TC8800KT-EL&TC8800KT-EL-50

Inverter Transformer Station user manual

TBEA product and solution team
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TBEA XI'AN ELECTRIC TECHNOLOGY CO., LTD.

Add: Shanglinyuan 4th Road No.70, High-tech Zone, XIAN (710119), CHINA

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Revised content

Date	Version	Revised content	Designer
6th May. 2024	1.0	First version	Xu minheng
25th Oct. 2024	1.1	Revised documentation Formatting,changed the English name of product to "Inverter Transformer Station", add TC8800KT-EL-50 model.	Shi Xingwen

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About this manual

This manual consists of two parts:

- Photovoltaic Inverter Transformer Station user manual.
- Communication power Cabinet User manual.

Part 1 About User manual

1.1 Symbol Interpretation

Please read carefully the instructions of the following symbols for your better use of this Manual:

Sign	Explanation
 **Danger**	**Indicates a hazard with a high risk that, if not avoided, will result in death or serious injury.**
 **Warning**	**Indicates a medium risk hazard that, if not avoided, could result in death or serious injury.**
 **Attention**	**Indicates a hazard with a low level of risk that, if not avoided, may result in minor or moderate injury.**
Note	**Indicates a potentially hazardous situation that, if not avoided, could result in equipment**

	damage, data loss, performance deterioration, or unexpected results. **Be aware of practices that are not related to personal injury.**
 **description**	**Added important information in the text. Note This section describes how to handle information that is not related to personal injury, equipment damage, or environment deterioration.**

1.2 Scope of Application

This Manual provides detailed product information and installation instructions for the 8.8MVA photovoltaic Inverter Transformer Station of TBEA Xi'an Electric Technology Co., Ltd.

This manual is applicable to the following models:

• TC8800KT-EL&TC8800KT-EL-50

This document is intended for the professional and technical personnel responsible for the installation, operation, and maintenance of the PV Inverter Transformer Station. Professional and technical personnel should meet the following requirements:

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

• Should be familiar with the composition and working principle of the photovoltaic system and its front and rear equipment.

•Received professional training related to the installation and commissioning of electrical equipment.

• Ability to respond quickly to hazards or emergencies during installation and commissioning.

•Familiar with the relevant standards and regulations of the country/region where the project is located.

2 Safety Instructions

2.1 Safety Precautions

Danger

- **Non-professionals are not allowed to connect and maintain cables.**
- Cable connection is prohibited before the Inverter Transformer Station is fixed.
- Before connecting the cables in the Inverter Transformer Station, the DC side and the transformer high-voltage AC side must be disconnected with the relevant power supply to ensure that the Inverter Transformer Station is not live.

- It is forbidden to contact live electrical equipment and the copper bars and cables between equipment in the Inverter Transformer Station. Before live equipment within is operated, disconnection of all AC and DC input and output power supply of the Inverter Transformer Station is a must. Then check whether the inverter is fully discharged after the capacitor discharges for 20 minutes by a multimeter to measure the DC voltage between DC buses of the inverter. A measured value of less than 12V means full discharge. Besides, before operation of such live equipment, it must be ensured that the Inverter Transformer Station has been reliably grounded.
- It is strictly forbidden to operate the control cables when the Inverter Transformer Station or the external control circuit is live. Even if the main circuit of the Inverter Transformer Station is disconnected, the externally control circuit can cause dangerous voltages in the Inverter Transformer Station.
- When the main circuit is live, the cabinets in the Inverter Transformer Station may have dangerous high voltages. When using measuring instruments such as a multimeter, please follow the instructions and be careful.
- Before overhaul of equipment, first confirm the internal power-off of the Inverter Transformer Station. Do not touch the bare copper bars and cables in the inverter until the relevant incoming lines are confirmed to be dead by a multimeter. Before overhaul of the DC side cables, the power supply of the combiner box must be disconnected. Do not touch the bare cables at the lower end of the AC side circuit breaker of the inverter until the relevant outgoing lines are confirmed to be dead by a

multimeter. Before overhaul of the AC outgoing cables, the power supply of box-type transformer substation must be disconnected.

Attention

- After the fault protection is activated, voltage may still exist on the main circuit and the auxiliary circuit.
- Do not arbitrarily arrange wires inside the Inverter Transformer Station. If necessary, please contact our after-sales service personnel to avoid damage to the electronic equipment inside the cabinet.
- Do not inhale the smoke generated during welding.
- Ensure good ventilation and heat dissipation of the equipment.
- The veneer is equipped with components that are very sensitive to static electricity. For operating on the veneer, please wear anti-static gloves and minimize direct contact with the veneer.

2.2 Precautions for Grounding

Danger

- The Inverter Transformer Station and the equipment connected with it must be grounded reliably to ensure personnel safety and reduce electromagnetic radiation.
- The specifications of ground wires must conform to relevant safety standards.

2.3 Other Precautions

Attention
● The Company shall not be liable for any consequences arising you're your improper operation, error or negligence. ● The Company shall not be liable for any consequences arising from your violation of the precautions mentioned in this Manual. ● In order to ensure continuous development and improvement of the product, the Company reserves the right to modify the specifications, performance and contents in this Manual without further notice. ● No organizations or individuals may reproduce or disseminate any part of this Manual in any way without the written permission of the Company.

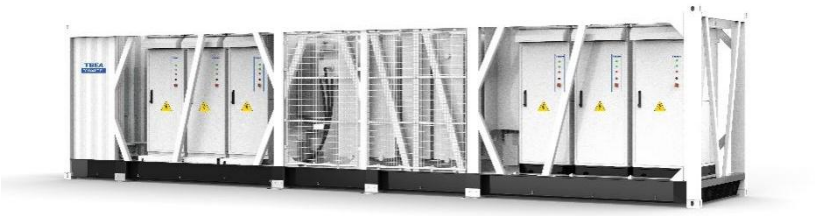
3 Product Description

This chapter mainly introduces the appearance, performance characteristics and internal structure of 8.8MVA Photovoltaic Inverter Transformer Station (please read the instructions before using transformer equipment).

3.1Product Introduction

Photovoltaic Inverter Transformer Station is suitable for large-scale photovoltaic power stations, using outdoor inverter, distribution unit, booster transformer, RMU, communication power cabinet and other integrated design, to meet the design requirements of modular design and rapid installation of large-scale photovoltaic power stations, to ensure the long-term, safe and

reliable operation of photovoltaic power stations.



TC8800KT-EL&TC8800KT-EL-50

Figure 3-1 Appearance of the inverter

3.2Performance Characteristics

The Inverter Transformer Station has the following main features:

•For the needs of rapid station construction of photovoltaic systems, from reducing the amount of foundation construction, reducing the difficulty of construction, reducing the difficulty of on-site installation, reducing the difficulty of on-site wiring and other aspects of consideration, all equipment in the factory once installed, debugging qualified, truly realize the substation construction of the factory, greatly shortening the construction period of the site;

•The system is composed of 4.4MW outdoor inverter, distribution unit, booster transformer, ring network cabinet, communication power cabinet and other integrated design main parts, in addition to smoke sensor, fire

extinguisher and other ancillary equipment;

•The system has the optimal structure layout, reasonable structure design, independent inlet and outlet, simple and generous appearance;

•The Inverter Transformer Station is waterproof and dust-proof to meet IP54, can prevent splashing in the range of 180°, in addition, it also has the function of dust collection and dust collection, can protect the internal equipment from the adverse external environment;

•Anti-shock and anti-theft design, fully ensure the safety of the Inverter Transformer Station and the internal equipment of the Inverter Transformer Station;

•The transformer shell is sandblasted and sprayed with special weathering board for containers, which has good anti-corrosion performance;

•The internal equipment of the Inverter Transformer Station is neatly arranged, simple decoration, suitable for inspection and maintenance

3.3Internal Structure

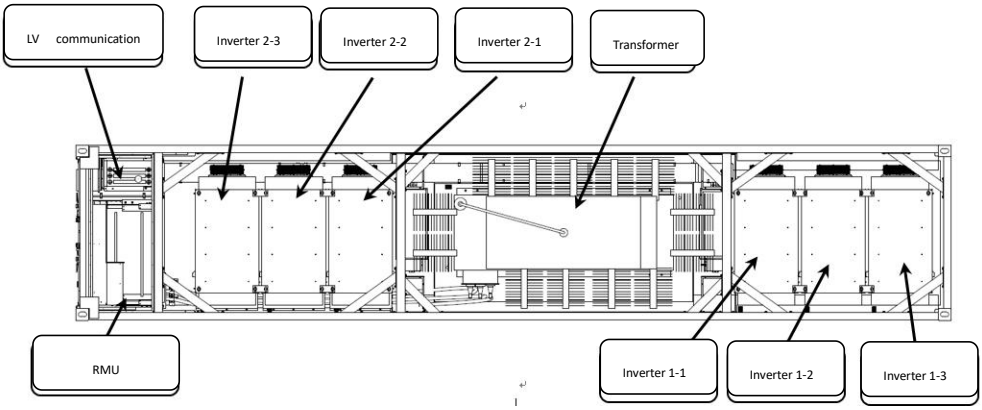


Figure 3-2 Layout of the inverter transformer station

4 Electrical Principle

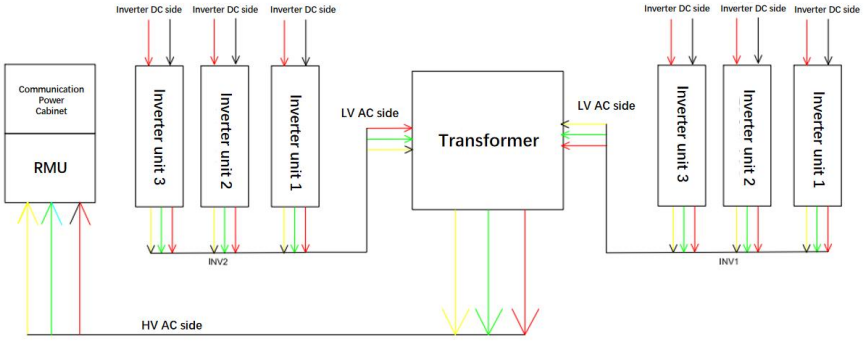


Figure 4-1 Electrical schematic diagram

No.	Name	Description
A	Photovoltaic array	Monocrystalline silicon, polycrystalline silicon, thin film batteries without grounding.
B	Photovoltaic array	The multi-channel photovoltaic array is output after

	bus box	confluence.
C	Medium voltage grid-connected inverter	The inverter unit is responsible for converting the direct current from the photovoltaic array It is alternating current. Contains a transformer, responsible for the inverter unit output AC low-voltage conversion It is piezoelectric in alternating current.
D	Power grid	-

5 Installation

Overall installation process of the boost inverter station:

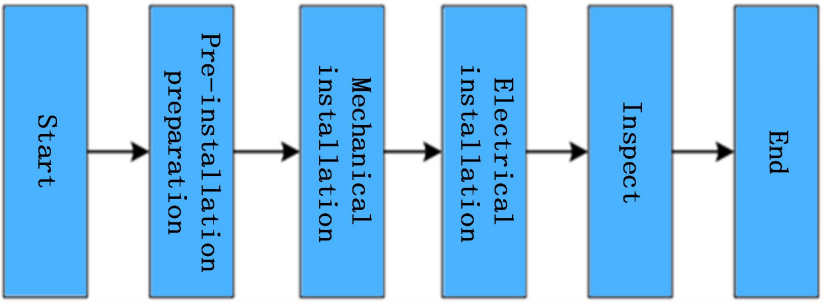


Figure 5-1 Installation process

Table 5-1 Installation process instructions

Installation steps	Installation instructions	Reference chapter

Installation preparation	● Check the outside of the Inverter Transformer Station and cabinets for damage. ● Check the inside of the Inverter Transformer Station and cabinets for device damage, looseness, and transformer leakage. ● Check if the accessories are complete ● Check if the installation environment meets the requirements ● Check if there is any available equipment at the site proper for hoisting the Inverter Transformer Station ● Check if the installation tools are complete	5.1 Installation preparation
Mechanical installation	● Move the 8.8MVA Inverter Transformer Station to the installation foundation by hoisting equipment ● Weld and fix the Inverter Transformer Station to the installation foundation ● Remove the protective film of dust mesh	5.2 Mechanical installation
Electrical connection	● DC cable connection ● AC cable connection ● Grounding wire connection ● Communication wire connection	6. Electrical connection
Inspection	● Check the electrical wiring ● Check if the oil level of the oil level gauge on the high voltage side of the transformer is normal ● Other matters	6 Check electrical connections 7 Transformer

5.1Installation Preparation

5.1.1 Pre-installation Inspections

Table 5-2 Pre-installation inspection of the Inverter Transformer Station

Inspection position	Acceptance criteria	Treatment if disqualified
Each fastening bolt (screw)	The bolts (screws) are not loose, and the fastening mark has no offset	Tighten the bolts (screws) and replace the sliding bolts (screws) with new standard parts.
Switch operation	The switch can be operated flexibly with no jamming	Contact the supplier
Circuit board	The connectors and the conductors are not loose or dropped.	Tighten the connector bolts (screws)
Conductor terminal	For cold-pressed terminals, they are not loosened on the binding posts through checking by hand	Tighten bolts (screws)

5.1.2 Installation Tools and Parts

Tools to be used in installation:

- Lifting crane (with a carrying capacity of at least 50 tons);
- Relevant supporting facilities and accessories required for welding;
- Screwdrivers, wrenches, torque wrenches;
- Stripping pliers, terminal crimping machines, hot blowers;

- Multimeter.

5.2Mechanical Installation

5.2.1Mechanical Installation Requirements

- Environmental requirements

The construction site of the Inverter Transformer Station shall meet the installation environment requirements specified in the following table:

Table 5-3 Installation environment requirements

Item		Requirements
Working conditions	Installation site	Ground inclination ≤ 1 °; Seismic resistance greater than 8: levelness ≤ 0.4g, perpendicularity ≤ 0.2g; Suitable for vertical mount on an indoor solid base. Cooling medium: air.
	Ambient temperature	-35 ° C ~ +60 ° C. Air temperature changes: less than 0.5 ° C / min.
	Relative humidity	0%~100%. Temperature changes shall not produce condensation.
	Other climatic conditions	No ice, rain, snow, hail, etc. Atmospheric pressure: 70-106 kPa.
	Contents of dust and solid particles	Sand: <30mg/m^3; Dust (floating): <0.2mg/m^3; Dust (deposited): <1.5mg/(m^2.h).

