

# ET/EP/EH Series Intelligent Flexible Driver Manual

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## Preface

We sincerely thank you for purchasing the STP ET/EP/EH Series **Intelligent Flexible Driver**.

To ensure correct installation and use of the **ET/EP/EH series intelligent flexible driver**, please carefully read this user manual and understand the product safety precautions before using this product.

### General Statement


Shanghai STEP Electric Corporation (hereinafter referred to as "STEP") has reviewed this manual for consistency with the hardware and software described herein. However, there may still be some omissions. We will periodically review this manual and make the necessary corrections in subsequent revisions. Suggestions for improvement are welcome.

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## About the guarantee

### Guarantee period

The product guarantee period is: 18 months from the date of delivery of the product.

### Guarantee scope

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Initial error diagnosis, in principle, is carried out by the user.

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	Safety Instructions	<b>1</b>
	Product Overview	<b>2</b>
	Installation of the inverter	<b>3</b>
	Wiring of the inverter	<b>4</b>
	Commissioning and trial operation	<b>5</b>
	Function parameter table	<b>6</b>
	Explanation of parameters	<b>7</b>
	Fault checking	<b>8</b>
	Care and Maintenance	<b>9</b>
	EMC Installation Guide for the Inverter	<b>A</b>
	Standards Suitable for the Inverter	<b>B</b>
	Modbus Communication Protocol	<b>C</b>

# CONTENTS

<b>CHAPTER 1 SAFETY INSTRUCTIONS .....</b>	<b>- 1 -</b>
1.1 DESCRIPTION OF SAFETY-RELATED MARKINGS .....	- 1 -
1.2 SAFETY MATTERS .....	- 2 -
1.2.1 Purpose .....	- 2 -
1.2.2 Arrival inspection .....	- 2 -
1.2.3 Transportation and storage .....	- 2 -
1.2.4 Installation .....	- 2 -
1.2.5 Electrical connection .....	- 3 -
1.2.6 Trial operation .....	- 3 -
1.2.7 Maintenance and inspection .....	- 4 -
1.2.8 Scrap .....	- 5 -
1.2.9 Compliance with the Low Voltage Directive .....	- 5 -
1.2.10 Others .....	- 5 -
1.3 PRECAUTIONS .....	- 6 -
1.3.1 Motor insulation inspection .....	- 6 -
1.3.2 Thermal protection of the motor .....	- 6 -
1.3.3 About motor heat and noise .....	- 6 -
1.3.4 Attention for input and output .....	- 6 -
1.3.5 When used beyond the rated voltage .....	- 6 -
1.3.6 Lightning surge protection .....	- 7 -
1.3.7 Leakage protection .....	- 7 -
1.3.8 Derating use .....	- 7 -
1.3.9 About the adaptive motor .....	- 7 -
1.3.10 About the use of power factor compensation capacitors .....	- 7 -
<b>CHAPTER 2 PRODUCT OVERVIEW .....</b>	<b>- 9 -</b>
2.1 DESCRIPTION OF THE NAMEPLATE .....	- 9 -
2.1.1 Product nameplate description .....	- 10 -
2.1.2 Description of product specifications .....	- 10 -
2.2 TECHNICAL PERFORMANCE AND SPECIFICATIONS OF THE INVERTER .....	- 12 -
2.3 INSTALLATION DIMENSIONS OF THE INVERTER .....	- 14 -
2.3.1 Product External Dimensions and Mounting Dimensions .....	- 14 -
2.3.1.1 Dimensions of Specifications .....	- 14 -
2.3.1.2 Operator dimensions .....	- 17 -
2.4 OPTION OF BRAKING UNIT AND BRAKING RESISTOR .....	- 19 -
<b>CHAPTER 3 INSTALLATION OF THE INVERTER .....</b>	<b>- 22 -</b>
3.1 INSTALLATION STEPS .....	- 22 -
3.2 MECHANICAL INSTALLATION .....	- 22 -
3.2.1 Installation environment of the product .....	- 22 -
3.2.2 Installation orientation and spacing requirements .....	- 23 -
If middle installation dimensions are required, please contact the technical team .....	- 27 -
3.3 REMOVAL AND INSTALLATION OF OPERATION PANEL AND COVER PLATE .....	- 28 -
3.3.1 Disassembly and installation of the operator .....	- 28 -
3.3.2 Opening and closing of the wiring cover .....	- 29 -
<b>CHAPTER 4 WIRING OF THE INVERTER .....</b>	<b>- 30 -</b>
4.1 CONNECTION BETWEEN THE INVERTER AND PERIPHERAL EQUIPMENT .....	- 31 -
4.1.1 Connection diagram of the inverter and peripheral equipment .....	- 31 -
4.1.2 Connection of main circuit peripheral devices .....	- 32 -
4.2 INVERTER TERMINAL WIRING .....	- 35 -
4.2.1 Inverter terminal wiring diagram .....	- 36 -
4.2.2 Notes on inverter terminal wiring .....	- 36 -
4.3 WIRING OF MAIN CIRCUIT TERMINALS .....	- 37 -
4.3.1 Layout of main circuit terminals .....	- 37 -
4.3.2 Descriptions on main circuit terminal markings and functions .....	- 37 -
4.3.3 The wire specifications of main circuit wiring .....	- 38 -

4.3.4	Description on main circuit terminal wiring .....	39 -
4.4	ANTI-INTERFERENCE MEASURES .....	42 -
4.4.1	Connect a special noise filter on the output side .....	42 -
4.4.2	Surge suppressor connected to the output side.....	43 -
4.4.3	Layout of the main circuit wiring.....	43 -
4.4.4	Better anti-interference measures.....	44 -
4.4.5	Relationship between wiring length and carrier frequency .....	44 -
4.5	WIRING OF CONTROL CIRCUIT TERMINALS .....	44 -
4.5.1	Layout of control circuit terminals.....	44 -
4.5.2	Control circuit terminal markings .....	45 -
4.5.3	Functional descriptions of control circuit terminals .....	46 -
4.5.4	Wire specifications for control circuit wiring .....	47 -
4.5.5	Detailed description of control circuit terminal wiring .....	48 -
4.5.5.4	Multifunctional analog output terminal.....	51 -
4.5.6	Other notes on wiring.....	52 -
<b>CHAPTER 5 COMMISSIONING AND TRIAL OPERATION .....</b>		<b>53 -</b>
5.1	RUNNING COMMAND SETTING.....	53 -
5.1.1	Inverter operation command channel .....	53 -
5.1.2	Inverter frequency setting channel .....	53 -
5.1.3	Inverter operating status.....	54 -
5.1.4	Inverter operation mode .....	54 -
5.2	OPERATION GUIDE .....	54 -
5.2.1	Introduction to the functions of various parts of the operator .....	55 -
5.2.2	LCD display .....	55 -
5.3	OPERATION OF LCD OPERATOR .....	55 -
5.3.1	Power-on initialization .....	55 -
5.3.2	Display after power-on.....	56 -
5.3.3	[Monitor Status] Details.....	56 -
5.3.4	Detailed description of [Panel Control].....	56 -
5.3.5	Operation status of the operator .....	57 -
5.4	FAULT DISPLAY.....	59 -
<b>CHAPTER 6 FUNCTION PARAMETER TABLE.....</b>		<b>61 -</b>
6.1	DESCRIPTION ON FUNCTION CODE PARAMETER TABLE.....	61 -
6.2	BRIEF TABLE OF FUNCTION CODE PARAMETERS .....	61 -
6.2.1	Group P0X User parameters .....	61 -
6.2.2	Group P1X Control parameters.....	61 -
	Group P15 SVC control parameters.....	64 -
	P16 group Weak magnetism parameters .....	65 -
	P17 group GVC parameter.....	65 -
6.2.3	Group P2X Motor parameters .....	65 -
	P22 auxiliary motor parameter.....	67 -
	P23 protection parameter .....	68 -
	Group P3X Digital parameters.....	68 -
	Group P30 Digital input parameters.....	68 -
	P31 group Digital output.....	68 -
	P32 group Analog input .....	69 -
	P33 Analog output parameters .....	70 -
	P4X group Frequency control .....	70 -
	P40 group Basic parameters .....	70 -
	P41 digital multi-segment speed .....	71 -
	P50 main and auxiliary preset.....	72 -
	P51 process PID.....	72 -
	P6X group Vector control parameter .....	73 -
	P60 group Speed loop PID.....	73 -
	P61 group Current loop PID .....	73 -
	P62 group Torque control .....	74 -
	P63 compensating torque control.....	74 -
	P7X group Enhanced control .....	74 -

P70 group Limit and protection .....	- 74 -
P71 Special function .....	- 75 -
Group P8X Communication parameters .....	- 76 -
Group P80 Communication selection parameters .....	- 76 -
Group P81 Modbus communication parameters .....	- 77 -
P82 group (Reserved parameter group) .....	- 77 -
Group P9X Error and display parameters .....	- 77 -
Group P90 Reserved parameters .....	- 77 -
Group P92 LED display parameters(Reserved parameter) .....	- 77 -
Group P93 Operation record parameters .....	- 78 -
Group P94 Troubleshooting parameters .....	- 78 -
P95 group Version .....	- 79 -
P96 group Inverter information .....	- 79 -

## **CHAPTER 7 EXPLANATION OF PARAMETERS ..... - 81 -**

7.1 PARAMETER GROUP CLASSIFICATION AND FORMAT .....	- 81 -
7.1.1 Parameter group format .....	- 81 -
7.1.2 Parameter group region division .....	- 81 -
7.2 GROUP P0X USER PARAMETERS GROUP .....	- 82 -
7.2.1 P00 Group Basic function parameters .....	- 82 -
7.3 GROUP P1X CONTROL PARAMETER GROUP .....	- 82 -
7.3.1 Group P10 Basic control parameters .....	- 82 -
7.3.2 Group P11 Start-up parameters .....	- 85 -
7.3.3 P12 group Stop parameters .....	- 89 -
7.3.4 P13 group Braking function .....	- 91 -
7.3.5 Group P14 V/F control parameters .....	- 91 -
7.3.6 P15 group SVC parameter .....	- 93 -
7.3.7 P16 group Weak magnetism parameters .....	- 94 -
7.3.8 P17 group GVC parameter .....	- 94 -
7.4 GROUP P2X MOTOR PARAMETERS .....	- 96 -
7.4.1 P20 group General parameter .....	- 96 -
7.4.2 P21 group Advanced parameters .....	- 98 -
7.4.3 P22 group Auxiliary parameters .....	- 99 -
7.4.4 P23 group Protection parameter .....	- 100 -
7.5 P3X GROUP TERMINAL FUNCTION .....	- 101 -
7.5.1 P30 group Digital input .....	- 101 -
7.5.2 P31 group Digital input .....	- 105 -
7.5.3 P32 group Analog input .....	- 112 -
7.5.4 P33 Group Analog Output Parameters .....	- 113 -
7.6 P4X GROUP VELOCITY PARAMETER GROUP .....	- 114 -
7.6.1 Group P40 Basic speed parameters .....	- 114 -
7.6.2 P41 Group Digital Multi-speed parameters Group .....	- 115 -
7.7 P5X GROUP PROCESS CONTROL .....	- 117 -
7.7.1 P50 group Main and auxiliary preset .....	- 117 -
7.7.2 P51 group Process PID .....	- 119 -
7.8 P6X GROUP VECTOR CONTROL .....	- 123 -
7.8.1 P60 group Speed loop PID .....	- 123 -
7.8.2 P61 group Current loop PID .....	- 125 -
7.9 P7X GROUP ENHANCED CONTROL .....	- 126 -
7.9.1 P70 group Limit and protection .....	- 126 -
7.9.2 P71 group Special functions .....	- 129 -
7.10 P8X GROUP COMMUNICATION CONTROL .....	- 133 -
7.10.1 P80X group Communication mode .....	- 133 -
7.10.2 Group P81 Modbus communication parameters .....	- 133 -
7.10.3 P82 group (Reserved parameter group) .....	- 134 -
7.11 P9X GROUP FAULT AND DISPLAY PARAMETER GROUP .....	- 135 -
7.11.1 P90 group (Reserved parameter group) .....	- 135 -
7.11.2 P91 group LCD display .....	- 135 -
7.11.3 Group P93 Operation record parameters .....	- 136 -
7.11.4 P94 group Fault processing .....	- 136 -

7.11.5	P95 group Version .....	- 138 -
7.11.6	P96 group Inverter information.....	- 139 -
<b>CHAPTER 8 FAULT CHECKING.....</b>		<b>- 141 -</b>
8.1	PROTECTION AND INSPECTION FUNCTIONS .....	- 141 -
8.2	FAULT DIAGNOSIS PROCESS.....	- 146 -
<b>CHAPTER 9 CARE AND MAINTENANCE.....</b>		<b>- 149 -</b>
9.1	WARRANTY PERIOD .....	- 149 -
9.2	PRODUCT INQUIRY .....	- 149 -
9.3	ROUTINE INSPECTION .....	- 149 -
9.4	PERIODIC INSPECTION .....	- 150 -
<b>APPENDIX A EMC INSTALLATION GUIDE FOR THE INVERTER .....</b>		<b>- 153 -</b>
A.1	NOISE SUPPRESSION .....	- 153 -
A.1.1	Type of noise.....	- 153 -
A.1.2	Propagation path of noise.....	- 153 -
A.1.3	Basic countermeasures for noise suppression .....	- 154 -
A.2	DISTRIBUTION REQUIREMENTS.....	- 155 -
A.2.1	Cable laying requirements.....	- 155 -
A.2.2	Requirements for cable cross-sectional area .....	- 155 -
A.2.3	Requirements for shielded cables.....	- 156 -
A.2.4	Requirements for shielded cable installation.....	- 156 -
A.3	GROUNDING.....	- 156 -
A.3.1	Grounding mode .....	- 156 -
A.3.2	Precautions for grounding cables .....	- 156 -
A.4	INSTALLATION OF SURGE ABSORBER.....	- 157 -
A.5	LEAKAGE CURRENT AND ITS COUNTERMEASURES.....	- 157 -
A.5.1	Earth leakage current .....	- 158 -
A.5.2	Line-to-line leakage current .....	- 158 -
A.6	RADIATION EMISSION SUPPRESSION OF THE INVERTER.....	- 158 -
A.7	GUIDE TO THE USE OF POWER LINE FILTER .....	- 159 -
A.7.1	Function of power line filter .....	- 159 -
A.7.2	Precautions for power line filter installation .....	- 159 -
A.8	DIVISION OF EMC INSTALLATION AREA OF THE INVERTER .....	- 159 -
A.9	PRECAUTIONS FOR ELECTRICAL INSTALLATION OF THE INVERTER .....	- 161 -
A.10	EMC STANDARDS MET BY THE INTELLIGENT FLEXIBLE DRIVER.....	- 163 -
<b>APPENDIX B STANDARDS SUITABLE FOR THE INVERTER .....</b>		<b>- 164 -</b>
<b>APPENDIX C MODBUS COMMUNICATION PROTOCOL .....</b>		<b>- 165 -</b>
C.1	COMMAND DATA [REGISTER 3, 6] [BIT 1, 5] .....	- 165 -
C.2	MONITORING DATA [REGISTER 4] [BIT 2] .....	- 167 -
<b>APPENDIX D PROFINET COMMUNICATION DESCRIPTION .....</b>		<b>- 173 -</b>
D.1	INTRODUCTION TO NETWORK SETTINGS .....	- 173 -
D.1.1	Introduction to PN communication card of STEP inverter .....	- 173 -
D.1.2	Host setting .....	- 173 -
D.1.3	Slave setting .....	- 173 -
D.1.4	GSD file acquisition.....	- 173 -
D.2	PROTOCOL CONTENT .....	- 174 -
D.2.1	2WORD communication protocol meaning, this type includes 2 control words and 2 status words:.....	- 174 -
D.2.1.1	Inverter control word .....	- 174 -
D.2.1.2	Inverter status word.....	- 175 -
D.2.2	4WORD communication protocol meaning, this type includes 4 control words and 4 status words:.....	- 176 -
D.2.2.1	Inverter control word .....	- 176 -
D.2.2.2	Inverter status word.....	- 177 -

D.2.3	8WORD communication protocol meaning, this type includes 8 control words and 8 status words:.....	- 178 -
D.2.3.1	Inverter control word .....	- 178 -
D.2.3.2	Inverter status word.....	- 179 -
D.3	PROTOCOL USAGE.....	- 181 -
<b>APPENDIX E OPTIONAL EXPANSION CARD .....</b>		<b>- 183 -</b>
<b>CUSTOMER COMPLAINT .....</b>		<b>- 186 -</b>
<b>WARRANTY CARD.....</b>		<b>- 187 -</b>
<b>WARRANTY AGREEMENT .....</b>		<b>- 188 -</b>
<b>CUSTOMER NOTIFICATION.....</b>		<b>- 189 -</b>

# Chapter 1 Safety Instructions

This chapter lists the safety instructions and precautions that requires attention during the use of intelligent flexible driver. These instructions are divided into safety instructions for marking instructions, usage, arrival confirmation, transportation and storage, installation, wiring safety instructions, commissioning/operation, troubleshooting, and product end-of-life disposal. To ensure personal safety and to prolong the service life of the equipment and its connections, please read the following safety rules and warnings, as well as all warning signs affixed to the equipment, before installing and commissioning the inverter. Please read this information carefully.

## 1.1 Description of safety-related markings

The following signs are used for the safety related content in this manual. The narrative with safety markings is important, so please be sure to observe it.



**Danger**

Indicates that incorrect use of indications will cause dangerous situations, which may lead to personal injury or even death.



**Caution**

Indicates that incorrect use of indications may lead to moderate personal injury and equipment damage.



**Important** indicates that the user needs to observe and pay special attention.



**Caution**

In addition, even matters may cause major accidents depending on the specific circumstances.

## WARNING


- This equipment should be serviced by qualified personnel only.
- Risk of injury and electric shock
- Observe the instructions described in the instruction manual.
- Wait 10 minutes for capacitor discharge after disconnecting power supply.
- Ensure proper earth connection.
- Never connect AC power to output UVW terminals.

## 危險


- 非专业人员请勿对装置进行维护
- 触电受伤危险
- 请务必遵循使用说明书的作业指导
- 断开电源后请等候电容放电十分钟
- 确认安全的接地连接
- 请勿将AC电源接到UVW端子上

## 1.2 Safety matters


### 1.2.1 Purpose

 <b>Danger</b>
<p>This series of inverter is used to control the variable speed operation of three-phase motors, and should not be used for single-phase motors or other applications, as this may cause inverter failure or fire.</p> <p>This series of inverter cannot be simply used in medical devices or other applications directly related to personal safety.</p> <p>This series inverter is manufactured under strict quality management system. If the failure of the inverter may lead to a major accident or loss, safety measures such as redundancy or bypass are required in case of emergency.</p>

### 1.2.2 Arrival inspection


 <b>Caution</b>
<p>Delivered goods must be in good condition and exactly match the information on the purchase order. If the goods are found to be damaged or inconsistent with the information on the purchase order, please contact the manufacturer or supplier immediately.</p> <p>If the delivered equipment is damaged or missing parts, it must not be installed or put into use, otherwise accidents may occur.</p>

### 1.2.3 Transportation and storage

 <b>Caution</b>
<p>Please avoid violent vibration and impact during transportation.</p> <p>If the device is found to be damaged, the shipping company should be notified immediately.</p> <p>The equipment must be transported and stored in accordance with the specified environmental conditions.</p> <p>If the device is stored for more than 1 year, the capacitors must be recharged.</p>

### 1.2.4 Installation

 <b>Danger</b>
<p>Beware of fire or electric shock!</p> <p>Do not install the device in an area that is flammable or explosive, or where there is a risk of exposure to water or corrosion.</p>

 <b>Caution</b>
<p>When handling or installing the device, please put pressure on the bottom of the product to prevent smashing or dropping the inverter.</p> <p>Do not install the equipment in an area susceptible to continuous vibration, shock or</p>



Caution

electromagnetic interference.

The inverter should be installed on metal or other flame retardant objects, away from flammable objects and heat sources.

Beware of fire! Be sure that the inside of the inverter and its heat sink are free of any debris (e.g., wood chips, iron filings, dust, paper).

A certain clearance is required between the inverter and the inverter, and between the inverter and another device/the inner wall of an electrical cabinet. (For specific requirements on clearance, please refer to 3.2.2 Installation orientation and spacing).

The inverter must not be installed horizontally.

### 1.2.5 Electrical connection



Danger

Wiring must be performed by a qualified electrical engineer, otherwise there is a risk of electric shock or damage to the inverter.

Make sure that the power supply is disconnected before wiring, otherwise there may be a risk of electric shock or fire.

Grounding terminal PE should be grounded reliably, otherwise there is a risk of electric shock to the inverter shell.

Do not touch the main circuit terminal, and do not contact the main circuit terminal wiring with the shell, otherwise there is a risk of electric shock.

When the power is turned on with the run signal on, the motor will automatically start running. Therefore, make sure that the run signal is off before turning on the power. Otherwise, there is a risk of injury.

When setting the 3-wire control, set the parameters of the multi-function input terminal and then connect the control circuit, otherwise there is a risk of injury due to motor rotation.

### 1.2.6 Trial operation



Caution

Do not connect the power input cable to the U/T1, V/T2, or W/T3 motor terminals, or the motor cable to the R/L1, S/L2, or T/L3 power input terminals.

Power and signal cables must be laid in separate raceways with at least 30cm spacing between them. The connected cables must not come into contact with rotating mechanical parts.

It is absolutely forbidden to connect capacitors or LC/RC noise filters with phase lead to the output of the inverter, as this will cause damage to the internal components of the inverter.

Use crimp terminals with insulated sleeves for the wiring cables of the main circuit terminals.

For the selection of inverter input and output cables, please select cables with appropriate cross-section according to the inverter power.

When the cable length between the inverter and motor exceeds 100m or when running with multiple motors, it is recommended to use output reactors to avoid over-current from excessive distributed capacitance causing inverter failure.

Do not use loads other than three-phase AC motors.

When performing rotary type self-learning, be sure to take off the load. The motor will

run and stop repeatedly until the end of self-learning, so do not touch the motor. Otherwise, there is a risk of injury.



**Danger**

Make sure that the front cover is installed before turning on the power. Do not remove the cover when the power is on, otherwise there is a risk of electric shock.  
Please prepare an emergency stop switch separately (the stop button is only effective when the function is set).  
Please reset the alarm after confirming that the operation signal is cut off, otherwise there is a risk of injury.



**Caution**

No-load commissioning of the motor must be performed before commissioning of the motor load.  
Do not touch the inverter heat sink, motor or other hot parts while the equipment is still running or for a period of time after power failure to avoid burns.  
Do not start or stop the inverter by repeatedly turning the power on and off, otherwise the equipment/system may be damaged.  
Before running, please make sure that the motor and machinery are within the allowed use range, otherwise the equipment may be damaged.  
When using on lifting equipment, please also configure mechanical holding device.  
Please do not modify the parameters of the inverter at will. Most of the factory-set parameters of the inverter can already meet the operation requirements, as long as some necessary parameters are set. Modifying the parameters at will may lead to damage of the machinery and equipment.

### 1.2.7 Maintenance and inspection



**Danger**

There are high-voltage terminals in the inverter, so please do not touch them at will. Otherwise, there is a risk of electric shock.  
Be sure to install a protective cover when the power is on. Also, when removing the protective cover, be sure to disconnect the circuit breaker used for wiring, otherwise there is a risk of electric shock.  
After disconnecting the main circuit, wait at least 10 minutes to make sure that the charging indicator on the front cover is off before performing maintenance and inspection, otherwise there is a risk of electric shock due to the voltage remaining on the capacitor.  
Except for designated personnel, others are not allowed to repair, inspect, or replace the components. Remove any metal accessories (watches, rings, etc.) from your body before operation. During operation, please use tools that have been insulated, otherwise there is a risk of electric shock.



Caution

There are CMOS large-scale integrated circuits on the circuit board, please do not touch them to prevent electrostatic damage to the circuit board.

### 1.2.8 Scrap



The electrolytic capacitors of the main circuit and the electrolytic capacitors on the printed circuit board may explode when they are burned. Toxic gas will be generated when the plastic parts are burned. The end-of-life disposal of this equipment must be carried out in accordance with the laws and regulations of the relevant environmental protection departments regarding the disposal of industrial electronic waste.

### 1.2.9 Compliance with the Low Voltage Directive



Our products comply with the requirements of IEC 61800-5-1:2007+A1:2016 standards, and further comply with Low Voltage Directive 2014/35/EU.

If the inverter is integrated as a component in an entire electrical system, please ensure that the entire system complies with the requirements of the EC Directive.

Note:

- ① Please ensure that the machine is grounded and that the ground terminal is grounded separately.
- ② The inverter is prohibited from being used in the  $\Delta$  grounding and IT power supply systems.
- ③ If it is installed in a cabinet, please ensure that the cabinet is grounded.
- ④ Please use the CE certified circuit breakers, electromagnetic contactors, and other accessories. Please use type B earth leakage circuit breaker.

Please use the inverter under the condition of overvoltage category III and pollution level II. The protection level of the inverter is Class I protection.

### 1.2.10 Others



Do not place the inverter in an environment with halogens (fluorine, chlorine, bromine, iodine) under any circumstances of transportation or setup, otherwise the inverter will be damaged or the parts will be burned.

## 1.3 Precautions

### 1.3.1 Motor insulation inspection

Motor insulation inspection should be carried out when the motor is used for the first time, used again after a long period of time, and regularly inspected to prevent the inverter from being damaged due to insulation failure of the motor winding. Insulation inspection must be done to separate the motor connection from the inverter, and it is recommended to use 500V voltage megohmmeter, which should ensure that the measured insulation resistance is not less than  $5M\Omega$ .

### 1.3.2 Thermal protection of the motor

If the selected motor does not match with the rated capacity of the intelligent flexible driver, especially when the rated power of the inverter is greater than that of the motor, be sure to adjust the motor protection related parameter values of intelligent flexible driver or install a thermal relay in front of the motor to protect the motor.

### 1.3.3 About motor heat and noise

Since the output voltage of inverter is PWM wave, it contains certain harmonics, so the temperature rise, noise and vibration of the motor will be slightly increased compared with the working frequency operation.

When the inverter drives a normal motor at low speed for a long time, the heat dissipation of the motor becomes worse and the motor temperature increases. If the device needs to run at low speed with constant torque for a long time, you must use inverter motor or use forced air cooling.

### 1.3.4 Attention for input and output

Output of intelligent flexible driver is PWM wave. If the output side is installed with capacitor for improving power factor or varistor for lightning protection, it is easy to trigger instantaneous overcurrent of inverter or even damage the inverter. Please do not use them.

The diagram of the output side of the inverter must not be connected with capacitors is shown in Figure 1-1.

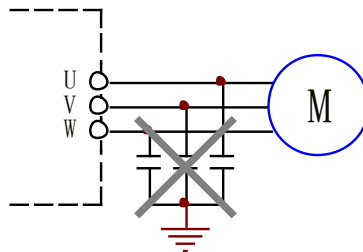


Fig. 1-1 The output side of the inverter must not be connected with capacitors

If a contactor is installed between the power supply and the input of the inverter, it is not allowed to use this contactor to control the start/stop of the inverter.

If contactors or other switching devices are installed between the output side and the motor, it should be ensured that the inverter is operated on and off when there is no output, and it is not allowed to open/close the contactor when the inverter is outputting, otherwise it may cause damage to the module.

It is desirable to control the start/stop of the inverter through the terminal. It is strictly forbidden to use contactors or other switching devices on the input side of the inverter for direct, frequent starting and stopping, otherwise it will damage the equipment.

### 1.3.5 When used beyond the rated voltage

If the intelligent flexible driver is used when the external voltage is not within the allowable working voltage range specified in this manual, it is easy to cause damage to the inverter components. If

necessary, use the appropriate step-up or step-down device to change the voltage.

### 1.3.6 Lightning surge protection

This series of inverter is equipped with lightning overcurrent protection device, which has certain self-protection ability to resist lightning. For places with frequent lightning, customers should also install additional protection at the front of the inverter.

### 1.3.7 Leakage protection

When the inverter operates with high-speed switching action, there is bound to be high-frequency leakage current, which may lead to leakage protection circuit misoperation. When encountering the above problem, in addition to appropriately reducing the carrier frequency and shortening the leads, the leakage protector should be properly installed.

When installing the leakage protector, the following points should be noted:

- The leakage protector is recommended to be set on the input side of the inverter and placed after the air switch (fuseless circuit breaker).
- Models insensitive to high harmonic or special leakage protectors for inverters shall be selected for the leakage protectors. If ordinary leakage protectors are used, models with a leakage current detection value above 200 mA and an action time above 0.1s shall be selected.

### 1.3.8 Derating use

When the EH6 series ambient temperature is within 40°C, the inverter does not derate; when over 40°C, 1% of rated current decreases per 1°C, the maximum allowable temperature is 50°C;

When the EP6 and ET6 series ambient temperature is within 50°C, the inverter does not derate; when over 50 °C, 1% of rated current decreases per 1 °C, the maximum allowable temperature is 60°C;

For areas within an altitude of 1,000 meters, it does not derate; when over 1,000 meters, 1% of rated current decreases per 100 meters, and the maximum allowable altitude is 2,000 meters;

### 1.3.9 About the adaptive motor

This inverter is suitable for AC asynchronous motor, please make sure to match the inverter according to the motor nameplate.

The built-in default motor parameters of the inverter are asynchronous motor parameters, but according to the actual situation, it is necessary to identify the motor parameters or modify the default value to meet the actual needs, otherwise the operation effect and protection performance will be sacrificed.

Short circuit inside the cable or motor will trigger the inverter alarm or even cause damage. Therefore, please first perform the insulation short circuit test on the motor and cable for newly installed devices, and this test should be performed frequently in the daily maintenance. Note that the inverter must be completely disconnected from the part being tested when doing this test.

### 1.3.10 About the use of power factor compensation capacitors

No power factor compensation is required when using AC converters. However, if a compensation capacitor is installed in the system connected to the inverter, that is, there is a power factor compensation capacitor in parallel with the three-phase input of the inverter, the following limitations should be noted:

- Do not connect high power capacitors on the power line while the frequency converter is connected. The connection will cause voltage transients that may trip or even damage the inverter.
- If the capacitor load is gradually increased/reduced while the AC converter is connected to

the power line, ensure that the connection capacity is low enough to not cause voltage transients that could trip the converter.

- Check that the power factor compensation device is suitable for use in systems with AC converters, i.e. harmonic generating loads. In such systems, the compensation device is typically equipped with a harmonic suppression reactor or harmonic filter.

## Chapter 2 Product Overview

The ET/EP/EH series intelligent flexible driver is a 400 V level (380 V - 480 V) high-performance vector inverter, applicable to three-phase asynchronous motors, permanent magnet synchronous motors, synchronous reluctance motors, etc. with motor capacity of 1.1-355 kW. The intelligent flexible driver with factory default settings provides an ideal solution for numerous simple motor control applications, and by setting related parameters, it can also be applied to more advanced motor control operations.

### 2.1 Description of the nameplate

The nameplate is attached to the side of the inverter. The nameplate records the model number, specifications, lot No., manufacturing No., etc. of the inverter.



Figure 2-1 Inverter nameplate (example)

### 2.1.1 Product nameplate description

The nameplate of the inverter records the model number, specification, lot No., etc. of the inverter.

Nameplate parameter description:

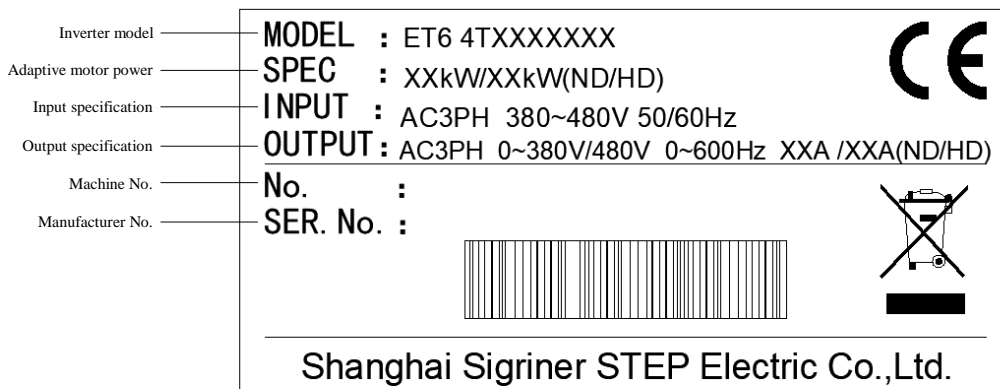


Figure 2-2 Inverter nameplate

### 2.1.2 Description of product specifications

In the column of "inverter specification" on the nameplate, the voltage level and the rated current value of the inverter are indicated by numbers and letters.

# EH6 4T018 A/B/A/A/1

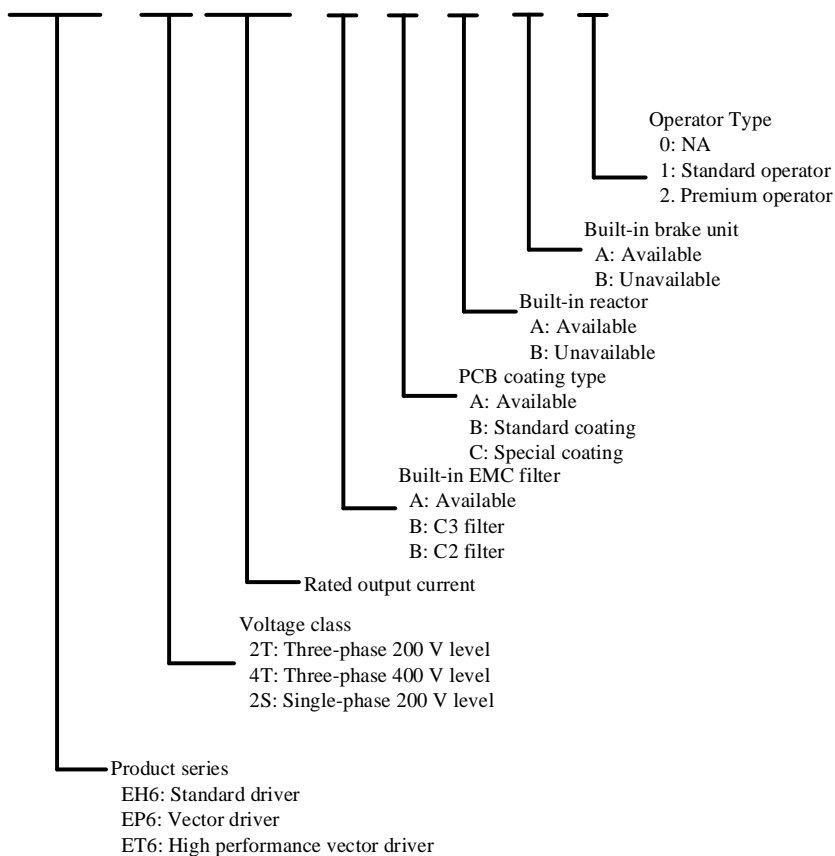


Table 2.1 Series of inverter specifications

Spec ifica tion	Inverter model	EP6/ET6 series (heavy load)					EH6 series (light load)			
		EP6 rated input current (A)	ET6 rated input current (A)	Rated output current (A)	Applica ble motor Power (kW)	Overload 150% (1min)	Rated input Current (A)	Rated output current (A)	Applic able motor (kW)	Overloa d 110% (1min)
F0	4T4A1	3.7	2.8	3.1	1.1	4.65	5.0	4.1	1.5	4.51
	4T5A6	5.0	3.6	4.1	1.5	6.15	7.0	5.6	2.2	6.16
	4T7A2	6.9	5.2	5.6	2.2	8.4	9.1	7.2	3	7.92
	4T9A4	9	6.8	7.2	3	10.8	11.8	9.4	4	10.34
	4T012	11.9	8.7	9.4	4	14.1	15.9	11.9	5.5	13.1
	4T018	15.9	13.7	14.8	5.5	22.2	21.7	18	7.5	19.8
F1	4T023	20.8	15	18	7.5	27	30.4	23	11	25.3
	4T031	29.7	21.4	23	11	34.5	40.4	31	15	34.1
F2	4T039	40.4	29.2	31	15	46.5	49.9	39	18.5	42.9
	4T045	50.2	36	39	18.5	58.5	60	45	22	49.5
F3	4T060	41.4	41.4	45	22	67.5	56.5	60	30	66
	4T075	56.5	56.5	60	30	90	69.6	75	37	82.5
F4	4T089	69.6	69.4	75	37	112.5	84.7	89	45	97.9
F5	4T103	84.7	83.5	91	45	136.5	103.5	103	55	113.3
	4T140	105	105	112	55	168	142	140	75	156.2
F6	4T168	142	142	150	75	225	170	168	90	184.8
	4T208	170	170	180	90	270	207	208	110	228.8

Specification	Inverter model	EP6/ET6 series (heavy load)					EH6 series (light load)			
		EP6 rated input current (A)	ET6 rated input current (A)	Rated output current (A)	Applicable motor Power (kW)	Overload 150% (1min)	Rated input Current (A)	Rated output current (A)	Applicable motor (kW)	Overload 110% (1min)
F7	4T250	207	207	216	110	324	248	250	132	275
	4T304	248	248	260	132	390	300	304	160	334.4
F8	4T377	300	300	304	160	456	373	377	200	414.7
	4T414	365	365	377	200	565.5	410	414	220	455.4
F9	4T477	410	410	414	220	621	456	477	250	524.7
	4T520	465	465	477	250	715.5	507	520	280	572
	4T605	520	520	520	280	780	584	605	315	666
F10	4T675	584	584	605	315	907.5	657	675	355	742.5

Remarks: 1. The DC reactor is equipped in the EP6 series  $\geq 22$  kW as standard configuration;

2. The DC reactor is equipped in the EH6 series  $\geq 30$  kW as standard configuration;

3. The DC reactor is equipped in the ET6 series full range as standard configuration.

## 2.2 Technical performance and specifications of the inverter

Power input	Input voltage	380-480 V (-15% - +10%), three-phased TN, TT
	Input frequency	50/60Hz ( $\pm 5\%$ )
	Allowable voltage fluctuation	Voltage imbalance $< \pm 3\%$

Power output	Voltage	0VAC~input voltage
	Overload level	Heavy load 150%, 1 min/10min; light load 110%, 1 min/10min
	Efficiency (full load)	96%-99%
	Output frequency accuracy	$\pm 0.01$ Hz

Control characteristics	Control mode	GVC	SVC	FOC
	Enabling torque	150%	150%	150%
	Output frequency	0~600Hz	0~600Hz	0~120Hz
	Carrier frequency	1.5-16 kHz (derated); the carrier frequency can be automatically adjusted according to load features. (Derating is required for the use above the rated carrier frequency)		
	Frequency setting resolution	Digital input: 0.01 Hz Analog input: 1/2048 of the highest output frequency (signed 11 bits)		
	Running command channel	Operation panel setting, control terminal setting, communication setting		
	Frequency setting channel	Operation panel preset, digital/analog preset, communication preset, pulse preset		
	Automatic Voltage	Automatically adjusts the duty cycle of the output PWM signal according to the fluctuation of bus voltage, thus reducing the impact of grid voltage		

	Regulation (AVR)	fluctuation on output voltage fluctuation
	Energy consumption braking capacity	EH6 series: This series are not equipped with the brake unit. EP6 series: The brake unit is equipped in HD ≤ 30 kW (standard); EH6 series: The built-in brake unit is equipped in HD ≤ 75kW (standard), the external brake unit is equipped in HD ≥ 90kW

Environmental conditions	Usage occasion	Vertically installed in a well-ventilated electrical control cabinet. Horizontal or other mounting is not allowed. Cooling medium is air. Installed in an environment free from direct sunlight, dust, corrosive gas, combustible gas, oil mist, steam and dripping water
	Ambient temperature	Intra-cabinet-mounted type (IP20): heavy load -10 °C - +50 °C Light load -10°C - +40°C
	Temperature derating use	The rated output current decreases by 1% per 1 °C increase of upper limit temperature Heavy load up to 60 °C, light load up to 50 °C
	Altitude	≤1000 m
	Altitude derating use	In case of >1000 meters, the rated output current decreases by 1% per 100 meters of elevation, up to 2,000 meters
	Environment humidity	5~95%, no condensation allowed
	Vibration (transportation)	2 ≤ f < 9 Hz, 3.5 mm; 9 ≤ f < 200 Hz, 10 m/s <sup>2</sup> ; 200 ≤ f < 500 Hz, 15 m/s <sup>2</sup>
	Vibration (installation)	2 ≤ F < 9, 0.3 mm; 9 ≤ f < 200 Hz, 1 m/s <sup>2</sup>
	Storage temperature	-40~+70°C
Protection level	IP20	

Control panel	Type	Movable
	Length	1m (length can be customized, maximum 3m)
	Connection	RJ45
	LCD text display	14 * 14 Chinese characters or letters, with 8 rows in total and 17 characters per row
	Visual LED indicators	Two
	Key	Twelve

Others	Cooling mode	Forced air cooling
	Installation type	Intra-cabinet wall mounted type

## 2.3 Installation dimensions of the inverter

### 2.3.1 Product External Dimensions and Mounting Dimensions

#### 2.3.1.1 Dimensions of Specifications

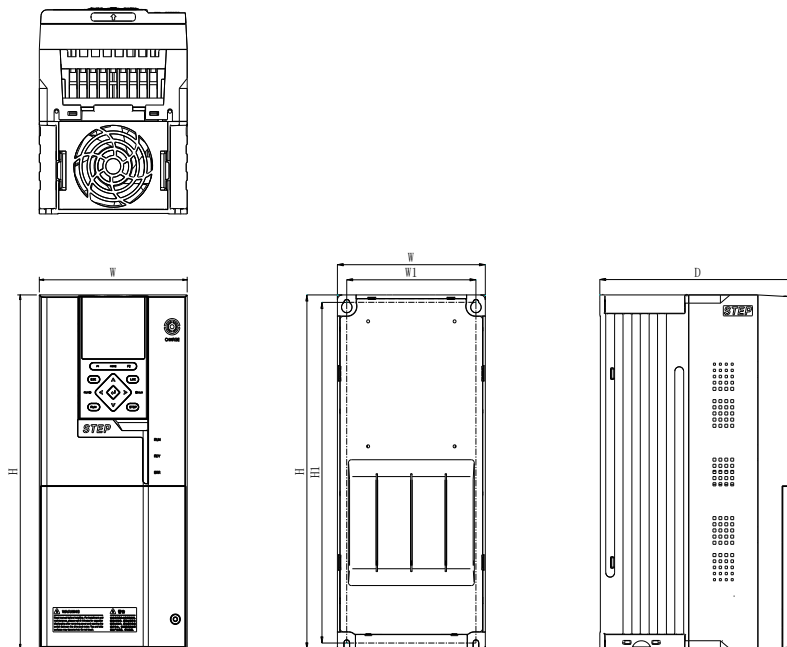


Figure 2-1 Installation Dimensions of F0 - F3 Inverters

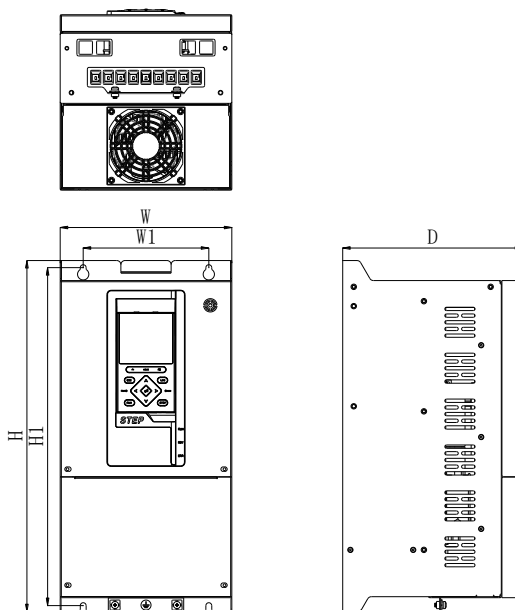


Figure 2-2 Installation Dimensions of F4 - F5 Inverters

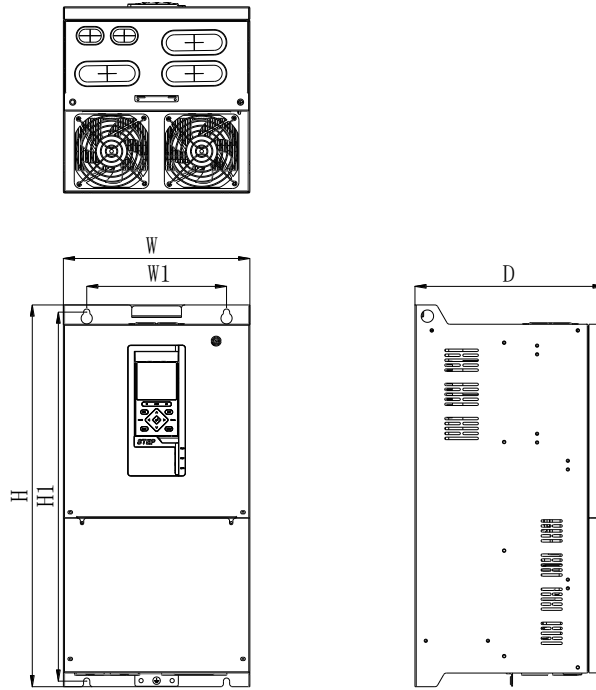


Figure 2-3 Installation Dimensions of F6 - F8 Inverters

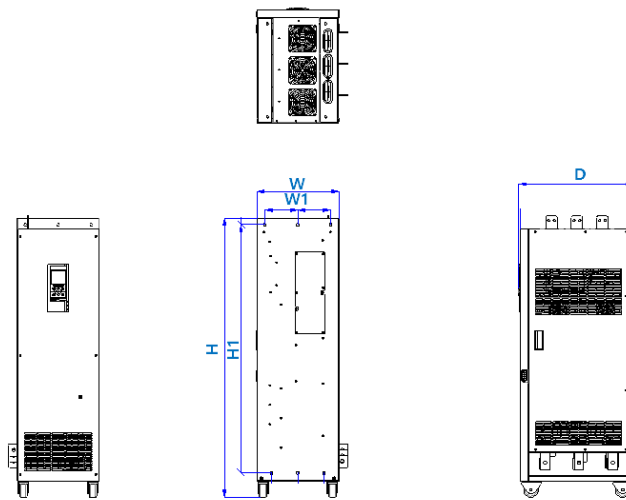


Fig. 2-4 F9 inverter mounting dimensions

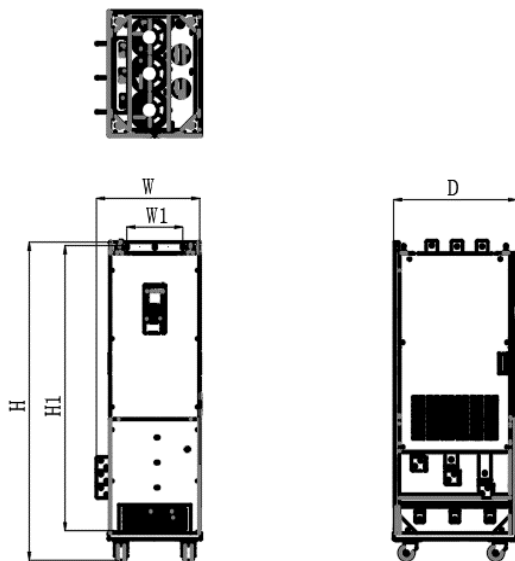


Fig. 2-5 F10 inverter mounting dimensions

Table 2-1 Overall Dimensions of F0 - F10

Specification	Overall dimensions	Installation spacing	Mounting screw
	H*W*D (mm)	W1*H1 (mm)	
F0	300*130*200	114*288	4-M5
F1	300*130*200	114*288	4-M5
F2	345*150*200	131*332	4-M5
F3	380*190*200	171*366	4-M6
F4	420*205*215	150*405	4-M6
F5	550*233*255	170*533	4-M6
F6	615*300*305	225*595	4-M8
F7	640*335*320	240*617	4-M8
F8	825*400*353	300*796	4-M10
F9	1230*360*510	290*1095	6-M8
F10	1400*400*548	250*1255	6-M8

### 2.3.2 Operator dimensions

For the operator dimensions of the inverter, see Figure 2-6.



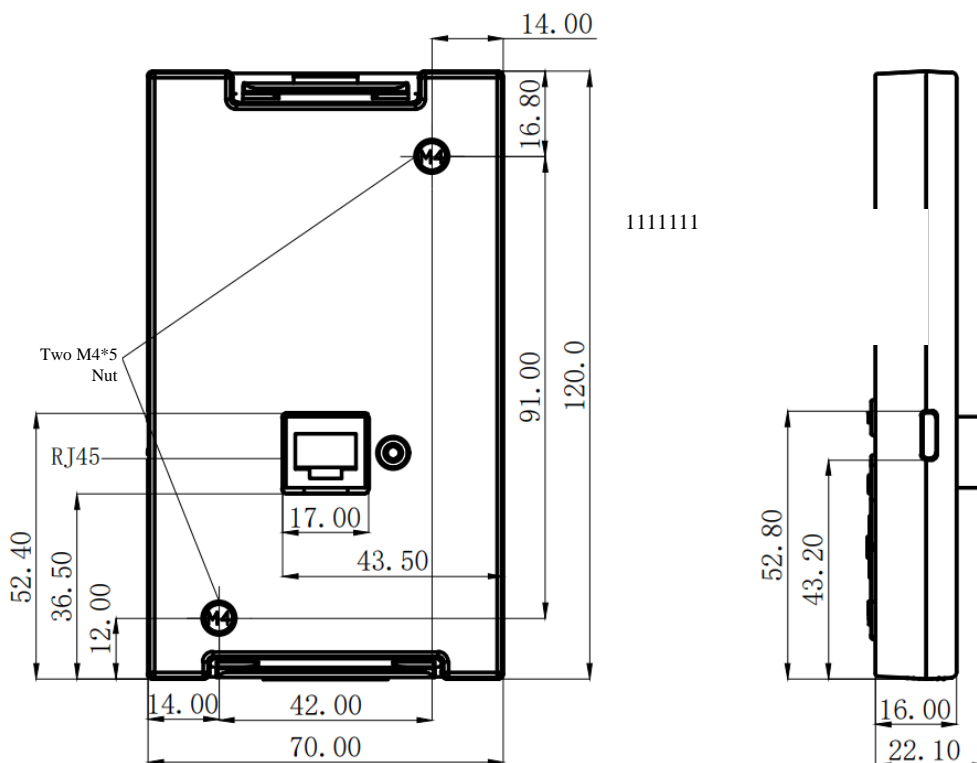


Figure 2-7 Operator dimensions of the inverter

- 1) Install the external access panel using a manual operator, punch holes on the door, and fix the cabinet door. The cabinet door punching dimensions are shown in Figure 2-8:

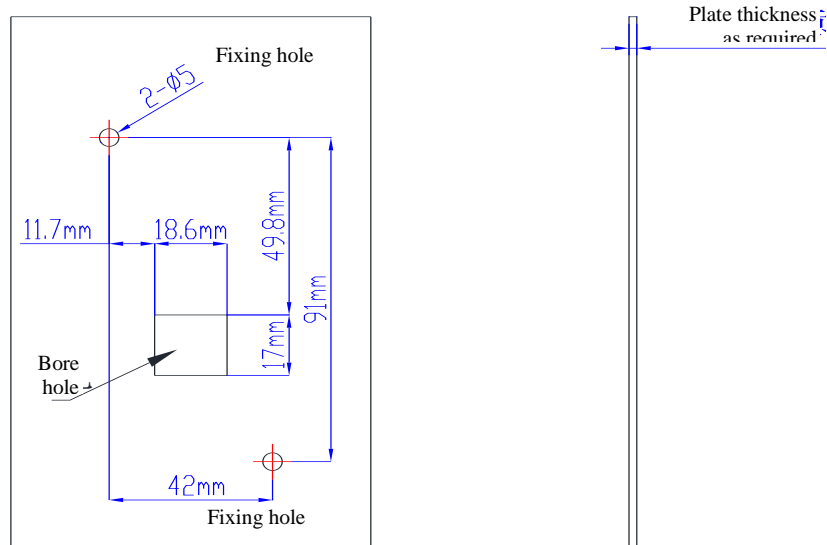


Figure 2-8 Diagram of dimensions of punching holes on the cabinet door of the external access panel

of the operator

- 2) Fix the embedded kit. The dimensions of the cabinet door opening are shown in Figure 2-9:

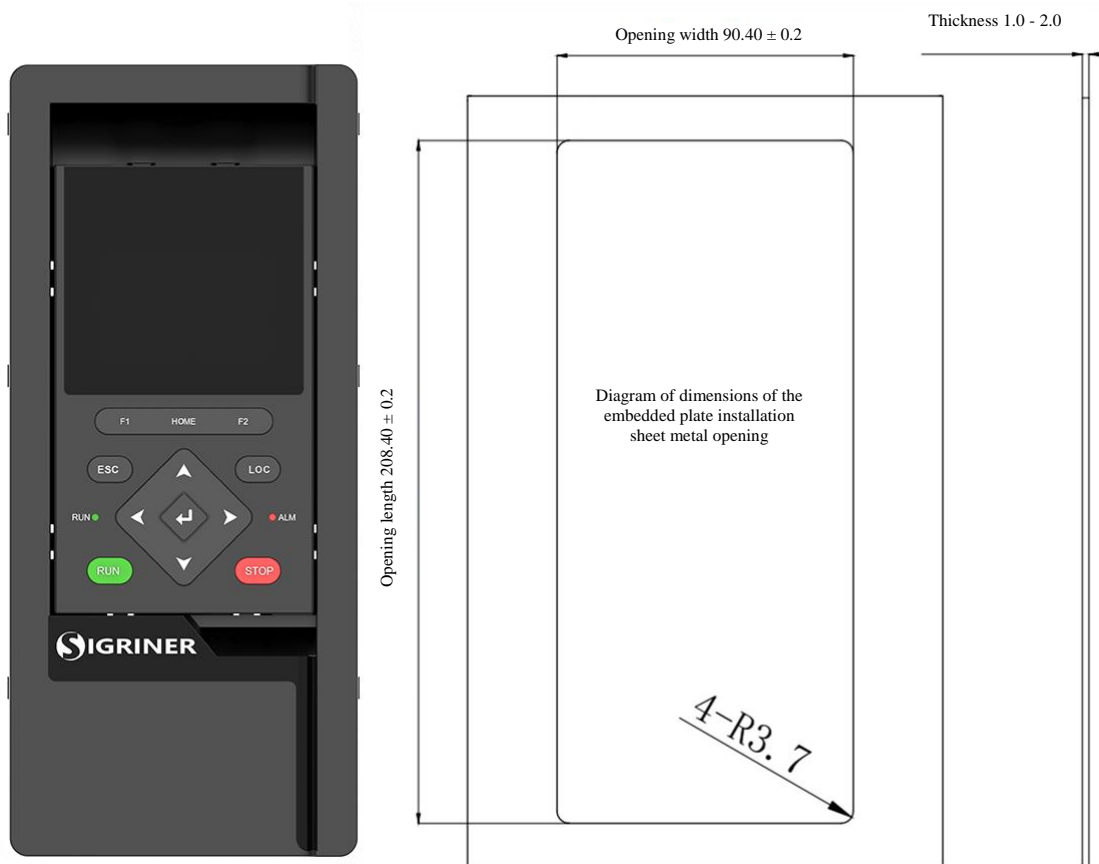


Figure 2-9 Diagram of the cabinet door opening dimensions

## 2.4 Option of braking unit and braking resistor

During motor brake running, there is negative torque. For this reason, the inverter should consider the optional braking unit, otherwise an overcurrent or overvoltage error will occur and lead to a trip.

