.

GREEN: Indicates the Grid voltage is healthy.

Remote monitoring status Indicator

OFF: Indicates the remote connection cannot be established. Ensure the dongle is properly inserted in to the port.

GREEN: Indicates the communication between the dongle and the inverter is healthy.

Bluetooth status indicator

OFF: Indicates the bluetooth is available for connection. Use Radius Neo App to establish connection with the inverter.

STABLE GREEN: Indicates the bluetooth is connected and communicating.

Note! **In case of a loss of communication with the connected bluetooth device, inverter automatically disconnects after 10 min and frees up the link for the connection with the other devices.**

Inverter Bargraph display

Inverter has 11 bars to indicate the various power level 0 % through 110% of the rated power.
Each bar 0 through 10 indicates 10% change in the power level. If the power exceeds 100% of the rated power, the 11th bar will turn on.

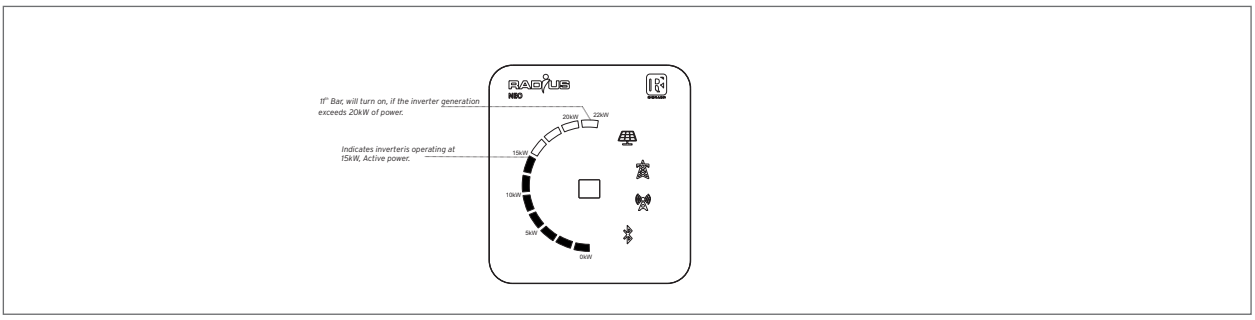


Figure 23 : Bargraph Display - 20kW

Inverter operating status indicator

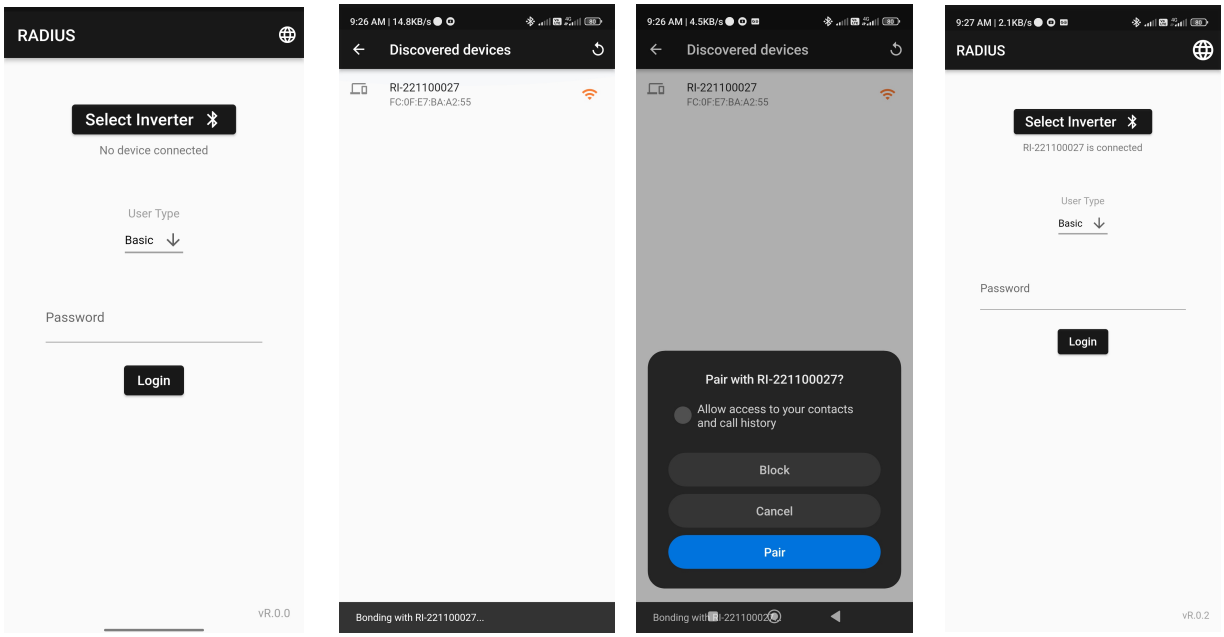
This is a multi-color indicator. Inverter uses various colors to indicate the different operating states of the inverter.

Reference	Colour	Function
Initialization procedure	Blue stable	the inverter is performing initialization procedures, calculating the isolation resistance, or waiting for the start command (if not started previously).
DC-Grid Connection phase	Blue flashing	The inverter has powered the DC circuit and is executing the ramp for connection to the grid.
Grid Connected	Green flashing	The inverter has connected to the grid (the AC Switch has closed.
Generation	Green stable	The inverter is generating (MPPT function is active) and is healthy.
Power Limitation	Cyan stable	Power generated to the grid is limited due to a derating or to a function imposed by regulations in the country of installation.
Fault	Red stable	The inverter is in a fault condition.
Warning	Yellow flashing	A warning is present.

7.2 Android Application

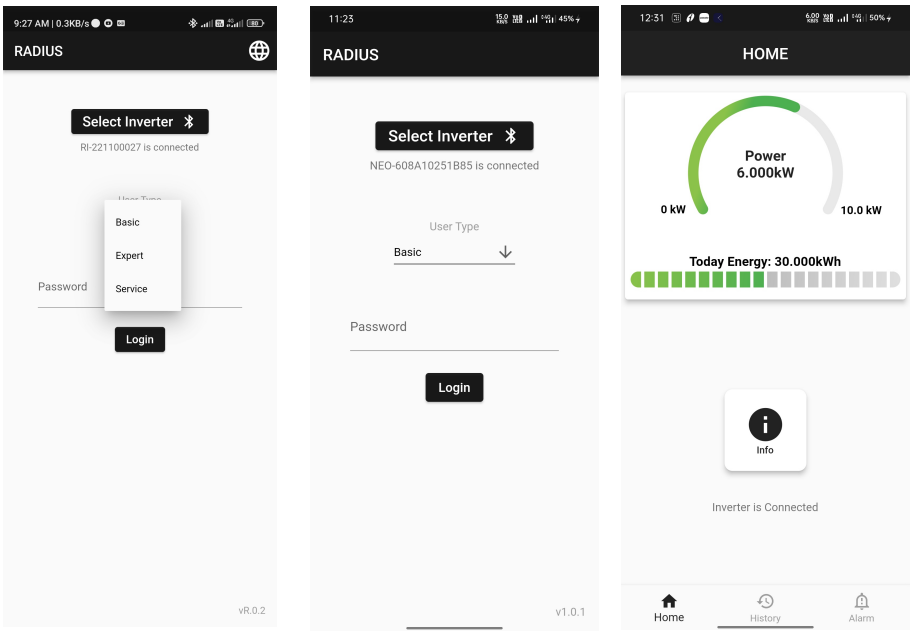
In order to record, monitor or analyze the realtime time as well as historical data, there is an easy to use android application available. The app "Radius Neo" can be downloaded from the Android playstore. Follow the general installation procedure and allow all the permissions required at the time of installation. The app connects to the inverter over the bluetooth. Follow the below procedure to connect to the inverter and to analyze various parameter and the performance of the inverter.

Once the installation is completed, follow the onscreen instructions to connect to the desired inverter, to visualize the various inverter parameters.

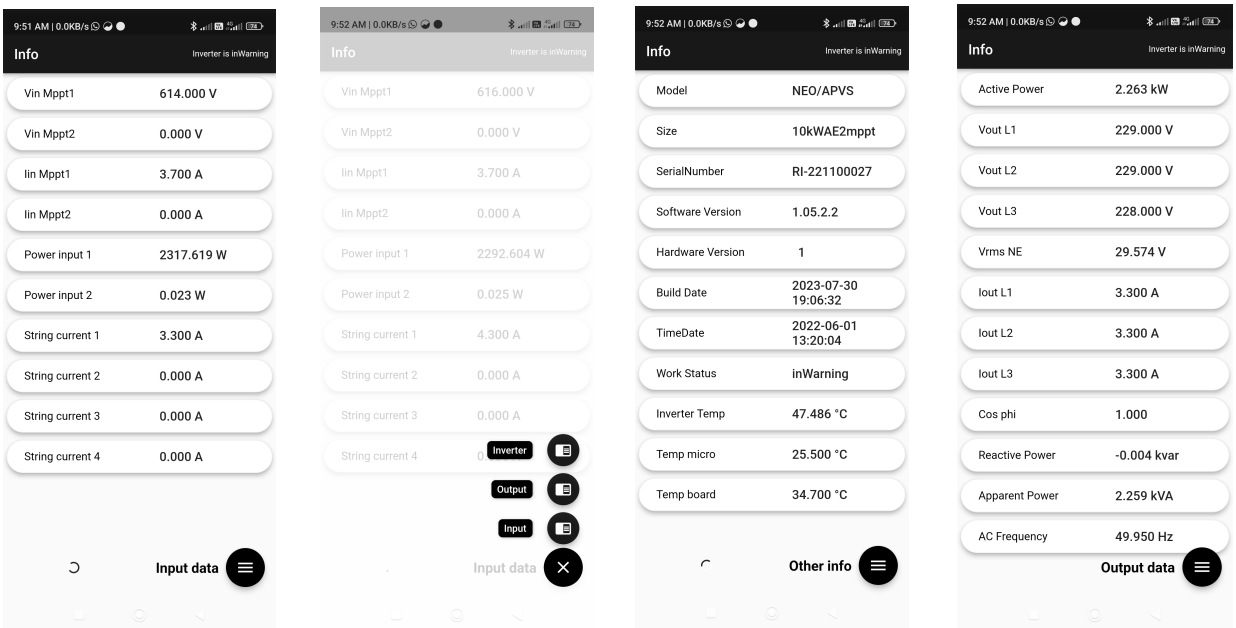


Note! **In order to visualize the data of the inverter using bluetooth, it is essential that the inverter is turned on. Also note that the inverter can only connect to one mobile device at one time.**

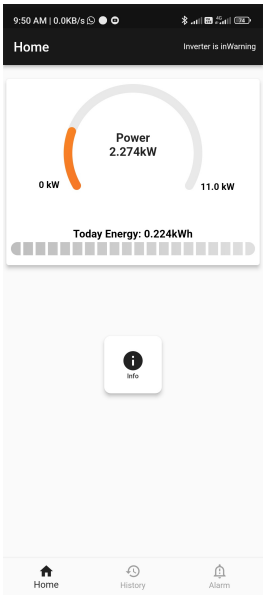
The application features 3 access modes/user types namely basic, expert and Service. The basic user can login without password.

