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Hybrid Inverter

E5

Operation and Installation Manual

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Safety Instructions

This manual uses the following instructions for conveying important safety related information.

CAUTION !



- Machine and equipment damage may occur if this hazardous situation is not avoided.

WARNING !



- Death and serious injury may occur if this hazardous situation is not avoided.
- Repair work on the device should ONLY be carried out by the manufacturer. No user serviceable parts inside.
- Installation and maintenance work shall be performed by qualified electrician and shall comply with local Regulations.

DANGER!



- The inverter is not allowed to remove the covers during installation and maintenance when inverter energized. Death and serious injury will occur if this hazardous situation is not avoided.

WARNING：BURN HAZARD!



- The unit may reach very high temperatures and the device surface can become quite hot. Sufficient cooling time is necessary for optimal yield.
- Avoid contact with the unit to minimize the risk of being burnt.

1 General Information

1.1 About this Manual

This manual is to provide the explanation and procedures for installing, operating, maintaining, and troubleshooting of E5 hybrid inverter.

1.2 Product Description

This device is a hybrid inverter with following features:

- Integrated energy management system
- Integrated charger controller and inverter
- Transformerless
- Single phase hybrid system
  - Solar / Battery to Grid
  - Solar / Battery / Grid to Load
  - Solar / Grid to Battery

The operation of hybrid inverter is shown as ***Figure 1-1***. Inverter convert the DC input power supplied from the PV Array and Battery into single phase AC output power to Grid and Load.

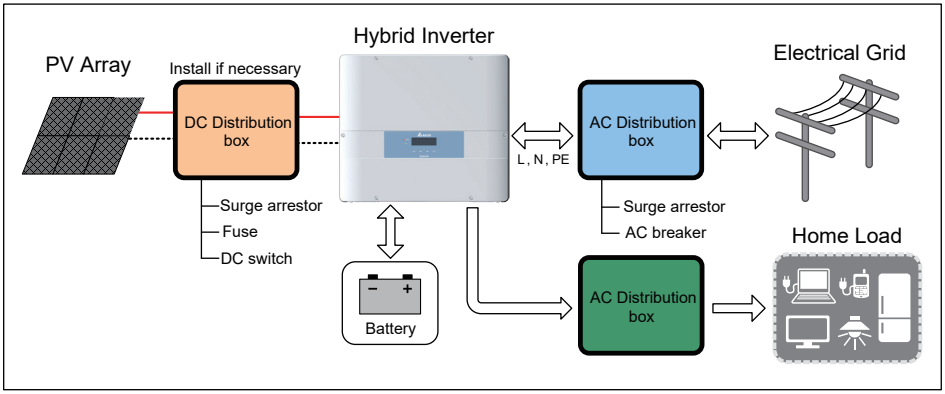


Figure 1-1 : Storage system operation illustration

1.3 Additional Information

For more detailed or other related product information, please visit http://www.deltaww.com

2 Product Overview

2.1 Unpack the Inverter

The unpacking procedure of E5 inverter is shown as ***Figure 2-1***.

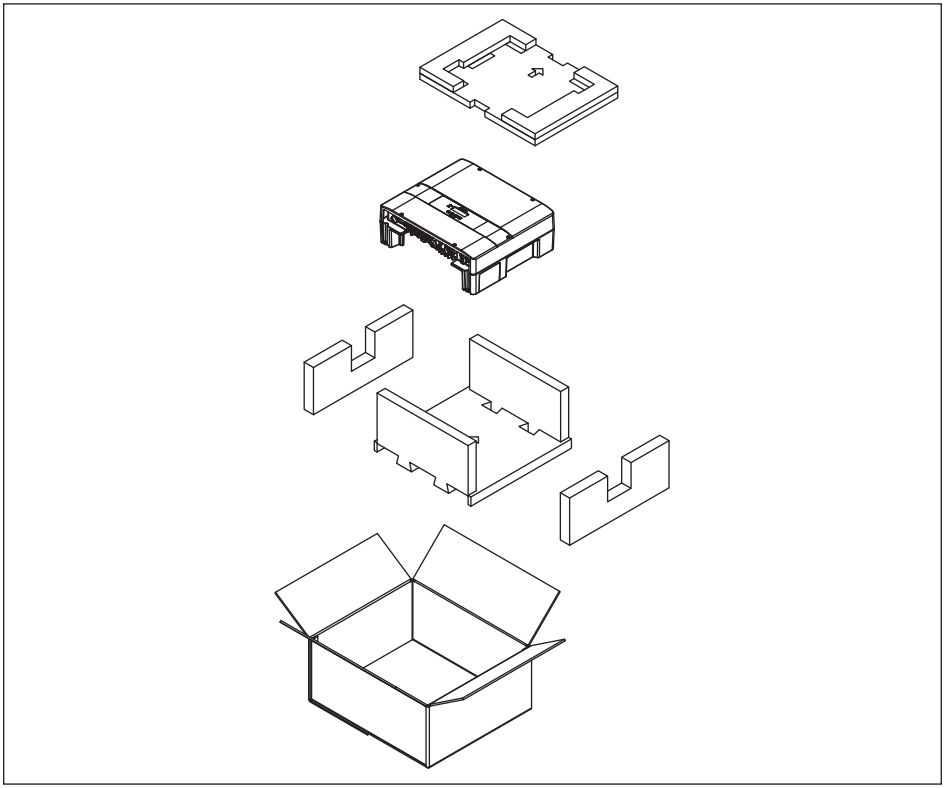


Figure 2-1 : Unpack the inverter

2.2 Checking Unit and Accessories

Unforeseeable events causing damage or movement may occur during shipment. Please check following items upon receiving your inverter.

- Check the damage on the packaging.
- Check if all the accessories are in the package.
  The standard accessories are shown in ***Figure 2-2*** and ***Table 2-1.***
- Check the model number and the serial number on the packaging is identical with the model number and serial number on the unit itself.

If there is any visible damage to the inverter / accessories or packaging, please contact your inverter supplier.

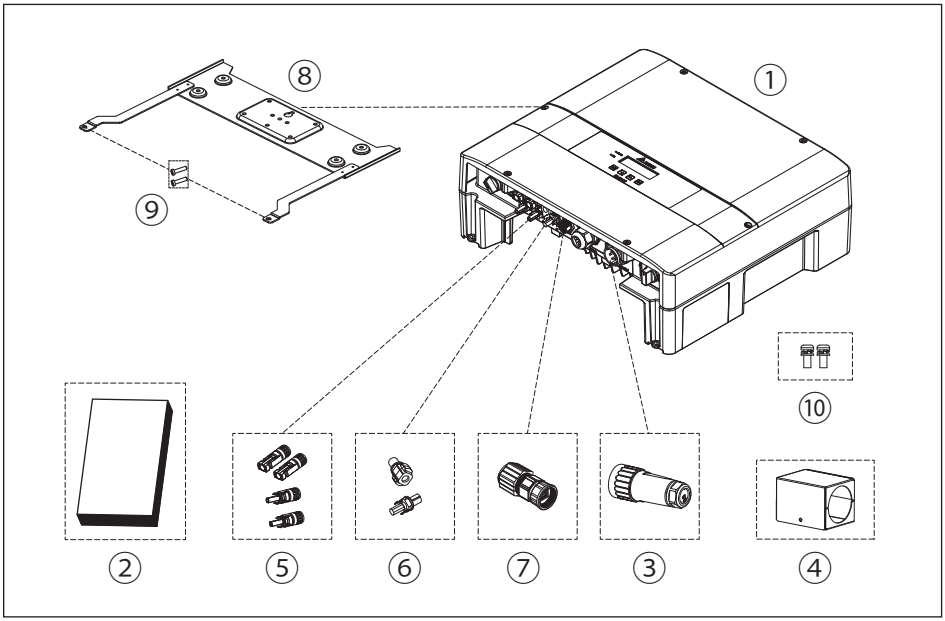


Figure 2-2 : Packing list

E5 Hybrid inverter			
	Object	Qty	Description
1	Hybrid Inverter	1 pc	E5 hybrid inverter
2	User Manual	1 pc	The Instruction to provide the information of safety, Installation, specification, etc.
3	AC Plug	1 pc	Connector for AC connection
4	AC Plug Shield	1 set	Exterior cover for AC Plug
5	DC Connector	2 sets	Connector for PV array connection
6	BT Connector	1 set	Connector for Battery connection
7	RJ45 Connector	1 pc	Connector for Battery communication
8	Mounting Bracket	1 pc	To mount the hybrid inverter on the wall.
9	M4 Screw	2 pcs	To fix the hybrid inverter on the wall.
10	#6-32 Screw	2 pcs	To fix the AC plug shield.

Table 2-1 : Packing list

2.3 Product Label

Please refer to ***Figure 2-3*** for the location of product label. You can identify the model number and the specifications by the information on the product label. In Australia and New Zealand, users can also identify the supported Demand Response Modes (DRMs) of E5 here.

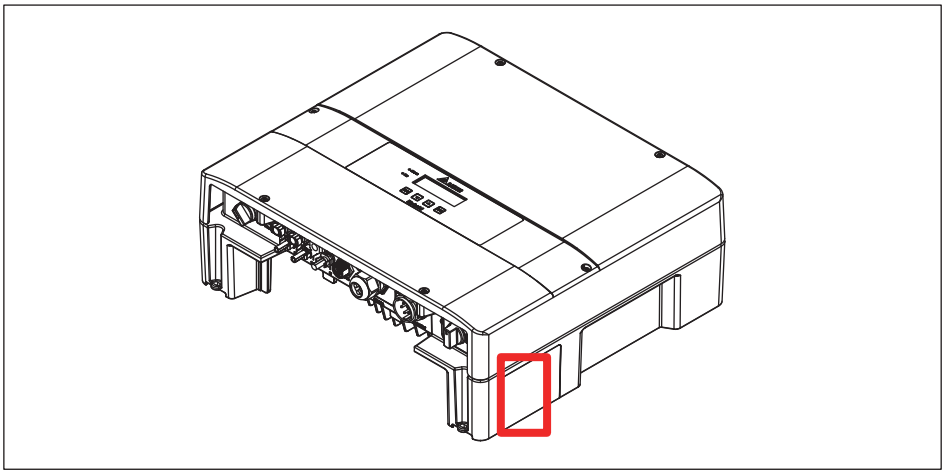


Figure 2-3 : Product label

2.4 Exterior Objects

The Inverter's exterior objects are shown in ***Figure 2-4***. The detailed input / output interfaces illustration is shown in ***Figure 2-5***.

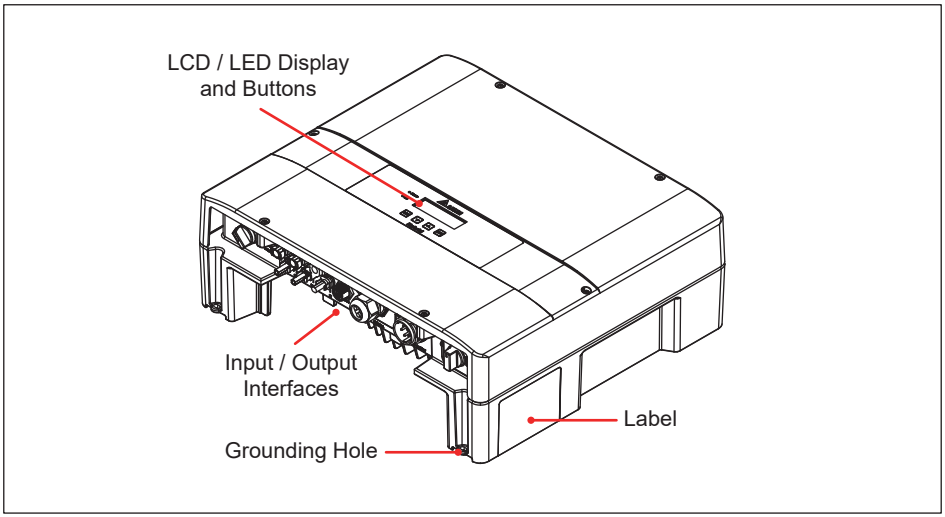


Figure 2-4 : Inverter's exterior objects

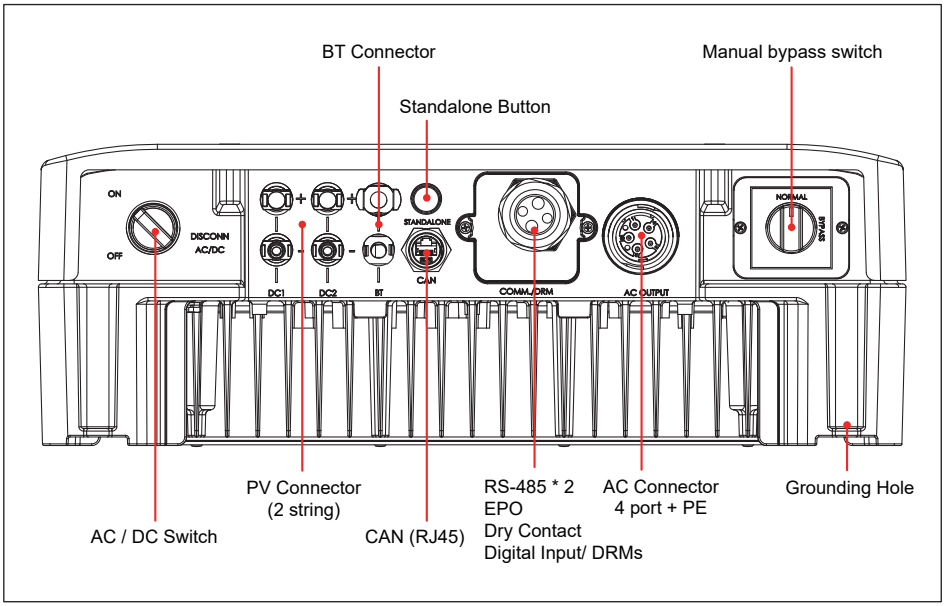


Figure 2-5 : Input / output interface

3 Installation

CAUTION !



- The unit should not be installed in a direct sunlight.
- Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.

WARNING !



- Do not install the unit near or on flammable surfaces.
- Please mount the unit tightly on a solid / smooth surface.

This unit is designed to be wall-mounted. Please ensure the installation is perpendicular to the floor and the AC plug at the bottom. Do not install the device on a slanting wall.

To mount the inverter on the wall, please follow the procedure below:

1. Screw the mounting bracket on the wall with 8 M6 Phillips head screws. Please refer to ***Figure 3-3***.
2. Attach the inverter to the mounting bracket.
3. Use Hex Wrench fixing the inverter with 2 M4 Hexagon Socket screws. Please refer to ***Figure 3-4***.

