INOMAX

Medium and Low-Voltage frequency drives Servo drives
Solar pump inverter soft starters solution provider

# ACS880E
## Series AC Drive
# User's Manual

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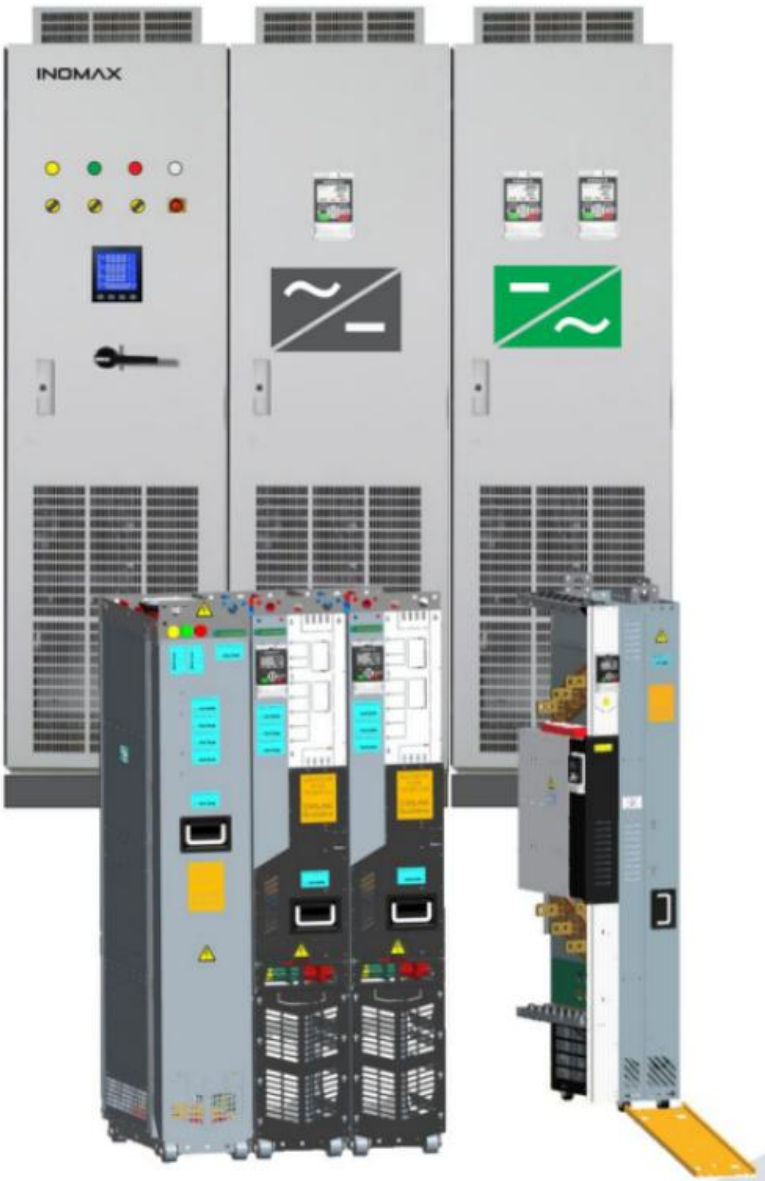
Please keep it carefully and
**hand it over to the end user**




Perfect Drive &High Efficiency Energy saing

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# 1.About the manual and the features of this series of products

**Congratulations and thank you for choosing to use the industry-leading motor drive control provided by this series of drives!**

**This manual will provide you with the necessary information about the installation, debugging and operation of the driver, and is suitable for engineering and technical personnel who design, install, debug, use and maintain the driver. This manual contains the drive's quick start guide, basic technical parameters, mechanical and electrical installation, wiring, drive control parameters, typical industry application macro settings, care and maintenance, as well as related operating methods and precautions.**

**In order to ensure that you can use this series of drives correctly, give full play to the excellent performance of the product, and ensure the safety of users and equipment, please be sure to read this manual carefully before starting to operate the drive. At the same time, readers should have basic knowledge of electricity, wiring, electrical components, and electrical schematic symbols. Please note: Improper use may cause the drive to operate abnormally, malfunction, or even cause equipment damage, personal injury and other accidents!**

**This manual is a random accessory, please keep it properly. If the driver is installed in machinery or transmission equipment, please ensure that this manual can be delivered to the end user along with the complete set of mechanical equipment so that they can obtain the product at any time during the operation of the driver. Related Features and Information.**

**Since we are always committed to the continuous progress and improvement of our products and related information, the information provided by our company is subject to change without prior notice. For the latest changes and more information, please contact our local representative office directly, or visit our website, or WeChat official account (the QR code is located on the cover of this manual).**

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**In order for you to quickly understand and maximize the advantages of the drive, its main features in terms of performance and functions are introduced as follows:**

**◎1. Supported by breakthrough direct torque control technology, it has outstanding performance comparable to industry benchmarks in terms of torque response and torque accuracy within the full speed range. This feature is particularly helpful for including in various open-loop drive control applications such as asynchronous and synchronous motors, it can improve system reliability, save investment in encoders and reducers, and reduce maintenance difficulty and costs.**

**◎2. In response to and pursuit of energy conservation, emission reduction and user energy cost savings, in the exploration of motor drive and control, power electronic energy conversion technology, the effective utilization rate of unit energy has been pushed to a higher level of development., thereby making it have better energy-saving effect. Especially in energy-saving applications that drive new types of motors such as high-efficiency asynchronous motors, permanent magnet synchronous motors, and synchronous reluctance motors.**

**◎3. Under the general trend of cherishing resources and improving their utilization rate, and helping the industry to upgrade to mid-to-high-end, through the tireless pursuit of product details and quality, scientific and systematic design and strict lean control, it has a higher level of Level of intelligence, reliability, and long service life.**

**◎4. In order to further improve the efficiency of your personnel in installation, configuration, debugging, use, maintenance and other aspects, developers should work on how to embed and share intuitive, flexible, convenient, intelligent, experts and industry experience products. New improvements and more efficient designs.**

**◎5. Under the historical process of Industry 4.0 or intelligent global industries and equipment intelligent manufacturing, network configuration, equipment access, high-speed communication type and compatibility, high-speed motor precision drive, positioning and servo control, etc. aspect, with a more flexible and extensive level of support.**

**Due to the simplicity of the text and the abstraction of technology, if you are interested or want to know more about the richer and more comprehensive features of this product, or need to discuss drive and motor control, or electrical automation,**
**For more professional experience, design, and application in improving the energy efficiency of motor drive systems, you are welcome to contact us at any time. We will be interested in maintaining an open mind to share and communicate with you, hoping to create better experiences with you. Much social value and contribution!**

Target：

High Efficiency、Large Torque、Fast Response、Precision、Stable speed

## 1. Introduction to the manual and the features of this series of products

# User manual

Basic description of hardware and firmware
ACS880E series

| Content | Chapter |  |
|---|---|---|
| Safety Instructions | 3. |  |
| Mechanical Installation | 7. |  |
| Electrical Installation | 5.、6.、8-9. |  |
| Startup/Parameters | 4.、10. |  |



**1. Introduction to the manual and the features of this series of products**

# 2. Content

# 3.Safety instructions and precautions

This chapter describes the safety instructions that must be observed when installing, operating, and maintaining the drive. Ignoring these safety instructions may result in personal injury or death or damage to the drive, motor and its driving equipment. Please read the safety instructions before performing any work on the device.

Warning and caution instructions, this manual contains 5 types of safety instructions (from left to right):

**Hazardous Voltage Warning:** Used to warn of the presence of high voltages that may cause personal injury and/or equipment damage.

**Hazardous voltage warning:** Used to warn that high voltage will continue to exist within the device within 10 minutes after the main power supply is cut off, which may cause personal injury and/or equipment damage.

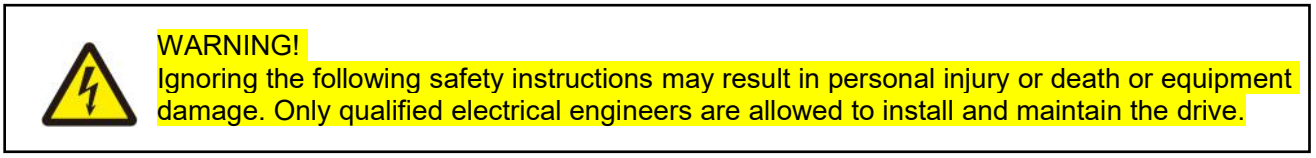
**General Warning:** Used to warn of non-electrical factors that may cause personal injury and/or equipment damage.

**Electrostatic discharge warning:** Used to warn about electrostatic discharge phenomena that can cause equipment damage.

**Surface high temperature warning:** Used to warn that the surface of the component is high and may cause burns when in contact.


〉General safety precautions during installation, operation and maintenance

The following warnings are intended for persons performing installation and maintenance work on drives, motor cables or motors.





## 〉3.1 Before installation

- If the box and the nameplate of the machine do not match the ordered model, please do not install it and contact the relevant person! It is recommended that you read this manual carefully before system design and installation. Referring to and following the relevant chapters of mechanical and electrical cabinets will help you obtain a safe, reliable, and professional drive system!
- When you open the box and find that water has entered the drive and its device, or parts are missing or damaged, please do not install it and contact the storage and transportation or relevant personnel in time to handle it! Otherwise, there is a risk of personal and property injury.
- When transporting the drive, be sure to hold (hook) the case firmly. If you hold the front cover to transport the machine, part of the main body of the machine may fall, posing a risk of injury. You should lift it with care when transporting, otherwise there is a risk of damaging the equipment!

This device has been tested for withstand voltage before leaving the factory. No insulation or voltage withstand test can be performed on any part of the driver. Because high voltage may cause damage to the driver's insulation and internal components.

## 〉3.2 When installing

- Non-electrical construction professionals should not perform installation, maintenance, inspection or component replacement. Otherwise there is a risk of electric shock. Do not twist the fixing bolts of equipment components at will, especially the bolts marked with red! It is strictly prohibited to modify the delivered machine, otherwise there is a risk of electric shock. If the driver device is modified or the nameplate information is changed and it is inconsistent with the factory status, the company will not be responsible and it will be deemed that you have voluntarily waived the random related warranty service!

- When the delivered driver product is installed in a cabinet, it needs to be installed in the final system for use. The final system should provide corresponding fireproof enclosures, electrical protection enclosures, mechanical protection enclosures, etc., and comply with local laws and regulations and relevant IEC standards.

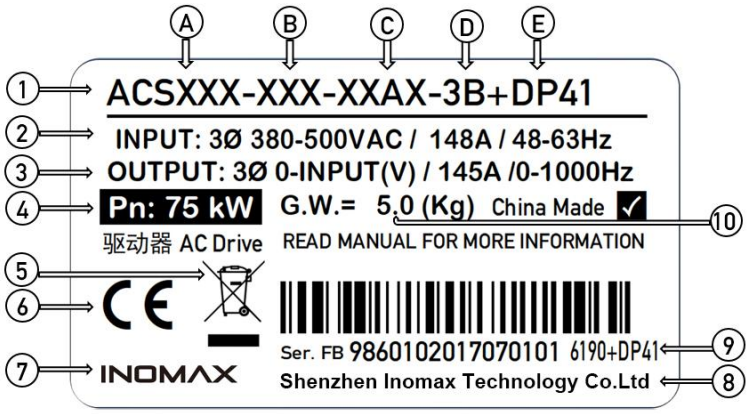
- Do not install transformers or other equipment that generate electromagnetic waves or interference around the driver, otherwise it may cause the driver to malfunction. If such equipment needs to be installed, a shielding plate should be installed between it and the frequency converter.

## 〉Preparation work before installation, model number and nameplate label instructions

Delivery inspection and drive module identification

Check delivered products for damage. Before starting installation and operation, please carefully check the model label on the delivered drive module to confirm whether the delivered product model is consistent with the ordered product model. This label is located on the top, front, and right side of the drive module.

Typical examples are as follows：




| No | Definition and description |
|---|---|
| 1 | Machine model: A is the product series, B is the product structure, volume and shape category, C is the product rated current, D is the product input voltage level (1 means single-phase 220V, 3 means three-phase 380V, 6 means three-phase 690V, etc., B means Built-in brake chopper), E is the hardware power type, or various option codes configured at the factory (such as +E3EC, +E3PN, +SMM, +BLM, +ALM, +DCDC). |
| 2 | The input voltage, current and frequency range of the product, and the electrical specifications of the applicable auxiliary power |
| 3 | Product output voltage, current, frequency range |
| 4 | Product rated power |
| 5 | The mark cannot be discarded at will under CE regulations. The product contains a variety of recyclable electrical components. |
| 6 | Certification marks applicable to various standards |
| 7 | Manufacturer LOGO |
| 8 | Manufacturer information |
| 9 | Product serial number (including model, production date, serial code, software version, etc.) |
| 10 | Product net weight, origin, QC inspection mark |

### Installation location requirements

For information on the permissible operating conditions of the drive, please refer to the **technical data**. Install in an upright orientation. The wall on which the drive is mounted should be as flat as possible, made of flame-retardant material, and strong enough to bear the weight of the drive. The floor beneath the drive should be of flame-retardant material.

About arc welding

Arc welding is not recommended for securing the enclosure and the drives inside it. However, if the installation can only be performed using arc welding, the return conductors of the welding equipment should be connected to the bottom chassis within 0.5 meters (1'6”) of the welding point. To avoid damage to the drive due to welding current passing through it, nearby If there is any welding operation, avoid powering on, starting up, or running the driver to prevent possible damage.

# Running

- When the input power is connected, the driver, motor cable or motor cannot be repaired. After disconnecting the power supply, you must wait at least 10 minutes before working on the drive, motor or motor cables to allow the DC link capacitors to discharge.
- Non-professional technical personnel should not detect signals during operation. Otherwise it may cause personal injury or equipment damage!
- Be careful with hot surfaces. Some components (such as the heat sink of the power semiconductor and its surrounding metal casing) will still be hot after the power supply is disconnected.
- Before installing the drive, keep it in its packaging or use other methods to protect it from dust and iron filings generated by drilling or grinding.
- The installed driver also needs to be protected from dust and iron filings. Wire debris inside the drive can cause damage or malfunction of the device.
- Use a vacuum cleaner to clean the area under the drive before starting to prevent the drive cooling fan from sucking dust into the drive.
- Do not block the air inlet and outlet when the driver is running to ensure adequate cooling. For more information, see Losses, Cooling Data and Noise in the Checking the Installation Site and Technical Data chapters at the front of this booklet.
- When setting the driver working limit, ensure that the motor and all driven equipment can always work normally under the set working limit.
- Before turning on the automatic fault reset or automatic restart function of the drive control program, please make sure that no dangerous situation will occur. These features automatically reset the drive and continue working after a fault or power outage.
- The drive starts up to five times every ten minutes. Too frequent starts may damage the charging circuit of the DC capacitor. The maximum number of charge cycles allowed for a DC capacitor (i.e. starting by applying power) is one every two minutes. For frame size R1-C/E2-C/E3 series models, the total maximum number of charges is 100,000 times, and for frame size C/E/R4 and above series models, it is 50,000 times.
- Never use the circuit breaker at the drive power supply to control the motor; use the start and stop keys on the control panel or commands through the drive I/O terminal. NOTE: If the control location is not set to Local, the control panel's stop key will not stop the drive.
- Before resetting the fault, send a stop command to the drive. If there is an external source sending a start command, and start is turned on, the drive will start immediately after the fault is reset, unless the drive is configured for pulse start. See the firmware (parameter) description.
- These warnings are intended for engineering personnel who design the operating procedures for the drive, start up or operate the drive.
- **Warning!** Ignoring the following safety instructions may cause personal injury or death or equipment damage.
- Before debugging and using the driver, it must be ensured that the motor and its dragging equipment can operate normally within the entire speed range provided by the driver. The drive can be adjusted so that it drives the motor at a higher or lower speed than would be achieved by connecting the motor directly to the grid.
- If a dangerous situation occurs, do not activate the automatic fault reset function of the standard application. If this function is activated after a fault, the drive will reset and resume operation.
- Do not use AC contactor or circuit breaker device (circuit breaker method) to control the motor. Instead, the drive is controlled using a control panel or via control commands from the drive I/O board or a fieldbus adapter.
- When controlling the driver of a permanent magnet motor, do not run the motor beyond the rated speed. Overspending the motor can cause overvoltage, which can permanently damage the drive. Note that if an external source for the start command is selected and that source is in the ON (start) state, the drive will start immediately after a fault reset unless the drive is configured for 3-wire (pulse) macro start/stop.
- The rotating permanent magnet motor feeds power to the drive, causing the drive to be energized even when the motor is stopped and power is cut off. Before carrying out maintenance work on the drive, please

- Disconnect the motor from the driver via the safety switch
- Prevent any other motors within the same mechanical system from starting
- Lock the motor spindle
- Measure the motor to confirm that it is de-energized, then connect the U, V and W terminals of the drive to each other and to PE.

Do not perform any work on the control cables while the drive or external control circuit is powered. Even if the power supply to the drive is cut off, the control circuit powered by the external power supply will introduce dangerous voltage into the drive.
For drives installed on IT power systems (ungrounded power systems or power systems grounded with high impedance (more than 30 ohms)), if their varistor or internal EMC filter is not disconnected, the drive will pass the voltage The sensitive resistor/filter is connected to ground. This may cause drive damage.
For drives installed on corner-grounded TN systems, the drive will be damaged if its varistor or internal EMC filter is not disconnected.

## 3.3 Maintenance and other types of guidance and precautions

**Note: It is strictly prohibited to plug or remove expansion boards while power is on, otherwise the driver or connected**

>> General precautionary guidance and principles before working with live electricity, please read these steps carefully<<

1. Clearly mark the work area.
2. Disconnect all possible power connections.
• Open the main circuit breaker for power to the drive.
• Make sure there is no reconnection. Lock the circuit breaker in the open position and place a warning notice on the circuit breaker.
• Disconnect all external power from the control circuit before working on control cables.
• After disconnecting the drive, always wait 5-10 minutes for the intermediate DC circuit capacitors to discharge before continuing.
3. Take protective measures to prevent contact with any live parts in the work area.
4. Use extreme caution when near exposed conductors.
5. Measure to make sure the installation is not powered.
• Use a multimeter with an impedance of at least 1 Mohm.
• Make sure the voltage between the drive input power terminals (R/L1,S/L2, T/L3) and the ground (PE) terminal is close to 0V.
• Make sure the voltage between the drive DC terminals ($U_{DC+}$ and $U_{DC-}$) and the ground (PE) terminal is close to 0V.
6. Install temporary grounding according to local codes.
7. Seek work permission from the person who controls the electrical installation work.

Confirm by measuring with a multimeter (resistance at least 1 MΩ):
1. There is no voltage between the driver's input R, S and T or (L1/L2/L3) three phases and ground.
2. The DC bus UDC+ and UDC- voltage to ground is zero.
3. PB, + and - have zero voltage to ground.

## 3.4 Beware of dangerous voltage

WARNING! Ignoring the following safety instructions may result in personal injury or death or equipment damage.
• Even if the motor is stopped, hazardous voltages may still be present on circuit terminals R/L1, S/L2, T /L3 and U, V, W and UDC+, UDC-, PB.
• Depending on the external wiring, hazardous voltages (115V, 220V or 230V) may be present at the relay output terminals on the drive control unit.
• Drives cannot be repaired directly in the field. Do not attempt to repair a failed drive in the field; please contact your local our representative office or authorized repair center for replacement.
• During installation, it must be ensured that conductive dust generated by drilling does not enter the inside of the driver. Conductive dust inside the cabinet may cause drive damage or failure.
WARNING! The printed circuit board contains components that are sensitive to electrostatic discharge. Always wear a grounding wristband when handling circuit boards. Avoid unnecessary contact with the circuit board.

## 3.5 About grounding

warn! Ignoring the following guidance can result in personal injury or death, as well as increased electromagnetic interference and equipment damage:
• Ground the drive, motor and connected equipment under all circumstances to ensure personal safety and reduce electromagnetic radiation and electromagnetic interference.
• The size of the grounding conductor must comply with local safety regulations. The ground wire resistance must be less than 10Ω. Otherwise, the equipment may malfunction or even be damaged.
• When installing multiple drives, provide separate protective earth grounding (PE) for each drive.
• In order to suppress electromagnetic interference, EMC radiation must be minimized. When cables enter and exit the cabinet, 360° high-frequency grounding is required. In addition, to meet safety regulations, the cable shield needs to be connected to earth ground (PE).
• In floating or high-resistance grounded power systems (resistance greater than 30 ohms), do not install EMC filters with strong leakage currents
• Do not install the drive on a corner-grounded TN system.
Notice:
• The power cable shield may be used as the grounding conductor of the equipment only if its dimensions meet the requirements of the safety regulations.
• Standard GB/IEC/EN 61800-5-1 requirements: If the rated contact current of the drive is greater than 3.5mA (AC) or 10 mA (DC), then a fixed protective earth wire and a cross-section of at least 10 mm must be used 2 protective earth conductor of copper wire or 16 mm 2 aluminum wire, or when the protective earth conductor is disconnected, the power supply is automatically cut off or the second protective earth conductor has the same cross-sectional area as the original protective earth conductor.

## 〉3.6About hoisting and handling

warn! Please follow these guidelines. If you ignore instructions, injury, death, or equipment damage may result.
•Please wear safety shoes with metal toe caps to avoid foot injuries. Please wear abrasion-resistant gloves and long sleeves. Some parts have sharp edges.
• Handle the drive carefully
• Frame sizes E/R4…9: Use lifting equipment to lift the drive. Use the drive's lifting eyes.
• Frame sizes E/R5…9: Do not tilt the drive. The drive is heavy and has a high center of gravity. An overturned drive can cause personal injury.

WARNING! When the system is in use, the surfaces of the drive system components (such as exposed heat sinks, metal cases, input reactors and braking resistors in use) will generate high temperatures. Do not touch, otherwise there is a risk of burns!

## 3.7Important precautions during the life cycle of Drives

### 1) Requirements for distribution side leakage protector RCD

Due to the hardware characteristics of the equipment's power electronic products, a large leakage current will flow through the protective ground conductor during operation. Please install a B-type leakage protector (RCD) on one side of the power supply. When selecting a leakage protector (RCD), the transient and steady-state ground leakage currents that may occur when the equipment is started and operated should be considered. Select a special RCD with measures to suppress high-order harmonics, or a 300mA general-purpose RCD (IΔn is 2 to 4 times the protective conductor current).

### 2) Insulation inspection of cables, motors and braking devices

Before connecting the drive's input power cables, check the insulation of the power (input) cables in accordance with local regulations.

When the motor is used for the first time, before reuse after being left for a long time, and during regular inspections, the motor insulation should be checked to prevent damage to the inverter due to insulation failure of the motor windings. Be sure to separate the motor wiring from the driver during insulation inspection.

NOTE: If there is moisture inside the motor, the insulation resistance will decrease. If moisture is suspected, the motor should be dried and measured again.

The steps for checking the insulation of motors and motor cables are as follows:

1. Make sure the motor cable has been connected to the motor, and then remove the motor cable from the output terminals U(U1), V(V1) and W(W1) of the driver.
2. Use a 1000 V DC megger to measure the insulation resistance between each phase conductor and the protective earth conductor. The insulation resistance of a typical motor must exceed 100 Mohm (given at 25 °C or 77 °F). For the insulation resistance of other specific motors, please refer to the manufacturer's instructions. When using a 500V voltage megohmmeter for some motors, it should be ensured that the measured insulation resistance is not less than 5MΩ.

Check and confirm the insulation and resistance value of the braking resistor device

Check the insulation of the braking resistor assembly (if present) as follows:

1. Check that the resistor cable is connected to the resistor and disconnected from the drive output terminals DCP/+ and PB.
2. At the driver end, connect the + (R+) and PB (R-) wires of the resistor cable together. Measure the insulation between the connected conductor and the PE conductor using a measuring voltage of 1 kV DC. The insulation resistance value must be higher than 1 Mohm.
3. The driver’s braking capacity is configured to be about 50% of the rated output power by default, and the target application is an application with a braking frequency of 50%. Please refer to the relevant guidelines in the braking chapter of the manual to select a resistor. Excessive braking power is too small. The resistance may damage the driver. If you have any questions, please contact relevant personnel.

### 3) Thermal protection of motor

Depending on the subdivision type of the motor, we recommend that you purchase motor temperature estimation, temperature sensor measurement and other methods to complete the thermal protection of the motor. For details, please refer to the description of the parameters related to motor protection. If the motor works under low-speed, high-current and high-torque output conditions for a long time, you should avoid using ordinary motor-driven servo motors with built-in fan blades at the rear or without motor cooling fans, because in this case the motor's heat generation and heat dissipation are lost. If there is a risk of burning the motor, you should choose a variable frequency and servo motor with its own cooling air and power supply. If the selected motor does not match the rated capacity of the driver, especially when the rated power of the driver is greater than the rated power of the motor, be sure to adjust the motor protection parameters in the driver or install a thermal relay in front of the motor to protect the motor.

### 4) Vibration of mechanical devices

At some output frequencies, the driver may encounter the mechanical resonance point of the load device, which can be avoided by setting the jump frequency parameters within the driver.

### 5) Regarding motor heat and noise

Because the driver output voltage is a PWM modulated wave and contains certain harmonics, the temperature rise, noise and vibration of the motor will increase slightly compared with power frequency operation. When the application scenario and the motor itself are sensitive to this point, the driver power

should be derated to increase the output carrier so that the output current has a higher sinusoidal degree. An ordinary L-type output reactor, LC-type sine wave filter, or LCLCL should be added to the output side. single or combined measures such as type output filters to alleviate the problem.

