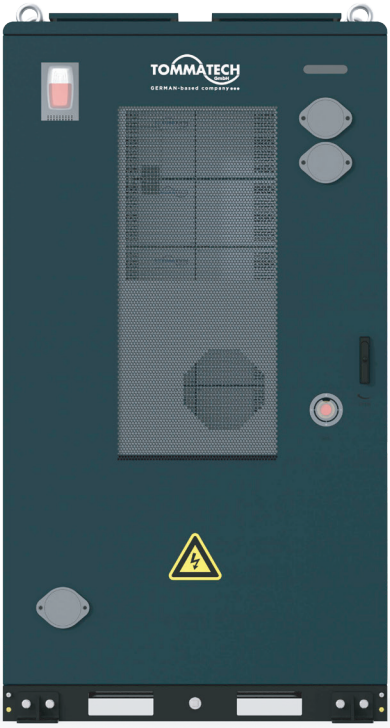
TOMMATECH GmbH
GERMAN-based company

User Manual

ORION OUTDOOR 241kWh



CONTENTS

1 General Information

Warning!

Read and follow carefully all safety warnings, instructions, illustrations and specifications provided with this product. Failure to follow instructions mentioned may results in electric shock, fire or serious injury.

Save all warnings and instructions for future reference.

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Trademarks and Permissions

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* It is prohibited to use data contained in firmware or software developed by the manufacturer, in part or in full, for commercial purposes by any means.

* It is prohibited to perform reverse engineering, cracking, or any other operations that compromise the original program design of the software developed by the manufacturer.

Disclaimer

"DANGER", "WARNING", "CAUTION","NOTICE" and "NOTE" in this manual do not represent all safety matters that should be followed, and you must also comply with relevant international, national or regional standards and industry practices. The manufacturer shall not be liable for personal injury, property loss, product damage and subsequent losses under the following circumstances:

* Damages caused by force majeure, including earthquake, flood, volcanic eruption, mudslide, lightning, fire, war, military conflict,typhoon, hurricane, and so on.
* Failure to comply with the provisions of this manual.
* The installation, operation and storage environment does not meet the relevant international, national or regional standards;
* Incorrect use of this product.
* Unauthorized or unqualified personnel repair the product, disassembly the rack and perform other operations.
* Use of unapproved spare parts.
* Unauthorized modifications or technical changes to the product or software.
* Incorrect shipment by yourself or the third party commissioned by you.
* Unsatisfactory materials and tools from you own that do not meet the relevant international, national or regional standards.
* Damage caused by yourself or the third party's negligence, intent, gross

negligence, improper operation, or other accidents not caused by manufacturer.

1.2 About This Manual

This manual mainly describes the product information, guidelines for installation, operation and maintenance. In this manual, “equipment” or “device” refers to relevant product, software, part, spare part or service,etc; “The manufacturer” refers to the producer, seller or service provider of the equipment.

1.3 Intended Use

The product is a high-voltage lithium-ion energy storage system. It is characterized by high integration, good reliability, long service life, wide working temperature range, etc. The system is modular. It provides a reliable backup power supply for private and commercial use, such as supermarkets, banks, schools, farms and small factories, to smooth the load curve and achieve peak load transfer. It can also improve the stability of renewable systems and promote the application of renewable energy. Misuse or abuse caused by unauthorized use may result in personal injury or property loss. If that happens, the user, instead of the manufacturer, shall bear liability.

2 Product Description

2.1 Product Introduction

The ESS mainly consists of lithium battery packs , power converter system (PCS), thermal management system, maximum power point tracking (MPPT) and fire suppression device .

It plays a significant role in reducing electricity costs, ensuring power reliability, integrating renewable energy, and optimizing energy management.

2.2 Application Scenarios

The energy storage system has a wide range of application scenarios, which can be described as follows:

• Electricity saving:

-Cut peak and fill valley to reduce electricity bills;

-Demand control reduces capacity chargers;

• Scenery tolerance:

-The remaining electricity emitted by the photovoltaic during the day is stored for the nigh discharge to smooth the output fluctuations of the wind power;

• Optical storage micro-grid:

-Electricity can be saved, and applications such as standby power supply

can provide stable power supply for islands, mountains and other areas that cannot be connected to the grid.

• Power expansion:

-When the power distribution capacity cannot meet the load requirements, the power is discharged to meet the load requirements and achieve virtual capacity expansion.

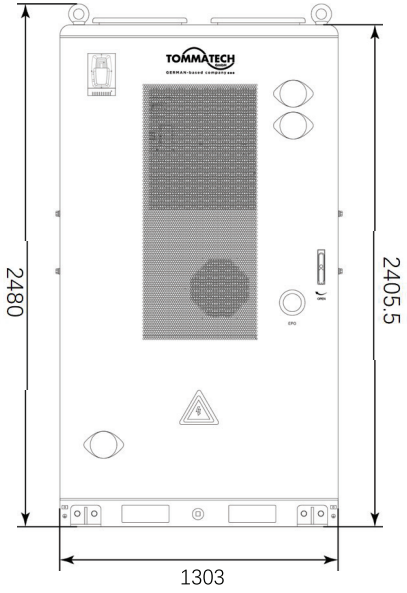
• Standby power supply:

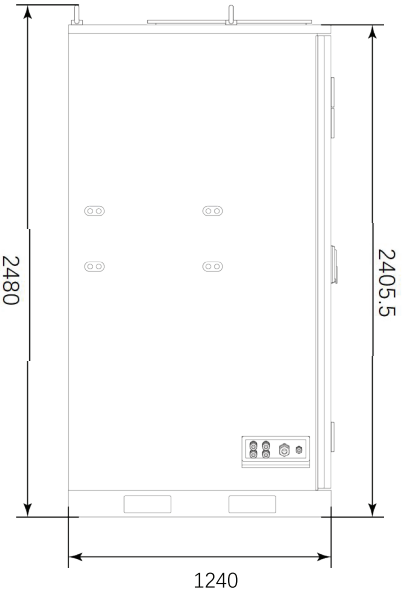
-Discharge in the case of power outage or power restriction to ensure power consumption

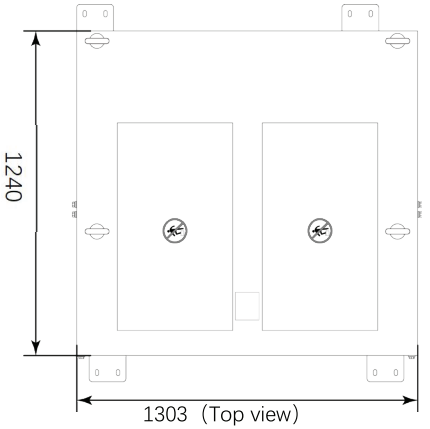
• Demand and response:

-Receive power grid dispatching and enjoy dispatching subsidies.

2.3 Product Size







Unit:mm

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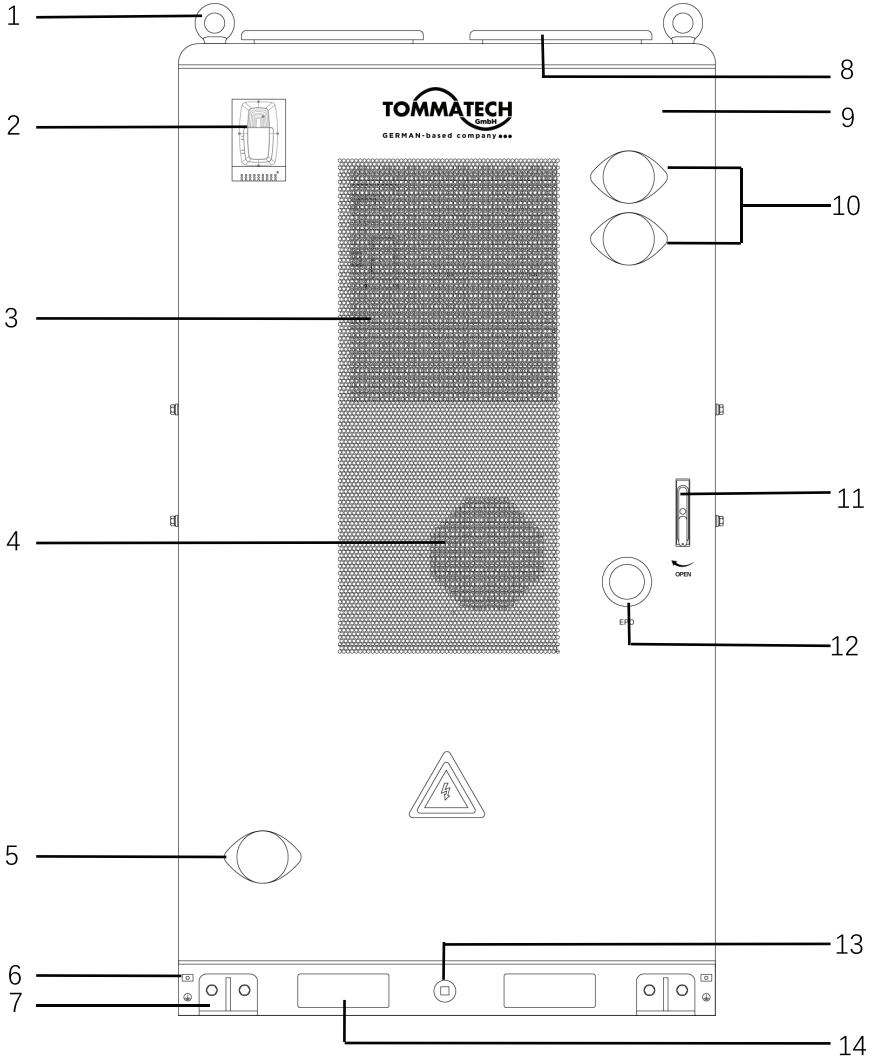
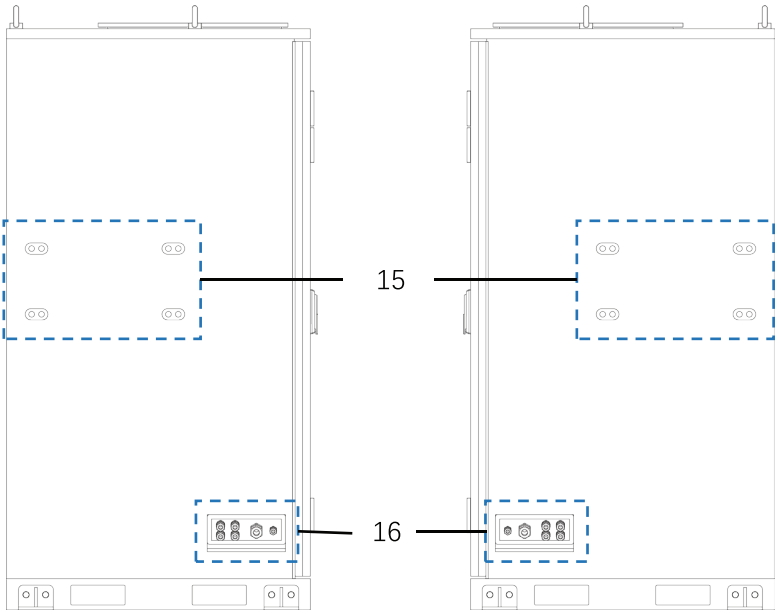
2.4 External Overview

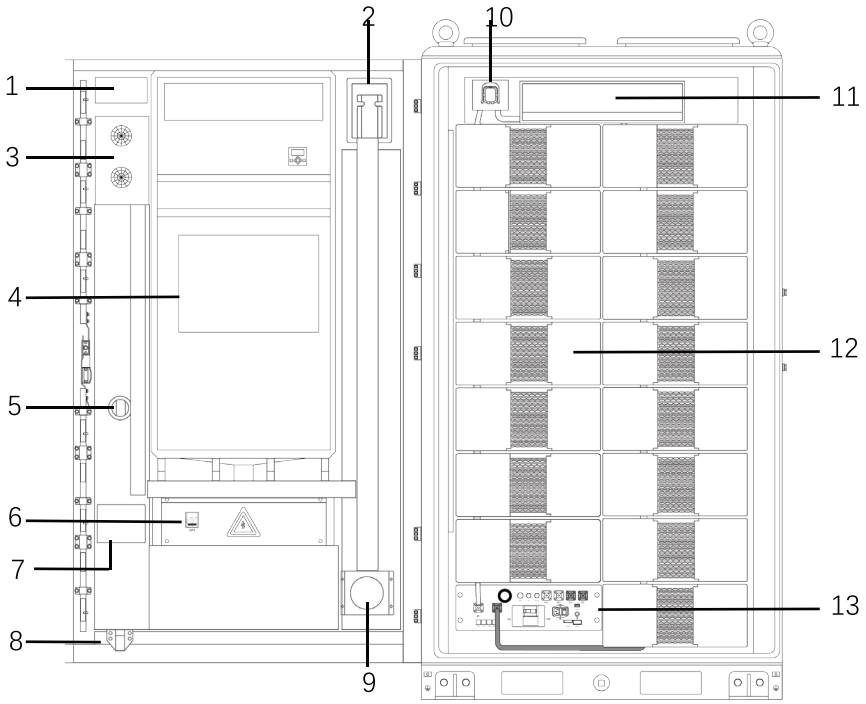




Left **Right**

No.	Item	No.	Item
1	Eyebolt	9	Status Indicator
2	Sounder Strobe	10	Exhaust Valve
3	Air Conditioner Air Outlet	11	Door Lock
4	Air Conditioner Air Inlet	12	EPO (Emergency Stop)
5	Air Intake Valve	13	Fire-fighting Water Inlet
6	Protective Grounding	14	Forklift Fork Insertion
7	Cabinet Mounting Feet	15	Inverter Assembly Holes
8	Explosion Relief Panel	16	Cable Outlet

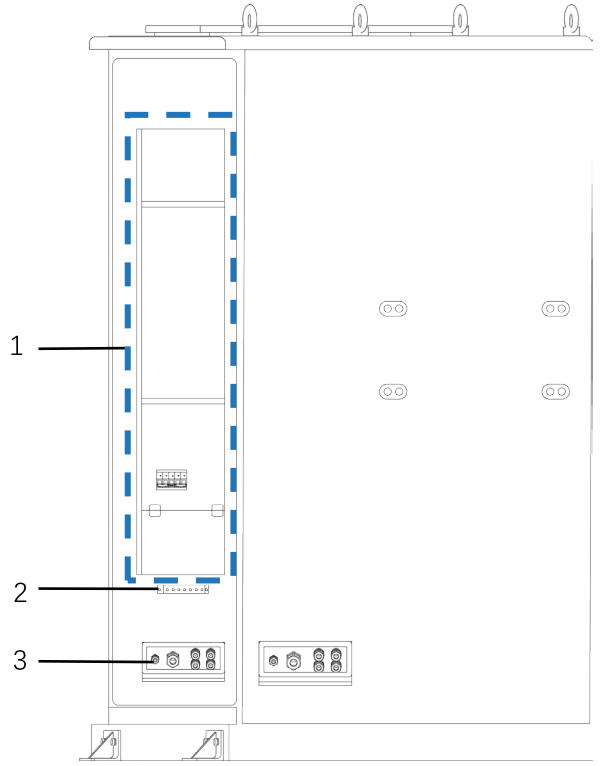
2.5 Internal Overview



Internal-front view

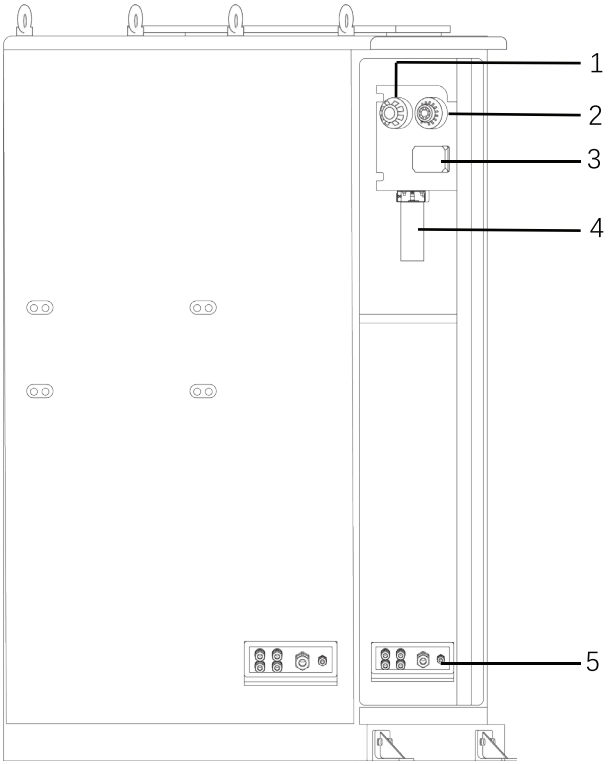
No.	Item	No.	Item
1	Indicator Light Panel	8	Door Lifting Roller
2	Sounder Strobe	9	Air Intake Valve
3	Exhaust Valve	10	MSD (Manual Service Disconnect)
4	Air Conditioner	11	Circulating Air Intake Port
5	EPO (Emergency Stop)	12	Battery Pack

6	Circuit Breaker QF3	13	BMS (Power Distribution Unit)
7	Nameplate		



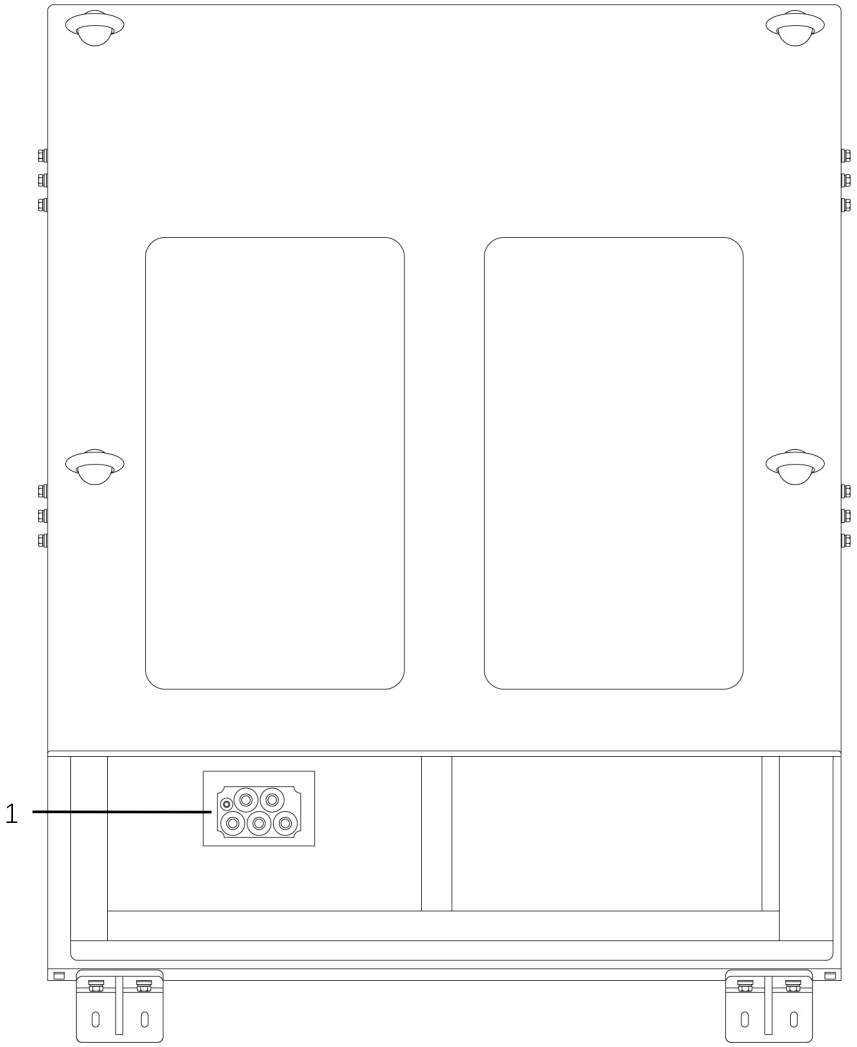
Internal-left side view

No.	Item	No.	Item
1	Power Distribution Area	3	Cable Outlet
2	Grounded Bus-bar		



Internal-right side view

No.	Item	No.	Item
1	Smoke detector	4	Aerosol
2	Heat detector	5	Cable Outlet
3	Gas detector		