Attention

- **The Company shall not be liable for any consequences arising from any improper operation, error or negligence.**
- **The company shall not be liable for the consequences caused by illegal operations not in accordance with the precautions indicated in this manual.**
- **In order to ensure the continuous development and improvement of products, the company reserves the right to modify the specifications, performance and contents of this manual without prior notice.**
- **No organization or individual may reproduce or disseminate any part of this Manual in any way without the written permission of the Company.**

Attention

- **Be sure to meet the dustproof requirements specified in the environmental conditions;**
- **After the external cable (grounding wire, main circuit cable, control signal line) is introduced into the outlet box, the inlet hole must be completely closed with fireproof mud;**
- **The air filter at the air inlet of the inverter boost appliance must be cleaned periodically (every three months) based on the working environment, and replaced once every three to five years. The details are determined according to the site working environment.**

- Machine dimensions

According to the different projects and configurations, the dimensions of the Inverter Transformer Station may vary. The standard product dimensions are as follows:

The dimensions of TC8800KT-EL&TC8800KT-EL-50 are as follows:

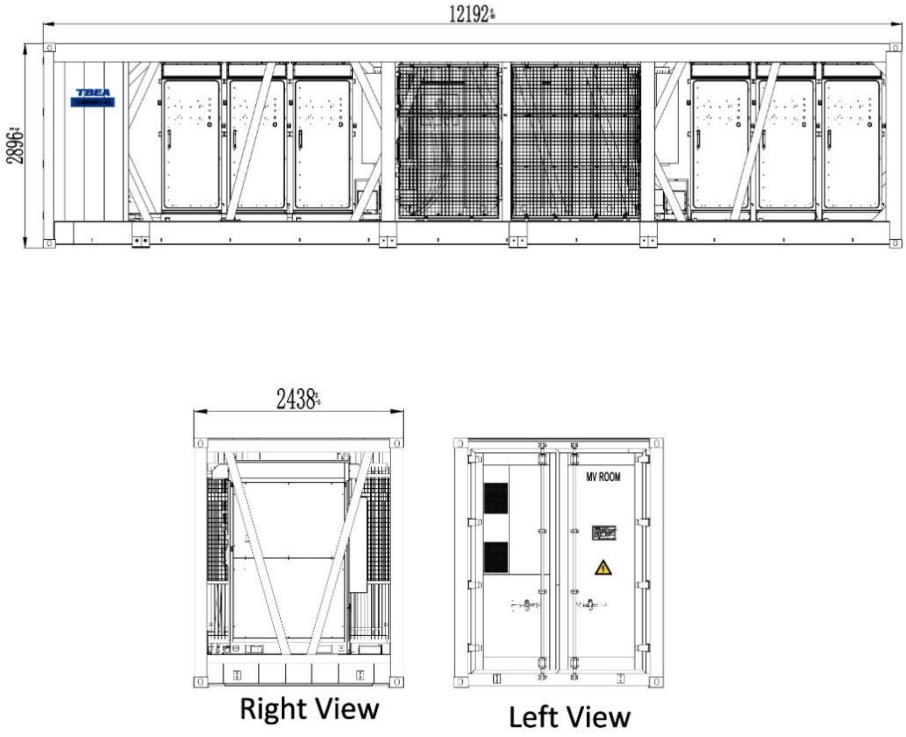


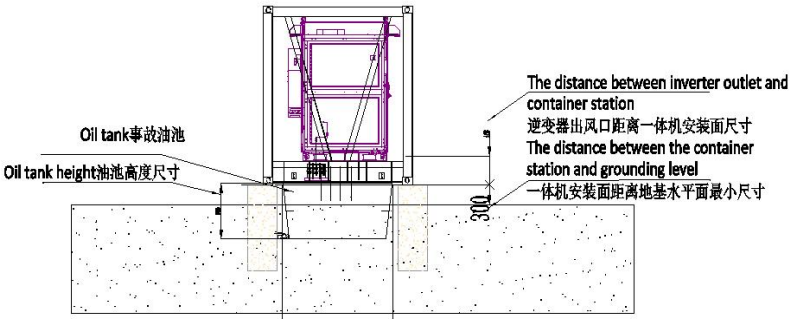
Figure 5-2 Dimensions of the inverter boost appliance (unit: mm)

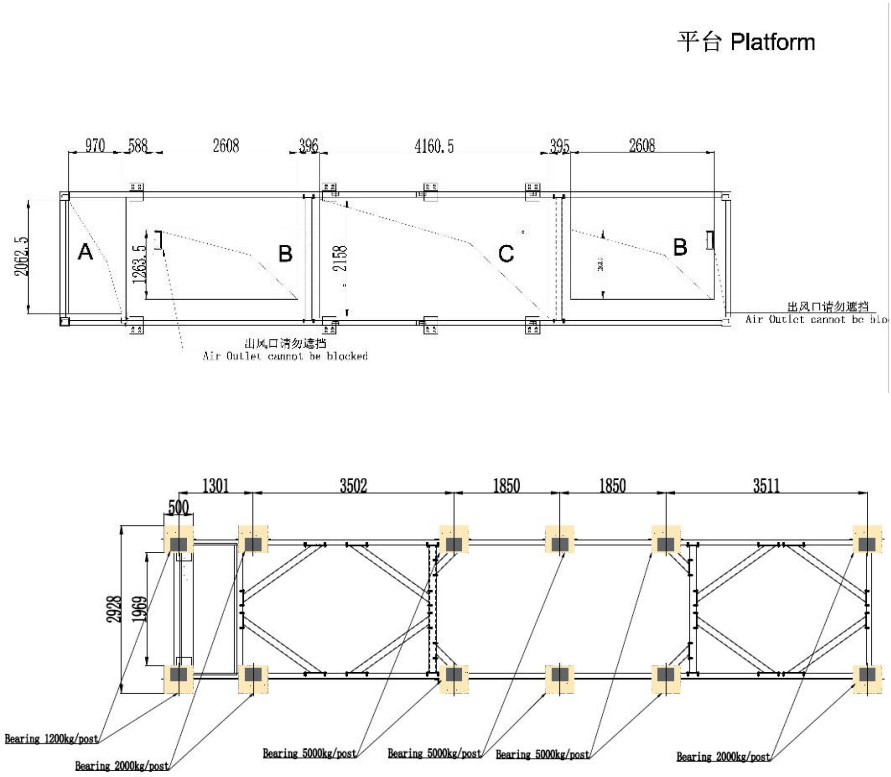
- Foundation requirements
- 1. The integrated machine is installed on the concrete platform, the dimensions and requirements are detailed in the construction drawing;
- 2. The foundation pit should be filled in.

- 3. The inverter is the heat dissipation of the bottom air, the foundation form needs to fully consider the heat dissipation of the inverter, and the open foundation in the form of pillars must be used;
- 4. The distance of the foundation above the ground and the cross-section of the foundation shall be carried out according to the construction drawing;
- 5. The upper surface of the embedded steel plate is guaranteed to be on the same level (height difference does not exceed 3mm);
- 6. The total weight of the machine is about 36 tons;
- 7. The integrated machine is placed on the foundation, after adjusting the position, the base of the integrated machine is welded with the embedded steel plate (or channel steel), and the anti-corrosion treatment is done;
- 8. Prebury a cable pipe at the bottom of the foundation according to the wiring position of the product. Both ends of all the embedded pipes should be temporarily blocked to prevent debris from entering, which is convenient for later cable laying;
- 9. The basic platform should be equipped with a ground iron, which is reliably connected to the ground position of the chassis base.

- For a schematic diagram of the foundation, see the working drawings.

The foundation diagram is shown below:





TC8800KT-EL&TC8800KT-EL-50

- Installation position requirements

The distance before and after installation is shown in the figure below:

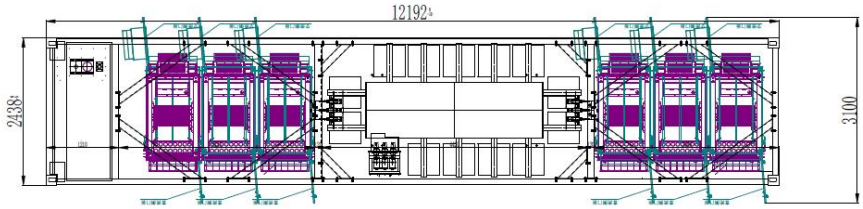


Figure 5-5 Installation position

Attention
● The entire Inverter Transformer Station is mounted on a concrete foundation; ● The foundation is about 300mm above the ground. The thickness of the foundation is determined by the civil works party. The upper surface of the foundation of the Inverter Transformer Station station shall be on the same level (no difference of more than 5mm). ● The Inverter Transformer Station weighs about 36 tons ● Steel plates (12 pieces, 250*300*12mm) shall be embedded in four corners of concrete foundation firmly and reliably.

- Hoisting requirements

The Inverter Transformer Station can be hoisted during the installation process, as shown below:

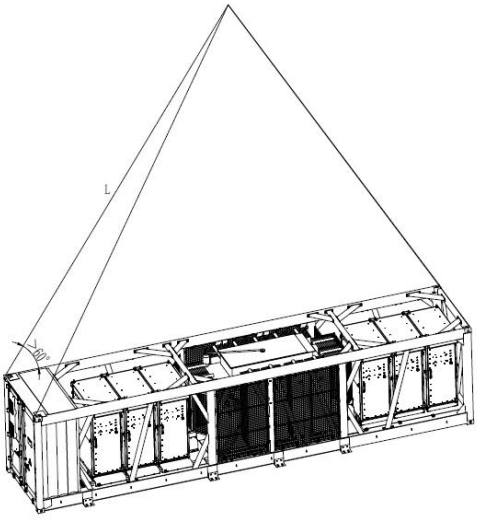


Figure 5-6 Hoisting schematic drawing of the Inverter Transformer Station

The following technical requirements shall be noted in hoisting:

(1) The illustrated angle of hoisting shall not be less than 60°;

(2) When hoisting, the Inverter Transformer Station shall be slowly put in place to reduce vibration and avoid damage to the components;

(3) With the Inverter Transformer Station weighing about 36 tons, the hoisting crane must meet the lifting weight requirements, and the hoisting ropes shall be sufficiently strong to withstand the weight of the inverter.

(4) During the hoisting of the Inverter Transformer Station, unauthorized personnel shall not stay on site so as to avoid accidental injuries;

(5) During hoisting, attention should be paid to avoiding hard objects colliding with the Inverter Transformer Station, so as to prevent any damage to its appearance.

5.2.2Installation and Fixing of the Inverter Transformer Station

Move the Inverter Transformer Station onto the installation foundation, as shown in the following figure:

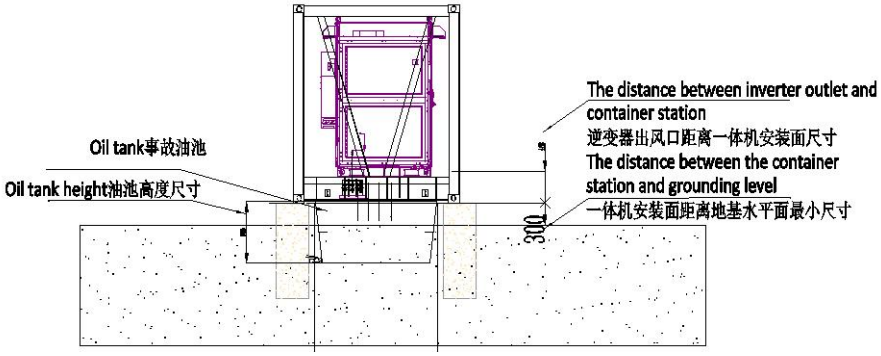


Figure 5-7Installation location plan of the Inverter Transformer Station

During fixing, the following technical requirements shall be noted:

(1) Before fixing, the inlet and outlet positions of the AC and DC sides of the Inverter Transformer Station must be considered, and adjusted in time according to needs during installation;

(2) As shown in Figure 5-7, after placing the Inverter Transformer Station in place, reliably connect the four corner post locks at the bottom of the Inverter Transformer Station to the iron plate on the concrete foundation by continuous seam welding. Spot welding is not allowed.

(3) After the welding is completed, the weld needs to be effectively painted, or anti-rust treatment to prevent rust and avoid affecting the service life of

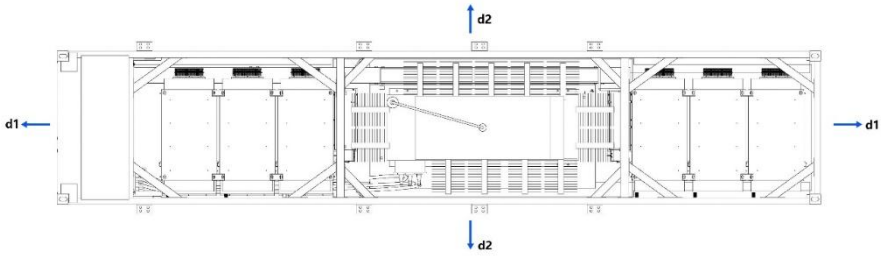
the overall frame of the Inverter Transformer Station.

5.2.3Installation space for the Inverter Transformer Station

- **Installation space requirement**

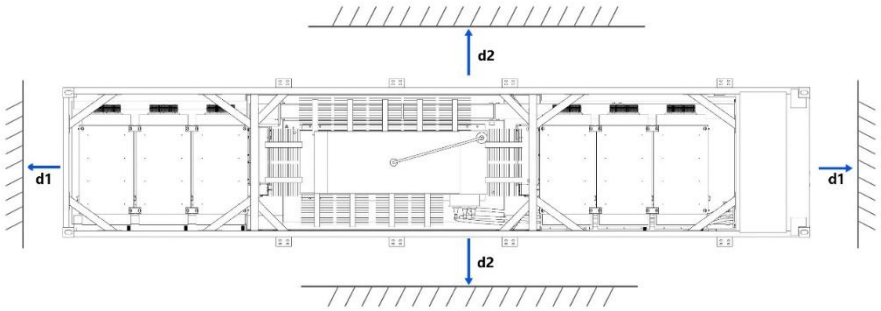
The installation space must meet the heat dissipation performance of the product and the convenience of later maintenance. Reserve an appropriate distance for the product based on the surrounding conditions.

- **There are no obstacles or heat sources around**



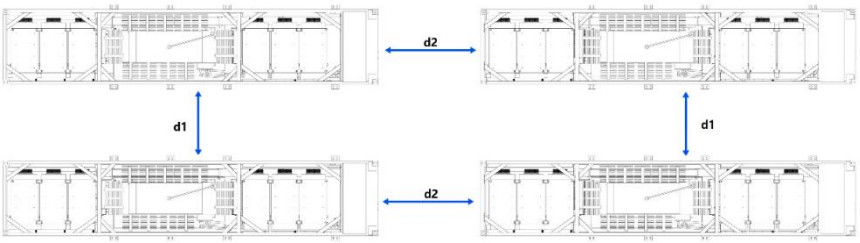
Model	Space Requirement d1	Space requirement d2
TC8800KT-EL&TC8800KT-EL-50	**≥1m**	**≥1.2m**

- **There are obstructions or heat sources around**



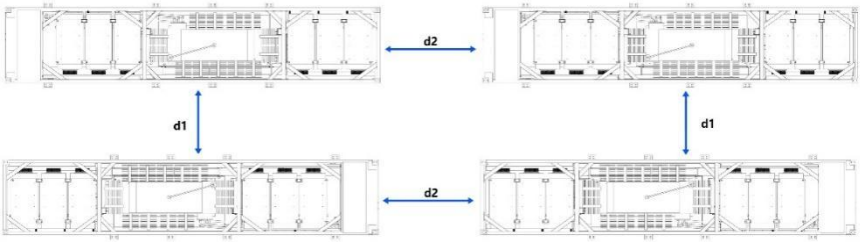
Model	Space Requirement d1	Space requirement d2
TC8800KT-EL&TC8800KT-EL-50	≥4.5m	≥2.5m

- **Side by side**



Model	Space Requirement d1	Space requirement d2
TC8800KT-EL&TC8800KT-EL-50	**≥12m**	**≥10m**

- **Symmetrical placement**



Model	Space Requirement d1	Space requirement d2
TC8800KT-EL&TC8800KT-EL-50	**≥8m**	**≥7m**

6 Electrical connection

6.1 Safety precautions

 **Danger**
● **Before electrical connection, ensure that the inverter is not damaged, otherwise it may cause danger!** ● **Before electrical connection, ensure that the device connected to the product is disconnected, and use the measuring device to ensure that there is no voltage at the connection, otherwise it may cause electric shock hazard!** ● **All switches are off until the electrical connection is complete.**

 **Danger**
Photovoltaic modules exposed to sunlight will produce dangerous voltages! ● **Operators must wear personal protective equipment when making electrical connections.** ● **Before electrical connection, disconnect the bus box and use the measuring device to ensure that there is no voltage in the cable.** ● **Comply with the protection requirements and precautions of photovoltaic modules.**

 **Danger**
There may be deadly high voltage inside the product! ● **When connecting cables, use special insulation tools.**

- **Pay attention to and follow the warning labels on the product.**
- **Follow the safety precautions listed in this manual and other documents related to this product.**

Warning

The entry of wind sand and moisture may damage the electrical equipment in the product or affect the operation performance of the product!

- **During sandstorm season or when the relative humidity in the surrounding environment is greater than 95%, do not work with electrical connections.**
- **When the weather is dry and clear and there is no wind and sand, the electrical connection of the product is carried out.**

Warning

Faulty wiring may cause damage to the equipment, and the resulting damage will not be covered by the warranty.

- **Electrical connection must be performed by professional personnel wearing personal protective equipment.**
- **The cables used in the photovoltaic power generation system must be securely connected, intact, well insulated, and of appropriate specifications.**

Warning

- **Before connecting the DC bus-box to the product, check the positive and negative polarity of the DC bus-box and then connect the DC**

bus-box to the corresponding position of the product.

- During the installation and operation of the product, ensure that the positive or negative terminal of the DC busbar is not short-circuited to the ground. Otherwise, it may cause AC/DC short circuit of the product, resulting in equipment damage, and the resulting damage will not be covered by the warranty.

Notice
● The wiring process must follow the relevant rules of the local power grid and the relevant safety instructions of the DC bus box. ● In the electrical connection process, do not pull the cable or wire, so as not to damage its insulation performance. ● All cables and wires should be guaranteed to have a certain bending space. ● ake necessary auxiliary measures to reduce the stress on the cable or wire. ● Keep a sufficient distance between cables and heating devices to prevent the insulation layer from aging or damage in high temperature.

Notice
All electrical connections must meet local and national electrical standards. ● Cables used by users should comply with local laws and regulations. ● The inverter must be approved by the power department of the country/region before it can be connected to the grid.

