



String INVERTERS

Single Phase 1kW - 10kW and
Three Phase 5kW - 150kW



ON-GRID PV INVERTER

USER'S MANUAL FOR INSTALLATION & OPERATION

Rotosol solar (Division of Rotomag Motors and Controls Pvt. Ltd.,) located near Anand, Gujarat, India specializes in manufacturing of Solar On-Grid Inverters.

Rotosol is dedicated to providing perfect power conversion solutions for Solar Power Generation by manufacturing and marketing of highly efficient and reliable Solar On-Grid Inverters.

Rotosol is equipped with highly efficient assembly lines and accurate testing equipment.

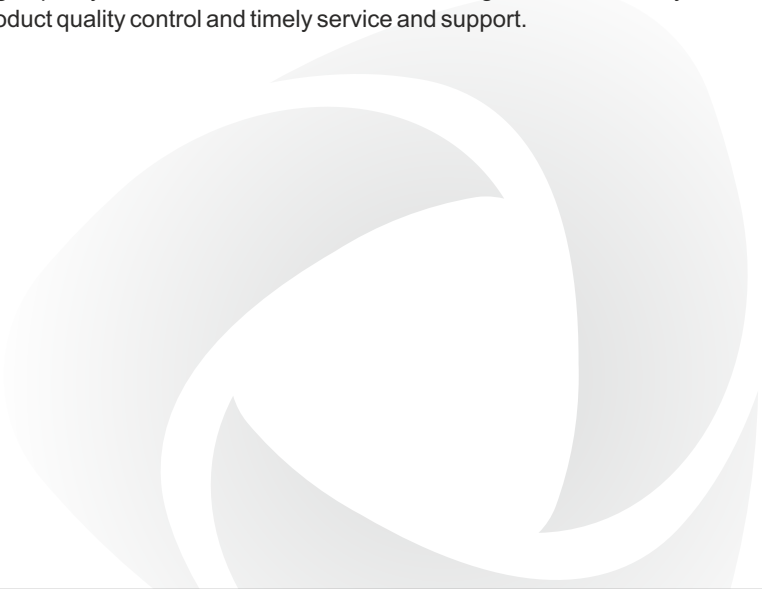
Rotosol provides highly efficient and reliable Solar On-Grid Inverters to ensure high energy generation to satisfy ever demanding customers for optimum output of generated power.

The newly designed Solar On-Grid Inverter features itself with full load high efficiency, high reliability and user-friendly interface.

The maximum conversion efficiency of our Inverter is up to 98%.

A user-friendly Installation Manual is prepared to enable perfect flawless installation and functioning of Inverters for a long time.

High quality with customer satisfaction is the goal of Rotosol by ensuring product quality control and timely service and support.



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1.1 Scope of Validity

This manual is an integral part of the On Grid Inverter.


- It describes the

1. Inverter installation
2. Commissioning
3. Operation and maintenance
4. Trouble shooting

This manual does not include complete information about (PV) Photo Voltaic System.

Single-Phase (One MPPT Tracker)

• RIS1K • RIS2K • RIS3K • RIS4K • RIS5K • RIS6K

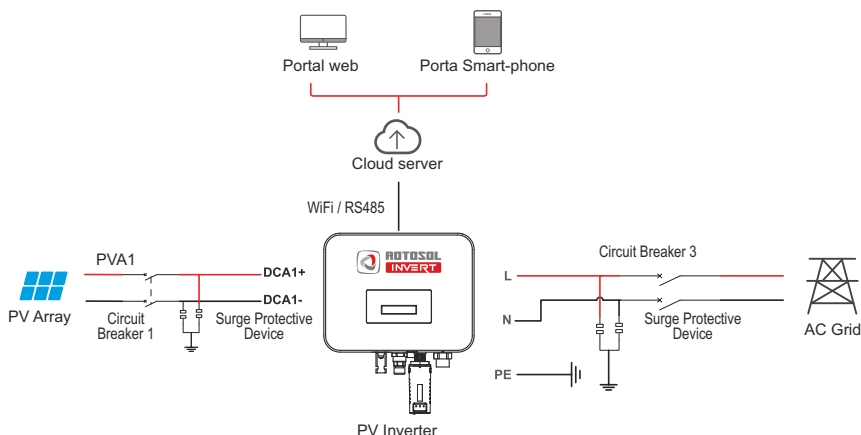
 ***Note:** Please keep this manual all the time available with you easily accessible in case of emergency.


1.2 Target Group

This manual is for qualified personnel. - The tasks described in this manual must only be performed by qualified personnel.

1.3 System Diagram

The typical on-grid PV system connection diagram.



 **Note:** Inverter image is only for representation purpose, the actual inverter image may differ.


Circuit Breaker and Surge Protector Recommendation:

Type	Max. AC Current (A)	Rated Current of AC Breaker (A)
Single-Phase (One MPPT Tracker)		
RIS1K	6	16
RIS2K	12	20
RIS3K	15	25
RIS4K	20	32
RIS5K	20	32
RIS6K	28	40

SPD (Surge Protection Device) :

Lightning protection system, refer to the following options:

- AC side, nominal discharge current 20KA, Type 2 - lightning protection, protection voltage 2.5KV
- DC side, nominal discharge current 20KA, Type 2 - lightning protection, protection voltage 3.2KV
- The wiring distance between the Inverter and the distribution box should be at least 5 meters.

 ***Note:** Please note that Single Phase Inverter can only be connected to low-voltage systems (namely, 220/230Vac, 50/60Hz).

2. Safety & Symbols

2.1 Safety Precautions

2.1.1 Safety Precautions For Inverter Movement

1. Care should be taken to ensure that damage to the Inverter is prevented during movement / installation of the Inverter.
2. Proper tools are to be used while installing the Inverter.
3. Do not store or install the Inverter close to “flammable or explosive objects”.
4. Ensure that unauthorised persons do not touch the Inverter when it is ON.

