Sinexcel

PWD-300M/P

User Manual

Ver 3.0

Sinexcel Electric PWD-300M/P Power Switching Device User's Manual

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Applicable to PWD-300M/P

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1. Chapter 1 Overview

1.1 Model Definitions

This section describes the product model definitions covered in the manual as shown in Figure 1-1.

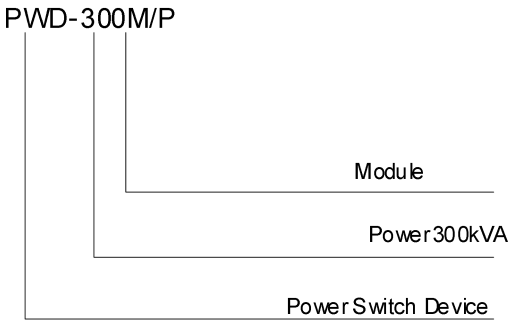


Figure 1-1 Model Number Definition

PWD-300M indicates a power switching device with a rated module capacity of 300 kVA, also known as PWD-300M power switching device, with a permissible maximum power of 150 kVA on the PCS side;

PWD-300P means that the power switching device with a rated module capacity of 300 kVA is also called PWD-300P power switching device, and the maximum permissible power on the PCS side is 300 kVA.

1.2 Explanation of symbols

The following is a list of the identifiers applied in this manual, please read carefully and understand the meaning represented by each symbol.

DANGER	This instruction indicates that there are hazards during operation and that failure to comply with such warning messages will directly result in serious personal injury or death.
WARNING	This instruction indicates that there are potential hazards during operation and that failure to comply with such warnings may result in personal injury or death.
CAUTION	This instruction indicates that there is a potential hazard during operation and that failure to follow such warnings may result in equipment damage.
	"Instructions" are additional information in the manual, highlighting and supplementing the content, and may also provide tips or tricks to optimize the use of the product, helping you to efficiently solve some of the problems in the application.

1.3 Safety Instructions

This manual covers the installation and use of the Power Switching Device PWD-300M/P from Sinexcel Electric.

- The PWD-300M/P power switching equipment must be commissioned and maintained by an engineer appointed by the manufacturer or its agent. Otherwise, it may endanger personal safety and cause equipment failure, and the resulting damage to the equipment is not covered by the warranty.
- PWD-300M/P power switching equipment is for commercial/industrial use only.
- PWD-300M/P power switching equipment is designed and tested in strict accordance with relevant international safety standards, and its installation, commissioning, operation and maintenance processes must comply with safe operating practices for electrical and electronic equipment. Improper use or misuse may endanger the personal safety of the operator or third parties, as well as damage the converter or other property safety. To avoid this, the following safety precautions must be strictly observed during operation and maintenance, which are described in detail in the respective sections.

 CAUTION	All installation, commissioning and maintenance operations must be performed by qualified personnel. Professional technicians must meet the following conditions. ● An engineer appointed by the manufacturer or its agent. ● Have received professional training. ● A complete reading of this manual and familiarity with safety matters in the operation of electrical and electronic equipment. ● Be familiar with the relevant safety codes for electrical systems.

 CAUTION	Misuse of the equipment poses a risk of injury! ● Must always follow the instructions in the manual when moving and placing the machine. ● Improper handling of equipment may result in electric shocks, burns, contusions, etc. ● Damage to the equipment caused by any private modification and dismantling of the system (or equipment) operation without permission is not covered by the warranty.

1.3.1 Safety instructions in mechanical installation

 DANGER	● Damage to the equipment caused by any unauthorized modification or disassembly of the system (or equipment) is not covered by the warranty. ● Always make sure that the converter is free of any electrical connections

	before installing power switching equipment!
 CAUTION	• Poor ventilation of the installation environment will affect the performance of the system! • Good ventilation needs to be ensured during the operation of the equipment. It is important to keep the unit upright and the air ducts smooth, with no strong air currents blocking air flow near the air outlets to ensure adequate cooling inside the unit.

1.3.2 Safety instructions in electrical connection

 DANGER	• Before making electrical connections, it is important to be safe and not to touch the metal terminals without adequate protection.
 WARNING	• The cables used in the electrical system must be securely connected, well insulated and of proper gauge.
 CAUTION	• All electrical installations must meet national/regional electrical standards. • Permission must be obtained from the electrical authority of the country/region in which it is located to operate on the grid. • Be sure to be reliably grounded and meet local electrical standards before connecting to input power.

1.3.3 Safety instructions for switching boxes in operation

 DANGER	• Any act of touching the copper strip, contacts, terminals, etc. inside the equipment connected to the grid circuit may cause a fatal burn or electric shock! • Do not touch the terminals and conductors connected to the grid circuit. • Pay attention to any instructions and safety instruction documents regarding connection to the grid.
 WARNING	• There may be a risk of electric shock inside the device! Do not open the power switching device housing while power switching device is operating or energized. • A complete and closed box enclosure is required to protect the operator's personal property. • Any operation of this equipment needs to be performed or directed by qualified personnel. • Please note the safety precautions listed in the user manual and other documents.

1.3.4 Repair and Replacement Safety Instructions

	Improper maintenance of the equipment may result in injury or damage to the equipment. Before performing any operation, the user must strictly follow the following steps. ● first disconnect the disconnect switches on the grid side, PCS side, and load side of the power switching equipment. ● Wait at least 5 minutes until the internal energy storage components are discharged, during which time it is strictly forbidden to touch the equipment terminals, contacts, copper row and other live parts with human body or any conductor. ● Use testing equipment to inspect to ensure that no voltage or current is present.
	● Do not allow unrelated personnel to enter the maintenance site! ● Temporary warning signs must be posted or barriers erected during electrical connections and maintenance work to prevent unrelated persons from entering the electrical connection or maintenance area.
	● Restart the power switching device only after troubles affecting the safety of the power switching device have been eliminated; ● Power switching devices do not contain service parts inside, if you need any service, please contact our after-sales service.
	● Do not replace the internal components of the power switching device without permission. We will not be responsible for any warranty or joint and several liability for any damage caused by this.
	● contact or improper handling of printed circuit boards or other electrostatic sensitive components can cause damage to the device. ● Avoid unnecessary contact with the circuit board. ● Observe electrostatic protection practices and wear anti-static bracelets.

1.3.5 Other

	All safety markings, warning labels, and nameplates on power switching devices: ● must be clearly visible. ● They must not be removed or covered.

1.4 Caution

1.4.1 Personnel requirements

The PWD-300M/P power switching equipment must be commissioned and maintained by an engineer appointed by the

manufacturer or its agent. Otherwise, it may endanger personal safety and cause equipment failure, and the resulting damage to the equipment is not covered by the warranty.

1.4.2 Scope of equipment use

The PWD-300M/P power switching equipment is for commercial/industrial use only and may not be used as an energy saving device associated with any life support equipment.

1.4.3 Chassis identification

Enclosure Markings contain important information for safe operation of the enclosure and must not be torn or damaged.

Ensure that the enclosure markings are legible and should be replaced immediately if damaged or obscured.

1.4.4 Instructions

In order to facilitate the user to read this manual more easily, the manual is equipped with a large number of pictures. The pictures are for illustration purpose only, and the specific information about the product is subject to the actual product.

2. Chapter 2 Product Introduction

2.1 System Applications

Intelligent switching equipment is usually connected between grid, PCS and load at the same time, used to dispatch the power configuration between the three, grid can be composed of low-voltage distribution network or small range of oil machine power supply network, load is local load for industrial and commercial use, when the grid fails, it can switch off the grid through PCS to realize grid and load switching, when PCS fails, cut off the connection between grid and PCS to ensure load normal operation, In the figure, Q4 and Q5 are the contactor modules of the front stage, which provide redundant protection between the grid side and PCS, Q1, Q2 and Q3, respectively, are the circuit breakers on the rack, and this part is configured by the customer cabinet.