6.2 Wiring overview diagram

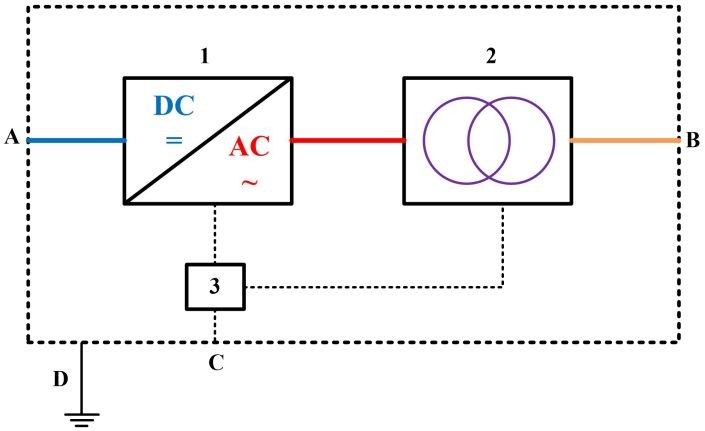


Figure 6-1 Cable overview

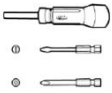
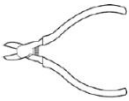
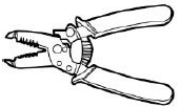
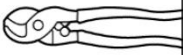
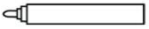
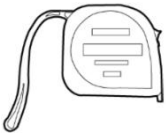
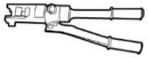
Table 6-1 Describes the components and wiring terminals

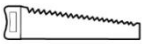
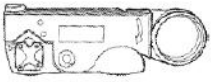
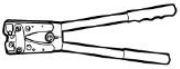
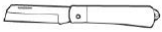
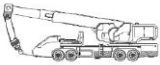
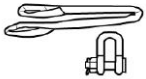
No.	Name	Recommended Cable Specifications
A	DC input port	Voltage class DC1500V, maximum cable support 400 mm2
B	AC output port	35kV voltage level, T-head connection, 3×185/240/300/400 cable entry connection requirements
C	Communication port	2 x 0.5mm2 twisted pair shielded cable
D	Ground connection	60 mm x 100 mm hot dip galvanized flat steel or 50 mm2 to 95mm2 ground cable

6.3 Preparation before connection

6.3.1Installation tool

Installation tools include but are not limited to the following recommended tools. If necessary, other auxiliary tools can be used on site.

Type	Tool			
Installation	 Hammer drill	 Socket wrench	 Torque wrench	 Torque screwdriver
	 Diagonal pliers	 Wire stripper	 Adjustable wrench	 Rubber mallet
	 Utility knife	 Cable cutter	 Open end torque wrench	 Combination wrench
	 File	 Vacuum cleaner	 Multimeter	 Marker
	 Measuring tape	Bubble or digital level	 Hydraulic pliers	 Heat shrink

				tubing
	 Heat gun	 Cable tie	 Leather measuring tape	 Hacksaw
	 Cable stripper	 Hex key	 Crimping tool	 Electrician's knife
Installation	 Crane	 Hoist clamp and lifting rope	 Claw hammer	 Step ladder
PPE	 Safety gloves	 Safety goggles	 Safety helmet	 Safety shoes

6.3.2 Open the product cabinet door

Step 1 Open the cabinet door.

Step 2 Secure the inverter unit and PDC door using a sliding rod or a limiting rod.

Step 3 Remove the protective cover from the cable connection area.

---- End

6.3.3Cable requirements

The selected cables must meet the following conditions:

• Adequate current carrying capacity. Factors affecting the current carrying capacity of conductors include but are not limited to the following conditions:

- Environmental status
- Type of conductor insulation material
- Cable routing method
- Cable material and cross-sectional area

• The cable diameter must be selected according to the maximum current carrying capacity, and the length must be allowed.

• The specifications and materials of all DC input cables must be consistent.

• Specifications and materials of three-phase AC output cables must be consistent

• Be sure to select flame-retardant cables.

Notice
● **Cables used should comply with local laws and regulations.** ● **The cable colors shown in this document are for reference only. Select cables according to local cable standards.**

6.4 DC cable connection

 **Danger**
● **The DC bus-box exposed to sunlight will produce dangerous voltage!** ● **Follow the safety precautions listed in the DC bus box and related**

documentation.

Warning

- **Before connecting the photovoltaic array to the inverter, ensure that the photovoltaic array is properly insulated from the ground.**
- **Ensure that the voltage and maximum short circuit current of the DC busbar are within the allowable range of the inverter. For details, see Technical Specifications.**
- **Before connecting the DC bus-box to the product, check the positive and negative polarity of the DC bus-box and then connect the DC bus-box to the corresponding position of the product.**
- **During the installation and operation of the product, ensure that the positive or negative terminal of the DC busbar is not short-circuited to the ground. Otherwise, it may cause AC/DC short circuit of the product, resulting in equipment damage, and the resulting damage will not be covered by the warranty.**

6.4.1 Intro

The DC input wiring area of the inverter unit is shown in the following figure.

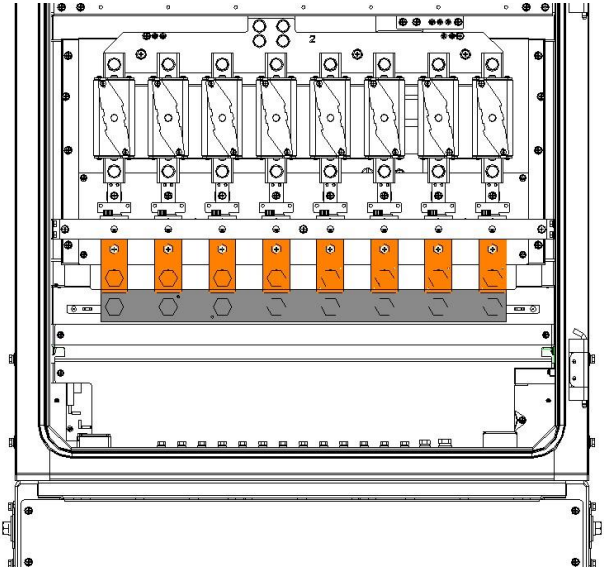


Figure 6-2 DC connection area of the inverter unit

* The figure is for reference only

6.4.2 Operation procedure

Step 1 Disconnect the circuit breaker of the upper level bus box and ensure that the DC cable is not powered on.

Step 2 Use a multimeter to measure the open circuit voltage of the photovoltaic array and ensure that the open circuit voltage does not exceed 1500V.

Step 3 Use a multimeter to determine the positive and negative terminals of the PV array, and connect the PV+ and PV- cables of the PV array to the DC input DC+ and DC- copper bars of the inverter.

Step 4 Use M16 bolts to secure the positive and negative cables of the PV

array to the DC input copper bar of the inverter.

Tighten the torque by referring to the following table.

Table 6-2 Requirements for bolt tightening torque

Bolt		Tightening moment （ N•m）
Bolt/nut Specification	Bolt class	
M6	4.8	6
M8	4.8	14
M10	4.8	30
M16	4.8	120

Step 5 After the cable connection is complete, gently drag the cable to ensure sufficient space.

---- End

Danger

- **Ensure that the selected DC cable terminal can directly contact the copper bar. If in doubt, contact the terminal manufacturer. Fasten the DC cable terminal to the DC copper bar of the inverter with a torque of no less than the specified torque. If the contact is not good or fixed firmly, will lead to serious failure, the resulting damage will not be within the scope of warranty, TBEA Xi 'an Electric Technology Co., Ltd. does not assume any responsibility.**

Danger

- **If aluminum cable is used, please ensure that the copper bar and aluminum wire are not in direct contact, if direct contact will lead to chemical corrosion, affect the reliability of the electrical connection, or will lead to serious failure, the resulting damage will not be covered by the warranty, TBEA Xi 'an Electric Technology Co., Ltd. does not assume any responsibility.**

Warning

- **If dual-core cables are used on the DC side, the split positive and negative cables must be under the inverter. Do not split inside the inverter. This may cause damage to the equipment, and the resulting damage will not be covered by the warranty.**

Warning

- **After connecting the cable, gently drag the cable to ensure sufficient space. No margin of the cable will produce excessive tensile stress on the terminal, resulting in damage will not be covered by the warranty.**
- **Use fireproof mud to seal the cable entry holes at the bottom. Because the cable entry holes after wiring are not blocked, excessive sand, water and other foreign matter will enter the inverter, which will affect the reliability of the inverter, and the resulting damage will not be covered by the warranty.**

6.5 AC cable connection

6.5.1 Pre-wiring requirements

Check that the AC side of the inverter is disconnected.

Open the transformer high voltage outside side door and inside side door, check and ensure that the live display on the inside door is not lit.

Refer to the ring cabinet manual and disconnect the switch on the ring cabinet using a dedicated lever.

Check and ensure that the cable outlet cabinet of the upper array ring network cabinet is disconnected.

Check and ensure that the bushing and copper bar in the wiring area of the high pressure chamber are free from damage, deformation and fracture.

6.5.2 Wiring procedure

Step 1 Open the cable inlet hole at the bottom of the high pressure chamber.

Step 2 Route the external cable through the cable entry hole at the bottom.

Attention
● Each three-phase cable (L1, L2, and L3) is routed through the same cable inlet hole.

Step 3 Prepare terminals and secure them by referring to the cable connector installation guide.

Attention
● The high voltage side cable head is connected with a T-plug that meets the EN50181 standard.

After connecting cables, secure cables by referring to 6.9.3 Securing Cables.

Use fireproof mud to seal the bottom inlet hole, remove debris from the high pressure chamber, close and lock the high pressure chamber cabinet door.

---- End

6.6 Ground connection

Two ground points are reserved on both sides of the Inverter Transformer Station. The ground points are connected to the power station in a systematic way. If foreign bodies or rust are found on the ground bar, polish the ground points before connecting them, and take anti-rust treatment.

 Danger
● **The product must be grounded reliably!** ● **The ground cable must be properly grounded. Otherwise, the operator may receive a fatal electric shock.** ● **If the ground cable is not properly grounded, the device may be damaged when lightning strikes.** ● **If the ground cable is not properly grounded, the device may not run properly.**

Warning

- **Before connecting the AC side, DC side, and communication side, make a ground connection.**
- **The two ground points on the side of the product must be reliably grounded, otherwise, the solar power supply does not assume any responsibility for the possible consequences.**

Attention

- **Note the following points when grounding:**
- **The grounding connection must comply with the grounding standards and regulations of the country/region where the project is located.**
- **All ground connections in the photovoltaic system must be securely secured.**
- **After grounding is complete, measure the grounding resistance. The resistance value cannot be greater than 4 Ω .**

6.6.1 Intro

There are two grounding methods: use flat steel to weld the ground and use a ground cable to fix the ground.

Ground screw specification: M12*30; Quantity: 8.

6.6.2 Earthing flat steel

Weld a 60mmx100mm hot-dip galvanized flat steel to a fixed ground

point.

6.6.3 Ground cable

Use a 50mm² to 95mm² ground cable to reliably connect the ground point to the system ground point, connecting 1/3 or 2/3 of the ground point.

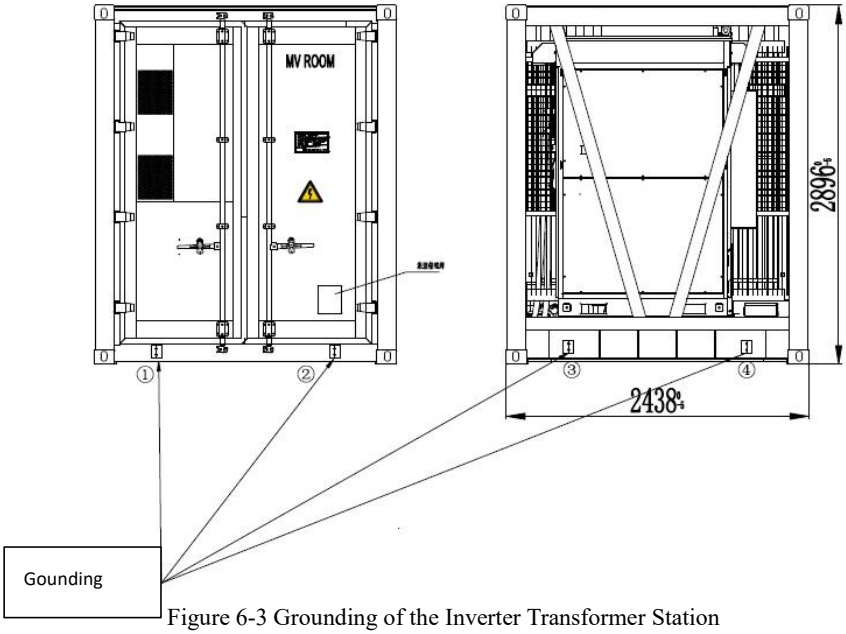


Figure 6-3 Grounding of the Inverter Transformer Station

6.7 The bus box is connected to the communication cable

The Inverter Transformer Station appliance is connected to the RS485 communication cables and power cables of the inverter and transformer monitoring unit. The user connects the communication cables of devices such as the bus box and optical fibers to the optical fiber welding box port in the power cabinet. Supports a maximum of 2 x 2.5 mm2 twisted-pair shielded

cables. Bare cables cannot be crimped.

6.8Ethernet connection

Communication power cabinet integrated display unit Ethernet communication port.

Attention
● **The communication interface can support Ethernet, but the network cable can not be electrically inserted and removed, otherwise there is the possibility of damage.** ● **Connect the Ethernet port to the external monitoring device using a CAT-5e cable.** ● **The EHT0 port is the SCADA port, and the ETH1 port is the GOOSE communication port.**

6.9 Post-wiring operation

6.9.1 Post wiring check

After all electrical connections are complete, the wiring should be thoroughly and carefully inspected.

• The inlet holes and surrounding gaps should be sealed with fireproof and waterproof materials.

• Firmly restore all shields.

 Warning

● **After connecting cables, check whether the cables are correctly connected. After connecting cables correctly, use fireproof/waterproof materials such as fireproof mud to seal the gaps in the inlet and outlet holes of the inverter to prevent foreign bodies or moisture from entering the inverter, which may affect the long-term normal operation of the inverter.**

6.9.2 Lock the cabinet door

After all electrical connections are complete, the wiring should be thoroughly and carefully inspected.

Step 1 Unfasten the inverter unit cabinet and PDC doors.

Attention
● It is strictly forbidden to forcibly close the cabinet door without removing the limit rod or slide rod.

Step 2 Lock the cabinet door and pull out the key.

 Danger
● **Danger of electric shock!** ● **Please be sure to lock the cabinet door, if the product is not locked, non-professional personnel contact the operating machine, may lead to casualties.**

---- End

6.9.3Cable fixing

After cables are connected, secure the cables to prevent damage caused by excessive force on the copper bar.

• The product is configured with cable clips, which are used to secure cables.

• If the product is not equipped with cable clips, you can select a range of 500mm from the AC/DC cable cover to fix the cables.

7 Transformer

7.1 Common components and functions

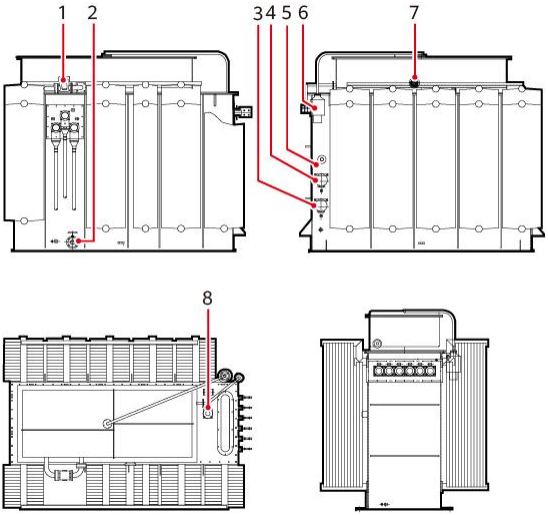


Figure 8-1 Product components

*The figure is for reference only，The actual device shall prevail

Table 8-1 Component description

No.	Name	Function
1	Gas relay	Generates a gas buildup alarm or oil flow trip

2	Oil feeding and draining valve	Refill or drain oil
3	Oil surface temperature controller	Measure and control the temperature of the top layer transformer oil。
4	Winding thermometer	By measuring the top oil temperature, the transformer winding temperature is measured and controlled by thermal simulation。
5	Off-load tap changer	regulating voltage
6	Moisture absorber	-
7	Oil level gauge	Indicating the oil level
8	Pressure relief valve	Release pressure

7.2 Common component descriptions

7.2.1 Gas relay

- When there is a small fault in the transformer, the oil of the transformer will produce gas. The gas will rise and enter the gas relay. In this case, the reed switch contact for gas accumulation will close to send a signal. When the gas is too much, it can be released through the gas nozzle of the gas relay.

- When there is a strong airflow in the transformer, the reed switch contacts for the oil flow will close and the circuit breaker will trip.
- Before use, check whether there is gas in the gas relay. If there is, release the gas.

（1） Through the glass window of the gas relay, it is observed that there is gas inside the cavity and it needs to be released.

（2）Open the gas relay cover.

（3）Remove the cap nut of air relief cock.

（4）Loosen the bolt of air relief cock, and the gas inside the cavity of air relief cock will be gradually discharged until the oil droplets emerging.

（5）Tighten the bolt of air relief cock, install the cap nut of air relief cock, and reinstall the gas relay cover.