### 6) When there is a voltage-sensitive device or a capacitor to improve the power factor on the output side

The driver outputs PWM modulated wave. Do not install capacitors to improve the power factor or varistor for lightning protection on the output side. This may cause instantaneous overcurrent of the driver or even damage the driver. If you really have installation needs, please contact the manufacturer or relevant professional technicians for communication and confirmation of technical solutions.

### 7) The main circuit of the driver input and output terminals is arc-sensitive, and a description of the contactors and other switching devices used

Based on the fact that the core of the driver is a power electronic conversion device, the maximum withstand DC side voltage of its internal rectifier and inverter components is 600V (220V system) 1200 (380V system)/1700-2200V (690V system). If the input and output of the driver Because of the common power cable short circuit or virtual connection or disconnection, when sparking and arcing occurs, there is a high probability that arc light will damage the power conversion device in the driver and cause irreversible and permanent damage to the driver. The reason is that The several thousand volts of voltage and sustained energy density generated by the arc light far exceed the withstand voltage of the power device. Although the driver has a built-in voltage surge mitigation measure, there is a high probability of damage. If a contractor is installed between the power supply and the input end of the driver, please follow the principle that the contactor cannot break with load and install arc extinguishing accessories as much as possible, that is, this contactor is not allowed to control the start and stop of the driver. When it is necessary to use this contactor to control the start and stop of the driver, the interval should not be less than 1 hour. Frequent charging and discharging can easily reduce the service life of the capacitors in the driver. If there is a switching device such as a contactor between the output end and the motor, please follow the principle that the contactor cannot break under load and install arc extinguishing accessories as much as possible. That is, you should ensure that the driver performs on-off operation when there is no output, otherwise it may easily cause the driver to fail. The internal module is damaged.

### 8) Use outside the rated voltage value

It is not suitable to use the driver outside the allowable operating voltage range specified in the manual, as it may cause damage to the components in the driver. If necessary, please use the corresponding step-up or step-down device to transform the power supply before inputting it to the driver.

### 9) Three-phase input is changed to two-phase input

The three-phase driver in this series cannot be changed to two-phase. When there is actual need, the drive should be used through large derating operation. At this time, it is recommended that you contact relevant professionals, otherwise it will cause malfunction or damage to the drive.

### 10) Surge suppressor

The driver is equipped with a varistor inside, which can suppress the surge voltage generated when the inductive load around the driver is turned on and off. When the surge voltage energy generated by the surrounding inductive load is large, be sure to use a surge suppressor or a diode on the inductive load. Please do not connect a surge suppressor to the output side of the driver. For its mechanism, please refer to the relevant description of the influence of contactors and arc light mentioned above.

### 11) Altitude and derating use

In areas where the altitude exceeds 1000m, due to the thin air, the heat dissipation effect of the driver becomes worse, so it is necessary to derate the driver (for every 100m the altitude increases, derate 1%, the maximum operating altitude is 4000m; when the temperature exceeds 40°C, the driver must be derated according to the temperature per 100m). Derate by 1.0-1.5% when the temperature rises by 1℃ (depending on the actual site and ventilation conditions in the cabinet). The maximum operating temperature is 50℃). In this case, please contact our company or relevant personnel for technical consultation.

### 12) Special professional usage such as multiple machines sharing DC bus

If the customer needs to use a method other than the recommended wiring diagram provided in this manual, such as a common DC bus, etc., this situation requires a basic knowledge of product hardware design and application conditions and the ability to calculate and verify. And complete the design scientifically and reasonably. If you are unclear or have any questions, please contact our company or relevant personnel for technical consultation.

### 13) Regarding the application of motor zero-speed locking and long-term high torque output

Such as machine tool spindle zero-speed positioning, servo punch bottom dead center hammer/blow and other related similar applications. If the customer requires the motor to be locked at zero speed with high torque for a long time, it is recommended that the mechanical brake is locked after the driver servo is in place. Either the output power of the driver is controlled, or the upper control system closely monitors the locking time and output power, because in this case the output current of the driver and the heating of the power device under DC cannot be circulated, and the power device is prone to occur under such application conditions for a long time. Failure due to premature arrival of physical life. Although most series of the product families related to this manual have real-time monitoring and protection functions for such stalling, at this time, it is also necessary to have basic knowledge of product hardware design and application conditions. Ability to calculate and verify, and complete design and product selection scientifically and rationally. If you are unclear or have any questions, please contact our company or relevant personnel for technical consultation.

### 14) Pay attention when scrapping the driver

The electrolytic capacitors in the main circuit and the electrolytic capacitors on the printed circuit board may explode when burned. Toxic gases are produced when plastic parts are burned. Should be disposed of as industrial waste. For more details, please refer to the relevant chapter descriptions of the materials.

### 15) About adapting motors

The standard universal series drive is suitable for applications under general working conditions of four-pole squirrel cage asynchronous induction motors. If it is not the application of the above motors and various specific or extreme working conditions, please be sure to select the driver according to the rated current of the motor, industry and professional application guidance.

Operation above power frequency (>50Hz)

The universal type of this driver provides an output frequency of 0Hz-500Hz, and the subdivision-specific model can provide output driving capabilities of 500-1333Hz and >1333Hz. If the customer needs to operate above 50Hz, please consider the endurance of the driven motor and related mechanical devices. At the same time, a higher output frequency will require a higher modulation carrier wave of the driver, resulting in greater heat loss of the driver. At this time, it is necessary to derate the driver, cool the driver well, and select a dedicated series of drivers and motors to meet the demand. Different shapes of The factory default configuration of the driver modulated PWM carrier is usually, 8K@<=25A, 4K@25A-363/400A, 2K@>=430A. For the selection of the adaptive driver for non-50Hz motors, you can refer to the above information and professional If you still have questions after calculation, please contact the relevant technical personnel for support.

Non-four-pole squirrel-cage asynchronous induction motors, such as various new permanent magnet synchronous motors, should be matched and correctly selected under the guidance of professionals or selection materials to avoid personal injury caused by incorrect selection. and property damage.

The cooling fan of the non-inverter motor is coaxially connected to the rotor shaft. When the speed decreases, the cooling effect of the fan decreases, or the sports non-power servo motor without its own cooling may overheat the motor when it performs work for a long time. Therefore, the motor overheats. In some cases, a forced exhaust fan should be installed or replaced with a variable frequency motor.

The driver has built-in adaptive motor standard parameters. According to the actual situation, it is necessary to identify the motor parameters or modify the default values to match the actual values as much as possible. Otherwise, the operation effect and protection performance will be affected.

The rated current of the pole-changing motor is different from the standard motor. Please confirm the maximum current of the motor and select the corresponding driver. Be sure to switch the pole number after the motor stops.

A short circuit inside the cable or motor will cause the driver to alarm or even be permanently damaged. Therefore, please first perform an insulation short-circuit test on the initially installed motor and cables. This test also needs to be performed frequently during routine maintenance. Note that when doing this kind of test, the driver must be completely disconnected from the part being tested. Please refer to the relevant content of insulation testing for details.

The speed control range of the motor varies depending on the lubrication method and manufacturer.

When operating the motor outside the speed control range, please consult the motor manufacturer.

More details that need to be paid attention to in the above points are described in the previous section of the safety instructions. It is recommended to read them carefully.

Limitation of Liability

Installations must always be designed and performed in compliance with applicable local laws and regulations. We disclaim any responsibility for any installation that violates local laws and/or other regulations. In addition, if the internal instructions in this manual are not followed or used beyond product specifications or recommendations provided by our company, the drive may be damaged beyond the scope of the warranty.

# 4. Quick start guide and introduction to general functions

## 4.1 Mechanical and electrical design and installation inspection checklist

Carefully check the drive's mechanical and electrical installation before starting the drive. It is recommended that two or more engineering technicians inspect the installation in accordance with the table below. Please read the safety instructions at the front of this manual carefully before starting to work on the equipment.

**◆It is strictly prohibited to insert or remove function expansion boards while power is on, otherwise the driver or connected components may be permanently**

### 4.1.1 Mechanical installation checklist

☐1. The surrounding environment (temperature, humidity, dust, fluff, vibration, corrosive gas, etc.) conditions must meet the requirements.

☐2. The drive device is correctly fixed on the cabinet. (See Cabinet Installation Design and Mechanical Installation.)

☐3. Whether the cooling air flows smoothly to prevent hot air from circulating near the driver body or cabinet, and whether the air volume of the cabinet fan is sufficient.

☐4. The motor and its actuator are installed. (See Electrical installation planning, Technical data: Motor connection.)

☐5. Whether dust, splashing water, humid air, and corrosive gases have been adequately assessed and corresponding countermeasures taken.

### 4.1.2 Electrical installation checklist

Please refer to the electrical installation design and electrical installation chapters. After completing each operation, proceed to the following key processes for confirmation and inspection.

☐6. If the drive is connected to the IT (ungrounded) power grid, the VAR's EMC disconnecting screw must be loosened or the jumper disconnected.

☐7. If the storage period exceeds one year, the capacitor needs to be reformed. (Please refer to relevant chapters or professional guidance)

☐8. The drive power terminals, drive chassis, I/O cards and signal terminals of the control unit are all correctly grounded.

☐9. The power supply (input power) voltage is consistent with the rated input voltage of the driver, and the phase sequence of the circuit with synchronization switching function is strictly consistent.

☐10. Connect the input power supply to R/S/T or L1/L2/L3 (UDC+/UDC- for DC power supply), and tighten the terminals to the specified torque.

☐11. Suitable power supply (input power) fuses and circuit breakers are installed.

☐12. The motor is connected to U/V/W, the terminals are tightened to the specified torque, and the insulation is well treated.

☐13. Connect the braking resistor (if any) to +/PB, check the insulation strength between the two poles of the resistor and its grounding, and tighten the terminals to the specified torque.

☐14. The motor cable (and braking resistor cable, if any) should be separated from other cables, and the shielding layer of the weak current signal line should be well grounded.

☐15. There is no power factor compensation capacitor in the motor cable. The length of the motor cable complies with the regulations. If it is too long, a Du/Dt reactor should be installed.

☐16. The external control connection of the control unit is normal.

☐17. There are no tools, foreign objects and conductive dust generated by drilling inside the driver.

☐18. The input supply voltage cannot be applied to the input terminal of the driver through a bypass connection.

☐19. The motor junction box and other covers are installed in place.

## 〉4.2 Basic steps and guidelines for quick start:

■→First 1: Check and confirm according to the above list one by one, especially confirm that the power wiring is correct (listed on the left side of the table below). Regarding the shielding and grounding points of the weak current signal control line, please refer to the description about grounding

■→Second 2: Motor rated parameter setting and online identification of parameters.

■→Next 3: Use the control keyboard or PC tool to perform LOC local debugging.

■→Again 4: REM remote startup and debugging.

### 4.2.1 Introduction to common wiring and terminals

◆It is strictly prohibited to plug or remove expansion boards while power is on, otherwise the driver or connected components may be permanently damaged!

Check whether the wiring is correct according to the logo. Wrong connection may cause permanent damage to the machine, which will invalidate the warranty!


| | | | |
|---|---|---|---|
| R/L1、S/L2、T /L3，PE | Power supply, protective ground interface | DI1 | REM remote forward start |
| U、V、W、PE | Motor interface | DI2 | REM remote reverse start |
| +(DCP+)、-(DCN-) | DC common bus interface | +24VD | DI reference power supply |
| +(DCP+)、PB | Braking resistor interface | AI1 | Analog speed regulation |
| Note: For more details, please refer to the standard wiring diagram and its related detailed diagrams | | GND | Common terminal |

### 4.2.2 Motor parameter identification

Confirm that you are in LOC local mode and press [5]LO/RE to quickly switch. LOC is displayed in the upper left corner to indicate local mode, start, stop and speed adjustment are only controlled by the control panel; REM is displayed to indicate remote mode, start, stop and speed adjustment are controlled by external terminals or communication. If you are not sure whether the drive has been modified, you can restore the drive to factory defaults and then debug:

A) **Correctly set the rated parameters of the motor**

enter the motor nameplate parameters into the relevant parameter group, and set the motor type (the default is asynchronous motor)

Enter the following parameters according to the motor nameplate:
(Take 3.7kW/100Hz/1500rpm/7.4A/380V synchronous motor as an example)

Current motor parameter group:

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1100 | Speed feedback port | 0 | 0=no sensor<br>1~4 corresponds to encoder 1~4 |
| P1101 | Position feedback port | 0 | Single closed loop: same as P1100<br>Fully closed loop: load side encoder port |
| P1102 | Motor type | 1 | 0=asynchronous motor<br>1=synchronous motor |
| P1103 | Motor rated frequency | 100Hz | |
| P1104 | Motor rated speed | 1500rpm | |
| P1105 | Motor rated voltage | 380V | |
| P1106 | Motor rated current | 7.4A | |

Note: 1. Correctly setting the motor parameters is fundamental to normal operation. Do not enter the maximum speed and frequency here, otherwise it will cause abnormal operation.
2. The back electromotive force corresponding to the rated frequency should be close to the rated voltage, and the rated speed should correspond to the rated frequency.

Global control parameters:

| | | | |
|---|---|---|---|
| P1251 | Control algorithm type | 1 | 0=Open loop vector<br>1=direct torque |
| P1252 | Parameter identification type | Choose according to the situation | 0=no request<br>1=Rotational<br>2=Standstill<br>3=PM autophasing |
| P1254 | Motor phase sequence | 0~1 | 1=swap phase sequence |

**Parameter identification and correction parameter table (asynchronous motor IM)**

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1110 | No-load excitation current | | About 30%~50% of the rated current of the motor |
| P1111 | Stator phase resistance Rs | | |
| P1112 | Rotor phase resistance Rr | | |
| P1113 | Stator phase inductance Ls | | |
| P1114 | Leakage inductance coefficient | | About 5%~15% |

**Parameter identification and correction parameter table (synchronous motor PM)**

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1108 | Electrical angle offset | 0~360 | It is only used when there is an encoder closed loop, reflecting the phase difference between the encoder zero point and the U phase of the motor. |
| P1111 | Stator phase resistance Rs | | |
| P1115 | Direct axis | | |

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| | inductor Ld | | |
| P1116 | Quadrature axis inductor Lq | | |
| P1117 | Back electromotive force coefficient E | | mV/rpm, the back electromotive force of the rated speed should be close to the rated voltage. If it is too low, it indicates insufficient torque of the motor. |
| P1118 | Core saturation coefficient | 0~100% | Typical value is 70%~90%, too low reflects core saturation |

Execute parameter identification: Set the P1252 identification type, and then start it locally. It will be completed in about 1 minute and stop automatically. Different identification methods identify different parameters, as follows

①Rotational (Rotation recognition)

On the basis of static identification, additionally added: asynchronous motor no-load current/stator inductance, synchronous motor back electromotive force coefficient/electrical angle offset, identification encoder resolution/direction

②Standstill (Station identification)

Asynchronous motor stator resistance/rotor resistance/leakage inductance coefficient, synchronous motor stator resistance/AC/DC axis inductance/core saturation coefficient

③PM Autophasing (PM phase identification)

In the stationary state, identify the electrical angle offset of the encoder (assuming the encoder resolution and direction are correct)

Motor direction adjustment

When the motor is running forward, if the motor rotation direction is opposite to the expected direction, it is recommended to exchange the wiring of V and W. If it is not convenient to implement, then by adjusting the parameter P1254 motor phase sequence, phase commutation (equivalent V and W exchange wiring)

**B). Introduction to the internal basic principles and working mechanism of motor parameter identification**

①、 Rated power (if any), voltage and current are mutually restricted. If there is a mismatch, the current will be automatically corrected based on power and voltage.

②、 The rated speed n and frequency f are mutually constrained. The driver automatically calculates the number of pole pairs p=60*f/n. If p is not an integer, p is automatically rounded.

For permanent magnet synchronous motors, if p is rounded, the speed is automatically corrected, at this time n=60*f/p. For example, n=2000rpm, f=133Hz, then p = 4, n is corrected to 1995rpm.

For asynchronous induction motors, n < 60*f/p is required, and the difference is the motor slip.

③、 The constraint relationship between rated voltage U and rated frequency f.

For permanent magnet synchronous motors, the back electromotive force corresponding to the rated frequency should be close to the rated voltage. Excessive deviation will cause parameter identification failure and even overcurrent alarm.

for asynchronous induction motors. The driver obtains the iron core saturation coefficient through rotation identification to determine the adjustment direction of the rated frequency. The ideal range is around 80%.

Saturation coefficient >90%, indicating that the rated frequency can be reduced

Saturation coefficient <70%, indicating that the rated frequency should be appropriately increased

The rest can be adjusted as needed. Lowering the rated frequency can increase the maximum torque of the motor, but it will cause the no-load current to increase. The no-load current of the motor should be controlled within 50% of the rated current as much as possible to reduce motor heating.

④、 Motor type.

The currently supported motors are three-phase sine wave permanent magnet synchronous motors and asynchronous induction motors. If the motor type cannot be determined, the easiest way is to short-circuit the three wires of the motor. If the motor shaft can rotate easily, it is an asynchronous motor. Otherwise, it is an asynchronous motor. Permanent magnet synchronous motor.

### 4.2.3. Motor parameter identification, parameter recording and calculation

The following two modes are available: static identification and rotation identification.

① Stationary identification: Set the parameters to stationary identification, press [3] Start green button to run, and it will end in about 10 seconds. In this mode, the motor will not rotate. The no-load current of the motor needs to be adjusted manually, which is generally 30%-50% of the rated current.

If the feedback speed fluctuates greatly (>5RPM), please check whether the encoder shielding layer is grounded and the encoder coaxiality, and whether there is shaking.

If the speed difference is large, please check whether the encoder resolution is true and correct.

② Rotation identification: Select parameter P1252 to 1 (rotation identification), press [3] Start green button to run, the driver will perform static identification first and then perform rotation identification and automatically stop. Before performing identification, a comprehensive evaluation of the mechanical system where the motor rotation pair is located should be carried out. Safe and controllable, this mode is suitable for situations where the load is separated from the motor shaft, and can correctly identify the motor's no-load current.

Finally, change the control mode to 1 (direct torque control) to enter the closed-loop state and conduct a trial run.

◆ If an emergency occurs, you can press the [4] STOP red button to stop learning urgently. ◆

### 4.2.4. Calculation of optimal range of motor parameters

4.2.4.1. For asynchronous induction motors, the no-load current is between 25% and 50% of the rated current; the leakage inductance coefficient is between 5% and 10%.

4.2.4.2.. Permanent magnet synchronous motor,

①.DQ axis inductance, L = U/(2π*f*In*1.732)*0.3, for example, U=380V, f=300Hz, In=40A, then L=380/(6.28*300*40*1.732 ) *0.3=0.87mH. A deviation of less than half or more than twice the size is unreasonable.

②. Saturation coefficient. The inductors identified with different rated currents are different, which can be reflected from the saturation coefficient. If it is less than 70%, it indicates that the motor is uncomfortable working at this rated current and the rated current needs to be reduced. Long-term oversaturation will cause the motor core to heat up.

③. Back electromotive force coefficient. The back electromotive force corresponding to the rated frequency should be more than 90% of the rated voltage.

## 〉4.3. Local LOC debugging and running

①. Press the [1] option key, select the menu "Local reference", then set the speed reference to 150-1000.0rpm, then press the OK key to save, and press [1] to exit to the main interface. Press the [3] Start button to start, observe the current, speed, frequency, and check the motor rotation. The parameter names monitored on the main interface of the panel can be displayed by pressing the OK button. Press the left and right buttons to switch to different pages. There are 8 page cycles in total. Press the right arrow to switch to the second interface, which can display the output voltage, motor flux, and motor torque. This is the most critical status of the motor. Left arrow to go back.

②. If the motor rotation direction is opposite to the equipment running direction, phase sequence exchange can be performed by adjusting parameters.

③. For permanent magnet motors, you can record the output voltage during operation, and then divide it by the rotation speed, which is the back electromotive force coefficient. Please set it to the parameters manually. If the output is 250.0Vrms at 1000rpm, then P1131 is set to 250.0mV/rpm.

## 〉4.4. Remote REM operation

Difference from local mode: Start operation/speed regulation through external signals such as DI1/AI1 terminal. The control panel is only used for monitoring and does not participate in starting, stopping and speed adjustment. By default, DI1 is used as the forward start and stop signal, DI2 is the reverse start and stop signal, and AI1 is used as the speed control signal. Make sure it is in REM remote mode (external control, panel startup is invalid at this time), press [5] LO/RE to quickly switch. REM is displayed in the upper left corner to indicate remote mode

①. LOC is local control, that is, controlled through the keyboard.

②. REM is remote control. The default is DI1 forward rotation, DI2 reverse rotation, and the default speed is set by the P147 AI1 conversion value.

Change the startup mode: the parameters are (note: external terminal startup, communication startup, control panel startup are optional)

③. Change the speed given source: the parameters are (Note: optional analog quantity given, control keyboard given, communication given, multi-step speed given, potentiometer UP/DOWN given, PID given)

## 〉4.5. Basic introduction to user I/O interface functions

### 4.5.1.Digital input DI1-DI6

4.5.1.1.Filter settings. The valid and invalid delay times can be set independently, see parameters P0200 ~ P0211.

### 4.5.2. Digital output or high-speed pulse output interface, DO1/DO2

4.5.2.1. DO1/DO2 only supports PNP output

4.5.2.2. See parameter P144 for the real-time status of the general output, which is only used to confirm whether the DO output is active.

4.5.2.3. General output signal source selection, parameter P230/P231 can point to any address and bit.

### 4.5.3. Relay output NO1, NO2

4.5.3.1. The meaning of terminal symbol abbreviations, NO (normal open), NC (normal closed), CM (common).

### 4.5.4. Analog input AI1, AI2

4.5.4.1. Real-time detection value. P146 AI1 measured value and P148 AI2 measured value.

4.5.4.2. Real-time conversion value. P147 AI1 conversion value and P149 AI2 conversion value.

4.5.4.3. Conversion relationship. Mapping of input ranges and output ranges.

4.5.4.4. Filter time setting. P257 and P271 correspond to the filtering time of AI1 and AI2 respectively.

4.5.4.5. Mode selection, parameters P254 and P268.

① Parameter value description

0).Voltage type unipolar, [0, 10V]
1).Current type unipolar, [0, 20mA]
2).Voltage type bipolar, [-10V, +10V]
3). Current type bipolar, [-20mA, +20mA]

② To select the voltage and current type, set the jumper of AI1 or AI2 to the corresponding position. The factory default is voltage type.

Analog input status and configuration (based on AI1, unipolar):

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| **P146** | AI1 actual value | | V |
| **P147** | AI1 conversion value | | rpm |
| **P250** | AI1 input maximum value | 10.0 | V |
| **P251** | AI1 input minimum value | 0 | V |
| **P252** | AI1 output maximum value | 1500.0 | rpm |
| **P253** | AI1 output minimum value | 0.0 | rpm |
| **P254** | AI1 mode | 0 | [0] 0 ~ 10V<br>[1] 0 ~ 20mA<br>[2] -10~+10V |
| **P257** | AI1 filter time | 10ms | |
| **P258** | AI1 correction gain | 1.0 | |

| | | | |
|---|---|---|---|
| **P259** | AI1 correction bias | 0 | |

③. Selection of unipolar and bipolar. Unipolar refers to [0, 10V] or [0, 20mA], bipolar refers to [-10V, +10V] or [-20mA, +20mA]◆ Note: At this time, AI1 and AI2 will be unipolar or bipolar at the same time. ◆

4.5.4.6. Error correction method.
See P250-P277 for details

**4.5.5.Analog output AO1, AO2**

① Actual output value. See parameters P152 and P154.
②. Signal source connection. P278 and P289.
③. Conversion relationship P278-P299.

