ANYHERTZ DRIVE (SHENZHEN)CO.,LTD.

About this manual

This manual is applicable to the general high-voltage frequency converter produced by our company.

Technical support

If you encounter any problems when using the universal high voltage frequency converter, please contact us.

In order to protect and respect intellectual property rights, no unauthorized unit or individual shall provide the information in the manual to a third party.

In order to ensure the accuracy of the manual, we have carefully reviewed the contents of the manual, but if users find errors in this manual are welcome to correct. If the information in this manual is different from the latest product, please refer to the product random description.

We reserve the right to change the technical improvement and interpretation of this manual without notice, subject to the relevant technical agreement.

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Safety Information and Precautions

1.1 Overview

First of all, thank you for choosing our general high voltage frequency converter!

General high voltage frequency converter is a kind of high voltage electrical equipment, which has been fully considered in the design, but like other high voltage equipment, there is dangerous voltage in the cabinet, if improper use may lead to personal injury or property loss of equipment property.

To prevent personal injury or equipment and property damage to you and others, please read this manual carefully before use! For the safe use of the universal high voltage inverter, please pay special attention to the "instructions" and "attention" marked in this manual.

Installation, debugging, operation and maintenance of general high voltage inverter in strict accordance with the guidance of this manual are safe.

1.2 Manual agreement

In this specification, safety matters are classified into two categories:

Danger: serious injury or even death.

Note: lead to moderate or minor injuries and damage to equipment.

Please read this chapter carefully when installing, debugging and repairing the system, and be sure to follow the safety precautions required in this chapter. Any injury and loss caused by the violation has nothing to do with the Company.

1.3 Safety precautions

We will conduct technical training to the field personnel involved in the operation and maintenance of the equipment, so that each relevant personnel can deeply learn the content of this manual. In addition, the site personnel must strictly abide by the relevant power industry regulations and specifications other than the safety knowledge introduced in this manual.

Our company will not bear any responsibility for the equipment damage and casualties caused by ignoring the above contents

1.4 Safe operation

1.4.1 Delivery inspection

Danger! 

- Open the control system water, missing or damaged parts, please do not install!
- When the packing list does not match the physical name, please do not install it!
- When moving and lifting equipment, to ensure that the lifting equipment strength is enough, otherwise there is a danger of damage to the equipment!
- Have missing parts or damaged inverter, please do not use, otherwise there is a risk of injury!

1.4.2 Installation

Pay attention to! 

- Please install on flame retardant objects such as metal, away from combustible. Otherwise, it may cause a fire alarm.
- During the installation process, do not touch the components in the inverter cabinet by hand, otherwise there is a danger of electrostatic damage.
- Do not screw the fixed bolts of the equipment components at will, otherwise there is a danger of damaging the equipment.
- Do not let the drilling residue, wire head or screws fall into the frequency converter during the operation, otherwise it will cause equipment damage.
- When the circuit board needs to be installed or removed, anti-static gloves must be worn and avoid touching electronic components.

1.4.3 Wiring

Danger! 

- Must comply with the guidance of this manual, by the professional electrical engineering personnel construction, otherwise there will be an unexpected danger!
- The wiring operation must be carried out under the guidance of our company professionals, in accordance with the relevant electrical safety operation standards!
- Before wiring, confirm that all power supply is disconnected, otherwise there may be a risk of electric shock or fire!
- The grounding terminal PE shall be reliably grounded, otherwise the inverter shell is in danger of electrification!
- Never connect the input power to the output terminal (U, V, W). Note the marking of the wiring terminals!
- Input and output cable should meet the insulation and capacity requirements in the relevant national or industry standards!
- The encoder must use the shielding line, and the shielding layer must ensure the single end reliable grounding!

1.4.4 Operation

Danger! 

- Further confirm whether the power voltage level is consistent with the rated voltage of the converter, and whether the main circuit terminal is firm!
- After the inverter wiring is completed and the cabinet door closes, the power is activated. It is strictly prohibited to open the cabinet door in the live state, otherwise there is a risk of electric shock!
- When the self-start related functions are enabled, safety isolation measures should be taken for the mechanical equipment, otherwise it may cause personnel injury!
- After the inverter is connected to the power supply, even if it is stopped, the terminal of the inverter is still charged and can not be touched, otherwise it may cause the danger of electric shock!
- Do not disconnect the power supply of the fan in the frequency converter, otherwise it will cause overheating and damage the system equipment!
- For the water-cooled frequency converter, the cooling water should be turned off immediately after the operation is stopped to prevent condensation damage to the frequency converter. It is strictly prohibited to put the cooling water under the shutdown state of the frequency conversion speed control device!
- After confirming that the operation command is cut off, the fault and alarm signal can be reset, otherwise it may cause personnel injury!

Pay attention to!

- Do not connect or disconnect the power supply to start or stop the frequency converter, otherwise it may cause damage to the frequency converter.
- Do not change the function group menu parameters of the manufacturer at will. The vast majority of the factory set parameters of the frequency converter have been able to meet the operation requirements. As long as some necessary parameters are set, the parameters modified at will may lead to the damage of the mechanical equipment.
- When used on the lifting equipment, please configure the mechanical lock device.
- In the case of power frequency and frequency conversion switching, the two contactors controlling power frequency and frequency conversion switching should be interlocking.

1.4.5, Maintenance and inspection

- When the power is on, please do not touch any part inside the inverter cabinet, otherwise there is a risk of electric shock.
- Do not perform maintenance on the inverter with power on. If you want to open and close the cabinet door, please be sure to cut off the power.
- Wait for at least 10 minutes after power failure or confirm that the unit power indicator is off before performing maintenance and inspection to prevent personal injury caused by the residual voltage of the electrolytic capacitor in the main circuit.
- Please designate qualified electrical engineering personnel for maintenance, inspection or replacement of parts.

1.4.6 Others

- It is forbidden to modify the inverter by yourself, otherwise there is a danger of personal injury.
- Please dispose of discarded components and parts according to industrial waste.

2.2, Product characteristics

General high voltage inverter is independently developed and produced by our company. This series of products is suitable for the speed regulation and drive of the high-voltage three-phase AC motor, with

The following functions and features are described:

- Motor control strategy

  Aynchronous general, asynchronous vector, asynchronous open ring vector, synchronous vector, synchronous open ring vector, etc

- Magnetic flux closed-loop vector control technology

  Closed-loop control of the motor magnetic flux is performed based on the motor mathematical model

- Unit side, road technology

  The bypass mode, including mechanical bypass and electronic bypass

- Neutral point drift technique

When a power unit fails, only bypass the fault unit, and adjust the output voltage neutral point to improve the voltage output capacity

- Output voltage self-adjustment function

  When the input voltage fluctuates (-10% ~ + 5%), the frequency converter has the rated voltage output capacity

- Torque lift, lift function

  Increase the band load capacity of the motor during start and low frequency operation ● Speed start, moving function

  When the motor is rotated, the frequency converter belt motor starts smoothly to reduce the impact on the power grid

- Instant power outage function

  When the power grid failure occurs instantly, the frequency converter runs continuously and stably

- High-voltage power loss self-start function

  After the power supply switch of the power grid or the short-term power loss is restored, the frequency converter will automatically restart

- Synchronous switching function (optional synchronous switching cabinet)

  Realize the motor between power frequency operation and frequency conversion operation, reduce the impact on electrical equipment and power grid

- Main and slave control, system function

  Dual-machine frequency converter or multi-machine joint operation

- Process PID control function
- Upper communication, message function

The power input of general high voltage frequency converter conforms to IEEE STD 519-2014 and GB / T 14549- 1993 standards, no need to install the input filter alone, save the harmonic governance cost for users, the system power factor is high, no power factor compensation device, can effectively reduce reactive input, reduce the input capacity. After the inverter input is converted to the secondary side through the phase shifting transformer and phase shifting, multi- pulse diode rectification is adopted to provide isolated power supply for the power unit, eliminating most of the harmonic current caused by a single power unit (see Figure 2.2).

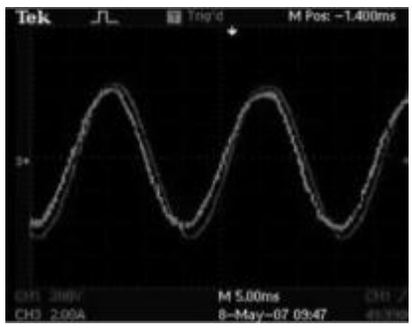


Fig. 2.2 30 Pulse input waveform (CH 1 voltage, CH 3 current)

The output sine wave with low harmonic content and nearly perfect value (see Figure 2.3 and Figure 2.4). Compared with other forms of high- capacity frequency converter, with

The following advantages:

- No need to add the output filter device
- Direct drive of the high-voltage AC motor
- Insulate the main loop motor and cable from the damage of dv / dt stress
- Small pulse torque, prolong the service life of the motor and mechanical equipment
- There is no length limit of the motor cable within the allowable range of the cable pressure drop

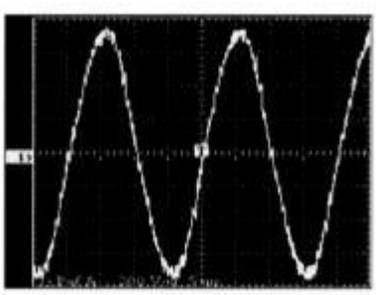


Figure 2 . 3 Voltage waveform of the output line

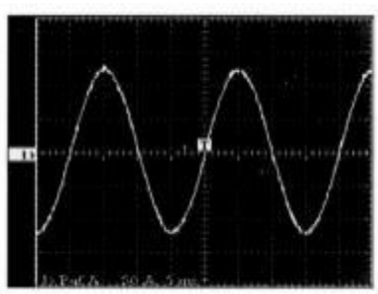


Figure 2.4 Output current waveform

2.2, and the technical parameters

General high voltage frequency converter has 6 kV and 10 kV voltage grade standard products, and other voltage grade products can also be customized according to user requirements.

2.3, and the

Table 2-1: Technical parameters of general high-voltage frequency converter

project	parameter
Rated capacity of the frequency converter	400~25000kVA※
rated voltage	2.3kV ~11kV (-20%~ + 5%) (out of scope, with special instructions)
rated frequency	50Hz /60Hz (-10%~+10%)※
control source	380VAC , 30kVA
Rated input power factor	≥0.96
overall efficiency	> 96%
Output frequency, and rate range	0~80Hz※
Speed accuracy	± 0.5% (open loop vector) ± 0.1% (closed loop vector)
Instantaneous overcurrent protection	150% (customizable to user request)
overload capacity	120% load, 120s
torque limitation	10%~150%
read analogue input	3 routes 4 ~20mA / excitation feedback 4 ~ 20 mA (customizable)
Analog output	4-road, 4~20mA
Upper communication	Isolation of RS 485 interface, ModBus RTU (optional: Profibus DP, Industrial Ethernet protocol)
Add deceleration time	5 seconds to 6000 seconds (load -related)
Switch quantity input and output	14 in 22 out (output 8 defined)
Running ring, the boundary temperature	-5~ +45℃※
Storage / transport temperature	-25~ +55℃※
cooling-down method	Forced air cooling (AF) / water cooling (WF) / Feng Shui cold (AFWF)
ambient humidity	<95%, without condensation
Install the sea, and pull out the height	1000 m, 1000 m above sea level, 1% for every 100 m
stive	Not conductive and non-corrosive, <6.5mg / dm^3※u
levels of protection	IP 30※
Cabinet body color	RAL 7035 (or customized according to the color standard provided by the user)

2.4, type selection instructions

The general high voltage frequency converter should be selected according to the motor type and load characteristics, and the rated voltage and rated current of the motor. For special load, special motor and special use environment, the selection of general high voltage frequency converter should also follow the following suggestions:

1. For the load condition with large torque fluctuation such as compressor and vibrator, the actual process and working condition should be understood, and the rated current of HIVT general high voltage frequency converter selected must be greater than the maximum current required for power frequency operation.

2. For the load conditions of submersible pump and submersible oil pump, the rated current of the HIVT general high voltage frequency converter selected should be greater than the rated current of the motor.

3. For oil pressure pump, the selection of general high voltage frequency converter should be amplified in one gear.

4. In some special applications such as high temperature, high altitude (1000m above the sea), HIVT general high voltage frequency converter should be used with capacity reduction, and the selection should be enlarged accordingly.

2.5, and the application field

General high voltage frequency converter has been widely used in various industries, providing users with perfect high voltage (asynchronous, synchronous) ac motor soft start, speed regulation and intelligent control scheme, won the praise of users. Typical applications in various industries are as follows:

Electric power generation

Powder exhaust fan	booster fan	blower	induced draft fan	condensate removal pump	ash pump
Pumped storage pump	circulating water pump	boiler pump	compression engine		

Petrified

booster fan	induced draft fan	Pipeline conveying pump	water injection pump	feedpump	oil
oil transfer pump	Halogen pump	circulating water pump	compression engine		

Metallurgy

induced draft fan	blower	Secondary dust removal fan	Compressor fan	blast furnace blower	B last furnace dust removal fan
Converter dust removal fan	Electric furnace removal, dust fan	Sulfur dioxide fan	The slag pump	feedpump	Water pump
In addition to the phosphorus pump	mud pump	Scaling pump	kneading machine	Oxygen compressor	gas compressio n pump

Municipal administration

Aeration fan induced draft fan, air supply fan, pressurized pump hot water circulating pump in the water pump

Sewage pump, net water pump, lifting pump, water supply pump

Light industry

Gas blower pressure pump, cleaning pump, axial flow pump, soft water pump, water supply pump

Compressor grouting machine, grinder

2.6, Implementation standards

Standard number	Standard name
GB 156-2017	normal voltage
GB /T 1980-2005	standard frequency
GB /T 3797-2016	Electrical control, manufacturing equipment
GB /T 4208-2017/ IEC 60529:2013	Housing protection level (IP code)
GB 4588.1-1996	Specification for single-plate printed plates without metalzed holes
GB 4588.2-1996	Metmetal hole single and even printed board specification
GB /T 12668.2-2002	Speed regulating electric transmission system-Part 2: General requirements of low voltage AC speed regulating electric transmission system rating provisions
GB 12668.3-2012/ IE C 61800-3:1996	Speed-regulating electric transmission systems- -Part 3: Electromagnetic compatibility requirements and their specific test methods
GB /T 12668.4-2006/ IEC 61800-4:2002	Speed regulating electric transmission system-Part 4: General requirement of the rating of AC regulating electric transmission system with AC voltage above 1kV but not more than 35kV
GB 12668.501-2013/ IE C 61800-5-1 : 2007	Speed-Part 5-1: Safety requirements Electrical, heat and energy
GB 12668.502-2013/ IE C 61800-5-2 : 2007	Speed-regulating electric transmission system- -Part 5-2: Safety requirement functions
GB /T 14549-1993	Power quality, public grid harmonics
GB /T 10228-2015	Technical parameters and requirements of dry-type power transformer
DL /T 994-2006	High voltage frequency converter for fan water pump in thermal power plant
GB /T 1094.3-2017	Power transformers-Part 3: Insulation level, insulation test and external insulated air clearance
GB /T 16935.1-2008/ I EC 60664-1:2007	Insulation coordination of equipment in low-voltage systems- -Part 1: Principle, requirements and tests
GB 5226.3-2005/IEC 60204-11 : 2000	Mechanical safety Mechanical electrical equipment-Part 11: Voltage above 1000 VA.c. Or a 1,500 Vd.c. But the technical conditions of the high-voltage equipment not exceeding 36kV
GB /T 4025-2010/ IEC 60073-2002	Basic and safety rules for MI marking, coding rules for indicators and operating devices
GB /T 30843.1-2014	General frequency conversion speed regulating equipment above 1kV and not more than 35kV, part 1: Technical conditions
GB /T 30843.2-2014	General frequency conversion speed regulating equipment above 1kV and not more than 35kV, part 2: Test method
GB /T 12668.701-2012	Speed-regulated electrical drives-Part 701: Definition of common and operational specification interfaces for electrical drives
GB /T 12668.8-2017	Speed-regulating electric drive system-Part 8: Voltage specification for power interfaces

The isolation transformer is a three-phase coherent rectifier transformer with forced air cooling; the original side is Y, directly connected with the high voltage inlet; the secondary side winding is triangular connection, which provides isolated three-phase power input for each power unit, the quantity is determined by the voltage level and structure of the frequency converter. In order to maximize the harmonic content of the input side, the secondary side winding of the same phase is shifted through the triangle connection method, and the phase difference between the windings is calculated by the following equation:

Phase shift angle =60°/unit progression

The frequency converter output is obtained by series stack of multiple three-phase input and single-phase

output. For example, 5 power units with a rated voltage of 690V In series, to obtain a 3450V phase voltage, as shown in Table 3-1.

classification of voltage	Each phase serie number of cells	Unit amount, fixed voltage (V)	Output phase voltage(V)	Output line voltage(V)	Each phase level quantity
6kV	5	690	3450	6000	11
6kV	6	580	3480	6000	13
10kV	8	720	5760	10000	17
10kV	9	640	5760	10000	19

3.2.1 Controller composition

The controller is mainly composed of main control board, optical fiber board, power board and signal board, as shown in Figure 3.6:

(1) Main control board

The main control board consists of the following two parts:

DSP subsystem: complete functions such as motor control algorithm, unit fault diagnosis, various real-time protection and communication with interface board;

FPGA subsystem: complete real-time communication with DSP, communication with unit, carrier phase-shift PWM output and other logic functions.

(2) Fiber optic board

The fiber optic board is the communication bridge between the controller and the power unit. Each controller is equipped with 3 fiber optic boards, and each fiber board controls the frequency converter in the three-phase unit.

All units of a phase. The fiber optic board periodically sends pulse width modulation (PWM) signals and work instructions to the unit, and the power unit receives its trigger through the optical fiber Command and status signals, and send fault code signals to the fiber optic board in case of failure.

(3) Power board

In addition to generating the power used by the controller, the power board also has I/O interface and speed sampling functions:

● Generate +5V, ±15V power supply for supplying power to main control board, fiber optic board and signal board;

● Transmission of digital signals inside the inverter control system;

● For closed-loop vector control models, collect the motor speed information fed back by the encoder.

(4) Signal board

The signal board collects the input/output voltage and current signals of the frequency converter, converts the collected signals into analog and digital, and sends them to the main control board

3.2.2 Description of the controller interface

3.2.2.1 Description of interface of optical fiber optic board

name	explain
A 1/B1/C1	Level 1 power unit optical fiber communication interface
A 2/B2/C2	Level 2 power unit optical fiber communication interface
A 3/B3/C3	Level 3 power unit optical fiber communication interface
A 4/B4/C4	Level 4 power unit optical fiber communication interface
A 5/B5/C5	Level 5 power unit optical fiber communication interface
A 6/B6/C6	Level 6 power unit optical fiber communication interface
A 7/B7/C7	Level 7 power unit optical fiber communication interface
A 8/B8/C8	Level 8 power unit optical fiber communication interface
A 9/B9/C9	Level 9 power unit optical fiber communication interface
L ED	State instructions

3.2.2.2 Description of the master control board interface

name	explain
CA NH	CAN CI
CAN L	
EGND	
485A	485 Communication interface
485B	
L ED	State instructions
RX	Optical fiber communication interface
TX	

3.2.2.3 Power board interface

order number	name	explain
1	P E	Shield ground
2	P GND	2 4 V power supply ground
3	24V DC	A 24V power supply
1	VC O	Encoder power supply: + 5V or + 24V output, 200 mA
2	A P	Encoder signal A + (RS 422 differential signal)
3	A N	Encoder signal A-
4	BP	Encoder signal B + (RS 422 differential signal)
5	B N	Encoder signal B-
6	ZP	Encoder signal Z + (RS 422 differential signal)
7	ZN	
8	P GND	Encoder power source ground
9	C LK +	Clock signal + output (RS422 differential signal)
10	CLK -	Clock signal-output
	L ED	State instructions

pin	name	explain
1	BACKOUT1	Standare output 1, open dry contact
2	BACKOUT2	Standby output 2
4	H V -OFF	High pressure ready output, often open dry contact, disconnect effective
5	D O -COM	Output public point
6	PRDY	Controller ready output, often open dry contact, closed effectively
7	P ENL	Interface board ready input, closed valid
8	BACKIN	Standby input
9	D I -COM	Enter the public point
10	PRST	The controller resets the input, and the closure is valid

3.2.2.4 Description of the signal board interface

order number	name	explain
1	V A	Phase A input voltage detection signal
2	V B	Phase B input voltage detection signal
3	V C	Phase C input voltage detection signal
4	AGND	Input voltage detection signal common end
9	U NITA	Unit voltage sampling +
10	U NITG	Unit Voltage Sampling-
12	AGND	Common end of the output voltage detection signal
13	V U	U- phase output voltage detection
14	V V	Phase V output voltage detection
15	V W	W- phase output voltage detection
1	+15V	The Hall sensor forward power supply
2	I U	U- phase output current sampling
3	-15V	The Hall sensor has a negative power supply
4	+15V	The Hall sensor forward power supply
5	I V	Phase V output current sampling
6	-15V	The Hall sensor has a negative power supply
7	+15V	The Hall sensor forward power supply
8	IW	W- phase output current sampling
9	-15V	The Hall sensor has a negative power supply
10	I A	Phase A input current sampling
11	I COM	Input current is in common
12	I C	Phase C input current sampling
14	P E	Shield ground
15	P E	Shield ground

3.2.3 Interface board

3.2.3.1 Introduction

Siemens S7-200 SMART PLC is selected for the interface board logic control device. The PLC is equipped with Siemens dedicated high-speed processor chip, and the basic instruction execution time can reach 0.15us. Combined with the control requirements of frequency converter, 24 DI, 16 DO, 4 AI and 4 AO are selected, which can ensure sufficient interface and fast operation and processing.

S7-200 SMART CPU module is standard equipped with Ethernet interface, supports Siemens S7 protocol, TCP/IP protocol, and effectively supports a variety of terminal connections. In addition, CPU module integrates one RS485 interface, which can communicate with third-party devices, and
adds CM01 signal board to realize RS232/RS485 and free pass
interrogate.

This machine integrates Micro SD card slot, using the market can realize program update and PLC firmware upgrade, which greatly facilitates the service support of customer engineers to end users, and also saves the inconvenience of PLC firmware upgrade and return service.

The interface board is used for the logical processing of the internal switch signal, field given and feedback signal and state signal of the frequency converter, and also has the ability to process 4 analog input and 4 analog output, as shown in Figure 3.7.