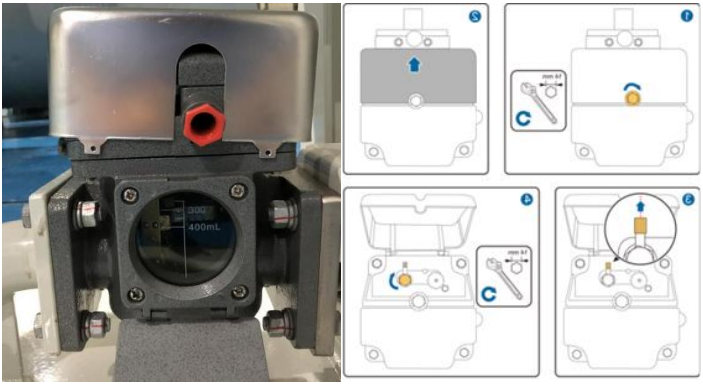


Figure 8-2 gas relay

7.2.2 Oil feeding and draining valve

- Oil feeding： Refill transformer oil using uncontaminated metal or

non-rubber hoses and oiling equipment. (Note: Prevent air from entering.)

- Oil drainage：Use an uncontaminated metal or non-rubber hose to direct transformer oil into the container.
- （1）Tools provided by user: clean steel hoses and≥N×200L oil tanks (N is the number of transformers in the project), rags, wrenches (16-18, 17-19, 22-24), adjustable wrenches (300mmx38mm), oil drain hose connectors, pipe clips.
- （2）Connect 60mm bore hose (oil drain valve)
- （3）Connect the inside diameter 35mm hose (oil tank feeding and draining valve)。
- Note: The transformer has two oil draining ports: the oil drain valve at the bottom of the transformer is DN50 cast iron valve; The oil feeding and draining valve of the oil storage tank located at the bottom of the oil storage tank is DN25 copper valve. The oil drain valve DN50 is recommended.
- （4）Make sure the oil drain valve is closed.
- （5）Remove the cover of the oil drain valve.
- （6）Secure drain hose connection. One end of the steel hose is connected to the drain hose connector and the other end is connected to the oil tank.
- （7）Open the oil valve, and the transformer oil slowly flows into the oil tank from the transformer.
- （8）On the basis of the local ambient temperature, check the position of the oil level gauge according to the oil temperature and oil level curve. When the transformer oil drops to the corresponding indicated position, stop the oil draining.

- （9）Close the drain valve and remove the drain hose connector and hose.
- （10）Reinstall the cover of the drain valve.

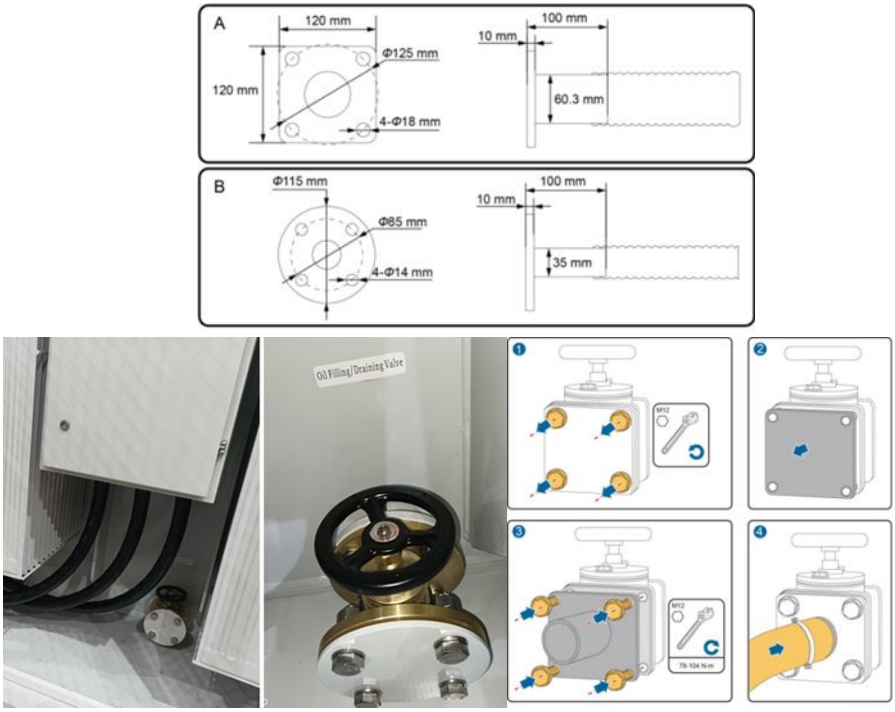


Figure 8-3 Oil feeding and draining valve

7.2.3 Oil surface temperature controller

- The top oil temperature of the transformer oil is displayed in real time, and the alarm and trip signal are sent through the built-in temperature control switch. The alarm temperature is 95℃ by default, and the trip temperature is 100℃ by default.

Figure 8-4 Oil surface temperature controller

7.2.4 Winding thermometer（optional）

- The temperature of the transformer winding is displayed through thermal simulation technology, and the alarm and trip signals are transmitted through the temperature control switch. The alarm temperature is 100℃ by default, and the trip temperature is 110℃ by default.

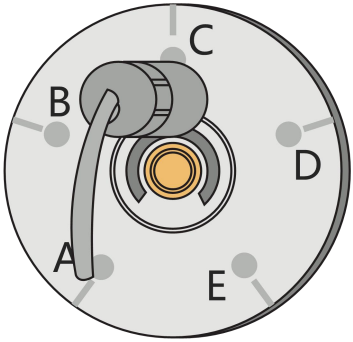
Figure 8-5 Winding thermometer

7.2.5 Off-load tap changer

- There are five levels. Grade A(1) indicates the maximum tap value, grade C(3) indicates the rated tap value, and grade E(5) indicates the minimum tap value.
- When the voltage of the low voltage side is fix, the output voltage of the high voltage side at different gears is:

tap position	Output voltage value
1	Rated Voltage×1.05
2	Rated Voltage×1.025
3	Rated Voltage×1.00
4	Rated Voltage×0.975
5	Rated Voltage×0.95

- Adjust the Off-load tap changer according to the power grid voltage before use (take adjusting to gear 1 as an example).



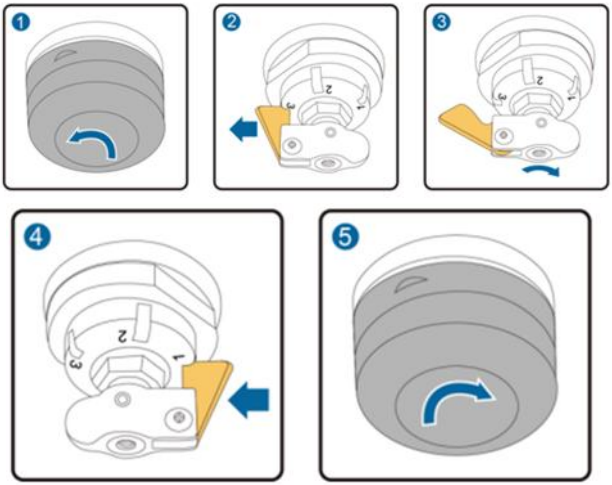


Figure 8-6 Off-load tap changer

7.2.6 Moisture absorber

- The insulating oil is isolated from the atmosphere by airbags in the oil tank. The airbag is connected to the atmosphere by a dehydrator. Moisture absorber contains silica gel, which can absorb moisture and impurities in the air, and maintain the good performance of the insulation oil.
- Install Moisture absorber before use.

  （1）Remove the flange cover from the Moisture absorber installation position.

  （2）Fix moisture absorber.

  （3）Remove moisture absorber end cap.

  （4）Add clean transformer oil to the end cap. The oil depth is 1/2 to 2/3 of the end cap depth.

  （5）Reinstall and tighten the oiled end cap.

Figure 8-7 Moisture absorber

7.2.7 Oil level gauge

- Indicates the oil level of the transformer oil tank and reports alarms for high and low oil levels.

Figure 8-8 oil level gauge

7.2.8 Pressure relief valve

- If there is fault of the transformer, a large amount of gas will be generated, and the pressure of the insulating oil will rise sharply. When a certain threshold is reached, the transformer oil is drained and the internal pressure of the transformer is reduced to a normal value. At the same time, a signal is sent to make the circuit breaker trip
- Remove the safety plate of the pressure relief valve before use.

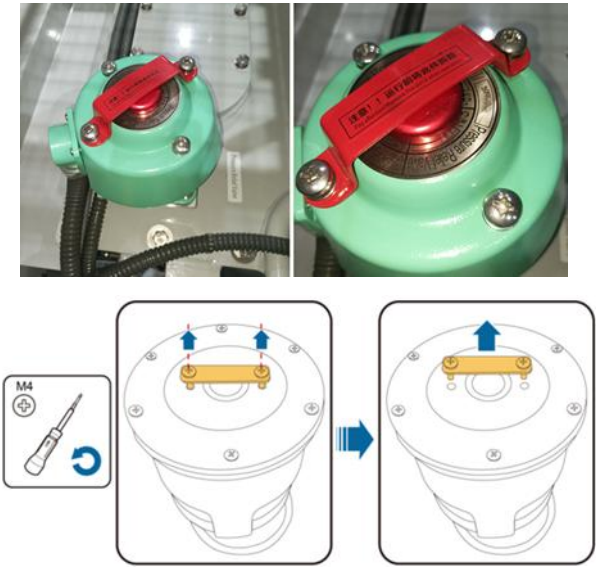


Figure 8-9 Pressure relief valve

8 RMU

For details about RMU operations, please refer to RMU User Manual.

- Take the 8DJH36 (DCV) cabinet as an example to describe the components of a RMU in Figure 9-1

  The DCV RMU contains a direct cable lead-in cabinet (D), a load switch

cabinet (C), and a circuit breaker cabinet (V).

When the power is turned on, the auxiliary chamber of the RMU cannot be opened.

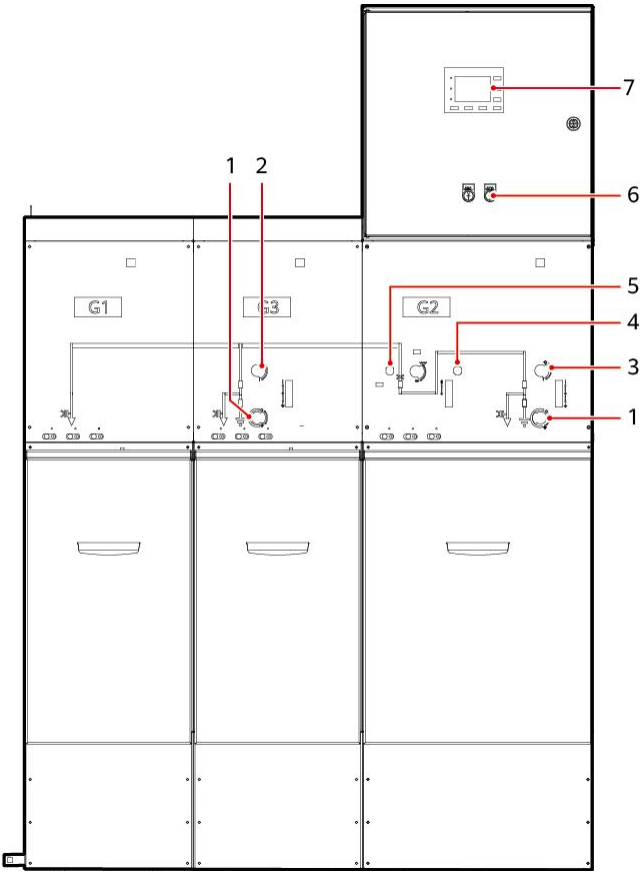


Figure 9-1 Appearance of a RMU

*The figure is for reference only，The actual device shall prevail

Table 9-1 Component description

NO	Component
1	Earth switch operating hole

2	Load-disconnector switch operating hole
3	Disconnector operating hole
4	Manually open button
5	Manually close button
6	Electric control button
7	Protection relay

9 Communication debugging

The measurement and control device is used for analog quantity acquisition, non-power protection, remote control and communication, and realizes remote management and automatic monitoring of the equipment in the Inverter Transformer Station.

- Communication

Provide at least 8 RS485 communications, and can complete protocol conversion; Support Ethernet, MODbus, CAN and other communication protocols.

- Telemetering

By AC sampling function, the I, U, P, Q, F, COSφ, active power, reactive power and other parameters can be remotely measured. Since there is no PT on transformer low voltage side, the device should be able to directly acquisite three-phase voltage.

- DC measurement

- It can provide 6 channels of DC measurement, which is used to collect PT100 and 4-20mA power signals sent by the transmitter, and indirectly measure non-electric signals such as temperature, humidity and oil temperature.
- Remote signalling

It is used for real-time acquisition of various signals in the inverter room or station. Such as low-voltage circuit breaker switching status signal in inverter room, high-voltage switch switching status signal of RMU.

- Telecommand

The device can provide output contact for remote control of switches with remote control conditions. Such as: open and close VCB of RMU.

- Protection

The device can provide multiple non-electric protection functions, such as: light gas, heavy gas, transformer high temperature, transformer ultra high temperature, transformer low oil level, pressure relief valve action and so on. At the same time, it can also provide a variety of electrical protection functions, such as: overcurrent I section, overcurrent II section, overcurrent III section, grounding protection, overvoltage protection, undervoltage protection and so on.

- Record

With thorough event report processing function and operation record function, it can save at least the latest 25 SOE change records and the latest 25 user operation records.

10 Power supply (subject to project technical agreement requirements)

10.1 Overview

Mainly supply power for inverter control system, low-voltage panel, communication box, heating and lighting, fire fighting equipment and other facilities in inverterand transformer station.

10.2Power supply mode

Internal inverter, low voltage panel, lighting, heating of Inverter Transformer Station are of internal power supply mode , power is converted by internal transformer and supply to inverter and low-voltage panel.

10.3 Reserved power allocation

During commissioning and maintenance, the power supply allocation varies according to the customer's requirements，the actual power allocation of the power station prevails。

11 Maintenance

Regular maintenance of the equipment can keep the Inverter Transformer Station in the best condition and prolong its service life.

11.1 Precautions

Danger

- **Improper maintenance operations may result in injury or equipment damage!**
- **Disconnect the switch between the product and all power supplies before maintenance operations.**
- **Maintenance must be implemented only after the inverter is powered off for 20 minutes, by the professional personnel wearing the protective assembly and use testing device ,and must be sure that there is no voltage or current.**

Danger

There is a high voltage in the inverter device, and accidental contact may result in a fatal electric shock hazard!

- **When measuring on line, please be sure it is operated by a PV system professional with protection (such as wearing high-voltage insulation gloves, wearing insulation shoes, wearing safety hats, etc.).**
- **When measuring on line, the operator must be accompanied by others to ensure personal safety.**

Danger

Damaged equipment or system failure may cause electric shock or fire!

- **Check the equipment visually for damage or other hazards before operation.**
- **Check that other external devices or circuit connections are secure.**
- **Ensure that the device is in a safe state before operation.**

Warning

- **During maintenance operation, if equipment replacement is involved, please contact TBEA Xi 'an Electric Technology Co., LTD.**
- **Do not maintain the product in rainy, wet or windy weather, otherwise, for the possible consequences, TBEA Xi 'an Electric Technology Co., Ltd. does not assume any responsibility.**
- **For products with a long downtime, before powering on, it is necessary to conduct a comprehensive and detailed inspection of the product, first of all to ensure that the product and internal equipment are intact, and the film of the air inlet and outlet is intact, and then it is necessary to ask professionals to check and test before it can be powered on and continued to be put into use.**

Warning

- **Do not open the door for maintenance of the product in rainy, wet or windy weather. For consequent loss , TBEA Xi 'an Electric Technology Co., Ltd. will not assume any responsibility.**

Warning

- **After shutdown, please wait at least 20 minutes before opening the door. Before performing maintenance, ensure that the inside of the product is completely free of power.**

Attention
● After the maintenance work, do not leave screws, washers and other metal parts in the inverter, otherwise it may damage the product!

Attention
● To reduce the risk of electric shock, do not perform maintenance items beyond this manual. If necessary, contact TBEA Xi 'an Electric Technology Co., Ltd. for maintenance, otherwise the resulting loss will not be within the scope of warranty.

 Caution
● To prevent irrelevant personnel from getting close to equipment and misoperating and any other accidents.Place eye-catching warning signs or set up safety warning belts around the equipment to prevent accidents caused by misoperation.

 Warning
● Considering the maintenance of the line without power cut, the transformer and inverter can be repaired after the V cabinet of the RMU is grounded. ● Considering the power-off maintenance of the power station, please turn off the switch of the upper level outlet cabinet and ensure that there is no power on the power side, turn off the load switch of the C

cabinet of the RMU , turn off the ground switch of the upper outlet cabinet and the C cabinet of RMU at this level,then maintenance operation can be implemented.