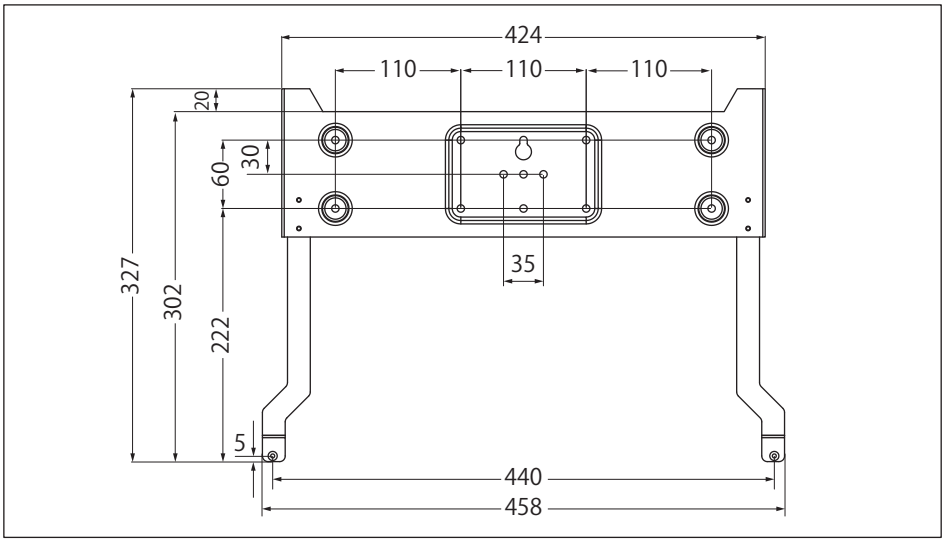


Figure 3-1 : Mounting bracket dimension

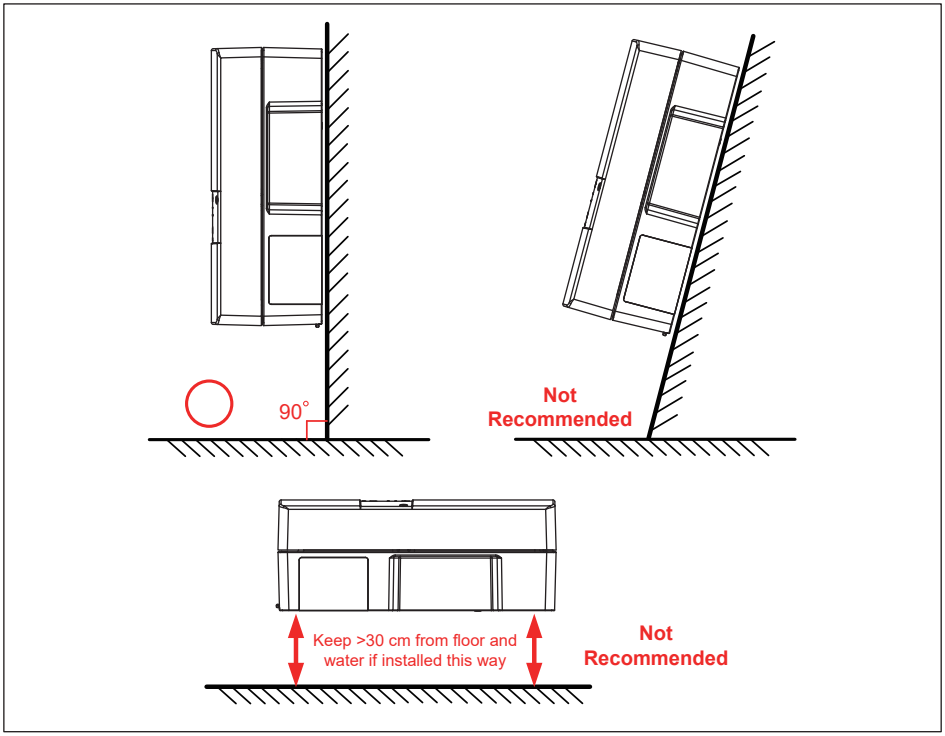


Figure 3-2 : Recommended installation

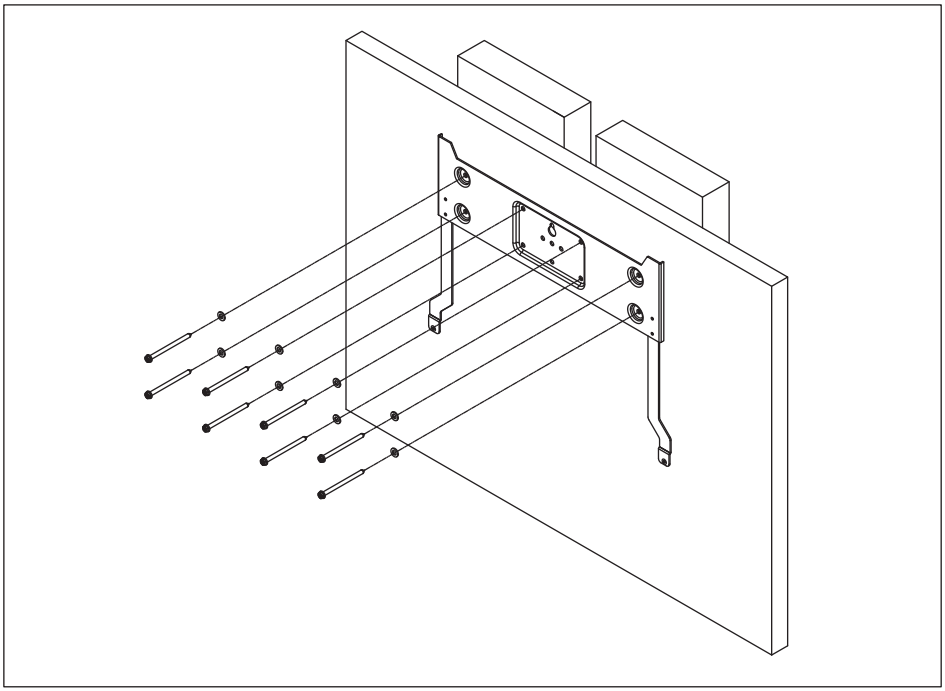


Figure 3-3 : Screw the mounting bracket

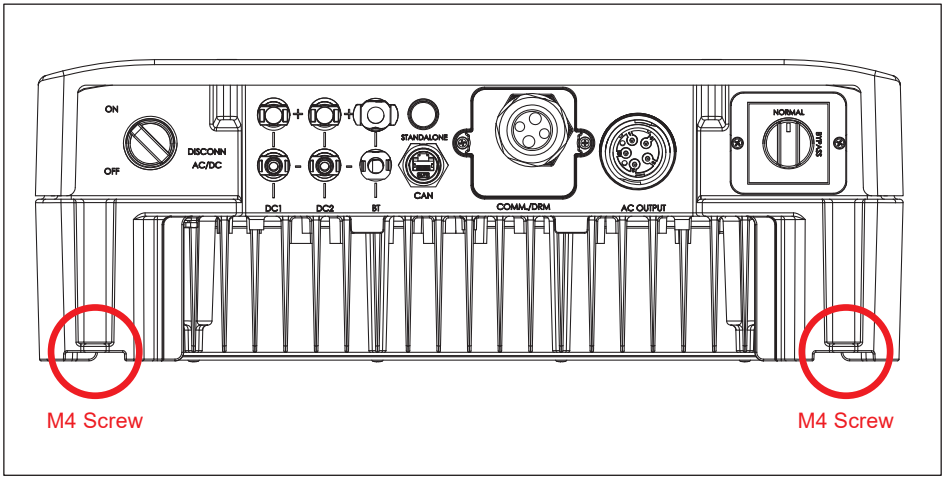


Figure 3-4 : Attach to the bracket and fasten with screws

CAUTION !

- The bracket supplied with the unit is specially designed and should be the only mounting device used for the unit.
- It is recommended to install the inverter in a suitable location which offers non-obscured and safe access, in turn ensuring easy access for service and maintenance.
- Please install hybrid inverter at an eye level to allow easy observation for operation and parameter setting.
- Ambient temperature -25° C~60° C. (power de-rating above 40° C)

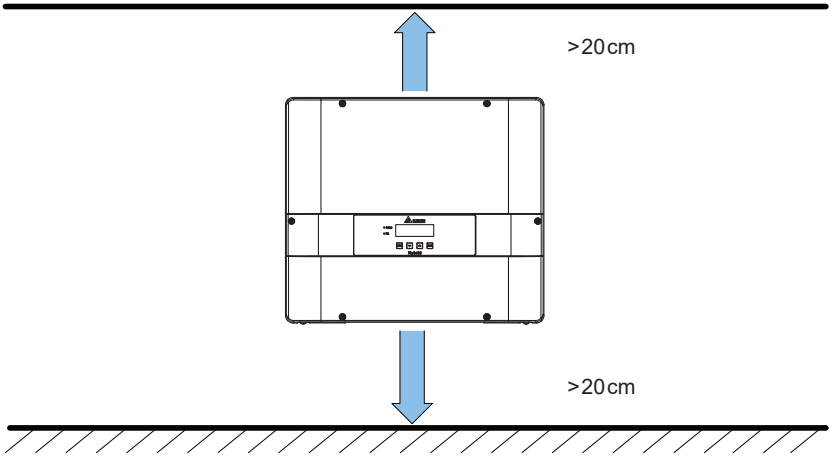


Figure 3-5 : Proper installation gaps

4 Wiring

WARNING：SHOCK HAZARD!



- Whenever a PV array is exposed to sunlight, a shock hazard may exist due to output wires or exposed terminals. To reduce the risk of shock during installation, cover the array with an opaque (dark) material and ensure that the AC/DC disconnect switch in the inverter is set to OFF before commencing any wiring.

4.1 Preparation Before Wiring

- Please use PVC insulated outdoor power cables and connected to the inverter through a specific certified connector.

- Please use ungrounded PV power system due to E5 does not have galvanic isolation between the DC-input, Battery and AC-output.

- E5 has array insulation resistance measuring function. Please ensure the insulation resistance of array is over 550k ohm.

- There are two earth bonding methods for E5.
  You can ground the inverter by enclosure grounding hole that shown in ***Figure 2-4*** or by PE terminal of AC plug. Please use at least one grounding method to avoid electric shock.

- Inverter can support DC inputs in parallel connection (1 MPP tracker) or separate connection (2 MPP trackers).

- The overview of wiring please refers to ***Figure 4-1***.

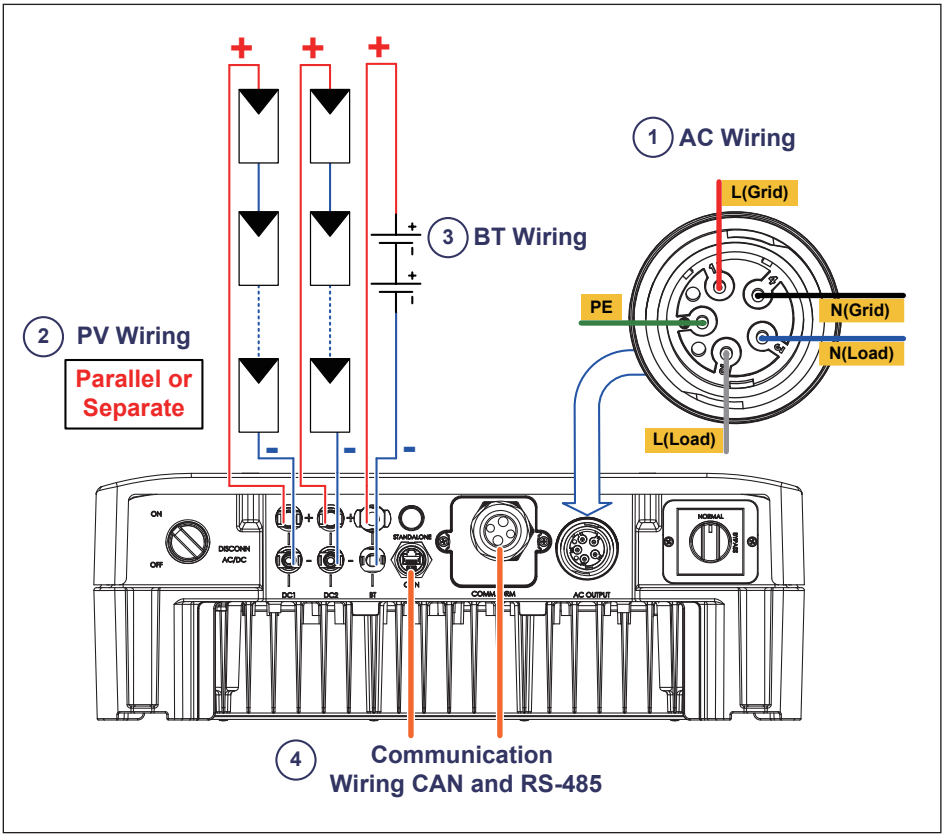


Figure 4-1 : Connection of system for floating solar array and battery

4.2 AC Connection

WARNING !

- Before commencing AC wiring, please ensure AC breaker is switched off.

4.2.1 Required Protective Devices and Cable Cross-sections

It is recommended to install a 30A or 32A upstream circuit breaker between AC side and inverter side for over current protection. The AC cable must be jacked and meet the specifications in ***Table 4-1.***

Model	Current Rating	Wire Size	Recommended Torque
E5	25 A	5 - 8mm^2	0.7 N • m

Table 4-1 : AC input cable requirement

4.2.2 AC Connection

Areas outside Australia and New Zealand, it recommended to connect AC wiring as shown in ***Figure 4-2***. The connection between Grid N and Load N is used to eliminate the floating voltage between Load N and PE.
However, E5 can still works without the Grid N and Load N connection.

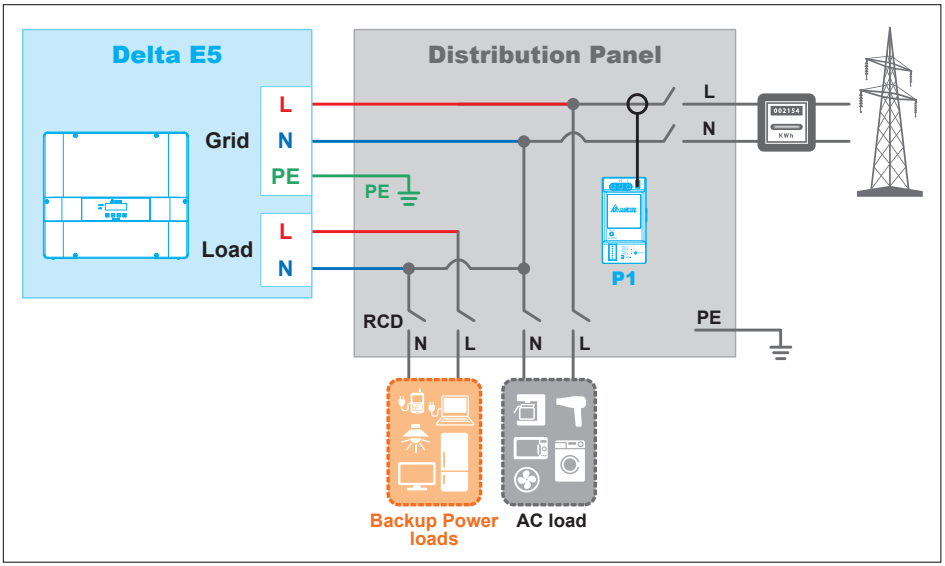


Figure 4-2 : AC connection

In Australia and New Zealand, Please connect the AC wiring as shown in ***Figure 4-3***. The connection between Grid N and Load N is necessary due to the grid code requires installer to ensure the continuity of the neutral conductor when inverter is in standalone mode.