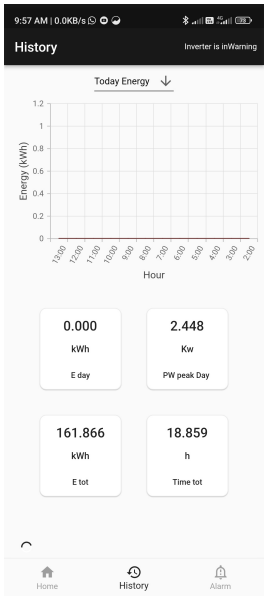


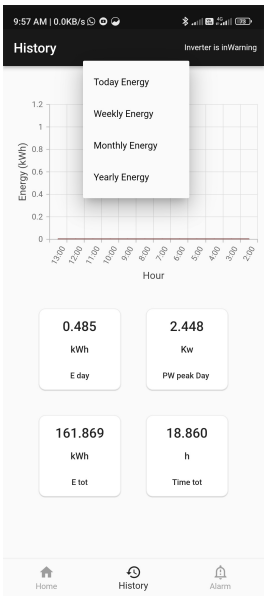
The basic parameters like input data, Output Data and Inverter info can be visualized inside the "info" menu.

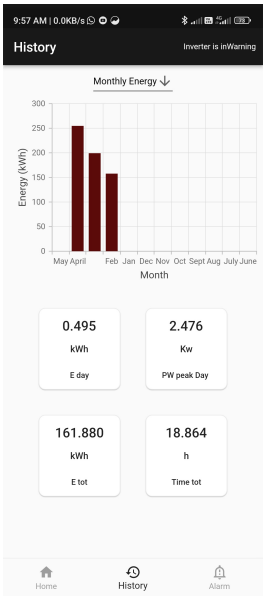


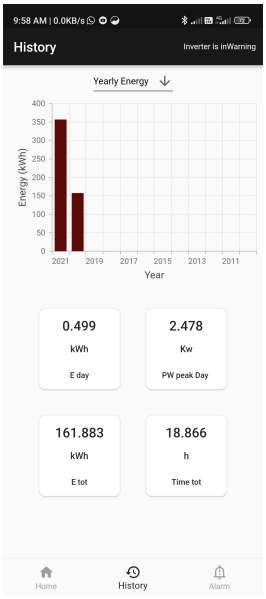
The historical production data of the inverter i.e Total Energy, Today Energy & Peak power etc can be visualized in the History Tab located at the bottom of the application.



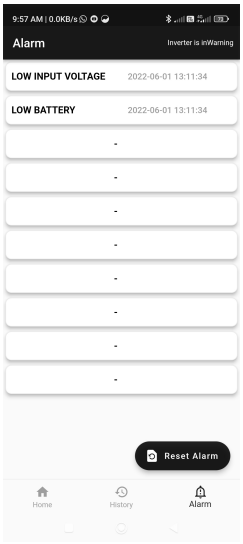




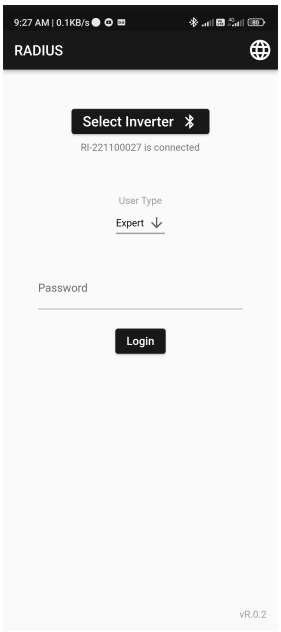


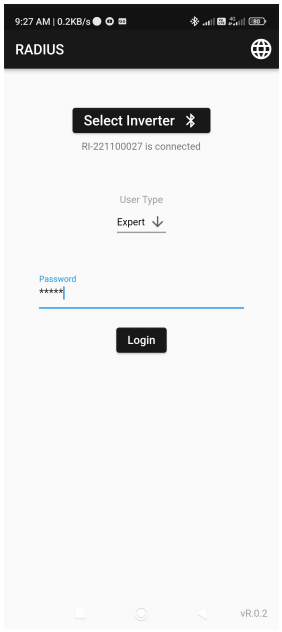


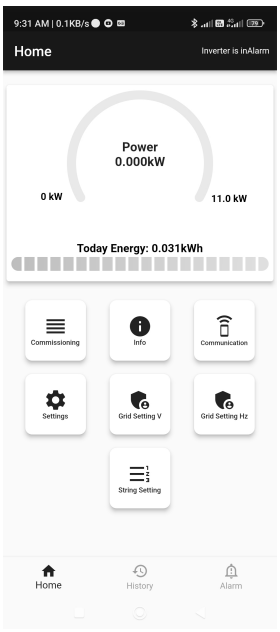
The Alarm and Warning data of the inverter can be visualized in the Alarm Tab located at the bottom of the application. The alarm indication is also indicated at the Title Bar in all the screens of the Application.

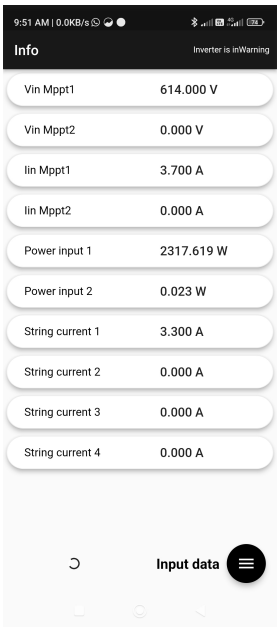


To login in to expert login use the password “1234a”. The expert menu provides access to various parameters of the inverter.

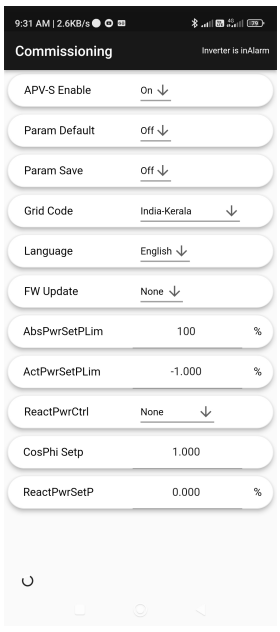


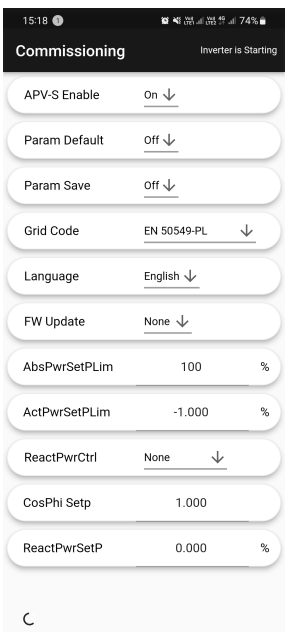


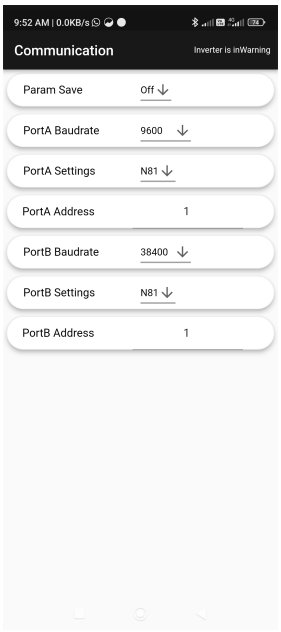


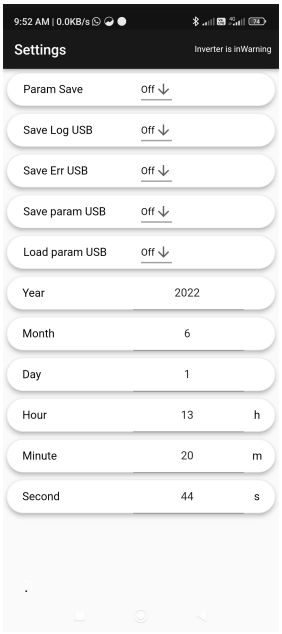


The parameters related inverter commissioning are grouped inside the menu “Commissioning”.
The parameters related to communication settings are grouped under the menu” Communication”. The para--meters related to other settings are grouped under the menu “Settings”.

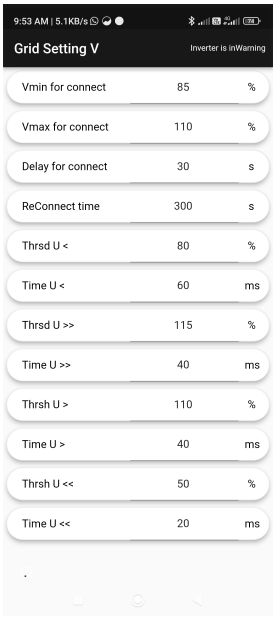


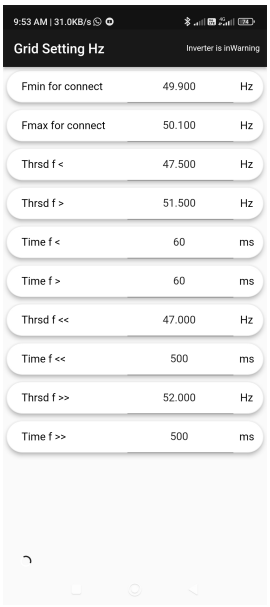


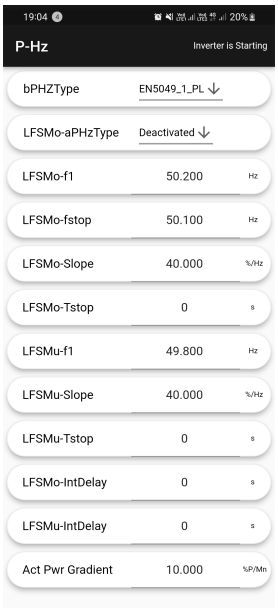




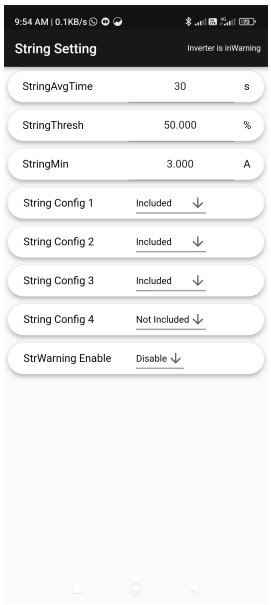
The parameters related to the Grid voltage & Grid Frequency settings are available under the menu “Grid Setting Voltage”& “Grid Setting Hz”. The parameters related to the P-Hz (LFSM) settings are available under the menu “P-Hz” setting.







The parameters related to the settings for string failure detection are available under the menu “String Setting”.



For the detailed description of all the parameters refer to the section “8 . Description of Parameters”.

7.3 Commissioning

Warning!

Operation to be performed by specially trained personnel.

First power on after performing parameter default

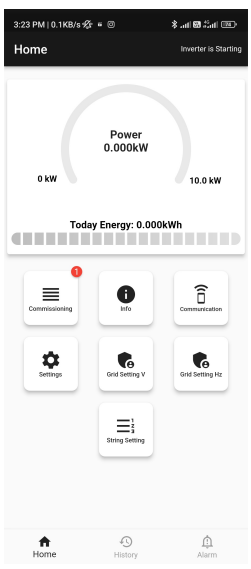
After you have carefully executed the electrical connection of the inverter, at first power, connect the inverter using mobile application as given in the section 7.3. If the commissioning of the inverter is pending then the app will show notification on the commisioning tab.

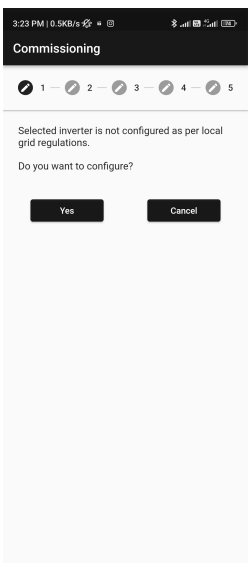
Warning!