Internal-bottom view

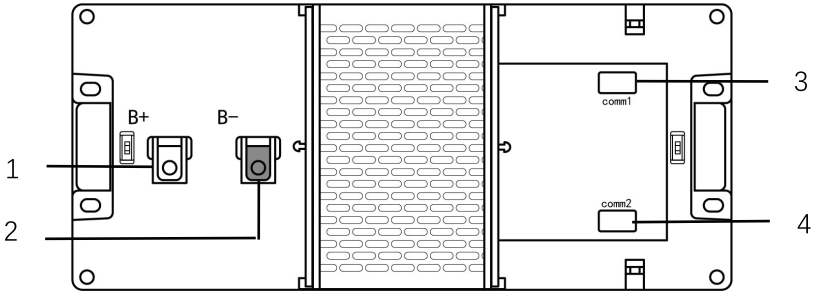
No.	Item
1	Cable Outlet

2.6 Components

2.6.1 Battery Pack

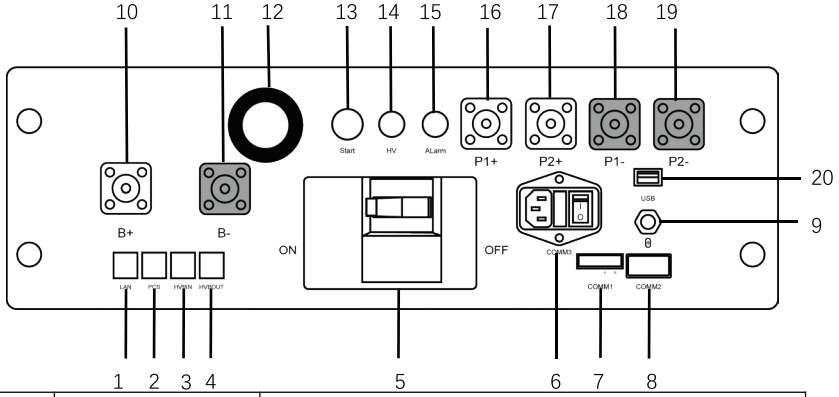
• Battery charging: the electricity from the mains or other power supplies is converted by the Inverter into DC electricity, which is then stored in batteries.

• Battery discharging: the electricity released by batteries is converted by the Inverter into AC electricity, which is then supplied to loads.



NO.	Designation	Description
1	B+	Battery module positive pole (orange)
2	B-	Battery module negative pole (black)
3	COMM1	Connection position of battery module communication and power supply input/output
4	COMM2	Connection position of battery module communication and power supply input/output

2.6.2 BMS



No.	Name	Description
1	Ethernet	Features not yet developed.
2	PCS COM	PCS COM battery communication terminal: used to output battery information to the inverter.
3	IN COM	Connection position with previous BOS-B-BMS-2-A communication output.
4	OUT COM	Connection position with next BOS-B-BMS-2-A communication input.
5	DC circuit breaker	It is used to manually control the connection between the battery rack and external devices.

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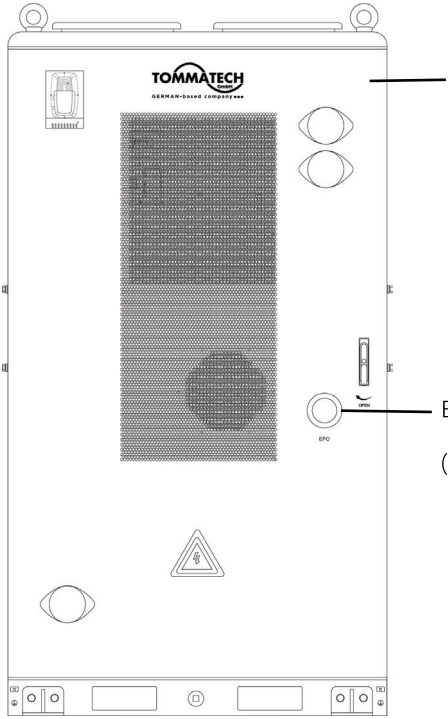
6	COMM3	This port must be connected to the power supply of 3A, 50-60Hz, 200~240V when this equipment is in use, otherwise the fan can not rotate normally.
7	COMM1	485communication and emergency power-off trigger interface
8	COMM2	Communicative connection with the first battery module; and providing 12VDC power for the first battery module.
9	Bluetooth	The mobile APP connects to the data acquisition rod of the energy storage system.
10	B+	Battery common positive connection position (orange).
11	B-	Battery common negative connection position (black).
12	Display screen	Display SOC and fault codes.
13	START	A start switch of 12VDC power inside the high-voltage control box.
14	HV light indicator	High-voltage hazard indicator (yellow).

15	ALRM light indicator	Battery system fault alarm indicator (red).
16	PCS1+	First PCS positive connection position (orange).
17	PCS2+	Second PCS positive terminal connection position (orange).
18	PCS1-	First PCS negative connection position (black).
19	PCS2-	Second PCS negative connection position (black).
20	USB	BMS upgrade port and storage expansion port.

2.6.3 Status Indicator and EPO

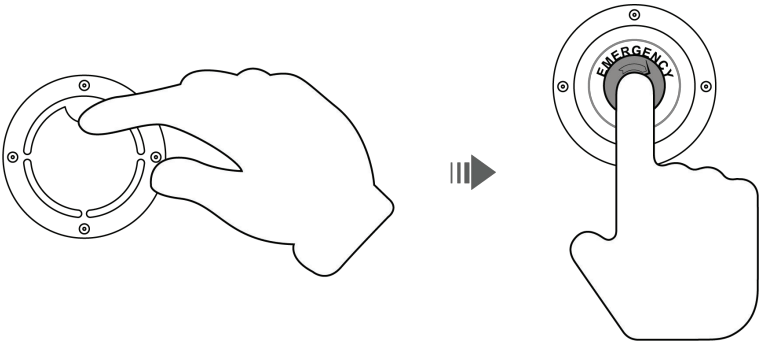
The status indicator is designed to display the equipment's state by illuminating the imprinted “TOMMATECH” in colors.



State	Description
TOMMATECH (Blue)	The system is in standby or discharge state.
TOMMATECH (Green)	The system is in charge state.
TOMMATECH (Yellow)	The system generates an alarm.
TOMMATECH (Red)	The system has a fault and has entered the protection state.

EPO (Emergency stop)

When in the emergency, immediately break off the emergency stop cover and press the EPO to shut off the system at once.



Notice!

Do not stop the ESS through the EPO if the system is running normally or the operator does not encounter with emergent conditions.

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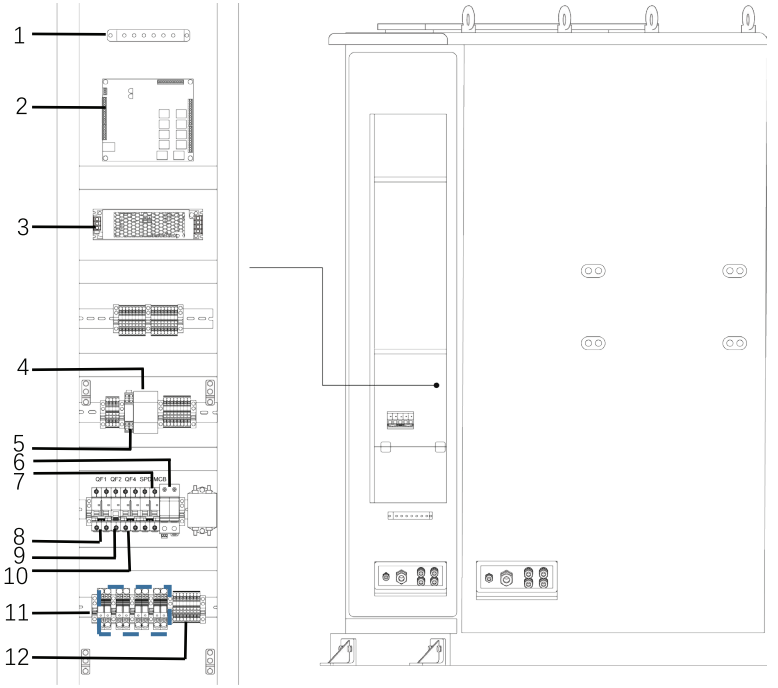
2.6.4 Controls and Terminal Blocks



No.	Item	No.	Item
1	Grounded Bus-bar	7	SPDMCB (Surge Protection Device Miniature Circuit Breaker)
2	IO(Input/Output) Board	8	Circuit Breaker QF1
3	AC/DC Power Module	9	Circuit Breaker QF2
4	Water Sensor	10	Circuit Breaker QF4
5	Contactor KM1	11	Live Line and Neutral Line (L1/L2/L3/N)*1

6	SPD (Surge Protection Device)	12	Reserved Terminals for Fire Module (optional)

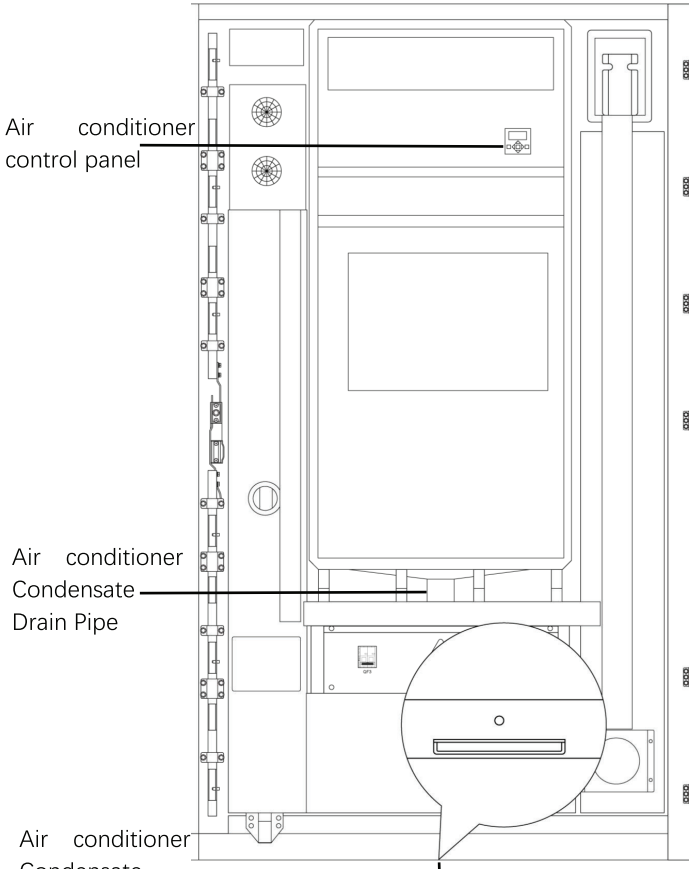
Note:

1. Terminal blocks for connection with PCS, LOAD or GRID. It is recommended to connect with LOAD.

2.6.5 Air conditioner

The air conditioning system can produce cold air and then send it to the internal air duct of the ESS to cool batteries.

The air conditioner is regarded as a part of air circulation.When the air conditioner is running, air circulation is formed inside the cabinet. The cool air is blown into the pack and then discharged out of the pack.



Condensate generated during the operation of the air conditioner is collected via the built-in condensate drain pipe and discharged through the drain outlet. It is recommended to clear the drain outlet with a screwdriver, steel rod or wooden stick every six months to prevent clogging caused by moss, dust and other foreign debris.

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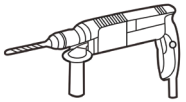
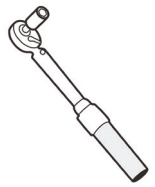
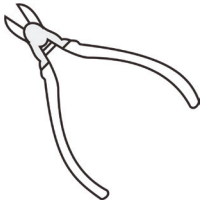
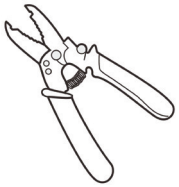
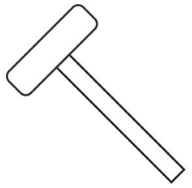
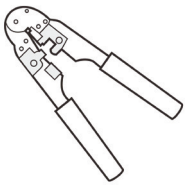
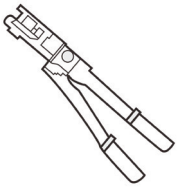
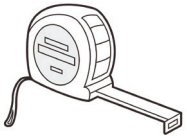
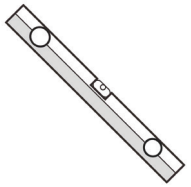
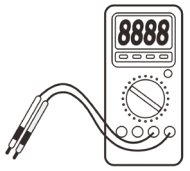
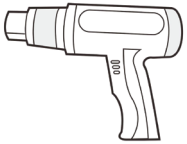
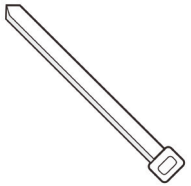
3 Installation

3.1 Materials Required

Tools			
			
Hammer drill	Phillips insulated torque screwdriver	Flat-head insulated torque screwdriver	Insulated torque socket wrench
			
Diagonal pliers	Wire stripper	Cable cutter	Rubber mallet
			
RJ45 crimping tool	Hydraulic pliers	Needle-nose pliers	Marker

			
Utility knife	Steel measuring tape	Level	Multimeter DC voltage measurement
			
Heat shrink tubing	Heat gun	Cable tie	Insulated ladder
			
Powered industrial forklift	Crane		
Personal Protective Equipment			

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			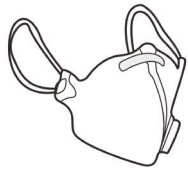
Insulated gloves	Protective gloves	Goggles	Dust mask
			
Insulated shoes	Safety helmet	Protective suit	

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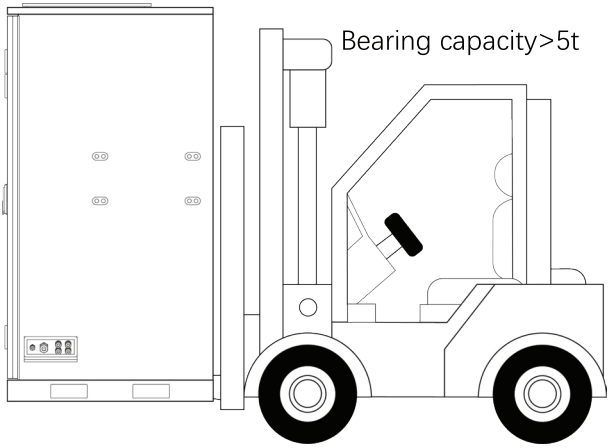
3.2 Moving Heavy Objects

After arrival of your goods, perhaps you need move it to designated working area. Refer to the following picture for movement of heavy objects.



When moving your product:

• Keep at least 2m away from the forklift during operation.

• No passengers are permitted to stand on or be lifted by forklifts.

• Do not overload forklifts or raise loads too high, as this can affect overall stability.

• Maintain speeds below 3mph and avoid sharp turns.

• Before reversing, the forklift operator must check behind them and ensure it is safe to proceed.

• When reversing in confined spaces, a spotter is needed,who directs the forklift operator.

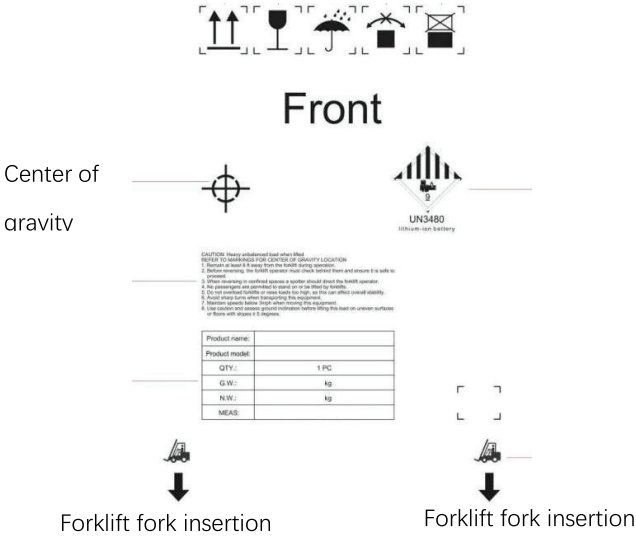
• Use caution when lifting this load on uneven surfaces.

• Never operate the forklift on slopes ⩾ 5 degrees.

• During movement, avoid tilting the cabinet or placing it upside down. If the cabinet must be tilted or inverted , please straighten it as soon as possible, and the cabinet needs to be left standing for 2 hours before it can be powered on.

• Suggest to insert the forklift tooth into the position indicated by the “Forklift fork insertion: in the package material. See the following figure.

• When lifted heavy unbalanced load, refers to the marking for center of gravity location.



3.3 Unpacking

Warning !

• After setting up the equipment well, carefully unpack the package so as to avoid scratching equipment.

• If possible, do not remove the transport packaging before arrival at the installation site.

• After unpacking, check whether the fasteners and removable parts are missing. If they are missing, please contact you vendor at once.

• Keep the equipment stable during unpacking.

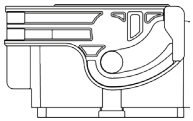
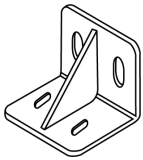
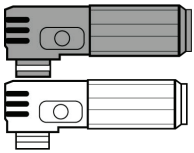
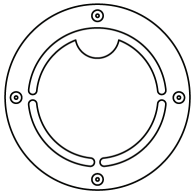
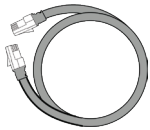
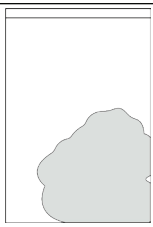
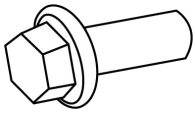
• If the installation environment is not friendly to the equipment, take measures to prevent failure inside the battery caused by condensation or dust corrosion (for example, cover with woven cloth or dust cover).

• When it comes to package, EPE foam is broadly used for most of products, which characterizes with anti-shock and easy-disassemble. It is possible to unpack the equipment with a tool like a cutter or knife.