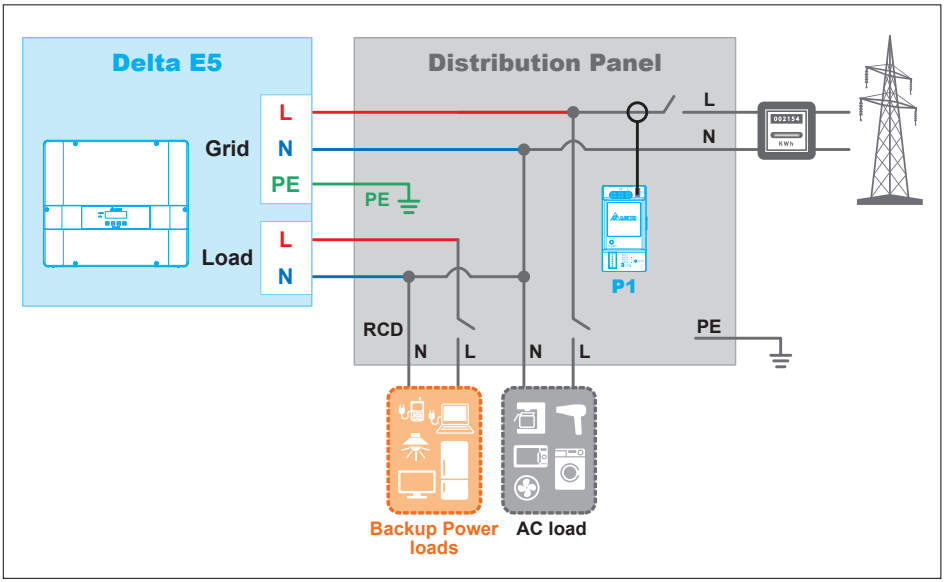


Figure 4-3 : AC connection in AU & NZ

4.2.3 AC Plug Assembly

CAUTION ! Machine and equipment damage may occur.

- Make sure to use the proper size of AC cable.
- Please choose the terminals as shown in ***Figure 4-4*** for wires crimping.
- Failed to follow these instructions may cause AC plug damage.

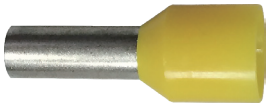


Figure 4-4 : Terminal for wire crimping

Follow the steps below to strip the wires before assembling the AC plug as shown in ***Figure 4-5*** :

- Remove 55 mm (2.2 inch) of AC cable outer jacket.
- Trim the L-N(Grid), L-N(Load) wire to 52.5 mm (2.0 inch).
- Strip 10 mm (0.5 inch) of insulation from all wires ends.
- Crimp terminals for all wires.

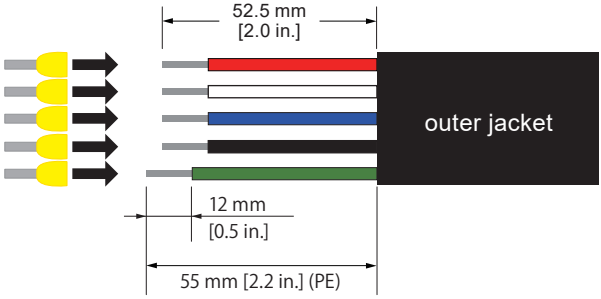


Figure 4-5 : Striping the wires

Assemble the AC plug and wires as the procedures shown in ***Figure 4-6***. The sequence of L(Grid), N(Grid), L(Load), N(Load) and PE must be connected correctly. The AC voltage should be L-N 230 Vac ± 10%.

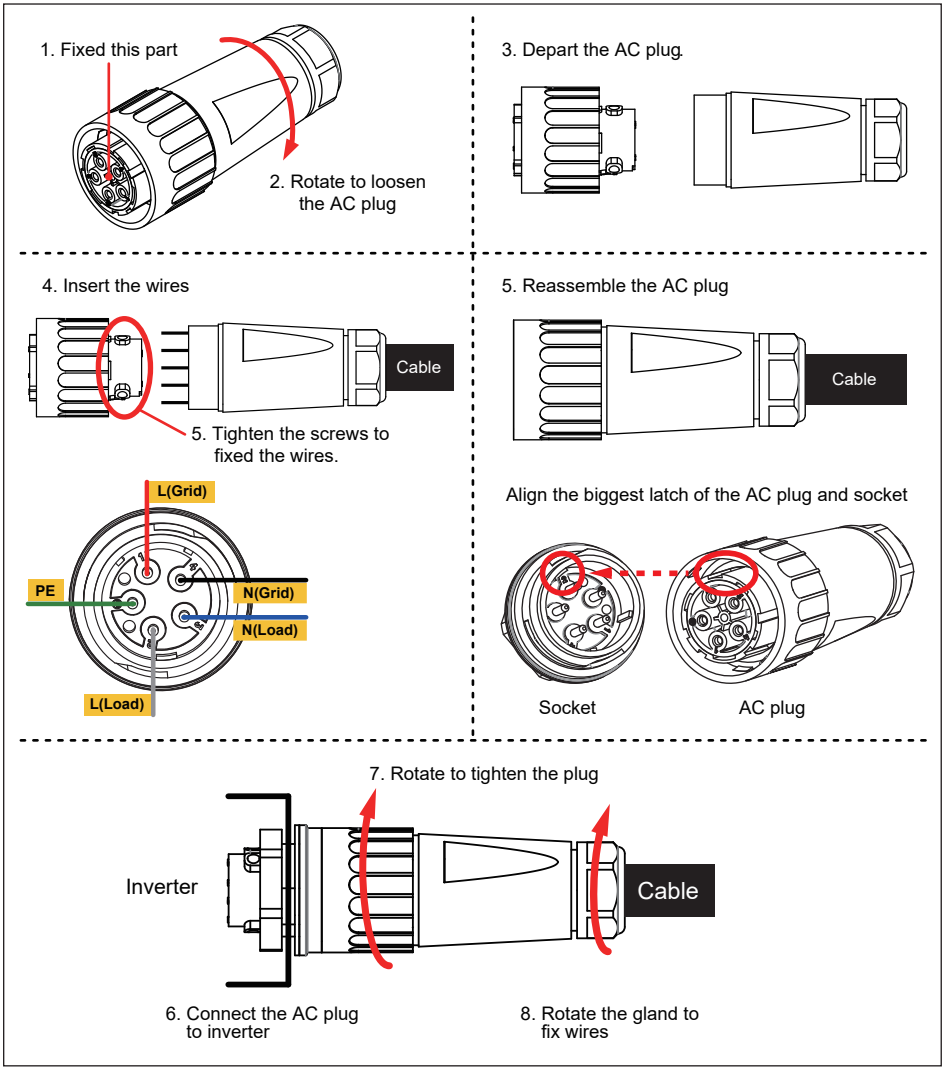


Figure 4-6 : AC plug illustration for E5

4.2.4 AC Plug Shield Assembly

AC plug shield is a cover to prevent users loosens the AC plug easily and cause electrical shock. To assemble the AC plug shield, please follow the instruction below.

1. There has a slot at well installed AC plug's upper side. Please refer to the dotted line in ***Figure 4-7***. Assemble 2 metal parts of AC plug shield at this slot.
2. Use 2 #6-32 screws to fix the metal parts.
   (The torque of the screw: 8±1 Kgf-cm)

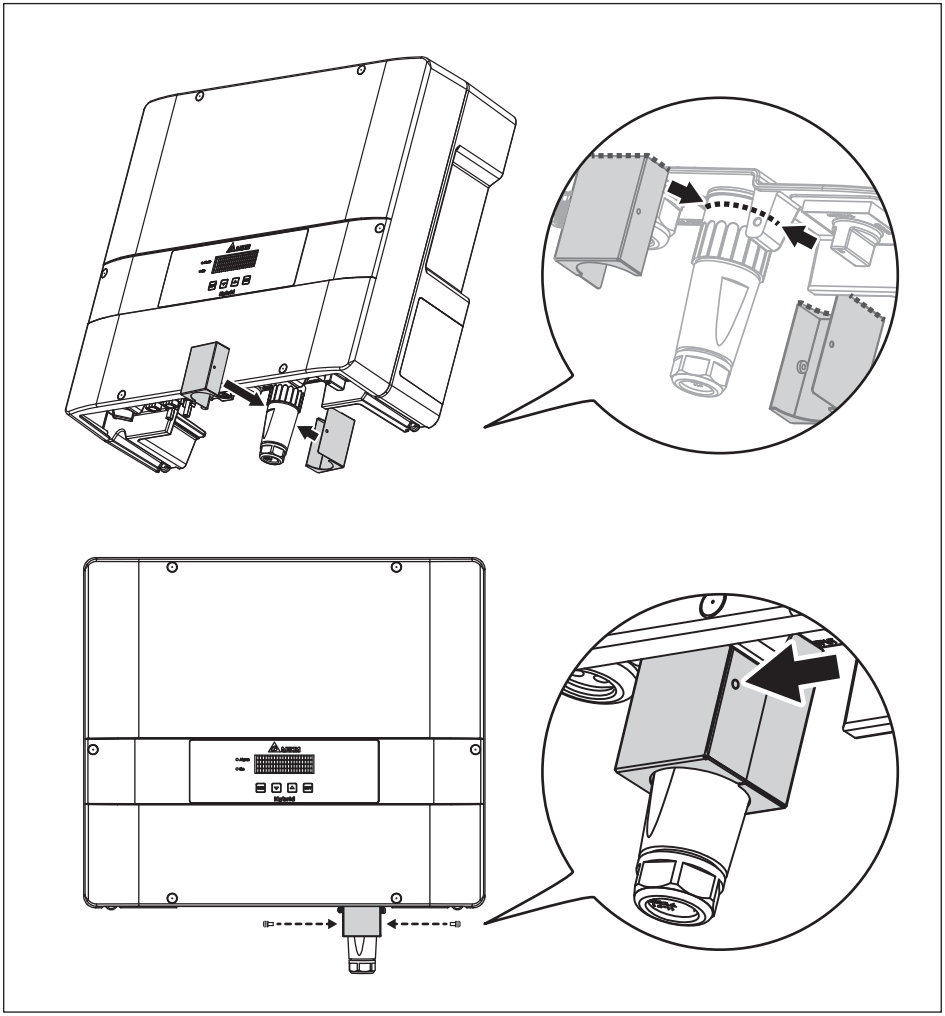


Figure 4-7 : AC Plug Shield Assembly

4.3 DC Connection (from PV Array)

WARNING !

- When undertaking DC wiring, please ensure the correct polarities are connected.
- When undertaking DC wiring please ensures that the power switch on the PV array is OFF.

CAUTION !

- The maximum open circuit voltage of PV array should not exceed 600Vdc.
- It is recommended to install an over current protection device between PV array side and inverter side.
- Any device installed between PV array and inverter must have capability to withstand the open-circuit voltage and short-circuit current of PV array.
- The input power to the inverter should not higher than the rated power shown in ***Table 4-2***.

Type of limit	E5
Total input power	5.5 kW
DC1 / DC2	2.75 kW / 2.75 kW

Table 4-2 : Maximum rating of input power

Model	Current Rating	Wire size
E5	DC 12A	2 - 3mm^2 / 14 AWG

Table 4-3 : Cable size

DC wiring polarities are divided into positive and negative, which is shown in ***Figure 4-8***. The connection shall be coherent with the indication marked on inverter.

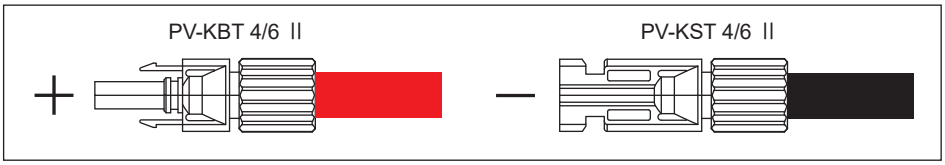


Figure 4-8 : DC plug wiring illustration

4.4 Battery Connection

WARNING !

- When undertaking battery wiring, please ensure the correct polarities are connected.
- When undertaking battery wiring, please ensures that the power switch on the battery side is OFF.
- There is an internal disconnection device and a battery management system (BMS) in the battery box. It's not necessary to install another disconnection device between inverter and battery box.
- Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.

Model	Current Rating	Wire size
E5	DC 40A	8 - 9mm^2 / 8 AWG

Table 4-4 : Battery cable size

Battery wiring uses 1 pair of Phoenix connector. Please follow the instructions below to assemble the connector.

1. Put the stripped wire into the cable adapter
2. Lock it.
3. Attach the bottom part of the cable adapter to the upper part of the cable adapter.
4. Rotate and tighten them.

Figure 4-9 depicts the procedure listed above.

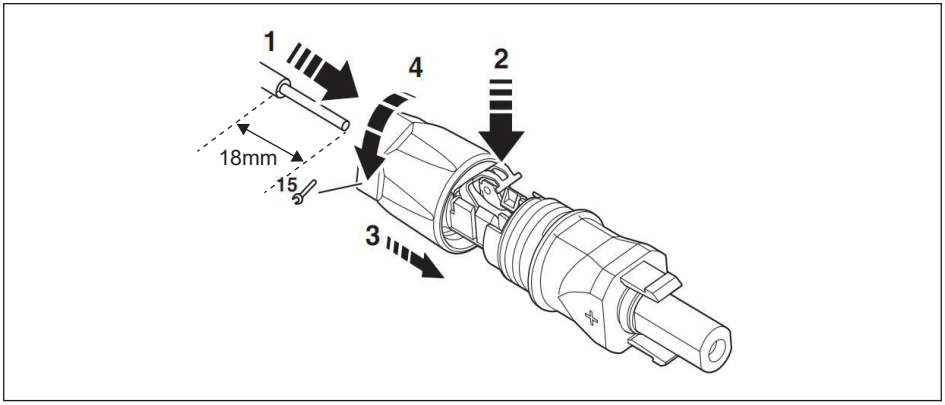


Figure 4-9 : Assemble the Battery Connector

The connection shall be coherent with the indication marked on inverter. Battery box's assembly please refers to battery box quick install guide.

4.5 CAN Connection

The communication interface between E5 and battery is CAN bus. The physical connection type is RJ45 socket. To meet the IP65 class, please use the RJ45 connector of E5 accessory. ***Figure 4-10*** describes the parts of RJ45 connectors.

