Rayleigh Instruments
EST. 1964

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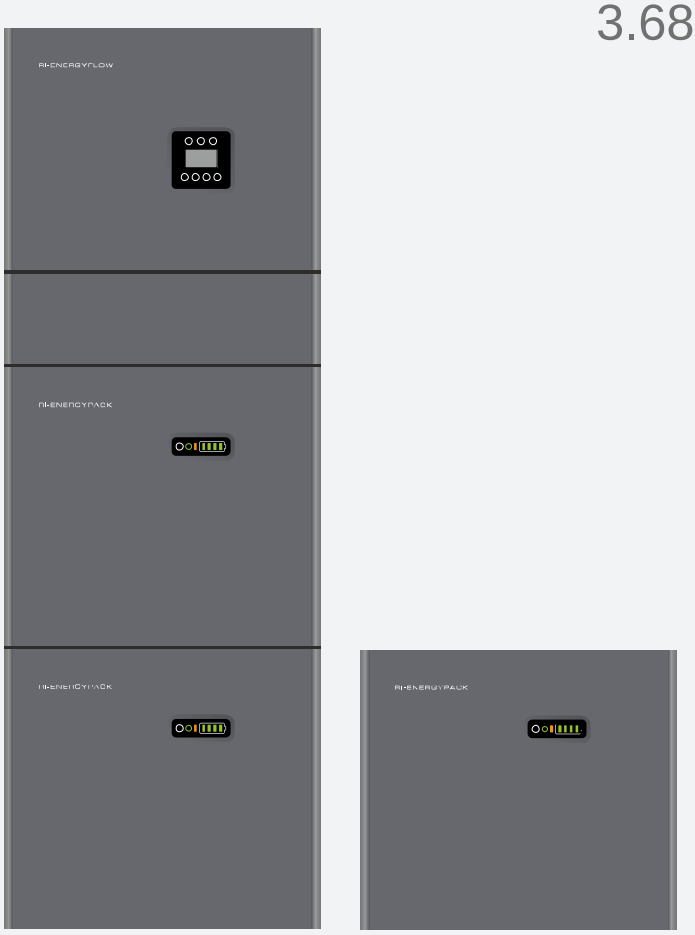
RI-ENERGYFLOW-MODULAR Series

RI-ENERGYFLOW

Modular Inverters

3.68kW | 5.0kW



User Manual

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1. Document Introduction

1.1 Introduction

This manual describes solar inverters:

RI-ENERGYFLOW-MODULAR-3.68kW /5.0kW.

These inverters are Battery Isolation based inverter.

Please read the safety instructions in this manual first. Throughout the manual it is assumed that the reader is familiar with AC and DC installations and knows the rules and regulations for electrical equipment and for connecting it to the utility AC grid. It is especially important to be familiar with the general safety rules for working with electrical equipment.

1.2 Applied Symbols

Throughout the manual important information is shown at different levels depending on the character of the information, as shown here:

	Safety information important for human safety. Violation of warnings may result in injury to persons or death.
	Danger of high voltage and electric shock!
	Signals danger due to electrical shock and indicates the time (5 minutes) to allow after the inverter has been turned off and disconnected to ensure safety in any installation operation.
	Danger of hot surface!
	Product should not be disposed as normal household waste.
CE	CE Mark.
UK CA	UKCA Mark.
RoHS	ROHS Mark.
!	Information important for the protection of property. Violation of this type of information may cause damage and loss of property.
	Useful additional information or “Tips and Tricks" on specific subjects.

1.3 Important safety information

Read this before installing, operating or maintaining the inverter.

Before installation:

Check for damage to inverter and packaging. If you are in doubt, please contact your supplier before installing the inverter. Check the voltages of the solar modules and make sure they are within the limits of the inverter specifications before connecting them to the inverter.

Installation:

Only trained and authorized personnel familiar with local electrical codes may install the inverter. For optimum safety, please follow the steps described in this manual. Keep in mind that the inverter has two voltage carrying sides, the PV input and the AC grid.

Disconnecting the inverter:

Always disconnect the AC line first! Afterwards disconnect the PV lines. Note that the inverter can still be charged with very high voltages at hazardous levels even when it is disconnected from grid and solar modules. Wait at least 5 min. before proceeding, after having disconnected from grid and PV panels.

Operating the inverter:

Before connecting the AC grid to the inverter, make sure that the installation cover is mounted again. The inverter must not be open during operation.

Maintenance and modification:

Only authorized personnel are allowed to repair or modify the inverter. To ensure optimum safety for user and environment, only the original spare parts available from your supplier should be used.

Functional safety parameters:

Unauthorized changes of functional safety parameters may cause injury or accidents to people or inverter. Additionally it will lead to the cancelling of all inverter operating approval certificates.

1.3.1 Warning Signs for Safety

During installation, maintenance and repair, follow the instructions below to prevent unauthorised personnel from causing injury or accident:

- Obvious signs should be placed at the front switch and rear-level switch to prevent accidents caused by false switching
- Warning signs or tapes should be set near operating areas.
- The system must be fully reassembled after maintenance or operation.

1.3.2 Measuring Equipment

To ensure the electrical parameters match the requirements, related measuring equipment are required when the system is being connected or tested. Ensure that the connection is reliable and use matched specifications to prevent electric arcs or shocks.

1.3.3 Moisture Protection

Moisture may likely cause damages to the system. Repair or maintaining activities in wet weather should be avoided or limited.

1.3.4 Operation After Power Failure

The battery system is part of the energy storage system which stores life-threatening high voltage even when the DC side is switched off. Touching the battery outlets is strictly prohibited. The inverter can store lethal voltage levels even after disconnection from the DC and/or AC side. Therefore, for safety reasons, it must be tested with a properly calibrated voltage tester before an installer works on the equipment.

1.3.5 Battery Safety Datasheet

1.3.5.1 Hazard Information

Classification of the hazardous chemical

Exempt from classification according to Australian WHS regulations.

Other hazards

This product is a Lithium Iron Phosphate Battery with certified compliance under the UN Recommendations on Transport of Dangerous Goods, Manual of Tests and Criteria, Part III, subsection 38.3. For the battery cell, chemical materials are stored in a hermetically sealed metal case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage. However, if the product is exposed to a fire, added mechanical shocks, decomposed, added electric stress by misuse, the gas release vent will be operated. The battery cell case will be breached at the extreme. Hazardous materials may be released. Moreover, if heated strongly by the surrounding fire, acrid or harmful fumes may be emitted.

1.3.6 General Precautions

DANGER

Danger to life due to high voltages of the PV array, battery and electric shock. When exposed to sunlight, the PV array generates dangerous DC voltage which will be present in the DC conductors and the live components of the inverter. Touching the DC conductors or the live components can lead to lethal electric shocks. If you disconnect the DC connectors from the system under load, an electric arc may occur leading to electric shock and burns.

- Do not touch uninsulated cable ends.
- Do not touch the DC conductors.
- Do not open the inverter or battery modules.
- Do not wipe the system with a damp cloth.
- Have the system installed and commissioned by qualified people with the appropriate skills only.
- Before performing any work on the inverter or the battery pack, disconnect the inverter from all voltage sources as described in this document.

WARNING

Risk of chemical burns from electrolyte or toxic gases. During standard operation, no electrolyte shall leak from the battery pack and no toxic gases shall form. Despite careful construction, if the Battery Pack is damaged or a fault occurs, the electrolyte may leak or toxic gases may form.

- Do not install the system in any environment with temperature below -10°C or over 50°C or in which humidity will exceed 90%.
- Do not touch the system with wet hands.

- Do not put any heavy objects on top of the system.
- Do not damage the system with sharp objects.
- Do not install or operate the system in potentially explosive atmospheres or areas of high humidity.
- Do not mount the inverter and the battery pack in areas containing highly flammable materials or gases.
- If moisture has penetrated the system (e.g. due to a damaged enclosure), do not install or operate the system.
- Do not move the system when it is connected to battery modules. Secure the system to prevent tipping with restraining straps in your vehicle.
- The transportation of the RI-Modular inverter must be made by the manufacturer or instructed personnel.These instructions shall be recorded and repeated.
- A certified ABC fire extinguisher with a minimum capacity of 2kg must be carried along when transporting.
- It is prohibited to smoke in the vehicle as well as close to the vehicle when loading and unloading.
- For the exchange of a battery module, please request a new hazardous goods packaging if needed, pack it and let it be picked up by the suppliers.
- In case of contact with the electrolyte, rinse the affected areas immediately with water and consult a doctor without delay.

CAUTION

Risk of injury through lifting or dropping the system. The inverter and battery are heavy. There is a risk of injury if the inverter or battery is lifted incorrectly or dropped during transport or when attaching to or removing from the wall.

- Lifting and transporting the inverter and battery must be carried out by more than 2 people.

1.4 System sizing

!	When dimensioning a photovoltaic system, it must be ensured that the open circuit voltage of the PV string never exceeds the maximum permissible input voltage, 3.68kW and 5.0kW series inverters the maximum input voltage is 580V DC. Higher voltages may result in permanent damage to the inverter.

The selection of PV string output should be based on the optimum utilization of the invested capital compared to the expected annual energy yield from the system. This optimization depends on local weather conditions and should be considered in each individual case.

The inverter incorporates an input power limiting device, which automatically keeps the power at levels that are safe for the inverter. The limitation depends mainly on internal and ambient temperatures. The limitation is calculated continuously and always allows the maximum possible amount of energy to be produced.

NOTE: Maximum input power per MPPT must not exceed 2400W (3.68kW)/ 3250W (5.0kW). If a single string is attached, a‘Y’ Splitter must be used and the input shared across both MPPT inputs in ‘Parallel’ PV mode.

2. System Overview

2.1 System configuration

RI-ENERGYFLOW-MODULAR inverters can be applied in DC-coupled systems (usually new installation), AC-coupled systems (usually retrofit) and Hybrid-coupled systems (usually retrofit to increase PV capacity), as the following schemes show:

Solution	Configuration	
	Inverter Module	Battery Module(s)
RI-3.68kW-5.1kWh	MODULAR-3.68kW	ENERGYPACK-5.1kWh
RI-3.68kW-10.2kWh	MODULAR-3.68kW	ENERGYPACK-10.2kWh
RI-3.68kW-15.3kWh	MODULAR-3.68kW	ENERGYPACK-15.3kWh
RI-5.00kW-20.4kWh	MODULAR-3.68kW	ENERGYPACK-20.4kWh
RI-5.00kW-5.1kWh	MODULAR-5.00kW	ENERGYPACK-5.1kWh
RI-5.00kW-10.2kWh	MODULAR-5.00kW	ENERGYPACK-10.2kWh
RI-5.00kW-15.3kWh	MODULAR-5.00kW	ENERGYPACK-15.3kWh
RI-5.00kW-20.4kWh	MODULAR-5.00kW	ENERGYPACK-20.4kWh