**4.5.6. High-speed pulse input**

①. Single-ended pulse input DI5/DI6
②. Set P0656 P0656 = 0x00xy,
x = [0] quadrature, [1] pulse+direction
y = [0] Differential, [1] DI single-ended input

| | | | |
|---|---|---|---|
| **P506** | Use DI input | 0 | 1=ABZ signal source DI port (specified by P523) |

③. Conversion relationship: P501 corresponds to one circle of resolution

**4.5.7. High-speed pulse output**

| No Parameter name | Description | Unit |
|---|---|---|
| P0700 resolution | Incremental encoder position signal resolution without 4x frequency | - |
| P0701 DO output enable | 1=Activate DO1 and DO2 as pulse output ports | - |
| P0702 Simulation mode enable | for testing | - |
| P0703 Simulation pulse frequency | Used when P702=1, used to set the number of pulses output per second | - |
| P0704 Position signal source selection | Select the encoder port to be associated<br>0=none<br>1=encoder 1<br>2=Encoder 2<br>3=encoder 3<br>4=encoder 4 | - |

**4.5.8. Motor temperature detection PT+/PT-**

①. Supports the following four temperature sensor types.
KTY84 (recommended)
PT1000, PT100
PTC (only a temperature switch, no actual temperature. The fault is triggered based on the resistance value comparison. P1512 (PTC fault triggering resistance)
②. Jumper settings, the PT+ and AO jumpers need to be jumped to PT+ (default AO2) to take effect.
Specify the specific sensor type through the motor overheating protection parameter group P1511, and monitor the resistance and temperature through P1028/P1029

**4.5.9. Remote control start and stop methods.**

①-wire or 3-wire control. The default is 2-wire control, DI1 starts with forward rotation and DI2 starts with reverse rotation.
Forward Reverse
start/direction
Forward/reverse/stop
Run/Stop/Direction
②.Bus communication control
Can come from various buses, such as MODBUS, CANopen, PROFINET, MODBUS TCP, etc.
③.Panel control
In remote mode, you can also use the panel to start and stop, and (L) is displayed in the upper left corner.
④. Start and stop mode selection, you can choose free stop or deceleration stop.
⑤. Remote control speed reference
Signal source selection. Parameters can specify two input signal sources. The common signal source list is:
Synthetic calculations. The parameter selects the operation type, and the operation data is the parameter value corresponding to signal source 1 and signal source 2.
⑥. Remote control torque reference

Torque reference based on analog quantity (AI2)

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1430 | Torque given 1 signal source | P149 | Numeric pointer, pointing to P149 AI2 conversion value |
| P264 | AI2 input maximum value | 10.0V | or 20mA |
| P265 | AI2 input minimum value | 0.0V | or 2V、0mA、4mA |
| P266 | AI2 output maximum value | 100% | |
| P267 | AI2 output minimum value | 0% | |
| P268 | AI2 working mode | 0 | [0]=0~10V<br>[1]=0~20mA |
| P271 | AI2 filter time | 10ms | Enter smoothing filter time |
| P274 | AI2 conversion output unit | 10 | [10]=%, note: torque reference conversion must be % |

Torque given based on bus communication

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1430 | Torque given 1 signal source | P1543 | Numeric pointer, pointing to P1543 Fb torque given output |
| P1535[0] | Fb torque given original value 1 | 0 | Int32, the format can be diversified |
| P1535[1] | Fb torque given original value 2 | 0 | Auxiliary torque given, used for torque two-way limiting |
| P1538 | Fb torque given reference value | 1000 | Int32, communication value corresponding to 100% motor rated torque |
| P1543 | Fb torque given conversion value | Float32 | =P1535[0] / P1538, communication given conversion result |
| P1544 | Fb auxiliary torque given conversion | Float32 | =P1535[1] / P1538, auxiliary torque given conversion |
| P1547 | Fb torque actual value | Int32 | =P1008 * P1538, the current torque is converted to the bus |

Panel-based torque reference

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|

| | | | |
|---|---|---|---|
| P1430 | Torque given 1 signal source | P1533 | Numeric pointer, pointing to P1533 local torque reference |
| P1533 | Local torque reference | 0% | -300%~+300% |

Torque given slope control

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1440 | Torque ramp up time | 0.0 | Refers to the time required for a 100% change |

⑦. Types and switching of control modes

⑦-1. Switching mode, only applicable to remote control (REM).

When using non-speed control, when a stop request and jog control are triggered, it will automatically switch to speed mode.

Speed control

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1358 | Remote control mode 1 | 0 | 0=speed |
| P1359 | Remote control mode 2 | 0 | |
| P1361 | Control mode switching signal source | 0 | When pointer value = 1, use control mode 2 |

Torque control

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1358 | Remote control mode 1 | 1 | 1=torque |
| P1359 | Remote control mode 2 | 0 | |
| P1361 | Control mode switching signal source | 0 | When pointer value = 1, use control mode 2 |

Torque limit speed

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1358 | Remote control mode 1 | 2 | 2=Torque limit speed |
| P1359 | Remote control mode 2 | 0 | |
| P1361 | Control mode switching signal source | 0 | When pointer value = 1, use control mode 2 |

Speed limit torque

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1358 | Remote control mode 1 | 6 | 6=Speed limit torque |
| P1359 | Remote control mode 2 | 0 | |
| P1361 | Control mode switching signal source | 0 | When pointer value = 1, use control mode 2 |

Speed limit bidirectional torque

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|

| | | | |
|---|---|---|---|
| P1358 | Remote control mode 1 | 4 | 4=Speed limit positive and negative torque |
| P1359 | Remote control mode 2 | 0 | |
| P1361 | Control mode switching signal source | 0 | When pointer value = 1, use control mode 2 |

speed mode. Parameters p1300 and p1301 specify the torque limit range.
Torque mode. Parameters p1390 and p1391 specify the speed limiting range.
Torque mode speed limit. Torque control, the speed limit depends on the speed given value, that is, torque priority.
Torque limit in speed mode. Speed control, the torque limit depends on the torque given value, that is, speed priority.

**⑧. Speed control**
For ramp control, p1410 and p1411 specify the acceleration and deceleration times respectively. In addition, there are two sets of ramp times that can be switched, and the S-curve ramp time can also be selected. See 1410-P1423 for details.
Digital potentiometer function, namely speed UP/DOWN. The actual values are parameters P1480 and P1481.
Save mode. There are three types of parameter P1485: 0, cleared after power on; 1, always saved; 2, cleared after shutdown.
Increase or decrease signal sources. Parameters P1480 and P1481 specify the increase and decrease signal sources respectively.
Speed range is limited. Parameters P1483 and P1484 respectively specify the two end points of the speed range.
rate of change. Parameter P1482 specifies the time required for the speed to change the entire range.

Multi-speed control

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1392 | Speed given 1 signal source | P1026 | Numeric pointer, pointing to P1026 multi-speed output |
| P1393 | Speed given 2 signal source | 0 | |
| P1394 | Synthetic function selection | 0 | 0：Y=A<br>1：Y=A+B<br>2：Y=A-B<br>3：Y=MIN（A，B）<br>4，Y=MAX（A，B） |
| P1395 | Speed given switch | 0 | bit pointer<br>0=use speed given composite value<br>1=switch to speed reference 2 |

Jog control, supports 2 jog input signals

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1381 | Jog enable | 1 | Pointer, can achieve total enable |
| P1382 | Jog 1 signal source | DI3 | Forward jog command source |
| P1383 | Jog 2 signal source | DI4 | Reverse jog command source |
| P1399 | Jog 1 speed setting | 300rpm | Forward jog speed |
| P1400 | Jog 2 speed setting | -300rpm | Reverse jog speed |

**⑨. Limit control**

Speed mode. Parameters p1300 and p1301 specify the torque limit range.
Torque mode. Parameters p1390 and p1391 specify the speed limit range.

## 〉4.6. Parameter copy and fast backup

When you need to copy parameters to another machine, first upload the parameters of the original machine that need to be copied to the control panel. Then take the panel to the new machine and select Download to copy the parameters.

The upload steps are: [Menu]->[PARA BACKUP]->[Upload to Local], then the changed parameters of the drive will be stored in the memory of the control panel.

The download steps are: [Menu]->[PARA BACKUP]->[Download to Drive]. After the upload and download are completed, the interface will display the total number of parameters transferred.

Note: After the overall debugging, it is recommended that the user upload the parameters to the local (control keyboard) to prevent parameter confusion and prepare for subsequent maintenance.
It can also be uploaded and saved by the host computer software.

## 〉4.7. System configuration and other common settings

Details to be updated

## 〉4.8. Quick handling of common problems

1. No response when starting from external terminal

① Check whether the drive is working in REM mode (check the display in the upper left corner)

② Check whether the running indicator light in the upper left corner of the driver panel is always on. If it is always on, it means that it has started to check the speed given value.

③Check the P140 parameter, whether there is an input signal coming in from the DI status, and whether it corresponds to the start signal terminal.

2. Unable to adjust speed normally

① Check whether the drive is working in REM mode (check the display in the upper left corner)

② Check whether the given channel corresponds to P1392

③Check whether the conversion value (or voltage/current signal) corresponding to AI changes with the adjustment of the given terminal.

3． The downtime is different from the set time

When shutting down, check whether the bus voltage is higher than 700V. If you want to get a shorter shutdown time, please connect a braking resistor.

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P164 | Braking voltage level | 700V | |
| P168 | Chopper brake enable | 1 | 0=disabled<br>1=Activate (can only be activated when a braking unit is installed) |
| P178 | Status indication | | 0=not initialized<br>1=not enabled (because P168=0)<br>2=Faulty (brake resistor short circuit or open circuit)<br>3=Ready waiting to trigger<br>4=braking is working |
| P179 | Actual duty cycle | | 0~100%, the larger the value, the greater the braking power. |
| P180 | Carrier frequency | 500Hz | |
| P181 | Voltage loop proportional gain | 0.5 | The greater the equivalent capacitance of the DC bus, the greater the gain required |

4. Operation report 02 (OC)

①. The acceleration and deceleration time is set too short, extending the deceleration time

②. Check whether the motor rated parameters are consistent with the motor nameplate

5. Operation alarm 05 (leakage to ground)

Check if the drive output has a series contactor and if so, make sure the contactor is absolutely closed during drive operation. Check whether the driver output cable is broken/whether the on-site environment is humid and the insulation is insufficient. At this time, an insulation test instrument needs to be used for detection and confirmation. If no abnormality is found, P1324 leakage protection enable = 0 (ground fault action selection). If there is no action, observe whether the operation is normal.

For more information, please refer to the troubleshooting and maintenance chapters of this manual.

## **********Quick Start Guide Postscript ***********

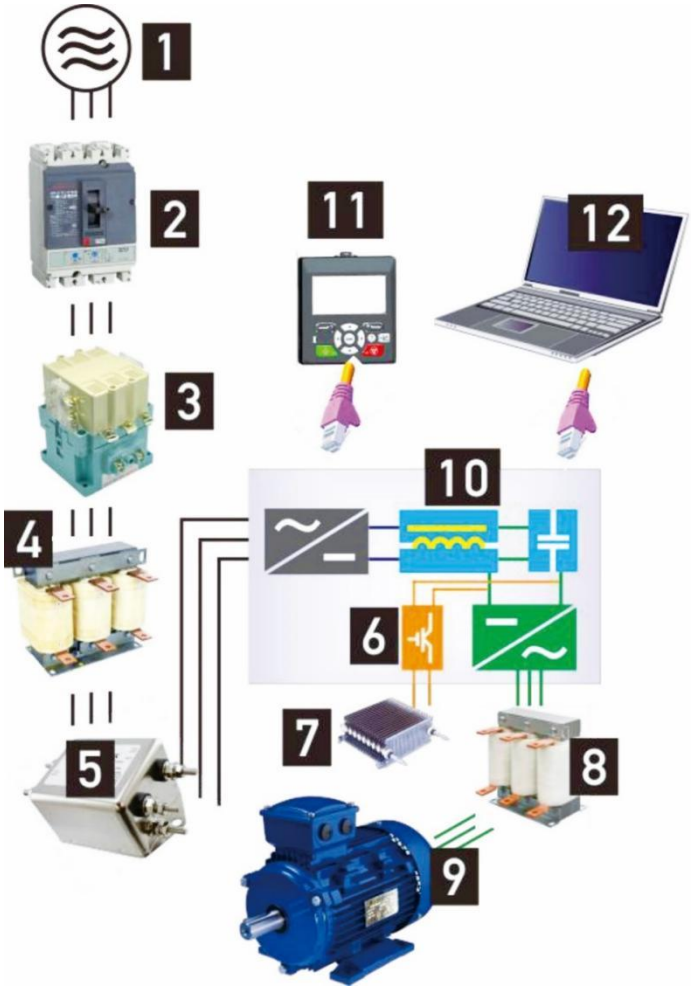
If you want to obtain more professional or flexible application configuration technology, industry application experience settings, etc., please read the following relevant chapters in detail. At the same time, you can also actively contact or participate in online/offline technical exchanges and support network communications related to this equipment. In order to obtain the best quality, fast and efficient response, it is recommended that you follow the following, top-down priority for processing or contacting:

1. Carefully read the quick start guide of this instruction manual and the detailed instructions in each relevant chapter.
2. Technical support from the manufacturer of the device where the drive is located
3. Our agents and distribution intermediary support personnel for the drives sold
4. Technical support from drive manufacturer
5. The driver links to Internet websites, WeChat and other communication platforms to obtain the latest relevant information or materials

# 5. Description of Drives and Con.hardware principles

## 5.1 Drive system functional hardware composition and overview

When this series of drivers is integrated into a drive system, due to the inherent physical characteristics of power electronic technology products and the requirements of popular electrical design and safety regulations, various related components should be installed on the input and output side circuits of the driver to ensure the drive system is a scientific and reasonable drive complete system that is standardized, safe, reliable, environmentally friendly, and meets relevant international or industry standards.

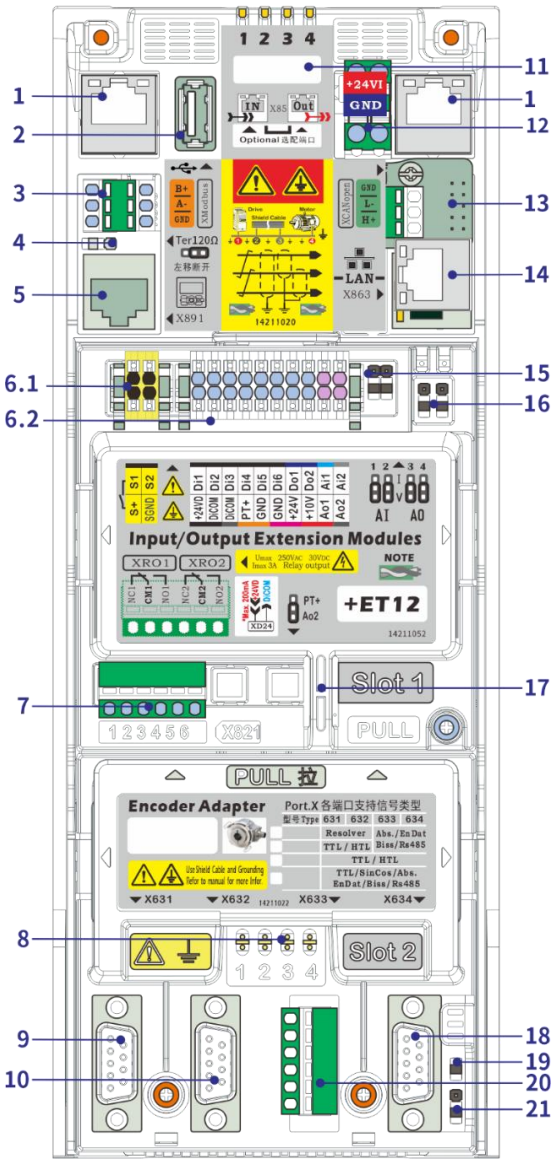



**1.Power supply**
(Please use a power supply that meets the specifications)
**2. Fuseless circuit breaker (MCCB)**
Or leakage circuit breaker (there will be a certain inrush current when the driver is powered on, please pay attention to the selection of the circuit breaker)
**3.Electromagnetic contactor**
(Do not use contactors to start and stop the drive, otherwise it will reduce the life of the drive)
**4. AC reactor on the input side**
(To suppress harmonics and improve power factor, this requirement is also reduced for some models with built-in DC reactors)
**5. Input side noise filter**
(Reduce electromagnetic conduction interference on the input side)
**6. Built-in energy consumption braking chopper** in the driver
7. Energy consumption **braking resistor**
**8. AC output reactor,and du/dt filter** (Improve the problem of too long motor cable and excessive leakage current)
**9. Motor**(Please pay attention to regular inspection of motor heat dissipation and insulation)
10.Drive
11. Extendable drive operation **control keyboard**
12**. Driver debugging**, configuration and monitoring software platform

[Brief description of professional technical instructions and suggestions]

**1. Please pay attention to using a power supply within the allowed specifications of the driver (voltage level, single or three-phase, voltage fluctuation, voltage unbalance, etc.).**
**2. Due to the driver input and high-speed switching electronic inverter characteristics, please choose a circuit breaker or leakage protection switch that meets electrical specifications.**
**3. A suitable AC reactor on the output side can effectively suppress high-order harmonics on the input side and improve the power factor (models containing DC reactors may have lower requirements for this, depending on usage or industry experience).**
**4. Noise filters, common mode inductors (magnetic rings), etc. on the input and output sides can effectively reduce the impact of conduction radiation between the drive system and external electrical components. They can be designed specifically under different application scenarios to improve the stability and reliability of the system. sex.**
**5. AC output reactor (Du/Dt) measures, etc., are used to suppress the resonant peak voltage generated on the wiring side of the motor winding when the motor cable is too long (such as more than 100 meters) to protect the motor coil when the drive is old, etc. This item needs to be carefully evaluated especially when the insulation performance of the coil winding is degraded or poor. This measure can also help reduce the leakage of the motor wire to ground due to distributed inductive capacitance.**
**6. Standardized separation of strong and weak current wiring, good standard grounding, GND following and twisting of weak control signal lines, and installation of absorption and arc extinguishing components in power contactor coils will effectively improve the electrical reliability of the drive system.**

## 〉5.2 Port hardware layout diagram of E/PCU control unit module

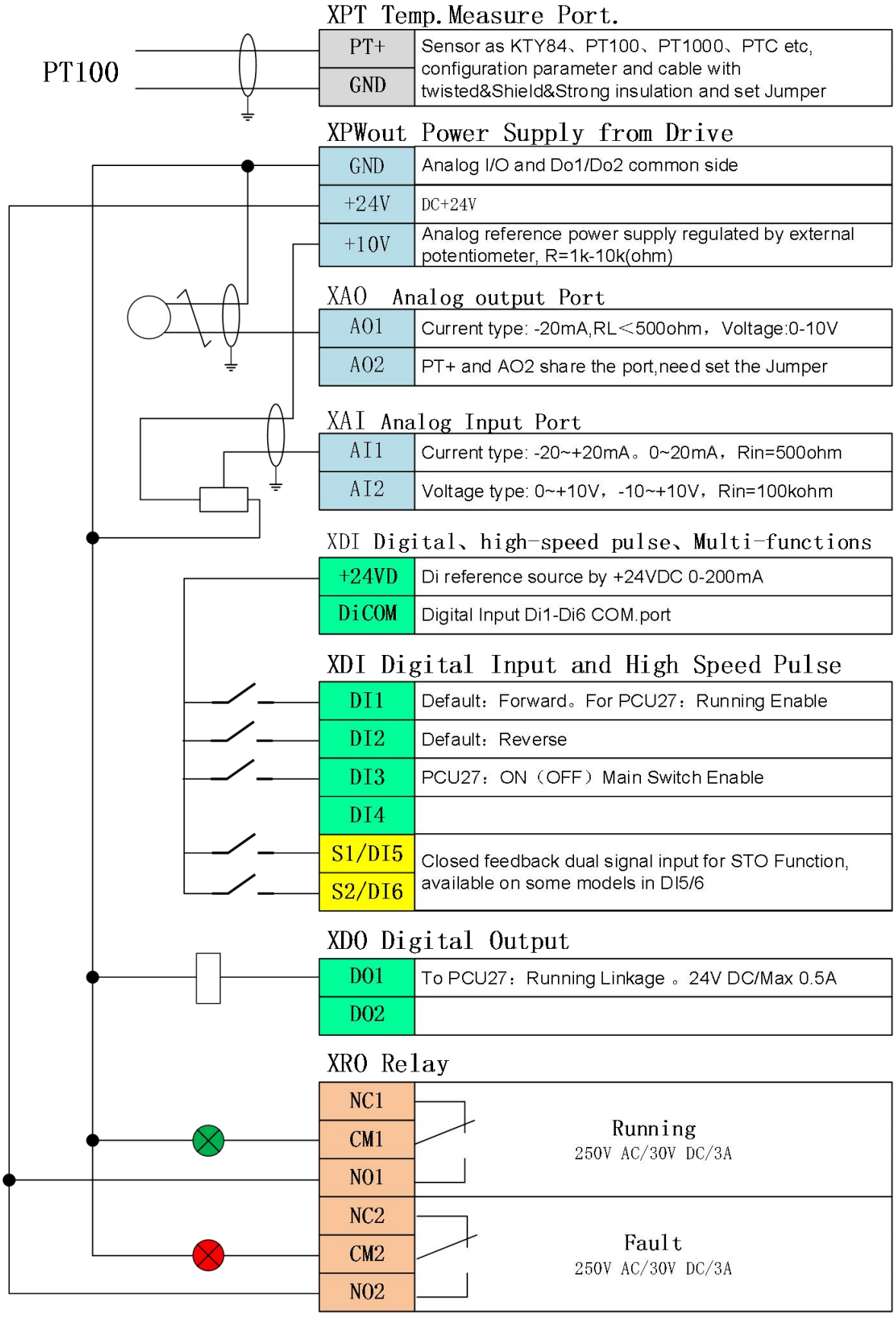




| No. | Port | Description |
|---|---|---|
| 17 | PT+/AO2 | PT+ and Ao2 are selected by jumpers, moving up PT+ and down to Ao2 |
| 18 | DB15 | This port is described in the function port in the encoder card option manual, 2-row DB9, 3-row/15 or spring-terminal interface |
| 20 | 9PinTer | |
| 19 | J5/PE/J6 | GND/DICOM to earth PE connection switch cap, depending on the degree of EMC interference and the need to switch |

| No. | Port | Description |
|---|---|---|
| 1 | X851/2 | Optional Field Bus Ports for EtherCAT、ProfiNET Type labled at Flag 11+E3EC or+E3PN |
| 2 | USB | USB to U drive for Configure storage,FAT32 format |
| 3 | **XModbus fieldbus** | |
| | B+ | Modbus ports :EIA-485,High speed fieldbus,,The wiring should with GND wire, A / B twisted pair, and shielded to enhance electromagnetic anti-interference |
| | A+ | |
| | GND | |
| 4 | Ter120Ω | Modbus/CAN.Ter. resistor, shift left to disconnect. Note：PCBA type |
| 5 | X891 | Panel port，Max.50m extension by cable in right EMC |
| 6.1 | **STO Safety Torque OFF function** | |
| | S1、S2 | Closed feedback dual signal input for STOs, available on some models DI5/6 |
| | S+、SGND | S+ is the internal power supply +24V output, and SGND is the GND when STO is powered by the external 24V power |
| 6.2 | **XPT Temp. Measure for Ext. Motor or Reactor** | |
| | PT+ | Sensor as KTY84、PT100、PT1000、PTC etc, configuration parameter and cable with twisted&Shield&Strong insulation |
| | GND | |
| | **XPW Inter.port as power output from Drive** | |
| | GND | Analog I/O and Do1/Do2 common side |
| | +24V | DC+24V Max 400mA is used as a power supply for external low-power sensors |
| | +10V | Analog reference power supply regulated by external potentiometer, R=1k-10k(ohm) |
| | **XAO Analog output Port** | |
| | AO1 | The output supports current type 0-20mA RL<500ohm, voltage type 0-10V DC is used for the motor speed, torque, current and other information configuration of the driver, and is used for external display or joint control equipment. Twisted pair, shielded, grounded |
| | AO2 | |
| | **XAI Digital input Port** | |
| | AI1 | Current type -20～+20mA,0～20mA,Rin=500ohm |
| | AI2 | Voltage type 0～+10V，-10～+10V，Rin=100kohm |
| | **XD24V Digital and inter. auxiliary power port** | |
| | +24VD | Di reference power supply +24VDC 0-200mA. can be used for external power supply of encoders |
| | DiCOM | The ground common side of Di1-Di6 signal |
| | **XDI Digital、high-speed pulse、Multi-functions port** | |
| | DI1 | (As default) = DI1:Stop (0)/Start (1), DI2: Forward (0)/Reverse (1) or for other function by parameters. |
| | DI2 | |
| | DI3 | DI3/4/5/6，Define its functions by parameters and pointers DI1/2/3:ON/OFF input only.DI4/5/6:ON/OFF or Plus input,f<=100kHz,or HTL encoder A、B、Z signal input，by parameter to NPN/PNP、encoder、etc. |
| | DI4 | |
| | DI5 | |
| | DI6 | |
| | **XDO Digital、pulse output、flexible functions** | |
| | DO1 | ON/OFF output(I<0.5A),or Pulse output(f<=120kHz) by paramete to switch NPN/PNP、pluse output、etc. |
| | DO2 | |
| 7 | **XRO Relay ports** | |
| | NC1 | RO1, Running (default), configurable to other functions 250VAC/30VDC/3A as required |
| | CM1 | |
| | NO1 | |
| | NC2 | RO2, fault (default), can be configured to other functions 250VAC/30VDC/3A as required |
| | CM2 | |
| | NO2 | |
| 8 | 1 2 3 4 | Tndicators correspond to the status of the four ports |
| 9 | x631 | The main options are EN21/22/23/24, and the interface form is DB9/15/terminal type |
| 10 | x632 | |
| 11 | 24VI/GND | External 24V input to control power supply to |
| 12 | X85Out | Communication output port, corresponding to 1 input |
| 13 | **CANopen Fieldbus【PCBA】** | |
| | Optional | GND、L-、H+ prot,Optional function, CANopen protocol |
| 14 | LAN/X863 | Modbus TCP for remote monitoring, communication, etc |
| 15 | AI | AI jumper, up-current, down-voltage |
| 16 | AO | AO jumper, up-current type, down-voltage type |

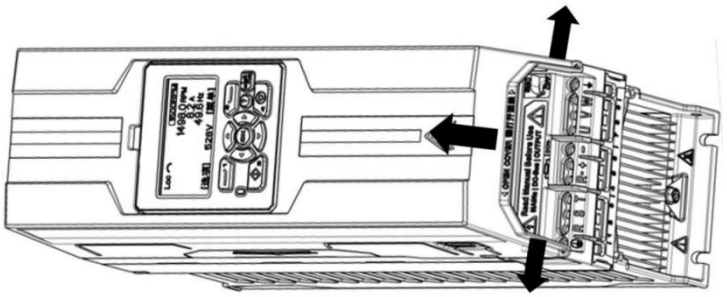
## 5.3 I/O connection circuit diagram of E/PCU control unit module (example)