2.1.2 Safety Precautions For Inverter Installation

1. All work on the Inverter must be carried out by qualified electricians.
2. Ensure that Inverter and it's Chassis is intact, dry and clean before installing the Inverter.
3. To reduce the risk of fire, OCPD (Over Current protective Devices) are required for circuits connected to the Inverters.
4. The device may only be operated in conjunction with PV Panels.
5. The body of PV panels and inverter must be connected to the ground.










2.1.3 Safety Precautions For Inverter Repairing and Maintenance

1. Do not touch cover until 3-5 minutes after disconnecting all DC and AC sources of supply. It may be hot.
2. Please do not touch the chassis when the Inverter is working.
3. Please ensure that the used device and any relevant accessories are disposed of in accordance with applicable regulations.
4. The Inverter should be placed upwards and handled with care in delivery. Proper protective shade is to be provided to avoid direct sunshine or rain falling on the Inverter.
5. Alterations or modifications to the Inverter not recommended by ROTOMAG SOLAR or the installation of components not sold by ROTOMAG SOLAR to be avoided for warranty claims.
6. To start the Inverter, the Grid Supply Main Switch (AC) must be switched ON before solar panel's DC switch is put On.
7. To stop the inverter, switch OFF the DC switch between inverter and solar panel and then switch OFF Grid supply Main switch.

2.2 Explanations of Symbols

- ROTOSOL Inverter strictly comply with relevant safety standards.
- Please read and follow all the instructions and cautions during installation, operation and maintenance.

Safety Instructions

Sr. No.	Symbol	Meaning of Symbol	Explanation of Symbol
1		Danger of Electric Shock.	<ul style="list-style-type: none"> The Inverter is directly connected with the public grid. All work on the Inverter must be carried out by qualified personnel only. Serious Physical injury or even death may occur if relevant requirements are not followed.
2		High Temperature	<ul style="list-style-type: none"> The Inverter can become hot during operation. Do not contact or touch the device during operation or Inverter ON.
3		Notes, Important	Non-adherence to these instructions may adversely affect the operating convenience or functionality of the device.
4		Domestic Waste	Do not dispose of this device with the normal domestic waste.
5		Without Transformer	This Inverter does not use transformer for the isolation function.
6		CE Mark	The Inverter complies with the requirements of the applicable CE guidelines.
7		Manual	Refer to manual before service.
8		Earthing/ Grounding Mark	The Inverter must be reliably grounded before operation.
9		Forbid (Electrostatic sensitive)	<ul style="list-style-type: none"> Damage may occur if relevant requirements are not followed. Do not open the surface cover of the Inverter unless authorized. The electronic components inside the Inverter are electrostatic sensitive. Take proper anti electrostatic measures during authorized operation.

3. Installation




3.1 Pre-installation

3.1.1 Unpacking & Package List

Unpacking and Inspection

- The Inverter is tested ok and inspected strictly before packing and dispatch/delivery.
- Inverters leave our factory in proper electrical and mechanical condition.
- Special protective packaging ensures safe transportation of Inverter.
- On receiving the Inverter, please handle it carefully.
- Thoroughly inspect and check the Inverter properly after receiving delivery.
- If on receiving the Inverter physical damage or missing items is noticed, kindly notify to the dealer/installer about it so that insurance claim is registered before using the Inverter.
- We will be glad to assist you, as and when required.
- Use proper packing or original or equivalent packaging when transporting the Inverter, this ensures safe transport (* For that please keep our empty box spare with you).







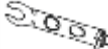







Package List

Sr. No.	Component	Name of Component	Requirement of Components
1		Inverter	Used for solar generation
2		Certificate of Inspection	Proof of Inverter's testing
3		Warranty Card	Used to trace Warranty period of Inverter

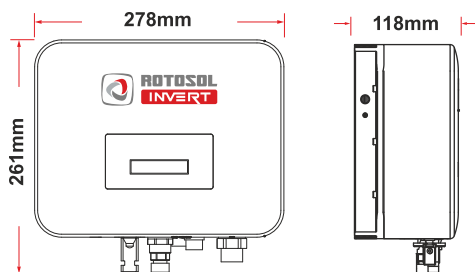
Package List

Sr. No.	Component	Name of Component	Requirement of Components
4		Wall Mounting Bracket/ Mounting Clamp	Used to mount Inverter
5		Monitor Module	Used to check Inverter's generation data online.
6		AC Connector	Used to connect AC supply to Inverter
7		Plastic Expansion Tube	Used to hold mounting screw of clamp
8		Tapping Screw	Used as fitment of mounting clamp
9		Security Screw	Used for safety of Inverter (Inserting in Inverter with Mounting clamp)
10		DC Connector set	Used to Connect DC supply with Inverter
11		Zero-Injection Connector (Optional)	Used to connect Smart Meter with Inverter
12		Monitoring Module Quick Installation Instructions	Used to connect and configure Monitoring Module with Inverter online.

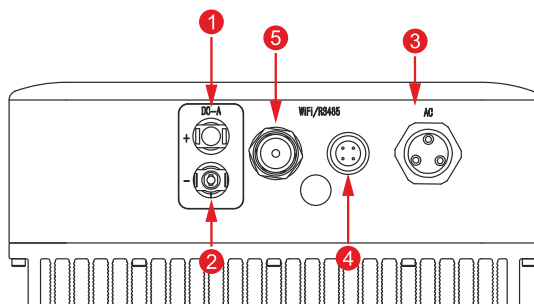
3.1.2 Tool Preparation for Inverter Mounting

Sr. No.	Tool	Tool's Name	Tool Used For
1		Electric Impact Drill	Used to drilling holes for Inverter Mounting .
2		Spirit Level	Used to check horizontal alignment of mounted Inverter.
3		Marker Pen	Used to mark of hole position for Inverter Mounting
4		Screw Driver	Used for screw fitment.
5		Terminal Crimping Tool	Used to crimping of lugs at cable termination.
6		Wire Stripper	Used to remove insulation from wire.
7		PV Disassembly Tool	Used to open PV Connector.
8		Multimeter	Used To measure electric parameters.
9		Hammer	Used to hammer nails.
10		Wire cutters	Used to cut wire.
11		Network cable pliers	Used for joining connectors on communication cable
12		Safety Shoes	Used for safe operation from electrical shocks.
13		Safety Goggles	Used to protect eyes.
14		Rubber Hand Glove	Used to protect from electric shocks.