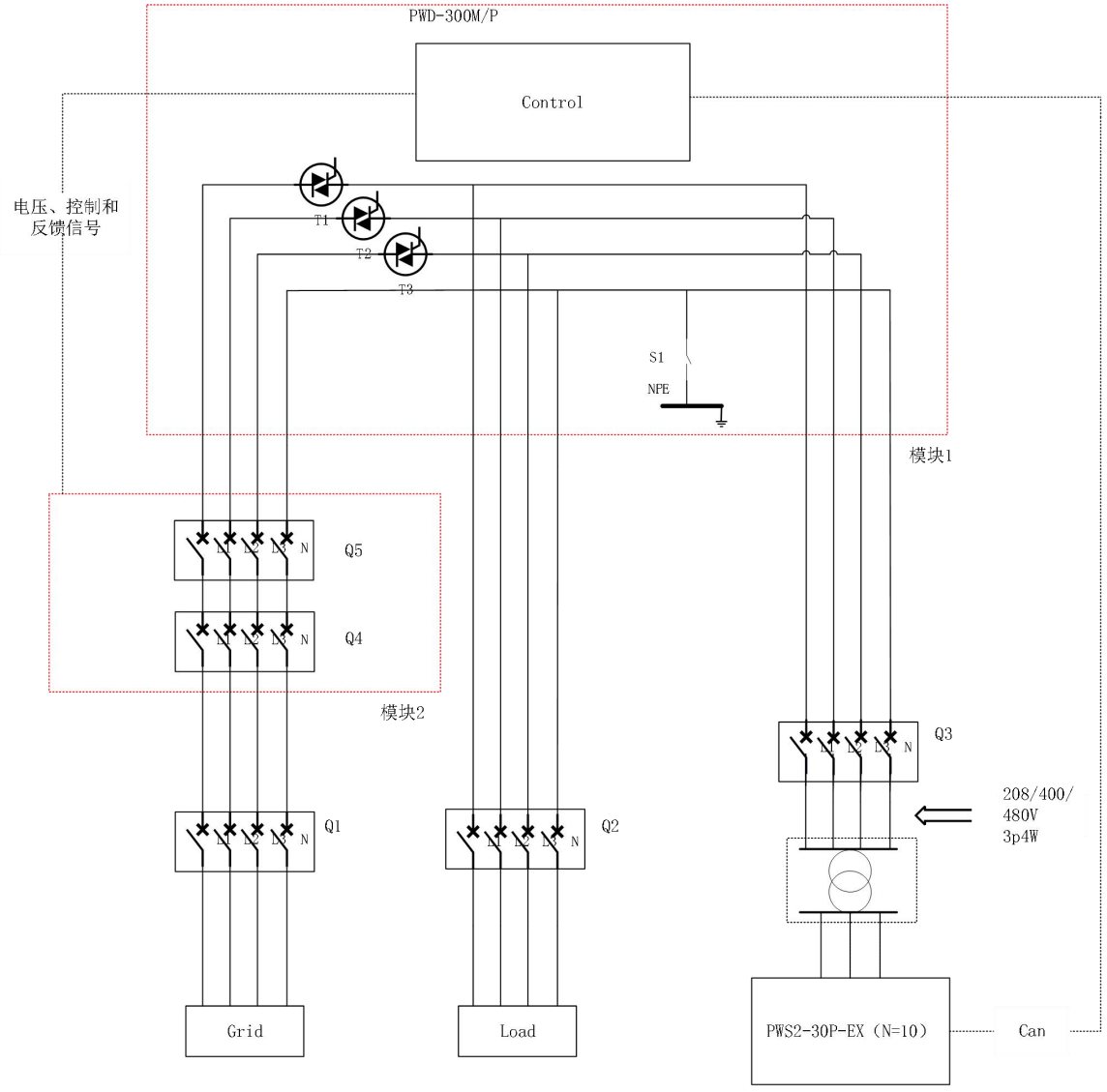


Figure 2-1 Intelligent switching topology diagram

2.2 Technical parameters

Table 2-1 shows the detailed technical parameters of PWD-300M/P power switching equipment.

Table 2-1 technical parameters table

Equipment name	Indicator item	Parameter	Remarks
PWD-300M/P	Grid side operating parameters		
	AC voltage range	AC：208V/400V/480V	
	AC rated current	434.8Aa.c	
	Maximum continuous input/output current	478.2Aa.c	
	AC rated power	156kVA (AC208V) 300kVA (AC400V) 360kVA（AC480V)	
	Rated frequency	50Hz/60Hz	
	Overcurrent protection	Software protection + external SCPD device	
	AC cut-off method	Contactor + thyristor	
	Adaptation to grid	TN-C-S;TN-S,TT,TN-C	
	PCS side operating parameters		
	AC voltage range	AC:208V/400V/480V	
	AC rated current	300M 217.4A 300P 434.8A	
	Maximum continuous input/output current	300M 239.1A 300P 478.2A	
	AC rated power	300M 78kVA（AC208V） 150kVA（AC400V） 180kVA（AC480V） 300P 156kVA（AC208V） 300kVA（AC400V） 360kVA（AC480V）	Load Side 223.6kVA（AC208V） 430kVA（AC400V） 516kVA（AC480V）
	Rated frequency	50Hz/60Hz	
	Switching time	＜20ms	(Switching is not supported when the power on the load side exceeds the permitted power on the PCS side)
	Adaptation Instructions	PWD-300M/P can only be used with Sinexcel's PCS.	
	Load side operating parameters		
	AC voltage range	AC：208V/400V/480V	

	AC rated current	623.2A	
	AC rated power	223.6kVA（AC208V） 430kVA（AC400V） 516kVA（AC480V）	
	Rated frequency	50Hz/60Hz	
	Conventional parameters		
	Module communication interface	CAN*2/RS485*4/WIFI*1/LAN*2	
	Communication distance	＜10m	
	DI	6	
	DO	4	
	Dimension(W*H*D)	440*300*645 MM	
	Weight	50kg	
	Connection method	Power crimp terminal, front side of module	
	Mounting method	With rack	
	Heat dissipation method	Air-cooled	
	Altitude	3000m	>3000m reduction
	Working environment pollution level	≤2	
	Working temperature	-25℃~60℃	>45℃ power derating
	Noise	<80dB	
	Protection grade	IP20	
	Certification	CE/UL1741	

2.3 Dimension

PWD-300M/P power switching equipment outline dimensions as shown in Figure 2-1, chassis length 645mm, width 440mm, height 300mm. The front panel consists of PCS and Load and the module communication terminal marked with 1, and the external communication interface marked with 2. From left to right, it is L1, L2, L3 and N of PCS and Load access terminals respectively. The wiring of the side panel of the network, from left to right, are N, L3, L2, and L1.