Default I/O connection circuit diagram of relevant control unit components. The following diagram is an example. For more usage methods, please refer to professional technical experience. The picture below lacks the connection method of S1 and S2, and it is no longer recommended to use DI5/6 to indicate the connection to STO. There is no optional ET12

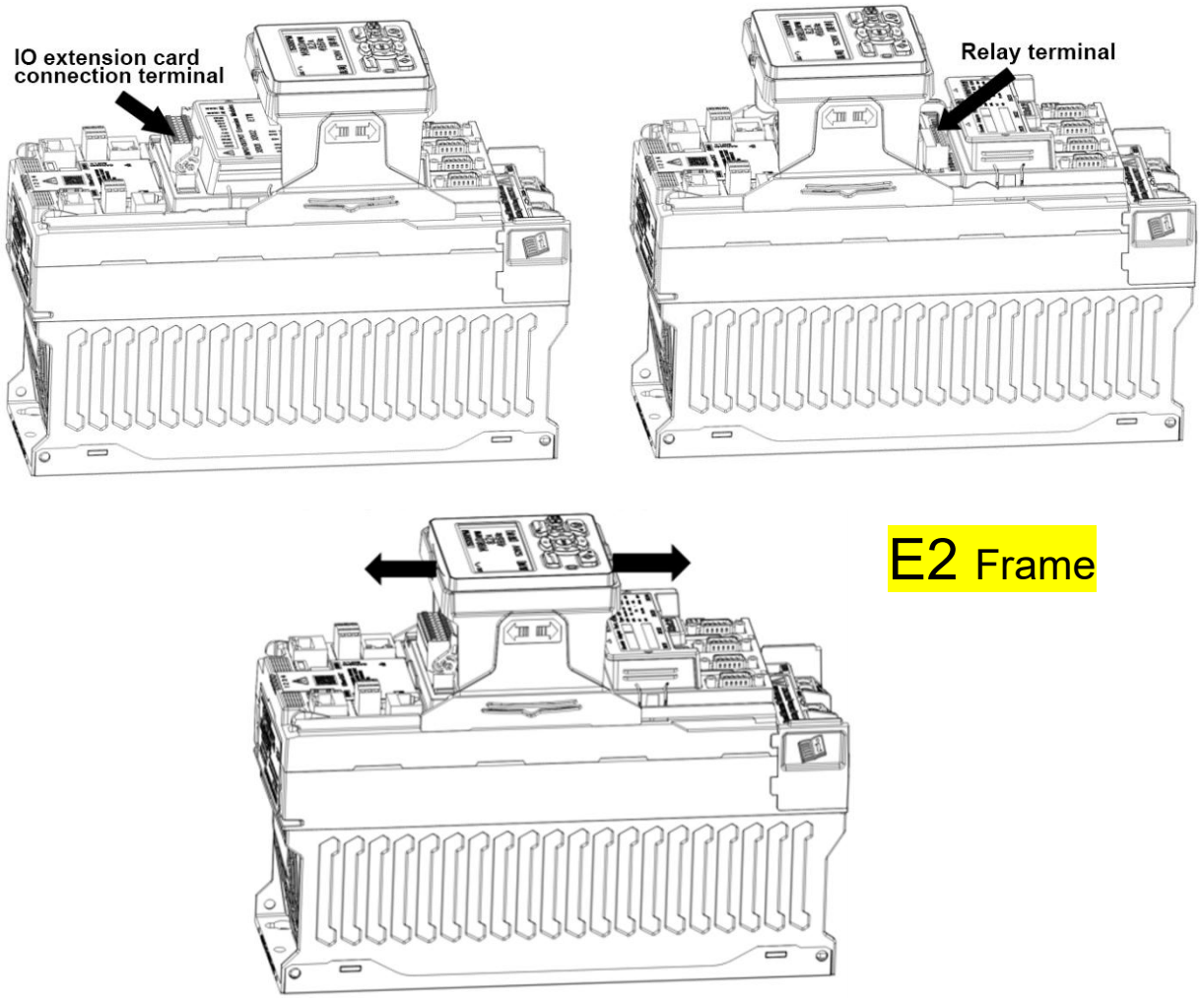


## 〉5.4 Introduce to the Control Unit I/O of E/PCU (E2 is an example)

For the wiring connection of the control part of this series, please refer to this manual for details. The E series control unit system standard wiring diagram (example). Standard wiring is required when connecting the optional encoder component to effectively avoid interference and must be well grounded! If some cable connections interfere with the keyboard bracket, you need to slide the bracket to the corresponding position. The following I/O control part cable connection takes the E-type control component as an example.
When connecting the control cables, you need to first flip open the front cover of the control component, slightly pull open the two sides of the front cover left and right in the direction of the arrow, and at the same time flip up to open or directly remove the front cover.



Slide the bracket and keyboard left and right to clear the I/O terminals to facilitate cable terminal connection. When sliding left and right, there are limit slots respectively. When you hear a "click" sound, it will slide to the limit position. After the wiring is completed, the slide will reset to facilitate the installation of the front cover.



## 〉5.5 DC busbar (DC-Bus) connection and DC24V auxiliary power supply wiring diagram of MX/R4/R5/R6 multi-drive

◆It is strictly prohibited to operate with electricity, otherwise it may cause personal injury!

Figure M41. Use a screwdriver to insert the screwdriver into the tool slot on the busbar upper cover and pry out the buckle. Then flip it upward along the rotation axis of the upper and lower covers. Pull outward to remove the upper cover with the semi-ring buckle.

Figure M42. Auxiliary external power supply DC+24V/GND spring terminal connection position (double entrance, bridgeable, power supply series bridge current capacity is up to 15A), supports DC current 0-200mA. The work indicator LED light is transmitted to the surface of the upper cover of the busbar through the light guide column.

When parallel machines need to share a busbar, first use a cross screwdriver to remove the two screws at the mark, loosen (no need to unscrew them all) the two screws at the mark, use the screws as the rotation axis, and rotate the two copper hooks 180 degrees counterclockwise, as shown in the Figure M43, and retighten the four screws and rotate and press to assemble the upper cover.

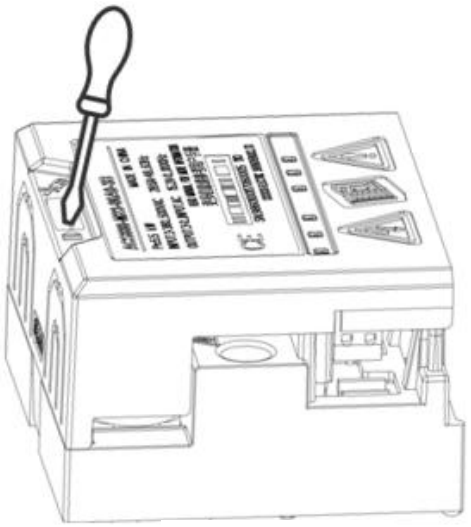


Figure M41

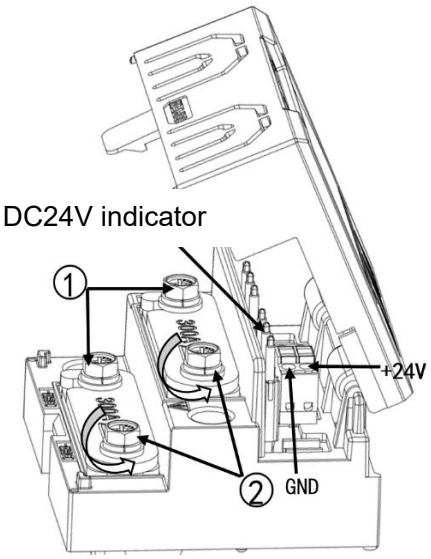



Figure M42

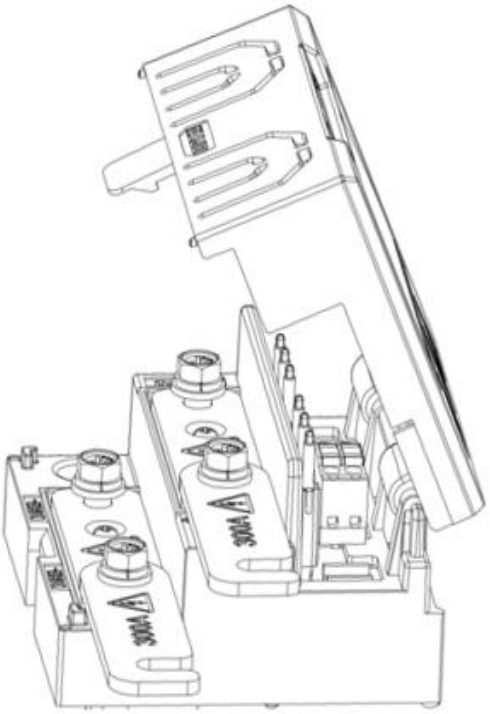


Figure M43

## 〉5.6 Control Panel Basic instructions for CP6X operation

The control keypad（CP66/CP68）can be used to control the drive, read status data and adjust parameters.

**Controlled instructions.** The icon located at the upper part of the display, LOC (LOCAL) means local control, REM (REMOTE) means remote control, (L) means that although it is under remote control, the startup command comes from the panel. The LO/RE button can quickly switch between local and remote modes.
In local mode, all starts, stops and speed adjustments are performed by panel operations. In remote mode, the start/stop mode and speed setting are determined by user configuration.
**The current speed is given.** The data in the upper right corner is the current speed setting value, which is used to quickly confirm whether the speed setting is consistent with the user's needs.


**DC voltage display.** The data in the middle position at the bottom is the real-time value of the DC bus voltage, which is used to quickly confirm the status of the power grid, etc.

**Monitoring content is displayed.** The three lines of large font area in the center are the main monitoring content. There are a total of 8 pages that can be switched and displayed in a cycle. You can switch by pressing the left or right arrow. Press OK to display the name and parameter address of the monitoring content.
When in the parameter group page, press the up and down keys for page turning, and the left and right keys for quick page turning.
**Menu directory.** The [Option] button is used to enter local speed or torque reference editing, forward and reverse rotation switching. The [Menu] button is used to enter the main menu, including browsing the complete PARA LIST, DATA LOG, parameter change log, parameter upload and download, etc.

**About the drive status** LCD version display panel: The arrow in the upper left corner is the main indicator mark. Specifically: the rotating solid arrow indicates that the output is equal to the given, and the dotted arrow indicates that the output is not equal to the given, usually during acceleration or deceleration. A stationary arrow indicates that the drive is in standby mode with no output. No arrow display indicates that the driver operation is prohibited (such as driver undervoltage, no start permission signal, etc.)

**Button function description**

1. [Start], the local start button does not match the graphic on the right, it is recommended to put the graphic
2. [Stop], the local stop button does not match the graphic on the right, it is recommended to put the graphic
3. [Lo/Re], local remote mode switching button
4. The left multi-function button is used to exit to the previous menu, cancel editing, or reset faults, etc.
5. The right multi-function button is used to enter the next level menu, or perform functions such as selection or saving editing.
6. [OK], confirmation key, used to perform functions such as selection or saving editing, or to display the parameter name and address of the current monitoring content.
7. [←], [→] are used to move the cursor or quickly turn pages in the PARA LIST, etc.
8. [↑] and [↓] are used to increase or decrease editing parameters. In the main interface state, you can directly modify the local given value.
9. [?], Help is used for help and tips

Special operating instructions for the LCD segment pattern display operation keyboard shown on the right:

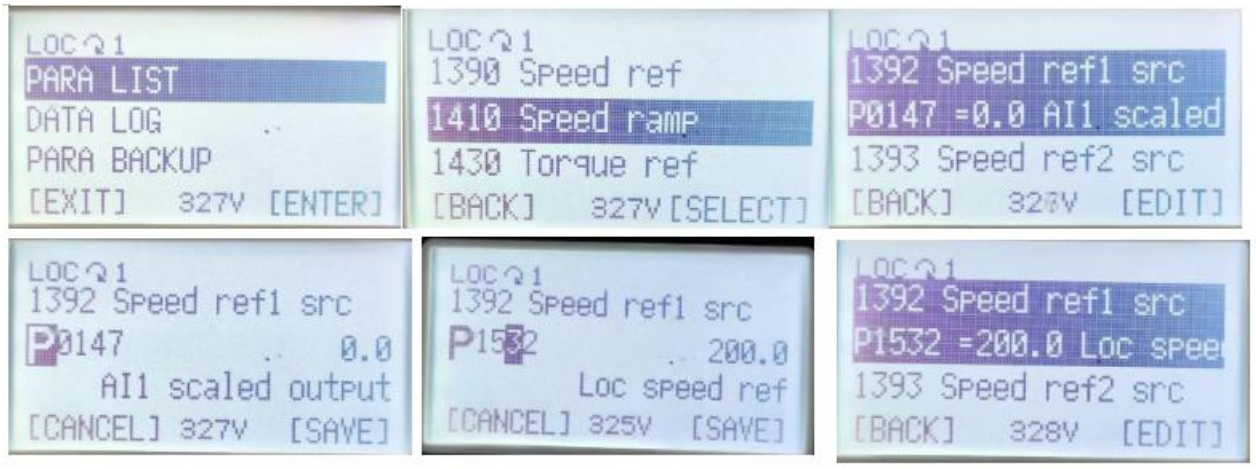
10. The upper left corner of the display window is the name of the parameter group. The above picture shows the full screen display of each segment and the name or symbol of each unit. The lower left corner is the setting entry, and the lower right corner is the parameter change save and return button.
11. The center position of the display window is the currently displayed or set physical quantity value. '-' before the value indicates negative value or reverse direction. For other operations, please refer to this chapter.

**Local control debugging**

Confirm that it is in LOC state, press [Start] to start, press [Stop] to stop, press [Option]->[Local Setting] to modify the speed setting. There is no Start or Stop on the panel.

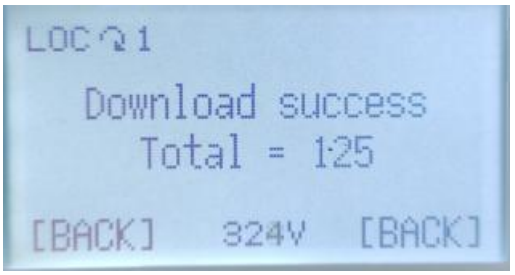
**Parameter reading and editing**

In the main interface, press **[Menu]->[PARA LIST]** to enter parameter group selection. Parameter group numbers range from P100 to P5200. Press the up and down keys to select any parameter group, and press the left and right keys to quickly turn pages. Press the **[OK]** or [**Select**] button to enter the submenu directory. Find the relevant parameters and press **[OK]** or **[Select]** to enter the parameter editing interface.
Take modifying parameter 1390 speed reference channel as communication reference as an example:



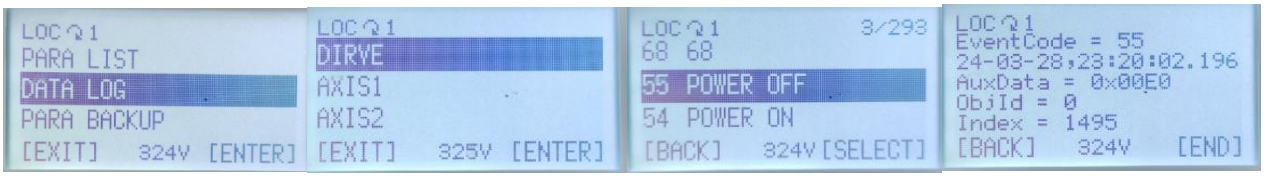

## Parameter upload and download

When you need to copy parameters to another machine, first upload the parameters of the source machine to be copied to the control panel. Then take the panel to the new machine and select Download to copy the parameters. The upload step is **[Menu]->[PARA BACKUP]->[Upload]**, then the changed parameters of the drive will be stored in the memory of the control panel. The download steps are: **[Menu]->[PARA BACKUP]->[Download]**. After the upload and download are completed, the interface will display the total number of parameters transferred. It is recommended to use the host computer software to upload and download, the accuracy will be higher


## Fault record tracking

**[Menu]->[DATA LOG]** allows you to view past fault records and contents. The drive group displays the drive power-on and power-off times. Motor axis 1 indicates the fault record and reset time of axis 1. The recorded diagnostic data varies depending on the fault type. The number 1 in the upper right corner indicates the most recent record. The principle is to only record data that is helpful in diagnosing the fault.



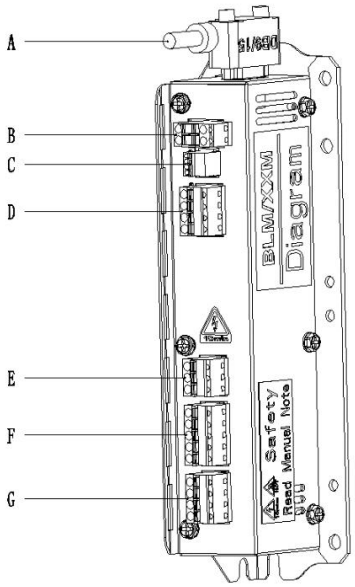

## Definition and editing of numerical pointers

The numerical transfer or connection between functional modules is realized through numerical pointers. If communication needs to be used as speed given, then the speed given source selection parameter P1392 needs to point to parameter P1532, that is, 1392= P1532 (1Fb speed given output). The constant Zero means that the pointer points to the constant 0.

**Definition and editing of bit pointers**

Logic signals are represented in the form of bits, and connections between logical units are connected through bit pointers. The format of the pointer is defined as a 16-bit variable. For example, in parameter P140 DI status, the pointer corresponding to DI3 is: P.140.02. Define fault reset as DI3, that is, P1355=P140.02. The constant Const.True means it is always 1, and Const.False means it is always 0.

## 〉5.7 MU21 Voltage Measure Unit port description and wiring diagram (example)



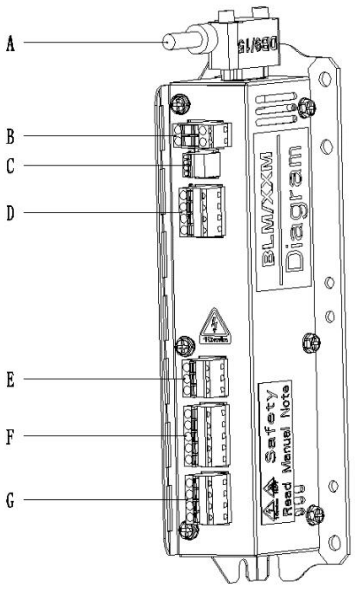

MU21 Frame，
Mainly applicable to:

1. Active rectification AIM: for precharge logic control

2.DC/DC DC conversion: for voltage detection
3.PTi/PTo: Voltage detection, used for power on and off logic control

Table 2 Port and function description of MU21 accessory module

| No | Name | Port | Port number | Description | Explanation |
|---|---|---|---|---|---|
| **A** | X15: Communication cable | / | / | DB9 communication cable | DB9 communication cable, communicates with PCU |
| **B** | X211: Auxiliary power input | **+24V** | **1** | 24VDC power supply | External power supply: 24VDC, 1.0A Cable cross-sectional area: 1.0~2.5mm2 |
| | | **GND** | **2** | Power ground | |
| **C** | X212: External current detection Hall type/DCDC function | **+15V** | **3** | +15VDCvoltage | Current sensing Hall element terminals Cable cross-sectional area: 0.5~1.0mm2 |
| | | **-15V** | **4** | -15VDCvoltage | |
| | | **$I_{dc}$** | **5** | Detect current input | |
| | | **GND** | **6** | GND | |
| **D** | X213: Closed response and temperature detection | **Di9** | **7** | Main switch closed Ready signal input | Read the main switch closing response signal cable cross-sectional area: 1.5mm2 |
| | | **COM** | **8** | | |
| | | **PT+** | **9** | Reactor temperature signal access | Read PT100 resistance value cable cross-sectional area: 0.5~1.0mm2 |
| | | **COM** | **10** | | |
| **E** | X214: Input voltage detection DC power remote | **DC+** | **11** | Remote DC power supply positive pole | Input voltage detection cable cross-sectional area: 1.5mm2 |
| | | **N/A** | **12** | / | |
| | | **DC-** | **13** | Remote DC power supply negative pole | |
| **F** | X215: DC power output detection AC input phase detection | **L1/DC+** | **14** | AC side or DC power supply positive pole | Cable cross-sectional area: 1.5mm2 |
| | | **N/A** | **15** | / | |
| | | **L2/DC-** | **16** | AC side or DC power supply negative pole | |
| | | **N/A** | **17** | / | |
| | | **L3** | **18** | AC side | |
| | X216: Relay output | **L** | **19** | Public live line L | Relay output |




| | | | | | |
|---|---|---|---|---|---|
| **G** | | **RO1** | **20** | Close precharge circuit contactor | cable cross-sectional area: 1.5mm2 |
| | | **RO2** | **21** | Combined cooling fan | |
| | | **RO3** | **22** | Close main switch | |

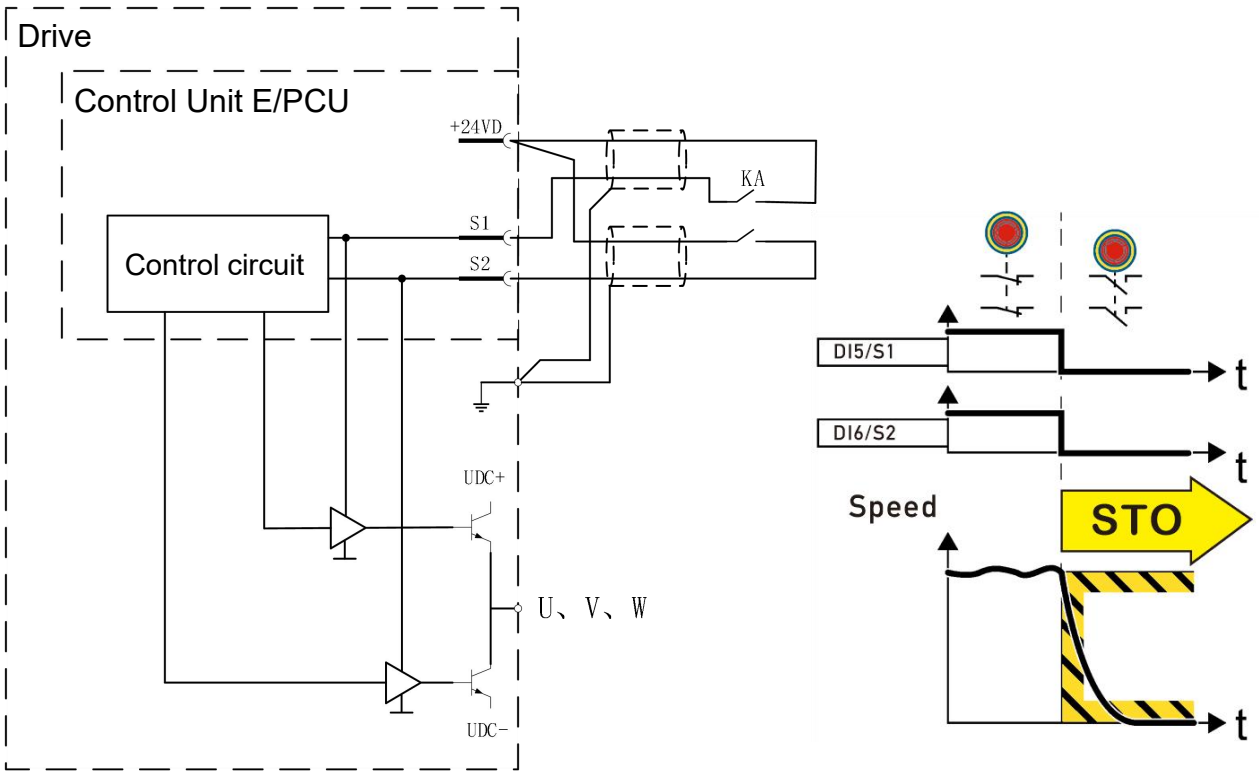
## 〉5.8 STO Safe Torque Off (interruption) function

This section introduces the safe torque (interruption) cancellation (STO) function and gives instructions for use.
1.. The safe torque off function can be used to stop the safety or drive circuitry of a drive in dangerous emergencies. Another potential application is to prevent malfunctions to allow short-term maintenance operations to be performed without turning off the power to the drive (e.g. : Cleaning or operating non-electrical parts of machinery)
2. Its basic implementation principle is: by configuring the control side hardware circuit of the motor power supply circuit in advance, this configuration will be solidified into the hardware of the driver, and control is achieved through the external physical connection circuit. That is, after activating this function, the motor's power supply control loop will be associated with the external STO control loop in real time.
3. After the safe torque off function is turned on, the internal control hardware circuit prohibits the inverter from outputting the IGBT control voltage, preventing the inverter from generating the torque required for motor rotation. If the safe torque off function is turned on when the motor is running, the motor will coast to a stop.
4. The safe torque cancellation function has a redundant structure, that is, both channels must be closed at the same time. Configure it in the parameters of the relevant control program.

NOTE: The 'Safe Torque Off' function does not disconnect voltage from the drive, please observe the following:
a. If the safe torque off function is used to stop a running drive, the drive will disconnect the supply voltage to the motor and the motor will coast to a stop. If this would cause a hazard or is otherwise unacceptable, the drive and machine should be stopped using an appropriate stop mode before activating the Safe Torque Off function.
b. The safe torque off function has priority over all other functions of the drive unit
c. The safe torque off function cannot effectively prevent vandalism or misuse.
d. The safe torque off function is designed to reduce known hazardous conditions, but it cannot always eliminate all potential hazards. Device manufacturers must inform end users of potential risks.