3.1.3 Product Overview



Inverter terminals Identification

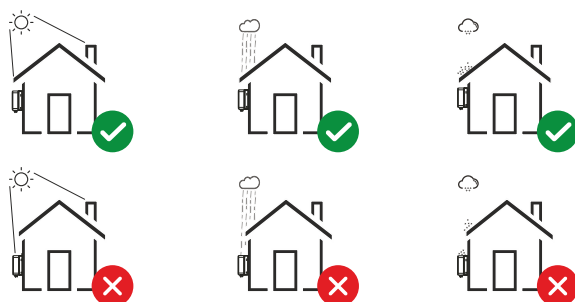


No.	Items
1	DC Connectors (+) For PV String
2	DC Connectors (-) For PV String
3	AC Connector
4	Monitor Module Port
5	Zero-Injection Port (Optional)

3.1.4 Mounting Location

The Inverters are designed for indoor and outdoor installation (IP65/IP66), to increase the safety, performance and lifespan of the Inverter. Please select the mounting location carefully based on the following rules:

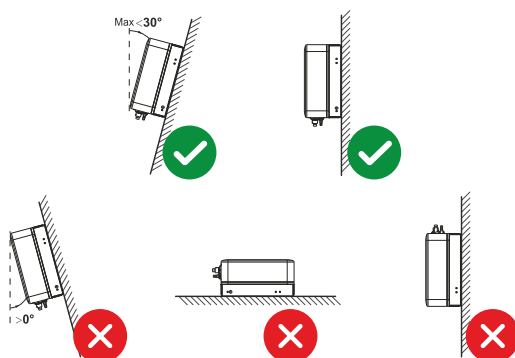
- The Inverter should be installed on a solid surface, far from flammable or potentially explosive and corrosive materials.
- The ambient temperature should be within $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$ (between -13°F and 140°F).
- The installation of Inverter should be protected under shelter. Do not expose the Inverter to direct sunlight, water, rain, snow, spray lightning, etc.



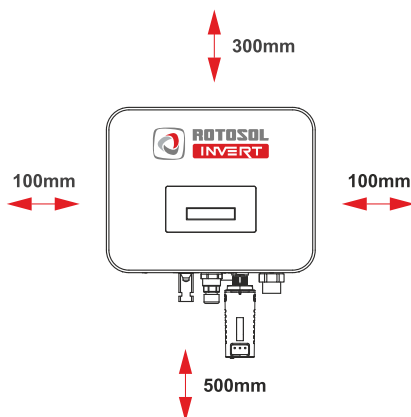
- Select the installation location to ensure visibility of Inverter display, warning sign/warning instruction and the product label.
- Ensure that the Inverter is installed in open shaded space where air can circulate freely.
- To avoid over-heating, always make sure that the flow of air around the Inverter is not blocked.
- The installation location must be easily accessible from all sides.
- Do not install the Inverter near television antenna or any other antennas and antenna cables.
- Do not put any heavy weight items on the Inverter. Do not cover the Inverter.

- The Inverter should be installed vertically on the wall, or lean back on plane with a limited tilted angle.

Please refer to below picture.

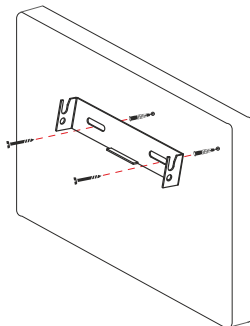
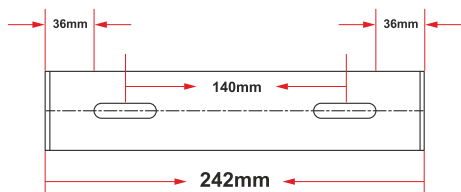


- Always ensure that Inverter cooling system or vents are unobstructed.
- There must be sufficient clearance between two Inverters to ensure that the air circulation is not affected.
- If necessary, increase the clearance spaces and make sure there is enough fresh air supply to ensure sufficient cooling of the Inverters.

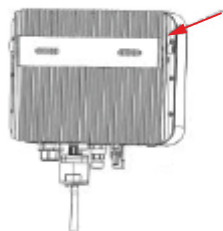
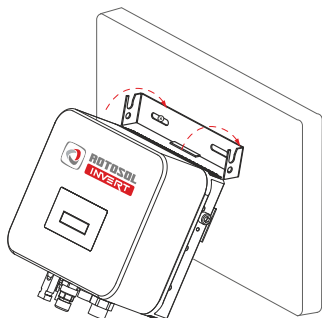


3.2 Mounting

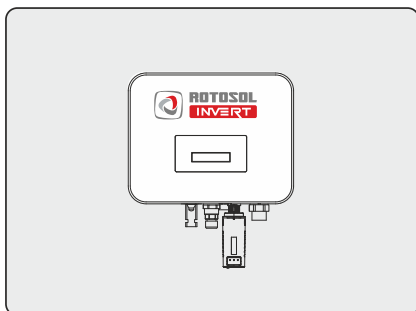
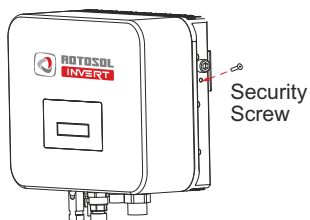
Step 1



Step 2



Step 3



4. Electrical Connection

4.1 PV Connection

- The Inverter having one MPPT track can be connected with one string of PV panels.
- For the best results, make sure that each MPPT track is correctly connected with PV string. Otherwise, the Inverter will activate voltage or current protection automatically.