Table 1 System Configuration

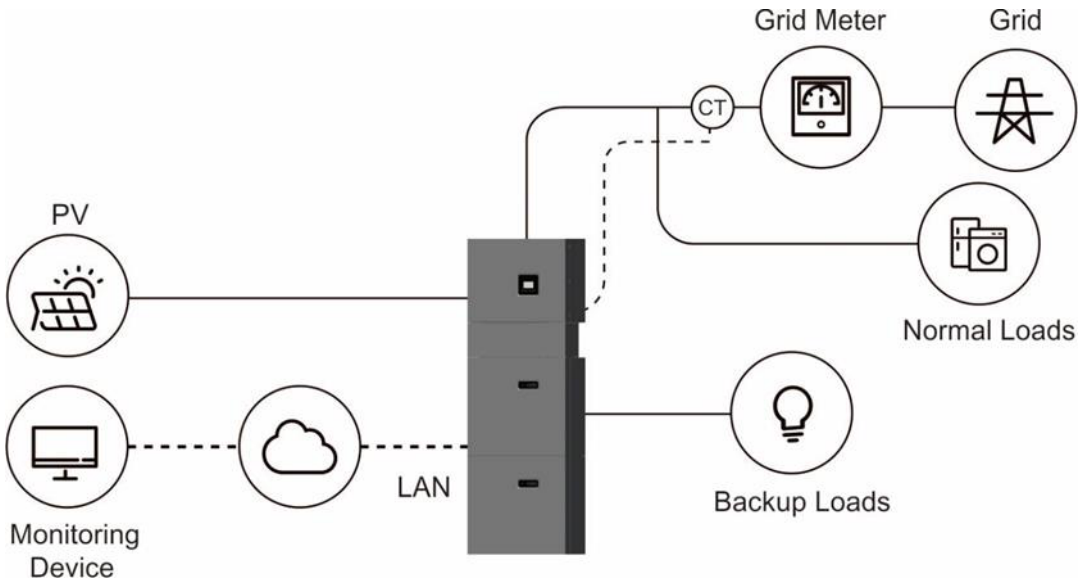


Figure 1 DC-coupled Storage System – Scheme

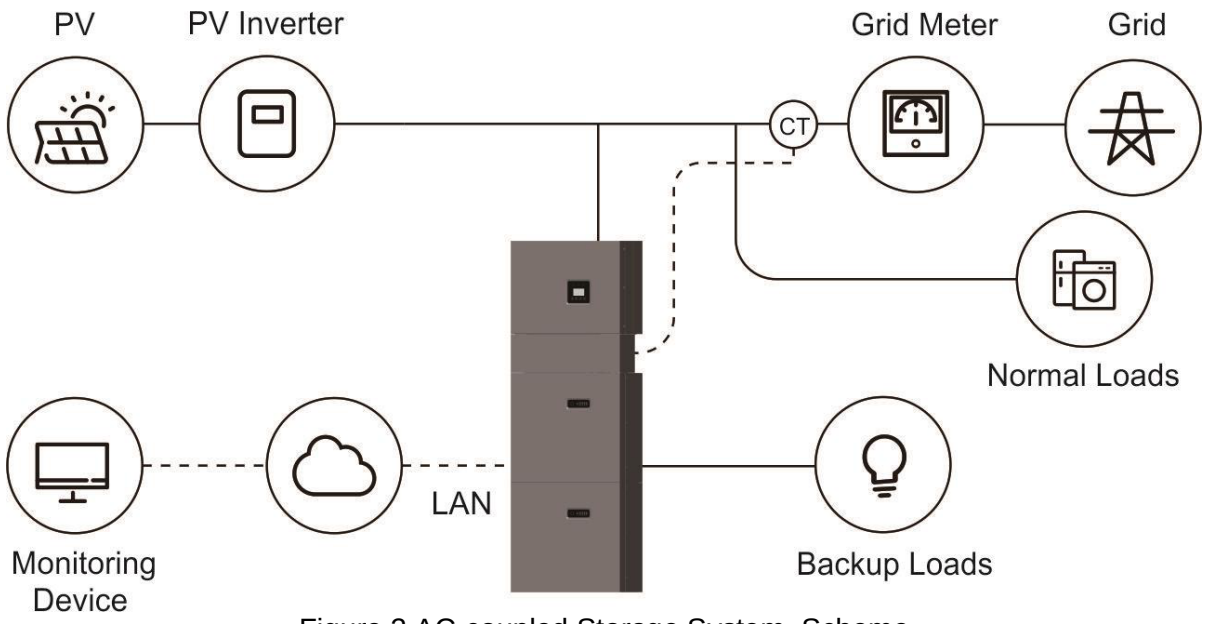


Figure 2 AC-coupled Storage System–Scheme

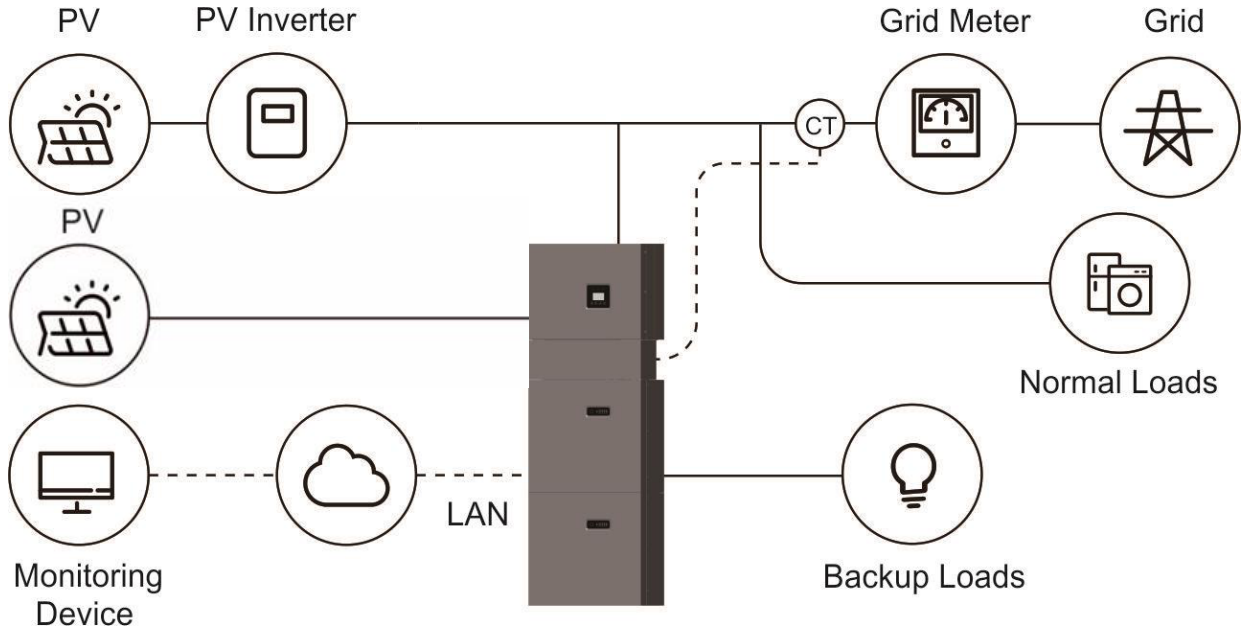
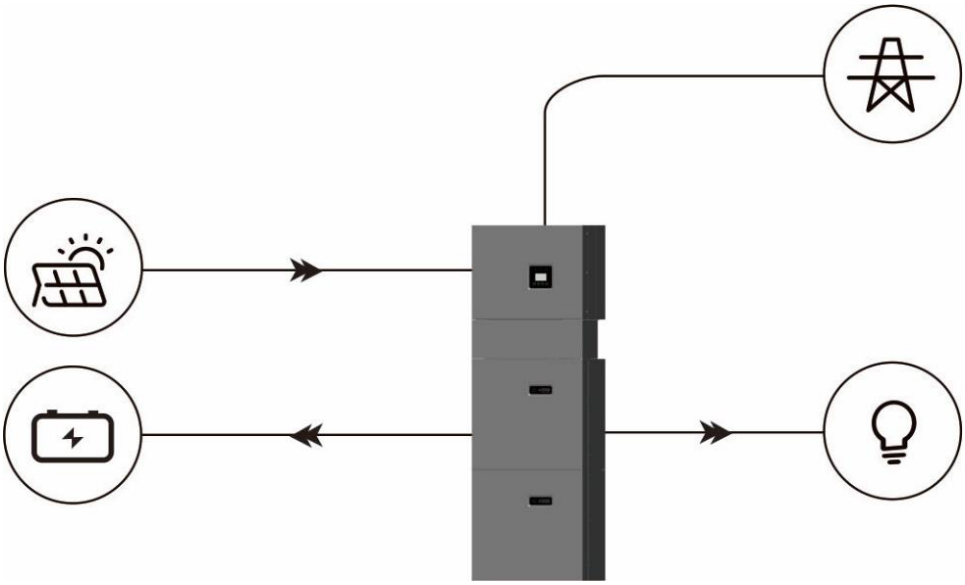


Figure 3 AC and DC (Hybrid)-coupled Storage System–Scheme

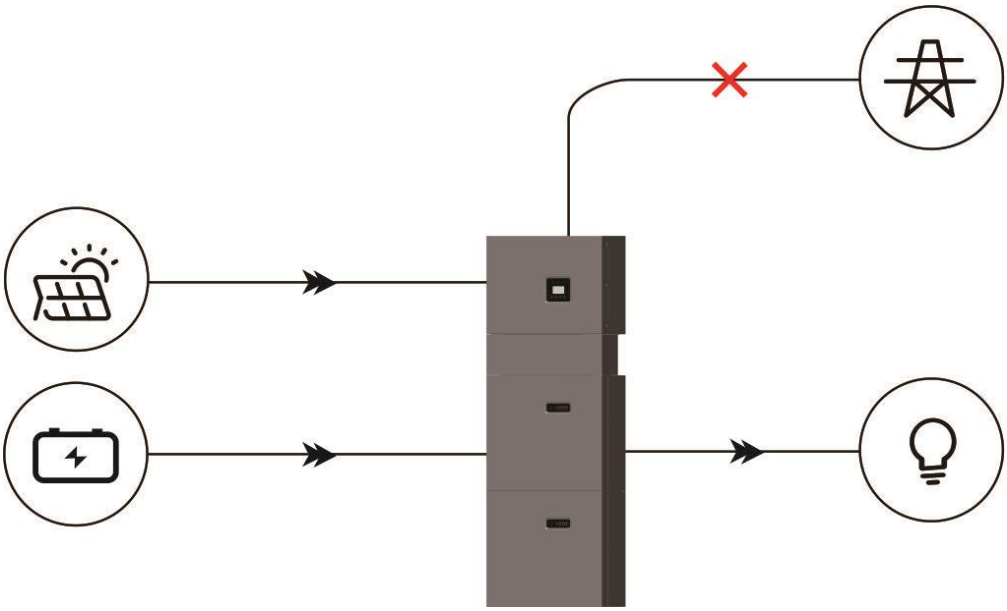
2.2 Operation Modes

There are three basic modes that end users can choose via inverter screen/APP.

• **SELF CONSUME**: The energy generated by the solar panels will be used in the following order: Feed the home loads; Charge the battery and then, feed into the grid. When the sun is not present, the load will be supported by the battery to enhance self-consumption. If the power supply from the batteries is not sufficient, the grid will support the load demand.



• **BAT PRIORITY**: The battery is only used as a backup power supply when the grid fails. As long as the grid works, the batteries won't be used to power the loads. The battery is charged with the power generated by the PV system or from the grid.



• **PEAK SHIFT**: This mode is designed for time-use mode. The customer can set up the desired charging/discharging time & power via inverter screen or APP.

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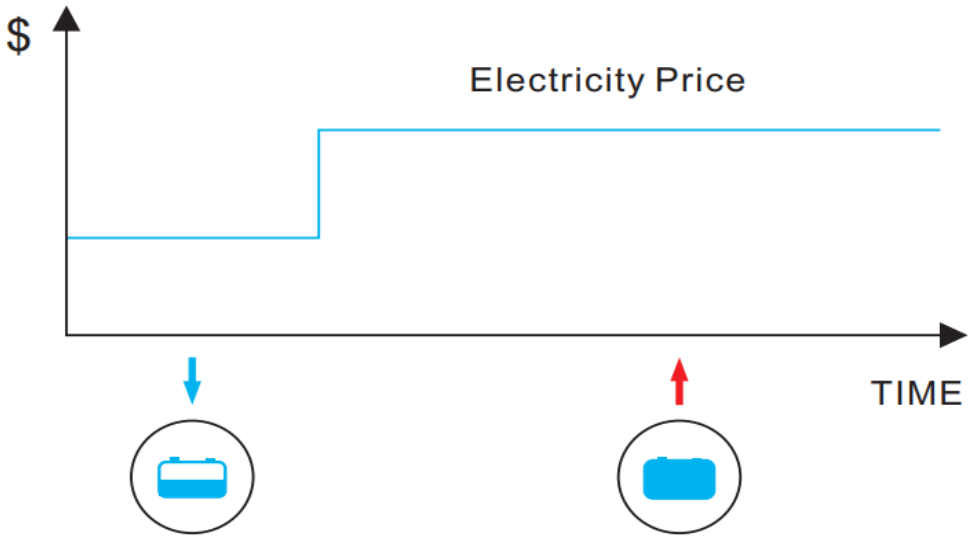
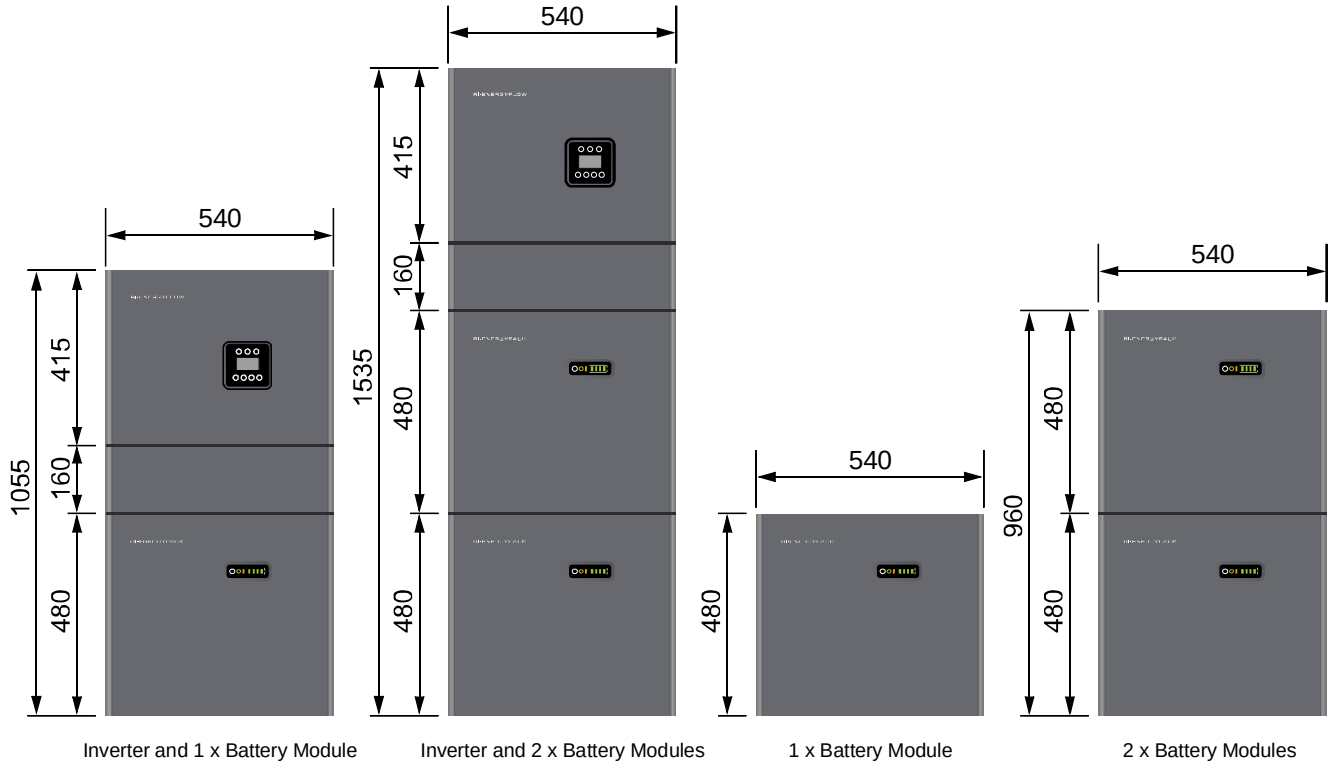


2.3 Dimensions

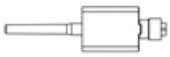
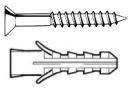
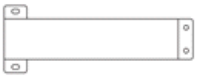


Module Depth: 240mm
Mounted Module Depth: 270mm (Including Mounting Bracket)

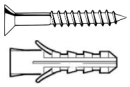
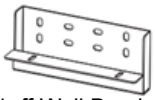
2.4 Getting Started: Included Accessories and Wiring Kits

Included Accessories

Inverter Module Accessories:

 4off M5x12mm Screws	 2 pairs of MC4 plugs	 1off WIFI Module	 1off AC Grid Connector and 2.5mm Allen Key	 1off Back-up Connector
 2off Mounting Screws and Nylon Wall Plugs	 1off CT/ Meter Connector (4Way)	 1off DRM Connector (6Way)	 1off Wall Bracket	 1off Current Transformer

Battery Module Accessories:

 4off Mounting Screws and Nylon Wall Plugs	 3off M5x12mm Screws	 4off M6 Flat Washers	 1off Wall Bracket	 Wiring Kit **

**An additional wiring kit will be required if the installation contains more than one battery module. Refer to table below.

Wiring Kits for Additional Battery Modules:

Total Number Of Battery Modules	Wiring Kit Part Number
2	RI-MOD-KIT10.2
3	RI-MOD-KIT15.3
4	RI-MOD-KIT20.4

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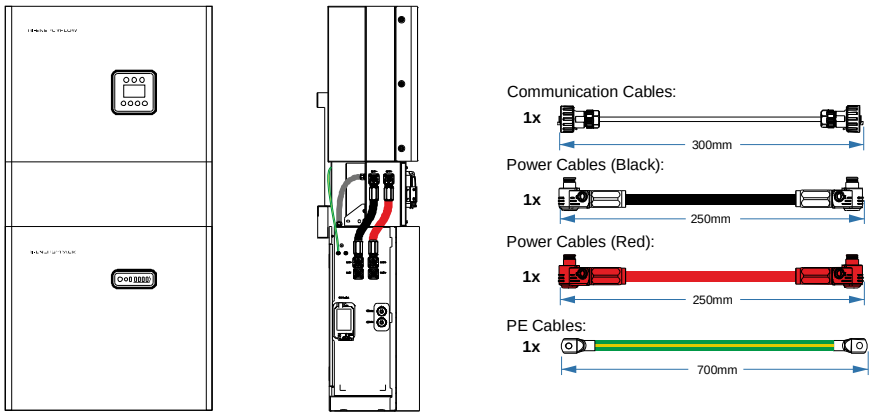
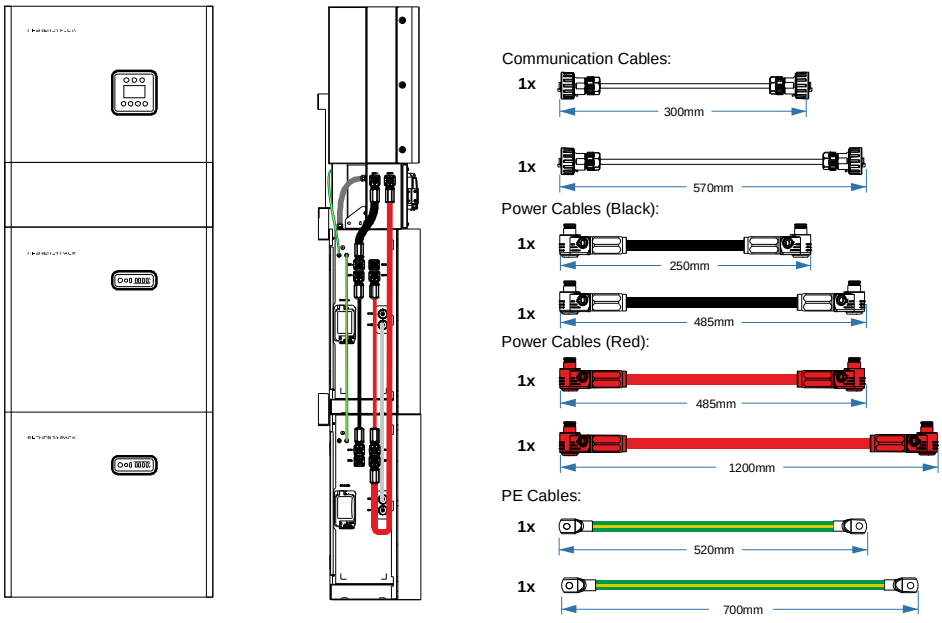
Wiring Kits