Regarding the STO function, the S1/2 port is configured on the ET12 control card, and the DI5/6 port with the same function of S1/2 is configured on the ET11 control card.

■ The inverter STO electrical wiring diagram does not have DI5 or DI6.



## Operation and operating principles

A. If you select "Activate the basic functions of built-in STO through on-board terminals" in the corresponding driver, the related functions of STO safe torque interrupt will be enabled in the driver. At this time, the drive automatically assigns the two digital inputs DI 5/6 or S1/2 to the STO function according to the relevant configuration. A "Low" signal state at both inputs activates the STO function. The specific work execution process is as follows:
B. The safe torque off function is activated (the safety relay auxiliary contact is disconnected or the control switch is disconnected);
C. The STO (S1 and S2) input on the inverter central control unit is powered off at 24V DC;
D. The central control unit disconnects the control voltage of the inverter IGBT;
E. The control program generates instructions defined by STO;
F. The motor coasts to a stop.

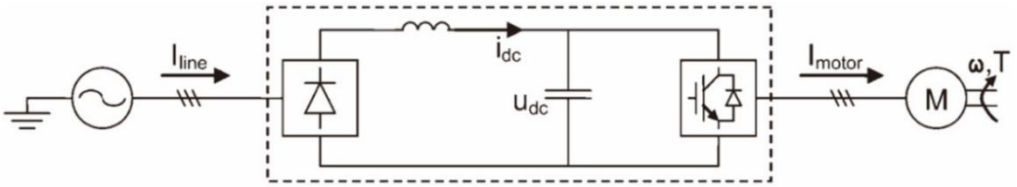
# 6. Power circuit topology principle of Drives

This series of power semiconductor converters (frequency converters, drivers) are composed of semiconductor diodes and reverse blocking three-pole thyristors (thyristors for short). The conversion can be AC to DC, DC to AC, DC to DC, and AC to AC. The difference between each model lies in the embedded software's motor control performance, rated power, parameter configuration and specific control by application experts in each industry. Policy firmware is different.

In terms of product hardware structure, it is divided into all-in-one stand-alone (VFD) with AC-DC-AC overall conversion, and modular products with different functional forms after splitting such as AC-DC, DC-AC, and DC-DC. Their main characteristics are introduced below:

## 6.1 Overview of VFD integrated single transmission drive

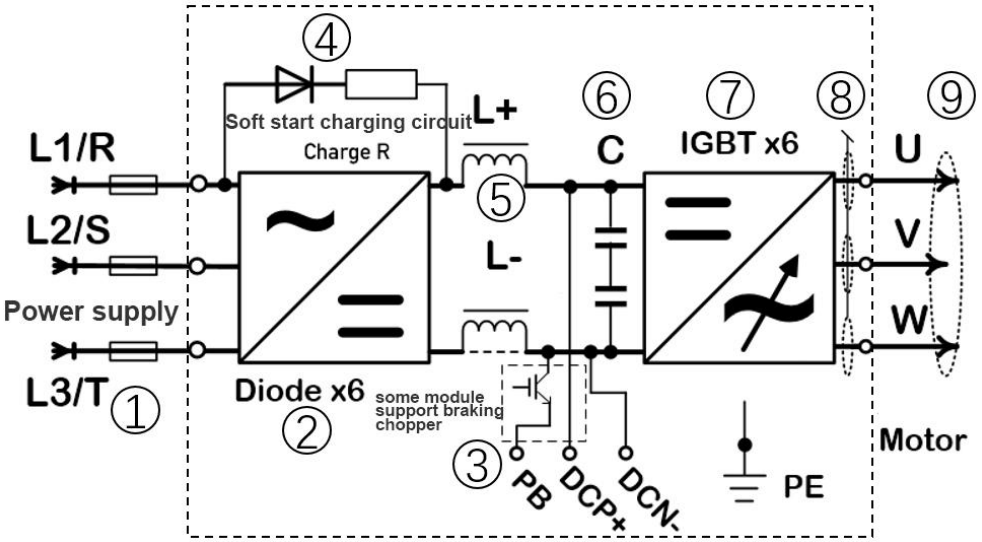
The figure below shows a typical internal power loop topology of a single drive (standard drive series models, some models separate rectifier and inverter)




Standard integrated single-machine drives usually use basic diodes/thyristors to complete the AC rectification, and then filter the intermediate DC L and C flat waves into DC energy. Finally, the controlled IGBT components invert the DC into voltage and frequency adjustable. The energy flow of the target drive AC output can only flow in one direction, and finally to the motor side. If the motor generates energy during this period, it is usually necessary to connect an external braking or feedback device to the intermediate loop to complete the energy processing.

## 〉6.2 Circuit connection diagram of VFD integrated single drive

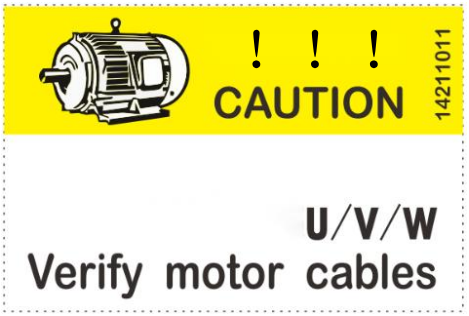
Main circuit connection diagram, schematic nature of functional components.




| No. | Description |
|---|---|
| 1 | AC grid power input |
| 2 | Rectifier, which converts AC current and voltage into DC current and voltage |
| 3 | The brake chopper transfers excess energy from the DC link of the drive to the braking resistor if necessary. The chopper starts operating when the DC circuit voltage exceeds a certain maximum limit, and the voltage rise is usually generated by deceleration (braking) of a high-inertia motor. Users need to prepare and install external braking resistors according to the data in the product catalog. |
| 4 | Soft start charging circuit, gradual charging through resistor protection circuit, to avoid large current impact on circuit components |
| 5 | DC smoothing filter reactor (some models are configured with dual DC reactors) |
| 6 | DC smoothing filter capacitor bank |
| 7 | Inverter, which converts DC current into a controlled AC output |
| 8 | Output AC shield grounding |
| 9 | U/V/W AC output connected to motor or power output |

## 6.3 VFD single drive appearance and functional Terminals

1. The following figure shows the physical location of the terminals of small and medium-power models and their relative distribution positions, so as to quickly and accurately identify the wiring locations of each power point under poor lighting conditions.



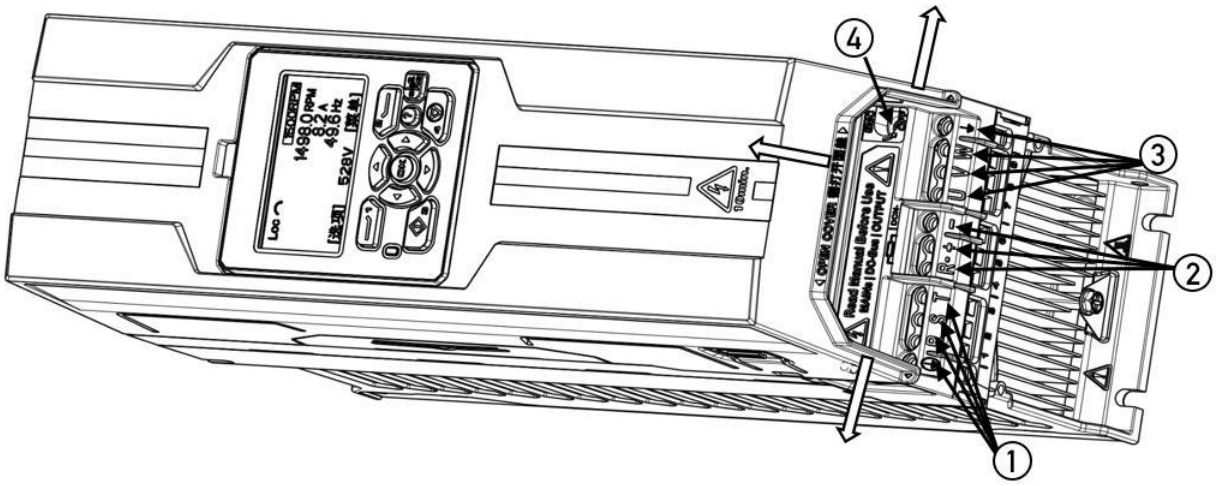

2. Wrong power wiring is very likely to cause permanent damage to the machine. While accurately identifying the location of each power terminal of the driver, it is also critical to carefully proofread the names of the wires you are holding to connect, because in more complex In wiring cabinet

◆ In practice, it often happens that the power cord in your hand is connected to the driver as a motor cord, causing serious damage to the machine. Please pay attention to precautions and inspections.

3. In order to make it as convenient as possible and remind you to accurately access the wires distributed by the driver terminals, some models already have motor wire terminal prompt labels on them when leaving the factory (as shown in the picture on the right, each label is Schematic diagram of the physical relative position of the power terminals of small and medium-power models). It is recommended that you properly handle this label before and after wiring to facilitate accurate wiring and future maintenance work.

The picture below shows a standard single drive with an E2 shape.

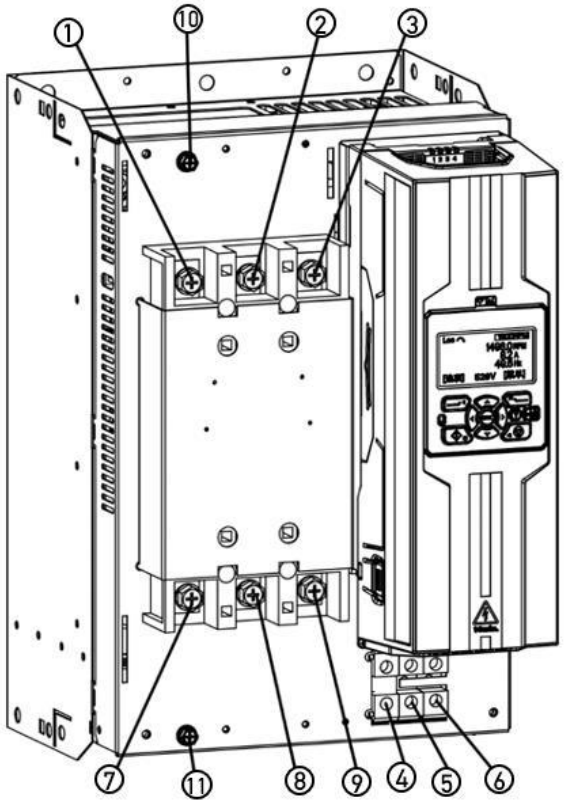
E2 Frame




| No | Description - E2 Series Hardware Form Factor Port [VFD] |
|---|---|
| 1 | Ground/R/S/T input, when disassembling and tightening, you need to slightly pull the sides of the front cover left and right in the direction of the arrow to release the fastening position. At the same time, open the front cover upwards to avoid interference with the front cover when tightening or disassembling. tool |
| 2 | The R-/+ connection of the external braking resistor, and +/- is the DC bus connection of DCP+ and DCN- after rectification |
| 3 | U/V/W/ground output (used for wiring the motor wire or motor case to improve EMC performance), motor connection |
| 4 | EMC adjustment screw, turn counterclockwise to disconnect. Loosen the screw spacer to separate from the PCBA. There is no need to completely remove the screw. |
| Remark | Power terminal wiring capacity: European square frame, spacing 7.62mm, maximum wiring capacity 4mm2, stripping length = 8mm |

**The picture below shows a standard single drive with an E4 shape.**

E4 Frame




| No | Description | Explanation |
|---|---|---|
| **1** | Power input L1/R (M8 screw) | Fence-type terminals, the maximum slot width is 27mm, and cable terminals (wire lugs) of appropriate width can be selected |
| **2** | Power input L2/S (M8 screw) | |
| **3** | Power input L3/T (M8 screw) | |
| **4** | Brake PB terminal (UK35 terminal) | The wire capacity is 10-35mm2, and the stripping length is 10mm. The thin wire should be double-folded and inserted into the wiring hole to ensure reliable pressure connection. |
| **5** | DC DCP+ (UK35 terminal) | |
| **6** | DC DCN-(UK35 terminal) | |
| **7** | Output U phase terminal (M8 screw) | Fence-type terminals, the maximum slot width is 27mm, and cable terminals (wire lugs) of appropriate width can be selected |
| **8** | Output V phase terminal (M8 screw) | |
| **9** | Output W phase terminal (M8 screw) | |
| **10** | General electrical ground point (M6 screw) | |
| **11** | PE grounding (M6 screw) | |

## 〉6.4 Multi-Drive by power module overview

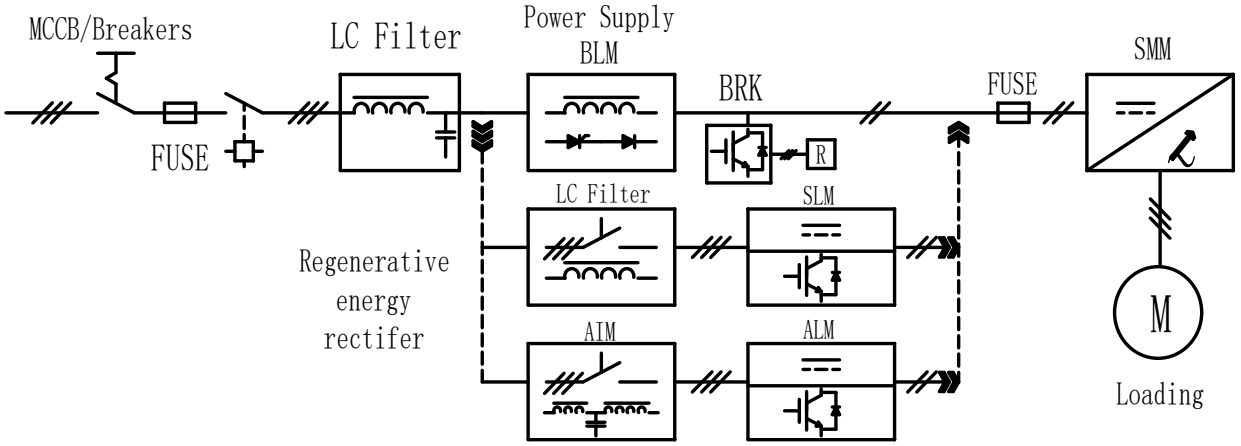
The power modular multi-drive transmission is a DC/AC multi-drive transmission device based on a common DC bus system. Rectifier and inverter motor modules of different power levels can be selected according to the number and performance level of the motors that need to be driven. The main components include:

1. Basic rectifier BLM modules (Basic Line Modules):
Designed for simple rectification only, it is composed internally of a thyristor diode and a DC reactor.

2. Intelligent feedback rectification ALM/SLM (former name) module (Active /Smart Line Module):
It is composed of IGBT and DC smoothing capacitor. While providing DC rectification power supply to the bus, it can also feed the energy of the bus's excessive voltage back to the power grid. At the same time, it can intelligently control and maintain the bus voltage constant. The actual current effect of the ALM module rectified or fed back on the power supply side is close to a sine wave and can suppress harmful harmonics. When selecting this rectifier module, a matching AIM incoming module must be used.

3.ALM incoming line interface AIM module (Active Interface Module):
The AIM is installed between the power grid and the ALM, and it integrates filters, precharge circuits, smoothing wave absorption LCL circuits, etc.

4.Single Motor Module:
An inverter with an IGBT component controls the energy to drive the motor through the common DC bus, or transfers the energy generated by the motor into the bus.
Note: It is recommended to arrange the common DC bus copper bar on the top of the **** modular driver, and use fast fuses to connect the copper bar and the driver module to achieve standardization, higher reliability and rapid isolation of single point faults.
The figure below shows a typical modular driver internal power loop topology with low harmonic intelligent rectification and feedback functions.

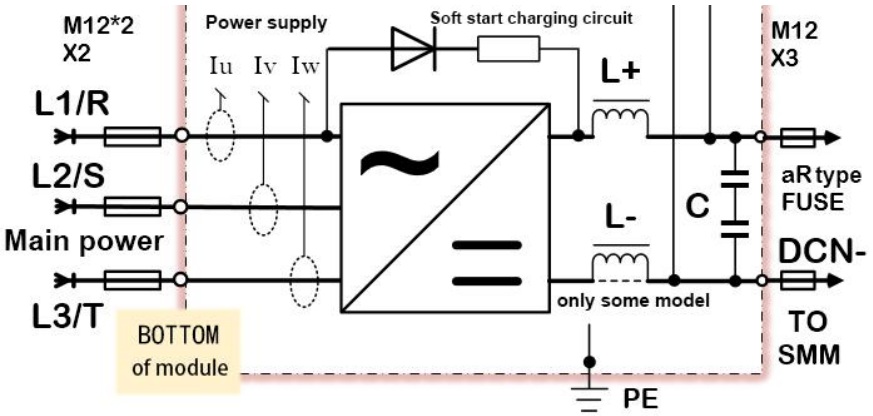


## 〉6.5 BLM basic rectifier module hardware principle description

### Operating principle

The core of the diode/thyristor power supply unit is a six-pulse diode bridge (half-controlled thyristor for medium and high powers). The bridge rectifies three-phase alternating current into direct current for use in the intermediate DC circuit of the drive. The intermediate DC link supplies the inverter that runs the electric motor. One inverter unit (single drive) or several inverter units (multidrive) can be connected to the intermediate circuit. The AC reactor can smooth the current waveform in the drive power supply grid and the voltage in the DC circuit (this is an external necessity on the liquid-cooled type), and is optional on the air-cooled type (inside the air-cooled module A DC smoothing reactor has been built in).
The rectifier in the BLM supply module is only half-bridge controlled:
It cannot control the DC link voltage when powered on, and the BLM with a built-in charging circuit can limit the charging current of the DC link capacitor. BLMs without soft-start charging circuits can only be used with inverters with internal charging circuits, or must be equipped with power supply units with independent external charging circuits. The control program allows the use of external charging circuits.

■ Main circuit diagram

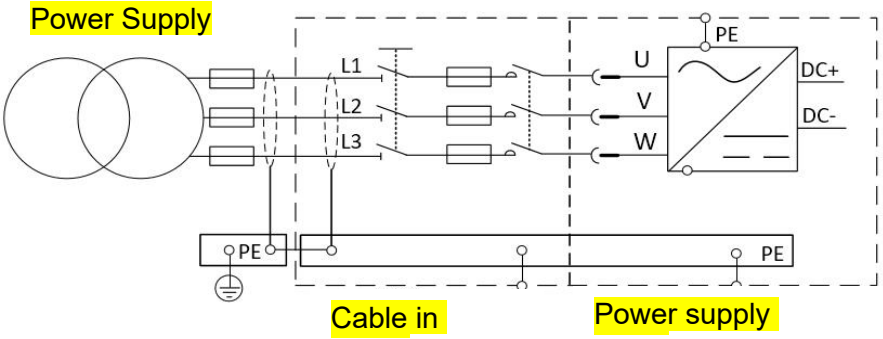



The schematic diagram of the rectifier main circuit is shown in the figure below.

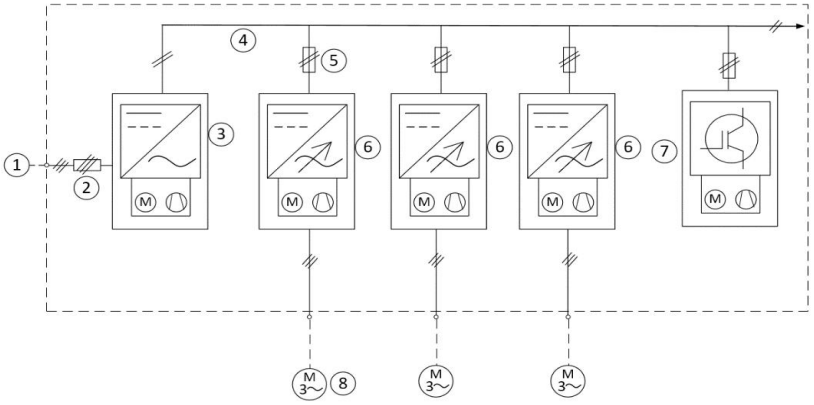
| No | Explanation |
|---|---|
| 1 | AC-DC main conversion components: diode/thyristor |
| 2 | Input side AC reactor, used to enhance the suppression of harmonic content on the input grid side |
| 3 | Output side DC fuse, used for rapid isolation of fault surfaces during multi-machine transmission |

**■ Overcurrent and short circuit protection**

The main circuit of the power supply unit is equipped with AC and DC fuses. These fuses protect equipment from greater damage due to overcurrent or short circuits

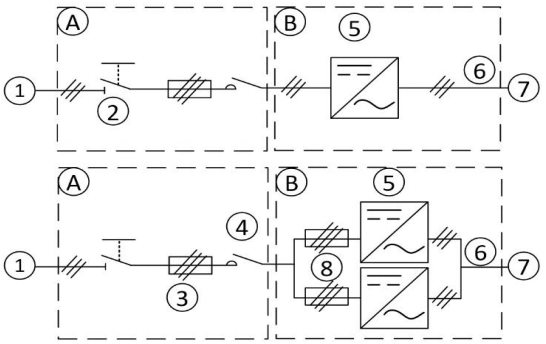


**Overview of BLM power supply transmission system**




| No | Explanation |
|---|---|
| 1 | AC power |
| 2 | Input AC fuse |
| 3 | For diode power supply modules, if a single unit is used to power multiple inverters, it is necessary to evaluate whether the buffer circuit power is sufficient. |
| 4 | DC bus |
| 5 | Inverter DC fuse |
| 6 | Inverter module |
| 7 | Optional brake and resistor. Resistor not shown in picture |
| 8 | motor |

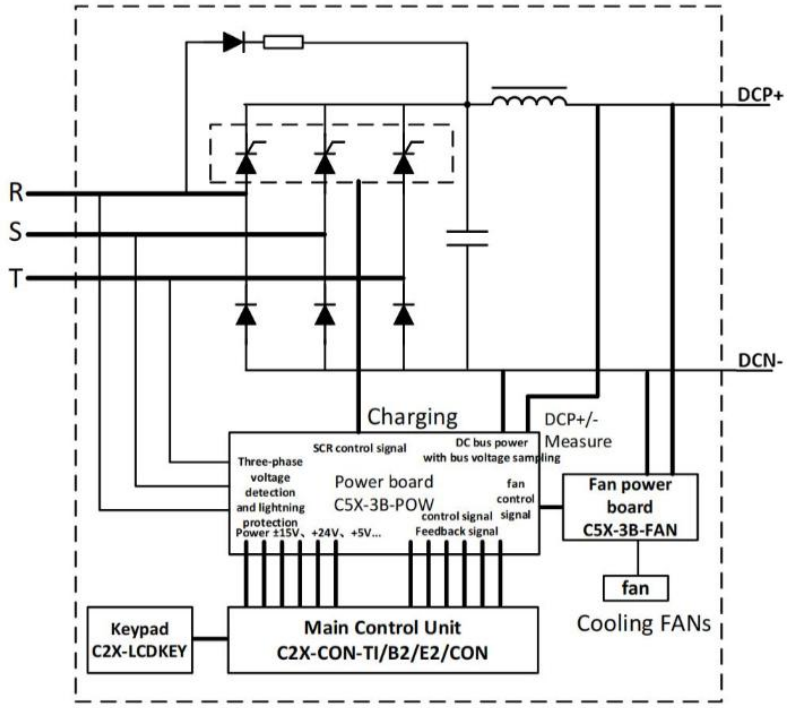
The figure below is a simplified diagram of a single diode power supply and a two-diode BLM power supply unit.



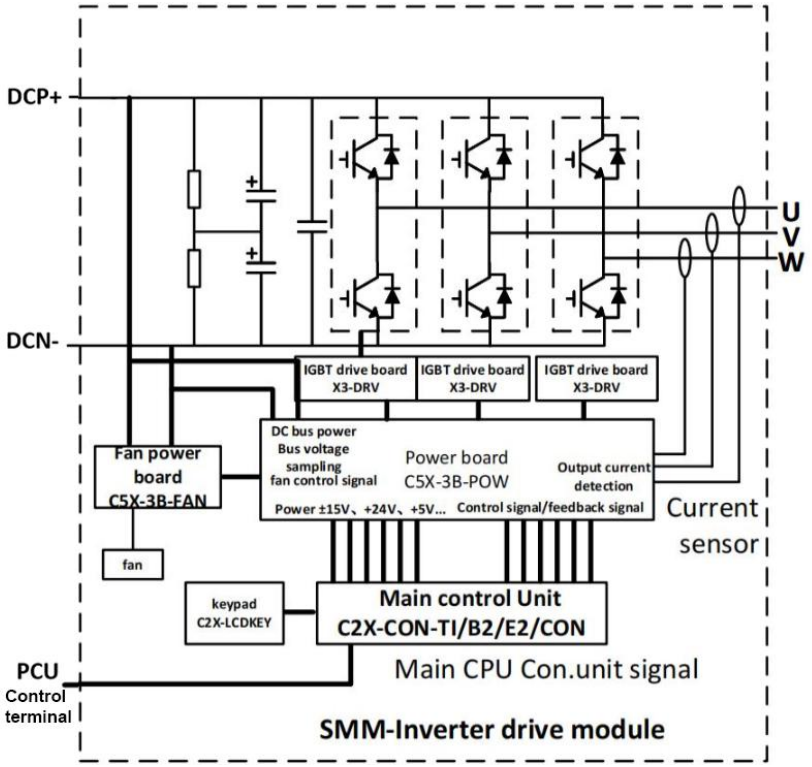

| No | Explanation |
|---|---|
| 1 | AC power |
| 2 | Isolating switch |
| 3 | AC fuse |
| 4 | contactor |
| 5 | Diode power supply module (single/two or more) |
| 6 | DC link |
| 7 | DC link connection for diode BLM supply |
| 8 | AC fuses for diode powered modules |
| A/B | AC incoming cabinet/diode BLM power supply module cabinet |

## 〉6.6 BLM basic rectifier modular combined drive hardware topology diagram (example)

The following two figures show the main hardware principles and topology diagrams after dividing the common integrated single drive into basic rectifier and motor inverter modules. The modular structure of this series will bring more flexibility, change and strong performance. Advances in electrical and mechanical adaptability and high reliability, direct hardware connection or communication between modules to achieve linkage or interlocking between logic and protection.