For the braking time in a braking cycle accounting for 10%, the external brake unit and braking resistor configuration is shown in Table 2-2.

Table 2-2 400V class braking unit and braking resistor configuration

Inverter model EP6/ET6	Inverter capacity (kW)	Braking unit		Braking resistor (10% utilization rate)	
		Specification	Quantity (pcs)	Equivalent braking Resistor specification	Quantity (pcs)
4T4A1	1.1	Built-in		150 W 500Ω	1
4T5A6	1.5			260 W 400 Ω	1
4T7A2	2.2			260 W 250 Ω	1
4T9A4	3			390 W 150 Ω	1
4T012	4			390W 150 Ω	1
4T018	5.5			520W 100Ω	1
4T023	7.5			780W 75Ω	1
4T031	11			1040W 50Ω	1

Inverter model EP6/ET6	Inverter capacity (kW)	Braking unit		Braking resistor (10% utilization rate)	
		Specification	Quantity (pcs)	Equivalent braking Resistor specification	Quantity (pcs)
4T039	15			1560W 40Ω	1
4T045	18.5			4800W 32Ω	1
4T060	22			4800W 27.2Ω	1
4T075	30			6000W 20Ω	1
4T089	37	BKU-4045	1	9600W 16Ω	1
4T103	45	BKU-4045	1	9600W 13.6Ω	1
4T140	55	BKU-4030	2	6000W 20Ω	2
4T168	75	BKU-4045	2	9600W 13.6Ω	2
4T208	90	BKU-4110	1	18kW 6.7Ω	1
4T250	110	BKU-4110	1	25kW 5Ω	1
4T304	132	BKU-4220	1	40kW 3.4Ω	1
4T377	160	BKU-4220	1	40kW 3.4Ω	1
4T414	200	BKU-4220	1	48kW 3Ω	1
4T477	220	BKU-4220	1	48kW 3Ω	1
4T520	250	BKU-4110	2	25kW 5Ω	2
4T605	280	BKU-4220	2	40kW 3.4Ω	2
4T675	315	BKU-4220	2	40kW 3.4Ω	2

For the braking time in a braking cycle accounting for 20%, the external brake unit and braking resistor configuration is shown in Table 2-3.

Table 2-3 400V class braking unit and braking resistor configuration

Inverter model EP6/ET6	Inverter capacity (kW)	Braking unit		Braking resistor (20% utilization rate)			
		Specification	Quantity (pcs)	Equivalent braking Resistor specification	Quantity (pcs)		
4T4A1	1.1	Built-in		260W 470Ω	1		
4T5A6	1.5			390 W 340 Ω	1		
4T7A2	2.2			520W 230Ω	1		
4T9A4	3			780W 140Ω	1		
4T012	4			780W 140Ω	1		
4T018	5.5			1040W 90Ω	1		
4T023	7.5			1560W 70Ω	1		
4T031	11			2000W 47Ω	1		
4T039	15			3000W 34Ω	1		
4T045	18.5			9600W 28Ω	1		
4T060	22			9600W 24Ω	1		
4T075	30			12.5kW 17Ω	1		
4T089	37			BKU-4045	1	20kW 15Ω	1
4T103	45			BKU-4030	2	10kW 24Ω	2
4T140	55	BKU-4045	2	12.5kW 18Ω	2		
4T168	75	BKU-4110	1	36kW 6.7Ω	1		
4T208	90	BKU-4045	3	12.5kW 18Ω	3		
4T250	110	BKU-4045	3	12.5kW 16Ω	3		
4T304	132	BKU-4220	1	80kW 3.5Ω	1		
4T377	160	BKU-4220	1	80kW 3.2Ω	1		

Inverter model EP6/ET6	Inverter capacity (kW)	Braking unit		Braking resistor (20% utilization rate)	
		Specification	Quantity (pcs)	Equivalent braking Resistor specification	Quantity (pcs)
4T414	200	BKU-4110	2	50kW 5Ω	2
4T477	220	BKU-4110	2	50kW 5Ω	2
4T520	250	BKU-4220	2	60kW 4.7Ω	2
4T605	280	BKU-4220	2	80kW 3.5Ω	2
4T675	315	BKU-4220	2	80kW 3.5Ω	2

For the braking time in a braking cycle accounting for 40%, the external brake unit and braking resistor configuration is shown in Table 2-4.

Table 2-4 400V class braking unit and braking resistor configuration

Inverter model EP6/ET6	Inverter capacity (kW)	Braking unit		Braking resistor (40% utilization rate)	
		Specification	Quantity (pcs)	Equivalent braking Resistor specification	Quantity (pcs)
4T4A1	1.1	Built-in		520W 370Ω	1
4T5A6	1.5			780W 270Ω	1
4T7A2	2.2			1300W 180Ω	1
4T9A4	3			2200W 110Ω	1
4T012	4			2200W 110Ω	1
4T018	5.5			3300W 75Ω	1
4T023	7.5			4500W 55Ω	1
4T031	11			6600W 37Ω	1
4T039	15			9000W 27Ω	1
4T045	18.5			11kW 22Ω	1
4T060	22			13kW 18Ω	1
4T075	30			20kW 13.5Ω	1
4T089	37			BKU-4030	2
4T103	45	BKU-4045	2	12.5kW 18Ω	2
4T140	55	BKU-4045	2	20kW 15Ω	2
4T168	75	BKU-4110	1	60kW 5Ω	1
4T208	90	BKU-4110	1	60kW 5Ω	1
4T250	110	BKU-4220	1	70kW 3.7Ω	1
4T304	132	BKU-4220	1	70kW 3.7Ω	1
4T377	160	BKU-4220	1	90kW 3Ω	1
4T414	200	BKU-4220	2	60kW 5Ω	2
4T477	220	BKU-4220	2	70kW 3.7Ω	2
4T520	250	BKU-4220	2	70kW 3.7Ω	2
4T605	280	BKU-4220	2	90kW 3Ω	2
4T675	315	BKU-4220	2	90kW 3Ω	2

## Chapter 3 Installation of the inverter

### 3.1 Installation steps

Step 1: Inverter delivery

- Check and confirm that the catalog number printed on the label is the same as the one on the purchase order
- Remove the packaging of the intelligent flexible driver and check for any damage from transportation

Step 2: Check line voltage

- Check and confirm that the line voltage is compatible with the voltage and frequency range of the inverter

Step 3: Install the inverter

- Install the inverter according to the instructions in this document
- Install any of the internal and external options

Step 4: Inverter wiring

- Connect the motor and make sure the voltage is the same
- Connect the control line
- Set connection speed
- Connect the communication cable
- Connect the power cable after ensuring the power is off

### 3.2 Mechanical installation

#### 3.2.1 Installation environment of the product

##### 3.2.1.1 Temperature and humidity

The heavy-duty rated working temperature is between  $-10\text{ }^{\circ}\text{C}$  and  $+50\text{ }^{\circ}\text{C}$ , the derating can reach up to  $60\text{ }^{\circ}\text{C}$ ; the light-load rated working temperature is between  $-10\text{ }^{\circ}\text{C}$  -  $+40\text{ }^{\circ}\text{C}$ , derating can reach up to  $50\text{ }^{\circ}\text{C}$ .

Relative humidity of air  $\leq 95\%$ , no condensation.

For the occasion of harsh installation environment on site, it is recommended to strengthen the inverter heat dissipation.

##### 3.2.1.2 Altitude

When the inverter is installed at an altitude below 1,000 m, it can run at its rated power; when over 1,000 meters, 1% of rated current decreases per 100 meters, allowing a maximum of 2,000 meters.

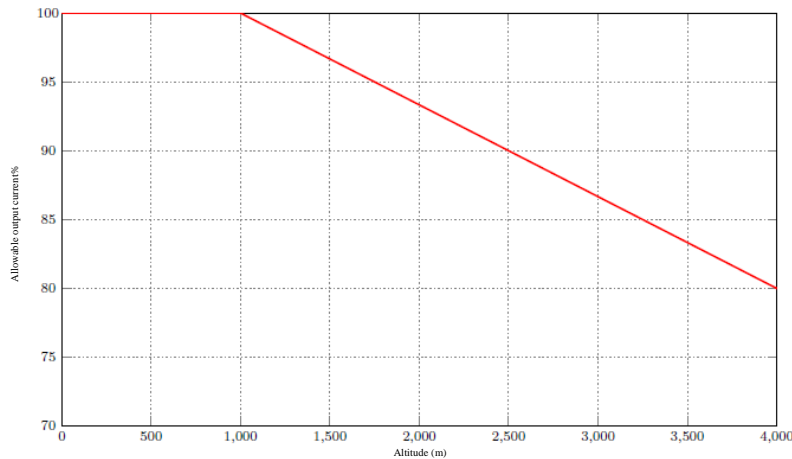


Figure 3-1 Diagram of the relationship between the inverter rated output current and the altitude

### 3.2.1.3 Other environmental requirements

- Avoid installation in a location that may be subjected to severe vibration and impact, and the maximum vibration acceleration shall not exceed 1 g (random vibration).
- Do not install in places where there are sources of electromagnetic radiation.
- Avoid installation in places with oil mist, metal dust or much dust.
- Avoid installation in places where there are harmful gases, liquids, corrosive, flammable or explosive gases.
- Avoid installation in places of much salt.
- Avoid installation in places of direct sunlight.
- Avoid installation in places of flammable objects such as wood.
- Do not drop the drilling residue into the inverter during installation.

### 3.2.2 Installation orientation and spacing requirements



According to the selected installation method, the inverter must be installed vertically in:  
 - the electrical cabinet  
 The inverter cannot be installed horizontally in the cabinet!

#### 3.2.2.1 Installation orientation

In order not to reduce the cooling effect of the inverter, the inverter should be installed in a well-ventilated place. It is generally installed vertically.

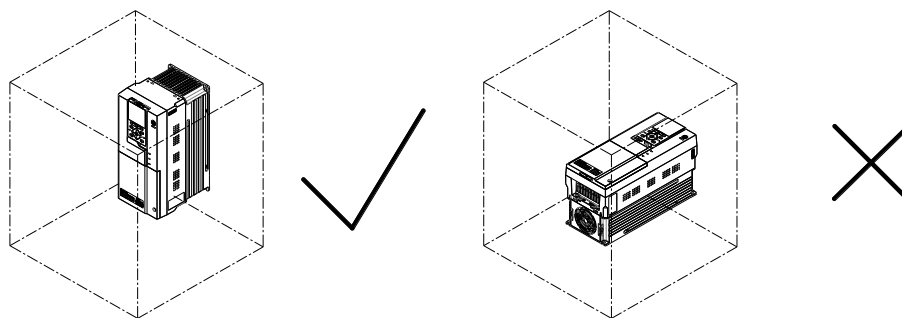


Figure 3-2 Installation orientation

When the user installs the inverter vertically, the angle between the inverter and the horizontal plane can be between 87° and 90°. Details are shown in Figure 3-3:

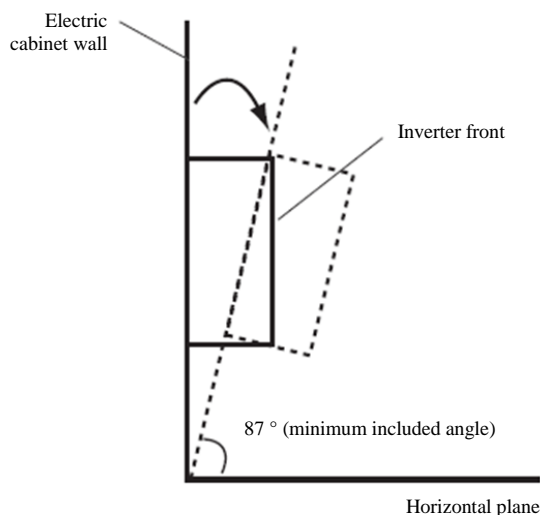


Figure 3-3 Permissible mounting angle

### 3.2.2.2 Installation spacing

#### 1. Single installation

To ensure the ventilation space and wiring space required for the inverter cooling, the installation space of the inverter shall be as shown in Figure 3-4:

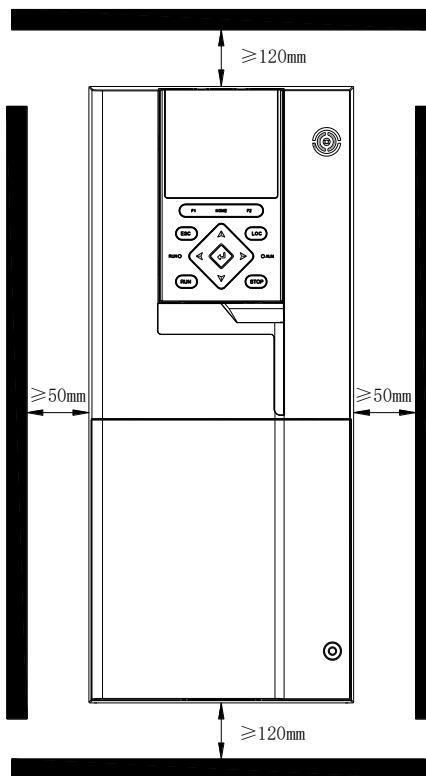


Figure 3-4 Installation space of the inverter (single unit)

2. Install multiple inverters in parallel

When installing other inverters in parallel, please ensure the required space for installing a single inverter. The installation space requirements are shown in Figure 3-5:

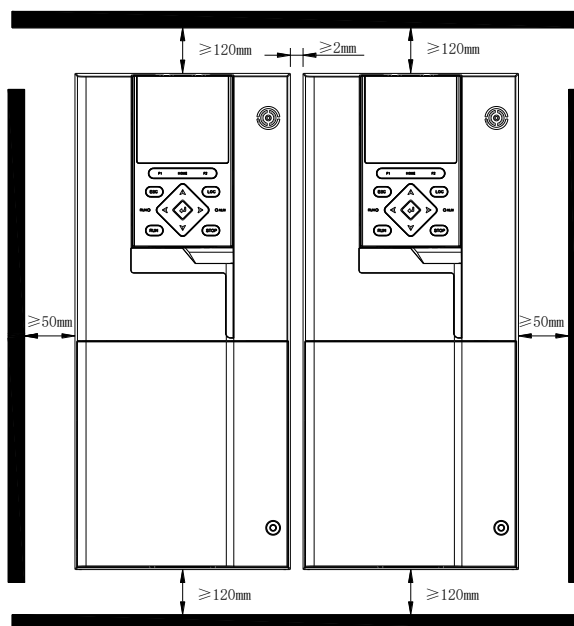


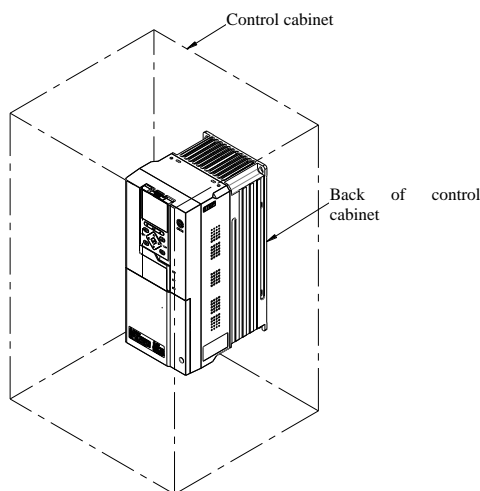
Figure 3-5 Mode of parallel standard installation for multiple inverters

When EP6/EH6 and ET6 are equipped with the built-in C2 filter, a spacing of 50 mm shall be reserved between drivers as heat dissipation space

**3.2.2.3 Installation method:**

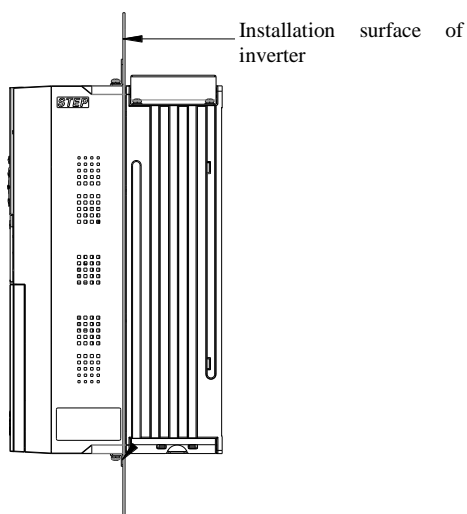
1. Intra-cabinet installation: The bottom of the inverter is installed on the back of the cabinet;

Diagram of installation inside the control cabinet

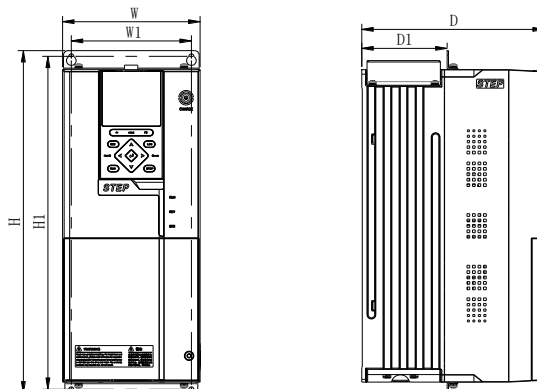


2. Mode of middle installation: The inverter radiator section is installed outside the cabinet

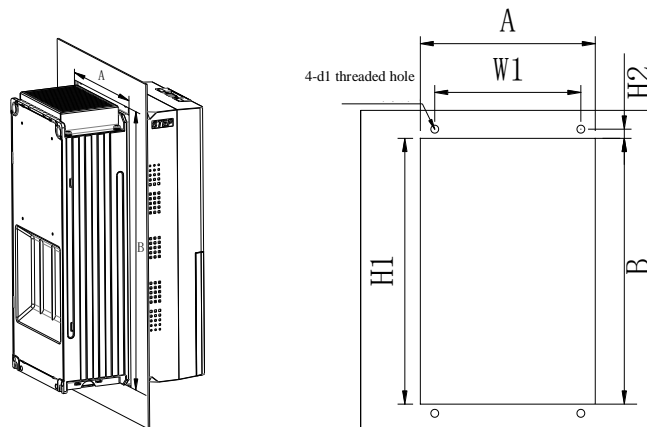
Diagram of external installation of radiator



Dimensions of radiator external product and panel processing diagram during installation



Panel opening dimensions



Specification	Overall dimensions	Middle installation dimensions						
	H*W*D (mm)	H1	W1	D1	A	B	H2	d1
F0	300*130*200							
F1	300*130*200							
F2	345*150*200							
F3	380*190*200							
F4	420*205*215							
F5	550*233*255							
F6	615*300*305							
F7	640*335*320							
F8	825*400*353							
F9	1230*360*510							
F10	1400*400*548							

If middle installation dimensions are required, please contact the technical team.

 **Important**

Fasteners shall have anti-vibration parts, such as spring washers; the 4 screws of the inverter must be tightened.

### 3.3 Removal and installation of operation panel and cover plate

#### 3.3.1 Disassembly and installation of the operator

Disassembly and installation of manual operator and wiring cover:

1. Remove the manual operator:

- ① Press the jack catch on the manual operator and pull it to dismantle it.



2. Installing the operator

- ① When placing the operator back to its original position, press it firmly until you hear a "click" sound



### 3.3.2 Opening and closing of the wiring cover

At main circuit wiring, it requires opening the wiring cover; at the time of dismantling the front panel, it also requires opening the wiring cover.

- ① Loosen the anti-off screw at the arrow
- ② Pull the cover plate outward in the downward direction to open the cover plate



## Chapter 4 Wiring of the inverter

This section describes in detail the connection between the inverter and peripheral devices, overview of inverter terminal wiring, wiring of main circuit terminals and control circuit terminals.



- ⊙ **Before wiring, please make sure that the input power is completely disconnected.**  
Otherwise, there is a risk of electric shock.
- ⊙ **Please ask electrical engineering personnel to perform wiring.**  
Otherwise, there is a risk of electric shock.
- ⊙ **Make sure the grounding terminal PE is reliably grounded.**  
Otherwise, there is a risk of electric shock.
- ⊙ **Do not touch the terminals directly with your hands. Do not touch the output wires of the inverter with the shell.**  
Otherwise, there is a risk of electric shock.
- ⊙ **Do not connect the power supply to the output terminals U/T1, V/T2, or W/T3.**  
Otherwise there is a risk of damaging the inverter.
- ⊙ **Do not short circuit terminal B1/DC+ to terminal DC -.**  
Otherwise there is a risk of explosion.



- ⊙ **Make sure that the voltage of the AC main circuit power supply is the same as the rated voltage of the inverter.**  
Otherwise, there is a risk of fire and injury.
- ⊙ **Please connect the braking resistor correctly according to the wiring diagram.**  
Otherwise, there is a risk of fire.
- ⊙ **The main circuit terminal and the wire or wire crimp terminal must be firmly connected.**  
Otherwise there is a risk of damaging the inverter.

## 4.1 Connection between the inverter and peripheral equipment

### 4.1.1 Connection diagram of the inverter and peripheral equipment

The connection diagram of the inverter and peripheral equipment is shown in Figure 4-1.

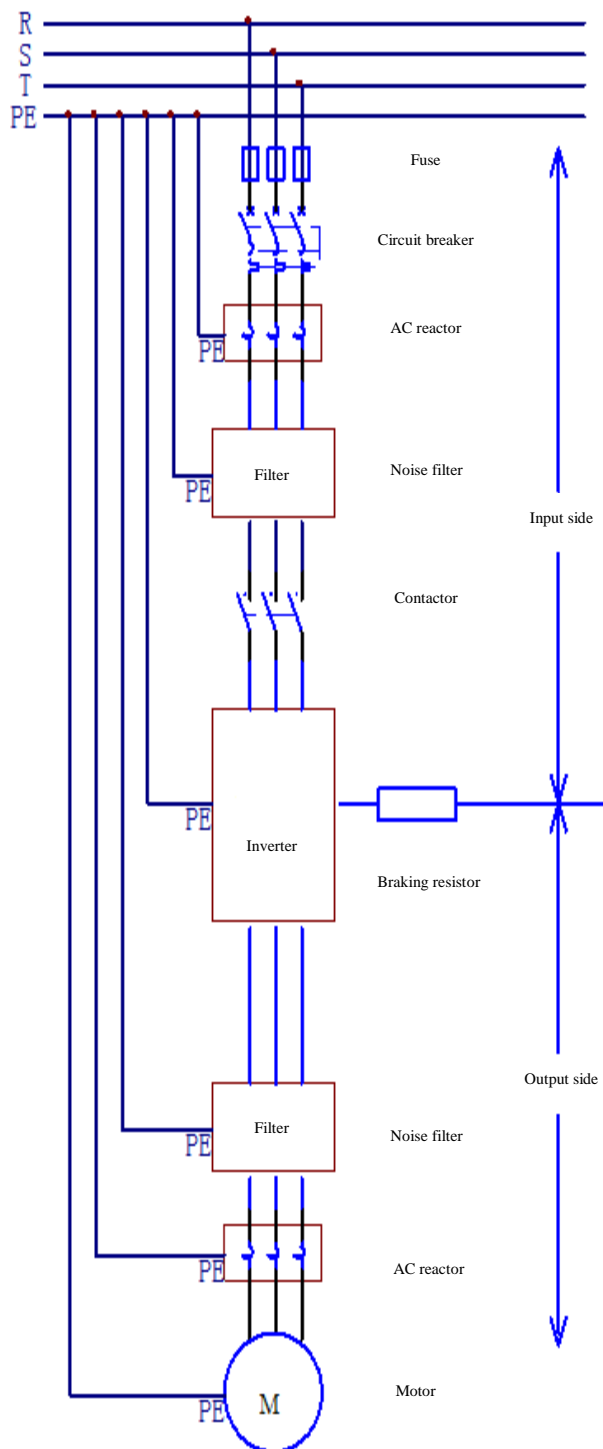


Figure 4-1 Connection diagram of the inverter and peripheral equipment

Note: The diagram is drawn based on an example of three-phase power input.

## 4.1.2 Connection of main circuit peripheral devices

### 4.1.2.1 Input power connection



The inverter cannot be operated outside the rated input line voltage range; overvoltage may cause permanent damage to the inverter.

Table 4-1 Technical requirements for input power

Technical requirements for input power (main circuit) connection	
Input voltage	Voltage is three-phase 380~480VAC, -15%~+10%
Short-circuit current (IEC60909 standard)	If the incoming cable of the inverter is protected by a suitable fuse, then the maximum allowable short-circuit current is 100kA within 1s
Frequency	50~60Hz, -5%~+5%
Unbalance degree	Maximum $\pm 3\%$ of rated input line voltage
Cable temperature	Min. rated value: 90°C

### 4.1.2.2 Input protection

Input protection includes circuit breakers, fuses, emergency stop devices, etc.

#### Circuit breaker

The inverter itself does not include disconnection device. Therefore, a disconnection device must be installed between the AC input power and the inverter. This disconnection device must conform to the following requirements:

- The device shall comply with safety regulations of the actual application, including (but not limited to) national and local electrical regulations.
- The disconnection device must stay in the off position and locked out during installation and maintenance of the inverter.
- The disconnection device should not be used to control the start/stop of the motor. The motor should be controlled using the operator keys, or commands from the I/O terminals.
- The capacity of the circuit breaker should be selected as 1.5 to 2 times the rated current of the inverter.
- The time characteristics of the circuit breaker should take full account of the time characteristics of the inverter overheating protection (150% of the rated output current for 1 min).

#### Fuse

The end user must provide a circuit protection device and the device should be selected in accordance with national and local electrical regulations. Table 4-2 provides the recommended fuse types to offer short circuit protection for the incoming power section of the inverter.

Table 4-2 Recommended fuse models (the recommended fuse Bussmann meets UL certification)

Inverter model	EP6/ET6 inverter capacity (kW)	EH6 inverter capacity (kW)	Main fuse	Model
4T4A1	1.1	1.5	10	FWP-10B
4T5A6	1.5	2.2	15	FWP-15B
4T7A2	2.2	3	15	FWP-15B
4T9A4	3	4	20	FWP-20B
4T012	4	5.5	30	FWP-30B
4T018	5.5	7.5	40	FWP-40B

Inverter model	EP6/ET6 inverter capacity (kW)	EH6 inverter capacity (kW)	Main fuse	Model
4T023	7.5	11	60	FWP-60B
4T031	11	15	60	FWP-60B
4T039	15	18.5	70	FWH-70B
4T045	18.5	22	100	FWH-100B
4T060	22	30	100	FWH-100B
4T075	30	37	100	FWH-100B
4T089	37	45	125	FWH-125B
4T103	45	55	150	FWH-150B
4T140	55	75	200	FWH-200B
4T168	75	90	250	FWH-250A
4T208	90	110	275	FWH-275A
4T250	110	132	325	FWH-325A
4T304	132	160	400	FWH-400A
4T377	160	200	500	FWH-500A
4T414	200	220	600	FWH-600A
4T477	220	250	600	FWH-600A
4T520	250	280	700	FWH-700A
4T605	280	315	800	FWH-800A
4T675	315	355	1000	170M5016

#### Emergency stop device

The overall design and installation must include an emergency stop device and other required safety device. Controlling the motor by means of a key from the inverter operator, or by commands from the I/O terminals or communications does not guarantee:

- Achieving emergency stop of the motor.
- Separating the inverter from dangerous voltages.

#### 4.1.2.3 Input power cables/connections

The input cable connection can be any of the following:

- The four-core cable (three-phase and grounding protection wire) does not require shielding layer (if there are requirements for conducted and radiated disturbances, the shielding wire needs to be configured).
- Four-core insulated conductors installed in the conduit.

In any case, the conductor must be smaller than the maximum limit defined by the terminal size. Motor cables should be used in derating when they are too long or when the cross-sectional area of the motor cable is too large. Only cables with a specified cross-sectional area should be used for inverters (see Table 4-11). Since the larger the cross-sectional area of the cable, the greater the capacitance to ground and the greater the leakage current to ground, the use of cables with a larger cross-sectional area should result in a lower output current, with a current reduction of about 5% for each additional step in area. Table 4-11 lists the cable types for copper-core cables at different load currents. The recommended models are only available for the cases listed in the upper part of the table. It is not recommended to use aluminum-core cables.

Table 4-3 Corresponding load currents for cables

IEC	NEC
Based on:	Based on:

EN60204-1 and IEC60364-5-2/2001 standards PVC insulation 30°C ambient temperature 70°C surface temperature Symmetrical cables with copper mesh shielding No more than 9 cables placed side by side in the same cable tray	For copper-core cables, see NEC Table 310-16 90°C cable insulation 40°C ambient temperature No more than 3 current-carrying wires in the same raceway, cable trench or buried cable Copper-core cables with copper mesh shielding
--	---

To ensure personnel safety, proper operation, and to reduce electromagnetic radiation, the inverter and motor must be grounded at the installation.

- The diameter of the conductors must meet the requirements of safety regulations.
- The power cable shield must be connected to the PE end of the inverter to comply with safety rules.
- The shield of the power cable wire may be used as a ground wire for the equipment only if the specifications of the shield meet the safety regulations.
- When installing multiple inverters, do not connect the inverter terminals in series.

#### 4.1.2.4 Output power cables/connections

The technical requirements for motor connections are shown in Table 4-4.

Table 4-4 Technical requirements for motor connection

Technical requirements for output power (motor) connection	
Output voltage	0~Input voltage, symmetrical three-phase voltage
Current	See chapter 2 "2.2 Technical performance and specifications of the inverter"
Switching frequency	Range: 2~16kHz
Cable rated temperature	Min. rated value: 90°C
Relationship between motor cable length and switching frequency	See chapter 4 "4.4.5 Relationship between wiring length and carrier frequency"

#### Grounding and wiring

Motor cable requires shielding with conductor tubes, armored cables or shielded cables. Shielded/Armored cables: High frequency, low impedance shielded cables such as braided copper wire mesh, aluminum wire mesh or iron wire mesh should be used.

#### Conduit

- Each end of the conduit needs to be fitted with a bridging connection with a grounding conductor.
- The conduits are secured to the shell.
- Use a separate conduit line for the motor cables (also separate the input power cables from the control cables).
- Use a separate conduit line for each inverter.

#### Armored cable

- Each end of the conduit needs to be fitted with a bridging connection with a grounding conductor.
- Use the MC type continuous corrugated aluminum armored cable with symmetrical ground wires and 6 conduits (3 power conduits and 3 ground conduits).
- The armored motor cable can share a cable tray with the input power cable, but cannot share a cable tray with the control cable.

#### Shielded cable

It is recommended that users use cables with symmetrical PE conductors that meet CE or C-Tick standards.

#### Grounding

The recommended values for the cross-sectional area of the grounding conduits refer to Table 4-13 in Section 4.3.4.1.

## 4.2 Inverter terminal wiring

The internal view of the inverter is shown in Figure 4-6.

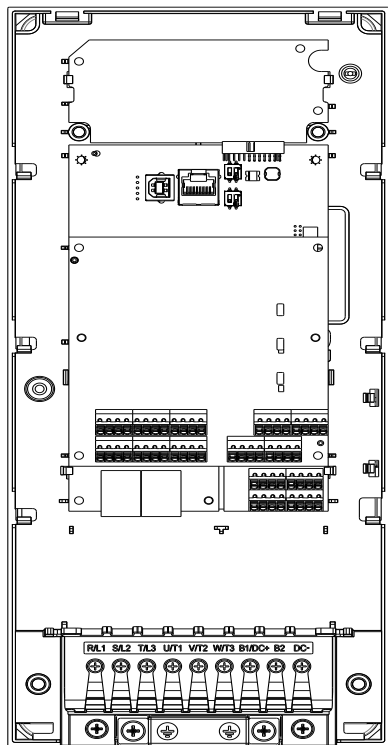


Figure 4-6 Internal view of inverter

**Note:** The terminals of inverters at each power level are the same except that the position and layout of the power input/output terminals are slightly different. The diagram is based on an example of 11 kW.

### 4.2.1 Inverter terminal wiring diagram

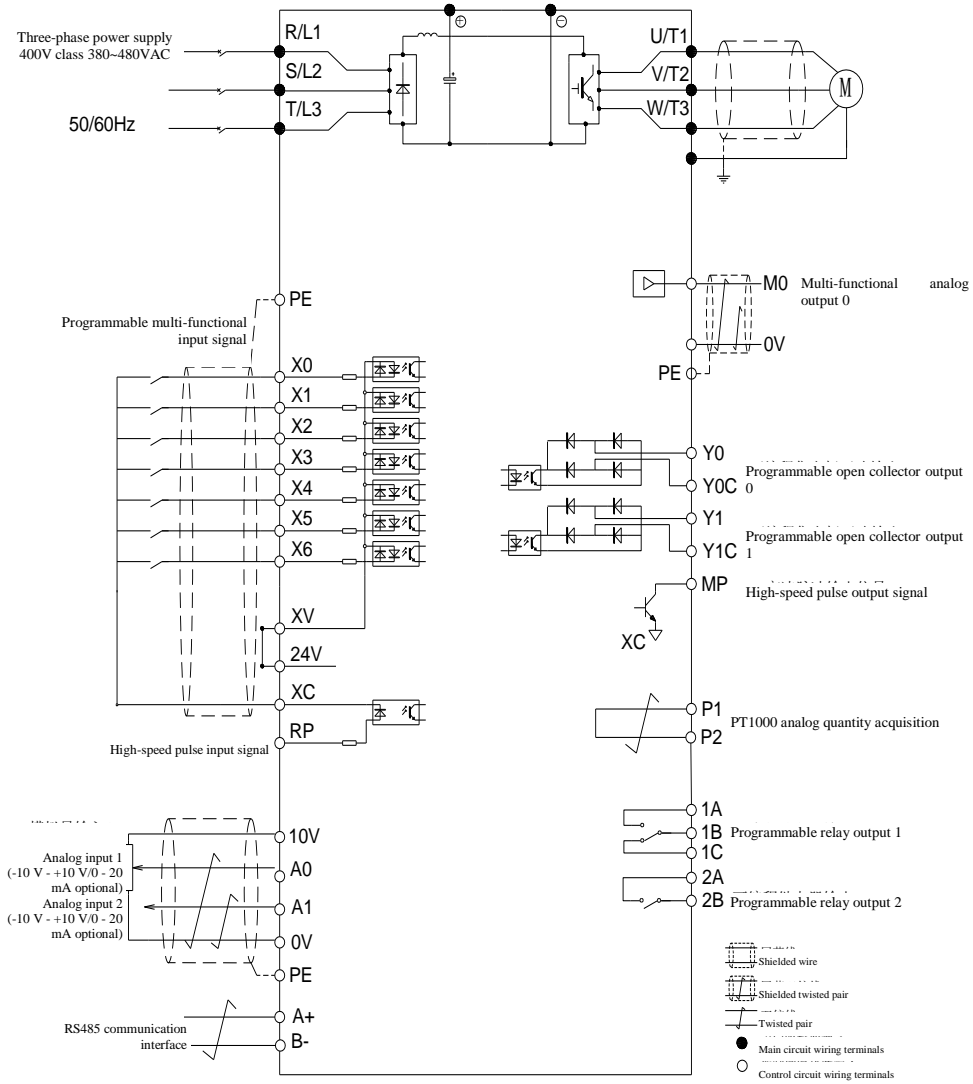


Figure 4-7 Diagram of universal inverter terminal wiring

### 4.2.2 Notes on inverter terminal wiring



**Important**

- a) The wiring specifications should be in accordance with the electrical standards.
- b) After wiring is completed, be sure to check the wiring for correctness and reliable connection. The following wiring checks are required:
  - ◆ Whether the wiring is incorrect;
  - ◆ Whether chips or screws of the wires are left in the inverter;
  - ◆ Whether the screws are loose;
  - ◆ Whether the stripped bare wire of the terminal part is in contact with other terminals.

- c) Partial power of the intelligent flexible driver has the built-in braking unit, but needs to be connected to an external braking resistor. Please install the braking resistor between terminal B1 and terminal B2, and do not connect it to any other terminals, otherwise it may damage the braking resistor and inverter.
- d) Partial power of the intelligent flexible driver has the built-in DC reactor.
- e) Inverter grounding PE is recommended to be connected to the special grounding pole, and the grounding impedance should be below 10Ω.
- f) The grounding cable should be as short as possible.
- g) After the power is turned on, if you want to change the wiring, first of all, the power should be cut off. Since it takes some time to discharge the charging capacitor of the main circuit of the inverter, to avoid danger, you must wait until the charging indicator goes off and measure the DC voltage at both ends of the charging capacitor with a DC voltmeter to confirm that the voltage value is less than the 24V DC safety voltage before you can proceed to the next step.

### 4.3 Wiring of main circuit terminals

#### 4.3.1 Layout of main circuit terminals

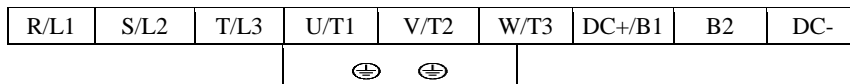


Figure 4-9-1 F0-F6 Diagram of main circuit connecting terminal

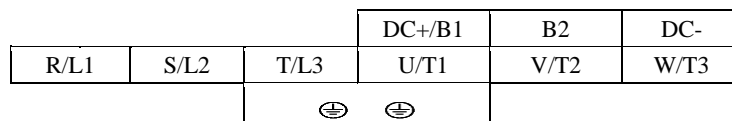



Figure 4-9-2 F7-F10 Diagram of main circuit connecting terminal

#### 4.3.2 Descriptions on main circuit terminal markings and functions

The functional descriptions of the main circuit terminals are shown in Table 4-10.

Table 4-10 Functional description of main circuit terminals

Terminal No.	Terminal function description
R/L1	Main circuit AC power input, connecting three-phase input power
S/L2	
T/L3	
U/T1	Inverter output, connecting to motor
V/T2	
W/T3	
B1	External braking resistor connection
B2	
B+	External braking unit
B-	
DC+	Common DC bus
DC-	

Terminal No.	Terminal function description
	Grounding terminal, connected to the protection ground, ground resistance can not be greater than 1Ω at 400V class

### 4.3.3 The wire specifications of main circuit wiring

The conductor uses 600V copper-core plastic insulated wire or similar wires for power supply. Wire specifications and tightening torque are shown in Table 4-11.

Table 4-11 Wire specifications and tightening torque

Inverter model Intelligent flexible driver	Connectable wire specifications (mm <sup>2</sup> )	Recommended wire specifications (mm <sup>2</sup> )	Fastening torque (N.m)
4T4A1	0.75~1.0	0.75	1.2
4T5A6	1.0~1.5	1.0	1.2
4T7A2	1.0~1.5	1.5	1.2
4T9A4	1.5~2.5	2.5	2.7
4T013	1.5~2.5	2.5	2.7
4T018	2.5~4	4	2.7
4T023	4~8	6	2.7
4T031	4~8	6	2.7
4T039	4~8	6	2.7
4T045	8~16	16	3
4T060	8~16	16	3
4T075	25~35	25	3
4T089	35~50	35	6
4T103	50~70	50	6
4T140	70~95	70	6
4T168	95	95	6
4T208	85~115	95	10
4T250	85~115	95	10
4T304	95~135	120	10
4T377	165~205	185	10
4Txxx	205~265	240	10
4T414	85~115(x2P)	95x2P	10
4T477	85~115(x2P)	95x2P	10
4T520	125~175(x2P)	150x2P	10
4T605	125~175(x2P)	150x2P	17
4T675	125~175(x2P)	150x2P	17
4T725	85~115(x4P)	95x4P	17
4Txxx	85~115(x4P)	95x4P	17



#### Important

Wire specifications are determined per an ambient temperature of 50°C and an allowable wire temperature of 75°C.

The main circuit of the inverter uses open type wiring terminals. For open type wiring terminals, round crimp terminals are recommended. Refer to table 4-12 for round crimp terminals:

Table 4-12 Specifications of round crimp terminals

Wire cross-sectional area (mm <sup>2</sup> )	Terminal screw specifications	Specifications for round crimp terminals
--	-------------------------------	--

Wire cross-sectional area (mm <sup>2</sup> )	Terminal screw specifications	Specifications for round crimp terminals
0.5	M3.5	1.25/3.5
	M4	1.25/4
0.75	M3.5	1.25/3.5
	M4	1.25/4
1.25	M3.5	1.25/3.5
	M4	1.25/4
2	M3.5	2/3.5
	M4	2/4
	M5	2/5
	M6	2/6
	M8	2/8
3.5/5.5	M4	5.5/4
	M5	5.5/5
	M6	5.5/6
	M8	5.5/8
8	M5	8/5
	M6	8/6
	M8	8/8
14	M6	14/6
	M8	14/8
22	M6	22/6
	M8	22/8
30/38	M8	38/8
50/60	M8	60/8
	M10	60/10
80	M10	80/10
100		100/10
120	M12	120/12
185	M12	185/12
240	M12	240/12
300	M12	300/12
380	M12	380/12



### Important

When determining the cross-sectional area of the wire, give due consideration to the voltage drop of the wire.

The general selection principle is to keep the voltage change within 2% of the rated voltage. When the voltage drop is too much, the cross-sectional area of the wire should be increased. The formula for calculating the voltage drop is as follows:

$$\text{Voltage drop between lines (V)} = \sqrt{3} * \text{wire resistance } (\Omega) * \text{current (A)}$$

## 4.3.4 Description on main circuit terminal wiring

### 4.3.4.1 Power supply

The inverter must be connected to a protective earth. Considering the high leakage current (over 3.5mA), a protective earth must be used in order to comply with the relevant current regulations.

#### 4.3.4.2 Grounding terminal (PE)

- The grounding terminal is preferably a special grounding electrode and must be well grounded with a grounding impedance of  $10\Omega$  or less.
- Do not share the grounding wire with welding machines or other power equipment.
- Use the specifications specified in the technical standards for electrical equipment and keep the grounding wire as short as possible. If the distance between the grounding wire and the grounding point is too far, the leakage current of the inverter will make the potential of the grounding terminal unstable.
- It is recommended to use special yellow and green grounding wire, and the cross-sectional area of the grounding wire is shown in Table 4-13.

Table 4-13 The cross-sectional area of the grounding wire

The cross-sectional area of the wire when installed $S$ ( $\text{mm}^2$ )	Minimum cross-sectional area of the corresponding ground lead $S_{\text{min}}$ ( $\text{mm}^2$ )
$S \leq 16$	$S$
$16 < S \leq 35$	16
$35 < S$	$S/2$

- When grounding multiple inverters, it is recommended that a loop be avoided as much as possible in order to avoid the formation of a loop by the grounding wire. See Figure 4-10 for the grounding method of multiple inverters.

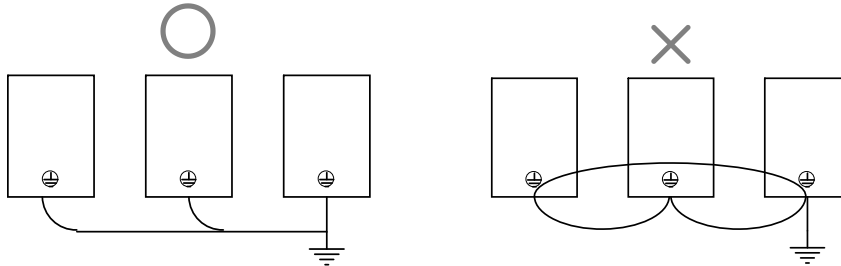



Figure 4-10 Grounding method for multiple inverters

 <b>Caution</b>
<p>Incorrect wiring:          If the input line voltage is applied to (U/T1, V/T2, W/T3), the inverter can be damaged.          Check the power connection before adding power to the inverter.          If another inverter is to be replaced, make sure all wiring to the inverter follows all wiring instructions in this manual.          Failure to follow the operating instructions can result in death or serious injury.</p>

#### 4.3.4.3 Main circuit power input terminals (R/L1, S/L2, T/L3)

- Three-phase AC power is connected through circuit breakers and main circuit terminals R/L1, S/L2, and T/L3. The phase sequence of the input power supply is independent of the order of the R/L1, S/L2, and T/L3 terminals, and either terminal can be connected.
- In order to reduce the conducted and radiated disturbances generated by the inverter on the input power supply, the three-phase four wire power line with shielding layer can be selected.



Caution

Use the inverter-dedicated noise wave filter.

#### 4.3.4.4 External braking resistor terminals (B1, B2)

- All power models of intelligent flexible drivers have the built-in braking units. In order to release the energy fed back during motor braking, an external braking resistor must be connected. The specifications of braking resistor are shown in Table 2-2 400 V Class Resistor Configuration.
- Install the braking resistor between terminal B1 and terminal B2.
- To make the braking resistor work normally, it requires fully considering the radiating conditions of the braking resistor to ensure its good ventilation.
- The wiring length of the braking resistor shall not be greater than 5 meters.

For the connection of the external braking resistor, see Figure 4-11.

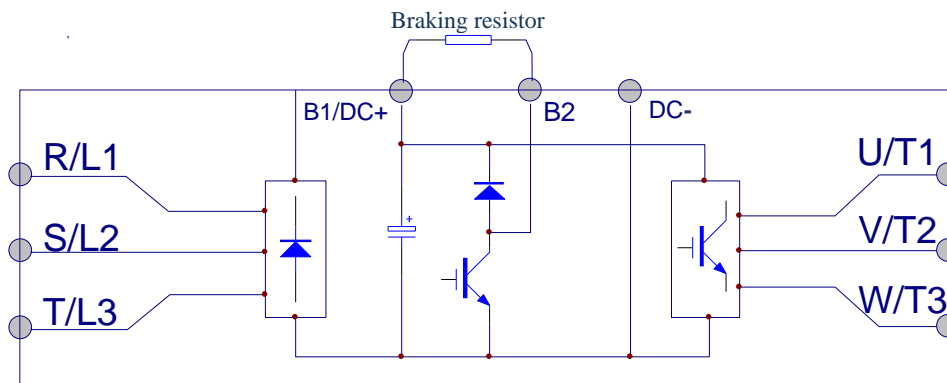


Figure 4-11 Diagram of external braking resistor connection

#### 4.3.4.5 External braking unit terminals (B+, B-)

- When an external braking unit needs to be connected, the  $\oplus$  and  $\ominus$  terminals of the braking unit correspond to the inverter (B+, B-) terminals one by one, and the BR1 and BR2 terminals of the braking unit is connected to the braking resistor.
- The wiring length between the inverter (B+, B-) end and the braking unit  $\oplus$ ,  $\ominus$  end shall be less than 5 m, and the wiring length between the braking unit BR1, BR2 and the braking resistor shall be less than 10 m.



Caution

The polarities of B+ and B- shall not be reversed; the B+ and B- terminals are not allowed to be directly connected to the braking resistor, otherwise it may damage the inverter or cause the risk of fire.

#### 4.3.4.6 Connection of energy feedback unit (DC+, DC-)

The company's RG series energy feedback unit can feed the electricity generated by the motor in the regenerative braking state back to the grid. RG series energy feedback unit adopts IGBT as rectifier to feed back, compared with the traditional three-phase reverse parallel bridge rectifier unit, the harmonic distortion component fed back to the grid is less than 5% of the fundamental wave, and the pollution to the grid is very limited.

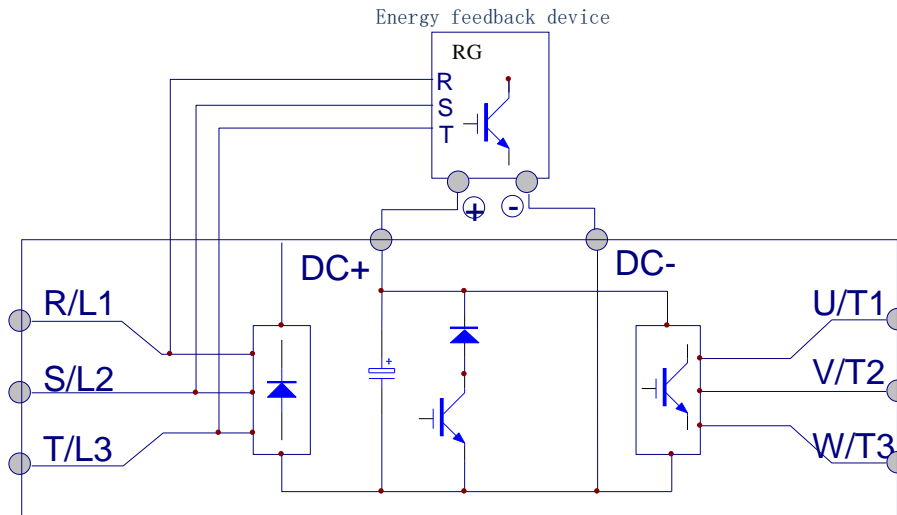


Figure 4-12 External energy feedback device

#### 4.3.4.7 Inverter output terminals (U/T1, V/T2, W/T3)

- The inverter output terminals U/T1, V/T2, W/T3 are connected to the motor terminals U/T1, V/T2, W/T3. If the motor rotates in the wrong direction, please exchange the wiring of any two phases of the inverter output terminal or motor terminal.
- It is strictly forbidden to connect the power input to the inverter output terminals U/T1, V/T2, W/T3.
- It is strictly forbidden to ground or short circuit the output terminals.
- It is strictly forbidden to connect capacitors or surge filters on the output side of the inverter. As the output of the inverter has high harmonics, the output side connected the capacitor or surge filter will make the inverter overheat and damage.
- The diagram of forbidding the capacitor to be connected to the output side of the inverter is shown in Figure 4-13.

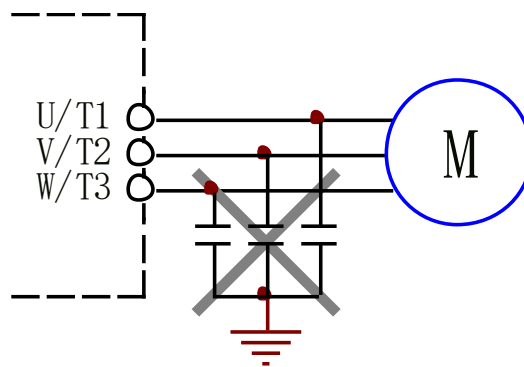


Figure 4-13: The capacitor is strictly prohibited to be connected on the output side

## 4.4 Anti-interference measures

### 4.4.1 Connect a special noise filter on the output side

To suppress the noise generated on the output side of the inverter, a special noise filter can be connected to the output side of the inverter. The wiring of the noise filter on the output side of the inverter is shown in Figure 4-14.

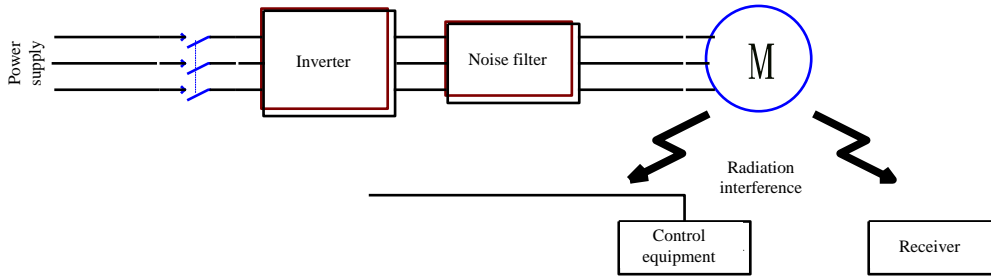


Figure 4-14 Wiring of the noise filter on the output side of the inverter

#### 4.4.2 Surge suppressor connected to the output side

When the inverter is connected to an inductive load device (electromagnetic contactor, relay, solenoid valve, etc.), be sure to use a surge suppressor on the coil of that load device, as shown in Figure 4-15:

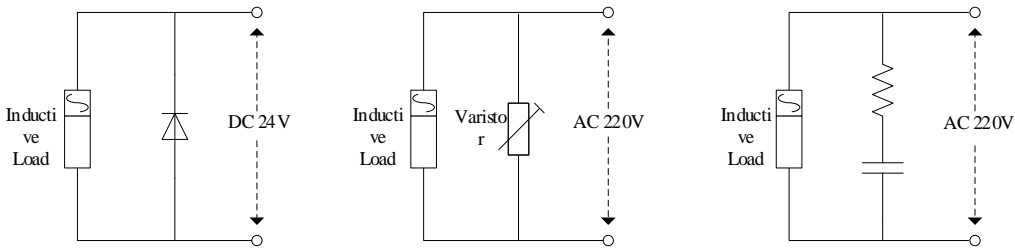


Figure 4-15 Applications of inductive load surge suppressor

#### 4.4.3 Layout of the main circuit wiring

To suppress the radiation interference generated from the output side of the inverter and enhance the anti-interference performance, they should generally be separated as far as possible, especially when the cables are installed in parallel and extended over a long distance. When the signal cable must cross the power cable, it should cross vertically. The layout diagram of main circuit wiring is shown in Figure 4-16, 4-17.