Please make sure below requirements are followed:

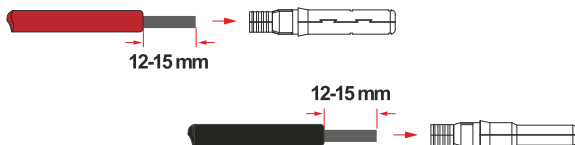
- The open-circuit voltage and short-circuit current of PV string should not exceed the reasonable range of the Inverters.
- The isolation resistance between PV string and ground must exceed 10 kΩ.
- The polarity of PV strings correctly connected to the respective polarity of the Inverter input.
- Use the DC plugs given in accessories wherever required.
- The lightning protector should be installed between PV string and Inverter.
- Disconnect all of the PV (DC) switch during wiring.

Warning: The voltage on the DC side could be fatal, so please comply with electric safety when connecting.



Please make sure the correct polarity of the cable is connected with Inverter, otherwise Inverter could be damaged.

Step 1

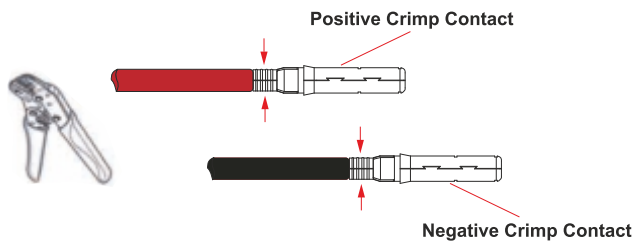


Note: PV Cable Suggestion

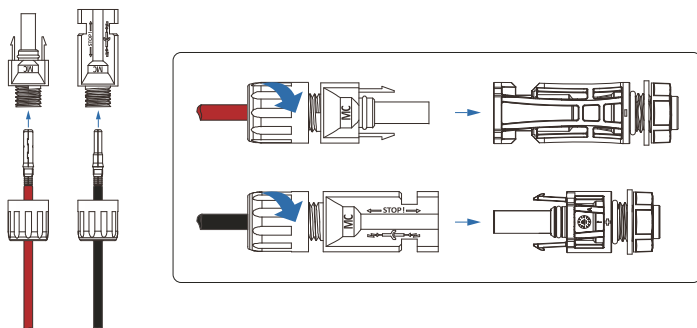
Cross Section
4 mm²

Cable Diameter
4 mm²

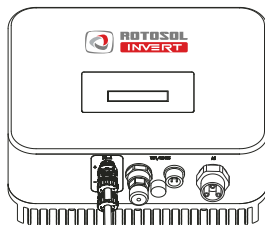
Step 2



Step 3



Note: You'll hear click sound when the connector assembly is correct



4.2 Grid Connection

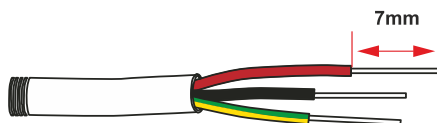
- The external AC switch should be installed between Inverter and grid to isolate from grid.
- Please make sure below requirements are followed before connecting AC cable to the Inverter.
- The AC (grid) voltage should not exceed the reasonable range of the Inverters.
- The phase-line from AC distribution box is correctly connected.
- Use the AC plugs given in the accessories wherever required.
- The surge protector should be incorporated between grid and Inverter.
- Disconnect the AC (grid) switch during wiring.

Warning: The voltage on the AC side could be fatal, so please comply with electric safety when connecting.



Please make sure the right line of AC grid connected with Inverter, otherwise Inverter could be damaged.

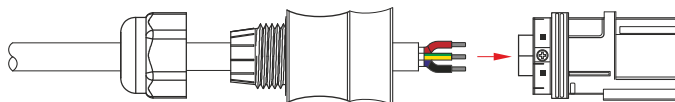
Step 1



Note: PV Cable Suggestion

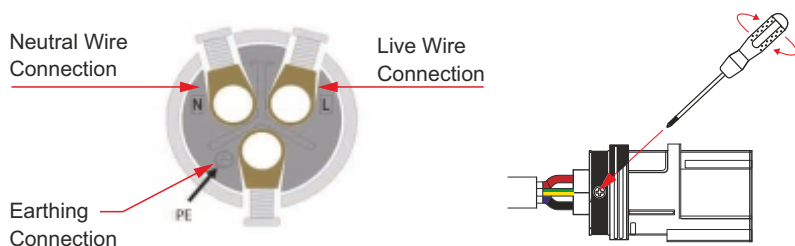
Cross Section
 4 mm^2

Step 2



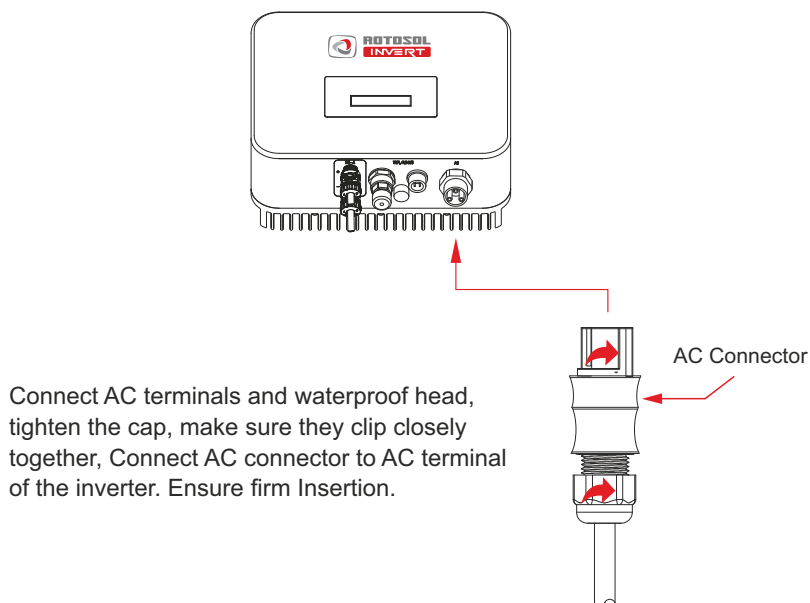
Note: AC line goes through AC terminal waterproof head and cap