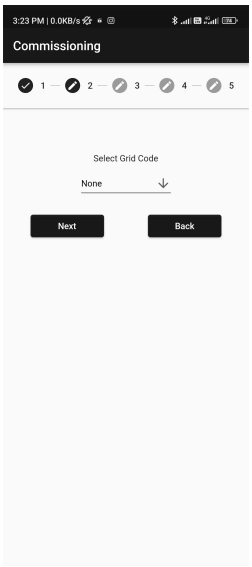
The process of commissioning of inverter can only be performed using expert login in the mobile application.

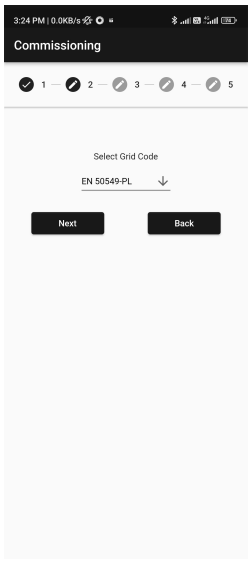
If the notification on the commissioning tab is available, the guided procedure inside the commissioning tab lets you set:

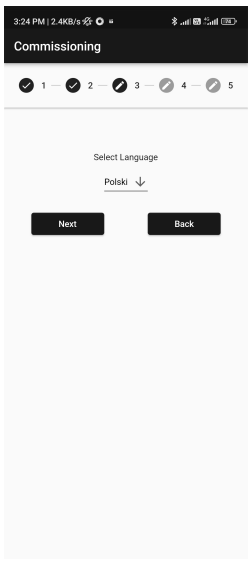
a) The country's grid standard(MANDATORY)
b) The language for display menus (MANDATORY)
c) The date and time (MANDATORY)
c) Selection of used string (MANDATORY)

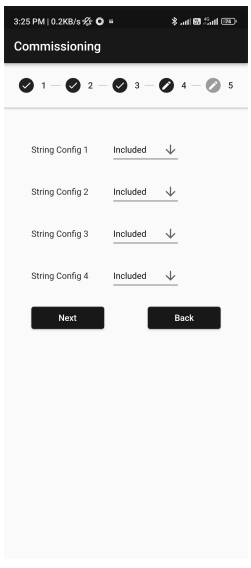












There are different grid parameters (dictated by the national/local grid code and/or by the distributor) depending on the country of installation.

The following table shows the grid standards selectable.

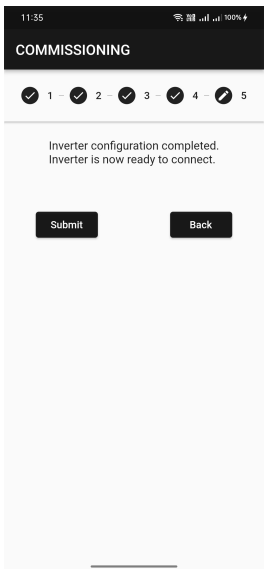
Sr.No.	Grid Standard	Mains Voltage
0.	None	-
1.	EN 50549-PL	400V
2.	EN 50549-1/2019	400V
3.	EN 50438/2014	400V
4.	India	400V
5.	India-Kerala	400V
6.	CEI 021	400V
7.	VDE 4105	400V
8.	VDE 0126 2006	400V
9.	VDE 0126 A1/2012	400V
10.	RD 661/2007	400V
11.	IEC 61727/2004	400V
12.	CEI 016	400V
13.	SAGC Cat A1-A2	400V
14.	SAGC Cat A3	400V
15.	SAGC Cat B	400V
16.	SAGC Cat C	400V
17.	NRS 097-2-1	400V
18.	UTEC C15-712	400V
19.	UK G83	400V
20.	UK G59/3 LV sys	400V
21.	UK G59/3 HV sys	400V

Before selecting, check that the grid code is correct for the grid to which the inverter will be connecting.
If you are not sure, check the technical specification of the system/grid or contact your local utility.

Note! **Select EN50549-PL to configure the inverter as per the requirements of PTPiREE in Poland.**

The grid standard is saved automatically and will not be requested when the inverter is switched on again.
If the wrong grid code has been selected, see chapter "7. DESCRIPTION OF MENUS."

After you have confirmed the grid code,you will see the following screen



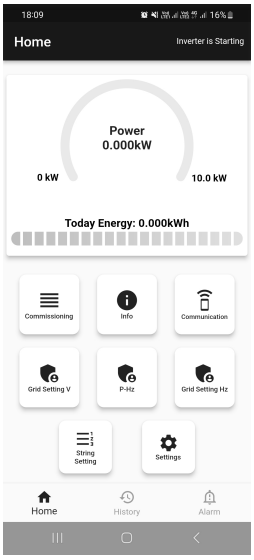
The starting procedure is now ended, and the home page of the inverter will appear. The inverter starts the grid connection procedure.

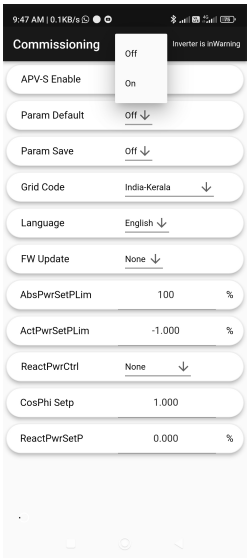
Attention

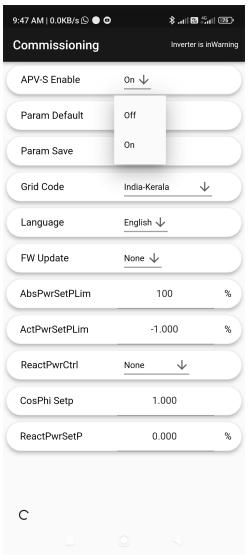
Correct setting of the TIME and DATE is necessary for saving the production log and alarm data in the inverter's integrated memory.

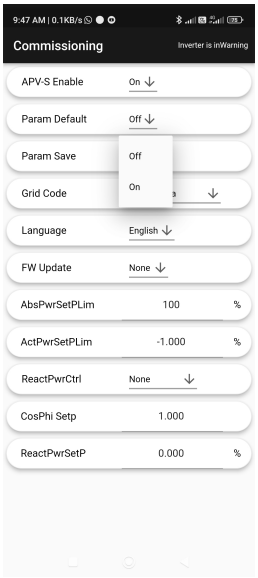
Incase if the grid code is wrongly selected or is not as per the requirements of the local authority, then the grid code can be changed using parameter default function. To set all the parameters to factory default settings, fol--low the below given instructions.

1. Login into the Application using Expert Mode.
2. Open "Commissioning-tab". Set the Inverter Enable to "Off".
3. Set Parameter Default to "ON". Wait until the Param default state changes back to "OFF:.
4. Set Param Save to "ON". Wait until the Param Save status changes back to "OFF".
5. Turn OFF the inverter. Wait until inverter is completely switched OFF.
6. Now switch on the inverter again.
7. Follow the instructions given in the section 7.3 Commissioning to select the proper grid code.



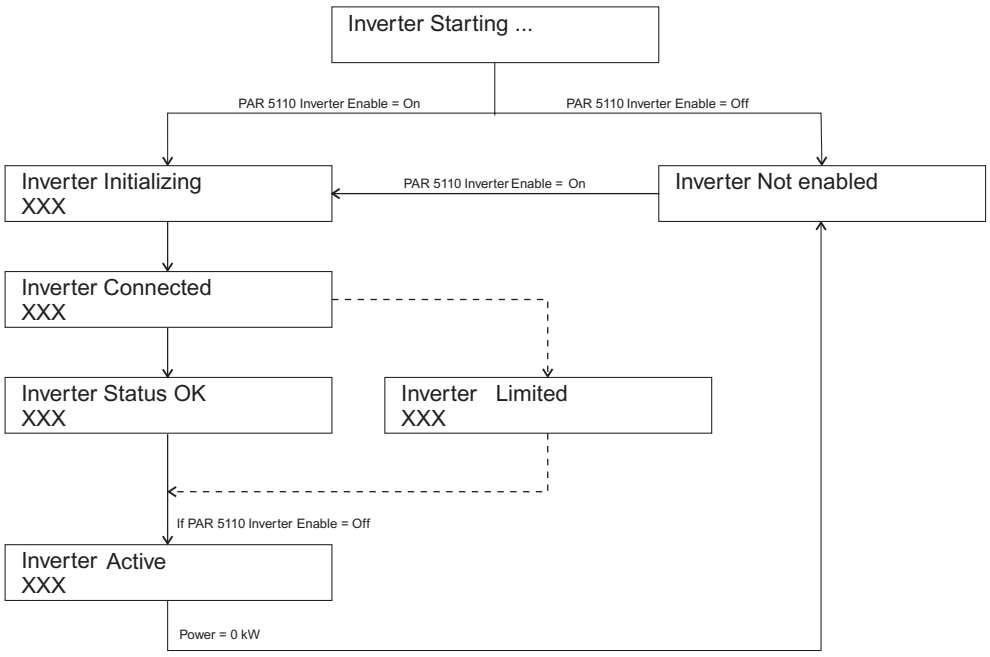






7.4 App screens: Operating statuses, stand by

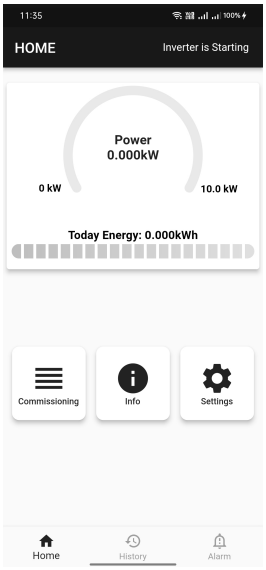
7.4.1 Operating statuses (advanced level)



Starting	Displayed for a few seconds after power-on.
Initializing	Initialization procedures and connection to DC circuit.
Connected	Inverter connects to AC grid and prepares for generation.
Status OK	Inverter is generating.
Limited	Power generated to the grid is limited due to a derating or to a function imposed by regula tions in the country of installation.
Active	0 power is generated: inverter is disabled (PAR5110 = Off) or is in test mode.
XXX	Sequential display of “Stand-by” data (see below).

7.4.2 Stand-by

The following screens are shown in sequence in the absence of alarms or warnings during normal operation of the inverter in expert mode.



8. Description of parameters

8.1 Parameters description

8.1.1 Legend

PAR	Description	UM	Def	Min	Max	Access
Parameter identifier	Parameter description	Unit of measure	Default value	Minimum value	Maximum value	Accessibility : E=Expert R=Read W= Write

Info

The Info menu displays the values of measured quantities, operating parameters, and information to identify the inverter and the configuration.

Note! The values on the display may diverge from real values and cannot be used to calculate an official invoice. The quantities read by the inverter are needed to check its operation and to control the current to be injected in the grid. The inverter does not have a meter approved for legal metrology.

Input data

PAR	Description	UM		Def	Min	Max	Access
650	**VinMppt1**	V	R				
652	**VinMppt2**	V	R				
	Display of DC voltage at input to MPPT channel no.						
656	**IinMppt1**	A	R				
658	**IinMppt2**	A	R				
	Display of DC current at input to MPPT channel no.						
140	**Power input 1**	W	R				
142	**Power input 2**	W	R				
	Display of power at input to MPPT channel no.						
(*)Enable monitoring to display string current. Unavailable strings have value 0.							
150	**String current 1**	A	R				
152	**String current 2**	A	R				
154	**String current 3**	A	R				
156	**String current 4**	A	R				
	Display of current at input of string "n".						
172	**String status**						ER

Display of strings status:

0 String not configured or out the threshold setting (*)

1 String OK

(*) occurs only if the string current is beyond the set limit (PAR 597) for the set time (PAR 596) compared to the average current of the strings.