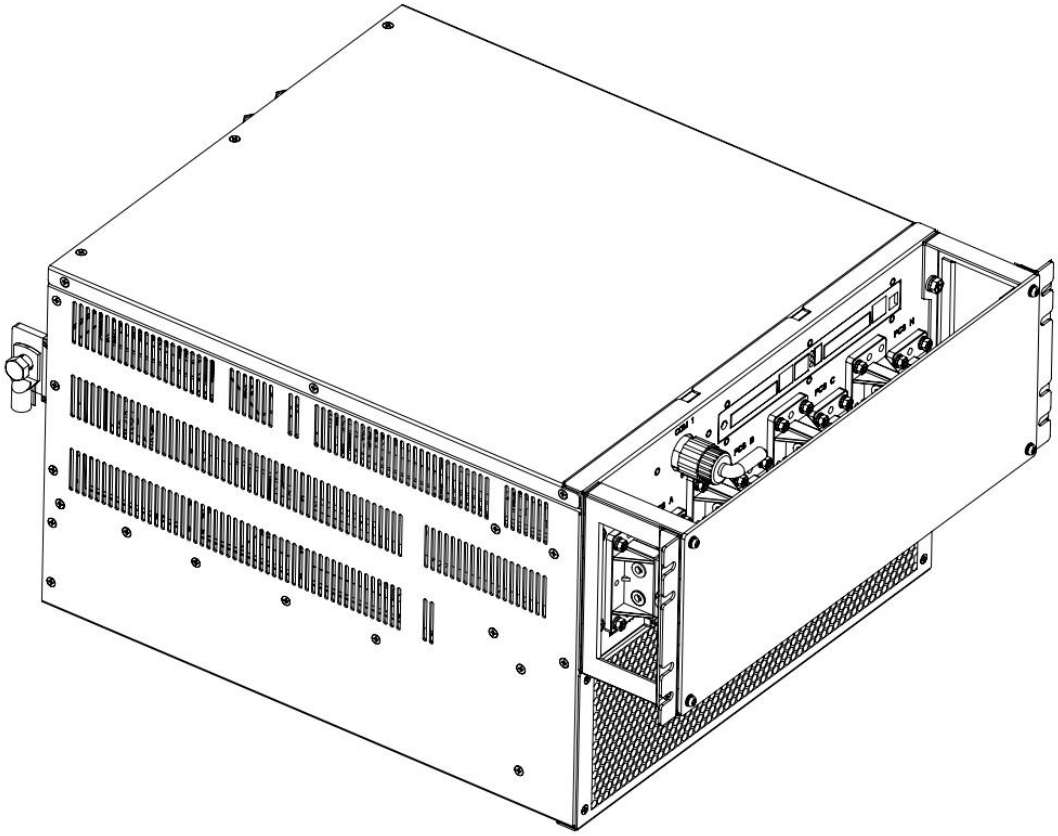


Figure 2-1 PWD-300M/P power switching equipment form factor

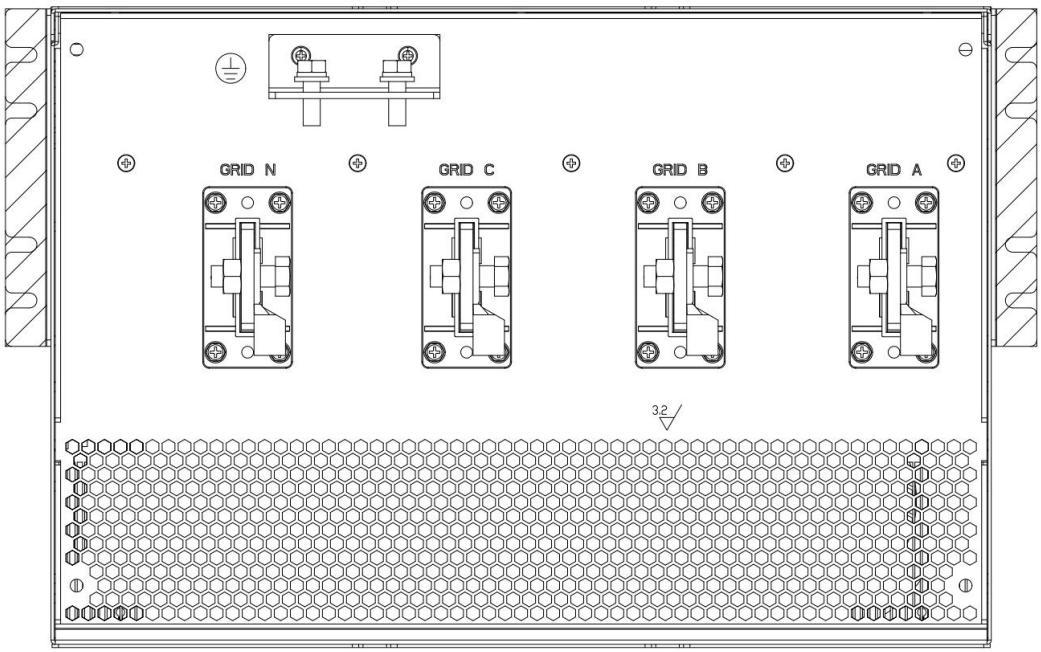


Figure 2-2 PWD-300M/P network side panel

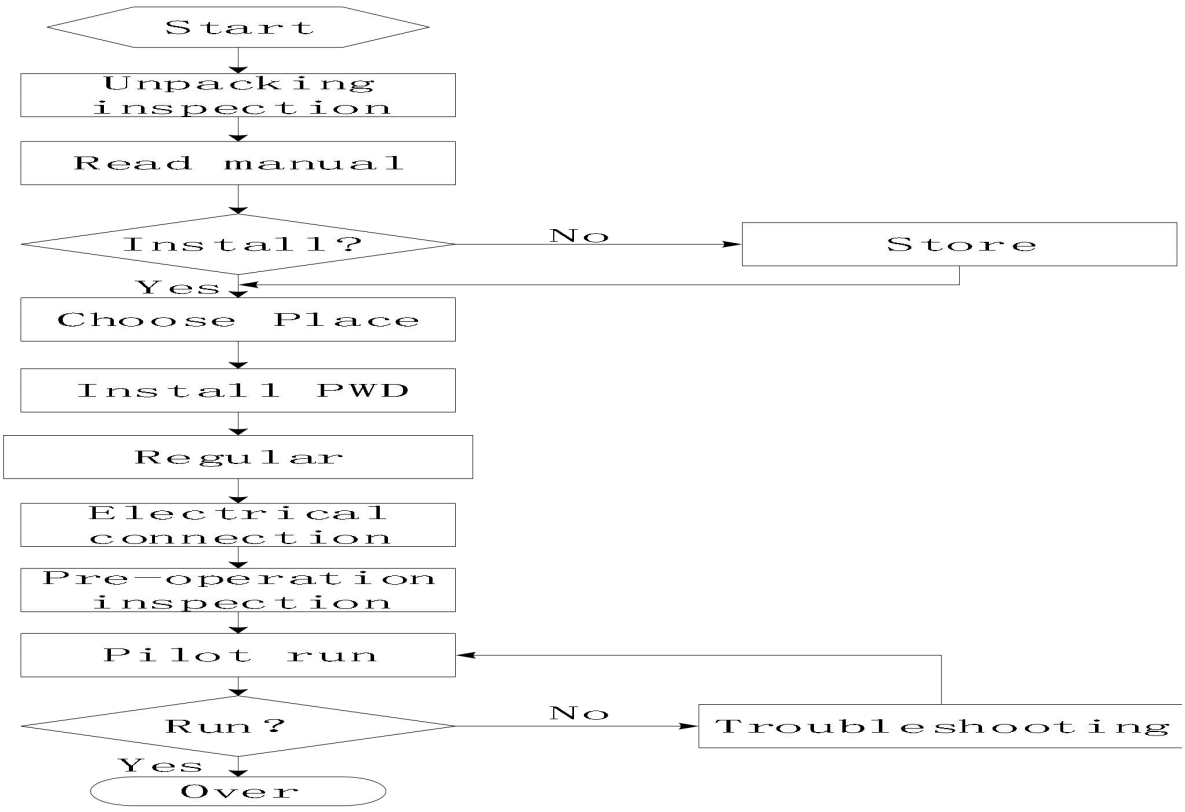


Figure 2-3 PWD-300M load, PCS side panel

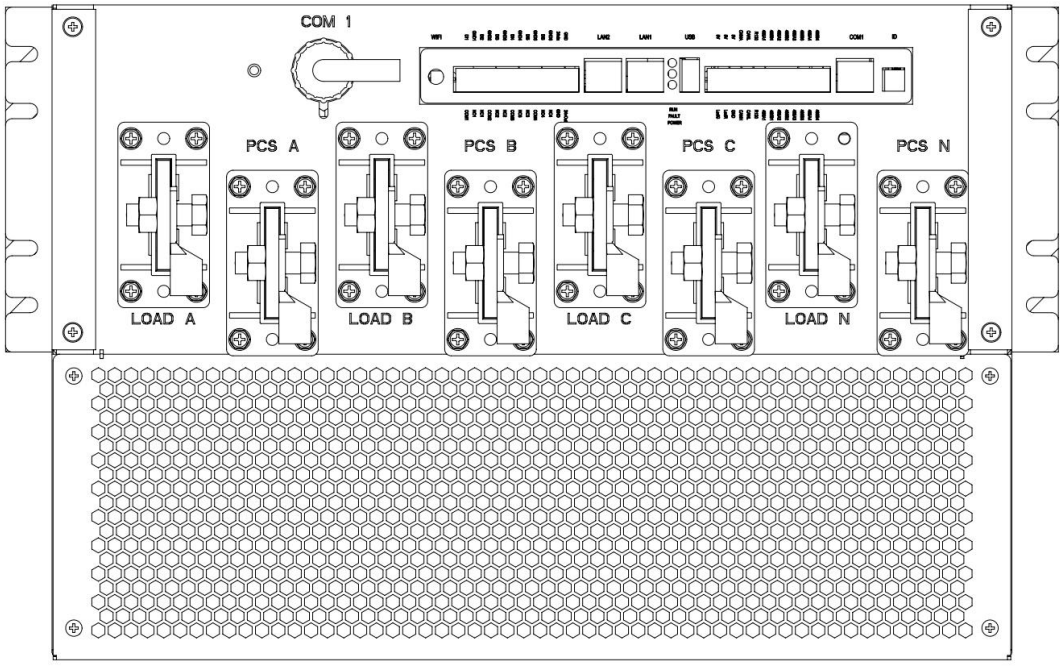


Figure 2-4 PWD-300P load, PCS side panel

2.4 Basic Function Description

The functions of the PWD-300M/P power switching equipment can be basically summarized as follows.

On-grid active cut off-grid: When PCS module PWS2-(29P,30P)-EX/PWS1-125M with PWD-300M/P power switching equipment system is working in on-grid state, if the user takes the initiative to set off-grid, the system switches off-grid operation, at this time the load is carried by PCS alone.

Off-grid active cut to grid: When PCS module PWS2-(29P,30P)-EX/PWS1-125M with PWD-300M/P power switching equipment system is working in grid-connected state, if the user takes the initiative to set grid-connected, the system switches to grid-connected operation, and the load is driven by PCS and grid together at this time.

When the PCS module PWS2-(29P,30P)-EX/PWS1-125M with PWD-300M/P power switching equipment system is working in grid-connected state, if abnormal condition of grid is detected, the system will automatically switch off-grid operation, and the load will be driven by PCS alone; if the grid is back to normal, the system will automatically return to grid-connected operation, and the load will be driven by PCS and grid together.

Data storage: PWD-300M/P power switching equipment stores operation information, operation records, fault records and other information.

Table 2-2 PWD-300M/P basic function description

Item	Function Logic	Description	Remarks
Basic Function	Switching control	The PWD-300M/P can be controlled to start and stop through the switch on/off command in the web interface. At the same time, the PWD-300M/P self-tests for faults under the automatic power-on setting and automatically turns on and runs when the power-on conditions are met.	
	Multiple voltage and power level compatible	Support 208V/400V/480V AC output level, and the rated power changes with it.	
	Grid reconnection	After grid fault recovery, PWD-300M/P will run again on grid only after grid recovery delay, grid recovery delay 0~10min can be set.	
	Off-grid function	PWD-300M/P can be used for off-grid operation.	
	Off-grid conversion	According to the model selection, the PWD-300M/P switches from grid-connected to off-grid status when the grid is down or islanded.	
	Remote upgrade	Support PWD-300M/P code remote and local upgrade.	
	Fan Control	The inverter controls the fan according to the current load condition, ambient temperature, etc. to make it energy-saving.	
	Module LED light display	The PWD-300M/P module places LEDs through the	

		control panel to characterize the module's internal fault, alarm, and operating status information.	
	Fault logging	When a fault occurs, it triggers the fault logging common function, and the module records the data of fixed time and points before and after the fault, and sends it to the monitoring for record.	For simple fault diagnosis
	Analog sampling and zero calibration	Calibration of sampling value zero point and deviation.	

Table 2-3 PWD-300M/P protection function description

Fault name	Fault criterion	Phenomenon
Grid overvoltage	AC overvoltage is judged in two stages, the overvoltage criterion and the judging time can be set	Report out grid over-voltage and turn off-grid operation, the fault can be automatically restored (all grid to off-grid is set to turn off-grid enable the premise, not enable when the direct shutdown)
Grid undervoltage	AC undervoltage is judged in two stages, and the undervoltage criterion and time can be set.	The under-voltage of the grid is reported and transferred to off-grid operation, and the fault can be automatically restored.
Grid overfrequency	AC overfrequency can be judged in two stages, and the overfrequency criterion and time can be set.	Over-frequency is reported and transferred to off-grid operation, and the fault can be recovered automatically.
Grid underfrequency	AC underfrequency is judged in two stages, and the underfrequency criterion and time can be set	The underfrequency of the grid is reported and transferred to off-grid operation, and the fault can be recovered automatically
Grid voltage reverse sequence	Grid phase sequence reversal	Report grid voltage reverse sequence and shutdown, fault recovery under power
Abnormal grid voltage	Network transient overvoltage	Report grid voltage abnormality and turn off the grid, can be automatically connected to the grid after fault recovery
Grid missing N	The grid is not connected to the N line	Reported grid lack of N, fault needs to be restored by power down
Grid dropout	Abnormal grid, serious voltage distortion	Reported grid dropout, switch to off-grid operation
Islanding protection	When the PCS sets islanding protection enable, islanding is	The islanding protection is reported, and the passive operation is cut to off-grid operation.

