MANUAL

Grid Switching Cabinet

Model: GSC1000-742-01

IEC



Table of Contents

1 ABOUT THIS MANUAL 1

1.1 Applicable Products 1

1.2 Validity, Purpose, Scope of this document and Legal Regulations 1

1.3 Explanation of Symbols and References 1

2 SAFETY INSTRUCTIONS 3

2.1 Personnel and Qualifications 3

2.2 Safety Procedures 3

3 ENVIRONMENT INSTRUCTIONS 5

3.1 Temperature And Altitude 5

3.2 Ventilation 5

3.3 Recycling 5

4 PRODUCT INSTRUCTIONS 6

4.1 Intended Use of Grid Switching Cabinet 6

4.2 Product Introductions 6

4.3 Dimension Drawings Of Cabinet 7

4.4 Structural Decomposition Drawings Of Cabinet 8

4.5 Nameplate Of Product 9

4.6 System Connection Diagram 10

4.7 Panel Signal Interface Diagram 10

4.8 Control And Feedback Interface 11

4.9 Operation Interface 12

4.10 Power-OFF And Delay Time Opening 12

4.11 Button Function 12

4.12 Panel LED 12

4.13 Auxiliary Power Supply 13

5 MECHANICAL INSTALLATION 14
5.1 Pre-installation Inspection 14
5.2 Installation Tool Preparation 14
5.3 Lifting Requirements 14
5.4 Forklift Requirements 15
5.5 Installation Requirements 15
5.5.1 Space And Position Requirements 15
5.5.2 Structrue Installation Requirements 15
6 ELECTRICAL INSTALLATION 17
6.1 Precautions 17
6.2 Preparing Installation Tools 17
6.3 Opening The Door Of Cabinet 18
6.4 Cable Entry Design Of Cabinet 18
6.5 AC Cable Connection 19
6.5.1 Connection With CESS 19
6.5.2 Connection With Load 20
6.5.3 Connection With Grid 20
6.5.4 Connection Method 21
6.6 Control Cable Connection 22
6.6.1 The Inlet Of Control Cables 22
6.6.2 The Connection Points Of Control Cables 23
7 EXCLUSION OF LIABILITY 24
8 TECHNICAL DATA 25
9 CONTACT 26

PREFACE

Thank you for choosing the RCT Grid Switching Cabinet!

You have purchased an innovative, high-quality product with unique features and consistently high efficiency.

With this device, you will always achieve the highest possible yield from your energy system.

 WARNING	Grid switching cabinet is an electrical device. During installation, wiring, grid connection, operation, maintenance and service they can cause various hazards. Please read the documents supplied with the product carefully and follow the instructions and device information to avoid material damage and personal injury.

	Keep this manual in a safe place for future reference.

1 About This Manual

1.1 Applicable Products

This manual is applying to the Grid Switching Cabinet.The lastest type of the Grid Switching Cabinet is **GSC1000-742-01**.

1.2 Validity, Purpose, Scope of this document and Legal Regulations

- This installation manual provides general instructions for installing, wiring and commissioning the grid switching cabinet.
- The content of this manual is regularly updated and revised as a part of the continuous product development.
- The current document version can be found at: www.rct-power.com.
- We explicitly reserve the right to make technical changes which improve the device or increase its safety standard. These changes do not require a separate notification. RCT Power is not liable for damages resulting from the use of this document.
- This manual does not supersede existing laws, regulations, rules, standards or conventions.
- The warranty conditions are enclosed with the device. No further warranty claims can be derived from this document.

1.3 Explanation of Symbols and References

It is important to follow the references in the manual during the installation, operation and maintenance of the grid switching cabinet. The table below shows the warning signs and symbols used in the manual.

Symbols and References	Description
 DANGER	This symbol indicates a direct imminent danger. If the safety regulations are not observed, this may result in death, personal injury or serious damage to property.
 WARNING	This symbol indicates a direct imminent danger of medium risk. If the safety regulations are not observed, this may result in death, personal injury or serious damage to property.
 CAUTION	This symbol indicates a direct imminent danger of low risk. If the safety regulations are not observed, it might result in minor or moderate material damage.
 NOTICE	This symbol indicates a potentially hazardous situation which, if not avoided, could result in material damage to equipment or property.
	This symbol indicates important information and hints. They will help you to better understand the functionality of the device.
	This symbol indicates that the user manual must be read and understood before the device is put into operation.

Symbols and References	Description
	HIGH VOLTAGE WARNING! Indicates hazardous high voltages are present, which, if not avoided, will result in death or serious injury. Thus, only authorized and trained personnel should install and/or maintain this product.
	After disconnecting the electrical connections, wait a minimum of 10 minutes before opening the unit.
	Hot surface!
	Equipment grounding conductor (PE).
	This product must not be disposed of as normal household waste.
	CE mark The grid switching cabinet complies with the requirements of the applicable CE guidelines.

2 Safety Instructions

2.1 Personnel and Qualifications

WARNING	The grid switching cabinet must only be installed, wired, connected, commissioned and serviced by qualified personnel to prevent material damage or personal injury.

Qualified personnel authorised to perform the tasks described in this manual must have the following skills and technical expertise:

- They are trained to install electrical equipment.
- They understand the technical functionality of the grid switching cabinet.
- They are familiar with lithium iron phosphate (LiFeP04) accumulators.
- They have read and understood the documents shipped with the unit.
- They know and use the appropriate tools and equipment to perform the tasks described in the manual.
- They are familiar with all current laws and applicable regulations, standards and directives for electrical equipment.
- They are familiar with the safety requirements and guidelines for electrical equipment.
- They are familiar with occupational health and safety regulations.
- They know and use appropriate personal protective equipment.

Before starting installation or commissioning, read through the entire manual and note all DANGER! WARNING! CAUTION! and NOTICE! statements.

2.2 Safety Procedures

The grid switching cabinet was developed and tested in strict accordance with international safety regulations. All safety instructions relating to electrical and electronic equipment must be complied with during installation, operation and maintenance.

DANGER	■ Make sure that the power is off before performing any operations. ■ Do not touch non-insulated parts or cables. ■ Before operating the device, make sure that it is disconnected from the voltage sources. ■ Do not touch the live parts and cables inside the device during operation, it might result in burning or death. ■ To prevent risk of electric shock during installation and maintenance, please make sure that all AC and DC terminals are disconnected. ■ Do not touch the surface of the device while its housing is wet, otherwise, it might cause electric shock. ■ Do not stay close to the device while there are severe weather conditions including storm, lighting, etc. ■ Before opening the housing, the grid switching cabinet must be disconnected from the inverter, grid and generator.

WARNING	■ Only qualified personnel who has full knowledge of local safety regulations and local standards can install, maintain and retrieve this product. ■ RCT Power shall not be liable for any loss or warranty claims arising from any unauthorized change of product which may cause fatal injury to the operator, third party or equipment performance. ■ For personal and property safety, do not short-circuit the positive (+) and negative (-) electrode terminals.

CAUTION	■ Do not modify or change any components in the product. ■ Risk of damage due to improper modification. ■ Use professional tools when operating the products.

NOTICE	■ During installation of the grid switching cabinet, circuit breaker must be disconnected from the inverter, grid and generator wiring. ■ The grid switching cabinet used as a set with inverter, otherwise it cannot be used normally.

3 Environment Instructions

3.1 Temperature And Altitude

- The ambient air temperature range for normal operation of the grid switching cabinet is from -25℃ to 45℃.
- The ambient air temperature range for storage of the grid switching cabinet is from -20℃ to 50℃.
- The altitude of the normal installation site should not exceed 2,000 meters.

3.2 Ventilation

The operation of the grid switching cabinet can generate heat, and excessive temperature can cause a decrease in the electrical parameters of the grid switching cabinet, which may also cause damage to the grid switching cabinet. To ensure the heat dissipation of the grid switching cabinet, the installation environment must meet the following requirements:

- The grid switching cabinet should be installed in a well ventilated environment.
- The air inlet must ensure sufficient fresh air intake.
- It is recommended to separate the ventilation system of the equipment from other ventilation systems in the control room.
- Please regularly check that the ventilation openings of the grid switching cabinet are well ventilated.

Adopting a forward and rear air outlet design, the positions of the air inlet and outlet are shown in the following figures:



Fig. 3-1 Air Inlet And Outlet Design

3.3 Recycling

The grid switching cabinet should not be disposed as residential waste. The grid switching cabinet that has reached the end of its life and is not required to be returned to your dealer, it must be disposed carefully by an approved collection and recycling facility in your area.

4 Product Instructions

4.1 Intended Use of Grid Switching Cabinet

The grid switching cabinet is not designed for other use cases or connections to other devices.
Any deployment of the device that is different from the intended use is considered a misuse.
The grid switching cabinet adopts parallel mode,since the two machines are shipped in parallel, the software has been set up and the mode selection switch will be ineffective. The two products shipped in parallel can only operate in parallel mode and cannot be separated for single operation.
RCT Power is not liable for damages resulting from misuse of the device.
Any misuse terminates the warranty, guarantee and general legal liability of the manufacturer.