Example: display 0111

0	1	1	1
String 4= ERROR	String 3= OK	String 2= OK	String 1= OK

PAR	Description	UM	Def	Min	Max	Access
176	**String active**					ER

Display of active strings: each bit corresponds to a string present. Together with PAR 172, indicates the strings present, the ones that are monitored, and in error.

0 String not active

1 String active

Example: Display 0111

0	1	1	1
String 4 = Not active	String 3 = active	String 2 = active	String 1 = active

370	**String Status 1**					ER
371	**String Status 2**					ER
372	**String Status 3**					ER
373	**String Status 4**					ER

Based on the models, only the parameters shown on the table are displayed.

Display of strings status:

Not Available string not present.

Not included string present but not configured

Active string functioning.

Error string current beyond limit ("String error" warning is generated). For more information See Alarms and Warnings list" on page 56.

Output data

PAR	Description	UM		Def	Min	Max	Access
112	**Vout L1**	V	R				
114	**Vout L2**	V	R				
116	**Vout L3**	V	R				

Display of AC output voltage of drive (L1 = phase U, L2 = phase V, L3 = phase W).

118	**Iout L1**	A	R				
120	**Iout L2**	A	R				
122	**Iout L3**	A	R				

Display AC output current of drive (L1 = phase U, L2 = phase V, L3 = phase W).

126	**Active Power**	kW	R				

display(Power).

124	**Cos phi**		R				

The power factor value (cos) is displayed.) .

128	**Reactive Power**	kW	R				

The value of the reactive power generated into the mains is displayed.

180	**Apparent Power**	kW	R				

Display of value of apparent power generated on the grid.

130	**AC Frequency**	Hz	R				

The drive output frequency is displayed.

Inverter info

PAR	Description	UM	Def	Min	Max	Access

478 **Name** R

Display of inverterfamily: NEO/PVSA/APV-S.

480 **Model** R

Display the inverter model, i.e.: XXk-AE-TL-X

482 **Size** ER

Display of inverter size (forexample: 10kWAE1mppt)

490 **Software Version** R

Display of FW version (Main inverter version and release of internal SW components).
I.e.:

V 02	00	00	00
Main version	Release HMI	Release AFE	Release Boost

T00
Type

498 **Build date** ER

Display of date of FW version.

511 **Work status** R

Display of inverter work status.

0	Starting	Displayed for a few seconds after power-on.
1	Initializing	Initialization procedures and connection to DC circuit.
2	Not Enabled	Inverter not enabled to generate power
3	Connected	Inverter connects to AC grid and prepares for generation.
4	Status OK	Inverter is generating.
5	Limited	Power generated to the grid is limited due to a derating or to a function imposed by regulations in the country of installation.
6	Warning	Inverter in warning status
7	Alarm	Inverter in alarm status
8	Active	0 power is generated: inverter is disabled (PAR 5110 = Off) or is in test mode.

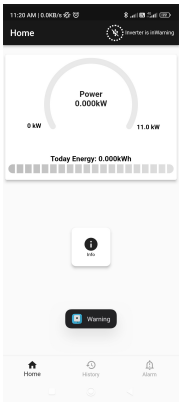
174 **Inverter state** ER

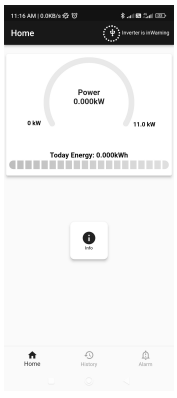
Status bit code.

510 **USB Status** R

Display of USB output status. The statuses are also indicated on the title bar of the application.

Status	Meaning
Not Ready	USB drive non inserted
Removed	USB drive removed
Ready	USB drive inserted
Busy	USB drive in use
Error	Drive error





PAR	Description	UM	Def	Min	Max	Access

146 **Inverter Temp** °C R

Display of heatsink temperature read by sensor.

240 **Temp micro** °C ER

Display of HMI micro temperature.

242 **Temp board** °C ER

Display of temperature in HMI card.

500 **Boot rel** ER

Display of boot SW release.

501 **Boot ver** ER

Display of boot SW version.

520 **Serial Number** R

Display of inverter serial number.

530 **Time Date** R

Display of current date and time of inverter. Format dd/MM/YY hh:mm:ss.

4840 **Warning 1** ER

Bit code of status of alarms specified on table.1 bit for each alarm.
For more information, see chapter 10 .

Bit	Code	Description
0	1	AFE Comm
1	2	Boost Comm
2	3	AFE Boot
3	4	Boost Boot
4	5	EEPROM error
5	6	String error
6	7	Log error
7	8	HMI Boot
8	9	Low Battery
9	10	File error
10	11	USB error
11	12	LoadDefault error
12	13	Slave Comm
13	14	Watchdog Error

PAR	Description	UM	Def	Min	Max	Access

4841 **Alarm B1** ER

Bit code of status of alarms specified on table.1 bit for each alarm.
For more information, see chapter 10.

Bit	Code	Description
0	17	Input OV DC Bus
1	18	Input OC 1
2	19	Com err
3	20	Input OC 2
4	21	Insulation err
5	22	Missed config 1
6	23	Leakage curr B
7	24	Micro OT B
8	25	Internal err 1
9	26	Ground kit err
10	27	Klixon err 1
11	28	Redundancy err 1
12	29	Internal err 2
13	30	Internal err 3

4842 **Alarm B2** ER

Bit code of status of alarms specified on table;1 bit for each alarm.
No alarm provided in this section.

Bit	Code	Description
15	48	Slave alarm

4843 **Alarm A1** ER

Bit code of status of alarms specified on table.1 bit for each alarm.
For more information, see chapter 10.

Bit	Code	Description
0	49	DC Link UV A
1	50	DC LINK OV A
2	51	DC Link Unbalance
3	52	Output OC 1
4	53	Output OC 2
5	54	Grid UV
6	55	Grid OV
7	56	Grid UF
8	57	Grid OF
9	58	Redundancy err 2
10	59	Sink OT B
11	60	Sink UT B
12	61	Sink OT A
13	62	Sink UT A
14	63	DC Current Inj
15	64	LeakageCurrent A

4844 **Alarm A2** ER

Bit code of status of alarms specified on table.1 bit for each alarm.
For more information, see chapter 10.

Bit	Code	Description
0	65	Power Relay err
1	66	Micro OT A
2	67	Klixon err 2
3	68	Missed config 2

4	69	AC Voltage Unbalanced
5	70	AC Current Unbalanced
6	71	Internal err 5
7	72	Internal err 6
8	73	A Overload

4845 **Warning 2** ER

Bit code of status of alarms specified on table.1 bit for each alarm.
For more information, see chapter 10.

Bit	Code	Description
0	81	OverVoltageVin
1	82	Module OT
2	83	Heatsink OT
3	84	Varistor not OK

History

Total

PAR	Description	UM		Def	Min	Max	Access
134	**E tot**	MWh	R				

Displays total energy generated since first firing.

138	**Time tot**	h	R				

Displays total generating / enabling time.

184	**LifeTime**	h	R				

Displays total operating / non operating time.

Today

PAR	Description	UM		Def	Min	Max	Access
132	**E day**	kWh	R				

Displays total daily energy.

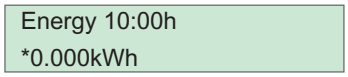
136	**PW peak Day**	kW	R				

Displays daily energy peak value.

2200	**Energy hh:mmh**	kWh	R
2202	**Energy hh:mmh**	kWh	R
2204	**Energy hh:mmh**	kWh	R
2206	**Energy hh:mmh**	kWh	R
2208	**Energy hh:mmh**	kWh	R
2210	**Energy hh:mmh**	kWh	R
2212	**Energy hh:mmh**	kWh	R

2214	**Energy hh:mmh**	kWh	R
2216	**Energy hh:mmh**	kWh	R
2218	**Energy hh:mmh**	kWh	R
2220	**Energy hh:mmh**	kWh	R
2222	**Energy hh:mmh**	kWh	R
2224	**Energy hh:mmh**	kWh	R
2226	**Energy hh:mmh**	kWh	R
2228	**Energy hh:mmh**	kWh	R
2230	**Energy hh:mmh**	kWh	R

Displays value of energy generated in previous 16 hours.
i.e.:if the time is 11:30,PAR 2200 shows "10:00h", PAR 2202 shows "09:00h",etc.



2122	**Energy MM/YYYY**	MWh	R

Displays value of energy generated in previous 12 months.
i.e.: if today is 06 Sep 2022, PAR 2100 shows "09/2022", PAR 2102 "09/2022", etc.

Last 10 years

PAR	Description	UM		Def	Min	Max	Access
2018	**E 1Yr**	MWh	R				

Displays total energy generated in last 12 months.

2020	**Time 1Yr**	h	R

Displays operating time in last 12 months.

2022	**CO2 1Yr**	kg	R

Displays calculation of kg of CO_2 saved in last 12months (compared to generation of electricity with fossil fuels).

2150	**Energy YYYY**	MWh	R
2152	**Energy YYYY**	MWh	R
2154	**Energy YYYY**	MWh	R
2156	**Energy YYYY**	MWh	R
2158	**Energy YYYY**	MWh	R
2160	**Energy YYYY**	MWh	R
2162	**Energy YYYY**	MWh	R
2164	**Energy YYYY**	MWh	R
2166	**Energy YYYY**	MWh	R
2168	**Energy YYYY**	MWh	R

Displays total energy generated in last 10 years.
i.e.: if today is 30 Sep 2022,PAR 2150 shows "2021", PAR 2152 "2020", etc.

Alarms

Note: **For more information on alarms and warnings, see chapter 10.**

Active alarms

The list of active alarms and warnings is saved on this menu, with indication of the time the alarm tripped.
Alarms are shown starting from the most recent (no.1) to the oldest (no.10).

Note: **The alarms reset command deletes only alarms and warnings whose cause has been eliminated or is no longer active.**

Settings

System

Note! **Any change to the value of parameters has an immediate effect on inverter operations, but is not automatically saved in permanent memory. All unsaved changes will be lost when power to the drive is switched off.**

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
550	**Param Save**		Off	Off	On	ERW

Any change to the value of parameters has an immediate effect on inverter operations, but is not auto matically saved in permanent memory.
All unsaved changes will be lost when power to the drive is switched off.
PAR 550 Param Save is used to save the value of currently used parameters in the permanent memory.
This parameter is also visible in Easy mode if a valid password has been entered (factory or personal).

590	**Password**		-	-	-	RW

Changing the password for advanced parameterization.

Attention **Make a note of the new password: when it is changed and saved, the default password is no longer valid. Only the new password can be used.**

554	**Access Mode**		Easy	Easy	Expert	RW

Easy
Expert
Set the parameter to Expert to access advanced parameterization.
To access the parameter, enter password 1234 (factory default).
The password can be changed with PAR 590 Password

Attention **After the Default param command is run, you have to repeat the Commissioning procedure when the inverter is switched on again.**

This parameter can be changed only with the inverter disabled (PAR 5110 Inverter Enable= Off) and when the inverter is not generating (PAR 511 Work status= 2, Not enabled).