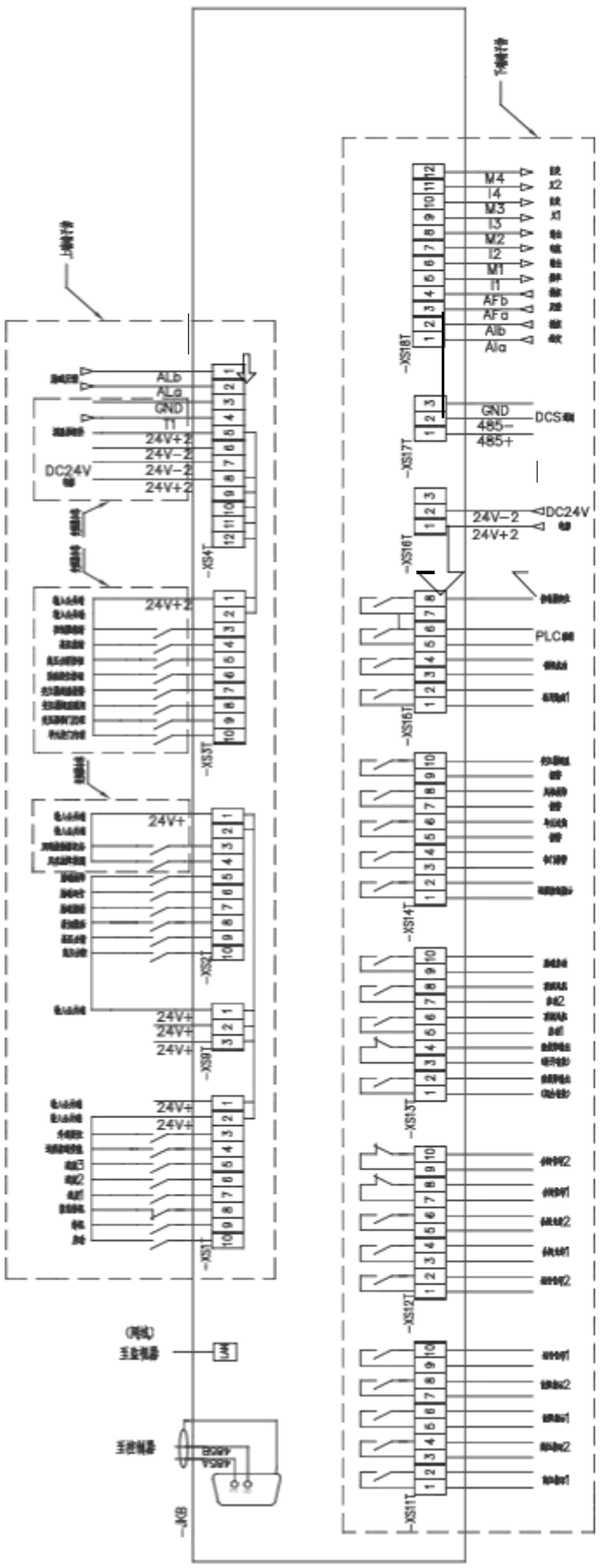


Figure 3.7 Schematic diagram of the I / O interface board

3.2.3.2 Interface signal of the upper terminal block

The upper terminal block interface signal is mainly composed of remote input signal set, signal in frequency converter cabinet and excitation feedback signal. The input power supply 24V + 2 is powered by the external switch power supply module, and then generates 24V + through the DC / DC module to power the remote signal part circuit, which separates the remote signal and the PLC through the relay.

The principle block diagram is shown in the following figure:

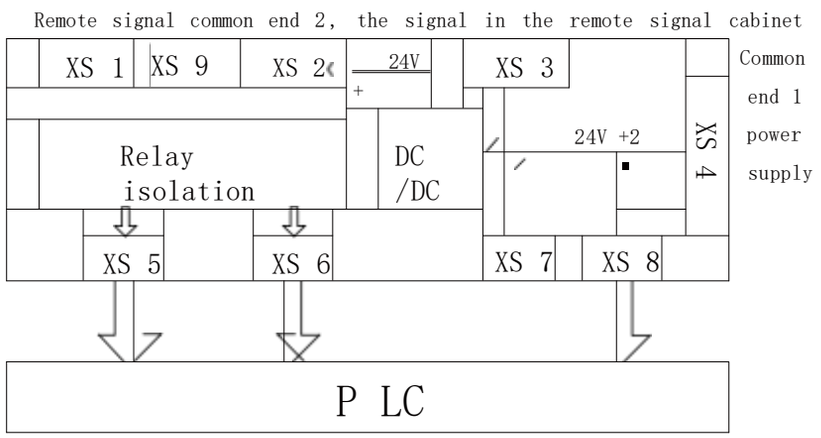


Figure 3.8 Block diagram of interface upper board

The upper terminal connects the remote control and field switching input signal, where the analog input is 4-20 mA current input, the load impedance requirement is less than 500 Ω; the remote

control support level and pulse signals can be set through "remote start and stop mode"; the switching activation signal terminal is only connected when using the synchronous switching function, see the

synchronous cutting cabinet manual for details.

Pay attention to!

Switswitching input is required to be passive nodes. When multiple switching quantities are connected in the same place, 24V + can share the common line.

The remote reset signal of the interface board has the same function as the reset button of the cabinet door: in the inverter, only the touch screen will have no other impact on the system (for example, the reset in operation) ; when the inverter has heavy fault and troubleshooting, reset the control system to restore the inverter to the normal state.

The terminal row on the interface board is defined as follows:

Terminal number	position	name	state	type	explain
XS1T	110	Level is start / pulse start	close / break	DI / level or pulse signal	The touch screen function item "Control Mode" is set to remote control. Two input modes are set according to "Remote Start and Stop Mode": Level forward start and stop: closed forward start, disconnected shutdown (level mode) Pulse start: open after closing (pulse width greater than 500ms), Start - up (pulse mode)
	19	Level reverse start stop / pulse shutdown	close / break	DI / level or pulse signal	The touch screen function item "Control Mode" is set to remote control. Two input modes are set according to "Remote Start and Stop Mode": Level reverse start and stop: closed reverse start, disconnected stop (level mode and inverter inversion set as allowed) Pulse shutdown: closed (pulse width greater than 500ms), Shutime (pulse mode)
	18	urgent halt	break valid	DI / constant closed level signal	After blocking the output, the motor shutdown freely
	17	Speed 1	close valid	DI / constant open level signal	The touch screen function item "operation mode" is open ring operation, and the "given mode" is switch timing. After closing, the given frequency corresponds to the touch screen parameter items "switch given 1", "switch" given 2 "and" switch given 3 " respectively
	16	Speed 2	close valid		
	15	Speed 3	close valid		
	14	Remote control is enabled	close valid	DI / constant open level signal	The touch screen function item "Remote setting control mode" is set to be valid when allowed, and the frequency converter control mode is remote control after closing
	13	outside reset	close valid	DI / normally open, pulse signal	Reset control system when heavy fault, or reset touch screen when running (equivalent door reset button)
XS	110	high-handed disjunction	close valid	DI / normally open, pulse signal	High voltage input power supply after closing (high voltage break button of equivalent cabinet door)
	19	high-handed disjuncti	close valid	DI / normall	High voltage input power supply after closing (high voltage break button of equivalent cabinet door)

2T		on		y open, pulse signal	
	18	Cut activation	close valid	DI / normally open, pulse signal	The touch screen function item "frequency conversion switching" is set to be effective when allowed. After being closed, the inverter output frequency is increased to the power grid frequency and phase-locked
	17	excitation ready	close valid	DI / normally open, pulse signal	This contact closing excitation is ready (for the synchronizer)
	16	excitation move	close valid	DI / normally open, pulse signal	This contact has closed excitation operation (for synchronizer)
	15	excitation hitch	close valid	DI / normally open, pulse signal	This contact is closed excitation fault (for synchronizer)
XS 4T	12	excitation feedback	4 ~20mA	AI/ current	The excitation current is fed to the interface board and the frequency converter is adjusted accordingly
	4	Cabinet temperature	4 ~20mA	AI/ current	The temperature signal feeds back to the interface board

3.2.3.3 Interface signal of interface panel

The lower terminal connects state output signal, interlocking signal of inverter incoming line switch, analog input and output and communication signal. Digital signal XS 11T: 1 to XS 13T: 8 node capacity is 250VAC / 8A (or 250VDC / 8A) and partially 250VAC / 16A (or 250VDC / 16A). If the demand is exceeded, please add the intermediate relay for capacity expansion. The analog input signal line must use shielding line, the input impedance is 250 Ω and the maximum input current is 30 mA (maximum input voltage is 15V); the phase locking success signal terminal is only connected when using the synchronous switching function, see the Manual for details.

Pay attention to!

Closing allowable and switching signal and inverter superior switch (power supply cabinet circuit breaker, or automatic bypass cabinet inverter incoming vacuum contactor / circuit breaker) are interlocking relationship:

Closing is a regular opening point, which should be connected to the closing circuit of the superior switch as the closing condition, but does not participate in the superior switch operation. When the point is closed, the superior switch is allowed to power on the frequency converter; otherwise, the superior switch is not allowed to switch on.

The switch signal is the constant closing point, which should be connected in parallel to the superior switch switch circuit. When a heavy failure occurs during the operation of the frequency converter, the point is closed, from Break the superior switch and protect the frequency converter.

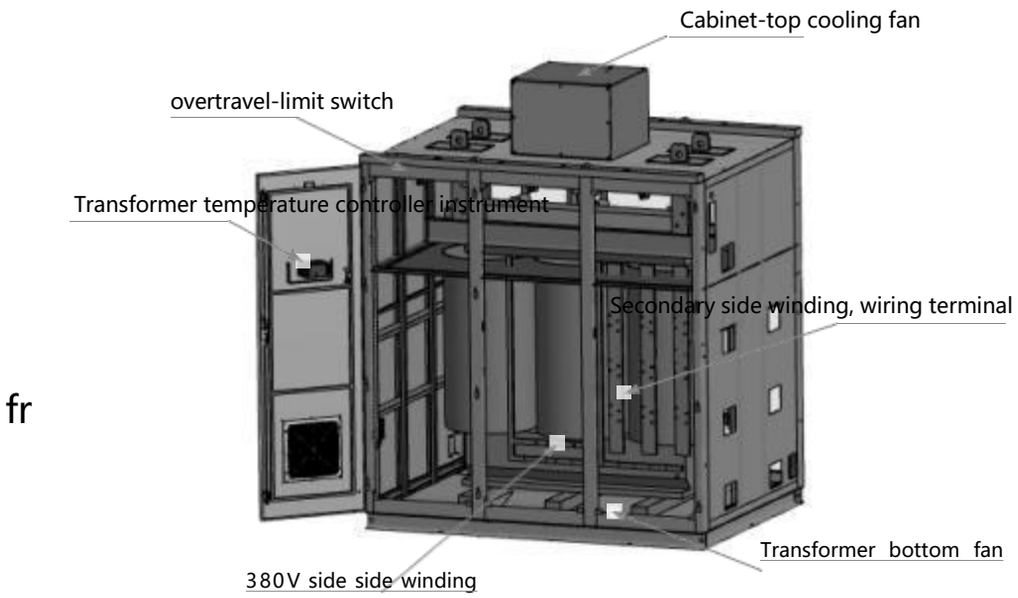
The number of the interface board is defined as follows:

Terminal number	position	name	state	type	capacity	explain
X S 11T	1 2	High pressure indication 1	Close effective	DO/ normally open	8A/250VAC	High pressure is right, and the thread is closed
	3 4	High pressure indication 2	Close effective	DO/ normally open	8A/250VAC	
	5 6	Fault indication 1	Close effective	DO/ normally open	8A/250VAC	Light fault flicker (1 second a cycle: 0.5s bright / 0.5s out), heavy fault is always on
	7 8	Fault indication 2	Close effective	DO/ normally open	8A/250VAC	
	9 10	Run signal 1	Close effective	DO/ normally open	8A/250VAC	The frequency converter operation is completely closed
X S 12T	1 2	Run signal 2	Close effective	DO/ normally open	8A/250VAC	
	3 4	The closing allows 1	Close effective	DO/ normally open	8A/250VAC	The touch screen function item "Control state" is in the normal state, and the frequency converter is closed with no heavy fault output
	5 6	The closing allows 2	Close effective	DO/ normally open	8A/250VAC	
	7 8	Switch signal 1	Close effective	DO/ normal close	8A/250VAC	The touch screen function item "Control state" is debugging state, and the frequency is closed when the converter has no heavy fault output
	9 10	Switch signal 2	Close effective	DO/ normal close	8A/250VAC	
X S 13T	1 2	Heavy fault output	Close effective	DO/ normally open	8A/250VAC	Heavy fault closure
	3 4	Heavy fault output	Disconnect effectively	DO/ normal close	8A/250VAC	The fault is disconnected
	5 6	Top fan start-up 1	Close effective	DO/ normally open	8A/250VAC	Close when the counter needs to be activated
	7 8	Top fan start 2	Close effective	DO/ normally open	8A/250VAC	
	9 10	Exciting magnetic start	Close effective	DO/ normally open	16A /250VAC	Close upon starting the excitation
	1 2	telecontrol indicate	Close effective	DO/ normally open	16A /250VAC	The control mode of the frequency converter is closed during the remote control

X S 14T	3 4	Cabinet door alarm	Close effective	DO/ normally open	16A /250VAC	Cabinet door is closed when open
	5 6	Unit over, the thermal alarm	Close effective	DO/ normally open	16A /250VAC	The unit cabinet is closed when overheated
	7 8	Fan fault alarm	Close effective	DO/ normally open	16A /250VAC	Close when the fan fails
	9 10	Transformer overtemperature alarm	Close effective	DO/ normally open	16A /250VAC	The transformer is closed at overtemperature
X S 15T	1 2	Standby output	Close effective	DO/ normally open	16A /250VAC	Standby contact
	3 4	Lock phase success	Close effective	DO/ normally open	16A /250VAC	During synchronous switching, the output voltage and grid voltage deviation close within the allowable phase locking range (maximum phase deviation ± 5°, maximum amplitude deviation ± 2%)

The power supply, communication and analog quantity of the interface board are defined as follows:

Terminal number	position	name	state	type	explain
X S 17T	1 2 3	DCS communication		RS 485	The Modbus communication interface between frequency converter and upper computer (1 is +, 2 is -) Note: If the lower plate of the interface board is upgraded, the XS 17 terminal position is changed, (2 is-, 3 is +) is consistent with the terminal XS 23 signal
X S 18T	1 2	To simulate a given	4~20mA	AI / current or voltage	Adjust the touch screen parameters "minimum given current" and "maximum given current" to adjust the correspondence relationship, with an accuracy of 1.5%. From 4 to 20 mA corresponds to 0Hz ~ the highest frequency
	3 4	analog feedback	4~20mA	AI / current or voltage	Adjust the touch screen parameters "minimum given current" and "maximum given current" to adjust the correspondence relationship, with an accuracy of 1.5%. 4 – 20 mA correspond to 0 – 100%
	5 6	output frequency	4~20mA	AO/ current	Maximum load of 500 Ω, 10-bit A / D sampling, 0.1% resolution, accuracy 1.0% From 4 to 20 mA corresponds to 0Hz ~ the highest frequency
	7 8	output	4~20mA	AO/ current	Maximum load of 500 Ω, 10-bit A / D sampling, 0.1% resolution, accuracy 1.0% 4 ~20mA corresponds to 150% of the rated current of 0A ~ frequency converter
	9 10	Custom simulation output of 1	4~20mA	AO/ current	Maximum load of 500 Ω, 10-bit A / D sampling, 0.1% resolution, accuracy 1.0% According to the touch screen function parameter "analog output 1" setting: 4 ~20mA corresponds to 0Hz ~ highest frequency (set to output frequency) 4 ~20mA corresponds to 1 50% of the rated current of 0A ~ frequency converter (set to output current) 4 ~20mA corresponds to 0 ~100℃ (set to unit cabinet temperature) 4 ~20mA corresponds to 0 ~ 1 (set to the output power factor) 4 ~ 20mA corresponds to 1 50% of rated output power (set to output power) 4 ~20mA corresponds to rated current of 0 ~ excitation cabinet (set to excitation current)



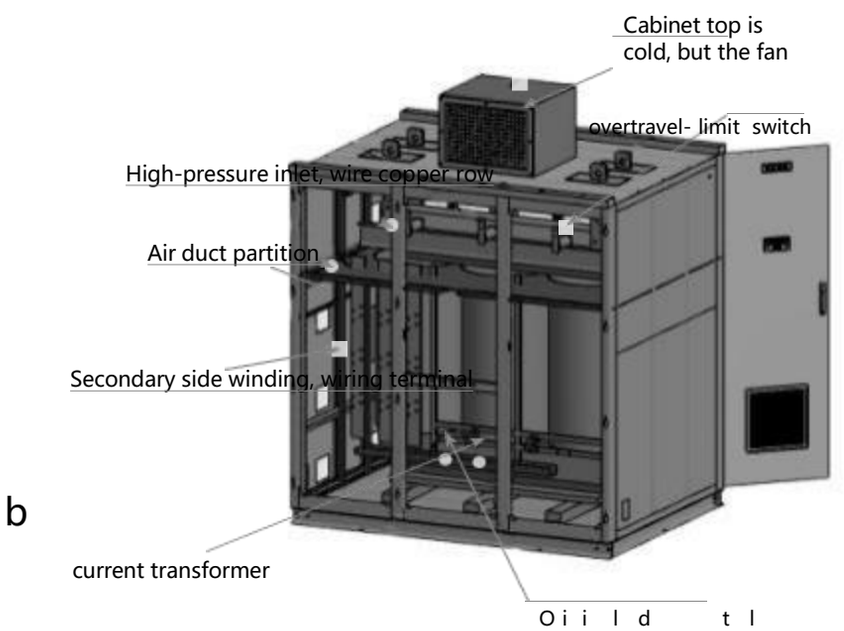


Figure 3.15, Assembly diagram of typical transformer cabinet

3.4.2 Control / unit cabinet

Control / unit cabinet (unit cabinet) contains the control system, power unit and its auxiliary components. The typical unit cabinet is shown in the following figure, the main package in the cabinet Include the following components:

- interface board
- Power unit resistor plate
- Control of the transformer components
- Primary wiring room
- D e humidifie r (op tional)

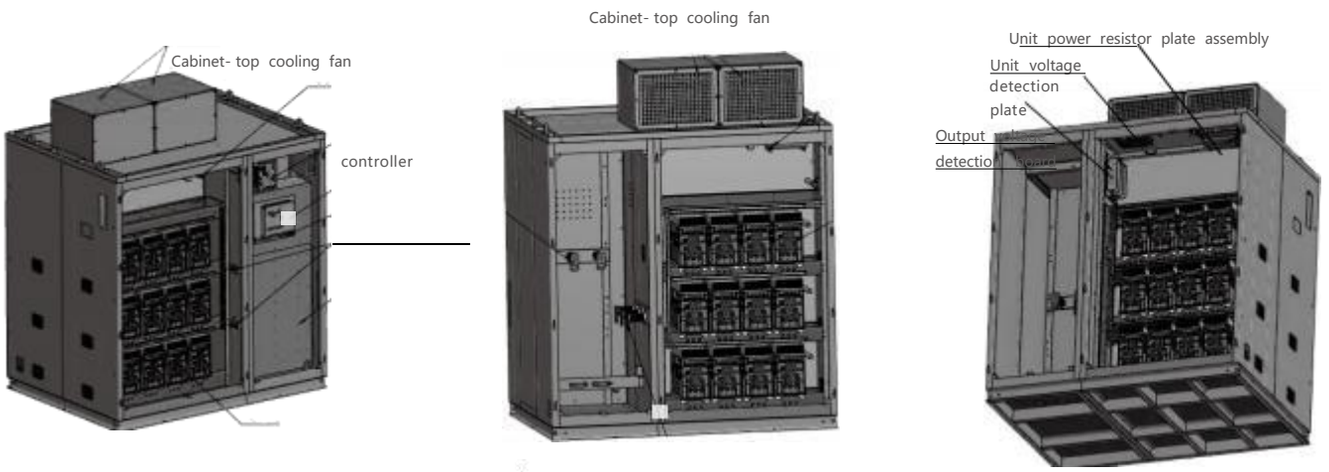


Figure 3.18, layout of typical unit cabinet

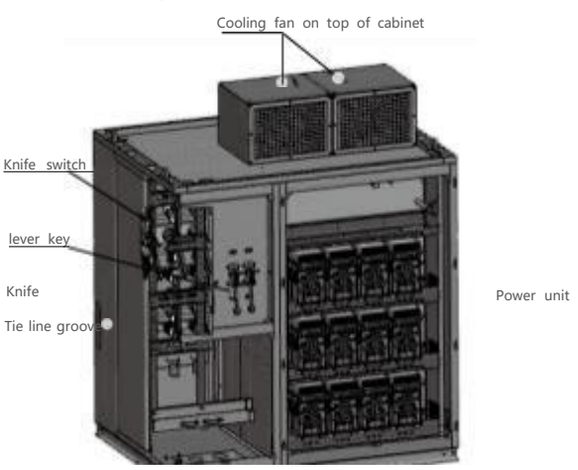


Figure 3.19, outline drawing with manual bypass cabinet

The 6kV series

6 The power units in the kV unit cabinet are divided into three groups from top to bottom, namely phases A, B and C. For example, with 5 series units per phase, each phase unit is arranged from right to left, such as the A phase units are A 1, A 2, A 3, A 4, and A 5 from right to left, respectively. The lower end of the unit is a three-phase input power supply, which is connected to the secondary side output of the transformer by a fast fuse. The upper end of the unit is a single-phase output. Each group of 5 units are formed in series by copper row. The left bridge arm of the three-phase first stage unit is short connected to form the Y-connected neutral point, and the output of the fifth stage unit is connected to the output of the frequency converter.

The power unit is fixed by two M 8 screws to the cabinet guide rail. The rear of the unit cabinet is a ventilation pipe. The cold air flows through the filter layer of the front door through the unit radiator, bringing the heat generated in the power unit to the rear ventilation pipe and is discharged by the centrifugal fan on the top of the cabinet.

cabinet door is equipped with a filter layer to prevent dust from entering the unit. The inside of the cabinet door is equipped with a travel switch for the cabinet door interlock alarm. The control System is installed on the back right side of the cabinet, with the controller and the interface board from top to bottom. The power switch and the user wiring terminal are arranged in the right side of the back, and the inverter output terminal is arranged in the left baffle of the back of the transformer cabinet.

The 10kV series

Taking the single-phase 8-level unit series as an example, in order to compress the width of the cabinet, the units are arranged in front and back, as shown in the figure below. The first four levels of each phase unit are located in the front of the cabinet. For example, the A phases are arranged from right to left as A 1, A 2, A 3 and A 4. The right side of the front is the control room, installed with the controller, power supply, switch, etc. On the back of the cabinet, load the remaining 4 units of each phase, also arranged from right to left, such as A phase A5, A6, A7 and A8 respectively. The left bridge arm of the three-phase first stage unit is short connected to form the Y-connected neutral point, and the output of the eighth stage unit is connected to the output of the frequency converter. The structural configuration is the same as that for the 6kV series.