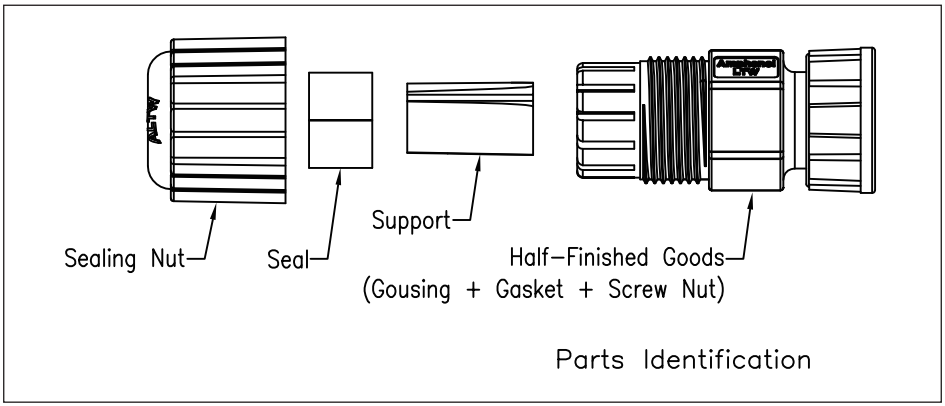


Figure 4-10 : Overview of RJ45 Connectors

To assemble the connector, please follow the procedure below:

1. Insert the sealing nut, seals, and support into the cable assembly.
   (Cable OD range: 5.0 ~ 6.5 mm.)
2. Connect the sealing nut on the half-finished goods and screw tightly.
   (Sealing nut torsion value range: 5~15 kgf-cm)

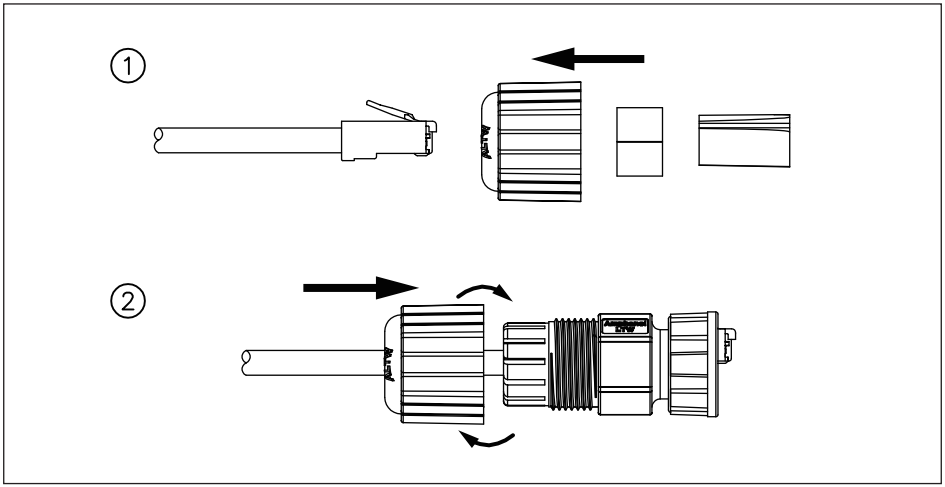


Figure 4-11 : Assembling Procedure of RJ45 Connectors

RJ-45 cable without cable connector boots plug cover (soft plastic) is recommended as indicated in ***Figure 4-12.***

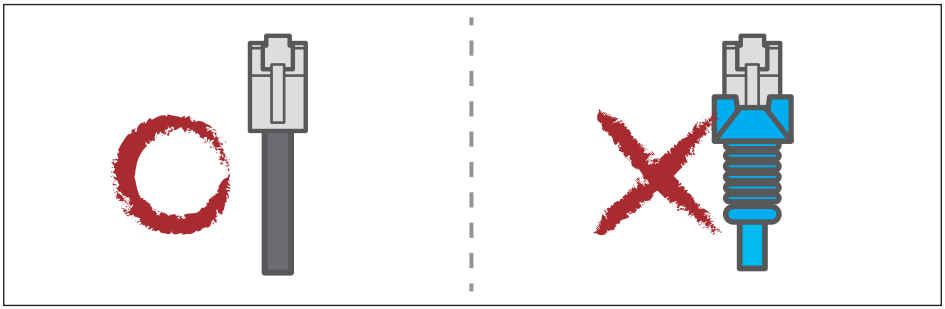


Figure 4-12 : Suitable cables for RJ45 connector

The terminal configuration of CAN connection as specified in ***Table 4-5.***

Pin	Assignment
1	VCC (+24V)
2	GND
3	Battery Fault Sensor
4	CANH
5	CANL
6	N/A
7	N/A
8	N/A

Table 4-5 : RJ45 socket pin assignment of CAN

4.6 Communication Module Connections

Please refer to ***Figure 4-13*** for the Communication Module illustration.
The module provides VCC, RS-485, dry contact, and EPO terminals for different use. The maximum supply current of VCC(24V) is 0.8A. The maximum input rating of dry contact connector is 250Vac/ 30Vdc/ 9A.

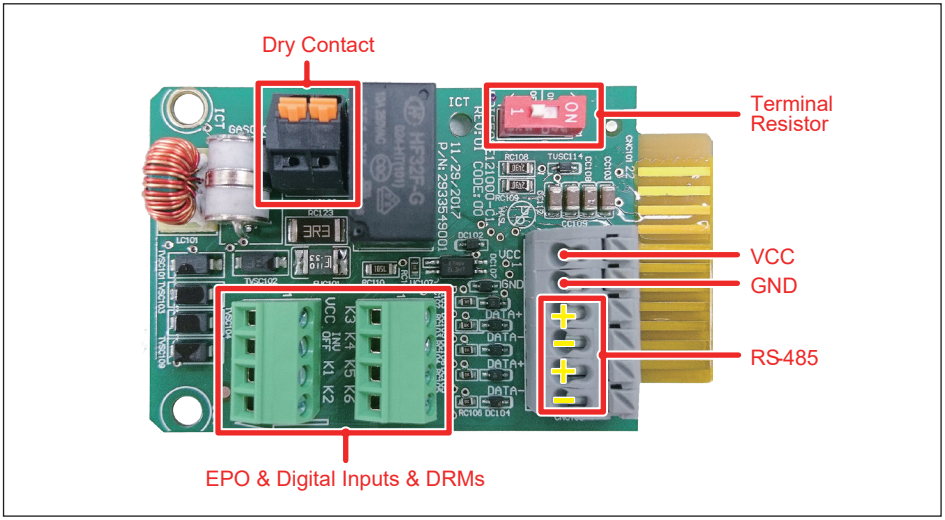


Figure 4-13 : Communication module

4.7 RS-485 Connection

The pin definition and data format of RS-485 is shown in ***Table 4-6***.
Installers should switch ON the terminal resistor when single inverter is installed.

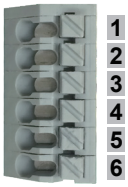
Pin	Function		Data Format
1	VCC (+24V)		Baud rate: 19200 Data bits: 8 Stop bit: 1 Parity: N/A
2	GND		
3	DATA+		
4	DATA-		
5	DATA+		
6	DATA-		
Maximum supply current of VCC(+24V): 0.8A			

Table 4-6 : Pin definition and data format of RS-485

4.8 Digital Input / DRM & EPO Functions

Communication Module has 1 set of emergency power off function (EPO). When the VCC and INV OFF pins are short-circuited, inverter will shut down immediately. The module also provides 6 sets of digital input function (K1~K6). Please refer to ***Table 4-7*** for the digital input definition. The suitable electric wire is 30-16AWG.

Short	Inverter's action
VCC & INV OFF	Emergency power off (EPO)
VCC & K1	0% active power
VCC & K2	Maximum 30% active power
VCC & K3	Maximum 60% active power
VCC & K4	Maximum 100% active power
VCC & K5	Reserved
VCC & K6	Reserved

Table 4-7 : Definition of digital input & EPO functions

In Australia and New Zealand, the Demand Response Modes (DRMs) are also use digital input function to assert. The definition is different from normal digital input function; please refer to ***Table 4-8*** for the DRMs pin definitions.

Short	Inverter's action
VCC & INV OFF	DRM 0 (Disconnect from grid)
VCC & K1	DRM 5 (0% generate power)
VCC & K2	DRM 6 (50% generate power)
VCC & K3	DRM 7 (75% generate power and sink reactive power)
VCC & K4	DRM 8 (100% generate power)
VCC & K5	Reserved
VCC & K6	Reserved

Table 4-8 : Definition of DRMs for Australia and New Zealand

4.9 Dry Contact Connection

Communication Module has 1 set of Dry Contact. The maximum input rating of dry contact connector is 250Vac/ 30Vdc/ 9A. The trigger condition of this function can be customized by Installer. When the function is triggered, the output two ports will be short-circuited. Please refer to section **5.3.8 Install Settings** for more details about trigger condition assignation.

4.10 Multiple inverter combinations

E5 can be used in single-phase parallel combination system. In this application, inverter may be parallel connected to a same AC grid. It recommended connecting the RS-485, EPO, and digital input together of all E5s for an easily and immediately remote control. Please refer to ***Figure 4-14***, ***Figure 4-15*** and ***Figure 4-16*** for the illustration of multiple inverters combination.

In Australia and New Zealand, the max valid combinations number of E5s is 3. Please do not install more than 3 E5s at same point of common coupling.

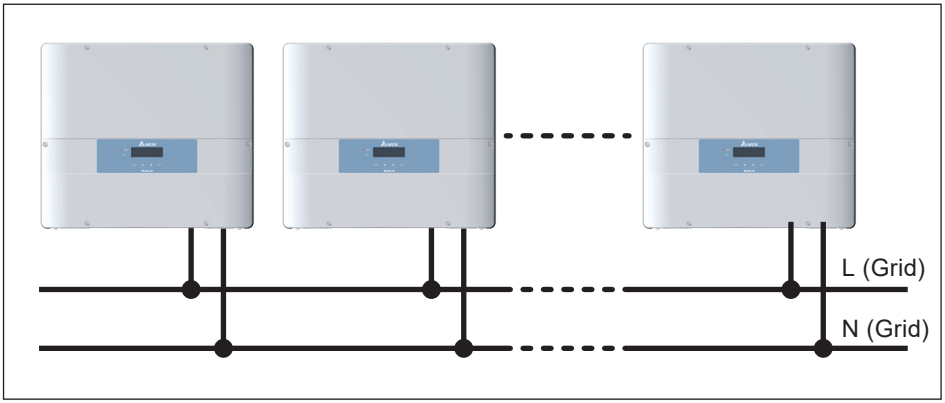


Figure 4-14 : Single-phase parallel combinations

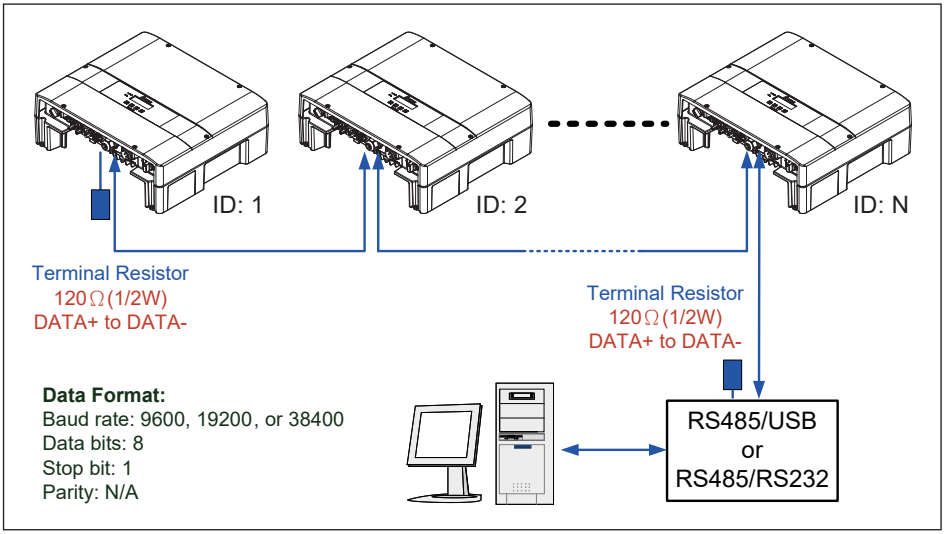


Figure 4-15 : Multiple inverters RS-485 connection

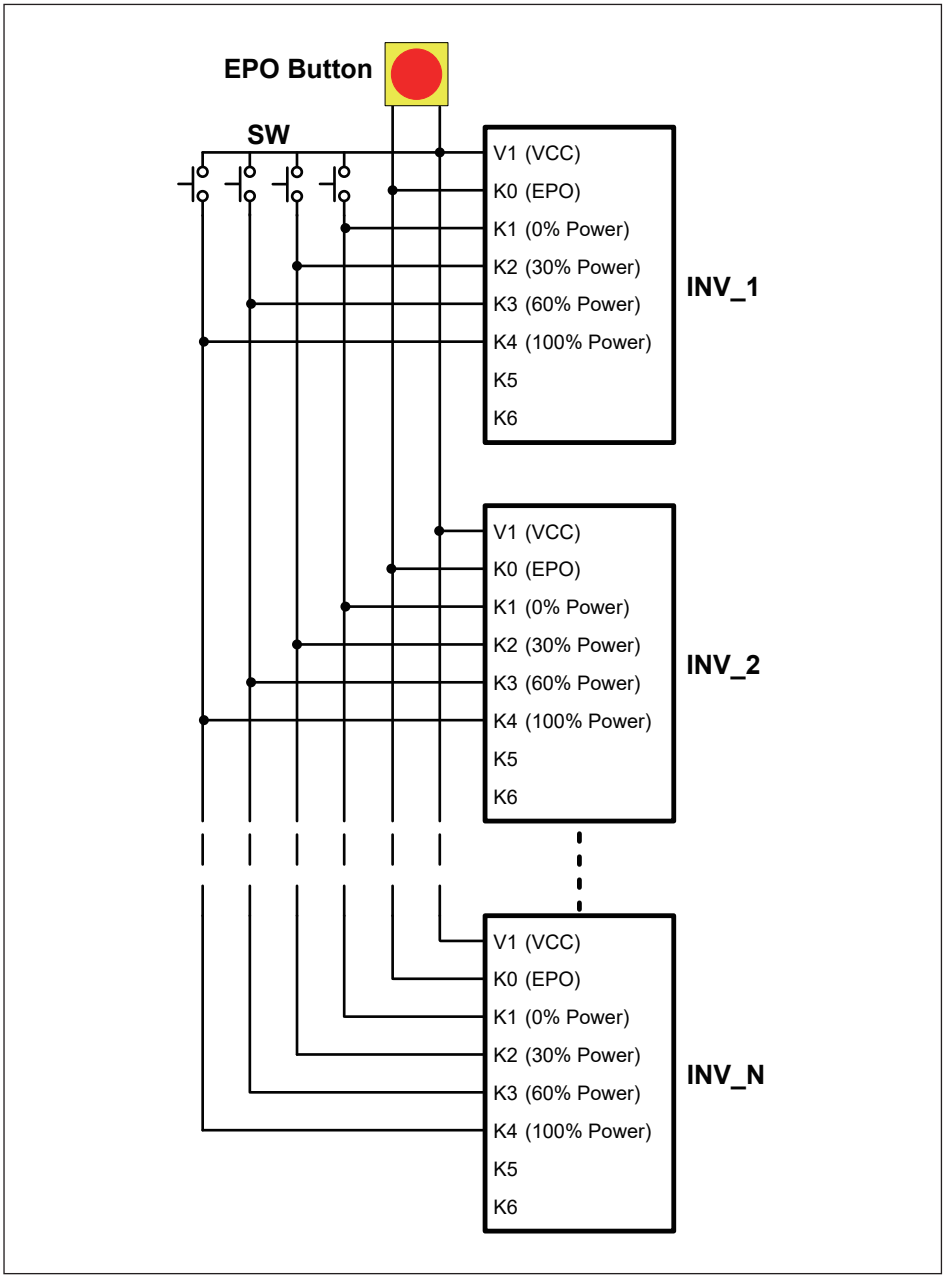


Figure 4-16 : EPO & Digital input & DRMs parallel connection

5 Turning On the Hybrid Inverter

WARNING：BURN HAZARD!