PAR	Description	UM	Def	Min	Max	Access
584	**Save Log**		Off	Off	On	RW
	Saving the production history on USB drive (csv format).					
586	**Save param USB**		Off	Off	On	RW
	Saving current parameter configuration on USB drive. The configuration is saved in the slot set with PAR 598 **Slot param USB**					
587	**Load param USB**		Off	Off	On	ERW
	Overwrite configuration of inverter parameters with parameters on USB drive. The configuration is saved in the slot set with PAR 598 **Slot param USB.**					

Attention

This parameter can be changed only with the inverter disabled (PAR 5110 APV-S **Enable**= Off) and when the inverter is not generating (PAR 511 **Work status** = 2, Not enabled).

598	**Slot param USB**		0	0	255	RW
	Selection of slot (automatic numbering of file) for saving/loading a configuration					
599	**Save Err**					RW
	Saving of alarms list on USB drive. The configuration is saved in the slot set with PAR598 **Slot param USB**.					
301	**Log Time**		300s			ERW
	Setting of interval for saving production history. Total memorization time, variable according to selected recording cycle. Circular memory: the oldest data are automatically overwritten.					

Recording cycles	Memorization time
0 sec	no history
60 sec	55 gg
120 sec	abt 3.5 months
300 sec	abt 9 months
600 sec	1.5 years
900 sec	2.2 years
1200 sec	3 years

Time

Note!

Any change to the value of parameters has an immediate effect on inverter operations, but is **not automatically saved** in permanent memory. All unsaved changes **will be lost** when power to the drive is switched off.

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
70	**Set DateTime**					ERW
	Setting internal clock. Format: dd/MM/YY hh:mm.					

PAR	Description	UM	Def	Min	Max	Access
72	**Year**	YY				ERW
	Setting year. Format:YY (example : 2014 = 14).					
74	**Month**	MM				ERW
	Setting month. Format : MM (example:June=06).					
76	**Day**	GG				ERW
	Setting day. Format : GG (example:05).					
78	**Hour**	DD				ERW
	Setting hour. Format: 24H (example: 10PM = 22).					
80	**Minute**	m				ERW
	Setting minutes. Format : mm (example : 9'=09).					
82	**Second**	s				ERW
	Setting seconds. Format : ss (example : 6''=06).					
83	**TimeZone**		0	-12	+12	ERW
	Time zone set relative to Universal Coordinated Time UTC).					
84	**DayLightSaving**		On	Off	On	ERW
	Automatic setting of Daylight Saving Time. With 84 "Daylightsaving" = On (default), the time automatically switches from solar to day light saving time (last Sunday in March and October) (check applicability in country of installation).					

Note! Any change to the value of parameters has an immediate effect on inverter operations, but is **not automatically saved** in permanent memory. All unsaved changes **will be lost** when power to the drive is switched off.

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
5110	**Inverter Enable**		Off	Off	On	ERW

Starts and stops inverter regeneration by remote control through serial communication.

On Automatically set to ON during first firing.

Off The inverter must be set to Off to make changes to PAR 5111, 580 and 587.

580	**Param Default**		Off	Off	On	ERW

Transfers the standard factory - set values to the inverter memory (“Def” column on the parameters table).

5111	**Grid code**		None	-	-	ERW

Setting of Gridcode. Requested and set at first firing.

0	None	10	RD 661/2007	20	UK G59/3 LV sys
1	EN 50549-PL	11	IEC 61727/2004	21	UK G59/3 HV sys
2	EN 50549-1/2019	12	CEI 016		
3	EN 50438/2014	13	SAGC Cat A1-A2		
4	India	14	SAGC Cat A3		
5	India-Kerala	15	SAGC Cat B		
6	CEI 021	16	SAGC Cat C		
7	VDE 4105	17	NRS 097-2-1		
8	VDE 0126 2006	18	UTEC C15-712		
9	VDE 0126 A1/2012	19	UK G83		

Nota! This parameter can be changed only with the inverter disabled (PAR 5110 Inverter Enable = Off) and when the inverter is not generating (PAR 511 **Work status**= 2, Not enabled).

595	**Language**		None			ERW

Setting the display language

None (English)

English

Polish

5120	**AbsPwrSetPLim**	%	100	0	100	ERW

Setting percentage of active power setpoint related to absolute power according to standard.

0 = 0% of absolute active power

100 = 100% of absolute active power

5114	**ReactPwrSetP**	%	0	-100%	+100%	ERW

Defines the reactive power that the inverter will generate at the connection point in “Fixed-Q” mode(PAR 5118 set to 1).

It is expressed as a percentage of rated active power Pn. The permitted range of values is:

-100.0 ....+100.0.

PAR	Description	UM	Def	Min	Max	Access

0.0 equals no reactive power delivery/draw

-10.0 equals reactive power of 0.1*Pn drawn from the grid.
The current produced by the inverter will be phased in advance compared to voltage, with convection of the generator (inductive behavior).

30.0 equals reactive power delivery of 0.3*Pn to the grid.
The current produced by the inverter will be phased in delay compared to voltage, with convection of the generator (capacitive behavior).

5116	**CosPhi Setp**		1.0	-0.9	+0.9	ERW

Defines the cosphi that the inverter controls at the connection point in "Fixed cos-phi "mode(PAR 5118 set to 2).

1.0 equals no reactive power delivery/draw

-0.9 equals production of current phased in advance compared to voltage, with convection of the generator (inductive behavior).

0.9 equals production of current phased in delay compared to voltage, with convection of the generator (capacitive behavior).

5118	**ReactPwrCtrl**		-	-	-	ERW

Setting of reactive power control mode.

0	None
1	Fixed Q
2	Fixed cos-phi
3	Q(U)
4	Cos-phi(P)

String Settings

380	**String config 1**		Included			ER
381	**String config 2**		Included			ER
382	**String config 3**		Included			ER
383	**String config 4**		Included			ER

Setting string monitoring.
Only the parameters of strings actually present in the inverter are shown. See the table on the "Input **Data**" menu.

Not Included **string not configured for monitoring.**
Included **configured for monitoring.**

596	**StringAvgTime**	s	300	5	1800	ERW

Setting string currents monitoring time.

597	**StringThresh**	mA	3000	0	30000	ERW

String currents monitoring limit.

594	**CO2factor**		531	1	1000	ERW

Conversion factor for calculating Kg CO_2.

Note! Any change to the value of parameters has an immediate effect on inverter operations, but is **not automatically saved** in permanent memory. All unsaved changes **will be lost** when power to the drive is switched off.

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
201	**PortA Baudrate**	bps	38400	1200	115200	ERW
	Select baudrate (inbps) of first port. 1200bps 2400bps 4800bps 9600bps 19200bps 38400bps 57600bps 115200bps					
202	**PortA Settings**		N81			ERW
	Configure data packet of first port. N81 E81 O81 N71 E71 O71 N82 E82 O82 N72 E72 O72					
203	**PortA Address**		1	1	63	ERW
	Modbus address.					
204	**PortB Baudrate**	bps	9600	1200	115200	ERW
	Baudrate (inbps) of second port. 1200bps 2400bps 4800bps 9600bps 19200bps 38400bps 57600bps 115200bps					

PAR	Description	UM	Def	Min	Max	Access
205	**PortB Settings**		N81			ERW
	Configure data packet of second port. N81 E81 O81 N71 E71 O71					
206	**PortB Address**		2	1	83	ERW
	Modbus address.					

Grid Settings - Voltage

Note! Any change to the value of parameters has an immediate effect on inverter operations, but is **not automatically saved** in permanent memory. All unsaved changes **will be lost** when power to the drive is switched off.

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
20604	**Vmin for Connect**	%				ERW
	Minimum voltage for connection to the Grid. This is set in %of VACnominal.					
20606	**Vmax for Connect**	%				ERW
	Maximum voltage for connection to the Grid. This is set in %of VACnominal.					
20610	**Delay for Connect**	s				ERW
	Minimum time delay for Grid connection.					
20612	**Reconnect time**	s				ERW
	Minimum time for Grid Reconnection.					
20852	**Thrsd U<**	%				ERW
	Grid undervoltage threshold - slow limit. This is to be set in % of VACnominal					
20854	**Time U<**	ms				ERW
	Time limit for grid undervoltage threshold-slow limit. This is to be set in ms.					
20860	**Thrsd U>>**	%				ERW
	Grid overvoltage threshold - Fast limit. This is to be set in % of VACnominal					
20862	**Time U>>**	ms				ERW
	Time limit for grid undervoltage threshold-Fast limit. This is to be set in ms.					
20874	**Thrsd U>**	%				ERW
	Grid overvoltage threshold - Slow limit. This is to be set in % of VACnominal					

PAR	Description	UM	Def	Min	Max	Access
20876	**Time U>**	ms				ERW
	Time limit for grid undervoltage threshold-Slow limit. This is to be set in ms.					
20878	**Thrsd U<<**	%				ERW
	Grid overvoltage threshold - Fast limit. This is to be set in % of VACnominal					
20880	**Time U<<**	ms				ERW
	Time limit for grid undervoltage threshold-Fast limit. This is to be set in ms.					

Grid Settings - Frequency

Note! Any change to the value of parameters has an immediate effect on inverter operations, but is **not automatically saved** in permanent memory. All unsaved changes **will be lost** when power to the drive is switched off.

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
20600	**Fmin for Connect**	Hz				ERW
	Minimum voltage for connection to the Grid. This is set in %of VACnominal.					
20602	**Fmax for Connect**	Hz				ERW
	Maximum voltage for connection to the Grid. This is set in %of VACnominal.					
20864	**Thrsd f<**	%				ERW
	Grid undervoltage threshold - slow limit. This is to be set in % of VACnominal					
20868	**Time f<**	ms				ERW
	Time limit for grid undervoltage threshold-slow limit. This is to be set in ms.					
20886	**Thrsd f>>**	%				ERW
	Grid overvoltage threshold - Fast limit. This is to be set in % of VACnominal					
20888	**Time f>>**	ms				ERW
	Time limit for grid undervoltage threshold-Fast limit. This is to be set in ms.					
20866	**Thrsd f>**	%				ERW
	Grid overvoltage threshold - Slow limit. This is to be set in % of VACnominal					
20870	**Time f>**	ms				ERW
	Time limit for grid undervoltage threshold-slow limit. This is to be set in ms.					
20882	**Thrsd f<<**	%				ERW
	Grid overvoltage threshold - Fast limit. This is to be set in % of VACnominal					
20884	**Time f<<**	ms				ERW
	Time limit for grid undervoltage threshold-Fast limit. This is to be set in ms.					

LFSM(P-Hz) Settings

Note! Any change to the value of parameters has an immediate effect on inverter operations, but is **not automatically saved** in permanent memory. All unsaved changes **will be lost** when power to the drive is switched off.

Run PAR 550 Param Save to save the value of currently used parameters.

PAR	Description	UM	Def	Min	Max	Access
11206	**bPHZType** Configure PHz Type. CEI 021 CEI-016 EN50549-1-PL EN50549-1-2019					ERW
20280	**LFSMo-aPHzType** Activates or deactivated the LFSMo function.					ERW
20286	**LFSMo-ThrsdFreq(f1)** F1 frequency threshold for LFSMo.	Hz				ERW
20288	**LFSMo-DeactThrsd(fstop)** Fstop frequency threshold for LFSMo.	Hz				ERW
20290	**LFSMo-Slope(Droop)** Slope or Droop parameter for LFSMo function. Slope of 40%/Hz indicates 5% droop.	%/Hz				ERW
20292	**LFSMo-DeactTime(tstop)** Deactivation time for LFSMo.	s				ERW
20294	**LFSMo-IntentionalDelay** Intentional delay for LFSMo.	s				ERW
22286	**LFSMu-ThrsdFreq(f1)** F1 frequency threshold for LFSMu.	Hz				ERW
22288	**LFSMu-DeactThrsd(fstop)** fstop deactivation threshold for LFSMu.	Hz				ERW
22290	**LFSMu Slope(Droop)** Slope or Droop parameter for LFSMu function. Slope of 40%/Hz indicates 5% droop.	%/Hz				ERW
22292	**LFSMu-DeactTime(tstop)** Deactivation time for LFSMu.	s				ERW
22296	**LFSMu-IntentionalDelay** Intentional delay for LFSMu.	s				ERW

9. Communication

9.1 RS485 serial connection with MODBUS RTU protocol

Communication is performed via RS485 serial connection with MODBUS RTU protocol.