After unpacking the equipment, check that the deliverable contents are intact and complete, and free from any damage. If any items listed in the *Packing List* is missing or damaged, contact your dealer or call service hotline

The standard accessory kit for the battery cabinet shipment consists of a combination of basic universal components and inverter-adapted components, which are divided into three configuration combinations according to the inverter matching form, as follows:

- Basic Universal Configuration (PACKING LIST-a): Mandatory components for all battery cabinet accessory kits, with no differences in inverter types and installation forms;

Packing List-a			
			
Manual service disconnect (MSD)×1 pc	Cabinet mounting feet ×4 pcs	Terminal×1 set	Terminal resistor ×1 pc
			
PMMA sheet ×1 pc (⌀=113mm, t=2mm)	3000mm 26AWG communication cable ×1 pc (black)	Fire-resistant mud ×1 bag (2.5kg)	M16*40 Hex bolt ×8 pcs (with spring washer and flat washer)

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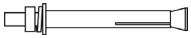
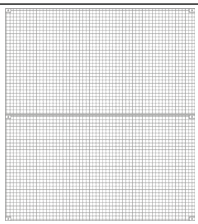
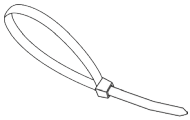
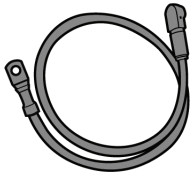
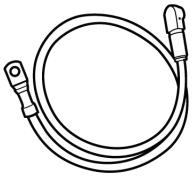
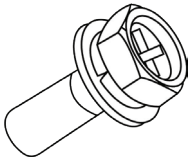
			
M12*80 Expansion bolt ×8 pcs	Insect screen ×2 pcs	Cable tie ×20 pcs	M30 Eye bolts× 4 pcs

- Cabinet-mounted inverter Adaptation Configuration (PACKING LIST-b): Adapted for four types of inverter, as specified below: INV-TT-TF-M125K – referred to as 125kW Inverter in this manual; INV-TT-TF-M80K – referred to as 80kW Inverter in this manual; INV-TT-TF-M50K referred to as 50kW-01 in this manual; INV-TT-TF-M50K – referred to as 50kW-02 in this manual. These types of inverter is directly installed on the battery cabinet body), which are exclusive supporting components for this scenario and shipped in combination with PACKING LIST-a;

Packing List-b			
			

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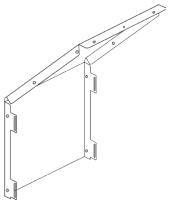
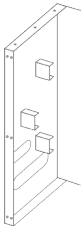
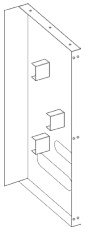
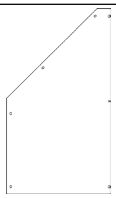
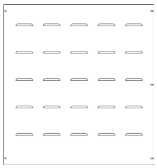
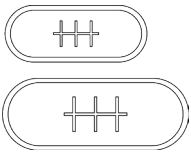
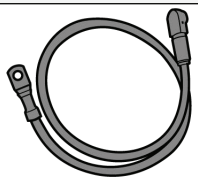
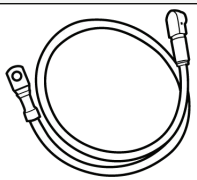
3000mm 3AWG Negative power cable ×2 pcs (black)	3000mm 3AWG Positive power cable × 2 pcs (red)	M4*10 Hex bolt ×22 pcs	Inverter support ×2 pcs
Cable Guard Shield ×1 set, including:			
			
Part 1 ×1 pc	Part 2 ×1 pc	Part 3 ×1 pc	Part 4 ×3 pcs
			
Part 5 ×1 pc	Part 6 ×1 pc	Cable grommet ×2 sets	

- Independent Cabinet-type PCS Adaptation Configuration (PACKING LIST-c): Adapted for independent cabinet-type PCS, that is, Hera PCS 125K+Hera STS 500K+Hera MPPT 200K

  This type of PCS is an independent cabinet and not installed on the

battery cabinet body), which are exclusive supporting components for this scenario and shipped in combination with PACKING LIST-a.

Packing List-c			
			
3000mm 1AWG Negative power cable ×1 pc (black)	3000mm 1AWG Positive power cable × 1 pc (red)		

3.4 Installing the Eye Bolts

1. Remove four M30*40 hexagon screws that are preset at the factory to prevent dust or other foreign objects entering the equipment. See the Figure.1.

2. Insert the four eye bolts into holes on the top of the machine and then turn them clockwise until they are secured firmly. See the Figure.2 and Figure.3.

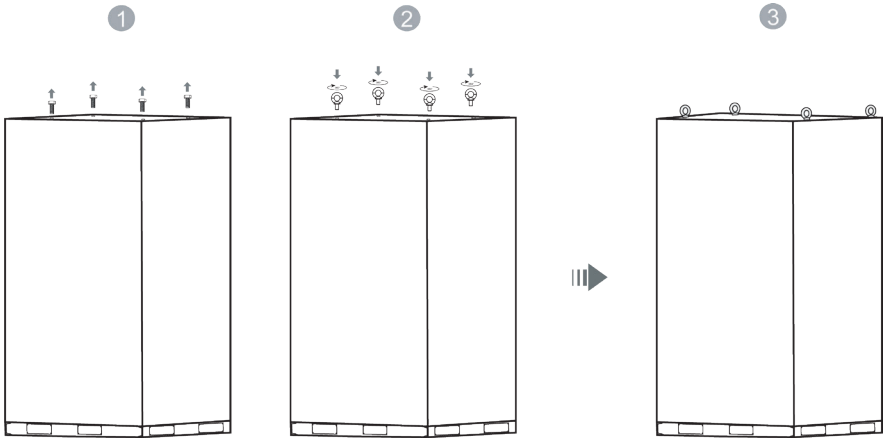


Figure.1 Figure.2 Figure.3

Warning!

Cabinet height exceeds 2 meters. Please take safety precautions when installing the Eye Bolts.

3.5 Hoisting

3.5.1 Hoisting Equipment

Warning!

• The hoisting personnel must be trained and qualified until they can take up the post.

• Use only approved lifting equipment to move the battery cabinet system.

Warning!

• Never operate the lifting equipment in bad weather, such as typhoon, heavy rain, thick fog,thunder and so on.

• Before hoisting, ensure that the crane and hoisting ropes meet the load-bearing requirements.

• Do not drag the cabinet when assembling or disassembling the hoisting equipment. Otherwise, the cabinet may be scratched.

• Do not lift or move the equipment after installing batteries into the energy storage system.

• Ensure that all doors of the equipment are closed and locked before hoisting.

3.5.2 Hoisting the ESS

Warning!

Remember to make sure that your device is connected to the lifting tool correctly and firmly before hoisting. Failure to do so may result in product damages, serious injury,even death.

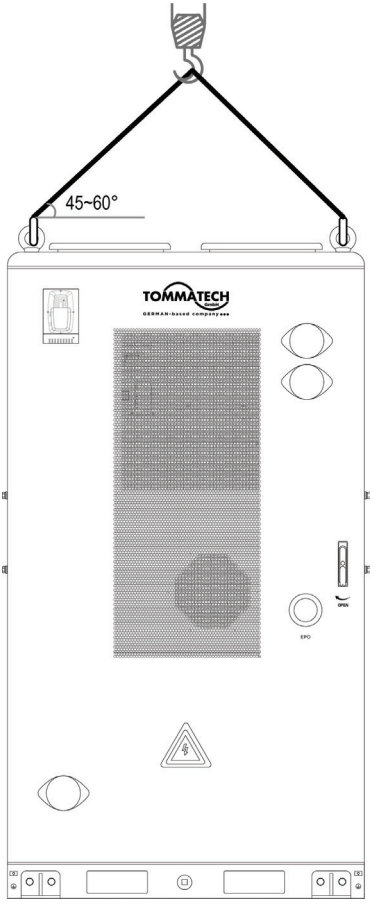


Figure.1

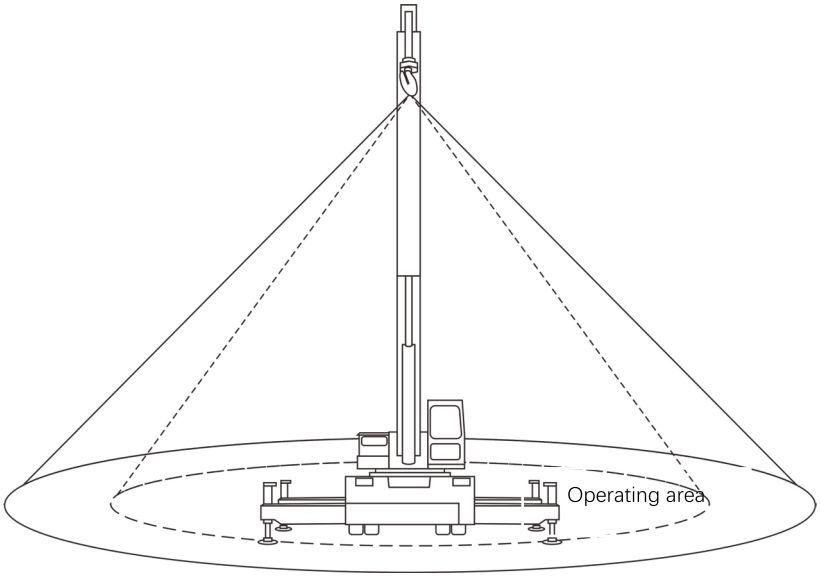


Figure.2

• Ensure that all sling connections are safe and reliable, and that the lengths of the slings connected to the corner fittings are equal. See the Figure.1

• Do not stand within 0.5-1m of the lifting area! During the whole lifting process, no one is allowed to stand under the boom or the work station. See the Figure.2

• A professional instructor is needed in the whole hoisting process.

• The length of the sling can be adjusted appropriately according to the actual requirements of installation site.

• During the lifting process, the devices must be stable and not skewed.

• Please lift the devices from the bottom.

• It is recommended to hoist the equipment from left to right or from

right to left to ensure the smooth hoisting.

• Ensure that the crane position is suitable, no long distance hoisting.

• The equipment should be hoisted vertically and should not be dragged on any surface during hoisting.

• Do not shake the crane in order to avoid sudden drop or shock against equipment.

• Hoisting should be handled gently, and the cabinet should fall slowly and smoothly to avoid shock against equipment.

3.6 Installation

Warning!

• Your product is delivered without full charge. It is recommended to make your equipment charged within three months.

• Assembly must be carried out in accordance with the design, technological requirements, regulations and relevant standards.

• The parts must be cleaned before assembly, free of burrs, flash edges, oxide, rust, sand, dust and stains.

• The parts shall not be bumped, scratched or rusted during assembly.

• Wear appropriate personal protective equipment at all times during any assembly operation on site. The following personal protective equipment is considered a minimum requirement:

-In a dry environment, wear S3 safety shoes.

-On rainy or wet ground, wear S5 safety boots.

-Wear flame-retardant work clothes.

-Wear flame-retardant work pants.

-Safety gloves.

3.6.1 Installation Requirements

3.6.1.1 Installation Personnel

• Only qualified professionals or trained personnel are allowed to install the equipment.

-Professionals:personnel who are familiar with the working principles and structure of the equipment, trained or experienced in equipment operations and are clear of the sources and degree of various potential hazards in equipment installation.

-Trained personnel: personnel who are trained in technology and safety have required experience,are aware of possible hazards on themselves in certain operations and are able to take protective measures to minimize the hazards on themselves and other people.

• Personnel who plan to install the equipment must receive all necessary safety precautions and local relevant standards.

•Only qualified professionals are allowed to remove safety facilities and inspect the equipment.

•Knowledge of electronic, electrical wiring and mechanical expertise, and be familiar with electrical and mechanical schematics.

• Understanding and complying with this document and other applicable documents.

3.6.1.2 Installation Site Requirements

Danger!

Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.

Danger!

Do not store any flammable or explosive materials in equipment area.

Danger!

Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices. Overheat may damage the equipment or cause a fire.

Warning!

Install the equipment in an area far away liquids. Do not install it under areas prone to condensation, such as under water pipe and air exhaust vent, or area prone to water leakage, such as air conditioner vents, ventilation vents, or feeder windows of the equipment room. Ensure that no liquid enters the equipment to prevent faults or short circuits.

Warning!

To prevent damage or fire due to high temperature, ensure that the ventilation vents or heat dissipation systems are not obstructed or covered by other objects while the equipment is running.

• The installation and usage environment must meet relevant international, the local laws and regulations.The user is obliged to protect the ESS against fire or other hazards.

• Do not install in low-lying areas. The installation level must be at least 300mm higher than the highest water level in the area.

• To protect the equipment from wildfires caused by high temperatures in summer, it should be free of vegetation and flammable plants within 3 meters of the surrounding area.

• Considering safety, the distance between the equipment and residential buildings should be more than 12m, and the distance between the equipment and schools, hospitals and other densely populated buildings should be more than 30.5m. If this safety distance cannot be met, a firewall should be built between the equipment and the building.

• The safe distance between the equipment and the production building shall comply with local fire codes or standards.

• Outdoor storage systems should be at least 10 feet away from boundaries, public roads, buildings, flammable materials, hazardous materials, high piles, and other hazards not associated with the grid infrastructure.

• The equipment should be installed in an environment free from the risk of explosion。

• During the installation, commissioning, and operation of the energy storage system, comply with the principle: the number of fire

extinguishers near each unit is not less than 2.

• The distance between the exhaust device of the energy storage system and the heating, ventilation, and air conditioning intakes, windows, doors, discharge platforms, and fire sources of other buildings or facilities shall be more than 4.6m.

•Reserve enough space for expansion according to the needs of the whole life cycle.

• Ensure that the equipment is installed in a clean, dry and well ventilated area with proper temperature, humidity ,altitude range and so on. Check for more data in the "***Technical Specifications***" section.

• Do not install energy storage systems in salt-damaged or polluted areas because they may be corroded. Energy storage systems can be used in the following or better environments:

-In a place where is 2000m far away from the coast. It is not recommended to use the energy storage system when it within 500m to 2000m away from the coast . The energy storage system cannot be used when the distance from the coast is less than 500m .

-In a place where the distance from heavy pollution sources, such as smelters, coal mines, thermal power plants, is more than 1500m at least.

-In a place where the distance from moderate pollution sources such as chemical, rubber, and electroplating is more than 1000m at least.

-In a place where the distance from light pollution sources such as food, leather, heating boilers, slaughter houses, centralized garbage dumps,

and sewage treatment stations is more than 500m at least.

• Keep the ESS out of the reach of children and away from daily working or living area, including but not limited to the following areas:studio, bedroom, lounge, living room, music room, kitchen,game room, room theater, sunroom,toilet,bathroom,laundry,and attic.

• Do not install the equipment in places without proper fire fighting facilities, or difficult for firefighters to access.

• Do not install the equipment in an easily accessible position because the temperature of the enclosure and heat sink is high when the ESS is running.

• Do not install the ESS on a moving object, such as ship, train, or car.

• Do not install the equipment in an environment with magnetic dust, volatile or corrosive gases, infrared and other radiations, organic solvents, conductive metal,or salty air.

• Do not install the equipment in an area conducive to growth of microorganism such as fungus or mildew.

• Do not install the equipment in an area with strong vibration, noise, or electromagnetic interference.

• Do not install the equipment in an position that may be submerged in water.

• Do not install the equipment near areas that may produce interfering gases, such as garbage dumps or chimney outlets.

3.6.1.3 Foundation Requirements

An inadequately constructed foundation can introduce substantial challenges to the installation of Energy Storage Systems (ESS), affecting the smooth operation of doors and the overall functionality of the system. Consequently, the foundation for an ESS must be meticulously designed and constructed in accordance with established standards. This ensures it fulfills the necessary requirements for mechanical support, cable routing, and future maintenance and overhaul operations. During the construction of the foundation, at least the following criteria must be satisfied:

1. **Surface Material:** Install cabinets on concrete or other non-combustible surfaces.
2. **Surface Condition:** Ensure the surface is level, secure, flat, with sufficient load-bearing capacity, and free of depressions or tilts.
3. **Concrete Specifications:** Default to C30 grade concrete with a thickness of 200mm if not specified.
4. **Extension Beyond Cabinet:** Extend each side 300mm beyond the cabinet edges.
5. **Reinforcing Steel Bars:** Use HRB400 (Grade III) steel bars, 12mm diameter, spaced 150mm apart.
6. **Anti-Corrosion Measures:** Apply anti-corrosion treatments to steel bars after rust removal as per standards.
7. **Bedding Layer:** Use a 100mm thick C15 grade bedding layer under the slab.

8. **Bearing Stratum:** Foundation bearing stratum must be undisturbed soil with a characteristic bearing capacity ⩾100Kpa.

9. **Dewatering Measures:** Implement dewatering during construction to prevent waterlogging in the foundation pit.

10. **Excavation Safety**: Ensure proper safety measures for excavation support.

11. **Water Prevention:** After excavation, the foundation pit must not be soaked in water. If disturbed by water, further excavation and replacement filling are required.

12. **Height Requirement:** The foundation must be higher than the local historical highest water level and at least 300mm above the ground level.

13. **Drainage System:** Build drainage facilities according to local geology and municipal drainage requirements to ensure no water accumulation occurs at the equipment foundation. It should meet the drainage needs for the largest rainfall in local history. Discharged water from the drainage system must be treated in accordance with local laws and regulations.

14. **Surface Leveling:** The levelness error between the equipment foundation and the cabinet contact surface must be ⩽3mm.

15. **Pit Compaction:** The bottom of the equipment foundation pit must be compacted and leveled before proceeding with construction.

16. **Weight Bearing:** The equipment foundation is configured according to the total weight of the equipment. If the bearing capacity of the foundation does not meet requirements, re-verification is necessary.

17. **Cable Management:** When building the foundation, consider the cable outlet of the energy storage system and reserve trenches or inlet holes accordingly.

18. **Sealing:** Both the reserved holes of the equipment foundation and the inlet holes at the bottom of the equipment should be sealed after installation.

Cable Trench Requirements

For energy storage cabinets adopting the bottom cable entry method, a trench must be pre-installed on-site since no side cable inlets are provided to prevent foreign objects from entering. The following requirements apply to the trenches:

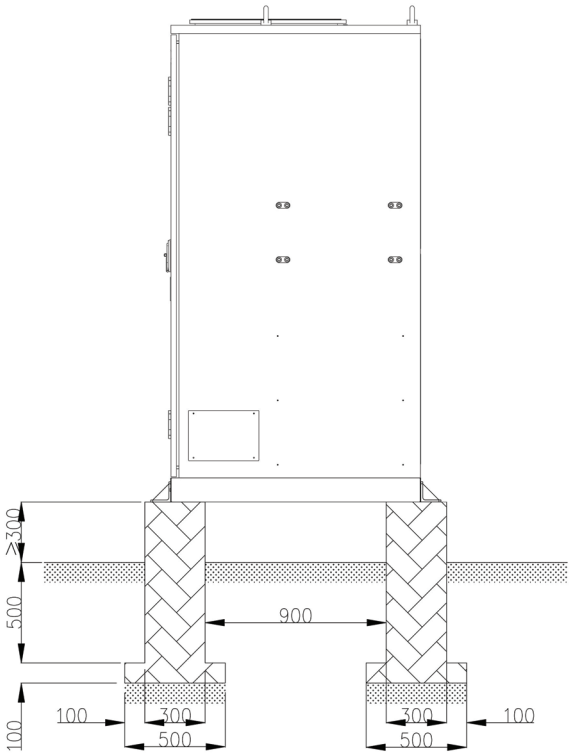
1. **Dust-proof and Rodent-proof Design:** To avoid foreign objects entering the energy storage cabinets, the trench must have an effective dust-proof and rodent-proof design.