	detected in grid-connected mode, and the islanding status flag is sent to PWD-300M/P to realize islanding protection.	
Grid overload alarm	Grid-side output current exceeds 300k rated current*1.1	Alarm for grid overload, but normal operation is still possible at this time
Grid overload timeout	Grid-side output current exceeds 300k rated current*1.1, the time of overload protection shutdown is related to the degree of overload	The grid overload alarm and grid overload timeout are reported, and the power is shut down, and the fault state is cleared for a certain period of time, and then the fault alarm disappears.
AC overload alarm	The output current of PCS side or load side exceeds 150k rated current*1.1	The AC overload alarm is reported, and it can still operate normally at this time.
AC overload timeout	The output current of PCS side or load side exceeds 150k rated current*1.1; the time of overload protection shutdown is related to the degree of overload	AC overload alarm and AC overload timeout fault are reported, and the power is shut down
Abnormal load voltage	PCS side output voltage transient overvoltage	Report load voltage abnormality and shutdown, voltage can be automatically restored after normal
Off-grid voltage reverse sequence	PCS side phase sequence is reversed	Off-grid voltage inverse sequence is reported and shutdown, cleared after fault power down
DSP initialization abnormal	Monitoring batch under the set parameters unsuccessful	Reported DSP initialization abnormal shutdown, automatic recovery after the fault is cleared
DSP version abnormal	Bootloader is not burned by the software detected after power on	The DSP version abnormal shutdown is reported, and will be restored after the fault is cleared.
Calibration parameters abnormal	after power on, read that all analog calibration is not completed.	Abnormal calibration parameters are reported, the machine can run, but sampling deviation will occur
Sampling zero point abnormal	After power on, all sampling zero calibration readings are not completed.	The machine can run, but the sampling will be deviated
Fan failure	The PWD-300M/P fan does not run during operation, or the fan is blocked during operation	Reported fan failure shutdown, automatically recover after the fault is cleared

Auxiliary source fault 1	A 15V auxiliary source fault is detected	Reported auxiliary source fault 1 shutdown, the fault is cleared and the next power recovery
Auxiliary source fault 2	PCS24V auxiliary source fault is detected	Auxiliary source fault 2 is reported to shut down, and the power is restored after the fault is cleared.
Auxiliary source fault 3	Grid24V auxiliary source fault is detected	Auxiliary source fault 3 is reported to shut down, and power is restored after the fault is cleared.
Ambient temperature over-temperature derating	The internal ambient temperature of the module is greater than the set value	Reported ambient temperature over-temperature derating, PCS power derating operation
Ambient temperature over-temperature protection	The internal ambient temperature of the module is greater than the limit value	Ambient temperature over-temperature protection, PWD-300M/P shutdown, automatic recovery after the alarm is cleared
CANA communication failure	Whether there is CAN interaction data between PWD-300M/P and PCS	CANA communication fault is reported and the PWD-300M/P is shut down, and will automatically recover after the fault disappears.
CANB communication failure	DSP will report this fault if it cannot receive the life frame set under monitoring and lasts for 10 seconds; the fault will be cleared automatically once the life frames are received from each other again.	report a CANB communication failure shutdown, automatically recover after the failure disappears
Concurrent failure	In the process of off-grid cut to grid, PWD-300M/P detects that the PCS does not meet the conditions of grid connection	Reported out of the same period of failure, PWD-300M/P shutdown, alarm disappears automatically after recovery
And off-grid frequent switching failure	The number of passive and off-grid switching occurs more than 10 times in 30 minutes	Reported and off-grid frequent switching failure, PWD-300M/P shutdown, the cause of the failure disappears, you need to send a reset command to clear the fault
AC contactor 1 open circuit fault	Network side contactor set closed command, no closed feedback received	Reported AC contactor 1 open circuit fault and shutdown, power down to restore after the cause of the fault is eliminated
AC contactor 1 short-circuit fault	Network side contactor set open command, received closed feedback	AC contactor 1 short-circuit fault is reported and shutdown, after the cause of the fault is eliminated, power down is resumed
AC contactor 2 open circuit fault	PCS contactor set close command, no close feedback received	AC contactor 2 open-circuit fault and shutdown, after the cause of the fault is eliminated, power down to resume

AC contactor 2 short-circuit fault	PCS contactor set open command, received closed feedback	AC contactor 2 short-circuit fault and shutdown, after the cause of the fault is eliminated, power down to resume
NPE contactor open circuit fault	NPE contactor set closed command, no closed feedback received	Reported NPE contactor open circuit fault and shutdown, after the cause of the fault is eliminated, power down to resume
NPE contactor short circuit fault	NPE contactor set open command, received closed feedback	NPE contactor short circuit fault is reported and shutdown, power down is resumed after the cause of the fault is eliminated
Parameter setting mismatch	Three-phase four-wire system and 480V voltage system cannot be set at the same time	The mismatch of parameter setting is reported and shutdown is resumed after the cause of the fault is eliminated.
Thyristor fault 1	The main power thyristor is short-circuited when the driver is not sent or open-circuited when the driver is sent	Thyristor fault 1 is reported and shut down, power down and resume after the cause of the fault is eliminated
Thyristor fault 2	N-line thyristor short-circuited when drive is not issued or open-circuited when drive is issued	Tell the thyristor fault 2 and shut down, after the cause of the fault is eliminated, power down and resume

3. Chapter 3 Equipment installation

3.1 Transport and storage

When transporting and storing the power switching device, please pay attention to the marking on the packing box and the following requirements should be met during transport and storage.

- Do not remove the outer packaging of the power switching device.
- No corrosive gases in the surrounding area.
- Storage temperature maintained at -40°C to 65°C and relative humidity maintained at 0% RH to 95% RH.
- Non-dusty environment.
- Periodic inspection is required during storage, if insects and rodents are found, the packaging material should be replaced in time.
- Compliance with fire-fighting requirements.
- After long-term storage, the converter needs to be inspected and tested by professionals before it can be put into use.

 CAUTION	• Cabinets should not be stacked when transported and stored, and other items are not allowed to be stacked on top. • The cabinet should be placed upright, not upside down or flat.

3.2 Open Box Inspection

3.2.1 Overview

Before PWD-300M/P power switching equipment is ready for installation, an unpacking inspection is required, mainly checking the following:

- Checking whether the quantity of each item of the packing list is consistent with the physical object.
- Checking whether the nameplate data of the product matches with the ordering contract, such as the product model, rated capacity, voltage level, etc..
- Checking whether the factory documents and accessories are complete.
- Whether the chassis is deformed, off-painted and loose.

3.2.2 Packing list

PWD-300M/P power switching equipment See Table 3-1 for the packing list.

Table 3-1 PWD-300M/P power switching equipment packing list

Serial number	Name	Quantity	Remarks
1	User manual	1 copy	
2	External communication terminal	2 pcs	
3	WIFI signal enhancement connector	1 pc	
4	Certificate of Conformity	1 copy	

3.3 Installation requirements

3.3.1 Environmental requirements

- Installation indoors, avoiding sunlight, rain and standing water.
- Clean installation environment, avoiding large amounts of dust in the air.
- Installation position without shaking.
- Ambient temperature guaranteed at: -25 to 60°C.

3.3.2 Carrier requirements

- Power switching equipment installation carrier must have fire resistance.
- Please do not install the equipment on flammable building materials.
- Please ensure that the installation surface is sturdy and meets the load-bearing requirements for installing power switching equipment.

3.3.3 Handling requirements

- The power switching equipment must not allow the power terminals to be stressed when handling, so as not to cause damage to the internal power devices.
- Use a forklift when handling, and take it lightly.

3.3.4 Other requirements

1) Waterproof

The PWD-300M/P power switching device has an IP20 protection rating and is only suitable for installation in dry, clean indoor use. Care is also needed to avoid water leakage from the house damaging the power switching device.

2) Anti-rodent

After the wiring is completed, the location of the inlet and outlet holes need to be sealed with fireproof mud to meet the rodent-proof requirements.

3.4 Equipment installation

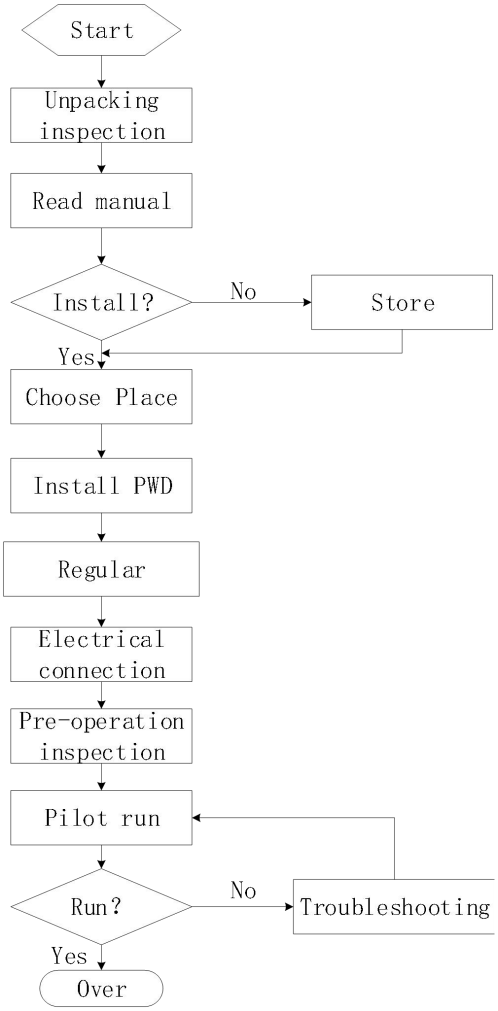


Figure 3-1 Equipment installation logic flow chart

3.5 Electrical connection

3.5.1 System Configuration

In order to ensure the safety and reliability of PWD-300M/P power switching equipment, a current limiting device and isolating switch should be installed in the input side of PWD-300M/P power switching equipment at the grid port, and it is recommended to equip a three-phase circuit breaker device with a current specification of more than 1.25 times the rated current to ensure the safe disconnection of power switching equipment from the grid.