Attention

- **Routine inspection and maintenance should follow the regulations of the power supply department.**
- **Inspection, maintenance and repair work should only be performed by personnel who are trained and familiar with the equipment, are certified and comply with the requirements of various safety procedures issued by the power Department.**
- **During maintenance, you are advised to use a multimeter to measure the voltage of the metal parts that you need to touch or may touch to avoid electric shock.**

11.2 Maintenance period

Table 12-1 shows the maintenance period of the Inverter Transformer Station.

Table 12-1 Maintenance periods of the Inverter Transformer Station

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
1	System running status and	Check whether the appearance and internal components of the device are damaged or deformed.	Once a month	Yes

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
	cleanliness	Check whether abnormal sounds occur when the device is running.		No
		Check that the warning label is clear. If the label is dirty or damaged, replace it in time.		No
		Check whether there is condensation inside the device. If there is visible condensation, ventilate and dehumidify the equipment.		Yes
		Inspect equipment for corrosion or peeling paint and repaint damaged areas.		No
	inverter	Check whether the inverter running indicator is normal. If not, check and replace it.		Yes
	transformer	Check for oil leaks around the pressure relif valve. If so, tighten the valve or replace the faulty part.		Yes
		Check whether there is oil leaks occuring on the bushings of each phase on both HV side and LV side. If so, tighten the bushing or replace the faulty part.		Yes
		Check the connection point between the transformer radiator and the tank flange for oil leakage. If so, tighten the connection point or replace the faulty		Yes

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
		part.		
		Check whether the sound of the transformer is normal during operation. If there is abnormal noise, turn off the transformer power supply and repair it.		Yes
		Check whether the color of the desiccant in the Moisture absorber has not changed. If the color changes from blue to pink or from orange to dark green, the desiccant should be replaced in time.		No
		Check that the transformer oil in the dehydrator oil cup is clean. If it becomes dirty, the transformer oil should be replaced in time.		No
		If the amount of water in the oil pan exceeds 50% of the oil pan capacity, it should be drained in time.		No
	RMU	Check whether the L1/L2/L3 voltage indicator is normal. If not, replace it.		Yes
2	inverter	Check the emergency stop button and the stop function of the interface.	Every half year to once a year	Yes
		Check the cleanliness of circuit boards and components.		Yes
		Check the temperature and dust of radiator. If necessary, use a vacuum		Yes

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
		cleaner to clean the cooling module.		
		Ventilation of air inlet must be checked. Otherwise, if the module is not cooled effectively, it will fail due to overheating. If necessary,please replace the air filter		Yes
	transformer	Check whether the real-time temperature of the oil temperature indicator is normal. If the difference between the temperature and the temperature displayed on the SmartLogger is greater than ±2°C, the temperature indicator is faulty and needs to be repaired in time.		Yes
	RMU	Check the SF6 gas pressure gauge to see if the pointer is in the green range. If the pointer is close to red, stop the operation of the RMU in time and refill SF6 gas.		Yes
3	heat exchanger	Check whether the heat exchanger has no abnormal sound during operation.	6 months after the first commissioning and every 6-12 months thereafter	Yes
4	inverter	Check whether flammable objects exist on the top of the inverter.	once a year	No

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
		Check whether the welding point between the inverter and the foundation steel plate is firm and whether there is rust.		No
		Check whether the inverter enclosure is damaged, paint off, or oxidized.		No
		Check whether the monitoring window and cabinet door lock can be opened flexibly.		No
		Check that seals, etc. are fixed properly.		No
		Check whether there is foreign matter, dust, dirt, and condensate inside the inverter.		Yes
		Check whether the cable layout is standard and short circuit exists. If there is an anomaly, correct it immediately.		Yes
		Check whether all inlet and outlet cable holes of the inverter are properly sealed.		Yes
		Check whether there is water seepage inside the inverter.		Yes
		Check whether the power cable connection is loose and tighten it according to the specified torque.		Yes
		Check power cables and control cables		Yes

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
		for damage, especially if there are signs of cuts on the skin in contact with the metal surface.		
		Check whether the insulation wrapping tape of the wiring terminal of the power cable is off。		Yes
		Check whether the grounding connection is correct. The grounding resistance value must not exceed the standard value.		Yes
		Check whether the equal potential connection inside the inverter is correct.		Yes
		Check the running status of the fan module.		No
		Check whether the fan is blocked.		
		Check whether abnormal noise occurs when the fan is running.		No
		Check whether screws fall off inside the inverter.		No
	transformer	Clean the surface of the transformer tank,conservator and radiator, tighten the bolts of the anchor, ground circuit and main circuit.		Yes
	RMU	The operating mechanism is tested manually to check its flexibility. If it cannot be closed or opened, the		Yes

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
		operating mechanism should be repaired in time.		
5	cable connection	Check that the power cable is securely connected to the signal cable or copper bar. If not, connect correctly according to the specified torque.	Six months after the first commissioning and every two years thereafter	Yes
		Check that the cable holes are properly sealed. Make sure there are no gaps.		Yes
		Check whether the power cable and control cable are damaged and whether there are scratches on the outside of the cable that comes into contact with the metal surface.		Yes
		Check that the insulation binding tape on the wiring terminal of the power cable is intact.		Yes
	inverter	Check whether the inverter and internal devices are damaged or deformed.		Yes
		Check whether there is abnormal noise during the running of internal devices.		No
		Check whether the temperature in the inverter cabinet is too high.		Yes
		Check whether the internal humidity and dust level of the inverter are within the normal range. Clean if necessary.		Yes

No.	Items	Inspection method	Maintenance period	Whether system need to be powered off or not
		Check whether the inlet and outlet of the inverter are blocked.		Yes
		Check whether the surge protection devices and fuses are properly secured.		Yes
		Check whether there is oxidation or corrosion inside the inverter.		Yes

NOTE

- The recommended routine maintenance periods are listed in the table. The actual maintenance period should be determined based on the specific installation environment.
- Power station scale, location, site environment and other factors will affect the product maintenance cycle. If the operating environment is large or dusty, it is necessary to shorten the maintenance period and increase the frequency of maintenance.

11.4 Common troubleshooting

- Major fault: once fault occures,must stop the machine, and stop the grid-connected generation.
- General fault: Some components fail, but they can still be connected to the grid to generate electricity.

- Warning fault: The function is normal, but external factors cause the output power to decrease.

Table 12-2 Troubleshooting table

Fault	Fault cause	Fault Level	Troubleshooting and possible causes of faults
Inverter			
Module manual restart command \ there is a non-restart fault	Indicates a shutdown fault, and the number of failures is greater than the number set by the program	Major fault	（1）High or low bus voltage, positive or negative bus overvoltage （2）Overcurrent occurs on the AC/DC side. （3）AC switch fault
Switch knob off	The parallel start switch is not turned on	Warning fault	（1）Artificial rotating switch button;
Scram shutdown	The emergency stop button is pressed	Warning fault	（1） The emergency stop button is pressed; （2） Cables to the emergency stop button are abnormal; （3）The emergency stop button is damaged; （4）Contact TBEA Xi ‘an Electric Technology Co., LTD;
IGBT air blower fault	The heat dissipation fan of the power cabinet is faulty	Major fault	（1）air blower fault; （2）Contact TBEA Xi ‘an Electric Technology Co., LTD;
AC lightning protection is faulty	AC SPD is damaged	Major fault	（1）AC SPD is damaged; （2）Contact TBEA Xi ‘an Electric Technology Co., LTD;

DC lightning protection is faulty	DC SPD is damaged	Major fault	（1）DC SPD is damaged； （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
measurement and control disconnect instruction	Remote measurement and control of real action	Warning fault	（1）Remote measurement and control of real action； （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
PID resistance fault \ input impedance fault \PV positive grounding \PV negative grounding \ System insulation impedance detection failed	The PID resistance fault indicates that the negative grounding resistance is greater than 100K for five times. Input impedance fault Indicates that the input impedance (insulation impedance between PV and ground) is lower than the set value.	Major fault	（1）Inverter front side combiner box is grounded or ground impedance is low; （2）Inverter PV to bus circuit is grounded or grounding impedance is low; （3）PV sampling circuit is grounded or grounding impedance is low; （4）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The DC load switch	The status of the DC	Major	（1）Contact TBEA Xi ‘an Electric Technology

is faulty	load switch is different from the actual status	fault	Co., LTD；
phase sequence of inverter is faulty	The inverter phase sequence self-test fails	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
amplitude lock fault of inverter	If the difference between the inverter voltage and the grid voltage amplitude is greater than the threshold during the startup self-test, the inverter amplitude lock fault is reported	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
AC grid voltage sampling fault \ Abnormal grid phase sequence	The inverter phase sequence self-test fails	Major fault	（1）Inverter AC output three-phase line phase sequence is incorrect； （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The bus voltage sampling is abnormal	The bus voltage sampling is abnormal	Major fault	（1）The bus voltage is abnormal；； （2）The DC fuse is faulty； （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；

The AC current sensor is faulty	current sensor is faulty	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The DC current sensor is faulty	current sensor is faulty	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
PV inversed connection	The DC branch circuit current is reversed	Major fault	（1）PV positive and negative electrodes are reversed； （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
AC switch fault	The ACB status does not match the feedback	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
EEPROM storage fault	EEPROM storage fault	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Smoke action warning \ Smoke alarm	smoke detector alarm	Major fault	（1）The smoke alarm is faulty or corroded by dust； （2）breaking out of fire （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The CAN bus communication is faulty	The CAN communication fails	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Communication	Communication	Major	（1）Contact TBEA Xi ‘an Electric Technology

between DSP and CPLD is faulty	between DSP and CPLD is faulty	fault	Co., LTD；
Low power shutdown	Indicates that the active power is low and the inverter unit shuts down at low power.	Warning fault	（1）The active power of PV array is too low and the fault trigger condition is met.
short circuit fault between phase and earth	The inverter short circuit \ phase to earth short circuit shutdown \ there is short circuit between phase and earth	Major fault	（1）phase to earth is actually short-circuited （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
there is an address conflict \ module address or model setting is abnormal \ model, series number, version information parameters abnormal	The slave machine which has the same ID as host exists in the system. The machine ID and model information are incorrectly set. The model, series number, and version information of different inverters are inconsistent.	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；

Grid resonance shutdown	The voltage distortion on the power grid side seriously exceeds the set threshold	Major fault	（1）There is resonance on power grid side； （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
High RMS of the grid \ Low RMS of the grid	Indicates that the RMS of the power grid voltage is higher or lower than the operating voltage range	Warning fault	（1）The power grid is abnormal; （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The PV voltage does not meet the operating voltage	The PV voltage does not meet the operating voltage	Warning fault	（1）The DC voltage exceeds the allowable range； （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Bus voltage soft start fault	Reactive power compensation soft-start failure (shutdown) indicates that the charging time in the non-grid-connected mode is greater than the threshold, and the bus	General fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；

	voltage is still less than the threshold.		
The ambient temperature is too high. The ambient temperature is too low	The ambient temperature exceeds the permissible range	General fault	（1） The ambient temperature exceeds the permissible range （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Reactor temperature alarm/Reactor temperature sensor fault/Reactor temperature overhigh fault	Reactor temperature Sampling temperature exceeds the limit	Major fault	（1）The dustproof mesh is blocked. （2） The ambient temperature exceeds the permissible range （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
IGBT Overtemperature fault	IGBT Module temperature is too high	Major fault	（1）The dustproof mesh is blocked. （2） The ambient temperature exceeds the permissible range （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The IGBT A/B/C temperature sensor is abnormal	The temperature sampling of the IGBT module is faulty	Major fault	（1）The dustproof mesh is blocked. （2） The ambient temperature exceeds the permissible range

			（3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
IGBT temperature unbalance	The temperature difference between IGBT modules is too large.	Major fault	（1）The dustproof mesh is blocked. （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The AC chamber temperature is too high \ The AC chamber temperature sensor is abnormal	The AC chamber temperature is abnormal	Major fault	（1）The dustproof mesh is blocked. （2）The ambient temperature exceeds the permissible range （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
A\B\C phase wave-by-wave current limiting	The sampling current exceeds the threshold	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
A\B\C phase A\B\C phase overcurrent \ grid-connected overcurrent fault \ grid-connected overcurrent fault	Overcurrent of inverter	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Positive or negative	Positive or negative bus	Major	（1）DC overvoltage；

bus hardware overvoltage	hardware overvoltage	fault	（2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
IGBT-A fault \ IGBT-B fault \ IGBT-C fault	The driver core board reports IGBT fault signal; Indicates an internal undervoltage or short circuit of the IGBT module	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
IGBT-A\B\C Overtemperature fault	IGBT-A\B\C Overtemperature fault	Major fault	（1）The dustproof mesh is blocked. （2）The ambient temperature exceeds the permissible range （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
High frequency synchronization anomaly	The high-frequency synchronization signal between inverters is lost	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
circulating current fault	The zero sequence current between inverters exceeds the threshold	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Phase-locked fault	The inverter	Major	（1）The phase sequence of AC cable

	grid-connected self-test failed, and the phase-lock fault occurred	fault	connection is incorrect. （2）Power grid phase loss; （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The midpoint of the clamp is unbalanced	The difference between the positive and negative bus voltages exceeds the threshold	Major fault	（1）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The grid voltage is not suitable for operation	The grid voltage is not suitable for operation	Major fault	（1）The power grid voltage exceeds the allowable range； （2）The WEB parameter is incorrectly set. （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
The grid frequency is not suitable for operation	The grid frequency is not suitable for operation	Warnin g fault	（1）The frequency of the grid exceeds the allowable range; （2）The WEB parameter is incorrectly set.； （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
derating running for ambient overtemperature \ DC	The inverter is running in derated state	Warnin g fault	（1）The ambient temperature and bus voltage exceed the allowable range of non-derating; （2）Contact TBEA Xi ‘an Electric Technology

bus overvoltage			Co., LTD;
remote shutdown	Remote shutdown signal triggered	Warnin g fault	（1）Artificial remote shutdown; （2）Contact TBEA Xi ‘an Electric Technology Co., LTD;
Transformer			
Heavy gas trip	The gas control circuit is faulty	Major fault	（1）Check the secondary circuit, whether gas relay terminals and leads are well insulated. （2）The transformer is improperly filled with oil during maintenance or installation. Therefore, the gas on the upper part of the oil storage tank is not discharged as required. Turn off transformer power and refill until oil overflows the oil storage tank. Then, refer to the oil temperature-oil level curve to release the oil to the appropriate oil level. （3）Check whether there is part violent vibration, whether the gas relay is leaking oil, and whether the secondary cable is corroded. （4）Check the transformer enclosure for obvious bumps and dents, whether the container is leaking oil, and whether the pressure relief device is spraying oil. If yes, there is a serious internal fault. （5）Contact TBEA Xi ‘an Electric Technology Co., LTD;
	The transformer did not operate correctly during oil filling	Major fault	
	Gas relay is faulty	Major fault	
	Short-circuit of transformer	Major fault	
Light gas alarm	Transformer oil leakage	General fault	（1）Check tank seals and welds for leaks. If the gas relay fails due to a drop of oil level, check that the oil level conforms to the oil temperature-oil level curve. Turn off the power and refill the transformer if necessary; （2）The transformer is improperly filled with oil during maintenance or installation. Therefore, the gas on the upper part of the oil storage tank is not discharged as required. Turn off transformer power and refill until oil overflows the oil storage tank. Then, refer to the oil temperature-oil level curve to release the oil to the appropriate oil level. （3）If there is no gas, check the secondary circuit and check that the gas relay terminals and leads are well insulated （4）Check whether there is part violent vibration, whether the gas relay is leaking oil, and whether the secondary cable is corroded. （5）Remove the gas sample from the gas relay. If a gas is colorless, odorless, and non-flammable, it is air. In this case, the air intake and the cause of the intake should be identified, which may be improper oil filling. If the gas is smelly or even flammable, it indicates an internal failure. In this case, the transformer
	The transformer did not operate correctly during oil filling	General fault	
	The gas relay or secondary circuit is faulty	General fault	
	Gas relay fault	General fault	
	A small fault occurred in the transformer, which produced a small amount of gas	General	