BLM-Basic rectifier module

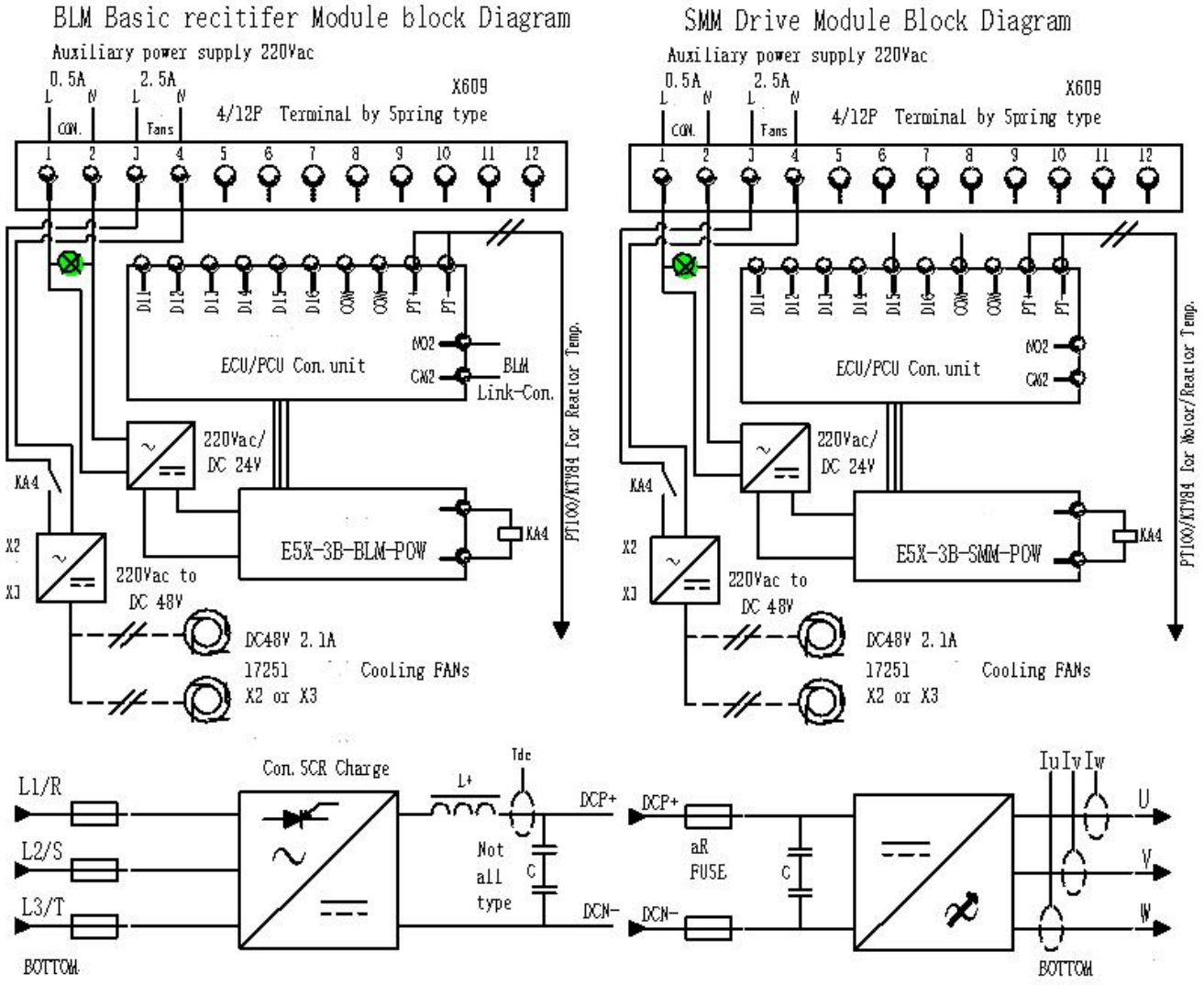



SMM-Inverter drive module

## 〉6.7 Hardware principle of BLM basic rectifier Multi-driver

The standard drive VFD=BLM+SMM is the input of the AC power grid. It is rectified by a diode (thyristor for medium and large power) and filtered by the reactor and smoothing capacitor on the DC side. It is then inverted by the actively controlled IGBT chopper conversion into a frequency sum with adjustable voltage and controllable sinusoidal energy, it can be used to control various sine wave driven motor objects such as asynchronous AC induction motors, permanent magnet synchronous motors and AC induction servo motors, or power energy conversion systems.

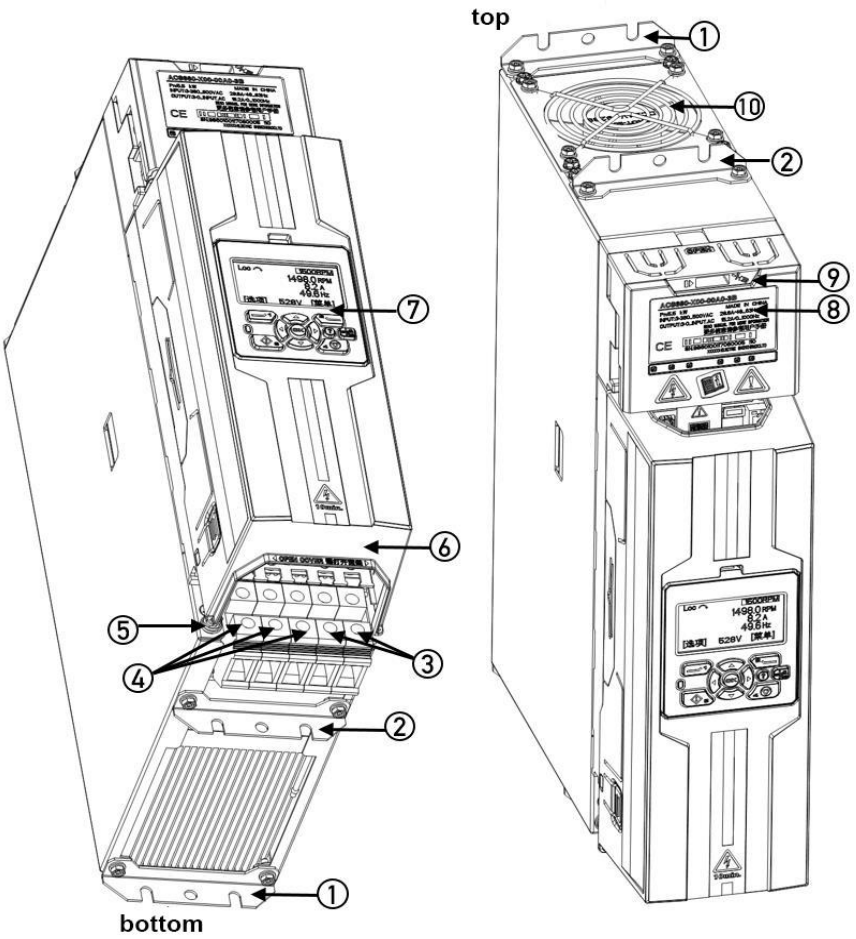
The figure below shows the stand-alone/modular driver VFD=BLM+SMM, and the basic rectifier BLM+inverter SMM module schematic diagram of the thyristor:




Note 1: The M1/R4 type machine is an all-in-one driver that can output 2 or 3 phases of U/V/W at the same time. Under the control of the same control unit and the same physical appearance of the hardware product structure, the driver can be connected to multiple motors at the same time.

Note 2: The auxiliary power access port in the figure is a 12P 5.08 pluggable spring-type terminal. Some models are 2+2=4P 5.08 dual-channel bridgeable terminals, and their bridge current capacity is 15A.

## 〉6.8 BLM- R4 series basic thyristor rectifier power supply module appearance and terminal function introduction



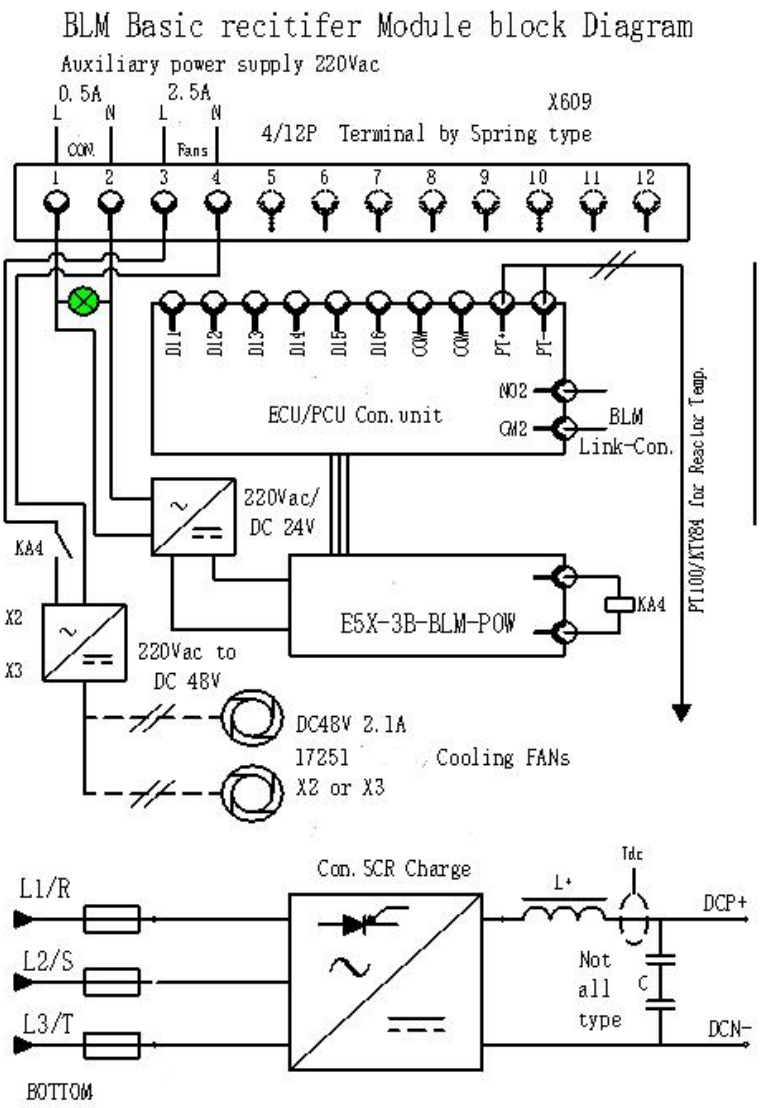

R4 Frame

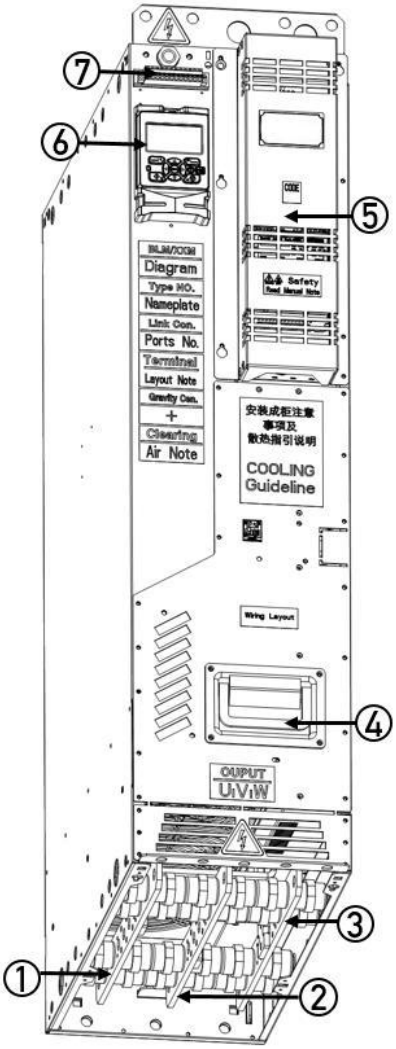
| No | Component function description |
|---|---|
| 1 | Machine suspension fixed bracket, distance between two holes is 50mm, hole diameter is 6.5mm |
| 2 | Machine wall-mounted fixing bracket, removable for optional use |
| 3 | Brake PB terminal position |
| 4 | Input R/S/T terminal connection bit |
| 5 | Shell grounding point, connect PE |
| 6 | The front cover of the control shell can be detached by slightly pulling outwards on the left and right and flipping up. After removing the front cover, connect the E-type universal control part. |
| 7 | Terminals (see the standard wiring diagram of the series control unit system in this manual for details) |
| 8 | +CP68 keyboard can be used after being disassembled and connected to an extension cable |
| 9 | Model label, including input and output current, voltage, frequency, power, and weight parameter data |
| 10 | DC busbar box, use a screwdriver tool to pry open the buckle and open the upper cover. Inside is the DCP+/DCN- DC busbar. |

## 〉6.9 BLM-R8 series basic thyristor rectifier power supply module schematic diagram

Note 1: This series of BLM is mainly based on the controllable pre-charge function circuit (a circuit that gradually turns on by controlling the thyristor), supplemented by the soft-start resistor + diode anti-reverse type in the picture above. The details are subject to the actual product.

Note 2: The auxiliary power access port in the figure is a 12P 5.08 pluggable spring-type terminal. Some models are 2/4P 5.08 dual-channel bridgeable terminals, and their bridge current capacity is 15A.




| No | **Description (Frame=R8: Applicable to BLM basic rectifier module, or ALM active rectifier feedback module, or SMM single motor inverter driver module)** |
|---|---|
| 1-3 | The input from left to right is the R/S/T phase terminal connection position, 2*M12 |
| 5 | The control part protects the cover. After opening the cover, it is the control part module. After opening the cover, it is the E-type universal control part wiring. |
| 7 | Terminals (see the "Control Unit System Standard Wiring Diagram" in this manual for details) |
| 8/9 | Spring-type 5.08 pitch pluggable terminal block, 220Vac auxiliary power access position + inter-module linkage control signal terminal |

## 6.10 AFE/NFE/PFE Overview of active rectifier feedback module components

### 6.10.1 Functions of AFE (Active Front End) active rectification/feedback unit

Active front end is translated from English Active Front End. The hardware structure of the AFE/NFE/PFE described in this article usually consists of two functional modules AIM (LC/LCL) + ALM. From a structural point of view, due to the use of IGBT power components, it is equivalent to an inverter. Different The most important thing is that its input is AC and its output is DC. Because it is located on the power incoming side, it is called the front end. The meaning of active is that compared with traditional diode or thyristor rectification technology, the active front end no longer passively converts AC into DC, but has many active control functions. It can not only eliminate high-order harmonics and improve power factor, but is not affected by power grid fluctuations and has excellent dynamic characteristics. For more details, please refer to the above or external public resources.

### 6.10.2 NFE (Non-regenerative Front End) function of non-regenerative rectifier unit

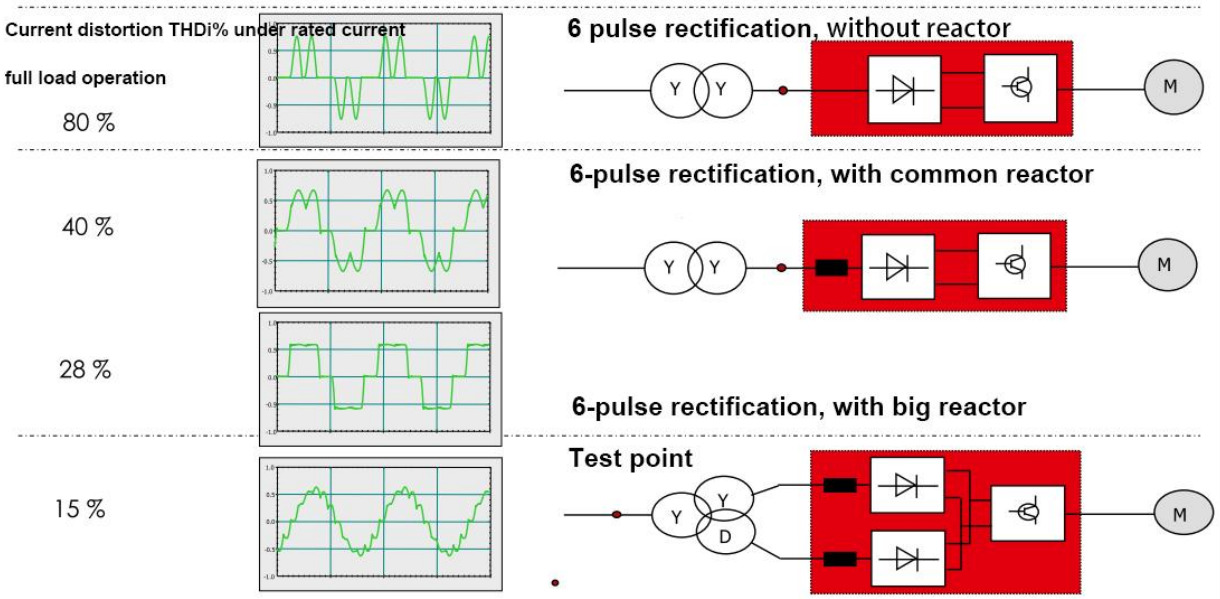
Its current design has the same hardware components as the above-mentioned AFE, and is also controlled by specialized AFE software. It realizes NFE mode through specific torque direction restrictions, that is, the front-end unit only works in rectification mode, realizing one-way flow of energy, and is suitable for low harmonics. Wave rectification applications where energy feedback is not required or cannot be performed.

### 6.10.3 Functions of PFE (Power-regenerative Front End) energy feedback unit

Its current design is similar to the hardware components of the above-mentioned AFE. It has one more diode unidirectional circuit on the DC loop than the AFE. It is also controlled by specialized AFE software and is realized through real-time monitoring and feedback of specific DC bus DC voltage. PFE mode, that is, the PFE front-end unit only works in the energy feedback mode to the grid, realizing the one-way flow of energy from the DC side to the grid side. It is suitable for replacing braking chopper energy consumption braking, etc. that need to control the public DC bus voltage in real time. amplitude and can provide energy feedback to the power grid.

### 6.10.4 A general introduction to the grid-side harmonic control capabilities between BLM (Basic Diode Rectification) and AFE

BLM (Basic Line Module) is a basic rectifier module that mainly uses ordinary diodes or thyristors to convert AC into DC. Generally, AC or DC reactors are needed to suppress the harmonics of the rectification circuit. If the front is configured with different inductance Separate rectification of multiple




power inputs via reactors or phase-shifted phase-shifting transformers can achieve lower input harmonics.

12 pulse rectifier

### 6.10.5 AFE (Active Front End) active rectification method

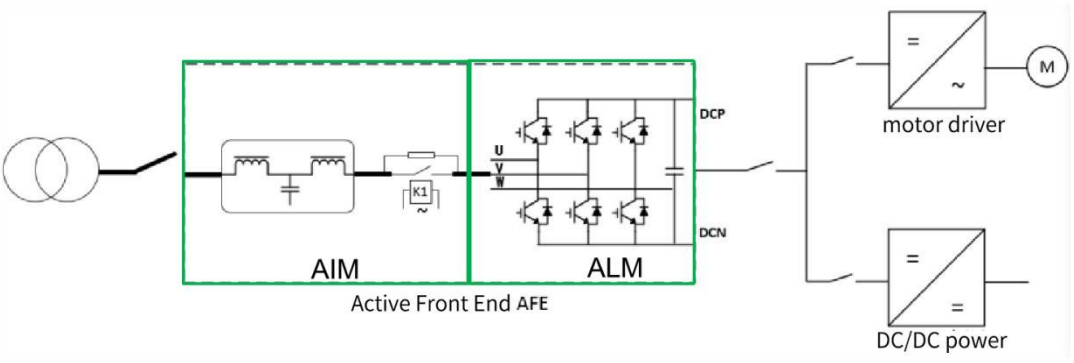
Because of its dynamic IGBT adjustment, so the typical value of THDi of the total current harmonic on the grid side can be controlled between 3-5%. When the input is at its rated load current, when the load is

smaller and lighter, the THDi value of the total current harmonics on the grid side will increase slightly due to the small inductance of LCL.
Its typical hardware topology principles and harmonic control values are introduced as follows:

A) Typical application mode

As an active front end, AFE works both in intelligent rectification and in power generation to the grid.
1. The AFE unit can be equipped with a single driver or with multiple drivers and DC/DC power supplies in the form of a common DC bus.
2. AFEs can also be connected in parallel with a common DC bus depending on power requirements. At this time, load distribution and master-slave control are required between each AFE.
About use: The product does not require complicated parameter adjustment. Just check that the wiring is correct before powering on and then run it.

B) Typical schematic diagram of the system




AFE/PFE/NFE and other series of current conversion devices (drivers) use specific IGBT control strategies to achieve constant speed, variable speed, speed mutation, and load mutation (50 -80%) to meet the requirements of complex controlled conditions such as entry or exit. The main features brought by the key technologies of the listed related products are as follows:
1. No specific power grid (or motor side) voltage real-time detection and monitoring module is required, and the reliability is higher.
2. Specific drive control methods improve the energy efficiency conversion rate of the system to a higher state.
3. Extremely strong adaptability to the load end and extremely fast adjustment response capability.

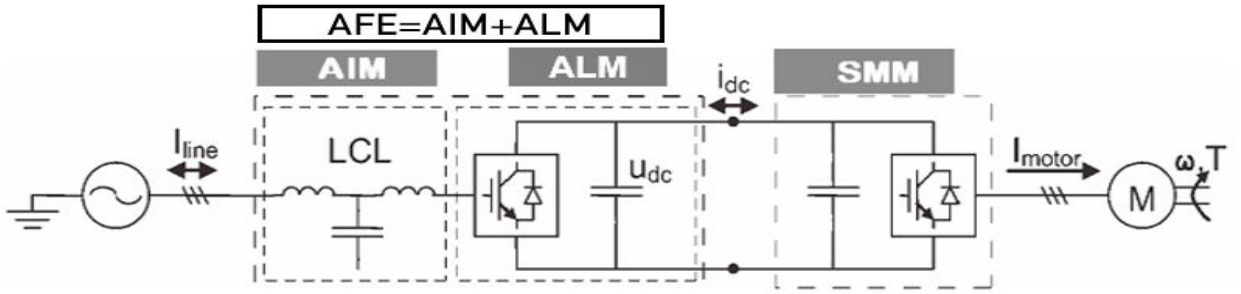
### 6.10.6 About harmonic distortion of AFE

According to industry standards, it is lower than the harmonic limit value given in IEEE519. Measured according to IEC 61000-4-7.

| Rsc | THDu【%】 | THDi【%】 |
|---|---|---|
| 20 | 3 | 3-5*# |
| 100 | 0.8 | 3-5*# |

~ 3-5% is the typical value of total THDi when the system >= 80% load rate. This value will be affected by the line obstruction of the power grid, short circuit ratio, real-time load rate, and subtle differences in hardware of different models. Currently, In an actual installed device system, the total harmonic distortion will vary significantly depending on the load rate of the AFE backend.

