REConvert

User Manual

Battery Inverter
InREC-36

Contents

1 About this Manual

1.1 Scope

This manual applies to the following models:

- InREC-36-HA-100
- InREC-36-HA-200

1.2 Target Group

This manual is designed for skilled personnel, including installers, operators, service technicians, and plant operators, who are expected to possess the following skills:

- Knowledge of how power conversion equipment is operated.
- Training or qualifications to work in electrical devices and installation and to deal with all risks involved.
- Knowledge of all applicable local laws and regulations.
- Have read and understand this manual and all safety information herein.

1.3 Symbol Definition

In this manual and/or on the equipment danger or hazards are indicated with labels and signs, read this manual carefully and pay attention to all markings.

DANGER
Indicates an important safety instruction, which if not followed could result in serious injury of death.

Warning
Indicates an important safety instruction, which if not followed could result in serious injury of death.

Caution
Indicates an important safety instruction, which if not followed could result in serious injury of death.

Notice
Indicates a situation which if not avoided could result in property damage.

2 Safety Precautions

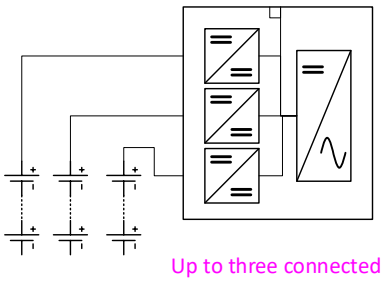
Read this manual thoroughly before operating the Battery Inverter.

Notice

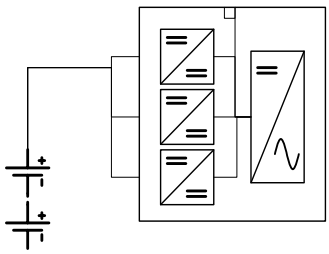
- The device has been manufactured and tested to comply with applicable safety standards. Prior to operating the equipment, adhere to all safety and caution instructions provided. Misuse of the equipment may result in personal injury or property damage.
- Prior to installation, commissioning, or servicing the product, thoroughly read all instructions provided in this manual.
- All procedures must be carried out by qualified and skilled personnel who have received training or possess experience in the technology of the equipment. They should also be knowledgeable about local standards and safety regulations.

2.1 Intended Use

The InREC36 is a bidirectional power converter, with input/output for DC and AC energy sources. The DC input is configurable as individual ports or as a cluster for single high power battery connection.



Up to three connected HV CoTS batteries, individually controlled



DC ports can be aggregated for single high power battery connection

The AC port can be configured to operate in various operating modes:

- Grid-connected for energy trading and peak-shaving applications
- Stand-alone applications as backup system

2.2 General Safety Instructions

Warning

- Ensure that the voltage and frequency of the AC input comply with the requirements of the local grid.
- It is recommended to install additional protective devices on the AC output during installation. The specified protective device should be rated at 1.2 times the maximum output current.
- Ensure that all grounding connections are properly established. If multiple inverters are connected in a cluster, ensure that the ground connections of the enclosures are bonded to the same equipotential level.

- Before installation, carefully read the battery's user manual and strictly adhere to all precautions and requirements outlined within.
- Avoid connecting the DC input with reverse polarity. Failure to do so may result in equipment failure.
- Use a fuse between the battery and the inverter DC input. The protection device shall be 1.2 times the maximum current.
- Do not connect a single battery pack to more than one inverter simultaneously.
- Ensure ambient conditions are within the ranges specified in the manual.
- Do not operate the product until it has been confirmed to comply with country-specific rules and safety regulations.
- When working on the product, disconnect it completely from all energy sources. Ensure it is secured against reconnection. Validate that no hazardous voltage levels exist before proceeding.
- When operating the product, use insulating tools and wear personal protective equipment to ensure personal safety. Additionally, when servicing inside the product, utilize anti-static materials such as gloves, cloths, wrist-straps, and shoes to prevent damage from Electrostatic Discharge (ESD).

⚠ DANGER

Danger: Electric shock hazard when touching live DC cables and/or components could result in fatal injuries or death due to electric shock.

- Do not touch uninsulated live parts or cables.
- Disconnect the product from all energy sources and ensure they cannot be reconnected before working on the product (lock and tag).
- Wear appropriate personal protection equipment.

⚠ DANGER

Danger: Electric shock hazard when touching live system components in the event of a ground fault. In the event of a ground fault, parts of the system may still pose a shock hazard. Touching these parts could result in serious injury or death by electric shock.

- Disconnect the product from energy source and ensure it cannot be reconnected before working on the product (lock and tag).
- Only touch insulated parts.
- Ensure no hazardous voltage is present.
- Wear proper personal protection equipment.

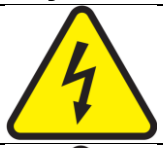
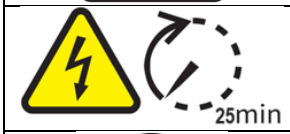
⚠ Caution

Caution: Risk of burns due to hot surfaces.

Some parts of the enclosure can heat up during operation.

- Do not touch any surfaces other than the handles when the product is in operation.
- Allow time for the product to cool down before touching any surfaces.

2.3 Symbols and Warnings on the Inverter

	Caution, risk of electric shock, if not avoided it could result in serious injury or death.
	Caution, important safety instruction, indicates potential hazardous situation, if not avoided, it could result in serious injury or death.
	Caution, hot surface indicates potential hazardous situation. Which if not avoided it could result in serious injury.
	Caution, risk of electric shock. Energy storage timed discharged of 25 minutes.
	Indicated connection point for protective conductor terminal.
	Refer to the operating instructions. Neglecting to do so, could lead to serious injury, death, or equipment damage.
	Discard the product in compliance with local law and regulations WEEE. Do not dispose as household waste.

2.4 Personnel Requirements

Notice
• Only qualified skilled person with training or experience in the equipment technology, is allowed to install, operate, and maintained the product. The skilled persons are expected to know local regulations, use their training and experience to recognize energy sources capable of causing pain or injuries and to take the appropriate action for protection.