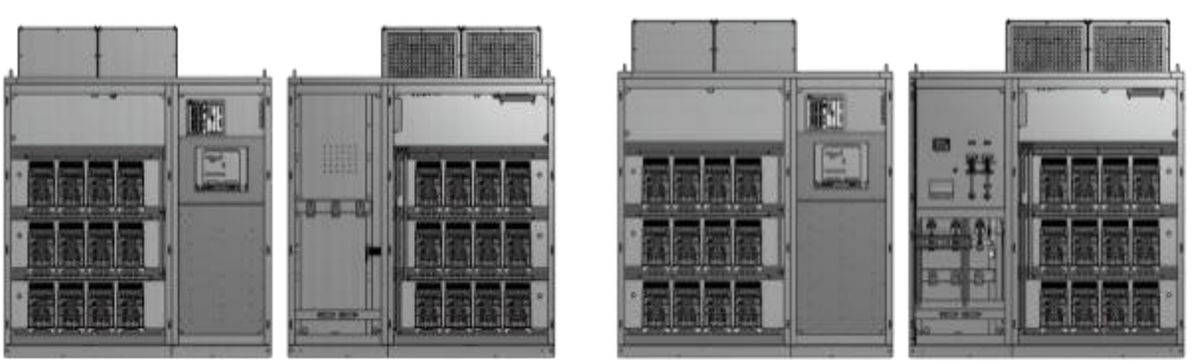


Fig. 3. Layout drawing of 2010 kV unit cabinet cabinet

3.4.3 Pre-charging box

When the power unit capacity of the frequency converter is too large (the rated current of the power unit is greater than 250A), the pre-charging box shall be configured. The pre-charging box has two working modes: pre-charging and unit detection.

Pre-charging mode: used for the capacitive pre-charging of the power unit. By switching the number of current limiting resistance in the charging circuit, the power unit can be charged in three levels. Send 3.5 seconds of closing allowable signal (4.5 seconds) after charging, allowing the superior high voltage switchgear to close.

Unit detection mode: used for unit self-detection. The charging process is the same as the pre-charging mode, and the only difference is that the third level of charging will continue until the user presses the high-voltage break button to stop.

The pre-charging box is installed inside the converter, and the power, resistance and quantity of resistance match the specifications of the converter. Pre-charging 2 circuit is shown in Figure.

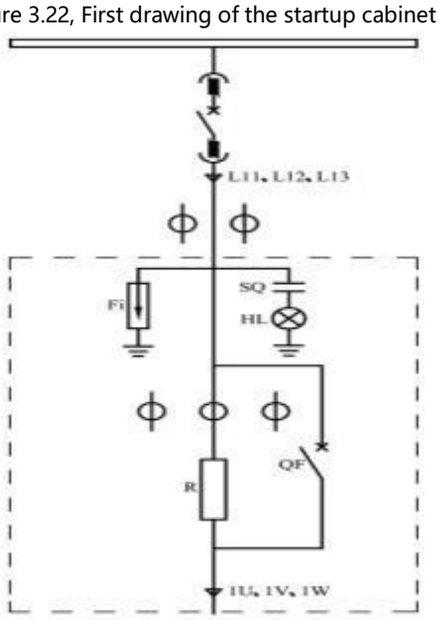
The pre-charging input side connects the user 380V power supply, and the output side connects the phase-shifting transformer auxiliary winding. The output voltage of the pre-charging cabinet changes with the number of pre-charging resistance switching, and the secondary winding of the transformer will sense the corresponding voltage to charge the DC capacitor of the power unit.

Note: To run the frequency converter, the motor cable of the output chamber must be removed.

3.4 .4 Starting cabinet (optional)

Due to the magnetic surge flow of phase shifting transformer, large capacity frequency converter will appear large impact current. The configuration of the starting cabinet can suppress the electric shock current. The principle of the starting cabinet is shown in the following figure. The width of the starting cabinet is 1.2 meters, installed on the left side of the converter. The power, resistance value and quantity of resistance match the specifications of the converter.

Figure 3.22, First drawing of the startup cabinet



3.4. 5 Switch cabinet (optional)

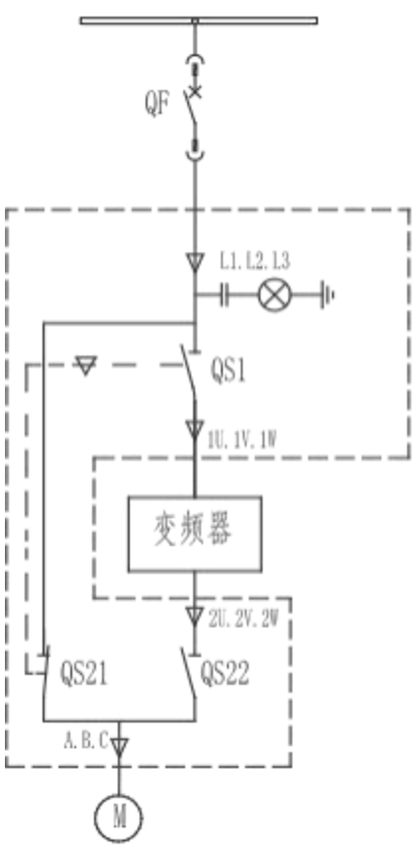
In practical application, often need switch cabinet to cooperate with frequency converter. Switch cabinet is divided into bypass cabinet and switch cabinet.

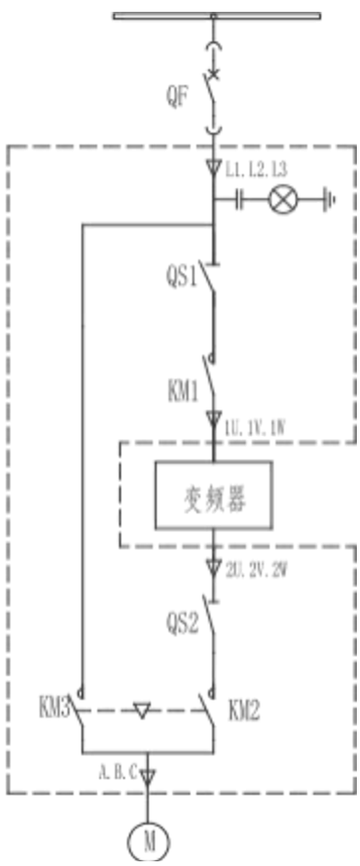
(1) Bypass cabinet

The bypass cabinet can switch the motor to the power frequency power grid when the frequency converter fails to ensure the continuous production of the system. Bypass cabinet is divided into manual bypass cabinet and automatic bypass cabinet: width of manual bypass cabinet is 0.8 m, interlocking of inverter and power supply cabinet is 1 m, and K M 1 interlock. When configuring the bypass cabinet, the user- side primary cable (power inlet line and motor outlet line) is usually entered by the bottom of the bypass cabinet, and the primary cable between the bypass cabinet and the frequency converter is arranged in the cabinet with flexible wire.

When the system allows a temporary shutdown, the manual bypass cabinet can be configured, as shown in Figure 3.23. There are three switches in the manual bypass cabinet (including QS 1 and QS 22 electrical interlocking, QS 21 and QS 22 are double knife and double throw isolating switches).

When the system is not allowed to stop, the automatic bypass cabinet can be configured, as shown in Figure 3.24 . T here are three vacuum contactors in the automatic bypass cabinet (KM 1 and KM 2 are interlocking, and KM 2 and KM 3 are interlocking relationship), and the switching process is realized through automatic control of the electrical loop . For the convenience of the maintenance of the inverter,the automatic bypass cabinet is usually equipped with an isolation switch to isolate the frequency converter from the high voltage power supply.





3.5 Type Selection of the cable

3.5.1 Selection of power cable

The selection of power cables must be strictly in accordance with the following requirements

- Cable carrying capacity
- Cable manufacturing, manufacturer specification
- Installation and laying method
- Pressure drop caused by the cable length
- Power industry specifications
- Comply with the EMC specification

Pay attention to! 

- The high voltage cable between the frequency converter and the user equipment (high voltage power supply cabinet, motor) is recommended to use the shielded armored cable to prevent rodent damage.
- If the total cross-sectional area of the cable shielding layer is less than 50% of the cross-sectional area of the single-phase conductor, it is necessary to add a ground wire along the cable to prevent the shielding layer overload caused by the potential difference of the factory grounding network.
- Ground cable section must be greater than 16mm^2。

3.5.2 Selection of control, signal and communication cables

Recommended section and specifications for control, signal and communication cables:

- Analulated input and output cable: overall shielded twisted pair, section 1.5mm^2~2.5mm^2
- Digital input and output cable: choose the whole shielding twisted pair wire, section 0.5 ~1.5mm^2
- Communication cable: choose the professional communication cable required by the relevant communication regulations, or the overall shielding twisted pair wire, section 0.5 ~1.5mm^2

Pay attention to! 

- The signal cables used for communication and control shall choose good quality single pair double pair cable or multiple pair twisted pair cable.
- Signal cable and power cable shall be wired separately, using different cable grooves and bridges. If it cannot be realized, the spacing between the two types of cables should be greater than 30cm to avoid parallel laying with each other.
- To forbid the power cable to share one shielded cable with the signal cable.
- Signal cables shall be laid near the corner and on the ground potential to improve interference resistance.
- The wires transmitting different types of signals must be crossed and vertically wired.
- To different components in the interference potential, should lay a potential balance cable parallel to the control cable, fixed connection to the ground (Cable section must be 16 mm^2)

4.1 Introduction to the touch screen

The touch screen is installed on the front of the inverter cabinet door. Users can set the parameters, state

observation and data reading of the inverter through the touch screen, including

window dishes The single brief structure block diagram is shown in the following figure:

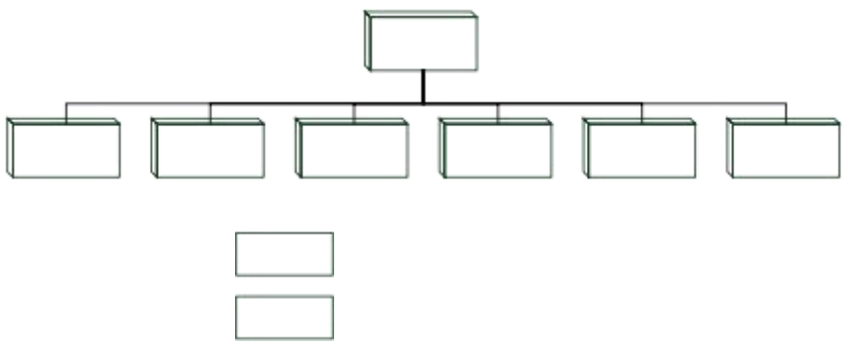


Figure 4. 1 Structure block diagram of the window menu

4.2 Operation and display instructions of the touch screen

4.2.1 Monitoring interface

The default boot is the monitoring interface, which can be divided into 4 areas: information display area, status

indication area, fault information display area, and window menu selection area, such as

Description of each area are shown below:

region	explain
Information display area	Main display area, including key parameter display, frequency converter operation status and inverter start / stop control, etc
Status indicator area	HV: Light on the inverter when the high voltage is ready (red) Standby: Light on standby system (green) Operation: frequency converter lit during operation (green) Fault: often bright (red), flashing (red)
Fault information display area	The area where fault alarm information is displayed, heavy fault corresponds to red alarm, and alarm (light fault) corresponds to yellow alarm
The Window menu selection area	Click the menu button of each window to switch the content of the information display area

Table 4-1 Description of the monitoring interface area

4.2.2 Trend curve

Trend curve is used to show the variable curve of frequency converter, which is divided into real- time curve and historical curve. All variables are unitary values.

Real-time curve: real-time display of variables such as operating frequency, output current and output voltage of the frequency converter. The data is sampled at 100ms / time, and each screen can display the variable waveform of 300s.

Historical curve: display the variable curve of the frequency converter in the last 30 days, and the excess part will be covered repeatedly. The curve data collection period is 5 s, and each screen can display the variable waveform of 300s, as shown in Figure 4.4. Users can save and delete history curves through the Export History Curves and Remove History Curves button.

4.2.3 Parameter setting

The setting parameters can be divided into three categories: frequency converter parameters, motor parameters and functional parameters, including 5 pages, see chapter 5 for parameter description.

Entering the "Parameter Settings" for the first time requires user login verification, as shown in the figure below.

The system default of users are 2: engineer and operator. User password and permissions are shown in the table below.

user name	rank	Password (6-bit)	authority
engineer	tall	456789	All parameters
console operator	low	123456 (initial password	Part of the parameters

Pay attention to!

Without a user login within 10 minutes, the parameter settings will be automatically encrypted.

There are three kinds of parameter settings: parameter upload, parameter download and restore factory settings. Function button description is shown in the table below:

function button	explain
factory data reset	All the parameters are restored to the factory settings
Parameter upload	Upload the parameter values in the controller to the PLC and transmit them to the touch screen
Parameter download	Transfer the parameter values of the touch screen to the PLC and download them to the controller

parameter

5.1 frequency converter and motor parameters

I D	description	unit	least value	crest value	Windows default
1	Start frequency	H z	0	5.0	0.2

The initial output frequency of the converter, namely the starting frequency of the inverter; the starting frequency is set too large, which may cause the inverter to overflow; the starting frequency is not zero, ensuring the output torque of the motor; in order to fully establish the magnetic flux of the motor, the starting frequency needs to be maintained for a certain time.

Aynchronous general: if the start frequency is not zero, and the actual output current is greater than the no-load current of the motor, the step-down function is turned on;

Asynchronous open ring vector: the startup frequency is used for the running frequency when establishing magnetic flux.

I D	description	unit	least value	crest value	Windows default
2	maximal frequency	H z	0	80.0	50.0
3	low-limit frequency	H z	0	80.0	0

Maximum frequency: maximum frequency (absolute value) ; if the inverter exceeds 1 0 % of the maximum frequency and reaches 0 . 5 seconds, the inverter reports " system overspeed" fault and shut down.

Minimum frequency: the lowest frequency (absolute value) for the continuous operation of the frequency converter.

I D	description	unit	least value	crest value	Windows default
4	Rated voltage of the frequency converter	V	380	15000	6000
5	Rated current of the frequency converter	A	30	3000	77
35	Rated input voltage of the frequency converter	V	380	15000	6000
36	Rated input current of frequency converter (proportional)		100	2000	200

The above parameters are set according to the logo on the inverter nameplate, or the factory setting of the inverter, the user does not need to modify.

I D	description	unit	least value	crest value	Windows default
6	Motor limit, flow coefficient	%	100	200	100

Set the current limit of the converter output to prevent the converter output from damaging the motor. 1 0 0 % corresponds to the rated current of the motor. For example, if the rated current of the motor is 6 1 A and the motor current limiting coefficient is 1 0 0 %, the maximum output current of the frequency converter is 6 1 A; if the current limiting coefficient of the motor is equal to 1 2 0 %, the maximum output current of the frequency converter is 7 3 . 2 A.

I D	description	unit	least value	crest value	Windows default
7	Motor rating, fixed voltage	V	380	15000	6000
8	Motor rating, fixed current	A	1	1600	77
9	Motor amount, fixed frequency	H z	5	80	50
10	Motor rating, fixed rotation speed	r pm	10	3600	980
11	Motor rating, fixed power	k W	1	60000	1000

The above parameters are set according to the mark on the motor nameplate, and the relationship between the motor rated frequency and the motor rated voltage is shown in the figure below:

Pay attention to! 

If the rated voltage setting of the motor is less than the motor nameplate, the inverter is reduced in operation; if the rated voltage setting of the motor is greater than the motor nameplate, it will guide

To the motor over- excitation operation, operation efficiency reduction, temperature rise increase.

I D	description	unit	least value	crest value	Windows default
12	Motor turn, dynamic inertia	Kg .m^2	1	3000	30
14	Empty motor, carrying current	%	0	50	25
16	Motor set, child resistance	%	0	25	0.1
17	Motor set, sub leakage feeling	%	0	50	16

If the above synchronous motor parameters are provided by the manufacturer, input the corresponding value; if not, they can be obtained by parameter identification.

Asynchronous open ring vector: parameter identification 1 is static motor identification, themotor and load do not need to be removed, and the motor stator resistance and stator leakage sense; the parameter identification 2 is dynamic identification, the inverter and load removal, that is equivalent to the no-load state, the motor inertia and the motor no-load current; the motor stator resistance is the unitary value.

Aynchronous machine: when the motor is running with no load or light load, the output power factor of the frequency converter is low. In order to avoid the overvoltage protection of the frequency converter, the step-down operation is usually adopted. When the start frequency is non-zero and the actual output current is less than the no-load current of the motor, the frequency converter automatically reduces the voltage output, and the minimum limit is the rated voltage of the motor Of 50%.

I D	description	unit	least value	crest value	Windows default
15	Primary-slave frequency difference value	H z	0	1.0	0.5
1-2	Master and from the setting		0	1	0
1-3	Master and slave mode		0	1	0

In the main-slave control situation, the main-slave frequency difference is used to balance the power output; for flexible connection, the maximum allowable value of the frequency difference is 1.0Hz and usually set to zero for rigid connection.

When the master-slave is set to 0-when the master-slave is invalid, the inverter runs alone; 1-When the master-slave is valid, the inverter allows the master-slave linkage operation.

Through the master and slave mode parameters, one inverter can be set as the host and the other as the slave; if two frequency converters are set as the dual linkage operation, one inverter can be set as the host and the other as the slave; do not set both as the host or both as the slave.

I D	description	unit	least value	crest value	Windows default
19	A magnetic flux given	p u	0.1	1.0	0.96

Aynchronous machine open ring vector: motor flux given, the default value is 0.96

I D	description	unit	least value	crest value	Windows default
20	acceleration time	sec	5	6000	30
21	deceleration time	sec	5	6000	50

Acceleration time refers to the time required for the frequency converter to accelerate from zero speed to the rated frequency of the motor, see t1 in Fig;

The deceleration time refers to the time required for the inverter to slow from the rated frequency of the motor to zero speed of the motor. see t2 in Fig.

Pay attention to!

The setting of fiel eleration and deceleration time shall consider the actual condition of the load. If the acceleration time is too short, the inverter will easily overflow; if deceleration

I D	description	unit	least value	Minimum value, and maximum value	Windows default
22	Speed ratio coefficient		0.5	20	5
23	Speed integration time	sec	0.1	20	3.0

Too short between, easy to lead to unit overpressure.

Vector control: the dynamic response characteristics of speed control can be improved by adjusting the speed ratio coefficient and speed integration time of the speed ring. Increasing the speed ratio coefficient and reducing the speed integration time can accelerate the dynamic response of the speed ring. However, the speed ratio coefficient is too large, or the speed integration time is too small may cause the system shock. The suggested adjustment method is as follows: if the default value cannot meet the requirements, fine- tune on the default value, first increase the proportion coefficient to ensure that the system does not shock; then reduce the integration time, so that the system has both fast response characteristics, overshoot and small.

Aynchronous machine general: asynchronous machine general belongs to the open ring control, sometimes in some low frequency band speed shock, while the motor current fluctuation, affect the reliability of the system operation, by adjusting the speed ratio system can effectively avoid shock. Note that the speed ratio coefficient is effective below 4 5 Hz, and the three- phase output waveform of the motor must be observed when adjusting.

I D	description	unit	least value	crest value	Windows default
24	The flux proportional coefficient		0.5	20	5
25	The magnetic flux integration time	s	0.1	20	2.0

For vector control, the dynamic response characteristics of magnetic flux control can be improved by adjusting the flux proportion coefficient of the flux ring and the flux integration time. The adjustment method is similar to the rotation speed ring.

I D	description	unit	least value	crest value	Windows default
26	Current ratio, the example coefficient		0.1	20	0.6
27	Current product, split in time	m s	0.1	50	10

Vector control: the dynamic response characteristics of the current ring can be improved by adjusting the current proportion coefficient and the current integration time. When adjusting this value in actual use, it is necessary to carefully observe the output current waveform. Inappropriate parameter setting will cause the output circuit waveform distortion.

VF controls the master- slave mode: adjusts the response characteristics of the master- slave power balance by adjusting the current proportional coefficient and current integration time. Inappropriate parameters can easily lead to the system.

I D	description	unit	least value	crest value	Windows default
28	Number of encoder pulses	p /r	512	65535	8192

For vector control and encoder installation, note that the number of encoder pulses must strictly correspond to the actual encoder.

I D	description	unit	least value	crest value	Windows default
29	Frequency searches for the current	p u	0.1	1.0	0.4

Aynchronous machine open ring vector: the start mode is set to the speed start, the frequency search mode is set to "positive search", "negative search" or "two-way search", this parameter is the search current during the frequency search, and the value is the percentage of the rated current of the motor.

I D	description	unit	least value	crest value	Windows default
30	Motor phase sequence 0: reverse, 1: forward		0	1	1

For synchronizing the machine vector and installing the encoder, that is, the selection of the inverter output phase sequence, UVW is positive order and UWV is negative order. This parameter generally does not require user setting and is automatically identified by the rotor positioning process of the synchronization machine. Wrong motor phase sequence setting will cause the frequency converter not to start properly.

I D	description	unit	least value	crest value	Windows default
31	Drop cut lock phase Angle	linear measure	0.5	5	5

For frequency converter with synchronous switching, the performance of synchronous switching is adjusted by setting the phase Angle.

The smaller the phase locking Angle, the smaller the difference between the power Angle and the output Angle of the inverter, the more accurate the phase locking, but the difficulty of phase locking, the smaller the impact current;

The larger the phase locking Angle, the greater the difference between the power Angle of the power grid and the output Angle of the inverter, but the worse the phase locking is, the easier the phase locking, and the greater the impact current.

I D	description	unit	least value	crest value	Windows default
32	Frequency converter type 1: asynchronous machine general 2: asynchronous machine vector 3: The synchronous machine is common 4: Synchronizer vector 5: asynchronous machine open ring vector 6: Synchronizer open ring vector		1	6	1

The control mode of the inverter can be changed by setting the inverter type.

For the load requirements are not high, or a master from the occasion, such as fan, pump load, usually choose asynchronous machine or synchronous machine general;

For high performance requirements, open loop vector control is usually selected; for high performance requirements and low frequency performance requirements, vector control is usually selected, namely closed loop vector or encoder vector.

I D	description	unit	least value	crest value	Windows default
33	Insient power outage time	m s	0	1000	0

When the frequency converter type is general asynchronous machine or asynchronous machine open ring vector, when the power grid voltage drops briefly, the frequency converter keeps normal operation for the maximum allowable time.

I D	description	unit	least value	crest value	Windows default
34	Cell series		2	9	5

Corresponding to the actual unit series of the frequency converter, set when the factory, generally without the user to change.

pay attention to! 

> This parameter must be accurate, or it may cause serious consequences!

I D	description	unit	least value	crest value	Windows default
37	Dead area, pay the time	u s	0	20	1

It is used to compensate for the dead area loss of power device, set when leaving the factory, generally without user change.

I D	description	unit	least value	crest value	Windows default
1-1	loadtype 0: Fan load 1: Pump load		0	1	0

When the speed is started, the excitation time can be adjusted according to the load type, and the fan load is greater than the pump load.

I D	description	unit	least value	crest value	Windows default
1-4	Unit bypass number 0: no 1:1		0	1	0
3-3	Bypass type 0: No bypass 1: Mechanical bypass 2: IGB T bypass		0	2	0

The bypass type of frequency converter is set according to the actual unit type, the default is 0-no bypass; the frequency converter with bypass function is selected according to the actual unit type, that is, mechanical bypass or IGBT bypass, usually changed by the user, the frequency converter conducts self-

check; if the contactor fails, the frequency converter reports "contactor fault".