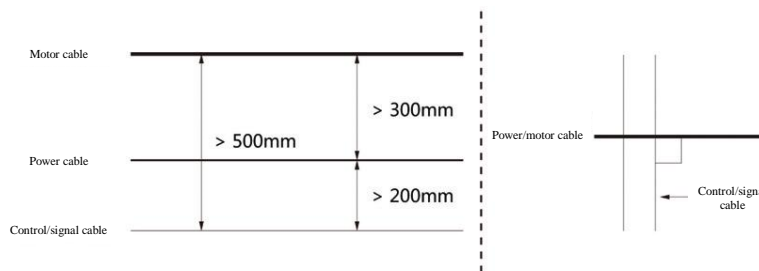


Figure 4-16 Layout of main circuit wiring 1

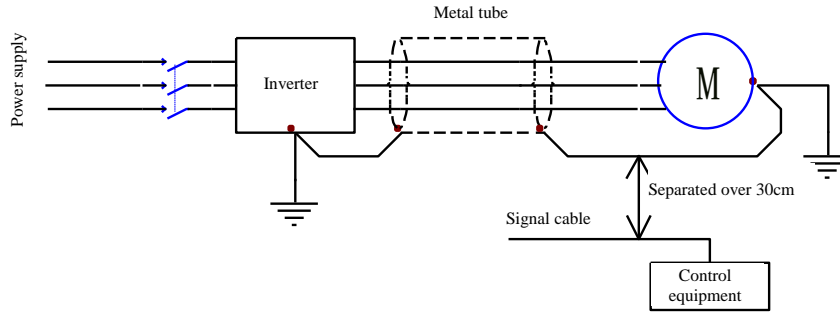


Figure 4-17 Layout of main circuit wiring 2

Generally, the control cable must be shielded and the shielded wire mesh must be connected to the metal chassis of the inverter through the cable clips at both ends. As in Figure 4-18.

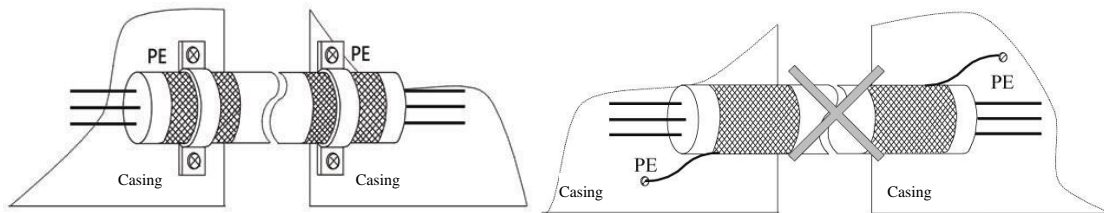


Figure 4-18 Comparison of grounding methods

#### 4.4.4 Better anti-interference measures

The better anti-interference measures are to set noise filters on both the input and output sides of the inverter, and to place the inverter body also in the iron box to shield it. See Figure 4-19.

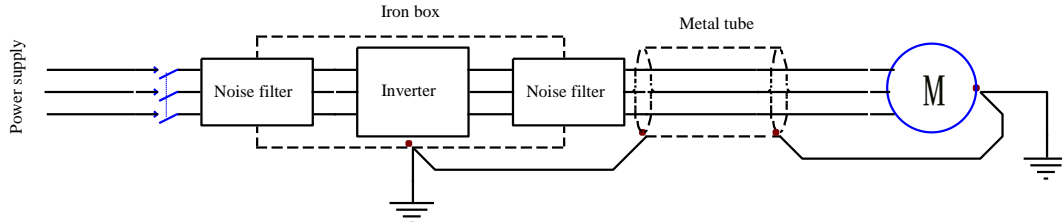


Figure 4-19 Better anti-interference measures

#### 4.4.5 Relationship between wiring length and carrier frequency

If the wiring between the inverter and the motor is too long, it will increase the high harmonic leakage current due to the influence of the distributed capacitance of the wire, which may make the inverter output over-current protection and have adverse effects on the surrounding equipment and the motor. Therefore, the length of the wiring between the inverter and the motor should not exceed 100 meters. If the wiring length exceeds 100 meters, please reduce the adjusting carrier frequency parameter P71.14, and install the output side filter and reactor.

### 4.5 Wiring of control circuit terminals

#### 4.5.1 Layout of control circuit terminals

The layout of control circuit terminals is shown in Figure 4-21 Control circuit terminals.

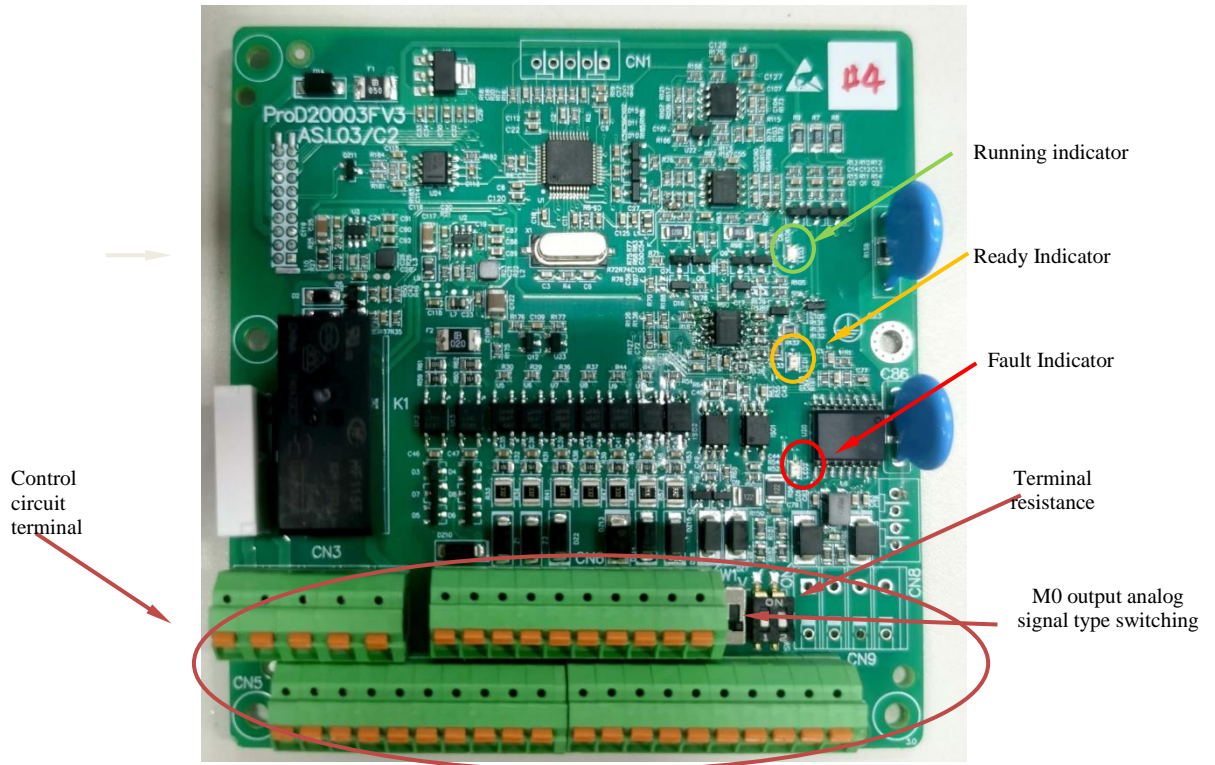


Figure 4-21 Control circuit terminals

A0/A1 can both input analog voltage signals (0V - +10 V) or analog current signals (0 - 20 mA). The input mode is modified by the corresponding software parameters of each port, with (0-10 V) voltage signals by default.

M0 can output analog voltage signals (0 - +10 V) or analog current signals (0 - 20 mA), and the output mode is determined by the dial switch SW1 corresponding to the port.

Dial the switch to the "V" end, and the corresponding port is in voltage operating mode; dial the switch to the "I" end, and the corresponding port is in current operating mode. The toggle switch layout for input/output signals is shown in Figure 4-22.

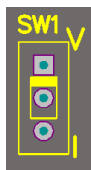


Figure 4-22 The toggle switch layout for input/output signals

#### 4.5.2 Control circuit terminal markings

The control circuit terminal markings are shown in Figure 4-23.

2B	2A	1C	1B	1A	10VA0	A1	0V	M0	0V	P1	P2	PS	AC	H1	H2	HO	HC	
X0	X1	X2	X3	X4	X5	X6	24V	XV	XC	RP	MP	Y0	Y0C	Y1	Y1CA+	B-	SC	PE

Figure 4-23 Control circuit terminal markings

### 4.5.3 Functional descriptions of control circuit terminals

The functional descriptions of control circuit terminals are shown in Table 4-15.

Table 4-15 Functional descriptions of control circuit terminals

Name	Terminal No.	Signal name	Remarks					
Digital input terminal	X0	Multi-function input 0	The input signal is valid when the contact is being input or closed. The function is selected by the parameters of function code group P30. Switching input circuit specifications are as follows:					
	X1	Multi-function input 1						
	X2	Multi-function input 2						
	X3	Multi-function input 3						
	X4	Multi-function input 4						
	X5	Multi-function input 5						
	X6	Multi-function input 6						
	24V	Internal +24VDC power supply output		<table border="1"> <tr> <td>Internal power supply</td> <td>+24VDC</td> </tr> <tr> <td>Maximum load current</td> <td>100mA</td> </tr> </table>	Internal power supply	+24VDC	Maximum load current	100mA
	Internal power supply	+24VDC						
Maximum load current	100mA							
XV	Input signal common terminal							
XC	Internal 24V power supply 0V							
Analog input terminal	A0	Multi-function analog input 0	Rated input range in voltage mode: 0 V - +10 VDC ( $\pm 0.1$ V), $R_{in} > 10$ k $\Omega$					
	A1	Multi-function analog input 1	Rated input range in current mode: 0 mA - +20 mA ( $\pm 0.2$ mA), $175 \Omega > R_{in} \geq 120 \Omega$					
	10V	+10V power supply output	+10VDC power output for analog input, maximum allowed current 20mA					
	0V	Analog input signal reference ground	Analog input signal reference ground					
Relay output terminal	1A 1B 1C	Relay output 1	Conversion output, where AB is the normally open contact and BC is the normally close contact. Contact capacity: Resistance: 8 A/250 VAC or 8 A/30 VDC, Inductance: 1.5 A/250 VAC or 1.5 A/30 VDC, The output function can be defined					
	2A 2B	Relay output 2	Normally open contact, contact capacity: Resistance: 4.5 A/250 VAC or 4.5 A/30 VDC, Inductance: 0.4 A/250 VAC or 0.4 A/30 VDC, The output function can be defined;					
Digital output terminal	Y0	Digital input 0	Integrated open out can be programmed, and the function can be defined. Driving capacity: not more than DC30V, 30mA					
	Y0C	Digital output common terminal						
	Y1	Digital input 1						
	Y1C	Digital output common terminal						
Analog output terminal	M0	Analog output 0	Bandwidth: 30 kHz; Rated output range in voltage mode: 0 V - +10 VDC ( $\pm 0.1$ V), $R_L \geq 1$ k $\Omega$ , with maximum output current of 10 mA Rated output range in current mode: 0 mA - +20 mA ( $\pm 0.2$ mA), $20 \Omega \leq R_L \leq 500 \Omega$ The output mode is selected by the dial switch SW1					
	0V	Analog output signal reference ground	Analog output signal reference ground					
High-speed pulse input	RP	Pulse input	Absolute conduction value: DC 8 V - 24 V; absolute turn-off value: DC 0 V - 3 V Bandwidth: 33 KHz					
	MP	Pulse output	Switch value OC output, with maximum allowable voltage of DC 32 V, $R_L \geq 250 \Omega$ and maximum output current of 100 mA Bandwidth: 33 KHz					

Name	Terminal No.	Signal name	Remarks
Over temperature protection terminal	P1, P2	PTC function connection port	Matching temperature sensor model: PT1000 Over-temperature protection point: 120°C
24 V auxiliary power supply	PS	Auxiliary 24 V power input	Connect to external power supply to make the inverter control system work; Power range: +24 V ( $\pm 5\%$ ); required power capacity: 700 mA
	0V	Auxiliary 24 V power ground	
Modbus communication terminal	A+	Modbus communication signal +	Signal terminal for Modbus communication, with maximum Baud: 115200bps;
	B-	Modbus communication signal-	The terminal resistance status is selected by the dial switch SW2 (not connected by default);
	SC	Communication isolated ground	Modbus communication isolated ground
	PE	Shielding layer ground	

Note: The analog signal line applies the twisted pair shielded wire, and the shielding layer shall be grounded properly. And the distance from the power wire shall be greater than 5 cm, preferably cross wiring with the power wire. Try to avoid the wiring parallel to the power wire. The shielding layer can be connected to the inverter housing.

#### 4.5.4 Wire specifications for control circuit wiring

The control circuit is recommended to use 600V voltage resistant plastic insulated copper core wire. Wire specifications and tightening torque are shown in Table 4-16.

Table 4-16 Wire specifications and tightening torque

Inverter model	Connectable wire specification mm <sup>2</sup>	Recommended wire specification mm <sup>2</sup>	Fastening torque (N.m)
Intelligent flexible drivers full range	0.5~1	0.75	1.5

Wire specifications are determined per an ambient temperature of 50°C and an allowable wire temperature of 75°C.

Bar terminals are recommended for wiring the control circuit. The specifications of the bar terminal are shown in Table 4-17.

Table 4-17 Bar terminal specifications

Wire cross-sectional area mm <sup>2</sup> (AWG)	d1(mm)	d2(mm)	L(mm)	Diagram
0.5(22)	1.3	2.5	16	
0.75(20)	1.5	2.8	16.4	

Wire cross-sectional area mm <sup>2</sup> (AWG)	d1(mm)	d2(mm)	L(mm)	Diagram
1.0(18)	1.7	3.4	16.4	

#### 4.5.5 Detailed description of control circuit terminal wiring

##### 4.5.5.1 Switching input terminals

Each multi-functional switching input terminal can define its input function by setting the parameters of function code group P30. P30.00~P30.06 set values between 0~63, see parameter group P30 for the meaning of each value.

Specific wiring method:

- Use the internal +24V inverter, the external controller is wired as passive contact

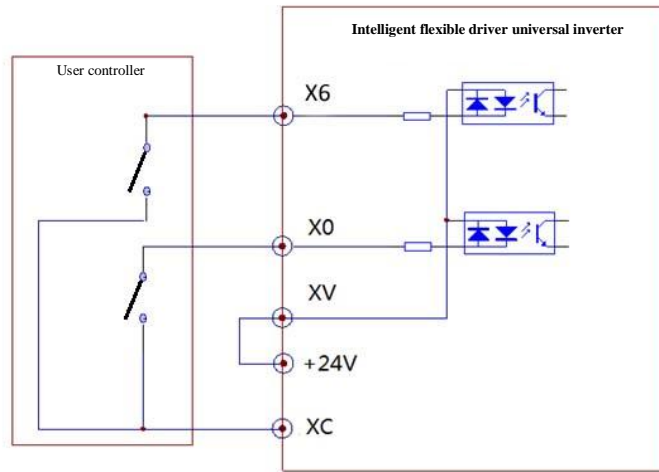


Figure 4-24 Mode of passive contact wiring

- Use the internal +24V inverter, the external controller is wired as NPN type current filling

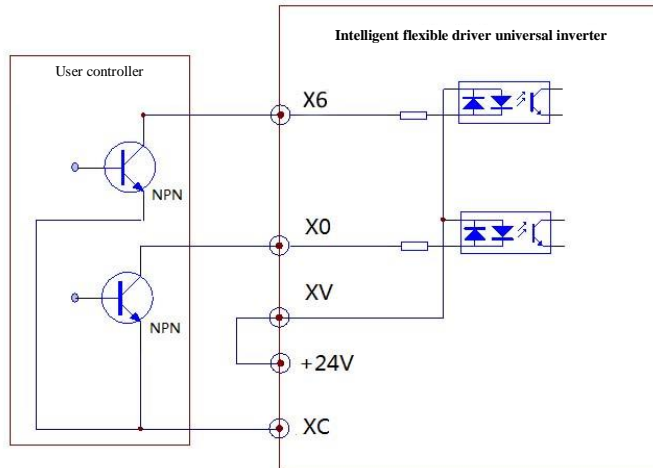


Figure 4-25 Mode of NPN-type sink current injection wiring

- Use the internal +24V inverter, the external controller is wired as PNP type current pulling

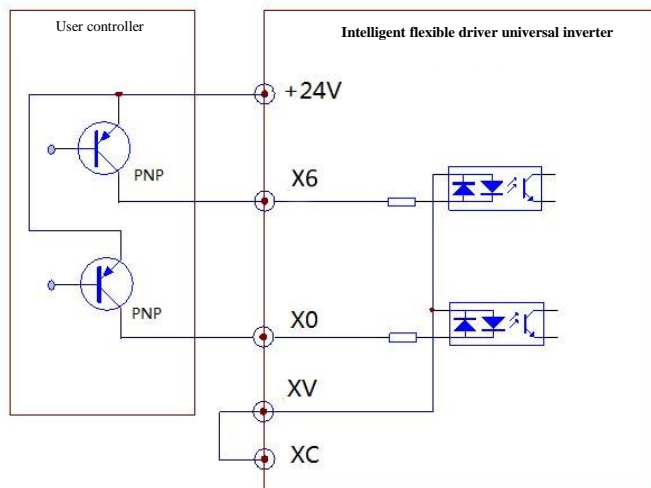


Figure 4-26 Mode of PNP-type source current wiring

**Note:** Be sure to remove the shorting piece between +24V and XV terminals, and short XC and XV terminals

- Using external power supply wiring method, the external controller is wired as NPN type current filling

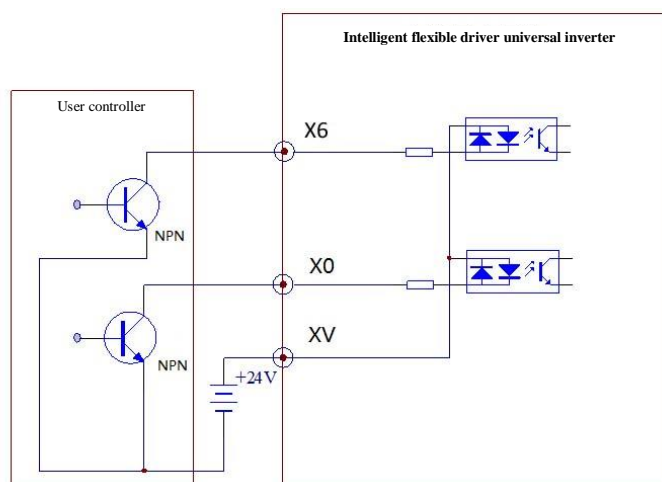


Figure 4-27 Mode of NPN-type sink current injection wiring

**Note:** Be sure to remove the shorting piece between +24V and XV terminals

- Using external power supply, the external controller is wired as PNP type current pulling

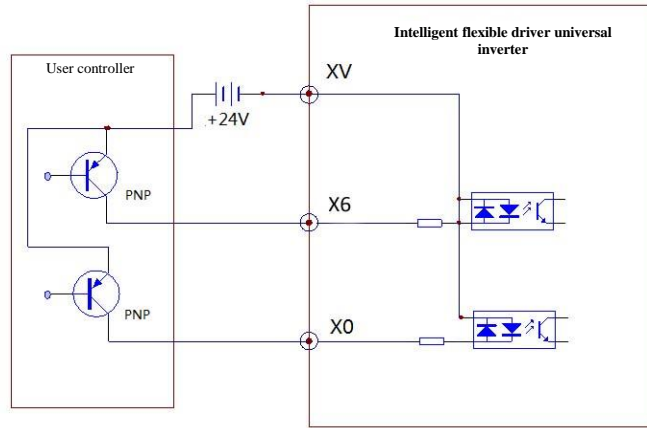


Figure 4-28 Mode of PNP-type source current wiring

**Note:** Be sure to remove the shorting piece between +24V and XV terminals

#### 4.5.5.2 Analog input terminal

This inverter has two analog input ports A0 and A1, and the signal type is voltage/current; the range of voltage signal is 0V~+10V, and the range of current signal is 0~20mA.

When using analog input signals, you can also select the gain, offset and signal filtering time of each corresponding input signal through P32.00~P32.11 parameters for better use of analog inputs. For details, please refer to Section 7.6.3.

When using analog signal connection, the connection line between analog signal and inverter should be as short as possible (less than 30m). Shielded wire shall be used, and the shield of the shielded wire should be grounded.

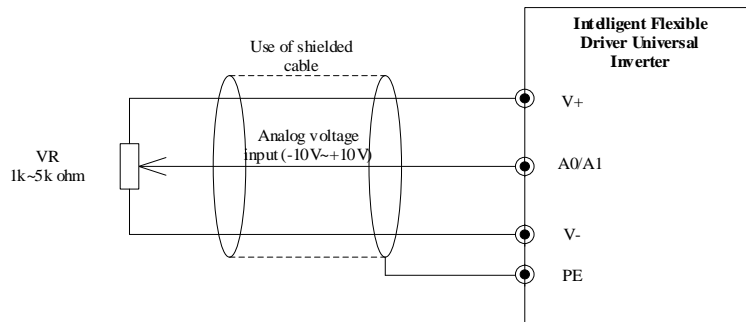


Figure 4-29 Analog signal shield wiring

In Figure 4-29, the analog voltage signal is provided by the inverter, and the voltage range is 0V~+10V. In most cases, the voltage signal of the analog input is provided by the controller that sends out the analog signal, and, if it is a voltage signal, the voltage range of 0~10V will be mostly used, and the wiring schematic is shown in 4-30. If it is a current signal, a current range of 0mA~20mA will be used, and the wiring schematic is shown in Figure 4-31.

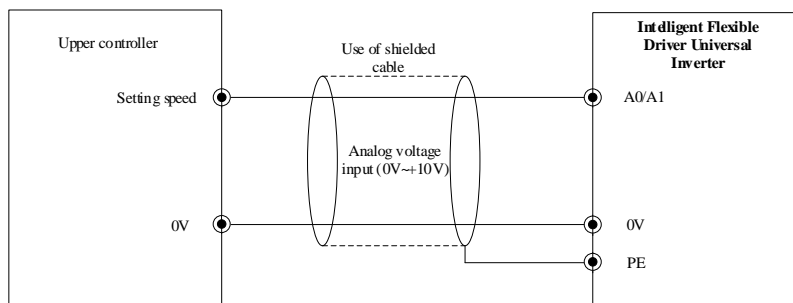


Figure 4-30 Analog voltage signal wiring

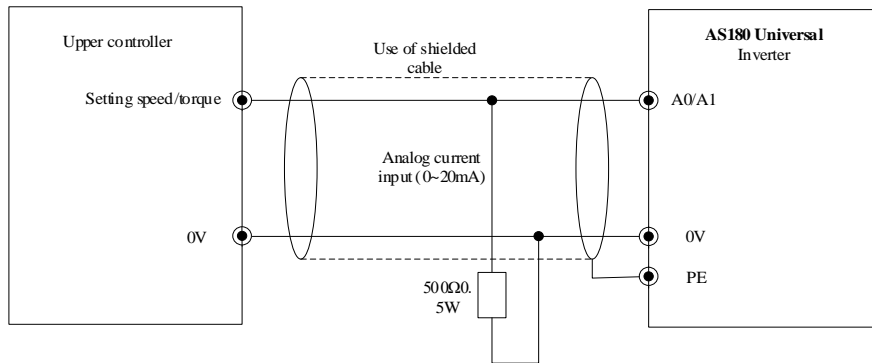


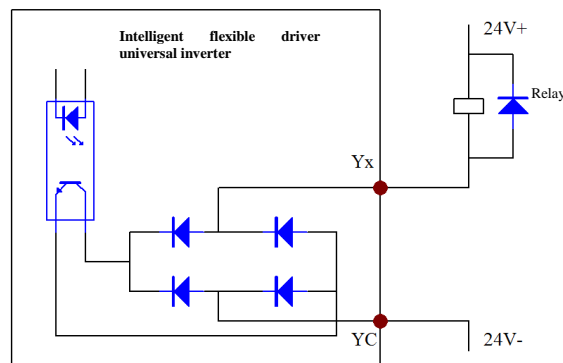
Figure 4-31 Analog current signal wiring

#### 4.5.5.3 On-off output terminal

The switching output terminals have two parts: relay contact output terminal and open-collector output terminal. The function of each switching output terminal can be defined by the parameter of function code group P31. The data range is 0~63, see parameter group P31 for the meaning of each value.

Note: The open-collector output uses external power supply, so please note the polarity of the power supply when connecting the external power supply. The maximum voltage of the output power supply is +30VDC and the maximum load current is 50mA, and there is a danger of damaging the output circuit if it exceeds this limit.

- The wiring method of the multi-functional open-collector output terminal of the external +24V power supply of the inverter is used



Note: If the Y0 or Y1 terminal is damaged when using this wiring method, please make sure that the polarity of the external diode is correct.

#### 4.5.5.4 Multifunctional analog output terminal

The multi-functional analog output terminal defines its output function through the setting of function code P33.00 and P33.03. The set value ranges from 0 to 16, and each data indicates its corresponding output point (P33.03 parameter corresponds to M1 output point) with the following functions:

- 0: No function
- 1: Output current
- 2: Output voltage
- 3: Torque setting
- 4: Bus voltage

- 5: Total output power
- 6: Output active power
- 7: Speed (unsigned)
- 8: Speed setting (signed)
- 9: Speed feedback (signed)
- 10: Acceleration rate
- 11: Heat sink temperature
- 12: Analog quantity A0
- 13: Analog quantity A1
- 14: Analog quantity A2
- 15: ModBus analog output 0
- 16: ModBus analog output 1

For detailed description, please refer to Chapter 7 "7.6.4 Analog output parameters".

#### **4.5.6 Other notes on wiring**

The wire of the control terminal must be far away from the power line of the main circuit, otherwise, it may cause misoperation due to electromagnetic interference.

# Chapter 5 Commissioning and trial operation

Terms related to the control, operation and status of the inverter will be mentioned several times in the following chapters. Please read this chapter carefully before using the product in order to properly understand and use the functions mentioned in the subsequent chapters.



**Danger**

Do not turn off the input power until you have confirmed that the inverter shell is installed. Do not remove the inverter shell after power is applied, otherwise there is a risk of electric shock. If the inverter has been set up with the power failure restart function, do not approach the mechanical transmission equipment to prevent injuries as the inverter starts the mechanical equipment when the power is turned on. If the energy consumption braking resistor is installed, please do not touch the braking resistor, otherwise there is a risk of electric shock and burns. Before the inverter starts the motor and mechanical equipment, please confirm the allowable range of the motor and mechanical equipment, otherwise there is a risk of injury.



**Caution**

Do not check the measurement signal during the operation of the inverter, otherwise there is a risk of damage to the equipment. Do not change the parameter setting of the inverter at will, otherwise the desired operation may not be achieved and there is a risk of damaging the transmission equipment. Before switching the operation command channel of the inverter, please make sure to debug first, otherwise there is a risk of damaging the equipment and personal injury.

## 5.1 Running command setting

The operator is the basic tool for inverter operation. It can be used to observe various status and error codes of the inverter, and also set and view various parameters of the inverter. This section describes the basic operation of the operator.

### 5.1.1 Inverter operation command channel

It specifies the physical channel for the inverter to receive operation commands: start, stop, etc. There are three types of operation command channels:

Operation panel: Control with RUN, STOP/RESET, LO/RE keys on the operation panel;

Control terminal: Control with control terminals X0~X6 (digital), A0~A1 (analog);

Communication port: Control start and stop through the upper computer with control terminals A+, B- (Modbus).

The command channel can be set by function code P10.02.

Note: Before switching the command channel, please make sure to debug first, otherwise there is a risk of damaging the equipment and personal injury!

### 5.1.2 Inverter frequency setting channel

There are four physical channels with preset frequencies under normal running mode, which are respectively:

Operation panel ▲, ▼ setting;

Terminal setting;

Communication setting;

Analog voltage and current setting.

### 5.1.3 Inverter operating status

The working status is divided into shutdown status and running status. Stop state: After the power-on initialization of the inverter, if there is no operation command input, or after the execution of the shutdown command during operation, the inverter will enter the shutdown state.

Running state: After receiving the running command, the inverter enters the running state.

### 5.1.4 Inverter operation mode

Closed-loop operation: The closed-loop selection function is effective (P51.00=1), the inverter will enter the closed-loop operation mode, i.e. PID adjustment according to the setting and feedback amount (see function code group P51).

Multi-segment speed operation: Multi-segment frequency 0~7 (P41.00~P41.15) is selected for multi-segment speed operation by opening/closing multi-function terminals (function 3, 4, 5).

Normal operation: that is, simple open-loop operation mode.

## 5.2 Operation guide

The operator is the basic tool for inverter operation. It can be used to observe various status and error codes of the inverter, and also set and view various parameters of the inverter. This section describes the basic operation of the operator.

Users can use the panel to:

- Monitor motor status
- Conduct motor self-rectification
- Control motor operation (motor start/stop, motor speed, forward/reverse rotation, etc.)
- View and respond to errors or alarms
- Set and modify parameters
- Switch between local mode and remote mode

### 5.2.1 Introduction to the functions of various parts of the operator

For the names and functions of various part of the operator, see Figure 5-1.



Figure 5-1 Names and Functions of Various Parts of the Operator

### 5.2.2 LCD display

There is a liquid crystal display in the middle of the LCD operator. The LCD display is the main window for setting parameters of the inverter, displaying operation parameters of the motor and viewing fault codes of the inverter.

## 5.3 Operation of LCD operator

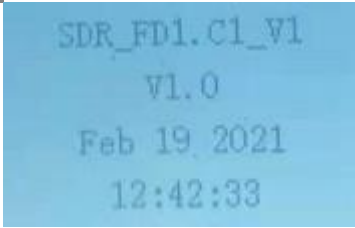
The operator has three states: [Monitor State], [Function Option] and [Parameter Modification]. The operator menu is displayed in Chinese and English. The factory settings are in Chinese, which can be switched to English by setting the parameter value of "Language Option" in the advanced menu to 1.

### 5.3.1 Power-on initialization

When the operator is powered on for the first time, it should be operated by the left shift key and right shift key to adjust the brightness of the LCD screen of the operator: pressing the left shift key to dim the brightness, and pressing the right shift key to brighten the brightness.

After powering on, there will be about a few seconds of initialization process, during which, the LCD screen of the operator will display [Boot Screen].

[Boot Screen] is shown as follows:



Description: enter the monitoring state after displaying the software version number.

### 5.3.2 Display after power-on

The "Monitoring Status" interface is displayed after power on for 2 seconds. This interface displays by default the current recorded target speed, preset speed, feedback speed, and output current.

### 5.3.3 [Monitor Status] Details

Entering the monitoring settings to select standard monitoring or waveform monitoring. 8 displays can be set by standard monitoring.

Table 5.1 Default running status data comparison

Name	Description	Setting range	Unit	Factory setting	Remarks
Target speed	Display the target speed command value of the motor	×	Hz	×	
Setting speed	Display the speed setting command value of the motor	×	Hz	×	
Feedback speed	Display the speed value of the motor feedback	×	Hz	×	
Output current	Display output current	×	A	×	
Output voltage	Display the output value	×	V	×	
Bus voltage	Display the DC voltage of the main circuit inside the inverter	×	V	×	
Output power	Display output power	×	kW	×	
Output torque	Display the torque output value	×	%	×	
Input X0-X6 status	Display the status of input terminals X0-X6. DI is displayed in "XXXXXXXX" format, where "x" = 0, indicating no input; "X" = 1, indicating input.	×	×	×	
Status of output K1-K2, Y0 and Y1	Display the status of output terminals K1-K2, Y0 and Y1. DO is displayed in "XXXXXX" format, where "x" = 0, indicating no output; "X" = 1, indicating output.	×	×	×	

### 5.3.4 Detailed description of [Panel Control]

Press “**LOC**” to switch between the “Monitoring Status” and “Panel Control” two statuses. In the “Panel Control” status, press “**RUN**” can control the inverter to enter the running status, and press “**STOP**” to control the inverter to enter the stopping status. In the “Panel Control” interface, press “**▲**” and “**▼**” keys to switch the monitored content, and the running frequency can be set via “**>**”, “**<**” or “**↻**”.

### 5.3.5 Operation status of the operator

There are seven operating statuses for the operator. These seven statuses are [Monitoring Settings], [Debugging Wizard], [Parameter Group], [Parameter Processing], [Fault Record], [Self Learning], and [System Settings] respectively. In any monitoring status interface, pressing  can enter the function selection interface

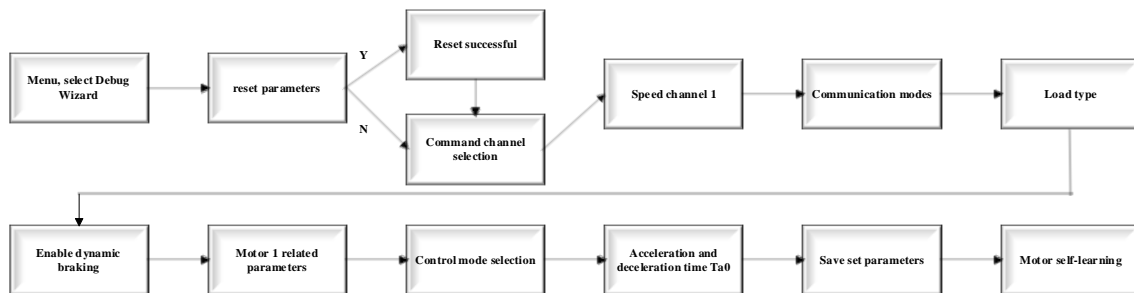
#### 5.3.5.1 [Monitoring Settings] status details

The [Monitoring Settings] status of the operator is used to modify the monitoring data, supporting two modes of standard monitoring and waveform monitoring.

In standard monitoring mode, 8 displayed data can be custom modified; in the waveform monitoring mode, the curve of preset speed and feedback speed can be displayed in real-time in the form of waveforms.

#### 5.3.5.2 [Debugging Wizard] status details

Debugging wizard is a fast parameter setting mode, where includes common parameters. Guided by this parameter, the inverter parameters can be quickly set according to the motor nameplate, achieving rapid completion of basic debugging work.



#### 5.3.5.3 [Parameter Group] status details

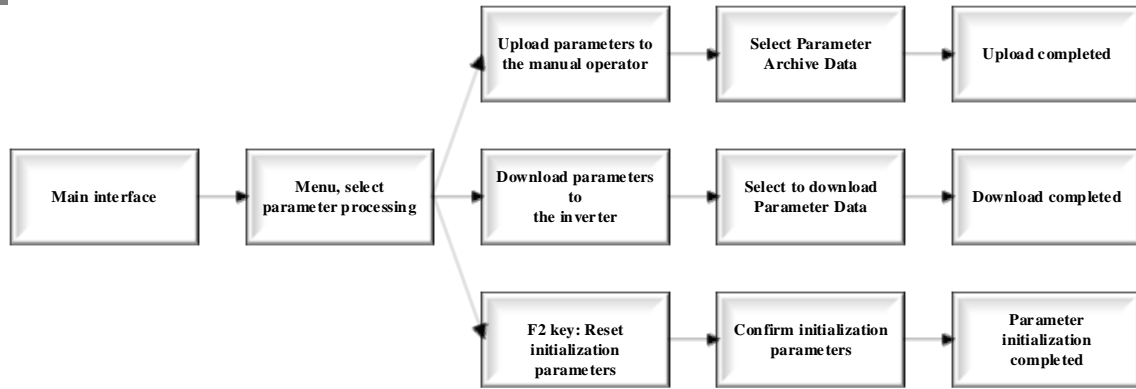
The [Parameter Group] status of the operator is used to modify parameters. See Chapter 6 for the setting range of parameters.

In the [Parameter Group] status, press  or  to select parameters. Press  to return to the higher-level menu, and press  or  to enter parameter settings. After selecting the parameter to be modified and pressing , and a cursor indicating the modification bit will be added to the parameter bit to be modified. The modification bit can be changed by pressing  or  to move the cursor. The parameter value can be modified by pressing  or  for addition and subtraction. The key  should be pressed to confirm that the modification is valid. If  is not pressed, the modification of the parameter will be invalid.

Press  to return to the previous menu state.

#### 5.3.5.4 Details of [Parameter Processing] status

In the [Parameter Processing] statuses, parameters can be uploaded, downloaded, and reset. The operator can store 4 groups of uploaded parameters.



### 5.3.5.5 [Fault Record] status details

In the [Fault Record] status, you can view the contents of the recent 8 faults as well as the voltage, current, preset speed, feedback speed status, U, V, W three-phase current instantaneous value and fault occurrence time recorded at the time of fault occurrence. In the main status interface, pressing

**ENTER** will display ER0=X, pressing **▲** or **▼** will switch between ER0 and ER7, where ER0 indicates the serial number of the recent fault, ER7 indicates the serial number of the earliest fault, X indicates the code of the fault under the current serial number, below which there is the fault meaning of the fault code displayed in Chinese. Users can press **↩** again in the fault code display state to display the DC bus voltage ( $U_{dc}$ ), instantaneous value of output current ( $I_{rms}$ ), current reference frequency ( $V_{ref}$ ), feedback frequency ( $V_{fbk}$ ), instantaneous value of U-phase current ( $I_u$ ), instantaneous value of V-phase current ( $I_v$ ) and instantaneous value of W-phase current ( $I_w$ ) recorded under the current fault, and press **ENTER** again to return to the fault code display state. Press **ESC** to return to the previous menu state.

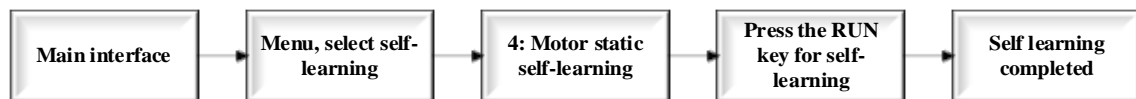


### 5.3.5.6 [Self learning] status details

In the self-learning status, self-learning for motor parameters can be conducted manually. Pressing **↩**, there is an additional cursor indicating the modification position on the parameter to be modified. Then, press **▲** or **▼** select the self-learning item, press **↩** to confirm, and press the “RUN” key to start self-learning. The meanings of self-tuning selection parameters are as follows:

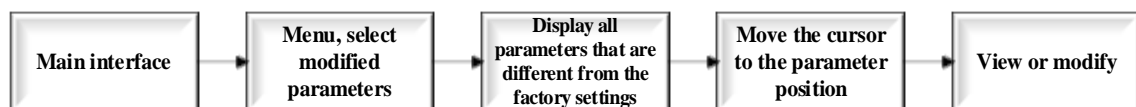
- 0: Normal operation mode
- 4: Motor static self-learning

Press **ESC** to return to the previous menu state.



### 5.3.5.7 [Query of Modified Parameters] status details

You can view the parameters that have been modified via the panel and directly modify the modified parameters.



### 5.3.5.8 [System Settings] status details

In the [System Settings] status, there are functions for setting date/time, program upgrade, and waveform acquisition. In which, program upgrade can be performed via the operator to upgrade the main control and IO board program; the waveform acquisition function can be enabled to achieve waveform acquisition (the acquisition channel can be configured), automatically stored to the SD card.

Press  to return to the previous menu state.

## 5.4 Fault display

When the inverter has a fault, the fault code and name are displayed in the operator LCD screen. For the fault code and name, see Table 5.5.

Table 5.5 Fault code and fault name

Error No.	Fault display	Error No.	Meaning
1	Module overcurrent protection	3	Radiator overheating
7	Speed deviation	8	Busbar overvoltage protection
9	Bus undervoltage	10	Output default phase
11	Motor overcurrent at low velocity	12	Encoder fault
17	Overspeed in the same direction	18	Overspeed in the reverse direction
21	abc overcurrent	27	Output overcurrent
29	Abnormal bus fluctuation	30	Overspeed protection
31	Motor I2T current	32	Ground protection
34	External fault	37	Current sensor failure
39	Abnormal current sampling	42	Fault of brake short circuit
43	Communication error	44	Fault of drive board communication
45	I2t instantaneous overcurrent value	46	I2t valid overcurrent value
47	Analog input error	48	Fault of POWERID
49	Fault of wave-by-wave current limiting	51	Running output current error
52	Abnormality of 15 V drive voltage	53	Abnormality of braking resistor wiring
54	Fault of power grid imbalance	55	Fault of power grid phase sequence
56	Fault of power grid undervoltage	57	Fault of power grid overvoltage



# Chapter 6 Function parameter table

## 6.1 Description on function code parameter table

Short form fields	Summary Fields
Function code No.	The number of function code, e.g. P00.00
Function code name	The name of the function code, explaining the code's function
Factory default	The set value after the function code restores the factory value (see P00.01)
Setting range	Minimum to maximum value allowed to be set by the function code
Unit	V: voltage; A: current; °C: degrees; Ω: ohms; mH: millihen rpm: rotational speed %: percentage; bps: baud rate; Hz, kHz: frequency; ms, s, min, h, kh: time; kW: power; /: no unit, etc.
Attribute	○: the function code can be modified during operation; ×: the function code can only be modified during shutdown; *: the function code is a read-only parameter and cannot be modified
Function code options	Function code parameter setting table
User settings	For user to record parameters

## 6.2 Brief table of function code parameters

### 6.2.1 Group P0X User parameters

Group P00 Password parameters						
Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P00.00	Login password	0	0~65535	/	×	0: no password; others: login password;
P00.01	Modify password	0	0~65535	/	×	0: no password; other: password protection;
P01 group Customer usage parameters						

### 6.2.2 Group P1X Control parameters

#### 6.2.2.1 Group P10 Basic control parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P10.00	Control mode selection	0	0~6	/	×	0: GVC control
						1: No PG vector control
						2: PG Torque control
						3: PG vector control
						4: spare
						5: No PG torque control
P10.01	Operation modes	0	0~4	/	×	0: Two-wire 1; 1: Two-wire 2;
						2: Three-wire 1; 3: Three-wire 2;
						4: One wire
P10.02	Command channel selection	0	0~6	/	×	0: Panel; 1: Terminal; 2: Communication (Modbus); 3: CAN(Spare); 4: DP(Spare); 5: PLC; 6:SSI
P10.03	Speed channel 1	0	0~17	/	×	0: Panel setting speed

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
						1: Digital multi-segment speed preset
						3: Analog 0 set target speed
						4: Analog 0 set current speed
						5: Analog 1 set target speed
						6: Analog 1 set current speed
						8: PID set target speed
						11: SSI preset current speed
						12: Communication (Modbus) preset target speed
						15: Up/Down setting speed
						17: PLC preset speed Other channels: spare
P10.04	Torque preset mode	0	0~6	/	×	0: Panel preset torque
						1: Analog quantity; 0 preset target torque
						2: Analog quantity; 1 preset target torque
						3: Standby
						4: Standby
						5: ModBus Preset torque
P10.05	Compensated torque preset mode	0	0~6	/	×	0: Uncompensated torque
						1: Set compensating torque internally
						2: spare
						3: spare
						4: spare
						5: spare
P10.06	Speed limits	0	0~5	/	×	0: Internal parameter limit 1-5: Spare
P10.07	Speed channel 2	0	0~17	/	×	Same as P10.03

### 6.2.2.2 Group P11 Start-up parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P11.00	Start modes	0	0~2	/	×	0: Normal start
						1: DC braking and then start
						2: Speed tracking start
P11.01	Start holding frequency	0.00	0.00~50.00	Hz	×	
P11.02	Start frequency hold time	0.0	0.0~3600.0	s	×	
P11.03	Start DC injection current	30.0	0.0~120.0	%	×	
P11.04	Start DC injection time	5.0	0.0~100.0	s	×	
P11.05	Excitation time	2.0	0.0~10.0	s	×	
P11.06	Zero servo time	0.0	0.0~100.0	s	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P11.07	Brake actuation time	0.20	0.00~100.00	s	×	
P11.08	Tracking delay time	1	0~65000	ms	×	
P11.10	Tracking voltage Kp	0.20	0.00~100.00	/	×	
P11.11	Tracking voltage Ki	0.50	0.00~100.00	/	×	
P11.12	Tracking voltage Kd	0.00	0.00~100.00	/	×	
P11.13	Tracking exit delay time	100	0~65000	ms	×	
P11.14	Maximum current at tracking	100.0	0.0~200.0	%	×	
P11.15	Tracking frequency change gain	10.0	0.0~100.0	%	×	
P11.17	Tracking initial frequency	50.00	0.00~360.00	Hz	×	
P11.19	Reverse braking current	20.0	0.0~100.0	%	×	

### 6.2.2.3 Group P12 Stopping parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P12.00	Stopping modes	0	0~4	/	×	0: Inertial stop
						1: Deceleration stop
						2: Deceleration + DC brake
						3: Deceleration + inertia parking
						4: Spare
P12.01	Stopping holding frequency	0.00	0.00~100.00	Hz	×	
P12.02	Stopping frequency holding time	0.0	0.0~1000.0	s	×	
P12.03	DC braking starting frequency	2.50	0.00~10.00	Hz	×	
P12.04	Stopping DC braking current	50.0	0.0~100.0	%	×	
P12.05	Stopping DC braking time	0.5	0.0~10.0	s	×	

### 6.2.2.4 Group P13 Braking function parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P13.00	Energy consumption braking option	1	0~1	/	×	1: Energy consumption braking on 0: Energy consumption braking off Built-in brake unit, 1 by default
P13.01	Brake opening voltage	660	340~1160	V	×	Under 600 by default, calculated according to the power grid voltage, otherwise it works by the set value

### 6.2.2.5 Group P14 V/F control parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P14.00	V/F curve setting	0	0~5	/	×	0: Standard V/F straight

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
						line; 1: 1.2 power curve 2: 1.5 power curve 3: 2 power curve 4: User-defined 5: Standby
P14.01	V/F voltage value V0	76	1~460	V	×	
P14.02	V/F frequency value F0	10.00	0.01~300.00	Hz	×	F0<F1
P14.03	V/F voltage value V1	152	1~460	V	×	
P14.04	V/F frequency value F1	20.00	0.01~300.00	Hz	×	F1<F2
P14.05	V/F voltage value V2	228	1~460	V	×	
P14.06	V/F frequency value F2	30.00	0.01~300.00	Hz	×	F2<F3
P14.07	V/F voltage value V3	304	1~460	V	×	
P14.08	V/F frequency value F3	40.00	0.01~300.00	Hz	×	F3<F4
P14.09	V/F voltage value V4	380	1~46	V	×	
P14.10	V/F frequency value F4	50.00	0.01~300.00	Hz	×	
P14.11	ASC set source	0	0~5	/	×	0: Internal number preset; 1: spare; 2: spare; 3: spare 4: spare 5: spare
P14.12	ASC voltage setting	380	0~690	V	×	
P14.13	ACS frequency setting	50.0	0~3000.0	Hz	×	
P14.14	Special power type	0	0~3	/	×	0: Voltage source 1: Current source 2: Fire pump 3: Fan patrol inspection

### Group P15 SVC control parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P15.00	Initial Magnetic Position Type	1	0~2	%	×	0: None 1: DC current injection 2: Pulse injection
P15.01	DC current injection	50	0~150	%	×	
P15.02	Pulse injection amplitude	50	0~100	%	×	
P15.03	Pulse angel compensation	0	0~1	/	×	0: No compensation 1: compensate 180 degrees
P15.05	Control status word	2	0~1000	/	×	
P15.06	PM current control type	1	0~10	/	×	
P15.07	Bandwidth of MTPA1	10	0~1000	Hz	×	
P15.08	Imin of MTPA	5	0~100	%	×	
P15.09	PM low speed compensation coefficient 1	40	0~200	%	×	
P15.10	Ka	15	0~1000	/	×	
P15.11	Kb	20	0~1000	/	×	
P15.12	Kr1	5	0~1000	/	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P15.13	Kr2	200	0~2000	/	×	
P15.14	Kr3	20	0~2000	/	×	
P15.15	Kr4	40	0~2000	/	×	
P15.16	Kr5	100	0~2000	/	×	

### P16 group Weak magnetism parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P16.01	Weak magnetism voltage preset	95	0~200	%	×	
P16.02	Weak magnetism control bandwidth	10.0	0.0~100.0	Hz	×	
P16.03	Magnetic chain loop bandwidth	1.0	0.0~100.0	Hz	×	

### P17 group GVC parameter

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P17.00	GVC DC injection current	30.00	0.10~200.00	%	×	
P17.01	DC injection slope	1.00	0.00~655.35	s	×	
P17.02	External synchronization switching frequency	5	0~100	%	×	
P17.03	Low-speed voltage compensation gain	0.00	0.00~200.00	%	×	
P17.04	Voltage compensation upper limit frequency	0.40	0.00~300.00	%	×	
P17.05	Vibration rejection gain	2.00	0.00~655.35	/	×	
P17.15	Compensation selection	256	0.00~65535	/	×	

## 6.2.3 Group P2X Motor parameters

### 6.2.3.1 Group P20 Basic motor parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P20.00	Type of motor 1	0	0~2	/		0: Asynchronous; 1: Synchronous; 2: Reluctance motor
P20.01	Motor 1 rated power	By inverter power	0~655.35	kW	×	Set by motor nameplate
P20.02	Motor 1 rated current	By inverter power	0.0~1000.0	A	×	Set by motor nameplate
P20.03	Motor 1 rated frequency	50.00	0.00~500.00	Hz	×	Set by motor nameplate
P20.04	Motor 1 rated speed	1460	0~60000	rpm	×	Set by motor nameplate
P20.05	Motor 1 rated voltage	380	0~690	V	×	Set by motor nameplate
P20.06	Number of poles of	4	2~128	/	×	Number of motor pole pairs =

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
	motor 1					number of poles / 2
P20.07	Motor 1 rated slip frequency	1.40	0.10~50.00	Hz	×	Set by motor nameplate
P20.08	Motor 1 maximum slip frequency	2.80	0.10~50.00	Hz	×	
P20.09	Phase sequence of motor 1	1	0~1	/	×	0: Negative phase sequence; 1: Positive phase sequence
P20.10	No-load current factor of motor 1	30.00	0.10~100.00	%	×	
P20.12	Motor 1 maximum power factor	250	50~400	%	×	
P20.14	Type of motor 2	0	0~1	/		0: Asynchronous; 1: Synchronous
P20.15	Motor 2 rated power	By inverter power	0~655.35	kW	×	Set by motor nameplate
P20.16	Motor 2 rated current	By inverter power	0.0~1000.0	A	×	Set by motor nameplate
P20.17	Motor 2 rated frequency	50.00	0.00~500.00	Hz	×	Set by motor nameplate
P20.18	Motor 2 rated speed	1460	0~50000	rpm	×	Set by motor nameplate
P20.19	Motor 2 rated voltage	380	0~690	V	×	Set by motor nameplate
P20.20	Number of poles of motor 2	4	2~128	/	×	Number of motor pole pairs = number of poles / 2
P20.21	Motor 2 rated slip frequency	1.40	0.10~50.00	Hz	×	Set by motor nameplate
P20.22	Motor 2 maximum slip frequency	2.80	0.10~50.00	Hz	×	
P20.23	Phase sequence of motor 2	1	0~1	/	×	0: Negative phase sequence; 1: Positive phase sequence
P20.24	No-load current factor of motor 2	30.00	0.10~100.00	%	×	
P20.25	Motor 2 maximum power factor	250	50~10000	%	×	

**Note 1: Different inverter powers correspond to different factory values.**

### 6.2.3.2 P21 Advanced motor parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P21.00	Motor setting	0	0~9	/		0: Normal operation mode 1: Encoder static self-learning 2: Standby 3: Standby 4: Motor static self-learning 5: Standby 6: Motor dynamic self-learning 7: Encoder dynamic self-learning 8: Pulse method magnetic pole identification 9: Standby
P21.01	Motor 1 stator resistance	0.100	0.000~65.00 0	Ω	×	
P21.02	Motor 1 rotor	0.441	0.000~65.00	Ω	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
	resistance		0			
P21.03	Motor 1 stator inductance	0.1028	0.0000~6.5000	H	×	
P21.04	Motor 1 rotor inductance	0.1028	0.0000~6.5000	H	×	
P21.05	Motor 1 mutual inductance	0.0991	0.0000~6.5000	H	×	
P21.06	Motor 2 stator resistance	0.100	0.000~65.000	Ω	×	
P21.07	Motor 2 rotor resistance	0.441	0.000~65.000	Ω	×	
P21.08	Motor 2 stator inductance	0.1028	0.0000~6.5000	H	×	
P21.09	Motor 2 rotor inductance	0.1028	0.0000~6.5000	H	×	
P21.10	Motor 2 mutual inductance	0.0991	0.0000~6.5000	H	×	
P21.11	PM1 stator resistance	0.100	0.000~65.000	Ω	×	
P21.12	PM1 motor shaft D inductance	0.0	0~6553.5	H	×	
P21.13	PM1 motor shaft Q inductance	0.0	0~6553.5	H	×	
P21.14	PM1 back electromotive force coefficient	340.1	0~690.0	V	×	
P21.15	DAL0	0.0	0~6553.5	/	×	Used internally
P21.16	DAL1	0.0	0~6553.5	/	×	Used internally
P21.17	DAL2	0.0	0~6553.5	/	×	Used internally
P21.18	DAL3	0.0	0~6553.5	/	×	Used internally
P21.19	DAL4	0.0	0~6553.5	/	×	Used internally
P21.20	DAL5	0.0	0~6553.5	/	×	Used internally
P21.21	Inertia coefficient	0.200	0.000~65.000	/	×	
P21.22	Parameter offset compensation	0.0	0.0~100.0	/	×	

### P22 auxiliary motor parameter

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P22.01	Encoder 1 type	0	0~3	/	×	0: Incremental; 1: SinCos; 2: spare; 3: Rezav
P22.02	Encoder 1 pulse count	1024	100~16000	ppr	×	Encoder pulse number
P22.03	Encoder frequency dividing coefficient	0	0~7	/	×	Encoder frequency dividing coefficient
P22.04	Encoder 1 position angle	0.0	0.0~360.0	degree	*	Encoder position angle
P22.05	Encoder feedback speed filtering time constant	10	0~1000	ms	×	
P22.06	Encoder 1 direction	1	1~1	/	×	
P22.07	SinCos encoder subdivision coefficient	11	2~16	/	×	7—128;9-512;11-2048

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P22.08	Rezav encoder 1 pole count	2	2~128	P	×	
P22.09	Encoder 2 type	0	0~3	/	×	0: Incremental; 1: SinCos; 2: spare; 3: Rezav
P22.10	Encoder 2 pulse count	1024	100~16000	ppr	×	Encoder pulse number
P22.11	Encoder 2 position angle	0.0	0.0~360.0	rad	*	Encoder position angle
P22.12	Encoder 2 direction	1	1~1	/	×	
P22.13	Rezav encoder 2 pole count	2	2~128	P	×	
P22.14	Feedback speed amplitude filtering	0.00	0.00~100.00	%	×	