3 Scope of Delivery

Enclosed in the packaging are the following items:

[1]

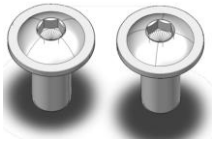
[2]

[3]

[4]

[5]

[6]



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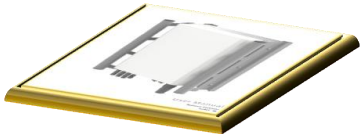
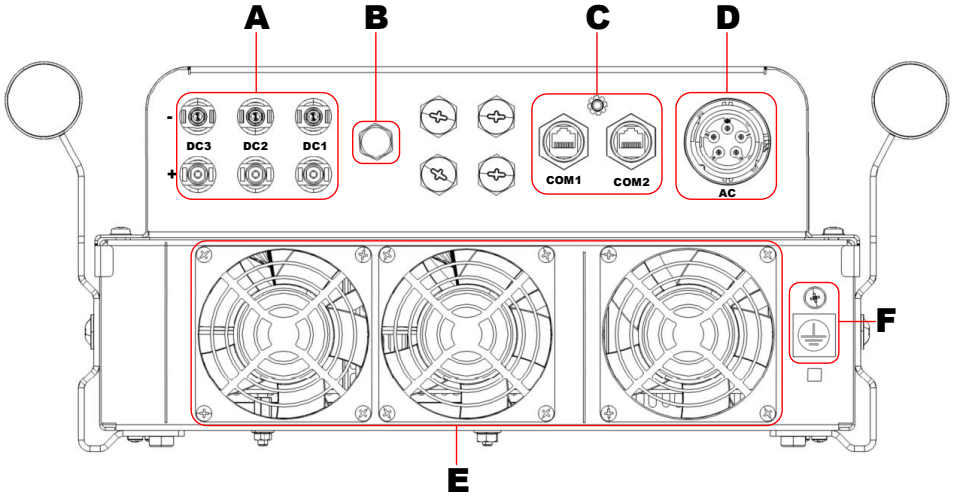
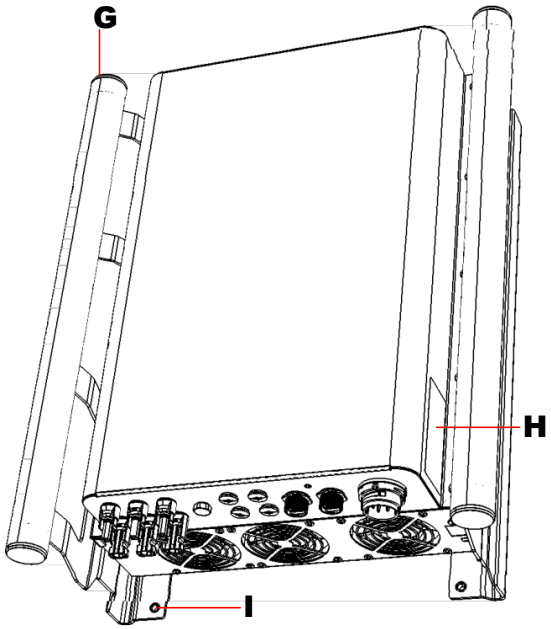
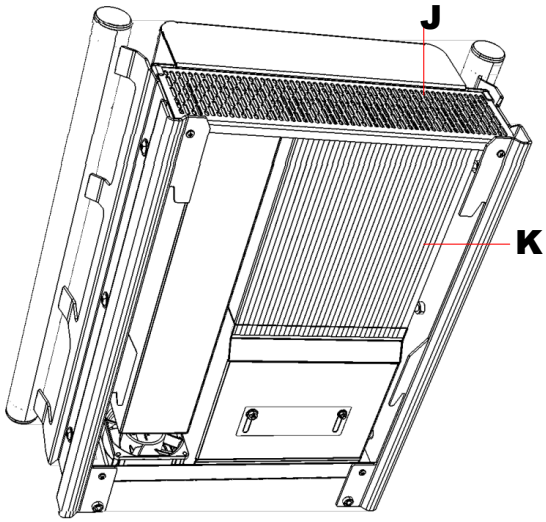


Item	Quantity	Description
[1]	1	Inverter
[2]	1	Mounting bracket
[3]	1	Cable mount AC connector
[4]	6	Three pairs of MC4 cable mount connectors (3 sockets and 3 plugs)
[5]	2	RJ45 modular connectors
[6]	2	Hexagon socket button head with flange M8x18, used to secure the inverter to the mounting bracket
[7]	1	Manual