Step 3



Connect AC Line, Live Line (L), Neutral Line (N) and Ground Wire (PE) according to polarity.

Step 4



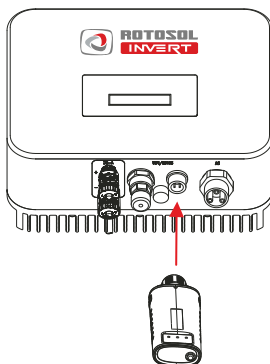
4.3 Communication Connection

- The monitoring module could transmit the data to the cloud server, and display the data on the PC, tablet and smart-phone.

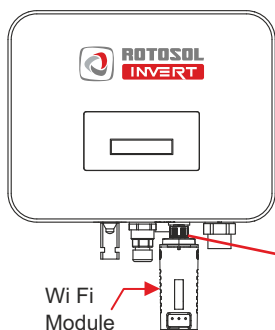
 **Note:** Install the WIFI / Ethernet / GPRS / RS485 Communication:

- WiFi / Ethernet / GPRS / RS485 communication is applicable to the Inverter.
- Please refer to "Communication Configuration Instruction" for detailed instruction.

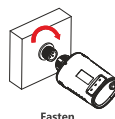
Step 1



Step 2



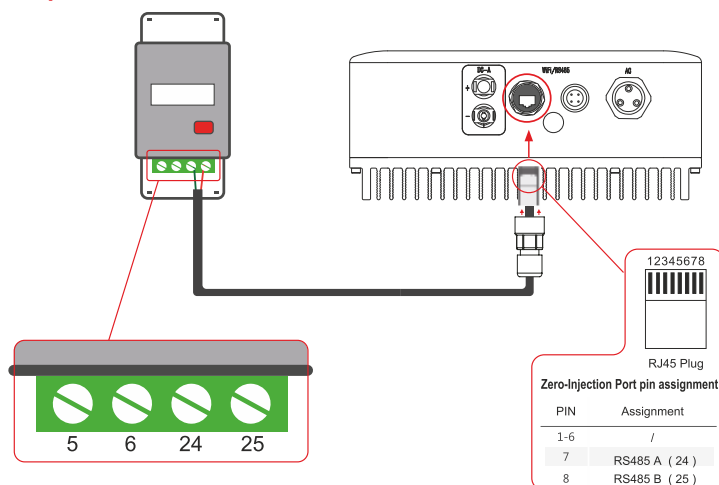
To do Fitment of Wi Fi
Module rotate it in as per
arrow Direction



4.4 Zero Injection Smart Meter (Optional)

- Smart meter is an intelligent control equipment which is used for On-Grid Inverters.
- Its main function is to measure the forward and reverse power on the grid-connected side, and transmit data to the Inverter through RS485 communication to ensure that the power of the Inverter is less than or equal to the user's home load, and no current flows into the grid.

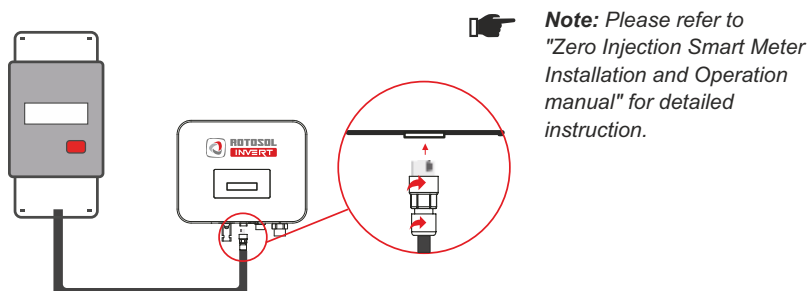
Step 1

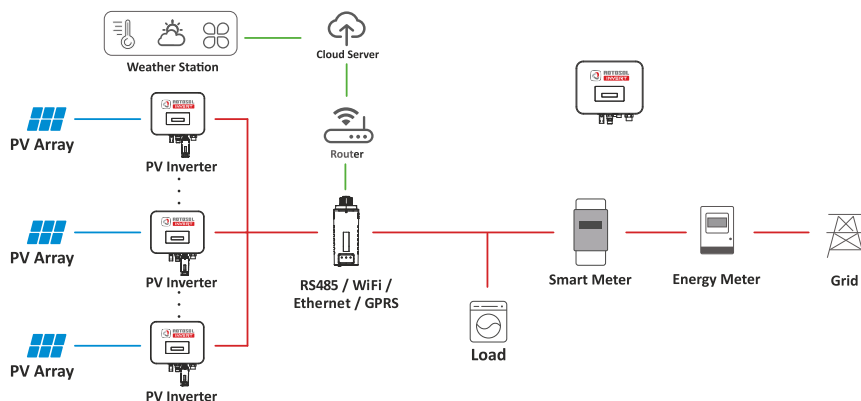


Note: For single-phase Inverter, please follow below pin order

- RS485A (Pin 7) to single-phase meter (Pin 24)
- RS485B (Pin 8) to single-phase meter (Pin 25)

Step 2

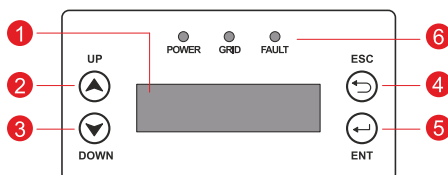




Note: The Inverter could be connected in parallel with Smart Meter, make sure the total load power does not exceed Smart Meter's limitation.