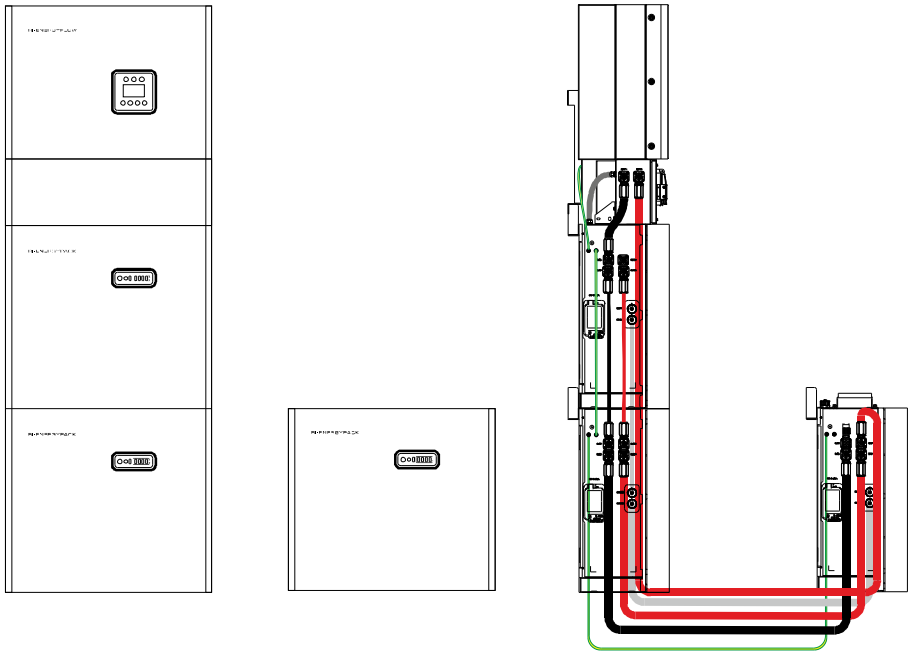
One battery installation using wiring kit RI-MOD-KIT5.1

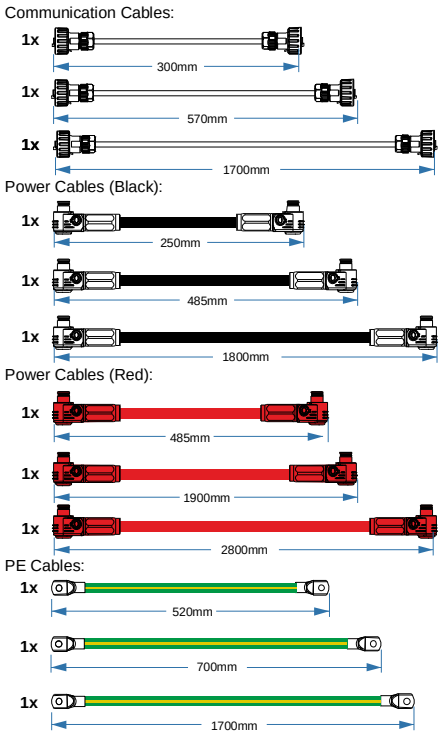


Two battery installation using wiring kit RI-MOD-KIT10.2

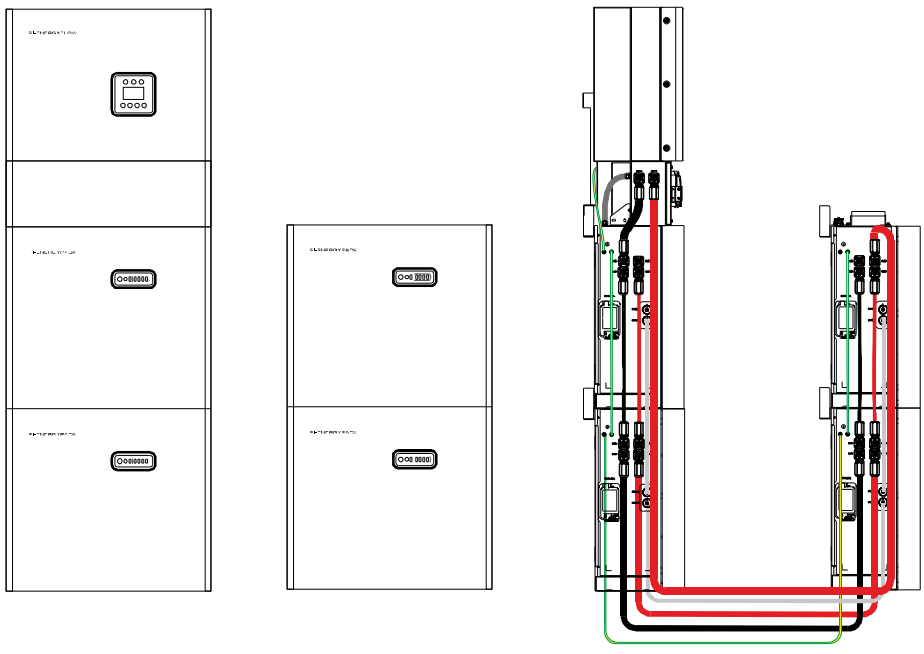


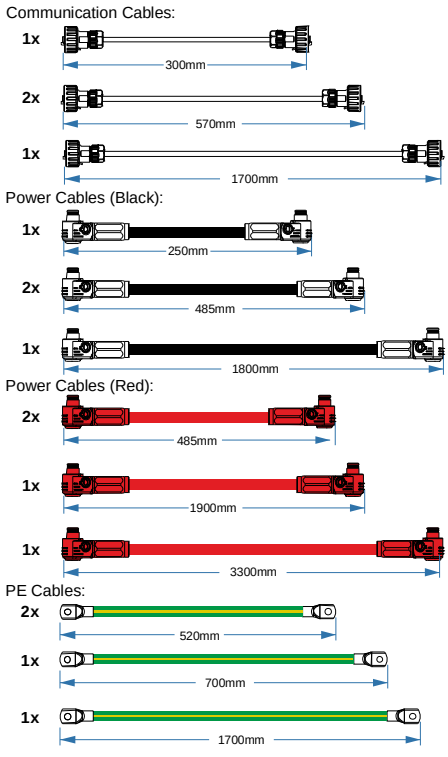
Three battery installation using wiring kit RI-MOD-KIT15.3





Four battery installation using wiring kit RI-MOD-KIT20.4





2.5 System Appearance and Connections

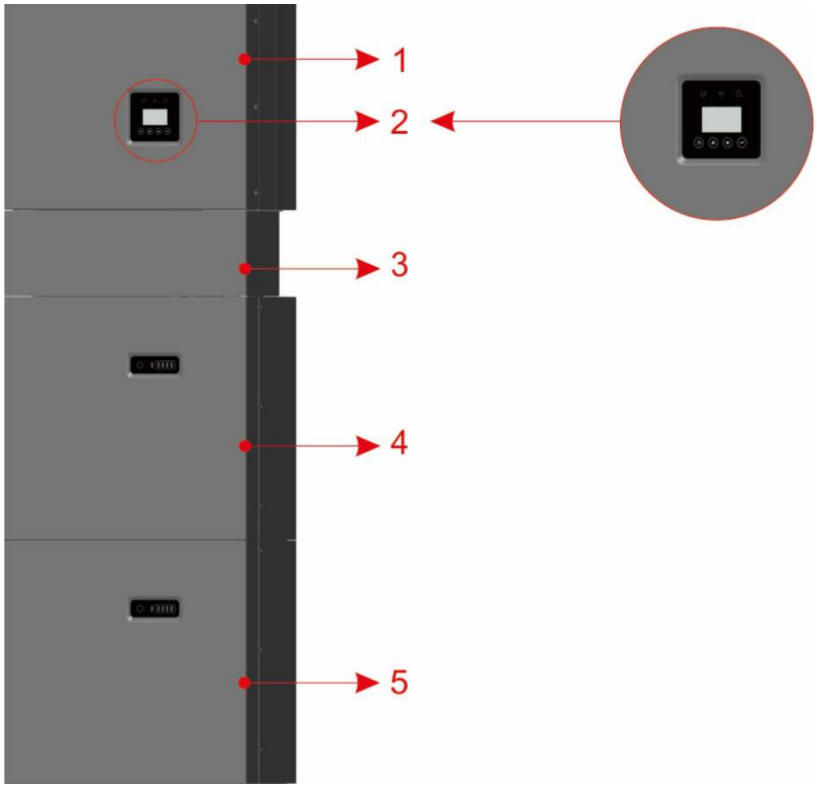


Figure 7 RI-ENERGYFLOW-MODULAR components

Object	Description
1	RI-ENERGYFLOW-MODULAR Inverter (3.68kW or 5kW)
2	Inverter Display Screen
3	Cable Box (connected to inverter)
4	RI-ENERGYPACK-MODULAR Battery 1
5	RI-ENERGYPACK-MODULAR Battery 2 (if configured)

Table 2 RI-ENERGYFLOW-MODULAR components

2.5.1 Cable Box Part

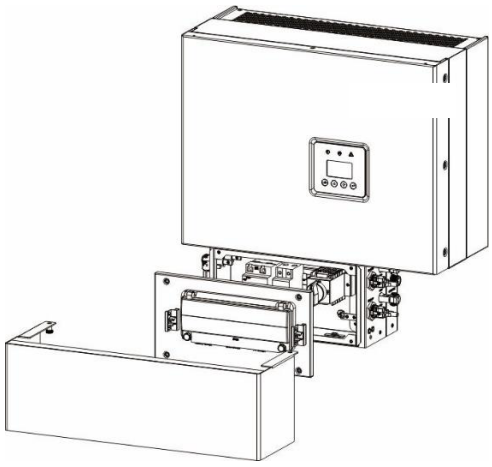


Figure 8 Inverter without Cable Box Covers– Front View

External Connections

Using the connectors described in the **Getting Started** section within this guide, proceed to connect the applicable items described in the below table. Connect the included WIFI module to the **COM** connector. All wiring must be performed in accordance with local wiring regulations.

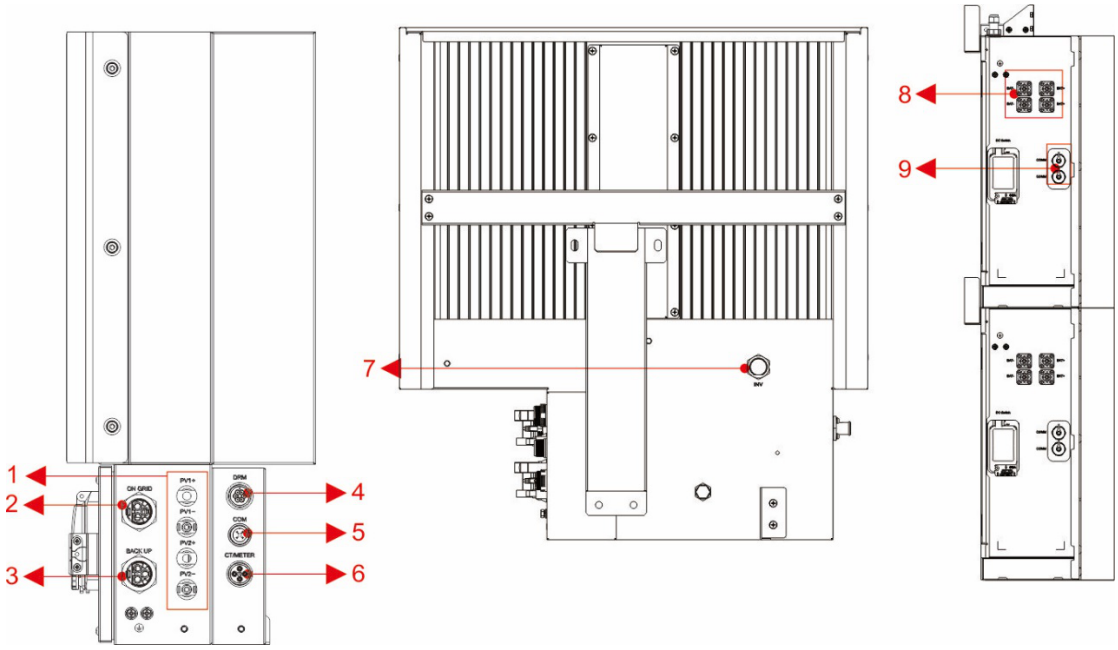


Table 3 RI-ENERGYFLOW-MODULAR Cable Box

Object	Designation	Description
1	PV1, PV2	Connection for PV panels
2	ON GRID	AC Grid tied connection
3	BACKUP	AC Output for up to 16A regardless of grid tied status
4	DRM	DRM Interface (Demand response management)
5	COM	RS485 communications port
6	CT/METER	Connection for external Current transformer or Modbus meter input
7	INV	1st battery module communications port
8	BAT+,BAT-	Positive and negative battery connections
9	2x RJ45	2 x RJ45 ports for daisy chaining additional battery module communications

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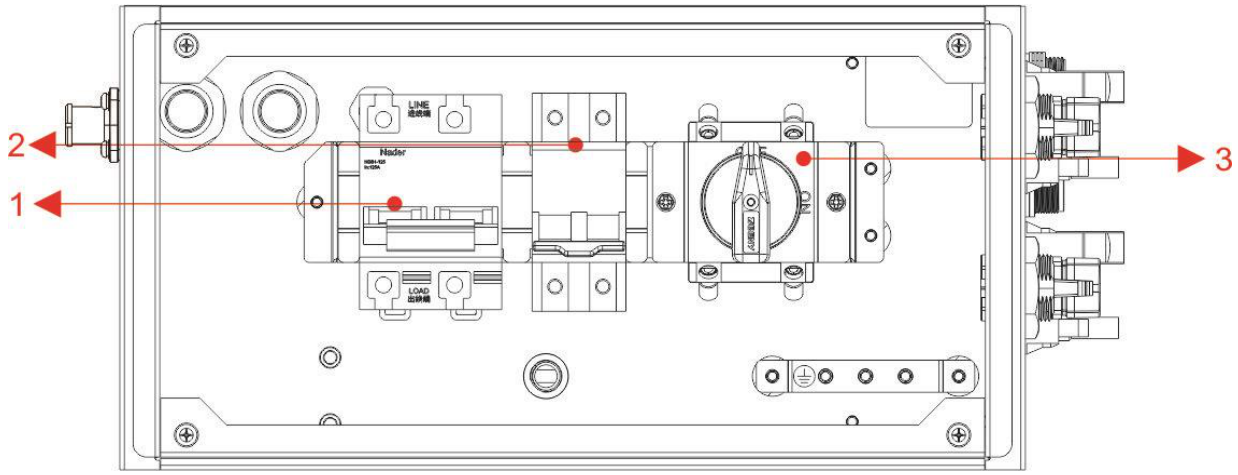


Figure 9 Cable Box Part without Covers – Front View

Object	Description
1	Battery circuit breaker
2	DC isolation switch
3	Output terminal block (BACK UP/ON GRID)

2.6 Liability Limitation

Any product damage or property loss caused by the following conditions, Rayleigh Instruments does not assume any direct or indirect liability.

- Product modified, the design changed or parts replaced without Rayleigh Instruments authorization;
- Changes, repair attempts and erasing of serial number or seals by unqualified personnel;
- System design and installation are not in compliance with standards and regulations; Fail to comply with the local safety regulations;
- Transport damage (including painting scratch caused by rubbing inside packaging during shipping). A claim should be made directly to the shipping or insurance company in this case as soon as the container/packaging is unloaded and such damage is identified;
- Failure to follow any/all of the user manual, the installation guide and the maintenance regulations;
- Improper use or misuse of the device;
- Insufficient ventilation for the device;
- The maintenance procedures relating to the product have not been followed to an acceptable standard; Force majeure (violent or stormy weather, lightning, overvoltage, fire etc.); Damages caused by any external factors.