4.2 Product Introductions

In the commercial and industrial energy storage system, the grid switching cabinet is mainly used to quickly and seamlessly switch between different power sources(such as the grid and energy storage system), avoiding the impact of a single power failure on the entire system.
When the grid fails(such as power outage, abnormal voltage, etc), the grid switching cabinet can quickly switch the load to the energy storage system for power supply, ensuring the continuous and stable operation of the load.After the grid is restored to normal, the load can be smoothly switched back to the grid for power supply, and the impact on the load during the switching process is minimal, which can effectively improve the reliability and continuity of power supply and reduce the losses of industrial and commercial production due to power interruption.
Core functions of the grid switching cabinet:

- Static Switch Technology: A combination of semiconductor and mechanical switch devices with significant advantages of extremely fast response speed and low energy consumption. It can complete conduction and shutdown actions in microseconds, support seamless switching between grid connected and off grid modes (switching time ≤ 20ms), and ensure power supply continuity.
- Advanced Control Algorithm: Based on complex power electronics theory and intelligent control strategies, real-time monitoring of key parameters of the power grid and energy storage system, including voltage, current, frequency, phase, etc. By quickly analyzing and processing these parameters, the operating status of the power grid and the working condition of the energy storage system can be accurately determined.
- Communication Interface: Adopt the standard MODBUS communication protocol, it has the advantages of stable communication, strong anti-interference ability, and simple wiring, and can achieve convenient connection with local monitoring equipment or small monitoring systems.The Ethernet interface supports TCP/IP protocol, providing high-speed and stable data transmission, suitable for distributed energy storage systems and scenarios that require remote real-time monitoring and management, facilitating data exchange with remote monitoring centers and energy management platforms.
- Advanced Control Functions:Include remote monitoring, fault alarm, automatic protection,etc.

4.3 Dimension Drawings Of Cabinet

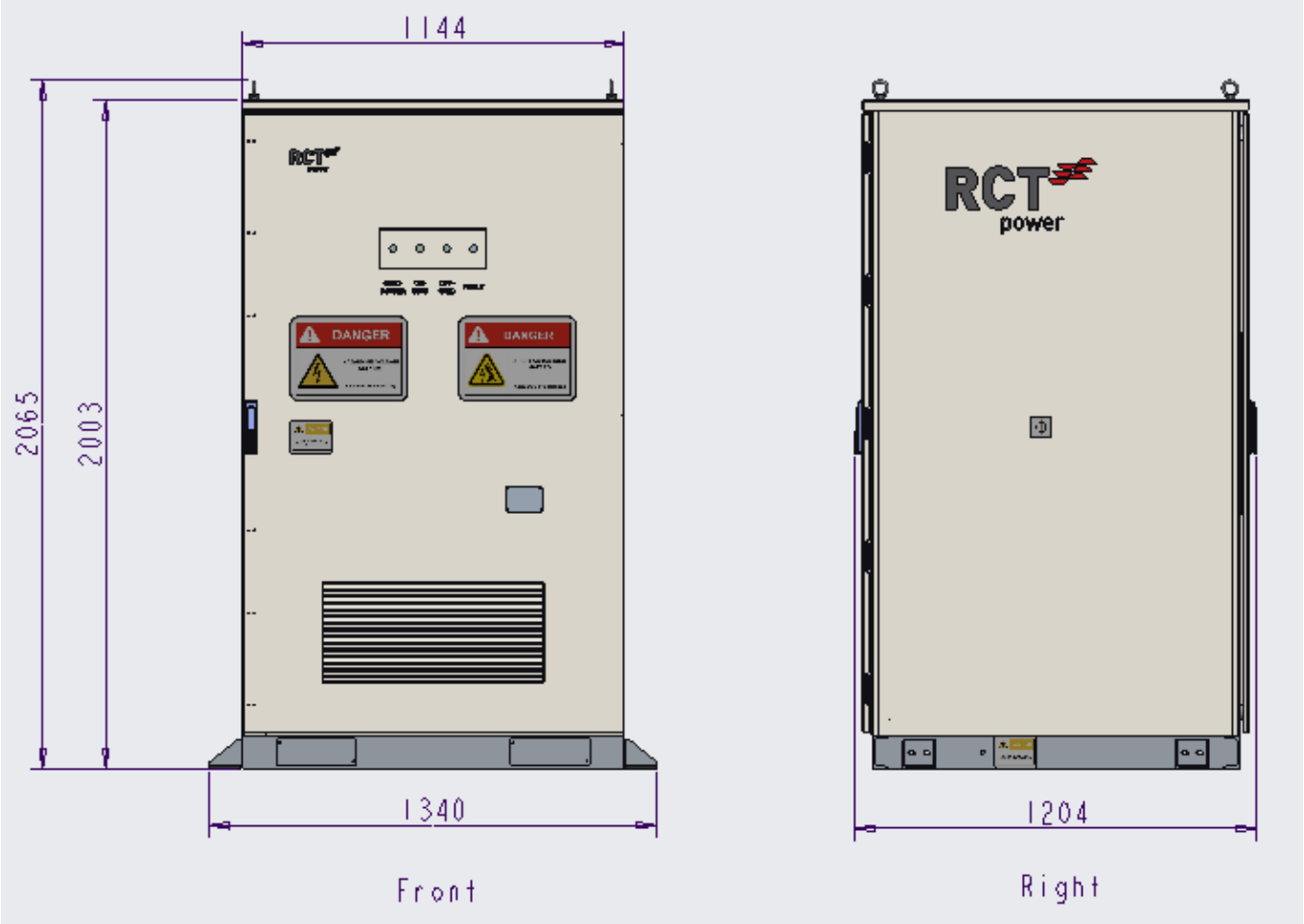


Fig. 4-1 Dimension Drawings Of Cabinet

4.4 Structural Decomposition Drawings Of Cabinet

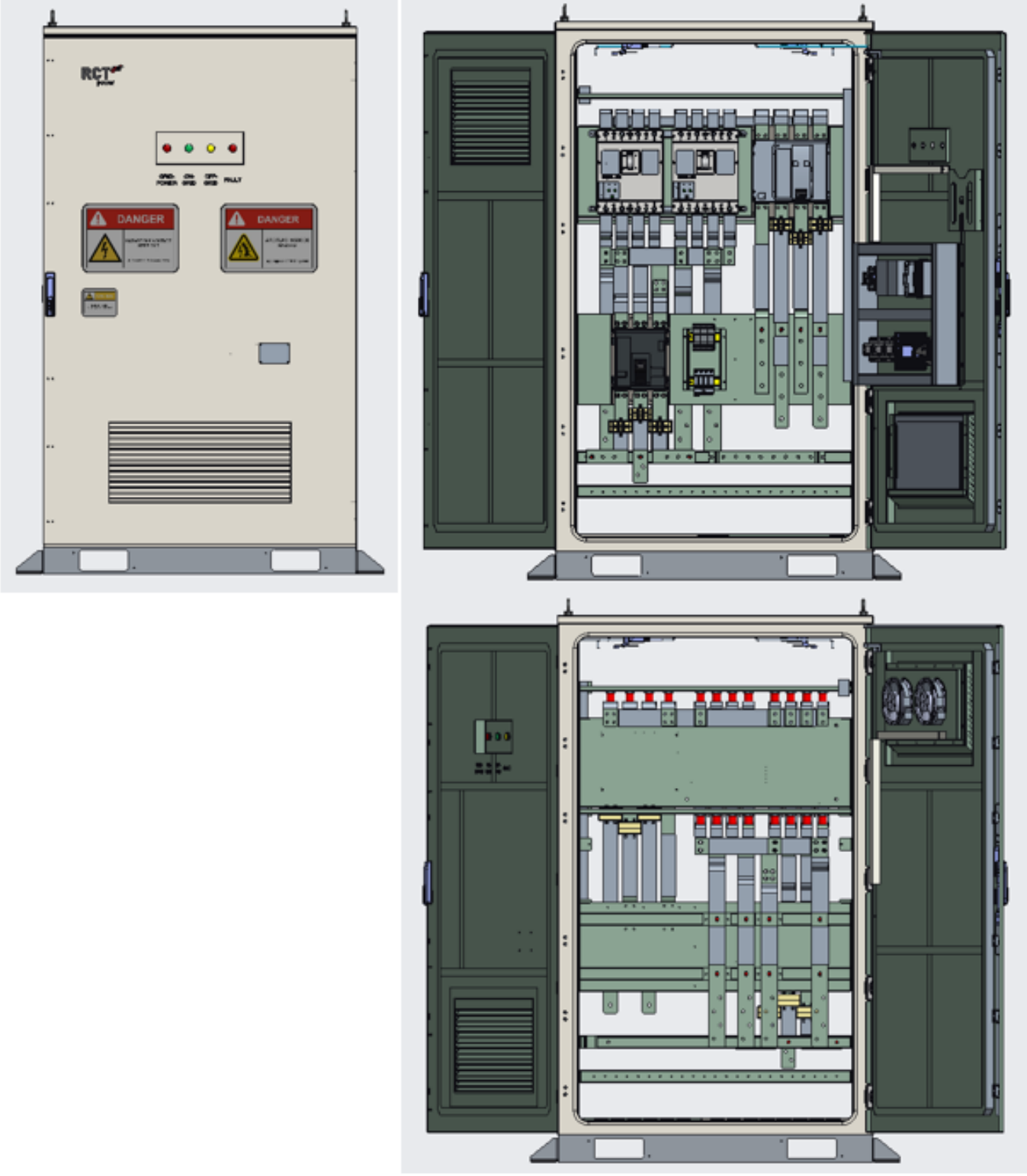
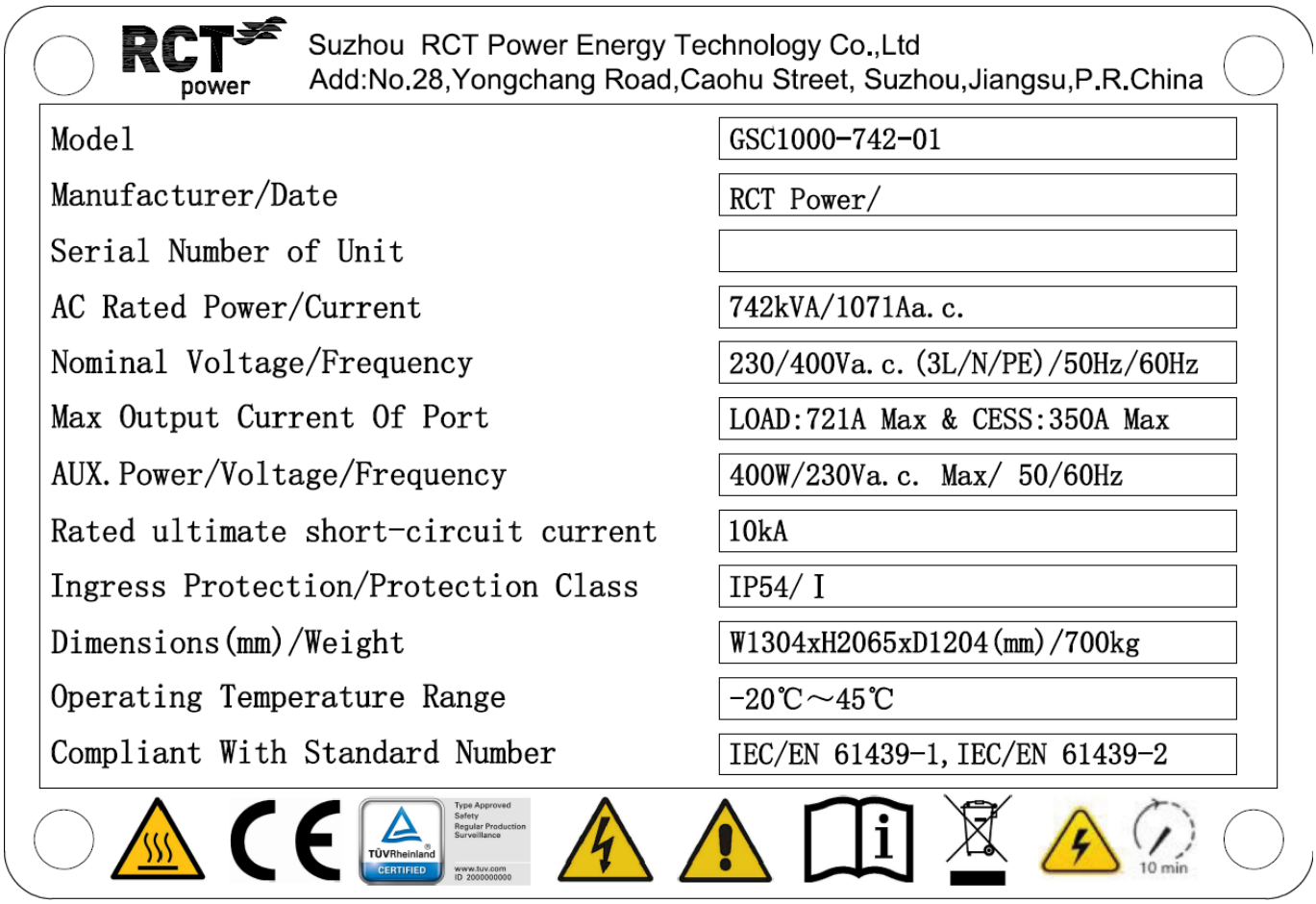