When the unit bypass number is set to 0, the frequency converter has no bypass function;

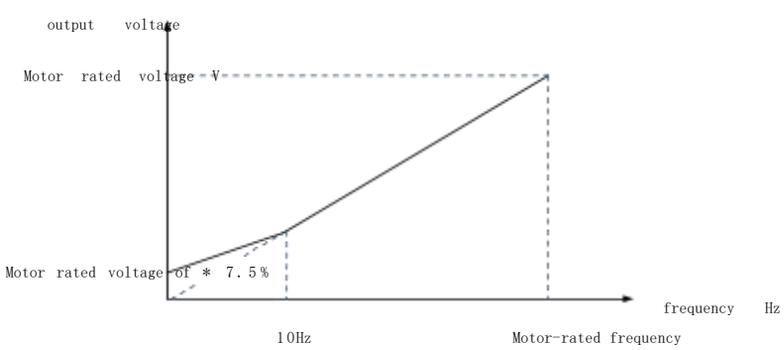
When set to 1, the bypass function of the unit is effective. If a hardware failure occurs in a unit during operation, the converter will automatically isolate the unit and maintain the bypass operation through the neutral drift function, the voltage output capacity of the converter is reduced, so as to reduce the frequency appropriately.

I D	description	unit	least value	crest value	Windows default
1-5	Recurrent ascension		0	15	0

The purpose of torqu e lifting is to compensate for the voltage drop consumed on the stator resistan ce of the motor during low - frequency operation, so as to improve the output torqu e of the moto r . Fo r the large torqu e load (such as compresso r, slurry machin e , belt conveyor , etc .) , the difficult starting proble m can be solved by setting this paramete r . T h e amplitude of the torqu e lifting shall be based on

The load situation is set appropriately, lifting too much, will produce a large current impact in the starting process.

Aynchronous machine general: the torque below 10Hz is effective, every 1 unit is equal to (rated voltage of motor * 0. 5%), when the torque is set to 1 5, corresponding The VF curve is as follows:



Synchronization machine general: the start process is DC orientation, current ring running to 5 Hz, switch to vf mode operation. Set the current unitary value of DC orientation and current ring operation (starting current unitary value) through the torque lifting, and the calculation formula of starting current unitary value is as follows:

Starting current (pu) = torque lifting value 0.1 motor current limiting coefficient

For example, torque lifting value = 10, motor current limiting coefficient = 100%, then start current (pu) = 1.0; if the motor rated current =61A, start current =61A.

Torque lifting value = 5, motor current limiting coefficient = 120%, start current (pu) =0.6; If the motor is rated current =61A, the start current = 36.6A.

Synchronizer common type, if the torque lifting value is set too small, the motor can not rotate is easy to lead to switching failure.

I D	description	unit	least value	crest value	Windows default
1-6	starting mode 0: Normal start 1: Speed start 2: Parameter identification 1 3: Parameter identification 2		0	3	0

Normal start: the frequency converter starts from the start frequency and accelerates to the target frequency. When the frequency converter type is common to the synchronous machine, the start is up to 5Hz; the start torque can be set according to the parameter-torque lift. Each unit is equal to 10% of the current limiting coefficient of the motor in 15, that is, 150% of the corresponding current limiting coefficient of the motor.

Speed start: the frequency converter starts in the rotating state of the motor. The frequency converter first tracks the speed of the motor, and then starts according to the tracked frequency of the motor, the rotating motor can be started without current shock. Suitable for large inertia load instantaneous power outage restart;

Parameter identification 1: frequency converter type is asynchronous machine open ring vector, used for parameter static identification;

Parameter identification 2: the frequency converter type is the asynchronous open ring vector, which is used for parameter dynamic identification.

I D	description	unit	least value	crest value	Windows default
1-7	Frequency search method 0: Residual pressure detection 1: Positive search 2: Negative search 3: Two-way search		0	3	0

When the speed starts, the frequency converter needs to track the speed of the motor first, and the default is 0-residual pressure detection;

Asynchronous machine open ring vector control: optional 0-residual pressure detection, 1-positive search, 2-negative search, 3-two-way search.

I D	description	unit	least value	crest value	Windows default
1-8	control mode 0: Debugging mode 1: Normal mode		0	1	0

Commissioning mode: the frequency converter has no high voltage state and is used for in-plant debugging;

Normal mode: the high voltage state on the frequency converter, used for the actual field.

I D	description	unit	least value	crest value	Windows default
1-9	Downtime method 0: Slow down 1: Free shutdown		0	1	0

Reducated shutdown: after receiving the deceleration time curve, block the output and standby frequency. In order to avoid the deceleration process, the inverter automatically judges the unit voltage during the deceleration process. If the unit voltage is too high, the inverter deceleration process is suspended, so the actual deceleration time may be greater than the set deceleration time; Free shutdown: the frequency converter immediately blocks the output after receiving the shutdown command, and the motor is stopped by uncontrolled inertia.

I D	description	unit	least value	crest value	Windows default
2-1	Overexcitation frequency	Hz	1	30	20
2-2	Overexcitation gain	%	0	30	0

In the site with large inertia, especially in the low frequency band, because the frequency converter is in the power generation mode, the output power is close to zero, prone to overvoltage failure. In order to solve the above problems, the motor is in the overexcitation state by adding the deceleration overexcitation function, which can suppress the continuous rise of the bus voltage and avoid the overvoltage fault of the frequency converter. The larger the excitation gain, the more obvious the inhibition effect, but too large is easy to lead to too large output current, which needs to be weighed in

the actual use process.

Overexcitation frequency: Overexcitation function frequency, the default value is 20 Hz.

5.2 Functional parameters

I D	The parameter name	Set the scope	Factory value	Change in run
1	Restore factory	0: Ban 1: allow	0	deny

This parameter is used to set whether the factory default value is allowed. The "Restore Factory Settings" button is valid for 1.

I D	The parameter name	Set the scope	Factory value	Change in run
2	Simulated given the drop line	0: Ban 1: allow	1	deny

Whether the given frequency is allowed to maintain the original given value after dropping the line, and the given mode is set to the simulation time valid;

Allow: maintain the given frequency after the drop; the given frequency changes to the lowest frequency; Prohibit: the given frequency becomes the lowest frequency after the drop.

I D	The parameter name	Set the scope	Factory value	Change in run
3	High voltage loss, electric speed is off	0: Ban 1: allow	0	deny

When the high voltage power loss occurs, the parameter is set to allow, and the frequency converter will report the high voltage power loss;

Set to prohibited, frequency converter will be standby, the state does not report heavy fault, show high voltage ready, operation time high voltage power loss (depending on setting the shielding delay time).

When the motor inversion operation is required, the touch screen function item "frequency converter inversion" should be set as allowed. Depending on how the frequency is given, it reverses The operation steps are different. the process is shown in Figure 5.21:

I D	The parameter name	Set the scope	Factory value	Change in run
4	High-voltage power loss from the start	0: Ban 1: allow	0	deny

- Local given or upper given: operate the touch screen or upper computer, set the frequency to a negative value, and the frequency converter can reverse the operation. If the control mode is set to remote control and the remote start-stop mode is set to level mode, the start-stop control is conducted through the interface board level positive start-stop signal.
- Simulation given or switch given: set the control mode to remote control, set the remote start and stop mode to level mode, and control the motor reverse start and stop through the interface board level reverse start and stop signal terminal.

I D	The parameter name	Set the scope	Factory value	Change in run
6	Power-frequency switching direction	0: Cut up to 1: cut down	0	yes

For the setting of remote start-stop trigger mode, the control mode is set to remote control.

Level mode: PLC-XS- 1 T-1 and 10 terminals are defined as positive start-stop; XS 1 T-1 and 9 terminals are reverse start-stop;

Pulse mode: PLC-X S 1T-1 and 10 terminals are defined as pulse start; XS 1T-1 and 9 terminals are pulse shutdown.

I D	The parameter name	Set the scope	Factory value	Change in run
8	Analog output 1	0: Output frequency 1: output current 2: Unit cabinet temperature 3: excitation current 4: Output power 5: Output power factor	0	deny

Set the custom analog output signal content for PLC-XS 18T-11 and M3 terminals.

I D	The parameter name	Set the scope	Factory value	Change in run
9	Analog output 2	0: Output frequency 1: output current 2: Unit cabinet temperature: 3: excitation current 4: Output power 5: Output power factor	1	deny

Set the content of custom analog output signal for PLC-XS 18T ~12 and M 4 terminals.

I D	The parameter name	Set the scope	Factory value	Change in run
10	Simulated feedback drops	0: Ban 1: allow	1	deny

Whether the given parameter is allowed to maintain the original given value after dropping the line, the given way is set to simulate the timing is valid.

Allowability: maintain the original given value of the given parameter after the drop line occurs;

Prohibited: the given parameter changes to 0 after the drop occurs.

I D	The parameter name	Set the scope	Factory value	Change in run
11	Remote set control mode	0: Ban 1: allow	0	deny

Whether the control mode of the frequency converter is allowed to be set remotely. When allowed, there are two control modes: local control (interface board remote control enable disconnection) and remote control (interface board remote control enable closure) .

I D	The parameter name	Set the scope	Factory value	Change in run
12	Switch to, to select	0: three speed 1: seven speed	0	yes

When the frequency converter is given by the switch, set the switch.

I D	The parameter name	Set the scope	Factory value	Change in run
13	Fan control	0: Stop 1: Start	0	yes

Selection of built- in fan of frequency converter.

I D	The parameter name	Set the scope	Factory value	Change in run
14	Light fault power	0: Ban 1: allow	0	yes

When the frequency converter has a light fault, whether the high voltage on the frequency converter is allowed to operate normally.

I D	The parameter name	Set the scope	Factory value	Change in run
15	Frequency conversion cut	0: Allow 1: prohibited	1	yes

Whether the " synchronous switching and cutting" function is allowed, that is, the mutual switching between power grid power frequency operation and frequency converter frequency modulation operation, see Section 6.1 for details.

I D	The parameter name	Set the scope	Factory value	Change in run
16	control method	0: Local control 1: Upper control 2: Remote control	0	yes

There are three control modes for setting the control mode:

● Local control: control the start and stop of the frequency converter through the button on the monitoring interface of the touch screen.

● Remote control: use the remote control signal to control the start and stop of the inverter through the remote level (or pulse) start- stop signal terminal of the interface board.

● Upper control: using the upper computer software, control the start and stop of the upper
computer communication.

I D	The parameter name	Set the scope	Factory value	Change in run
17	Given the way	0: Local given 1: analog given 2: switch given 3: upper given	0	yes

There are four given modes for the inverter frequency:

● Local given: the local given frequency of the touch screen function parameter interface through the numerical input given frequency.

● Simulation given: set the inverter frequency by simulating the given signal through the interface board . The input current signal (4 ~ 20 mA) can be adjusted by the touch screen parameters "Minimum given Current" and "Maximum given Current". Under open - loop control, simulating a given signal corresponds to 0Hz ~ highest frequency, and under closed - loop control,Simulated a given signal corresponds to 0% ~100%. The correspondence of a given value to the frequency is shown in Figure Figure 5.22.

● Switch given: set the given frequency of the inverter through the 3-gear switch volume signal (1 ~ 3 for the switch), only effective under the open loop operation (invalid during the closed loop operation). W hen no switch is closed, the given frequency is the lowest frequency; when the multigear switch is closed, the given frequency is the most advanced given, given
value and frequency
The correspondence of the rates is shown in Figure Figure 5.23.

● Upper given: set the given frequency (or given parameter) through the upper computer communication.

mode selection	switch selection			The frequency given		
	Switch 3 #	Switch 2 #	Switch 1 #	Frequency f3	Frequency f2	Frequency f1
Three speed	001			f1		
	010			f2		
	100			f3		
Seven sections of speed	001			f1		
	010			(2* f 1 + f 2)/3		
	011			(2* f 2 + f 1)/3		
	100			f2		
	101			(2* f 2 + f 3)/3		
	110			(2* f 3 + f 2)/3		
	111			f3		

I D	The parameter name	Set the scope	Factory value	Change in run
18	run mode	0: Open loop operation 1: Closed loop operation	0	yes

There are two operating modes of the frequency converter:

- Open-ring operation: the operating frequency of the frequency converter is directly given by the user.
- Closed- loop operation: the operating frequency of the frequency converter is generated by adjusting the actual value of the controlled amount (such as pressure and temperature) and the user set value.

I D	The parameter name	Set the scope	Factory value	Change in run
19	cooling-down method	0: Air cooling 1: Water cooling	0	yes

When the temperature of frequency converter cabinet is too high, set the heat dissipation mode of frequency converter.

I D	The parameter name	Set the scope	Factory value	Change in run
20	Motor parameter group selection	Group 0: Group 1: Group 1: Group 2 Group 3: Group 3: Group 4: Group 4	0	deny

When the frequency converter drags multiple motors one time, the selection of motor parameters can only be four groups at most.

I D	The parameter name	Set the scope	Factory value	Change in run
21	Communication mode	0 : Modbu s 1: Profibus-DP	0	deny

When the frequency converter conducts upper communication, you can choose 0: Modbus or 1: P rofibus- DP communication.

I D	The parameter name	Set the scope	Factory value	Change in run
23	Baud rate	0：1200 1：2400 2：4800 3：9600 4：19200 5：38400	3	yes

When the frequency converter conducts Modbus upper communication, the selection of Modbus communication wave rate, the default is 9600.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
24	A given frequency resolution	0.00~1.00	Hz	0.01	yes

Resolution for the given frequency values, the default value is 0.01Hz.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
25	Jump frequency: 1L	0.00~80.00	Hz	51.00	yes
26	Jump frequency is 1U	0.00~80.00	Hz	51.00	yes
27	Jump frequency of 2L	0.00~80.00	Hz	51.00	yes
28	Jump frequency is 2U	0.00~80.00	Hz	51.00	yes

The jump frequency is set to avoid the inherent resonance points of the mechanical system, and the frequency jump range of the inverter should be set. There are two points in the jump frequency.

Unless in the process of addition and deceleration, the system automatically adjusts the running frequency when the set frequency is in the upper limit of the jump frequency. In order to determine the jump frequency area, two parameters should be set for each jump frequency point, namely the upper frequency U and the lower frequency L. In the same jump area, the upper frequency value must be greater than the lower frequency value; if there are two jump frequency points, the jump frequency 2 must be greater than the jump frequency 1, as shown in Figure 5.24:

The correction coefficient for the input voltage value. If the measured input voltage is less than the true value, the value should be increased, vice not.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
29	Input electricity, voltage coefficient	50~200		100	yes

I D	The parameter name	Set the scope	unit	Factory value	Change in run
30	Maximum, given the electric current	10.00~25.00	mA	20	yes
31	Minimum, given the current current	0.00~8.00	mA	4	yes

I D	The parameter name	Set the scope	unit	Factory value	Change in run
32	Switch given 1	0.00~80.00	H z	10	yes
33	Switch given 2	0.00~80.00	H z	20	yes
34	Switch given 3	0.00~80.00	H z	30	yes

Switswitch timing, speed 1, speed 2, speed 3 closed corresponds to different given frequency values.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
35	Lost power screen, blind time	1~100	S	1	deny

When high voltage loss occurs and the delay time of shielding high voltage loss fault is set to 100s, it is equivalent to infinity (unlimited).

I D	The parameter name	Set the scope	unit	Factory value	Change in run
36	Maximum feedback current	10.00~25.00	mA	20	yes
37	Minimum feedback current	0.00~8.00	mA	4	yes

When simulating feedback, the maximum value of the field feedback current signal corresponds to 100% of the feedback amount.

The minimum value of the field feedback current signal, corresponding to 0% of the feedback amount.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
38	Process closed-loop proportional coefficient	0.5~20.00		10	deny
39	Process closed-loop integration time	0.01~20.00	M in	10.00	deny
40	Process closed-loop differential time	0.00~20.00	M in	10.00	deny

The operation mode is when the closed-loop operation, P controls the proportional coefficient, I controls the integration time, and D controls the setting of differential time.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
41	Timed dust removal time	15~3000	D ay	0	yes

The ventilation screen cleaning is set as a reminder, and this parameter is valid.

I D	The parameter name	Set the scope	unit	Factory value	Change in run
42	Ventiator stop time	0~30	M in	0	yes

After the frequency converter stops running, allow the ventilator to continue to run for heat dissipation of the cabinet.

I D	The parameter name	Set the scope	Factory value	Change in run
43	Selection of critical fault of cabinet	0: Light fault 1: Heavy fault	0	yes

When the cabinet door fails, the alarm type can be set as light fault and heavy fault. Light fault does not affect the normal operation, and heavy fault will lead to direct shutdown.

I D	The parameter name	Set the scope	Factory value	Change in run
44	Clean the ventilation filter screen	0: No reminder 1: Reminder	0	yes

When the ventilation filter has too much dust, choose whether to set an alarm reminder for the ventilation filter cleaning.

Functional

This chapter describes some of the more complex applications and features of the general high voltage frequency converter.

6.1 synchronous switching

Using synchronous switching technology, the inverter can be used to soft start and control multiple motors . Synchronous switching is divided into frequency power switching(upper cutting) and power frequency switching(C ut) Both operations .

Frequency switching refers to switching the motor from the frequency conversion drive to the operation state of the power grid, and then separating the motor from the frequency converter. After the frequency converter gets the switching instruction, the frequency converter detects the frequency of the power grid on the input side and takes the frequency as the output speed instruction to achieve the frequency matching. After the frequency matching of the input and output, the phase matching is performed by using the grid phase information measured by the input side phase locking loop and the output phase information measured by the output side phase locking loop. When the output voltage frequency, amplitude and phase of the frequency converter are consistent with the power grid, the touch screen shows the phase locking successfully and can be switched. After successful switching, the converter output contactor is disconnected and the converter is stopped freely. In order to adapt to different working conditions, add the switching lock phase angle parameter to the range of 0.5° to 5° .
Power frequency switching refers to the separation of the motor of the grid from the grid and then switching to the operation state of frequency conversion drive. When the motor is running at power frequency, the frequency converter first runs no- load and tracks the power grid to phase lock. After connecting to the grid, the motor is cut out from the power frequency and put into frequency conversion operation.

Before trying to synchronous pitch, need to check whether the system parameters set reasonable and meet the requirements, must prohibit the command or function that may lead to pitch failure, such as speed curve, speed limit, the given way may change the output frequency of the inverter during synchronous switching, leading to pitch failure.
When using the synchronous casting and cutting function, it is necessary to equip the synchronous casting and cutting cabinet, reactor cabinet and synchronous casting and cutting sampling board. See Synchronization for details

Cutting Manual.

6.2, rotational speed start

When the motor is in the rotating state, the speed starting function allows the frequency converter to determine the motor speed, the same frequency of the frequency converter output and the rotation frequency of the motor voltage, so that the start of the inverter minimum impact on the motor.

When [shutdown mode] is set to free shutdown and [startup mode] is set to rotational speed start, the frequency converter always detects the rotation speed of the motor before starting. Once receiving the start command, the frequency converter immediately output the frequency corresponding to the rotation speed, and conducts acceleration and deceleration on this basis to reach the given frequency operation.

6.3 Instantaneous power outage function

In the actual operation of the site, the power grid will often be unstable. When the frequency converter detects the grid voltage sag, it is equivalent to charging the grid side. Within [instantaneous power outage time], the frequency converter operates normally; if the power grid is not restored after [instantaneous power outage time], the state at this time Switching refer see 6.4.

6.4 High-voltage power loss treatment

When the grid voltage drop exceeds [instantaneous outage time], the state at this time is called high voltage loss. By setting the parameters [high voltage power loss], [high voltage power loss], the user can choose whether the frequency converter will report heavy fault during high voltage power loss, and whether the frequency converter will automatically operate when the call is restored.

The high voltage power loss state machine is shown in the figure above. According to different parameter settings, the transformer status is shown in the following table:

order number	High-voltage state before power loss	parameter	condition	bear fruit
1	Standby, running	[High voltage power loss] = allowed		High voltage power loss weight fault
2	await the opportune moment	[High voltage loss off] = prohibited	Return to high pressure within 10 seconds	await the opportune moment
3	await the opportune moment	[High voltage loss off] = prohibited	The high pressure was not restored within 10 seconds	High pressure is not ready
4	move	[High voltage power loss] = prohibited [power loss from start] = prohibited	Return to high pressure within 10 seconds	await the opportune moment
5	move	[High voltage power loss] = Prohibited [power loss from start] = allowed	Return to high pressure within 10 seconds	move
6	move	[High voltage power loss] = prohibited [power loss from start] = prohibited	The high pressure was not restored within 10 seconds	High voltage power loss weight fault

6.5 System Bypass Function (selection)

When the frequency converter fails and the normal operation of the motor cannot be guaranteed, and the field working conditions do not allow the shutdown, the optional bypass cabinet can realize the system bypass function, and the motor is put into the power frequency power grid operation.

Bypass cabinets are divided into manual and automatic two kinds. When the system can be stopped temporarily, the manual bypass cabinet is switched by the operator; when the system requires no shutdown, it is recommended to use the automatic bypass cabinet, and the switching process shall be automatically realized. After the power frequency operation of the motor, the frequency converter can be isolated from the high voltage power supply to facilitate the maintenance and repair of the inverter.

6.6 Master and slave controls

The master and slave control is designed for multi- transmission application conditions. The system is driven by two or more high voltage frequency converters, and the motor shaft is coupled through a coupling, chain, gear or conveyor belt. Through the master- slave control function, the load can be evenly distributed between the individual motors.

When applying master and slave control, the system parameters [master and slave setting] should be set as valid, [master and slave mode] host set as master mode and slave set as slave mode. Optical fiber communication is used between the host machine and the slave machine. The main opportunity transmits the information of operation, speed and torque to the slave machine in real time, and the slave machine will respond to the data instructions transmitted by the host according to its own measured data.

6.7 Motor overload protection function

In order to prevent the motor from damaging the motor in the overloaded overcurrent state for the long time, HIVT high voltage inverter protects the motor according to the thermal overload model of the motor. The specific motor overload reverse time protection expression is as follows:

$$\int_0^t \left[\left(\frac{I}{I_N} \right)^2 - 1 \right] dt \geq k$$

amongI_NFor the motor- rated current, Is the motor current, t is the intime overcurrent protection time, kSet the value for the protection constant. By the expression

It can be seen that when the motor current exceeds the rated current, the reverse time limit protection function will be started, and the larger the motor current, the shorter the protection action time. The reverse time limit protection diagram is shown in the figure below:

Inverse time limit protection is an integral process. The larger the overcurrent multiple of the motor, the larger the integration step, and the shorter the continuous running time of the frequency converter. For quantitative explanation, assuming that the output current of the converter is constant at a certain overload multiple of the motor, the converter will continue to run for the corresponding time until the corresponding fault is reported.

Motor overload ratio and duration of HIVT

overload multiples	D uration (seconds)
110%	251
120%	120
130%	76
140%	55
150%	42
200%	18

6.8 frequency converter stall prevention function

If the given acceleration or deceleration time of the converter is too short, the change of the output frequency of the converter far exceeds the change of the motor speed, the converter will trip due to overcurrent or overvoltage, this phenomenon is called stall. In order to prevent stall and make the motor run stably, it is necessary to detect the size of the current and unit voltage to conduct frequency control and appropriately inhibit the acceleration and deceleration rate.