- The enclosure temperature may exceed 70°C while inverter is operation. A dangerous burn hazard is present in this situation.

5.1 LCD Flow Chart

E5 includes a 4x20 character type LCD display and 2 LED to indicate inverter's status. ***Table 5-1*** reveals more information about inverter status and LED indicator.

The following section will introduce the functions that can be adjusted by users through the LCD panel. When you are adjusting settings, LCD panel will change the display cursor from "►" to "↠".

Meter	5.3.1
Energy Log	5.3.2
Event Log	5.3.3
Inverter Information	5.3.4
General Setting	5.3.5
Operation Mode	5.3.6
Function Setting	5.3.7
Install Setting	5.3.8

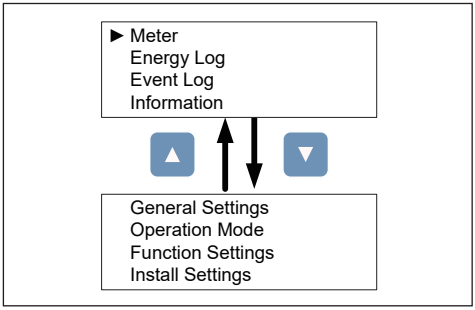


Figure 5-1 : Menu page

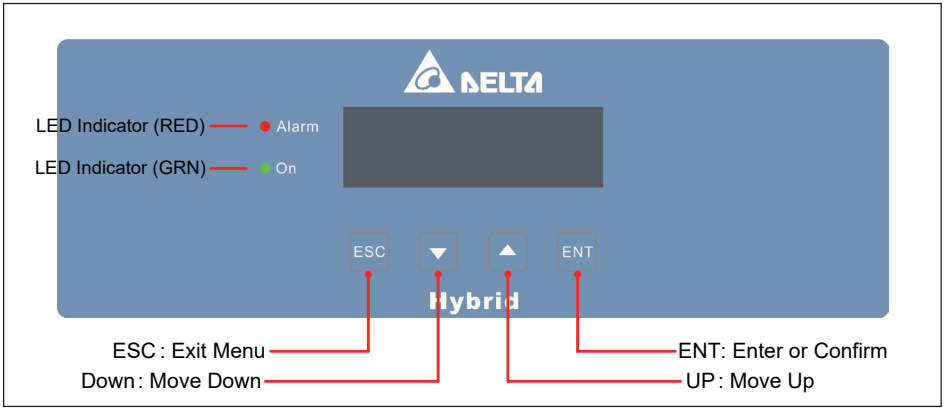


Figure 5-2 : User Interface

Condition	Green LED	Red LED
Countdown or Standalone	FLASH	OFF
Power ON	ON	OFF
Error or Fault	OFF	ON
AC/DC switch off	OFF	OFF
Bootloader mode	FLASH	

Table 5-1 : LED indicator

5.2 First Startup

At first startup, you have to supply AC power and turn on the AC/DC switch. After a while, LCD display will come live and ask you to set language, country (electricity regulation), and operation mode.

When all the settings are done, you can see Home Page showing on display. Now you can supply DC power and wait inverter doing self-test and starting operation.

In the case of no AC power, you can turn on DC power first then switch on the AC/DC switch and press the standalone button about 1 second. If DC side has enough voltage and power, inverter will turn on after a while. In this condition, inverter is forced operating in standalone mode.

You can also turn on E5 by using battery power. Switch on AC/DC switch and wake up the battery, waiting about 30 seconds you will see inverter starting to work in standalone mode. The method of wake up battery will be described in battery box's manual.

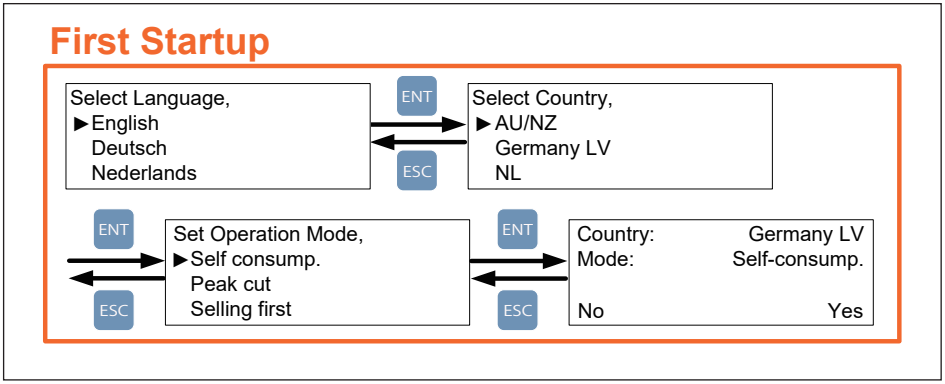


Figure 5-3 : Country and language settings for first startup

5.3 Home Page

When inverter is operating normally, the LCD display will show home page on screen. In this page, you can get the information about inverter operation status, PV power, BT power (charge/ discharge), load power, and grid power (purchase/ selling).

Pressing any key in home page can you enter menu page. There are 8 branches in the menu. The following chapters will introduce you these subpages.

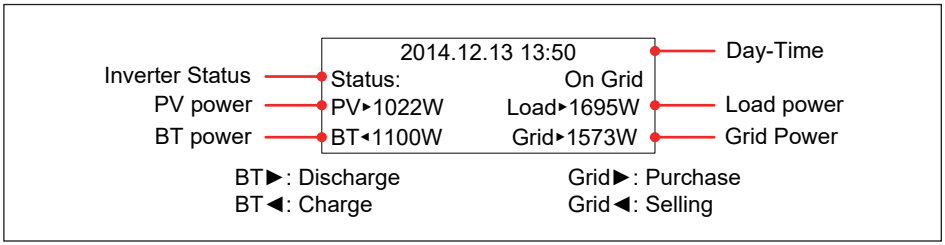


Figure 5-4 : Home page

5.3.1 Meter

In meter page, you can get more detail information about PV, BT, Load, and Grid power.

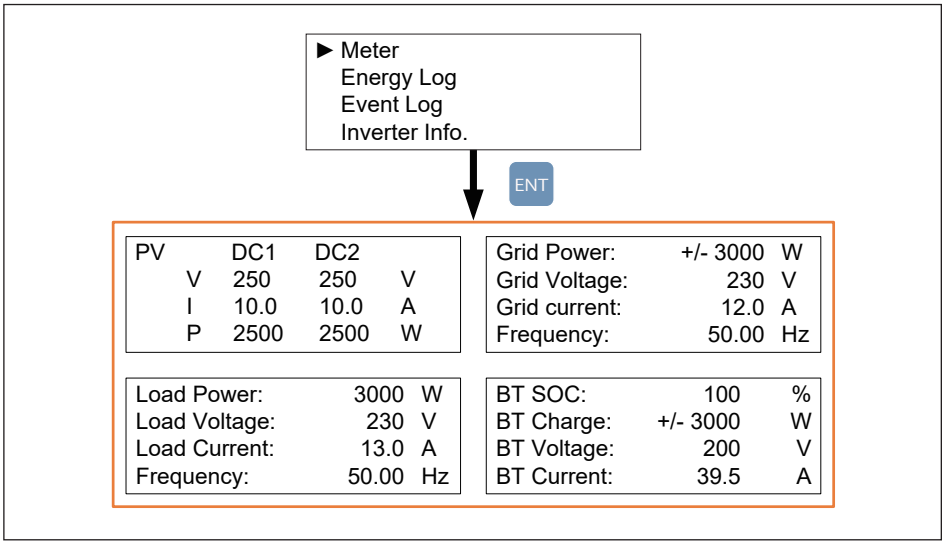


Figure 5-5 : Power meter page

5.3.2 Energy Log

Energy log can be separate into load power log and PV power log; each log can record its own day / month / year power.

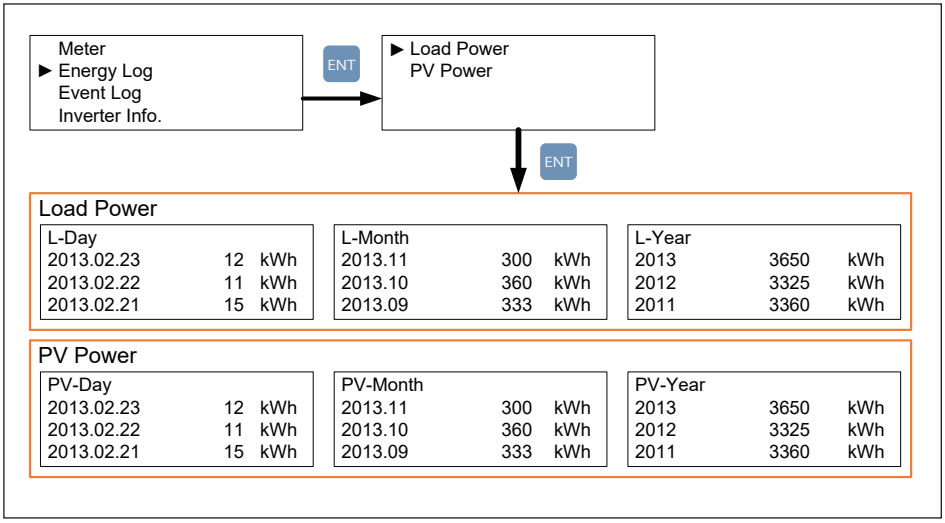


Figure 5-6 : Energy log flow chart

5.3.3 Event Log

This page can records the last 30 events of error and fault. The latest event will be revealed on the top.

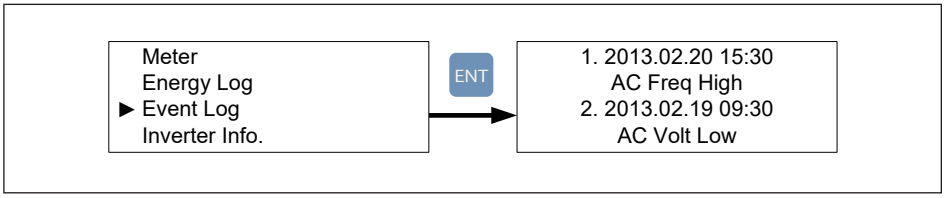


Figure 5-7 : Event log flow chart

5.3.4 Inverter Information

This page can helps you to recognize your inverter. There are serial number, installation date, firmware version, setting country, inverter operation mode, BT SOH, and BT Capacity information in this page.

Please be noticed that inverter operation mode shown in this page is not the same as the operation mode set by user. Please refer to **5.3.6 Operation Mode** chapter for more detail information.

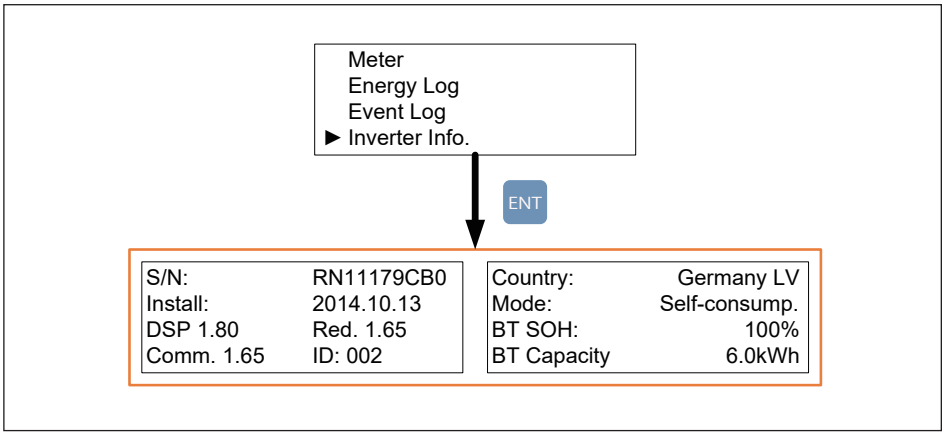


Figure 5-8 : Inverter information page

5.3.5 General Settings

In this page you can change display language, time, and RS-485 communication baud rate.

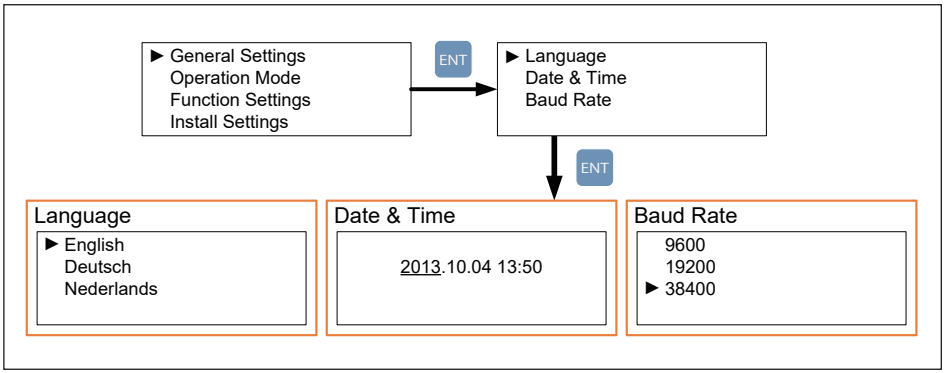


Figure 5-9 : General settings page

5.3.6 Operation Mode

Hybrid inverter has 6 normal operation modes for users to choose.
Each mode has different behavior between PV, battery, grid, and home load.
The following are the description of these modes.

In some area, the detail behavior of each operation mode may be different due to the local electricity regulations.

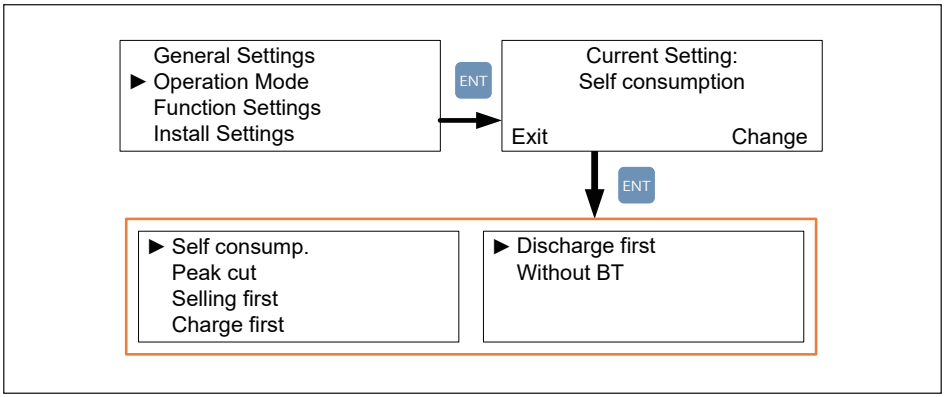


Figure 5-10 : Operation mode page

5.3.6.1 Self-consumption mode

Self-consumption mode is standard hybrid inverter mode.
In this mode, PV power is supplied in following priority :
1. Supply for home load.
2. Charge the battery until it is full.
3. Feed-in the remaining power to grid.