In order to ensure the safety and reliability of PWD-300M/P power switching equipment, the PWD-300M/P power switching equipment should be installed in the output side of the load port and PCS port isolation switch, the recommended current specifications for the rated current of more than 1.25 times the circuit breaker device, to ensure that the power switching equipment and other equipment safety disconnect, external circuit breakers need to be installed to release current for more than 10 times the rated current Circuit breaker, to prevent the transformer throw cut when the circuit breaker off.

 WARNING	• All electrical connections, only qualified professionals can carry out wiring work.

3.5.2 System grounding

Through the protection ground, connect the power switching equipment with the grounding row to achieve the purpose of grounding protection.

Cable and terminal specifications.

- Grounding cable: recommended to use cross-sectional area ≥ 50mm^2(1/0AWG) outdoor copper-core cable.

 CAUTION	• Good grounding is beneficial for resisting surge voltage shocks and improving EMI performance, so grounding wire is required before connecting AC, DC, and communication cables. • Near-end grounding is recommended. For multiple PWS2-(29P,30P)-EX/PWS1-125M with PWD-300M/P power switching equipment systems, the grounding points of all equipment need to be connected to each other to ensure that the ground wire is connected equipotentially.

3.5.3 WireCable connection

PWD-300M/P power switching equipment output is three-phase four-wire, currently only support our PWS2-(29P,30P)-EX and PWS1-125M converter to achieve off-grid function, if you need to match other companies' converters, please consult our service personnel; and only support one way load. AC Cable is connected to "L1", "L2", "L3" and "N" of the AC terminal block of GRID, LOAD and PCS respectively. If you have other needs, please consult customer service.

Detailed wiring precautions.

- When wiring, please ensure that the connected cables are in the correct sequence.
- Do not pull the cable during the wiring process, so as not to damage its insulation properties.
- All external connection switches must be disconnected when connecting cables.
- All cables must have a certain amount of bending space.
- Select the appropriate length of screws for cable locking, too long screws may affect the insulation performance of the equipment.
- Make sure the wiring is secure

 WARNING	• Wiring should only be done by professionals, incorrect wiring can lead to fire and combustion. • When wiring, ensure that no dangerous voltage exists at the connection point. • Do not shake the copper wiring at will when wiring, so as not to loosen the insulation underneath, resulting in misalignment of the copper wiring.

3.5.4 Connecting communication lines

The function of the signal interface area is defined as follows: this part is the external communication location of the power switching equipment, including multiple 485 communication, multiple input and output dry contacts, two network ports, and COM port with parallel communication.

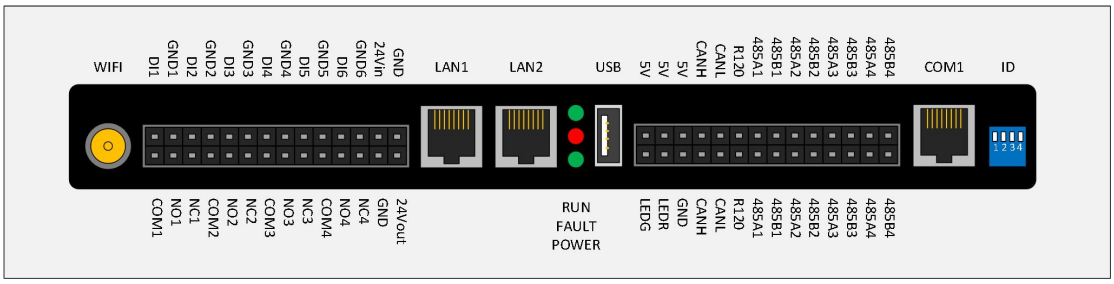


Figure 3-2 Schematic diagram of the signal interface area

Table 3-2 Signal interface area description

28Pin left Phoenix terminal	24Vin: External 24V input. 24Vout: Internal 24V output. GND: Input and output auxiliary source 24V common ground. Dix: 6-channel input dry contact. GNDx: Ground for each of the 6 input dry contacts. COMx: Common terminal of output dry contact. NOx: Normally open output dry contact. NCx: Normally closed output dry contact.
28Pin right Phoenix terminal	485Ax: 485 bus A. 485Bx: 485 bus B. CANH/CANL: Bus CAN2. R120 to UCANR2: Reserved 5V. GND: Power supply 5V ground. LEDG: External access LED green signal. LEDR: External access LED red signal.
COM1	Pin1: Synchronous_CANH. Pin2: Synchronous_CANL. Pin3: CANAH at 30k parallel Pin5/8: Sync signal ground. Pin4: PWD output of parallel and off-grid state switching data. Pin6: CANAL at 30k parallel. Pin7: 50HZ industrial frequency synchronization signal output.
ID	Pin1: CANAH enable switch Pin2: CANAL enable switch Pin3:CANA120Ω matching resistor switch. Pin4: /

(1) Ethernet cable connection

The PWD-300M/P power switching device can be directly networked through Ethernet or directly connected to a PC terminal for communication. The network enables remote operation of the PWD-300M/P power switching equipment. Through the background software on the PC terminal, it is possible to query the operation status and other information of the power switching equipment, as well as to control and set parameters for the power switching equipment.

(2) (Optional) RS485 cable connection EMS

PWD-300M/P power switching equipment can be connected to EMS via RS485_1 to obtain dispatching instructions, etc. and complete and off-grid switching operation.

 **WARNING**	● All communication connection lines are restricted to professionals for debugging or installation.

(3) COM1 port to realize communication with the converter.

COM1 port of PWD-300M/P power switching equipment can be used to communicate with multiple converters in the form of daisy chain (see the content of chapter 5 on communication methods).

3.5.5 Dry node connection

EPO (emergency stop) function, input dry node 5 can be used as EPO interface, which is 3.81MM pitch plug-in terminal block. To enable the EPO function, the EPO output signal needs to be shorted to maintain normal operation of the PWD-300M/P power switching device. If disconnected, the device will trigger an EPO alarm to shut down and go off-grid.

The state of the input and output dry contacts can be customized according to the customer, the following is the default definition of Sinexcel	
Dix: 6 input dry contacts. NDx: The ground of each of the 6 input dry contacts.	Input dry contact 1: single fire Input dry contact 2: compound fire alarm Input dry contact 3: Fire fault Input dry contact 4: gas overload Input dry contact 5: upper EPO (need to short it when normal) Input dry contact 6: access control enable
COMx: output dry contact common terminal.	Output dry contact 1: discrete decoupling dry contact, NC_1 is normally closed state for the normal signal, and vice versa decoupling. Output dry contact 2: start-stop oil engine signal, NC_2 is normally closed when stopping the oil engine, and vice versa to start the oil engine. Output dry contact 3: start-stop PV, NC_3 is normally closed state, stop the oil machine, and vice versa to start the oil machine. Output dry contact 4: output DRM0 shutdown command, send shutdown command when the device has communication failure, defined as normal communication when NC_4 is normally closed, and abnormal communication when the opposite is true.

 **WARNING**	● NO4 and COM_4 interface is only for professional debugging or installation use.

3.6 Check after installation

Power switching equipment Post-installation inspection is required after installation is completed:

- Reasonable position of equipment placement and installation to meet safety distance requirements.
- The power connection is correct, the lower lead ground is well connected to the ground network, and the construction unit is required to detect the grounding resistance value;
- Confirm that the Ethernet, RS485 communication lines have all been correctly connected, and that the connection is free of disconnection and short circuit.
- Compare the main wiring diagram from the factory with the actual wiring at the site to understand whether there are differences and to determine whether the differences will affect the safe operation of the system.

 **DANGER**	Electrical wiring inspection links need to be completed by qualified operators. After closing the switch, the system is already charged with high voltage and it is strictly forbidden to touch any parts inside the converter.

4. Chapter 4 Commissioning operation

4.1 Operating status Description

When the external wiring of PWD-300M/P power switching equipment is completed, and the wiring situation has been fully checked to confirm that it is correct, close the external input/output AC circuit breaker to confirm the operating status of PWD-100 intelligent control box, PWD-300M/P power switching equipment working state description is shown in Table 4-1, common fault handling methods are shown in Table 4-2.

Table 4-1 PWD-300M/P power switching equipment Operating status description

Operating state	Conditions	Status indication
Shutdown	Fault occurred	All switches are off
Standby	1. Is the grid normal 2.EMS set and off-grid command 3.Whether PCS is running off-grid 4. No fault occurs	1. Grid-connected state: N relay inside the machine, KM1 and KM2 are closed. 2. Off-grid status: If PWS2-30P is running, then KM2 and NPE inside the machine will be closed; if PWS2-30P is not running, then KM2 and NPE inside the machine will be disconnected.
Grid-connected	Standby state is grid-connected state, PCS receives grid-connected power-on command	Run/RUN green light is always on
Off-grid	Standby state is off-grid, PCS receives off-grid power-on command	Run/RUN green light is always on
Alarm	Any fault message	Fault/FAULT is always on or blinking