When the inverter has a large current in the process of acceleration and deceleration, if the current exceeds the preset overcurrent adjustment point (that is, the maximum allowable value of the acceleration current) , the output frequency of the inverter will no longer change, and the acceleration and deceleration will be postponed, and the current will continue to increase and deceleration after the current drops below the overcurrent recovery point. As shown in the figure below:

When the frequency converter is slowing down, if the load inertia is too large or the deceleration time is too short, it will cause the rise of the DC bus voltage, which may lead to the unit overvoltage protection action. In order to avoid this situation, the frequency converter will detect the unit bus voltage in real time. When it exceeds the unit overvoltage adjustment point, stop the deceleration process, and then slow the unit bus voltage is lower than the overvoltage regulating point, as shown in the figure below:

9.6 Mechanical bypass and neutral point drift

6.9.1 Mechanical bypass

Each phase unit of the high voltage frequency converter is connected in series. When one or several units of the frequency converter fail, in order not to completely stop the customer on site, bypass operation is usually adopted to maintain the site production.

The universal high voltage inverter mechanical bypass unit achieves the bypass function by adding a contactor to the output end. When the inverter detects a unit occurrence

In a fault, immediately block all IGBT outputs and simultaneously issue bypass instructions to close the corresponding contactor, thus separating the unit from the output circuit, restart the frequency converter, and downgrade the operation.

Mechanical bypass can bypass almost any fault type, including fiber failure, rather than limited to the power semiconductor device failure.

6.9.2 Neutral point drift

The faulty unit bypass will not affect the current output capacity of the frequency converter, but its voltage output capacity will decrease. In the traditional peer bypass mode, when a unit fails, in order to maintain the balance of three-phase output, the bypass mode of one unit per phase is adopted, so the voltage output capacity is greatly reduced.

The general high voltage frequency converter follows the neutral point drift mode. When a unit fails, only the unit and other units operate normally to maximize the voltage output capacity.

Figure 6.5 shows the schematic diagram of level 5 high voltage frequency converter, each phase is composed of 5 power units. At this time, all units are normal and no fault occurs, so the voltage Angle of A, B and C is 120°. In the figure, taking phase A as an example, A1 refers to the first stage unit of phase A, A2 refers to the second stage unit of phase A, and so on.

When one unit of the inverter phase A fails and is bypassed, only four units remain to operate normally, and the output voltage will become unbalanced, as shown in Figure 6.6.this

The output phase voltage of phase A is significantly reduced, and the output line voltage is no longer balanced.

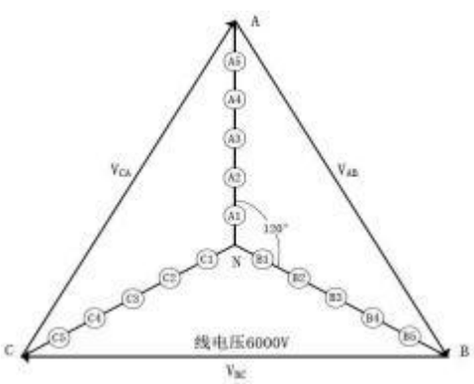


Figure 6.5 No-bypass schematic diagram of level 5 frequency converter

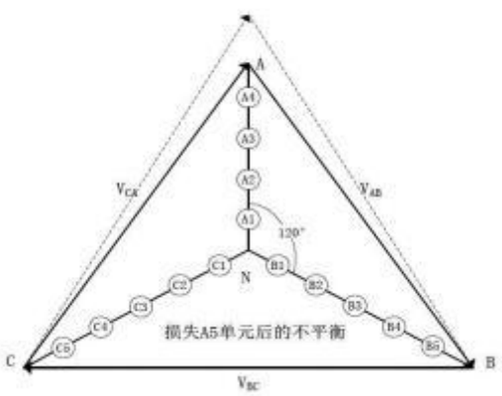


Figure 6.6 Unit bypass diagram of A 5

The neutral point drift algorithm was used, as shown in Figure Figure 6.7. The premise of this method is that the neutral point of the unit is floating and is not connected to the neutral point of the motor, so the neutral point of the output voltage of the frequency converter can deviate from

the neutral point of the motor. We can change the balance of the output line voltage by adjusting the phase angle of the output phase voltage. Therefore, although the number of units working in each phase is different, and the output phase voltage is unbalanced, the balanced line voltage can be obtained, and the motor can operate normally. This approach is equivalent to the injection of unbalanced zero- order components in the modulation waveform during PWM modulation. The 14 units in the figure are still operating normally and can provide an output voltage equivalent to 92.9% of the nominal output voltage. As can be seen in the figure, the phase angle of the output phase voltage is properly adjusted for the phase of phase A and phase B (phase C)
The difference of 126.4° is not the usual 120°, but it is the phase difference between such phase voltages that produces a balanced line voltage output.

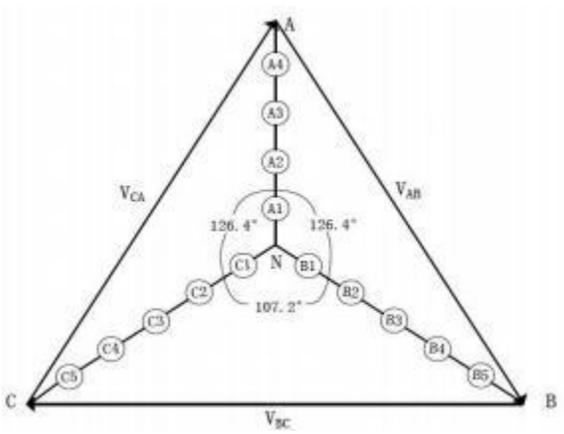


Figure 6.7 Neutral point drift, output schematic diagram

6.10 Aring vector

Asynchronous open-loop vector control is suitable for most single induction motor applications. In this way, the frequency converter estimates according to the measured voltage and current, the slip difference, magnetic flux, synchronization *i*Angle and other parameters according to the motor model, to realize the magnetic flux and speed closed-loop control, which can provide the performance close to the band coding vector control.

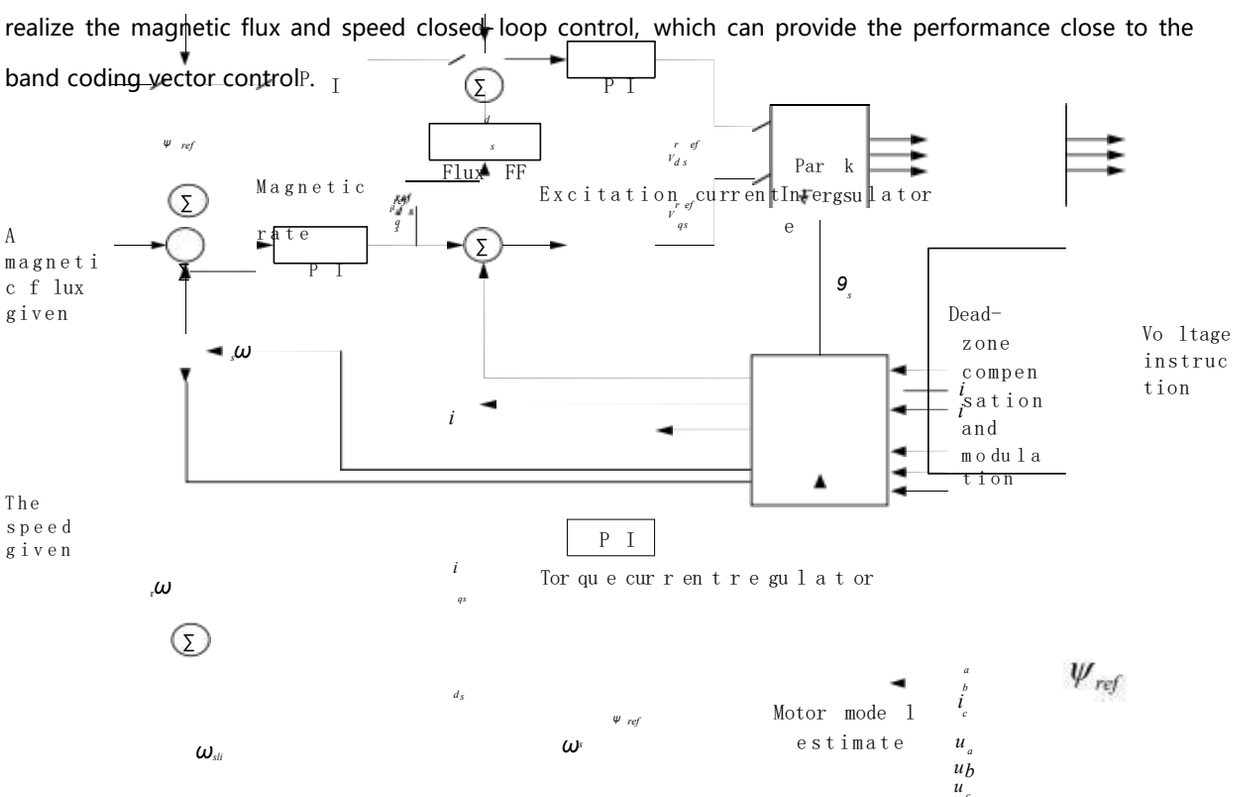


Figure 6.8 Block diagram of open-loop vector control of asynchronous machine

As shown in Figure 6.8, according to the measured stator current, voltage. The magnetic flux is estimated fast, Synchronizing with the electrical angle of 9_sWith slip difference ω_{slip}。

stator current i_a 、 ibi_c Follow the synchronous electrical angle 9_sCoordinate transformation yields the magnetic flux current i under the synchronous coordinate systemd_s, Torque current$i_{q\ s}$。

The flux regulator adjusts PI according to the given and difference to generate the excitation current given ψ_{ref} $i_d^{ref}{}_s$, The excitation current regulator gives the i according to the excitation current $i_d^{ref}{}_s$ PI adjusts the difference with the flux current ids to generate the d-axis voltage output V_{ds}^{ref}。

The speed regulator is given by the $_{rqs}$peed according to the actual speedω The difference is PI adjusted to generate a torque current given i^{ref}, Torque current regulator according to the torque Current given the $i_q^{ref}{}_s$With the torque current i_{qs}The difference was adjusted by PI to generate the q-axis voltage output V_{qs}^{ref} 。

The dq axis voltage output VV according to the synchronization angle$_{ds}^{ref}$ $_{qs}^{ref}$$9_s$Coordinate transformation and dead zone compensation modulation to obtain the voltage output instruction.

7.1 Transportation and storage requirements

General high voltage inverter can be transported by cars, trains, ships and other vehicles. In addition, the frequency converter shall be stored in the room with air circulation, temperature of-25℃ ~55℃ and maximum relative humidity of air not exceeding 95%; avoid direct sunlight from flooding, rain and corrosion.

● General high voltage frequency converter in the transportation process is strictly prohibited to rain, exposure, no violent vibration, impact and inversion. ● When choosing the transportation means and path, please consider whether there are limited and high factors in the transportation process.

● The load-bearing capacity of the automobile and other transport vehicles should be greater than the actual weight of the general high voltage frequency converter.

.27 Inspection of goods

- Confirm whether the inverter outer package is in good condition;
- Check whether the appearance of the inverter is damaged after unpacking;
- Check the delivery list and confirm that the equipment is complete and correct specifications.

If the frequency converter is damaged or damaged, please refuse to sign for it, and immediately contact Beijing Shente Innovation Technology Co., Ltd. for confirmation!

7.3 Hit unloading

When unloading and installing is in place, the general HV inverter can be transported in the following three ways: ● crane

- chain block
- contact roller

When using a crane or a hand gourd, confirm:

- Weight bearing is within the allowable range of the crane or hand pull gourd;
- The wire rope must be long enough, and the strength of the rope must support the weight of the equipment;
- Wwire rope is not to directly through the lifting hole and wire rope with safety hook must be used.

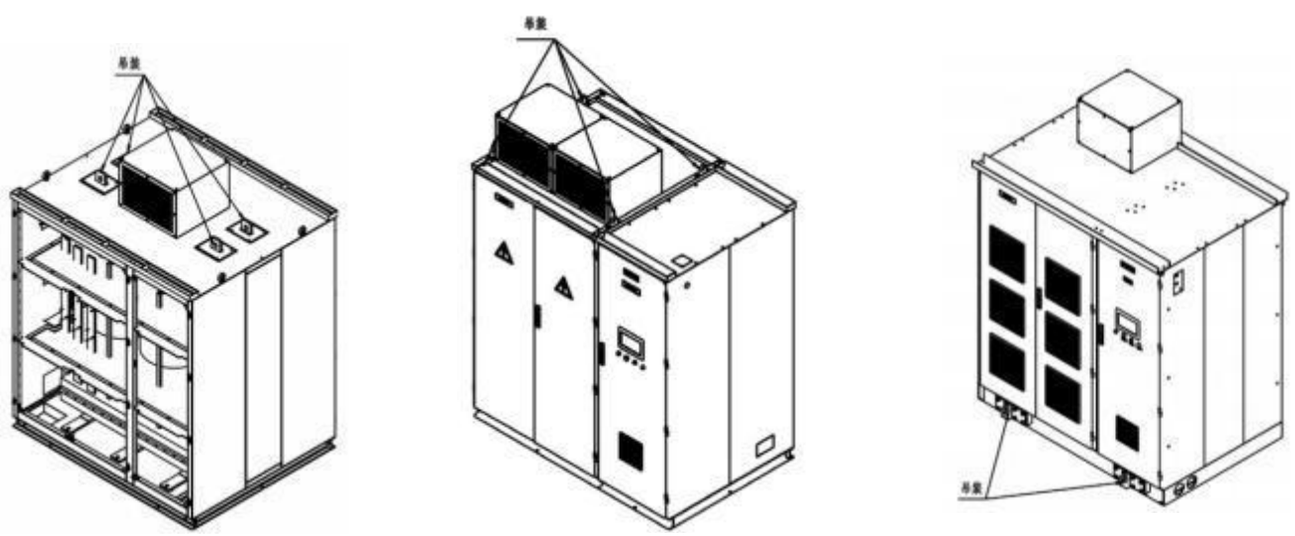
Roller is suitable for small space without the above equipment: put the roller side by side on the floor and place

the cabinet on it; cooperate with the crowbar and cycle

Move the roller and carry it in place.

pay attention to!

- When using crane, hand pull gourd and roller for handling, avoid damaging the surface of the cabinet; the lifting rope shall not touch the fan.
- When hoisting any cabinet body, four hanging rings must be used simultaneously.
- When lifting the unit cabinet, the Angle of the cabinet deformation between the lifting rope and the cabinet shall not be less than 60°.
- When hoisting the transformer cabinet, except for the packaging identification and special instructions on the location of the drawing, the flat steel part of the transformer itself should be hoisted, and the transformer cabinet body cannot be hoisted (see Figure 7.1). If there are many fans installed on the top of the transformer cabinet, the fan must be removed when lifting the transformer, and it should be restored as is after lifting.
- Must be careful when operating in the transformer cabinet. It is strictly prohibited to touch the transformer coil with hard objects to prevent foreign objects from falling into the transformer. At the same time, when hoisting the transformer, the lifting Angle should consider the position of the cover plate of the cabinet top and the fan, and the fan or cover plate cannot be deformed.
- The cabinet should be placed on the flat ground. The metal shell of the frequency converter may be deformed, making the door misplaced and cannot be switched normally.
- It is strictly prohibited to stand under the lifting equipment when the cabinet is lifted, loading and unloading; when the cabinet slopes during the lifting process.



Hoisting on the transformer cabinet　　Unit cabinet, upper hoisting　　Unit cabinet, lower hoisting

Fig. 7.1 Lifting diagram of the cabinet body

7.4 Installation and emplacement

In order to provide the stable and reliable operation, the installation environment of the frequency converter is required as follows:

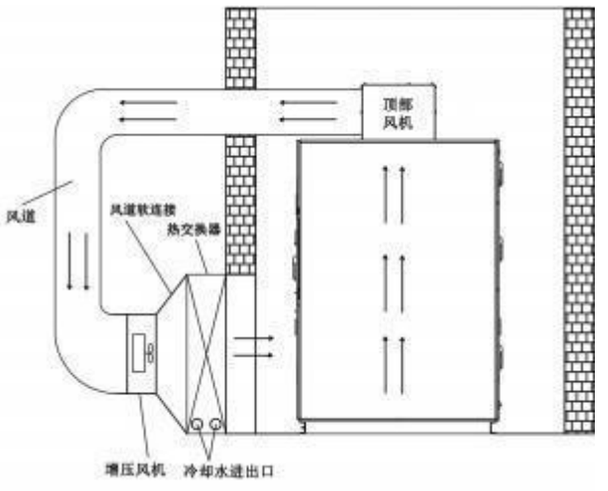
- The equipment shall be installed in a room without corrosive gas, flammable gas, conductive dust, dripping water, salt and lampblack.

- The ambient temperature shall be within the range of-5℃ ~45℃ . If the environment exceeds the allowable value, a safe and reliable temperature regulating device shall be installed.
- The equipment site shall be equipped with protective measures to prevent the invasion of small animals such as snakes and rats, and the equipment damage caused by the invasion of such animals shall be strictly avoided.

In order to ensure the smooth cooling air road (see Figure 7.3 and 7.4 for the cooling air road) and facilitate the operation and maintenance, some space must be left for the frequency converter during installation:

As shown in Figure 7.2:

For the occasions with high ambient temperature or poor ventilation, it is necessary to increase the circulating fan or the industrial air conditioning with the corresponding refrigeration capacity. In order to further reduce the ambient temperature of the inverter, the user can install a centralized ventilation air duct, pass the hot air through the centrifugal fan, and directly to the outdoor through the air duct. The centralized air duct outside the cabinet is directly connected to the cooling fan on the cabinet top, as shown in Figure 7.5.



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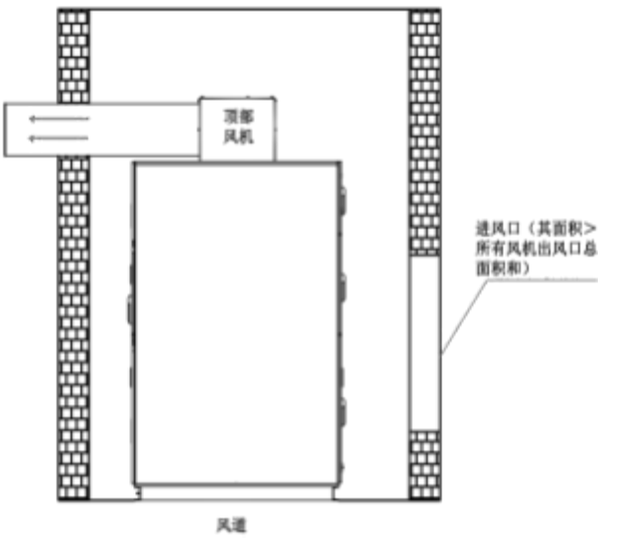

Air water cooling map

Fault handling and maintenance

Universal high voltage frequency converter has perfect fault monitoring and protection function. Fults are divided into two categories: light fault and heavy fault. Light fault: only alarm, the system can normally power up, start and run; heavy fault: the system immediately cut off the high voltage power supply, save the fault information, and latch the system status.

Before seeking the service, users can first conduct self-examination according to the fault name and the prompts in this section, analyze the cause of the fault, and find out the solution. Seek clothing Service, with the agent of your frequency converter or directly contact Beijing Shente Innovation Technology Co., LTD.

8.1 Light fault and alarm

In the light fault, the system sends an alarm signal (the system does not remember the light fault, only makes the fault indication), the fault indicator flashes, and the alarm is automatically cancelled after the fault disappears. When the light fault alarm on the inverter in operation, the system will not stop; when the light fault occurs before the high voltage on the inverter, the power option can be set through the light fault on the touch screen: select the allowed, the upper inverter power cabinet can be closed, and the power cabinet on the inverter is prohibited.