		fault	shoule be turned off and maintained, and the oil sample shoule be taken for chromatographic analysis; （6）Contact TBEA Xi ‘an Electric Technology Co., LTD；
High oil temperature alarm	Transformer overload	General fault	（1）Check whether the transformer is overloaded. If so, a high oil temperature alarm is generated in some cases. （2）Check whether false alarm are generated based on the cable connection of the secondary circuit. （3）Check that the temperature on the monitoring device is consistent with the temperature on the oil level thermometer. If not, correct the fault of the oil level thermometer. （4）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	False alarm due to secondary circuit	General fault	
	The winding thermometer is faulty	General fault	
Oil temperature ultra high trip	Transformer overload	Major fault	（1）Check whether the transformer is overloaded. If so, a high oil temperature alarm is generated in some cases. （2）Check whether false alarm are generated based on the cable connection of the secondary circuit. （3）Check that the temperature on the monitoring device is consistent with the temperature on the oil level thermometer. If not, correct the fault of the oil level thermometer. （4）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	False alarm due to secondary circuit	Major fault	
	The winding thermometer is faulty	Major fault	
High oil level	Abnormal oil level due to oil leakage, water seepage or other accident.	General fault	（1）If gas relay protection is available, remove the trip circuit to prevent accidental trip. （2）peration and maintenance personnel need to check the oil level gauge frequently. If the oil level is too high, drain some oil. （3）If there is abnormal oil injection in the oil storage tank or explosion-proof pipe, the transformer power supply should be cut off immediately to prevent the escalation of failures and accidents. （4）Check the pipes of the dehumidifier/dehumidifier device for blockage. If yes, fix the pipe. （5）drain oil. （6）Contact TBEA Xi ‘an Electric Technology Co., LTD；
	Wrong oil level	General fault	
	Excessive oil filling.	General fault	
Low oil level	Transformer oil leakage or long-term oil seepage	General	（1）检查辅助循环是否存在错误操作。如果继电器动作正确，则向变压器加油。Check the secondary circuit for incorrect operations. If the

		fault	relay is operating correctly, fill oil into the transformer. （2）Check consevstor for damage. If yes, replace the consevstor. （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
	After oil discharge due to maintenance, repair or testing, the transformer is not replenished to the normal level in time	General fault	
	False alarm due to secondary circuit	General fault	
	Oil leaked into the consevator	General fault	
The temperature of the transformer winding overheats alarm	Transformer overload	General fault	（1）Check whether the transformer is overloaded. If so, a high winding temperature alarm is generated in some cases. （2）Check whether false alarm is generated based on the cable connection of the secondary circuit （3）Check that the temperature on the monitoring device is the same as that on the winding thermometer. If not, correct the fault on the winding thermometer. （4）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	False alarm due to secondary circuit	General fault	
	The winding thermometer is faulty.	General fault	
Transformer winding temperature overtemperature trip	Transformer overload	Major fault	（1）Check whether the transformer is overloaded. If so, a high winding temperature alarm is generated in some cases. （2）According to the cable connection of the secondary circuit, check whether the circuit breaker has tripped incorrectly. （3）Check that the temperature on the monitoring device is the same as that on the winding thermometer. If not, correct the fault on the winding thermometer （4）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	False alarm due to secondary circuit	Major fault	
	The winding thermometer is faulty.	Major fault	
Transformer pressure valve action -	The pressure relief valve control circuit is faulty	Major fault	（1）Check whether the elastic element expander of the pressure relief valve is not working properly, twhether the film is damaged due to the bolts holding them too tight or the pressure relief valve is open, and whether the

induction tripping	The transformer did not operate correctly during the oil filling process	Major fault	seal ring of the pressure relief port is damaged (check the pressure relief port for oil leakage with a piece of paper or a white cloth), and that the secondary circuit of the gas relay and the terminals and leads are well insulated. If yes, replace it or contact the manufacturer （2）The transformer is improperly filled with oil during maintenance or installation. Therefore, the gas on the upper part of the oil storage tank is not discharged as required. Turn off transformer power and refill until oil overflows the oil storage tank. Then, refer to the oil temperature-oil level curve to release the oil to the appropriate oil level. （3）A short circuit fault usually affects a gas relay from which you can first extract a gas sample. （4）Check the humidity of the silicone in the dehumidifier by the color of the silicone and if the silicone exceeds 2/3 of the dehumidifier. Check that the pipeline is not clogged with nitrogen. （5）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	Short-circuit of transformer	Major fault	
	The transformer is not breathing well	Major fault	
HV Room			
The cooling system of the HV room is faulty	The fan of the HV Room heat exchanger is faulty	General fault	（1）Check whether the fan is faulty. If yes, replace the fan. （2）Check whether the fan port on the monitoring device has a 48V voltage. If no, replace the monitoring device or switching power supply. （3）Check whether the T/H sensor is faulty. If yes, replace the sensor. （4）Contact TBEA Xi ‘an Electric Technology Co., LTD；
	The power supply of the fan is interrupted	General fault	
	The T/H sensor in the HV Room is faulty.	General fault	
	The communication between the T/H sensor and the monitoring device is interrupted。	General fault	
HV room T/H sensor fault	The T/H sensor is faulty.	Major fault	（1）Check whether the T/H sensor is faulty. If yes, replace the sensor. （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
HV room door open	The door to the HV room is open	Major	（1）Check that the end door is open. If so, close the door；

		fault	（2）Check whether the stroke switch is faulty. If yes, replace the switch. （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
	Stroke switch fault	Major fault	
The protection relay power supply is faulty	HV room protection relay power supply is unavailable	Major fault	（1）Check whether the power circuit of the RMU is normal. If not, please repair the power circuit; （2）Check whether the relay protection in the HV room is damaged. If so, replace the relay protection； （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
	HV room relay protection is damaged	Major fault	
Relay protection communication error	The communication cable between the protection relay and the main controller is disconnected.	General fault	（1）Check whether the communication cable is damaged. If yes, replace the cable. （2）Check whether the terminals are secure. If not, fix the terminal; （3）Contact TBEA Xi ‘an Electric Technology Co., LTD；
	The terminal contact is poor.	General fault	
Transformer non-electrical protection action	Transformer tripping due to heavy gas, overtemperature or pressure relief valve action	Major fault	（1）Check whether the transformer is faulty. If so, repair the transformer or reduce the transformer load. Clear the fault before switching on the medium voltage circuit breaker; （2）Contact TBEA Xi ‘an Electric Technology Co., LTD；
Medium voltage switch control circuit disconnected	VCB control circuit is open	Major fault	（1）Check whether the closing, opening and tripping coils of the circuit breaker are damaged. If so, replace the coil. （2）Pull out the handle and make sure the stroke switch is reset. （3）Install the cable room door panel and ensure that the stroke switch is in the correct position. （4）Reset relay protection. （5）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	The handle of the RMU is not removed	Major fault	
	The door panel of the cable room of the RMU is incorrectly installed.	Major fault	

The circuit breaker in the transformer protection cabinet is disconnected or the spring is not charged	The secondary circuit power supply of the RMU is abnormal	Major fault	（1）Check whether the power supply of the RMU secondary circuit is abnormal. If yes, repair the power supply; （2）Check whether the energy storage circuit stroke switch is damaged. If yes, replace the parts. （3）Check whether the rectifier bridge of the energy storage circuit is damaged. If yes, replace the bridge. （4）Contact TBEA Xi 'an Electric Technology Co., LTD；
	The energy storage circuit stroke switch is damaged	Major fault	
	The rectifier bridge of the energy storage circuit is burned out	Major fault	
The circuit breaker of the transformer protection cabinet of RMU open fault	The operating circuit of the circuit breaker is faulty. Therefore, the remote shutdown failed	Major fault	（1）Check whether the operating circuit of the circuit breaker is faulty. If yes, replace the parts. （2）Contact TBEA Xi 'an Electric Technology Co., LTD；
Transformer overcurrent protection action	The transformer is overloaded or short circuit occurs on the low voltage side, but the low voltage circuit breaker does not open.	Major fault	（1）View and download RMU relay protection event records on site, determine the phase of short circuit, locate the fault, and rectify the fault. （2）Clear the fault before switching on the medium voltage circuit breaker; （3）Contact TBEA Xi 'an Electric Technology Co., LTD；
Transformer zero sequence overcurrent protection action	Three-phase current imbalance or single-phase cable grounding in medium voltage network	Major fault	（1）View and download RMU relay protection event records on site, compare the records with the monitoring data of the Inverter Transformer Station, find out the fault cause, and rectify the fault; （2）Check whether there is medium voltage cable grounded. If yes, repair the cable； （3）Clear the fault before switching on the medium voltage circuit breaker （4）Contact TBEA Xi 'an Electric Technology Co., LTD。
Transformer safety shutdown	The transformer is short-circuited or the medium voltage cable is faulty	Major fault	（1）View and download RMU relay protection event records on site, determine the phase of short circuit, locate the fault, and rectify the fault. （2）Clear the fault before switching on the medium voltage circuit breaker; （3）Contact TBEA Xi 'an Electric Technology Co., LTD。
RMU circuit breaker	The circuit breaker cannot trip	Major	（1）Check whether the breaker trip coil is damaged. If so, replace the coil.

fault protection action		fault	（2）Check whether the handle is removed. If not, pull out the handle and make sure the stroke switch is reset （3）Check whether the door panel of the cable room is correctly installed. If not, install the door panels and make sure the stroke switch is in the correct position. （4）Reset relay protection. （5）Contact TBEA Xi ‘an Electric Technology Co., LTD。
The RMU insulation gas pressure is low	Insulation gas leakage of RMU	Major fault	（1）Check the RMU's barometer or barometer on site. If the pointer is not in the green area, the sf6 is leaking. In this case, contact technical support. （2）If the barometric indicator or barometer pointer is in the red area, the load switch of the upper RMU or the feeder switch of the switch station should be turned off immediately。 （3）Contact TBEA Xi ‘an Electric Technology Co., LTD。
The UPS power supply is faulty	The main power supply is faulty	Major fault	（1）Measure the AC input voltage. If the voltage is abnormal, correct the grid fault. （2）Check whether the AC input circuit breaker is disconnected. If so, correct the downstream circuit fault and switch on the circuit breaker. （3）Check whether the AC input power cable is loose. If yes, fix the cable. （4）Contact TBEA Xi ‘an Electric Technology Co., LTD。
	AC input circuit breaker is closed	Major fault	
HV room Smoke sensor fault	Smoke sensor failure	Major fault	（1）Check whether the smoke sensor is faulty. If yes, replace the sensor. （2）Check the scene for fire. In the event of a fire in the HV room, the low and medium voltage circuit breakers should be turned off immediately. In case of fire at RMU, turn off the circuit breaker at the Inverter Transformer Station。 （3）Contact TBEA Xi ‘an Electric Technology Co., LTD。

11.5 Dust removal

After the Inverter Transformer Station is connected to the grid, to avoid electrical problems caused by long-term dust accumulation, periodically clean the dust inside the Inverter Transformer Station and inverters according to Table 12-1. The cleaning area must contain at least the following parts:

- The power distribution unit area and maintenance channel inside the Inverter Transformer Station;
- All power modules in the inverter and their surrounding areas;
- All boards in and around the inverter;
- All power devices such as contactors and circuit breakers in the inverter and their surrounding areas.

11.6 Check electrical connections

After six months of commissioning of the Inverter Transformer Station and every two years thereafter, it is necessary to regularly check the firmness reliability of the electrical connection. The following locations need to be checked:

- Ensure that all power supplies are disconnected before maintenance to prevent the risk of electric shock;
- AC and DC input and output cables of the Inverter Transformer Station: Check the reliability of the power cable connections of the copper bar in the AC cabinet of the inverter. Check the reliability of the DC cable connection of the inverter.
- Power distribution unit and communication unit in the Inverter Transformer Station: Check the reliability of the cable connections

between the power distribution unit and communication unit and cabinets in the Inverter Transformer Station.

11.7Clean power cable

Power cable must be cleaned two years after the Inverter Transformer Station put into use. When cleaning power cables, pay attention to the following:

- Ensure that all power supplies are disconnected before maintenance to prevent the risk of electric shock;
- To prevent corrosion of cable joints, do not use conductive liquid such as water to clean power cables, and do not use any wet fabric to clean power cable connectors.
- Clean the dust on the insulation skin of the power cable with a dry fabric or brush. Clean the metal joints and bolts of the power cable with a dry brush.
- The copper bar connected to the power cable and the port of the electromagnetic component also need to be cleaned accordingly
- If corroded bolts are found, replace them in time.

11.8Maintenance of air blower

- Three years after the Inverter Transformer Station is put into use, all air blowers and fans in the Inverter Transformer Station must be repaired

or replaced. Pay attention to the following when maintaining the fan or fan:

- Ensure that all power supplies are disconnected before maintenance to prevent the risk of electric shock;
- The maintenance contents include: cleaning of the fan, fastening bolts, firmness reliability of connecting cables, etc.
- If the fan is found damaged in the maintenance process, please contact our after-sales staff to replace it in time, and it is strictly prohibited to replace it without permission, otherwise, our company will not bear any responsibility for any subsequent quality caused by it.

11.9 Air filter maintenance

All air filters in the Inverter Transformer Station must be cleaned or replaced three months after commissioning. When cleaning and replacing the air filter, pay attention to the following:

- Ensure that all power supplies are disconnected before maintenance to prevent the risk of electric shock;
- Air filter includes: Inverter Transformer Station air intake, inverter air intake;
- Clean the air filter every three months according to the onsite working environment. If the air filter is damaged, replace it in time.

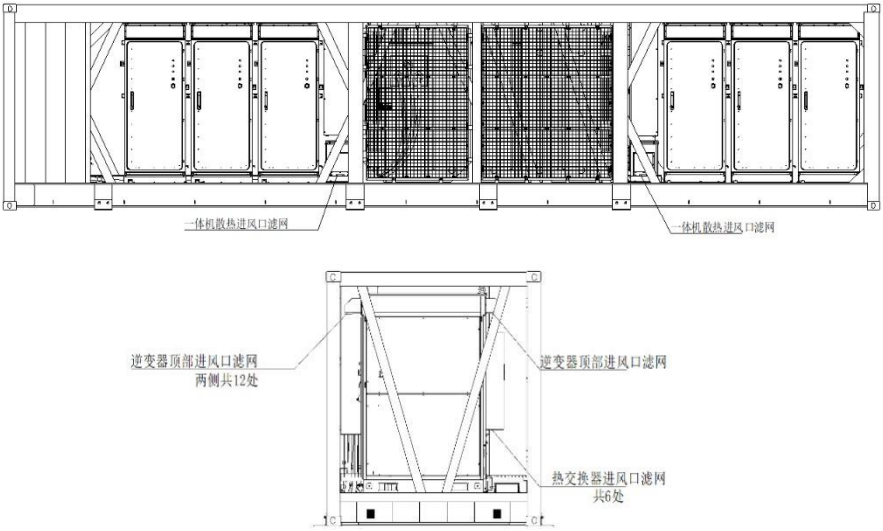
Inverter Transformer Station is of forced air cooling system, relevant maintenance of the filter screen are:

1. Inverter top air inlet filter screen, a total of 12;

2.Heat dissipation out take air filter, 2 places;

3.Heat exchanger air inlet filter, 6 places.

The position of the filter screen is shown in the figure below:



For details on how to replace the inverter filter, see the inverter user manual.

11.10 UPS and other optional systems

- Equipped with UPS, please read the UPS manual before use.

- If the UPS is not used for more than seven days, shut down the UPS and check the battery parameters before starting it again.

12 Appendix

12.1 Quality Assurance

- This product can be free maintained during the warranty period. Under the following circumstances, the Company has the right not to provide quality assurance:
- Incorrect installation;
- Incorrect modification;
- Not correct use;
- Anything beyond the scope of installation and use of international standards;
- damage caused by any abnormal natural environment.

12.2 Contact us

If you have any questions about the product, please contact as follows:

The name of the company: Tbea Xi 'an Electric Technology Co., LTD

Address: Xi 'an Industrial Park of TBEA New Energy, No. 70, Shanglinyuan Fourth Road, High-tech Zone, Xi 'an City

Post: 710119

Customer service hotline: 400-606-6029

Email：tbeapower@tbea.com

Fax：029-68760500-042

Website：http://www.tbeapower.com

kind remind

Dear customer:

- There may be some scratches on the surface of the Inverter Transformer Station caused during transportation, and some repair work needs to be done on site.

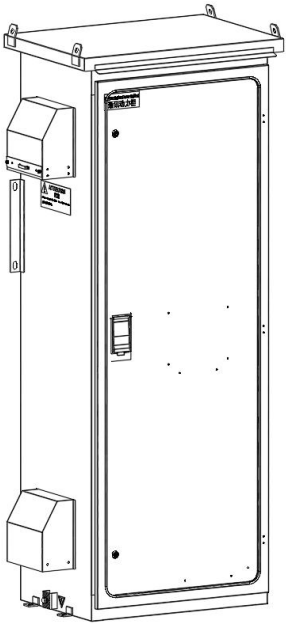
- There mau be auxiliary facilities such as lighting in the Inverter Transformer Station loosened due to turbulence during transportation, and necessary restoration work needs to be carried out on site.

- In order to achieve the protection level of IP54, the access door of some products may be too tight during the process of opening and closing, and a certain force needs to be applied during the opening and closing.

- The content of the chapter on communication management in this manual is only for the reference of devices equipped with communication management devices.

Chapter 2 Communication Power cabinet user manual

Based on intelligent box to standardize communication power cabinet- user manual



TBEA XI'AN ELECTRIC TECHNOLOGY CO., LTD

1 About This Manual

1.1 Symbol Interpretation

Please read carefully the instructions of the following symbols for your better use of this Manual:

Danger!