3.Installation

	Please be cautious unpacking the battery, otherwise, components could be damaged.

3.1 Installation Environment

3.1.1 General

RI-ENERGYFLOW-MODULAR energy storage system is an outdoor version and can be installed in an outdoor or indoor location. When RI-ENERGYFLOW-MODULAR systems are installed in a room, RI-ENERGYFLOW-MODULAR must not be hampered by the structure of the building, the furnishings and equipment of the room. The Inverter is naturally ventilated. The location should therefore be clean, dry and adequately ventilated. The mounting location must allow free access to the unit for installation and maintenance purposes, and the system panels must not be blocked. The following locations are not allowed for installation:

- Habitable rooms;
- Ceiling cavities or wall cavities;
- On roofs that are not specifically considered suitable;
- Access/exit areas or under stairs/access walkways;
- Locations with humidity and condensation over 90%;
- Places where salty and humid air can penetrate;
- Seismic areas - additional security measures are required;
- Sites with altitude above 2000m;
- Places with an explosive atmosphere;
- Locations with direct sunlight or a large change in the ambient temperature;
- Places with flammable materials or gases or an explosive atmosphere.

3.1.2 Restricted Locations

RI-ENERGYFLOW-MODULAR shall not be installed :
(a) In restricted locations as defined for panels in AS / NZS 3000.
(b) within 600mm of any heat source, such as hot water unit, gas heater, air conditioning unit or any other appliance.
(c) Within 600mm of any exit.
(d) Within 600mm of any window or ventilation opening.
(e) Within 900mm of access to 240Vac connections.
(f) Within 600mm of another device.

If the inverter is installed in any corridor, hallway, lobby or similar which leads to an emergency exit, please ensure a sufficient clearance of at least 1 meter for safety. The inverter must not be installed in potentially explosive atmospheres for gas cylinders that are heavier than air gases and have a vent clamp.

3.1.3 The Barrier to Habitable Rooms

To protect against the spread of fire in living spaces where RI-ENERGYFLOW-MODULAR is mounted or on surfaces of a wall or structure in living spaces with RI-ENERGYFLOW-MODULAR on the other side, the wall or structure shall have a suitable non-combustible barrier. If the mounting surface itself is not made of a suitable non-combustible material, a non-combustible barrier can be placed between RI-ENERGYFLOW-MODULAR and the surface of a wall or structure. If RI-ENERGYFLOW-MODULAR is mounted on a wall or at 300mm from the wall or the structure separating it from the habitable space, the distances to other structures or objects must be increased. The following distances must remain free:
(i) 600 mm beside RI-ENERGYFLOW-MODULAR;
(ii) 500 mm above RI-ENERGYFLOW-MODULAR;
(iii) 600 mm before RI-ENERGYFLOW-MODULAR.

If the distance between RI-ENERGYFLOW-MODULAR and the ceiling or any object above the system is less than 500mm, the ceiling or structural surface above the system must be made of noncombustible material within a radius of 600mm around the system. RI-ENERGYFLOW-MODULAR must be mounted to ensure the highest point is not more than 2.2m above the ground or the platform.

3.2 Installation Procedures

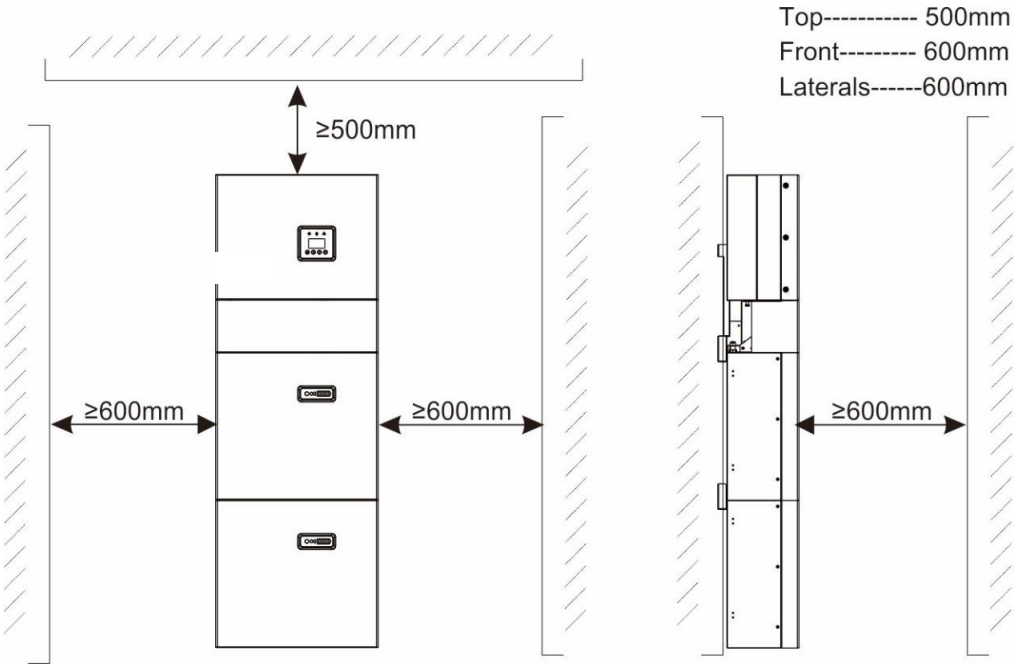
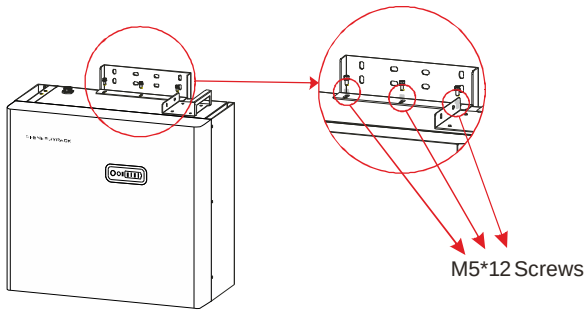


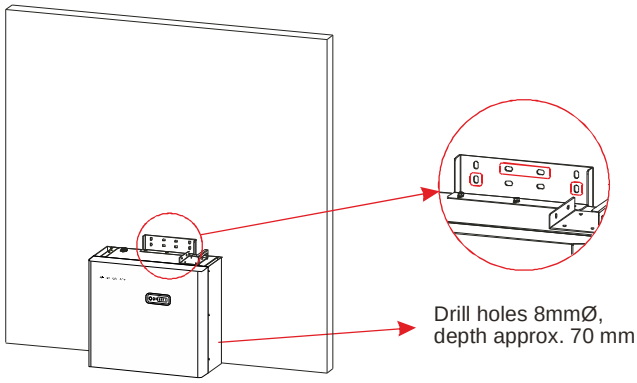
Figure 11 Limited Distance of Installation to Neighboring Objects

Battery Installation - Note: The installation location must be in accordance with the previous chapter

Step 1: Attach the supplied wall mounting bracket to the battery module using the supplied M5x12mm screws.



Step 2: Place the battery module against the wall and mark the 4 holes indicated below that are to be drilled. Using an 8mm Ø masonry drill bit, drill 4 x holes approximately 70mm depth. Gently tap supplied nylon wall plugs in to the holes.



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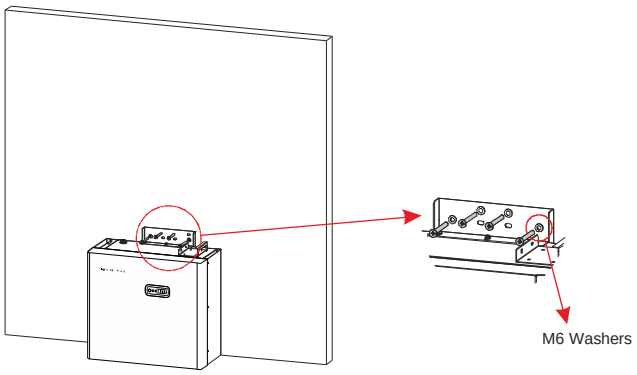
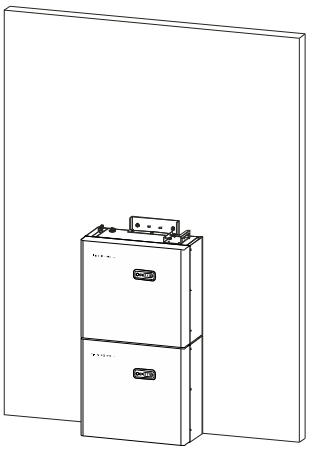
Step 3: Remove any debris. Secure the battery module to the wall using the supplied mounting screws and M6 washers. On the last battery module of the stack, leave the two central screws unfitted and proceed to the next section for **Inverter Installation**

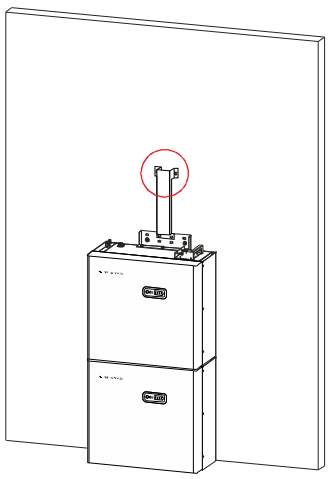


Step 4: Repeat steps 1-3 for any additional batteries. Please note, for installs with more than 2 battery modules it will be necessary to start a second battery stack to the right-hand side of the first.

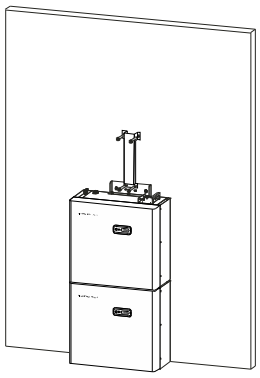


Inverter Installation

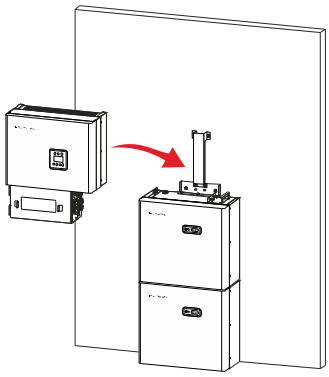
Step 1: Place the wall mounting bracket included with the inverter against the wall and mark the two top holes. Using an 8mmØ masonry drill bit, drill 2 x holes approximately 70mm depth. Gently tap supplied nylon wall plugs in to the holes.



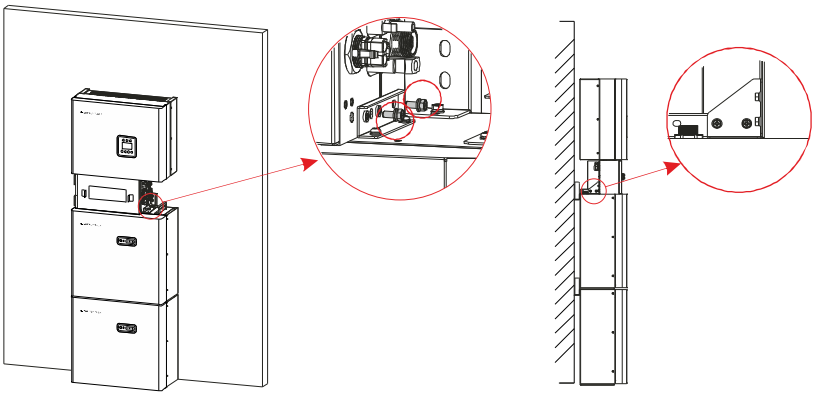
Step 2: Remove any debris. Secure the inverter bracket to the wall using the supplied screws (2 from battery installation + washers for the bottom holes and 2 without washers for the top holes).



Step 3: Fit the inverter on to the bracket. Take care to ensure the rear tang correctly engages with the bracket.



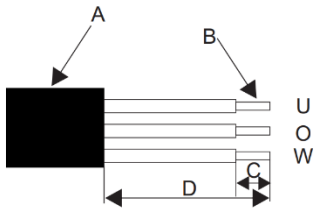
Step 4: Loosely fit the 4xM5x12mm screws through the battery brackets in to the inverter. Before tightening the screws position the inverter so that the removable inverter cover fits flush with the battery front panel(s). Do not fit the cover at this stage.



3.2.1 Wiring and connections

1. Please make AC cables on site. Wiring sizing to be in accordance with local wiring regulations

⚠	There are"L" "N" "⏚" symbols marked inside the connector, the Line wire of grid must be connected to "L" terminal; the Neutral wire of grid must be connected to "N" terminal; the Earth of grid must be connected to "⏚"

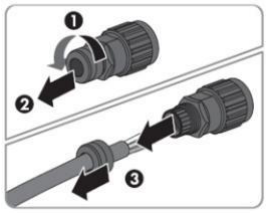


Object	Description	Value
A	External diameter	12mm to 18mm
B	Copper conductor cross-section	4mm² to 10mm²
C	Stripping length of the insulated conductors	approx.13mm
D	Stripping length of the outer sheath of the AC cable	approx.53mm
The PE conductor must be 10mm longer than the L and N conductors		

b. Insert the conductor into the suitable ferrule acc. to DIN 46228-4 and crimp the contact.

b

c. Unscrew the swivel nut from the threaded sleeve and thread the swivel nut and threaded sleeve over the AC cable.

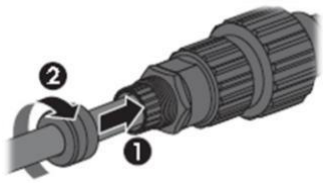


c

d. Insert the crimped conductors L, N and PE into the corresponding terminals and tighten the screw with a hex key wrench screwdriver (size:2.5, 1.2-2.0N.m). Ensure that all conductors are securely in place in the screw terminals on the bush insert.

d

e. Screw the swivel nut onto the threaded sleeve. This seals the AC connector and provides strain relief for the AC cable. When doing so, hold the bush insert firmly by the locking cap. This ensures that the swivel nut can be screwed firmly onto the threaded sleeve.



e

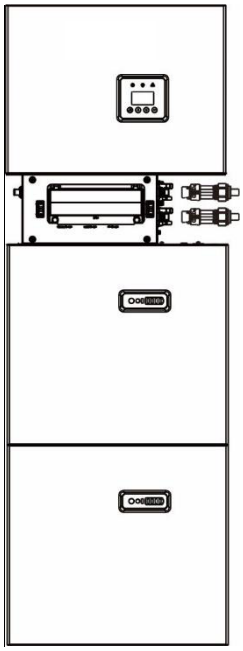
f. Assembly the plug shell adapter as below picture, push the adapter and shell by hand until a “Click” is heard or felt.

f

NOTE: Maximum input power per MPPT must not exceed 2400W (3.68kW)/ 3250W (5.0kW). If a single string is attached, a‘Y’ Splitter must be used and the input shared across both MPPT inputs in ‘Parallel’ PV mode.

g. Plug the AC connector into the jack for the AC connection by hand until a “Click” is heard or felt.

2. Use tool to clamp the AC wiring terminal and wire rod; screw the nut, but do not tighten it. Make sure that the cable is free to pass through the waterproof components. Once the terminal is connected to the right side of the inverter, tighten the nut.