Light faults include:

- Light fault of the transformer cabinet door
- Unit cabinet door alarm
- The excitation difference is too large
- Fan fault alarm
- Simulation given the drop line
- Water-cooling failure
- Fan fault
- Unit bypass
- Please clean the ventilation filter screen
- Fan power loss
- Motor overload
- Transformer heat exchanger leaks
- Transformer overheating alarm
- The Touch screen is not communicating
- Unit cabinet of overheating alarm

8.2 Heavy fault and alarm

Heavy fault alarm is divided into system heavy fault and unit heavy fault. When the heavy fault alarm, the system sends out the alarm signal and fault indication, and gives the high voltage break command (the high voltage power supply of the frequency converter incoming line will automatically break off). In addition, remember the fault indication and high voltage breaking instruction —— Even if

order number	Detection items		Check the key points
1	Inverters and auxiliary equipment	switch cabinet	Whether the primary inlet power supply L1, L2, L3 voltage is normal and whether the circuit breaker is closed
		Bypass cabinet	Whether the charged display device is indicated Whether the high-pressure vacuum contactor is closed
		A line	Whether the wiring from the switch cabinet to the bypass cabinet is correct Whether the connecting line from the bypass cabinet to the frequency converter is correct
		Interlock wiring and control power supply	Whether the power supply of the bypass control cabinet is normal Whether the closing allowable and high voltage switch interlock wiring is correct
2		frequency transformer	Whether the primary wiring from transformer cabinet to unit cabinet is correct Whether the parameters of the frequency converter are set correctly Whether the inverter status shows that the high voltage is not ready Whether the fault indicator light is always on, and whether there is a heavy fault signal output
3			

8.3.2, List of light fault information

order number	Fault name	Protection value	Failure original, due to investigation	Fault, the countermeasures
1	Transformer overtemperature alarm	100℃	1. Wrong setting of temperature protection value 2, the platinum thermal resistance value is abnormal 3. The fan on the cabinet top and cabinet bottom is not running 4, frequency converter long time overload operation The environment, the temperature is too high	1. Check whether the temperature setting and protection value is correct 2. Check whether the platinum thermal resistance is damaged 3. Check whether the circuit breaker, contactor and thermal relay are working normally 4. Observe the temperature of the transformer after reducing the load 5, control the ambient temperature, increase the air conditioning refrigeration
2	Over-temperature alarm of the unit cabinet	55℃	1. Unit cabinet, and the fan is not running 2, the filter screen blockage 3. The frequency converter overruns for a long time 4, the ambient temperature is too high	1. Check whether the circuit breaker, contactor and thermal relay are working normally 2. Use A 4 paper to test whether it adsorbs to the air inlet 3. Observe the temperature of the touch screen after reducing the load 4, control the ambient temperature, increase the air conditioning refrigeration
3	Door interlocking alarm		1. The travel switch and the cabinet door top touch parts are not compacted 2, the travel switch secondary line open circuit 3. The interface board IO port relay is damaged	1. Check whether the travel switch is in good contact 2. Check whether the secondary wiring is correct and measure the secondary wiring 3. Seek technical support
4	Simulated given the drop line		1, analog quantity, signal line open circuit 2. The current source is not supplied	1. Check whether the analog signal wiring is correct and whether the measurement is broken 2. Check whether the current source works normally
5	Simulated feedback drops		1, analog quantity, signal line open circuit 2. The current source is not supplied	1. Check whether the analog signal wiring is correct and whether the measurement is broken 2. Check whether the current source works normally
6	Touch screen does not communicate		1. The communication network cable is disconnected 2. Poor contact 3. Touch screen port is damaged	1. Check the network cable disconnection 2. Check whether the network cable is plugged in and is in place 3. Seek technical support
7	The fan power loss		1. Fan power supply circuit breaker, contactor and thermal relay are not closed 2, the fan thermal relay protection trip 3. Fan auxiliary contact is open	1. Check whether the circuit breaker, contactor and thermal relay are working normally 2. Whether the protection value of the thermal relay is set is too small, and adjust the protection value 3. Seek technical support

8	Fan failure		1. Wrong wiring at the fan fault point 2. The internal auxiliary contact of the fan is disconnected	1. Check whether the fault signal line connection of the fan is correct 2. Measure the connection and disconnection of the fan auxiliary contact
9	Clean the ventilation filter screen	remind	1. The alarm value of the ventilation filter screen is not appropriate 2. Dust net is blocked	1. Check whether the alarm protection value of the ventilation filter is appropriate 2. Replace the dust filter
10	Motor overload		1. Motor current reaches the protection value 2. The acceleration time is short 3. The deceleration time is short 4. Wrong parameter setting 5, motor, mechanical blocking rotation 6. The input power supply is too low 7, the frequency converter selection is small	1. Check whether the frequency converter is under overload operation, reduce the load and observe the output current 2. Extend the acceleration time 3. Extend the deceleration time 4. Check whether the rated current value of the motor is set correctly 5. Change the motor or remove the mechanical faults 6. Check whether the voltage value of the bus net is within the allowable range 7. Select the matching frequency converter according to the load characteristics

order number	Fault name	Protection value	Failure original, due to investigation	Fault, the countermeasures
11	The controller does not communicate		1. Communication line connection is wrong 2. The power supply of the interface board is abnormal 3. The power supply of the controller is abnormal 4, the master control board program version does not match 5. The main control board is damaged	1. Check whether the internal wiring is correct 2, the end direction of the communication line, and whether the contact is firm with the connection 3. Measure whether the voltage of the power supply board is within the allowable range 4. Seek technical support 5, seek, technical support
12	Unit bypass		1. Fuse fault 2. IGB T fault 3. Optical fiber failure 4. Contactor fault 5. Unit, overheating fault 6. Excessive dust on the circuit board leads to the false positive failure of the unit module	1. Seek technical support 2. Seek technical support 3. Seek technical support 4. Seek technical support 5, seek, technical support 6. Remove the dust inside the circuit board and the unit module
13	Water cooling failure		1. Too high temperature 2. Too high electrical conductivity 3. Water level is too low 4. Error wiring	1. Check whether the parameter setting is correct and whether the external circulating water is turned on 2. Check whether the conductivity value exceeds the set value and open the internal water for deion process 3. Check whether the water level is too low 4. Check whether the secondary line is correct
14	Excitation difference, excessive value	≥ 10%	1. Wrong parameter set 2. The deviation between the given current and the feedback current value of the excitation cabinet is more than 10%	1. Check whether the excitation interface parameters are set correctly 2. Check whether the current deviation value is within the allowable range
15	Transformer heat exchanger is leaking		1. Heat exchanger leaks	1. Seek technical support

8.3.3 List of heavy fault information

order number	Fault name	Protection value	Failure original, due to investigation	Fault, the countermeasures
1	Motor overflow	110% - 150%	1. Wrong parameter set 2, the motor or auxiliary mechanical blocking rotation 3. The input power supply is too low	1. Check whether the motor current parameters are set correctly 2. Change the motor or remove the mechanical faults 3. Check whether the voltage value of the bus net is within the allowable range

2	Frequency converter overflow	150%	1. Load mutation 2. Wrong parameter setting 3. The main loop wiring is wrong 4. The control mode is the open ring vector of asynchronous machine and no parameter identification 5. The control mode is the wiring error of the asynchronous machine vector encoder 6. The control mode is the wrong wiring of the synchronous machine vector encoder 7. The main loop connecting line is empty 8, the output voltage detection plate diode is damaged 9. Output current oscillation 10. Motor insulation is damaged 11. The Hall sensor wiring is wrong 12. Short deceleration time 13. Short acceleration time 14. The unit work is abnormal 15, motor or auxiliary mechanical blocking rotation	1. Find out the cause of the load mutation and eliminate the fault 2. The signal board current module is consistent with the parameter setting 3. Check whether the output circuit wiring is correct 4. Determine the motor parameters according to the correct order of parameter identification 5. Check whether the signal line connection of the encoder is correct 6. Check whether the signal line of the encoder is correctly connected 7. Check whether there is poor contact with peripheral cables and bronze medals 8. Seek technical support 9. Adjust the rotation speed ratio parameter to optimize the output current waveform 10. Measure whether the insulation of the connecting cables and the motor winding is within the allowable range 11. Check whether the Hall sensor wiring is correct and whether the measured Hall sensor voltage is within the allowable range 12. Extend the deceleration time 13. Extend the acceleration time 14. Seek technical support 15. Change the motor or remove the mechanical faults

order number	Fault name	Protection value	Failure original, due to investigation	Fault, the countermeasures
2	Frequency converter overflow	150%	16. The startup frequency is set as too high 17. The torque lifting is set up too large 18, the output side power factor correction capacitor or surge absorption device wiring error 19, the frequency converter selection is small	16. Check whether the startup frequency setting is appropriate 17. Check whether the torque lifting value setting is appropriate 18. Check whether the wiring of the peripheral electrical equipment at the output end of the frequency converter is correct 19. Select the matching frequency converter according to the load characteristics
3	Fuse fault		1. Input power supply is in phase deficiency 2. Abnormal power cut of the power grid 3. The unit module inlet line is not connected 4. The unit module fuse is damaged 5. The electrical distance of the secondary side terminals of the transformer to the adjacent wiring terminals is not up to the standard 6. The grounding body of the frequency converter cabinet is not up to the standard 7. Excessive ash accumulation on the circuit board leads to the false positive failure of the unit module	1. Check whether the wiring of the superior power supply cabinet is correct 2. Check the cause of abnormal power grid power failure to eliminate the fault source 3. Check whether the three-phase inlet line of the unit module is correctly connected 4. Seek technical support 5. Check whether the electrical distance of the secondary terminal terminals and adjacent terminals is within the allowable range 6. The grounding resistance of the frequency converter cabinet shall not be greater than 0.1 Ω 7. Remove the dust inside the circuit board and the unit
4	An IGBT driver failure		1. Unit voltage detection board is short-circuit 2. Load mutations 3. The output grounding wire of the frequency converter is not removed 4, the motor insulation damage 5, motor, load blocking rotation 6. The electrical distance of the secondary side terminals of the transformer to the adjacent wiring terminals is not up to the standard 7. The frequency converter cabinet is not grounded according to the requirements 8. Excessive ash accumulation on the circuit board leads to the false positive failure of the unit module	1. Check whether the unit voltage detection board and power resistance wiring are correct 2. Check the cause of the load mutation to eliminate the fault 3. Check whether the output wiring of the inverter is correct 4. Measure whether the motor insulation is within the allowable range 5. Change the motor or remove the mechanical faults 6. Check whether the electrical distance between the secondary side terminals and adjacent terminals of the transformer is within the allowable range 7. The grounding resistance of the frequency converter cabinet shall not be greater than 0.1 Ω 8. Remove the dust inside the circuit board and the unit

5	Unit overheating	85℃	1. The counter headwind machine is not working 2, the filter screen blockage 3. The unit overheating sensor is damaged 4. Overload state for a long time The environment, the temperature is too high	1, with A 4 paper on the filter net to see whether the adsorption 2. Check whether the filter screen is blocked 3. Seek technical support 4. Check whether the motor load is running under excessive load, and reduce the load and observe the operation situation 5, control the ambient temperature, increase the air conditioning refrigeration
6	Unit overpressure	1150-1190VDC	1. Slow down the time is too fast 2. The input power supply exceeds the rated value 3. Output current oscillation 4. The Hall sensor works abnormally 5, the motor reactive power is large 6, the dual-machine linkage load output is not balanced	1. Extend the deceleration time and adjust the overexcitation gain coefficient 2. Check whether the voltage of the bus net is within the allowable range 3. Adjust the rotation speed ratio coefficient 4. Check whether the Hall device is intact and whether the wiring is correct 5, seek, technical support 6. Seek technical support
7	Fiber fault		1. The unit module control board works abnormally 2. The connection of optical fiber signal sending and receiving position is wrong 3. There is dust inside the optical fiber connection seat 4. Poor contact between the optical fiber core and the external plug 5. Fibre circuit breaker 6. The optical fiber optic connector falls off 7. The frequency converter cabinet is not grounded according to the requirements 8. Excessive ash accumulation on the circuit board leads to the false positive failure of the unit module 9. Unit module is damaged 10. The optical fiber optic board is damaged	1. Seek technical support 2. Check whether the optical fiber optic connection is correct 3. Remove the dust with a dust-free cloth 4. Check whether the optical fiber optic plug contact is in place 5, replacement, the whole optical fiber 6. Check whether the optical fiber peripheral pressing parts are firm 7. The grounding resistance of the frequency converter cabinet shall not be greater than 0.1 Ω 8. Remove the dust inside the circuit board and the unit 9. Seek technical support 10. Seek technical support

order number	Fault name	Protection value	Failure original, due to investigation	Fault, the countermeasures
8	The frequency converter is tripped immediately		1. The ground line of the main circuit is not removed 2. The protection value of the superior power supply cabinet is too small 3, the transformer magnetic surge flow is too large	1. Check whether the main circuit wiring is correct 2. Adjust the protection value of the power supply cabinet according to the field capacity 3. Seek technical support
9	The output frequency fluctuates at a low speed during startup		1. The inverter output torque is insufficient 2, the frequency converter output phase deficiency 3. The current limiting coefficient of the frequency converter is not appropriate 4. The acceleration time parameter setting is not appropriate 5. The unit module is working abnormally	1. Adjust the torque lifting parameters, and monitor the output current and output voltage waveform with the CAN background 2. Check whether the output terminal wiring of the frequency converter is correct 3. Adjust the current limiting coefficient of the frequency converter, 4. Adjust the acceleration time parameter 5, seek, technical support
10	Output imbalance		1. Low output voltage of a certain unit module 2. A certain unit outputs a half-wave 3. The signal board version does not match	1. Seek technical support 2. Seek technical support 3. Seek technical support
11	Output pair, ground short circuit		1. The control mode is the output short circuit of asynchronous open ring vector inverter	1. Check whether the output terminal wiring and motor connection of the frequency converter are correct
12	Input imbalance		1. Unbalance of bus net voltage 2. The signal board version does not match with the control system 3, the signal board sampling resistance does not match	1. Check whether the input power supply is normal 2. Seek technical support 3. Seek technical support
13	Input pairs, with a short circuit to the ground		1. The grounding wire of the transformer input terminal is not removed 2. The insulation of the input cable is damaged 3, the lightning protection plate is abnormal	1. Check whether the main circuit wiring of the frequency converter is correct 2. Measure whether the insulation resistance of the input cable is within the allowable range 3. Check whether the lightning protection device is damaged
14	Automatic bypass cabinet automatic bypass, when the superior switch cabinet trip		1. Abdelay suction time relay in bypass cabinet 2. The setting value of the power supply cabinet is too small	1. Need for technical support 2. Seek technical support

15	Cabinet temperature overheating	60℃	1. Unit cabinet, and the fan is not working 2, the filter screen blockage 3. The frequency converter overruns for a long time 4, the ambient temperature is too high 5. The temperature measuring plate is damaged	1. Check whether the circuit breaker, contactor and thermal relay work normally 2. Use A 4 paper to test whether it adsorbs to the air inlet 3. Check whether the inverter is running over load or reduce the load to observe the touch screen temperature 4, control the ambient temperature, increase the air conditioning refrigeration 5, seek, technical support
16	Transformer overheating	130℃	1. Temperature protection, and protection and setting are error 2, the filter screen blockage 3. The fan on the cabinet top and cabinet bottom are not working 4, frequency converter long time overload operation The environment, the temperature is too high	1. Check whether the temperature protection value is set correctly 2. Use A 4 paper to test whether it adsorbs to the air inlet 3. Check whether the circuit breaker, contactor and thermal relay are working normally 4. Observe the temperature of the transformer after reducing the load 5, control the ambient temperature, increase the air conditioning refrigeration
17	parameter error		1. The control mode sets the vector parameter of the synchronization machine wrongly	1. Check whether the parameters are set correctly
18	Contactor failure		1. The power supply of the unit control board is abnormal 2. The contactor is damaged	1. Seek technical support 2. Seek technical support

order number	Fault name	Protection value	Failure original, due to investigation	Fault, the countermeasures
19	The commissioning status is prohibited		1. The signal line of the XS 3 T-4 terminal is broken circuit 2. The power supply cabinet is not forcibly closed with an interlock	1. Check whether the wiring is broken or virtual connection 2. Check whether the interlock protection is operating normally
20	System speeding		1. The control mode is wrongly set for the general parameters of the asynchronous machine 2. The control mode is wrongly set for the general parameters of the synchronmachine	1. Seek technical support 2. Seek technical support
21	Exciting magnetic failure		1. Excitation cabinet failure 2, the interface board excitation fault IO port signal line short connection	1. Check whether the excitation cabinet has any fault 2. Check whether the interface board wiring is correct
22	External failure		1. High-pressure break button of the cabinet door is closed 2. Remote high-voltage breakpoint is closed 3. Interface board high voltage break input point short connection 4. The internal relay of the interface board is damaged	1. Check whether the high-pressure break button is closed 2. Check whether the remote high pressure break button is closed 3. Check whether the input point port wiring of the interface board is correct 4. Seek technical support
23	High voltage power loss		1. High voltage power off during operation of frequency converter 2. The shielding delay parameter is not appropriate 3. The signal plate is abnormal	1. Check whether there is any abnormal situation in the field power grid 2. Check whether the parameters are set correctly 3. Seek technical support
24	The controller enables disdisconnection		1. The wiring between the controller and the PLC interface board is disconnected	1. Check whether the wiring is in bad contact and broken line
25	Input power display value is incorrect		1. The input current ratio parameter is set correctly 2. The KA 1 relay is not closed 3, the input voltage, the input current phase sequence wiring error	1. Check whether the input current variable ratio parameter is set correctly 2. Check whether the KA 1 relay worker is normal 3. Check whether the input voltage phase sequence and the input current phase sequence signal line are connected correctly
26	Master board version error		1. The parameters are not uploaded 2. The program version does not match	1. The fault is automatically cleared after parameter upload 2. Seek technical support

8.4 Replacement of the power unit

The model and appearance size of the power unit module in the unit cabinet are exactly the same. It is confirmed that the frequency converter cannot work normally due to the failure of a unit, so it can be replaced by a standby unit at the time allowed to exit. When replacing, contact Beijing Shente Innovation Technology Co., LTD to repair the fault unit module
block. Power unit module replacement follows the following steps:

- Stop, make the inverter out of operation state;
- Cut off the high voltage power supply, exit the high voltage cabinet car (when there is a bypass cabinet, the frequency converter can be isolated by the isolation switch of the bypass cabinet), lock the local or remote high voltage break switch, and ground the grounding switch of the high voltage cabinet.
- Open the cabinet door and wait for the indicator light of all units to go off;
- Unplug the TX and RX two fiber optic heads of the fault unit;
- Remove the R, S and T input power supply wiring of the fault unit and the L1 and L2 output connection to the copper row;
- Remove the fixing screws of the fault unit and the track;
- Pull out the fault unit along the track, pay attention to light light;
- Place the fiber optic seat plug on the new unit on the replaced unit;
- Install and connect the spare unit in the order opposite to the above disassembly;
- The system is reback into operation.

8.5 Maintenance

.18.5 Daily inspection

project	scope of examination	Inspection means	criterion for judgement
Java runtime environment Java	temperature	thermometer	-10~ +40℃ Use between 40 and 50℃, 1℃ per liter, rated Output current is reduced by 1%
	humidity	hygrometer	From 5 to 95% without condensation
	Dust, oil stains, water and dripping	visualization	No dirt, oil stains, water leakage traces
	vibrate	Special tester	0.15mm ,9-58Hz;03m/s2,
	gas	Special tester, nose smell, visual	No odor, no abnormal smoke
frequency transformer	give out heat	Special tester	The outlet temperature is normal
	sound	Special test, instrument, ear listening	No abnormal sound
	gas	Nasal sniff, visual	No odor, no abnormal smoke
	surface	visual	The appearance was intact and without a defect
	Cooling air duct	visual	No dirt, cotton wool and other blocked air duct

	input currenton	ammeter	Within normal operation, refer to nameplate
	input voltage	voltmeter	Within normal operation, refer to nameplate
	output	ammeter	In the rated range, a short time overload is allowed
	output voltage	voltmeter	In the rated value range
any power-generating or power-driven machine	give out heat	Special test, instrument, nose smell	Fever without abnormal, no burning smell
	sound	aural	There is no abnormality in the sound
	vibrate	Special tester	There is no abnormality in vibration

8.5.2 Periodic maintenance

Please conduct regular maintenance every 3 to 6 months according to the following table

project	scope of examination	Inspection means	criterion for judgement
frequency transformer	Main loop terminal	Screwdriver / sleeve	The screw is fastened and the cable is not damaged
	PE terminal	Screwdriver / sleeve	The screw is fastened and the cable is not damaged
	Control loop terminal	bolt driver	The screw is fastened and the cable is not damaged
	Internal cable, connector is solid	Screw knife, hand	Plug firmly
	mounting screw	Screwdriver / sleeve	The screw fastening
	Dust cleaning	vacuum cleaner	No dust, cotton wool, etc
	Internal foreign body	visual	No foreign body
any power-generating or power-driven machine	Insulation test	2500V Memeter	NA

pay attention to! 

- The regular maintenance interval is recommended to clean once every 3～6 months. If there is more dust, the filter screen should be cleaned regularly, and the replacement cycle can be shortened to once a week.
- It is suggested that within the first month when the inverter is put into operation, tighten all the incoming and outgoing cables of the transformer, power unit incoming cables and control cables, and then every 3～6 months, and remove the dust in the cabinet with a vacuum cleaner.
- Record the operation of frequency converter (see Table 8-2). In case of fault trip, the fault situation should be recorded and the cause should be identified and eliminated before the power is turned on again.

8.5.3 Maintenance of standby inverter and unit module

- Ensure that the TX and RX fiber optic seat plugs of the standby unit are inserted to prevent dust contamination.
- Power on the standby unit module regularly (generally 6 months).
- When the frequency converter is stored for a long time, the power on test should be guaranteed for 6 months, the power on time is not less than 1 hour, and the voltage regulator is slowly boosted to the rated value.

Instructions for dry type transformer

9.1 Instructions for installation and use of grade H dry-type transformer

summary:

This description includes instructions for installation and maintenance.

Be sure to read the complete instructions before installing, commissioning and using the equipment.

9.1.1 Purpose

The company currently production of H dry frequency conversion with rectifier transformer has two series: domestic frequency converter with dry rectifier transformer ZTSFG series and foreign frequency converter with dry rectifier transformer ZPSG series, are non-enclosed structure, insulation material heat resistance grade is H, coil turn insulation using NOMEX paper, voltage level of 20kV and below, widely used in water plant, power plant, metallurgy, petrochemical frequency conversion speed control device.

9.1.2 Model description

instance: a. ZTSGN- -500 / 6:500 KVA / 6K V H class three-phase coherent rectifying transformer for variable frequency speed regulation,

b . ZTSFGN-1000 / 10:1000 KVA / 10 KVH class three-phase air cooled dry type frequency conversion speed control rectifier transformer, H class insulation with NOMEX paper as the coil turn insulation.

Example: ZPSG- 1000 / 10: 1000KVA / 10 KVH class three- phase air-cooled dry type frequency conversion speed regulating rectifier transformer, our company class H insulation to NOMEX Paper is the turn insulation of the coil.

.39.1 Normal use conditions

- An elevation of no more than 1,000 meters;
- ambient temperature:

-Maximum air temperature of + 40℃

-Maximum daily average air temperature of + 30℃

-Maximum annual average air temperature of + 20℃

- Minimum air temperature- 5 ℃ (suitable for indoor transformer)

- The use of ambient air does not contain corrosion and damage of insulation harmful gas or dust, and the transformer shall not be soaked by water, rain and snow in use;
- The power supply voltage waveform is similar to the sine wave, and the power supply voltage connected by the multi-phase transformer should be approximately symmetrical;
- Protection shell with louver surface distance from the shielding object more than 1 meter, to ensure good ventilation;

9.1.4 Transportation and storage

- H class dry frequency conversion speed regulating rectifier transformer in transportation, there should be rain and moisture-proof measures, the factory data should be properly packed to prevent moisture;
- H class dry frequency conversion rectifier transformer in the process of loading and unloading and transportation, there should not be serious impact and vibration;
- H class dry type frequency conversion speed regulating rectifier transformer arrived at the site, should be timely appearance inspection, to check whether there is mechanical damage, whether the accessories are complete, whether the factory data is damp, rainproof and moisture-proof measures are intact.
- After the H-type dry frequency conversion rectifier transformer arrives at the site, it should be installed in place in time. If it cannot be installed in time, it should be stored indoors and effective rain and moisture-proof measures should be taken.

9.1.5 General inspection before installation

- H class dry type frequency conversion speed regulating rectifier transformer after long-distance transportation and storage, the user must carry out a comprehensive appearance inspection. Check and remove all parts of the transformer

Position (in the air duct between core and coil), whether all fasteners are loose. After the inspection, clean the ash with dry compressed air. The loose fastener should be tightened.

- iron core examination

-The core shall have no deformation, and the insulation between the yoke and the clamp should be good;

-The iron core should not have a multi-point grounding;

If necessary, the clamp and yoke ground plate can be further opened, and the insulation resistance of the core should be measured with a 2500V megohm meter of 5 MΩ, through the core screw and iron

The insulation resistance between the core and clamp shall be 100 MΩ;

- Winding inspection

-The winding insulation layer shall be complete without damage, dislocation and deformation;

- Each winding shall be neatly arranged with even clearance;

- The upper and lower yoke pads of the winding should be tightened, and the fastening nut should be locked;

● The insulation dressing of the lead line is firm, without damage, displacement, breaking, bending phenomenon; the lead line is firmly fixed, the fixed support should be fastened, and the insulation support of the lead line should be intact;

● The connection of the non-excitation voltage regulating wiring board or each tap of the device to the coil should be correct and tightened, and the contact position or rotating contact should be correctly left in each position, and consistent with the position indicated by the sign or indicator;

● The H class dry type frequency conversion speed regulating rectifier transformer shall use 2500V megohm meter under the condition of external connection to measure the insulation resistance of the coil to the ground. If the coil is lower than the minimum allowable insulation resistance value listed in the table below, corresponding drying measures can be taken according to the appendix.