2. **Waterproof and Moisture-proof Measures:** In order to prevent cable aging and short circuits that could impact the normal operation of the energy storage cabinets, the trench needs waterproof and moisture-proof measures.

3. **Sufficient Cable Bending Radius:** Considering the larger power rating of the energy storage cabinets and the requirement for thicker cables, the trench design must take into account the cross-sectional area of the cables and provide a sufficient bending radius.

Warning!

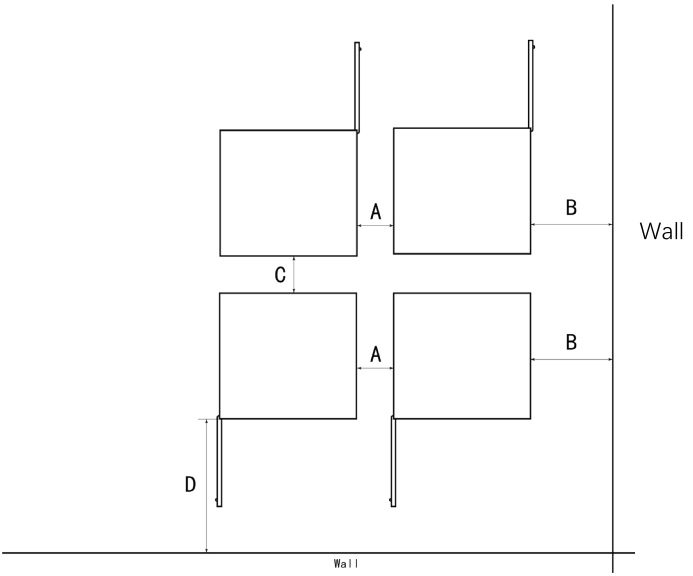
The foundation drawing cannot be used as the final construction drawing but only for reference. Users must verify the design parameters of the energy storage system foundation based on the installation environment, ground bearing capacity, geological conditions, and seismic requirements of the project site.



3.6.1.4 Installation Clearance Requirements

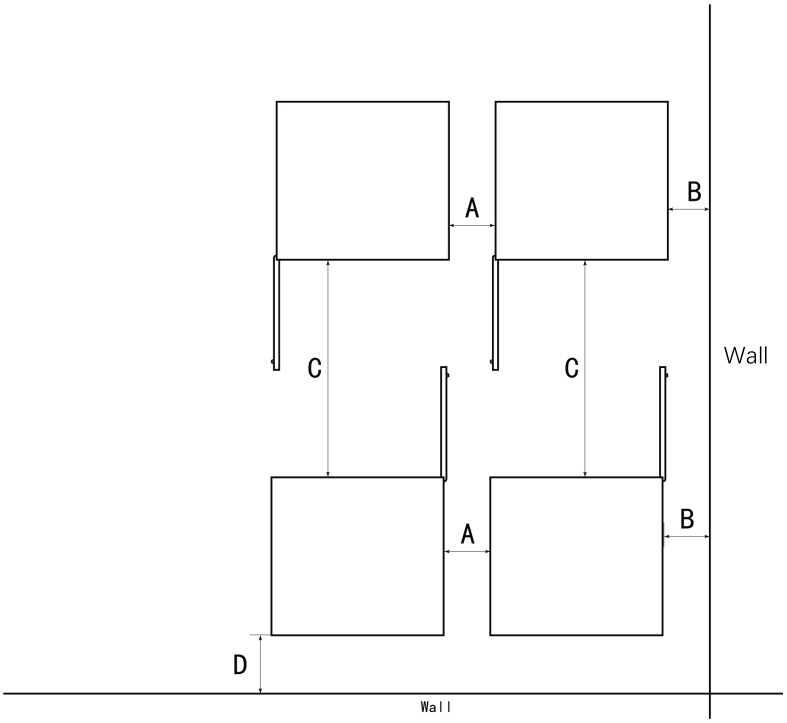
Danger!

No one is allowed to pass within 1.5m behind the cabinet, otherwise this person may be hurt by the explosion relief panel when explosion.



Installation clearance drawing (Plan view)-layout mode 1

Serial number	Distance (mm)
A	100
B	150
C	150
D	1500

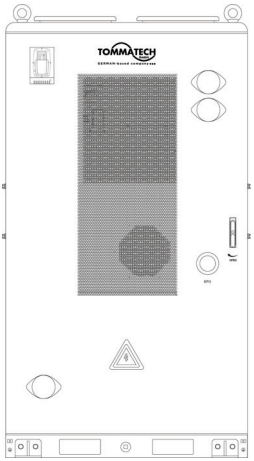


Installation clearance drawing (Plan view)-layout mode 2

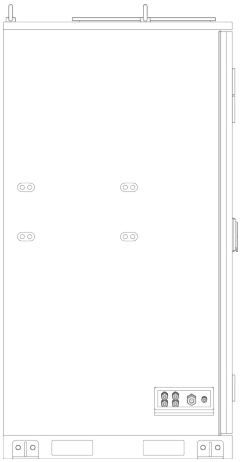
Serial number	Distance (mm)
A	100
B	150
C	3000
D	150

3.6.2 Fixing the ESS

To secure the cabinet, you need to install four cabinet mounting feet. There are two installation methods for the mounting feet: front-rear installation and left-right installation. You may choose either method for installation, as shown in the figure below.



Front-rear installation



Left-right installation

Although the installation positions differ between these two methods, the installation steps remain identical. Below, using the front-rear installation method as an example, the specific installation steps will be explained.

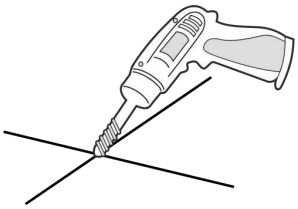


Figure.1

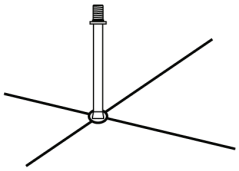


Figure.2

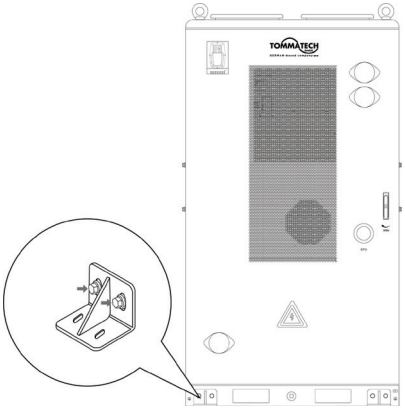


Figure.3

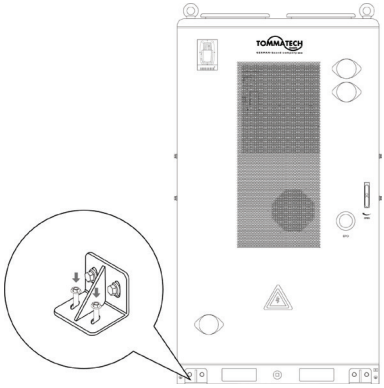


Figure.4

1. Place the cabinet at the designated position.

2. Position the four cabinet mounting feet at the corresponding locations on the cabinet (no screw fastening required).

3. Use a pen to mark circles on the floor corresponding to the holes in the cabinet mounting feet.

4. After marking, remove the cabinet mounting feet and drill holes at the marked circle positions. Drill holes, with 102-105mm depth, on the ground using an electric hammer.(Figure.1)

5. Pre-install the 8 expansion bolts (M12*80) with 140 N•m. (Figure.2)

6. Secure four cabinet mounting feet onto the cabinet using M16*40 Hex bolts (Figure.3).

7. Secure the cabinet to the ground by mounting nuts onto the expansion bolts. (Figure.4)

Note!

Due to the uncertainty of drilling accuracy and bit material, it is recommended to choose a drill bit from Φ20.5 to Φ21.

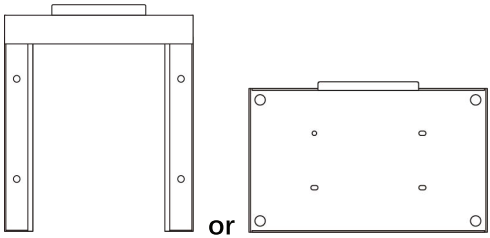
3.6.3 Mounting the Inverter (Optional)

The inverter compatible with this device can be installed on either the left or right side of the device according to actual requirements. The following installation steps are illustrated with the inverter mounted on the left side of the device as an example.

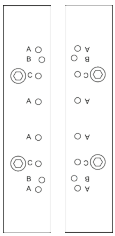
Before installing the inverter, remove the factory-installed fixing screws on the left side of the device first. Keep these screws properly, as they will be used for fixation in the subsequent steps.

Please know:

Wall mounting bracket supplied with the inverter



Inverter supports



- **Installation Steps for 80kW Inverter**

Key points:

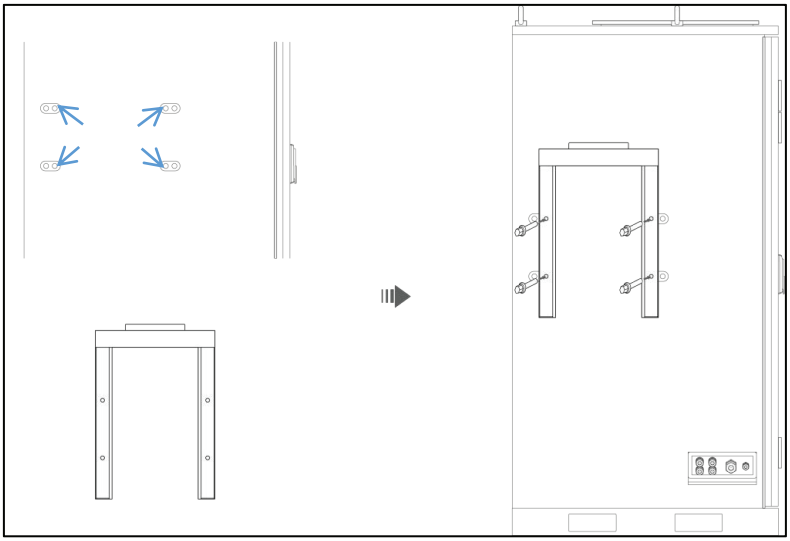
1. Inner screw holes;
2. Use wall mounting bracket only.

Step 1:

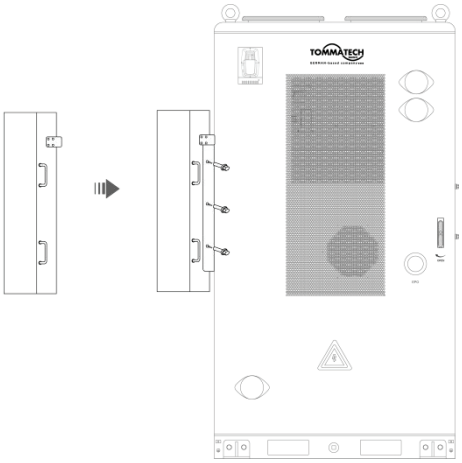
Fasten the wall mounting bracket to the designated position of the device with the factory-installed fixing screws.

Step 2:

After the wall mounting bracket is securely fastened, hoist the inverter and place it on the bracket (Caution: Heavy equipment! Ensure coordination between manual labor and forklift operation).



Step 3: Secure the inverter with screws supplied with the inverter on both sides of the bracket, 3 screws on each side, 6 screws in total for both sides.



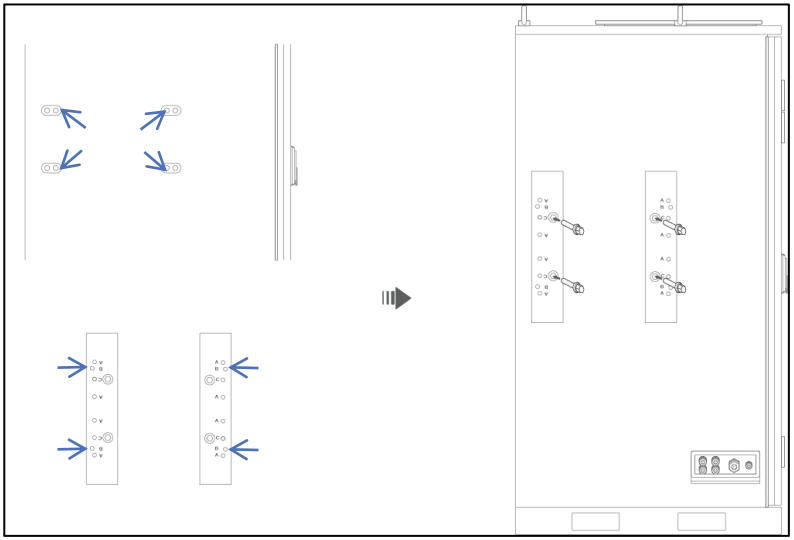
- **Installation Steps for 125kW Inverter**

Key points:

1. Inner screw holes;
2. Use inverter supports and wall mounting bracket;
3. Large screw holes orient towards the inner side;
4. Screw holes marked B

Step 1:

Fasten the two inverter supports to the device in the direction shown in the diagram using the factory-installed fixing screws. Ensure that the four large screw holes of the supports are all oriented towards the inner side.

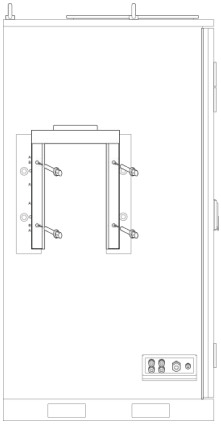


Step 2:

Fasten the wall mounting bracket to the screw holes marked B on the inverter supports installed in Step 1, using the factory-installed fixing screws.

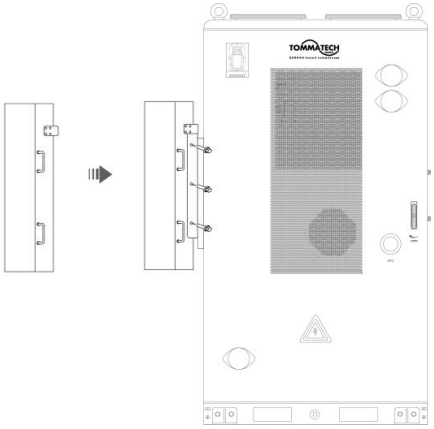
Step 3:

After the wall mounting bracket is securely fastened, hoist the Inverter and place it on the bracket (Caution: Heavy equipment! Ensure coordination between manual labor and forklift operation).



Step 4:

Secure the Inverter with screws supplied with the Inverter on both sides of the bracket, 3 screws on each side, 6 screws in total for both sides.



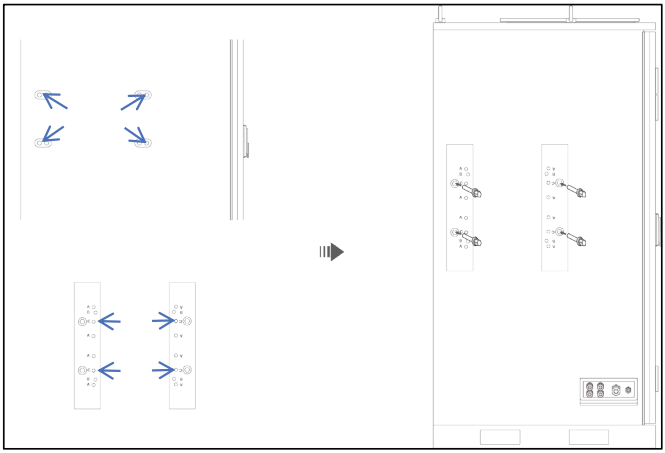
- **Installation Steps for 50kW-01 Inverter**

Key points:

1. Outer screw holes;
2. Use inverter brackets and wall mounting bracket;
3. Large screw holes orient towards the outer side;
4. Screw holes marked C

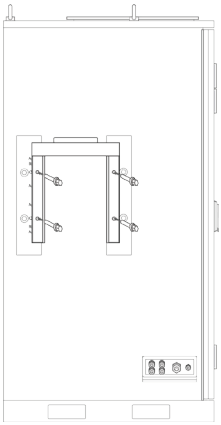
Step 1:

Fasten the two inverter supports to the device in the direction shown in the diagram using the factory-installed fixing screws. Ensure that the four large screw holes of the supports are all oriented towards the outer side during installation.



Step 2:

Fasten the wall mounting bracket supplied with the inverter to the screw holes marked C on the inverter supports installed in Step 1, using the factory-installed fixing screws.

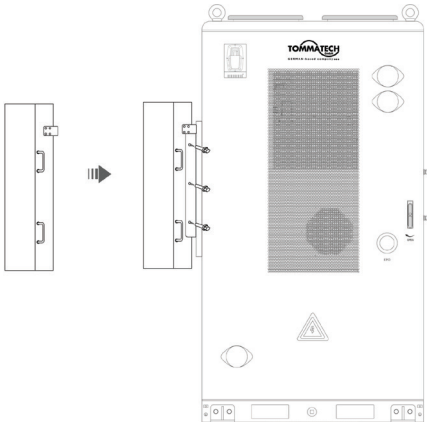


Step 3:

After the wall mounting bracket is securely fastened, hoist the inverter and place it on the bracket (Caution: Heavy equipment! Ensure coordination between manual labor and forklift operation).

Step 4:

Secure the inverter with screws supplied with the inverter on both sides of the bracket, 3 screws on each side, 6 screws in total for both sides.



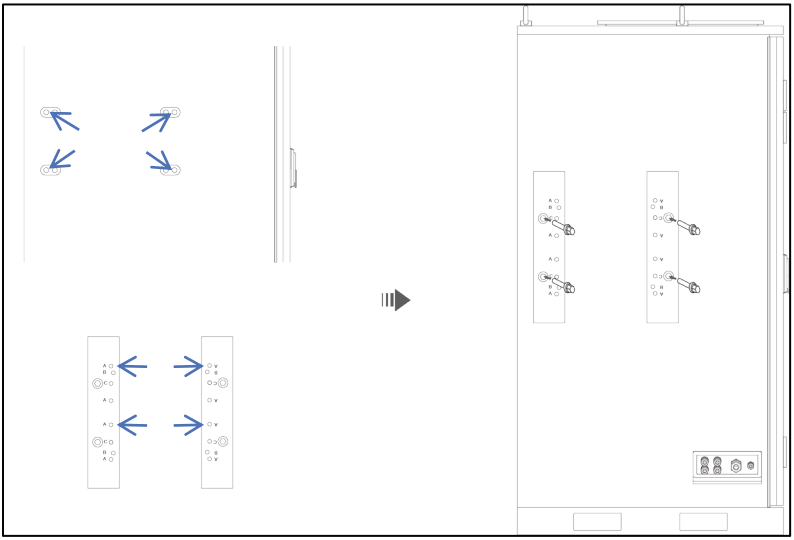
- **Installation Steps for 50kW-02 Inverter**

Key points:

1. Outer screw holes;
2. Use inverter supports and wall mounting bracket;
3. Large screw holes orient towards the outer side;
4. Screw holes marked A

Step 1:

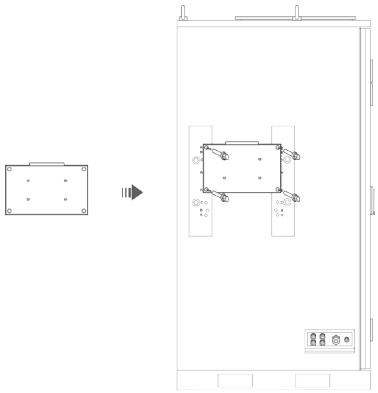
Fasten the two inverter supports to the device in the direction shown in the diagram using the factory-installed fixing screws. Ensure that the four large screw holes of the supports are all oriented towards the outer side.