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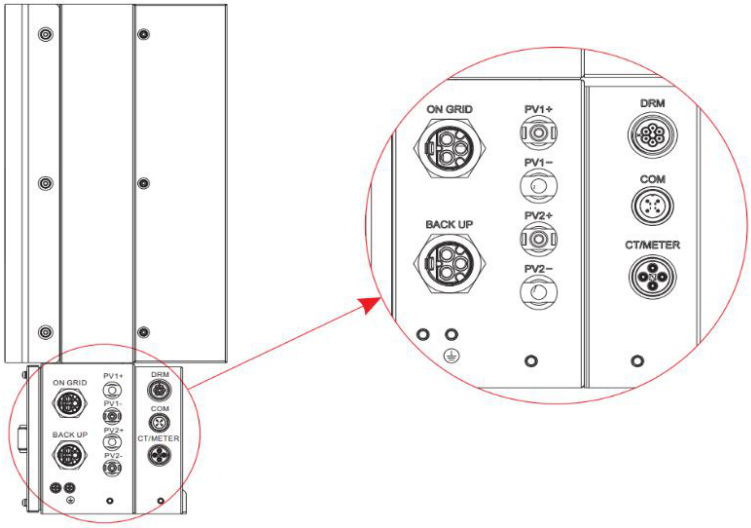
3. Connect the AC wiring terminal to the corresponding hole site of the inverter and lock it with a screwdriver or electric screwdriver (suggestion: stem diameters and torsion of a screwdriver or electric screwdriver should be 4mm and 8~12kg-f.cm respectively) and tighten the nut.

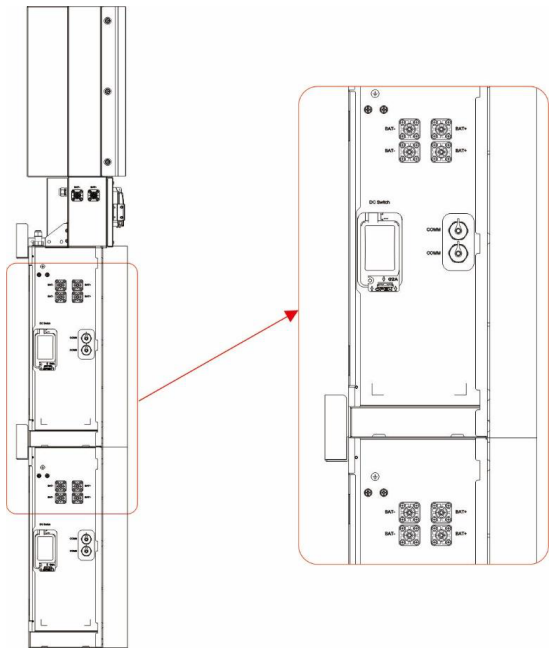
4. Circuit breaker parameters are recommended:

- Back-up 32A/400Vac 6KA
- On-grid 40A/400Vac 6KA

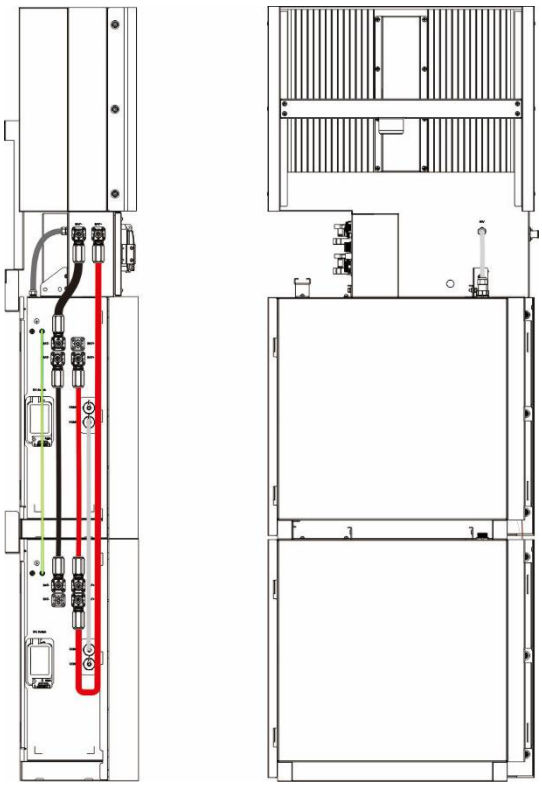
5. Connect the Backup and Grid cables in advance according to the connector mode and connect them to the Backup and Grid board connectors in turn.



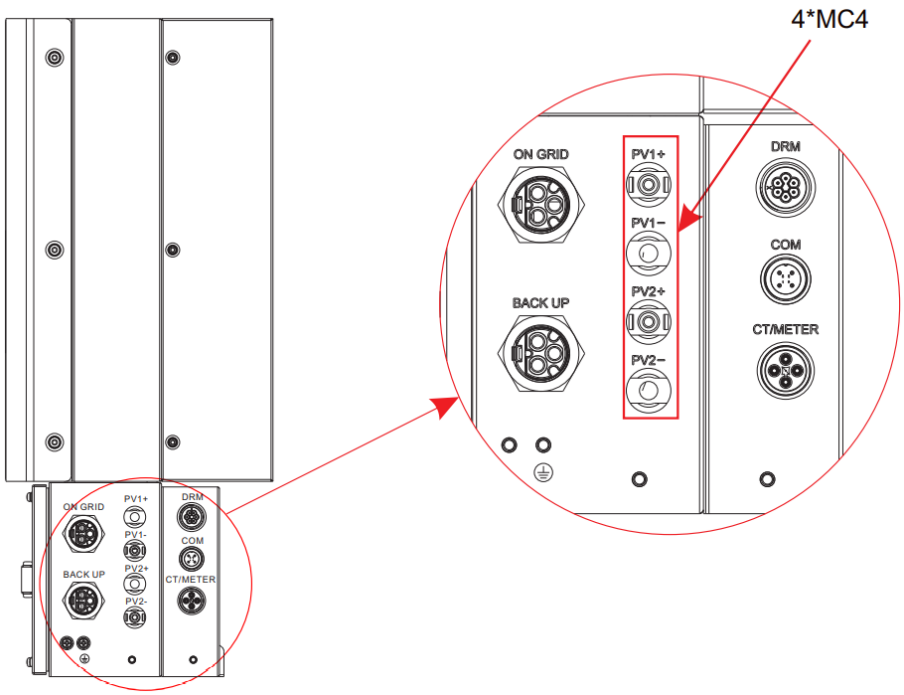
6. Connect the BAT communication cable of the cable box from Step 17 to the topmost battery on the right side. Then use the communication cable supplied with the batteries to connect the batteries via the respective connectors on the left side. After you have connected all the modules, close all covers (if you want to connect further battery modules, you must mount them before closing).



7. Connect the power cables of the bottom battery from S tep 4 to the side terminals of the top battery. Make sure that red connects to red and black connects to black.



8. Close the battery covers and connect the PV -MC4 connectors to the system (connection on both sides). Also, connect all AC cables, the meter communications cable METER, and the Ethernet cable LAN. Then close the cable box cover. The installation is now complete.



9. Close the lid and tighten the screw.

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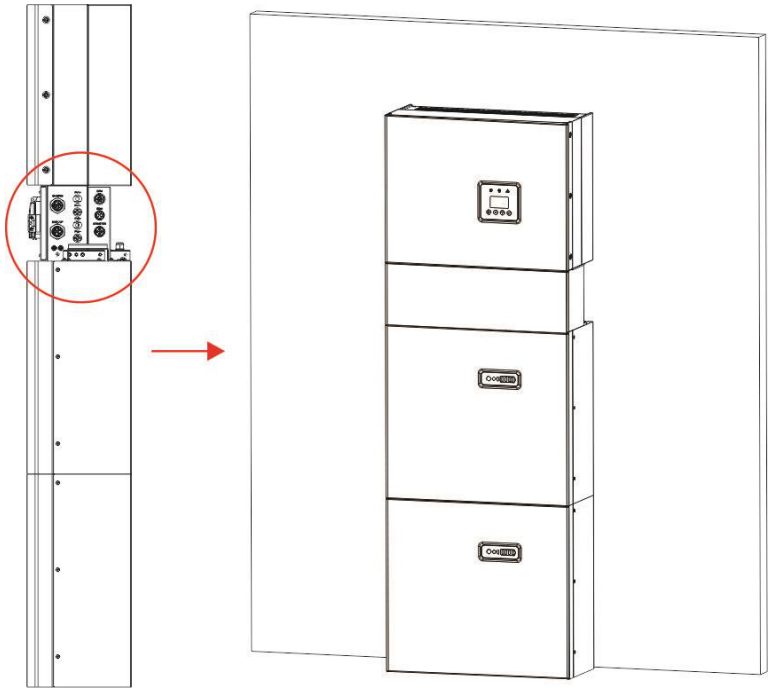
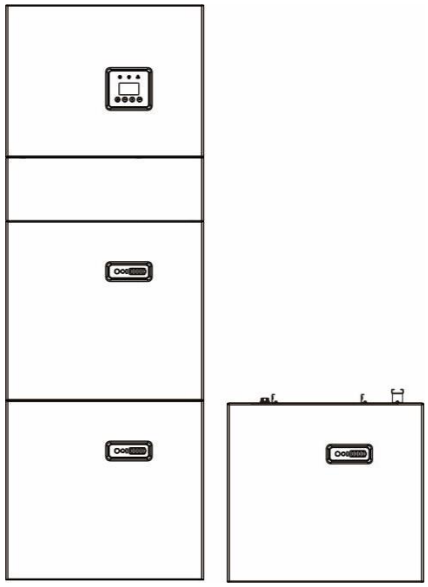


If you connect more than 2 battery modules to the system, only install the additional batteries 5-6 (third module) on the side of the system. You can connect up to 6 batteries (three modules), each 2 batteries are mounted on top of each other.
To do this, carry out the individual installation steps as for the first two batteries (first module), including the DIP setting on the last module.



⚠	1) Recommended AC circuit breaker rating is 32A. 2) It is necessary to disconnect the power line, communication line and communication line between the battery pack and inverter to manually sleep all battery packs. 3) The method of anti-islanding protection is Method(c)

3.3 External CT or Meter with CT Connection

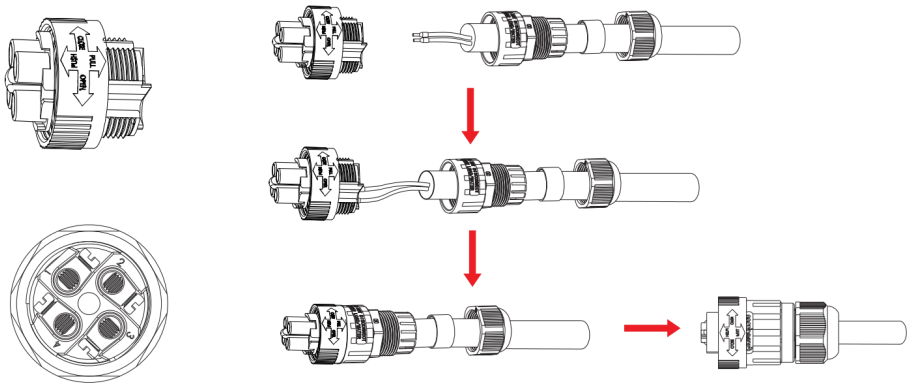
In order for the system to work correctly, a load sensing current transformer MUST be installed. Alternatively, an external Modbus meter may be used. Meter installation and current transformer installation is described below. **Only one option may be used.**

Current Transformer
The current transformer must be connected to the inverter using the supplied 4 way CT/Meter connector.
The White wire (S1+) must be connected to pole 1 of the connector. The Black wire (S2-) must be wired to pole 2.

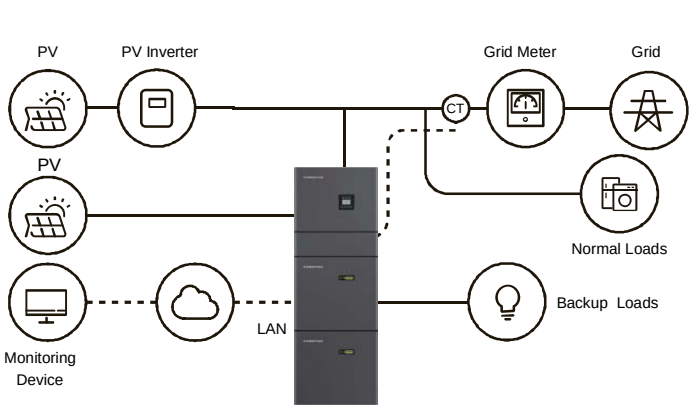
External Meter Option
An RI-D18-CT-16-100 external Modbus meter can be connected to the inverter using the supplied 4 way CT/Meter connector. The RX(+) must be connected to pole 3 of the connector. The TX(-) must be connected to pole 4.

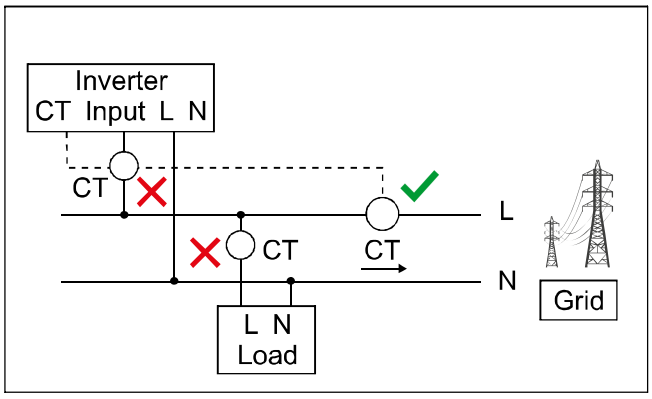
CT/ Meter Wiring Connections:

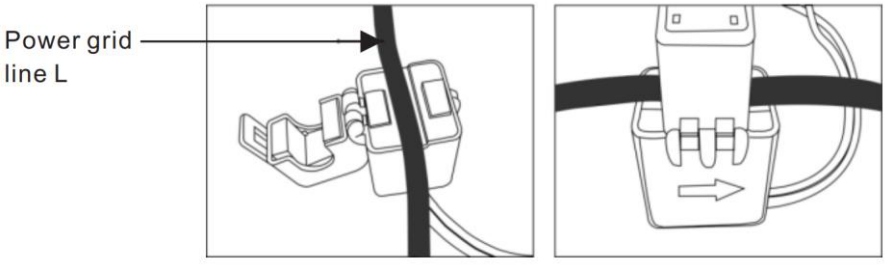
Pin	Description	Pin	Description
1	CT positive electrode	3	Meter Modbus RX (+)
2	CT negative pole	4	Meter Modbus TX (-)



In both cases, (CT or Meter option), the sensing current transformer must be installed as shown below. The arrow on the transformer **must** point towards the incoming utility meter. The inverter must be able to see 100% of the load or it will not work correctly







3.4 DRED Port Connections (Optional)

DRED means demand response enable device. The AS/NZS 4777.2:2015 required inverter need to support demand response mode (DRM). This function is for the inverter that complies with AS/NZS 4777.2:2015 standard. RI-ENERGYFLOW-MODULAR single-phase inverter fully complies with all DRM. A 6P terminal is used for DRM connection.