When there is no PV power, battery starts to discharge and supply home load until it's empty.
If you had set the time settings, the behavior of hybrid inverter will change.
We will explain it in **5.3.7 Function Setting** chapter.

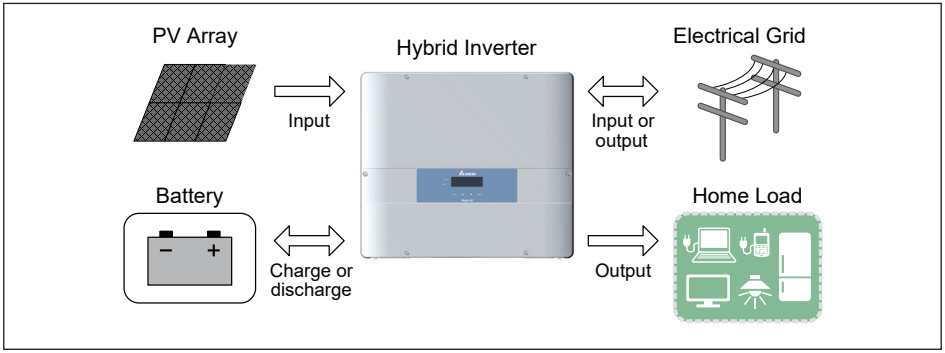


Figure 5-11 : Self-consumption mode current flows

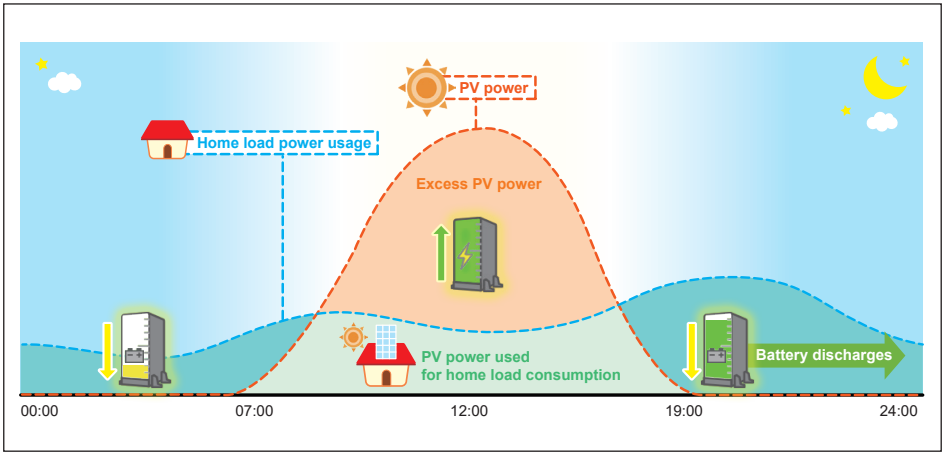


Figure 5-12 : Self-consumption mode behavior

5.3.6.2 Peak cut mode

When home load consumption exceeds the Peak Cut Power you set in Function Setting page, battery will discharge to assist the power usage.

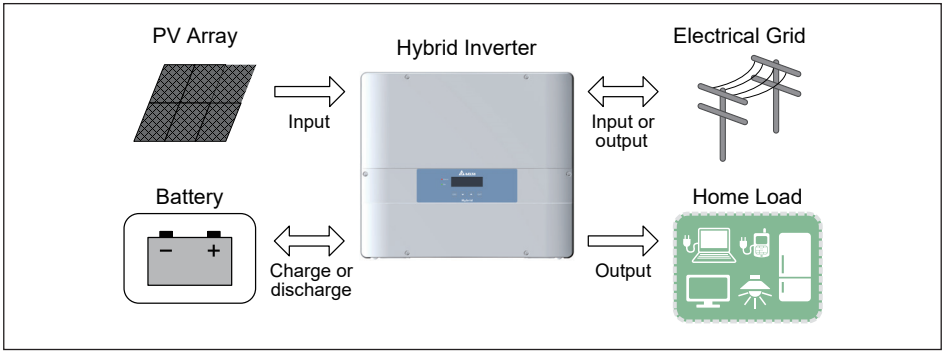


Figure 5-13 : Peak cut mode current flows

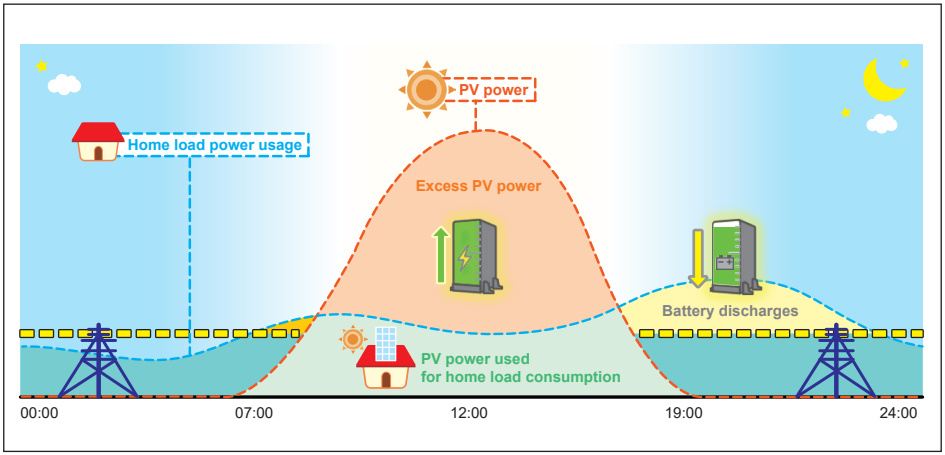


Figure 5-14 : Peak cut mode behavior

5.3.6.3 Selling first mode

Selling first mode is a standard PV inverter mode combining with 6 time settings. In normal operation, power generated by PV array will all feed-in to home load and grid. If users have set the time settings, inverter will change behavior in these time intervals. Please refer to **5.3.7 Function Setting** chapter for more detail about time settings.

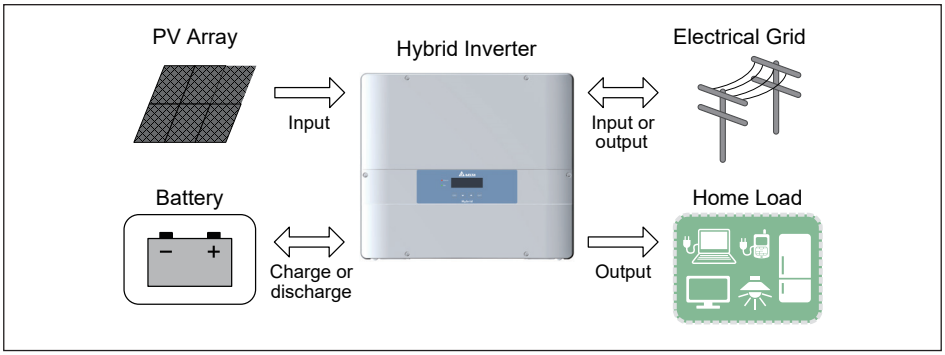


Figure 5-15 : Selling first mode current flows

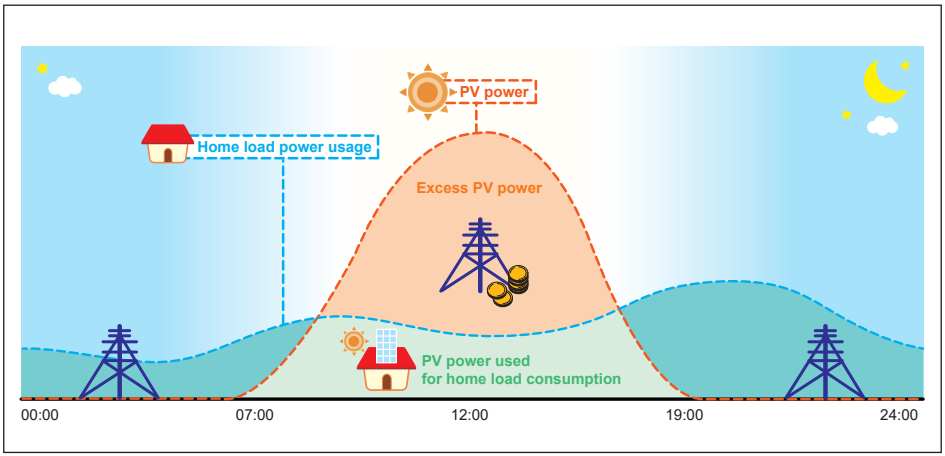


Figure 5-16 : Selling first mode behavior

5.3.6.4 Charge first mode

In this mode, PV power is supplied for battery charging first. After battery is fully charged, the remaining PV power then feed-in to home load and grid. Battery will not discharge in this mode even if there is no PV power.

Users in Australia and New Zealand can charge the battery from grid power by using this mode due to the permission of electricity regulations. Battery will be charged by PV or grid with the maximum charge current.

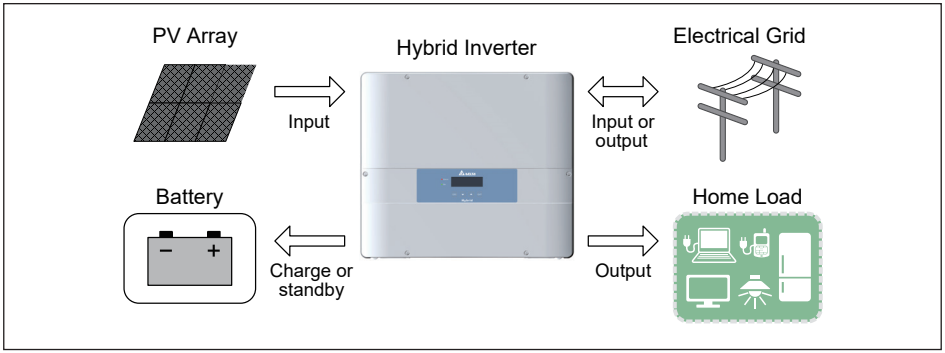


Figure 5-17 : Charge first mode current flows

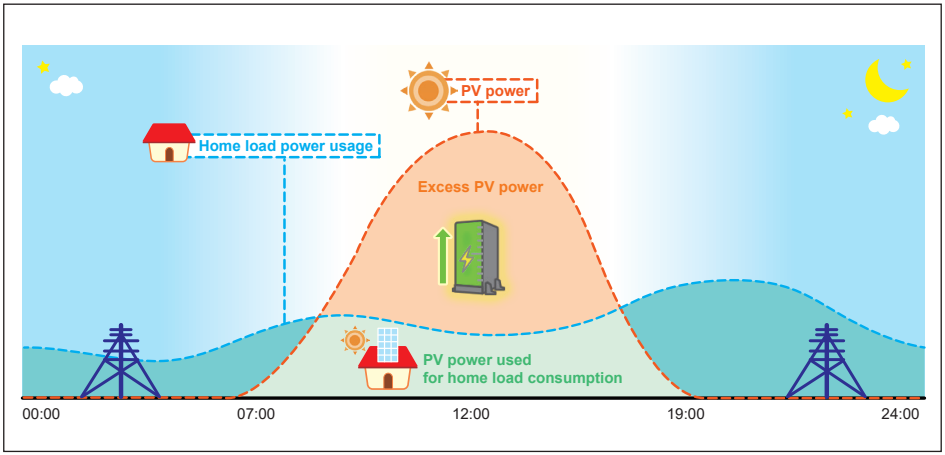


Figure 5-18 : Charge first mode behavior (general)

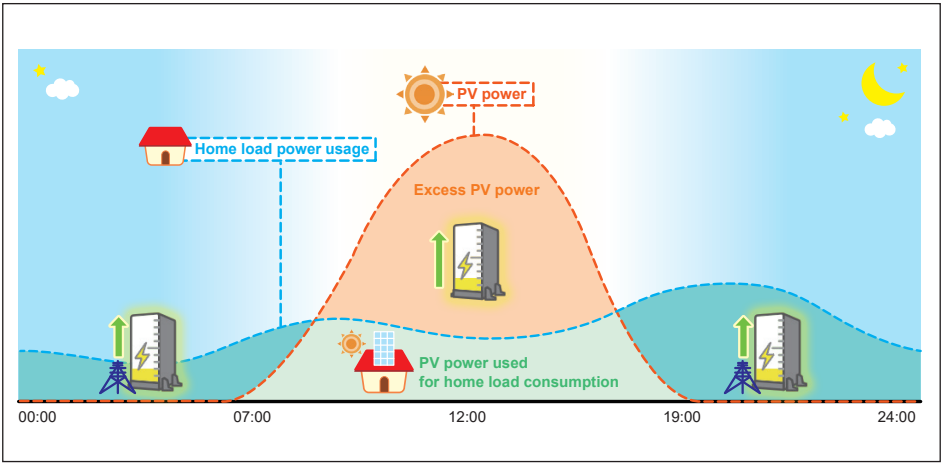


Figure 5-19 : Charge first mode behavior (for AU & NZ)

5.3.6.5 Discharge first mode

In this mode, battery will not be charged any more.
All the PV power is feed-in to home load and grid. Battery keeps discharging when there is no PV power until it is empty.