4 Product Overview



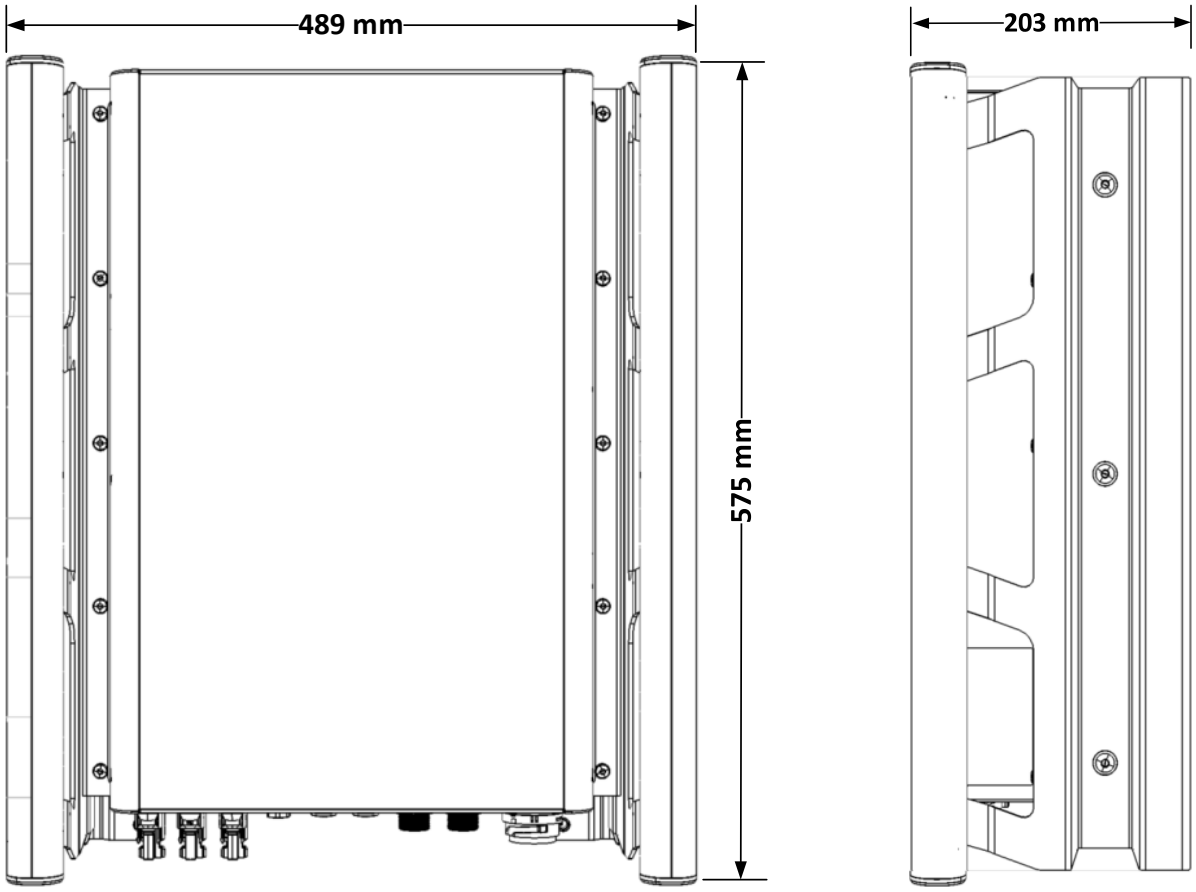




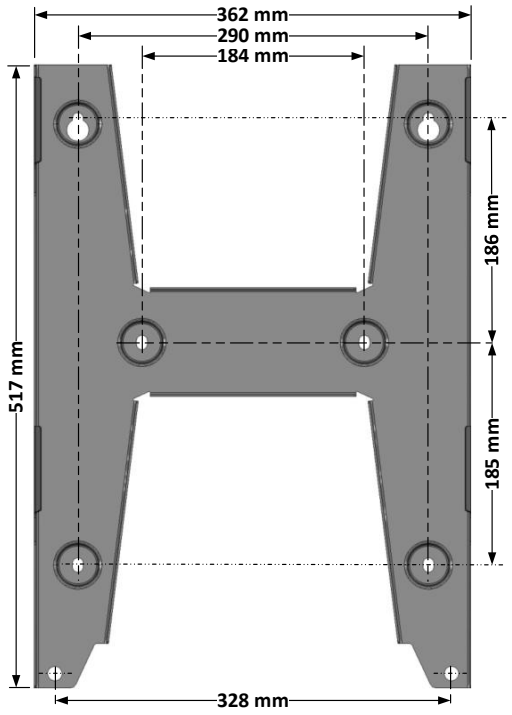
Item	Description
A	DC port
B	Depressurization vent
C	Communication ports
D	AC port
E	Air intake for cooling fans
F	Ground (PE) terminal
G	Handles
H	Type plate
I	Points for securing the inverter to the mounting bracket
J	Air outlet vents
K	Heatsink

4.1 Dimensions

Inverter Dimensions



Mounting Bracket Dimensions



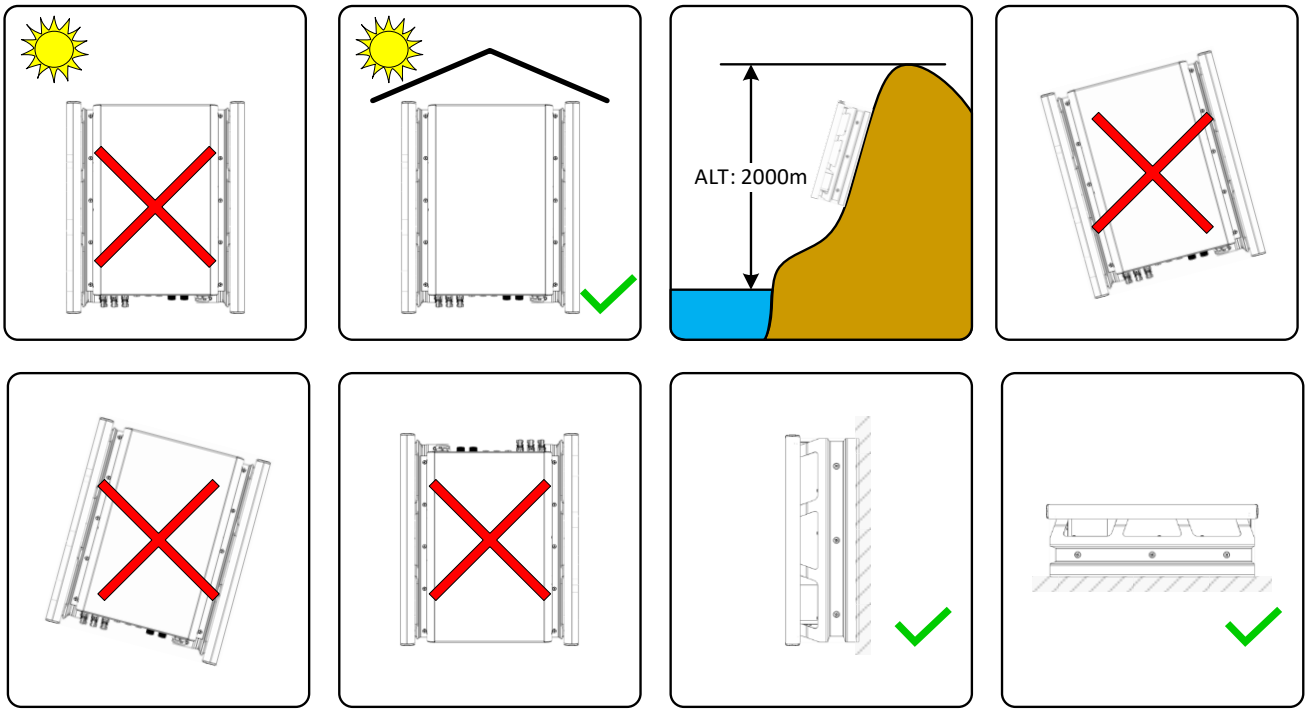
5 Installation

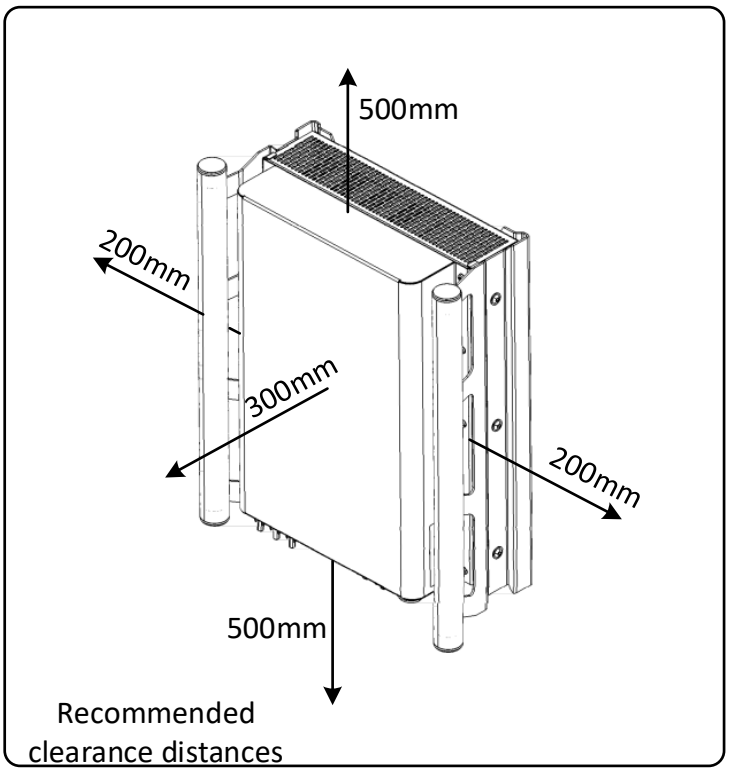
5.1 Environmental Considerations

Warning

Warning: Danger due to fire or explosion. Despite careful construction, electrical devices could cause fire.