Step 2:

Fasten the wall mounting bracket to the screw holes marked A on the inverter supports installed in Step 1, using the factory-installed fixing

screws.

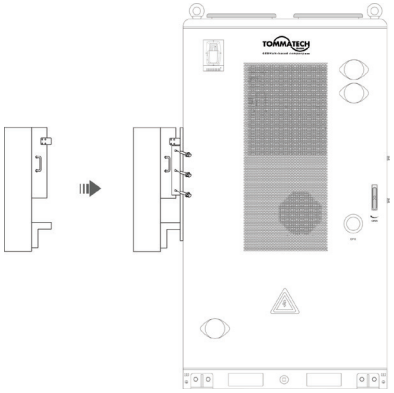


Step 3:

After the wall mounting bracket is securely fastened, hoist the Inverter and place it on the bracket (Caution: Heavy equipment! Ensure coordination between manual labor and forklift operation).

Step 4:

Secure the Inverter with screws supplied with the Inverter on both sides of the brackets, 3 screws on each side, 6 screws in total for both sides.



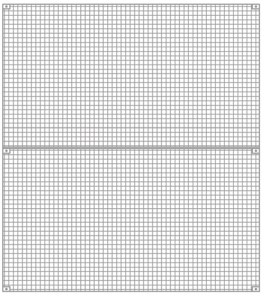
3.6.4 Attaching the Insect Screen

- Function

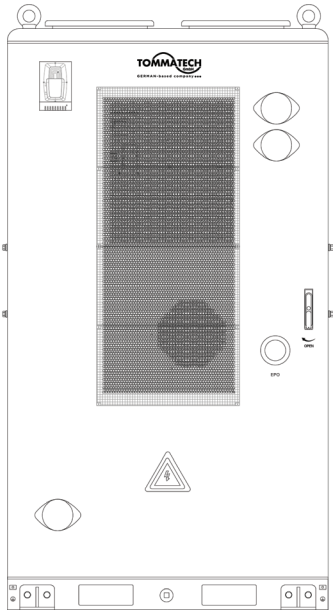
It effectively blocks catkins, large flying insects, and other foreign objects from entering the air conditioner, ensuring the unit's heat dissipation performance and stable operation.

- Installation

Align the insect screen with the air inlet/outlet of the cabinet air conditioner. Secure it in place by the magnetic points on both sides of the screen.



x2

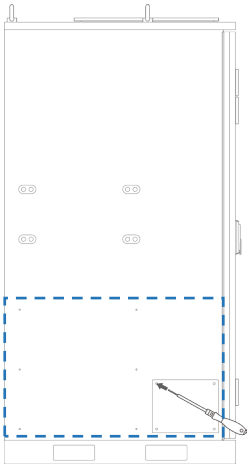


3.6.5 Mounting the Cable Guard Shield

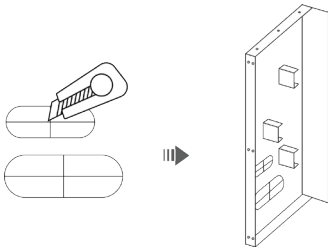
For enhanced cable protection, the cable guard shield can be installed. All screws used in this section shall be the M4 hex bolts supplied with the device. The following installation steps are illustrated with the cable guard shield mounted on the left side of the device as an example.

- **Preparatory Work**

- Remove the 10 built-in screws on the cabinet (the 10 screws indicated by the dashed box in the figure) and the cover plate of the cable outlet. Keep these built-in screws properly, as they will be used for fixation in the subsequent steps.

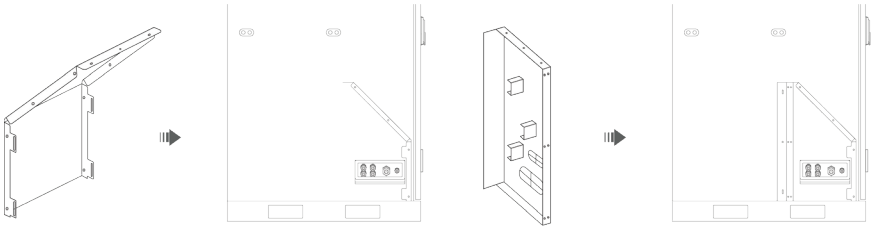


- Slit the center of the cable grommet with a cutting tool according to the cable diameter. Press the preprocessed cable grommets into the oval mounting hole of the cable guard shield.



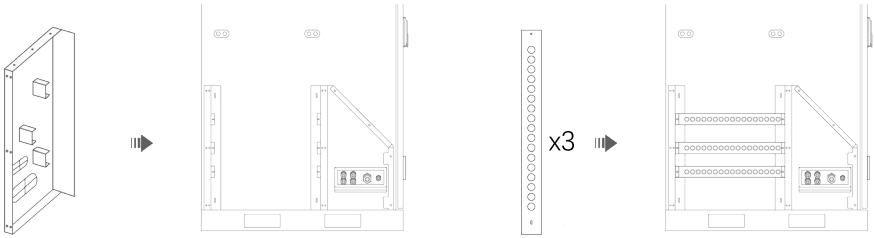
- **Installation Steps**

1. Use the removed built-in screws to fasten Part 1 to the cabinet. Pre-fasten Part 1 and Part 3 first, then fully tighten the three M4×10 screws which are supplied with the accessory kit at the top overlapping section of Part 1 and Part 3.



❶ ❷

2. Install Part 2 and Part 4. Fasten Part 2 with the built-in screws removed from the cabinet, and fasten Part 4 with the M4×10 screws from the accessory kit. It is noted to install three units for the Part 4.



❸ ❹

3. Perform the electrical connection. Cable ties are recommended to secure and organize cables. The specific wiring procedures and relevant requirements shall comply with the provisions in Chapter 4.

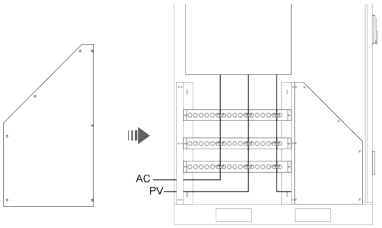
Notes:

- Conduct the following steps only after the wiring is completed;

- It is recommended that the customer route the AC and PV cables as shown in the figure, and the customer may also determine the routing of AC and PV cables freely according to actual conditions;

- For the specific wiring method of the inverter follow the original instruction manual supplied with the inverter.

4. Install Part 5 and Part 6, then fasten them with the M4×10 screws from the accessory kit. When installing Part 6, ensure the air vent faces downward for dustproof performance.



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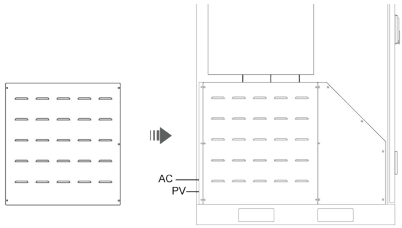
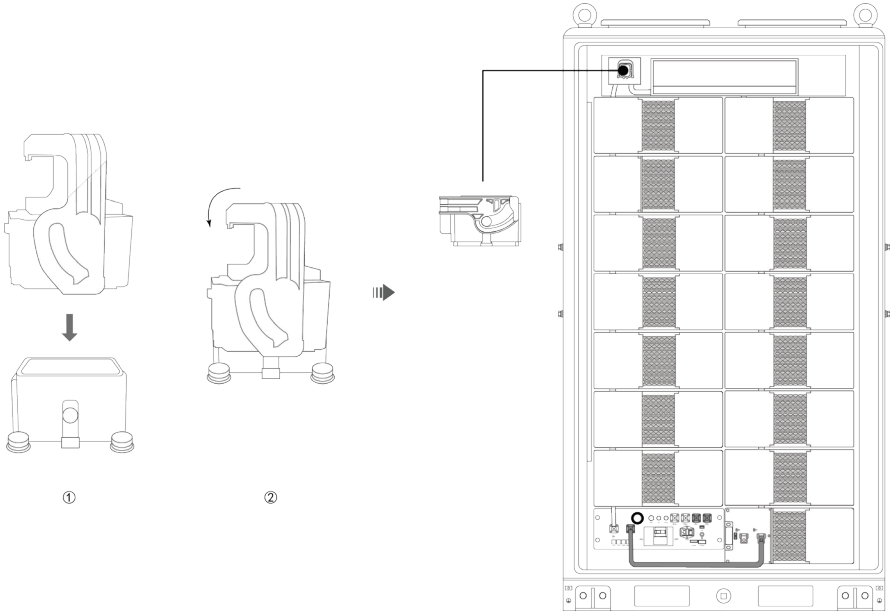


7

3.6.6 Installing the MSD

After all cables have been connected correctly and firmly, remember to plug in the MSD.



4 Electrical Connection

4.1 Preparation before Connection

Notice!High voltage! Shock!

• Do not contact live parts directly without protection!

• Before installation, ensure that there is no voltage on the AC side and DC side.

• Do not place the equipment on a flammable surface.

Warning!

• Sand and moisture infiltration can damage the electrical equipment in the container or affect its operating performance!

-Do not perform electrical connections during sandstorms or when the relative humidity of the surrounding environment is greater than 95%.

-Make electrical connections when there is no wind or sand and when the weather is clear and dry.

• Before connecting cables, check that the polarity of all input cables is correct. Do not pull wires and cables forcibly during electrical installation.

• Otherwise, the insulation performance may be affected. Make sure all cables and wires have enough room to bend. Take necessary auxiliary measures to reduce the stress on cables and wires.

• After each connection is complete, carefully check whether the connection is correct and secure.

4.1.1 Cable Requirements

When wiring, cables are supposed to meet the following requirements:

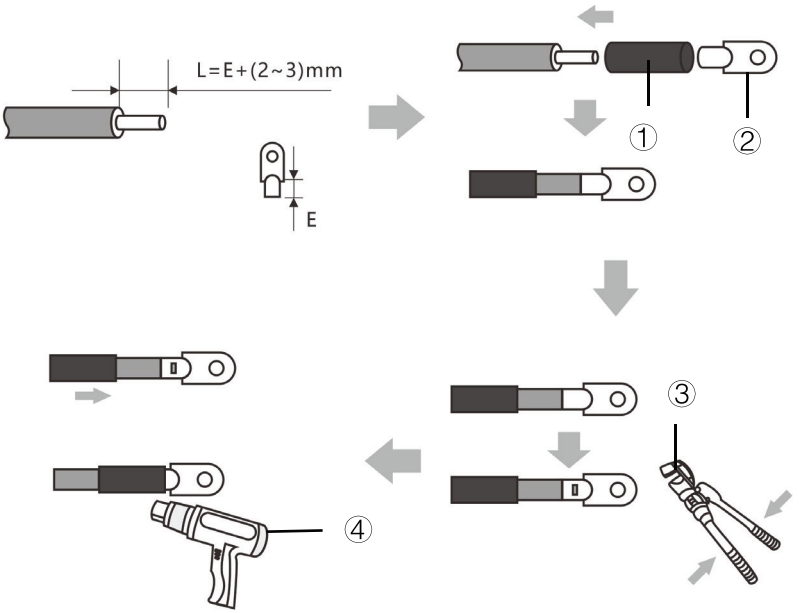
- Sufficient current-carrying capacity. Factors that can influence this capacity are shown as follows:

-environment condition;
-the type of insulated materials of conductors;
-cable routing;
-material and cross-section of cables;

- Suitable diameter and length of cables
- Correct specification and material of cables used for DC input
- Correct specification and material of cables used for AC input
- Only use fire-resistant cables.

How to crimp an OT or DT terminal?

NO.	Description	NO.	Description
1	Hot air duct	3	Hydraulic pliers
2	OT/DT	4	Heat Gun



4.1.2 Opening the Door

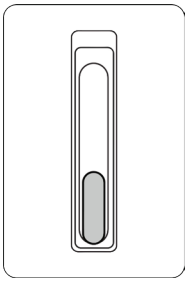


Figure.1

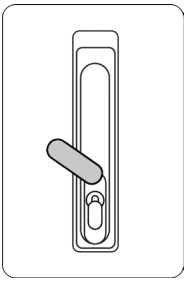


Figure.2

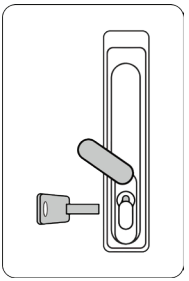


Figure.3

1. The door of the cabinet is in locked state.See the Figure.1
2. Move upward the cover above the keyhole.See the Figure.2
3. Insert the door key and turn it clockwise to eject the handle.See the Figure.3.
4. Rotate the door handle following the direction marked by the indicator arrow on the door to unlock and open the door.

4.2 Cable Connection

Danger!

All electrical connections must be made when the equipment is completely powered off.

Danger!

Note the polarities when installing batteries. Do not connect the positive and negative poles of a battery or battery string together. Otherwise, the battery may be short-circuited.

Danger!

Do not smoke or have an open flame around batteries.wear personal protective equipment and and use dedicated insulated tools to avoid electric shocks or short circuits.

Warning!

• Equipment damage caused by incorrect connections is not covered by the product warranty.

• Only qualified electrical technicians are allowed to connect cables.

• Operation personnel must wear proper PPE when connecting cables.

Warning!

When connecting cables, do not place installation tools, metal parts, or sundries on the ESS. After the connection, clean up objects around the area.

Caution!

• Do not connect two or more cables to the positive or negative power port a battery in parallel.

• Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.

Notice!

When connecting to inverters or being in parallel mode, please use cables provided in the unpacking list. If other cables must be used in special cases, ensure they meet relevant standard.

4.2.1 Grounding

Warning!

Ensure that the ground cable is securely connected. Otherwise, electric shocks may occur.

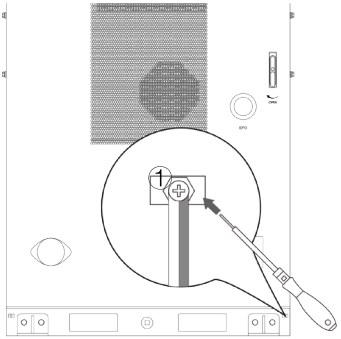
Note！

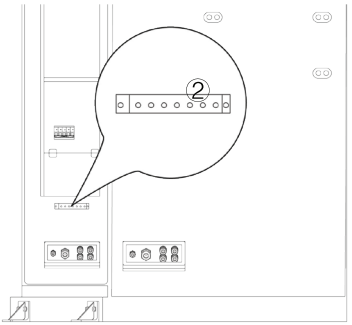
● The grounding point at the AC output port is used only as a protective earthing equipotential bonding point, and cannot substitute for the grounding point on the enclosure.

● It is recommended that silicone grease or paint be applied around the ground terminal after the ground cable is connected.

●After completing the grounding connection, the grounding resistance must be measured. The specific grounding resistance value should comply with the relevant national/local standards and regulations.

●Implementation of either protective earth or auxiliary power grounding is mandatory.



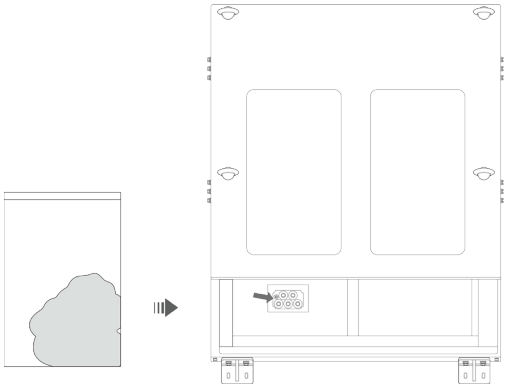


No.	Type	Cable (mm²)	Terminal	Torque (N•m)
①	Protective earth	30~50	M8 OT/DT terminal	25
②	Auxiliary power grounding	5-6	M5 OT terminal	6

4.2.2. Multi-Unit Wiring

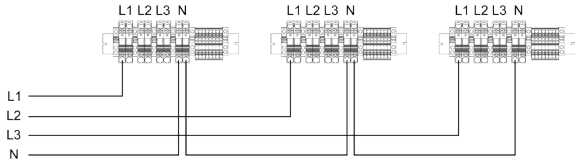
Note！

- After wiring, pull out cables slightly to prove that they are connected securely.
- A Orion Outdoor 241kWh system,as a master, can be in parallel with other 9 Orion Outdoor 241kWh systems at most.
- After completing the wire connection, use fire-resistant mud to seal the cable pass-through holes. It is noted that only cable holes through which cables pass need to be sealed with fire-resistant mud.