### P23 protection parameter

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P23.00	Motor fan mode	1	0~2	/	×	0: Shielding; 1: Independent fan; 2: No independent fan
P23.01	Motor normal running threshold	110	70~200	%	×	
P23.02	Motor I2T overcurrent threshold	150	120~300	%	×	

### Group P3X Digital parameters

#### Group P30 Digital input parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P30.00	X0 terminal input functions	7	0~199	/	×	
P30.01	X1 terminal input functions	8	0~199	/	×	
P30.02	X2 terminal input functions	0	0~199	/	×	
P30.03	X3 terminal input functions	0	0~199	/	×	
P30.04	X4 terminal input functions	0	0~199	/	×	
P30.05	X5 terminal input functions	0	0~199	/	×	
P30.06	X6 terminal input functions	0	0~199	/	×	
P30.08	Number of digital input filtering	5	1~200	Time(s)	×	

#### P31 group Digital output

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P31.00	Output K1 function definition	2	0~199	/	×	
P31.01	Output K2 function definition	25	0~199	/	×	
P31.02	Output Y0 function	0	0~199	/	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
	definition					
P31.03	Output Y1 function definition	0	0~199	/	×	
P31.06	Output K1 action delay	0.0	0.0~120.0	s	×	
P31.07	Output K1 reset delay	0.0	0.0~120.0	s	×	
P31.08	Output K2 action delay	0.0	0.0~120.0	s	×	
P31.09	Output K2 reset delay	0.0	0.0~120.0	s	×	
P31.10	Output Y0 action delay	0.0	0.0~120.0	s	×	
P31.11	Output Y0 reset delay	0.0	0.0~120.0	s	×	
P31.12	Output Y1 action delay	0.0	0.0~120.0	s	×	
P31.13	Output Y1 reset delay	0.0	0.0~120.0	s	×	
P31.20	Zero current detection width	4.0	0.0~50.0	%	×	
P31.21	Frequency arrival detection width	1.00	0.0~300.00	Hz	×	
P31.22	Detection frequency	1.00	0.0~655.35	Hz	×	
P31.23	Detection frequency width	0.20	0.0~300.00	Hz	×	
P31.24	Single runtime arrival	2	0.0~65535	h	×	
P31.25	Cumulative runtime arrival	8	0.0~65535	h	×	
P31.26	Detection frequency 3 upper limit	50.00	0.0~655.35	Hz	×	
P31.27	Detection frequency 3 upper and lower limit	45.00	0.0~655.35	Hz	×	
P31.28	Detection frequency 4 upper limit	100.00	0.0~655.35	Hz	×	
P31.29	Detection frequency 4 lower limit	90.00	0.0~655.35	Hz	×	

### P32 group Analog input

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P32.00	AIO input type	0	0~3	/	×	0:0V~10V 1: Standby 2: 0~20mA 3: 4~20mA
P32.01	Input AIO function	0	0~7	/	×	0: No function 1: Target speed signal 2: Current speed signal 3: Torque signal 4: Standby 5: Standby 6: Standby 7: Standby
P32.02	Analog quantity AIO lower limit	0.00	-100.00~327.67	%	×	
P32.03	Analog quantity AIO upper limit	100.0	0.0~6553.5	%	×	
P32.04	Input AIO filtering time	10	0~65535	ms	×	
P32.05	Input AIO amplitude limit	10.000	0.000~65.535	V/mA	×	
P32.06	Input AI1 type	0	0~3	/	×	0:0V~10V 1: Standby 2: 0~20mA

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
						3: 4~20mA
P32.07	Input AI1 function	0	0~7	/	×	
P32.08	Analog quantity AI1 lower limit	0.00	-100.00~327.67	%	×	
P32.09	Analog quantity AI1 upper limit	100.0	0.0~6553.5	%	×	
P32.10	Input AI1 filtering time	10	0~65535	ms	×	
P32.11	Input AI1 amplitude limit	10.000	0.000~65.535	V/mA	×	

### P33 Analog output parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P33.00	Output M0 function	1	0~30	/	×	1: Output current 2: Output voltage 3: Torque setting 4: Bus voltage 5: Total output power 6: Output active power 7: Current speed 8: Speed preset 9: Speed feedback 10: Standby 11: Heat sink temperature 12: Analog quantity A0 13: Analog quantity A1 14: Standby 15: Modbus analog output 0 16: Modbus analog output 1 17-20: Spare 21: For IQ(1) debugging 22: For IQ(2) debugging 23: For IQ(-1) debugging 24: For IQ(-2) debugging
P33.01	Output M0 lower limit	0	-100~327.67	%	○	
P33.02	Output M0 upper limit	100.0	0.0~6553.5	%	○	
P33.06	Output M0 type	0	0~4	/	×	1:0~10V 3:0~20mA 4:4~20mA

### P4X group Frequency control

#### P40 group Basic parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P40.00	Panel speed	5.00	0.0~655.35	Hz	×	
P40.01	Basic frequency	50.00	0.0~655.35	Hz	×	
P40.02	Acceleration time 0	5.00	0.0~500.00	s	×	
P40.03	Deceleration time 0	5.00	0.0~500.00	s	×	
P40.04	Acceleration time 1	5.00	0.0~500.00	s	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P40.05	Deceleration time 1	5.00	0.0~500.00	s	×	
P40.06	Acceleration time 2	5.00	0.0~500.00	s	×	
P40.07	Deceleration time 2	5.00	0.0~500.00	s	×	
P40.08	Acceleration time 3	5.00	0.0~500.00	s	×	
P40.09	Deceleration time 3	5.00	0.0~500.00	s	×	
P40.10	Accelerated fillet Ts0	0.00	0.0~10.00	s	×	Acceleration start
P40.11	Speed-up rounded corner Ts1	0.00	0.0~10.00	s	×	End of acceleration
P40.12	Decelerated fillet Ts2	0.00	0.0~10.00	s	×	Deceleration start
P40.13	Deceleration rounded corner Ts3	0.00	0.0~10.00	s	×	End of deceleration
P40.14	Top arc rounding suppression	0	0~3	/	×	
P40.15	Corner frequency 1	190	0~200	%	×	Acceleration/deceleration switching point 1
P40.16	Corner frequency 2	200	0~200	%	×	Acceleration/deceleration switching point 2

#### P41 digital multi-segment speed

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P41.00	Digital multi-segment speed f0	0.00	0.0~655.35	Hz	×	
P41.01	Digital multi-segment speed f1	0.00	0.0~655.35	Hz	×	
P41.02	Digital multi-segment speed f2	10.00	0.0~655.35	Hz	×	
P41.03	Digital multi-segment speed f3	20.00	0.0~655.35	Hz	×	
P41.04	Digital multi-segment speed f4	30.00	0.0~655.35	Hz	×	
P41.05	Digital multi-segment speed f5	40.00	0.0~655.35	Hz	×	
P41.06	Digital multi-segment speed f6	50.00	0.0~655.35	Hz	×	
P41.07	Digital multi-segment speed f7	60.00	0.0~655.35	Hz	×	
P41.08	Digital multi-segment speed f8	0.00	0.0~655.35	Hz	×	
P41.09	Digital multi-segment speed f9	0.00	0.0~655.35	Hz	×	
P41.10	Digital multi-segment speed f10	0.00	0.0~655.35	Hz	×	
P41.11	Digital multi-segment speed f11	0.00	0.0~655.35	Hz	×	
P41.12	Digital multi-segment speed f12	0.00	0.0~655.35	Hz	×	
P41.13	Digital multi-segment speed f13	0.00	0.0~655.35	Hz	×	
P41.14	Digital multi-segment speed f14	0.00	0.0~655.35	Hz	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P41.15	Digital multi-segment speed f15	0.00	0.0~655.35	Hz	×	
P41.16	Point frequency setting	5.00	0.0~655.35	Hz	×	

### P5X group Process control

#### P50 main and auxiliary preset

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P50.00	Open-loop auxiliary setting mode	0	0~5	×	×	
P50.01	Open loop auxiliary preset operation	0	0~6	×	×	

#### P51 process PID

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P51.00	Closed loop control option	0	0~1	×	×	
P51.01	Closed loop main reference mode	0	0~6	×	×	
P51.02	Close loop auxiliary preset mode	2	0~6	×	×	
P51.03	Closed loop auxiliary reference operation	0	0~6	×	×	
P51.04	Closed loop main feedback mode	1	0~6	×	×	
P51.05	Close loop auxiliary feedback mode	2	0~6	×	×	
P51.06	Closed loop auxiliary feedback operation	0	0~6	×	×	
P51.07	PID internal setting value	0.70	0.00~10.00	×	×	
P51.09	Proportional gain Kp	0.50	0.00~100.00	×	×	
P51.10	Integral gain Ki	0.50	0.00~100.00	×	×	
P51.11	Differential gain Kd	0.00	0.00~100.00	×	×	
P51.12	Integral modes	0	0~1	×	×	
P51.13	The upper limit of integration effect	100.0	0.0~6553.5	%	×	
P51.14	Upper limit of closed-loop input	50.0	0.0~6553.5	%	×	
P51.15	Lower limit of closed-loop input value	0.0	0.0~6553.5	%	×	
P51.16	The upper limit of closed-loop output	100.0	0.0~6553.5	%	×	
P51.17	Hibernation	0	0~1	×	×	
P51.18	Hibernation frequency	30.00	0.00~655.35	Hz	×	
P51.19	Hibernation delay	10.0	0.0~6553.5	s	×	
P51.20	Wakeup error	0.10	0.00~655.35	×	×	
P51.21	Wake-up delay	10.0	0.0~6553.5	s	×	
P51.22	Acceleration and deceleration time reference	0.0	0.0~6553.5	s	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P51.23	Closed loop output filtering time	0.010	0.000~65.535	s	×	
P51.24	Minimum preset quantity	0.00	0.00~10.00	%	×	
P51.25	RefMin-->FdbMin	0.00	0.00~10.00	%	×	
P51.26	Maximum preset quantity	10.00	0.00~10.00	%	×	
P51.27	RefMax-->FdbMax	10.00	0.00~10.00	%	×	
P51.28	Preset frequency	22.00	0.00~655.35	Hz	×	
P51.29	Preset frequency hold time	0	0~65535	s	×	
P51.30	Positive and negative characteristics	0	0~1	×	×	

## P6X group Vector control parameter

### P60 group Speed loop PID

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P60.00	Speed loop - zero speed P	5.00	0.00~655.35	/	×	Zero servo section
P60.01	Speed loop - zero speed Ti	73	0~65535	ms	×	
P60.03	Speed loop - low speed P	5.00	0.00~655.35	/	×	Low speed section
P60.04	Speed loop - low speed Ti	73	0~65535	ms	×	
P60.06	Speed loop - high speed P	8.00	0.00~655.35	/	×	High-speed section
P60.07	Speed loop - high speed Ti	73	0~65535	ms	×	
P60.09	Switching frequency f0	10.0	0.00~655.35	%	×	
P60.10	Switching frequency f1	60.0	0.00~655.35	%	×	
P60.11	Speed loop period	0	0~50	/	×	
P60.12	Torque command filtering	1	0~1000	ms	×	
P60.13	Speed loop suspension P	8.00	0.00~655.35	/	×	
P60.14	Speed loop suspension Ti	73	0~65535	ms	×	

### P61 group Current loop PID

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P61.00	Current loop Kp	0.30	0.00~655.35	/	×	
P61.01	Current loop Ki	0.50	0.00~655.35	/	×	
P61.02	Current loop bandwidth	200.0	0.00~655.35	Hz	×	
P61.03	Current loop selection	4	0~65535	/	×	

**P62 group Torque control**

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P62.00	Digital torque preset	0.0	0.0~400.0	%	×	
P62.01	Torque direction	0	0~1	/	×	
P62.02	Torque increase time	1.00	0.01~655.35	s	×	
P62.03	Torque decrease time	1.00	0.01~655.35	s	×	

**P63 compensating torque control**

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P63.00	Compensating torque direction	0	0~1	/	×	
P63.01	Compensation gain	100.0	0.0~6553.5	%	×	
P63.03	Preset torque compensation	0.0	0.0~6344.0	%	×	

**P7X group Enhanced control****P70 group Limit and protection**

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P70.00	Upper frequency limit	50.00	0.00~655.35	Hz	×	0~maximum frequency
P70.01	Lower frequency limit	0.00	0.00~655.35	Hz	×	0~upper frequency limit
P70.02	ID preset limit	0.00	0.00~2.00	%	×	
P70.03	ID limit gain	0	0~10000	/	×	
P70.04	Output torque limit	150	0~250	%	×	
P70.05	Accelerated overcurrent threshold	160	0~200	%	×	
P70.06	Decelerated overvoltage threshold	750	540~800	V	×	
P70.07	Overspeed protection factor	120.00	0.00~655.35	%	×	
P70.08	Special function selection	6	0~65535	/	×	
P70.10	PT signal channel	0	0~3	/	×	0: NC 1:PT1000/PT100 2: PTC high resistance 3: PTC low resistance
P70.11	PT protection upper threshold	120.0	0.0~1000.0	degree	×	
P70.12	PT protection lower threshold	0.0	0.0~1000.0	degree	×	
P70.13	PT protection action delay	3.0	0.0~10.0	s	×	
P70.19	Bus undervoltage threshold	380	0~540	V	×	
P70.20	Power grid imbalance threshold	50.0	10.0~200.0	%	×	
P70.21	PWM detection delay	800	0~65535	ms	×	
P70.23	Current-limiting frequency reduction threshold	120	50~200	%	×	Overcurrent frequency reduction function
P70.24	Current limiting KP	0.001	0.000~65.53	/	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
			5			
P70.25	Current limiting KP	0.0001	0.000~6.553 5	/	×	
P70.26	Current limiting OutMin	0.005	0.000~1.000	%	×	
P70.27	Current limiting recovery threshold	10	0~65535	%	×	
P70.28	Power grid overvoltage threshold	530	0~530	V	×	
P70.29	Overtemperature frequency reduction starting temperature	91.0	0.0~100.0	degree	×	Overtemperature frequency reduction function
P70.30	Over-temperature frequency reduction recovery temperature	80.0	0.0~100.0	degree	×	
P70.31	Over-temperature frequency reduction slope	1	0~65535	Hz	×	
P70.32	Up-frequency overtemperature threshold	88.00	0.0~100.0	degree	×	
P70.33	Overtemperature detection interval	20.00	0.00~655.35	s	×	

### P71 Special function

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P71.00	Frequency hopping speed f1	0.00	0.00~655.35	Hz	×	
P71.01	Frequency hopping speed f2	0.00	0.00~655.35	Hz	×	
P71.02	Frequency hopping speed f3	0.00	0.00~655.35	Hz	×	
P71.03	Frequency hopping width	0.00	0.00~655.35	Hz	×	
P71.05	Reversal prohibition	0	0~1	/	×	0: N 1: Y
P71.06	Interval time of forward and reverse rotation	0.0	0.0~6553.5	s	×	
P71.07	PWM modulation mode	1	0~3	/	×	0: 5-segment; 1: 7-segment; 2: < 30% rpm 7-segment, > 30% 5-segment 3: SPWM mode
P71.14	Carrier frequency	8.000	1.100~16.00 0	KHz	×	Power level dependent
P71.21	Dead zone compensation selection	2	1~2	/	×	
P71.22	Zero speed threshold	0.20	0.00~10.00	Hz	×	
P71.23	Amount of forward rotation dead-time compensation	90	0~65535	%	×	
P71.24	Dead-time threshold factor	0.8	0~2.0	%	×	
P71.29	PWM modulation	1	0~15	/	×	0: Lower overflow update 1:

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
						Both upper/lower overflow update Note: Carrier frequency below 4K can be set to 1
P71.30	Vector control compensation	132	0~65535	/	×	
P71.31	Inertia compensation coefficient	0.0	0.0~6553.5	%	×	
P71.32	Inertia compensation filtering time	5	0~1000	ms	×	
P71.33	UPDOWN compensation	1.00	0.00~20.00	Hz	×	
P71.40	Input shaping type	0	0~2	.	×	
P71.41	Oscillation frequency	0.30	0.00~600.00	Hz	×	
P71.42	Damping coefficient	0.05	0.00~2.00	/	×	
P71.45	Output shutdown delay	0.03	0.00~655.35	s	×	
P71.49	Power outage detection threshold	420	380~550	v	×	
P71.50	KEB bus target voltage	480	380~550	v	×	
P71.51	KEB proportion Kp	100	0~10000	s	×	
P71.52	KEB integral Ki	100	0~10000	%	×	
P71.53	KEB deceleration upper limit	0.50	0.00~100.00	s	×	
P71.54	KEB acceleration upper limit	10.00	0.00~100.00	s	×	
P71.55	KEB deceleration initial limit	2.00	0.00~100.00	s	×	
P71.57	Fan control	0	0~4	/	×	
P71.61	Frequency decimal point digits	2	1~2		×	
P71.62	Function switch	5	0~65535	×	×	See Chapter 7 for detailed explanation of bits
P71.63	Enable phase-locked function	0	0~100	/	×	Use power frequency conversion and phase lock
P71.64	System bypass angle error	3.60	0.01~360.00	degree	×	
P71.65	System bypass voltage error	5	1~100	V	×	
P71.66	Fan control duty ratio	100	0~65535	%	×	
P71.70	Deceleration inertia coefficient	30.0	0.0~3600.0	S	×	

### Group P8X Communication parameters

### Group P80 Communication selection parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P80.00	Communication modes	2	0~4	\	×	0: No communication 1: Standby; 2: Modbus; 3: Spare 4: SSI

## Group P81 Modbus communication parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P81.00	Baud rate	7	0~7	bps	×	0:1200 bps 1:2400 bps
						2:4800 bps 3:9600 bps
						4:19200 bps 5:38400 bps
						6:57600 bps 7:76800 bps
P81.01	Data format	0	0~3	/	×	0: 1-8-1 format, no parity
						1: 1-8-1 format, even parity
						2: 1-8-1 format, odd parity
						3: 1-8-2 format, no check
P81.02	Transmission modes	1	0~1	/	×	0: ASC; 1: RTU
P81.04	Local address	1	0~247	/	×	1~247, 0 is broadcast address
P81.07	Communication address formats	1	0~1	/	×	0: Hexadecimal; 1: Decimalism

## P82 group (Reserved parameter group)

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P82.02	Custom status block 1	16	0~45		×	
P82.03	Custom status block 2	13	0~45	/	×	
P82.04	Custom status block 3	10	0~45	/	×	
P82.05	Custom status block 4	18	0~45	/	×	

## Group P9X Error and display parameters

## Group P90 Reserved parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P90.00	Reserved area	0	0~1	/	×	Standby

## 6.2.10.1 P91 group LCD display parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P91.00	U01 display data	1	0~63	/	×	
P91.01	U02 display data	2	0~63	/	×	
P91.02	U03 display data	3	0~63	/	×	
P91.03	U04 display data	8	0~63	/	×	
P91.04	U05 display data	7	0~63	/	×	
P91.05	U06 display data	6	0~63	/	×	
P91.06	U07 display data	9	0~63	/	×	
P91.07	U08 display data	10	0~63	/	×	

## Group P92 LED display parameters(Reserved parameter)

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
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P92.00	Reserved area	2	0~63	/	×	Standby
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**Group P93 Operation record parameters**

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P93.00	Accumulated power-on time	0	0~65535	h	*	
P93.01	Accumulated running time	0	0~65535	h	*	
P93.02	Set total power-on time	0	0~30000	day	*	
P93.03	Remaining power-on time	0	0~30000	day	*	
P93.04	The highest value of heat sink temperature	0.0	0.0~6553.5	degree	*	
P93.05	Cumulative output power	0.0	0.0~6553.5	kWh	*	
P93.06	Inverter output power	6	0~65535	MWh	*	
P93.07	Cumulative fan running time	3	0~65535	h	*	
P93.08	Record maximum current	14.3	0~65535	A	*	
P93.09	Recorded maximum power	2.1	0~65535	KW	*	

**Group P94 Troubleshooting parameters**

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P94.00	Inverter minor error handling	1	0~3	/	*	0: When a minor error occurs, no error relay is output 1: When a minor error occurs, the error relay is output
P94.01	Inverter error automatic reset time	10.0	0.0~6553.5	s	*	Inverter error automatic reset time
P94.02	Inverter error automatic reset times	0	0~65535	/	*	Inverter error automatic reset times
P94.03	Heat sink overheating time	0.50	0.00~18.00	s	×	
P94.04	Overspeed protection time	1.00	0.00~180.00	s	×	
P94.05	Bus fluctuation voltage threshold	100	30~150	V	×	
P94.07	Encoder disconnection confirming times	2	0~65535	Time(s)	×	
P94.08	Output phase loss determination	2.000	0.000~65.535	s	×	
P94.09	Fault shielding function	0	0~65535	/	×	
P94.10	CD phase mismatch threshold	300	9~65535	/	×	
P94.11	ABZ protection threshold	20	1~100	%	×	
P94.12	IGBT protection times	2	1~65535	/	×	
P94.13	Pt protection	0	0~3	/	×	Bit0 shielding 27# fault Bit1 shielding 45# fault
P94.14	Analog A0	50.0	0.0~100	%	×	

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
	disconnection value					
P94.15	Speed deviation	0.0	0.0~655.35	/	×	
P94.16	Analog troubleshooting	0	0~1	/	×	0: No processing 1: Protection shutdown
P94.18	Communication protection	1	0~2	/	×	0: No processing; 1: Protection shutdown
P94.19	Communication disconnection protection time	2.000	0.000~65.535	s	×	
P94.20	Grounding protection times	20	1~60000	/	×	
P94.21	Error action 1	0	0~12221	/	×	0: Free parking; 1: Park by parking method
P94.22	Error action 2	0	0~22222	/	×	0: Free parking; 1: Park by parking method
P94.23	Error action 3	0	0~22122	/	×	0: Free parking; 1: Park by parking method
P94.24	Error action 4	0	0~2222	/	×	0: Free parking; 1: Park by parking method
P94.25	Continue operation frequency	0	0~4	/	×	0: Run by target frequency; 1: Run by current frequency; 2: Run by frequency upper limit; 3: Run by frequency lower limit; 4: Running at multi-segment speed 15

### P95 group Version

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P95.00	Inverter hardware version	580.04		/	*	Inverter hardware version
P95.01	Inverter software version	100.01		/	*	Inverter software version
P95.02	Version number	6.04		/	*	Software version number
P95.03	Drive board software version	2.0			*	Drive board software version

### P96 group Inverter information

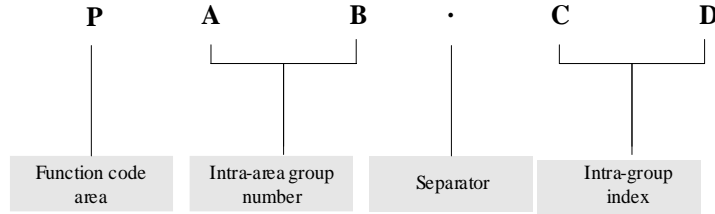
Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P96.00	Rated power of inverter	Per power	0.0~999.9	kW	×	
P96.01	Rated current of inverter	Per power	0.0~999.9	A	×	
P96.02	Maximum current of inverter	Per power	0.0~999.9	A	×	
P96.03	Rated voltage of inverter	380	0~690	V	×	0~480
P96.04	Inverter power factor	Per power	0~99		*	
P96.05	Inverter sensor current	Per power	0~9999	A	*	0~9999
P96.06	Inverter module rated current	Per power	0~9999	A	*	0~9999

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P96.07	Built-in brake unit current	Per power	0~9999	A	*	0~9999
P96.08	Three-phase current balance coefficient	1.000	0.900~1.200		*	
P96.09	Rated current (480 V)	Per power	/	A	*	
P96.10	Light load current (480 V)	Per power	/	A	*	
P96.15	Software build	6	/	/	*	
P96.16	Special parameters	90	1~65535	/	*	POWERID lock
P96.17	Sensor factor correction	2	0~3	/	*	
P96.18	Voltage correction coefficient	100.0	90.0~110.0	%	*	Bus sampling correction
P96.19	Current correction coefficient	100.0	50.0~200.0	%	*	Current sampling correction
P96.20	Light load and heavy load selection	0	0~2	/	*	0: Light load (standard) 1: Heavy load (standard) 2: Light load (ES)

# Chapter 7 Explanation of parameters

## 7.1 Parameter group classification and format

### 7.1.1 Parameter group format



### 7.1.2 Parameter group region division

Function code area	Domain group number	Function code description
P0X function specific	P00 group	Password parameter group
P1X control parameters	P10 group	Basic control parameter group
	P11 group	Start parameter group
	P12 group	Stop parameter group
	P13 group	Braking function parameters
	P14 group	V/F parameter group
	P15 group	SVC parameters
	P16 group	Weak magnetism parameter
	P17 group	GVC parameters
P2X motor parameters	P20 group	General parameter
	P21 group	Advanced parameter
	P22 group	Auxiliary parameter
	P23 group	Protection parameter
P3X terminal function	P30 group	Digital input parameter group
	P31 group	Digital output parameter group
	P32 group	Analog input parameter group
	P33 group	Analog output parameter group
P4X frequency control	P40 group	Basic parameters
	P41 group	Digital multi-segment speed
P5X process control	P50 group	Main and auxiliary preset
	P51 group	Process PID
P6X Vector control	P60 group	Speed loop PID
	P61 group	Current loop PID
	P62 group	Torque control
	P63 group	Compensating torque control
P7X enhanced control parameters	P70 group	Limit & protection
	P71 group	Specific function
P8X communication parameters	P80 group	Communication mode
	P81 group	Modbus
	P82 group	Reserved parameter group
P9X display parameters	P90 group	Reserved parameter group
	P91 group	LCD display
	P93 group	Running record
	P94 group	Fault processing
	P95 group	Version

Function code area	Domain group number	Function code description
	P96 group	Inverter information

## 7.2 Group P0X User parameters group

### 7.2.1 P00 Group Basic function parameters

Function code	Name	Setting range	Factory setting
P00.00	Login password	0~65535	0

This function is used to prevent irrelevant personnel from querying and modifying parameters and protect the security of inverter parameters.

**00000:** No password protection, and all parameters can be queried; and there is no factory password of the inverter.

Once the user password setting takes effect, when entering the parameter setting state again, all the parameters will not be modified through the operation panel and they can only be viewed, unless the user enters the correct password. The password in the parameter is always shown as 00000.

**Note:** The factory setting of the intelligent flexible driver is no user password (P00.00 = 0), therefore, no password is required to log in for the first use.

Function code	Name	Setting range	Factory setting
P00.01	Modify password	0~65535	0

#### Set password:

Enter 5 digits as user password; press ENTER to confirm, and repeat setting again.

#### Modify password:

Press ENTER to enter the password verification state in which 00000 is displayed. Enter the correct password and enter the parameter editing state. Select P00.01 (P00.00 parameter is displayed as 00000), enter the new password and press ENTER to confirm; repeat the password setting with the same password for P00.01 to successfully complete the new password setting after the screen displays "Password Setting Successfully".

#### Cancel password:

Press ENTER to enter the password verification status in which 00000 is displayed; enter the correct user password and enter the parameter editing state. Check P00.01 is 00000, and press ENTER to confirm; and repeat setting of P00.01 = 00000 to clear the password after the screen displays "Password Clear".

## 7.3 Group P1X Control parameter group

### 7.3.1 Group P10 Basic control parameters

Function code	Name	Setting range	Factory setting
P10.00	Control mode selection	0~6	0

This function is used to set the control operation mode of the inverter.

**0: GVC control** applies to most applications, adapting to synchronous motors, asynchronous motors, and reluctance motors. This control mode mainly corresponds to P17 group parameters.

**1: No PG vector control** without sensor vector control, adapting to synchronous motors and asynchronous motors.

**2: PG torque control**, supporting ABZ encoder, SINCOS encoder, and Rezav encoder.

- 3: **PG vector control**, supporting ABZ encoder, SINCOS encoder, and Rezav encoder.
- 5: **No PG torque control**, supporting synchronous motors and asynchronous motors.
- 6: **Voltage and current sources**, adapting to special applications, such as fire pump, current source, voltage source, etc.

Function code	Name	Setting range	Factory setting
P10.01	Operation modes	0~4	0

P10.01 is used to set the mode of X0 (FWD) and X1 (REV) terminals to control the start and stop of inverter when the terminal running command is given.

0: 2-wire type 1

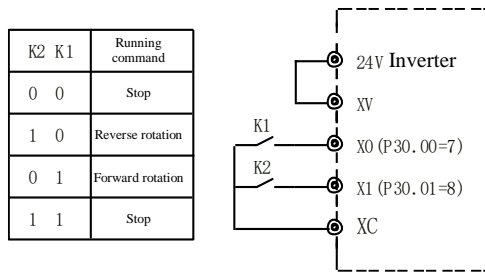


Figure 7-1 Two-wire Running Mode 1

1: 2-wire type 2

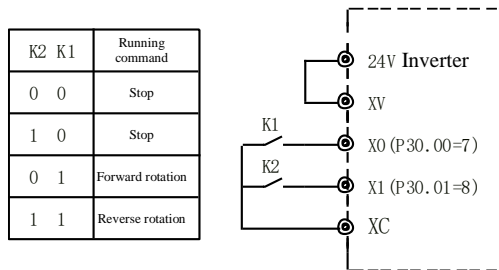


Figure 7-2 Two-wire Running Mode 2

2: 3-wire type 1

The Xi (i=2 - 7) terminal is set to "9: three-wire run control".

When K3 is closed, K0 (FWD) and K1 (REV) control is effective; when K3 is disconnected, K0 and K1 control is invalid and the inverter stops running;

The rising edge of X0 terminal indicates the forward run command; the rising edge of X1 terminal indicates the reverse run command.

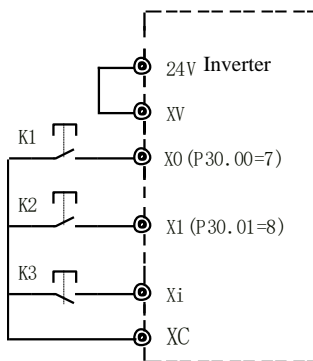


Figure 7-3 Three-wire Running Mode 1

3: 3-wire type 2

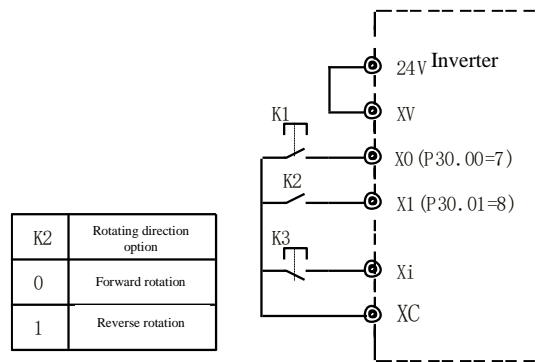


Figure 7-4 Three-wire Running Mode 2

The Xi (i=2 - 7) terminal is set to "9: three-wire run control".

The rising edge of K1 terminal indicates the running command; the disconnection of K2 terminal indicates the forward direction command; the closing of K3 terminal indicates the reverse direction command; when K3 disconnects, the inverter will stop.

Function code	Name	Setting range	Factory setting
P10.02	Command channel selection	0~6	0

There are three different ways to set inverter running command.

**0: Use operation panel to set running command** Press the buttons on the operation panel, such as Run (F 1), Stop (F 2) and LO/RE (F 3) to control the running, stop and forward/reverse rotation of the inverter.

**1: Use terminal to set running command** The running, stop and forward/reverse rotation of the inverter is performed by defining terminals X0 to X6. See P30.00 - P30.06 for description.

**2: Use communication to set running command** The running, stop and forward/reverse rotation of the inverter is performed by Modbus communication. See Appendix Modbus Communication Protocol.

**5: PLC preset command** When ProfiNet board card is configured, this control mode can be selected.

**6: SSL preset command** When IO board card of SSI is configured, this control mode can be selected.

Function code	Name	Setting range	Factory setting
P10.03	Speed channel 1	0~17	0

This function is applicable to frequency reference. See group P10.00 function code for the option of control mode.

**0: Panel digital frequency reference** Set the frequency reference by P40.00, and users can increase or decrease the frequency by ▲ and ▼ keys during the running. The setting will remain unchanged when the machine is shutdown; and when the power supply fails, this setting will not maintain unchanged.

**1: Digital multi-speed setting target velocity** The digital multi-speed terminals 0 - 3 are valid, and the frequency is determined by the combination of this terminal. See P41.00 - P41.15.

**3: A0 analog target speed preset**

4: **A0 analog current speed preset**

5: **A1 analog target speed preset**

6: **A1 analog current speed preset**

The target velocity can be set through the analog input port, and at this time, the output frequency is calculated according to the acceleration and deceleration time of group P40, and the current velocity can also be set; at this time, the acceleration and deceleration time of group P40 is invalid

8: **PID function preset target speed** Industry application macro scenario

11: **SSI preset speed** Optional SSI board card

12: **Modbus preset target velocity** standard configuration. See Modbus protocol

15: **Up/Down preset target speed** See terminal function

17: **PLC preset speed** Configure ProfiNet board card

Function code	Name	Setting range	Factory setting
P10.06	Speed limits	0~5	0

Select different channels to limit the velocity reference, so as to prevent velocity overruns.

0: **Internal parameter limit** Limit by P70.00 upper and lower limit frequency

Function code	Name	Setting range	Factory setting
P10.07	Speed channel 2	0~17	0

Same as P10.03 velocity channel option 1

### 7.3.2 Group P11 Start-up parameters

Function code	Name	Setting range	Factory setting
P11.00	Start modes	0~2	0

Different starting methods can be adopted for different applications.

0: **Normal starting mode**

The running starts from the starting frequency P11.01 and accelerates to the set frequency after the starting frequency holding time P11.02.

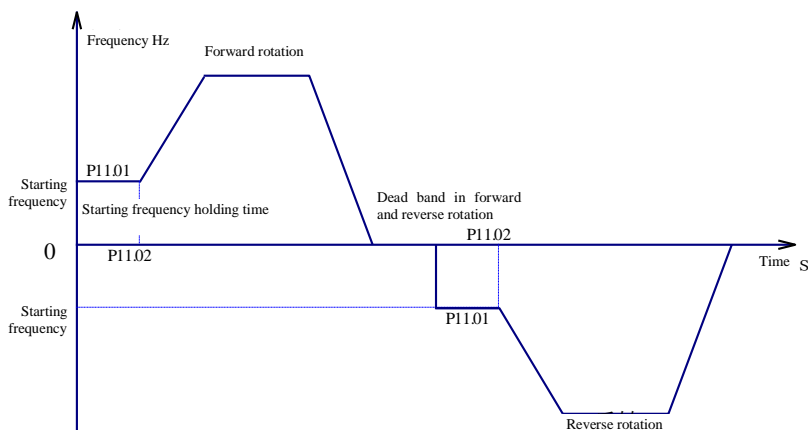


Figure 7-5 Diagram of Normal Starting Mode

1: **Starting after DC braking**

DC is injected first for DC excitation and DC braking. The size and time of DC injection are set by

P11.03 and P11.04. After the DC injection time, the running starts from the starting frequency P11.01 and accelerates to the set frequency after the holding time P11.02.

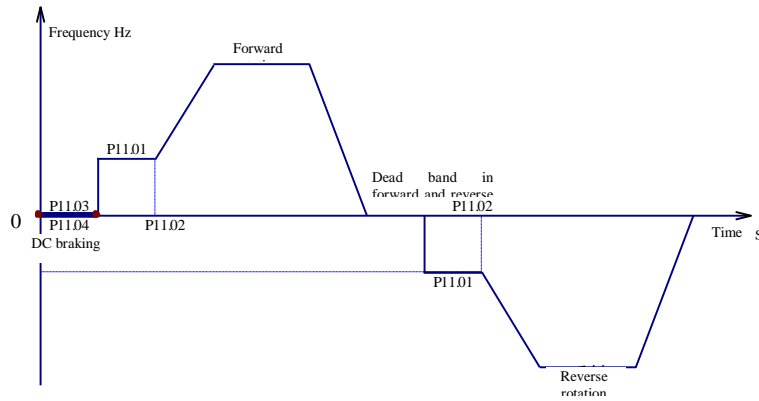


Figure 7-6: Diagram of Starting after DC Braking

2: Speed tracking starting

The inverter recognizes velocity of the rotating motor and directly tracks the starting based on the recognized frequency, and the current and voltage are smooth and shock-free during the starting process.

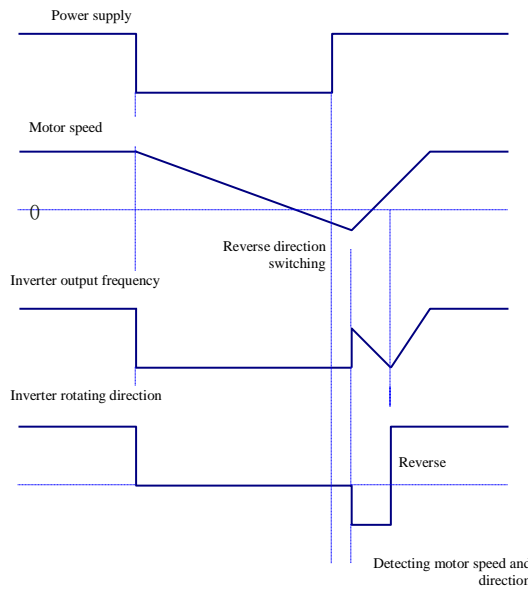


Figure 7-7 Diagram of Speed Tracking Starting Mode

Function code	Name	Setting range	Factory setting
P11.01	Starting holding frequency (Hz)	0.00~50.00	0.00
P11.02	Starting frequency holding time (s)	0.00~3600.00	0.00

Starting frequency refers to the initial frequency at which the inverter starts, as  $f_s$  shown in the figure; starting frequency holding time  $t_s$  refers to the time that the inverter maintains running at the starting frequency during the starting process, as shown in the figure, the frequency instruction is lower than the starting hold frequency and the inverter is not running.

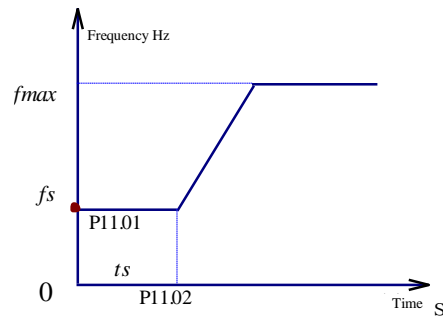


Figure 7-8 Diagram of Starting Frequency and Starting Time

The inverter starts running from the starting frequency P11.01, and accelerates according to the set acceleration time after the starting frequency holding time P11.02.

**Note:** For heavy load starting, a proper starting frequency holding time should be set for better starting.

Function code	Name	Setting range	Factory setting
P11.03	Starting DC injection current (%)	0.0~120.0	30.0
P11.04	Starting DC injection time (s)	0.0~100.0	5.0

P11.03 and P11.04 are only valid when "Start after DC Braking (P11.00=1)" is selected as starting running mode", as shown in the following figure.

The setting of starting DC braking current (P11.03) is relative to the percentage of inverter rated current. If the set DC braking current is greater than 120% motor rated current, the injected current is 120% motor rated current. Under heavy load: 0.0 - 120.0%; under light load: 0.0 - 90.0%.

The starting DC braking time (P11.04) is the action time of injection. When P11.04 = 0, there is no DC braking process.

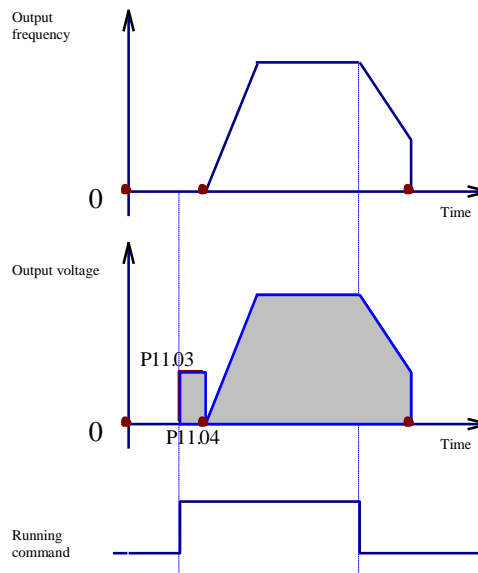


Figure 7-9 Diagram of DC braking

Function code	Name	Setting range	Factory setting
P11.05	Excitation time (s)	0.0~10.0	2.0

Excitation time is the time required to establish magnetic flow before starting the motor, for the

purpose of achieving quick response at motor starting. When there is a run command, users can enter the pre-excitation state according to the time set by this function code; establish the magnetic flux, and then enter the normal acceleration running. If this function code is set to 0, it will indicate that there is no pre-excitation process.

**Note:** The motor may rotate during pre-excitation, users should use the mechanical brake.

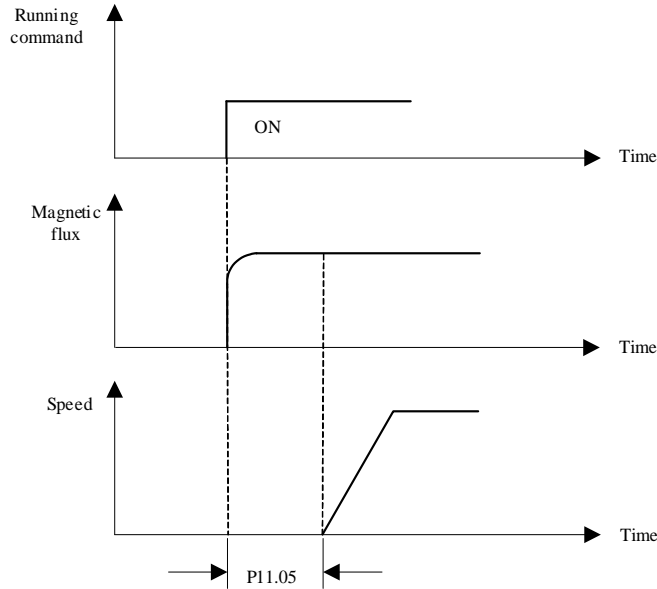


Figure 7-10 Schematic Diagram of Pre-excitation

Function code	Name	Setting range	Factory setting
P11.07	Braking action time (s)	0.00~100.00	0.20

The brake action time refers to the time of the external brake from receiving the braking command to fully opening; and the time from opening to entering the zero servo, i.e., the zero velocity holding time.

Function code	Name	Setting range	Factory setting
P11.08	Tracking delay time (ms)	0~65000	1

This time is used to wait for demagnetization of the motor. If overcurrent occurs immediately after the start of tracing, this value should be increased.

Function code	Name	Setting range	Factory setting
P11.10	Tracking voltage Kp	0.0~100.0	0.2

Kp during tracking process. If the value is too small, the tracking process will be longer; if the value is too large, an overcurrent will be observed during tracking.

Function code	Name	Setting range	Factory setting
P11.11	Tracking voltage Ki	0.0~100.0	0.3

Ki during tracking process. If the value is too small, the tracking process will be longer; if the value is too large, an overcurrent will be observed during the tracking.

Function code	Name	Setting range	Factory setting
P11.12	Tracking voltage Kd	0.0~100.0	0.0

Kd during tracking process. If the value is too small, the suppression of overshoot current will be not obvious in the tracking process; if it is too large, an overcurrent will be observed during the tracking.

Function code	Name	Setting range	Factory setting
P11.13	Tracking exit delay (ms)	1000~65000	100

Ensure a smooth exit from the tracking process. Increase of this value will be conducive to a smooth exit.

Function code	Name	Setting range	Factory setting
P11.14	Maximum current during tracking (%)	0.0~200.0	100.0

The percentage of the rated current of motor. Ensure that the maximum current during tracking is lower than the rated current of the frequency inverter when a small inverter is used for a larger motor. If an overcurrent is observed during the tracking, this value should be reduced.

Function code	Name	Setting range	Factory setting
P11.15	Tracking frequency change gain (%)	0.0~100.0	10.0

If an overvoltage is observed or the P60.09 is greater than 600V during the tracking, the value should be reduced.

Function code	Name	Setting range	Factory setting
P11.17	Tracking initial frequency (Hz)	0.00~360.00	50.00

It is usually set to the maximum running frequency before tracking. If the inertial stopping velocity of the system decreases fast, the value can be reduced appropriately.

Function code	Name	Setting range	Factory setting
P11.19	Reverse breaking current (%)	0.0~100.0	20.0

Motor breaking control in the lifting industry is adopted. The breaking condition can only be met when the reverse starting current of the motor is greater than the current of P 11.19.

### 7.3.3 P12 group Stop parameters

Function code	Name	Setting range	Factory setting
P12.00	Stopping mode option	0~4	0

Different stopping modes can be used for different applications.

0: The inverter blocks the output and the motor stops freely;

1: The inverter decelerates and stop running according to the set deceleration time;

2: The inverter decelerates and stops according to the set DC braking. When the frequency is lower than the DC braking starting frequency P12.03, the DC braking current P12.04 will be injected, and

the DC braking time will be determined by P12.05;

3: Deceleration parking to the lower limit frequency, then inertia parking;

Function code	Name	Setting range	Factory setting
P12.01	Stopping holding frequency (Hz)	0.00~100.0	0.00
P12.02	Stopping frequency holding time (s)	0.0~1000.0	0.0

The inverter decelerates from the normal running velocity to the stopping frequency P12.01, and then decelerates to zero according to the set deceleration time after the stopping frequency holding time P12.02, which will be beneficial for smooth stopping.

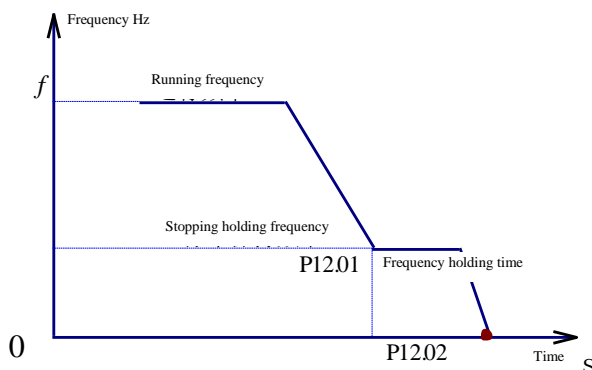


Figure 7-11 Schematic Diagram of Stopping Holding Frequency

Function code	Name	Setting range	Factory setting
P12.03	DC braking starting frequency (Hz)	0.00~10.00	2.50
P12.04	Stopping DC braking current (%)	0.00~100.00	50.00
P12.05	Stopping DC braking time (s)	0.0~10.0	0.5

P12.03 - P12.05 will be valid only when "Deceleration + DC braking (P12.00=2)" is selected for the stopping mode.

The stopping DC braking current (P12.03) is set as a percentage relative to the rated current of the inverter. If the set DC braking current is greater than 100% of the rated motor current, the current injected will be 100% of the rated motor current. Under heavy load: 0.0 - 100.0%; under light load: 0.0 - 90.0%.

The starting DC braking time (P12.04) refers to the injection time. When P12.04=0, there is no DC braking process.

When P12.00=2, P12.03 can be set as the braking starting frequency for fast braking.

P12.03 is used to set the size of the DC braking current, and this value is a percentage relative to rated current of the inverter. The value under varying torque load: 0.0 to 90.0%.

P12.04 is used to set the action time of DC braking.

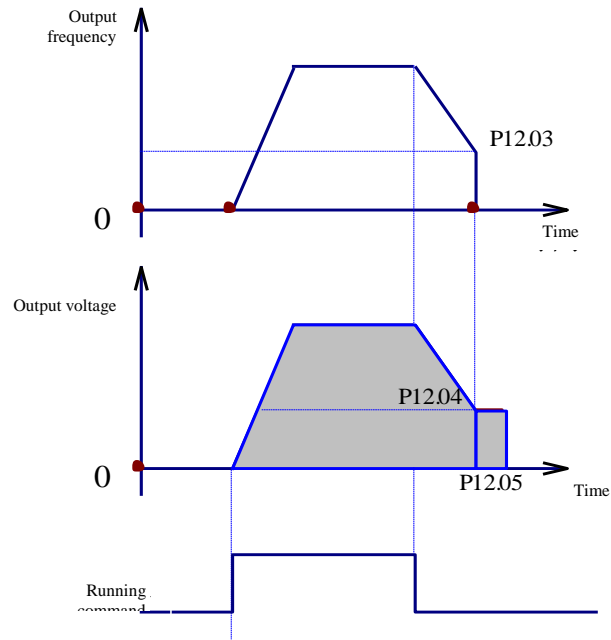


Figure 7-12 Schematic Diagram of Stopping DC Braking

### 7.3.4 P13 group Braking function

Function code	Name	Setting range	Factory setting
P13.00	Energy consumption braking option	0~1	1
P13.01	Brake opening voltage	340~1160	660

P13.00 energy consumption braking option reflects whether the inverter is designed with energy consumption braking or not.

1: Energy consumption braking function is enabled.

0: Energy consumption braking function is not used.

For large rotational inertia, if a quick braking stop is required, the matching braking unit and braking resistor can be selected and the braking parameters can be set to achieve quick braking stop.

The action voltage of the braking unit can be selected by adjusting P13.01. An appropriate action voltage can be used to realize fast energy consumption braking stop.

Brake switch voltages are divided into two types: at 660 by default, the turning-on voltage is calculated by the power grid voltage peak;

At non 660, follow the set value.

### 7.3.5 Group P14 V/F control parameters

Function code	Name	Setting range	Factory setting
P14.00	V/F curve reference	0~5	0
P14.01	V/F voltage V0 (V)	1~460	76
P14.02	V/F frequency F0 (Hz)	0.01~300.00	10.00
P14.03	V/F voltage V1 (V)	1~460	152
P14.04	V/F frequency F1 (Hz)	0.01~300.00	20.00
P14.05	V/F voltage V2 (V)	1~460	228
P14.06	V/F frequency F2 (Hz)	0.01~300.00	30.00
P14.07	V/F voltage V3 (V)	1~460	304
P14.08	V/F frequency F3 (Hz)	0.01~300.00	40.00

Function code	Name	Setting range	Factory setting
P14.09	V/F voltage V4 (V)	1~460	380
P14.10	V/F frequency F4 (Hz)	0.00~300.00	50.00

The P14.00 parameter is used to determine the different V/F curves in the voltage vector V/F control running mode (P10.00 = 0).

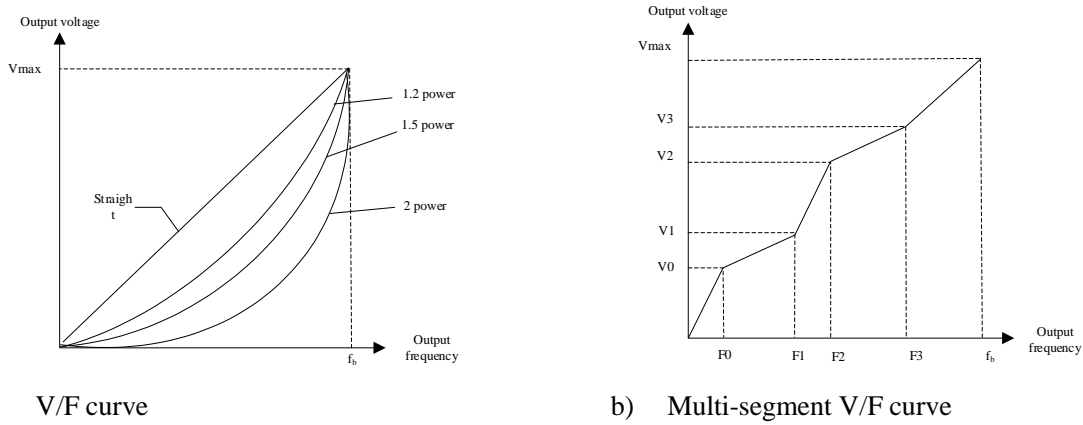


Figure 7-13 Schematic Diagram of VF Curve

P14.00 = 0 is applicable to the constant torque load case; there is a linear relationship between V and F with a coefficient of 1. See the straight line in the figure for details.

P14.00 = 4 user-defined curve, which is suitable for segmented constant torque load. See the above figure.

In Figure 7-13 b):  $F_0 < F_1 < F_2 < F_3 < F_4 \leq f_b$   $f_b$  is the basic running frequency P40.01

$V_0 \leq V_1 \leq V_2 \leq V_3 < V_4 \leq V_{max}$   $V_0, V_1, V_2, V_3$  and  $V_4$  refer to the actual output voltage relative to the maximum output voltage and rated frequency ( $V_1 = (V_{max} / f_b) * F_1$ ,  $V_{max} = 380V$ ,  $f_b = 50Hz$ ).

P14.00 = 1 - 3, which is suitable for loads with variable torque, such as fan and pump. P14.00 is set to 1 - 3, corresponding to curves of 1.2 power, 1.5 power and 2 power, respectively. See Figure 7-13a. The 2-power curve is applicable to water supply, and the 1.2 power and 1.5 power curves are applicable to liquid load of other media. The curves can be selected according to the actual situation.

Function code	Name	Setting range	Factory setting
P14.12	ACS voltage setting	380	0~690
P14.13	ACS frequency setting	50.0	0.0~3000.0
P14.14	Special power type	0	0~3

When P10.00 is set to 6 voltage and current source control mode and P14.14 setting to 0 can achieve VF separation mode. At this time, inverter's three phase output connects to three phase LC, and can be used as three phase power sources. P14.12 setting output voltage amplitude, and P14.13 setting output frequency.

P14.14 setting to 1 is for the current source mode. This mode is constant current control mode. By setting P20.02's current, P14.13 can set frequency, which can be applied to power supplying scenarios including inductive load or resistive load.

P14.14 setting to 2 is for the fire pump application. This mode is mainly applied to fire pump patrol inspection. The motor is normally asynchronous motor. During each patrol inspection, let the motor run with no load for some time to ensure it functions normally.

P14.14 setting to 3 is for fan patrol inspection application. This mode is mainly applied to fan patrol

inspection. The motor is normally synchronous motor. During each patrol inspection, let the motor run with no load for some time to ensure it functions normally.

### 7.3.6 P15 group SVC parameter

Function code	Name	Setting range	Factory setting
P15.00	Initial magnetic pole judgment	0~2	1

0: **No judgment** No load starting capability, requiring long acceleration time.

1: **DC injection starting** Incrementally inject DC current to (P15.05\* motor rated current), and drag the motor magnetic pole to the excitation direction.