- Do not install the inverter in potentially explosive atmospheres.
- Do not install the inverter in areas with highly flammable materials or gases.
- Install the inverter on a solid surface capable of bearing its weight.
- Avoid installing the inverter on surfaces with poor sound insulation to prevent noise generation.
- Ensure the installation site is inaccessible to children.
- Install the inverter in a well-ventilated area.
- Install the inverter with recommended clearance distances to facilitate handling and prevent power reduction due to overheating.
- Avoid installing the inverter in direct sunlight to prevent output power limitation and premature component aging.
- Ensure the maximum installation altitude does not exceed 2000m.
- The inverter is designed to operate within an ambient temperature range of -20°C to 60°C and a relative humidity of 0% to 95%.
- Ensure all ambient conditions are met for proper operation.





Recommended clearance distances

5.2 Mounting the Inverter

⚠ Caution

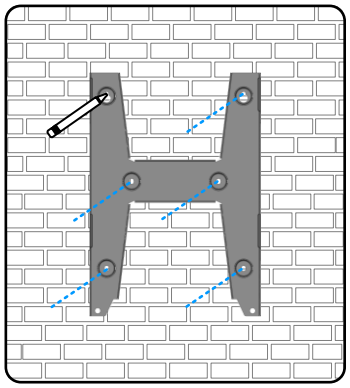
Caution: Risk of injury

The inverter weighs 40kg, posing a risk of injury if dropped or lifted incorrectly during transportation, mounting, or removal from the mounting bracket.

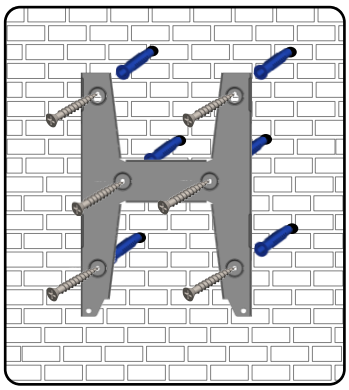
- Only qualified persons should install the inverter.
- Take the weight into account and use caution when transporting and handling the inverter.
- Wear suitable personal protective equipment when transporting, handling, or performing any work on the inverter.
- Always handle the inverter with two persons to ensure safe handling.

Procedure:

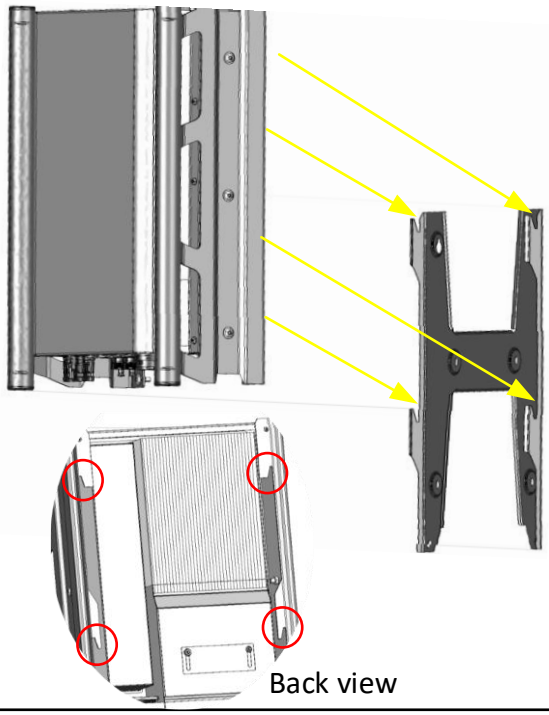
1. Position the wall bracket horizontally on the target surface and mark the hole positions for drilling.
2. Drill the mounting holes for the selected screws and anchorage system or expansion bolts. For mounting the inverter, use a minimum of 6mm screw bolts with a depth of 70mm.



3. If necessary, insert screw anchors into the drilled holes.
4. Secure the wall bracket to the mounting surface using screws.

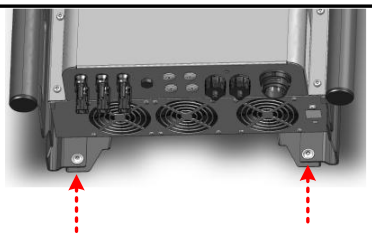


5. Mount the inverter on the wall bracket by aligning the four mounting points on the back of the inverter with the corresponding mounting points on the wall bracket.



Back view

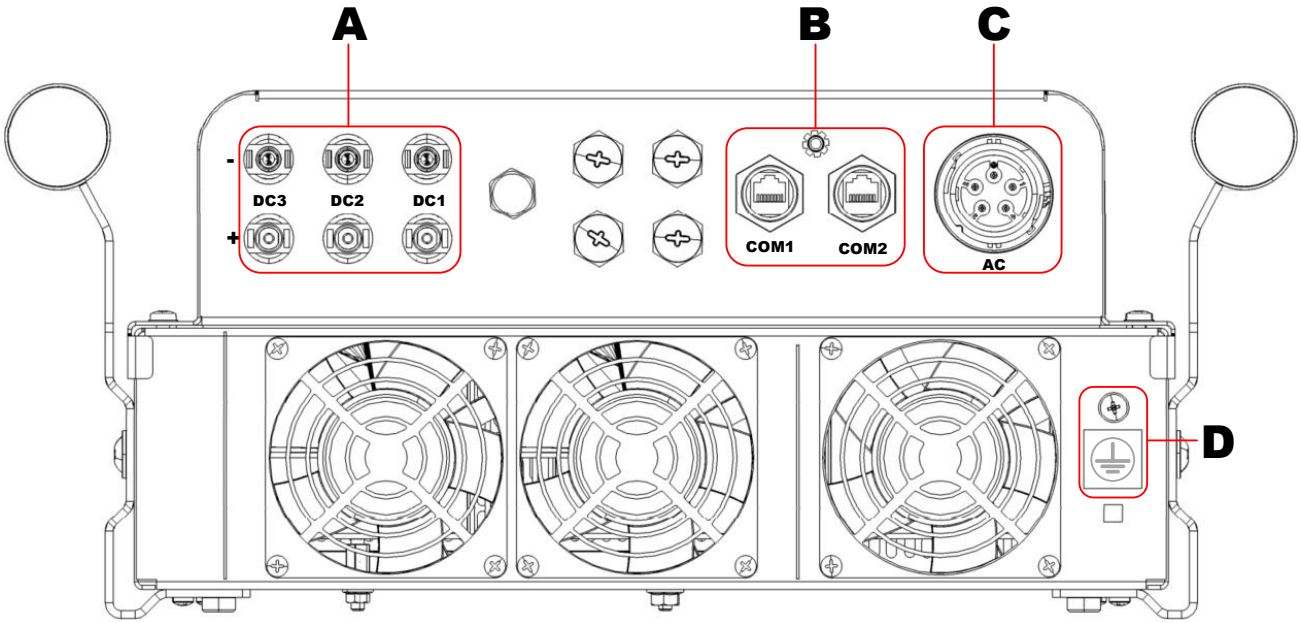
6. Secure the inverter to the wall bracket using the two M8x18 button-head screws provided in the scope of delivery. Tighten the screws with torque 10Nm±1Nm