### 6.10.7 AFE/NFE Description of the hardware working principle of the active rectifier power supply module



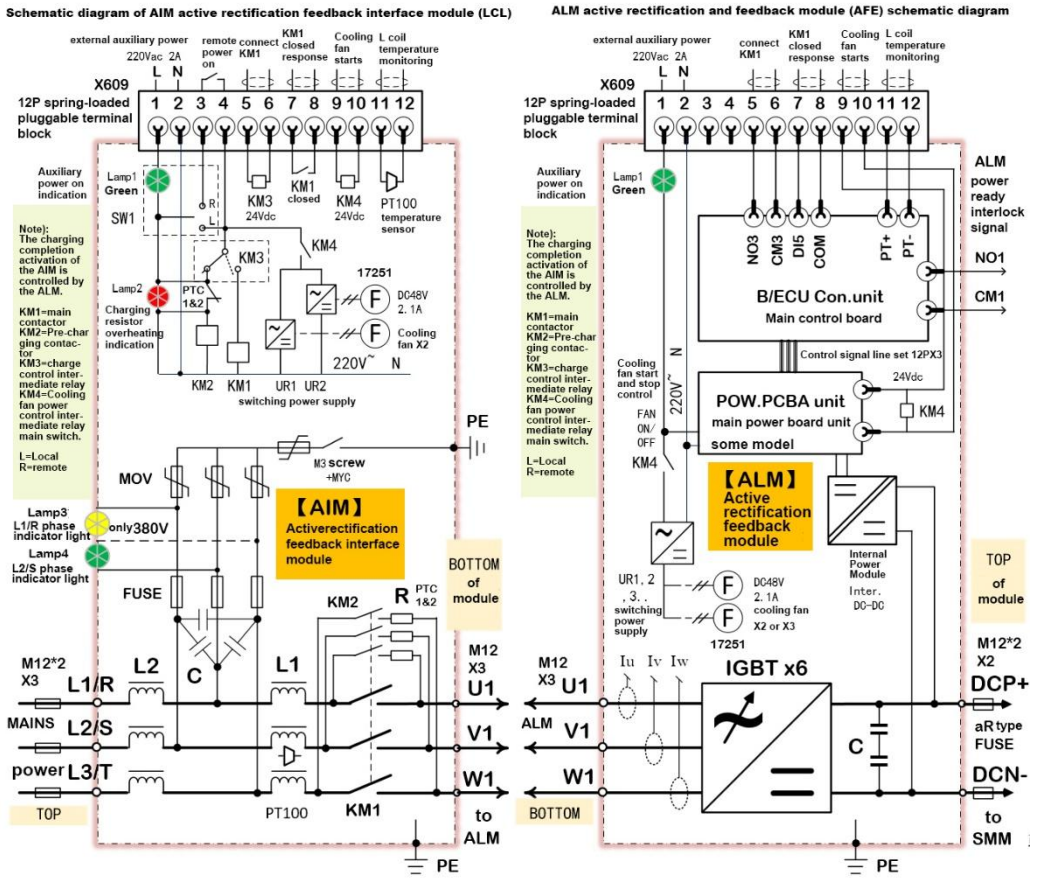

**Intelligent feedback rectification ALM module (Active/Smart Line Module):**

It is composed of IGBT and DC smoothing capacitor. While providing DC rectification power supply to the bus, it can also feed the energy of the bus's excessive high voltage back to the power grid. At the same time, it can intelligently control and maintain the bus voltage. The actual current effect generated by the ALM module on the power supply side is close to a sine wave and can suppress harmful harmonics. When selecting this rectifier module, a matching AIM incoming module must be used.

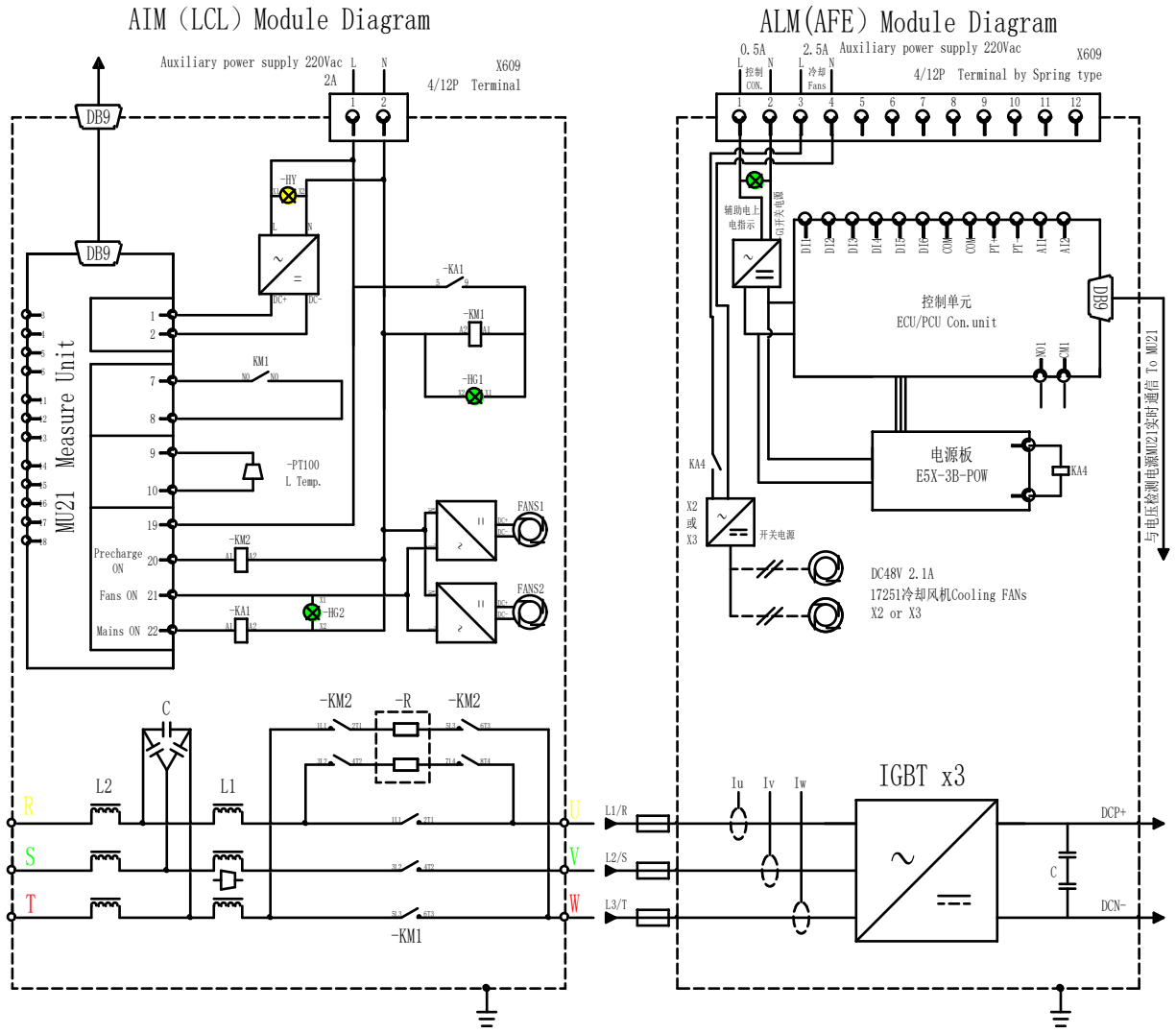
The AIM is installed between the power grid and the ALM. It integrates filters, precharge circuits, smoothing wave absorption LCL circuits, etc.

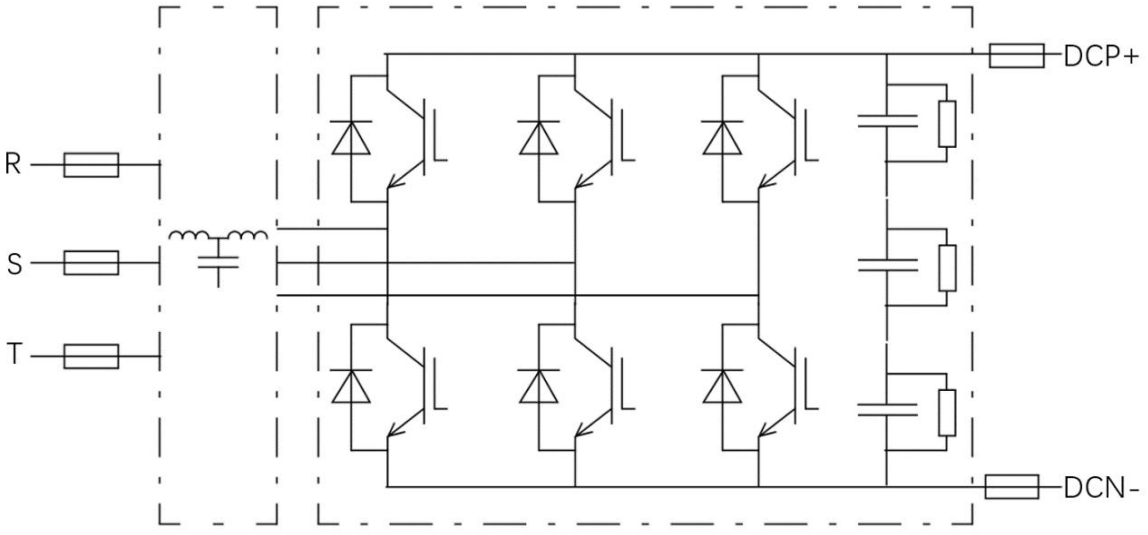
The ALM module IGBT power supply unit rectifies the three-phase AC power of the drive into DC power. The intermediate DC circuit supplies power to the inverter that runs the motor. One or more inverter units can be connected to the intermediate circuit.

The IGBT power supply module uses a filter to actively filter the AC line current to resemble a sinusoidal waveform and filter out most of the ripple current at the switching frequency and higher. The IGBT power supply module combined with a filter can reduce the harmonic components on the output side.

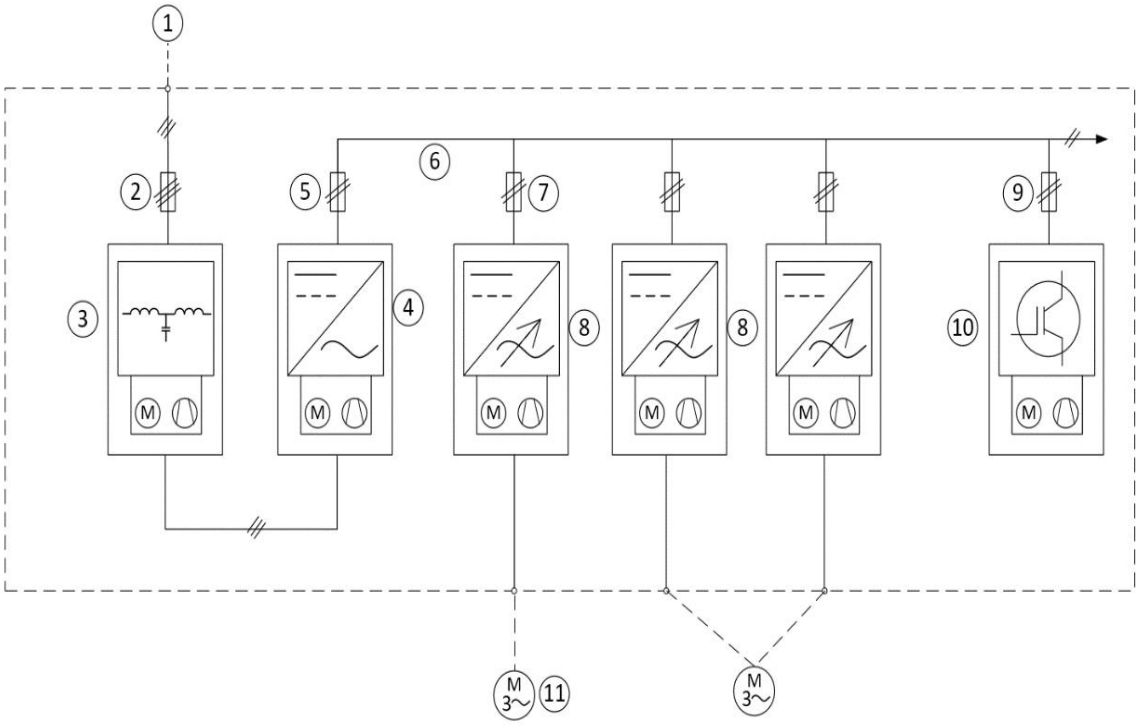


## Typical configuration diagram of AFE source rectification LCL+ALM main circuit:



Main circuit diagram of common DC bus drive system:




### 6.10.8 AFE/NFE active rectifier feedback four-quadrant combined driver hardware topology diagram (example)

The electrical connections and topology diagram between the multi-transmission energy feedback four-quadrant drive units are as follows, and the wiring instructions mainly include:

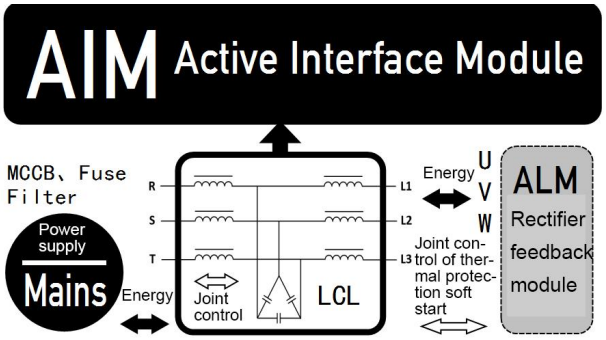
1. LCL and ALM realize hardware interlocking control through IO docking, and realize logical linkage and control through the following items or direct communication
2. The PT+/PT- on the ALM control module has been connected at the factory to detect the temperature of the LCL unit. If it is disconnected or short-circuited, the ALM cannot be started.
3. DI5 and COM on the ALM control module have been connected at the factory for the ALM operation enable signal, which means that the LCL is powered on and ready, and the ALM can run. If it is disconnected, the ALM will not be able to run.
4. COM1 and NO1 on the ALM control module need to be connected to DI5 and COM of SMM1 and SMM2.., and there is no line sequence requirement. This signal line serves as the operation enable signal

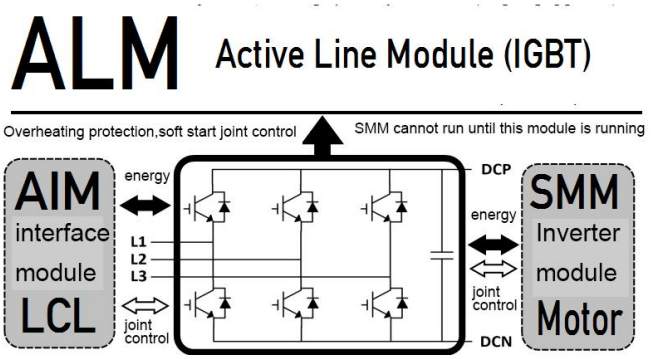
| No | Explanation |
|---|---|
| 1 | AC power |
| 2 | AC input fuse |
| 3 | Filter air-cooled LCL, or liquid-cooled LLCL, or integrated AIM module with built-in soft start charging circuit |
| 4 | Power supply IGBT active rectifier feedback module |
| 5 | DC fuse |
| 6 | DC bus |
| 7 | Inverter DC fuse |
| 8 | Inverter SMM or PSMM (this picture shows two inverter parallel modules) |
| 9 | DC fuse for brake chopper, optional |
| 10 | Brake chopper module + BRK, optional |
| 11 | Motor |

of SMM1 and SMM2.., indicating that ALM is running. SMM1, SMM2.. can run, but SMM1, SMM2.. will not run if disconnected.
5. The R, S, and T of LCL are connected to the power grid, the chassis is grounded, and the 12Pin terminal strip on LCL (if any, only some models use 220V contactors) is connected to 220VAC for the control of the internal main contactor.
6. The AC main power terminals R/L1, S/L2 and T/L3 of ALM are connected to L1/U, L2/V and L3/W of LCL respectively. The U, V, W outputs of SMM are connected to the motor
7. The DC bus terminals DC+ and DC- of ALM are connected to the DC+ and DC- of SMM1 and SMM2....

**》》》Four-quadrant combination mode operation, start-up and shutdown operation sequence》》》**

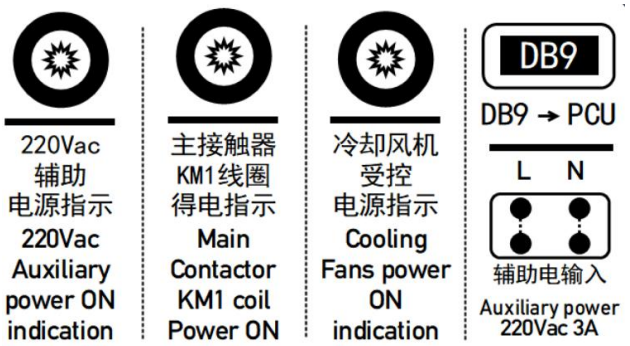
1. Confirm that the wiring between each unit is ready and then power on.
2. After powering on, ALM does not need to set parameters. SMM1, SMM2.. units need to set the P1352 parameter operation enable to DI5 one by one.
3. To start the ALM unit, press the green start button on the panel or start it remotely through the external terminal (Note: the set voltage must be > the initial bus rectification voltage)
4. Start each SMM unit
5. The shutdown sequence is to stop each SMM unit first, then the ALM unit.

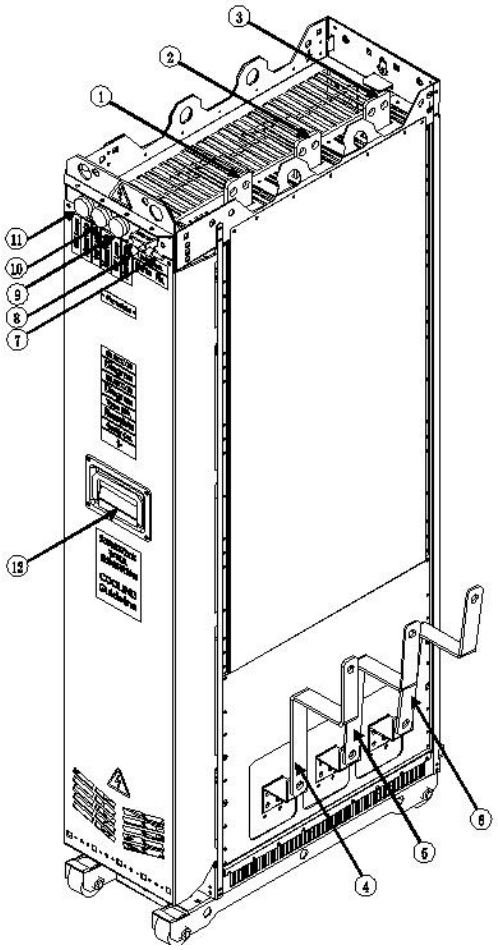


### 6.10.9 AFE - AIM-R7A/R8A active rectifier feedback interface module hardware appearance and terminal block function introduction

R7/R8 Frame



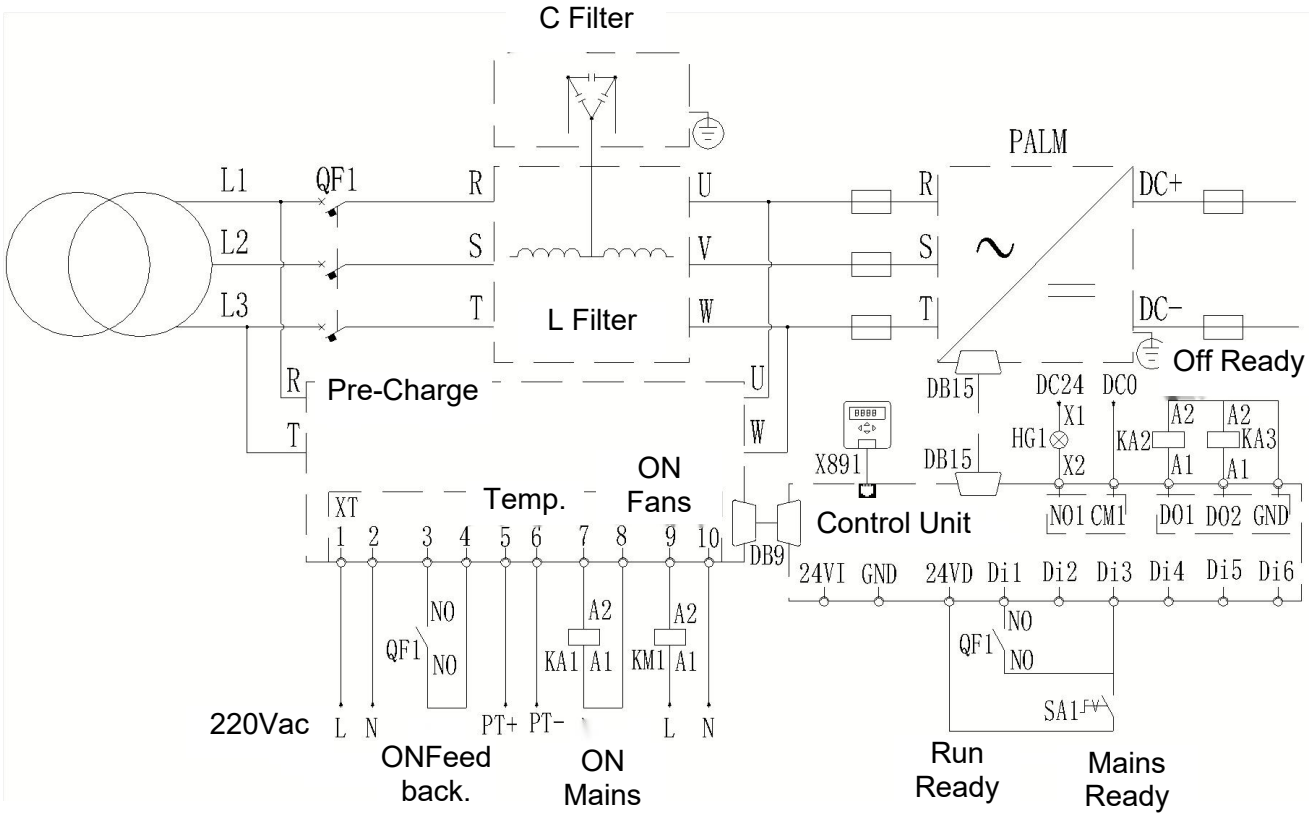

| No | Description (Frame=R7A, R8A: suitable for AIM active rectifier feedback interface module and various LCL sine filters) |
|---|---|
| 1 | L1/R (power input, M12 screw) |
| 2 | L2/S (power input, M12 screw) |
| 3 | L3/T (power input, M12 screw) |
| 4 | U (filtered output, Z-shaped copper bar connected to ALM, M10 screw) |
| 5 | V (filtered output, Z-type copper bar connected to ALM, M10 screw) |
| 6 | W (filtered output, Z-type copper bar connected to ALM, M10 screw) |
| 7 | MU21 module communication cable DB9 |
| 8 | 2P spring-type pluggable terminal block, 220Vac auxiliary power access terminal, bridge transfer (Max.15A) |
| 9 | Cooling fan controlled power indicator light |
| 10 | AC main contactor closed indicator light |
| 11 | Auxiliary power on indicator light |
| 12 | Handle, used to assist in controlling balance during installation |

### 6.10.10 AFE - AIM-LC8 active rectifier feedback interface module hardware working principle description

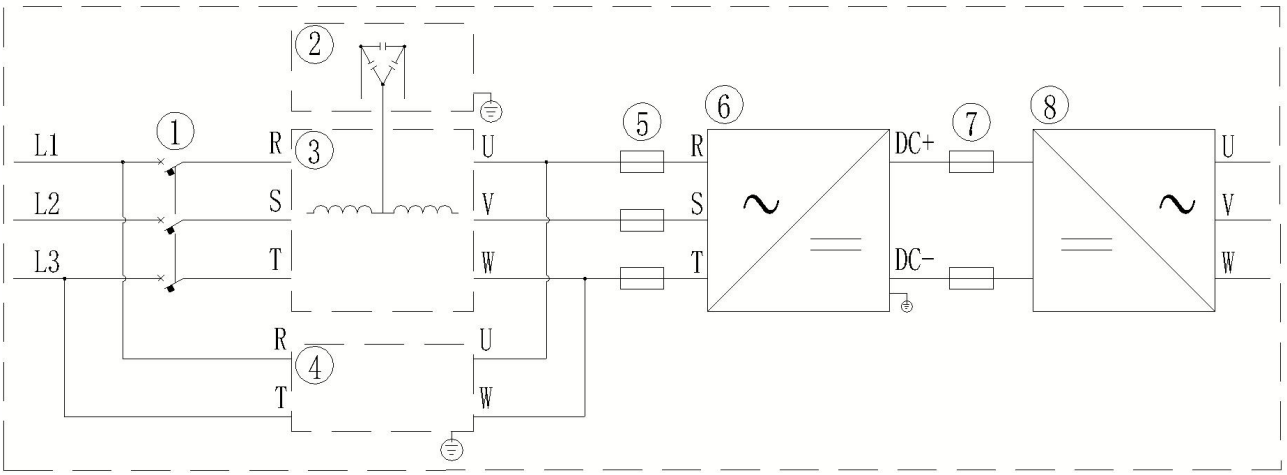
Active rectifier feedback interface LC8 module
LC8 is installed between the power grid and ALM and contains pre-charge module, reactor module and capacitor module.
The precharge module is mainly used to reduce the inrush current when the frequency converter is started, protect the rectifier circuit, and ensure the normal operation of the frequency converter. At the same time, slowly increasing the voltage of the capacitor makes the charging process of the capacitor more stable, thereby better protecting the capacitor and extending its service life.
Reactor modules have impedance properties and can block high-frequency signals.
Capacitor modules eliminate low-frequency signals by switching on and off.
The reactor module and capacitor module can filter harmonic signals of different frequencies and amplitudes to obtain a smooth output voltage waveform.

Note: When using the LC8 precharge module + frame circuit breaker solution, the frame circuit breaker must have an undervoltage automatic trip function (usually an undervoltage trip module needs to be selected in the circuit breaker), otherwise under abnormal circumstances, There is a possibility of damaging the related rectifier module.