Coil Voltage Level (kV)		0.4			3.0			6.0			10			20		
leave the factory trial	test condition	Room temperature was 10 – 40℃, and the humidity was <85%														
	Insulation resistance (MΩ)	≥50			≥100			≥200			≥300			≥500		
scene trial	humidity (%)	≤85														
	temperature (℃)	5	15	25	5	15	25	5	15	25	5	15	25	5	15	25
	Insulation resistance (MΩ)	11.5	7.5	5.0	45	30	20	68	45	30	90	60	40	225	75	50

9.1.6 H class dry frequency conversion transformer and accessories

9.1.6.1 The transformer shall be installed smoothly and the base bolts fastened; if there is a roller, the wheel pitch shall be coordinated with the gauge and fixed with the brake device after being in place.

9.1.6.2 Installation of the fan: install the fan according to the requirements of the cooling fan operation manual, and distinguish between side blowing fan and top blowing fan. Fan generally installed under the transformer, (sometimes have the fan installed on the top of the cover, the hot air from the top through the out), should be the side blower or top blower best position installation, according to the rotating direction of the fan to air core cooling duct, low voltage coil duct, high and low voltage coil duct and high voltage coil duct. The voltage and phase number of the connected power supply shall be consistent with the rated voltage and phase number of the fan. The fan on the same transformer is connected to the temperature controller in parallel. Large capacity fan should be equipped with an intermediate relay. After the initial installation of the fan, it should be powered on and test run to check whether the wiring is correct, whether the steering is consistent with the mark of the fan, whether the air flow passes through the corresponding heat dissipation airway, and whether the three phases are uniform. The insulation resistance of the fan shall not be less than 0.5MΩ. In order to prevent the foreign body from falling into the fan impeller during the installation, our company has protective paper before leaving the factory. Please remove the protective paper before the
equipment installation and commissioning.

9.1.6.3 Installation of temperature controller: (Note: when the transformer is running, we must ensure that the temperature control power supply is normal, otherwise the transformer may burn out!)

Install and debug the instrument strictly according to the operating manual of the temperature controller. Class H is fixed at the upper end of the high and low pressure coil airway with three inner diameter Φ 11. The sensor cable is installed in the wire epoxy pipe of the upper clip, and the three platinum thermal resistance pt 100 are inserted into the pipe respectively with the same depth of insertion (made according to customer requirements), and the temperature measuring probe shall be

inserted into the gear of the temperature control pipe before installation and operation; the rear cover wiring identification: control fan start and stop, overtemperature alarm, overtemperature trip, failure alarm, check the corresponding contact and the action is correct.

9.1.6.4 The wiring of the temperature controller and the cooling fan shall be carried out according to the installation standards of the low-voltage electrical devices.

9.1.6.5 Grounding: The transformer and its shell, fan and temperature controller must be reliably grounded.2 Ω of ground resistance is required.

9.1.6.6 No-load operation of the transformer suggests power transmission from the original side, and it is not recommended to send power from the 380V winding of the secondary side, which may cause overheating damage of the 380V winding.

9.1.7 Acceptance test and trial operation of H-class dry-type frequency conversion rectifier transformer for speed regulation

9.1.7.1 Acceptance test items and standards; press the table:

test item		scope of application		Quality characteristic requirements and allowable deviations						remarks
1	Straight winding, flow resistance	capacity (kVA)		unbalance rate						
				each other		Line				
		With variable 2500 Power transformer: 630		≤4% ≤ 2% (The middle point leads to)		≤2% ≤2% (Midpoint is not introduced)				
		Rectifier and converter transformer		Not specified, provide the factory measured value and test temperature						
2	Connect the group label	All transformers		In line with the nameplate						
3	Iron core ground	All transformers		There must be only a little ground thing						10-40℃ humidity ≤85%
	Iron-core insulation resistance	All transformers		2500V, meђ meter for 1 min, there should be no flashover and breakdown						
4	I nsulation resistance (not less than)	All transformers (Disconnect the external wiring)		k V	1	3	6	10	20	25℃ humidity ≤85%
				M Ω/2500V	5	20	30	40	50	
					R 2 = R 1 × 1. 5 (t 1 -t 2)/1 0					
5	transformer ratio	Distribution transformer, electric power transformer		Rated tap ± 0.5% or measured impedance ± 10%						
		Rectifier and converter transformer	The DC voltage is <250V	According to the technical agreement						Or by technique, by technique protocol
			The DC voltage is> 250V	Rated tap is ± 1%						
6	Check and test of the voltage -regulating and switching device	Unexcitation voltage regulating transformer	Wiring plate type	The gear meets the nameplate with reliable connection						
			tap switch	Flexible rotation and gear is consistent with the indicator sign						
7	AC voltage resistance	Distribution transformer,		the classification of voltage kV	≤1	3	6	10	15	No breakdo

	(disconnect external wiring, remove temperature measuring probe)	electric power transformer	withstand voltage kV/1m in	2.6	8.5	17	24	32	wn or flashover pheno menon
8	Check the phase	All transformers	The primary side is consistent with the power grid phase						
			The secondary side is consistent with the user's design requirements						

9.1.7.2 Inspection before the trial run

A comprehensive inspection shall be conducted to confirm whether the transformer has the following 8 test operation conditions:

- Body and cooling device, all accessories shall be complete and free of defects; - Metal objects and non-metal foreign bodies shall not be left on the transformer body;
- The split position shall meet the voltage and operation requirements of the site power grid, and the split joint nuts shall be fastened and fastened with locking nuts;
- The transformer phase and wiring group shall meet the operation requirements, and the wiring sequence and phase sequence identification shall meet;
- The connection of grounding lead and grounding grid shall meet the design requirements and be reliable;
- The temperature measuring device is indicated and the setting value is correct (see clause 9.1.8.3);
- The fan is connected correctly (see 9.1.6.2);
- All transformer handover test items are qualified, the protection setting value meets the regulations, and the operation and linkage test are correct.

9.1.7.3 Impact closing of the transformer under no-load rated voltage

The size of the excitation surge current depends on the phase of the line voltage in the transformer and the state of the core remaining flux, which can reach 10- 12 times of the rated current value. Its value attenuates after several weeks to a few seconds, so the surge current is not much harmful to the transformer, but if no corresponding measures are taken, it may cause the transformer overcurrent or
Differential and other protection misoperation, so the transformer operation should be paid attention to, phase excitation magnetic surge

Disconnect the secondary side wiring, conduct 5 impact closing at the rated voltage, no less than 10 min after the first power supply, and once every 5 m in thereafter. The transformer should be abnormal, the excitation surge flow should not cause the misoperation of the protection device;

$$\frac{0.6}{\sqrt{2}}$$

9.1.7.4 Trial operation of the transformer

After the H- class dry frequency conversion rectifier transformer is qualified, the load can be gradually carried out until the rated load and run for 24 hours. If there is no abnormality, the trial operation is over; the transformer equipment can be put into formal operation after handover and acceptance according to relevant regulations.

9.1.8 Problems that should be paid attention to in the operation of H-class dry frequency conversion rectifier transformer

. 19.1.8 For the operation of H class dry frequency conversion speed regulating transformer, please follow DL / T 572-2010 Operation Regulations for Power Transformer and GB / T 17211-1998 Load Guidelines for Dry Power Transformer;

9.1.8.2 Excitation surge flow during no-load closing

The flow peak ip should be converted to the effective value of the phase excitation magnetic surge flow

I Φ = ip (A)。

.8.39.1 According to the temperature grade of insulation materials, the temperature rise limit of class B, F and H in winding is as follows:

temperature grade	B level	F level	H level
The maximum allowable temperature of the insulating material is ℃	130	155	180
Winding temperature, rise limit value K	80	100	125

The coil temperature rise of the transformer in operation under normal service conditions shall not exceed the limit value shown in the table (resistance method). Because the pt thermal resistance of the dry variable temperature controller is inserted into the protective tube of the upper part of the airway, the temperature shown is the temperature of the airway, which is generally about 30℃ less than the actual temperature of the coil, the user should according to the specific environmental conditions and

For alarm and tripping, please refer to the following table:

Temperature ℃ (airway temperature)	Ultra temperature alarm ℃	Ultra-warm trip ℃
H level	110	130

9.1.8.4 Transformer shall be monitored and checked frequently during operation

- Monitor the sound and temperature of the transformer during operation;
- Monitor the appearance of coil, core and seal, without damage and discoloration; dust accumulation and dirt;
- Monitor whether the air cooling device, tap switch and temperature measuring device are normal;
- To prevent water droplets from falling on the transformer and prevent the direct sunlight coil; the operation duty record of the transformer shall be recorded.
- Operation duty record of the transformer shall be made.

9.1.9 H class dry frequency conversion transformer for speed regulation

9.1.9.1 Please refer to DL / T 596-2005 Preventive Test Regulations for Electric Power Equipment for regular maintenance;

9.1.9.2 H class dry type rectifier transformer for variable frequency regulation shall be maintained once half a year according to the site operation environment (harsh site operating conditions and no more than one year) for the following items:

Check the coil, core, sealing line, connecting terminals and all fasteners without damage, deformation, discoloration, loosening, overheating trace and corrosion phenomenon; if abnormal, identify the cause and take necessary measures;

Open the top fan with dry compressed air to remove the dust on the transformer and the box and out of the box, can also be wiped with cotton dry cloth, do not use volatile detergent;

Remove dust from the external and internal impeller of the fan and check the supplement or replacement of bearing grease;

No-load or on-load tap switch can be inspected and maintained according to the operating manual;

9.1.9.3 The insulation resistance of the transformer must be tested for each inspection and maintenance, and the insulation resistance value tested shall not be lower than the provisions stipulated in Article 5.6 of the operating manual. When the insulation resistance value meets the requirements, the H-class dry frequency conversion speed regulating transformer can have the conditions to be put into operation again;

9.1.9.4 There is dust filter in the transformer inlet shutter, which shall be checked according on the operating environment of the equipment (put A 3 paper or newspaper on the inlet shutter at the air inlet, the paper shall be qualified and cleaned. If the paper can be checked on the air inlet, to prevent the blockage of the air outlet and the hot air in the cabinet.

9.1.10 Appendix

H class dry type frequency conversion speed regulation with the rectifier transformer after damp drying.

9.1.10.1 Selection of drying method: According to the transformer insulation moisture situation and site conditions, infrared lamp, oven, hot air, short circuit and other methods can be used for drying. The specific use method can be described as follows:

- Infrared lamp drying method: around and top of the transformer using high power infrared lamp irradiation;
- Oven drying method: suitable for small capacity H dry type frequency conversion speed regulating rectifier transformer, lift it into the oven, oven temperature control 100℃, dry in the oven for 3~4 hours, oven every 50 minutes about 10 minutes, dry after the transformer natural cooling before measuring the insulation resistance;
- Hot air drying method: according to the size of H class dry type variable frequency conversion rectifier transformer, build a drying room with wall board, the wall board is covered with asbestos board or its sail linen or asbestos subcloth impregnated with fireproof solution. The transformer is hoisted into it, the distance from the surrounding is not less than 200mm, and the hot air volume of the electric furnace or steam snake pipe is 1.5 the volume of the drying chamber m^3/ Min, no more than 100℃ of hot air from the body, and moisture released from the upper vent.
- Low voltage winding short circuit heating method: low voltage winding short circuit, using the generator set or the coil regulator to the high voltage winding from zero voltage power supply, maintain the high voltage winding current equal to the rated current, until the drying;

9.1.10.2 Temperature control in drying: When drying, a platinum resistance thermometer must be installed in each part of the transformer for monitoring. Note the uniform heating, and the heating speed of 10- 15℃ / h. In particular, the winding should not exceed the maximum allowable temperature of its insulation level. For grade B insulated transformer, its airway temperature shall not exceed 80℃ and H grade shall not exceed 100℃ . Measure the temperature of each part of the high and low coil every 1 hour;

9.1.10.3 Judgment of the end of drying: After the transformer is dried, the transformer is naturally cooled to room temperature, and the insulation resistance shall be measured every 1 hour. If the insulation resistance value is measured for three consecutive times, the insulation resistance value conforming to the factory test report shall be qualified;

9.1.10.4 When drying the transformer, fire safety measures should be taken in advance to prevent the heating system failure or overheating of the winding from burning the transformer;

9.1.10.5 The dried transformer shall be inspected, all electrical connection bolts and fastening parts shall be free, and the insulation surface shall be free from overheating.

9.2 Instructions for use of LD-B 10-10 series dry-type transformer

9.2.1 Overview

LD-B 10-10 series dry-type transformer temperature controller (abbreviated as temperature controller) is an intelligent controller specially designed for the safe operation of dry-type transformer. The temperature controller adopts single chip microcomputer technology, uses the three platinum thermal resistance embedded in the three-phase winding of the dry transformer to detect and display.

the temperature rise of the transformer winding, and can automatically start and stop the cooling fan to force the winding, and can control the overtemperature alarm and overtemperature trip output, so as to ensure the transformer operation in a safe state.

9.2.2 Technical Indicators

- Measuring range: -30.0℃ ~240.0℃
- certainty of measurement:

-Accuracy level level 1 (temperature controller level 0.5, sensor level B);

-Resolution of 0.1 ℃

- service condition:

-Ambient temperature-20℃ ~ + 55℃

-Relative humidity is <95% (25℃)

-Power supply voltage AC220V (+ 10%, -15%)

-Power supply frequency of 50Hz or 60Hz (± 2Hz

- Temperature controller power consumption: 8W
- operative norm:

Production standard: JB / T7631-2005 Electronic Temperature controller for Transformer -

Approved certification: ISO 9001:2008 International quality management system certification -Test passed: IEC 61000-4:2002 International Standard

GB / T 17626-2008 "Electromagnetic compatibility test and measurement technology" standard ● Relay contact output: fan contact capacity: 10A / 250VAC

Control output capacity: 5A / 250VAC; 5A / 30VDC (resistance)

- Pt 100 sensor leads adopts three-wire system, and its probe size: Φ 3mm 30mm or Φ 4mm 40mm
- External size of temperature controller: 80mm 160mm 100mm (height, width and depth) -Size: 76 + 1mm 152 + 1mm (height and width)

9.2.3 Function and model classification

LD-B 10-10D (conventional type)	Three-phase circuit measurement; three-phase circuit display / maximum display and two functions switching; input open circuit and fault self-test display and output; automatic start and stop output of cooling fan; overtemperature alarm display and output; overtemperature trip display and output; display of fan manual / automatic control; display of each channel Digital compensation; "black box" function; fan timing start-stop control function; output status detection.
LD -B 10-10E	Like LD-B 10-10D, add three independent 4 ~ 20 mA analog current output.

After 6 seconds, the thermostat automatically turns to the normal working state. If the input wiring is correct, the measurement loop of the temperature controller is not faulty, and PV and SV are displayed respectively Values and measured winding phase order. If the thermostat is required to self-test, press the reset key.

- If the temperature controller measuring loop wiring is wrong, PV flashes display-Er-, the fault relay J5 is closed.
- If the thermostat measurement loop is open, the PV flashes the OP-and the fault relay J5 is closed.
- If the input signal exceeds the measurement range of the temperature controller:
  Over the upper limit, PV flicker display-OH-, fault relay J 5 closed.
  Over the lower limit, PV flicker display OL-, fault relay J 5 closed.
- Fan operation: the green indicator light is on, and the fan control relay J 3 is closed.
- Over-temperature alarm: the yellow indicator light is on, and the over-temperature alarm relay J 2 is closed.
- Over temperature trip: PV flashing shows the temperature value, over temperature trip relay J1 closed.
- SV display value meaning:

S V	Operating state of the thermostat	remarks
PH X	Three-phase circuit display state, the three-phase winding temperature is lower than the alarm value.	X, X'are A, b, C phases, (d road) X: The order of the phase display that is being measured X ': means supertemperature phase order
X′ X	The X'-phase overtemperature in the three-phase winding.	
HH X	The three-phase winding temperature is normal, and the fan is being manually started.	
HX′ X	The fan is in the manual start state, X'phase overtemperature.	
UU X	The thermostat displays the status at the maximum value.	
HU X	The thermostat is in the maximum state and the fan is in the manual state.	

9.2.5.2 Key function

key	function
S ET	In the normal working state, press the key, the temperature control turns to the parameter setting state, and during the setting process, press the key to enter the next step.
△	In the set state, press the key once, increase the parameter value by 1, press the key, can quickly increase the number. Press this under the normal working state, and the key can switch the fan in the manual control state or the automatic control state.
▽	In the set state, press the key once, the displayed parameter value is reduced by 1, press the key down, can be rapid reduction. Press this key to switch the temperature controller in the maximum display or each phase circuit display state.

Note: During the key operation, if any key is not pressed, the temperature controller will automatically return to the normal working state after about 100 seconds, and the setting is invalid.

step	show / key	P V	S V	explain	remarks
1	S ET	-Cd-	1000		
2	△ perhaps ▽	-Cd-	1002	Enter the black box operation password	The password should be entered correctly
3	S ET	x xx .x	EE A	Temperature value of the phase A winding at the time of power failure	Press the SET key key to return to the normal working state. Note: Only type G / I has this step
4	△	x xx .x	EE b	Temperature value of the B phase winding at the time of power-off	
5	△	x xx .x	E E C	Temperature value of the C phase winding at the time of power-off	
6	△	x xx .x	E E d	Temperature value of d winding at the time of power off	
7	S ET	The thermostat exits the black box function operation state and returns to the normal operating state.			

9.2.6.2 Function of cooling fan excitation (regular start and stop of fan)

step	show / key	P V	S V	explain	remarks
1	S ET	-Cd-	1000		
2	△ perhaps ▽	-Cd-	1003	Enter the timing start and stop fan password	The password should be entered correctly
3	S ET	-00-	xx x	Set the start-stop interval time before the fan	
4	△ perhaps ▽	-00-	xx x	Set the start-stop interval time of the rear fan	
5	S ET	The temperature controller exits the regular start and stop function of the fan and returns to the normal working state.			

Note: The time interval is in hours, and the set range is 0~150. The automatic operation time of the fan has been set as 2 minutes by the software, and the user cannot modify it.

Example: set to 0, it means the start and stop function when the fan is uncertain; if set to 24, the fan will automatically start and stop every 24 hours, and the user can set the interval according to the actual situation.

9.2.6.3 Parameter setting steps (all the parameters shown in the table are the reference values, and the specific set value is subject to the product factory label)

● Operation process of LD-B 10-10D / E / F temperature controller:

step	show / key	P V	S V	explain	remarks	
1	S ET	-Cd-	1000			
2	△ perhaps ▽	-Cd-	1005	Enter the parameter to set the password of 1005	The password should be entered correctly	
3	S ET	-Ob-	90.0	The target value of the fan start temperature set at the factory is 90.0℃ .	Set the scope -30.0 ~240.0	△

4	S ET	-dF-	10.0	The difference of fan start set at factory is 10.0℃ .	Set the scope 0.0~15.0	Have or join ▽ Numb er key All repair Can change need
5	S ET	-AH-	150.0	The overtemperature trip temperature value set at the factory is 150.0℃, and the return difference value is 0.3℃ .	Set the scope -30.0 ~240.0	
6	S ET	-AL-	130.0	The overtemperature alarm temperature value set at the factory is 130.0℃, and the return difference value is 0.3℃ .	Set the scope -30.0 ~240.0	
7	S ET	After confirm the modified parameter value, the temperature controller exits the parameter setting state and returns to the normal working state.				

Note: If Ob = 90.0 dF = 10.0, the fan start temperature> 90.0 +10.0 =100.0℃, the fan turn-off temperature <90.0 -10.0 =80.0℃

● Operation process of LD-B10- 10G temperature controller:

step	show / key	P V	S V	explain	remarks	
┇	10.2 6.3 LD-B 10-10D / E / F temperature controller operation process steps 1~6					
7	S ET	-ObJ	35.0	Set the target value of machine room fan as 35.0℃ .	Set the scope -30.0 ~240.0	All ▵ or reference ▽ number keys can be changed
8	S ET	-dFJ	2.5	Set the difference of fan to 2.5℃.	Set the scope 0.0~15.0	
9	S ET	-AHJ	70.0	The overtemperature trip temperature value of the equipment room is 70℃, and the return difference value is 0.3℃ .	Set the scope -30.0 ~240.0	
10	S ET	After confirm the modified parameter value, the temperature controller exits the parameter setting state and returns to the normal working state.				

Note: ① If ObJ = 35.0 dFJ = 2.5 i. e. the fan starting temperature of the machine room> 35.0 +2.5 =37.5℃ fan closing temperature of the machine room <35.0-2.5 =32.5℃ ② the machine room and the winding overtemperature trip, please change the temperature value of the machine room trip (AHJ) carefully.

● Operation process of LD-B10- 10 Type I temperature controller:

step	show / key	P V	S V	explain	remarks	
┇	10.2.6.3 LD-B 10- 10D / E / F temperature controller operation process steps 1~6					
7	S ET	-ALJ	130.0	The temperature of the core is 130.0℃, The return value was 0.3℃ .	Set the scope -30.0 ~240.0	Available ▽ or ▵ Key modification
8	S ET	After confirm the modified parameter value, the temperature controller exits the parameter setting state and returns to the normal working state.				

9.2.6.4 Setting steps of digital compensation value of temperature controller

step	show / key	P V	S V	explain	remarks
1	S ET	-Cd-	1000		
2	▵ perhaps ▽	-Cd-	1008	Enter the display value compensation to set the password	The password should be entered correctly
3	S ET	Phase A temperature value	A 0.0	Entering the A phase compensation value setting state, the original A phase compensation value is 0.0℃ .	The compensation value can be set

9.2.6.5 Operation steps of output status detection

The output state of the temperature controller and the corresponding contacts of the temperature controller can be detected.

step	show / key	P V	S V	explain	remarks
1	S ET	-Cd-	1000		
2	△ perhaps ▽	-Cd-	1012	Input and output function detection password	The password should be entered correctly
3	S ET	-30.0	EE A	The starting temperature was-30.0℃	
4	△	100.1	EE A	Excthe fan start temperature	Fan running light is on, fan output
5	△	130.4	EE A	Overtemperature alarm temperature	Over- temperature alarm light is on, and the alarm output
6	△	240.1	EE A	Beyond the measurement, the quantity range	Fault alarm light is on and fault output
7	▽	240.0	EE A	Enter within the measurement range	Fault alarm lamp is off and fault is off
8	▽	129.6	EE A	Below the overtemperature alarm temperature	The overtemperature alarm light is off and the alarm is off
9	▽	79.9	EE A	Below the fan stop temperature	Fan running lamp is off, fan is off
10	S ET	The thermostat exits the output function detection state and returns to the normal operating state.			

Note: ① In order to avoid causing the transformer error trip, the software does not support the simulated overtemperature trip function!

The ② Type G / I thermostat has no analog fault output function.

③ The actual action temperature point shall be subject to the internal temperature control parameters (1005 function setting).

9.2.7.1 Functional features

On the basis of general functions, the independent 3 (4) 4 ~ 20 mA current signal with a linear correspondence with the detection temperature value can be directly connected with the distal A / D card to form a distributed monitoring system (DCS).

- Output conversion

If the user' s acquisition system requires to receive the analog voltage signal, it can directly connect the existing current output end with a high precision 250 Ω resistance, and can obtain a voltage signal of 1 to 5 V, and access to the load resistance R 20K Ω .