Secure inverter to wall-bracket
Torque: 10Nm

6 Electrical connections

6.1 Overview of Electrical Connections



Item	Description
A	3 positive and 3 negative DC connectors, Type: STÄUBLI MC4
B	COM1: RJ45 [RS485-1 and CAN1] | COM2: RJ45 [RS485-2 and CAN2]
C	AC-grid terminal 3P+N+PE, Type: Amphenol C016 20E004 801 2
D	Ground connection terminal for ring terminal for lug size of 5mm

DANGER

Danger: Electric shock hazard

- Electrical connection and commissioning must be performed by qualified personnel only.
- Install, commission, and operate the inverter in accordance with local laws and regulations.
- Ensure all energy sources are disconnected and de-energized before making any electrical installation or performing any work on the inverter. Neglecting to do so poses a serious risk of injury or death.
- Wear personal protection equipment.
- Install a DC breaker between the DC energy source (battery) and the inverter.

6.2 DC Connection

Warning

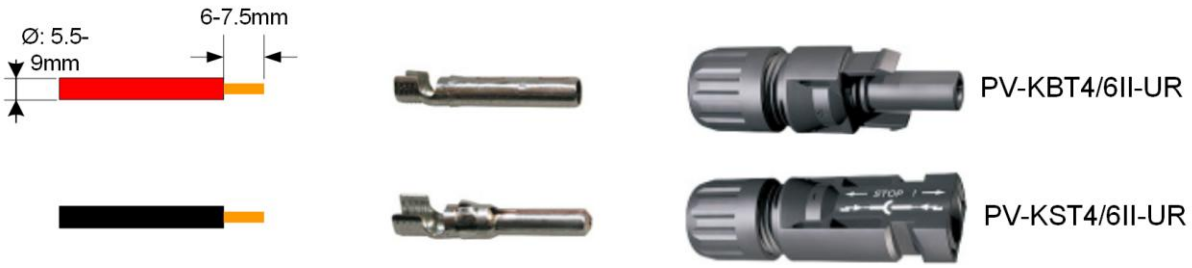
- Install a DC breaker between the DC energy source (battery) and the inverter.
- Before connecting or powering the inverter, check that the DC connectors have the correct polarity. Reverse polarity could cause inverter damage or risk of fire.
- Ensure that the voltage levels are within the absolute maximum inverter specifications to prevent damage from overvoltage.

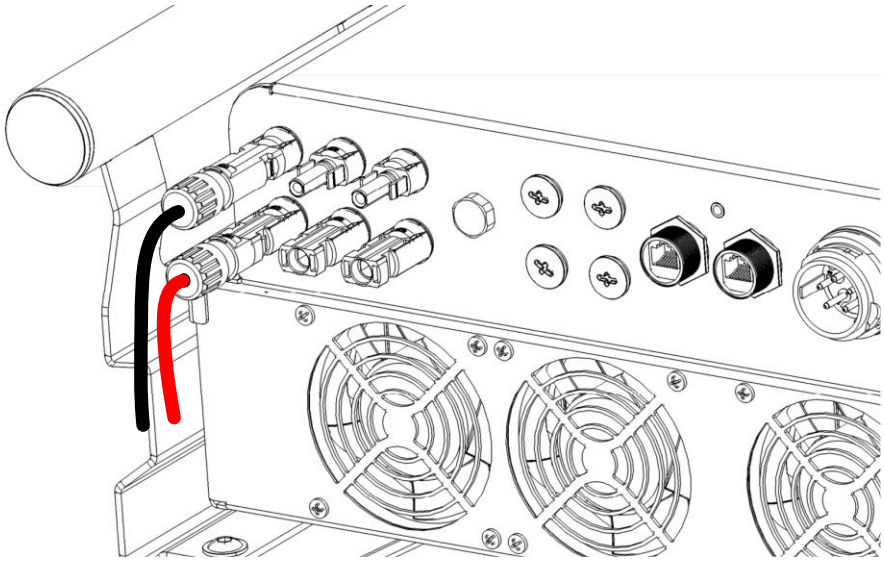
Notice

- For circuit protection, install a fuse between every battery input and the inverter. Use a fuse value of 1.2 to 1.3 the nominal DC current. Use gG/gL or gR type fuses.
- Use a cable with a minimum cross section area of $6mm^2$.

Procedure:

1. Strip the cable insulation in a range of 6mm to 7.5mm
2. Crimp the contacts on the cable using the appropriate crimping pliers. Confirm that all the strands have been captured in the crimp sleeve, and there is no deformation.
3. Insert the crimped contact into the male or female coupler until a “click” sound occurs, check by gently pulling on the cable.
4. Tighten the gland assembly.
5. Mate the cable coupler until a “click” sound.





6.3 AC Connection

Warning

- Do not connect loads directly to the inverter output. Always use a breaker between the inverter any loads or the grid.
- Connect the phases following the prescribed pin assignment. Otherwise, the inverter may not function properly.

Notice

- The cable and circuit braker must be sized in accordance with local laws and regulations.
- To protect the AC conductors and AC input of the inverter an overcurrent protection device must be installed per inverter. Multiple inverters cannot share the same circuit breaker.
- An automatic circuit breaker with thermal-magnetic protection is recommended. 4W(3 phases with neutral), 63A breaker type is recommended for the inverter. With a voltage/current rating of 400Vac/63A and magnetic curve B/C
- External diameter: 16mm to 20mm

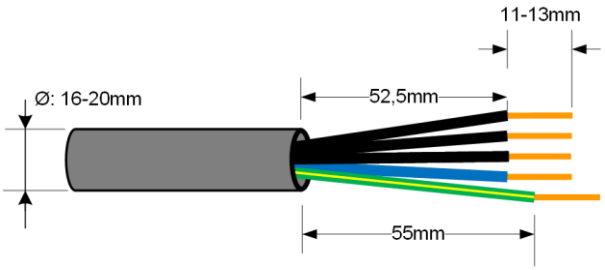
Compatibility with RCD and RCM

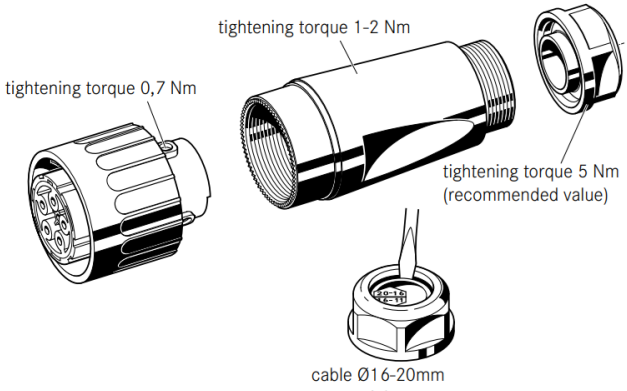
The inverter is equipped with an internal residual current monitoring circuit. Ground leakage current exceeding the tripping limits 300mA, 150mA, 60mA and 30mA will cause the inverter to cease to energize and disconnect from the grid. It required by local regulations an RCD can be connected to the inverter; the following must be observed:

- This product can cause current with a d.c. component. Where a residual current operated protective (RCD) or monitoring (RCM) device is used for protection in case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.
- Each inverter in the system must be connected to the load/grid via a separate residual-current device, with a rated residual-current of 100mA or higher.