Serious injury or damage to people or the machine may be caused if the machine is not operated as required.

Attention!

Moderate or minor injury or damage to people or the machine may be caused if the machine is not operated as required .

1.2 Scope of Application

This Manual provides detailed product information and installation instructions for standardize communication & power cabinet of TBEA Xi'an Electric Technology Co., Ltd.

This manual is specially designed for operators. Operators shall have appropriate expertise to identify electronic components and electrical schematic symbols and have relevant experience in standard electrical distribution operation.

2 Safety Instructions

2.1 Safety Precautions

Danger!

- Non-professionals are not allowed to connect and maintain cables.
- Before the standardized communication power cabinet is fixed, cable connection is prohibited.
- Before connecting the cables in the standardized communication power cabinet, QS1, UPS and related power supplies must be disconnected to ensure that the standardized communication power cabinet is not electrified.
- It is forbidden to contact the live electrical equipment in the standardized communication power cabinet and the connecting copper bars and cables between the equipment. If you want to operate a live equipment, you must first disconnect the input and output power supply of the standardized communication power cabinet, and before operating the electrical equipment in the standardized communication power cabinet, you must ensure that the standardized communication power cabinet is reliably grounded.
- When the standardized communication power cabinet or the external control circuit is charged, it is strictly forbidden to operate the control cable. Even if the main circuit of the standardized communication power cabinet is disconnected, the control circuit of the external power supply can make the standardized communication power cabinet have dangerous voltages.
- When the main circuit is electrified, the components in the standardized communication power cabinet may have dangerously high voltages. When

using measurement tools such as multimeters, it is necessary to operate according to specifications and pay attention to safety.

- When the equipment is overhauled, first confirm the power failure inside the standardized communication power cabinet, remember not to touch the exposed copper bars and cables in the standardized communication power cabinet, and first use a multimeter to confirm that the incoming cable is not charged before you can touch the cable; Remember not to touch the exposed cable at the top of the QS1, and you must first use a multimeter to confirm that the incoming and outgoing cables are not charged before you can touch the cable; If the AC outlet cable needs to be serviced, the box must be disconnected from the power supply.

Attention!

- After the fault protection function is activated, voltages may still exist on the main and auxiliary circuits.
- Do not wire in the standardized communication power cabinet without authorization, if necessary, please contact the company's after-sales service personnel in time to avoid damage to the electronic equipment in the cabinet.
- Ensure good ventilation and heat dissipation of the device.
- There are components that are very sensitive to static electricity on the board, please wear anti-static gloves when operating on the board to minimize direct contact with the veneer.

2.2 Precautions for Grounding

2.3 Other Precautions

 **Danger !**
● Standardized communication power cabinets and the equipment connected to them must be reliably grounded to ensure the safety of personnel and reduce electromagnetic radiation. ● The specifications of the ground wire must meet the requirements of the relevant safety standards.
 **Attention !**
● The Company shall not be liable for any consequences arising you're your improper operation, error or negligence. ● The Company shall not be liable for any consequences arising from your violation of the precautions mentioned in this Manual. ● In order to ensure continuous development and improvement of the product, the Company reserves the right to modify the specifications, performance and contents in this Manual without further notice. ● No organizations or individuals may reproduce or disseminate any part of this Manual in any way without the written permission of the Company.

3 Product Description

This chapter mainly introduces the appearance, performance characteristics and internal structure of standardized communication power cabinets (please read the instructions before using transformer equipment).

3.1 Product Introduction

Standardized communication power cabinet is suitable for all-in-one machine supporting scheme, using integrated design such as power distribution unit, communication unit, temperature and humidity monitoring, etc., to meet the design requirements of modular design and quick installation, and ensure the long-term, safe and reliable operation of all-in-one machine. The appearance of the product is shown in the figure below:

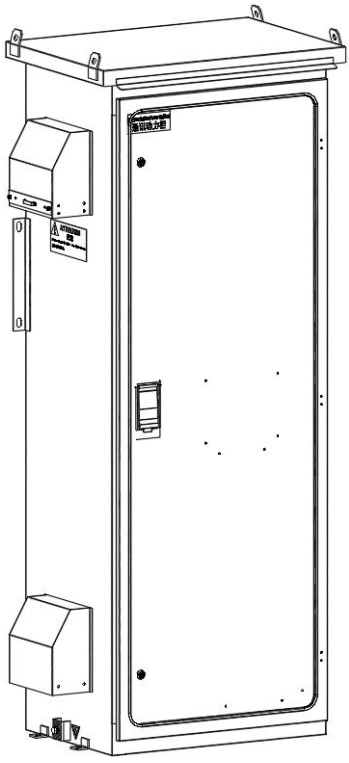


Fig. 3-1 Appearance of the standardized communication power cabinet

3.2 Performance Characteristics

The standardized communication power cabinet has the following main features:

- In view of the rapid construction of photovoltaic systems, from the aspects of reducing the amount of foundation construction, reducing the difficulty of construction, reducing the difficulty of on-site installation, and reducing the difficulty of on-site wiring, all equipment is installed and qualified in the factory at one time, truly realizing the industrialization of substation construction, and greatly shortening the construction period of the site;
- The system is composed of communication unit, power distribution unit, temperature and humidity monitoring unit and other main parts;
- The system has the optimal structural layout, reasonable structural design, independent air inlet and outlet, simple and elegant appearance;
- Standardized communication power cabinet meets IP54 protection requirements, can prevent splashing water within 180°, in addition to dust capture, dust collection function, can protect internal equipment from the external harsh environment;
- Anti-shock and anti-theft design, fully ensure the safety of standardized communication power cabinet and internal equipment of

the cabinet;

- The cabinet shell adopts spray treatment, which has good anti-corrosion performance;The internal devices of the standardized communication power cabinet are neatly arranged, suitable for inspection and maintenance.

3.3 Internal Structure

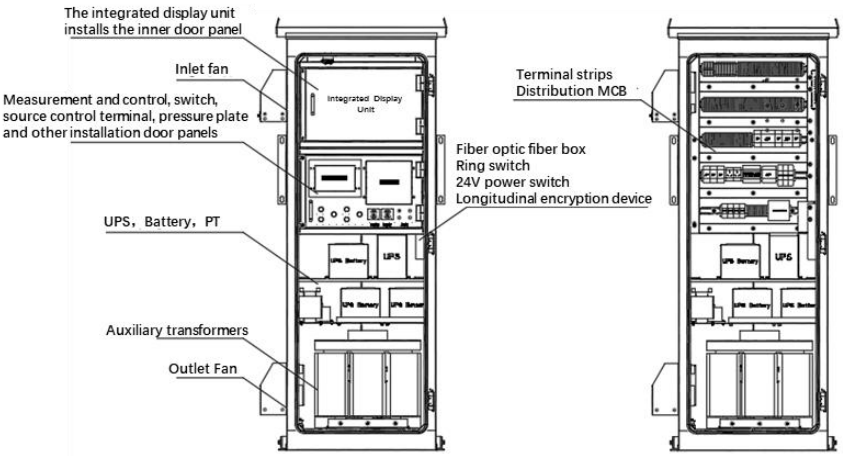


Fig. 3-2 standardized communication power cabinet layout

As shown in the figure above, devices such as measurement and control, source control terminal, pressure plate, and switch are arranged in the inner door panel for convenient operation area, and the device layout is compact and concentrated; The inner door panel installed in the integrated display unit is selected according to the model adapted to the communication power cabinet; The internal device reserved mounting hole adopts a compatible design, which can be compatible with different configurations of multiple models; The inner

door panel is open, the upper side is the terminal block, the middle side is the distribution air, and the lower part is the UPS and distribution transformer.

4 Electrical Principle

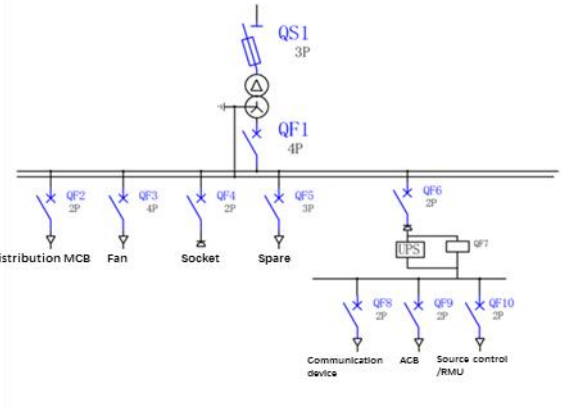


Fig. 4-1 Electrical schematic diagram

Table 4-1 List of internal cables

No.	Purpose	Cable specifications	Remarks
1	Power disturbution unit	10AWG	
2	RS485 cable for communication	2CAWG20/RVVSP 2*0.5 mm^2	Shielded twisted pair
3	Shell grounding	BVR-50 mm^2(yellow-green)	Cabinet grounding

5 Installation

Overall installation process of the standardized communication power cabinet:

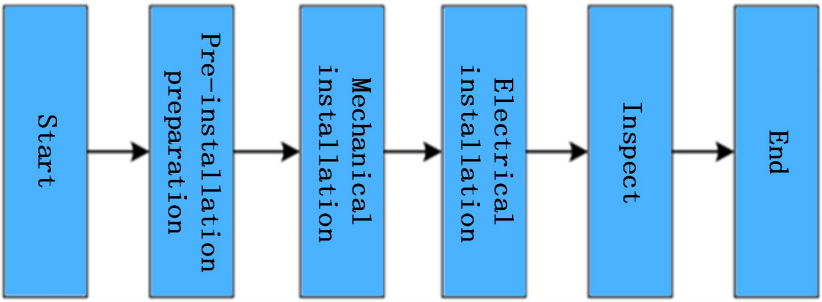


Fig. 5-1 Installation process

Table 5-1 Installation process instructions

Installation steps	Installation instructions	Reference chapter
Installation preparation	● Check the outside of the standardized communication power cabinet for damage. ● Check the inside of the standardized communication power cabinet and cabinets for device damage, looseness, and transformer leakage. ● Check if the accessories are complete ● Check if the installation environment meets the requirements ● Check if there is any available equipment at the site proper for hoisting the standardized communication power cabinet ● Check if the installation tools are complete	5.1 Installation preparation

Mechanical installation	● Move the 6.8MVA standardized communication power cabinet to the installation foundation by hoisting equipment ● Weld and fix the standardized communication power cabinet to the installation foundation ● Remove the protective film of dust mesh	5.2 Mechanical installation
Electrical connection	● Power distribution cable connection ● Ground wire connection ● Communication line connection	6. Electrical connection
Inspection	● Check the electrical wiring ● Other matters	9.4 Inspection of electrical connection

5.1 Installation Preparation

5.1.1 Pre-installation Inspections

Table 5-2 Pre-installation inspection of the standardized communication power cabinet

Inspection position	Acceptance criteria	Treatment if disqualified
Each fastening bolt (screw)	The bolts (screws) are not loose, and the fastening mark has no offset	Tighten the bolts (screws) and replace the sliding bolts (screws) with new standard parts.
Switch operation	The switch can be operated flexibly with no jamming	Contact the supplier
Circuit board	The connectors and the conductors are not loose or dropped.	Tighten the connector bolts (screws)
Conductor	For cold-pressed terminals, they	Tighten bolts (screws)

terminal	are not loosened on the binding posts through checking by hand	

5.1.2 Installation Tools and Parts

Tools to be used in installation:

- Lifting crane (with a carrying capacity of at least 20 tons);
- Screwdrivers, wrenches, torque wrenches;
- Stripping pliers, terminal crimping machines, hot blowers;
- Multimeter.

5.2 Mechanical Installation

5.2.1 Mechanical Installation Requirements

- Environmental requirements

The construction site of the standardized communication power cabinets shall meet the installation environment requirements specified in the following table:

Table 5-3 Installation environment requirements

Item		Requirements
Working conditions	Installation site	Ground inclination ≤ 1 °; Seismic resistance greater than 8: levelness ≤ 0.4g, perpendicularity ≤ 0.2g; Suitable for vertical mount on an indoor solid base.
	Ambient temperature	-35°C ~+60°C

	Relative humidity	0%~95%, Temperature changes shall not produce condensation.
	Other climatic conditions	No ice, rain, snow, hail, etc. Atmospheric pressure: 70-106 kPa.
	Contents of dust and solid particles	Sand: <30mg/m^3; Dust (floating): <0.2mg/m^3; Dust (deposited): <1.5mg/(m^2.h).

Attention

(1) Always meet the dust requirements specified in the environmental conditions;

(2) After the external cables (grounding wires, main circuit cables, control signal wires) are introduced into the lead box, the entrance hole must be completely sealed with fireproof mud;

- Machine dimensions

Standardized communication power cabinets have differences in the configuration of internal devices according to the differences in adapted models, but the overall external dimensions of standard products remain unchanged, as shown in the figure below：

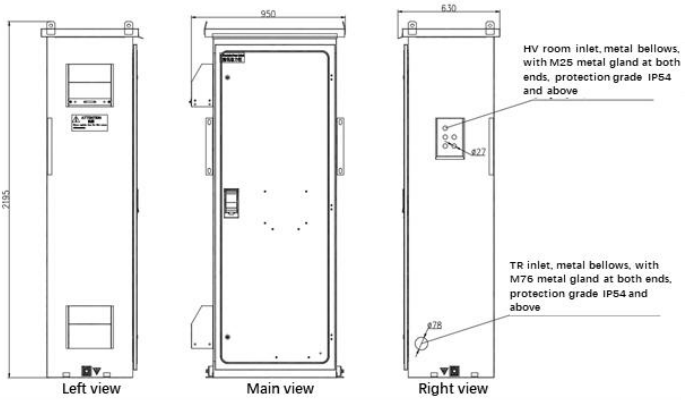


Figure 5-2 Standardized communication power cabinet dimensions (unit: mm)

- Installation location requirements

The installation distance dimensions are shown in the figure below:：

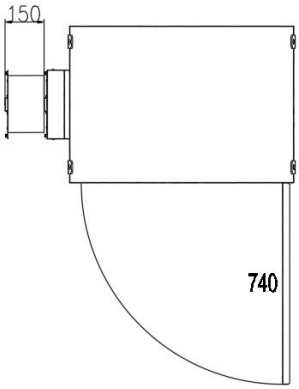


Figure 5-3 Schematic diagram of installation position

Attention！

(1) The entire standardized communication power cabinet is installed on the base of standardized communication power cabinet;

(2) The length of the high-voltage chamber inlet cable and the length of the transformer inlet cable are determined according to the installation location；

(3) The standardized communication power cabinet weighs about 0.5 tons.

- Hoisting requirements

The standardized communication power cabinet can be hoisted during the installation process, as shown below:

Fig. 5-4 Hoisting schematic drawing of the standardized communication power cabinet

The following technical requirements shall be noted in hoisting:

(1) The communication power cabinet must adopt 4 lifting points of the top cover, and the lifting method is shown in the figure.

(2) When hoisting, the standardized communication power cabinet should be slowly put in place to reduce the vibration of the product and avoid damage to the components;

(3) The standardized communication power cabinet weighs about 0.5 tons, the cabinet height is about 2.2m, the lifting crane must meet the lifting weight requirements, lifting height requirements, and the lifting rope and cable should have sufficient strength to withstand the weight of the standardized communication power cabinet;

(4) During the lifting process of the standardized communication power cabinet, non-relevant personnel shall not stay on the scene to avoid accidental injury;

(5) During the lifting process, pay attention to avoid the collision of hard objects with the standardized communication power cabinet, and shall not damage the appearance of the standardized communication power cabinet.

5.2.2 Installation and Fixing of the Standardized Communication Power Cabinet

Standardized communication power cabinet adopts bolts for installation and fixation, the top 2 installation fixing points are connected and fixed with

the high-pressure chamber or container, and the bottom 4 installation fixing points are fixed with the base of the all-in-one machine or the base of the box-changing container, and the installation fixing points are selected according to the actual applicable model.

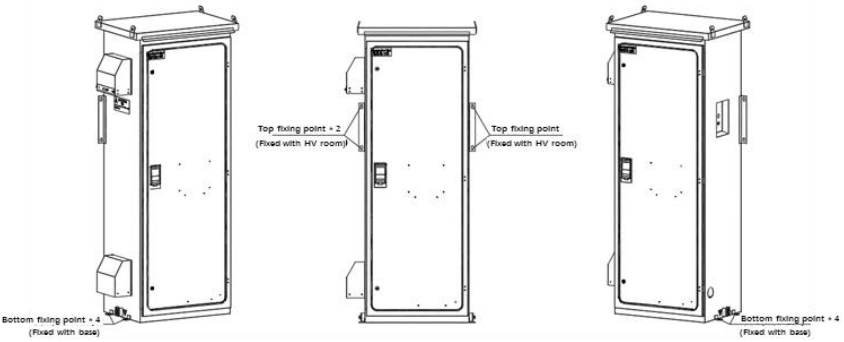


Fig. 5-5 Installation location plan of the standardized communication power cabinet r

During fixing, the following technical requirements shall be noted:

(1) According to Figure 5-5, after the standardized communication power cabinet is placed in place, the fixing point of the communication power cabinet is fixed with stainless steel bolts according to the fixed connection position of the all-in-one machine or box;

(2) After fixing the position of the communication power cabinet, connect the grounding point of the communication power cabinet with the all-in-one machine or box with flat steel or copper wire.