2: **Pulse voltage injection starting** Inject voltage pulses to conduct initial magnetic pole judgment.

Function code	Name	Setting range	Factory setting
P15.01	DC injection size (%)	0~150	50

With the motor rated current, pay attention to this parameter setting in the load start.

Function code	Name	Setting range	Factory setting
P15.02	Pulse injection amplitude (%)	0~100	50

Use this parameter when P15.00=2 in the open-loop vector control PM control mode.

Function code	Name	Setting range	Factory setting
P15.03	Pulse angle compensation	0~1	0

During P15.00=2 in the open-loop vector control PM control mode, it needs to use pulse angle compensation function when encountering few special motors.

Function code	Name	Setting range	Factory setting
P15.05	Control status word	0~1000	2

Control mode selection, recommending default control word mode 2.

Function code	Name	Setting range	Factory setting
P15.06	PM current control strategy	0~10	1

Default 1: **MTPA** requiring motor static self-learning.

Function code	Name	Setting range	Factory setting
P15.07	MTPA1 bandwidth (Hz)	0~1000	10

MTPA loop adjusts the bandwidth, default is 10 Hz, no modification is needed generally

Function code	Name	Setting range	Factory setting
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P15.08	Imin of MTPA(%)	0~100	5
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MTPA minimum control current

Function code	Name	Setting range	Factory setting
P15.09	PM low speed compensation coefficient 1 (%)	0~200	40

Observer bandwidth parameter, used to control the observer convergence speed.

Function code	Name	Setting range	Factory setting
P15.10	Ka	0~1000	15
P15.11	Kb	0~1000	20
P15.12	Kr1	0~1000	5
P15.13	Kr2	0~2000	200
P15.14	Kr3	0~2000	20
P15.15	Kr4	0~2000	40
P15.16	Kr5	0~2000	100

P15.10~P15.16 is speed observer related parameters (no modification of internal research monitor parameters is needed)

### 7.3.7 P16 group Weak magnetism parameters

Function code	Name	Setting range	Factory setting
P16.00	Weak magnetism voltage preset	0~200	95

Weak magnetism control loop's voltage preset;

Function code	Name	Setting range	Factory setting
P16.02	Weak magnetism control bandwidth (Hz)	0.0~100.0	10.0

If current fluctuation is too large in the weak magnetism status, you can reduce control bandwidth appropriately to adapt to synchronous and asynchronous motor.

Function code	Name	Setting range	Factory setting
P16.03	Magnetic chain loop bandwidth (Hz)	0.0~100.0	1.0

If current fluctuation is too large in the weak magnetism status, you can reduce magnetic chain loop bandwidth; only applicable to asynchronous motor.

### 7.3.8 P17 group GVC parameter

Function code	Name	Setting range	Factory setting
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P17.00	DC injection current (%)	0.1~200.00	30.00
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Starting injection DC size. Use injecting DC current during start-up as start torque. If current has oscillation during start-up, you can increase the size of current injection appropriately.

P17.01	DC injection slope (s)	0.00~655.35	1.00
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Slope of DC injection current rise and the increasing speed of start injection current represent the current increase from 0 to the set corresponding time. Unit is s and default is 1.0s. This parameter should be smaller than excitation time (P11.05) to ensure DC injection current or excitation current reach the set value.

P17.02	External synchronization switching frequency (%)	0~100	5
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Setting to 0 indicates that there is no external synchronization function. If set to a non-zero value, the external synchronization function will be enabled. The setting value is the external synchronization switching frequency point. When preset frequency is less than or equal to switching point corresponding frequency, the output control is constant current. GVC control is selected if the value is greater than this frequency.

For example, for the motor with 50Hz rated frequency, if this parameter is 10%, then it uses constant current output control when running frequency is below and including 5Hz. If greater than 5Hz, GVC control is used.

External synchronous output current can be set by parameter P17.00. During heavy load start-up, DC injection current value should be increased. Generally during motor start-up vibration or when reporting 21#fault, you can try external synchronization start-up.

Function code	Name	Setting range	Factory setting
P17.03	Low-velocity voltage compensation gain (%)	0.00~200.00	0.00

During low velocity operation, increase output voltage capabilities and also increase the motor capabilities of low velocity operation with load. The default value of P17.03 is 0%, which means no low velocity voltage compensation by default.

Function code	Name	Setting range	Factory setting
P17.04	Voltage compensation upper limit frequency (%)	0.00~300.00	0.40

Voltage compensation upper limit frequency P17.04 is the calibration value, and the default value is 40%, which means if rated frequency is 50Hz, then default voltage compensation upper limit frequency is  $50\text{Hz} \times 40\% = 20\text{Hz}$ .

No output voltage compensation when greater than P17.04 voltage compensation upper limit frequency; Output voltage will compensate when lower than P17.04 voltage compensation upper limit frequency.

P17.05	Vibration rejection gain	0.00~655.35	2.00
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Generally, the value is 1/25 of rated frequency. For example, the motor rated frequency is 50.00Hz, then this value should be 2.00. This value is used to adjust the current fluctuation rejection function of the GVC control algorithm. The greater the vibration rejection gain, the more obvious the vibration rejection effect; but dynamic performance will deteriorate.

P17.15	Compensation function selection	0~65535	256
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**Bit 0: Voltage curve auto adjust**, automatically adjust output voltage according to the load.

**Bit 1: Low velocity voltage compensation**, can improve low-speed load capacity.

**Bit 2: Shock suppression**, control motor vibration when carrying light load operation.

**Bit 3: Stator resistance compensation**, stator resistance voltage compensation, which improves low-speed load capacity.

**Bit 8: energy saving mode**, after enabling energy saving operation, when there's no load, the motor operates according to the voltage curve corresponding to the back electromotive force. When fully loaded, the motor operates according to the curve corresponding to the rated voltage. This way, it can reduce motor current during light load, and also increase efficiency.

### GVC debugging steps:

First step: If used for the first time, please reset inverter's parameter. The default is GVC (P10.00=0), then set motor nameplate parameter to group P20.

Second step: During the occasion of heavy load start up, set the self-learning to the stator resistance; otherwise set stator resistance to zero.

Third step: To get a better control effect, you can do a complete motor static self-learning, after which can acquire a relatively accurate stator resistance P21.01 and vibration rejection gain P17.05.

GVC common debugging questions and solutions:

Question one: The starting current has a large impact

1. Check if stator resistance P21.01 is accurate. Do a stator resistance self-learning.
2. Adjust the DC injection current during start up and make it close to actual no-load current.
3. Increase P17.05 vibration rejection gain; Increase 0.5 each time; The default is 2.00.
4. Increase low-velocity voltage compensation gain P17.03 (reference range 1%-5%).
5. Enable constant current output (external synchronization) function; set P17.04 external synchronization frequency switching point.

Question two: Over current or over voltage when the load suddenly reduces:

1. Reduce vibration rejection gain P17.05

Question three: Motor loses control and dynamic capability deteriorates when load increases suddenly:

1. During low-speed situation, you can increase low-velocity voltage compensation gain P17.03.
2. Reduce vibration rejection gain P17.05.

## 7.4 Group P2X Motor parameters

### 7.4.1 P20 group General parameter

Function code	Name	Setting range	Factory setting
P20.00	Type of motor 1	0~2	0
P20.01	Rated power of motor 1 (kW)	0.00~655.35	/
P20.02	Rated current of motor 1 (A)	0.0~1000.0	/
P20.03	Rated frequency of motor 1 (Hz)	0~500.00	/
P20.04	Rated speed of motor 1 (rpm)	0~60000	/

Function code	Name	Setting range	Factory setting
P20.05	Rated voltage of motor 1 (V)	0~690	/
P20.06	Number of poles of motor 1	2~128	/
P20.07	Rated slip frequency of motor 1 (Hz)	0.10~50.00	/

P20.00 Motor type:0: asynchronous motor.

P20.01 - P20.07 and P20.11 are used to set the parameters of the motor driven by the inverter, which need to be set correctly according to the motor nameplate before use.

P20.06 is used to set the number of motor poles, which is set according to the nameplate. If there is no motor pole number parameter on the nameplate, it can be calculated according to the following equation.

$$\text{Number of poles} = (120 \times f) \div n$$

Where: n - rated speed; f - rated frequency.

For the calculated value, the even integer should be taken as the "number of poles".

**Note:** The inverter power level should be matched with the motor.

P20.07 is used to set the slip frequency.

If there is no slip frequency data on the motor nameplate, the value of P20.07 can be calculated by the following equation.

If the rated frequency is set to be f(P20.03), the rated velocity is set to be n (P20.04), and the number of motor poles is set to be p(P20.06):

$$\text{Slip frequency} = f - ((n \times p) \div 120)$$

**Example:** The rated frequency is 50Hz, the rated speed is 1430rpm, and the motor pole number is 4, the set value of P20.07 =  $50 - ((1430 \times 4) \div 120) = 2.33\text{Hz}$ .

Function code	Name	Setting range	Factory setting
P20.08	Maximum slip frequency of motor 1 (Hz)	0.10~50.00	2.80
P20.09	Phase sequence of motor 1	0~1	1
P20.10	No-load current coefficient of motor 1 (%)	0.10~100.00	30.00

P20.08 is used to set maximum slip frequency of motor, generally 2 times the rated slip frequency.

P20.09: motor rotation direction, 0 is rotation with negative phase sequence and 1 is rotation with positive phase sequence.

P20.10 is used to set no-load current coefficient of motor, generally around 30%.

Function code	Name	Setting range	Factory setting
P20.14	Type of motor 2	0~1	0
P20.15	Rated power of motor 2 (kW)	0.00~655.35	
P20.16	Rated current of motor 2 (A)	0.0~1000.0	
P20.17	Rated frequency of motor 2 (Hz)	0.00~500.00	50
P20.18	Rated speed of motor 2 (rpm)	0~50000	1460
P20.19	Rated voltage of motor 2 (V)	0~690	380
P20.20	Number of poles of motor 2	2~128	4
P20.21	Rated slip frequency of motor 2 (Hz)	0.10~50.00	1.40
P20.22	Maximum slip frequency of motor 2 (Hz)	0.10~50.00	2.80

P20.23	Phase sequence of motor 2	0~1	1
P20.24	No-load current coefficient of motor 2 (%)	1.00~100.00	30.00

Descriptions of the parameters P20.14 - P20.26 of motor 2 are the same as that of motor 1.

#### 7.4.2 P21 group Advanced parameters

Function code	Name	Setting range	Factory setting
P21.01	Stator resistance of motor 1 ( $\Omega$ )	0.000~65.000	0.100
P21.02	Rotor resistance of motor 1 ( $\Omega$ )	0.000~65.000	0.441
P21.03	Stator inductance of motor 1 (H)	0.0000~6.5000	0.1028
P21.04	Rotor inductance of motor 1 (H)	0.0000~6.5000	0.1028
P21.05	Mutual inductance (H)	0.0000~6.5000	0.0991

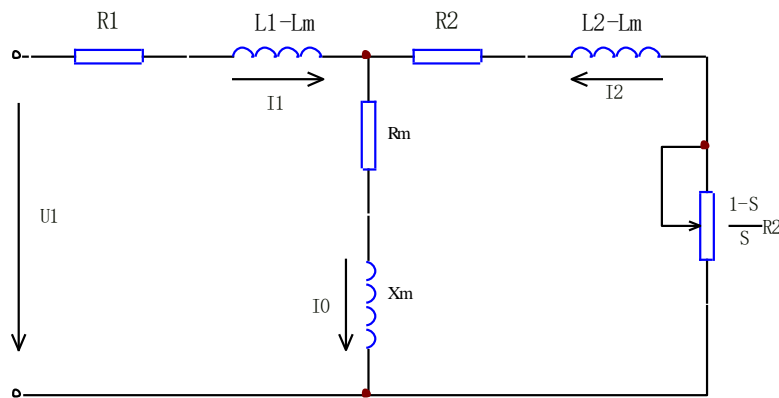


Figure 7-14 Steady-state Equivalent Circuit Diagram of Asynchronous Motor

$R_1$ ,  $R_2$ ,  $L_1$ ,  $L_2$ ,  $L_m$ ,  $I_0$  in the figure represent stator resistance, stator inductance, rotor resistance, rotor inductance, mutual inductance, and excitation current, respectively. The excitation current can be calculated based on the rated motor current, motor power factor, or measured based on the rotation auto-tuning.

The relationship between rated torque current, excitation current and rated motor current:

Rated torque current = power factor  $\times$  motor rated current

No-load excitation current =  $\sqrt{1 - \text{Power factor}^2} \times \text{Rated motor current} \times \text{Motor efficiency}$  ; generally, the motor efficiency is approximately 85.

The five parameters, P21.01, P21.02, P21.03, P21.04 and P21.05, are only valid for asynchronous motors, which are internal characteristic parameters of the motor, and automatically obtained by the inverter during the motor self-learning process.

The key motor parameters that affect the operation control of the inverter are determined by performing parameter auto-tuning. After the parameter auto-tuning process is completed, these motor parameters will be automatically saved in the inverter until the next parameter input or a new parameter auto-tuning.

The process of parameter auto-tuning is shown as follows:

- ① Input P20.00 - P20.11 correctly according to the motor nameplate; set the basic running frequency P40.01, maximum output frequency P70.02 and maximum output voltage P70.03 correctly; set the appropriate acceleration and deceleration times P40.02 and P40.03;
- ② Select the execution method of parameter auto-tuning (see starting menu option).

Function code	Name	Setting range	Factory setting
P21.06	Stator resistance of motor 2 ( $\Omega$ )	0.000~65.000	0.100
P21.07	Rotor resistance of motor 2 ( $\Omega$ )	0.000~65.000	0
P21.08	Stator inductance of motor 2 (H)	0.0000~6.5000	0
P21.09	Rotor inductance of motor 2 (H)	0.0000~6.5000	0
P21.10	Mutual inductance (H)	0.0000~6.5000	0

Descriptions of the parameters P21.06 - P21.10 of motor 2 are the same as that of motor 1.

Function code	Name	Setting range	Factory setting
P21.11	PM1 stator resistance (ohm)	0.000~65.000	0.100
P21.12	PM1 motor shaft D inductance	0.000~6553.5	0
P21.13	PM1 motor shaft Q inductance	0.000~6553.5	0
P21.14	PM1 back electromotive force coefficient (V)	0.0~690.0	0

P21.11 - P21.14 are parameter of synchronous motor.

P21.15~P21.20 are the results of asynchronous motor auto-tuning, which are used for display only.

Function code	Name	Setting range	Factory setting
P21.21	Inertia coefficient	0.000~65.000	0.200

Appropriately adjust this value according to the actual system inertia.

Function code	Name	Setting range	Factory setting
P21.22	Parameter deviation compensation	0.0~100.0	0.0

Generally not used.

### 7.4.3 P22 group Auxiliary parameters

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P22.01	Encoder 1 type	0	0~3	/	×	0: Incremental; 1: SinCos; 2: EnDat(backup); 3: Rezav
P22.02	Encoder 1 pulse count	1024	100~16000	ppr	×	Encoder pulse number
P22.03	Encoder frequency dividing coefficient	0	0~7	/	×	Encoder frequency dividing coefficient
P22.04	Encoder 1 position angle	0.0	0.0~360.0	degree	*	Encoder position angle
P22.05	Encoder feedback speed filtering time constant	10	0~1000	ms	×	
P22.06	Encoder 1 direction	1	1~1	/	×	1: Positive phase sequence
P22.07	SinCos encoder subdivision coefficient	11	2~16	/	×	7—128;9-512;11-2048
P22.08	Rezav encoder 1 pole count	2	2~128	P	×	

This group of parameters selects encoder 1 type, pulses per revolution, etc, division coefficient, etc. The Position angle is from reading in self-learning, unable to be set. The filtering time shall be adjusted within a controllable range. P22.06 or hardware line changing shall be selected for encoder according to actual situation.

P22.01 setting encoder type, 0: Incremental encoder; 1: SinCos encoder; 2: Spare; 3: Rezav encoder.

P22.02 setting the encoder pulse count.

P22.03 setting division coefficient, 0 - 7 corresponds to 1 - 128 divisions.

When P22.05 encoder feedback filtering time is at P10.00=3, the default is 0, and the default for other control modes is 10 ms, which all can be modified.

P22.06 parameter can select encoder feedback direction, with a default value of 1, normally not needing to be changed. However, if it is found on site that the feedback direction is contrary to the actual direction due to encoder wiring error, it can also be adjusted by modifying P22.06 parameter.

P22.07 set the SinCos encoder subdivision coefficient, adjusted according to actual situation.

Function code	Function code name	Factory default	Setting range	Unit	Attribute	Option description
P22.09	Encoder 2 type	0	0~3	/	×	0: Incremental; 1: SinCos; 2: EnDat(backup); 3: Rezav
P22.10	Encoder 2 pulse count	1024	100~16000	ppr	×	Encoder pulse number
P22.11	Encoder 2 position angle	0.0	0.0~360.0	degree	*	Encoder position angle
P22.12	Encoder 2 direction	1	1~1	/	×	0: Negative phase sequence; 1: Positive phase sequence
P22.13	Rezav encoder 2 pole count	2	2~128	P	×	
P22.14	Feedback speed amplitude filtering	0.00	0.00~100.00	%	×	

This group of parameters selects encoder 2 type, pulses per revolution, etc, division coefficient, etc and is the same as that of encoder 1.

#### 7.4.4 P23 group Protection parameter

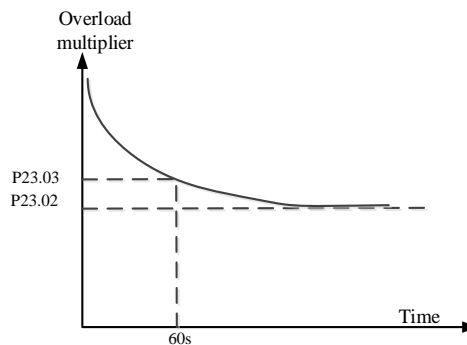
Function code	Name	Setting range	Factory setting
P23.00	Motor fan mode	0~2	1
P23.01	Motor normal running threshold (%)	70~200	110
P23.02	Motor I2T overcurrent threshold (%)	120~300.0	150

P23.00 Motor fan mode:

- 1: Motor has independent fan
- 2: Motor has no independent fan

Motor current less than P23.01, can run for a long time;

P23.02 is the 1-minute overcurrent threshold.



Motor overheat protection curve

## 7.5 P3X group Terminal function

### 7.5.1 P30 group Digital input

Function code	Name	Setting range	Factory setting
P30.00	X0 terminal input functions	0~199	7
P30.01	X1 terminal input functions	0~199	8
P30.02	X2 terminal input functions	0~199	0
P30.03	X3 terminal input functions	0~199	0
P30.04	X4 terminal input functions	0~199	0
P30.05	X5 terminal input functions	0~199	0
P30.06	X6 terminal input functions	0~199	0

Definition of function input terminals:

No.	Function definition	No.	Function definition
0	No function	1	Acceleration and deceleration velocity option 0
2	Acceleration and deceleration velocity option 1	3	Digital multi-speed option 0
4	Digital multi-speed option 1	5	Digital multi-speed option 2
6	Digital multi-speed option 3	7	Forward rotation
8	Reverse rotation	9	3-wire operation control
10	Motor fan feedback	11	Frequency conversion switching power frequency
12	Standby	13	External reset signal
14	External fault signal	15	Magnetic pole tuning signal
16	Emergency power supply operation	17	Weighing compensation signal
18	Base electrode locking signal	19	Light load switch input
20	Heavy load switch input	21	Output contactor detection
22	Brake contactor detection	23	Brake switch detection
24	Motor option	25	Encoder option
26	Function parameter 0	27	Function parameter 1
28	Pulse input 0	29	Pulse input 1
30	Speed/torque switching	31	Frequency increase (not maintained)
32	Frequency decrease (not maintained)	33	Emergency stop signal (Standby)
34	Forward deceleration input	35	Reverse deceleration input
36	Forward stop input	37	Reverse stop input
38	Frequency increase (maintained)	39	Frequency decrease (maintained)
40	Jogging frequency option	41	Command is set by the panel
42	Command is set by the terminal	43	Command is set by the upper computer
44	Main and auxiliary reference switching under open loop control	45	PID main reference switches to the internal reference
46	PID main preset switching to analog A0	47	PID auxiliary reference is invalid
48	PID auxiliary preset switching to analog A0	49	FJOG command

No.	Function definition	No.	Function definition
50	RJOG command	51	PID main preset switching to analog A1
52	PID auxiliary preset switching to analog A1	53	Velocity channel switching
54	PID pause	55	Control mode switching 0 (Standby)
56	Control mode switching 1 (Standby)	57	Control mode switching 2 (Standby)
58	Motor vibration signal (Standby)	59	Trickle heating (Standby)
60	Reverse de-icing (Standby)		

0: No function

1: Acceleration and deceleration selection 0

2: Acceleration and deceleration selection 1

See the following table for instructions on usage:

Acceleration and deceleration velocity option 1	Acceleration and deceleration velocity option 0	Acceleration and deceleration time option
OFF	OFF	Acceleration and deceleration time 0 (P40.02, P40.03)
OFF	ON	Acceleration and deceleration time 1 (P40.04, P40.05)
ON	OFF	Acceleration and deceleration time 2 (P40.06, P40.07)
ON	ON	Acceleration and deceleration time 3 (P40.08, P40.09)

3: Digital segment speed 0

4: Digital segment speed 1

5: Digital segment speed 2

6: Digital segment speed 3

See P41.00 - P41.15 for instructions on usage

7: Terminal forward input (FWD)

8: Terminal reverse input (REV)

9: 3-wire operation control

It is valid only when the terminal running command is used (P10.02=1). See P10.01 for instructions on usage.

11: Variable frequency to power frequency

When this signal is valid, it switches from variable frequency drive to grid direct drive.

13: External reset terminal

The external reset terminal signal is valid, and the external signal resets the fault of the inverter.

14: External fault terminal

The external fault terminal signal is valid, and the inverter stops running.

17: Weighing compensation input (spare)

Command input for weighing compensation set by the user for a specific application.

**18: Base blocking**

If this function terminal is valid, it will disable the inverter output.

**19: Light load switch input (spare)****20: Heavy load switch input (spare)**

Both of these functions are used in the elevator industry. Compared with the counterweight, if the actual load is lower than the counterweight, it is light load; if the actual load weight is greater than the counterweight, it is heavy load.

**21: Output contactor feedback (spare)**

Generally, it is used in conjunction with output function 17 to control the inverter output contactor, so as to confirm the pull-in state of the contactor before the inverter outputs the current, and cut off the inverter output in time when the contactor trips and disconnects.

**22: Brake contactor feedback (spare)**

It is usually used together with output function 18 to identify whether the output contactor of the brake is closed.

**23: Brake limit feedback (spare)**

It is usually used together with output function 18 to determine whether the brake is open in real time.

**31: Frequency increase (not maintained)**

When this signal is valid, the target frequency will continue to increase until it reaches the limit value. When the signal is invalid, the current frequency will maintain unchanged, with the stop and power-off frequency of 0.

**32: Frequency decrease (not maintained)**

When this signal is valid, the target frequency will continue to decrease until it reaches 0. When the signal is invalid, the current frequency will maintain unchanged, with the stop and power-off frequency of 0.

**34: Forward rotation deceleration**

In the case of forward rotation, when this signal is valid, the target frequency will be 0Hz, and the inverter will decelerate to 0Hz.

**35: Reverse rotation deceleration**

In the case of reverse rotation, when this signal is valid, the target frequency will be 0 Hz, and the inverter will decelerate to 0Hz.

**36: Forward rotation stop**

In the case of forward rotation, when this signal is valid, the inverter will stop running.

**37: Reverse rotation stop**

In the case of reverse rotation, when this signal is valid, the inverter will stop running.

**38: Frequency increase (maintained)**

When this signal is valid, the target frequency will continue to increase until it reaches the limit value. When the signal is invalid, the current frequency will maintain unchanged, even if the inverter is shut down or powered off.

**39: Frequency decrease (not maintained)**

When this signal is valid, the target frequency continues to decrease until it reaches 0. When the signal is invalid, the current frequency will maintain unchanged, even if the inverter is shut down or powered off.

**40: Jog frequency selection**

In the case of multi-speed operation, when this signal is valid, the target frequency will be switched to the jogging frequency.

**41: Command switching to operation panel**

In stop state, when this signal is valid, the command will be controlled by the panel reference.

**42: Command switching to terminal**

In stop state, when this signal is valid, the command will be controlled by the terminal reference.

**43: Command switching to Modbus communication**

In stop state, when this signal is valid, the command will be controlled by the Modbus reference.

**44: Open-loop main and auxiliary switching**

When this signal is valid, the velocity channel source is controlled by the open loop auxiliary reference, i.e. P10.03 velocity channel option is controlled by the P50.00 reference.

**45: PID main preset switching to internal**

When this signal is valid, main reference channel under the process closed loop control is controlled by the digital internal reference, otherwise it will not switch.

**46: PID main preset switching to analog A0**

When this signal is valid, main reference channel under the process closed loop control is switched to A0, otherwise it will not switch.

**47: PID auxiliary preset switching to invalid**

When this signal is valid, control auxiliary reference channel under the process closed loop is invalid, otherwise it will not switch.

**48: PID auxiliary preset switching to analog A0**

When this signal is valid, auxiliary reference channel under the process closed loop control is controlled by the A0, otherwise it will not switch.

**49: FJOG instruction (jog forward instruction)**

When this signal is valid, it will run in forward rotation with the jogging frequency as the target frequency; if the signal is invalid, it will stop running.

**50: RJOG instruction (jog reverse instruction)**

When this signal is valid, it will run in reverse rotation with the jogging frequency as the target frequency; if the signal is invalid, it will stop running.

**51: PID main preset switching to analog A1**

When this signal is valid, main reference channel under the process closed loop control is switched to A1, otherwise it will not switch.

**52: PID auxiliary preset switching to analog A1**

When this signal is valid, auxiliary reference channel under the process closed loop control is controlled by the A1, otherwise it will not switch.

Note: add 100 to negate the signal, for example: 7: Terminal forward input (FWD), the forward signal is valid when turned on. The inverter stops when the signal turns off. The forward signal is valid when 107 signal disconnects. The inverter stops when the signal turns on.

Function code	Name	Setting range	Factory setting
P30.08	Digital input filtering times (times)	1~200	5

The anti-interference ability of the terminals can be improved by appropriately increasing the reference value of P30.08. The more times the terminal filters, the longer the delay.

## 7.5.2 P31 group Digital input

Function code	Name	Setting range	Factory setting
P31.00	Output K1 function definition	0~199	2
P31.01	Output K2 function definition	0~199	25
P31.02	Output Y0 function definition	0~199	0
P31.03	Output Y1 function definition	0~199	0

Y0 - Y1 terminal outputs can be defined as multi-functional switching outputs or as high-speed pulse outputs (function 19, 20), and K1 – K2 relay outputs can also be defined as multi-functional outputs, but not as pulse outputs.

Function definition table of multifunction switch output

Function settings	Meaning	Function settings	Meaning
0	No function	1	Normal power-on self-inspection
2	Fault output	3	Running
4	Frequency arrival output	5	Frequency consistency output
6	Zero speed signal output	7	Normal bus voltage
8	It exceeds 5% of rated current during running and 10% of rated current when stop running	9	In tuning
10	Frequency detection 1	11	Frequency detection 2
12	Predicting fault output	13	Auto-tuning request output
14	Zero servo torque direction	15	Zero current detection output
16	Power generation/electric status	17	Output contactor control
18	Brake contactor control	19	Pulse output 0
20	Pulse output 1	21	Radiator overheat alarm
22	Motor overheat alarm	23	Motor option output
24	Encoder option output	25	Brake output
26	Cumulative runtime arrival	27	Single runtime arrival
28	Output X1	29	Output X2
30	Undervoltage blocking is stopping	31	Fan control
32	Analog disconnection	33	Motor PTC overheating
34	Reverse running	35	Sleep
36	Alarm output	37	Amplitude and phase locking completed
38	Frequency detection 3	39	Frequency detection 4

Settings of six parameters P31.00 - P31.05 defines the functions of six output ports from K1 – K2 and Y0 - Y1. The range of setting values and the function of the corresponding output port when setting each value are as follows.

0: No function

1 or 101: Inverter running preparation completed (RDY)

1: The self-test of the inverter is normal without fault, and the corresponding output point is connected, otherwise it will be disconnected;

101: The self-test of the inverter is normal without fault, and the corresponding output point is disconnected, otherwise it will be connected.

2 or 102: **Inverter fault**

2: When the inverter is in a fault shutdown state, the corresponding output point is connected, otherwise it will be disconnected;

102: When the inverter is in a fault shutdown state, the corresponding output point is disconnected, otherwise it will be connected.

**3 or 103: Inverter running signal (RUN)**

3: When the inverter can operate normally in response to the running command, the corresponding output point is connected, otherwise it will be disconnected;

103: When the inverter can operate normally in response to the running command, the corresponding output point is disconnected, otherwise it will be connected;

**6 or 106: Inverter running at zero speed**

6: When the output frequency of the inverter during running is 0, the corresponding output point is connected, otherwise it will be disconnected;

106: When the output frequency of the inverter during running is 0, the corresponding output point is disconnected, otherwise it will be connected;

**7 or 107: DC bus voltage not less than 85% of rated value**

7: When the inverter bus voltage is not lower than 85% of the rated voltage, the corresponding output point is connected, otherwise it will be disconnected;

107: When the inverter bus voltage is not lower than 85% of the rated voltage, the corresponding output point is disconnected, otherwise it will be connected;

**8 or 108: Exceeding 5% of rated current during running and exceeding 10% of rated current when stopped**

8: When the above conditions are met, the corresponding output point is connected, otherwise it will be disconnected;

108: When the above conditions are met, the corresponding output point is disconnected, otherwise it will be connected.

**9 or 109: Tuning (spare)**

9: When the inverter is in the self-learning state, the corresponding output point is connected, otherwise it will be disconnected;

109: When the inverter is in the self-learning state, the corresponding output point is disconnected, otherwise it will be connected.

**10 or 110: Frequency detection 1**

When output frequency of the inverter reaches or exceeds the value of any detected frequency (P31.22) plus detected frequency width (P31.23), the frequency detection 1 will be triggered; After the action of corresponding output point, when output frequency of the inverter falls back to any detected frequency (P31.22), the frequency detection 1 will reset.

10: When the frequency detection 1 operates, the corresponding output point will be disconnected;

110: When the frequency detection 1 operates, the corresponding output point will be connected;

**11 or 111: Frequency detection 2**

When output frequency of the inverter reaches or exceeds the value of any detected frequency (P31.22), the frequency detection 2 will be triggered; After the action of corresponding output point, when output frequency of the inverter falls back to the value of any detected frequency (P31.22) minus the detected frequency width (P31.23), the frequency detection 2 will reset.

11: When the frequency detection 2 operates, the corresponding output point will be connected;

111: When the frequency detection 2 operates, the corresponding output point will be disconnected;

**12 or 112: Fault prediction**

12: When the fault is predicted, the corresponding output point is connected, otherwise it will be disconnected;

112: When the fault is predicted, the corresponding output point is disconnected, otherwise it will be connected.

13 or 113: Spare

14 or 114: **Zero servo torque direction judgment (used at motor power outage emergency leveling, spare)**

14: When the test load of the inverter is heavy and the counterweight is light, the corresponding output point is connected, otherwise it will be disconnected;

114: When the test load of the inverter is heavy and the counterweight is light, the corresponding output point is disconnected, otherwise it will be connected.

15 or 115: **Zero current detection**

15: When the inverter stops running, if the output current of the inverter is greater than the zero current detection threshold (set by P31.20), the corresponding output point is connected, otherwise it will be disconnected;

115: When the inverter stops running, if the output current of the inverter is greater than the zero current detection threshold (set by P31.20), the corresponding output point is disconnected, otherwise it will be connected;

16 or 116: Power generation and electric status discrimination

16: 0 - power-driven state; 1 - power generation;

116: 0 - power generation; 1 - power-driven state.

17 or 117: **Output contactor closing**

17: When the output value is 1, the contactor will be closed;

117: When the output value is 0, the contactor will be closed.

Usually, it is combined with input function 21 to control the output contactor to pull in before the inverter outputs current.

21 or 121: Greater than 90 degrees, overheat alarm

Radiator temperature greater than or equal to 90, corresponding output point connected, otherwise it is disconnected.

22: Motor overheat alarm output

23: Motor switching output

Motor selection output, corresponding output point disconnected: Motor 1, corresponding output point connected: Motor 2.

24: Encoder switching output

Encoder selection output, corresponding output point disconnected: Encoder 1, corresponding output point connected: Encoder 2.

25: Holding brake output

Holding brake opened, output point connected: holding brake closed loop, output point disconnected

26: Accumulated running time arrival

If the accumulated running time of inverter exceeds the time set by P31.25, the output terminal is connected, otherwise it is disconnected.

27: Setting continuous running time arrival

If the accumulated running time of inverter exceeds the time set by P31.24, the output terminal is

connected, otherwise it is disconnected.

#### 28: Output X1

The level state of the input terminal X1 is output through the output terminal.

#### 29: Output X2

The level state of the input terminal X2 is output through the output terminal.

#### 30: Undervoltage lockout stopping

System undervoltage, and the output terminal outputs an effective level.

#### 31: Fan control

Inverter running or overheating, output terminal connected, otherwise disconnect after a delay of one minute.

#### 32: Analog input disconnection

#### 33: Motor PTC overheating

#### 34: Reversing status

#### Note:

- ① The meaning of "ON" mentioned above is: for relay output, normally open contacts (1B and 1C, 2B and 2C) connected, normally closed contacts (1B and 1A, 2B and 2A) disconnected; for open collector output, it means that the output point is in a low level status. Similarly, in terms of the above-mentioned "disconnected": for relay output, it means that the normally opened contacts (1B and 1C, 2B and 2C) are disconnected and normally closed contacts (1B and 1A, 2B and 2A) are connected; for open collector output, it means that the output point is in a high impedance state.
- ② Factory setting, p 31.04 = 3, Y0 port is designated as the running signal (RUN) output port; P31.05 = 2, Y 1 port is designated as the output port of the inverter fault signal.
- ③ Running signal (RUN): The inverter will give the running signal (RUN) only when it receives the up/down direction command signal and there is no base electrode locking.
- ④ Timing of fault signal: In case of any inverter fault, the fault signal will be output. At the same time, the running signal will be cleared. The fault signal is latched, which can be cleared by externally input reset signal, by an operator's reset operation, by power failure, or after an internally set delay time. The timing of fault signal is shown in Figure 7-15.



Figure 7-15 Timing of Fault Signals

#### 35: Sleeping

Process PID control is in sleeping status

#### 36: Alarm output

Inverter is in the alarm status

#### 37: Amplitude locking and phase locking completed

In the power and variable frequency startup mode, it can realize status switching.

#### 38: Frequency detection 3

The running frequency is between P31.26~P31.27

#### 39: Frequency detection 4

The running frequency is between P31.28~P31.29.

Function code	Name	Setting range	Factory setting
P31.06	Output K1 action delay (s)	0.0~120.0	0.0
P31.07	Output K1 reset delay (s)	0.0~120.0	0.0
P31.08	Output K2 action delay (s)	0.0~120.0	0.0
P31.09	Output K2 reset delay (s)	0.0~120.0	0.0
P31.10	Output Y0 action delay (s)	0.0~120.0	0.0
P31.11	Output Y0 reset delay (s)	0.0~120.0	0.0
P31.12	Output Y1 action delay (s)	0.0~120.0	0.0
P31.13	Output Y1 reset delay (s)	0.0~120.0	0.0

P31.06 - P31.13 are the time constants for setting the signal action delay and reset delay of the output terminals K1 – K2 and Y0 - Y1. By using these terminals, the delay time of the output state of each output terminal relative to its corresponding actual signal can be flexibly set as required. Moreover, the delay time of the above-mentioned output state can be set separately when the signal is triggered or when the signal is reset.

Function code	Name	Setting range	Factory setting
P31.20	Zero current detection width (%)	0.0~50.0	4.0

This function can be used for load change detection. Set the output terminal function to "15: zero current detected", and output the indicating signal after the output current of the inverter is lower than the zero current detection width set by P31.20.

When the inverter stops, if the inverter current is greater than the threshold, the corresponding output terminal set by function code 15 (or 115) acts.

**Note:** This function parameter is the percentage of inverter output current relative to motor rated current.

Function code	Name	Setting range	Factory setting
P31.21	Frequency arrival detection width (Hz)	0.00~300.00	1.00
P31.22	Detection frequency (Hz)	0.00~655.35	1.00
P31.23	Detection frequency width (Hz)	0.00~300.00	0.20

P31.21 this function is used for deviation detection between output frequency and set frequency. Setting the output terminal function to "4: Frequency arrival signal", the deviation between the output frequency and the set frequency of the inverter is within the setting range of this function code. Output indication signal, as shown in the figure, frequency arrival signal FAR.

Yi represents Y0 – Y1 terminals or relay K1 - K2 terminals.

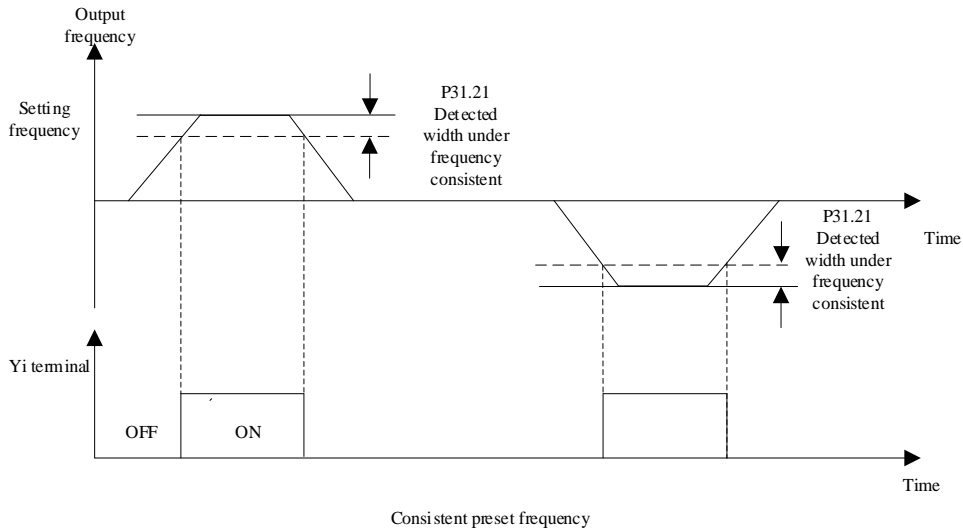


Figure 7-16 Frequency consistency detection 1

P31.22 and P31.23 are used for two parameters detected at any frequency: any frequency detection width and any frequency detection width. Combination of these two parameters is used for three functions: frequency/speed consistency, frequency detection 1, and frequency detection 2. Mainly used to determine whether the output frequency of inverter is within a specified frequency range. In frequency detection 1, when the inverter output frequency arrives or exceeds the value of frequency detection speed (P31.22) plus frequency detection width (P31.23), frequency detection 1 is triggered; after corresponding output point action, when the inverter output frequency drops back to the frequency detection speed (P31.22), frequency detection 1 resets. Frequency detection 1 is negative logic, when triggered, the corresponding output status is OFF; when reset, the corresponding output status is ON.

In frequency detection 2, when the inverter output frequency arrives or exceeds the value of frequency detection speed (P31.22), frequency detection 2 is triggered; after corresponding output point action, when the inverter output frequency drops back to the value of frequency detection speed (P31.22) minus frequency detection width (P31.23), frequency detection 2 resets. Frequency detection 2 is positive logic, when triggered, the corresponding output status is ON; when reset, the corresponding output status is OFF.

Set output terminal function to "5: Frequency/speed consistency", as shown in the following figure.

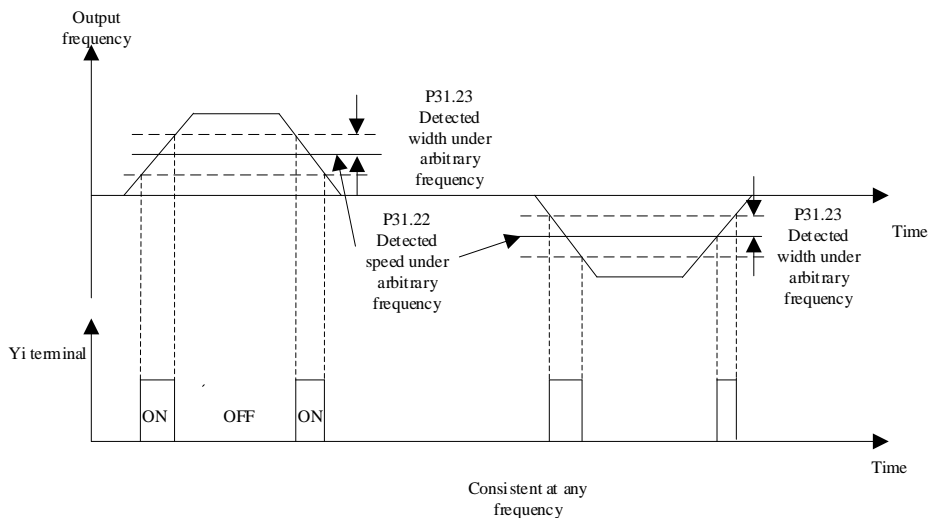


Figure 7-17 Frequency consistency detection 2

Set output terminal function to "10: speed detection 1", as shown in the following figure.

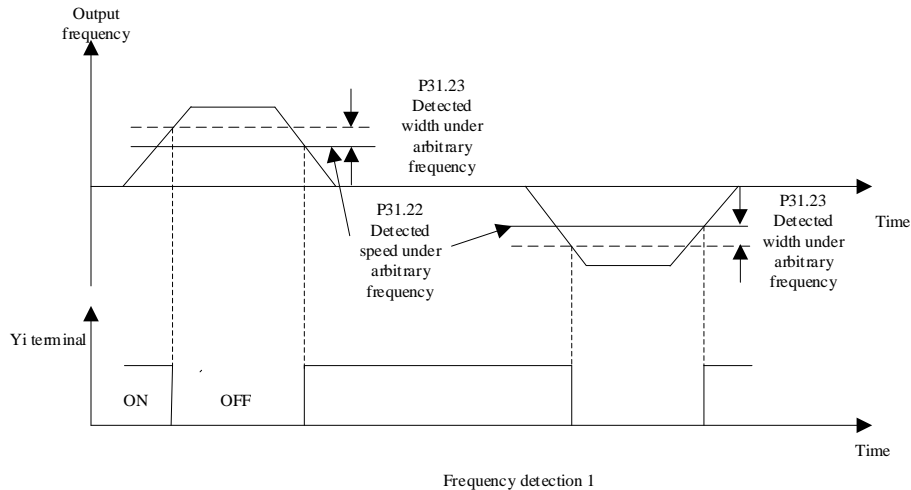


Figure 7-18 Speed detection 1

Set output terminal function to "11: speed detection 2", as shown in the following figure.

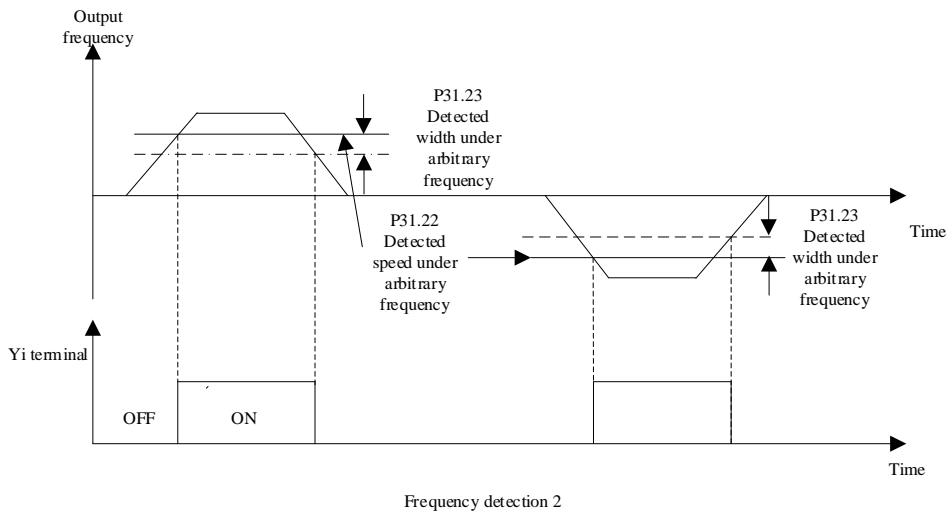


Figure 7-19 Speed detection 2

Function code	Name	Setting range	Factory setting
P31.24	Single running time arrival (h)	0~65535	2

When the run command of the inverter is given, after the single continuous running hours reaches the value of P31.24, the indicator signal is output. The output indication signal can be activated by defining the function code of the output terminal as "27".

Function code	Name	Setting range	Factory setting
P31.25	The cumulative running hours are reached (h)	0~65535	8

When the inverter is powered on and the cumulative running hours reaches the value of P31.25, the indicator signal is output. The output indication signal can be activated by defining the function code of the output terminal as "26".

Function code	Name	Setting range	Factory setting
P31.26	Detection frequency 3 upper limit	0~655.35	50.00
P31.27	Detection frequency 3 lower limit	0~655.35	45.00
P31.28	Detection frequency 4 upper limit	0~655.35	100.00
P31.29	Detection frequency 4 lower limit	0~655.35	90.00

Detection frequency 3 corresponds to the terminal function code “38” and detection frequency 4 corresponds to terminal function code “39”.

### 7.5.3 P32 group Analog input

Function code	Name	Setting range	Factory setting
P32.00	Input AI0 type	0~3	0
P32.06	Input AI1 type	0~3	0

Parameter setting of analog input type:

0:0~10V; 2:0~20mA; 3:4mA~20mA

1: -10 V - 10 V (not supported)

Function code	Name	Setting range	Factory setting
P32.01	Input AI0 function	0~7	0
P32.07	Input AI1 function	0~7	0

P32.01 and P32.07 set the input function of analog AI:

0: No function

1: Target speed signal

2: Current speed signal

3: Torque signal

Function code	Name	Setting range	Factory setting
P32.02	Input AI0 lower limit (%)	-100.00~327.67	0
P32.03	Input AI0 upper limit (%)	0.0~6553.5	100.0
P32.04	Input AI0 filtering (ms)	0~65535	10
P32.05	Input AI0 amplitude limit (V)	0.000~65.535	10.000
P32.08	Input AI1 lower limit (%)	-100.00~327.67	0
P32.09	Input AI1 upper limit (%)	0.0~6553.5	100.0
P32.10	Input AI1 filtering (ms)	0~65535	10
P32.11	Input AI1 amplitude limit (V)	0.000~65.535	10.000

P32.02 - P32.05 and P32.08 - P32.11 respectively set the upper limit, lower limit, filtering time and limiting of the two analog input ports.

The **upper limit/lower limit** combination is a proportionality coefficient.

By modifying the **filtering time**, the anti-interference ability of the terminal input can be improved, because the analog input through the A0 and A1 terminals in the field application usually carries a certain interference signal. However, the longer the filtering time, the longer the response delay of the terminal action.

The **limiting** is only to limit the final processed signal of the analog input to a certain control range, and the limit of current type is required to be modified to 20.000 mA.

Actual input=analog input × (input upper limit - input lower limit) + input lower limit

#### 7.5.4 P33 Group Analog Output Parameters

Function code	Name	Setting range	Factory setting
P33.00	Output M0 function	0~30	1

Analog DAC monitoring digital output 0 - 1000 represents 0 - 10.00V

Function definition table of multifunction analog output (some common monitoring data):

Function settings	Meaning	Corresponding relationship
0	No function	
1	Output current	0 - Ie corresponds to 0 - 10V
2	Output voltage	0 - Ue corresponds to 0 - 10V
3	Torque presetting	0 - Te corresponds to 0 - 10V
4	Bus voltage	0 - Udc corresponds to 0 - 10V
5	Total output power	0 - Pe corresponds to 0 - 10V
6	Output active power	0 - Ne corresponds to 0 - 10V
7	Current velocity (unsigned)	0 - Ne corresponds to 0 - 10V
8	Velocity reference (signed)	0 - Ne corresponds to 0 - 10V
9	Speed feedback	0 - Ne corresponds to 0 - 10V
10	Standby	0 - 50Hz/s corresponds to 0 - 10V
11	Heat sink temperature	0 - 100 degrees correspond to 0 - 10V
12	Analog A0	0 - 10V corresponds to output 0 - 10V
13	Analog A1	0 - 10V corresponds to output 0 - 10V
14	Standby	0 - 10V corresponds to output 0 - 10V
15	ModBus analog output 0	0 - 10,000 corresponds to 0 - 10 V
16	ModBus analog output 1	0 - 10,000 corresponds to 0 - 10 V

Function code	Name	Setting range	Factory setting
P33.01	Output M0 lower limit (%)	-100.00~327.67	0.00
P33.02	Output M0 upper limit (%)	0.0~6553.5	100.0

If you need to adjust the analog output defined by the table above, you can use this function. The adjusted analog is the actual output of M terminal.

The above parameters are different from other function codes, and adjustment will affect M output in real time. M0 and M1 share the same output correction method.

Actual output = M output × (output M0 upper limit - output M0 lower limit) + output M0 lower limit

Actual output voltage range: -10 V - 10 V

Under default parameter settings,

Example 1: Output is frequency 0 - 50.00 Hz (rated frequency), gain set to 100% and bias set to 15.000 V, then the actual output voltage is 0 V at 0Hz and 5 V at 50.00 Hz.

Example 2: Output is frequency 0 - 50.00 Hz (rated frequency), gain set to 200% and bias set to 15.000 V, then the actual output voltage is 0 V at 0 Hz and 10 V at 50.00 Hz.

Example 3: Output is output current 0 - 2 Ie (rated current), gain set to 50% and bias set to 15.000 V,

then the actual output voltage is 0 V at 0 Hz and 5 V at 2Ie.

Function code	Name	Setting range	Factory setting
P33.06	Output M0 type	0~4	0

Parameters P33.06 are used to select the analog output type:

0: No selection; 1: 0 - 10 V; 2: -10 V - 10 V; 3: 0 - 20 mA; 4: 4~20mA

## 7.6 P4X Group Velocity Parameter Group

### 7.6.1 Group P40 Basic speed parameters

Function code	Name	Setting range	Factory setting
P40.00	Panel speed	0.00~655.35	5.00

The starting velocity is set by the panel, and the velocity can be changed by the button.

Function code	Name	Setting range	Factory setting
P40.01	Basic frequency	0.00~655.35	50.00

The basic running frequency is the minimum frequency corresponding to the maximum voltage output from the inverter. See the motor nameplate for the rated frequency value corresponding to the motor when using a standard AC motor.

Function code	Name	Setting range	Factory setting
P40.02	Acceleration time 0 (s)	0.00~500.00	5.00
P40.03	Deceleration time 0 (s)	0.00~500.00	5.00

In this function, you can set the rate at which the inverter accelerates to a constant velocity or decelerates from a constant velocity to a stop process after it starts running.

Acceleration time 0: The time P40.02 used for the inverter output frequency to rise from zero frequency to the maximum frequency.

Deceleration time 0: The time P40.03 used for the inverter output frequency to decrease from the maximum frequency to the zero frequency.

Function code	Name	Setting range	Factory setting
P40.04	Acceleration time 1 (s)	0.00~500.00	5.00
P40.05	Deceleration time 1 (s)	0.00~500.00	5.00
P40.06	Acceleration time 2 (s)	0.00~500.00	5.00
P40.07	Deceleration time 2 (s)	0.00~500.00	5.00
P40.08	Acceleration time 3 (s)	0.00~500.00	5.00
P40.09	Deceleration time 3 (s)	0.00~500.00	5.00

In addition to the previously defined acceleration time 0 (P40.02) and deceleration time 0 (P40.03), three groups of acceleration and deceleration times (acceleration and deceleration time 1, acceleration and deceleration time 2, acceleration and deceleration time 3) can be defined. By defining the multifunctional X terminal (acceleration and deceleration time option functions 1 - 2), different acceleration and deceleration times can be selected with different terminal states. The meanings of these three groups of acceleration and deceleration times are the same as those of P40.02 and P40.03.

Function code	Name	Setting range	Factory setting
P40.10	Acceleration rounded corner 0(s)	0.00~10.00	0.00
P40.11	Acceleration rounded corner 1(s)	0.00~10.00	0.00
P40.12	Deceleration rounded corner 2(s)	0.00~10.00	0.00
P40.13	Deceleration rounded corner 3(s)	0.00~10.00	0.00
P40.14	Top arc rounding suppression	0~3	0

Acceleration and deceleration rounded corners: the time P40.10 - P40.13 of the arc segment added to improve the smoothness of the beginning and end segments of the acceleration and deceleration process. The arc segment curve time is suitable for conveyors carrying fragile items or for applications requiring smooth velocity regulation.

P40.10 - P40.13 are the S-curve (velocity curve) parameters during motor operation when the switch multi-speed set is set. They specify the acceleration time (P40.02), deceleration time (P40.03), speed-up rounded corner time (P40.10 and P40.11), and deceleration rounded corner time (P40.12 and P40.13). These parameters directly affect the characteristics of S curve and therefore also directly relate to the running efficiency and riding comfort of motor. The specific positions of the above parameters in the motor operation S-curve are shown in Figure 7-20.

P40.14 parameter is mainly used for the elevator application scenario: P40.14=1, acceleration state rounding corner suppression; P40.14=2, deceleration state rounding corner suppression; P40.14=3, enabling both acceleration and deceleration state rounding corner suppression.

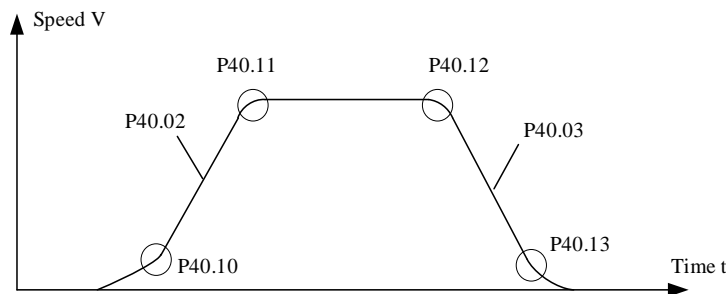


Figure 7-20 Positions of Parameters in Motor Operation S-curve

Function code	Name	Setting range	Factory setting
P40.15	Corner frequency 1 (%)	0~200	190
P40.16	Corner frequency 2 (%)	0~200	200

By setting of P40.15 and P40.16, P40.04 - P40.09 acceleration and deceleration can be corresponded according to actual speed.