5. Operation

5.1 Control Panel



Note: Display could be somewhat different

Control Panel' S Description

Sr. No	Item	Description	Used for
1	Display	LCD Display	To See Menu
2	Button	UP Touch button	To Go UP side in Menu and also use for Enter Password
3		DOWN Touch button	To Go Down side in Menu also use for Enter Password
4		ESC Touch button	To Escape from Menu
5		ENT Touch button	To Enter in Menu and also used to Select Parameters
6	LED	Work as Indicator	To See Status of Inverter

LED's Description

Sr. No	Indicates	Supply	Colour When Supply "ON"	Explanation
1	Power	ON	Green	When Inverter Switch ON
		OFF		When Inverter Switch OFF
2	Grid	ON	Green	The Inverter is Feeding power to Grid
		OFF		The Inverter is Not Feeding power to Grid
3	Fault	ON	Red	It Shows Inverter have Fault
		OFF		It Shows Inverter have No Fault

5.2 Menu Structure

Explanation of LCD Display Content

Sr. No	Nouns	Explanation
1	Inverter Info	It Shows the serial number and firmware version of Inverter
2	Error Record	It shows the error list of Inverter including date and time
3	Wi-Fi Info	It Shows Wi-Fi serial number and assigned IP address
4	Date & Time	It shows date and time of the Inverter and also can be set by it
5	Setting	To set the protection parameters of Inverter
6	Zero Injection	Meter switch

Menu Structure Divided into 3 Levels

1. Level 1

- It known as 1st Level Menu, It Contains Nouns.

We can enter in it directly using button.

Press ENT button to Select Noun and to reach Noun Press UP DOWN Button.

2. Level 2

- It known as 2nd Level Menu, It Contains Parameters.
- We can select parameter by using UP-DOWN button.

We can enter in it through Level 1.

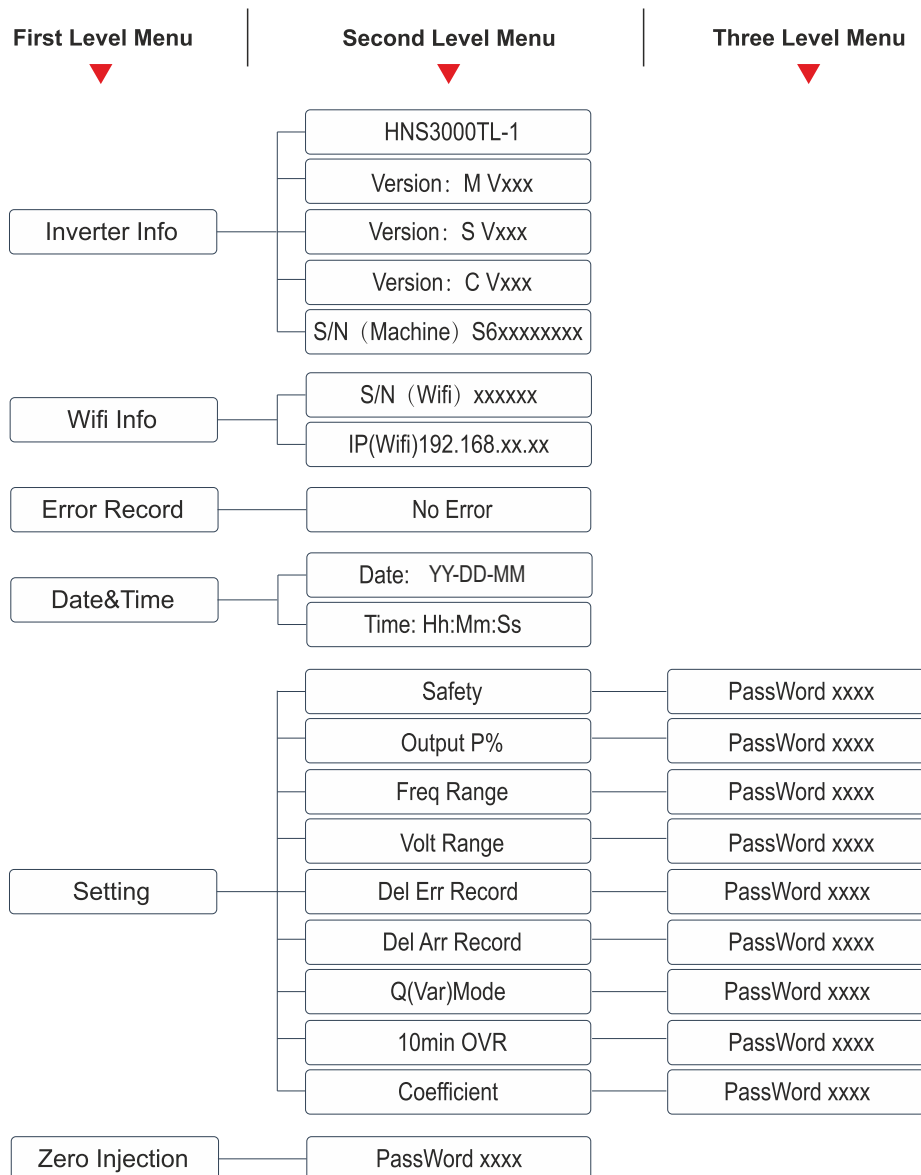
Press ENT button to Select Noun and to reach Noun Press UP DOWN Button.