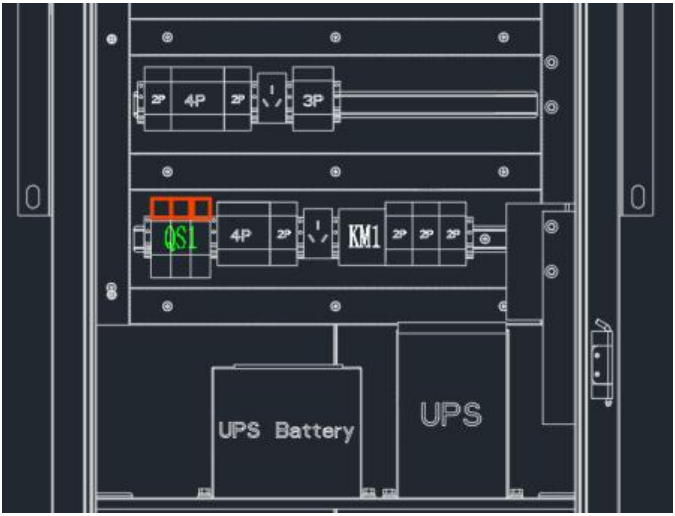
6 All Equipment Wiring of the Cabinet

Danger!

Before connecting the cables inside the cabinet, the DC side and the high-voltage AC side of the transformer must be disconnected from the relevant power supply, and the multimeter must be used to confirm that it is not electrified.

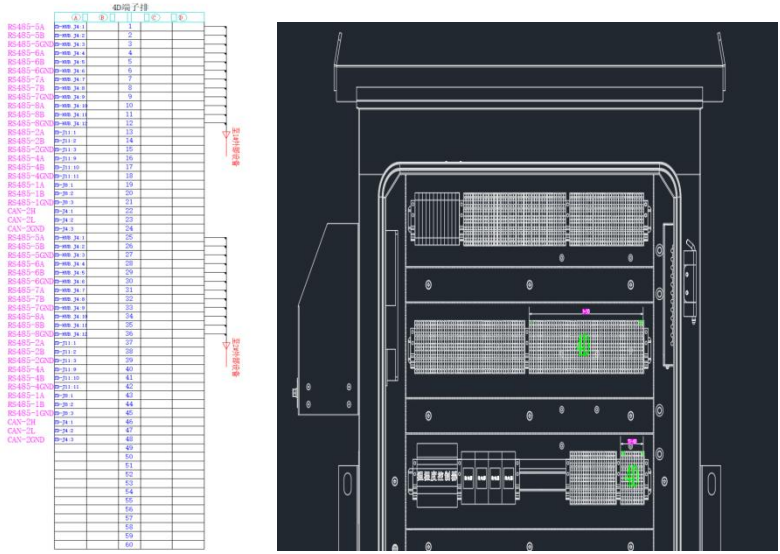
6.1 Power Distribution Cable Connection

The input cable in the standardized communication power cabinet must be crimped and ended, and the cable access of 10~20 mm2 is supported. The wiring location is shown in the figure, connected to the upper port of QS1:



6.2 Communication Line Connection

The communication input cable in the standardized communication power cabinet must be crimped to support 0.5~2.5 mm2 cable access. The wiring



location is shown in the figure, 4D terminal block：

6.3 Grounding Wire Connection

Standardized communication power cabinet on both sides of the reserved grounding point, and the power station is systematically connected, if you find foreign matter or rust on the grounding bar when connecting the ground wire, please polish and then connect the ground wire, and do rust prevention treatment.

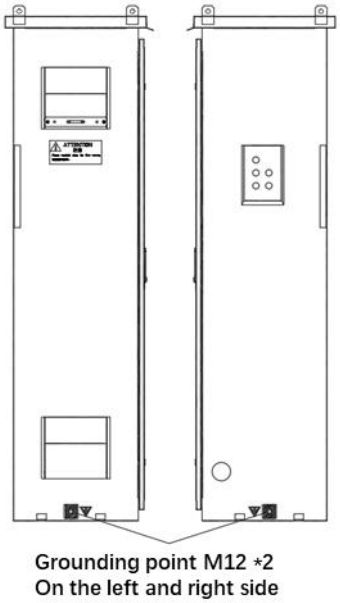


Fig.6-1 Standardized communication power cabinet grounding diagram

Grounding screw specification: M12*30. Use 50 mm^2 – 95 mm^2 grounding cable or 50 mm × 5 mm hot-dip galvanized flat steel to reliably connect the grounding point to the system grounding point.

6.4 Incoming and Outgoing Cable Connection

Attention !

After connecting the incoming and outgoing cables, the entrance and exit holes shall be completely sealed with fire-proof mud to prevent rodent infestation.

Standardize the input and output interfaces of the communication power cabinet, as shown in the following layout diagram:

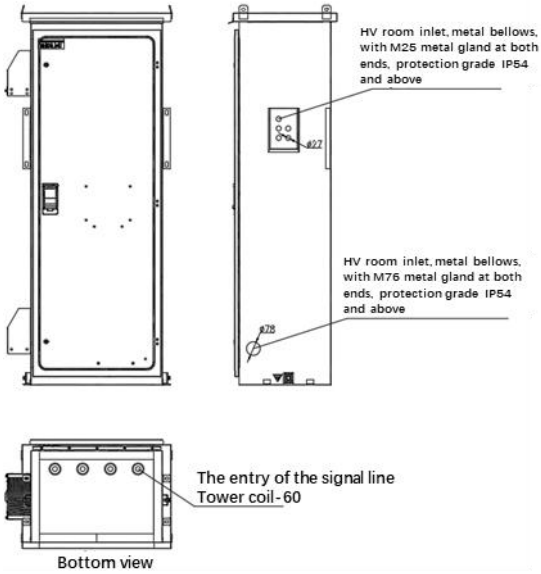


Figure 6-2 Schematic diagram of the input and output interface of the standardized communication power cabinet

Metal hose fitting is composed of nut cap, leather pad, iron sleeve, main body, lock mother, leather pad, etc., stainless steel hose connector with dental ring one end is connected with the metal hose, first the nut, leather gasket, iron sleeve on the metal hose, and then the main tooth ring along the inner wall of the metal hose spiral tightening, and then the nut and the nut connection to complete the connection between the metal hose and the joint; The other end of the connector is fixed with the reserved mounting hole of the cabinet body through the lock female connection.

Figure 6-3 Composition and installation of metal hose fittings

When installing transformers/high-voltage chamber inlet joints, the following technical requirements should be noted:

(1) Excessive bending and stretching of the metal hose should be avoided during installation to avoid fatigue damage of the metal hose;

(2) The fiddling of the metal hose needs to be tightened to ensure that it is tightly connected to prevent problems such as water leakage and ash ingress.

7 Standardized communication power cabinet operation process

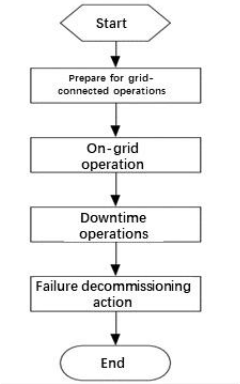


Figure 7-1 Operation flow

Table 7-1 Description of the grid connection process

operating steps	operating instructions
Power transmission preparation operation	● Connect the input and output lines according to the wiring instructions; ● Measure whether the voltage on the upper side of the QS1 knife fusion switch is normal; ● Close the QS1 knife fusion switch;
Power delivery operation	● Measure the voltage on the upper side of QF1 and close QF1 after normal; ● Measure QF2~QF6 and close QF2~QF6 after the voltage on the upper side is normal; ● Turn on the UPS, measure the voltage on the output side QF8~QF10 of the UPS output side and close it after normal.
Power-off operation	● If the system needs to be powered off during normal operation, it needs to be powered off step by step.
Failure decommissioning action	● If the system fails during operation, the power is cut off immediately; ● Before troubleshooting, you should put all switches in the "OFF" position before troubleshooting.

During operation, all switching operations (e.g. switching circuit breakers, plugging fuses, etc.) must be carried out by an electrician with an electrician operating certificate.

8 Power Supply (subject to specific project technical agreements)

8.1 Overview

- Mainly complete the power supply of inverter control system, low-voltage distribution, communication box, heating lighting, fire equipment and other facilities inside the Inverter Transformer Station station;
- Two redundant power supply schemes, external power supply and internal power supply, improve the power supply reliability of the control system.

8.2 Power Supply

The internal inverter, low-voltage distribution, lighting heating and other power supply modes of the Inverter Transformer Station station are the internal power supply mode, and the power supply is converted to the inverter, low-voltage distribution and other equipment through the power supply transformer.

8.3 Reserved Power Distribution

In the process of commissioning and maintenance, depending on the customer's needs, the power distribution is slightly different. The actual power distribution of the power station prevails.

9 Communication Monitoring

9.1 Data Monitoring

- Telemetry

With AC sampling function, it can measure I, P, Q, F, COSφ, active electricity, reactive electricity and other remote measurement, the low-voltage side of the transformer is not set PT, the device should be able to directly collect three-phase voltage.

- Direct traffic

It can provide 4 direct flow signals for collecting PT100 and 4-20mA power signals sent on the transmitter, and indirectly measuring non-electrical signals such as temperature, humidity, and oil temperature.

- Remote signaling

It is used to collect various signals in the inverter room or box transformer in real time. Such as inverter room low-voltage circuit breaker discrete status signal, box-variable high-voltage switch discrete status signal, etc.

- Remote control

The device provides control output contacts for remote control of switches with remote control conditions. Such as: low-voltage circuit breaker opening and closing, etc.

- Protection

The device can provide multiple non-electrical quantity protection functions, such as: light gas, heavy gas, transformer high temperature, transformer ultra-high temperature, transformer oil level low, pressure relief valve action, etc. At the same time, it can also provide electrical quantity protection functions, such as: overcurrent I. segment, overcurrent II. segment, overcurrent III. section.

- Records

It has perfect event report processing function and operation record function, and can save at least the latest 25 SOE shift records and the latest 25 user operation records.

10 Maintenance

Regular maintenance of the equipment can keep the standardized communication power cabinet in the best condition and prolong its service life.

10.1 Precautions

Before the maintenance of the standardized communication power cabinet, ensure that the system is not live and follow these steps:

Step 1: Power off and shut down the inverter;

Step 2: Disconnect the main circuits of the standardized communication power cabinet, the combiner box and the power grid;

Step 3: After completing the above operations, wait for 20 minutes before performing maintenance on each cabinet in the standardized communication power cabinet.

Attention!

Before maintenance, it is recommended to use a multimeter or other instruments to conduct voltage detection on metal parts to be contacted so as to avoid electric shock

10.2 Maintenance Cycle

The maintenance cycle of the standardized communication power cabinet is shown in Table 10-1.

Table 10-1 Maintenance cycle of the standardized communication power cabinet

Cycle	Maintenance item
Six months after commissioning and every two	Check electrical

years thereafter	connection
One year	Clean power cables
Three years	Overhaul blowers and fans
Three months *	Remove dust and clean the dust mesh
Note*: The replacement frequency of the dust net depends on the dust content in the environment, when the communication power cabinet has overheating protection, please check the dust net blockage in time.	

10.3 Dust Cleaning

The standardized communication power cabinet is forced air cooling, and the air inlet filter and dust cotton need to be regularly cleaned and maintained, and the location of the filter and dust cotton is shown in the figure below：

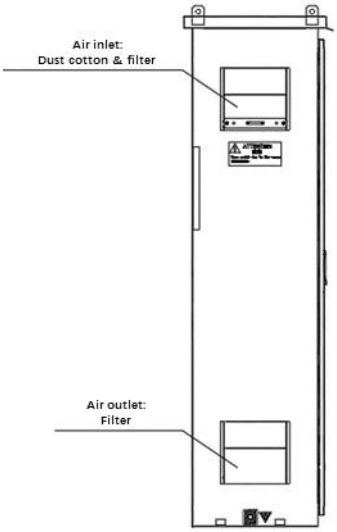


Figure 10-1 Schematic diagram of the location of steel wire filter and dust cotton

After the standardized communication power cabinet is debugged and connected to the grid, in order to avoid the overheating problem caused by long-term accumulation of dust, please clean the dust inside the standardized communication power cabinet regularly according to Table 10-1, and the cleaning area should contain at least the following parts:

- Standardize the distribution unit area inside the communication power cabinet;
- Inlet and outlet steel wire filter and dustproof cotton;
- Fan blades inside the fan.

After the standardized communication power cabinet is debugged, after 3 months of use, all the dustproof cotton in the standardized communication power cabinet must be cleaned or replaced. When cleaning and replacing dust cotton, please pay attention to the following:

- Ensure that all power is disconnected before servicing to prevent the risk of electric shock;
- Dust-proof cotton includes: standardized communication power cabinet air inlet;

- According to the on-site working environment conditions, clean the dustproof cotton every 3 months, if the dustproof cotton is found to be damaged, please replace it in time.

10.4 Inspection of Electrical Connection

Six months after commissioning of standardized communication power cabinets and every two years thereafter, the robustness of the electrical connections needs to be checked regularly. The locations that need to be checked are as follows:

- Ensure that all power is disconnected before servicing to prevent the risk of electric shock;
- Standardized AC and DC inlet and outlet lines of communication power cabinet: check the firmness and reliability of the copper power cable connection of the inverter AC cabinet; Check the firmness and reliability of the inverter DC cable connection;
- Power distribution unit and communication unit in standardized communication power cabinet: check the firm reliability of the cable connection between the power distribution unit, communication unit and each cabinet in the standardized communication power cabinet.

10.5 Cleaning of Power Cables

Two years after the standardized communication power cabinet is put into service, the power cable must be cleaned. When cleaning the power cable, note the following:

- Ensure that all power is disconnected before servicing to prevent the risk of electric shock;
- In order to prevent rust at the cable connection, it is forbidden to use conductive liquids such as water to clean the power cable, and at the same time it is forbidden to use any water-stained fabric to clean the power cable connector;
- Use dry fabric or dry brush to clean the dust accumulation of the insulating skin of the power cable, and use a dry brush to clean the metal joints and fixing bolts of the power cable;
- The copper bar and electromagnetic component ports connected by the power cable also need to be cleaned accordingly;
- If you find rusty fastening bolts, please replace them in time.

10.6 Replacement of Fans

Three years after the standardized communication power cabinet is put into use, all the fans and fans in the standardized communication power cabinet

must be overhauled or replaced. When carrying out the maintenance process of fans and fans, please pay attention to the following matters:

- Ensure that all power is disconnected before servicing to prevent the risk of electric shock;
- The contents of the overhaul include: cleaning the fan, tightening the bolts, and the firmness and reliability of the connecting cables;
- If the fan is found to be damaged during the maintenance process, please contact our after-sales staff in time to replace it, it is strictly forbidden to replace it privately, otherwise, our company does not assume any responsibility for any quality caused by this.

10.7 UPS and Other Optional Systems

- Equipped with UPS, please read the manual of UPS before use.
- If the UPS is not used (more than 7 days), please turn off the UPS and check the UPS battery parameters when it is enabled again.
- This standardized communication power cabinet is equipped with an environmental monitoring system, read the instruction manual equipped with the system before use.
- Read the instruction manual before using other optional equipment.

11 Appendix

11.1 Warranty

This product is free to be maintained during the warranty period. But in the event of the following circumstances, the Company shall have the right not to undertake quality assurance:

- Damage caused by the transportation;
- Improper installation;
- Modification;
- Improper use;
- Any installation and use beyond the relevant international standards;
- Damage caused by abnormal natural environment.

11.2 Contact Us

If you have any questions about this product, please feel free to contact us. Detailed contact information is as follows:

Company: TBEA Xi'an Electric Technology Co., Ltd.

Address: Xi'an Industrial Park of TBEA New Energy, No. 70, fourth Shanglinyuan Road, High-tech Zone, Xi'an

Postal code: 710119

Customer service hotline: 400-606-6029

Email: tbeapower@tbea.com

Fax: 029-68760500-042

Website: http://www.tbeapower.com

Tips

Dear customer:

- As a certain scratches may be caused on the surface of the standardized communication power cabinet during transportation, it is necessary to carry out some repair work on site;
- The bumps in the transportation process may cause the auxiliary facilities of the standardized communication power cabinet, such as light-fixtures, to loosen, so it is necessary to carry out some restoration work on site.
- In order to achieve IP54 protection grade, some products' maintenance doors are closed too tight, so some strong force needs to be applied to open the doors.

The contents of the section on communication management in this manual are for reference only for devices equipped with communication management machines, and there is no need to pay attention to such devices.