### 7.6.2 P41 Group Digital Multi-speed parameters Group

Function code	Name	Setting range	Factory setting
P41.00	Digital multi-speed setting 0 (Hz)	0.00~655.35	0.00
P41.01	Digital multi-speed setting 1 (Hz)	0.00~655.35	0.00
P41.02	Digital multi-speed setting 2 (Hz)	0.00~655.35	10.00
P41.03	Digital multi-speed setting 3 (Hz)	0.00~655.35	20.00
P41.04	Digital multi-speed setting 4 (Hz)	0.00~655.35	30.00
P41.05	Digital multi-speed setting 5 (Hz)	0.00~655.35	40.00
P41.06	Digital multi-speed setting 6 (Hz)	0.00~655.35	50.00
P41.07	Digital multi-speed setting 7 (Hz)	0.00~655.35	60.00
P41.08	Digital multi-speed setting 8 (Hz)	0.00~655.35	0.00

Function code	Name	Setting range	Factory setting
P41.09	Digital multi-speed setting 9 (Hz)	0.00~655.35	0.00
P41.10	Digital multi-speed setting 10 (Hz)	0.00~655.35	0.00
P41.11	Digital multi-speed setting 11 (Hz)	0.00~655.35	0.00
P41.12	Digital multi-speed setting 12 (Hz)	0.00~655.35	0.00
P41.13	Digital multi-speed setting 13 (Hz)	0.00~655.35	0.00
P41.14	Digital multi-speed setting 14 (Hz)	0.00~655.35	0.00
P41.15	Digital multi-speed setting 15 (Hz)	0.00~655.35	0.00

It can be set as process open loop frequency. By defining multifunctional X terminal (digital multi-segment 0 - 3), different multi-segment frequency can be selected with different terminal states. ON means the terminal is valid, and OFF means the terminal is invalid.

P41.00 - P41.15 define the velocity command values of the fifteen velocity from digital multi-speed set 1 to digital multi-speed set 15 respectively. The four input points binary codes from switch multi-speed set 0 - 3 are combined into 16 states, which correspond to the above 15 set velocity commands and 0 set velocity (when the combination code is 0) of P41.00 - P41.15, respectively. The relationship between the multi-speed input port signals and the set velocity commands is shown in Table 6.2 below.

Table 6.2 Relationship between multi-speed input port combination and the set velocity

Multi-segment speed Combination code	Multi-speed setting 3	Multi-speed setting 2	Multi-speed setting 1	Multi-speed setting 0	Reference frequency
0	0	0	0	0	Reference velocity 0
1	0	0	0	1	Reference velocity 1
2	0	0	1	0	Reference velocity 2
3	0	0	1	1	Reference velocity 3
4	0	1	0	0	Reference velocity 4
5	0	1	0	1	Reference velocity 5
6	0	1	1	0	Reference velocity 6
7	0	1	1	1	Reference velocity 7
8	1	0	0	0	Reference velocity 8
9	1	0	0	1	Reference velocity 9
10	1	0	1	0	Reference velocity 10
11	1	0	1	1	Reference velocity 11
12	1	1	0	0	Reference velocity 12

Multi-segment speed Combination code	Multi-speed setting 3	Multi-speed setting 2	Multi-speed setting 1	Multi-speed setting 0	Reference frequency
13	1	1	0	1	Reference velocity 13
14	1	1	1	0	Reference velocity 14
15	1	1	1	1	Reference velocity 15

In the above table, the status "0" means that there is no input signal at the input port, and the status "1" means that there is an input signal at the input port. The following example further explains the above table: If there is an input signal for velocity reference 0, an input signal for velocity reference 1, no input signal for velocity reference 2, and no input signal for velocity reference 3, then the binary code is "0011" = 3, and the corresponding set velocity is velocity reference 3, whose velocity value is specified by parameter P41.03.

Function code	Name	Setting range	Factory setting
P41.16	Jogging frequency reference (Hz)	0.00~50.00	5.00

It is the frequency value set by the jogging running.

## 7.7 P5X group Process control

### 7.7.1 P50 group Main and auxiliary preset

Function code	Name	Setting range	Factory setting
P50.00	Open loop auxiliary reference mode	0~5	0

The process open loop auxiliary reference mode P50.00 is selected as follows:

0: None; 1:A0; 2:A1; 5:PID sets the target velocity

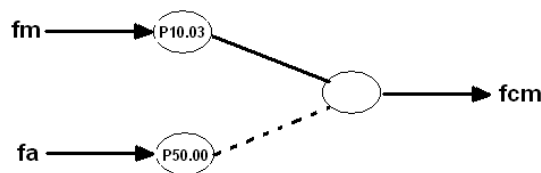


Figure 7-21 Schematic Diagram of Open Loop Auxiliary Reference

By default, the  $f_c$  is set by P10.03 main reference value  $f_m$ . When inputting 44 through digital quantity: when open loop main and auxiliary reference switches to auxiliary reference, the main reference value  $f_m$  switches to auxiliary reference value reference  $f_a$ .

Function code	Name	Setting range	Factory setting
P50.01	Open loop auxiliary preset operation	0~6	0

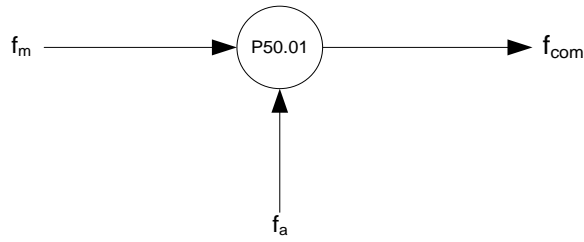


Figure 7-22 Schematic Diagram of Open Loop Main and Auxiliary Reference Synthesis

In the process open-loop control mode, an auxiliary preset value  $f_a$  overlays on the main preset value  $f_m$ , generating process open-loop synthesis frequency preset  $f_{com} = f_m + f_a$ .

The main reference value  $f_m$  and the auxiliary reference value  $f_a$  can be operated by means of "addition", "subtraction", "offset", "maximum", and "minimum".

The process open loop reference main and auxiliary operation P50.01 are defined as follows.

0: No operation

1: **Main reference + auxiliary reference** Auxiliary frequency reference value is superimposed on the main reference, and the function is "addition".

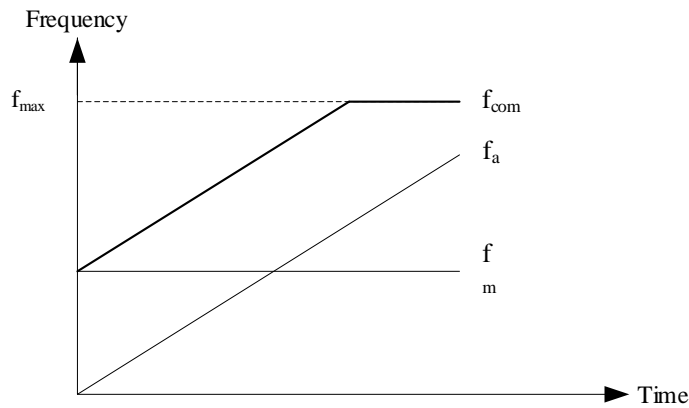


Figure 7-23 Open Loop Main and Auxiliary Reference Operation 0

Process open loop synthetic reference  $f_{com} = \text{main reference } f_m + \text{auxiliary reference } f_a$

2: **Main reference - auxiliary reference** Auxiliary frequency reference value is superimposed on the main reference, and the function is "subtraction".

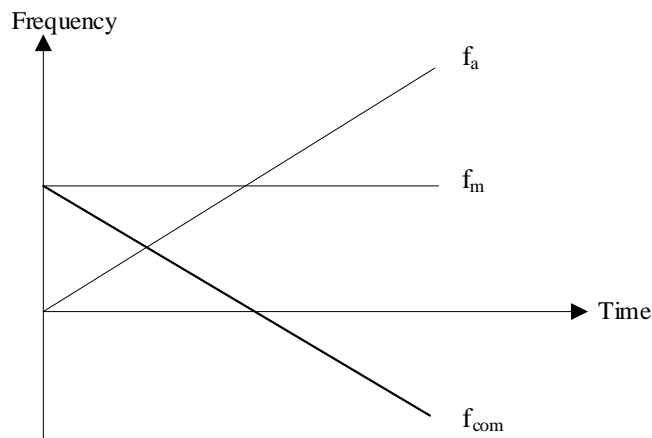


Figure 7-24 Open Loop Main and Auxiliary Reference Operation 1

Process open loop synthetic reference  $f_{com} = \text{main reference } f_m - \text{auxiliary reference } f_a$

**5:Take the maximum value** Take the maximum value of the main reference  $f_m$  and auxiliary reference  $f_a$ .

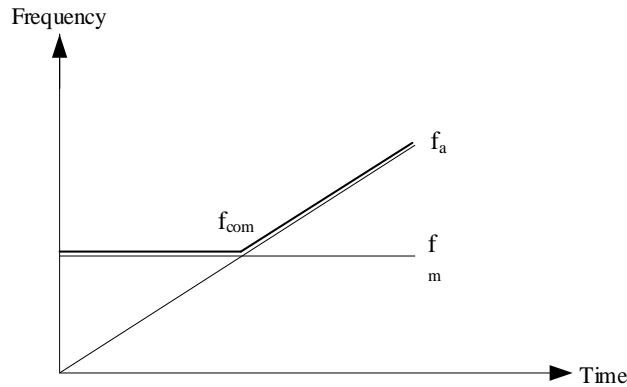


Figure 7-25 Open Loop Main and Auxiliary Reference Operation 4

Process open loop synthetic reference  $f_{com} = \text{Max}\{\text{main reference } f_m, \text{auxiliary reference } f_a\}$

**6:Take the minimum value** Take the minimum value of the main reference  $f_m$  and auxiliary reference  $f_a$ .

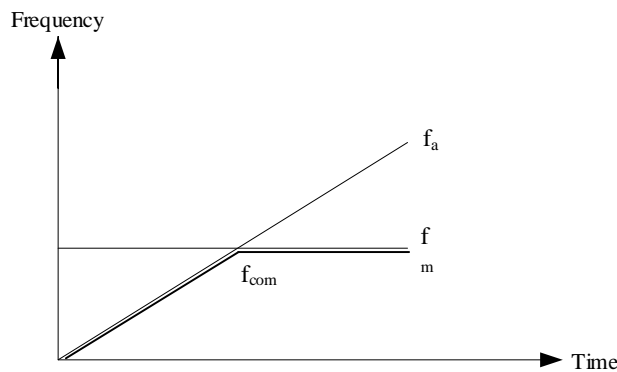


Figure 7-26 Open Loop Main and Auxiliary Reference Operation 5

Process open loop synthetic reference  $f_{com} = \text{Min}\{\text{main reference } f_m, \text{auxiliary reference } f_a\}$

**Note:** When the frequency corresponding to the synthesis value  $f_{com}$  exceeds the upper and lower frequency limits, the output frequency is limited to the upper and lower limits.

### 7.7.2 P51 group Process PID

PID control is a common method for process control, which adjusts the inverter output frequency by performing proportional, integral, and differential operations on the deviation between the control feedback signal and the target quantity signal, constituting a negative feedback system to stabilize the control quantity on the target quantity. Applies to process controls such as flow control, pressure control, and temperature control. The basic principle block diagram of control is as follows.

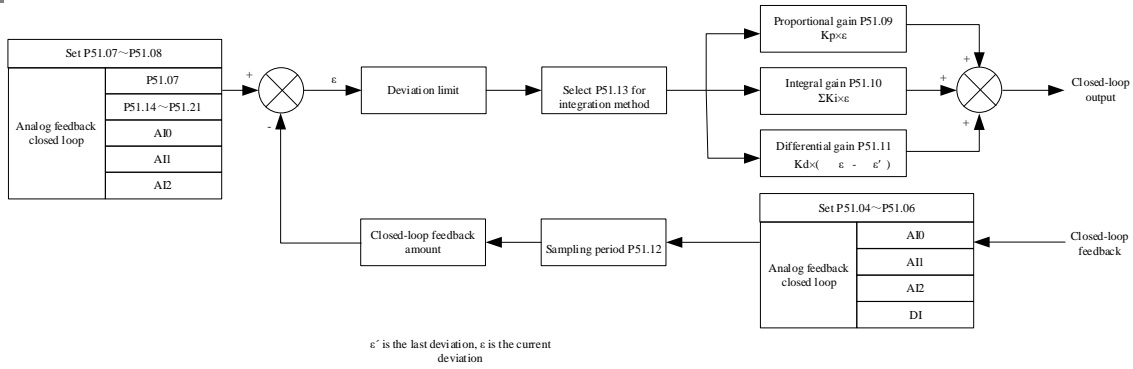


Figure 7-27 PID principle block diagram

Function code	Name	Setting range	Factory setting
P51.00	Closed loop control option	0~1	0

Closed loop running control options: 0: invalid; 1: valid

Function code	Name	Setting range	Factory setting
P51.01	Closed loop main reference mode	0~6	0
P51.02	Closed loop auxiliary reference mode	0~6	2
P51.03	Closed loop auxiliary reference operation	0~6	0

In closed loop system with feedback, if there are main and auxiliary reference, the main reference value can be internal reference, analog, communication; the auxiliary reference value can be analog, internal reference.

P51.01 closed loop control main reference mode is selected as follows.

0: Digital voltage pressure internal preset (P51.07); 1: A0; 2: A1; 6: Modbus communication reference

P51.02 closed loop control auxiliary reference mode is selected as follows.

0: None; 1: A0; 2: A1; 6: Modbus communication reference

P51.03 closed loop control reference main and auxiliary operations are selected as follows.

0: No operation; 1: Main + auxiliary; 2: Main - auxiliary; 5: Taking maximum value; 6: Taking minimum value

The function of main and auxiliary operation of closed loop reference is the same as that for open loop reference. See P50.01 for details.

**Note:** The closed loop control analogs such as main reference, auxiliary reference, main feedback and auxiliary feedback cannot be set to the same channel.

Function code	Name	Setting range	Factory setting
P51.04	Closed loop main feedback mode	0~6	1
P51.05	Closed loop auxiliary feedback mode	0~6	2
P51.06	Closed loop auxiliary feedback operation	0~6	0

In a closed loop system with feedback, the main and auxiliary feedback can be analog or pulse.

The process closed loop feedback main and auxiliary operation function is the same as that of the process closed loop reference and the process open loop reference. See P50.01 for details.

P51.04 closed loop control main feedback mode is selected as follows.

0: None; 1: A0; 2: A1; 6: Modbus communication reference

P51.05 closed loop control auxiliary feedback mode is selected as follows.

0: None; 1: A0; 2: A1; 6: Modbus communication reference

P51.06 closed loop control feedback main and auxiliary operations are selected as follows.

0: No operation; 1: Main + auxiliary; 2: Main - auxiliary; 5: Taking maximum value; 6: Taking minimum value

**Note:** The closed loop control analogs such as main reference, auxiliary reference, main feedback and auxiliary feedback cannot be set to the same channel.

Function code	Name	Setting range	Factory setting
P51.07	PID internal setting value	0.00~10.00	0.70

The current control operation mode P51.00=1 should be determined before determining the process closed loop reference.

When the current control operation mode is analog feedback process closed loop, if P50.01 is set to 0, P51.07 is used to determine the closed loop reference value.

Function code	Name	Setting range	Factory setting
P51.09	Proportional gain Kp	0.000~10.000	0.500
P51.10	Integral gain Ki	0.000~10.000	0.500
P51.11	Differential gain Kd	0.000~10.000	0.000

The larger Kp is, the faster the response is, but it is easy to oscillate if it is too large. Kp can't completely eliminate deviation, but Ki can be used to eliminate deviation. The larger Ki is, the faster the inverter responds to the variation of deviation, but it is easy to cause oscillation if it is too large. If there is jumping feedback in the system from time to time, it is necessary to use Kd, which can quickly respond to deviation changes between the system feedback and the set value. A greater Kd value gives rise to quicker response, but an excessively large value may cause oscillation.

Function code	Name	Setting range	Factory setting
P51.12	Integral option method	0~1	0

This function determines the specific mode of running during the process closed loop regulation.

If the output of the process closed loop regulation reaches the upper or lower frequency limit (P70.00 or P70.01), there are two action options in the integration.

**0: When the frequency reaches the upper and lower limits, the integration regulation is stopped**  
The integral value remains the same, and when the size between the set value and the feedback value changes, the integral value will quickly follow this trend.

**1: When the frequency reaches the upper and lower limits, the integral control continues.**  
The integral value responds to the change between the set value and the feedback value in real time, unless the internal integration limit has been reached. When the size between the set value and the feedback value changes, it will take longer to counteract the influence of continuous integration before the integral value follows this trend.

Function code	Name	Setting range	Factory setting
P51.13	Upper limit of integration effect (%)	0.0~6553.5	100.00
P51.14	Closed-loop input upper limit value (%)	0.0~6553.5	50.0
P51.15	Closed-loop input lower limit value (%)	0.0~6553.5	0.0
P51.16	Upper limit of closed loop output (%)	0.0~6553.5	100.0

P51.14 - P51.16 set the limit value in the process closed loop control. If it is above the input upper limit P51.14, adjust it according to the upper limit; if it is lower than the lower limit, PID adjustment will not be performed. This is how it sets the limit value in the process closed loop control.

Function code	Name	Setting range	Factory setting
P51.17	Hibernation	0~1	0
P51.18	Sleeping frequency (Hz)	0.00~655.35	30.00
P51.19	Sleeping delay (s)	0.00~655.35	10.00
P51.20	Wake-up deviation (%)	0.00~655.35	0.10
P51.21	Wake-up delay (s)	0~6553.5	10.0

Sleeping parameters:

P51.17 Sleep selection: 0: Invalid; 1: Valid

When sleeping option is active, sleeping frequency, sleeping delay, wake-up deviation and wake-up delay can be set

Function code	Name	Setting range	Factory setting
P51.22	Acceleration and deceleration time reference	0.0~6553.5	0.0
P51.23	Closed loop output filtering time	0.000~65.353	0.010

When the closed loop process suddenly changes, these two parameters can be adjusted to control the reference within a certain response time, so that the response of the closed loop process is stable in some circumstances.

Function code	Name	Setting range	Factory setting
P51.24	Minimum preset quantity	0.0~10.00	0.0
P51.25	Feedback quantity corresponding to the minimum preset quantity	0.0~10.00	0.0
P51.26	Maximum preset quantity	0.0~10.00	10.0
P51.27	Feedback quantity corresponding to the maximum preset quantity	0.0~10.00	10.0

P51.24 - P51.27 defines the relationship curve between the analog closed loop reference and the desired feedback. The set value is the percentage of the actual value of the set and feedback physical quantities relative to the reference value (10V or 20mA).

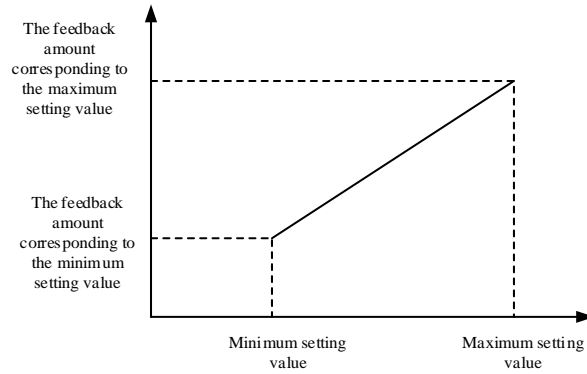


Figure 7-28 Feedback positive regulation

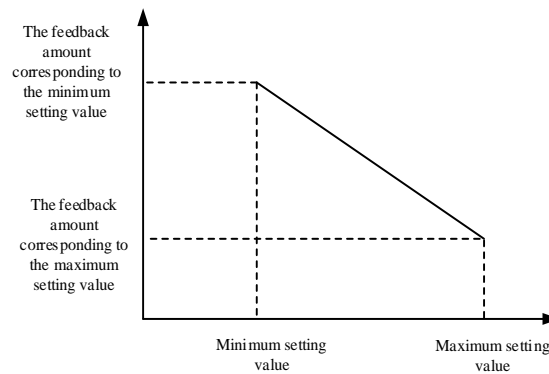


Figure 7-29 Feedback negative regulation

Function code	Name	Setting range	Factory setting
P51.28	Preset frequency (Hz)	0.00~655.35	22.0
P51.29	Preset frequency holding time (s)	0~65535	0

After the start of closed loop operation, according to the acceleration time, the frequency is first accelerated to the closed loop preset frequency P51.28, and continues to operate at this frequency for a period of time P51.29 before operating according to the closed loop characteristics. If the closed loop preset frequency function is not required, both the preset frequency and the holding time can be set to 0.

Function code	Name	Setting range	Factory setting
P51.30	Positive and negative characteristics	0~1	0

Whether the comparison results between feedback signal and set value are reversed, 0: forward feature; 1: reverse feature.

## 7.8 P6X group vector control

### 7.8.1 P60 group Speed loop PID

Function code	Name	Setting range	Factory setting
P60.00	Speed loop – zero speed P	0.00~655.35	5.00

Function code	Name	Setting range	Factory setting
P60.01	Speed loop – zero speed Ti (ms)	0~65535	73
P60.03	Speed loop - low speed P	0.00~655.35	5.00
P60.04	Speed loop - low speed Ti (ms)	0~65535	73
P60.06	Speed loop - high speed P	0.00~655.35	8.00
P60.07	Speed loop - high speed Ti (ms)	0~65535	73
P60.09	Switching frequency f0 (%)	0.0~6553.5	10.0
P60.10	Switching frequency f1 (%)	0.0~6553.5	60.0

For the PID adjustment of the velocity loop, P0, I0 are used as zero-servo section adjustable parameters, and the other three groups are divided into three groups by P60.12 and P60.13. P1, I1 are used as low-velocity section adjustable parameters; P3, I3 are used as high-velocity section adjustable parameters.

The P60 parameter group mainly adjusts the proportional gain and integration time of the velocity regulator.

Proportional gain P:

Please adjust it according to the size of the rotational inertia of the mechanical device connected with motor. For mechanical devices with large moment of rotational inertia, please increase P gain; for mechanical devices with small moment of rotational inertia, please decrease P gain.

When P gain is greater than inertia, the motor may oscillate or overshoot, although the control response can be accelerated. On the contrary, if the P gain is lower than inertia, the control response will slow down and the time to adjust the velocity to stable value will become longer.

Integration time I:

Setting it to 0 means that the integral is invalid (controlled by P alone). In order to make the deviation between velocity command and actual velocity in steady state zero, the integration time I is set to a non-zero value. When I is set to a small value, the system responds quickly; but if it is too small, it may oscillate; when I is set to a large value, the system response is slow.

PID setting value adjustment at high velocity and low velocity:

When the motor velocity is higher than the switching frequency P60.10, P60.06 - P60.07 work, which makes the system achieve better dynamic response and no oscillation; when the motor velocity is lower than the switching frequency P60.09, P60.03 - P60.04 work. In general, in order to obtain better dynamic response at low velocity, the proportional gain P60.03 can be appropriately increased and the integration time P60.04 can be reduced. When the velocity is lower than the switching frequency P60.10 and higher than the switching frequency P60.09, P60.03 - P60.07 work.

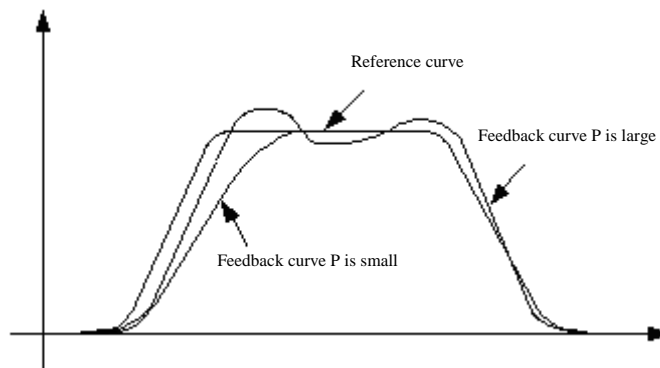


Figure 7-30 Effect of the proportionality constant P on the feedback tracking

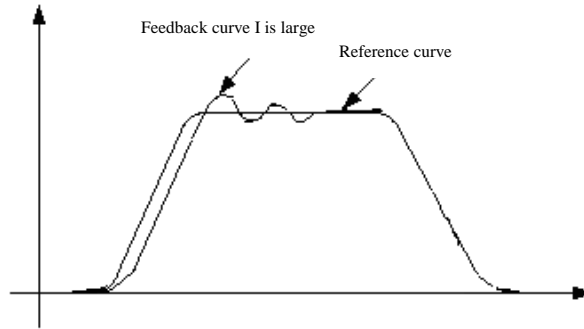


Figure 7-31 Effect of integration constant I on feedback tracking

Function code	Name	Setting range	Factory setting
P60.11	Speed loop period	0~50	0

The default is 0, generally not modified. The greater the value, the slower the speed loop execution period.

Function code	Name	Setting range	Factory setting
P60.12	Torque command filtering (ms)	0~1000	1

The torque command filtering time, generally not modified

Function code	Name	Setting range	Factory setting
P60.13	Speed loop suspension P	0.00~655.35	8.00
P60.14	Speed loop suspension Ti	0~65535	73

When configuring SSI board, after enabling suspension function, the PI parameters at zero speed.

## 7.8.2 P61 group Current loop PID

Function code	Name	Setting range	Factory setting
P61.00	Current loop Kp	0.00~655.35	0.30
P61.01	Current loop Ki	0.00~655.35	0.50
P61.02	Current loop bandwidth (Hz)	0.00~655.35	200.0
P61.03	Current loop selection	0~65535	4

P61.00- P61.01 mainly adjust the PID of current loop, generally, it is not adjusted but set according to default values.

P61.02 is the current loop bandwidth. When current fluctuation is large, reduce the bandwidth accordingly.

PI parameters selection for P61.03 current loop, default is 4, PI parameters using self-learning results. Setting it to 0, then use P61.00~P61.01

Function code	Name	Setting range	Factory setting
P62.00	Torque preset (%)	0.0~400.0	0.0
P62.01	Torque direction	0~1	0
P62.02	Torque increase time (s)	0.01~655.35	1.00
P62.03	Torque decrease time (s)	0.01~655.35	1.00

P62.00 - P62.03 Corresponding parameters in torque control mode, by setting P62.01, torque

direction can be set, 0 indicates forward direction and 1 indicates reverse direction; by setting P62.02 and P62.03, torque acceleration and deceleration rate can be set.

Function code	Name	Setting range	Factory setting
P63.00	Compensating torque direction	0~1	0
P63.01	Compensation torque gain (%)	0~6553.5	100.0
P63.03	Preset torque compensation (%)	0.0~6344.0	0.0

This parameter group is used mainly in applications requiring compensating fixed torque.

## 7.9 P7X group Enhanced control

### 7.9.1 P70 group Limit and protection

Function code	Name	Setting range	Factory setting
P70.00	Frequency upper limit(Hz)	0.00~655.35	50.00
P70.01	Frequency lower limit (Hz)	0.00~655.35	0.00

The maximum output frequency  $f_{\max}$  is the highest frequency allowed to be output by the inverter.

The maximum output voltage  $V_{\max}$  is the output voltage of the inverter when it runs at the basic operating frequency, which corresponds to the rated voltage of the motor when using a standard AC motor. See the motor nameplate.

The upper frequency limit  $f_H$  and lower frequency limit  $f_L$  are the maximum and minimum frequencies of motor operation set by the user according to the requirements of the production process.

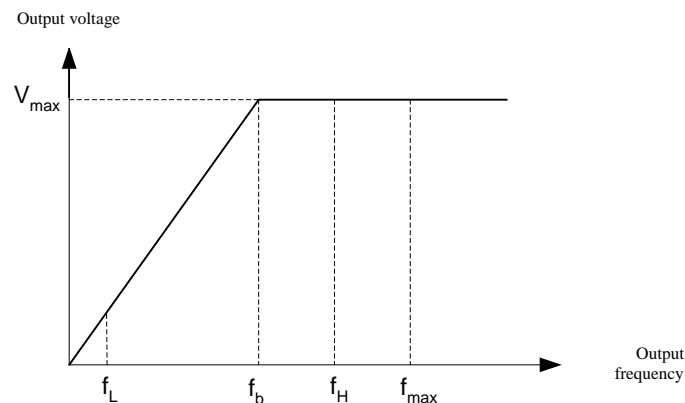


Figure 7 - 32 Diagram of frequency upper and lower limits

Function code	Name	Setting range	Factory setting
P70.02	ID preset limit	0.00~2.00	0.00
P70.03	ID limit gain	0~10000	0

P70.02 is the D axis current preset limiting value. Exceeding this value will enter the speed reduction control.

P70.03 is the ID limiting gain, which determines amplitude value of the speed reduction.

Function code	Name	Setting range	Factory setting
P70.04	Output torque limit (%)	0~250	150
P70.05	Accelerated overcurrent threshold (%)	0~200	160
P70.06	Decelerated overvoltage	540~800	750

Function code	Name	Setting range	Factory setting
	threshold (V)		
P70.07	Overspeed protection coefficient (%)	0.00~655.35	120.00

P70.04 - P70.06 set thresholds for over-current and over-voltage of the inverter. Under normal circumstances, when the set velocity or motor load changes sharply, the output current of the inverter may reach above the overcurrent protection point, resulting in an overcurrent failure. The current limiting function is that the inverter controls the instantaneous output, and limits the rapidly changing output current not to exceed the protection action value, thereby effectively reducing overcurrent faults and ensuring continuous and reliable operation of the system. When the current exceeds a certain value (P70.04), the inverter enters the current-limited state; when running at a constant velocity, the load capacity is stable through current limiting, and there will be no overcurrent fault. When the load becomes lighter, it will automatically exit the current limiting state and resume normal work. This function is especially suitable for the situation of rapid change of velocity or load.

P70.07 sets the overspeed protection value. When the time exceeds the set value of P94.04, the 30#fault will be reported.

Function code	Name	Setting range	Factory setting
P70.08	Special function selection	0~65535	6

Bit0: Overcurrent frequency reduction. Setting this bit to 1 enables the function. Function settings can be set via parameter P70.23~P70.27.

Bit1: Overtemperature frequency reduction. Setting this bit to 1 enables the function. Function settings can be set via parameter P70.29~P70.33.

Bit2: Variable carrier function. Setting this bit to 1 enables the function. Radiator temperature higher than 80 and the temperature rises every 2 degrees, carrier frequency reduces 1kHz (lower limit 2kHz)

Bit6: Undervoltage fault not recorded. Setting this bit to 1 enables the function.

Bit11: GVC energy-saving mode. Setting this bit to 1 enables the function.

Bit13: KEB function. Setting this bit to 1 enables the function. When powered off, motor reduces the speed and generates electricity, compensating the bus voltage and prolonging the trigger time of the undervoltage alarm.

Function code	Name	Setting range	Factory setting
P70.10	PT signal channel	0~3	0
P70.11	PT protection upper threshold (V)	0.0~1000.0	150.0
P70.12	PT protection lower threshold(V)	0.0~1000.0	0.0
P70.13	PT protection action delay time(s)	0.0~10.0	3.0

P70.10 selects the channel of PT signal (0: NC; 1: PT1000/PT100; 2: PTC high resistance; 3: PTC low resistance).

Standard IO board supports the protection logic for high and low resistance of PT1000 and PTC. Optional board supports the IO board of PT100 and can support PT100.

Trigger conditions for fault No. 49 (PT detect fault): "PT value > P70.11" or "PT value < P70.12" for 5 seconds (P70.13 not used);

Clearing conditions for fault No. 49 (PT detect fault): After 5 seconds of a fault, "P70.12 < PT value P70.11", clear the fault.

Function code	Name	Setting range	Factory setting
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Function code	Name	Setting range	Factory setting
P70.19	Bus undervoltage threshold (V)	0~540	380

The default bus undervoltage threshold for 400V class inverter is 380V.

Function code	Name	Setting range	Factory setting
P70.20	Power grid imbalance threshold (%)	10.0~200.0	50.0

Determine the power grid imbalance fault according to the power grid voltage sampling, the threshold can be set according to the on-site power grid conditions.

Function code	Name	Setting range	Factory setting
P70.21	PWM detection delay (ms)	0~65535	800

After the inverter runs, if the output current is 0, the inverter will report 51# fault after the delay of parameter PWM detection.

Function code	Name	Setting range	Factory setting
P70.23	Current-limiting frequency reduction threshold (%)	50~200	120
P70.24	Current limiting KP	0~65.535	0.001
P70.25	Current limiting Ki	0~6.5535	0.0001
P70.26	Current limiting OutMin	0.000~1.000	0.005
P70.27	Current limiting recovery threshold	0~65535	10

P70.23 - P70.27 are overcurrent frequency reduction related parameters, Bit0 setting of P70.08 is required to enable this function. If current exceeds P70.23, the frequency reduction function is enabled.

Function code	Name	Setting range	Factory setting
P70.28	Power grid overvoltage threshold	0~530	530
P70.29	Overtemperature frequency reduction starting temperature	0~100.0	91.0
P70.30	Over-temperature frequency reduction recovery temperature	0~100.0	80.0
P70.31	Over-temperature frequency reduction slope	0~65535	1
P70.32	Up-frequency overtemperature threshold	0~100.0	88.0
P70.33	Overtemperature detection interval	0~655.35	20.00

When Bit1 of P70.08 is 1, the overtemperature frequency reduction function is enabled;

When the module temperature exceeds P70.32 (up-frequency overtemperature threshold), the speed curve pauses and up-frequency stops;

When the module temperature is higher than P70.29 (overtemperature frequency reduction starting temperature), frequency reduction starts, up to the lower limit frequency, with frequency reduction cycle being P70.33 and each frequency reduction quantity being P70.31;

When the module temperature is lower than P70.30, frequency reduction ends, and according to the

quarter cycle of P70.33 and step length of P70.31, restore normal speed.

### 7.9.2 P71 group Special functions

Function code	Name	Setting range	Factory setting
P71.00	Frequency hopping velocity 1 (Hz)	0.00~655.35	0.00
P71.01	Frequency hopping velocity 2 (Hz)	0.00~655.35	0.00
P71.02	Frequency hopping velocity 3 (Hz)	0.00~655.35	0.00
P71.03	Frequency hopping width (Hz)	0.00~655.35	0.00

In order to avoid the mechanical resonance point, you can set the frequency hopping range of the inverter. When the frequency set by the inverter falls within the frequency hopping range, it will automatically adjust to the frequency hopping range. The frequency hopping range can be set from [frequency hopping velocity - 0.5 × frequency hopping width, frequency hopping velocity + 0.5 × frequency hopping width], and three frequency modulation ranges can be set.

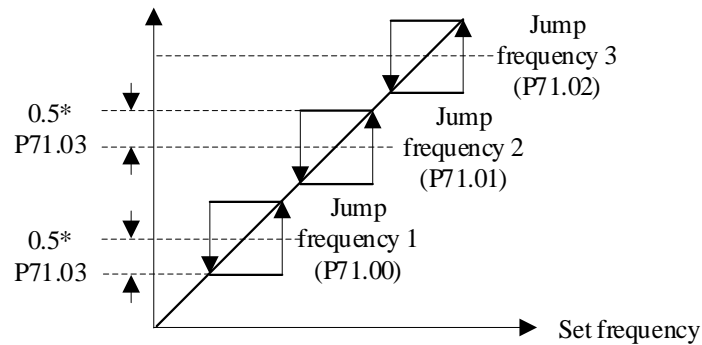


Figure 7-33 Upper and Lower Limits of Frequency Hopping

Function code	Name	Setting range	Factory setting
P71.05	Reversal prohibition	0~1	0
P71.06	Forward and reverse rotation interval time (s)	0.0~6553.5	0.0
P71.07	PWM modulation mode	0~3	1

For some production equipment, reversal may cause equipment damage, which can be disabled by using this function. P71.05 factory default allows reversal and it is set to **1**; Reversal is disabled.

When the rotation direction of the motor is opposite to the direction required by the equipment, you can exchange the wiring of any two terminals on the output side of the inverter to make the forward rotation direction of the equipment the same as that defined by the inverter.

Set P71.06 to realize the waiting time when the inverter goes from forward to reverse (or from reverse to forward) when the velocity passes zero.

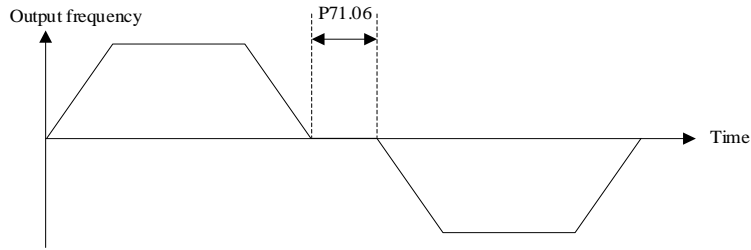


Figure 7-34 Dead Time of Forward and Reverse Rotation

P71.07 function sets the PWM modulation mode. **0**: 5-segment; **1**: 7-segment; **2**: < 30% rpm 7-segment, > 30% 5-segment; **3**: SPWM mode.

Function code	Name	Setting range	Factory setting
P71.14	PWM Carrier frequency (kHz)	1.1~16.000	8.000

Carrier frequency adjustment: When the sound of the variable frequency motor is too loud, the carrier frequency can be increased to make the sound lighter, and the carrier frequency interval can be adjusted by random PWM width.

**Note:** The default carrier frequency is related to the inverter power. The higher the power, the lower the default carrier frequency. If it exceeds the default value, please derate for use.

Function code	Name	Setting range	Factory setting
P71.22	Zero velocity threshold (Hz)	0.0~10.0	0.2

P71.22 sets the zero velocity threshold; the default value is 0.2 Hz, and it is considered as zero velocity when the actual running frequency is lower than the set value.

Function code	Name	Setting range	Factory setting
P71.21	Dead zone compensation mode	1~2	2
P71.23	Forward rotation deadband compensation (%)	0~65535	90
P71.24	Dead zone threshold coefficient (%)	0.0~2.0	0.8

P71.21 supports two dead zone compensation modes.

P71.23 compensates the dead time of the transition between the opening and closing of the upper and lower bridge arms in forward rotation, and the default value is 100%.

Function code	Name	Setting range	Factory setting
P71.29	PWM modulation	0~15	1

PWM modulation mode:

**0**: Underflow update

**1**: Overflow and underflow update

Function code	Name	Setting range	Factory setting
P71.30	Vector control compensation	0~65535	132
P71.31	Inertia compensation coefficient (%)	0.0~6553.5	0
P71.32	Inertia compensation filtering time (ms)	0~1000	5

The above parameters are used to compensate for the acceleration and deceleration performance of large inertia systems.

Function code	Name	Setting range	Factory setting
P71.33	UPDOWN compensation	0.00~20.00	1.0

Used with UPDOWN terminal function enabled.

Function code	Name	Setting range	Factory setting
P71.40	Input shaping type	0~2	0
P71.41	Oscillation frequency	0.00~600.00	0.3
P71.42	Damping coefficient	0~2.00	0.05

P71.40 - P71.42 are anti-swing control algorithm parameters, mainly applied to occasions where anti swing is required, such as stackers, etc.

Function code	Name	Setting range	Factory setting
P71.45	Output shutdown delay	0.00~655.35	0.03

After brake holding, PWM output delay is closed.

Function code	Name	Setting range	Factory setting
P71.49	Power failure detection threshold (V)	380~550	420
P71.50	KEB bus target voltage (V)	380~550	480

P71.49 is generally set to 420. If the KEB process reports a fault, increase the value appropriately with reference to the bus voltage of the inverter.

The value of P71.50 should be greater than that of P71.49 (power failure detection threshold) and lower than the inverter bus voltage during normal power supply. This value can be appropriately increased with reference to the inverter bus voltage.

Function code	Name	Setting range	Factory setting
P71.51	KEB proportion Kp	0~10000	100
P71.52	KEB integral Ki	0~10000	100
P71.53	KEB deceleration upper limit	0.00~100.00	0.50
P71.54	KEB acceleration upper limit	0.00~100.00	10.00
P71.55	KEB deceleration initial limit	0.00~100.00	2.00

The above parameters should be set according to the factory default values, and generally do not need to be changed.

For the Kp in the KEB process, if this value is too small, the KEB time will be too short; if it is too large, it will lead to overvoltage fault of the bus.

For the Ki in the KEB process, if this value is too small, the KEB time will be too short; if it is too large, it will lead to overvoltage fault of the bus.

Function code	Name	Setting range	Factory setting
P71.58	Fan control	0~4	0

- 0: Inverter runs and fan runs; inverter stops and fan stops with a delay of 1 minute;  
 1: Inverter runs and fan runs; inverter stops and fan stops with a delay of 5 minutes;  
 2: Inverter runs and fan runs; inverter stops and fan stops with a delay of 30 minutes;  
 3: Fan runs when the radiator temperature > 40 degrees; fan stops when the radiator temperature < 35 degrees after a delay of 1 second;  
 4: After the inverter is powered on, the fan is always running.

Function code	Name	Setting range	Factory setting
P71.61	Frequency decimal point digits	1~2	2

By this parameter, frequency accuracy can be selected, 1-digit decimal point can be selected for high-speed motors.

Function code	Name	Setting range	Factory setting
P71.62	Function switch	0~65535	5

Special functions enabled, commonly used by debugging personnel.

Bit1: RS485 with RJ45 port virtual oscilloscope control function

Bit2: RS485 with RJ45 port virtual oscilloscope monitoring only function

Bit3: USB port virtual oscilloscope control function.

Bit4: USB port virtual oscilloscope monitoring only function.

Bit9: enabling the function of STO board base blocking (avoid misoperation without STO board)

Bit10: enabling the base blocking function of bit1 of Word0 in PN function.

Function code	Name	Setting range	Factory setting
P71.63	Enable phase-locked function	0~100	0
P71.64	System bypass angle error (degree)	0.01~360.00	3.60
P71.65	System bypass voltage error (V)	1~100	5

When enabling the frequency conversion switching function, set P71.63, enable this function, and detect phase lock status;

P71.64 sets the phase lock completion angle error value;

P71.65 sets the phase lock completion voltage error value.

Function code	Name	Setting range	Factory setting
P71.66	Fan control duty ratio (%)	0~65535	100

This parameter mainly applies to speed-regulating fans with power levels of 22 KW and above.

Function code	Name	Setting range	Factory setting
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Function code	Name	Setting range	Factory setting
P71.70	Deceleration inertia coefficient (%)	0~200	100

The percentage relative to the P71.31 is used to adjust the inertia compensation size of the deceleration section.

## 7.10 P8X group Communication control

### 7.10.1 P80X group Communication mode

Function code	Name	Setting range	Factory setting
P80.00	Communication modes	0~4	2

Select the communication mode used by the inverter now:

0: No communication

1: DP (Backup)

2: Modbus

3: CAN (Backup)

4: SSI

### 7.10.2 Group P81 Modbus communication parameters

Function code	Name	Setting range	Factory setting
P81.00	Baud rate	0~7	7
P81.01	Data format	0~3	0
P81.02	Transmission modes	0~1	1

This machine supports the internationally accepted Modbus protocol, RTU format. See appendix.

P81.00 determines the communication baud rate, and supports 1200-115200 bps.

0:1200bps

1:2400bps

2:4800bps

3:9600bps

4:19200bps

5:38400bps

6:57600bps

7:115200bps

P81.01 sets the communication format, parity check.

0:1-8-1 format, no parity.

1:1-8-1 format, even parity.

2:1-8-1 format, odd parity.

P81.02 sets transmission mode: 0:ASCII; 1:RTU

Function code	Name	Setting range	Factory setting
P81.04	Local address	1~247	1

P81.04 sets local address; 0 is broadcast address; available addresses are 1 - 247; 248 - 255 are reserved.

Function code	Name	Setting range	Factory setting
P81.07	Communication address formats	0~1	1

Select the communication address format, 0: Hexadecimal; 1: Decimal.

### 7.10.3 P82 group (Reserved parameter group)

Function code	Name	Setting range	Factory setting
P82.02	Custom status word 1	0~45	16
P82.03	Custom status word 2	0~45	13
P82.04	Custom status word 3	0~45	10
P82.05	Custom status word 4	0~45	18

P82.02 - P82.05 set the custom status:

- 0: Running status 1
- 1: Running status 2
- 2: Detection status
- 10: Output torque
- 13: Target frequency preset
- 14: Current running frequency
- 15: Feedback speed (Hz)
- 16: Feedback speed (rpm)
- 18: Output voltage valid value
- 19: Output current valid value
- 22: Total output power
- 23: Bus voltage
- 29: Output terminal status
- 31: Input terminal status
- 34: Analog input AIO
- 35: Analog input AI1
- 37: Output DA0
- 38: Output DA1
- 40: Recent fault number
- 43: Radiator temperature

## 7.11 P9X Group Fault and Display Parameter Group

### 7.11.1 P90 group (Reserved parameter group)

### 7.11.2 P91 group LCD display

Function code	Name	Setting range	Factory setting
P91.00	U01 display data	0~63	1
P91.01	U02 display data	0~63	2
P91.02	U03 display data	0~63	3
P91.03	U04 display data	0~63	8
P91.04	U05 display data	0~63	7
P91.05	U06 display data	0~63	6
P91.06	U07 display data	0~63	9
P91.07	U08 display data	0~63	10

A total of 8 LCD display parameters are set, and the following is the display parameter table.

Function settings	Meaning	Function settings	Meaning
0	No definition	1	Target speed (Hz)
2	Preset speed (Hz)	3	Feedback velocity (Hz)
4	Preset speed (rpm)	5	Feedback speed (rpm)
6	Bus voltage (V)	7	Output voltage (V)
8	Output current (A)	9	Output power (kW)
10	Output torque (%)	11	Input terminal status
12	Output terminal status	13	Analog input A0
14	Analog input A1	15	Capacitor discharge reference (s)
16	Capacitor discharge time (s)	17	Target torque (%)
18	Cooler temperature (degree)	19	Accumulated power on time (h)
20	Accumulated running time (h)	21	Remaining power-on time (days)
22	Inverter running status	23	Power grid imbalance (%)
24	Weighing compensation amount	25	Speed deviation rpm
26	Rectifier bridge temperature (degree)	27	AB phase count value
28	CD corresponding pulse count	29	AB phase count at Z signal
30	Times of AB phase being disturbed	31	Times of Z phase being disturbed
32	Encoder sin center point	33	Encoder cos center point
34	Encoder C phase center point	35	Encoder D phase center point
36	Standby	37	Power grid voltage
38	Bus maximum during running	39	SPI communication abnormality count
40	, analog output M0	41	, analog output M1
42	Weighing (%)	43	IO board type
44	Wave-by-wave current limit time	45	U phase AD sampling value
46	V phase AD sampling value	47	W phase AD sampling value
48	Cia402 status	49	Cia402 jump instruction
50	Object dictionary Ai1	51	Object dictionary Ai2
52	Braking status	53	Braking voltage (V)

Function settings	Meaning	Function settings	Meaning
57	PID reference value	58	PID feedback value
63	Encoder speed (Hz)		

### 7.11.3 Group P93 Operation record parameters

Function code	Name	Setting range	Factory setting
P93.00	Accumulated power on time (h)	0.000~65.535	0.000
P93.01	Accumulated running time (h)	0.000~65.535	0
P93.02	Set total power-on time (days)	0~30000	0
P93.03	Remaining power-on time (days)	0~30000	0
P93.04	The highest value of heat sink temperature (degree)	0.000~6553.5	0.0

The inverter can automatically record the following information: the accumulated power on time of this machine, the accumulated running time of this machine, and the maximum radiator temperature.

Function code	Name	Setting range	Factory setting
P93.05	Cumulative output power (kWh)	0.0~6553.5	0.0

The cumulative sum of the power output per unit time of the inverter from the start of operation after power-on, in kWh.

Function code	Name	Setting range	Factory setting
P93.06	Inverter output power (MWh)	0~65535	0

The cumulative sum of the power output per unit time of the inverter from the start of operation after power-on, in MWh.

Function code	Name	Setting range	Factory setting
P93.07	Cumulative fan running time (h)	0~65535	0

It is the inverter fan running time, and the unit is h.

Function code	Name	Setting range	Factory setting
P93.08	Record maximum current (A)	/	0
P93.09	Record maximum power (KW)	/	0

### 7.11.4 P94 group Fault processing

Function code	Name	Setting range	Factory setting
P94.00	Minor fault processing	0~3	1
P94.01	Automatic reset time of fault (s)	0.0~65535.5	10.0
P94.02	Automatic reset times of fault	0~65535	0

P94.00 sets the fault handling mode:

- 0: No fault relay output when a light fault is observed;  
 1: Output the fault relay when a light fault is observed;  
 2: When 52# PTC fault occurs, output fault relay and shut down, and the fault does not automatically reset;  
 3: Both 1 and 2 are valid.

P94.01 sets the auto-reset time, and the default is 10 seconds.

P94.02 sets the number of auto-reset within 30 minutes; default is not auto-reset; auto-reset fault may trigger dangerous system operation, please use with caution.

Function code	Name	Setting range	Factory setting
P94.03	Cooler overheat time (s)	0.0~18.0	0.5
P94.04	Overspeed protection time (s)	0.00~180.00	1.00
P94.05	Bus fluctuation voltage threshold (V)	30~150	100

P94.03 sets the protection time for cooler overheat protection (3#fault). When the cooler temperature exceeds 80 degrees, the protection time P94.03 will be performed;

P94.04 sets the acknowledging time for overspeed protection (30#fault);

P94.05 sets the determining voltage drop value of bus fluctuation voltage threshold (Fault No. 29). When input voltage fluctuation is greater than P94.05 value protection, it can be increased in unstable power grid areas;

Function code	Name	Setting range	Factory setting
P94.08	Output phase loss determination (s)	0.000~65.535	2.000
P94.09	Fault shielding function	0~65535	0
P94.10	CD phase mismatch threshold	9~65535	300
P94.11	ABZ protection threshold (%)	1~100	20

The input phase loss acknowledging time set by P94.08 is only detected during normal operation or encoder dynamic self-learning, and when the phase current is continuously greater than the time of P94.08.

P94.09 fault shielding function, Bit0 setting to 1 can shield power grid voltage faults, Bit1 setting to 1 for bus undervoltage faults, and Bit2 setting to 1 for shield fan fault detection.

P94.10 sets the threshold for CD phase stagger judgment:

- ① SinCos encoder, protection if the difference between AB signal and CD signal exceeds 94.10 for 500 ms;
- ② Protection if the difference between the absolute position of Endate and the position of AB signal exceeds 94.10.

P94.11 is ABZ protection threshold for incremental encoders:

When P10.00 = 3, feedback speed is less than 1%, and when speed error is large, there is protection after it lasts for 400 ms.

Function code	Name	Setting range	Factory setting
P94.13	I <sup>2</sup> t protection option	0~3	0

I<sup>2</sup>t protection option:

0: I<sup>2</sup>t protection works;

1: Protection faults only with 45# or 46 #, for frequent start and stop applications;

2: Protection faults only with 21# or 27#, for continuous overload applications;

3: I<sup>2</sup>t not protecting.

Function code	Name	Setting range	Factory setting
P94.14	Analog A0 disconnection value (%)	0.0~100.0	50.0

The disconnection detection value of analog A0/A1 input signal is the percentage relative to 10 V. If the analog A0/A1 input voltage is lower than 10V multiplied by the value of P94.14, the analog input is considered disconnected.

Function code	Name	Setting range	Factory setting
P94.15	Speed deviation	0.0~655.35	0.0

Default 0 represents blocking this fault detection. Setting it to non-zero value enables speed deviation detection.

Function code	Name	Setting range	Factory setting
P94.16	Analog troubleshooting	0~1	0

If the inverter reports an abnormal analog input failure, P94.16 sets the operation mode of the inverter.

0: Disabling protection;

1: Enabling protection;

Function code	Name	Setting range	Factory setting
P94.18	Communication protection	0~1	1
P94.19	Communication disconnection protection time (s)	0.000~65.535	2.000

P94.18 communication protection: 0: Not enabling; 1: Enabling communication protections.

After the normal communication interruption for the value of P94.19, 43#fault is reported.

Function code	Name	Setting range	Factory setting
P94.20	Grounding protection times (times)	0~60000	20

Used to set the confirmation times of No.32 fault.

### 7.11.5 P95 group Version

Function code	Name	Setting range	Factory setting
P95.00	Inverter hardware version		580.04
P95.01	Inverter software version		100.01

Function code	Name	Setting range	Factory setting
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Function code	Name	Setting range	Factory setting
P95.02	Version number		6.04
P95.03	Drive board software version		2.0

The P95 group mainly displays the software and hardware version parameters of the inverter, which are generally set directly by the manufacturer.

### 7.11.6 P96 group Inverter information

Function code	Name	Setting range	Factory setting
P96.00	Rated power of inverter (kW)	0.0~999.9	/
P96.01	Rated current of inverter (A)	0.0~999.9	/
P96.02	Inverter light load current (A)	0.0~999.9	/
P96.03	Rated voltage of inverter (V)	0~460	/
P96.04	Inverter power coefficient (%)	0~99	/
P96.05	Current sensor current (A)	0~9999	/
P96.06	IGBT module (A)	0~9999	/
P96.07	Braking IGBT (A)	0~9999	/
P96.08	Three-phase current balance coefficient (%)	0.800~1.200	1.000
P96.09	Rated current (480 V)	Per power	/
P96.10	Light load current (480 V)	Per power	/

The P96 group mainly displays the fixed parameters of the inverter, which are generally set directly by the manufacturer.

P96.00~P96.04, being initially set by the manufacturer;

P96.05~P96.08 are parameter settings of the inverter itself, which are determined by the hardware and read-only.

P96.09 - P96.10 are the current derating under 480 V level input voltage working conditions.


Function code	Name	Setting range	Factory setting
P96.20	Inverter model	0~2	0


Setting to 0 indicates light load (standard), 1 indicates heavy load (standard), and 2 indicates light load (ES).



## Chapter 8 Fault checking

This chapter gives a detailed description of the inverter fault, fault code, content, causes and countermeasures, and gives an analysis process of various failures during motor debugging and operation.