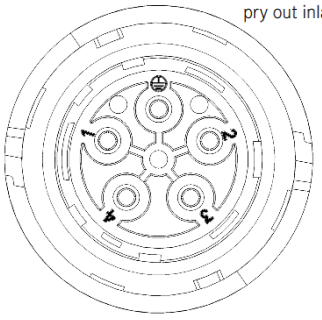
Procedure:

1. Disconnect the circuit breaker on the AC side and secure against reconnection.
2. Remove the cable sheath (jacket) to expose the individual conductors. Ensure the length of the phases falls within a range of 66mm to 68mm.
3. Decrease the length of the phase conductors by 2.5mm.
4. Strip the conductors with a range of 11mm to 13mm.
5. Assemble the connector following the pin assignment and tighten with the indicated torque.

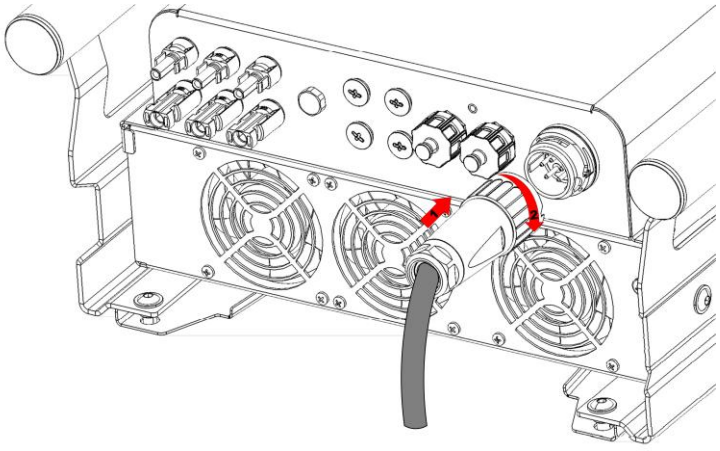




Pin	Assignment
1	L1
2	L2
3	L3
4	N
⏚	PE



6. Mate the AC connector with the inverter, rotate the locking mechanism clockwise until a “click” sound occurs.
7. Verify the connector is locked into place by trying to rotate the locking mechanism anti-clockwise.



6.3.1 Connecting the Ground Cable

Warning

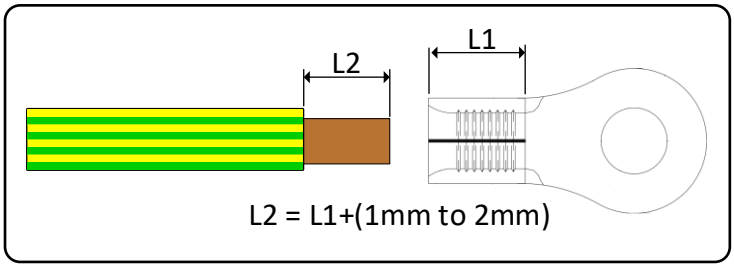
- Ensure all PE grounding points have an equipotential connection when connecting multiple inverters in the same installation.
- A protective earthing conductor must be always connected to the inverter when power is supply to the inverter by an energy source.

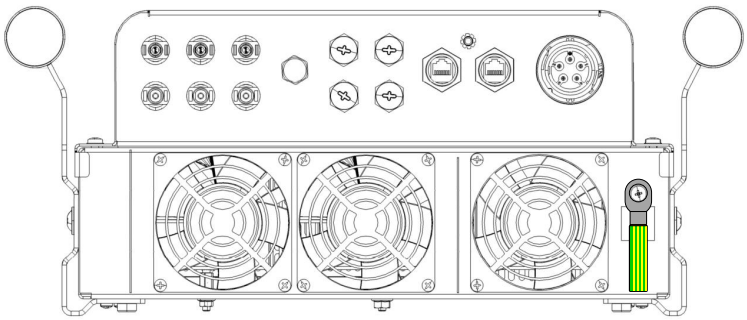
Notice

- The inverter is provided with means of connection for protective bonding, to ensure electrical contact between accessible conductive parts and an external earthing conductor.
- It is possible to use solid, flexible, or fine-stranded conductors.
- The cross-section range 6mm^2 to 10mm^2.
- The minimum cross-section area of the external protective conductor shall have the same cross section area than the phase conductors.
- Use an insulated or uninsulated ring terminal or lug with stud-size M5 and outer diameter of 12mm to 15mm.

Procedure:

1. Strip the cable to the appropriate length based on the selected ring terminal.
2. Crimp the cable on the ring terminal.
3. Secure the ground cable on the inverter grounding terminal, tighten the screw with torque 6.0Nm±0.5Nm.

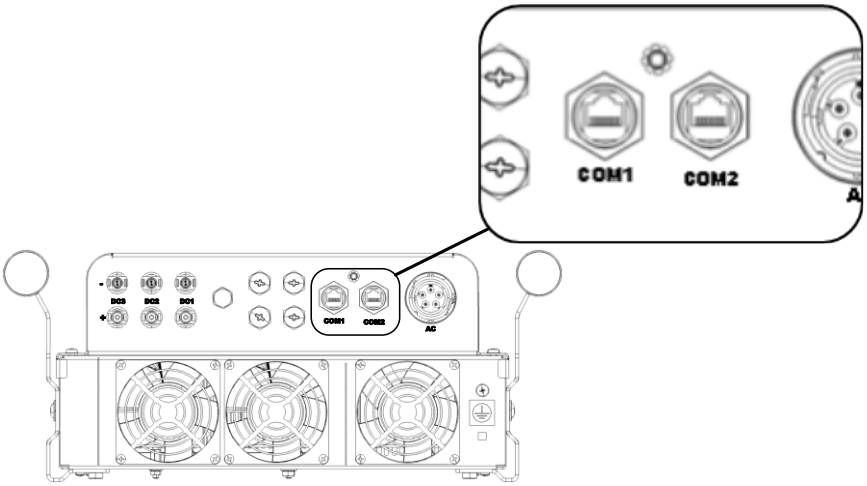




6.4 Communication Connections

The inverter is equipped with two CAN communication ports and two RS-485 communication ports. There is a CAN and RS-485 mapped on the same RJ45 connector.

Notice
• The inverter has an IP65 rating, to maintain the IP65 rating, ensure the RJ45 modular connector is properly assembled and coupled to the inverter. • The maximum length of the CAN bus is 100m between each pair of inverters. • The maximum length of the RS-485 bus is 100m between each pair of inverters.