Fig. 4-3 Structural Decomposition Drawings Of Cabinet

4.5 Nameplate Of Product



4.6 System Connection Diagram

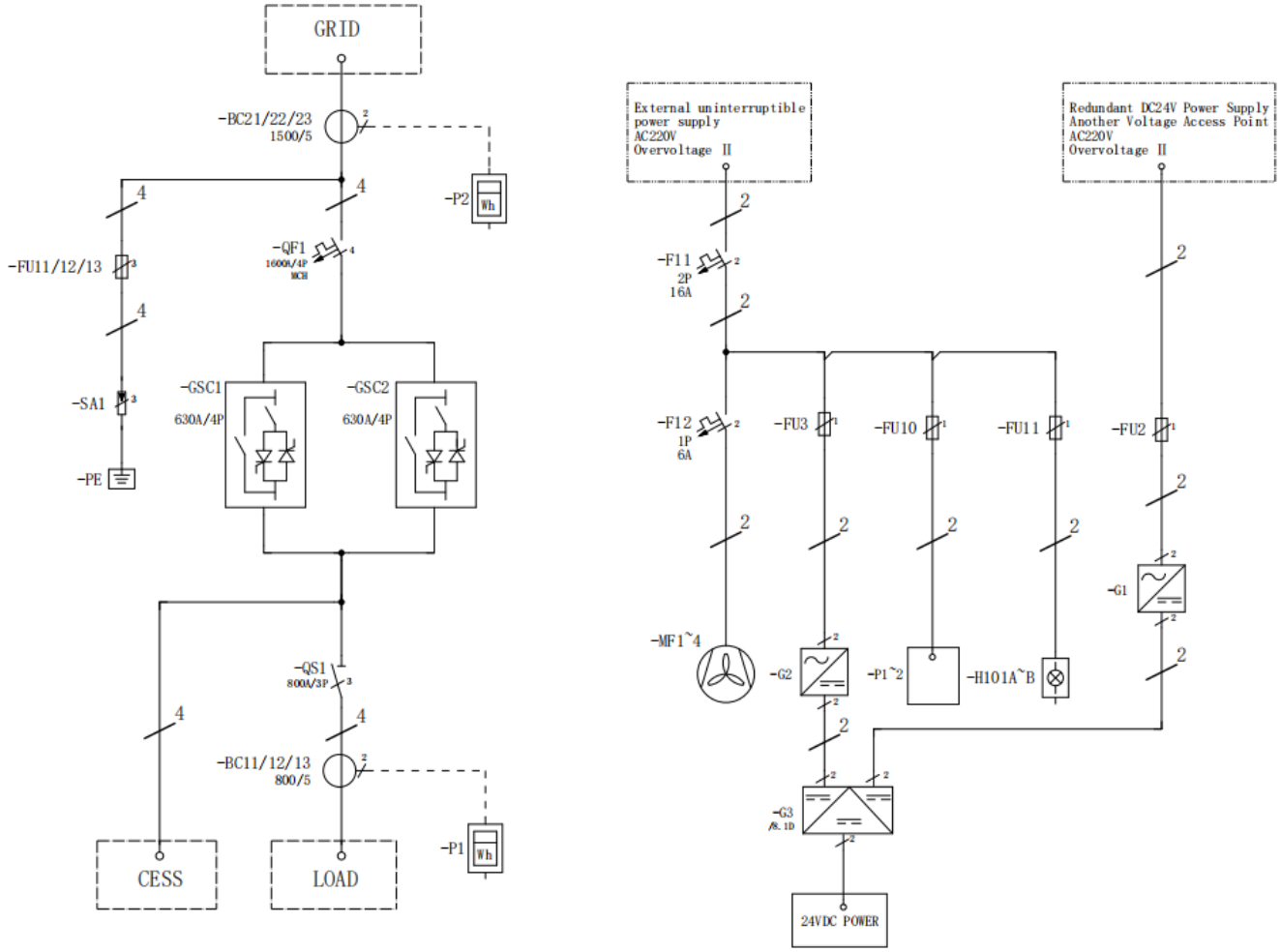


Fig. 4-6 System Connection Diagram

4.7 Panel Signal Interface Diagram

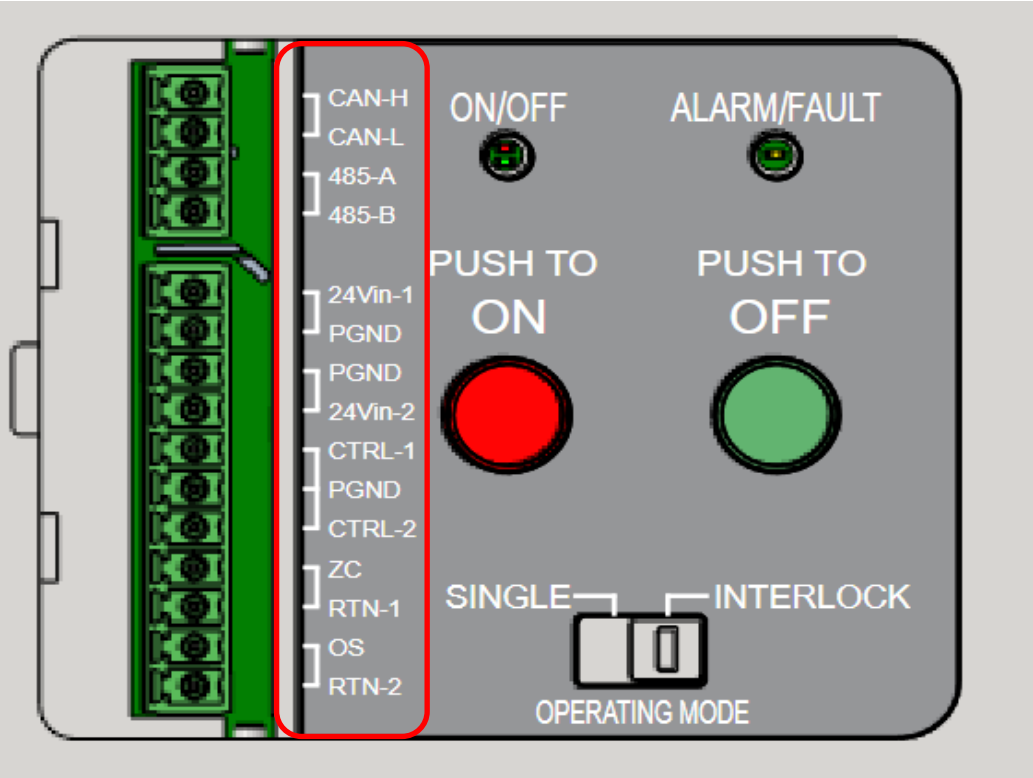


Fig. 4-7 Panel Signal Interface Diagram

4.8 Control And Feedback Interface

No.	Definition	Explanation	Operating Instructions
1	CAN-H	CAN Communication	Attached document provided.
2	CAN-L		
3	485-A	485 Communication	Attached document provided.
4	485-B		
5	24Vin-1	Auxiliary power input 1	Power Supply Mode 1: Dual Input The auxiliary power input 1 requires a DC power supply of 60W, 24VDC/2.5A.
6	PGND		
7	PGND	Auxiliary power input 2	The auxiliary power input 2 requires a DC power supply of 60W, 24VDC/2.5A. It is recommended that the auxiliary sources come from both the grid side and the energy storage side to ensure that the product can work under any circumstance where one side has power. Power Supply Mode 2: Any auxiliary power supply input is required, with a DC power supply of 120W, 24V/5A. This power supply method must ensure the uninterrupted power supply of the auxiliary source. The load adjustment rate of the external auxiliary power supply selected by the user needs to be less than 1%.
8	24Vin-2		
9	CTRL-1	Remote control of dry contact input	Dry contact input, pulse signal triggering, pulse width time needs to be greater than 250us. In parallel mode: CTRL-1 is short-circuited with PGND, corresponding to the input of the closing command. CTRL-2 is short-circuited with PGND, corresponding to the input of the opening command.
10	PGND		
11	CTRL-2		
12	ZC	Zero crossing point Signal feedback	Passive dry contact output, contact capacity DC24V/0.05A,customers can complete signal conversion by connecting a current-limiting resistor and a pull-up power supply. Contact Open: Represents the positive half-cycle of phase A; Contact Closed: Represents the negative half-cycle of phase A.
13	RTN1		
14	OS	Opening completed feedback	Passive dry contact output, contact capacity DC24V/0.05A, customers can complete signal conversion by connecting a current-limiting resistor and a pull-up power supply. Contact Open: Represents the closed state; Contact Closed: Represents the open state.
15	RTN2		

4.9 Operation Interface

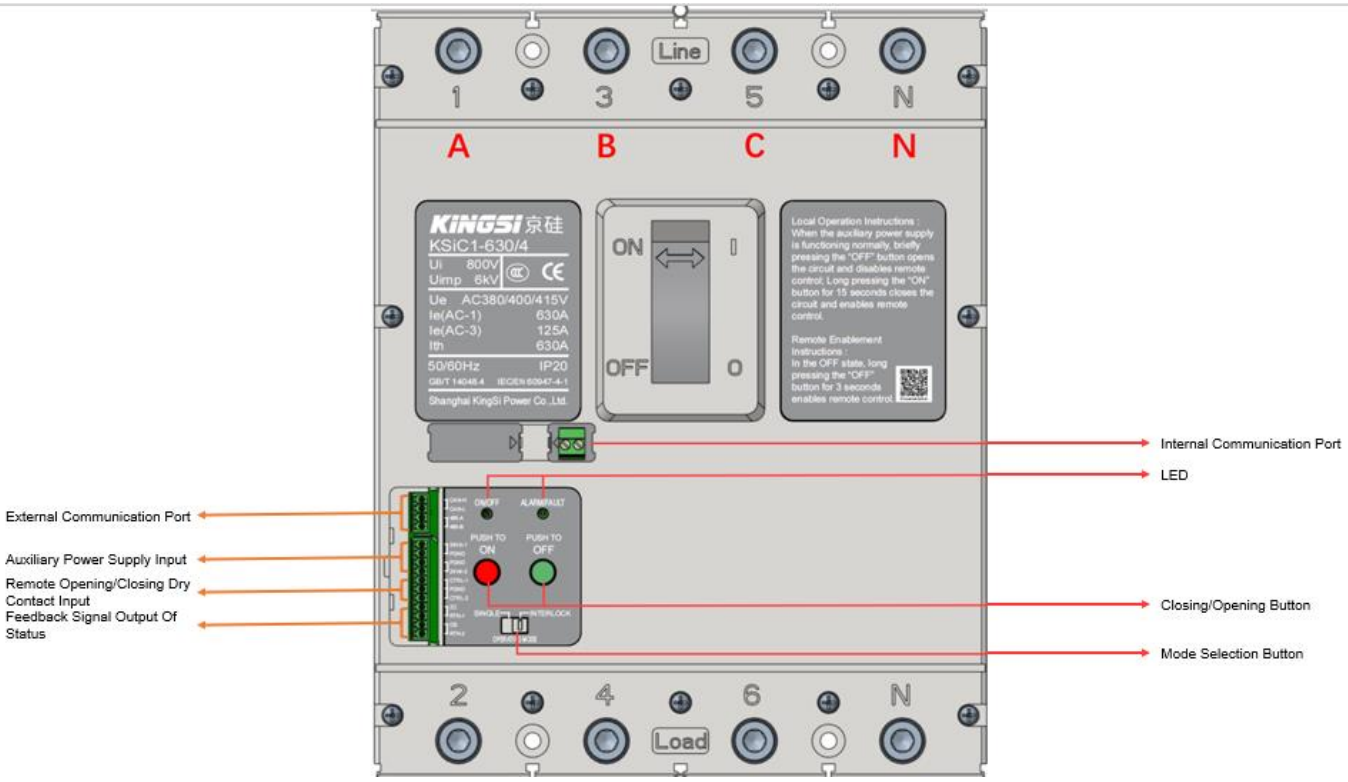


Fig. 4-8 Operation Interface Diagram

4.10 Power-OFF And Delay Time Opening

When the product is in the closed state and auxiliary power supply loses power, it can delay the response to the opening signal; when in the open state and loses power, it does not respond to the closing signal; after losing power, if there is no control signal input, the switch remains in its current state without action.

4.11 Button Function