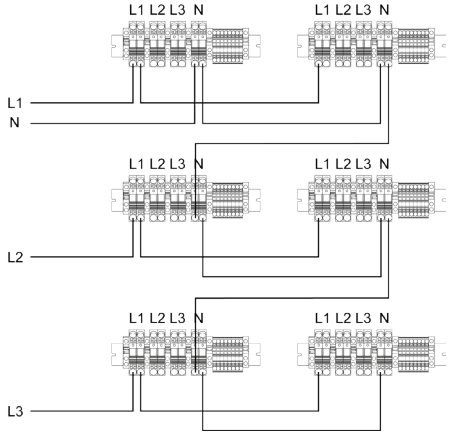


1. Auxiliary power

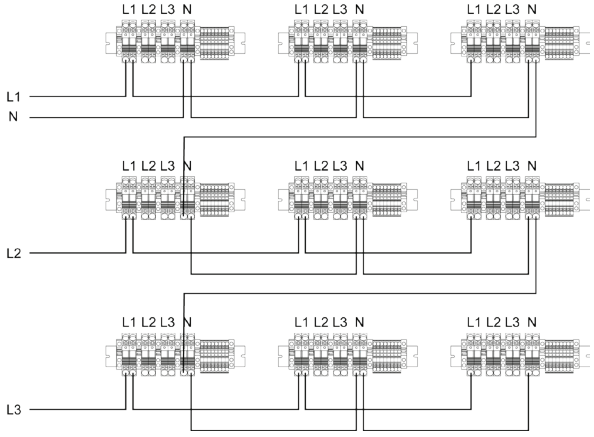
Three Orion Ooutdoor 241kWh systems are in parallel:



Six Orion Ooutdoor 241kWh systems are in parallel:



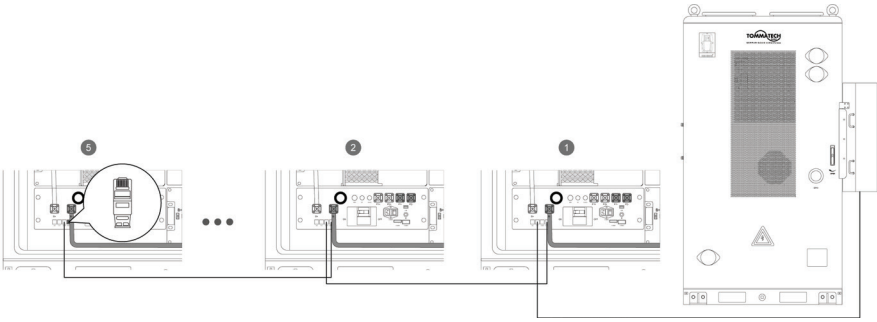
Nine Orion Ooutdoor 241kWh systems are in parallel:



Step	Port	Description	Recommendation
Step 1: Attach to auxiliary power	L1*	Connecting with the L1 line of exterior power supply, 3P-380V/400V	Insulated Tube Ferrules
	L2*	Connecting with the L2 line of exterior power supply, 3P-380V/400V	
	L3*	Connecting with the L3 line of exterior power supply, 3P-380V/400V	
	N	Connecting with the N line of exterior power supply	

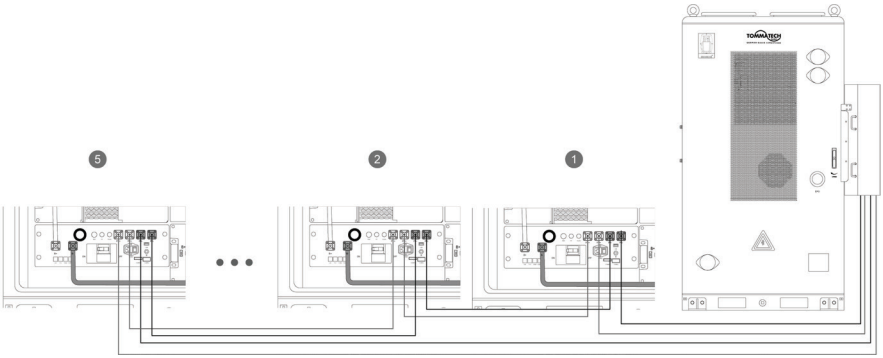
*The terminal's current carrying capacity is 65A. When multiple units are connected in parallel, the single-phase load should not exceed 3 units. Refer to the wiring diagram for details.

2. Communication cable



When two or more battery cabinets are operated in parallel, the terminal resistor shall be connected to the final BMS.

3. Power cable



4. Connecting with the Inverter

- **80KW inverter as an example**

Notice!

All cables connected from the BMS to your inverter are advised to thread through the cable cover in the figure.1.

The wiring principle remains the same whether the inverter is mounted on the left or right side. When selecting cable entry ports, choose the nearest one and maintain neat, untangled wire routing, avoiding any crossover of cables.

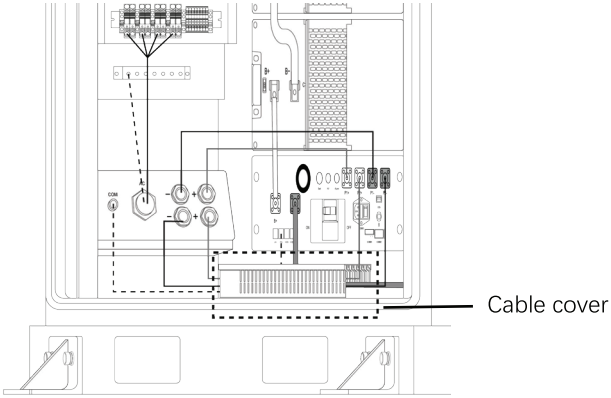


Figure.1

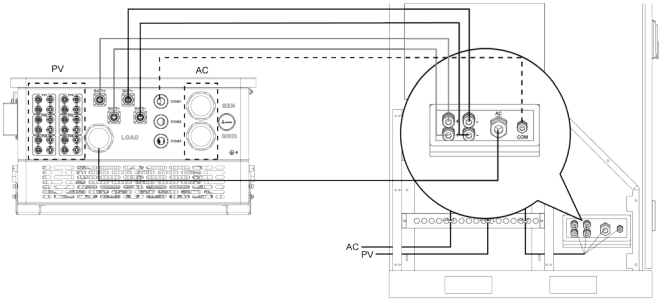


Figure.2

- **125KW PCS as an example**

Fasten the OT terminals of the positive and negative power cables to the BAT input terminals of the PCS, following the polarity markings. Then connect the BMS port of PCS and the corresponding interface of the cabinet control box with the communication cable. If multiple of cabinets are connected in parallel, only the control box of master cabinet needs to communicate with PCS.

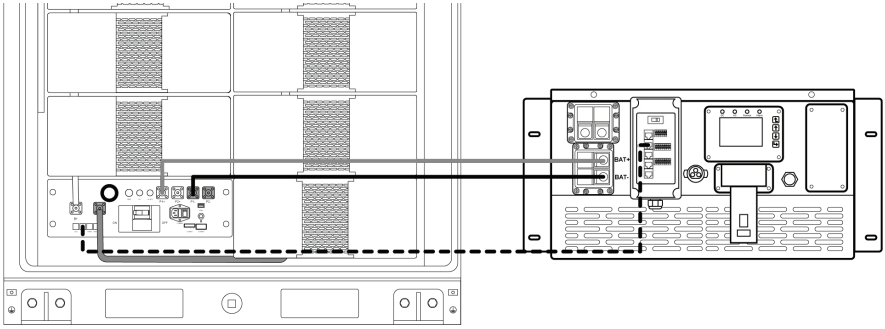


Figure.3

5 Operation Instructions

5.1 Powering on the Equipment

5.1.1 Check Before Power-On

General Check

No.	Check Item	Acceptance Criteria
1	Appearance	• The equipment is intact and free from rust or paint flake-off. If the paint flakes off, repair the damaged paint. • The labels on the device are clear. Damaged labels must be replaced.
2	Cable appearance	• Cable sheathings are properly wrapped and not damaged. • Cable hoses are intact.
3	Cable connection	• Cables are connected in the designed positions. • Terminals are prepared as required and securely connected. • Labels on both ends of each cable are clear and specific, and attached in the same direction.

4	Cable routing	• Cables are neat and tidy. • Cable tie joints are evenly cut without burrs. • Cables are placed properly and with slack at bending points to avoid stress. • Cables are routed neatly without twists or crossovers in the cabinets.

Cabinet

No.	Check Item	Acceptance Criteria
1	Installation	• The installation meets the design requirements. • The cabinet is level, and each door opens normally.
2	Appearance	• The cabinet surface is free from cracks, dents, and scratches. If the paint flakes off, repair the damaged paint.
3	Cabinet grounding	• Ground the cabinet correctly according to the requirements of the power distribution system.
4	Accessory	• The number and positions of accessories installed meet design requirements.
5	Label	• All labels are correct, clear, and complete.

Interior

No.	Check Item	Acceptance Criteria
1	Cable	The bolts for installing the cables are tightened and the cables are not loose.
2	Cable hole sealing	Cable holes are sealed.
3	Components	All components are intact.
4	Foreign object	Foreign objects such as tools and remaining materials are cleared.
5	Meter	The meter is free from cracks, dents, and damage, and its buttons are normal.
6	Cabinet grounding	The ground conductor is securely connected to the ground terminal of the cabinet.

5.1.2 Power-On Operations

Danger!

Wear insulated gloves and use insulated tools to prevent electric shocks or short circuits.

Caution!

• During the power-on procedure, monitor the system for faults. If you detect any faults, power off the ESS, rectify the faults, and then continue with the procedure.

• If batteries are fully discharged or over-discharged during system installation and commissioning, charge the batteries promptly to prevent damage due to over-discharge.

• If the ESS has not been used for six months or longer after being installed, it must be checked and tested by professionals before operation. If a circuit breaker in the ESS trips, check the corresponding load side.

• Turn on the circuit breaker only after you have confirmed that there is no short circuit or other fault to prevent the fault from spreading and causing safety risks.

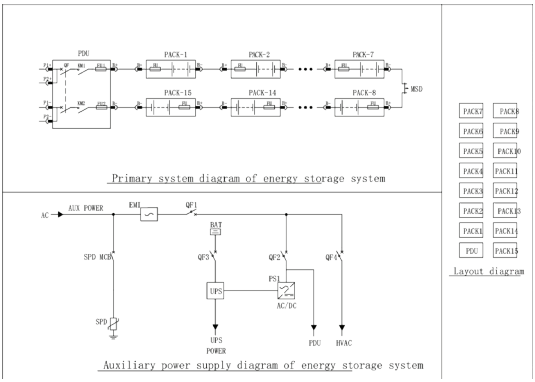
Notice!

Before power-on and long-term operation, remove the desiccants from the ESS and dispose of them according to the applicable local waste disposal act. If the ESS is powered off immediately after being powered on,

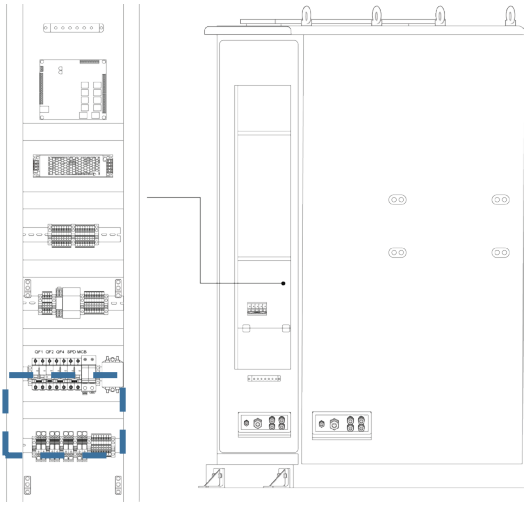
keep the desiccants in the ESS.

Notice！

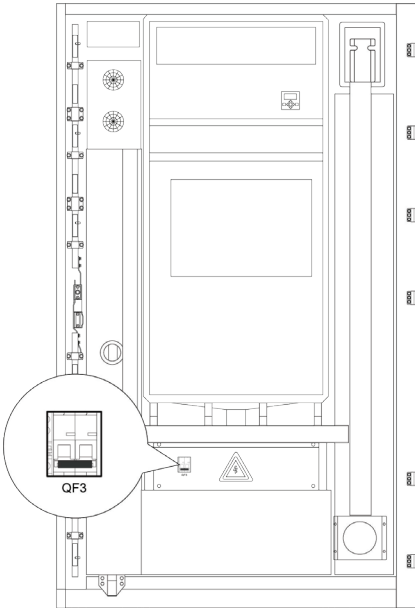
Press the emergency stop switch to stop the ESS only in emergency situations.



1. Turn on circuit breakers **QF1, QF2, QF4,** and the **SPD MCB** in the power distribution area.

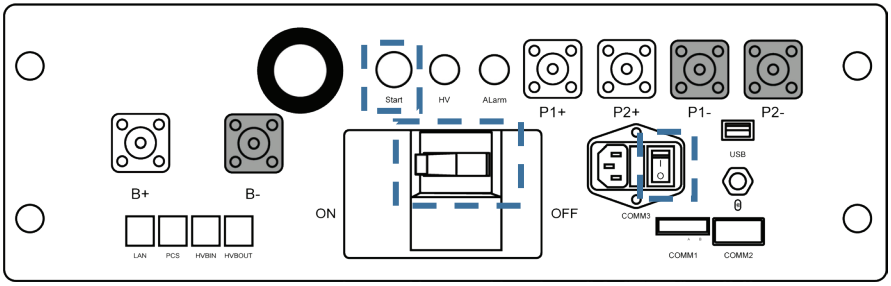


2. Turn on circuit breaker **QF3** of UPS.



3. Turn the COMM3 to the "**I**" position and circuit breaker to the "**ON**" position on the BMS.

4.Press the **start button** on the BMS.



5.2 Powering Off The Equipment

Notice!

Press the emergency stop switch to stop the ESS only in emergency situations.

1.Turn off circuit breakers **QF1, QF2, QF4**, and the **SPD MCB** in the power distribution area.

2.Turn off circuit breakers **QF3** of UPS.

3.Press the **start button** on the BMS again

4.Turn the COMM3 to the "**O**" position and circuit breaker to the "**OFF**" position on the BMS.

6 Maintenance

6.1 General Maintenance

Danger!

- Servicing should be performed or supervised by professional personnel.
- Wear personal protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits
- Do not smoke or have an open flame around batteries.
- Do not use wet cloth to clean exposed copper bars or other conductive parts.
- Do not use water or any solvent to clean batteries.
- Charge your equipment in 48 hours after over-discharge.

Warning!

- Do not maintain batteries with power on. Before moving or reconnecting the equipment, disconnect the mains and batteries and wait for five minutes until the equipment powers off. Before maintaining the equipment, check that no hazardous voltages remain in the components to be maintained by using a multi-meters.
- Do not wear jewelry, watches and other metal jewelry when servicing.

Caution!

- Do not connect two or more cables to the positive or negative power port of a battery in parallel.

- Place a warning sign indicting that switch must not be turned on at the position where the switch resides.
- Use a electroscope of a proper voltage level to check whether the equipment is energized and ensure that the equipment is completely powered off.
- Before performing maintenance or repair, securely connect the loop to be repaired to the main ground loop using a ground cable.
- After the maintenance or repair is complete, remove the ground cable between the loop that has been maintained and the main ground loop.
- Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.
- Cables should be inserted and removed in accordance with regulations. Violent or brute force operations are prohibited.
- After the maintenance is complete, clean the tools and materials in time, and check whether metal objects remain inside or on the top of the product.
- When replacing batteries, replace with the same type of spare parts.
- Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
- If you have any questions about the operation and maintenance of this product, please contact the customer service center. Do not operate without authorization.

6.2 Maintenance Schedule

6.2.1 Quarterly Maintenance

Maintenance Category	Maintenance Action	Expected Result
Safety inspection	Check that EPO and switches to shut off the equipment can work normally	●EPO and switches can work normally
Air conditioner	● Check the radiator. ● Clean the filter*1 .	● The radiator can direct the heat out of the air conditioner efficiently. ● The filter is clean and free from blockage.
Cabinet	Perform the visual inspection: ● Rust condition ● Settings	●There is no obvious paint peeling or rust. ●Meet technical requirements in normal run.
Pressure relief	Perform the visual inspection:	● There is no obvious

window*2	● Appearance ● Rust condition ● Foreign objects/Ice and snow	paint peeling or rust. ● Pressure relief windows are not damaged. ● There is no foreign object, ice, or snow on the top.
Battery pack	Perform the visual inspection: ● Temperature and humidity ● Run condition	● Check that there is no obvious damage, paint peeling off, or rust on the appearance. ● Check that the temperature and humidity around batteries are in reasonable ranges ● Check whether voltage and current are in reasonable ranges when in run.

Notes:

1. You are advised to clean the filter after each occurrence of a sandstorm and before summer in sandstorm-stricken areas. In other areas, clean the filter according to the actual situation and ensure that the filter or condenser is not blocked. The recommended tool is high pressure water gun.

2. In areas with severe sandstorms or heavy ice or snow, perform maintenance based on the actual situation. Ensure that there is no foreign object, ice, or snow on the pressure relief windows. Clean the foreign objects, ice, or snow in the specified area to avoid damaging the pressure relief devices due to improper operations.

6.2.2 Semi-annual Maintenance

Maintenance Category	Maintenance Action	Expected Result
Outside the cabinet	Perform the visual inspection: ● Inflammable materials.	There is no any inflammable objects around the cabinet.
Cabinet	Perform the visual inspection: ● Appearance ● Rust condition ● Door lock ● Vent ● Fasteners ● Settings ● Drain outlet	● There is no obvious paint peeling or rust. ● The door locks are not damaged. ● There is no dust at the vents. ● There are no insects, rodents, snakes or other animals. ● All fasteners are secured firmly. ● All technical settings can support the normal run of the

		equipment. ● Clear the drain outlet with a screwdriver, steel rod or wooden stick to prevent clogging caused by moss, dust and other foreign debris.
Cables	● Check whether cables are securely connected. ● Check whether cables are damaged, especially whether the cable sheath that contacts a metal surface is damaged. ● Check whether water is entering into the ESS ● Check whether any insulating tape	● Cables are securely connected. ● No damages are found on the cables. ● No water enters the equipment and contacts with cables. ● There are no insulating tape is peeling off. ● Cable routing is performed correctly and reasonably

	on terminals is not detached. ● Check whether all cables are routed correctly.	
Grounding reliability	● Check whether the PE cable is securely connected.	The PE cable is securely connected.
Battery pack	Perform the visual inspection: ● Appearance ● Rust condition ● Foreign objects ● Fan	● The coating is not peeling or scratched. ● There is no obvious rust. ● There is no foreign objects around the batteries. ● The fan rotates properly without excessive noise.

Maintenance Category	Maintenance Action	Expected Result
System	Perform the visual inspection: ● Appearance ● Temperature and humidity ● Vent ● Dust ● Rust	● There is no obvious deformation inside the cabinet . ● Temperature and humidity are in normal ranges. ● There is no dust at the vents. ● There is no obvious noise when interior devices are in normal run. ● There is no rust inside the cabinet.
Alert labels	● Check the warning labels.	● All warning labels are visible, and no damages or stains on them.
Overload protection devices	Perform the visual inspection:	● These devices including fuse,SPD are secured firmly.

	● SPD ● Fuse	
Battery pack	Perform the visual inspection: ● Appearance ● Temperature and humidity ● Vent ● Dust ● Rust ● Cable	● There is no obvious deformation on the battery. ● Temperature and humidity are in normal ranges when in run. ● There is no dust at the vents. ● There is no obvious noise when batteries are in run. ● There is no rust inside the batteries. ● Cable are connected correctly between battery and battery, battery and other devices.
Fire suppression system	Perform the visual inspection: ● Fire suppression	● No any obvious damages on the appearance.

	devices ● Cables	● The settings of all the fire suppression devices can meet relative requirements. ● There is no obvious obstacles when the fire suppression devices are in run. ● Cable are connected correctly and securely. ● There are no insulating tape is peeling off.

*Gas detector: LEL detector is recommended to be zeroed once every six months and calibrate once 1 year; The CO detector is recommended to be zeroed once every 1 year and calibrated once every 2 years. Remote/field zeroing is possible.

7 Fire suppression system

7.1 Heat Detector

The heat detector monitors temperature and provides a voltage output proportional to the external air temperature by using either a dual thermistor network. One thermistor is exposed to give good thermal contact with the surrounding air while the other thermistor is thermally insulated and it emits red light to reminder the operator when detecting abnormality.

- Ideal for environments that are dirty or smoky under normal circumstances
- Wide operating voltage.

7.2 Smoke Detector

The smoke detector uses the scattered light principle to detect smoke entering the chamber located within the detector housing.