COM1:

Item	Color (T568B)	Function	Used for
1	Orange/white	CAN_H1	Inverter control or ACS-A (smart meter)
2	Orange	CAN_L1	Inverter control or ACS-A (smart meter)
3	Green/white	GND_ACS1	
4	Blue	RS-485A1	Internal communication bus for cluster operation
5	Blue/white	RS-485B1	Internal communication bus for cluster operation
6	Green	AUX_ACS1	
7	Brown/white	GND_5V_1	
8	Brown	5V_1	

COM2:

Item	Color (T568B)	Function	Used for
1	Orange/white	CAN_H2	BMS communication with 3rd party batteries
2	Orange	CAN_L2	BMS communication with 3rd party batteries
3	Green/white	GND_ACS2	
4	Blue	RS-485A2	Inverter control via Modbus
5	Blue/white	RS-485B2	Inverter control via Modbus
6	Green	AUX_ACS2	
7	Brown/white	GND_5V_2	
8	Brown	5V_2	

6.4.1 Connecting the Communication Cables

1. Remove the dust cap from COM1 or COM2.
2. Pass the communication cable through the modular connector.
3. Crimp the RJ45 connector on the cable.
4. Mate the RJ45 connector with inverter. Ensure the engagement of the RJ45 locking mechanism.
5. Screw the clamping ring on the inverter.
6. Screw the seal nut.

7 Commissioning the Inverter

Warning

Warning: Electric shock hazard

- High DC and AC voltages present a risk of shock hazard. Therefore, installation, commissioning, and operation of the inverter must be performed by a qualified person.

7.1 Preliminary Checks

- Ensure the inverter is properly mounted.
- Check the polarity of each battery input connection.
- Ensure that the maximum voltage of each battery input does not exceed the inverter ratings.
- Verify the integrity of all connections, including DC, AC, additional grounding, and communication terminals.
- Check DC ground faults by measuring leakage to ground.
- Check the AC voltage and frequency are within local grid standards.
- Check the phase-rotation is correct (right turning or clockwise) the correct order shall be A(L1)-B(L2)-C(L3).
- Ensure that the circuit breakers have the appropriate rating and are mounted correctly.

Notice

Notice: Property damage

- The inverter is not equipped with an internal pre-charge circuit. Connecting a high voltage battery directly without pre-charging could cause an inverter failure or a blown DC fuse. Hence, it is recommended to use an external pre-charge circuit.

7.2 Start-up Procedure

1. Switch on the AC breaker.
2. Switch on the DC breaker.
3. Switch on the DC energy source (battery). After pre-charging, the inverter is powered and ready to start normal operation.

7.3 Shutdown Procedure

1. Switch off the AC breaker.
2. Switch off the DC breaker.

DANGER

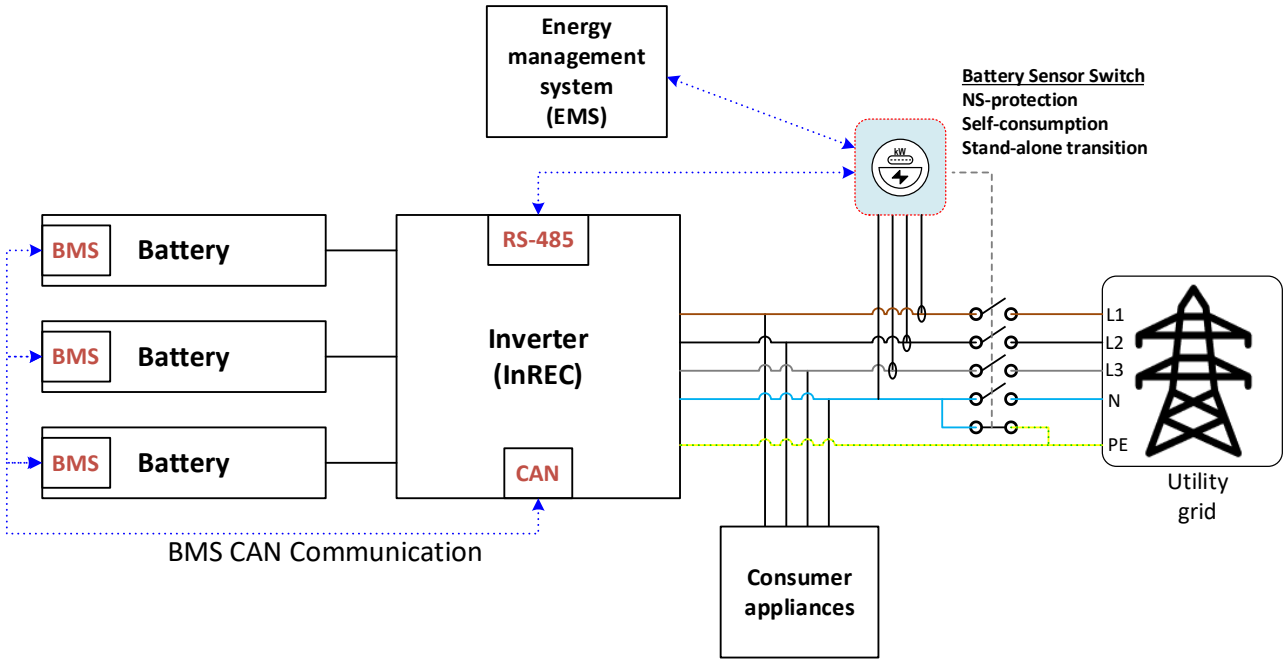
Danger: Electric shock hazard

- There is stored energy in the output capacitors after switching off the device. Wait 25 minutes for the stored energy to be dissipated before handling the inverter.

8 Operating and Control

Warning

- Do not place objects of any kind on the inverter during operation.
- Do not touch the heatsink of the inverter when it is in operation. Some parts may become hot and could cause burns.



The InREC is equipped with three DC ports to where three independent batteries can be connected, when connecting several batteries, they must be of the same type with the same BMS protocol. Each battery BMS transmits battery charge/discharge limits and data to the InREC via CAN communication. The power of the InREC is always limited to the total battery charge/discharge limits. Additionally, operation of the InREC requires the installation of battery sensor switch BSS (**Sold Separately**), the BSS measures power feed-in into/out of the utility grid, controlling the output power of the InREC.

Also, the BSS performs NS-protection to disconnect the inverter in the event of inadmissible voltage and frequency values. Additionally, the BSS also performs grid support functions to contribute to network stability.

9 Maintenance

DANGER

Danger: Electric shock hazard

- Power off the inverter and wait for total de-energization.
- Always disconnect the inverter from all energy sources before performing any operations on the device.
- There is stored energy in the output capacitors after switching off the device. Wait 25 minutes for the stored energy to be dissipated before handling the inverter.