Pin	Description	Pin	Description
1	DRM 1/5	4	DRM 4/8
2	DRM 2/6	5	RefGen
3	DRM 3/7	6	Com/DRMO

Please follow below figure to assemble DRM connector

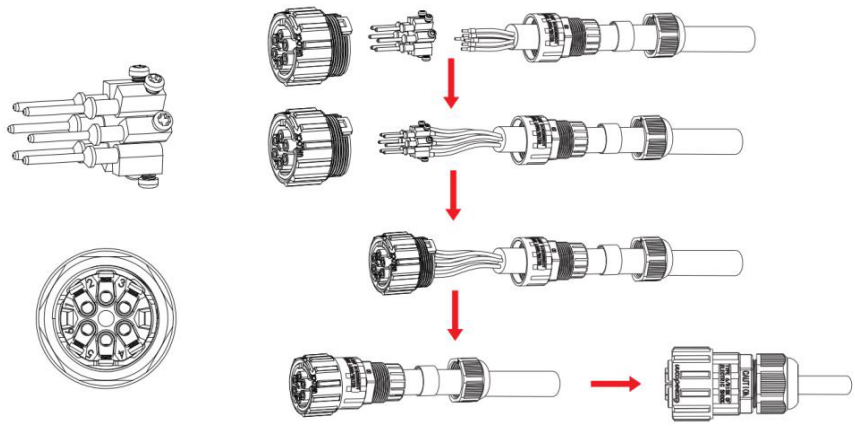


Figure 13 DRM connector

3.5 Single Line Diagram

The single line diagrams of DC-, AC- and Hybrid-coupled systems are as below:

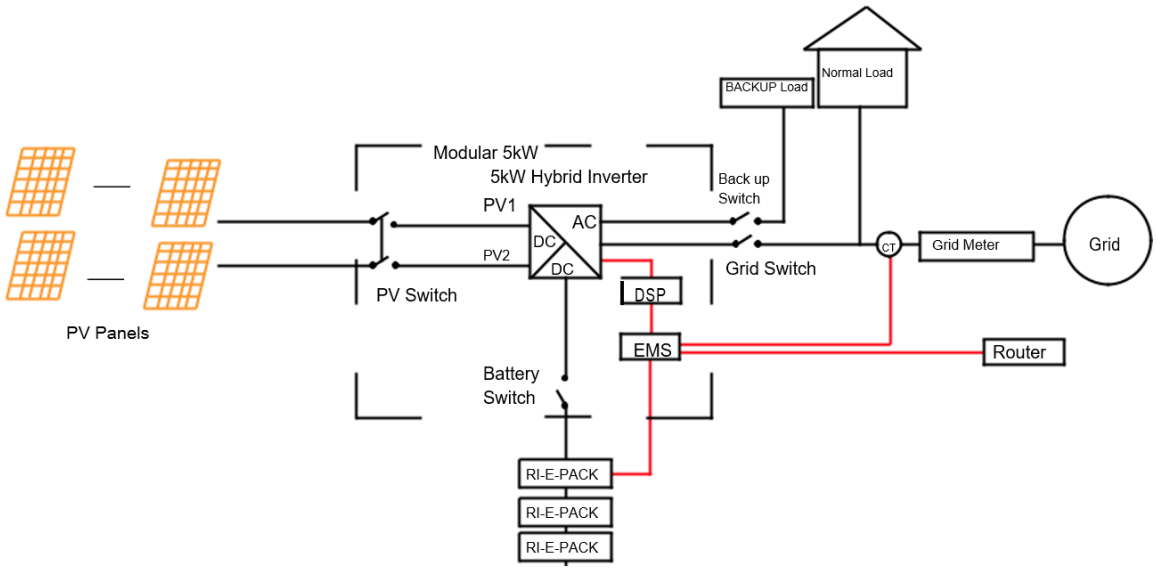


Figure 14 DC-coupled system

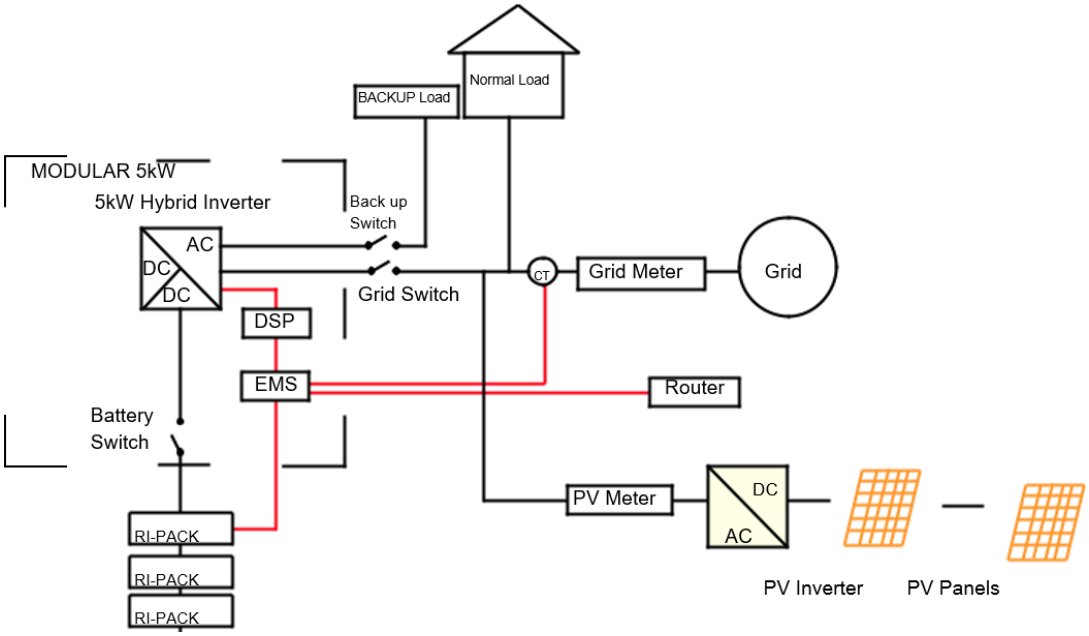


Figure 15 AC-coupled system

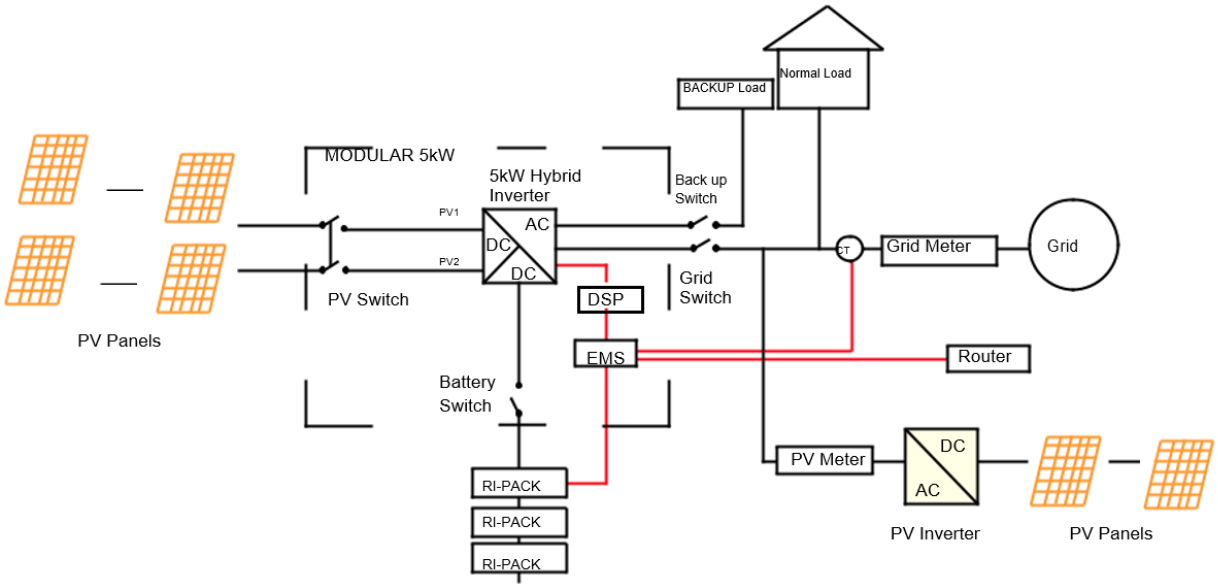


Figure 16 Hybrid-coupled system

4. System Operation

4.1 Switch On

When turning on the system, it is necessary to follow the steps below to prevent damage to the system.

⚠	Please check the installation again before turning on the system

- Turn on the external PV switch.
- Turn on the external grid switch.
- If backup load is applied, turn on the external Backup switch.

⚠	the Backup switch is only used when a backup load is applied.

- Open the outer shell of the cable box. Open the battery switch cover and turn on the battery switch on the cable-box.
- Press power button on all the batteries until the indicator lights turn on.
- Close the battery switch cover and the outer shell of the cable box.

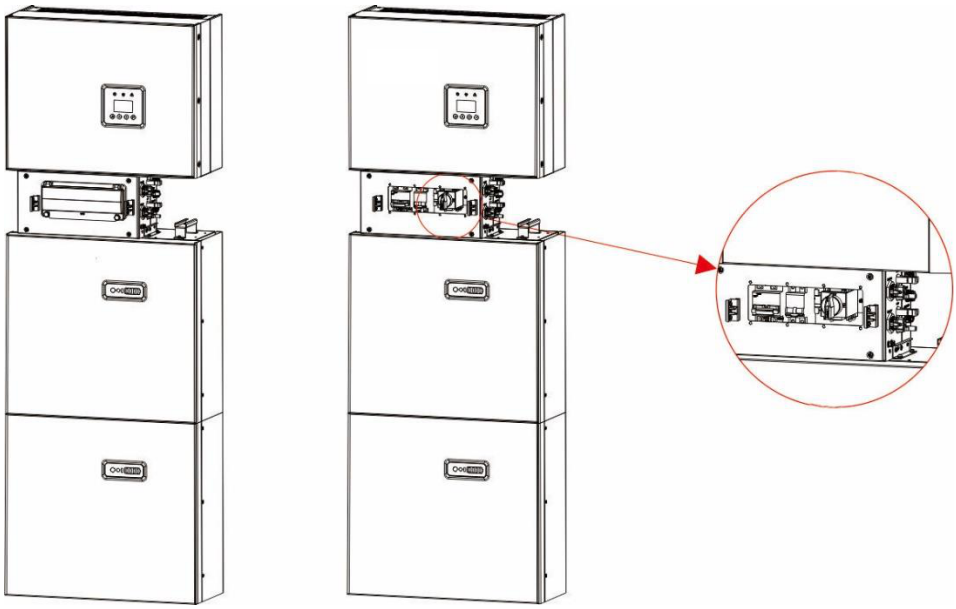


Figure 17 The external PV switch.

4.2 Switch Off

- Press the power button on all the batteries, till the lights turn off.
- Open the cable box outer shell, open the battery switch cover and turn off the battery switch.
- Turn off the external grid switch.
- If backup load is applied, turn off the external backup switch.
- Turn off the external PV switch on the cable box.
- Close the battery switch cover and the outer shell of the cable box.

4.3 Emergency Procedures

When the RI-ENERGYFLOW-MODULAR energy storage system appears to be running abnormally, you can turn off the grid-connected main switch that directly feeding the BESS, and turn off all load switches within the BESS, turn off the battery switch at the same time. To prevent a potentially fatal personal injury, if you want to repair or open the machine after the power is switched off, please measure the voltage at the input terminals with a suitably calibrated voltage tester. Before working on this equipment, please confirm that there is no grid electric supply to the BESS! The upper cover plate cannot be opened until the DC-link capacitance inside the battery modules discharges completely about 15 minutes later.

4.3.1 Emergency Handling Plan

- Disconnect the AC breaker.
- Check the control power supply. If it is OK, return the power supply to find out the reason.
- Please record every detail related to the fault, so Rayleigh Instruments can analyse and solve the fault. Any operation of equipment during a fault is strictly forbidden, please contact Rayleigh Instruments as soon as possible.
- As battery cells contain a little Oxygen inside and all cells have got explosion-proof valves, explosion hardly happens.
- When the indicator light on the battery shows a red fault, check the fault type through the communication protocol, and contact our after-sales service for advice.

4.3.2 Hazards

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If someone is exposed to the leaked substance, immediately perform the actions described below:
Inhalation: Evacuate the contaminated area, and seek medical attention.
Eye contact: Rinse eyes with running water for 5 minutes, and seek medical attention.
Contact with skin: Wash the affected area thoroughly with soap and water, and seek medical attention.
Ingestion: Induce vomiting and seek medical attention.

4.3.3 Fire

If a fire breaks out in the place where the battery pack is installed, perform the following countermeasures:

Fire extinguishing media
During the normal operation, no respirator is required. Burning batteries cannot be extinguished with a regular fire extinguisher, this requires special fire extinguishers such as the Novec 1230, the FM-200 or a dioxin extinguisher. If the fire is not from a battery, normal ABC fire extinguishers can be used for extinguishing.

Firefighting instructions
1. If a fire occurs when charging the batteries, if it is safe to do so, disconnect the battery pack circuit breaker to shut off the power to charge.
2. If the battery pack is not on fire yet, extinguish the fire before the battery pack catches fire.
3. If the battery pack is on fire, do not try to extinguish but evacuate people immediately.

	There may be a possible explosion when batteries are heated above 150°C. When the battery pack is burning, it leaks poisonous gases. Do not approach.

Effective ways to deal with accidents

1. The battery in a dry environment: Place the damaged battery into a segregated place and call the local fire department or service engineer.
2. The battery in a wet environment: Stay out of the water and don't touch anything if any part of the battery, inverter, or wiring is submerged.
3. Do not use a submerged battery again and contact the service engineer.

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5. Inverter and Battery Module Displays

5.1 Function Description

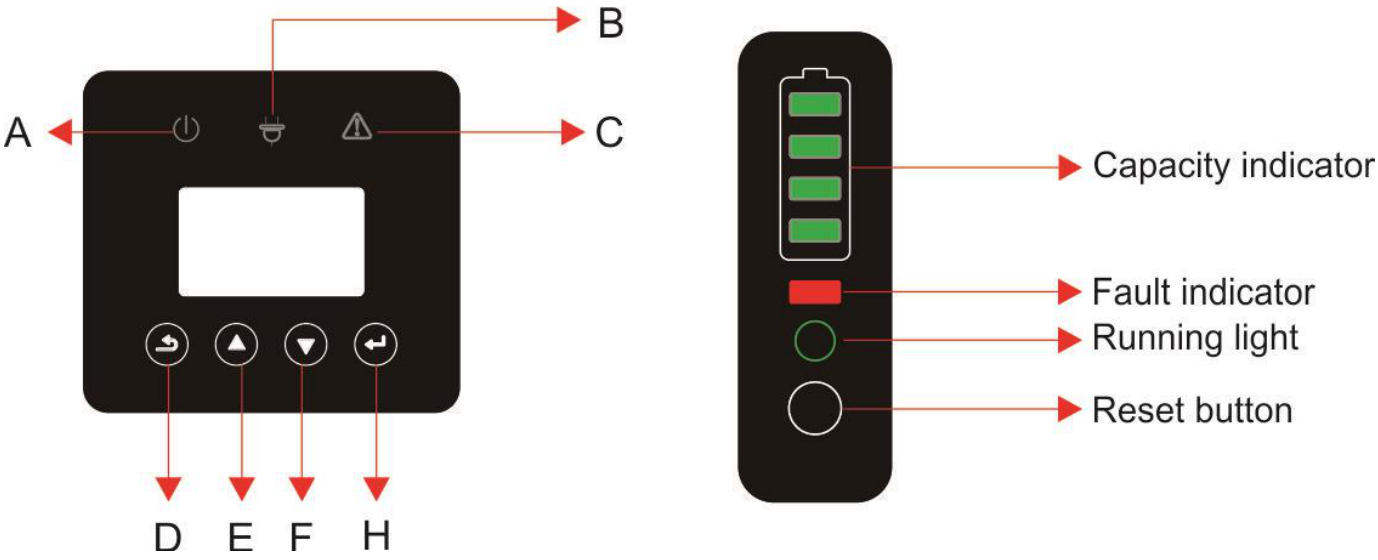


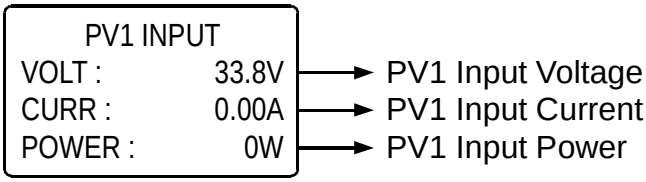
Figure 18 RI-ENERGYFLOW-MODULAR-EMS Interface (Left) / RI-ENERGYPACK-MODULAR interface (Right)

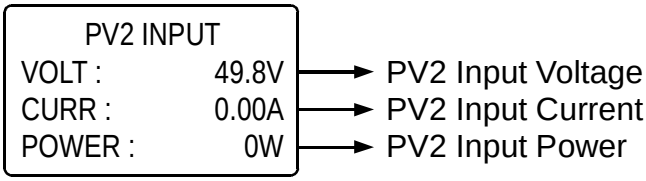
Object	Name	Description
A	Indicator LED	**Green**: Grid connection (Solid). Not connected (Flashing)
B		**Green**: Indication of Off-grid status
C		**Red**: The inverter is in fault.
D	Key Function	**Return** key: Enter programming or return one level.
E		**Up** key: Move cursor up or increase value.
F		**Down** key: Move cursor down or decrease value.
H		**Enter** key: Confirm the selection.