 <b>Danger</b>
<ul style="list-style-type: none"> <li>⊙ <b>Maintenance operation should be carried out after the input power supply is disconnected for 10 minutes. At this time, the charging indicator is completely off or the DC bus voltage is lower than 24VDC.</b> Otherwise, there is a risk of electric shock.</li> <li>⊙ <b>Never modify the inverter by yourself.</b> Otherwise, there is danger of electric shock and personal injury.</li> <li>⊙ <b>Please contact professional electrical engineers for maintenance. Do not leave wire ends or metal objects inside the inverter.</b> Otherwise, there is a risk of fire.</li> </ul>

 <b>Caution</b>
<ul style="list-style-type: none"> <li>⊙ <b>Do not change the wiring and disconnect the terminal when the power is on.</b> Otherwise, there is a risk of electric shock.</li> </ul>

### 8.1 Protection and inspection functions

See Table 8.1 Fault Table for the fault causes and countermeasures corresponding to the fault codes of inverter.

Table 8.1 Fault Table

Error code	Fault display	Possible causes	Countermeasures
1	Module overcurrent protection	Overvoltage at DC terminal	Check the power supply of the power grid and check whether the high inertia load stops quickly without dynamic braking
		Short circuit in the periphery	Check whether the motor output wire is short connected and whether it is short connected to ground
		The output has a phase gap	Check whether the motor and output wire become loose
		Encoder fault	Check whether the encoder is damaged or whether the wiring is correct
		Poor or damaged hardware contact	Request for maintenance of professional and technical personnel.
		Internal connector of inverter becomes loose	Request for maintenance of professional and technical personnel.
		The power circuit parts are overheated due to the problem of cooling fan or cooling system.	Check the cooling fan. Check whether the cooling fan power supply is correct and whether it is blocked by dirt.
Warning: The inverter operation must be started after clearing the fault cause to avoid damage to IGBTs.			
3	Radiator overheating	Excess environment temperature	Reduce the environment temperature and strengthen ventilation and heat dissipation Keep the ambient temperature below 40° or

Error code	Fault display	Possible causes	Countermeasures
			check the capacity of the inverter according to this performance
		Damage to the cooling fan or foreign objects entering the cooling system	Check whether the power cord of the fan is connected properly, or replace the fan with the same model one and remove foreign objects
		Abnormal cooling fan	Check the cooling fan. Check whether the cooling fan power supply is correct and whether it is blocked by dirt.
		A failure in the temperature detection circuit	Request for maintenance of professional and technical personnel.
7	Speed deviation	The acceleration time is too short	Extend the acceleration time
		The load too is large	Alleviate the load
		Current limit is too low	Appropriately increase the current limit value within the allowable range
8	(In accelerated running) bus overvoltage protection	Abnormal voltage of the input power	Check the input power supply
		Quick start again in motor high-speed rotation	Start after the motor stops running
	(In decelerated running) bus overvoltage protection	Excessive load moment of inertia	Use appropriate dynamic braking components
		The deceleration time is too short	Extend the deceleration time
		Brake resistance is too large or not connected	Connect a suitable brake resistance
	(In constant-speed running) bus overvoltage protection	Input power exception	Check the input power supply
		Excessive load moment of inertia	Use appropriate dynamic braking components
9	Bus undervoltage	The power voltage is below the minimum working voltage of the equipment	Check the input power supply
		Momentary power failure	Check the input power supply. After the input power supply is normal, reset and restart
		Voltage variation of input power supply is too large	
		The connecting terminal of the power supply is loose	Check the input wiring
		Abnormal internal switching power supply	Request for maintenance of professional and technical personnel.
		There is a load with high starting current in the same power system	Change the power system to meet the specification value
10	Output phase loss	Abnormal wiring, missing connection or disconnection at the inverter output side	Check the wiring at the inverter output side according to the operating instructions to eliminate the missing connection and disconnection
		Loose output terminal	Adjust the inverter capacity or motor capacity
		The motor power is too small and is below 1/20 of the maximum applicable motor capacity of the	

Error code	Fault display	Possible causes	Countermeasures
		inverter	
		Output three-phase imbalance	Check whether the motor wiring is intact Disconnect the power and check whether the terminal characteristics are consistent at the inverter output side and DC side
17	Overspeed in the same direction (within the maximum speed allowed)	Encoder parameter setting is incorrect or disturbed	Check encoder circuit
		Excessive positive load or sudden load change	Check the external causes for sudden load change
18	Overspeed in the reverse direction (within the maximum speed allowed)	Encoder parameter setting is incorrect or disturbed	Check encoder circuit
		Excessive reverse load or sudden load change	Check the external causes for sudden load change
21	abc overcurrent (three-phase instantaneous value)	Motor single phase short circuit to ground	Check the motor and output line loop
		Encoder fault	Check whether the encoder is damaged or whether the wiring is correct
		Drive board detection circuit error	Replace the drive board
27	Output overcurrent (valid value)	Running for too long in an overload status, the greater the load, the shorter the time	Stop running for a period of time, and if it reappears again after running, check whether the load is in the allowed range
		Motor stalling	Check the motor or brake
		Motor coil short circuit	Check the motor
		Output short circuit	Check the wiring or motor
29	Abnormal bus fluctuation	Input side voltage anomaly	Check the network voltage
		Input voltage phase missing	
		The input side connecting terminal is loose	Check the input terminal wiring
		Rectifier module damaged	Check whether the rectifier module is damaged
30	Overspeed protection (exceeding the maximum speed protection limit)	Encoder parameter setting is incorrect or disturbed	Check encoder circuit
		Load sudden change	Check the external causes for sudden load change
		Overspeed protection parameter setting error	Check the parameter
31	Motor I2T overcurrent	Low grid voltage	Check the input power supply
		Sudden load change during running	Reduce the sudden load change frequency and amplitude
		The motor parameters are not set normally	Correctly set the motor parameters
		Encoder parameter setting is incorrect or disturbed	Check encoder circuit
32	Ground protection	Wiring error	Correct the false wiring according to the user's manual

Error code	Fault display	Possible causes	Countermeasures
		Motor abnormality	To replace the motor, the ground insulation shall be tested first
		The earth-leakage current is too large on the output side of inverter	Request for maintenance of professional and technical personnel.
34	External fault	There is an external input failure signal	Check external failure causes
35	PT detection error	PT detection signal exceeds the set threshold	Check whether the motor temperature is too high or if the PT sensor is abnormal
37	Current sensor failure	Driver board hardware failure	Request for maintenance of professional and technical personnel.
39	Excessive current instantaneous value	Alarm of excessive three-phase current instantaneous value when Ia, Ib and Ic are not running	Request for maintenance of professional and technical personnel.
42	Braking IGBT short circuit protection	Braking resistor has short circuit	Request for maintenance of professional and technical personnel.
43	Communication error	Communication disconnection No communication data received at a fixed time	Check the communication signal line
44	Fault of drive board communication	Connection between the main control board and the driver board is abnormal	Check whether the drive board cable is connected properly
45	I <sub>2t</sub> instantaneous overcurrent value	IGBT overheating	Request for maintenance of professional and technical personnel.
46	I <sub>2t</sub> valid overcurrent value	IGBT overheating	Request for maintenance of professional and technical personnel.
47	Analog input error	Disconnected analog input signal Abnormal analog input signal	1. Modify related parameters 2. Check the analog input signal
48	Fault of POWERID	Abnormal drive board program	Check whether the drive board updates the program normally or whether the drive board chip works normally
49	Fault of wave-by-wave current limiting	Abnormal load Abnormal drive control	Check whether the load or motor control is abnormal
51	Running output current error	Improper parameter settings Disconnection between the inverter and the motor Failure of inverter hardware	Check the parameter P70.21 Check the connecting line Request for maintenance of professional and technical personnel.
52	Abnormal drive 15 V power supply	Abnormal drive board power circuit	Request for maintenance of professional and technical personnel.
53	Abnormality of braking resistor wiring	Brake resistor connecting terminal position error	Check whether the braking resistor wiring is abnormal
54	Fault of	Abnormal power grid	Power grid voltage imbalance too large

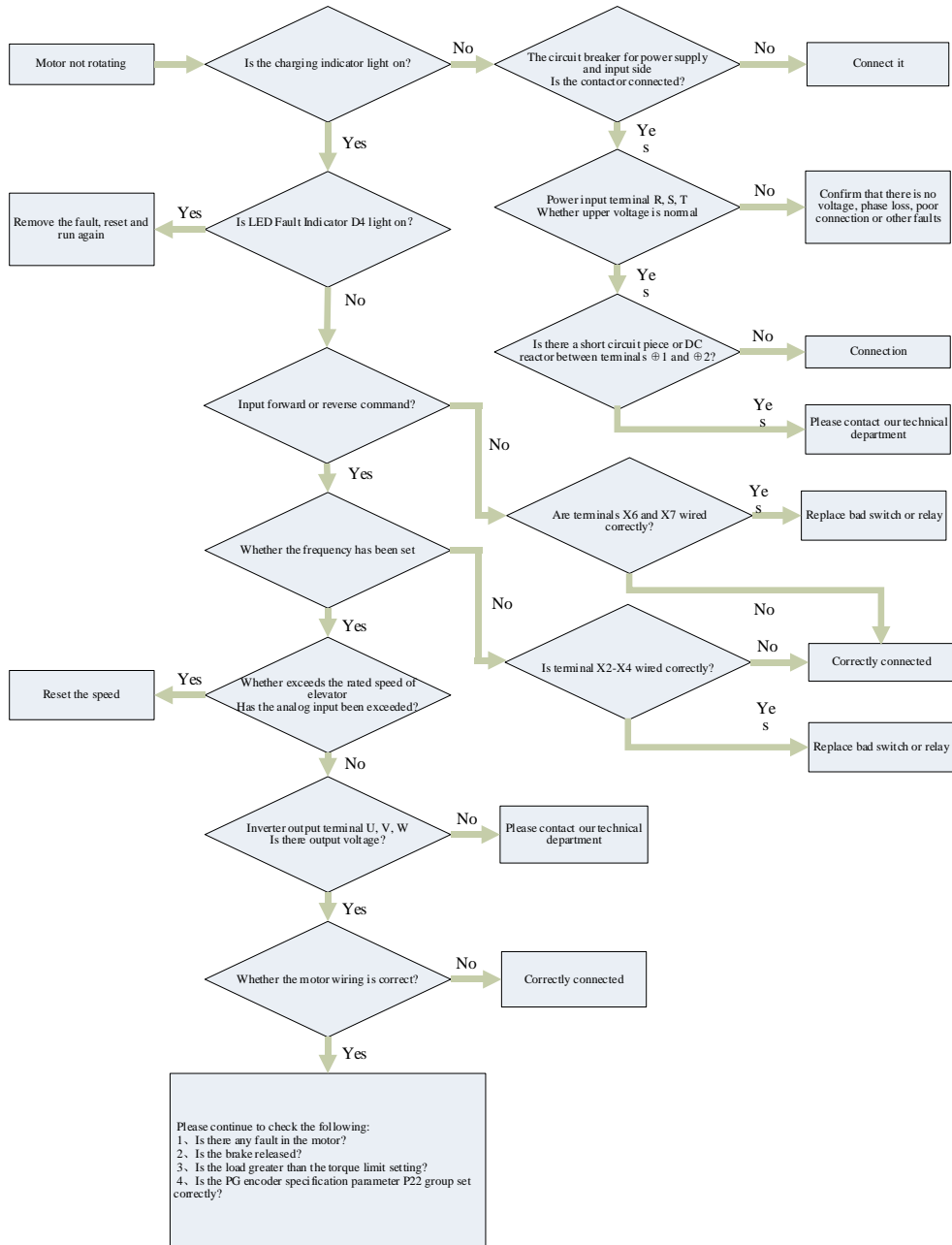
Error code	Fault display	Possible causes	Countermeasures
	power grid imbalance	voltage Abnormal drive board sampling circuit	Abnormal circuit sampling
55	Fault of power grid phase sequence	Abnormal input wiring	Adjust the input wiring order
56	Fault of power grid undervoltage	Power grid voltage below 300 V	The network voltage is too low Abnormal drive board communication
57	Fault of power grid overvoltage	Power grid voltage over 540 V	Power grid voltage too high Abnormal drive board communication

## 8.2 Fault diagnosis process

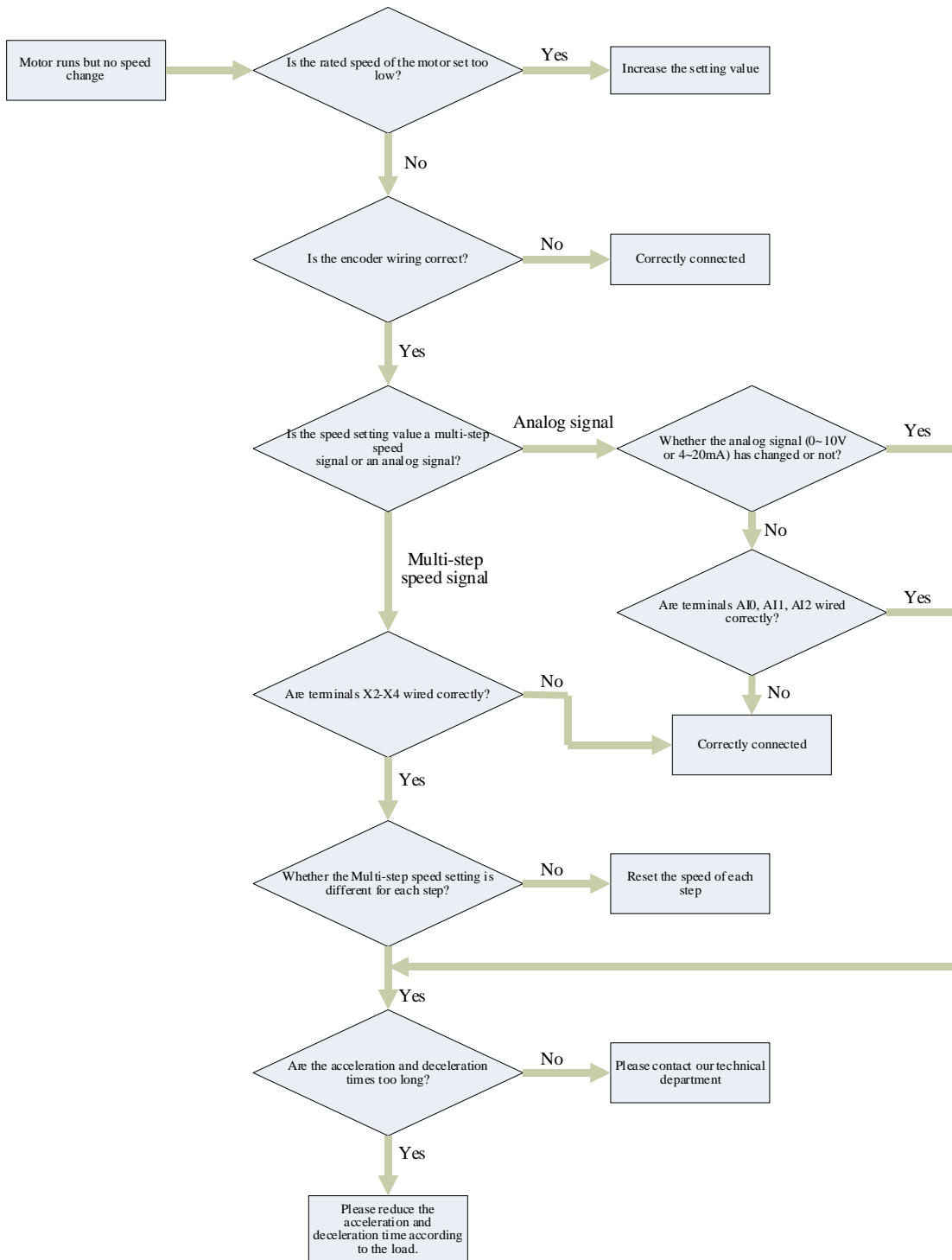
When the system is started, the inverter and motor may sometimes run out of the set due to the error of parameter setting and wiring. In this case, please refer to the fault diagnosis process introduced in this section for analysis and handling.

[Abnormal motor running]:

- When there is a running instruction on the control terminal, the motor does not rotate:




■ Motor runs without velocity change:






## Chapter 9 Care and Maintenance

This chapter contains the general information on care and maintenance.

 <b>Danger</b>
<ul style="list-style-type: none"> <li>◎ <b>Maintenance operation should be carried out after the input power supply is disconnected for 10 minutes. At this time, the charging indicator is completely off or the DC bus voltage is lower than 24VDC.</b> Otherwise, there is a risk of electric shock.</li> <li>◎ <b>Never modify the inverter by yourself.</b> Otherwise, there is danger of electric shock and personal injury.</li> <li>◎ <b>Please contact professional electrical engineers for maintenance. Do not leave wire ends or metal objects inside the inverter.</b> Otherwise, there is a risk of fire.</li> </ul>

 <b>Caution</b>
<ul style="list-style-type: none"> <li>◎ <b>Do not change the wiring and disconnect the terminals when the power is on.</b> Otherwise, there is a risk of electric shock.</li> </ul>

### 9.1 Warranty period

The company will provide warranty services for the inverter (main body) in the following cases:

In case of any failure or damage in normal use, the manufacturer shall be responsible for the warranty within the warranty period (from the date of delivery). The reasonable maintenance fees will be charged after expiration date of the warranty period.

However, even during the warranty period, the failure caused by the following reasons will be charged:

- 1) Problems caused by non-use in accordance with the instruction manual or self-repair or modification without permission.
- 2) Problems caused by use beyond standard specifications.
- 3) Drops after purchase or damage during transportation.
- 4) Damage caused by earthquake, fire, flood, lightning strike, abnormal voltage or other natural disasters and the causes associated with disasters.

### 9.2 Product inquiry

In case of any product damage, failure or other problems, please contact our office or after-sales service department for the following items.

Inverter model

Production serial number

Date of purchase

Problems requiring contacting include: damage, unclear problems and faults.

### 9.3 Routine inspection

When the inverter is powered on and running, its shell should not be removed, and the operation status of inverter should be checked by external visual inspection. The following items can be checked in routine inspection:

- 1) Whether the surrounding environment meets the standard specifications;
- 2) Whether the operation performance meets the standard specifications;
- 3) Whether there is abnormal noise, vibration and abnormality;
- 4) Whether the cooling fan installed on the inverter operates normally;
- 5) Whether there is overheating.

## 9.4 Periodic inspection

During regular inspection, stop running first, and remove the shell after cutting off the power supply. At this time, there is still charging voltage on the energy storage capacitor in the main circuit, so, the discharging will take some time. Therefore, the inspection can only be after the charging indicator is off, and a multimeter is used to test that the DC bus voltage is lower than the safe value (below DC 24V)

If you touch the terminal immediately after cutting off the power supply, there will be a danger of electric shock.

See Table 9.1 for the regular inspection items.

Table 9.1 Regular Inspection Items

Inspection part	Inspection item	Method of inspection	Judgment criteria	
Operating environment	<ol style="list-style-type: none"> <li>1) Confirm the ambient temperature, humidity, vibration and existence of dust, corrosive gas, oil mist, water droplets, etc.</li> <li>2) Whether there are any dangerous goods around</li> </ol>	<ol style="list-style-type: none"> <li>1) Visual inspection, thermometer, hygrometer</li> <li>2) Visual inspection</li> </ol>	<ol style="list-style-type: none"> <li>1) The ambient temperature is lower than 40°C. Humidity and other requirements meet environmental requirements</li> <li>2) No dangerous goods</li> </ol>	
Liquid crystal display	<ol style="list-style-type: none"> <li>1) Whether the LCD display is clear and the backlight is uniform</li> <li>2) Whether there are missing LCD characters displaying</li> </ol>	Visual inspection	<ol style="list-style-type: none"> <li>1) Uniform backlight</li> <li>2) Normal display</li> </ol>	
Connector Terminals and bolts	<ol style="list-style-type: none"> <li>1) Whether the bolt is loose</li> <li>2) Whether the connector is loose</li> </ol>	<ol style="list-style-type: none"> <li>1) Tighten</li> <li>2) Visual inspection</li> </ol>	<ol style="list-style-type: none"> <li>1) No abnormalities</li> <li>2) Secure installation</li> </ol>	
Main circuit	Wire	<ol style="list-style-type: none"> <li>1) Whether the protective layer is cracked and discolored</li> <li>2) Whether the shape of the connecting copper bar is deformed</li> </ol>	Visual inspection	No abnormalities
	Electromagnetic contactor and relay	<ol style="list-style-type: none"> <li>1) Whether there is vibrating sound at work</li> <li>2) Whether the contact is closed</li> </ol>	Auditory and visual inspection	<ol style="list-style-type: none"> <li>1) None</li> <li>2) There is contact closing sound</li> </ol>
	Energy storage electrolytic capacitor	<ol style="list-style-type: none"> <li>1) Whether there is leakage, discoloration, cracking and shell expansion</li> <li>2) Whether the safety valve comes out and whether the valve body expands significantly</li> </ol>	Visual inspection	No abnormalities
	Cooling fin	<ol style="list-style-type: none"> <li>1) Whether there is dust accumulation</li> <li>2) Whether the fan duct is blocked or attached with foreign objects</li> </ol>	Visual inspection	No abnormalities
	Cooling fan	<ol style="list-style-type: none"> <li>1) Whether there is abnormal noise</li> <li>2) Whether there is abnormal vibration</li> <li>3) Whether it is discolored and deformed due to overheating</li> </ol>	<ol style="list-style-type: none"> <li>1) Auditory and visual inspection, turn the fan blade by hand after cutting off the power supply</li> <li>2) Visual inspection</li> <li>3) Visual inspection, sense of smell</li> </ol>	<ol style="list-style-type: none"> <li>1) Smooth rotation</li> <li>2), 3) No abnormalities</li> </ol>

Inspection part		Inspection item	Method of inspection	Judgment criteria
Control circuit	Connection plug-ins	Whether there is dust and foreign object attached on the double row connection plug-in between the control panel and the main circuit	Visual inspection	No abnormalities
	Control panel	1) Whether there is discoloration and odor on the control circuit board 2) Whether the circuit board is cracked, damaged or deformed	1) Visual inspection, sense of smell 2) Visual inspection	No abnormalities



# Appendix A EMC Installation Guide for the Inverter

This appendix introduces the EMC design and installation guide for the inverter from the aspects of noise suppression, wiring requirements, grounding, surge absorption of external equipment, current leakage, installation area division and installation precautions, power filter use, radiation noise treatment, etc., for the reference of inverter users.

## A.1 Noise suppression

The working principle of the inverter determines that it will produce certain noise. Its influence on peripheral equipment is related to type and propagation path of noise, and design, installation, wiring and grounding of transmission system.

### A.1.1 Type of noise

Type of noise is shown in Figure A-1.

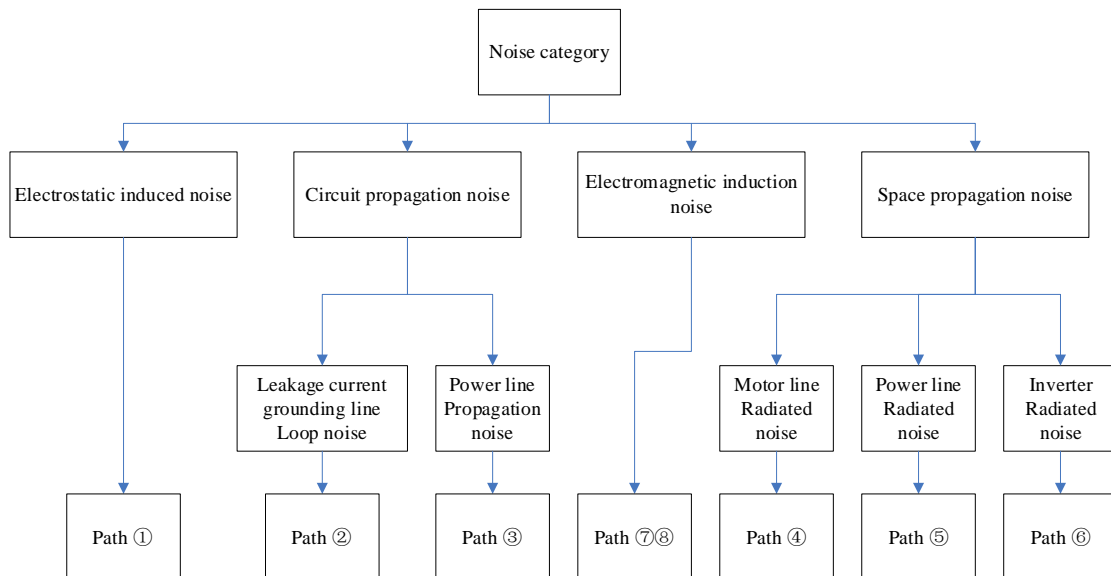


Figure A-1 Schematic Diagram of Noise Types

### A.1.2 Propagation path of noise

Propagation path of noise is shown in Figure A-2.

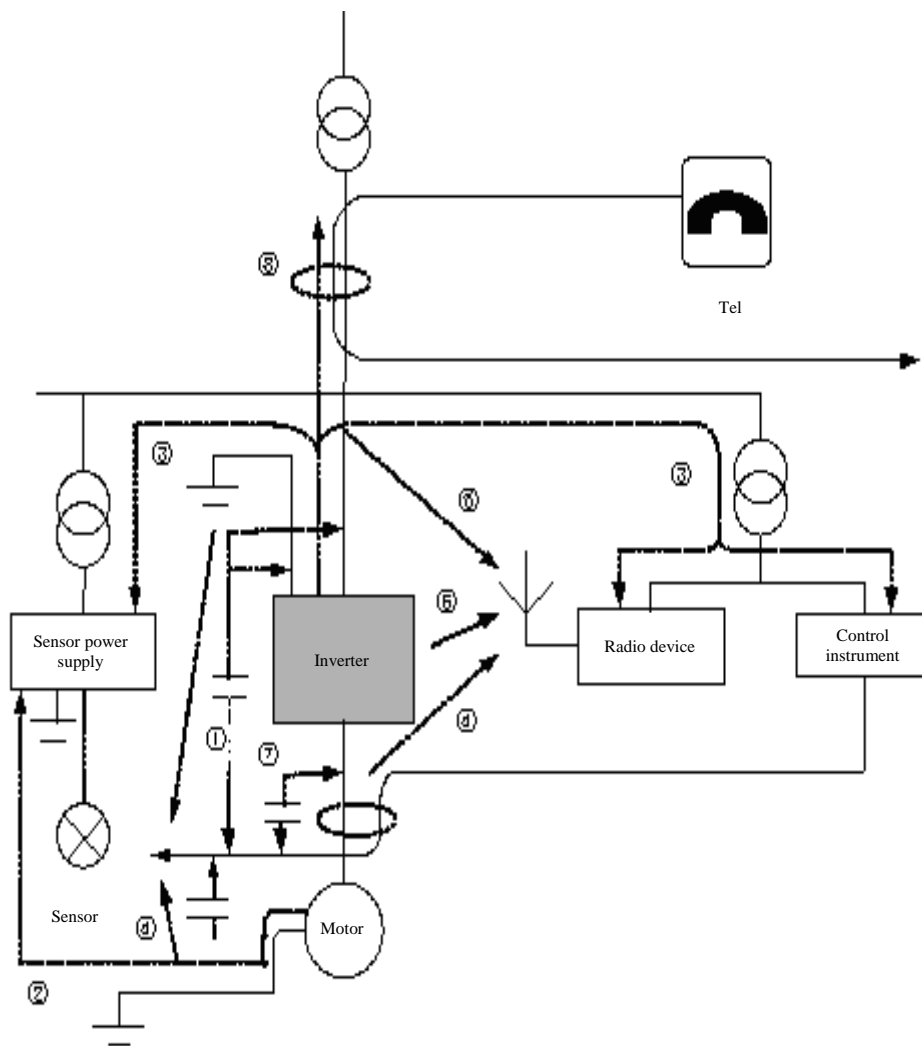


Figure A-2 Schematic Diagram of Noise Propagation

### A.1.3 Basic countermeasures for noise suppression

The basic countermeasures for noise suppression are shown in Table A.1.

Table A.1 Basic Countermeasures for Noise Suppression

No.	Cause	Countermeasures
① ⑦ ⑧	If the signal line is wired in parallel with the power line or bundled with the power line, the noise will propagate along the signal line due to electromagnetic induction and electrostatic induction, which will cause the misoperation of peripheral equipment.	<ol style="list-style-type: none"> <li>1. Avoid parallel wiring and bundled wiring of signal lines and power lines;</li> <li>2. Keep the susceptible peripheral equipment away from the inverter as far as possible;</li> <li>3. Keep the susceptible signal lines away from the input and output cables of the inverter as far as possible;</li> <li>4. Shielded wires are used for signal wires and power wires, and which will have a better performance if they are respectively sheathed with metal tubes (the distance between metal tubes should be at least 20cm), .</li> </ol>
②	When the peripheral equipment forms a closed loop through the wiring of the inverter, the current leakage of grounding wire to the inverter will cause the misoperation of peripheral equipment.	At this time, if the peripheral equipment is not grounded, the misoperation caused by leakage current will be eliminated.

No.	Cause	Countermeasures
③	When the peripheral equipment and the inverter operate in the same power supply system, the noise generated by the inverter propagates along the power line, which may cause the misoperation of other peripheral equipment connected in the system.	Install a noise filter at the input end of the inverter, or isolate other peripheral devices from noise with an isolation transformer/power filter.
④ ⑤ ⑥	If the peripheral equipment, such as control computers, measuring instruments, radio devices, sensors and other weak current devices and their signal lines, is installed in the same control cabinet with the inverter and the wiring is close to the inverter, it will cause misoperation due to radiation interference.	<ol style="list-style-type: none"> <li>The susceptible peripheral devices and their signal lines should be installed as far away from the inverter as possible. The signal lines should be shielded lines, with the shielding layer grounded, and the signal cables sheathed into the metal tube and stay as far away from the inverter and its input and output cables as possible. If the signal line must pass through the input and output cables of the inverter, they must be orthogonal.</li> <li>Install the radio noise filter or linear noise filter (ferrite common mode choke) on the input and output sides of the inverter respectively, which may suppress noise radiation from input and output cables of the inverter;</li> <li>The cable from the inverter to the motor should be placed in a thick barrier, such as a pipe more than 2mm thick or a cement tank. The cable should be sheathed into a metal tube and shielded and grounded (the motor cable can be a 4-core cable, one of which is grounded at the inverter side and the other side is connected to the motor shell).</li> </ol>

## A.2 Distribution requirements

### A.2.1 Cable laying requirements

In order to avoid interference with mutual coupling, the control signal cable should be laid separately from the power cable and the motor cable to ensure a sufficient distance as far as possible, as shown in Figure A-3(a). When the control signal cable must pass through the power cable or the motor cable, the orthogonal crossing between them should be ensured, as shown in Figure A-3(b).

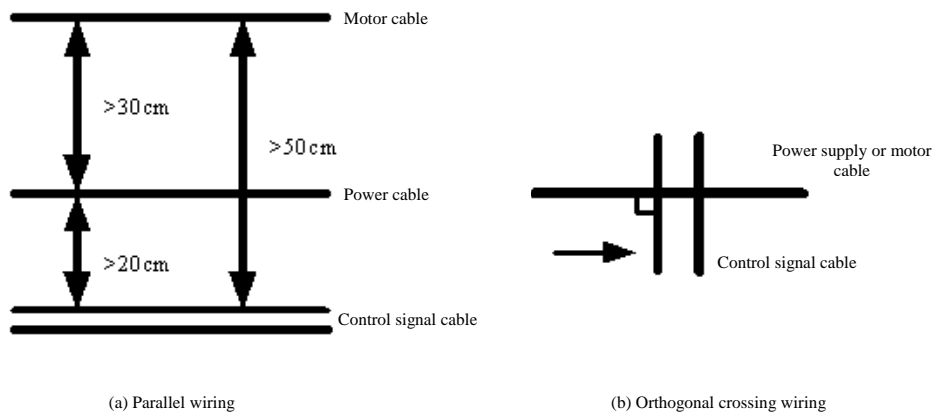


Figure A-3 Wiring Requirements

### A.2.2 Requirements for cable cross-sectional area

The larger the cross-sectional area of the cable, the greater the capacitance to the ground and the greater the leakage current to the ground. Therefore, if the cross-sectional area of motor cable is too large, it should be derated to reduce the output current (the current will be reduced by 5% for each increase of the cross-sectional area).

### A.2.3 Requirements for shielded cables

The high-frequency and low-impedance shielded armored cables, such as braided copper wire mesh and aluminum wire mesh, should be used.

### A.2.4 Requirements for shielded cable installation

Generally, the control cable should be a shielded cable, and the shielded wire mesh must be connected to the metal cabinet by 360° loop connection through cable clamps at both ends, as shown in Figure A-4. The shielding grounding method as shown in Figure A-5 is wrong.

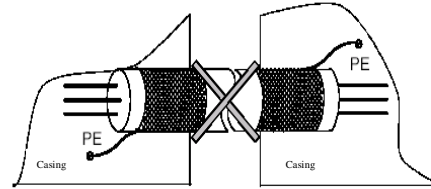
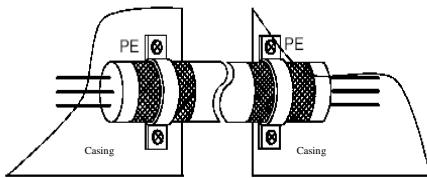


Figure A-4 Correct Shield Grounding Method

Figure A-5 Incorrect Shield Grounding Method

## A.3 Grounding

### A.3.1 Grounding mode

See Figure A-6 for the grounding mode of grounding electrode.

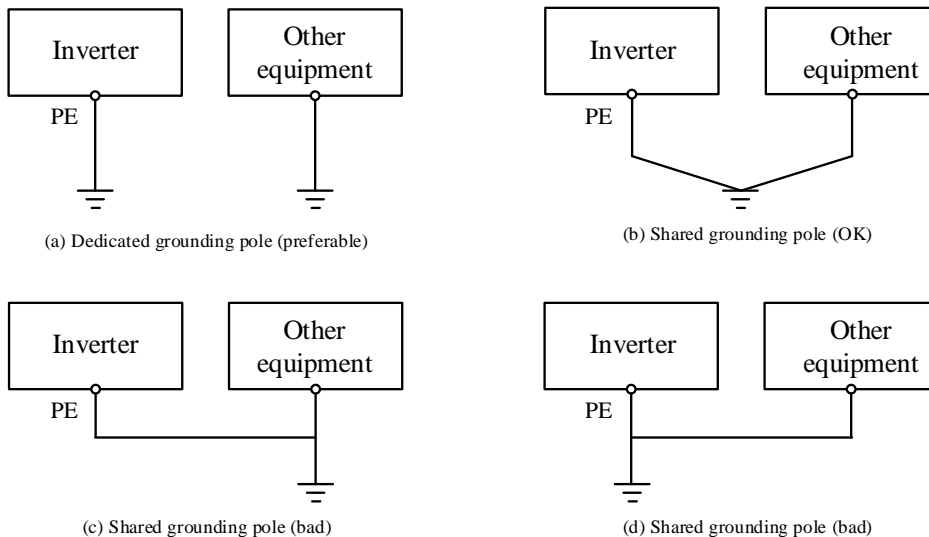


Figure A-6 Schematic Diagram of Special Grounding Electrode

Among the four grounding modes in the above figure, method (a) is the best one, users are advised to use this method for grounding as much as possible.

### A.3.2 Precautions for grounding cables

- (1) The grounding cable with standard section should be selected as much as possible to ensure that the grounding impedance is as small as possible. As the high frequency impedance of flat cable is smaller than that of circular conductor, it is better to choose flat cable with the same cross-sectional area.
- (2) The grounding cable should be as short as possible, and the grounding point should be as close to the inverter as possible.
- (3) If a four-core cable is used as the motor line, one of the four-core cable must be grounded at the inverter side, and the other side must be connected to grounding end of the motor. If the

motor and inverter are equipped with their own dedicated grounding electrodes, the best grounding performance can be achieved.

- (4) When the grounding terminals of all components in the control system are connected together, the noise source formed by grounding leakage current will affect other peripheral devices other than the inverter in the control system. Therefore, in the same control system, the grounding of the inverter should be separated from that of weak current equipment such as computer, sensor or audio equipment to avoid connection together.
- (5) In order to obtain lower high-frequency impedance, the fixing bolts of each equipment can be used as the high-frequency terminals connected to the back panel of the cabinet. Please pay attention to removing the insulating paint at the fixing points during installation.
- (6) The grounding cable should be laid far away from the wiring of I/O part of noise-sensitive equipment, and the ground cable should be as short as possible.

#### A.4 Installation of surge absorber

A large number of noise-producing devices such as relays, contactors and electromagnetic brakes must be equipped with surge suppressors even if they are installed outside the inverter chassis, as shown in Figure A-7.

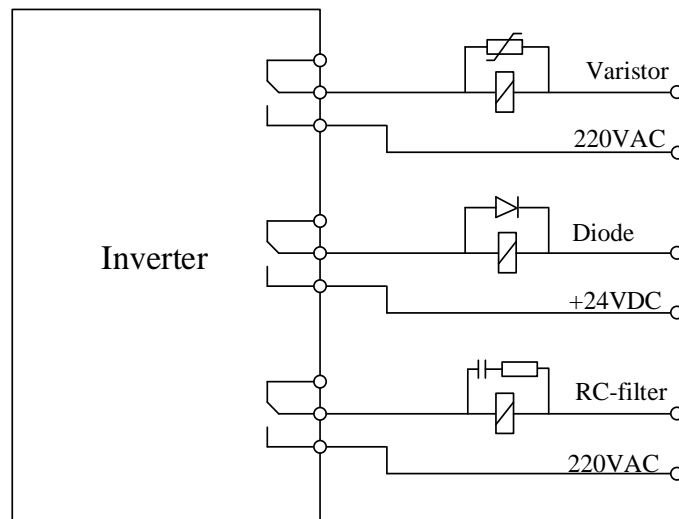


Figure A-7 Requirements for the Use of Relays, Contactors and Electromagnetic Brakes

#### A.5 Leakage current and its countermeasures

The leakage current flows through the line capacitance and motor capacitance at the input and output sides of the inverter, including earth leakage current and line-to-line leakage current, as shown in Figure A-8. The magnitude of leakage current depends on the carrier frequency and the capacitance.

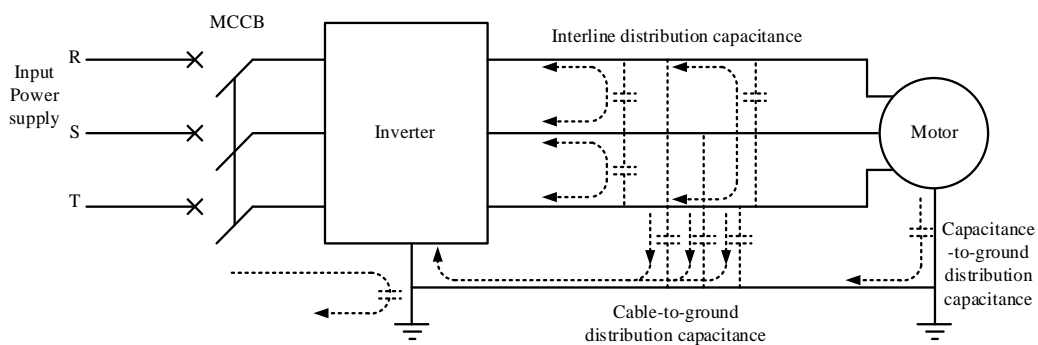


Figure A-8 Leakage Current Path

### A.5.1 Earth leakage current

The earth leakage current will not only flow into the inverter, but also into other equipment through the ground wire. It may cause misoperation of leakage circuit breakers, relays or other equipment. The higher the carrier frequency of the inverter and the longer the motor cable, the greater the leakage current.

Suppression measures: reduce carrier frequency; shorten the motor cable as much as possible; use leakage circuit breakers specially designed for high harmonic/surge leakage current.

### A.5.2 Line-to-line leakage current

The higher harmonics of the leakage current flowing through the capacitor among between cables on the output side of the inverter may cause the misoperation of external thermal relay. When the wiring is very long (more than 50 m), the leakage current will increase, which will easily lead to misoperation of external thermal relay.

Suppression measures: reduce carrier frequency; install an AC output reactor at the output side. It is recommended to directly monitor the motor temperature with a temperature sensor, or to replace external thermal relay with the electronic thermal relay with the motor overload protection function of the inverter itself.

## A.6 Radiation emission suppression of the inverter

The inverter is generally installed in a metal control cabinet. The instruments and equipment outside the metal cabinet are slightly affected by radiation emission of the inverter, and the external connection cable is the major source of radiation emission. Because all of the power cables, motor cables, control cables and keyboard cables of the inverter need to be led out of the shielding cabinet, special measures should be taken at the lead-out position, otherwise the shielding will be invalid.

In Figure A-9, the cable in the shielding cabinet acts as an antenna, and after receiving the noise radiation in the cabinet, it will propagate the noise to the outside of the shielding cabinet through the cable and radiate to the space. In Figure A-10, the cable shielding layer is connected to the ground of the shielding case at the exit, then the noise radiation received by the cable in the cabinet can directly flow into the ground through the shielding case, thus eliminating the influence on the outside world.

When the shielding layer grounding method shown in Figure A-10 is used, the cable shielding layer should be connected to ground of the case as close as possible to the outlet, otherwise the cable from the grounding point to the outlet will still be coupled as an antenna. The distance between the noise grounding point and the outlet should be less than  $\lambda/15$  cm, and the smaller the distance, the better.

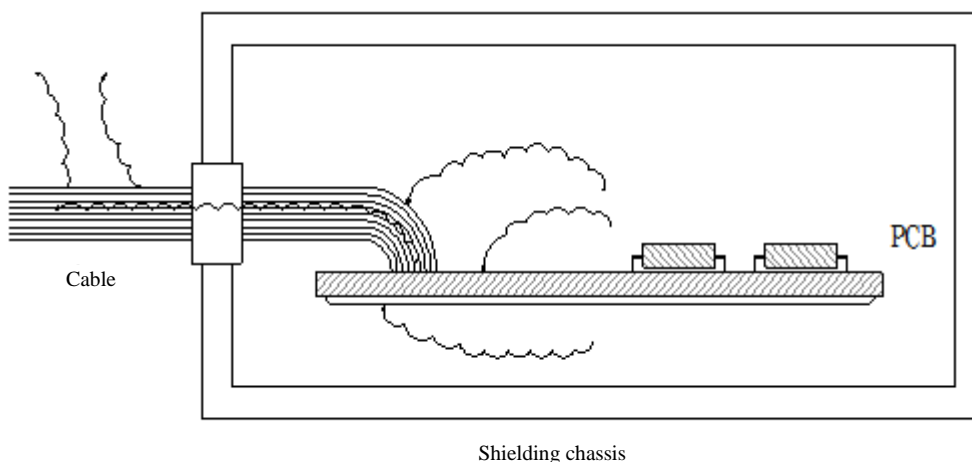


Figure A-9 Radiation Caused by Outgoing Cable of Shielding Cabinet

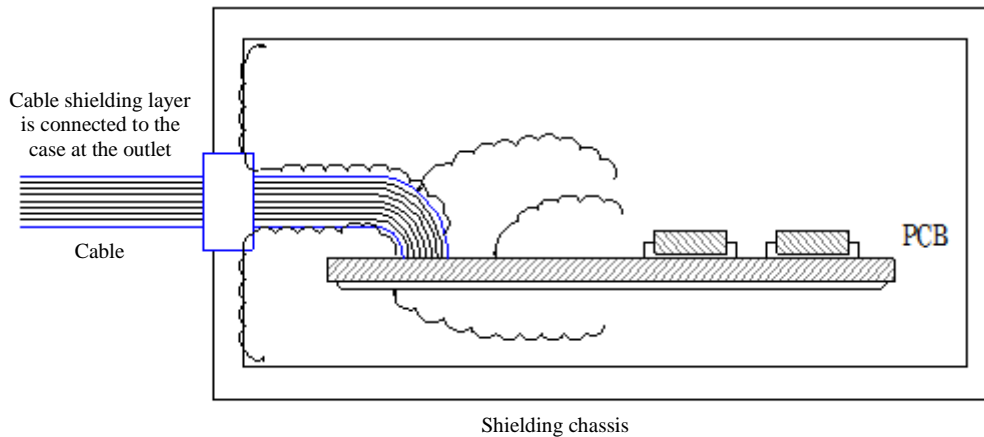


Figure A-10 Radiation Suppression of the Cable Shielding Layer Connected to Ground of the Shielding Case

## A.7 Guide to the use of power line filter

Power line filter can be used for the equipment that can generate strong interference and the equipment that is sensitive to external interference.

### A.7.1 Function of power line filter

- (1) The power line filter is a bidirectional low-pass filter, which only allows the pass-through of DC and 50Hz power current, and does not allow the pass-through of electromagnetic interference current with higher frequency. Therefore, it can not only prevent the electromagnetic interference generated by the equipment itself from entering the power line, but also prevent the interference on the power line from entering the equipment.
- (2) The power line filter can enable the equipment to meet the requirements for electromagnetic compatibility standards on conducted emission and conduction susceptibility, and it can also suppress the radiation interference of the equipment.

### A.7.2 Precautions for power line filter installation

- (1) In the cabinet, the filter should be installed at a position as close as possible to the inlet of the power line, and the power input line of the filter should be as short as possible in the control cabinet.
- (2) If the input line and output line of the filter are laid too close to each other, the high frequency interference will directly couple the filter bypass through the input and output lines of the filter, making the power filter ineffective.
- (3) There is usually a special grounding terminal on the shell of the filter. However, if the grounding terminal of the filter is connected to the cabinet shell with a wire, the long wire will not play an effective bypass role due to its high frequency impedance, then the filter will be useless. The correct installation method is to stick the filter shell on the conductive plane of the metal housing, to make the contact area as large as possible. Pay attention to the removal of insulating paint during installation to ensure a good electrical contact.

## A.8 Division of EMC installation area of the inverter

In the transmission system composed of inverter and motor, the inverter and the peripheral devices such as control devices and sensors are usually installed in the same control cabinet. The interference caused by the control cabinet to the outside of the cabinet can be suppressed by taking measures at the main contact, so a radio noise filter and an incoming AC reactor should be installed at the incoming terminal of the control cabinet. In order to meet EMC requirements, electromagnetic

compatibility should also be realized in the control cabinet.

In the transmission system composed of inverter and motor, the inverter, braking unit and contactor are all strong noise sources, which may affect the normal operation of noise-sensitive peripheral devices such as automation devices, encoders and sensors. The peripheral devices can be installed in different EMC areas according to their electrical characteristics, so as to realize spatial isolation of noise source and noise receiver, which is the most effective measure to reduce interference.

The division of EMC installation area of the inverter is shown in Figure A-11.

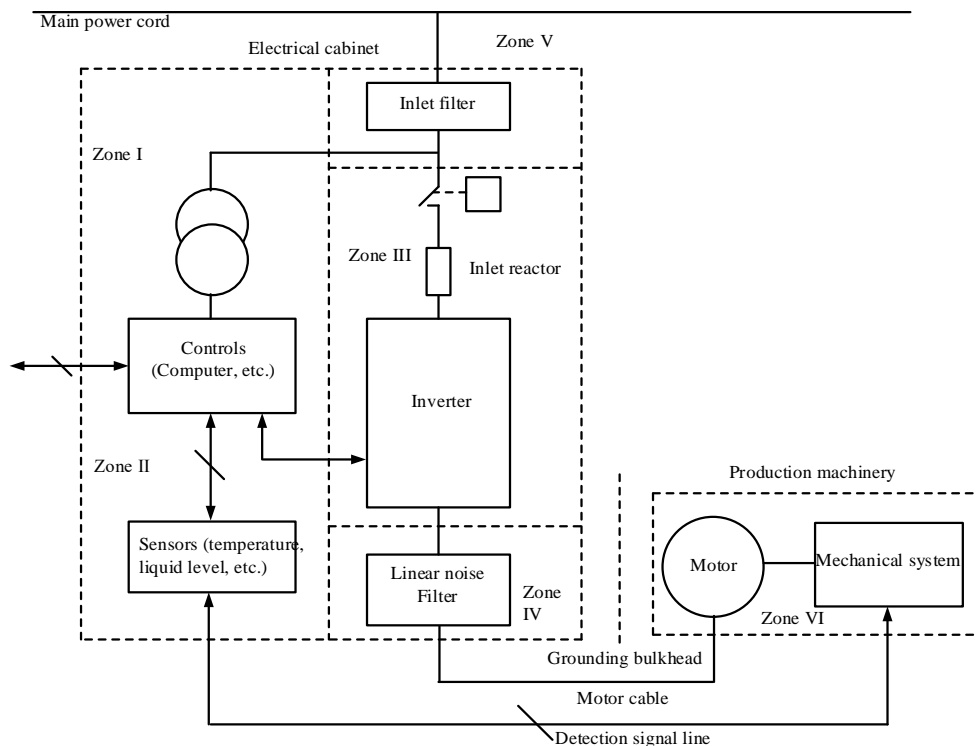


Figure A-11 Schematic Diagram of EMC Installation Area of the Inverter

The division of the above installation areas is described as follows:

Area I: control power transformer, control device, sensor, etc.

Area II: control signal and its cable interface, requiring a certain immunity.

Area III: incoming line reactor, inverter, braking unit, contactor and other main noise sources.

Area IV: output noise filters and their wirings.

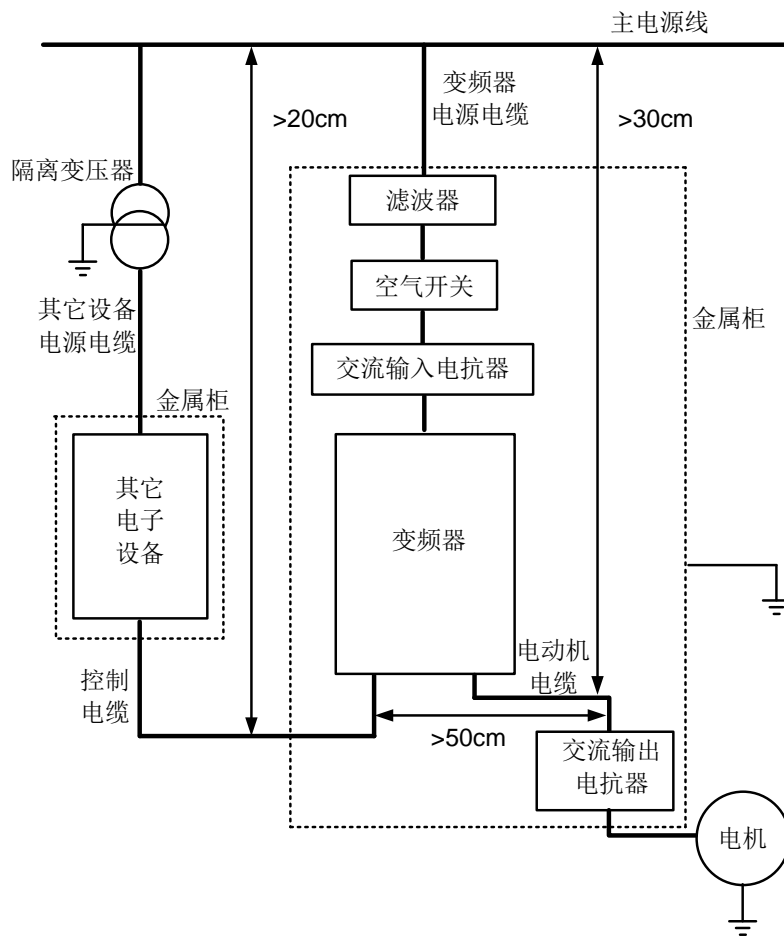
Area V: power supply (including the wirings of radio noise filter).

Area VI: motor and its cables.

Each area should be isolated with a minimum distance of 20 cm to achieve electromagnetic decoupling. Each area is best decoupled with the grounding partition, and the cables in different areas should be put into different cable ducts. The filter (if necessary) should be installed at the interface between the areas. All bus cables (such as RS485) and signal cables leading out of the cabinet must be shielded.