3. Level 3

- It known as 3rd Level Menu, parameters can be change through it by using Password.
- Password can be enter using UP DOWN and ENT button using

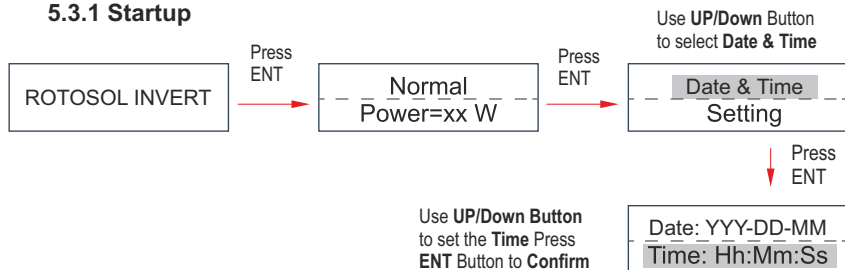
We can enter in it through Level 1 and Level 2.

Press ENT button to Select Noun and to reach Noun Press UP DOWN Button.

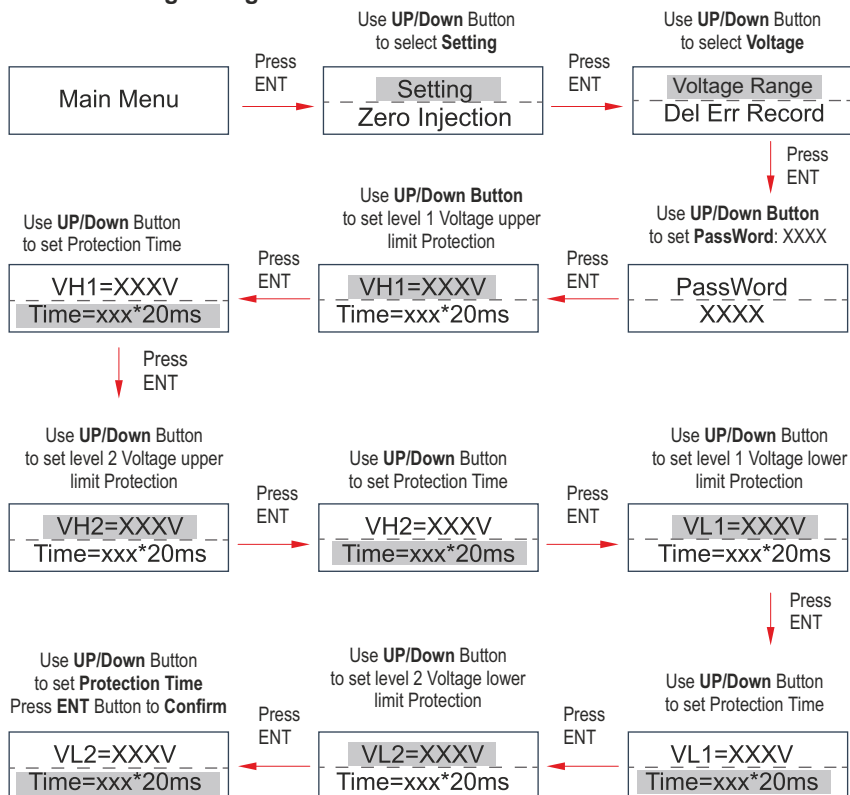


5.3 Setting

5.3.1 Startup

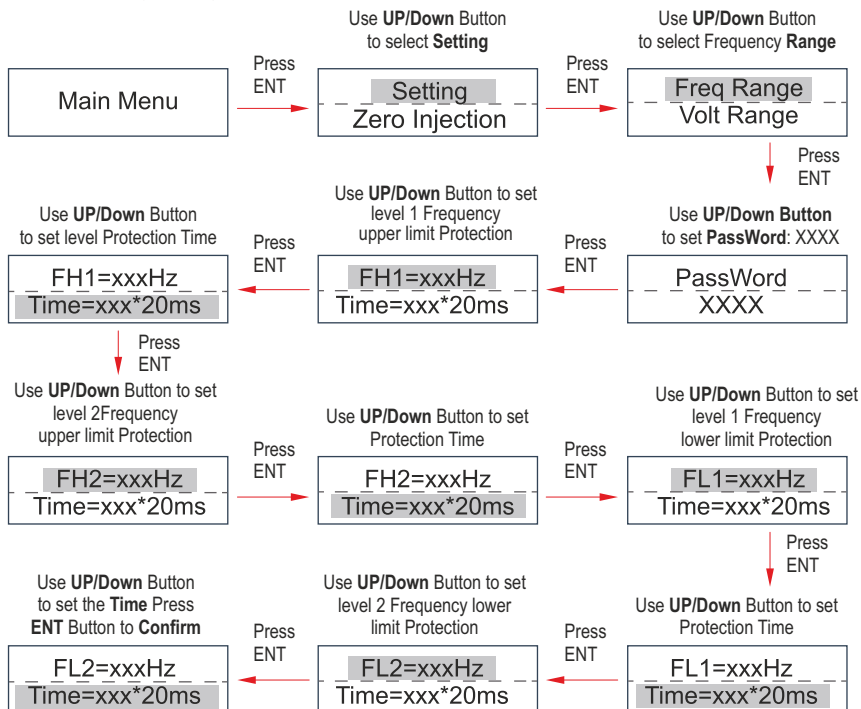


5.3.2 Voltage Range



Note: The parameters setting only works after the Inverter is restarted.

5.3.3 Frequency Range



Note: The parameters setting only works after the Inverter is restarted.

6. Commissioning

Before starting commissioning at site, please make sure below procedures and requirements are fully meet.

- Mounting location is meeting the requirements.
- All of the electrical wiring is firmly connected, including PV wiring, Grid wiring and Earth wiring.
- The Inverter setting has been finished accordingly to local standards or regulations.