Table 4-2 PWD-300M/P Power Switching Device Common Fault Description

Fault name	Fault cause	Troubleshooting
Grid overvoltage protection	Grid voltage is greater than the protection range	1. correct configuration of the AC side parameters according to the operating instructions. 2. AC side should be connected to meet the required voltage.
Grid undervoltage protection	Grid voltage is less than the protection range	1. Correctly configure the AC side parameters according to the operation instruction; 2. 2. The AC side should be connected to the voltage that meets the requirements.
Grid over-frequency protection	Grid frequency is greater than the protection range	1. Correctly configure the AC side parameters according to the operating instructions. 2. The AC side should be connected to the frequency that meets the requirements.
Grid	Grid frequency is less than the protection range	1. correct configuration of AC side parameters

under-frequency protection		according to the operation instruction. 2. The AC side should be connected to a frequency that meets the requirements.
Grid Reverse Sequence	The grid phase sequence is reversed	1. Check whether the line sequence is reversed. 2. If the phase sequence access is normal, check whether the PWD port voltage sampling is abnormal.
Network lack of N	The grid is not connected to the N line	1. Check whether the N line of the grid is connected.
Grid overload timeout	Grid-side output power exceeds 100k*1.1 or more for a long time and lasts for 1min	1. Reduce the load and operating power within the rated range and eliminate in 5min.
AC overload alarm	Net-side output current exceeds 100k*1.1 for 200ms	1. Reduce the load to within the rated range, the alarm can be eliminated.
Fan failure	The fan does not run or the fan cable is loose during operation	1. Open the cover of the chassis and check whether the fan cable is properly connected. 2. Exclude the fan itself fault, change the fan can continue to use.
Auxiliary source 1 fault	A 15V auxiliary source fault is detected	1. When this fault occurs, contact Sinexcel R & D staff for guidance
Auxiliary source 2 fault	PCS24V auxiliary source fault is detected	1. open the chassis to check whether the PCS side auxiliary source output and input cables are connected. 2. Measure whether there is 24V at the output of the auxiliary source and check the fault of the auxiliary source itself.
Auxiliary source 3 fault	A 24 V auxiliary source fault of Grid is detected	
Fault of the loop temperature probe	The temperature tested by the ambient temperature probe is greater than the threshold value	1. Whether there is a disconnection in the ambient temperature probe pins 2. There is a problem with the ambient temperature display sampling.
AC contactor 1 open circuit fault	Contactor drive and status feedback is faulty	1. Confirmation that the contactor drive and feedback cables are connected in accordance with the power distribution diagram. 2. Confirmation that the terminals controlling the contactor are not loose. 3. There is a problem with the contactor itself.
AC contactor 2 open circuit fault	Contactor drive and status feedback is faulty	1. Verify that the contactor drive and feedback cables are connected according to the power distribution diagram. 2. Verify that the terminals of the control contactor are not loose.

		3. There is a problem with the contactor itself.
PE contactor open-circuit fault	There is a problem with the contactor drive and status feedback	1. Confirmation of whether the contactor drive and feedback cables are connected in accordance with the distribution diagram. 2. Confirmation that the terminals of the control contactor are not loose. 3. There is a problem with the contactor itself.

4.2 Control method

1. **Use WIFI connection (Apple phone as an example).** First, please open the unlimited area network on the phone settings, search the network to find the corresponding serial number of the device, enter the WIFI password "12345678", and connect to this network, as shown in Figure 4-1. Then open the browser on the phone, enter 10.10.10.1 in the URL bar, the login screen appears as shown in Figure 4-1, finally, enter “admin” into the “Name” input box and “123456” into the “Password” input box, and click “Log in” to enter the background operation interface, as shown in Figure 4-2, after logging in to **monitoring settings**, reset the IP and subnet mask and gateway, in line with the local settings, so that IP communication can be carried out, see the background display instructions section.

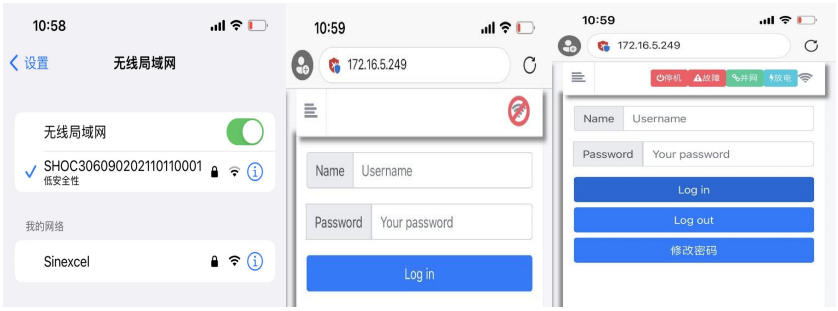


Figure 4-1 Mobile phone login and operation interface

2. **Use Ethernet connection.** First, please open a browser on your desktop (Google/Firefox is recommended), then enter the IP address you set in the previous step in the URL bar of the browser, and the login screen will appear as shown in Figure 4-2, finally, enter "admin" into the Name input box, finally, enter “admin” in the “Name” input box and “123456” in the “Password” input box, and click "Log in" to enter the background operation interface, as shown in Figure 4-2.

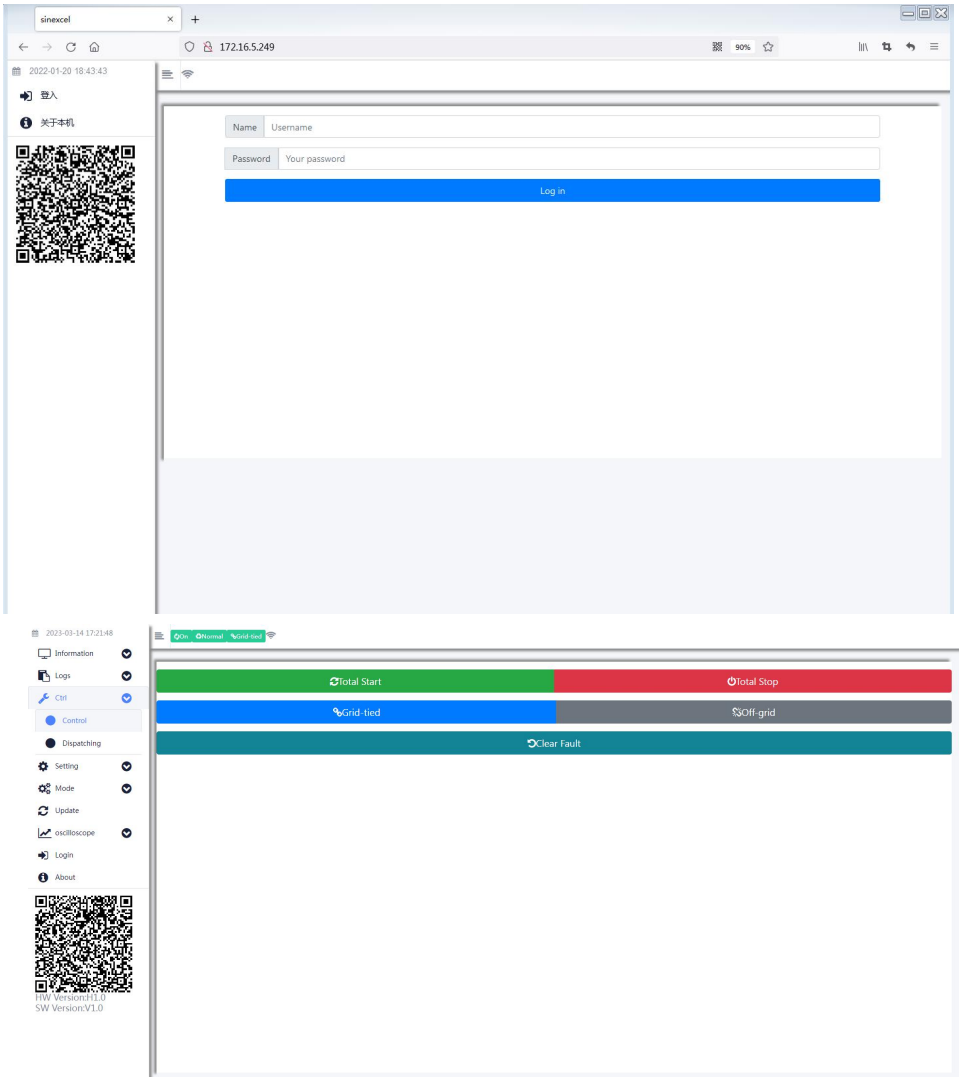


Figure 4-2 IP login and operation interface

4.3 Backstage display description

4.3.1 Event logging interface display

Event logging interface: including the current alarm information display, real-time display of alarm information, monitoring the operation status of the module; historical alarm information display, all alarms will be recorded in the historical alarms after they disappear, so as to maintain the fault query; the status record of machine operation, including the power-on status, setting the grid-connected status, setting the off-grid status, etc.; and the export function of alarm records.