- Responds well to slow burning, smouldering fires
- Unaffected by wind or atmospheric pressure
- Flashing LED and magnet operated test switch option on selected detectors.
- Alarm indicator:Clear light emitting diode (LED) emitting red light

7.3 Gas Detector

The sensors are used to accurately measure carbon monoxide concentrations in the environment.This module adopts RS485 mode output and alarm point output, which is convenient for users to use and has good consistency and stability.

- Long life
- High stability
- High precision and sensitivity
- Modular design and easy maintenance

7.4 Aerosol Fire Suppression Device

This is a aerosol extinguishing device. When a fire occurs, the fire extinguishing device ignites the thermal line after receiving the electric start signal or the open fire, and the electric initiator or thermal line burns and activates the aerosol generator in the fire extinguishing device. The aerosol generator decomposes the chemical coolant through the heat released by a series of reactions, so that the aerosol generator and the coolant can be combined to fight against the fire.

7.5 Explosion Relief Panels

The two explosion relief panels are located at the top of the battery cabinet. In the event of an explosion, the pressure difference generates a

shock wave that is smoothly transmitted to the relief panels, allowing them to open efficiently and thereby reducing the impact on the internal components of the Energy Storage System (ESS).

7.6 Water Fire Suppression System

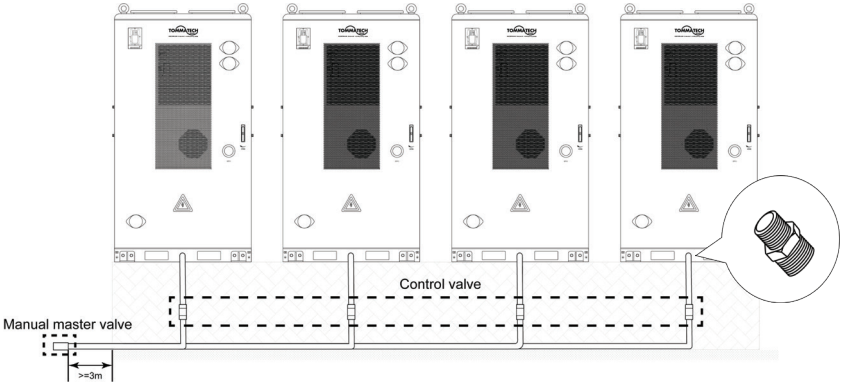
Water fire protection is manually activated, it is the last protective barrier, and it should be opened when all fire protection settings are executed or fail.

The water spray extinguishing system should be assembled by your own.

How to install the water pipe?

When installing multiple cabinets, you are advised to install an extension pipe (the length is based on customer requirements),tee-junction connectors, and finally connect the water source (the direction of water supply varies according to customer demand).

It is recommended that the inlet pressure of the water connection port be not less than 0.16 MPa and the inlet flow rate be not less than 10 L/s.



Notice!

For safety reasons, we recommend that the length of the manual master valve of the fire-fighting water pipe extending horizontally out of the foundation shall be not less than 3 meters.

Notice!

The final layout of fire protection facilities shall be reviewed and confirmed through consultation with the local AHJ (Authority Having Jurisdiction).

Danger!

If the fire is too violent, flee as soon as possible and call the fire police.

8 Upgrade and Monitor

8.1 Upgrade

8.1.1 USB Upgrade

USB only supports USB flash drives with FAT32 file system format.

In addition, there is a fixed folder name for storing upgrade files inside the U disk, the upgrade files must be placed in the first level of the directory folder: upgrade inside.

At the same time, it is suggested that it is best to keep only the bin files that need to be upgraded.

8.1.2 PC Upgrade

1. Upgrade all modules

Step 1： After successfully connecting to the upper computer, carry out the operation in the order "Open inter-can bus→ Firmware → Browser→Upgrade File→Open".

Step 2：Click the ” Start”.

Step 3： If the system upgrades successfully, the “OK “ in green will shows up, otherwise the “NG “ in red it will be displayed.

2. Upgrade a single module

Step 1 ：After successfully connecting to the upper computer, carry out the operation in the order "Open inter-can bus→ Firmware → Browser→Upgrade File→Open".

Step 2 ： Select the upgraded module number. If there is "0x" in "Device Address", enter the corresponding hexadecimal number. For example, if the module No. 29 needs to be updated, you can enter 1D; If there is no "0x" in "Device Address", enter the corresponding decimal number For example, if the module No. 25 needs to be updated, you can enter 25. After that, click the “Start”.

Step 3 ： If the system upgrades successfully, the “OK “ in green will show up, otherwise the “NG “ in red it will be displayed.

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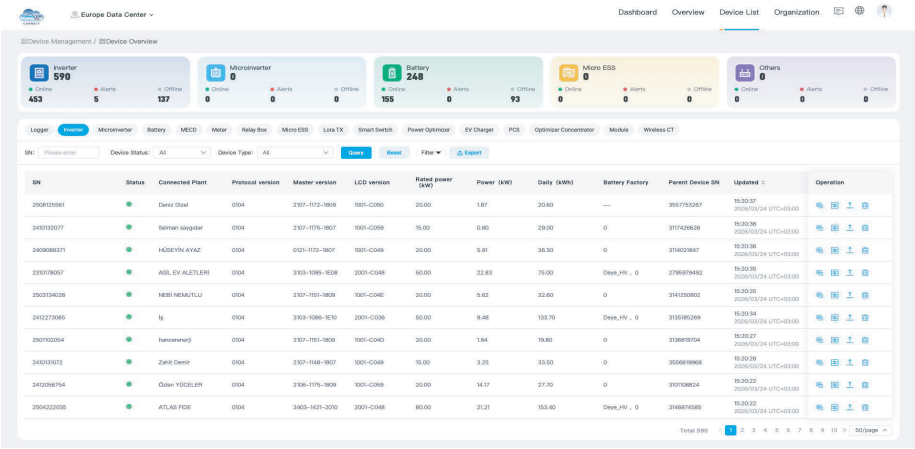
8.2 Monitor

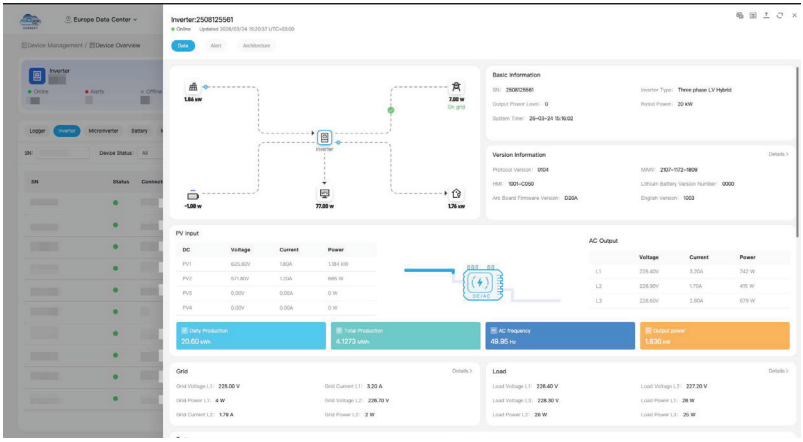
8.2.1 Viewing Battery Data via TommaTech Websites

1. Log in to the TommaTech Connect with your account and password.

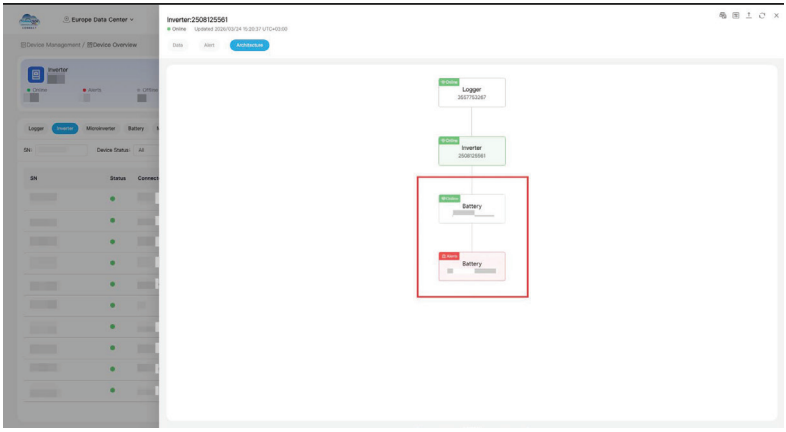
2. 3.After logging in to the TommaTech Connect, enter the SN code of the inverter collector in the search bar....



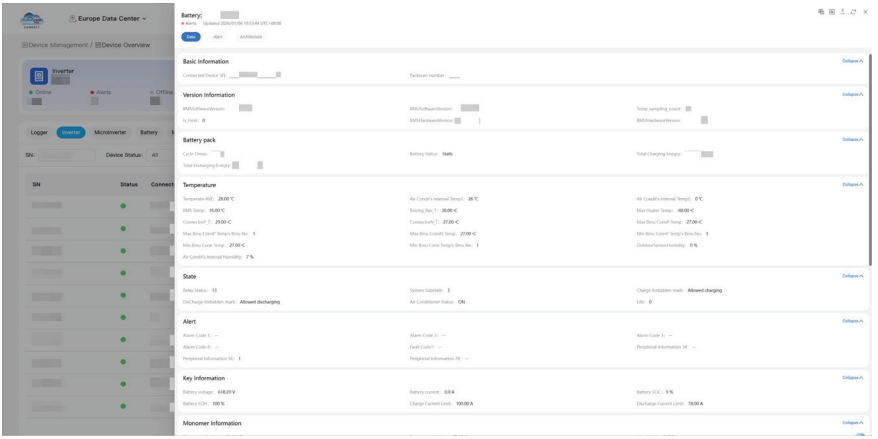
3. On the Device Details Page, click **“Architecture”** (marked by the red box) to navigate to the **Inverter Architecture Page**.



4. On the Inverter Architecture Page, click Battery Module (marked by the red box) to view the corresponding battery data.



5. The **Battery Data Page** is shown in the figure below.


Europe Data Center
Device Management / Device Overview
Inverter
Online
Alerts
Offline
Logger
Inverter
Microinverter
Battery
SN:
Device Status:
All
SN
Status
Connect
Battery:
Data
Alert
Architecture
Basic Information
Collapse
Version Information
Collapse
Battery pack
Collapse
Temperature
Collapse
State
Collapse
Alert
Collapse
Key Information
Collapse
Monomer Information
Collapse

8.2.2 Viewing Battery Data via the Cloud APP

You can control and monitor the product through the TommaTech Connect and TommaTech Cloud App. Download TommaTech Apps by scanning the QR code

TOMMATECH GmbH GERMAN-based company CLOUD

TOMMATECH GmbH GERMAN-based company CONNECT

Step 1: Login

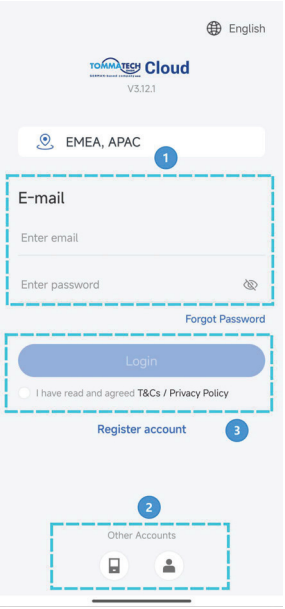
On the login page, you can choose to log in via email, phone number, or username.

Note: Only accounts registered with usernames in the old version support username login.

① Phone number login: Log in with password or verification code.

② Click the icon at the bottom of the page to switch to email login or username login.

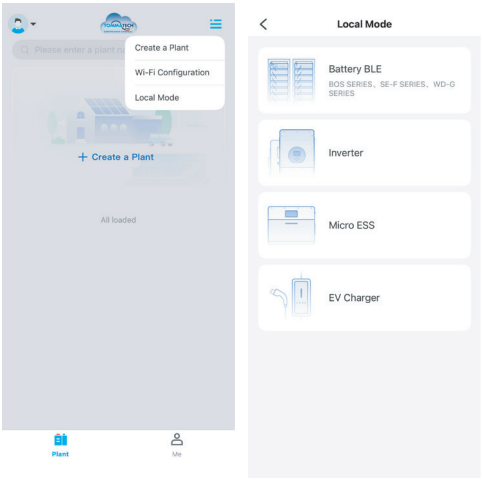
③ Check [I have read and agreed T&Cs/ Privacy Policy] and click [Login].



Step 2: Local Mode

① Click the top right corner of the HOME page and select [Local Mode].

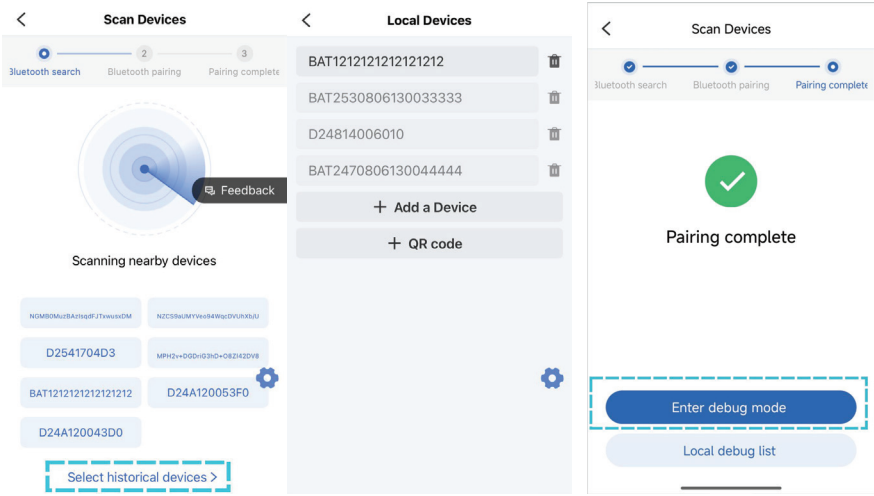
② Select the device type [Battery BLE].



Step 3: Add a Device

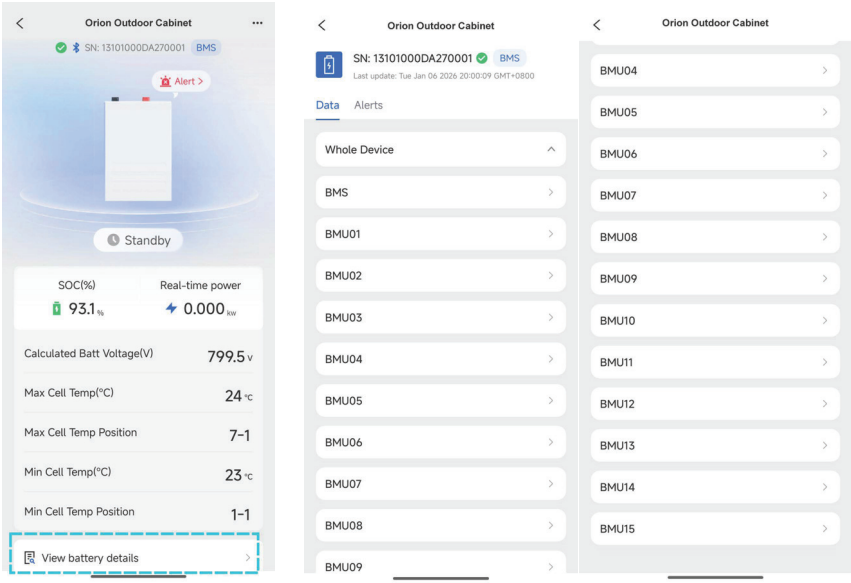
After clicking [Battery BLE], the App will activate the phone's Bluetooth to scan nearby devices. Select the device whose details you need to view from the searched SN number(s). The device SN number can be found on the device panel.

Alternatively, click "Select historical devices" at the bottom of the scanning page to enter the device information interface by scanning the SN code or manually entering the SN code. After the "Pairing complete" shows up, click the [Enter debug mode] to view your data.



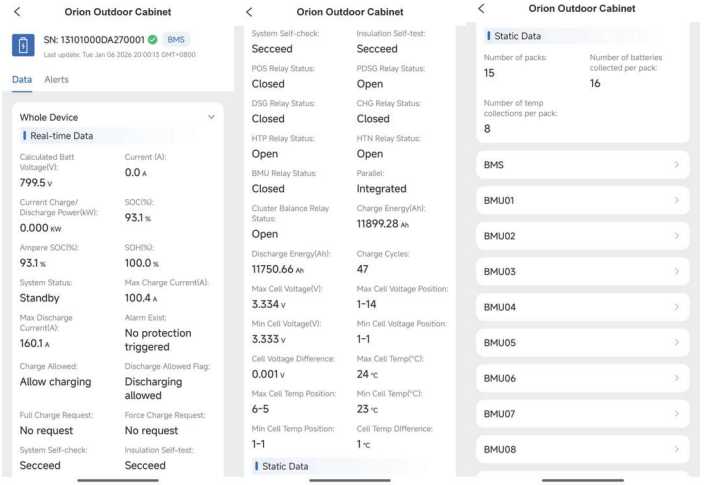
Step 4: Device Information

The home page of device information is as follows. Click “View Battery Details” at the bottom of the page to enter the device details interface.

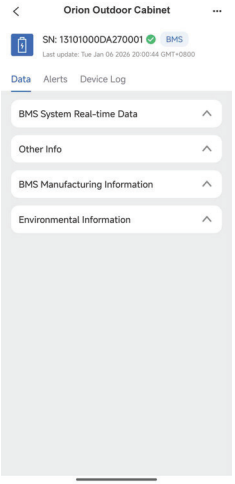


You can click the corresponding items to view information as needed: The

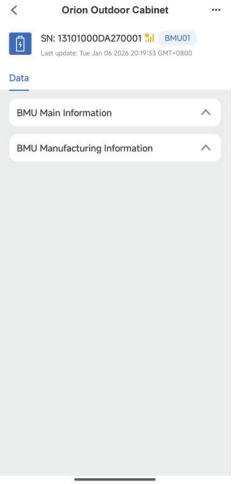
information of the whole device will be displayed on this page as shown in the figure below; The information of BMS and individual batteries will be displayed on the next-level pages.



The BMS details page is as follows:



The battery details page is as follows:



9 Repair Paint Damage

9.1 Prerequisites

• Do not apply paint in bad weather, such as rain, snow, strong wind, and sandstorm, when there is no shelter outdoors.

• You have prepared the required paint that matches the color palette delivered with equipment.

9.2 Paint Repair

The equipment appearance should be intact. If paint has flaked off, repair paint damage immediately.

Note!

Check the paint damage on the equipment and prepare appropriate tools and materials. The number of materials depends on site requirements.