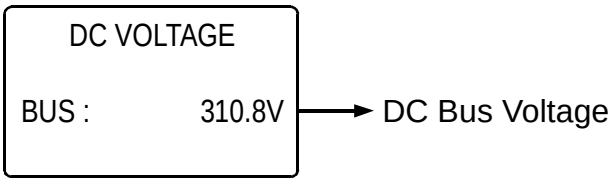
Table 5 Function Description

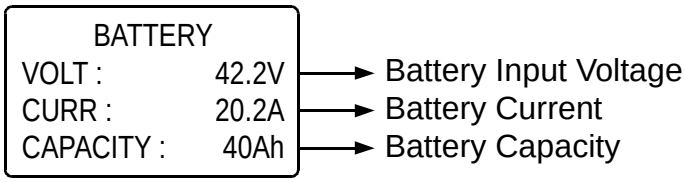
5.2 Online Display Pages

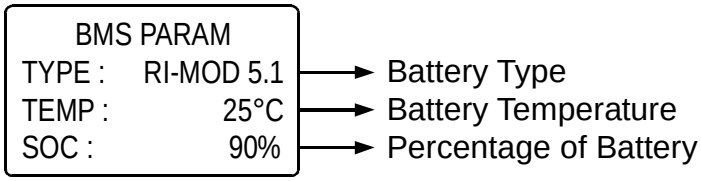
The inverter online pages will are shown below. The displayed page will change every 3 seconds automatically. If the user wishes to manually cycle through the pages, use the UP and DOWN buttons. If the user wishes to stop the pages cycling, press the ENTER key to lock the current screen.











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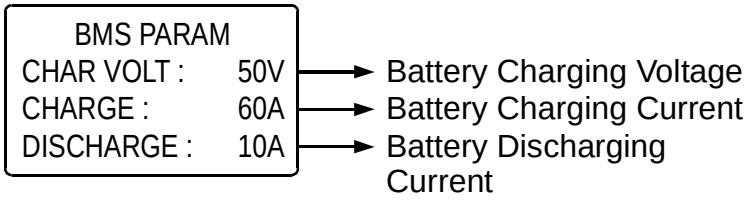
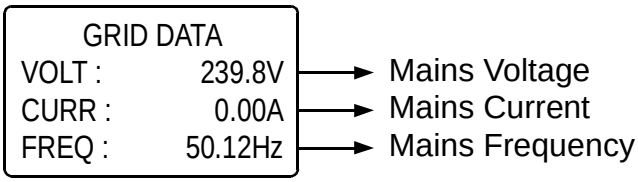
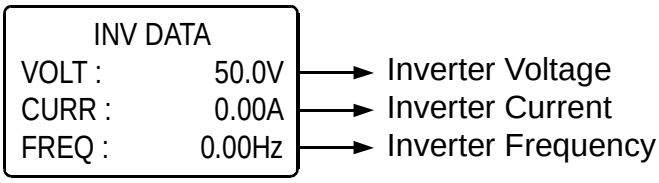
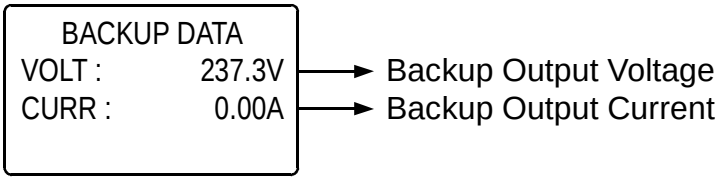
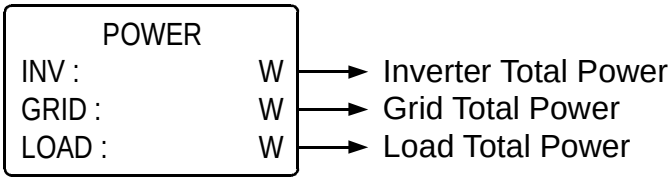
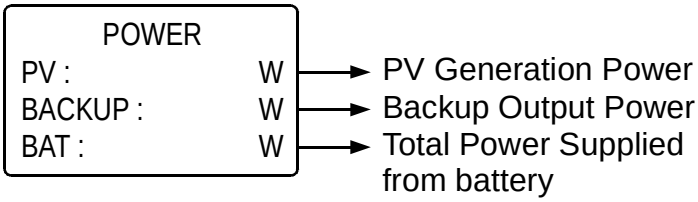


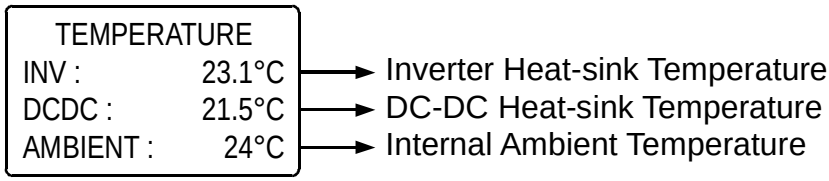


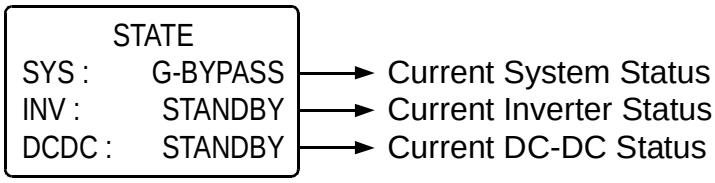


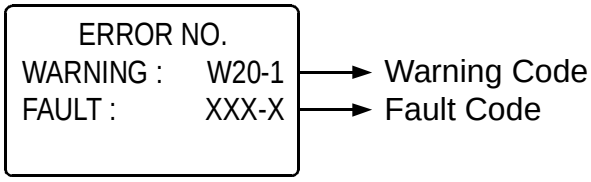


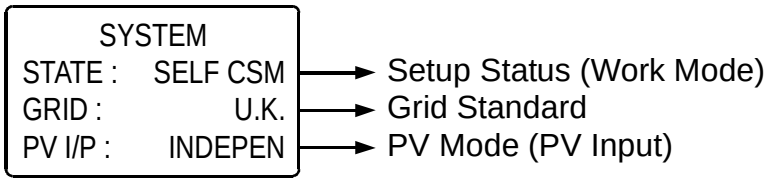





TEMPERATURE
INV : 23.1°C
DCDC : 21.5°C
AMBIENT : 24°C
Inverter Heat-sink Temperature
DC-DC Heat-sink Temperature
Internal Ambient Temperature


STATE
SYS : G-BYPASS
INV : STANDBY
DCDC : STANDBY
Current System Status
Current Inverter Status
Current DC-DC Status


ERROR NO.
WARNING : W20-1
FAULT : XXX-X
Warning Code
Fault Code


SYSTEM
STATE : SELF CSM
GRID : U.K.
PV I/P : INDEPEN
Setup Status (Work Mode)
Grid Standard
PV Mode (PV Input)

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5.3 Programming Menu

Menu Path: ***Setup > Enter Password (Default 00000) > SYS Setting:***

SYS Setting	Work Mode	Self Consume	Charge from Grid: Enable Disable	Enable	The energy generated by the solar panels will be used in the following order: Feed the home loads; Charge the battery and then, feed into the grid. When the sun is not present, the load will be supported by the battery to enhance self-consumption. If the power supply from the batteries is not sufficient, the grid will support the load demand.
		Peak SFT	Time Setting	Disable	This mode is designed for time-use mode. The customer can set up the desired charging/discharging time & power via the inverter screen or APP.
			Charge		Manually forces the system to charge the batteries from the grid
			DISCHG		Manually forces the system to discharge to the connected load
		BAT Priority		Disable	The battery is only used as a backup power supply when the grid fails. As long as the grid works, the batteries won't be used to power the loads. The battery is charged with the power generated by the PV system or from the grid.
	PV input	Independent CV Parallel		Independent	Allows the user to change the PV array configuration (wiring changes would also apply!)
	Zero export	Disable		Disable	Allows the user to set the export to grid limit
		Enable			If Enable is selected, the user will be prompted to enter the power
	DRM Enable	Disable Enable		Disable	Only applicable in Austrailia and New Zealand at this time
	EPS Enable	Disable Enable		Disable	Enables the Backup output (the Load Switch needs to be turned ON).
	Remote CTRL	Disable Enable		Disable	Allows control via RS485 (Scada system for example)
	Start Delay	20...300		180s (when set to UK)	This is the boot delay from when power is applied to the inverter
	CEI SPI Ctrl	Disable Enable		Disable	This function is only applicable to use via DRM for remote control (Australian and New zealand markets only)
	GFCICHK ENB	Disable Enable		Enable	Ground fault monitoring on the AC grid connection
	DISC MODE	Rated power Load priority		Rated power	Allows the user to select the mode of discharge. Rated power means that the applied discharge power percentage. Load priority mean that the system supplies the full output to drive the load

Menu Path: ***Setup > Enter Password (Default 00000) > SYS Setting: (CONTINUED)***

SYS Setting	DOD Enable	Disable Enable	Enable	Depth of discharge. This should always be enabled. Disabling will result in the battery discharging to 0%
	Generator	Disable Enable	Disable	This option allows the user to install a secondary means of generation. For example, wind generator or diesel
	CT or METER	CT	CT	CT option is used for measuring the system current
		Meter: Estron Acrel Rayleigh		Meter option is used for measuring the system current
	AC Couple	Disable Enable	Disable	Allows the user to connect an external inverter to the system (either instead of PV, or in-addition to PC -
	CT Direction	Positive Negative	Positive	Reverses the direction of current flow measurment
	ISLAND	Disable Enable	Enable	When enabled, the inverter will continue to export power via the BACKUP port in the event grid

Menu Path: ***Setup > Enter Password (Default 00000) > BAT Setting***

BAT Setting	BAT Type	Lead Acid RI-MOD 5.1	RI-MOD 5.1	Shows the user what type of battery is connected to the system
	DISC Depth	0...100%	90%	Sets the maximum depth of discharge during grid connected state
	OFFGRID DOD	0...100%	90%	Sets the maximum depth of discharge when off-grid
	CHG CURR	0...100A	60A	Sets the maximum battery charge current
	DISC Power	0...100%	80%	Sets the maximum discharge power - % of rated output
	CHG Power	0...100%	100%	Sets the maximum charge power - % of rated output
	BAT End Volt	0...48V	43.2V	Sets the voltage that is seen as 0% remaining
	BAT Wake-up	Enable	Enable	If enabled the battery will contantly monitor state of charge and depth of discharge. If time option is selected, the battery will wake up and check the state of charge and depth of discharge at the interval set
		Time: Set time		If time is selected the user will be prompted to enter a value 0...300 minutes
	Heating FLIM	Automatic ON OFF	Automatic	Allows the user to enable or disable the heating film installed within the battery modules. Automatic means the system measures the Outside temperature and turns the film on as needed. **Only applicable if heating film is requested at time of ordering**
	BMS DOD	Disable Enable	Disable	Leave disabled. The inverter will monitor depth of discharge.
	Maintain SOC	Disable Enable	Enable	Disable: The minimum SOC will not be maintained. Enable: The minimum SOC 2% is maintained. When the battery SOC is less than 2%, the grid charges the battery pack to 5% through the inverter.
	Force Wake	Disable Enable	Disable	Enabling this option means the battery will always remain online and will not go to sleep

Menu Path: ***Setup > Enter Password (Default 00000) > Grid STD):***

Grid STD	1. China 2. Germany 3. Australia 4. Italy 5. Spain 6. UK 7. Hungary 8. Belgium 9. New Zealand 10. Greece 11. France 12. Bangkok	13. Thailand 14. South Africa 15. 50549 16. Brazil 17. 0126 18. Ireland 19. Israel 20. Poland 21. Chile 22. Local 23. 60Hz 24. Denmark	6. UK	Allows the user to select the country that the system is installed in

Menu Path: ***Setup > Enter Password (Default 00000) > Run Setting:***

Run Setting	REACT MODE	Power Factor	Enabled - PF1.0 (UK)	The inverter can monitor reactive power in several ways. This setting is set according to the selected grid standard and should not be changed. For UK grid setting the default method is power factor.
		React Power		
		QU Curve		
		QP Curve		
	GRID POWER	0...110%	100%	Limit or increase the power exported from the system to the grid.
	VOLT MAX	INV Max	264V (UK)	**These settings should not be altered. They are set automatically according to the country selected within Grid Setting.** **If the inverter sees that these values have been reached, or exceeded, then the inverter will stop generating.**
		Grid Max	276V (UK)	
	VOLT MIN	INV Min	184V (UK)	
		Grid Min	172V (UK)	
	FREQ MAX	INV Max	52Hz (UK)	
		Grid Max	53.5Hz (UK)	
	FREQ MIN	INV Min	47Hz (UK)	
		Grid Min	46Hz (UK)	
	OVER VOLT	Disable Enable	Enabled (264V UK)	
	UNDER VOLT	Disable Enable	Enabled (200V UK)	
	OVER FREQ	Disable Enable	Enabled (50.2Hz UK)	
	UNDER FREQ	Disable Enable	Enabled (49.25Hz UK)	
	REACT RESP	0...60	10 Seconds	This is the time it takes for the exported reactive power to reach the grid standard level. This setting should not be changed and is set according to the grid standard.
	VRT ENABLE	Disable Enable	Enable	Voltage-ride-through. This setting should not be changed and is set automatically according to the grid
	POW SI RATE	0...300%	100%	This is the rate of change of the output. This setting should not be changed and is set according to grid standard. 100% means that the output will hit full power

Menu Path: *Setup > Enter Password (Default 00000)* > All other settings within Setup *:*

485 Address	1...255	1	Allows the user to select the RS485 address for the COM port
Baud Rate	1. 2400 2. 4800 3. 9600	3. 9600	Allows the user to select the RS485 serial baud rate for the COM port
Language	1. Chinese 2. English 3. Italian	2. English	Allows the user to select Chinese, English or Italian language
Backlight	0...120 seconds	20 seconds	Allows the user to select how long the display back light remains lit
Date/ Time	Set time, date and day		Allows the user to set the time, date and day
Clear REC	Cancel Confirm	Cancel	Clears all stored records
Password	Old password New password Confirm new password	00000	Allows the user to change the programming password
Maintenance	User cannot access	N/A	Not accessible to user
Factory RESET	Cancel Confirm	Cancel	Resets the sytem to factory default settings
Auto Test	Not applcable in UK	N/A	Only applicable in Italy

Menu Path: *Inquire:*

INV Module	Shows the user what model of inverter is in use
Module SN	Shows the user the serial number of the inverter
Firmware	Shows the user the firmware version
Record	Shows the user the active faults or errors
BMS Info	Shows the user the battery modules connected and connection status

Menu Path: *Statistic:*

Time stat	Run: Grid: Unit: hours	Shows the user the hours run of Inverter and Grid connection
Conne Time	Times:	
Peak Power	History: Today: Units: watts	Shows the user the total generated watts and today's generated watts
E-Today	PV: xx kWh Meter: xx kWh Grid: xx kWh Load: xx kWh Charge: xx kWh Discharge: xx kWh	Shows the user what was generated today

6 Battery storage and recharging

6.1 Battery storage requirements

1. Storage environment requirements:

–ambient temperature: -10℃...45℃; recommended storage temperature: 20℃...30℃;

–relative humidity: 0%...90%RH;

–in a dry, ventilated and clean place;

–no contact with corrosive organic solvents, gases and other substances;

–no direct sunlight;

–less than 2 meters from any heat source.

6.2 Storage expiration

In principle, it is not recommended to store the battery for a long time. Be sure to use it in time. The stored batteries should be disposed according to the following requirements.