Commissioning Procedures

- Turn on the AC switch between Inverter output and the public grid.
- Turn on the PV switch of the system.

7. Start-up & Shut Down

7.1 Shut down

- Turn off the DC switch on the Inverter if provided OR/AND
- Turn off the DC switch between PV panels and the Inverter (if any).
- Close the AC switch between the Inverter and the public grid.

 **Note:** The Inverter will be operatable after minimum 5 minutes.

7.2 Restart

- Shut down the Inverter according to Chapter 7.1.
- Start-up the Inverter according to Chapter 6.

8. Maintenance & Trouble Shooting

8.1 Maintenance

 **Note:** Do Maintenance after Disconnect AC and DC Supply

Periodic maintenance is necessary, please follow steps as below.

- **PV connection:** twice a year
- **AC connection:** twice a year
- **Earth connection:** twice a year
- **Heat sink:** clean with dry towel once a year.

8.2 Trouble Shooting

Fault messages will be displayed when fault occurs, please according to trouble- shooting table find related solutions.

Trouble Shooting List

Type of Fault	Name	Description	Recommend Solution
PV Fault	Isolation Fault	The impedance between ground and PV (+) & PV (-) is too low, beyond the reasonable range.	<ul style="list-style-type: none"> • Check whether the battery and wiring are immersed in water and whether the insulation layer is damaged, and then make corrections. • If the fault occurs continuously and frequently, please ask help for local distributors.
	PV Volt Low	The DC input voltage from PV strings is below the minimum reasonable value.	<ul style="list-style-type: none"> • Reconfigure the PV strings by increasing the number of PV strings to increase DC input voltage. • Contact local distributors for suggestions and solutions.
	PV Volt High	The DC input voltage from PV strings is exceeding the maximum reasonable value.	<ul style="list-style-type: none"> • Reconfigure the PV strings by reducing the number of PV strings to decrease DC input voltage. • Contact local distributors for suggestions and solutions.
	PV1 Over Current	PV1 current is too high, protection is triggered.	<ul style="list-style-type: none"> • Power off, then restart (Ref. Chapter 6) • If fault still occurs continuously and frequently, please ask help for local distributors.
	PV2 Over Current	PV2 current is too high, protection is triggered.	

Maintenance & Trouble Shooting

Type of Fault	Name	Description	Recommend Solution
Grid Fault	Island Fault	The public grid is outage or the grid is disconnected to the inverter.	<ul style="list-style-type: none"> The fault will disappear automatically when the public grid go back to normal. Contact the local distributor or grid company to adjust the voltage protection parameters.
	10min Over Volt	The 10-minute average value of the grid voltage is abnormal and beyond the protection range.	<ul style="list-style-type: none"> Power off, then restart (Ref. Chapter 6) If fault still occurs continuously and frequently, please ask help for local distributors.
	Grid Volt Fault	Grid voltage is abnormal, beyond the protection range.	<ul style="list-style-type: none"> The fault will disappear automatically when the grid voltage is back to normal. If fault still occurs continuously and frequently, please ask help for local distributors.
	Grid Freq Fault	Grid frequency is abnormal, beyond the protection range.	<ul style="list-style-type: none"> The fault will disappear automatically when the grid frequency is back to normal. If fault still occurs continuously and frequently, please ask help for local distributors.
DC Fault	Bus Low Fault	When inverter is running, bus voltage is lower than the normal value beyond the protection range.	<ul style="list-style-type: none"> Power off, then restart (Ref. Chapter 6) If fault still occurs continuously and frequently, please ask help for local distributors.
	Bus High Volt	Bus voltage is too high and beyond the protection range.	
	Bus Unbalance	Bus voltage unbalanced, beyond the protection range.	
	DC Offset Fault	The DC component of grid-connected current is too high that beyond the reasonable range.	
System Fault	Over Temperature	The temperature of the installation environment is too high or too low, beyond the reasonable range.	<ul style="list-style-type: none"> Improve or change the installation environment to adjust the inverter installation environment temperature to normal range. Power off, then restart (Ref. Chapter 6) If fault still occurs continuously and frequently, please ask help for local distributors.
		The temperature of the cooling device is high or low that beyond the protection range.	
		The temperature of the CPU is high that beyond the protection range.	

Maintenance & Trouble Shooting

Type of Fault	Name	Description	Recommend Solution
System Fault	Auto Test Fail	Automatic test failed.	<ul style="list-style-type: none"> • Power off the inverter to check the AC connection, then restart. • If fault still occurs continuously and frequently, please ask help for local distributors.
	No Utility	No continuous utility	
	Grid Volt AD	Grid voltage AD value deviation is too high, beyond the protection range.	<ul style="list-style-type: none"> • Power off, then restart (Ref. Chapter 6) • If fault still occurs continuously and frequently, please ask help for local distributors.
	Self Lock	Inverter is locked at the waiting interface.	
	Consistent Fault	The detection results of the two CPUs for the same voltage and frequency are different.	
	Device Fault	Grounding is abnormal or the ground wire is disconnected.	<ul style="list-style-type: none"> • Check whether the ground wire of the inverter is properly connected and the ground impedance is too high, if it is, make corrections. • Power off, then restart (Ref. Chapter 6) • If fault still occurs continuously and frequently, please ask help for local distributors.
Inner Warning	Fan Fault	The fan can not work when is started up.	<ul style="list-style-type: none"> • Check if there is objects which blocking the fan rotation and remove it.
	EEPROM Fault	EEPROM abnormal	<ul style="list-style-type: none"> • Power off, then restart (Ref. Chapter 6) • If fault still occurs continuously and frequently, please ask help for local distributors.
	Communication Lose	CPU to Flash abnormal	
		CPU to EEPROM abnormal	
		Main CPU to auxiliary abnormal	
		Main CPU to HMI abnormal	



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