To configure communication between the inverter and the monitoring/software system, you have to respect numerous elements in order to ensure correct functioning.

You can connect and communicate with a maximum of 50 nodes. DO NOT exceed 250 meters for the communication line (for longer lengths please contact Solar Service).

In case of communication between a single inverter and a PC(with supervision SW or inverter configuration SW installed), you need to use a USB-RS485 converter cable(were commend our cable code 8S8F60 length 1.8 meters or code 8S8F61 length 5 meters (laboratory tested); other "passive" converters may not work).

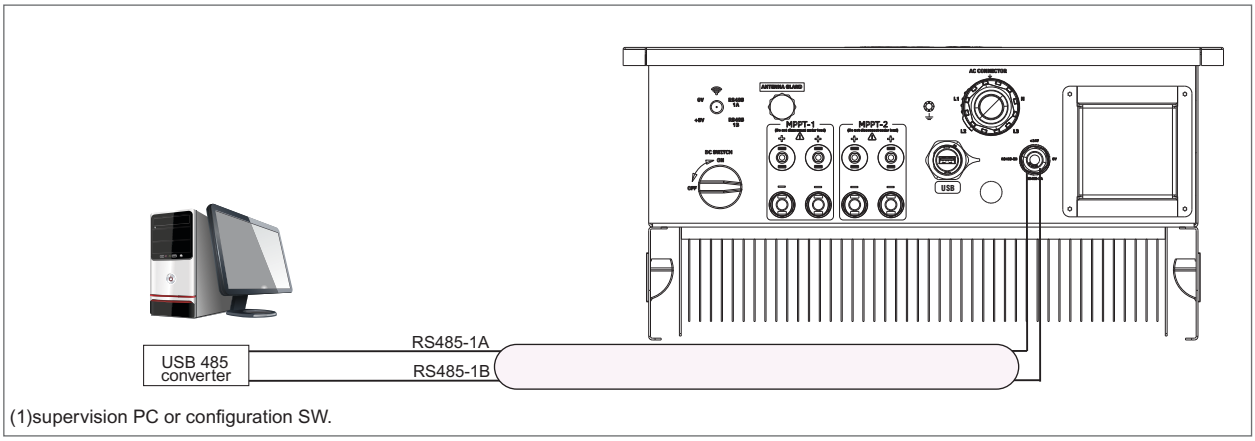
Example of connection: with one inverter see Figure 24.

Attention

We recommend running the serial connection cable in a **tray separated from power cables**.
In case of systems with high interference, we recommend shielding the cables with a metal pipe (grounded at a single point).

In case of communication between multiple inverters and a PC or between one or more inverters and the datalogger:

- for the connection, use a cable consisting of two symmetrical twisted pairs, spiraled with a single shield, typical impedance Z0=120 ohm (minimum 2x2x0.22 mm^2 or min.2x2 AWG24),
- the cable shield must be continuous for the entire chain and must be grounded at a single point.



(1)supervision PC or configuration SW.

Figure 24 : Rs485 connection to the inverter

Note! The first and last element of the modbus chain must have the termination resistor inserted.

10. Troubleshooting

10.1 Error messages classification

The inverter PVSA is able to report alarms / warnings on the display if the input voltage is higher than the VSTART.

It is possible to distinguish the type of error in "alarm" or "warning" as described in the following table:

Alarms	Red led on Green led off	These alarms stop the inverter
Warnings Code from 1 to 16	Red led off Green led blinking	The inverter continues to operate and generate but it reports this warning by detecting an abnormality at inverter level. The inverter can stop if these warnings are combined with other alarms.
Warnings Code from 81 to 84	Red led off Green led blinking	The inverter continues to operate and generate but it reports this warning by detecting an abnormality at system / plant level or the need to perform maintenance

10.2 Alarms and Warnings list

Cod. (1)	Displayed message	Type	Description	Cause	Solution
1	AFE Comm	Warning	AFE Communication error	No communication with AFE micro	Do an alarm reset. *
2	Boost Comm	Warning	Boost Communication error	No communication with Boost micro	Do an alarm reset. *
3	AFE Boot	Warning	AFE in Boot State	AFE did not load software. Occurs if update is interrupted	Do an alarm reset. *
4	Boost Boot	Warning	Boost in Boot State	Boost did not load software. Occurs if update is interrupted	Do an alarm reset. *
5	EEPROM error	Warning	Parameter Save/Load error	HMI lost saved parameters	Re-parameterize inverter. *
6	String error	Warning	String Current Test error	One or more monitored strings have values beyond limit	Check set limits and that strings are correctly connected.. * / **
7	Log error	Warning	Log error	Cannot read or write production or alarms log	Check that log was correctly copied to USB drive. If not, copy it again. If you are not copying the log to a USB drive, contact Radius Solar Service **
8	HMI Boot	Warning	HMI in Boot State	HMI did not load software	Contact Radius Solar Service
9	Low Battery	Warning	Low Battery	Replace clock battery	Check that battery is correctly inserted. If it is, it means that it is drained. Replace it by following the instructions in the manual. */**
10	File error	Warning	File error	USB read/write error	Check that USB is inserted correctly and that process was successful. If not, reinsert USB and/ or repeat process. *
11	USB error	Warning	USB error	USB hardware error	Do an alarm reset. *
12	LoadDefault error	Warning	Load default error	Cannot load default parameters	Check inverter parameterization. */**
13	Slave Comm	Warning	PVSA Slave comm error	Slave Communication error	Check that slave inverters are connected and on
14	WatchDog Error	Warning	WatchDog Error	Internal Error detected by HMI	Do an alarm reset. *
15	Low InputVoltage	Warning	Low Input Voltage	Input voltage too low	Do an alarm reset. *
16	Grid Not OK	Warning	Grid voltage is not suitable for grid connection.	Grid voltage not proper.	Check that available grid voltage conforms to requirement of selected relevant Grid Standard. */**
17	Input OV DC Bus	Alarm	Over Voltage on DC bus detected from Boost	Input voltage too high .	Check that configuration of strings conforms to characteristics of inverter specified in manual. */**
18	Input OC SW 1	Alarm	Over Current Boost SW	Maximum input current exceeded	Check that inputs from PV panels are correct. */**
19	Internal com err	Alarm	Wrong internal communication	Communication problems among internal devices	Switch inverter OFF and then back ON. *
20	Input IGBT Desat	Alarm	Overcurrent Boost 2	Maximum input current exceeded	Check that inputs from PV panels are correct. */**

Cod. (1)	Displayed message	Type	Description	Cause	Solution
21	Insulation err	Alarm	Insulation Resistance Error	PV field insulation below limits	Check insulation of PV field. *
22	Missed config 1	Alarm	Wrong Configuration / Size	Initialization error	Do an alarm reset. *
23	Leakage curr B	Alarm	Leakage current Error detected from Boost	Leakage current detected on AC side	Check insulation of PV field. *
24	Micro OT B	Alarm	Boost micro over temperature	Temperature too high	Wait for inverter to cool and return to working range. If problem persists, contact Radius Solar Service
25	Internal err 1	Alarm	Internal error 1	Internal error in inverter	Switch inverter OFF and then back ON. *
26	Ground kit err	Alarm	Ground Kit Error	Loss of PV generator isolation and leakage to ground	Check isolation to ground and replace fuse after eliminating cause of error.. *
27	Klixon err 1	Alarm	Klixon error	Temperature too high	Wait for inverter to cool and return to working range. If problem persists, contact Radius Solar Service
28	Redundancy err 1	Alarm	Redundancy Error	Conflict between measurements of leakage current	If problem persists, contact Radius Solar Service
29	Boost Trap	Alarm	Boost Trap	Internal error in inverter	Switch inverter OFF and then back ON. *
30	AFE Reset	Alarm	AFE Reset	Internal error in inverter	Switch inverter OFF and then back ON. *
31	Overtemperature HW	Alarm	Overtemperature HW	Overtemperature in inverter	Check inverter ventilation is as per requirement.
32	Input Overcurrent HW	Alarm	Input Overcurrent HW	Maximum input current exceeded	Check input panels are correctly configured. If problem persists, then restart the inverter.
49	DC Link UV A	Alarm	DC bus undervoltage	Voltage on DC bus below limits	If problem persists, contact Radius Solar Service
50	DC LINK OV A	Alarm	DC bus overvoltage (Inverter)	Voltage on DC bus above limits	Do an alarm reset. *
51	DC Link Unbalance	Alarm	DC bus unbalanced	Voltage on DC bus above limits	Check that configuration of strings conforms to characteristics of inverter specified in manual. */**
52	Output OC 1	Alarm	Over Current SW Inverter	Maximum output current exceeded	Do an alarm reset. *
53	Output IGBT Desat	Alarm	Over Current IGBT inverter	Maximum output current exceeded	Do an alarm reset. *
54	Grid UV	Alarm	Grid Under Voltage	Grid voltage below minimum levels	Wait for return of grid conditions needed to start the inverter
55	Grid OV	Alarm	Grid Over Voltage	Grid voltage above maximum levels	Wait for return of grid conditions needed to start the inverter
56	Grid UF	Alarm	Grid Under Frequency	Grid frequency below minimum levels	Wait for return of grid conditions needed to start the inverter
57	Grid OF	Alarm	Grid Over Frequency	Grid frequency above maximum levels	Wait for return of grid conditions needed to start the inverter
58	Redundancy err 2	Alarm	Redundancy Error	Conflict between measurements of output voltage	Do an alarm reset. *
59	Sink OT B	Alarm	Input Side Module Over Temperature	Temperature too high	Wait for inverter to cool and return to working range. If problem persists, contact Radius Solar Service
60	Sink UT B	Alarm	Input Side Module Under Temperature	Temperature below allowed limits	Wait for temperature to return to working range. If problem persists, contact Radius Solar Service
61	Sink OT A	Alarm	Output Side Module Over Temperature	Temperature too high	Wait for inverter to cool and return to working range. If problem persists, contact Radius Solar Service
62	Sink UT A	Alarm	Output Side Module Under Temperature	Temperature below allowed limits	Wait for temperature to return to working range. If problem persists, contact Radius Solar Service
63	DC Current Inj	Alarm	DC Injected Over Limit	DC current injected in grid has exceeded limit	Do an alarm reset. *
64	LeakageCurrent A	Alarm	Leakage Current Over Limit	Leakage current detected on AC side	Check insulation of PV field. *
65	Power Relay err	Alarm	Grid Relay Fault	Relay check procedure failed	Do an alarm reset. *
66	Micro OT A	Alarm	Inverter Micro Over Temperature	Temperature too high	Wait for inverter to cool and return to working range. If problem persists, contact Radius Solar Service