No.	Button	Function
1	Red Button (Closing)	Push the red button for 15 seconds, release to trigger closing, and enable remote control after closing successful.
2	Green Button (Opening)	Push the green button briefly to open the product and disable remote control. In the OFF state, push the ON button for 3 seconds to enable remote control.

4.12 Panel LED

The red light is on when closing, the green light is on when opening, and the yellow light is an alarm light.

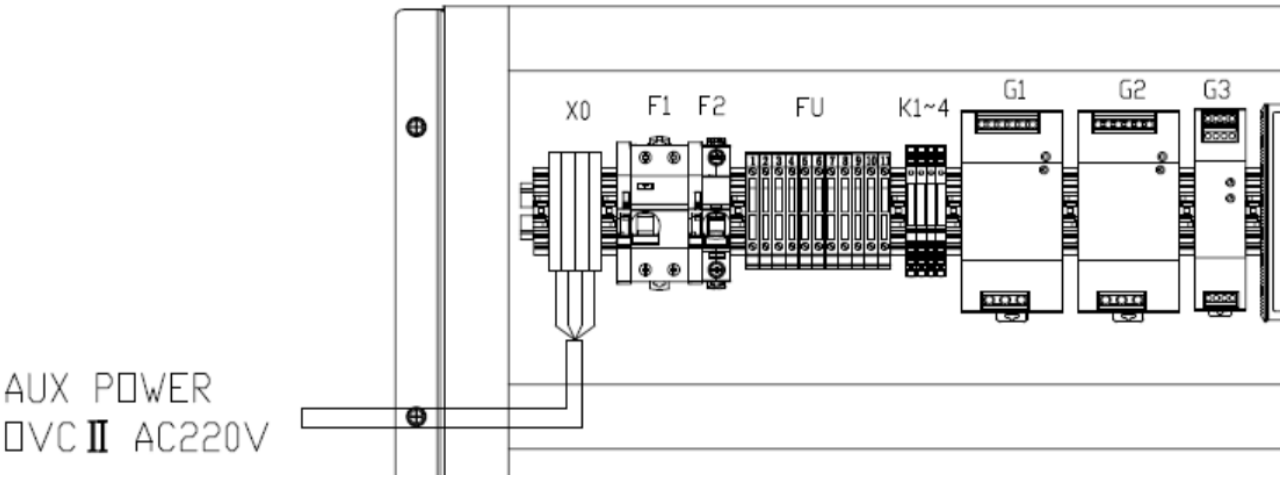
Common light language is as follows (arranged in descending order of display priority):

Light Language Status	The Meaning Of Light Language
Dual-light Quick Flash (Yellow Light + Red or Green Light).	Internal communication lost in series or parallel mode or N phase connected to ABC phase in error.
Yellow light flashing quickly (lit for 0.25 seconds, off for 0.25 seconds).	Disable remote control.

Yellow light flashes slowly (on for 1 second, off for 1 second).	Alarm for forbidding to close.
Yellow light always on.	General alarm, allowing on/off commands.
Green light flashing, yellow light always on.	Relay drive fault or feedback fault. SCR damage or current sampling fault.

4.13 Auxiliary Power Supply

The auxiliary power supply needs to get power from **UPS**.



5 Mechanical Installation

5.1 Pre-installation Inspection

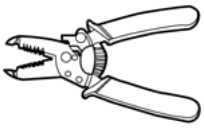
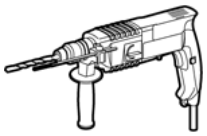
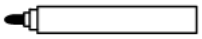
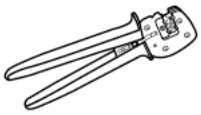
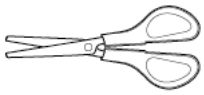
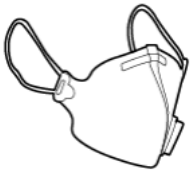
Check the outer package

Before unpacking the outer package of the grid switching cabinet, check the outer package for visible damage, such as holes, cracks or other signs of possible internal damage, and check the switch type. If there is any abnormal packaging or device type does not match, do not open, and contact your dealer as soon as possible.

Check delivery

After unpacking the grid switching cabinet, check that the deliverables are complete and there is no obvious external damage. If anything is missing or damaged, contact your dealer.

5.2 Installation Tool Preparation

Category	Tool			
Installation	 Measuring tape	 Wire stripper	 Hammer drill	 Marker
	 Terminal crimping	 Rubber hammer	 Multimeter	 Phillips insulated
	 Scissors	 Heat shrink tube		
Personal protective articles	 Insulating gloves	 Goggles	 Dust mask	 Safety shoes
	 Safety helmet	 Reflective vest	 Protective gloves	

5.3 Lifting Requirements

- The total weight of the grid switching cabinet is 700kg, please choose suitable lifting equipment based on the total weight of the equipment and the site conditions.
- When installing the lifting wire rope, be careful not to scratch the paint surface of the cabinet.