Table 6.2 Stored lithium battery recharging interval

Required Storage Temperature	Actual Storage Temperature	Recharge Interval
-10°C... +45°C	-10°C≤T≤30°C	12 months
	30°C< T≤45°C	8 months

1. If a battery is deformed, broken or leaking, discard it immediately regardless of its storage time.

2. The allowable maximum stored battery recharging period is 3 years and the allowable maximum stored battery recharging times is 3. For example, if recharging is performed once every 8 months, the allowable maximum recharging times is 3 times; if recharging is performed once every 12 months, the allowable maximum recharging times is 3 times; if the allowable maximum stored battery recharging period or times is exceeded, it is recommended to discard the battery.

3. A lithium battery will have its capacity decreasing after being stored for a long time, and typically will have its capacity irreversibly decreasing by 3%–10% after being stored at the recommended storage temperature for 12 months. If the customer conducts the discharge test and acceptance according to the specification, there is a risk that the battery with a capacity less than 100% after being stored will fail the test.

6.3 Inspection before battery recharging

Before recharging a battery, check its appearance: Deformation/Shell damage/Leakage

6.4 Recharge Operation Steps

Step 1 Connect power cables to the battery charger correctly. The maximum number of battery PACK connected parallel is 5.
Step 2 Turn on the battery PACK DC breaker to ON; Press the battery “ start key” for 3 second to start the battery PACK. Check the LED on the battery PACK is on.
Step 3 Turn on the battery charger.
Step 4 Set charging parameter on the battery charger.
Case #1, One battery PACK is charged. Set the charge limited voltage 56.5V; Set the charge limited current 50A;
Case #2, Two ~ Five battery PACKs are charged. Set the charge limited voltage 56.5V; Set the charge limited current 100A;
Step 5 After the battery is charged, switch off the battery charger and then the battery DC breaker. Disconnect the DC cables and then press the battery “ start key” for 3 second to switch off the battery PACK.

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7. Alarm code and error code

7.1 Alarm Code

Codes	Description
W00	Grid Volt Low
W01	Grid Volt High
W02	Grid Frequency Low
W03	Grid Frequency High
W04	Solar Loss
W05	Bat Loss
W06	Bat Under Volt
W07	Bat Volt Low
W08	Bat Volt High
W09	Over Load
W10	GFCI Over
W11	LN Reverse
W12	Fan Fault
W13	BAT Power Down
W14	BMS Discharge Over Current
W15	BMS charge Over Current
W16	BMS Over Volt
W17	BMS Over Temp
Codes	**Description**
W18	BMS Discharge Low Temp
W19	BMS Volt Imbalance
W20	BMS Communicate Fault
W21	BMS Under Volt
W22	BMS Chg Temp Low
W23	BMS Severe Over Volt
W24	BMS Severe Over Temp
W25	CT Reverse

7.2 Error Code

Codes	Description
F00	Soft Time Out
F01	INV Volt Short
F02	GFCI Sensor Fault
F04	Bus Volt Low
F05	Bus Volt High
F06	Bus Short Circuit
F07	PV ISO Under Fault
F08	PV Input Short Circuit
F09	Bypass Relay Fault
F10	INV Curr Over
F11	INV DC Over
F12	Ambient Over Temp

F13	Sink Over Temp
F14	Grid Relay Fault
F15	DisChg Curr Over
F16	Chg Curr Over
F17	Current Sensor Fault
F18	INV Abnormal
F19	EPS Relay Fault
F20	Alway Over Load
F32	SCI Fault

8. Fault diagnosis and solutions

Types	Codes	Solutions
Soft Time 0ut	F00	(1) Restart the inverter and wait until it functions normally; (2) Contact customer service if error warning continues.
INV Volt Short	F01	(1) Cut off all the power and shut down all the machines; disconnect the load and plug in to restart machines, then check whether the load is short circuited if the fault has been eliminated; (2) Contact customer service if fault remains unremoved.
GFCI Sensor Fault	F02	(1) Cut off all the power, Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
Bus Volt Low	F04 F05	(1) Check the input mode setting is correct. (2) Restart the inverter and wait until it functions normally. (3) Contact customer service if error warning continues.
Types	**Codes**	**Solutions**
Bus Volt Short	F06	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
PV ISO Under Fault	F07	(1) Check for good ground connection.; (2) Check if the earth resistance of PV+ and PV- is greater than 2MΩ; (3) If it is smaller than 2MΩ, check PV string for ground fault or poor ground insulation; if it is greater than 2MΩ, please contact the local inverter customer service once fault is not removed.
PV Input Short Circuit	F08	(1) Check the input mode setting is correct. (2) Disconnect the PV input, restart the inverter and wait until it functions normally. (3) Contact customer service if error warning continues.
Relay Fault	F09 F14 F19	(1) Disconnect the PV input, restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
INV Current Over	F10	(1) Wait five minutes for the inverter to automatically restart;

		(2) Check whether the load is in compliance with the specification;
CFCI Over	W10	(1) Check PV string for direct or indirect grounding phenomenon; (2) Check peripherals of machine for current leakage; (3) Contact the local inverter customer service if fault remains unremoved.
LN Reverse	W11	(1) Check whether the installation follows the instructions; (2) Contact customer service if error warning continues.
Fan Fault	W12	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
BMS Fault	W14~W25	(1) Please contact the distributor.

9. Machine Parameters

9.1 Technical Data – Inverters

Model – RI-ENERGYFLOW-MODULAR	**3.68kW**	**5.0kW**
PV input data		
Max. PV-generator power	4800W (2400W per MPPT)	6500W (3250W per MPPT)
Max. DC Voltage	580V	
Nominal voltage	400V	
MPPT Voltage Range	120…550V	
Start-up Voltage	130V	
Max. DC current (Input A / Input B)	15A / 15A	
Numbers of MPPT	2	
Strings per MPPT	1	
Max. Short-circuit current per MPPT	18A	
Type of DC Connector	MC4	
AC Output data (On-gird)		
Nominal AC power	3680W	5000W
Max. Input current	32A	
Max. AC Power	3680W	5000W
Max. AC Current	16A	22A
Nominal AC Voltage	230V	
Grid frequency/ range	50/60Hz (±5Hz), (adjustable)	
Output Power factor	0.8 leading ~ 0.8 lagging (adjustable)	
Output THDi (@Nominal Output)	<3%	
AC Output data (Back-up)		
Max. Output Apparent Power	4000VA	5000VA
Nominal Output Voltage	230V (Fluctuation range ±0.2%)	
Nominal Output Frequency	50/60Hz (Fluctuation range ±0.2%)	

Model – RI-ENERGYFLOW-MODULAR	**3.68kW**	**5.0kW**
AC Output data (Back-up)		

Max. Output Current	16A	20A
Harmonic distortion [THD] at rated output	<2% (Linear Load)	
Automatic Switch Time	<20ms	
Peak power [VA], Duration	6900VA, 10s	
Battery Input Data		
Battery Type	LFP (LiFePO4)	
Nominal Battery Voltage	51.2V	
Max. Charging Voltage	57.6V	
Max. Charging/Discharging Current	50A / 80A	100A / 100A
Communication interfaces	RS485 / CAN	
Efficiency		
Max. efficiency	97.6%	
Euro efficiency	97%	
Max. Battery to Load Efficiency	94%	
Battery charged by PV Max. Efficiency	98%	
General data		
Dimension [W x H x D]	540 x 640 x 240 mm	
Weight	32kg	
Mounting	Wall fixing	
User Interface	LCD/App	
Communication	RS485 / CAN2.0 / WIFI / 4G	
Operating Temperature Range	0°C…+55°C (Charging) / –20°C…+55°C (Discharging)	
Relative Humidity	0…95% (No condensation)	
Operating Altitude	<2000m	
Standby Self Consumption	2W per module	
Topology	Battery Isolation	
Cooling	Natural Convection	
Protection Grades	IP65	
Noise	<25db	
Warranty	5 years Product Warranty, 10 years Performance Warranty	
Protection	DC Isolation Switch Bipolar DC Switch Protection (125A/Pole) Anti-islanding Protection Output Overcurrent Protection DC Reverse Polarity Protection String Fault Detection AC/DC Surge Protection - DC Type II, AC Type III Insulation Detection AC Short-circuit Protection	
Certification & Standards		
Grid Regulation	IEC60529, IEC60068, IEC61683, IEC62116, IEC61727, EN50549-1, AS4777.2, NRS097, VDE-AR-N-4105, CEI0-21, G98, G99, C10/C11	
Safety Regulation	IEC 62109-1, IEC 62109-2	
EMC	IEC/EN61000-6-1, IEC/EN61000-6-2, EN61000-6-3, IEC/EN61000-6-4, IEC/EN61000-3-11, EN 61000-3-12	

		(2) Check whether the load is in compliance with the specification; (3) Contact customer service if error warning continues.
INV DC Over	F11	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
NTC/Sink Temp Over	F12 F13	(1) Restart the inverter, restart the machine after a few minutes of cooling, and observe whether the machine can return to normal. (2) Check if the ambient temperature is outside the normal operating temperature range of the machine. (3) Contact customer service if error warning continues.
Dischg Curr Over	F15	(1) Wait one minute for the inverter to restart; (2) Check whether the load is in compliance with the specification; (3) Contact customer service if error warning continues.
CHG Current Over	F16	(1) Check if battery wiring port is short circuited; (2) Check if charging current is in compliance with presetting; (3) Contact customer service if error warning continues.
Current Sensor Fault	F17	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
INV Abnormal	F18	(1) Please contact the distributor.
Communication Fault	F32	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
Grid Fault	W00 W01 W02 W03	(1) Check if the local voltage and frequency is in compliance with the machine specification; (2) If voltage and frequency are within the accepted range, then wait 2 minutes for the inverter to function normally; but if no recovery or fault repeats, please contact the local inverter customer service; (3) Contact the local power company if voltage and frequency are beyond range or unstable.
Solar Loss	W04	(1) PV is not connected; (2) Check grid connection; (3) Check PV availability.
Bat Loss	W05	(1) Battery is not connected; (2) Check if battery wiring port is short circuited; (3) Contact customer service if error warning continues.
Bat Volt Low	W06 W07	(1) Check the battery availability; (2) Contact customer service if error warning continues.

Types	Codes	Solutions
Bat Volt High	W08	(1) Check if the battery is in line with the presetting; (2) If so, power off and restart; (3) Contact customer service if error warning continues.
Over Load Warning	W09	(1) Wait one minute for the inverter to restart;

9.2 Technical Data – Batteries

Model – RI-ENERGYPACK-MODULAR	5.1kWh	10.2kWh	15.3kWh
Nominal Energy	5.12kWh	10.24kWh	15.36kWh
Voltage Range	44.8V…56.5V		
Nominal Voltage	51.2V		
Max. Charging Current	50A	100A	100A
Max. Discharging Current	80A	100A	100A
Battery Type	LFP (LiFePO4)		
Communication	CAN and RS485 compatible		
Max. Storage Period	6 months		
Humidity Range	0…95%		
Ambient Temperature	0°C…50°C (Charging) / –10°C…50°C (Discharging)		
Storage Temperature Range	–30°C…60°C		
IP Grade	IP65		
Battery dimensions (mm)	540 × 560 × 240	540 × 1050 × 240	540 × 1050 × 240
Battery weight	Approx. 48Kg	Approx. 95Kg	Approx. 113Kg
Nominal Energy(kWh)	5.1kWh	10.2kWh	15.3kWh
Max Power(kW)	3.84kW Charge / 2.4kW Discharge	3.84kW Charge / 2.4kW Discharge	4.8kW Charge & Discharge
Cycle Life	10,000		
3S Peak Power(kW)	6.9kW		
3S Peak Current(A)	30A		
Charging Current(A)	50A (3.68kW Inverter) / 100A (5.0kW Inverter)		
Discharge Current(A)	50A (3.68kW Inverter) / 100A (5k.0W Inverter)		
Ventilation type	Passive and Active Cooling		
Certification & Standards			
Regulations	IEC/EN 62619;UN38.3		

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9.3 Grid Specifications

Grid Specification	Output Voltage Range (Vac)	Output Frequency Range (Hz)	Boot wait time(S)
China	187-252	48-50.5	30
Germany	184-264	47.5-51.5	60
Australia	180-260	47-52	60
Italy	184-276	49.7-50.3	60
Spain	196-253	48-50.5	180
U.K.	184-264	47-52	180
Hungary	196-253	49-51	300
Belgium	184-264	47.5-51.5	60
W-Australia	180-260	45-52	60
Greece	184-264	49.5-50.5	180
France	184-264	47.5-50.4	60
Bangkok	150-264	49-51	150
Thailand	150-264	48-51	60
Local	150-280	45-55	30
60Hz	184-264	59.5-60.5	60

10. Routine Maintenance

10.1 Maintenance Plan

- Check if wire connections are loose.
- Check if cables are aged/damaged.
- Check if cable insulating ribbon drops.
- Check if the cable terminal is loose, any overheat sign.
- Check if the ground connection is good.

10.1.1 Operating Environment

(Every six months)
Carefully observe whether the battery system equipment is ineffective or damaged;
When the system is running, listen to any part of the system for abnormal noise;
Check whether the voltage, temperature and other parameters of the battery and other equipment parameters are normal during system operation;

10.1.2 Equipment Cleaning

(Every six months to one year, depending on the site environment and dust content, etc.) Ensure that the ground is clean and tidy, keep the maintenance access route unblocked, and ensure that the warning and guiding signs are clear and intact. Monitor the temperature of the battery module and clean the battery module if necessary.
12.1.3 Cable, Terminal and Equipment Inspection

(Every six months to one year)

- Check if the cable connections are loose.
- Check whether the cables are aged/damaged.
- Check whether the cable tie of the cable has fallen off.
- Check if the cable terminal screws are loose and the terminal position has any signs of overheating.
- Check whether the management system of the system equipment, monitoring system and other related equipment are invalid or damaged. Check that the grounding of the equipment is good and the grounding resistance is less than 10 ohms.

10.2 Notes

After the equipment is out of operation, please pay attention to the following notes while maintaining :

- Related safety standards and specifications should be followed in operation and maintenance.
- Disconnect all the electrical connections so that the equipment would not be powered on.
- Wait at least 5 minutes after disconnection, so that the residual voltage of the capacitors drops to a safe voltage. Use a multimeter to make sure that the equipment is completely discharged.
- The equipment should be repaired by professional staff only and it is strictly forbidden for maintenance staff to open equipment modules on their own.
- Appropriate protective measures should be taken while maintaining, such as insulated gloves, shoes, and anti-noise earplugs.

- Life is priceless. Make sure no one would get hurt first.
- In case of a deep discharge, the battery must be charged to a SOC rate of 30% to 50% if the entire system is static (ie the battery has not been charged for two weeks or more).

Please contact us in time if any conditions could not be explained in the manual.

11. Quality Assurance

When product faults occur during the warranty period, Rayleigh Instruments or its partner will provide free service or replace the product with a new one.

Evidence
During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, Rayleigh Instruments has the right to refuse to honour the quality guarantee.

Conditions
• After replacement, unqualified products shall be processed by Rayleigh Instruments.
• The customer shall give Rayleigh Instruments or his partner a reasonable period to repair the faulty device.
Exclusion of Liability
In the following circumstances, Rayleigh Instruments has the right to refuse to honour the quality guarantee:

- The free warranty period for the whole machine/components has expired.
- The device is damaged during transport.
- The device is incorrectly installed, refitted, or used.
- The device operates in a harsh environment, as described in this manual.
- The fault or damage is caused by installation, repairs, modifications, or disassembly performed by a service provider or personnel, not from Rayleigh Instruments or its authorized partner.
- The fault or damage is caused by the use of non-standard or non- Rayleigh Instruments.

Components or Software

- The installation and use range are beyond stipulations of relevant international standards.
- The damage is caused by unexpected natural factors. For faulty products in any of the above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of Rayleigh Instruments.

If you have any further technical questions about our product please contact us:

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