## A.9 Precautions for electrical installation of the inverter

Electrical installation of the inverter is shown in Figure A-12:



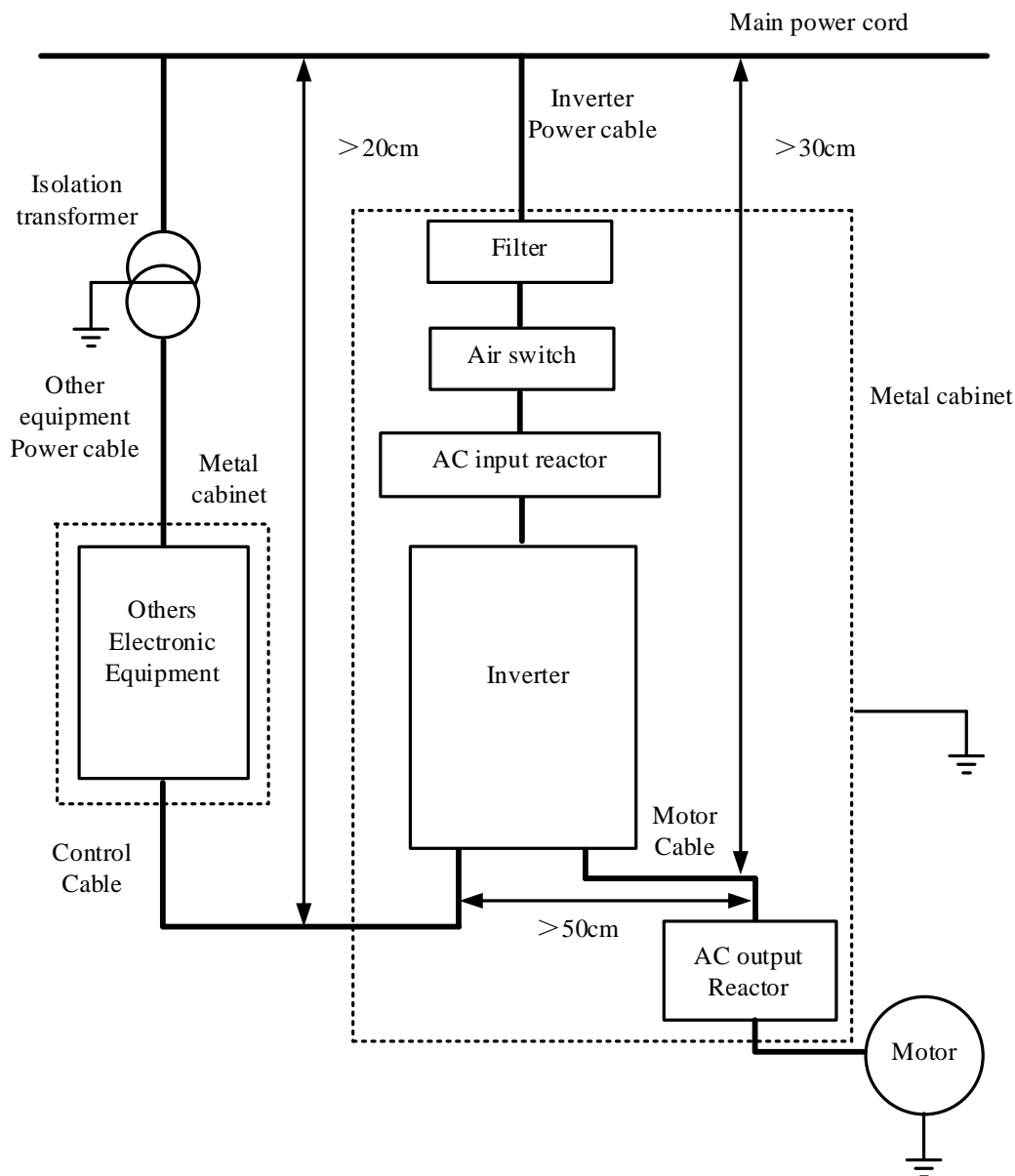


Figure A-12 Schematic Diagram of Electrical Installation of the Inverter

In order to meet EMC requirements, please pay attention to the following aspects during the installation:

- (1) The inverter should be installed in the cabinet, and the baseplate of inverter, the input filter and other peripheral enclosures should be fixed on the back plate of the control cabinet to ensure a good electrical contact with the back plate. The distance between the inverter and the filter should be as short as possible and less than 15 cm, to minimize the high-frequency impedance between the ground wire of inverter and the ground of input filter and reduce the high-frequency noise.
- (2) A wide grounding bar should be installed at the entrance of the control cabinet (no more than 5 cm away from the exit). The shielding layers of all cables entering and exiting the cabinet should be fixed on the grounding bar by 360° loop connection to ensure a good electrical contact.
- (3) The shielded cables, preferably the ones with spiral metal belt and wire mesh for double shielding must be used for motor cables. The shielding layer of the motor cable at the inverter end must be fixed to the back plate of the cabinet by 360° loop connection (as shown in Figure A.4) with metal cable clamps. There should be two fixing positions: one point should

be as close to the inverter as possible, preferably less than 15 cm; the other point should be on the grounding bar. The shielding layer should be connected with metal shell of the motor by 360° loop connection at the motor end when it passes through the motor terminal box. In case of any difficulty, the shielding layer can be twisted into a braid, and then connected to ground terminal of the motor after flattening, with the flattening width greater than 1/5 of the braid length. Length of the motor cable core and the lead wire of soft PE braid should be as short as possible, preferably less than 5 cm.

- (4) The shielded cables must be used for the terminal control cables. The shielding layer needs to be connected to the grounding bar at the entrance of the cabinet by 360° loop connection with metal cable clamps, and can be fixed to metal case of the inverter with metal cable clamps. In case of any difficult, the shielding layer can be twisted into a wide and short braid, and then connected to PE terminal of the inverter after flattening. Length of the exposed part of cable core and the lead wire of soft PE braid should be as short as possible, preferably less than 15 cm.
- (5) The keyboard cable is not allowed to go through the shielding cabinet.
- (6) The aperture in the shielding cabinet should be as small as possible, and not exceeding 15 cm.

## A.10 EMC standards met by the intelligent flexible driver

After the intelligent flexible driver is installed with appropriate input/output filters and AC reactors (see "Optional Accessories" for optional filters and reactor models), and wiring by referring to the above precautions, the EMC standards that can be met are shown in Schedule A.2.

Schedule A.2 Summary of EMC Performance for the Intelligent Flexible Driver

Item	Satisfied standard	Level of satisfied standard
Conducted disturbance emission	EN12015.1998	$0.15 \leq f < 0.50MHz$ , 100dB( $\mu v/m$ )Quasi – peak value $0.50 \leq f < 5.0MHz$ , 86dB( $\mu v/m$ )Quasi – peak value $5.0 \leq f < 30MHz$ , 90: 70dB ( $\mu v/m$ )Quasi – peak value
Radiation disturbance emission	EN12015.1998	$30 \leq f < 230MHz$ , 40dB( $\mu v/m$ )Quasi – peak value $230 \leq f < 1000MHz$ , 47dB ( $\mu v/m$ )Quasi – peak value
Electrostatic discharge immunity	EN12016.2004	Criterion B (contact discharge of 4,000V, air discharge of 8,000V)
Immunity of radiated electromagnetic field	EN12016.2004	Level 3 criterion A (3V/m)
Immunity of electrical fast transient / burst	EN12016.2004	Level 4 criterion B ( $\pm 2KV/2.5kHz$ at strong electricity terminal)
Surge immunity	EN12016.2004	Criterion B ( $\pm 1KV$ )
Conduction immunity	EN12016.2004	Criterion A (3V, 0.15~80MHz)

## Appendix B Standards Suitable for the Inverter



### European low voltage specifications

The intelligent flexible driver complies with the requirements of EN61800-5-1:2007 standard, thus complying with Low Voltage Directive 2006/95/EU.

This inverter also meets the following standard specifications:

EN61800-5-1: 2007: Adjustable speed electrical powerdrive systems –Part 5-1:Safetyrequirements – Electrical, thermal and energy

### 1. European EMC specifications

When you follow the recommendations proposed in this manual for installation, the intelligent flexible driver product complies with the following EMC standards:

EN12015.1998 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Emission.

EN12016.2004 Electromagnetic compatibility-Product family standard for lifts, escalators and passenger conveyors-Immunity.

EN61800-3:2004: Adjustable speed electric drive system D Part 3



### ISO9001 quality management system

Shanghai Sigriner STEP Electric Co., Ltd. manages its quality management system according to the requirements of **ISO9001** standard.

# Appendix C Modbus Communication Protocol

The **Modbus** address is set to that of the inverter in hexadecimal:

Register **Modbus** address = register address + 0x999A

Register bit **Modbus** address = register address \*16+ bit number n (n=0, ..., 15)

**Modbus** address of inverter parameter = parameter number expressed in hexadecimal (for example, Modbus address of parameter P10.23 is 0x1023)

The **Modbus** address is set to that of the inverter in decimal:

Register **Modbus** address = register address + 10000

Register bit **Modbus** address = register address \*16+ bit number n (n=0, ..., 15)

**Modbus** address of inverter parameter = parameter number expressed in decimal (for example, Modbus address of parameter P10.23 is 1023)

## C.1 Command data [Register 3, 6] [Bit 1, 5]

Read the register function code 3 in the table and write the register function code 6 in the table

Read the bit function code 1 in the table and write the bit function code 5 in the table

Register address	Description
0000H	Communication control word bit0      1: forward rotation    0: invalid bit1      1: reverse rotation    0: invalid bit2      1: Run                      0: Stop bit3      Reserved (1: external fault) bit4      1: reset fault instruction bit7~5    Reserved (multi-speed option # Schedule Z-1) bit8      Reserved (1: effective jogging frequency #) bit10~9   Acceleration and deceleration time option 0: curve 1      1: curve 2 bit11    Reserved (1: locking base electrode #) bit12    1: select the running and giving command 2      0: select the running and giving command 1 bit13    1: Select PID parameter group 2; 0: Select PID parameter group 1 bit15~14   Unused *
0001H	Reference value for modbus target frequency and communication 0~30000:0.00~300.00Hz
0002H	Reserved (reference value for current modbus frequency) IQ10 (1.0): rated frequency
0003H	Reserved (reference value for Modbus PID) 10,000 corresponds to 100% of the reference value
0004H	Reserved (validity of Modbus PID target value    1: valid      0: invalid)
0005H	Reserved (AO1 output value) -1024~1024: -5.00~5.00V
0006H	Reserved (AO2 output value) -1024~1024: -5.00~5.00V
0007H	Multifunctional port output # bit0      1: DO0 (relay A) ON    0: OFF bit1      1: DO1 (relay B) ON    0: OFF bit2      1:DO2 ON    0:OFF bit3      1:DO3 ON    0:OFF bit4      1:DO4(OC) ON    0:OFF bit5      1:DO5(OC) ON    0:OFF bit6      Unused

Register address	Description
	bit7 Unused bit15~8 Unused <i># Actual value of terminal output = Modbus setting value / internal output value of functional terminal</i>
0008H	Reserved (Modbus broadcast data validity) bit0 1: Terminal DI0 Modbus broadcast preset 0: invalid valid bit1 1: Terminal DI1 Modbus broadcast preset 0: invalid valid bit2 1: Terminal DI2 Modbus broadcast preset 0: invalid valid bit3 1: Terminal DI3 Modbus broadcast preset 0: invalid valid bit4 1: Terminal DI4 Modbus broadcast preset 0: invalid valid bit5 1: Terminal DI5 Modbus broadcast preset 0: invalid valid bit6 1: Terminal DI6 Modbus broadcast preset 0: invalid valid bit7 1: Terminal DI7 Modbus broadcast preset 0: invalid valid bit8 Unused bit9 Unused bit10 1: Target frequency broadcast preset value 0: invalid valid bit11 1: Current frequency broadcast preset value 0: invalid valid bit12 1: valid reference value for running command (forward rotation, reverse rotation and start-stop command) broadcast bit15~13 Unused
0009H	Reserved (reference value for target frequency broadcast)
000AH	Reserved (reference value for current frequency broadcast)
000BH	Reserved (reference value for operation signal broadcast) bit0 Reference value for Modbus broadcast of terminal DI0 # (the corresponding specific function is set by parameters) bit1 Reference value for Modbus broadcast of terminal DI1 # (the corresponding specific function is set by parameters) bit2 Reference value for Modbus broadcast of terminal DI2 # (the corresponding specific function is set by parameters) bit3 Reference value for Modbus broadcast of terminal DI3 # (the corresponding specific function is set by parameters) bit4 Reference value for Modbus broadcast of terminal DI4 # (the corresponding specific function is set by parameters) bit5 Reference value for Modbus broadcast of terminal DI5 # (the corresponding specific function is set by parameters) bit6 Reference value for Modbus broadcast of terminal DI6 # (the corresponding specific function is set by parameters) bit7 Reference value for Modbus broadcast of terminal DI7 # (the corresponding specific function is set by parameters) bit8 Unused bit9 Unused bit10 1: forward rotation 0: invalid bit11 1: reverse rotation 0: invalid bit12 1: running 0: stop bit13 1: external fault bit14 1: reset fault instruction bit15 Unused <i># Adopted value for function input terminal = (Modbus broadcast value &amp; validity of reference value for broadcast) / Actual input value of function terminal</i>
000CH~0018H	Reserved (broadcast data)
0019H	Virtual input terminal Bit0: virtual terminal X0 Bit1: virtual terminal X1

Register address	Description
	Bit2: virtual terminal X2 Bit3: virtual terminal X3 Bit4: virtual terminal X4 Bit5: virtual terminal X5 Bit6: virtual terminal X6 Bit7: virtual terminal X7 bit 8~15: reserved <i># Actual terminal input value = Modbus setting value / input value for external terminal</i>
001AH~0068H	Reserved control word (79 spaces) 001AH: communication reference torque -1,000~1,000 → - 100.0%~100.0% rated motor torque 001BH: velocity limit value 0~40,000 → 0.00~400.00 Hz
0069H	<b>Parameter update request</b> After the slave inverter receives the parameters through Modbus, the parameters are stored in the parameter image area of the inverter. 0x55: Update the actual parameters in RAM with the parameters in the image area 0xAA: Update the actual parameters in RAM with the default factory parameters Zero: no update [Note]: This unit will be cleared automatically after each update
006AH~01F9H	Reserved (parameter)
01FAH~046FH	Reserve 630 spaces

## C.2 Monitoring data [Register 4] [Bit 2]

Read the register function code 4 in the table and read the bit function code 2 in the table

Register address	Description
0470H	Inverter status word bit0 1: With running signal 0: Without running signal bit1 1: running bit2 1: at zero speed bit3 1: Forward rotating 0: Reversing rotating bit4 1: Inverter power on normal 0: Inverter power on abnormal bit5 1: base electrode locking bit6 Unused bit7 1: failure occurring bit8 Reserved (1: fault retry) bit9 Reserved (1: wrong parameter setting) bit10 1. auto-tuning bit11 1: request for auto-tuning bit15~12 Unused
0471H	Detection status bit0 1: Frequency detection LF, frequency ≤ detection frequency bit1 1: Frequency detection GF, frequency ≥ detection frequency bit2 1: Frequency detection EF, given and feedback frequency in the detection frequency band bit3 1: velocity achieved bit4 Reserved (1: reference frequency command for analog signal is lost) bit5 1: over torque detecting bit6 1: undervoltage detecting bit7 1: bus voltage is greater than 85% of the rated voltage bit8 1: exceed 5% of the rated current during running and 10% of the rated current when stop running bit9 1. fault prediction bit15~10 Unused
0472H	Reserved (reference target frequency)
0473H	Current operating frequency 5,000 corresponds to 50.00 Hz
0474H	Reserved (reference PID value)

Register address	Description
0475H	Reserved (PID feedback value)
0476H	Reserved (PID output value)
0477H	Reserved (PID proportional term)
0478H	Reserved (PID integral term)
0479H	Reserved (PID differential term)
047AH	Reserved (communication failure) bit0 1: communication timeout bit1 1: frame format bit2 1: CRC error bit3 1: data length error bit4 1: parity check error bit5 1: overload error bit6 1: illegal command bit7 Reserved (operator communication failure) bit15~8 Unused
047BH	Parameter update status bit0 1: updating 0: update completed bit1 Reserved (1: data overrun) bit2 Reserved (1: data mismatch) bit3~15 Unused
047CH~0484H	Unused (9 units)
0485H	Inverter output monitoring 1 bit0 1: normal power-on 0: abnormal power-on bit1 1: faulty 0: normal bit2 1: running signal 0: no running signal bit3 1: frequency/velocity arrival signal bit4 1: consistent frequency/velocity bit5 1: at zero speed bit6 1: DC bus voltage is greater than 85% of the rated voltage bit7 1: exceed 5% of the rated current during running and 10% of the rated current when stop running bit8 1: auto-tuning bit9 1: Speed detection 1 bit10 1: Speed detection 2 bit11 1: fault prediction bit12 1: auto-tuning request
0486H	Reserved (inverter output monitoring 2)
0487H	Reserved (inverter output monitoring 3)
0488H	Reserved (inverter output monitoring 4)
0489H	Pump output monitoring 1 bit0 1: Water pump sleep bit1 1: motor 1 starting bit2 1: motor 2 starting bit3 1: motor 3 starting bit4 1: motor 4 starting bit5 1: motor 5 starting bit6 1: motor 6 starting bit7 Reserved (Y8) bit8 Reserved (Y9) bit9 Reserved (Y10) bit10 Reserved (Y11) bit11 Reserved (Y12) bit12 Reserved (Y13) bit13 Reserved (Y14) bit14 Reserved (Y15) bit15 Reserved (Y16)
048AH	Pump output monitoring 2 bit0 Reserved (Y17) bit1 Reserved (Y18) bit2 Reserved (Y19)

Register address	Description
	bit3 Reserved (Y20) bit4 Reserved (Y21) bit5 Reserved (Y22) bit6 Reserved (Y23) bit7 Reserved (Y24) bit8 Reserved (Y25) bit9 Reserved (Y26) bit10 Reserved (Y27) bit11 Reserved (Y28) bit12 Reserved (Y29) bit13 Reserved (Y30) bit14 Reserved (Y31) bit15 Reserved (Y32)
048BH	Fault indication 1 bit0 Module overcurrent protection bit1 ADC failure bit2 Radiator overheating bit3 Brake unit failure bit4 Reserved bit5 Reserved bit6 Speed deviation bit7 Bus overvoltage bit8 Bus undervoltage bit9 Output default phase bit10 Motor overcurrent at low velocity bit11 Encoder fault bit12 Reserved bit13 Reserved bit14 Reserved bit15 Wrong phase sequence of motor
048CH	Fault indication 2 bit0 Overspeed in the same direction bit1 Overspeed in the reverse direction bit2 Reserved bit3 Encoder communication failure bit4 abc overcurrent bit5 Brake failure detection bit6 Input overvoltage bit7 Reserved bit8 Reserved bit9 Encoder does no self-learning bit10 Output overcurrent bit11 SINCOS encoder fault bit12 Input phase loss bit13 Overspeed protection bit14 Motor high speed overcurrent bit15 Ground protection
048DH	Fault indication 3 bit0 Capacitor is aging bit1 External fault bit2 Reserved bit3 Reserved bit4 Current sensor failure bit5 Brake resistance short circuit bit6 Excessive current instantaneous value bit7 Output contactor error bit8 Brake switch fault bit9 IGBT short circuit protection bit10 Communication error bit11 Input power supply error bit12 Reserved bit13 Reserved bit14 Reserved

Register address	Description
	bit15 Reserved
048EH	Reserved (fault indication 4) bit15~0: reserved
048FH	Input state of multi-function terminal bit0 1: multi-function terminal X0 ON 0:OFF bit1 1: multi-function terminal X1 ON 0:OFF bit2 1: multi-function terminal X2 ON 0:OFF bit3 1: multi-function terminal X3 ON 0:OFF bit4 1: multi-function terminal X4 ON 0:OFF bit5 1: multi-function terminal X5 ON 0:OFF bit6 1: multi-function terminal X6 ON 0:OFF bit7 1: multi-function terminal X7 ON 0:OFF bit8 Unused bit9 Unused bit15~10 Unused
0490H	Output state of multi-function terminal bit0 1:K1 ON 0:OFF bit1 1:K2 ON 0:OFF bit2 1:Y0 ON 0:OFF bit3 1:Y1 ON 0:OFF bit4 1:Y3(K3) ON 0:OFF bit5 1:Y4(K4) ON 0:OFF bit6 Unused bit7 Unused bit15~8 Unused
0491H	Feedback velocity (Hz) -30000~30000 → -300.00~300.00Hz
0492H	Setting speed -30000~30000 → -300.00~300.00Hz
0493H	Reference velocity filtering value
0494H	Valid value of output voltage
0495H	Valid value of output current
0496H	Output torque -1000~1000 → -100.0%~100.0% rated current of inverter
0497H	Driver efficiency
0498H	Bus voltage
0499H	Analog input AI0/TM motor temperature -10000~10000→-10.000~10.000V detection input
049AH	Analog input AI1 -10000~10000→-10.000~10.000V
049BH	Analog input AI2 (reserved)
049CH	System time
049DH	Heat sink temperature
049EH	U-phase voltage (instantaneous value)
049FH	V-phase voltage (instantaneous value)
0490H	W-phase voltage (instantaneous value)
04A1H	U-phase current (instantaneous value)
04A 2H	V-phase current (instantaneous value)
04A 3H	W-phase current (instantaneous value)
04A 4H	Output active power
04A 5H	Total output power
04A 6H	Reactive power
04A 7H	Power factor
04A 8H	Feedback speed (rpm) -9999~9999→-999.9~999.9
04A 9H	Pretorque
04AAH~04B9H	Reserve 16 units
04BAH~04D9H	View [0~31]: The specific monitoring content is related to the inverter model. Please refer to the description of "Selecting LCD Display Data Content" in the inverter manual. 04BAH: View[0]/no definition

Register address	Description
	04BBH:View[1] 04BCH:View[2] 04BDH:View[3] 04BEH:View[4] 04BFH:View[5] 04C0H:View[6] 04C1H:View[7] 04C2H:View[8] 04C3H:View[9] 04C4H:View[10] 04C5H:View[11] 04C6H:View[12] 04C7H:View[13] 04C8H:View[14] 04C9H:View[15] 04CAH:View[16] 04CBH:View[17] 04CCH:View[18] 04CDH:View[19] 04CEH:View[20] 04CFH:View[21] 04D0H:View[22] 04D1H:View[23] 04D2H:View[24] 04D3H:View[25] 04D4H:View[26] 04D5H:View[27] 04D6H:View[28] 04D7H:View[29] 04D8H:View[30] 04D9H:View[31]
04DAH~04E5H	Uxx monitoring data (curve data) 04DAH: U01 data value (curve 1) 04DBH: U02 data value (curve 2) 04DCH: U03 data value (curve 3) 04DDH: U04 data value (curve 4) 04DEH: U05 data value (curve 5) 04DFH: U06 data value (curve 6) 04E0H: U07 data value (curve 7) 04E1H: U08 data value (curve 8) 04E2H: low byte: U01 identification (curve 1 configuration); high byte: U02 identification (curve 2 configuration) 04E3H: low byte: U03 identification (curve 3 configuration); high byte: U04 identification (curve 4 configuration) 04E4H: low byte: U05 identification (curve 5 configuration); high byte: U06 identification (curve 6 configuration) 04E5H: low byte: U07 identification (curve 7 configuration); high byte: U08 identification (curve 8 configuration)
04E6H~04E9H	Reserve 4 units (for drivers)
04EAH~05E9H	U-phase current (buffered at 256 points for graphic display) [sampled every 10 PWM cycles]
05EAH~06E9H	V-phase current (buffered at 256 points for graphic display)
06EAH~07E9H	W-phase current (buffered at 256 points for graphic display)
07EAH	Output torque (for graphic display)
07EBH	Reference velocity (for graphic display)
07ECH	Feedback velocity (for graphic display)
07EDH	Bus voltage (for graphic display)
07EEH~09EDH	Reserve 512 spaces (for graphic display)
0A34H~0A38H	Historical fault 0
	Error code Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz

Register address	Description	
	(the earliest)	Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A39H~0A3DH	Historical fault 1	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A3EH~0A42H	Historical fault 2	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A43H~0A47H	Historical fault 3	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A48H~0A4CH	Historical fault 4	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A4DH~0A51H	Historical fault 5	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A52H~0A56H	Historical fault 6	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault
0A57H~0A5BH	Historical fault 7 (the latest)	Error code
		Actual velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Reference velocity at the time of fault -30000~30000→-300.00~300.00Hz
		Bus voltage at the time of fault
		Current at the time of fault

# Appendix D Profinet Communication Description

## D.1 Introduction to Network Settings

### D.1.1 Introduction to PN communication card of STEP inverter

\* Model of STEP inverter PN communication card is AS.L03/C9. The image is as follows:



### D.1.2 Host setting

\* The PROFINET slave file (.xml) must be configured in the master station, with three types of protocols integrated internally: 2WORD, 4WORD, and 8WORD. Users can choose according to their actual needs., automatically identifying protocol types from opportunities.

\* Set the name and IP address of each PROFINET slave station in TIA Portal software.

### D.1.3 Slave setting

\* The PROFINET slave station (STEP inverter) sets the running command and speed preset to PROFINET in the P10 group parameter.

### D.1.4 GSD file acquisition

\* GSD file name is **GSDML-V2.32-STEP-Profinet Adapter-XX.xml**.

Please contact the product manager to obtain the GSD file.

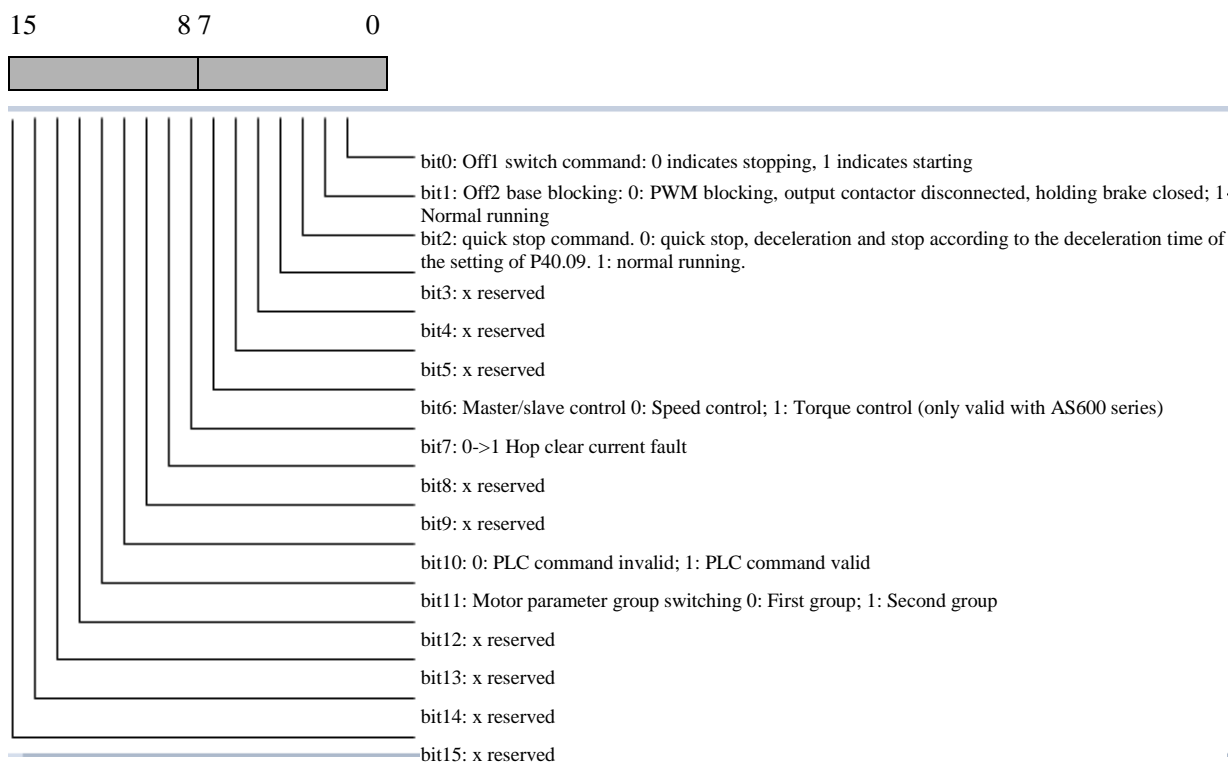
## D.2 Protocol Content

There are three types of PROFINET communication protocols: 2WORD, 4WORD, and 8WORD. This part of protocol content is selected by users, who can choose protocol type according to actual needs:

### D.2.1 2WORD communication protocol meaning, this type includes 2 control words and 2 status words:

#### D.2.1.1 Inverter control word

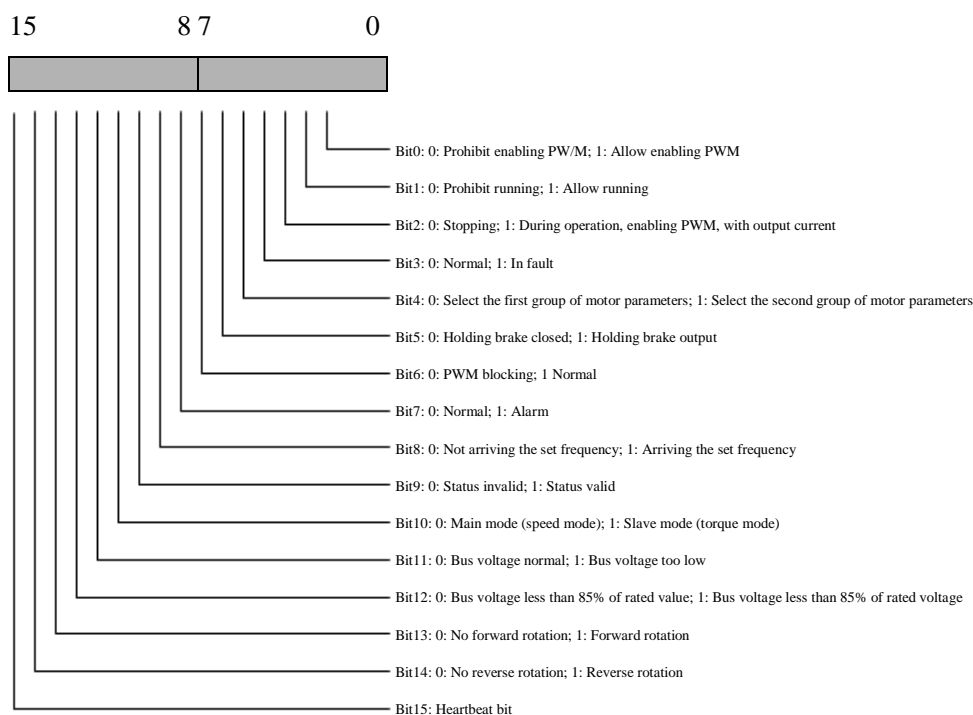
Control word **WORD1**, specific definition of each bit is as follows:



Control word **WORD2**: used for speed preset, for example: 5000 indicates forward rotation at 50.00 Hz; -5000 indicates reverse rotation at 50.00 Hz

### D.2.1.2 Inverter status word

Status word **WORD1**, specific definition of each bit is as follows:



Note: meaning of the ninth bit (i.e. bit9) of the status word **WORD1**:

=0: Indicates that the inverter status received by PLC from PROFINET is invalid

=1: Indicates that the inverter status received by PLC from PROFINET is valid

#### Status word **WORD2**:

Feedback frequency HZ, for example, 5000 means forward rotation at 50.00 HZ; -5000 means reverse rotation at 50.00 Hz

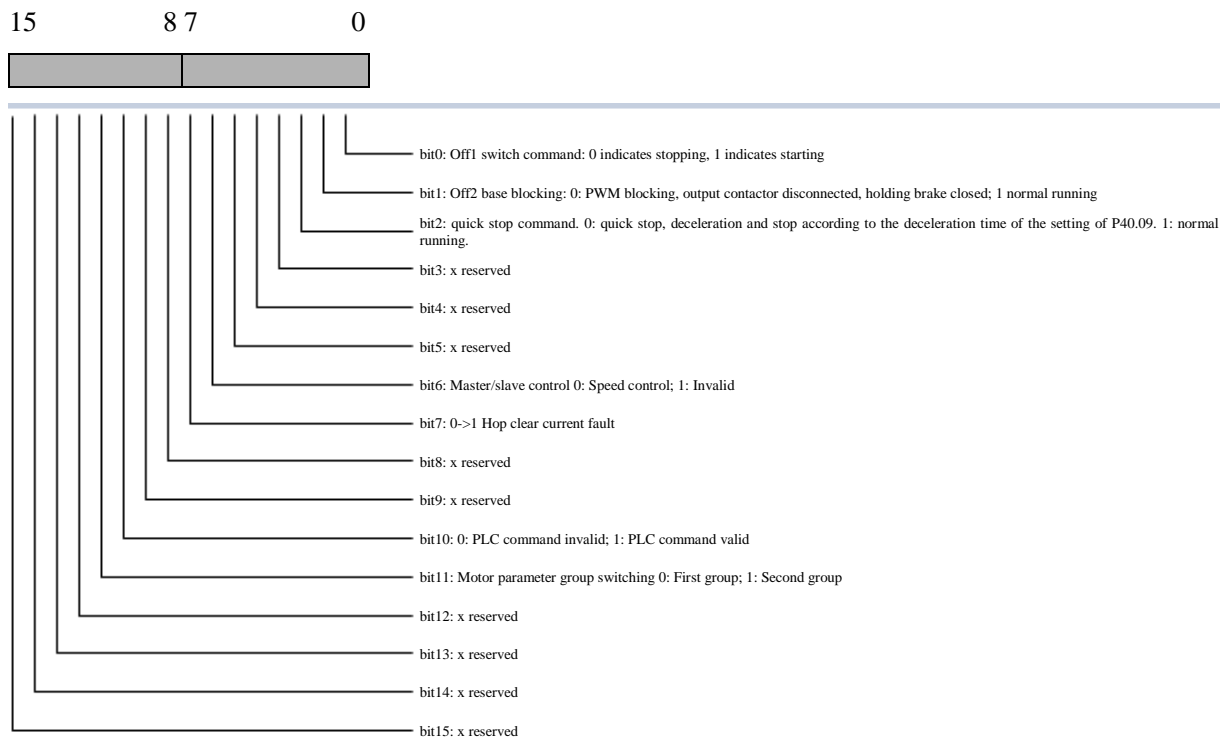
In closed-loop control mode: this word represents the encoder feedback velocity

In V/F control mode: this word represents the actual output frequency

**D.2.2 4WORD communication protocol meaning, this type includes 4 control words and 4 status words:**

**D.2.2.1 Inverter control word**

**Control word WORD1**, specific definition of each bit is as follows:



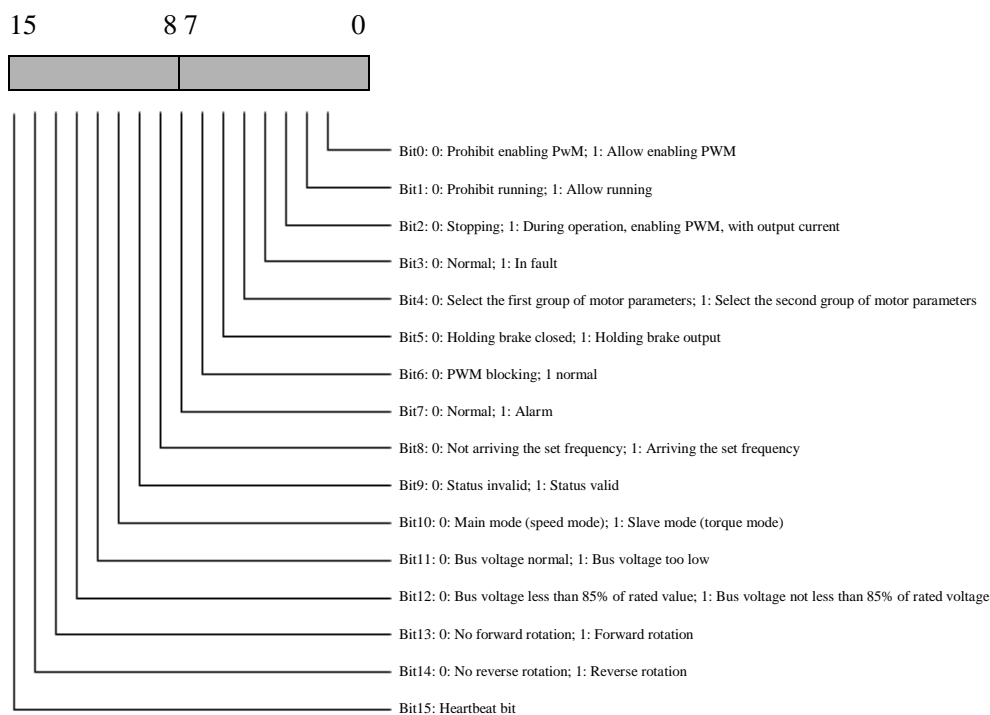
**Control word WORD2:** speed preset, for example: 5000 indicates forward rotation at 50.00 Hz; -5000 indicates reverse rotation at 50.00 Hz

**Control word WORD3:** torque preset (0.1%), with symbol, standard value motor rated torque, 999 indicates 99.9%, -1000 indicates -100.0% (only valid in the slave mode (torque mode) of the AS600 series)

**Control word WORD4:** compensating torque preset (0.1%), with symbol, standard value motor rated torque, 999 indicates 99.9%, -1000 indicates -100.0% (only valid in the slave mode (speed mode) of the AS600 series)

### D.2.2.2 Inverter status word

Status word **WORD1**, specific definition of each bit is as follows:



Note: meaning of the ninth bit (i.e. bit9) of the status word **WORD1**:

=0: Indicates that the inverter status received by PLC from PROFINET is invalid

=1: Indicates that the inverter status received by PLC from PROFINET is valid

**Status word WORD2:** Feedback frequency Hz, for example: 5000 indicates forward rotation at 50.00 Hz; - 5000 indicates reverse rotation at 50.00 Hz

In closed-loop control mode: this word represents the encoder feedback velocity

In V/F control mode: this word represents the actual output frequency

**Status word WORD3:** Output current A, for example: 100 indicates 10.0 A

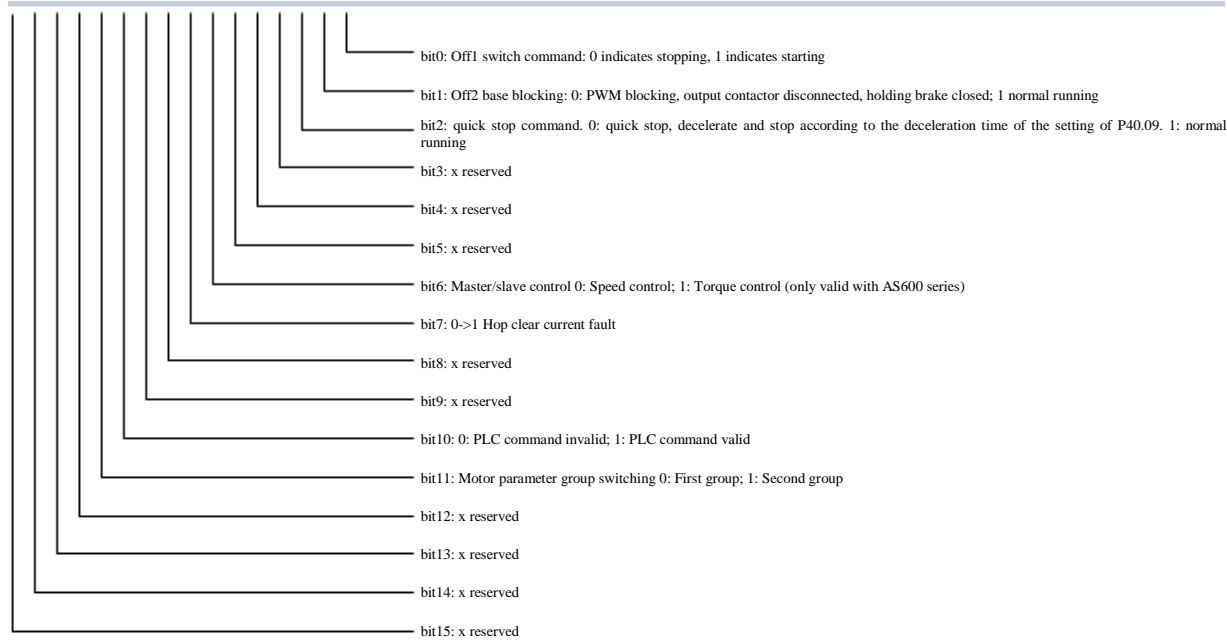
**Status word WORD4:** Output current A, for example: 380 indicates 380 V

**D.2.3 8WORD communication protocol meaning, this type includes 8 control words and 8 status words:**

**D.2.3.1 Inverter control word**

**Control word WORD1**, specific definition of each bit is as follows:

15                      8 7                      0



Bit12: Switching speed loop integral adjustment

**Control word WORD2:** speed preset, for example: 5000 indicates forward rotation at 50.00 Hz; -5000 indicates reverse rotation at 50.00 Hz

**Control word WORD3:** torque preset (0.1%), with symbol, standard value motor rated torque, 999 indicates 99.9%, -1000 indicates -100.0% (only valid in the slave mode (torque mode) of the AS600 series)

**Control word WORD4:** Compensating torque preset (0.1%), with symbol, standard value motor rated torque, 999 indicates 99.9%, -1000 indicates -100.0% (only valid in the master mode (speed mode) of the AS600 series)

**Control word WORD5:** VF separation voltage preset (0.1%)

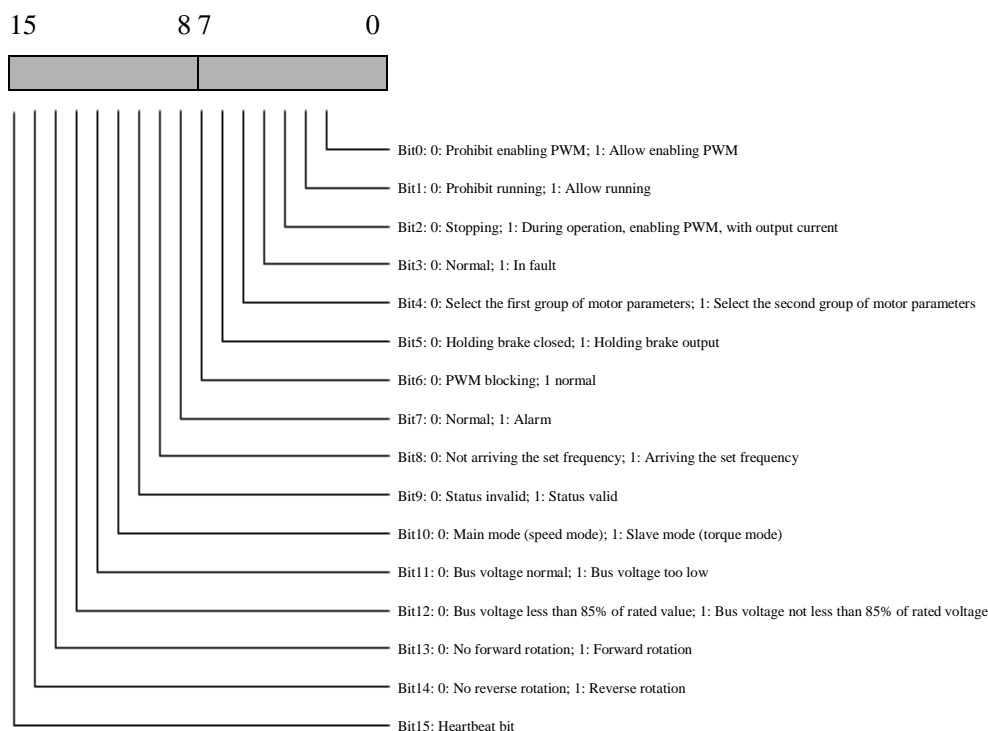
**Control word WORD6:** PLC forced DO output, high 8 bits enable output, and low 8 bits are output values

**Control word WORD7:** Acceleration (\* \*, \* \* s), 10000 indicates 10.00s. This sets the time accelerated from 0 to rated frequency.

**Control word WORD8:** Deceleration (\* \*, \* \* s), 10000 indicates 10.00s. This sets the time decelerated from rated frequency to 0.

### D.2.3.2 Inverter status word

Status word **WORD1**, specific definition of each bit is as follows:



Note: meaning of the ninth bit (i.e. bit9) of the status word **WORD1**:

=0: Indicates that the inverter status received by PLC from PROFINET is invalid

=1: Indicates that the inverter status received by PLC from PROFINET is valid

**Status word WORD2:** Feedback frequency Hz, for example: 5000 indicates forward rotation at 50.00 Hz; - 5000 indicates reverse rotation at 50.00 Hz

In closed-loop control mode: this word represents the encoder feedback velocity

In V/F control mode: this word represents the actual output frequency

**Status word WORD3:** Output current A, for example: 100 indicates 10.0 A

**Status word WORD4:** Output voltage V, for example: 380 indicates 380 V

**Status word WORD5:** Custom status 1, set according to parameter P82.02

**Status word WORD6:** Custom status 2, set according to parameter P82.03

**Status word WORD7:** Custom status 3, set according to parameter P82.04

**Status word WORD8:** Custom status 4, set according to parameter P82.05

### Attachment: Description of PROFINET custom status word

This description is mainly valid for the **PROFINET 8WORD** communication protocol type. The last four words of the status word can be selected via the inverter parameters P82.02, P82.03, P82.04, and P82.05. The selectable definitions for each parameter are as follows:

Parameter set to 0-7    standby

Parameter set to 8    reference torque of the inverter, signed, standard value for rated motor torque, 999 means 99.9%, -1000 means -100.0%

Parameter set to 9    standby

Parameter set to 10 current output torque of the inverter, signed, standard value for rated motor torque, 999 means 99.9%, -1000 means -100.0%

Parameter set to 11-12 standby

Parameter set to 13 reference target frequency of the inverter, unsigned, 5000 means 50.00Hz

Parameter set to 14 current operating frequency of the inverter, signed, 5000 means 50.00Hz, -5000 means -50.00Hz

Parameter set to 15 feedback frequency of the inverter, signed, 5000 means 50.00Hz, -5000 means -50.00Hz

Parameter set to 16 feedback velocity of the inverter, signed, 1000 means 100.0rpm, -1000 means -100.0rpm

Parameter set to 17 standby

Parameter set to 18 effective output voltage of the inverter, unsigned, 380 means 380V

Parameter set to 19 effective output current of the inverter, unsigned, 100 means 10.0A

Parameter set to 20 active output power of the inverter, unsigned, 1000 means 100.0% of the rated motor power

Parameter set to 21-22 standby

Parameter set to 23 bus voltage of the inverter, unsigned, 537 means 537V

Parameter set to 24-25 standby

Parameter set to 29 output terminal status of the inverter, 1: ON 0: OFF

Parameter set to 30 standby

Parameter set to 31 input terminal status of the inverter, 1: ON 0: OFF

Parameter set to 32-33 standby

Parameter set to 34 analog input channel 0, 10000 means 10.000V

Parameter set to 35 analog input channel 1, 10000 means 10.000V

Parameter set to 36-39 standby

Parameter set to 40 number of the most recent fault 0~63

Parameter set to 41-42 standby

Parameter set to 43 radiator temperature, 60 means 60 degrees Celsius

Parameter set to 44 encoder count 0~65535

Parameter set to 45-59 standby

### D.3 Protocol Usage

Based on the above description of various communication protocols, we have a general understanding of the PROFINET communication of STEP inverters. Here are the specific application examples of PROFINET communication:

**Step 1: Prepare a PLC supporting PN communication, such as Siemens S7-1200;**

**Step 2: Prepare properly the GSD file GSDML-V2.32-STEP-Profinet Adapter-XX.xml provided by our company;**

**Step 3: Prepare an inverter with PROFINET functions of our company;**

**Step 4: Power on the inverter, and set the following parameters in the parameter group of inverter:**

P10.02 = 5 PROFINET command reference

P10.03 = 17 PROFINET reference velocity

P82.02 custom status word 1 the status word to be detected can be selected through the comments on the operator

P82.03 custom status word 2 the status word to be detected can be selected through the comments on the operator

P82.04 custom status word 3 the status word to be detected can be selected through the comments on the operator

P82.05 custom status word 4 the status word to be detected can be selected through the comments on the operator

**Step 5: Connect the PLC and the inverter with standard cables for PROFINET. (Note: Please perform Step 5 after Step 4)**

**Step 6: After the GSD file is imported into the PLC, no matter which type of protocol is selected, the following bits of the control word WORD1 of the inverter protocol must be preset through PROFINET communication, which is the operating condition of the inverter:**

#### Word1 (operating condition)

Bit0 = 1 running Bit0 = 0 stop

Bit1 = 1 normal running Bit1 = 0 base blocking

Bit2 = 1 normal running Bit2 = 0 quick stop, deceleration and stop according to the deceleration time of the setting of P40.09

Bit10 = 1 valid PLC command

Bit7 = 1 reset fault Bit7 = 0 normal state

#### Word2 (velocity reference)

-30000 ~ 30000 velocity reference

#### Notes:

If AS600 series software and master-slave control are used for the inverter, it is necessary to set the parameters of the inverter

Host P10.03 = 17 PROFINET reference frequency/velocity

Slave P10.04 = 7 PROFINET reference torque

Set in PLC programming communication

Word1

Bit6 = 0 velocity mode in main mode

Bit6 = 1 torque mode in slave mode

In main mode Word2 -30000 ~ 30000 velocity reference Word3 invalid

In slave mode    Word3            -1000 ~ 1000    torque reference            Word2 invalid

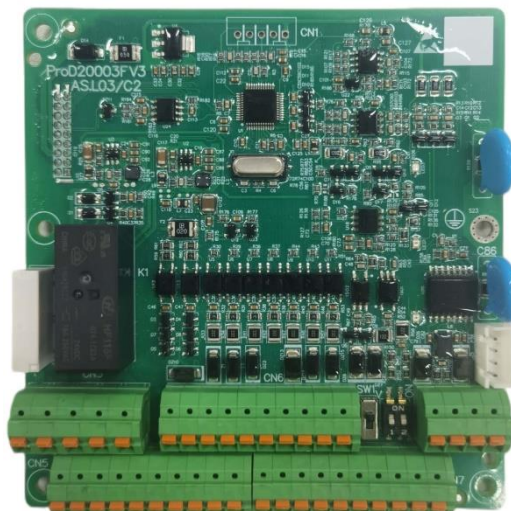
## Appendix E Optional expansion card



Torque off STO expansion card Board card model: AS.L17/P



PN communication card Board card model: AS.L03/C9



**Universal standard IO board card**

Intelligent flexible driver optional IO board	
Optional classification	Board card model
Universal standard IO board	AS.L03/C2
With SSI programmable IO board - with isolation 485	AS.L03/D4.01
With SSI programmable IO board - with isolation CAN	AS.L03/D4.02
Elevator dedicated IO board - with isolated CAN and isolated 485	AS.L03/D5



**Encoder PG card**

<b>Intelligent flexible driver optional PG card</b>	
<b>Optional classification</b>	<b>Board card model</b>
Intelligent flexible 5 V incremental PG card	AS. L06/C9. 01
Intelligent flexible 12 V incremental PG card	AS. L06/C9. 02
Intelligent flexible 5 V incremental frequency division PG card	AS. L06/C9. 03
Intelligent flexible 12 V incremental frequency division PG card	AS. L06/C9. 04
Intelligent flexible Endat PG card 5 V with frequency division	AS. L06/D1. 01
Intelligent flexible Endat PG card 5 V without frequency division	AS. L06/D1. 02
Intelligent flexible Resolver PG card 12 V with frequency division	AS. L06/D2. 01
Intelligent flexible Resolver PG card 12 V without frequency division	AS. L06/D2. 02
Intelligent flexible SINCOS-5V - frequency division	AS. L06/C5. 01
Intelligent flexible SINCOS-5V - no frequency division	AS. L06/C5. 02

## Customer complaint

Customer name:	
Tel:	Fax:
Type of complaint: <input type="checkbox"/> Sales <input type="checkbox"/> Publicity <input type="checkbox"/> Service <input type="checkbox"/> Quality <input type="checkbox"/> Business <input type="checkbox"/> Products <input type="checkbox"/> Others	
Details of complaint:	
Complainant (signature): Complaint unit (official seal): Date :      Date:	

# Warranty Card

Customer name:	
Tel:	Fax:
Warranty product:	
Warranty content:	
Warrantor (signature): Warranty unit (official seal): Date :      Date:	

## Warranty Agreement

1. The warranty period of this product is eighteen months (subject to the bar code information on the product). During the warranty period, the company shall be responsible for free maintenance of the product for its any fault or damage under normal use according to the instruction manual.
2. During the warranty period, a certain amount of maintenance fees will be charged for any damage caused by the following reasons:
  - A. Damage to the machine caused by errors in use and unauthorized repair and transformation;
  - B. Damage to the machine caused by fire, flood, abnormal voltage, other natural disasters and secondary disasters;
  - C. Hardware damage caused by human falling and transportation after purchase;
  - D. Damage to the machine caused by a failure of operating according to the user manual provided by our company;
  - E. Failure and damage caused by obstacles other than the machine (such as external equipment factors);
3. In case of any fault or damage of the product, please completely and correctly fill in the *Product Warranty Card* in detail.
4. The collection of maintenance fees shall be subject to the newly adjusted *Maintenance Price List* of our company.
5. The Warranty Card will not be reissued under normal circumstances. Please carefully keep this card and show it to the maintenance personnel for warranty.
6. In case of any problem in the service process, please contact our agent or our company in time.
7. The right to interpret this agreement belongs to Shanghai Sigriner STEP Electric Co., Ltd.

**Shanghai Sigriner STEP Electric Co., Ltd.**  
(Customer Service Center) Service hotline: 400-821-0325

**Address: No.1560 Siyi Road, Jiading District, Shanghai**

**Postal code: 201801**

**Tel: 021-69926000**

**Fax: 021-69926000**

**Website: <http://www.stepelectric.com>**

## Customer Notification

Dear customers:

RoHS is an acronym for the Restriction of the use of certain Hazardous Substances. The EU implemented the RoHS on July 1, 2006, which provides for restrictions on the use of six hazardous substances, namely lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), in new electronic and electrical equipment products placed on the market.

On February 28, 2006, seven ministries and commissions, that is, MIIT, NDRC, MOC, GAC, SAIC, GAQS and SEPA jointly promulgated the Measures for Administration of the Pollution Control of Electronic Information Products, which is China's version of the RoHS and is enforced. The *Management Measures for the Prevention and Control of Environmental Pollution by Electronic Wastes* promulgated by the Ministry of Environmental Protection of the People's Republic of China began to be implemented on February 1, 2008. The regulations explicitly stipulate that users of electronic and electrical products should provide or entrust electronic waste to dismantling, utilizing and disposing units (including individual businesses) with corresponding business scope listed in the catalog (including temporary catalogs) to dismantle, utilize or dispose of.

Our products comply with the Measures for Administration of the Pollution Control of Electronic Information Products and the requirements (of RoHS) in selection and procurement of electronic components, PCB panels, wire harness materials, structural components, with strict control of six hazardous substances, namely lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE). And in the production, PCB components are welded in Xinchu lead-free welding production line, based on the lead-free welding process.

The following components may contain the following toxic and harmful elements:

Component type	Electronic component	Printed Circuit Board (PCB)	Sheet metal pieces	Radiator	Plastic parts	Wire
<b>Toxic and hazardous elements that may be contained</b>	Six hazardous substances, namely lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)					

### I. Environmental impact analysis:

The company's electronic products will produce some heat during use and may lead to the micro-emission of some harmful substances, but will not cause a serious impact on the surrounding environment. Once an expired electronic product is discarded, its heavy metals and toxic and harmful chemicals will cause serious pollution to the soil and water resources.

### II. Life cycle of electronic products and equipment:

Any electronic product or equipment has a life span and will be damaged and scrapped. Even if it can still be used, it will be eliminated by the upgrading of electronic products. Our electronic products and equipment are subject to a life cycle generally not more than 20 years.

### III. Disposal of scrapped electronic products:

Discarded electronic products may pollute the environment if not properly disposed of. We require customers to establish a recycling system according to the relevant provisions of the status. No electronic products are allowed to be discarded or disposed of as general household garbage or general industrial solid waste, instead, they must be stored and utilized in an environmentally sound manner or uniformly recycled by qualified organizations in strict accordance to the *Management Measures for the Prevention and Control of Environmental Pollution by Electronic Waste* promulgated by the Ministry of Environmental Protection. No disassembly, utilization and disposal of e-waste by unqualified individuals or organizations is allowed.

Do not discard e-waste with ordinary household waste. Please call your local waste management agency or environmental protection agency for advice on handling e-waste.

Shanghai Sigriner STEP Electric Co., Ltd.