- When lifting, ensure that there are no personnel or obstacles around, and lift slowly and steadily to ensure lifting safety.
- The lifting speed is ≤ 5m/min.

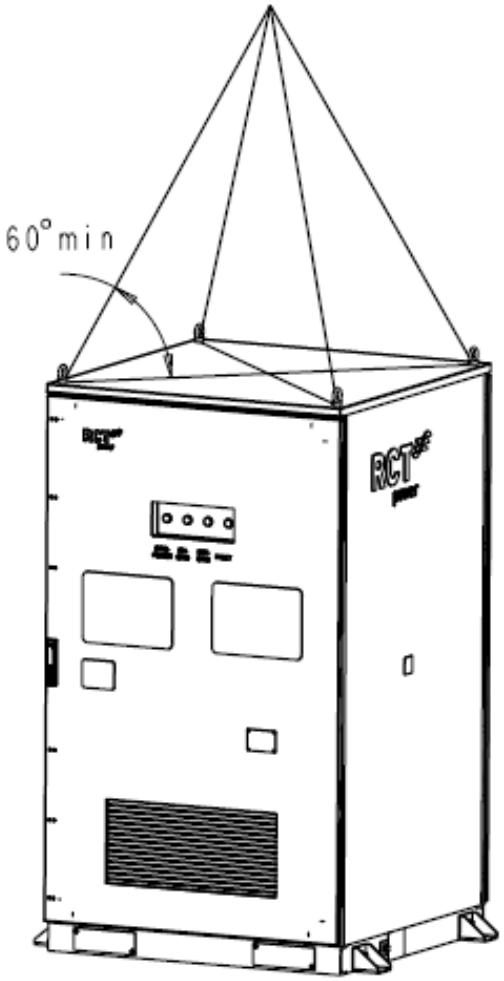


Fig. 5-1 Cabinet Lifting Diagram

5.4 Forklift Requirements

- The total weight of the grid switching cabinet is 700kg. Please choose a suitable forklift based on the total weight of the equipment and the site conditions.
- The forks of the forklift used should be inserted to the full depth of the integrated cabinet, the length of the forks should be at least 1050mm.
- During the process of lifting, lowering, and moving the fork, it is necessary to ensure that it is slow and smooth, and a fork test must be conducted.

5.5 Installation Requirements

5.5.1 Space And Position Requirements

- Considering the requirements for communication distance between the grid switching cabinet and PCS, the grid switching cabinet needs to be installed on the left side of the CESS energy storage cabinet or on the right side ,where is 0.8m away from the energy storage cabinet.
- The maintenance space requirement for the front and rear doors of the cabinet is not less than 1.5m.

5.5.2 Structrue Installation Requirements

- The range of cabinet installation is shown by this following figure:

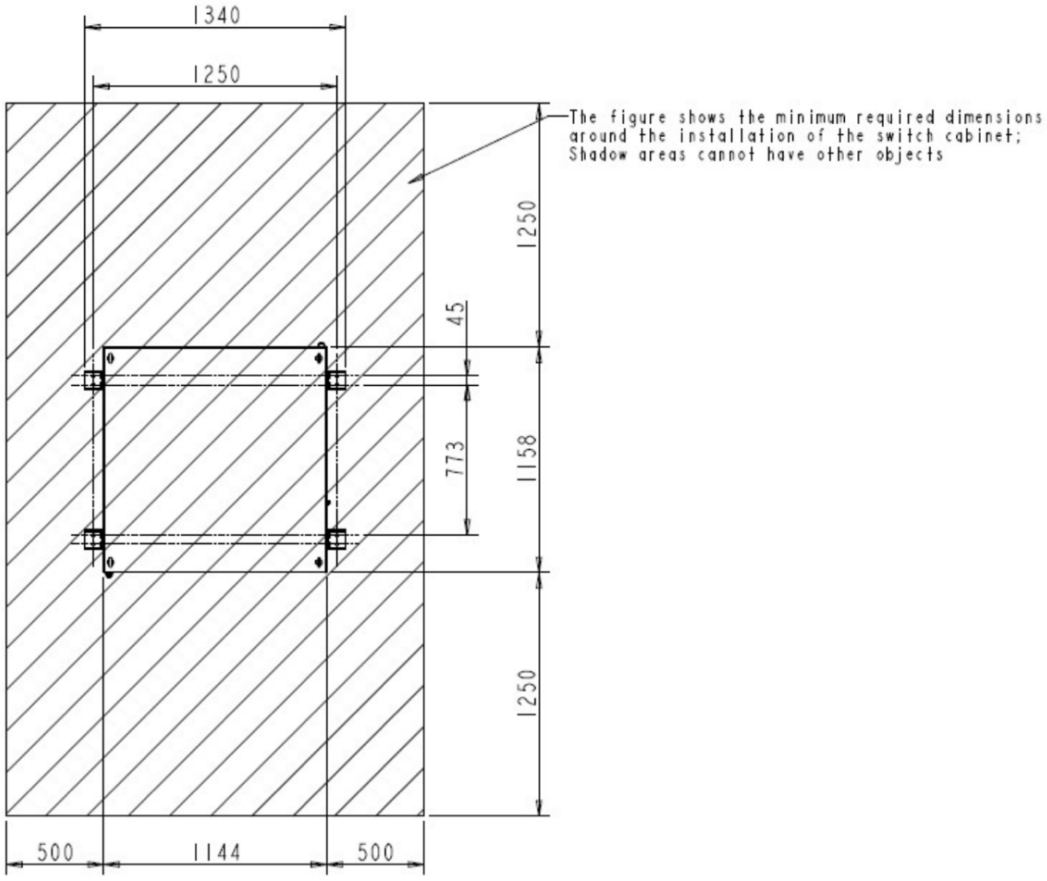


Fig. 5-2 The Range Of Cabinet Installation

- It is recommended that the grid switching cabinet should be installed on the foundation,and the range of foundation is shown by this following figure:

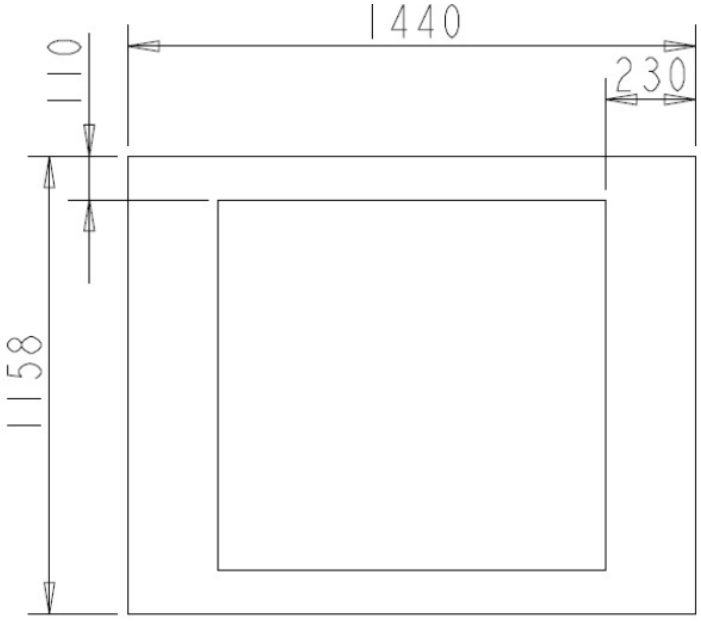


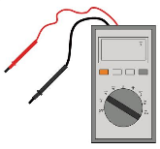
Fig. 5-3 The Range Of Foundation

6 Electrical Installation

6.1 Precautions

DANGER	High voltage! Electric shock! ■ It is strictly forbidden to directly touch the live parts in the unprotected state! ■ Before installation, ensure that all switches are off.
WARNING	Sand and moisture penetration may damage the electrical equipment in the cabinet or affect their operating performance! ■ Avoid electrical connections during sandstorms or when the relative humidity in the surrounding environment is greater than 95%. ■ Perform electrical connection when there is no sandstorm and the weather is fair and dry. ■ Before wiring, check and ensure that the polarity of all input cables is correct. ■ During electrical installation, do not forcibly pull any wires or cables, as this may compromise the insulation performance. ■ Ensure that all cables and wires have sufficient space for any bends. ■ Adopt the necessary auxiliary measures to reduce the stress applied to cables and wires. ■ After completing each connection, carefully check and ensure that the connection is correct and secure.