Warning

Warning: Electric shock hazard

- Always use personal protective equipment (PPE).
- Before performing any work ensure all energy sources have been disconnected from the inverter.
- Adhere and comply with any local safety regulations.

Notice

- Maintenance and routine operations must only be performed by qualified personnel, skilled or instructed person with knowledge of how to perform these tasks.

9.1 Shut-down the Inverter

1. Switch off (open) the AC breaker between the inverter AC output and the grid or any loads.
2. Switch off (open) the DC breaker between the battery and inverter.
3. Wait for 25min.

9.2 Removing the Inverter

1. Disconnect all the cables from the inverter communication, DC cables, AC cables and PE cable.
2. With a multimeter, verify there is no residual charge on the inverter's ports by measuring the voltage on the inverter's inputs. Proceed to the next step only when the voltage measured is below $60V_{DC}$
3. Remove the mounting bracket locking screws.
4. Remove the inverter from the mounting bracket. Ensure storage conditions are met in the event the inverter is going to be used later.

9.3 Disposing the Inverter

Notice
• REConvert is not responsible for the disposal of the inverter or any parts of it. • Inappropriate disposal of waste can have a detrimental effect on the environment and/or human health. • Follow recycling laws and regulations in the local area of installation and disposal.

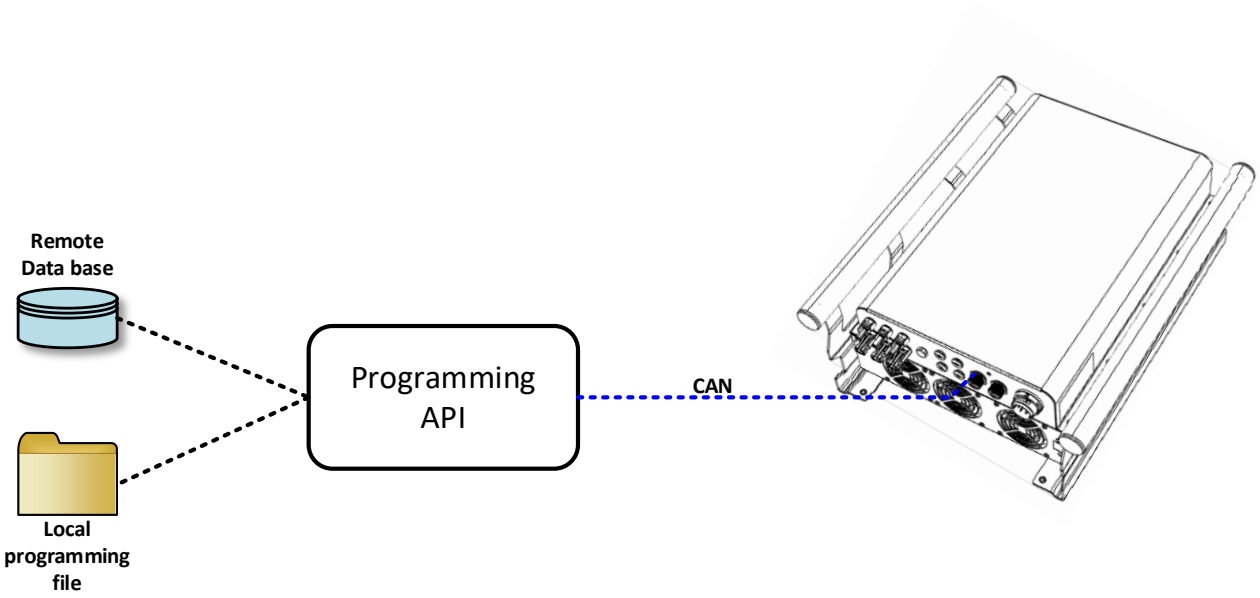
The European Union with the Waste Electrical and Electronic Directive, by law requires separate collection and proper treatment of electrical and electronic waste. The symbol comprised by the crossed-out wheelie bin, indicates that the inverter must be delivered to a waist collection point suitable for the purpose and must not be deposed with domestic waste.

9.4 Routine Maintenance

Activity	Description
Annual visual inspection	• Check the inverter is functioning as intended without any error codes or warnings. • Check all the labels and safety symbols are visible. • Check all the cables and connection points to the inverter, look if cables are broken, check the strength of the connections and retighten if necessary. • Check air inlet and outlet of the inverter are free of any objects, look for any obstacles or residue buildup in the heatsink. • Check environmental conditions are still within the inverter specifications
Annual operations	• Check all cable glands and connectors are properly tighten.
Annual cleaning	• Ensure the inverter is free of dust, or any other foreign agents like foliage or any other dirt.

9.5 Firmware update

Notice
• Firmware updates may only be performed by qualified personnel, skilled or an instructed person with knowledge of how to perform these tasks. Wrong operation could lead to device malfunction. • The firmware update can be performed using a computer or controller an running an API of the programming tool. The API can be used to update the device using a local programming file or allow remote firmware update.



10 Technical Data

10.1 Specifications

Technical Data	InREC-36-HA-100	InREC-36-HA-200
DC input/output data		
Battery type	Chemistry independent provided compatibility with battery management system	
Maximum battery voltage [V_{DC}]	500	
Nominal battery voltage range [V_{DC}]	300 – 500	
Minimum battery voltage [V_{DC}]	150	
Maximum charging current [I_{DC}]	33 x 3	100
Maximum discharging current [I_{DC}]	33 x 3	100
Maximum overcurrent protection [I_{DC}]	43 x 3	130
Maximum charging power [W]	30000	
Maximum discharging power [W]	30000	
AC input/output data		
Nominal output power [W]	30000	
Maximum output power [W]	30000	
Nominal apparent power [VA]	30000	
Maximum apparent power [VA]	30000	
Rated grid voltage [V_{AC}]	230(3-phase/N/PE)	
Voltage range [V_{AC}]	207 – 253	
Feed-in phases	3	
Grid configuration	TN-C, TN-S, TN-C-S	
Nominal frequency [Hz]	50	
Frequency range [Hz]	45 – 50	
Power factor range	±0.8...1	
Maximum output current [I_{AC}]	50	
Maximum overcurrent protection [I_{AC}]	63	
Current harmonic distortion I_{THD}	<3%	
Stand-alone waveform	Sinusoidal	
Voltage harmonic distortion V_{THD}	3%	
Overvoltage protection	DC: II / AC: III	
General data		
Width x height x depth	489mm x 575mm x 203mm	
Weight	40kg	
Ingress protection	IP65	
Environmental category	Indoor unconditioned	
Pollution degree	3	
Operating temperature range	-20°C ... +60°C	
Storage temperature	-40°C ... +70°C	
Relative humidity	0% ... 95%	
Maximum operating altitude	2000m	
Topology	Non-isolated	
Protection class	I	

Cooling method	Forced cooling
Interfaces	2x CAN / 2x RS-485
Communication protocols	Modbus RTU, CAN-CCP

10.2 Voltage-Current Operating Profile