Cod. (1)	Displayed message	Type	Description	Cause	Solution
67	Kilxon Error 2	Alarm	Inverter overtemperature	Inverter overtemperature	Check inverter temperature and inverter ventilation
68	Wrong Size	Alarm	Wrong Size file	Wrong size file detected	Switch inverter OFF and then back ON. *
69	AC Voltage Unbalanced	Alarm	AC Voltage Unbalanced detected	Grid unbalanced	Check voltages and connection to grid
70	Internal Comm. Error	Alarm	Internal Error	Comm. problem in internal devices	Switch inverter OFF and then back ON. *
71	AFE trap	Alarm	Afe Trap	Internal error in inverter	Switch inverter OFF and then back ON. *
72	Boost Reset	Alarm	Boost Reset	Internal error in inverter	Switch inverter OFF and then back ON. *
73	A Overload	Alarm	Overload detected	Overload in output	Check grid voltages
74	AFE wrong firmware	Alarm	AFE Wrong Firmware	AFE wrong firmware	Download the correct firmware*
75	AC current unbalance	Alarm	Current unbalance detected	AC current unbalance detected	Check output current of the inverter.
76	N-E overvoltage	Alarm	N-E overvoltage	Earth to neutral voltage not correct	Check earth to neutral voltage*
77	Output OC HW2	Alarm	Output overcurrent HW	Output side overcurrent	Check output current of the inverter.
81	OverVoltageVin	Warning	Over Voltage Input Voltage	Input voltage is in over the warning level	Check the PV plant
82	Module OT	Warning	Over Temperature IGBT Boost Module (first level)	Inverter temperature over the warning level	Check the PV plant
83	Heatsink OT	Warning	Over Temperature Sink Module (first level)	Inverter temperature over the warning level	Check the PV plant
84	SPD not OK	Warning	At least one SPD failed	At least one SPD failed	Do an alarm reset. *

** Do an alarm reset,

If problem persist contact Radius Solar Service

11. Specifications

11.1 NEO/PVSA/APV-S-XXk... models

NEO/PVSA/APV-S model		3k-AE-TL-1/2	4k-AE-TL-1/2	5k-AE-TL-1/2	6k-AE-TL-1/2	7k-AE-TL-1/2	8k-AE-TL-1/2	9k-AE-TL-1/2	10k-AE-TL-1/2	12k-AE-TL-1/2	15k-AE-TL-2	18k-AE-TL-2	20k-AE-TL-2
INPUT DATA (DC SIDE)													
MPPT number		1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	2	2	2
Number of strings per MPPT		1/1	1/1	1/1	1/1	2/1	2/1	2/1	2/1	2/1	2	2	2
Maximum DC current per MPPT	(A)	15/15	15/15	15/15	15/15	25/15	25/15	25/15	25/15	25/15	25	25	25
Max short circuit current Isc	(A)	20/20	20/20	20/20	20/20	32/20	32/20	32/20	32/20	32/20	32	32	32
VDC Range	(V)	175-950											
Absolute maximum permessible DC - voltage (without load)	(V)	1100											
MPPT range (@ maximum power)	(V)	180...850 180...850	295...850 180...850	368...850 180...850	440...850 220...850	308...850 256...850	352...850 293...850	396...850 330...850	440...850 366...850	528...850 440...850	330...850	396...850	440...850
Switch ON DC voltage	(V)	>200											
OUTPUT DATA (AC SIDE)													
Rated AC power (from cosphi -0.9 to cosphi 0.9)	(kW/kVA)	3/3.3	4/4.4	5/5.5	6/6.6	7/7.7	8/8.8	9/9.9	10/11.1	12/13.2	15/16.5	18/19.8	20/22.2
AC Rated current / Max current	(A)	4.3/4.7	5.7/6.3	7.2/7.97	8.6/9.56	10.1/11.1	11.5/12.7	13.0/14.3	14.4/16.0	17.3/19.2	21.7/23.9	26.1/28.6	28.9/32
AC voltage	(V)	{(239V_{LN}/415V_{LL} 3-phases + Neutral)/ (230V_{LN}/400V_{LL} 3-phases + Neutral)} {output voltage Range (320 ... 480V_{LL}) / (184...277V_{LN})} [1]											
Rated AC frequency	(Hz)	50/60 (output frequency interval 47...53/ 57...63) [1]											
Grid connection		TN-C / TN-S / TN-C-S/ TT											
THDi	(%)	≤ 3											
Power factor (settable)		± 0.8											
Max inverter backfeed current to the array (AC or DC)	(A)	0											
Max output fault current (AC. Peak and Duration)		Peak:45Apk (td:80us)											
Max inrush current	(A)	0											
EFFICIENCY [1)2)]													
Maximum efficiency	(%)	**98.3**	**98.3**	**98.1**	**98.1**	**98.2**	**98.3**	**98.3**	**98.3**	**98.1**	**98.1**	**98.1**	**98.1**
European efficiency (Euro E TA)	(%)	**97.7**	**97.7**	**97.7**	**97.7**	**97.8**	**98.0**	**97.6**	**97.6**	**97.6**	**97.6**	**97.6**	**97.6**
PROTECTIONS [3)]													
Interface protection (grid monitor)		Integrated (Excluded models for Italy)											
Anti-Islanding		Integrated (Where required by local regulations)											
Insulation control		Integrated											
Residual current monitoring		Integrated											
Reverse DC polarity protection		Integrated											
DC circuit breaker		Circuit beaker under load											
AC/DC overvoltage category		DC(OVC - II) and AC(OVC - III)											
DC Fuses and String failure detection		16A Fuses on both poles of each string + Current sensors for each string (-F models)											
DC Injection control		Integrated											

NEO/PVSA/APV-S model	3k-AE-TL-1/2	4k-AE-TL-1/2	5k-AE-TL-1/2	6k-AE-TL-1/2	7k-AE-TL-1/2	8k-AE-TL-1/2	9k-AE-TL-1/2	10k-AE-TL-1/2	12k-AE-TL-1/2	15k-AE-TL-2	18k-AE-TL-2	20k-AE-TL-2
INTERFACES												
Display	**BT = LED indications/Display and Bluetooth App for onsite data monitoring and analysis** **DX = OLED Display, LED indications and bluetooth App for onsite data monitoring and analysis**											
Communications	**2 Rs485 ports (Port A for Wifi Dongle[4] and Port B for User to access the parameters)** **Optional USB2.0 port (only for firmware updates and downloading of historical data)** **In built GSM based remote monitoring system(optional)**											
Inputs / Outputs	24V OUT (500mA MAX)											
COOLING												
Cooling method	Natural convection											
ENVIRONMENT DATA												
Temperature Range	-25…+60°C[4]											
Vibration	1G											
IP protection degree	IP 66											
Environmental Pollution degree classification for external environment	PD 3											
Environmental Class	Outdoor											
Maximum permissible value for relative humidity, non- condensing	100%											
Climatic category according to IEC 60721-3-4	4K4H											
Altitude	3000m											
STANDARDS												
Directives and standards	IEC 62109-1, IEC 62109-2, IEC 62116											
Electromagnetic immunity and emissions	EN 61000-6-3, EN 61000-6-2											
CE marking	Yes											
Grid connections	IEC 61683, IEC 60068-2-1/2/14/30, IEC 60529 IEC 61727, IEC 62109-1/2 VDE V 0126-1-1:2012/A1 EN50438-1, EN50549-1:2019											

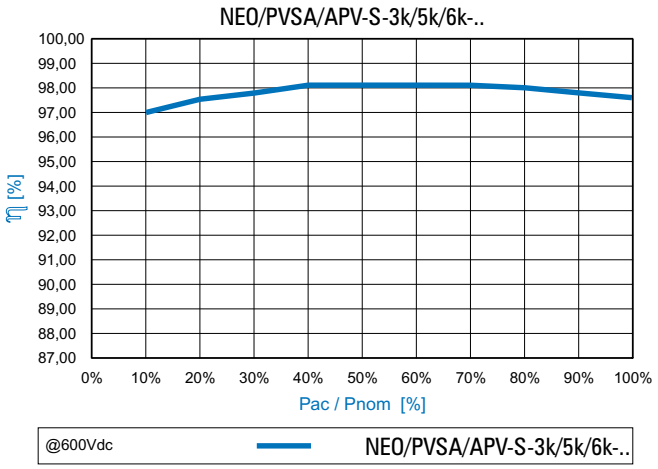
1) The inverters not working under nominal conditions can have different efficiency data.

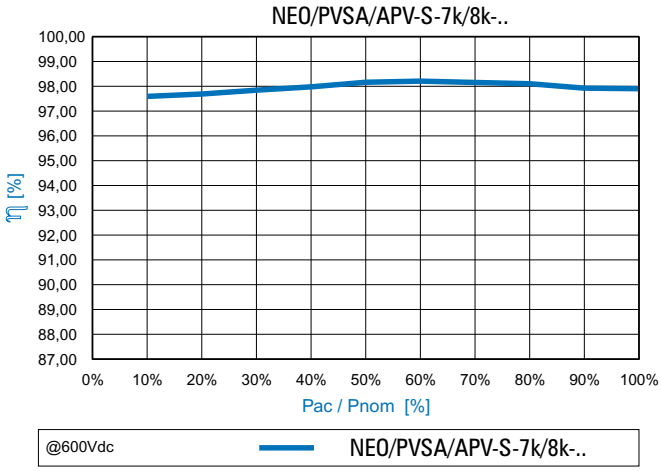
2) The efficiency values are defined through measuring process with high precision instruments during nominal conditions.

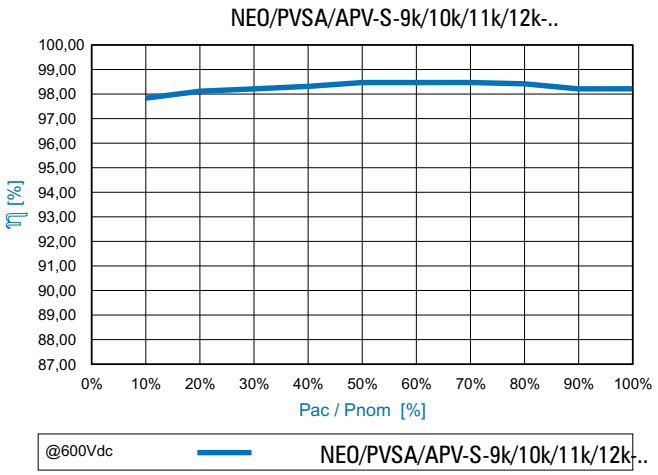
3) Refer temperature vs power derating curve on page 61

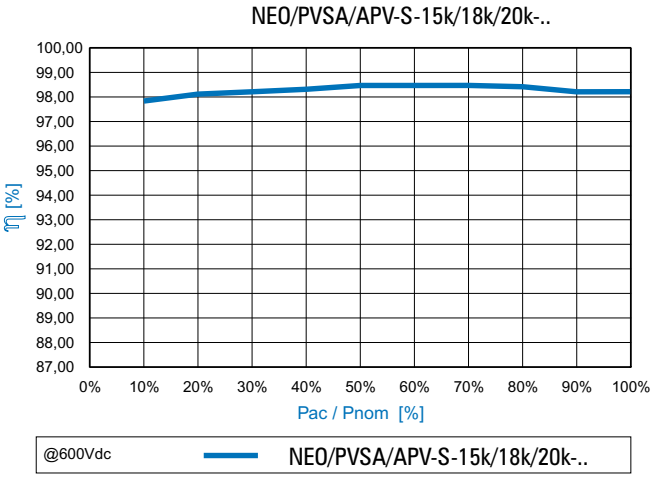
Note! Inverter has inbuilt Type 2 DC and Pluggable Type 2 AC SPD.