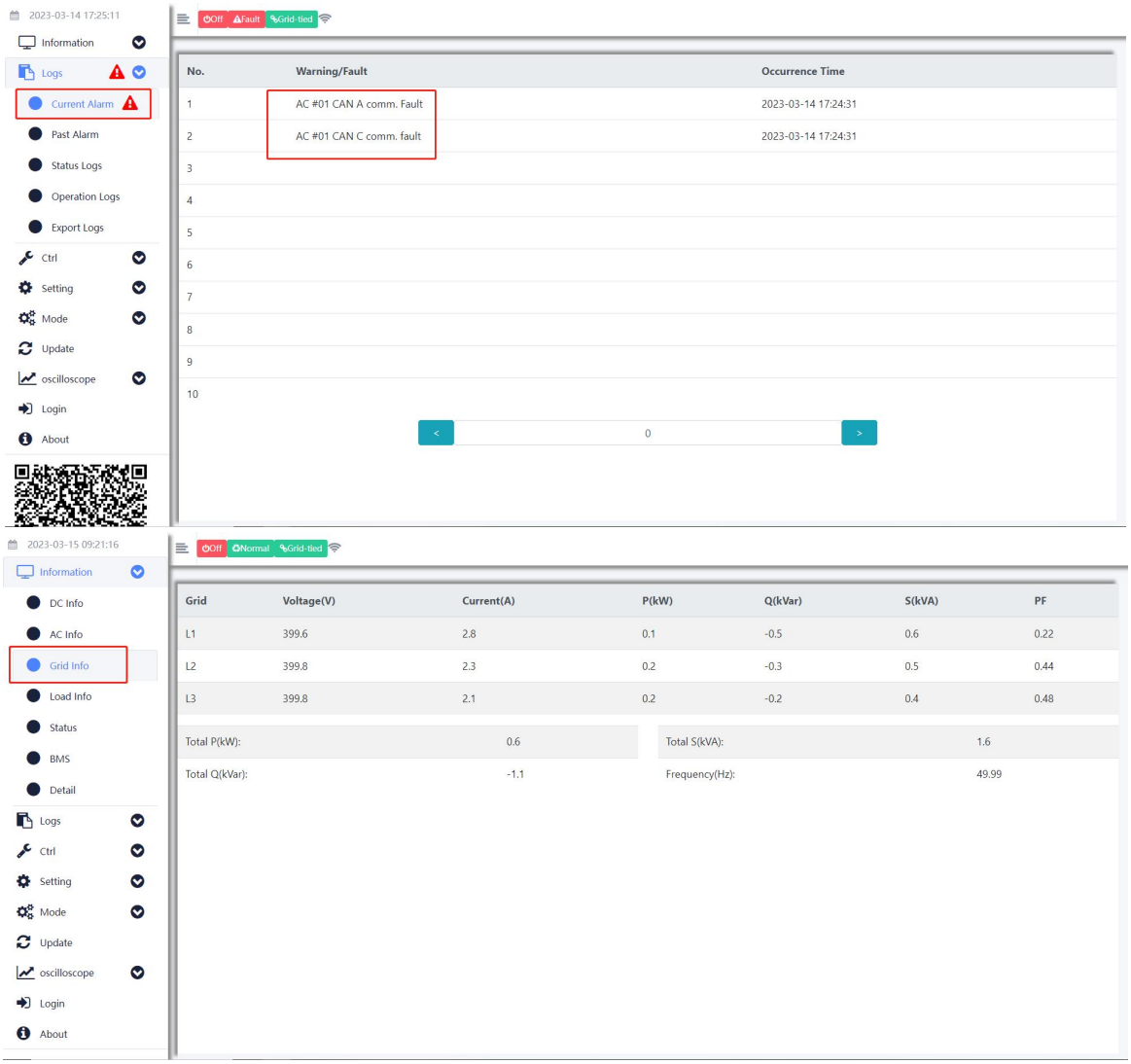


Figure 4-3 Operation information and event records

Operation information interface : Real-time monitoring of grid information and load information, including grid-side and load-side voltage, current, power and frequency display, which is convenient for customers to understand the current operating status of the current module and intuitively display the operating data;

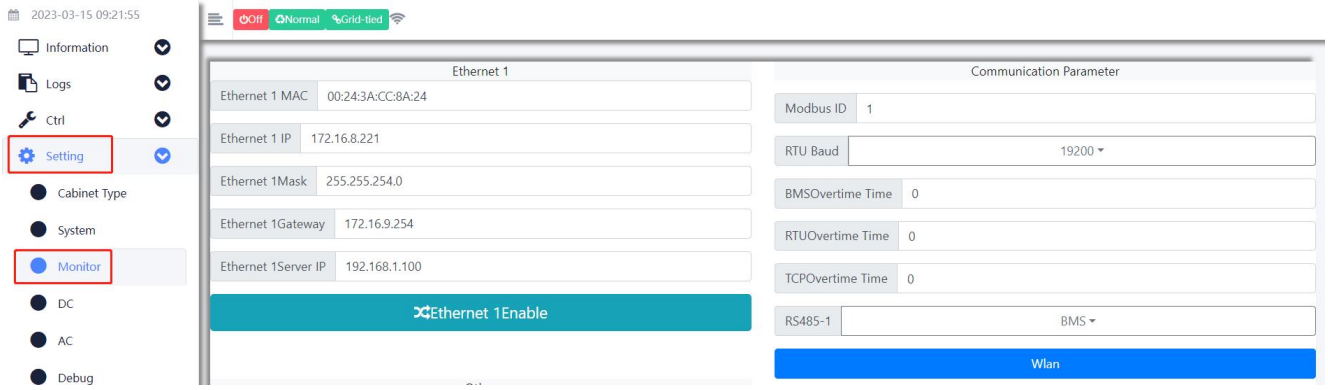


Figure 4-4 Monitoring parameter setting

Monitor setting interface: Customers need to set the IP, subnet mask, gateway according to the actual use, the figure shows the basic parameters of Sinexcel monitoring settings, for reference only, the parameters are set before you can use the network port to search for the corresponding IP address in the browser to connect to the background. The default IP of the module is 192.168.1.10. The subnet mask is 255.255.255 (the same as the 30P module); You can directly connect to port 1 for the first time, to get the information of the module and change the monitoring parameters;

4.4 Switching on and off

4.4.1 Pre-boot check

Before power on, the equipment should be checked according to the following steps.

1) Visually inspect the exterior of the PWD-300M/P power switching device for signs of damage.
2) Check whether the PWD-300M/P power switching equipment AC input/output wiring is normal, the network cable wiring is normal, and the grounding is good, according to the check items in Chapter 3 after installation is completed.
3) The PWD-300M/P power switching equipment must be installed and properly commissioned by an engineer and the external power switch closed.
4) check whether the phase voltage and line voltage on the net side are within the normal range and record the voltage value.
5) The power-on step can be executed only after the pre-start check is normal.

4.4.2 Grid connection procedure

1. This power-on procedure is applicable to the machine grid connection operation when the PWD-300M/P power switching equipment is in the complete power-off state. The operation steps are as follows.

1) Close the external grid AC circuit breaker, PWD-300M/P power switching equipment grid side port power on,At this time will see the power indicator on the panel is lit.
2) PWD-300M/P power switching equipment automatically detects the grid voltage and PCS side voltage after the initialization is completed, and automatically enters the grid connection state after there is no alarm.
3) All thyristors are closed at this time.
4) When using Ethernet connection, please open a browser on the desktop (Google/Firefox is recommended), then enter the default IP address of the machine in the URL bar of the browser, and finally, enter "admin" into the "Name" input box, "Password" input box to enter the password "123456", click "Log in" to enter PWD-300M/P power switching equipment background operation interface, at this time in the "event record" in the "current alarm" whether there is alarm information, in the "operating information check the phase voltage and line voltage of the network side in the "Operation Information".
5) The load port of the PWD-300M/P power switching equipment is connected to the grid.

6) the AC side of the PWS2-30P is connected to the grid, and if the PWS2-30P has the power-on condition, the power-on command is issued to the PWS2-30P.
7) When the PWS2-30P is running, the PWS2-30P with PWD-300M/P power switching equipment system will enter grid-connected operation mode.
8) If it cannot run in grid-connected mode, the corresponding alarm message will be displayed.

2. In the normal off-grid process of the PWS2-30P with PWD-300M/P power switching equipment system, if grid connection is required, the following steps can be followed.

1) When using Ethernet connection, please open a browser on the desktop (Google/Firefox is recommended), then enter the default IP address of the machine in the URL bar of the browser, and finally, enter "admin", "Password" into the "Name" input box, "Password" input box to enter the password "123456", click "Log in" to enter PWD-300M/P Power Switching Device background operation interface;
2) In the background operation interface of the PWD-300M/P power switching device, select the "Control Scheduling" tab and click on "Grid Connection".
3) The PWS2-30P with PWD-300M/P power switching equipment system starts the off-grid active grid connection operation, during which all loads are unplugged.
4) After completing the off-grid active cutting and grid connection operation, the NPE contactor is disconnected, all other thyristors are closed, and the operation indicator is always on.
5) PWS2-30P with PWD-300M/P power switching equipment system then enters grid-connected operation mode.
6) If it can not run on the grid will display the corresponding alarm information.

3. PWS2-30P with PWD-300M/P power switching equipment system will automatically turn off-grid after the following conditions are met.

- Alarm will be issued if the grid voltage is too low or too high, or if the frequency is abnormal.
- Passive cut off-grid control is enabled.
- No other alarm faults.

4.4.3 Off-grid steps

1. This power-on procedure is applicable to the PWS2-30P with PWD-300M/P power switching equipment system in a complete power-off state for the machine off-grid power-on operation. The operation steps are as follows.

1) PWS2-30P DC side is only connected to the battery, if the PWS2-30P has the power-on condition, the power-on command is issued to the PWS2-30P.
2) After the PWS2-30P is fully operational, the PWD-300M/P power switching device is powered on the PCS side port, at which time you will see the power indicator on the panel being lit.
3) PWD-300M/P power switching equipment automatically detects the grid voltage and PCS side voltage after the

initialization is completed, and automatically enters the off-grid state after there is no alarm.

4) At this time, only the N thyristor is closed, the NPE contactor is closed, other switches are disconnected, and the operation indicator is always on.
5) PWS2-30P with PWD-300M/P power switching equipment system then enters off-grid operation mode.
6) If off-grid operation is not possible, the corresponding alarm message will be displayed.

2. In the process of normal grid connection of PWS2-30P with PWD-300M/P power switching equipment system, if off-grid operation is required, the following steps can be taken.

1) To connect using Ethernet, please open a browser on your desktop (Google/Firefox is recommended), then enter the default IP address of your machine in the URL bar of your browser, and finally, enter "admin" in the "Name" input box and "Password" in the "Password" input box, "Password" input box to enter the password "123456", click "Log in" to enter PWD-300M/P Power Switching Device background operation interface;
2) In the background operation screen of the PWD-300M/P power switching device, select the "Control scheduling" tab and click on "Off-grid".
3) The PWS2-30P with PWD-300M/P power switching equipment system starts the grid-connected active cut-off operation, during which all loads are unplugged.
4) After completing the grid-connected active cut-off operation, only the NPE contactor is closed and the other thyristors are disconnected, and the operation indicator is always on.
5) PWS2-30P with system then enters off-grid operation mode.
6) If off-grid operation is not possible, the corresponding alarm message will be displayed.

3. PWS2-30P with PWD-300M/P power switching equipment system will automatically switch to grid after the following conditions are met.