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9.2.1 Paint Repair Description

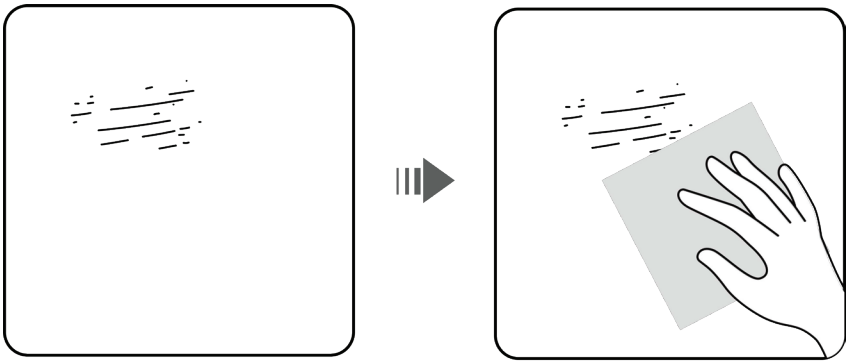
Paint Damage	Tool and Material	Procedure	Description
Slight scratch (steel base material not exposed)	Spray paint or paint, brush (required for repainting a small area), fine sandpaper, anhydrous alcohol, cotton cloth, and paint spray gun (required for repainting a large area)	Steps 1, 2, 4, and 5	1. For a few scratches, smudges, or rust, manual paint spraying or brushing is recommended. 2. For many scratches or large-area smudges and rusts, use a paint spray gun. 3. The paint coating should be thin and even. Paint drops are prohibited on
Smudges and rust that cannot be removed			
Deep scratch (primer damaged, steel base material exposed)	Spray paint or paint, zinc-rich primer, brush (required for repainting a small area), fine sandpaper,	Steps 1, 2, 3, 4, and 5	

	anhydrous alcohol, cotton cloth, paint spray gun (required for repainting a large area)		the coating. The surface should be smooth. 4. Leave the repainted area for approximately 30 minutes before performing any further operation.
Logo and pattern damage	If a logo or pattern is damaged, provide the logo size and color number. Seek help from a local supplier of advertisement coatings to formulate a repair solution based on the logo size, color, and damage.		
Dent	If a dent is less than or equal to 100 mm^2 in area and less than 3 mm in depth, fill the dent with Poly-Putty base and then perform the same operations as those for processing deep scratches. If a dent is greater than 100 mm2 in area or greater than 3 mm in depth, ask the local supplier for an		

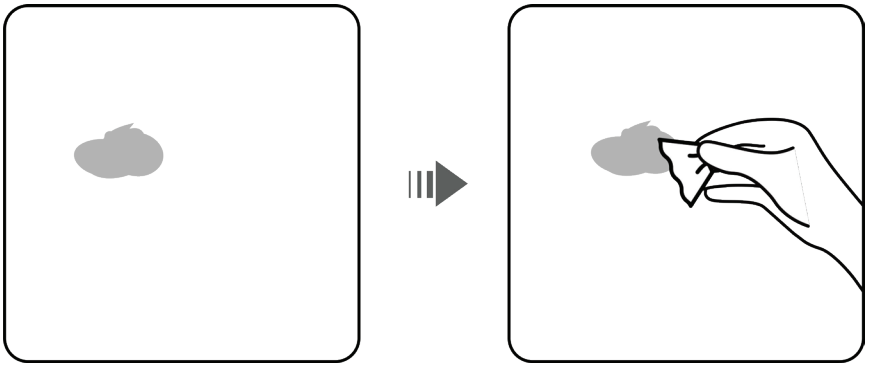
	appropriate repainting solution.	

9.2.2 Procedure

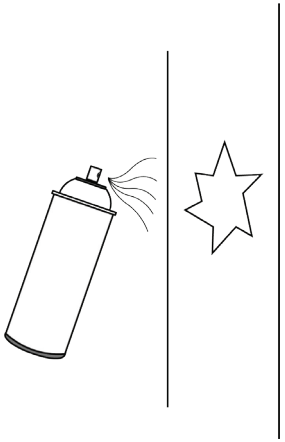
1. Gently polish damaged areas using fine sandpaper to remove smudges or rust.



2. Dip a piece of cotton cloth into anhydrous alcohol and wipe the polished or damaged area to remove the dirt and dust. Then wipe off the anhydrous alcohol with a clean and dry cotton cloth.



3. Paint zinc-rich primer on the damaged coat using a brush or paint spray gun.



Notice!

• If the base material is exposed in the area to be repaired, apply epoxy zinc-rich primer, wait until the paint has dried, and then apply acrylic acid top coat.

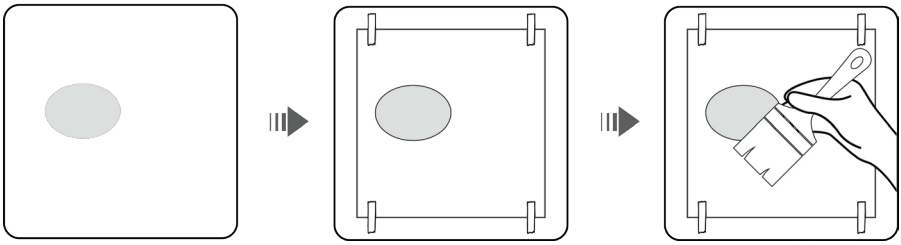
• Select epoxy zinc-rich primer or acrylic acid top coat with a color the same as the surface coating color of the equipment.

4. Apply paint evenly to the damaged area based on the damage degree of the paint using an aerosol spray, brush, or paint spray gun until all damage traces are invisible.

Notice!

• Ensure that the painting is thin, even, and smooth.

• In the case that an equipment pattern has different colors, to prevent undamaged areas and those with different colors as the damaged area from being contaminated during repainting, cover such areas using white paper and adhesive tape before repairing paint.



5. Wait for 30 minutes and check whether the painting meets the requirements.

Note!

• The color of the repainted area must be consistent with that of the surrounding area. Make sure that there is no visible edge between the repainted area and the surrounding area. The paint should be free of bulges, scratches, flaking, or cracks.

• If you choose to spray paint, it is recommended that you spray paint three times before checking the result. If the color does not meet the requirements, paint more times until the painting meets the requirements.

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10 Emergency Handling

If an accident (including but not limited to the following) occurs on the site, ensure the safety of onsite personnel first and contact the service engineers.

10.1 Battery Falling or Strong Impact

• If a battery has obvious damage or abnormal odor, smoke, or fire occurs, evacuate the personnel immediately, call emergency services, and contact the professionals. The professionals shall use fire extinguishing facilities to extinguish the fire under safety protection.

• If the appearance is not deformed or damaged, and there is no obvious abnormal odor, smoke, or fire, ensure safety and perform the following operations:

-Warehouse: Evacuate personnel, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the service engineers. Leave the battery for an hour and ensure that the battery temperature is within the room temperature range (tolerance: ±10°C) before handling.

-ESS onsite: Evacuate personnel, close the doors of the ESS, transfer the battery to an open and safe place by professionals using mechanical tools, and contact the service engineers. Leave the battery for an hour before handling.

10.2 Flood

• Power off the system if it is safe to do so.

• If any part of the batteries is submerged in water, do not touch the batteries to avoid electric shock.

• Do not use batteries that have been soaked in water. Contact a battery recycling company for disposal.

10.3 Fire

Danger!

• If a fire occurs, power off the system if it is safe to do so.

• Extinguish the fire with carbon dioxide, FM-200 or ABC dry powder fire extinguishers.

• Ask firefighters to avoid contact with high-voltage components during fire fighting to prevent the risk of electric shock.

• Overheating may cause battery deformation, faults, and leakage of corrosive electrolytes or toxic gases. Use respiratory protective equipment and keep a safe distance from the batteries to prevent skin irritation and chemical burns.

10.4 Fire Alarm Horn/Strobe

When the alarm indicator on the equipment blinks or buzzes:

• Do not approach.

• Do not open the door.

• Stay away immediately.

• Cut off the power supply remotely only when your safety is guaranteed.

10.5 Gas Exhaust

• Onsite personal protection: Do not directly face the exhaust vents.

• Post-disaster product maintenance: Contact the service engineers for evaluation.

10.6 Extinguishant Release or Fire

Suggestions for onsite O&M personnel:

• When a fire occurs, evacuate from the building or equipment area, press the fire alarm bell, and immediately call the fire emergency service. Notify the professional firefighters and provide them with relevant product information, including but not limited to battery pack types, ESS capacity, and battery pack location and distribution.

• Do not enter the affected building or equipment area under any circumstances, and do not open the doors of the ESS. Isolate and monitor the site. Keep irrelevant personnel away from the site.

• After calling the fire emergency service, remotely power off the system while ensuring your own safety.

• After professional firefighters arrive, provide relevant product information, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.

• After the fire is extinguished, the site must be handled by professionals in accordance with local laws and regulations. Do not open the doors of the ESS without permission.

• Post-disaster product maintenance: Contact the service engineers for evaluation.

Suggestions for professional firefighters:

• For product information, see the information provided by O&M personnel, including but not limited to battery pack types, ESS capacity, battery pack location and distribution, and user manuals.

• Do not open the doors of the ESS before it is deemed safe by professionals.

• Follow local fire fighting regulations.

• When a fire occurs, prevent the fire from spreading to nearby ESSs.

11 Storage

Note!

• Only trained and qualified personnel are allowed to operate batteries. Wear insulated gloves and use dedicated insulated tools during the operation.

• Do not store battery packs for extended periods. Batteries that have been stored for extended period shall be charged periodically.

Long-term storage of lithium batteries cay cause capacity loss.

• The storage environment must comply with local regulations and standards.

11.1 ESS Storage

Storage Requirements

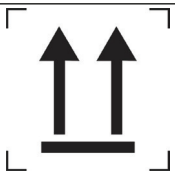
• You are advised to store the ESS in a dry, clean, and ventilated indoor environment that is free from sources of strong infrared or other radiations, organic solvents, corrosive gases, and conductive metal dust. Do not expose the ESS to direct sunlight or rain. Keep the ESS far away from sources of heat and fire.

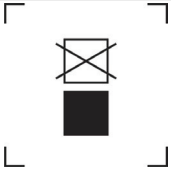
• Store the ESS separately to avoid mixing with other equipment. The site must be equipped with qualified fire fighting facilities, such as fire sand and fire extinguishers.

• The ESS must be disconnected from external equipment during storage, and the ESS indicators must be off.

Place the ESS correctly according to the signs on the packing case during storage. Do not place the ESS upside down, lay it on one side, or tilt it.

The ESS packaging signs are described as follows.

Name	Symbol	Description
Up		The package shall be kept upright during transportation and storage.
Fragile		The package contains fragile objects and shall be handled with care.

Keep dry		The package shall be protected against rain, and rainproof measures shall be taken during transportation and storage.
Do not roll		The package shall not be rolled during transportation.
Do not stack		The package shall not be stacked.

• Do not unpack an ESS if it will be stored for a long time.

• Do not stack the ESS.

• Ensure that the ground surface is flat (for long-term or temporary storage).

• Refer to the section “Technical Specification” for storage temperature and humidity.

• Close the cabinet door.

• For long-term storage (more than six months after delivery), replace the desiccants with those of the same specifications and amount.

• The storage duration starts from the latest charge time labeled on the ESS packaging.The following table lists the maximum charge intervals. Charge

the ESS promptly and calibrate the SOC to 50%. Otherwise, the battery performance and service life may be deteriorated.

• When stored in low SOC, the batteries must be charged within the maximum interval corresponding to the SOC when the batteries are powered off. If the ESS is not charged within the specified interval, the batteries may be damaged due to over-discharge.

• If the ESS has been stored for longer than allowed, promptly report the condition to the person in charge.

• Ensure that the ESSs are delivered on a "first-in, first-out" basis.

• Handle the ESS with care to prevent damage.

11.2 Battery Storage

• Ensure that batteries are stored in a dry, clean, and ventilated indoor environment that is free from sources of strong infrared or other radiations, organic solvents, corrosive gases, and conductive metal dust. Do not expose batteries to direct sunlight or rain and keep them far away from sources of heat and ignition.

• Store batteries in a separate place. Do not store batteries together with other devices. Do not stack batteries too high. The site must be equipped with qualified fire fighting facilities, such as fire sand and fire extinguishers.

• After batteries are powered off, static power consumption and self-discharge loss may occur in internal modules, which may cause battery damage due to over-discharge. Do not store batteries in low SOC and charge batteries in a timely manner.

• The batteries in storage must be disconnected from external devices. The indicators on the batteries must be off.

• If a battery experiences an abnormality such as bulging or smoking during charge, stop charging immediately and dispose of it.

• If batteries have been stored for longer than allowed, promptly report the event to the person in charge.

• Ensure that batteries are delivered based on the "first in, first out" rule.

• Handle batteries with caution to avoid damage.

11.3 Inverter Storage

When devices are stored as spare parts and will not be put into use immediately, the following storage requirements must be met:

- If devices are unpacked but will not be used immediately, put them back to the original packaging with the desiccant, and seal with tape.
- When temporarily storing devices outdoors, do not stack them on a pallet. Take rainproof measures such as using tarpaulins to protect devices from rain and water.
- Refer to the Technical specification for more information including storage temperature and relative humidity
- Do not remove the packaging. Check the packaging regularly (recommended: once every three months). Replace any packaging that is damaged during storage.
- Do not store devices for more than two years. If devices have been stored for two years or longer, they must be checked and tested by professionals before being put into use.
- To avoid personal injury or device damage, exercise caution when stacking devices to prevent them from falling over.

12 Transport

1. The battery products should be transported after packaging and during the transportation process. Severe vibration, impact, or extrusion should be prevented to prevent sun and rain. It can be transported using vehicles such as cars, trains, and ships.

2. Always check all applicable local, national, and international regulations before transporting a Lithium Iron Phosphate battery.

3. Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specially limited or prohibited.

4. Transportation and storage service providers must have the certification for dangerous goods operations required by local laws, regulations, and standards.

5. Before transportation, make a compliant and accurate declaration. Ensure that the battery packaging, labels, and markings are intact and there is no abnormal smell, leakage, smoke, or fire. Otherwise, the batteries must not be transported.

6. Exercise caution when moving batteries to prevent bumping and ensure personal safety.

7. Unless otherwise specified, dangerous goods must not be mixed with goods containing food, medicine, animal feed, or their additives in the same vehicle or container, and sharp objects are not allowed in the same vehicle or container.

8. Store batteries in a separate area away from heat sources. Protect batteries from moisture, water, and rain. Stack batteries according to the labels on the packing case. Do not stack batteries more than the allowed stacking layers. Do not place batteries on one side or upside down.

9. When transporting faulty batteries, avoid approaching flammable material storage areas, residential areas, or other densely populated places, such as mass transit facilities or elevators.

10. The transport of the Li-Ion battery falls under hazard class UN3480, class 9. For transport over water, air and land, the battery falls within packaging group PI965 Section I. Use Class 9 Miscellaneous Dangerous Goods and UN Identification labels for transportation of lithium-ion batteries which are assigned Class 9. Refer to relevant transportation documents.

Miscellaneous Dangerous Goods and UN Identification Label

13 Environmental Disposal

• Used batteries can not be disposed of as household waste. Incorrect disposal may result in pollution or explosion.

• If damages or leakage happen to the battery, ask for technical supports or contact the qualified recycle body to help deal with batteries.

• Batteries of end of life need to be disposed of in an environmentally-friendly manner.

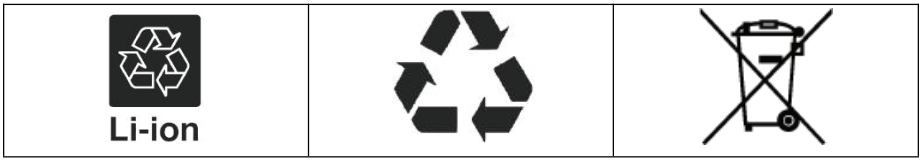
• You are obliged to handle waste batteries, such as removal of privacy on product, and return them to designated or authorized recovery point according to applicable regulations and standards on waste battery disposal.

Attention!

1. Do not dispose of batteries and rechargeable batteries as domestic waste! You are legally obliged to return used batteries and rechargeable batteries.

2. Waste batteries may contain pollutants that can damage the environment or your health if improperly stored or handled.

3. Batteries also contain iron, lithium and other important raw materials, which can be recycled.**Do not dispose of batteries as household waste!**



For more information, please visit http://www.tommatech.de.

14 Technical Specifications

Model		Orion Ooutdoor 241kWh
Main Parameters		
Cell Type		$LiFePO_4$
Module Capcity (Ah)		314
Module Nominal Voltage (Vdc)		51.2
Module Energy (kWh)		16.08
Module Qty In Series		15
System Nominal Energy (kWh)		241.15
System Usable Energy (kWh)*1		241.15
System Nominal Voltage (Vdc)		768
System Operating Voltage (Vdc)		600-876
Rated DC Power (kW)		121
Charge/Discharge Current(A)*2	Recommend	157
	Max. Continuous	180
	Peak discharge@15s/20-45℃	285
Other Parameters		
Fire Protection System		Aerosol and Water fire interface

	CO gas detection, Active exhaust and Explosion venting
Cooling Method	Smart Fan Cooling
Communication Port	CAN
Communication protocol	CAN2.0
Operating Temperature (℃)[*3]	-30~55
Recommend Storage Temperature (℃)	0~35
Humidity	5% ~ 95%RH (No Condensing)
Altitude	3000m
IP Protection	IP55
Anti Corrosion Level	C4-M
Dimension(W x D x H,mm)	1303 x 1240 x 2405.5
Weight(kg)	2610
Installation Location	Floor mount
Cycle Life	⩾8000 (25±2°C,0.5P,EOL70%)
Certification	UN38.3, CE, IEC, VDE, ROHS, REACH

Notes:

1. Test conditions : 100% DOD, 0.5P charge & discharge at 25°C. System usable energy may vary due to system configuration parameters.

2. The current is affected by temperature and SOC.

3. Derated operation at ＞45°C.

15 EU Declaration of Conformity

CE

Within the scope of the EU directives

Restriction of the use certain hazardous substances2011/65/EU (ROHS)Radio Equipment Directive2014/53/EU(RED)

TommaTechGmbH.confirms here with that the products described in this document are in compliance with the fundamental requirements and other

relevant provisions of the above mentioned directives.

Annex I-Manufacturer Self Declaration

The electrochemical performance and durability parameters

Product Model:Orion Outdoor 16.08kWh

Parameters	Value	Test method
Rated Capacity	314Ah	Actual measurement@25℃±3℃ ①0.5C charge ②rest30min ③0.5C discharge
Capacity Fading	8000 Cycles, fade≤30%	Actual measurement@25℃±3℃ ①0.5C charge ②rest30min ③0.5C discharge，90%DOD
Power	8038W	@25℃±3℃ charge and discharge@20%~80%SOC
Power Fading	10 years,fade≤30%	/
Internal Resistance	≤0.0013Ω	Actual measurement@25℃±3℃ ①0.5C CC 3.65V,CV 0.05C, Cut ②Discharge to 50%SOC,rest 3h，V0 ③discharge 0.5C,10s，V1 ④(V0-V1)/157
Increased internal Resistance	10 years,Increased ≤30%	/
Energy efficiency	95%	Actual measurement@25℃±3℃ ①0.5C CC 3.65V ②Discharge to 2.5V，E0 ③0.5C CC 3.65V，E1 ④E0/E1
Energy efficiency Fading	10 years,fade≤3%	/
Cycle Life	≥8000@70%SOH, 10 years	Actual measurement@25℃±3℃ ①0.5C charge ②rest30min ③0.5C discharge，90%DOD

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