6.2 Preparing Installation Tools

Item	Name and Graphics			
Installation tools	 Torque screwdriver	 Heat gun	 Wire stripper	 Hydraulic pliers
	 Torque wrench	 Screwdriver	 Multimeter	
Protective tools	 Safety gloves	 Protective clothing	 Goggles	 Safety shoes

6.3 Opening The Door Of Cabinet

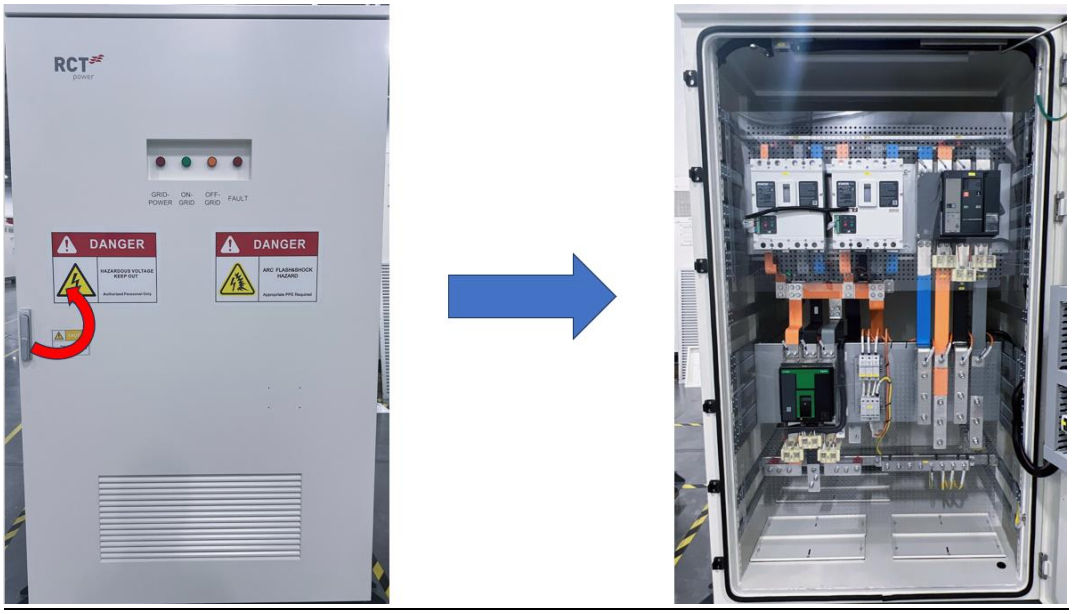


Fig. 6-1 Open The Door Of Cabinet

6.4 Cable Entry Design Of Cabinet

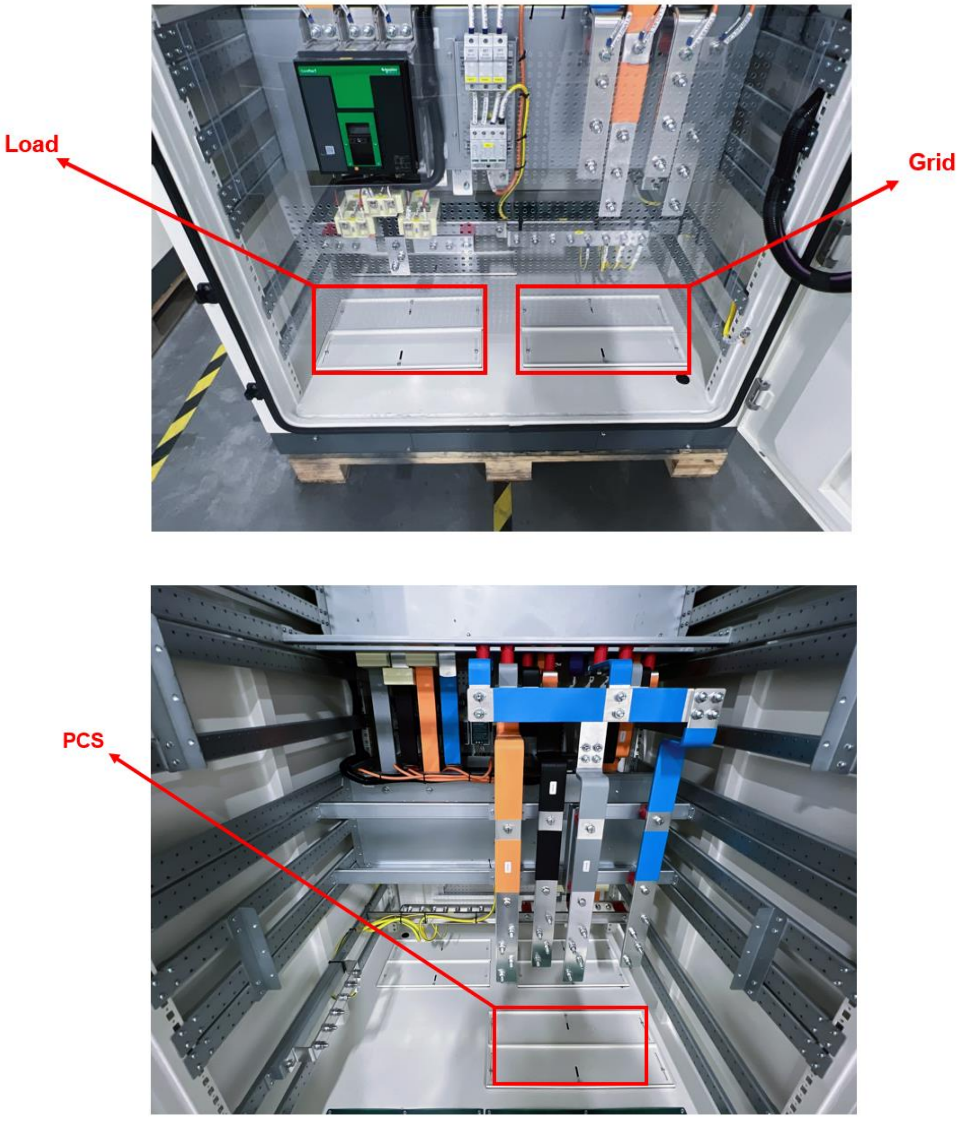
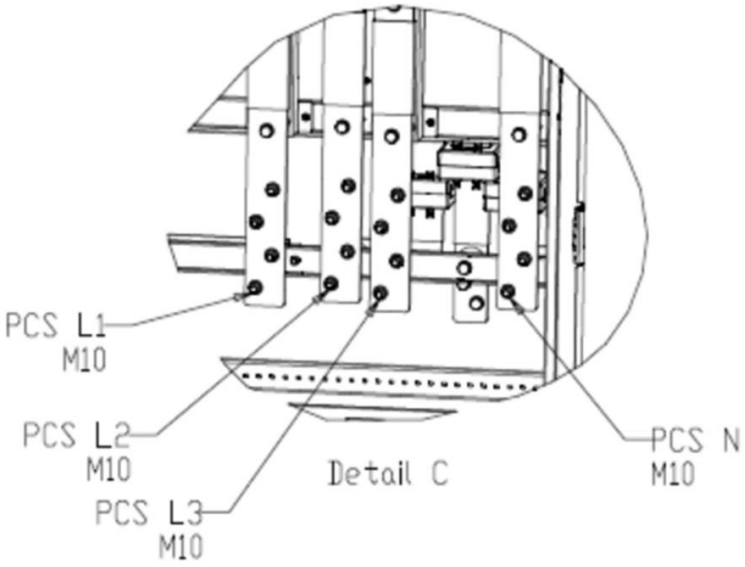


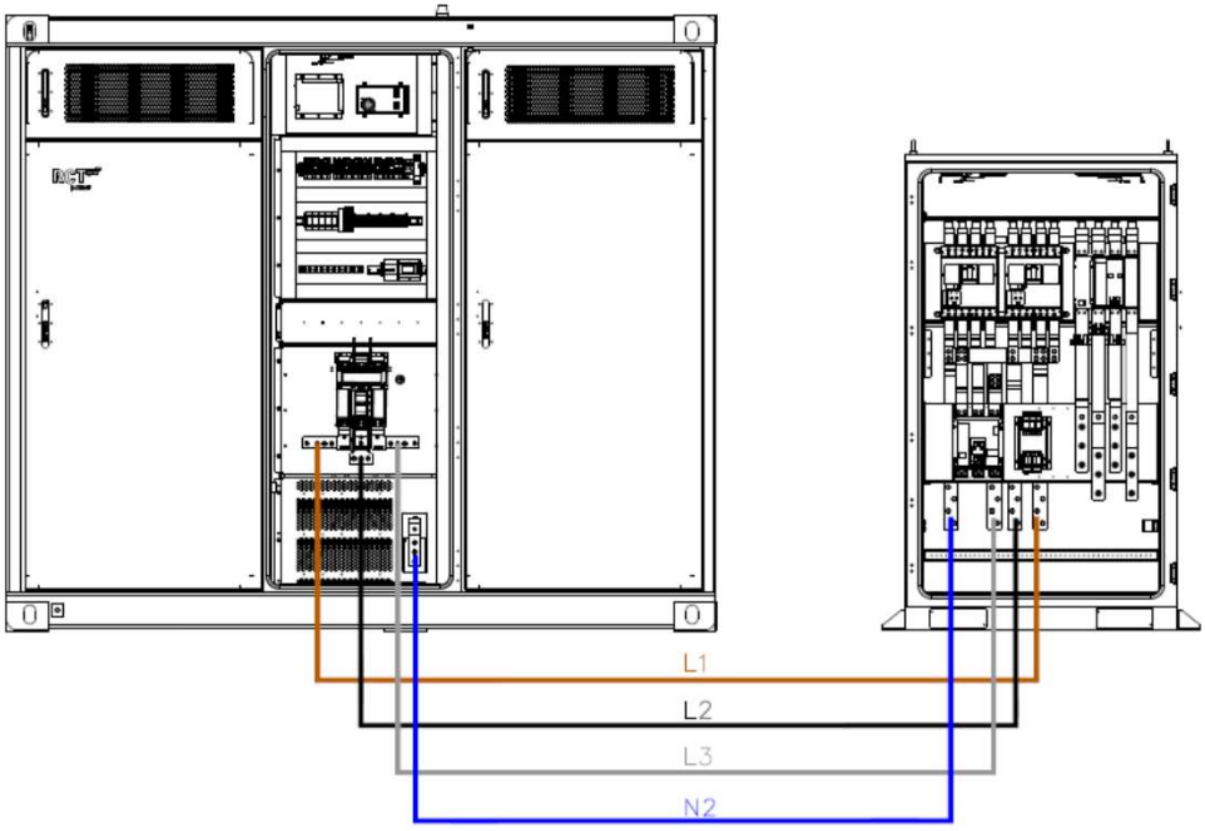
Fig. 6-2 Cable Entry Design Of Cabinet

6.5 AC Cable Connection

6.5.1 Connection With CESS

- The AC cable ports of CESS energy storage cabinet are located on the back of grid switching cabinet.
- Connect these copper busbars to those copper busbars, which are below the AC outgoing circuit breaker of the CESS energy storage cabinet by using AC cables.
- The sequence of phase lines is: **L1 (brown)**, **L2 (black),** **L3 (gray)**, **N2 (blue)**.
- It is recommended that to use multi-core or single core copper cables above 400V.
- It is recommended that cross-sectional area of copper cable conductor is: L1/L2/L3: 2×185 square millimeters; N: 2×95~120 square millimeters.
- The connection diagram is shown by these following figures:





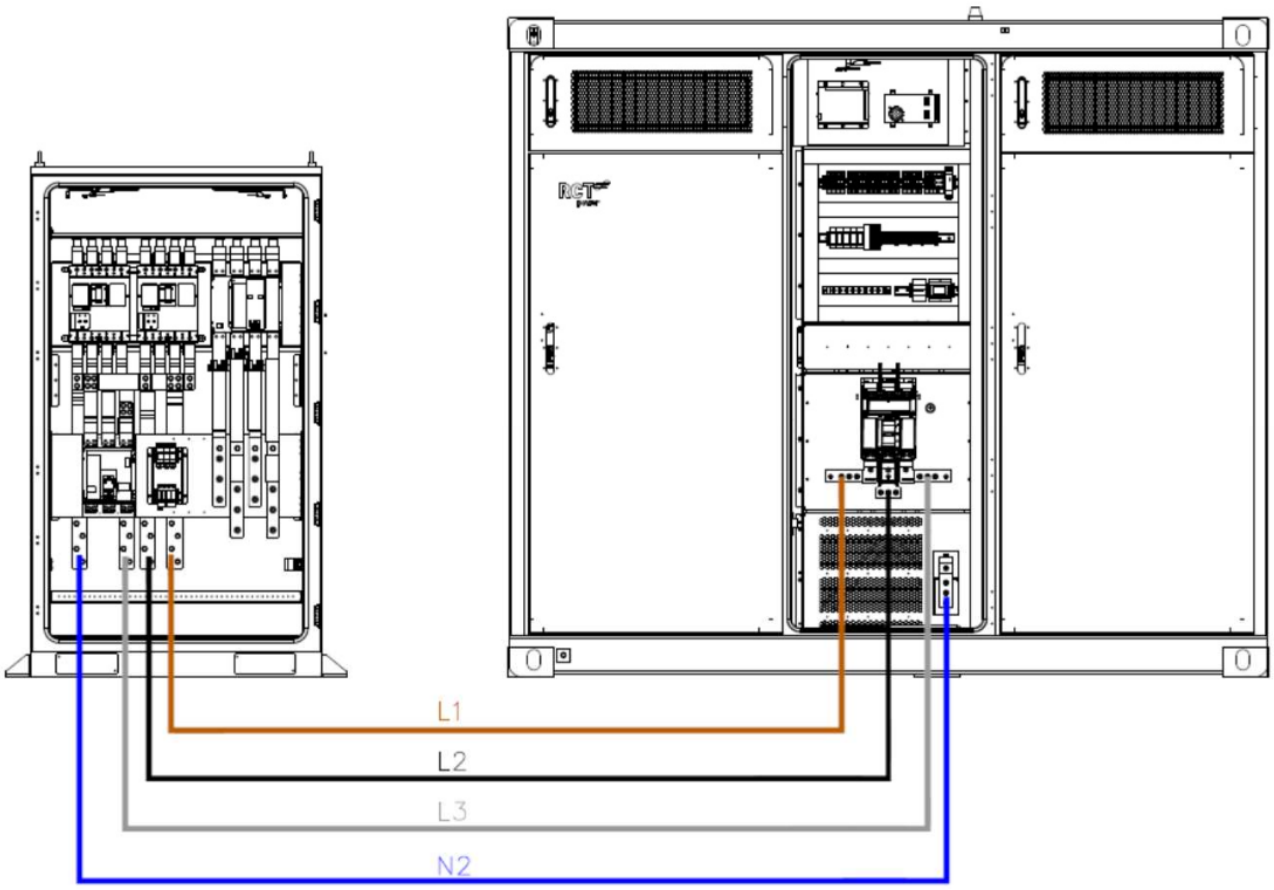


Fig. 6-3 CESS(PCS) Connection Diagram

6.5.2 Connection With Load

- The AC cable ports of the load are located on the right side of the front of the grid switching cabinet, which are used to connect with the load.
- The sequence of phase lines is: **L1 (brown)**, **L2 (black),** **L3 (gray)**, **N2 (blue)**, and this copper busbar N2 is located on CESS side.
- It is recommended that to use single core copper cables above 400V.
- It is recommended that cross-sectional area of copper cable conductor is: L1/L2/L3: 2×185 square millimeters; N: 2×95~120 square millimeters.
- The connection diagram is shown by figure 6-4.

6.5.3 Connection With Grid

- The AC cable ports of the grid are located on the left side of the front of the grid switching cabinet, which are used to connect with the grid.
- The sequence of phase lines is: **L1 (brown)**, **L2 (black),** **L3 (gray)**, **N2 (blue)**.
- It is recommended that to use single core copper cables above 400V.
- It is recommended that cross-sectional area of copper cable conductor is: L1/L2/L3: 4×185 square millimeters or 5×120 square millimeters; N: 2×120 square millimeters.
- The connection diagram is also shown by figure 6-4.

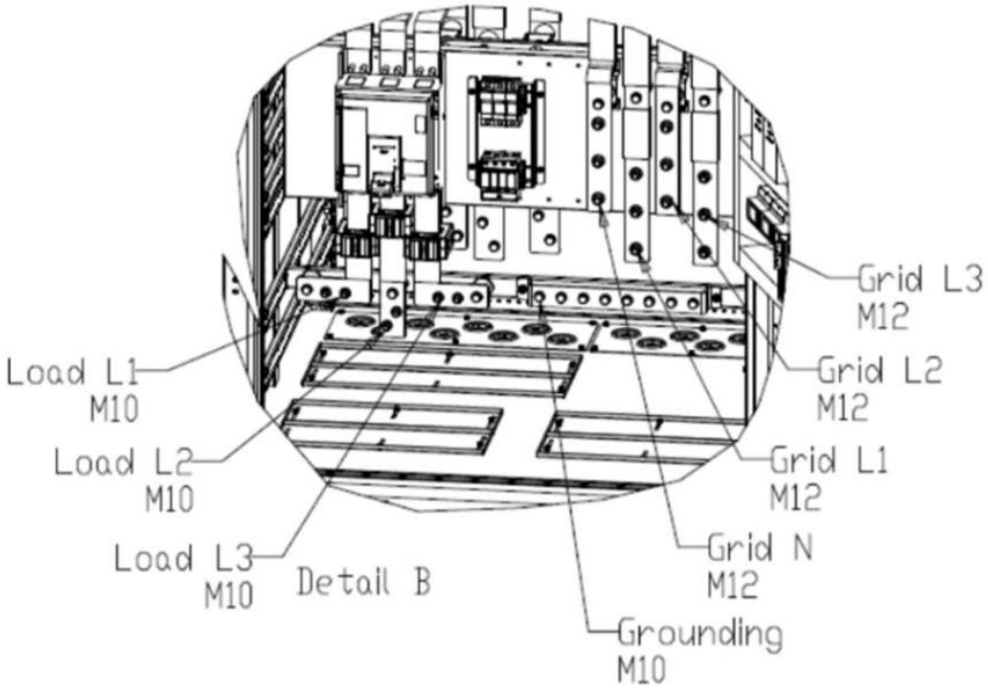
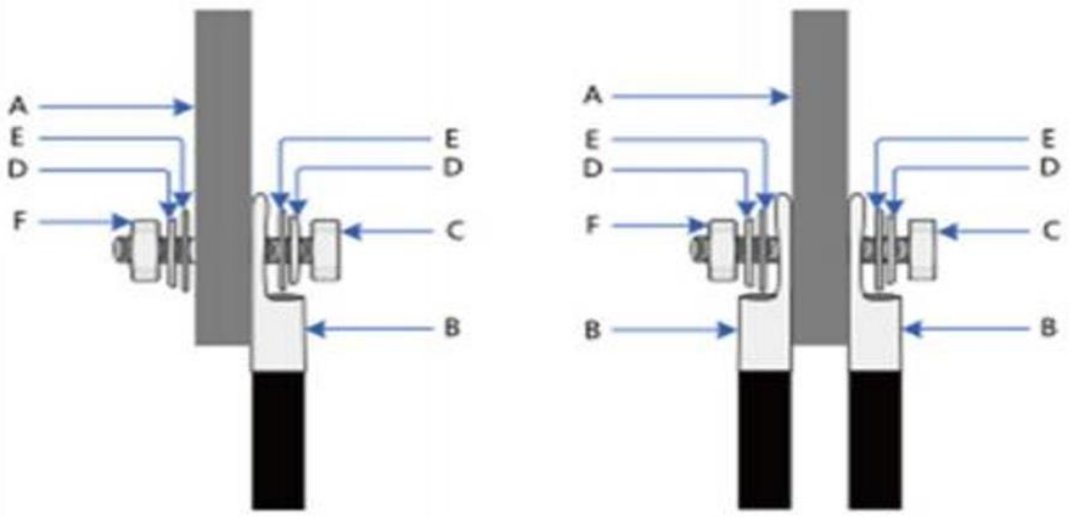


Fig. 6-4 Grid And Load Connection Diagram

6.5.4 Connection Method

The method of connection between AC cable and copper busbar is shown by this following figure:



A	B	C	D	E	F
Copper Busbars	Copper Connecting Terminal	Bolt	Dsic-shaped Gasket	Flat Gasket	Nut

Fig. 6-5 Connection Diagram

6.6 Control Cable Connection

6.6.1 The Inlet Of Control Cables

- The grid switching cabinet is an optional product for the CESS energy storage cabinet, and there needs to be control lines between them to achieve fast switching function.
- Three types of cables are required: 485 communication cables, CAT 6 network cables, and 20 core control cables.
- The control cable inlet is shown by this following figure:

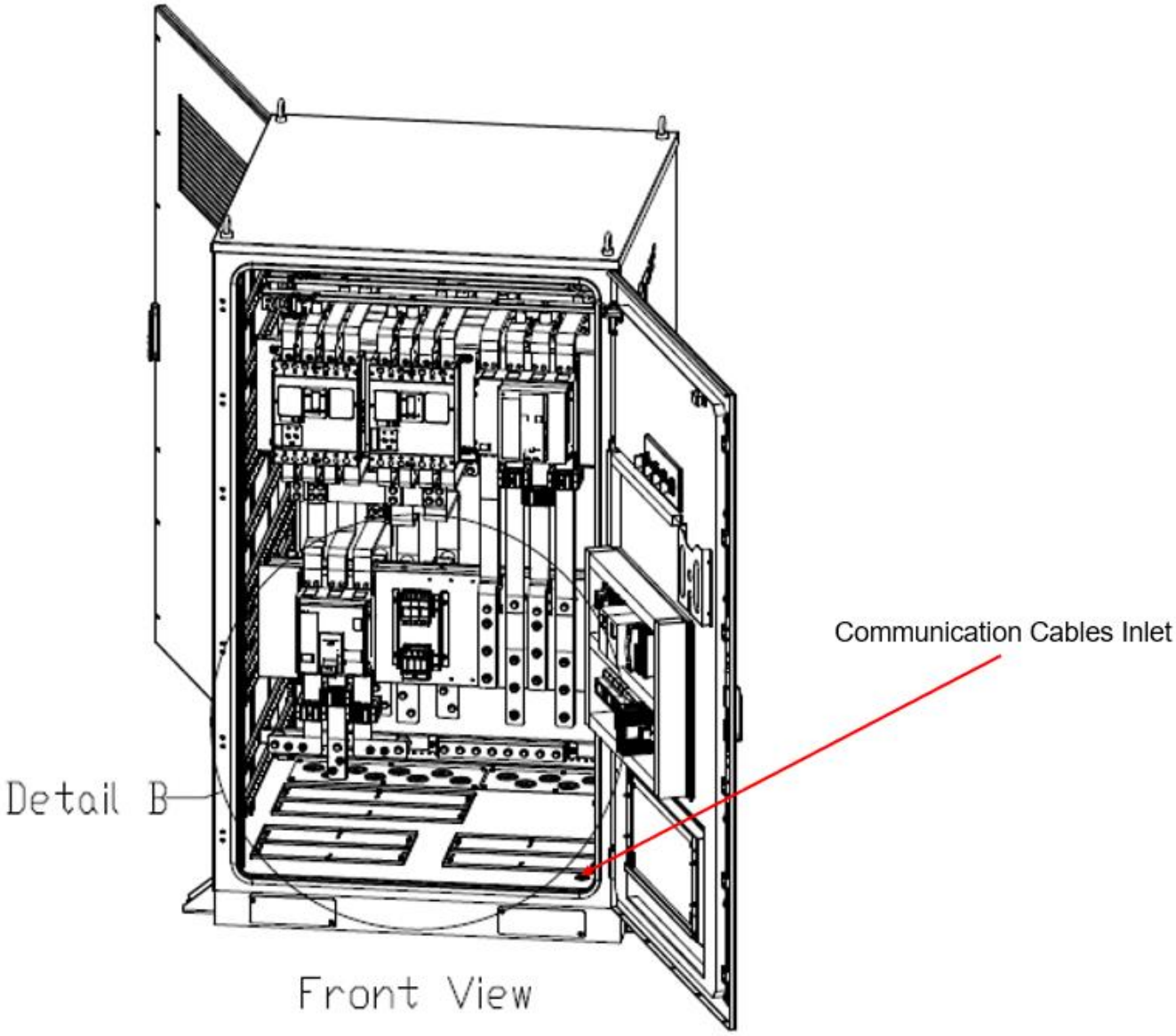


Fig. 6-6 Communication Cables Inlet

6.6.2 The Connection Points Of Control Cables

The control cable needs to be connected to the corresponding terminal of the distribution panel as shown by this following figure:

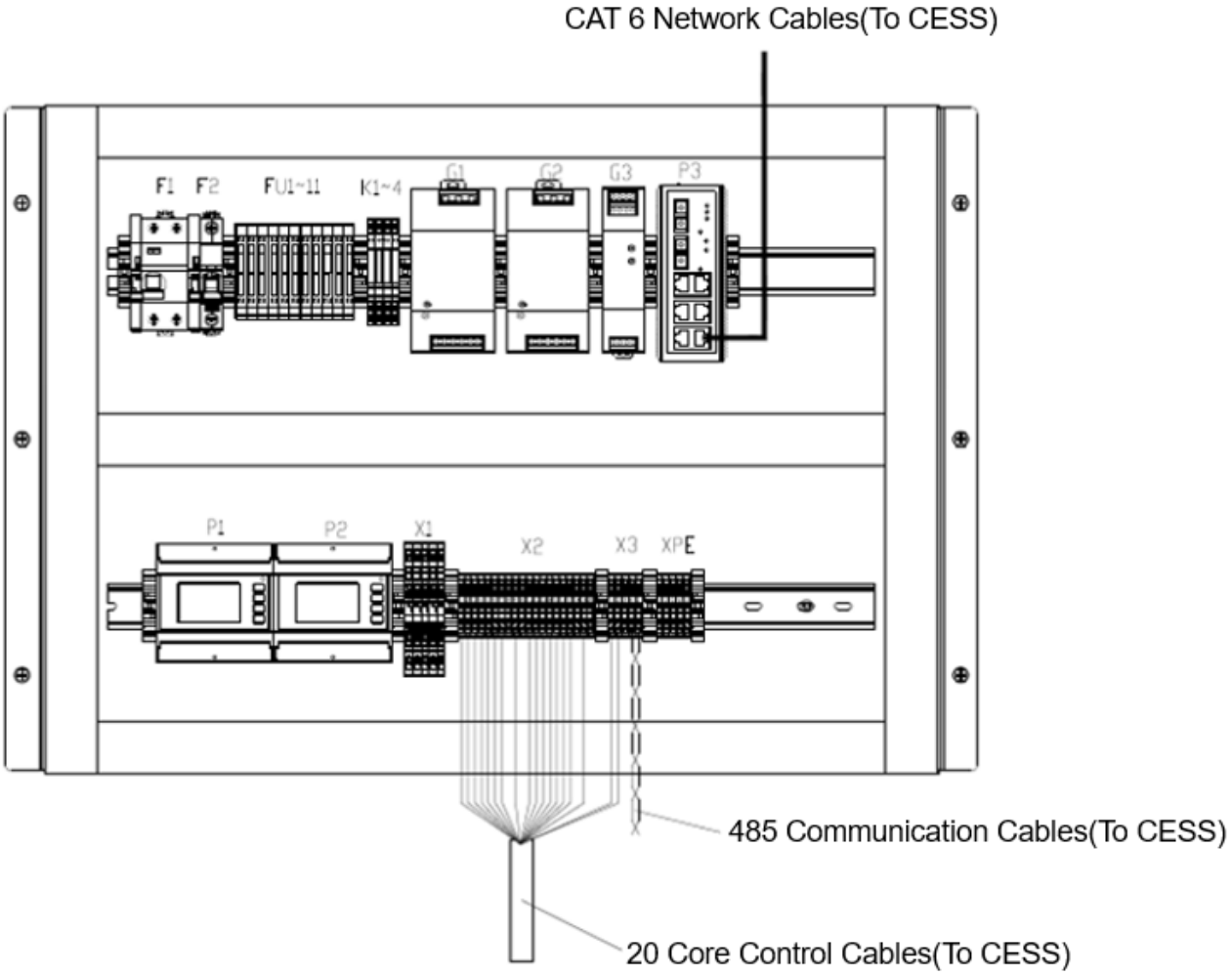


Fig. 6-7 The Connection Points Of Control Cables

7 Exclusion of Liability

Although the information contained in this manual has been carefully checked for accuracy and completeness, no liability can be assumed for errors or omissions.

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- Installation or operation of the product in an unsuitable environment.
- The relevant safety regulations during installation and commissioning at the operation site are ignored.
- The product relevant safety notices and instructions contained in the product documentation are ignored.
- By installing or operating the product under insufficient safety and security conditions.
- By modifying the product or by unauthorised software installation.
- A defect in the product caused by the operation of the product or adjacent equipment outside the permitted limits.
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RCT Power does not accept any liability for damage caused by incorrect or lost data, due to incorrect operation or malfunction of the grid switching cabinet, the software, additional devices or personal computers.

8 Technical Data

Technical Data	Grid Switching Cabinet
Model Name	**GSC1000-742-01**
GENERAL	
Nominal Capacity	742 kVA
Rated Working Voltage	230 / 400Va.c.
Working Voltage Range	±15%
Rated Impact Withstand Voltage	6kV
Industrial Frequency Withstand Voltage	2500V/5s
Rated Working Voltage Frequency	50 / 60 Hz
Max. Output Current Of Port	Load: 721A Max & CESS: 350A Max
Short-time Overload Tolerance Capability	1.5 Ie / 20min 2 Ie / 10min 5 Ie / 10s
Opening Time	≤20ms
Closing Time	≤20ms
Connection	Three Phases+Neutral+PE
Relative Operating Humidity	0% ~ 100% RH, No-condensation
Operating Temperature Range	-20℃ ~ 45℃
Max. Operating Altitude	≤2000m
Dimensions (mm)	W1304*H2065*D1204
Corrosion-proof Grade/Salt Spray Resistance	C4/(C5 Optional)
Weight	700kg
IP Rating	IP54
Noise Level	56dB
Cooling	Forced Air-cooling

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