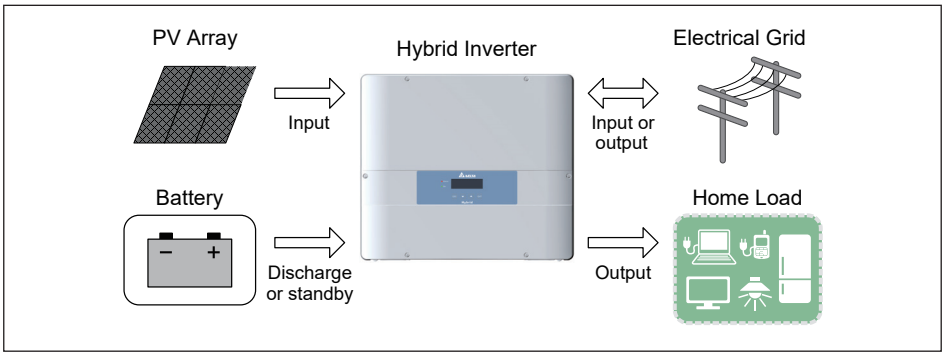


Figure 5-20 : Discharge first mode current flows

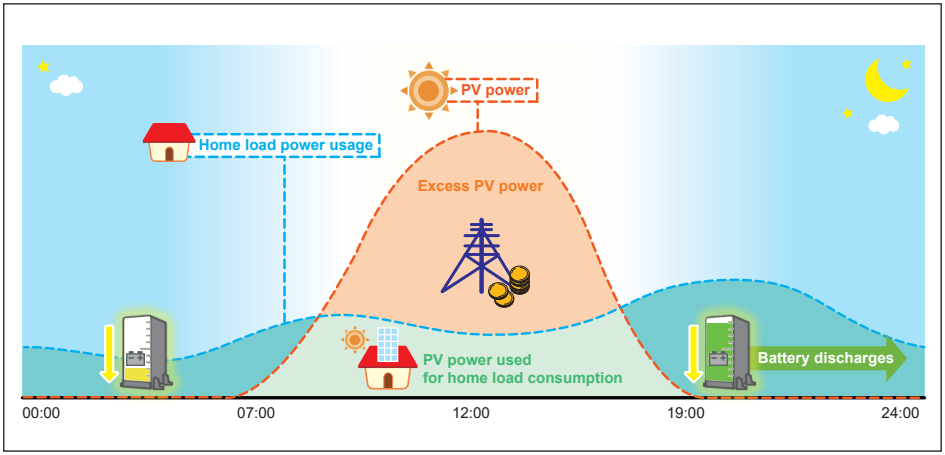


Figure 5-21 : Discharge first mode behavior

5.3.6.6 Without battery mode

If your battery was damaged for some reason, you can disconnect the battery wiring and choose without BT mode. In this mode, hybrid inverter acts like a basic grid-tie PV inverter.

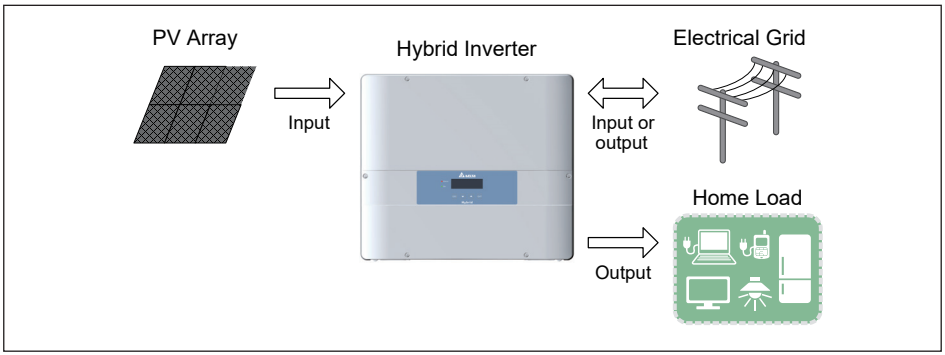


Figure 5-22 : Without battery mode current flows

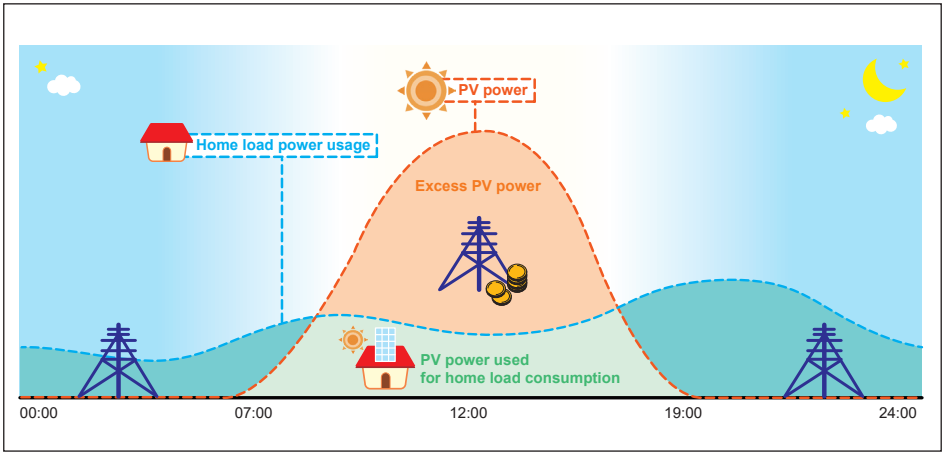


Figure 5-23 : Without battery mode behavior

5.3.6.7 Special Modes

In addition to the 5 modes above, hybrid inverter still have 3 special modes. These modes cannot be enabled by user but will be enabled automatically by inverter in some special condition.

- **Standalone mode**

  Hybrid inverter changes to standalone mode automatically during a power outage occur. At this time, grid side is disconnected by inverter and home load are supported by PV and battery power as much as possible.If the battery is not connected, only when there has sufficient PV power can inverter enter standalone mode.

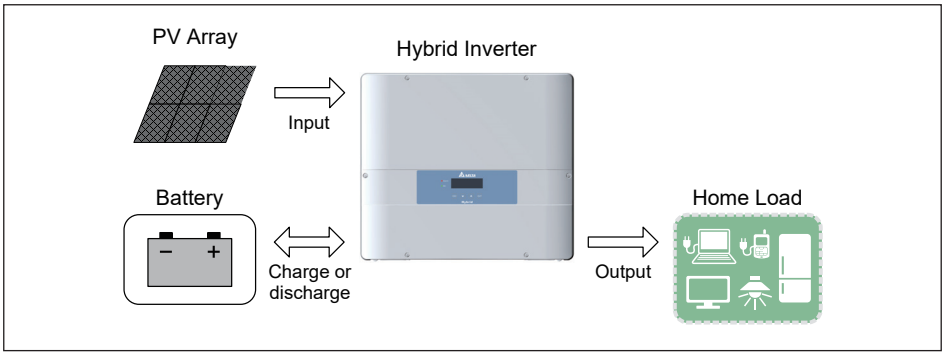


Figure 5-24 : Standalone mode current flows

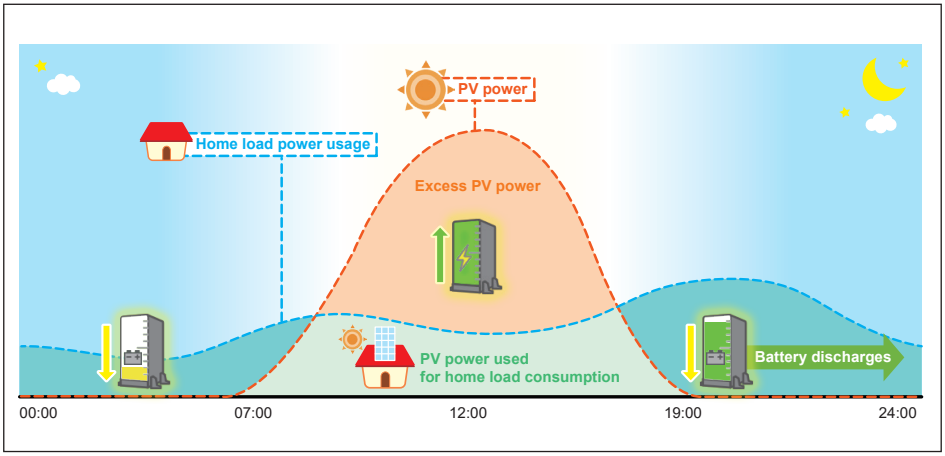


Figure 5-25 : Standalone mode behavior

- **Forced charge mode**

  Although battery stops any action when SOC (state of charge) reach 0%, the self-discharge phenomenon may still causing SOC lower than 0%. At this time, hybrid inverter will force battery charging from PV power and grid power until the battery SOC reaching 30%.

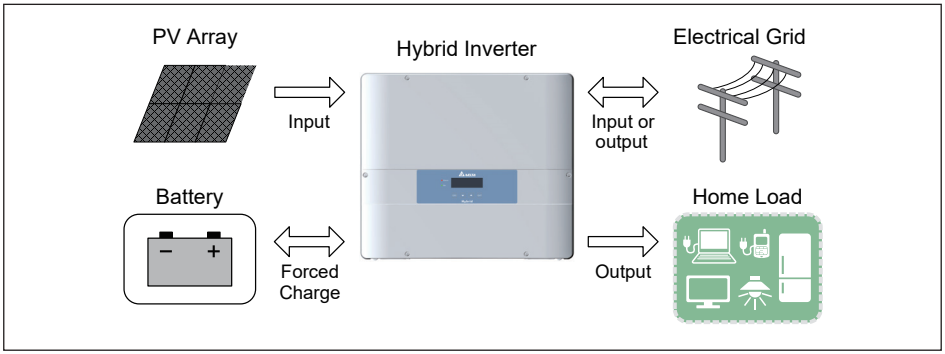


Figure 5-26 : Forced charge mode current flows

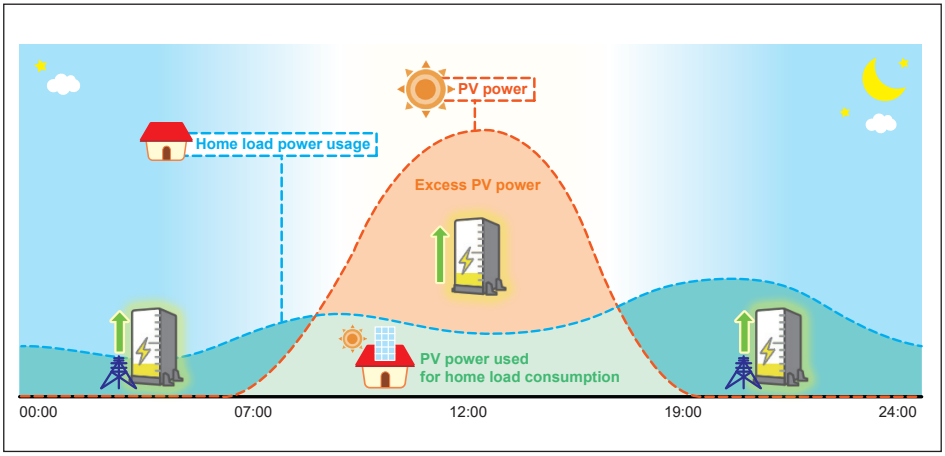


Figure 5-27 : Forced charge mode behavior

5.3.7 Function Setting

In function settings page, you can assign SOC limit, peak cut power, and BT charge / discharge time interval.

• SOC Limit

You can assign the lower limit of battery SOC. Battery will stop discharging when its SOC reach this limit.

• Peak Cut Power

Peak cut power is used in peak cut mode. You can assign the peak power of home load usage from grid. When the home load consumption exceeds this value, battery will discharge to supply remaining power.

• Time Settings

Time settings can be separated into BT charge time and BT discharge time. Each setting can set 3 time intervals. These 6 time intervals cannot overlap with each other.

When the inverter operation mode set to self-consumption or selling first mode, time settings is enabled. Hybrid inverter will automatically change the mode to charge first / discharge first in the time intervals you set and return to self-consumption / selling first mode outside the intervals.

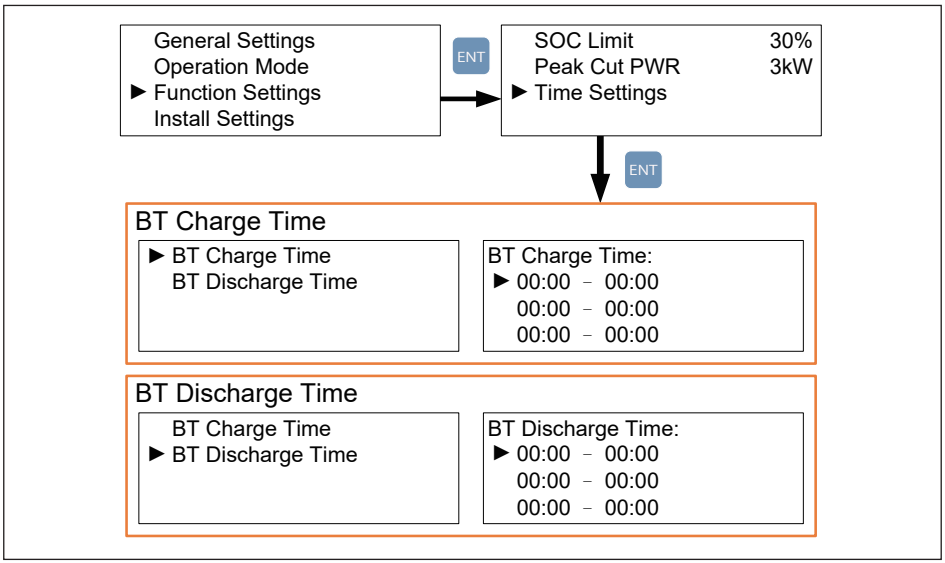


Figure 5-28 : Function Settings page

5.3.8 Install Settings

CAUTION !

- The settings in Install Settings page can only be adjusted by qualified installers or engineers. Changing these settings may result in damage to the inverter and other equipment.

Install Settings page is for installer only.
To enter this page, installer has to key in installer password.
The page includes following functions :

- **Inverter ID**

  Inverter ID is used to recognized the inverter when you communicating with it via RS-485.

- **Insulation**

  Inverter will measure the impedance between PV array and PE before connecting to grid. To avoid risk of electrical shock, it's not recommending to disable this function.

- **Country**

  Each country has its own electricity regulations. The hybrid inverter can meets more than one electricity regulations. Installer must select the country correctly.

- **Dry Contact**

  Installer can choose the trigger condition of dry contact. The explanations of these conditions are shown in following table.

Setting	Dry Contact Trigger Timing
Disable	No action.
On Grid	Inverter is connecting to grid.
Insulation	Insulation test fail.
Alarm	Any error or fault occurs.
Error	Any error occurs.
Fault	Any fault occurs.

Table 5-2 : Dry contact trigger condition

- **Subsidy Function**

  This function is currently used in Germany only. Installer in Germany should set the PV array capacity and enable this function. The maximum feed-in power to grid will be limited at a percentage of PV array capacity. Installers can set the various limit percentage to meet the local electricity regulation.

- **Return to Factory**

  This option is used to return factory settings. The entire energy log will be cleared. Please use it with caution.