9.2.8 RS 485 Communication type (Type F)

Please see the Communication S pecification (attached also) .

9.2.9 Installation drawing of temperature controller (unit mm)

10.1, the basic principles

Universal high voltage frequency converter provides RS 485 communication interface and supports Modbus communication protocol. Through this protocol interface, users can use the upper computer to read or change the parameters of the converter and check the working status and fault information of the converter, and use the upper computer to send the start and stop commands of the converter, control the start and stop of the converter, so as to realize the centralized control of the industrial field.

Topology structure: single host multiple slave system, the slave address is unique, the slave address range is 1 ~247,0 is the broadcast communication address. Host refers to a personal computer or programmable logic controller (PLC), etc., the slave refers to a frequency converter. The host can communicate separately to one slave and publish broadcast information to all them.

Interface mode: RS485 hardware interface.

Transmission mode: asynchronous serial semi-duplex transmission mode, at the same time the host and slave can only one send data and the other receive data.

Data and frame format: frequency converter adopts RTU mode, data bit-8; parity-no check; stop bit-1; port rate is optional at 2400,4800,9600,19200,38400bps. The RTU data frame, using CRC check, each frame starts at a pause interval of at least 3.5 characters, and after the last transmission character (CRC check data), a pause of at least 3.5 character time represents the end of the message. The information of a frame must be transmitted in the form of a continuous data stream. If there is more than 1.5 characters before the end of the whole frame transmission, the receiving device thinks the message frame is incomplete and discard the message frame.

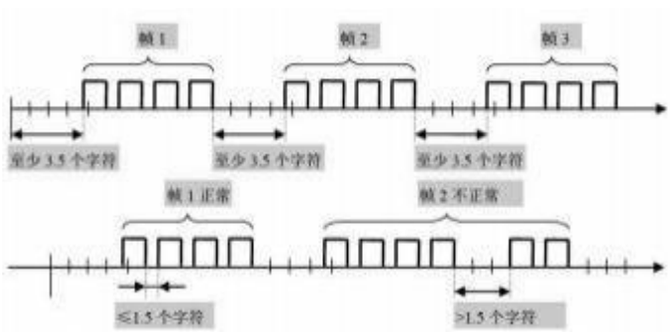

Figure 11.1 Data and frame format

Standard structure of the RTU frames:

name	explain
Frame-head START	T 1-T 2-T 3-T 4 (3.5 bytes time)
The slave address domain is the ADDR	A ddress: 0 ~ 247 (decimal) (0 is radio address)
domain CMD	03H: Read slave parameters; 06H: send slave command; 10H: write slave parameters
data field DATA (N -1) ... DATA (0)	2 * N bytes of data, this part is the main content of communication, is also the communication, the core of data exchange.
CRC low-order	Test value: CRC calibration value (16 BIT)
CRC high-order	
Frame tail E ND	T 1-T 2-T 3-T 4 (3.5 bytes time)

10.2 Package structure

order number	name	Byte number	scope	remarks
1	address code	1	1 ~247	From the machine address
2	FC	1	0x 03、0x 06、0x10	03H 、06H 、10H
3	data field	2*N	0x 00 ~0x FF	The core content of the data exchange
4	check code	2	0x 00 ~0x FF	CRC verification
amount to		≤256		

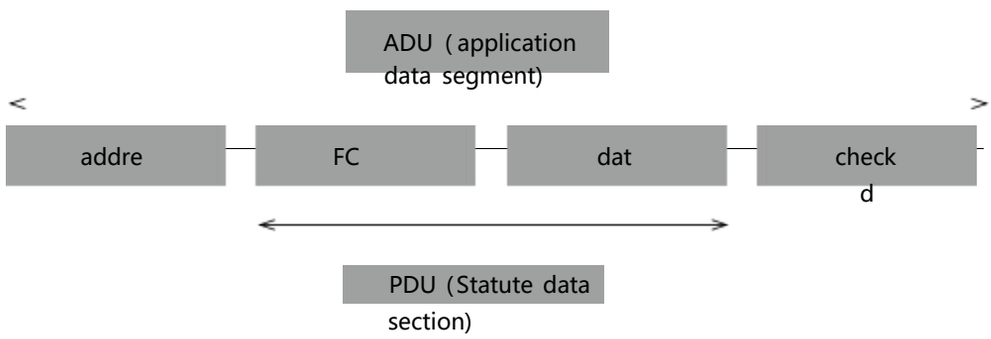

Figure 11.2 Data Package Structure

10.3 Function code definition

FC	name	description
03H	Read the multiple registers	Read the slave register internal data（parameter settings)
06H	Write a single, in a register	Set the slave machine a one-register value
10H	Write multiple, registers	Sets the slave machine with multiple register values

10.4 Common function code and response

10.4.1 Function code 0x03, read multiple registers

Host request packet

Data content	Byte number	explain
From the station address	1	1 ~247
FC	1	0x 03
Start place, high address	1	0x 00 ~0x FF
Starting site, low address	1	0x 00 ~0x FF

High number of registers	1	The N registers
Low number of registers	1	
CRC, check the low level	1	crc
CRC, check the high level	1	

Answer the data packet from the machine

Data content	Byte number	explain
From the station address	1	1 ~247
FC	1	0x 03
Number of bytes	1	2 * N bytes
The starting address corresponds to the register data high level	1	First register
The starting address corresponds to the register data low level	1	
...	...	...
The N th register corresponds to the data high level	1	N register
The N th register corresponds to the data low level	1	
CRC, check the low level	1	crc
CRC, check the high level	1	

* N = the number of registers

Error response

Data content	Byte number	explain
FC	1	0x 83
Error code	1	01 or 02 or 03 or 04

Error code description:

01 Function code error

02 Start address or (start address + register number) error

03 Number of register is wrong

04 Read multiple register errors

10.4.2 Function code 0x06, write a single register

Host request packet

Data content	Byte number	explain
From the station address	1	1 ~247
FC	1	0x 06
Register address high level	1	0x 00 ~0x FF
Register address is low	1	0x 00 ~0x FF
Register, high value	1	0x 00 ~0x FF
Register, low value	1	0x 00 ~0x FF
CRC, check the low level	1	crc
CRC, check the high level	1	

The slave response packet

Data content	Byte number	explain
From the station address	1	1 ~247
FC	1	0x 06

Error response

Data content	Byte number	explain
FC	1	0x 86
Error code	1	01 or 02 or 03 or 04

Error code description:

01 Function code error

02 Register address error

03 Wrong register value

04 Write a single register error

.310.4 function code 0x10, write multiple registers

The slave response packet

Data content	Byte number	explain
From the station address	1	1 ~247
FC	1	0x 10
Start place, high address	1	0x 00 ~0x FF
Starting site, low address	1	0x 00 ~0x FF
High number of registers	1	0x 00
Low number of registers	1	0x 01 ~ 0x 7B (1 ~ 123)
byte count	1	2×N
Register 1st value is high	1	0x 00 ~0x FF
Register 1st value is low	1	0x 00 ~0x FF
...		
The N th register value is high	1	0x 00 ~0x FF
N register value low	1	0x 00 ~0x FF
CRC, check the low level	1	crc
CRC, check the high level	1	

* N = the number of registers

The slave response packet

Data content	Byte number	explain
From the station address	1	1 ~247
FC	1	0x 06
Start place, high address	1	0x 00 ~0x 81
Starting site, low address	1	0x 00 ~0x FF
High number of registers	1	0x 00
Low number of registers	1	0x 01 ~ 0x 7B (1 ~ 123)
CRC, check the low level	1	CRC
CRC, check the high level	1	

Error response

Data content	Byte number	explain
FC	1	0x 90
Error code	1	01 or 02 or 03 or 04

Error code description:

01 Function code error

02 Start address or (start address + register number) error

03 Wrong number of registers or bytes

04 Write multiple registers with errors

10. 5 CRC calibration (16 - bit)

CRC: cyclic redundancy check (Cyclic Redundancy CHeck)

CRC Calculation steps:

(1) Xomalor mulynomial U = 0xA 001

(2) CRC register initial value V = 0x FFFF

(3) V and the first byte (B 0, for the address code) differ or coexist in V, V = V XOR B 0

(4) V, one right sh ift

(5a) If the shift is 1, V = V XOR U, back to step 6

(5 b) If the shift to is 0, back to step 6

(6) Repeat 4 or 5 steps to complete 8 shifts

(7) V and the next byte (B 1, function code) are different or coexist in V, V = V XOR B 1

(8) Repeat 4-7 steps until all bytes in the packet are changed and shifted 8 times.

(9), register V is the CRC check code, attached to the end of the data package, low byte in the front high byte in the back.

10.6 Definition and allocation of address codes

In order to facilitate the user to control and manage the converter, all the parameters and operating status variables of the converter are open to the user. Through the upper control system, the user can view all the parameters and operating status in the converter. Users can send different function codes and address code messages through the upper computer, control the operation of the converter, obtain the converter status information and set the relevant function parameters of the converter.

Modbus, The address range of the communication message is: 00H~79H.

The address range 27 H ~ 3 DH is the functional parameter, and the user can change the parameters, but some functional parameters cannot be changed when the converter is in operation; the address range 3 EH ~ 63 H is the system parameter to change the parameters when the converter is in standby; change the parameters, pay attention to the setting range of the parameters.

Frequency converter status address code distribution table

I D	name	attribute	Register address	PLC address	parameter declaration				
4	Feedback parameter	R	3H	40004	0.01%				
5	running frequency	R	4H	40005	0.01Hz				
6	input voltage	R	5H	40006	1V				
7	input currenton	R	6H	40007	0.1A				
8	interiorinput power	R	7H	40008	1kW				
9	Input the work, and the rate factor	R	8H	40009	0.01				
10	output voltage	R	9H	40010	1V				
11	output	R	A H	40011	0.1A				
12	output power	R	B H	40012	1kW				
13	Output work, the rate factor	R	CH	40013	0.01				
14	motor speed	R	DH	40014	1R PM				
15	Cabinet temperature	R	E H	40015	0.1℃				
16	Frequency converter state	R	F H	40016	high byte	move state	0: Master control initialization 1: Master control is ready 2: The PLC is in Ready 4: System standby 5: frequency converter operation 6: Excitation state 7: Rotation load 8: Downtime status 10: Failure status 11: Synchronization, pitch cutting: cut up 12: Synchronization, throwing and cutting: lower cutting 13: Parameter identification		
					lower byte	system state	B it	0	1
							7	Main control board fault	The main control board is normal
							6	Lock phase success	The lock phase failed
							5	The parameters are set correctly	Wrong parameter set
							4	The interface board is ready	Interface board, not ready
							3	normal	System speeding
							2	normal	Frequency converter overflow
							1	normal	Unit weight failure
							0	normal	High pressure is not ready

Frequter command parameter address code allocation table

I D	name	attribute	Register address	PLC address	parameter declaration		
					B it	0	1
39	Parameter control group	R /W	26H	40039	15		
					14		
					13		
					12		
					11		
					10		
					9		
					8		Upload failed
					7		Download failed
					6		Upload success
					5		Download success
					4		Parameter upload (pulse signal)
					3		Parameter download (pulse signal)
					2		factory data reset
					1	Restore the factory setting is prohibited	Restore the factory settings allowed
					0	The parameter setting is prohibited	The parameter settings allow for the setting

Function parameter address code allocation table

I D	name	attribute	Register address	PLC address	parameter declaration			
					B it	name	0	1
40	Parameter combination 1	R /W	27H	40040	15	Communication mode	Mod bus Communication	P rofibus-DP Communications
					14	Selection of critical fault of cabinet door	Light fault	Heavy fault
					13	Reminder of ventilation filter cleaning screen	Don't remind	remind
					12	cooling-down method	forced air cooling	hydrocooling
					11	Frequency conversion cut	prohibit	permit
					10	Light fault power	prohibit	permit
					9	Fan control	cease	firing
					8	Switch to, to select	3 Sections of speed	7 Sections of speed
					7	Remote set control mode	prohibit	permit
					6	Simulated feedback drops	prohibit	permit
					5	Remote start-stop mode	impulse	electrical level
					4	Frequency converter reversal	prohibit	permit
					3	High-voltage	prohibit	permit

						power loss from the start		
					2	High voltage loss, electric speed is off	prohibit	permit
					1	Simulated given the drop line	prohibit	permit
					0	run mode	Open ring operation	operation with closed ring
41	Parameter combination 2	R /W	28H	40041	byte	name	Byte parsing	
					high byte	Given the way	0: Local given 1: analog given 2: switch given 3: upper given	
					lower byte	control method	0: Local control 1: Upper control 2: Remote control	
42	Analog output	R /W	29H	40042	byte	name	Byte parsing	
					high byte	Analog output 1	0: Operating frequency 1: output current 2: Unit cabinet temperature: 3: excitation current 4: Output power 5: power factor 6: Output voltage	
					lower byte	Analog output 2		

I D	name	attribute	Register address	PLC address	parameter declaration		
					byte	name	Byte parsing
43	Mod bus Parameter	R /W	2AH	40043	high byte	Mod bus Address	1-311
					lower byte	Mo dbus Paud rate	0：1200 1：2400 2：4800 3：9600 4：19200 5：38400
44	Jump frequency: 1L	R /W	2BH	40044	0~80.00Hz		
45	Jump frequency is 1U	R /W	2CH	40045	0~80.00Hz		
46	Jump frequency of 2L	R /W	2DH	40046	0~80.00Hz		
47	Jump frequency is 2U	R /W	2EH	40047	0~80.00Hz		
48	Input electricity, voltage coefficient	R /W	2FH	40048	50-200		
49	Switch given 1	R /W	30H	40049	0~80.00Hz		
50	Switch given 2	R /W	31H	40050	0~80.00Hz		
51	Switch given 3	R /W	32H	40051	0~80.00Hz		
52	Power loss screen, blind delay	R /W	33H	40052	1.0~100.0s		
53	Minimum, given the current current	R /W	34H	40053	0~8.00mA		
54	Maximum, for a given electric current	R /W	35H	40054	10.00~25.00mA		
55	Minimum feedback current	R /W	36H	40055	0~8.00mA		
56	Maximum feedback current	R /W	37H	40056	10.00~25.00mA		
57	Process closed-loop proportional coefficient	R /W	38H	40057	0~50.00		
58	Process closed-loop integration time	R /W	39H	40058	0.01~20.00min		
59	Process closed-loop differential time	R /W	3AH	40059	0~20.00min		
60	A given frequency resolution	R /W	3BH	40060	0.01-1.00Hz		
61	Timed dust removal time	R /W	3CH	40061	From 15 to 30,000 days		
62	Vator stop time	R /W	3DH	40062	0~30min		
63	Motor parameter group selection	R /W	4EH	40079	0: Group 11: Group 22: Group 33: Group 4		

System parameter address code allocation table

I D	name	attribute	Register address	PLC address	parameter declaration			
64	Start frequency	R /W	3EH	40063	0~5.00Hz			
65	maximal frequency	R /W	3FH	40064	0~80.00Hz			
66	low-limit frequency	R /W	40H	40065	0~80.00Hz			
67	Motor limit, flow coefficient	R /W	41H	40066	10%-200%			
68	Parameter combination 3	R /W	42H	40067	byte	name	Byte parsing	
					high byte	Next to the cell, the road cell number	0-1	
						Cell series	2~9	
69	Parameter combination 4	R /W	43H	40068	byte	name	remarks	
					high byte	Death zone compensation	0-20	
					lower byte	Recurrent ascension	0-15	
70	acceleration time	R /W	44H	40069	5.0s~6000.0s			
71	deceleration time	R /W	45H	40070	5.0s~6000.0s			
72	Insient power outage time	R /W	46H	40071	0~1000m s			
73	Parameter combination 5	R /W	47H	40072	B it	name	0	1
					15			
					14			
					13			
					12			

<table>
<tr><th>I D</th><th>name</th><th>attribute</th><th>Register address</th><th>PLC address</th><th colspan="4">parameter declaration</th></tr>
<tr><td rowspan="12">73</td><td rowspan="12">Parameter combination 5</td><td rowspan="12">R /W</td><td rowspan="12">47H</td><td rowspan="12">40072</td><td>B it</td><td>name</td><td>0</td><td>1</td></tr>
<tr><td>11</td><td></td><td></td><td></td></tr>
<tr><td>10</td><td></td><td></td><td></td></tr>
<tr><td>9</td><td></td><td></td><td></td></tr>
<tr><td>8</td><td></td><td></td><td></td></tr>
<tr><td>7</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>control mode</td><td>debug mode</td><td>whack</td></tr>
<tr><td>3</td><td>Downtime method</td><td>Slow down</td><td>Free shutdown</td></tr>
<tr><td>2</td><td>Master and slave mode</td><td>holotype</td><td>From the pattern</td></tr>
<tr><td>1</td><td>Master and from the setting</td><td>of no avail</td><td>valid</td></tr>
<tr><td>0</td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">74</td><td rowspan="3">Parameter combination 6</td><td rowspan="3">R /W</td><td rowspan="3">48H</td><td rowspan="3">40073</td><td>byte</td><td>name</td><td colspan="2">Byte parsing</td></tr>
<tr><td>high byte</td><td>Frequency converter type</td><td colspan="2">2. Aynchronous vector
4. Synchronization machine vector
5. Aynchronous machine open ring vector 6
7. brushless DC synchronous machine 8</td></tr>
<tr><td>lower byte</td><td>starting mode</td><td colspan="2">0: Normal start 1: Speed start
2: Parameter identification 1.3: Parameter identification 2</td></tr>
<tr><td>75</td><td>Rated input voltage of the frequency converter</td><td>R /W</td><td>49H</td><td>40074</td><td colspan="4">380~15000V</td></tr>
<tr><td>76</td><td>Rated voltage of the frequency converter</td><td>R /W</td><td>4AH</td><td>40075</td><td colspan="4">380~15000V</td></tr>
<tr><td>77</td><td>Rated current of the frequency converter</td><td>R /W</td><td>4BH</td><td>40076</td><td colspan="4">31.0~1600.0A</td></tr>
<tr><td>78</td><td>Rated input current ratio of the frequency converter</td><td>R /W</td><td>4CH</td><td>40077</td><td colspan="4">100-2000</td></tr>
<tr><td>79</td><td>Drop cut lock phase Angle</td><td>R /W</td><td>4DH</td><td>40078</td><td colspan="4">0.5-5°</td></tr>
<tr><td>80</td><td>Motor rating, fixed voltage</td><td>R /W</td><td>4FH</td><td>40080</td><td colspan="4">380~15000V</td></tr>
<tr><td>81</td><td>Motor rating, fixed current</td><td>R /W</td><td>50H</td><td>40081</td><td colspan="4"></td></tr>
<tr><td>82</td><td>Motor amount, fixed frequency</td><td>R /W</td><td>51H</td><td>40082</td><td colspan="4">5.00~80.00H z</td></tr>
<tr><td>83</td><td>Motor rating, fixed rotation speed</td><td>R /W</td><td>52H</td><td>40083</td><td colspan="4">0~3600R PM</td></tr>
<tr><td>84</td><td>Motor rating,</td><td>R /W</td><td>53H</td><td>40084</td><td colspan="4">1~60000kW</td></tr>
</table>

	fixed power							
85	Motor turn, dynamic inertia	R /W	54H	40085	0.1-300kg.m²			
86	Empty motor, carrying current	R /W	55H	40086	1~1600.0A			
87	Motor set, sub-resistance	R /W	56H	40087	0.001~10.000Ω			
88	Motor set, sub leakage feeling	R /W	57H	40088	0.1~1000.0mH			
89	Function word 2	R /W	58H	40089	B it	name	0	1
					B 15			Automatically calculate the speed loop
					B 14			Automatically calculate the current ring
					B 13			Automatically calculate the magnetic flux rings
					B 12			The VF slip difference compensation
					B 11~B4	reserve		
					B 3~B0	Excitation time	1~16s	

I D	name	attribute	Register address	PLC address	parameter declaration
90	A magnetic flux given	R /W	59H	40090	0.1~1.0pu
91	Speed ratio coefficient	R /W	5AH	40091	0.5~20.00
92	Speed integration time	R /W	5BH	40092	0.1~20.00s
93	The flux proportional coefficient	R /W	5CH	40093	0.5~20.00
94	The magnetic flux integration time	R /W	5DH	40094	0.1~20.00s
95	Current ratio, the example coefficient	R /W	5E H	40095	0.1~15.00
96	Current product, split in time	R /W	5F H	40096	0.15~30.00ms
97	Number of encoder pulses	R /W	60H	40097	0: 512 1: 1024 2: 2048 3: 4096 4: 19200 5: 16384 6: 65535
98	Frequency searches for the currents	R /W	61H	40098	0.1~1.0pu
99	Motor phase order	R /W	62H	40099	0: reverse 1: forward
100	Function word 3	R /W	63H	40100	B it / name / 0 / 1
					B15~B13 / The VF curve selection / 0: A linear VF curve 1:1.2 power curve 2:1.5 power curve 3:1.7 power curve 4:2 power curves 5: VF separation curve
					B 12~B8 / Overexcitation frequency / 1~30
					B 7~B3 / Overexcitation gain / 1~30
					B 2~B0 / Bypass type / 0: No bypass 1: Mechanical bypass 2: IGB T bypass

Excitation parameter address code distribution table

I D	name	attribute	Register address	PLC address	parameter declaration			
					B it	name	0	1
					15			
					14			
					13			
					12			
					11			
					10			

101	Parameter combination 7	R /W	64H	40101	9			
					8	Excitation fault condition	trouble-free	hitch
					7	Excitation operation state	cease	move
					6	Excitation-ready state	Not ready	ready
					5	Start / stop the excitation	cease	firing
					4	Whether the excitation feedback is available	possess	Do not have
					3	Change switch	prohibit	permit
					2	work pattern	manual regulation	closed-cycle control
					1	Selection of the excitation mode	asynchronous starting	synchronous starting
					0	Exciting magnetic control	prohibit	permit

I D	name	attribute	Register address	PLC address	parameter declaration
102	Set the work, the rate factor	R /W	65H	40102	0.5-0.98
103	Autoadjust the switching frequency	R /W	66H	40103	25.00-50.00Hz
104	Aynchronous investment, excitation frequency	R /W	67H	40104	0-50.00Hz
105	Motor forehead, fixed excitation	R /W	68H	40105	0.1~1600.0A
106	Excitation minimum for a given current	R /W	69H	40106	0-20.00mA
107	Excitation maximum for a given current	R /W	6AH	40107	0-20.00mA
108	Minimum excitation feedback current	R /W	6BH	40108	0-20.00mA
109	Maximum excitation feedback current	R /W	6CH	40109	0-20.00mA
110	excitation cabinet current	R /W	6DH	40110	0~1600.0A
111	Given the excitation current	R /W	6EH	40111	0~1600.0A
112	Feedback of the excitation current	R	6FH	40112	0.1A
113	Output excitation, magnetic current	R	71H	40113	0.1A
114	Excitation closed -loop proportional coefficient	R /W	70H	40114	0~20.00
115	Excitation closed -loop differential time	R /W	72H	40115	0~30.00min
116	Excitation closed -loop integration time	R /W	73H	40116	0.1~20.00min