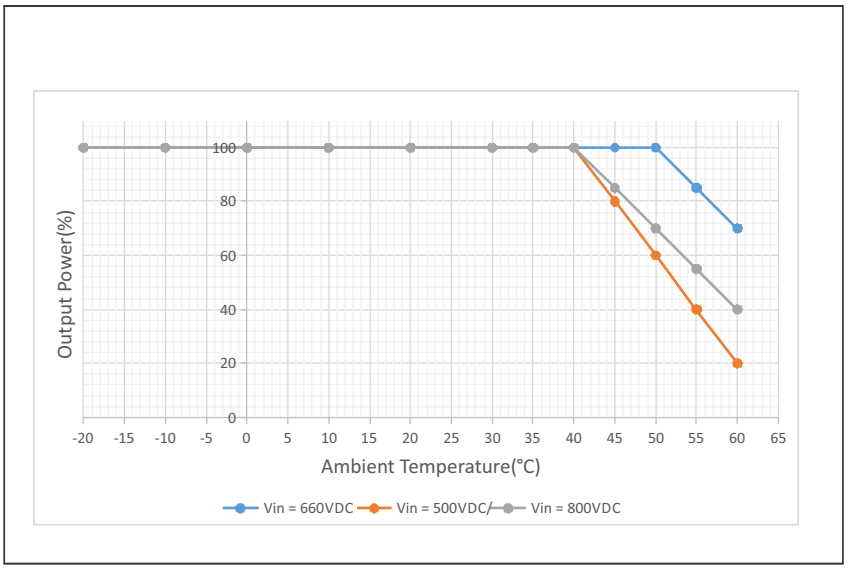
11.1.1 Efficiency curves











Note! The efficiency values are defined through measuring process with high precision instruments during nominal conditions. The inverters not working under nominal conditions can have different efficiency data.

12. Dimensions and weight

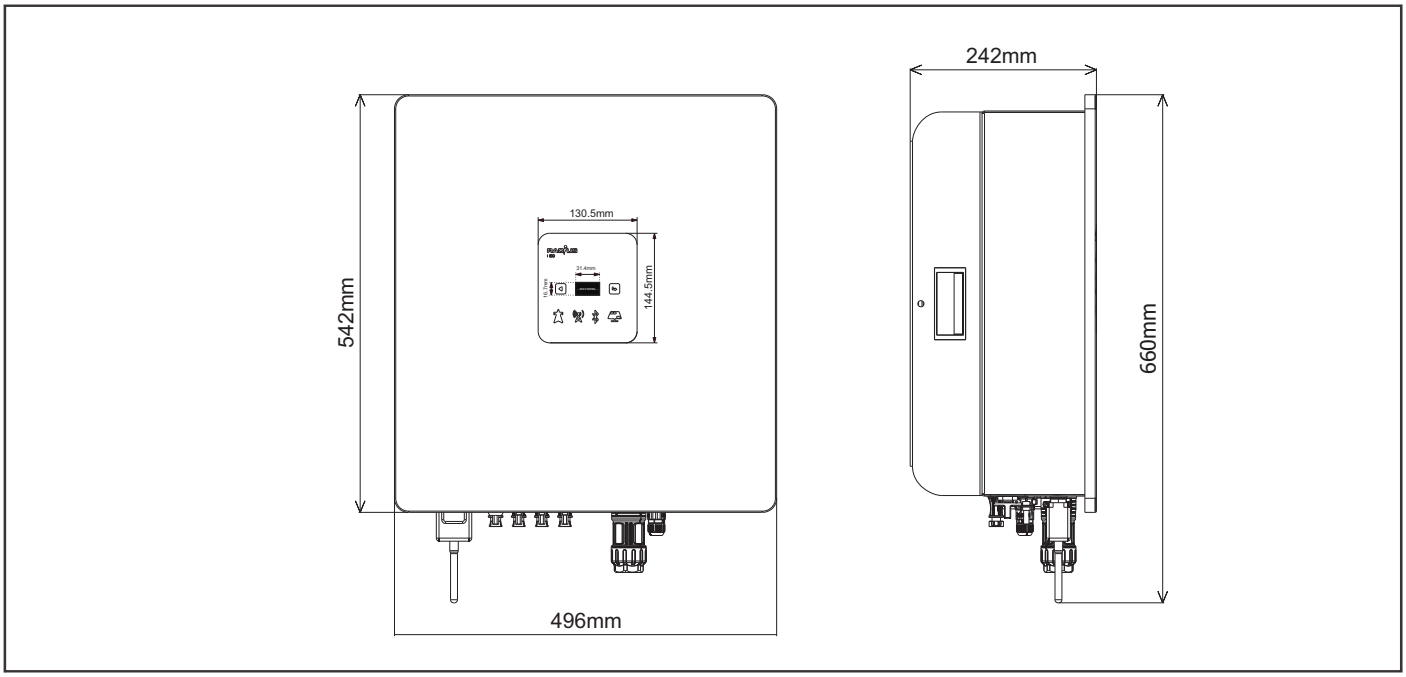


Figure 25: Dimensions - NEO/PVSA/APV-S model

NEO/PVSA/APV-S model		3k-AE-TL-1/2	4k-AE-TL-1/2	5k-AE-TL-1/2	6k-AE-TL-1/2	7k-AE-TL-1/2	8k-AE-TL-1/2	9k-AE-TL-1/2	10k-AE-TL-1/2	12k-AE-TL-1/2	15k-AE-TL-2	18k-AE-TL-2	20k-AE-TL-2
INTERFACES													
Dimensions: Width x Height x Depth	mm	496 x 542 x 245											
	[inches]	[19.52 x 21.33 x 9.64]											
Weight	kg	19/20	19/20	19/20	19/20	24/26	24/26	24/26	24/26	24/26	30	30	30
	[lbs]	[41.8/44.0]	[41.8/44.0]	[41.8/44.0]	[41.8/44.0]	[52.9/57.3]	[52.9/57.3]	[52.9/57.3]	[52.9/57.3]	[52.9/57.3]	[66.1]	[66.1]	[66.1]

13. Maintenance and cleaning

The maintenance and cleaning operations described here are necessary to guarantee the minimum safety requirements of the PV inverter. It is strongly recommended to have maintenance and cleaning procedures performed by Radius personnel.

Warning!

Operation to be performed by specially trained personnel.

Before carrying out any maintenance or cleaning operations, remove all dangerous voltage from inside the panel.

To remove all dangerous voltage from inside the panel, disconnect all the external power connections (AC side and DC side) and take steps to prevent voltage from being accidentally re-applied. Put up appropriate signs to indicate work in progress and to prohibit all maneuvers.

Wait 10 minutes before starting any work (to allow the capacitors to discharge).

Follow all the safety instructions in this manual.

Make sure all power supplies have been disconnected before touching any parts.

Maintenance personnel must be qualified and provided with adequate protective equipment.

Qualified personnel must have the followings kills:

- **Knowledge of how an inverter works and is operated;**
- **Training in how to deal with the dangers and risks associated with controlling and servicing electrical devices and plants;**
- **Training in the maintenance of electrical devices and plants;**
- **Knowledge of all applicable standards and directives;**
- **Knowledge of and adherence to these instructions, including all safety precautions.**

Protective equipment used must meet the requirements of directive 89/686/EC. Protective equipment must also include any additional protections required under applicable legislation or otherwise prescribed.

Never remove any interlocks, guards or protective devices on the equipment or use these incorrectly.

Do not remove or conceal warning signs affixed to machinery.

Do not modify circuits or software programs or make adjustments without the manufacturer's prior consent. Any such modifications could pose a risk for persons or equipment.

13.1 Product label

The product label identifies the inverter.

Environmental conditions during maintenance

The penetration of humidity and dust can damage the inverter.

Maintenance must only be carried out in humidity- and dust-free conditions.

Keeping technical documentation

This manual must always be available for use by persons responsible for operating and servicing the equip ment.

Keep this documentation next to the inverter.

13.2 Cleaning operations

It is important to avoid any build-up of dust on the outside of the inverter. DO NOT use corrosive products or material that generates electrostatic charges for this purpose.

Check the cleanliness of the internal components of the inverter panel every 12 months. Remove any dust with a low-pressure jet of water or soft cloth.

Cleaning must be performed on inverters installed in particularly dusty environments.

13.3 Routine maintenance procedures

- Periodic checks

Action	Frequency
Check that all labels and danger signs are completely legible	12 months
Check that the cables coming from outside the inverter are in perfect condition	12 months
Visually check for any damage to the inverter casing	12 months
Check that the ambient conditions of the inverter installation still comply with the ambient data shown on chapter 11.	12 months
Check integrity of cable clamps	12 months

13.4 Replacing the Pluggable Type 2 SPDs

Warning!

Operation to be performed by specially trained personnel.

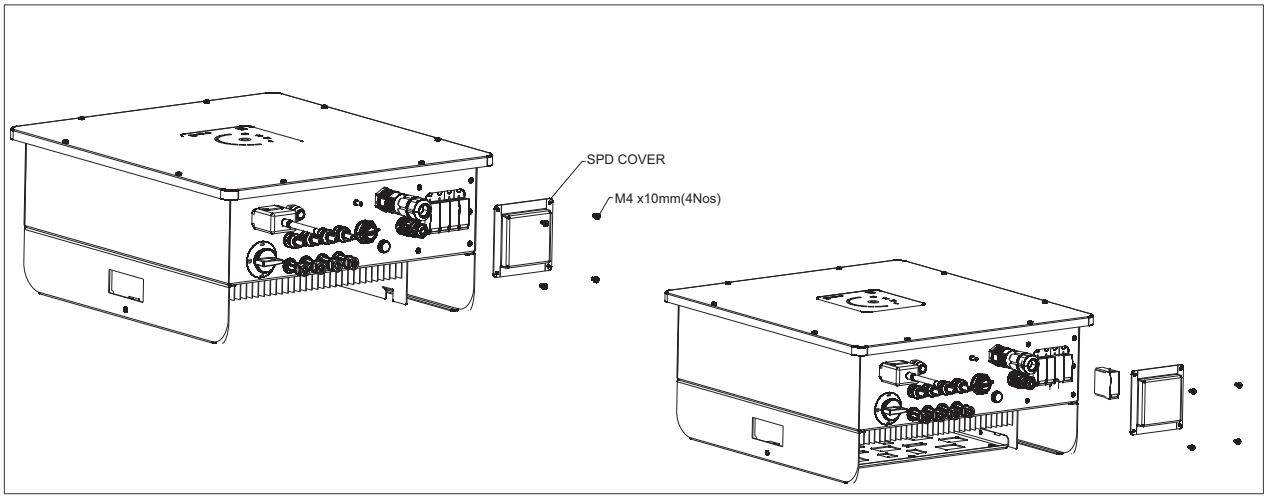


Figure 26 : Position of Type - II AC SPD

Radius inverter is equipped with replaceable TYPE II AC SPD to provide protection against surges and ovevoltages. In case of SPD failure it is indicated by red indication on the SPD cartridge itself and warning is also indicated. To replace the faulty/damaged SPD, unscrew the 4, M4 screw of AC SPD cover. Check for the Red indication on the AC SPD. Pull the faulty SPD and reinsert the new SPD. Now screw back the AC SPD cover again, Torque(5 N.m)

14. Warranty conditions

The warranty is valid from the date of delivery of the RADIUS products.

The standard manufacturer's warranty, included in the price of the product, is valid starting from the date of delivery.

Before the end of that period you may purchase the extended warranty.

For more information on warranty terms and conditions, contact RADIUS solar sales.

15. Contact

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