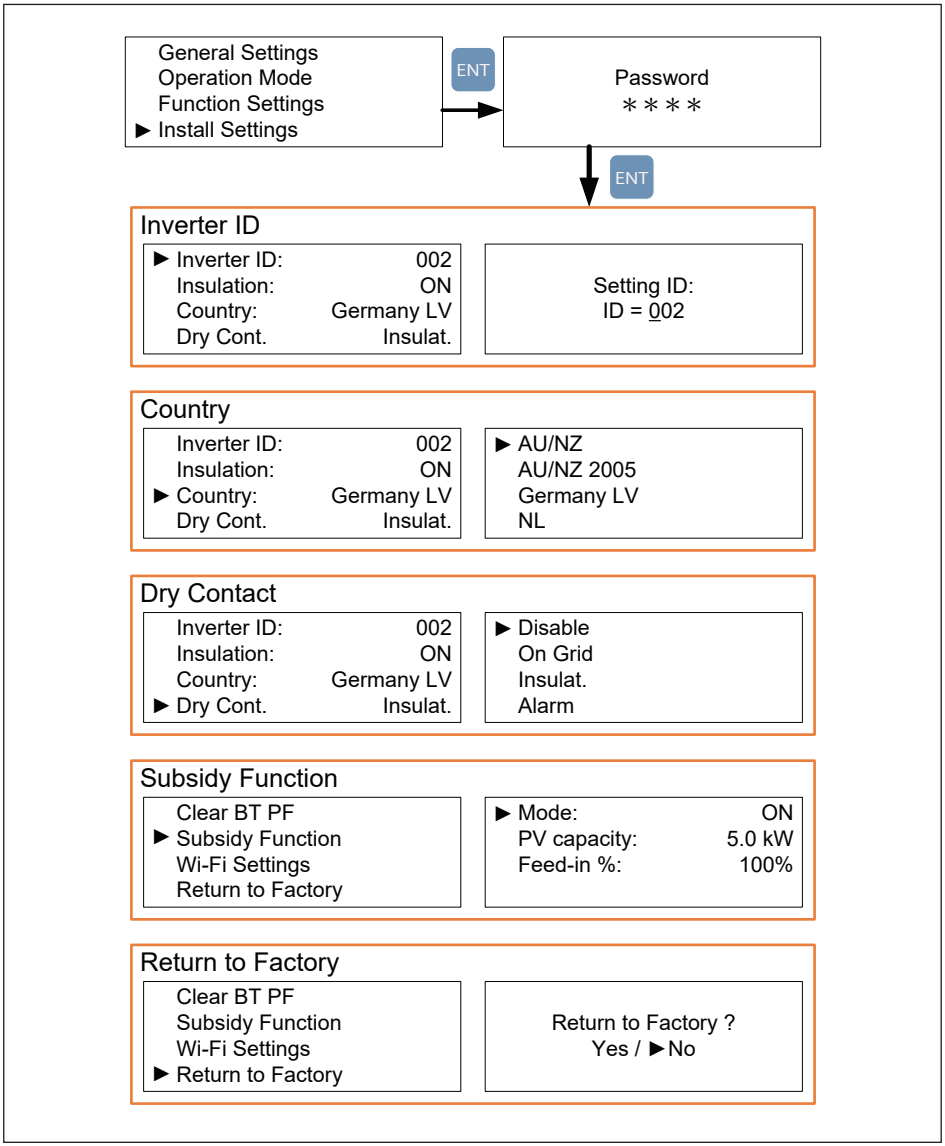


Figure 5-29 : Install Settings page

6 Maintenance

Warning ! Electric Shock



- Before any maintenance, please make sure you are well insulated to avoid risk of electric shock.

In order to ensure the normal operation of inverter, please check and clean the unit regularly. Once there are any impaired or loose parts, please contact your inverter installer.

If the hybrid inverter was damaged and cannot supply the power to home load, please turn off the AC/DC switch at bottom left and turn on the manual bypass switch at bottom right to keep the power supply to home load via grid.

Please be noticed that when you turn on the manual bypass switch, grid and home load are forced connected together. In this case, if grid fault occurred, inverter will stop supplying any power to grid and home load for avoid electrical shock of maintainer.

7 Error message and Trouble Shooting

ERROR			
Code	**Message**	**Cause**	**Action**
E01	AC Freq High	Grid frequency over the limit of electricity regulation.	Check the grid frequency. If grid frequency is not in acceptable range, contact the utility operator to modify it. If grid frequency lies in acceptable range but the error still exist, please contact your inverter supplier.
E02	AC Freq Low	Grid frequency under the limit of electricity regulation.	Check the grid frequency. If grid frequency is not in acceptable range, ask the utility operator to modify it. If grid frequency lies in acceptable range but the error still exist, please contact your inverter supplier.
E07	Grid Quality	Grid harmonic distortion >8.5% and >2.2s	Check AC wiring; keep the wire short and straight. Contact the utility operator to improve the grid quality. If the grid quality is good but the error still exist, please contact your inverter supplier.
E09	No Grid	Grid voltage <20V or voltage half-cycle > 50ms	Check the triggering of upstream circuit breaker. Check the wire connection between inverter side and grid side. Contact the utility operator for the information about power failure.
E10	AC Volt Low	Grid voltage under the limit of electricity regulation.	Check the grid voltage. If grid voltage is not in acceptable range, ask the utility operator to modify it. If grid voltage lies in acceptable range but the error still exist, please contact your inverter supplier.
E11	AC Volt High	Grid voltage over the limit of electricity regulation.	Check the grid voltage. If grid voltage is not in acceptable range, ask the utility operator to modify it. If grid voltage lies in acceptable range but the error still exist, please contact your inverter supplier.
E12	AC Volt High	Grid voltage over the limit of electricity regulation.	Check the grid voltage. If grid voltage is not in acceptable range, ask the utility operator to modify it. If grid voltage lies in acceptable range but the error still exist, please contact your inverter supplier.

ERROR			
Code	**Message**	**Cause**	**Action**
E13	AC Volt High	Grid voltage over the limit of electricity regulation.	Check the grid voltage. If grid voltage is not in acceptable range, ask the utility operator to modify it. If grid voltage lies in acceptable range but the error still exist, please contact your inverter supplier.
E30	Solar1 High (DC Voltage High)	DC1 voltage > 600V (more than 0.1s)	Disconnect the DC1 input and check the PV array voltage. If the PV array voltage still over 600V, please contact the PV array supplier. If the PV array voltage is fine but the error still exist, please contact your inverter supplier.
E31	Solar2 High (DC Voltage High)	DC2 voltage > 600V (more than 0.1s)	Disconnect the DC2 input and check the PV array voltage. If the PV array voltage still over 600V, please contact the PV array supplier. If the PV array voltage is fine but the error still exist, please contact your inverter supplier.
E34	Insulation (Insulation Fault)	PV array impedance in either input < 550 kohm	Check the insulation of DC input wiring. Check the string for ground faults. If the insulation of DC wiring is fine but the error still exist, please contact your inverter supplier.

Table 7-1 : Error Message

Fault			
Code	**Message**	**Cause**	**Action**
F01	DC Injection	DC component in grid current over the limit	Check the power supply line for direct current. Contact the utility operator to improve the grid quality.
F05	Temp High (Temperature High)	Internal temperature too high to cause power output < 5%	Check the temperature of installation environment. Contact your inverter supplier.
F06	HW NTC1 Fail (Amb Temp Fault)	Internal fault	Contact your inverter supplier.
F07	Temp Low (Temperature Low)	Internal temperature < -25℃	Check the temperature of installation environment. Contact your inverter supplier.
F08	HW NTC2 Fail (Boost Temp Fault)	Internal fault	Contact your inverter supplier.
F09	HW NTC3 Fail (Bidir. Temp Fault)	Internal fault	Contact your inverter supplier.
F10	HW NTC4 Fail (Inverter Temp Fault)	Internal fault	Contact your inverter supplier.
F13	HW RLY (AC RLY Fault)	Internal device fault	Contact your inverter supplier.
F15	HW DSP ADC1 (AC Sensor Fault)	Internal fault	Contact your inverter supplier.
F16	HW DSP ADC2 (Vdc Sensor Fault)	Internal fault	Contact your inverter supplier.
F17	HW DSP ADC3 (Idc Sensor Fault)	Internal fault	Contact your inverter supplier.
F18	HW Red ADC1 (AC Sensor Fault)	Internal fault	Contact your inverter supplier.
F19	HW Red ADC2 (Idc Sensor Fault)	Internal fault	Contact your inverter supplier.
F20	HW Eff. (Eff. Abnormal)	Inverter efficiency < 70% or > 130%	Contact your inverter supplier.

Fault			
Code	**Message**	**Cause**	**Action**
F22	HW COMM2 (Red COMM Fault)	Internal fault	Contact your inverter supplier.
F23	HW COMM1 (DSP COMM Fault)	Internal fault	Contact your inverter supplier.
F24	Ground Cur. (Ground Cur. High)	Residual current over the limit	Check the insulation of DC input wiring. Check the string for ground faults.
F27	RCMU Fail (RCMU Fault)	Internal device fault	Contact your inverter supplier.
F28	RLY Short (AC RLY Short)	Internal device fault	Contact your inverter supplier.
F29	RLY Open (AC RLY Open)	Internal device fault	Contact your inverter supplier.
F30	Bus Unbal. (Bus Unbalance)	Internal fault	Contact your inverter supplier.
F31	HW Bus OVR (Bus Voltage High)	Internal fault	Contact your inverter supplier.
F33	HW Bus OVR (Bus Voltage High)	Internal fault	Contact your inverter supplier.
F35	HW Bus OVR (Bus Voltage High)	Internal fault	Contact your inverter supplier.
F36	AC Cur. High (AC Current High)	Grid current >135% rated and keep over 50ms	Contact your inverter supplier.
F37	AC Cur. High (AC Current High)	Grid current >125% rated and keep over 5s	Contact your inverter supplier.
F42	HW CT (AC CT Fault)	Internal device fault	Contact your inverter supplier.
F45	HW AC OCR (AC Current High)	AC current over the limit 20 times within 2s	Check AC and DC wiring for ground faults. Inverter may be struck by the lighting. Check the whole wiring of hybrid system. If this fault occurs often, please contact your inverter supplier.
F48	SA OPP (SA Over Load)	System overload	In standalone mode, PV and BT power is insufficient to supply the home load. Please reduce the load.

Fault			
Code	**Message**	**Cause**	**Action**
F50	HW ZC Fail (ZC Circuit Fault)	Internal fault	Contact your inverter supplier.
F60	Solar 1 OCR (DC Current High)	DC1 current > 135% rated and keep over 0.2s	Contact your inverter supplier.
F61	Solar 2 OCR (DC Current High)	DC2 current > 135% rated and keep over 0.2s	Contact your inverter supplier.
F70	Solar 1 OCR (DC Current High)	DC1 current > 140% rated and keep over 0.1s	Contact your inverter supplier.
F71	Solar 2 OCR (DC Current High)	DC2 current > 140% rated and keep over 0.1s	Contact your inverter supplier.
F97	BT OVP	Battery system internal fault	Contact your inverter supplier.
F98	BT UVP	Battery system internal fault	Contact your inverter supplier.
F99	BT OTP	Battery system internal fault	Contact your inverter supplier.
F100	BT UTP	Battery system internal fault	Contact your inverter supplier.
F101	BT OCP	Battery system internal fault	Contact your inverter supplier.
F102	BT CVI	Battery system internal fault	Contact your inverter supplier.
F103	BT TF	Battery system internal fault	Contact your inverter supplier.
F104	BT PF	Battery system internal fault	Contact your inverter supplier.
F112	HW COMM BT	Loss communication between inverter and battery over 10 seconds.	Check CAN connection between inverter and battery.
F113	BT EOL	Battery system SOH < 50%	Contact your inverter supplier.

Table 7-2 : Fault Message

8 De-Commissioning

WARNING !



- To avoid injuries, please follow the procedures to unload the inverter.

If it is necessary to put the device out of operation for maintenance or storage, please follow the procedures below:

At inverter side:

1. Switch off the AC/DC switch and wait for display turning off.
2. Switch the manual bypass switch to normal.
3. Wait for E5's display panel and battery box's LED indicator light off.

At wiring side:

4. Switch off AC power line breaker to disconnect from grid.
5. Switch off DC power line breaker to disconnect from PV array.
6. Use proper voltmeter to check that the AC and DC power are truly disconnected.
7. Remove the AC, DC, and battery wiring.
8. Remove the communication module RS-485 connection from the computer connection.

Now you may unload the inverter.

9 Technical Data

Model	E5
GENERAL	
Enclosure	Mounting bracket
	Aluminum with powder coating
Operating temperature	-25℃~60℃ full power up to 40℃
Operating Altitude	0 to 2000m (0 to 6666 ft.)
Relative humidity	0% – 100% non-condensing.
Environmental category	Outdoor, wet locations
Protection degree	IP65 (Electronics)
Pollution degree	Internal : II, External : III
Overvoltage category	AC output :III, DC Input :II
Maximum backfeed current to the array	0
Galvanic isolation	NO
Safety class	Class I metal enclosure with protective earth
Weight	27kg
Dimensions(W*H*D)	510 × 445 × 177mm
Connectors	Weather resistant connectors
Audible noise	< 40dB
DC INPUT (Solar side)	
Maximum input power	5.5kW
Recommended PV power range	5kW–6kW
Nominal voltage	370Vdc
Operating voltage	100Vdc – 550Vdc
Startup voltage	> 125Vdc
Startup power	30W
MPP tracker	1 MPP tracker (Parallel connection) 2 MPP trackers (Separate connection)
Absolute maximum voltage	600Vdc
Full power range	220Vdc – 450Vdc

Model	E5	
DC INPUT (Solar side)		
Number of inputs	2 pairs MC4	
Rated current	12Adc x 2	
Maximum short circuit current per MPPT (Isc)	15A / 15A	
BT INPUT		
Operating voltage	40Vdc – 450Vdc	
Maximum allowed charge / discharge current	40A	
Nominal charge/discharge current	According to the battery specification	
Battery type	Refer to battery box user manual	
Number of inputs	1 pair Phoenix connectors	
AC INPUT / OUTPUT	**Grid**	**Standalone**
Nominal power	5000VA	3600VA
Maximum power	5250VA*	3600VA
Voltage	According to country setting (Programmable 230Vac ± 20%)	
Nominal current	21.7A	15.7A
Maximum current	24A	15.7A
Inrush current	16A / 100us	
Maximum output fault current (rms)	28A	
Maximum overcurrent protection	28A	
Frequency	Rated 50/60 Hz (Programmable 45-65 Hz)	
Active anti-islanding method	Reactive power injection	
Total harmonic distortion	< 3 %	
Power factor	> 0.99 @ full power Output adjustable: 0.80 leading – 0.80 lagging	
Output current DC component	< 0.5% rated current	
Tare loss	< 25W	
Maximum efficiency	97.2%	
EU efficiency	96.5%	
AC connector	Line + Neutral + PE; AC plug meets IP67	
Rated conditional short-circuit current (Icc)	≤ 6.0kA	

* Charging power will be limited at 3200W when charging BX_6.0 battery box.

Model		E5
SYSTEM INFORMATION / COMMUNICATION		
User interface		Black-on-white character type LCD display
		365 days data logger and real time clock
		30 events record
External communication		2 RS-485 connections
REGULATIONS & DIRECTIVES		
CE conformity		Yes
Grid interface		VDE-AR-N 4105, AS4777, G59/3, EN 50438
Emission		EN 61000-6-3
Harmonics		EN 61000-3-2
Variations and flicker		EN 61000-3-3
Immunity		EN 61000-6-2
Immunity	ESD	IEC 61000-4-2
	RS	IEC 61000-4-3
	EFT	IEC 61000-4-4
	Surge	IEC 61000-4-5
	CS	IEC 61000-4-6
	PFMF	IEC 61000-4-8
Electrical safety		IEC 62109-1/ -2, IEC 62040

Table 9-1 : Specifications for E5



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