- Has occurred due to grid abnormalities passively cut to off-grid operation mode.
- The grid is restored to its normal state.
- No other alarm faults.

4.4.4 Shutdown procedure

This shutdown procedure is applicable to the system shutdown operation when the PWS2-30P with PWD-300M/P power switching equipment system is in grid-connected operation mode. The operation steps are as follows.

1) First issue shutdown command to PWS2-30P, PWS2-30P stops running, and the operation indicator is always off.
2) PWD-300M/P power switching equipment internal thyristor is still in the closed state, at this time the load port is still in the state of access to the grid.
3) disconnecting the external grid switch, the NPE contactor, and all thyristors are disconnected.

This shutdown procedure is applicable to the system shutdown operation when the PWS2-30P with PWD-300M/P power switching equipment system is in off-grid operation mode. The operation steps are as follows.

1) First issue a shutdown command to PWS2-30P, PWS2-30P stops operation and the operation indicator is always off.
2) PWD-300M/P power switching equipment internal A, B, C thyristor disconnection and NPE contactor disconnection, when the load port is still directly connected to the PCS port.

4.4.5 Emergency shutdown

When the PWD-300M/P power switching equipment has an abnormal situation, you can disconnect the emergency shutdown "EPO" outside the chassis, the system will immediately disconnect the power grid, while all load switches will be decoupled and monitor the alarm.

 **WARNING**	● To prevent personal injury, after shutdown, if you want to do maintenance or open the chassis operation, please use a multimeter to measure the voltage at the input first, to ensure that there is no utility access to the situation before the relevant operation! ● This device is for professional use only!!

4.4.6 Parallel operation

Parallel operation is suitable for use with the PWS2-30P and when the 30P module uses the external switching function.

The operation procedure is similar to the parallel operation procedure. At this time, the monitoring and control function of the PWD-300M/P module is no longer in effect, and the implementation of the parallel and off-grid control mode needs to be carried out in the background of the PWS2-30P.

5. Chapter 5 Communication mode

5.1 EMS communication

PWD-300M/P power switching equipment supports Modbus protocol and adopts RS485 and Ethernet communication interface, which is convenient for users to monitor PWD-300M/P power switching equipment in the background and realize telematics, telemetry and telecontrol of PWD-300M/P power switching equipment.

5.1.1 Ethernet port

PWD-300M/P power switching equipment Support Modbus TCP/IP protocol with its own IP address. The Ethernet port of the PWD-300M/P power switching device and of multiple storage converters can be connected to the switch uniformly, and then the switch can be connected to a remote monitoring computer or EMS to.

5.1.2 RS485 serial port

RS485 communication interface is left on the panel of PWD-300M/P power switching equipment, which can be used to communicate with EMS The user can use EMS for stand-alone commissioning of PWD-300M/P power switching equipment, read the operation information of PWD-300M/P power switching equipment, alarm information, make corresponding setting and off-grid operation, etc.

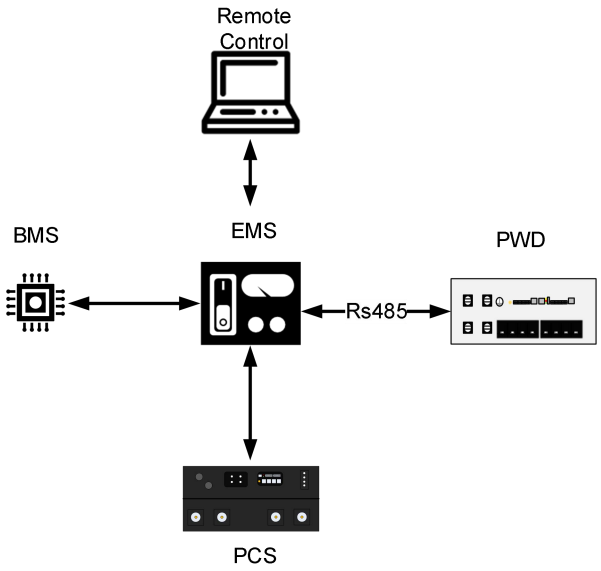


Figure 5-1 Communication between intelligent power distribution box and energy management system

5.2 PWD-300M/P and PCS cascade networking

One PWD-300M/P power switching device can take three PCS, and connect to PWD-300M/P power switching device at COM1 or COM2 at the beginning or end of the network to realize grid monitoring, fast response, fast dispatch or protection functions, etc.,PWD-300M/P power switching device's dip code switch needs to set 1 and 2 to ON state, while 3 is set to OFF

state, this kind of network only needs to daisy chain the other end of PCS matching resistor 2 to closed state. The following figure shows.

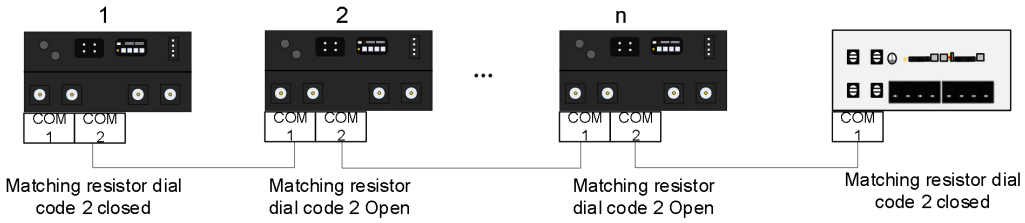
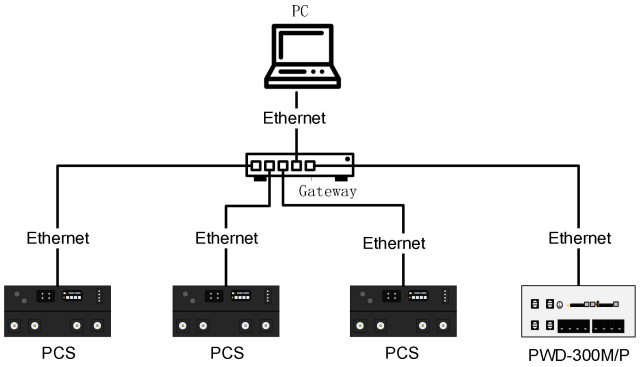


Figure 5-2 Multiple PWS2-(29P,30P)-EX cluster network communication

	• To ensure the quality of communication, it is recommended that the length of the communication line be less than 10m, please contact customer service if you have special requirements. • The number of converters in a cluster network should not exceed 5(300M) / 10(300P) units;

5.3 PWD-300M/P is connected to the same network with multiple PCS

The PWD-300M/P power switching device can be connected to a network with multiple PCS and the background monitoring and scheduling system is connected to realize the operation and control of the energy storage device, which provides great convenience for detecting and controlling the operation of the energy storage device, and the overall structure of the system network is shown in Figure 5-3



5-3 Background monitoring system structure diagram

6. Chapter 6 Maintenance

6.1 Maintenance

Due to the influence of environment, humidity, dust and vibration, the internal connection devices of the power switching equipment will be aging and wear, etc., which will lead to potential failure.

Therefore, it is necessary to implement regular daily maintenance of power switching equipment to ensure its normal operation and service life.

 CAUTION	● Only qualified and authorized personnel may perform maintenance operations on the intelligent switching device. ● Do not place or leave the replaced screws, randomly inside the intelligent switching device during maintenance, to avoid damage to the equipment. ● All external connections must be disconnected before starting maintenance to ensure that the equipment is not powered during operation.

6.2 Power circuit connection maintenance

After the equipment is put into operation need to regularly check the electrical and fixed parts of the equipment connection, recommended every three months, each inspection is completed need to make a record.

- The cabinet grounding connection.
- The electrical connection of the AC output.
- The electrical connection of communication cables.
- Reading the fault information of the monitoring.

 CAUTION	● Only qualified and authorized personnel are allowed to perform maintenance operations on the intelligent switching device. ● Do not place or leave the replaced screws inside the intelligent switching device during maintenance, so as not to cause damage to the equipment. ● Before starting maintenance, all external connections must be disconnected to ensure that the equipment is not powered during operation.

6.3 System working condition maintenance

- Observe whether the power switching equipment is damaged or deformed.
- Listening to the power switching equipment for strange noises during operation.
- Checking whether each measurement parameter appears abnormal while the system is operating.
- Checking whether the key devices are normal.
- Checking whether the system heat dissipation is normal.

- Checking whether the power switching equipment panel has accumulated a lot of dust.

6.4 Cleaning and sanitation

Before the equipment is put into operation, the dust and debris at the copper row, terminal and mesh should be cleaned up. After the equipment is put into operation, the dust in the machine room should be cleaned up regularly, and the ventilation and exhaust facilities in the machine room should be checked to see if they are normal, and it is recommended to clean up once every three months.

7. Appendix

Appendix I: Quality assurance and after-sales service

1）Quality assurance

Ltd. (hereinafter referred to as the Company) will repair or replace the product with a new one free of charge if the product fails during the warranty period.

2）Disposal of defective products

After the replacement of non-conforming products handled by the company, the user should properly store the faulty products; for the need to return to repair the product, the user should be given a reasonable amount of time, your use of the inconvenience caused by the user, please understand.

3）The Company has the right not to carry out quality assurance after the following circumstances.

1. Transportation damage.

2. operation under environmental conditions other than those specified in this manual, and its harsh conditions.

3. Improper installation, modification or use.

4. unauthorized disassembly, assembly, etc. of the machine or system components.

5. Exceeding the warranty period.

6. Damage caused by unexpected events or natural disasters, etc.

Product failure caused by the above circumstances, the customer requests for maintenance services. After the determination of our customer service department, we can provide paid maintenance services.

In order to continuously improve customer satisfaction, the company's products and user manuals are in continuous improvement and upgrading, if you receive the manual and product differences, there may be version reasons, please refer to the specific product, if there is still doubt, please contact the company.

8. Installation record