LC8 active rectifier feedback interface module hardware electrical wiring diagram



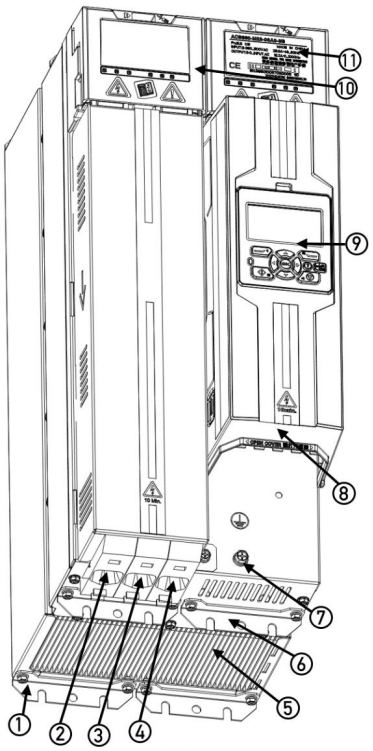
**Main circuit diagram of common DC bus drive system:**

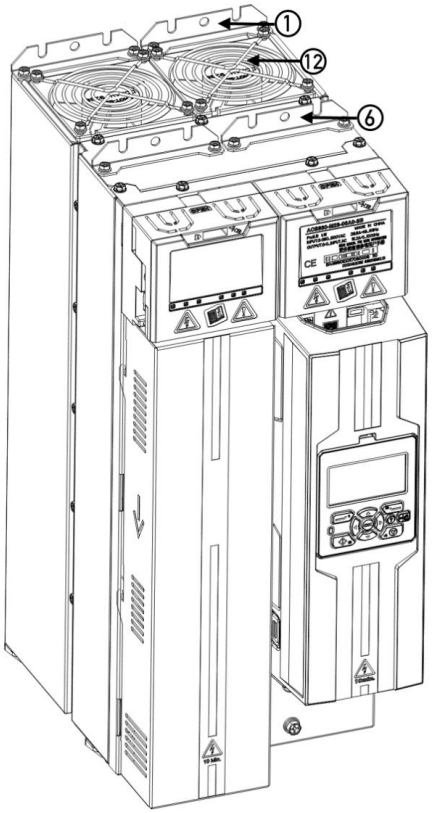



| No | Explanation |
|---|---|
| 1 | AC input circuit breaker |
| 2 | LC8 air-cooled capacitor module |
| 3 | LC8 air-cooled reactor module |
| 4 | Precharge module |
| 5 | AC input fuse |
| 6 | Power supply IGBT active rectifier feedback module |
| 7 | DC fuse |
| 8 | Inverter SMM or PSMM (this picture shows a single inverter parallel module) |

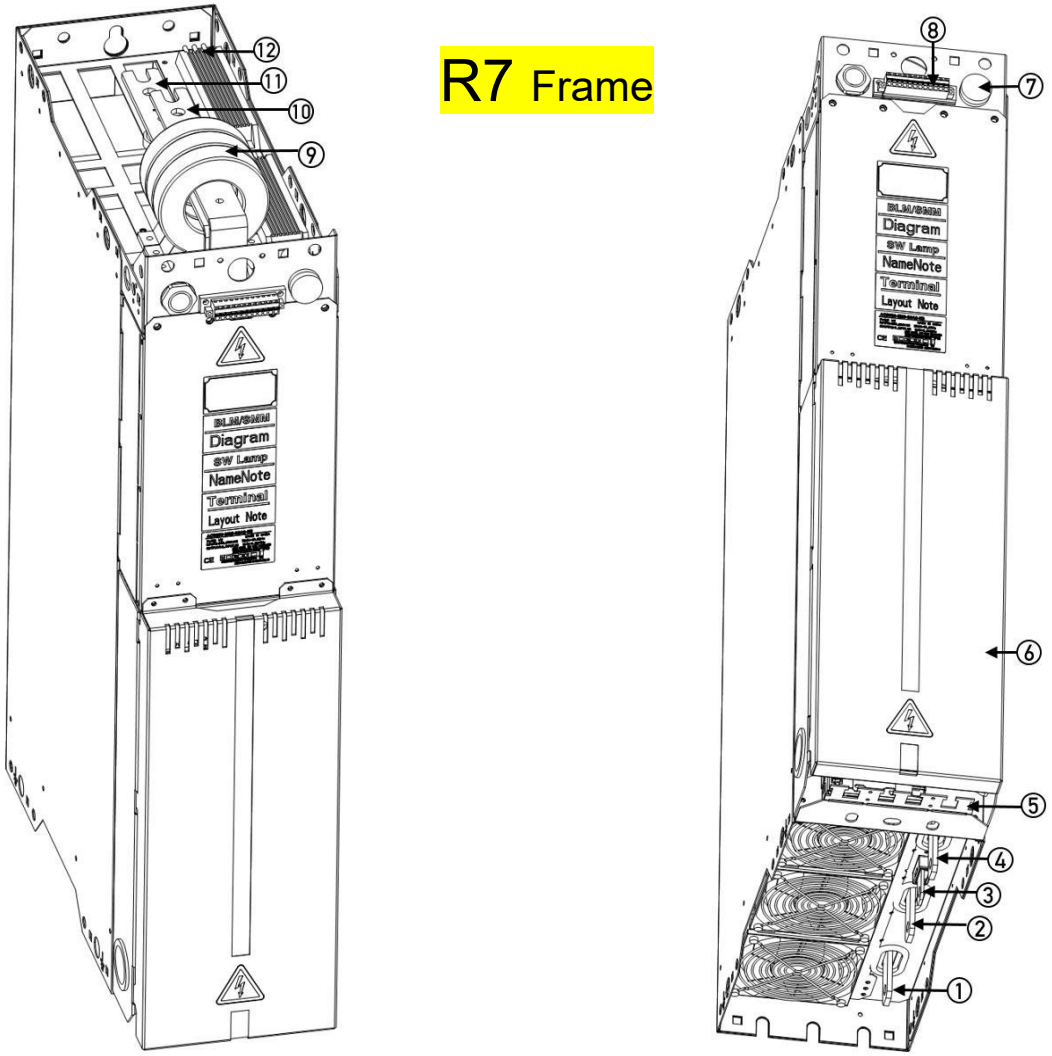
### 6.10.11 AFE Introduction to the hardware appearance of ALM active rectifier feedback module or single motor inverter drive module SMM

## R5 Frame

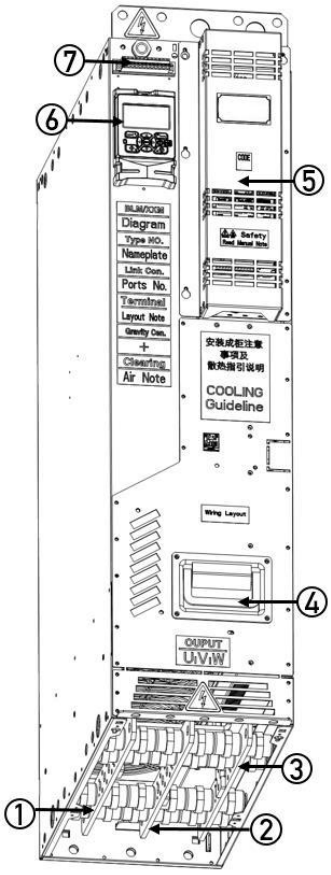


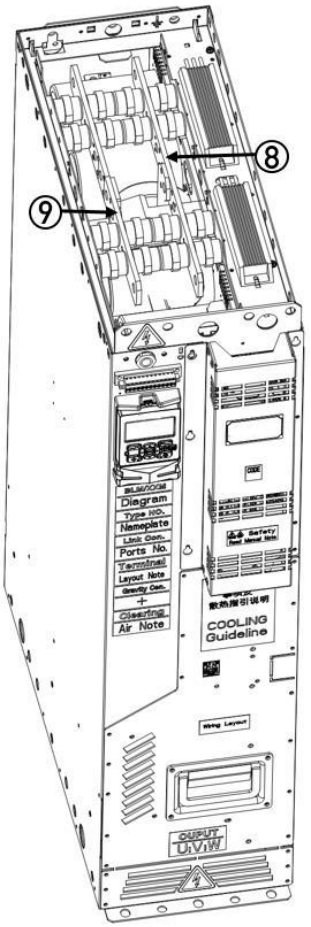




| No | Description (Frame=R5: Applicable to ALM active rectifier feedback module, or SMM single motor inverter driver module) |
|---|---|
| 1 | Machine suspension fixed bracket, distance between two holes is 50mm, hole diameter is 6.5mm |
| 2 | Input R phase terminal connection bit |
| 3 | Input S phase terminal connection bit |
| 4 | Input T phase terminal connection position |
| 5 | The radiator needs to be regularly cleaned of dust and lint at the air inlet end to keep the cooling air flow smooth. |
| 6 | Machine wall-mounted fixing bracket, removable for optional use |
| 7 | Shell grounding point, connect PE |
| 8 | The front cover of the control shell can be detached by slightly pulling outwards on the left and right and flipping up. After removing the front cover, connect the E-type universal control part. |
| 9 | Terminals (see the "Control Unit System Standard Wiring Diagram" in this manual for details) |
| 10 | +CP68 keyboard can be used after being disassembled and connected to an extension cable |
| 11 | DC busbar box, use a screwdriver tool to pry open the buckle and open the upper cover. Inside is the DCP+/DCN- DC busbar. |
| 12 | Fan protection net, the internal fan can be maintained after the fastening screws are removed |




| No | Description (Frame=R7: Applicable to ALM active rectifier feedback module, or SMM single motor inverter driver module) |
|---|---|
| 1 | Output W phase terminal connection position, 1*M10 |
| 2 | Output V phase terminal connection position, 1*M10 |
| 3 | Brake PB terminal connection position, 1*M10 |
| 4 | Output U phase terminal connection position, 1*M10 |
| 5 | Control part cable fixing and bundling position |
| 6 | The control part protects the cover. After opening the cover, it is the control part module. After opening the cover, it is the E-type universal control part wiring. |
| 7 | Terminals (see this manual "Control Unit System Standard Wiring Diagram" for details) |
| 8 | Auxiliary power on indicator light |
| 9 | 12P spring-type 5.08 pitch pluggable terminal block, 220Vac auxiliary power access position + inter-module linkage control signal terminal |
| 10 | DC side common mode filter, used to suppress motor bearing current and improve EMC performance |
| 11 | DC input DCP+, 1*M10 |
| 12 | DC input DCN-, 1*M10 |



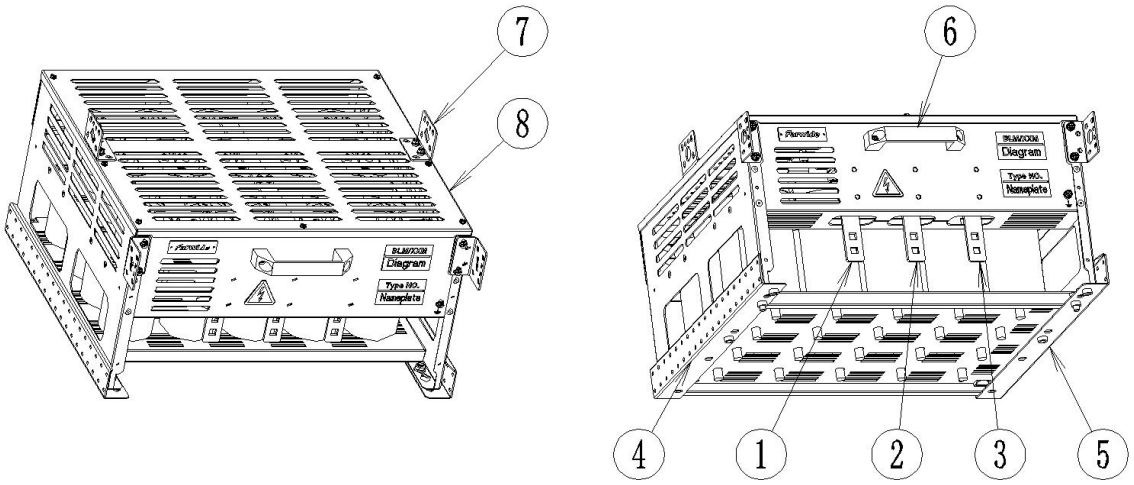




R8 Frame

| No | Description (Frame=R8: Applicable to BLM basic rectifier module, or ALM active rectifier feedback module, or SMM single motor inverter driver module) |
|---|---|
| 1 | Output U phase terminal connection position, 2*M12 |
| 2 | Output V phase terminal connection position, 2*M12 |
| 3 | Output W phase terminal connection position, 2*M12 |
| 4 | The machine handle is used to assist in controlling balance during installation and can be disassembled during maintenance for cleaning the windward side of the radiator. |
| 5 | The control part protects the cover. After opening the cover, it is the control part module. After opening the cover, it is the E-type universal control part wiring. |
| 6 | Terminals (see the "Control Unit System Standard Wiring Diagram" in this manual for details) |
| 7 | The human-computer interaction control keyboard can be used after being disassembled and connected to an extension cord. The factory default keyboard assembly is shipped independently to facilitate regular cabinet door installation. |
| 8 | 12P spring-type 5.08 pitch pluggable terminal block, 220Vac auxiliary power access position + inter-module linkage control signal terminal |
| 9 | DC input DCP+, built-in common mode filter (BLM none, used to suppress motor bearing current and improve EMC performance) |

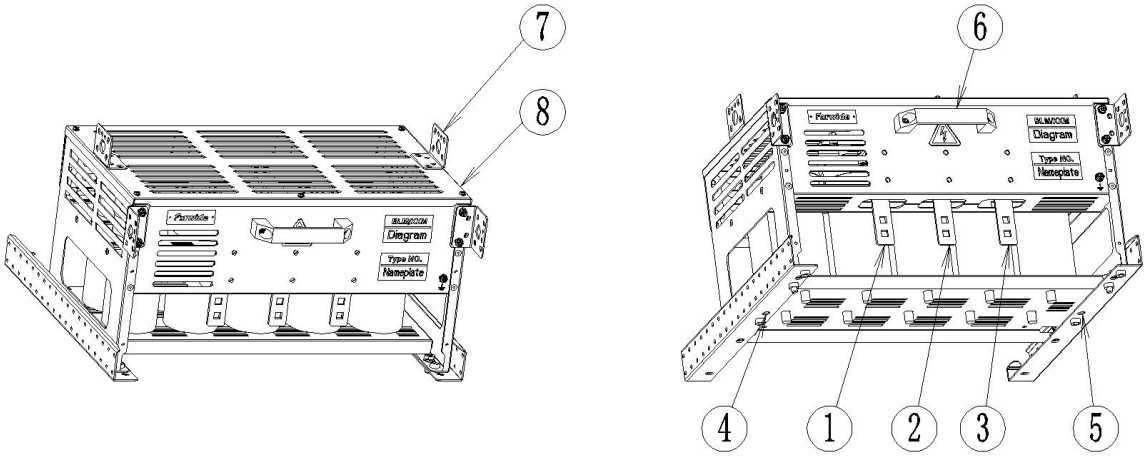
### 6.10.12 Introduction to the appearance and function of the LC8 series air-cooled AIM filter component-level module hardware

LC8 series module capacitor module AIM-C20-3/6



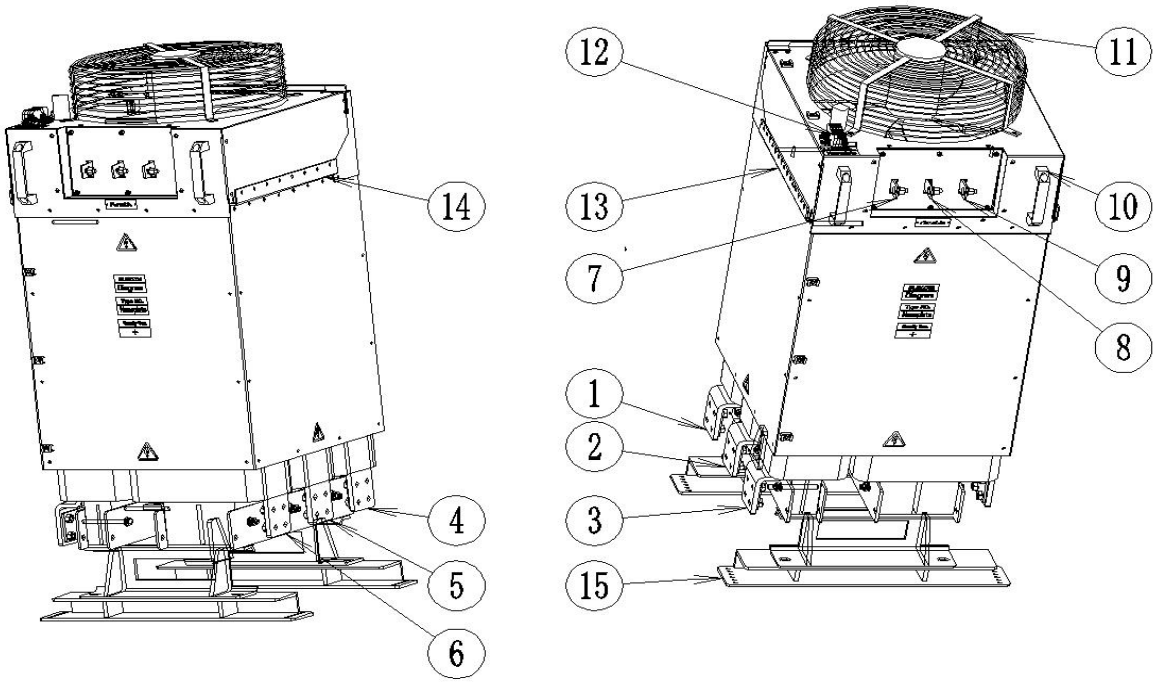

| No | Explanation |
|---|---|
| 1 | Input R phase terminal connection position, 2xM8 copper bar wiring hole position |
| 2 | Input S phase terminal connection position, 2xM8 copper bar wiring hole position |
| 3 | Input T phase terminal connection position, 2xM8 copper bar wiring hole position |
| 4 | Left slide rail for quick installation of capacitor modules |
| 5 | Right slide rail for quick installation of capacitor modules |
| 6 | Machine handle, used to assist in controlling balance during installation |
| 7 | Mounting ears for lifting and fixing capacitor modules |
| 8 | Capacitor module AIM-C20-3/6 |

LC8 series module capacitor module AIM-C10-3/6



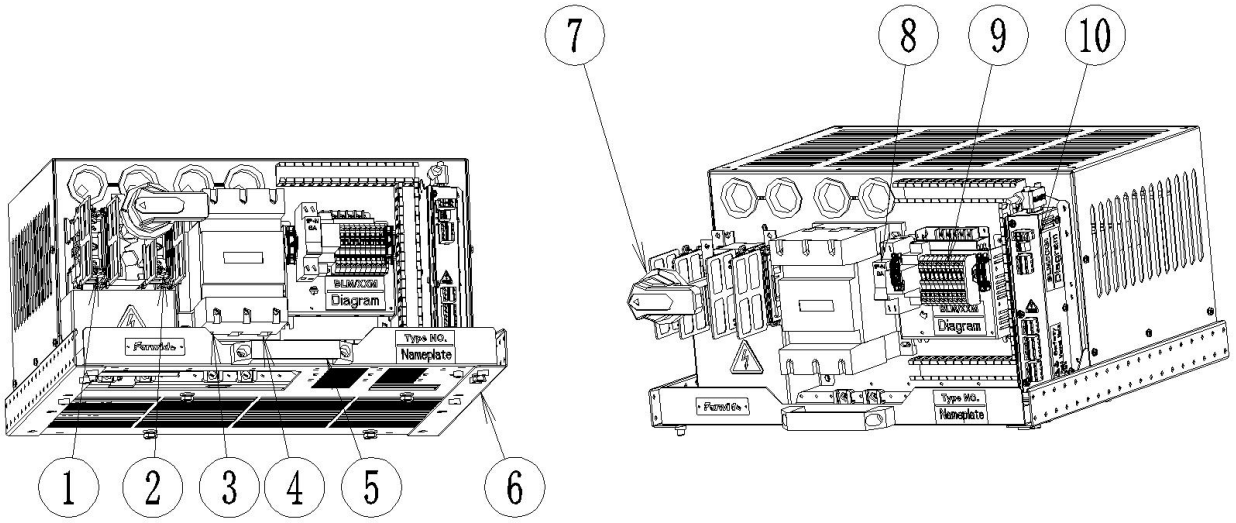

| No | Explanation |
|---|---|
| 1 | Input R phase terminal connection position, 2xM8 copper bar wiring hole position |
| 2 | Input S phase terminal connection position, 2xM8 copper bar wiring hole position |
| 3 | Input T phase terminal connection position, 2xM8 copper bar wiring hole position |
| 4 | Left slide rail for quick installation of capacitor modules |
| 5 | Right slide rail for quick installation of capacitor modules |
| 6 | Machine handle, used to assist in controlling balance during installation |
| 7 | Mounting ears for lifting and fixing capacitor modules |
| 8 | Capacitor module AIM-C10-3/6 |

LC8 series module reactor module AIM-ALCL-3/6




| No | Explanation |
|---|---|
| 1 | **Input R phase terminal connection position, 4xM12 copper bar wiring hole position** |
| 2 | **Input S phase terminal connection position, 4xM12 copper bar wiring hole position** |
| 3 | **Input T phase terminal connection position, 4xM12 copper bar wiring hole position** |
| 4 | **Output U-phase terminal connection position, 4xM12 copper bar wiring hole position** |
| 5 | **Output V phase terminal connection position, 4xM12 copper bar wiring hole position** |
| 6 | **Output W phase terminal connection position, 4xM12 copper bar wiring hole position** |
| 7 | **Output U-phase terminal connection position, 1xM8 copper bar wiring hole position, connected to the capacitor module** |
| 8 | **Output V phase terminal connection position, 1xM8 copper bar wiring hole position, connected to the capacitor module** |
| 9 | **Output W phase terminal connection position, 1xM8 copper bar wiring hole position, connected to the capacitor module** |
| 10 | **Machine handle, used to assist in balancing control when installing the fan cover** |
| 11 | **Axial flow fan, ventilation and heat dissipation** |
| 12 | **4P spring-type 5.08 pitch terminal block, 220Vac axial flow fan auxiliary power access position terminal** |
| 13 | **Left limit bracket, limiting the reactor module** |
| 14 | **Right limit bracket, limiting the reactor module** |
| 15 | **Channel steel base, fixed installation** |

LC8 series module precharge module MU21+PCM-3/6

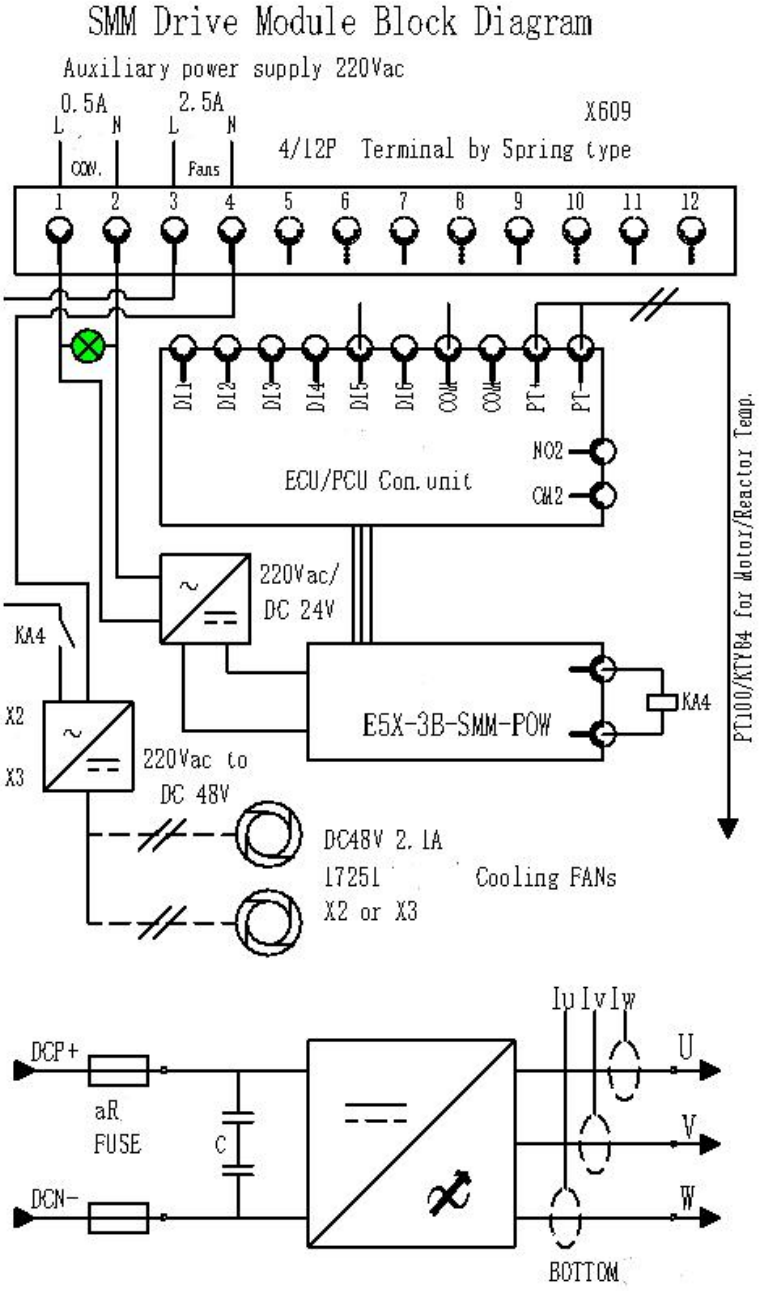



| No | Explanation |
|---|---|
| 1 | Input R phase terminal connection position, 1xM6 copper bar wiring hole position |
| 2 | Input T phase terminal connection position, 1xM6 copper bar wiring hole position |
| 3 | Output U phase terminal connection position |
| 4 | Output W phase terminal connection position |
| 5 | Machine handle, used to assist in controlling balance during installation |
| 6 | Right slide rail for quick installation of pre-charged modules |
| 7 | Handle for opening/closing the knife fuse switch outside the cabinet. When shipped, the handle is tied to the pre-charging module and is not installed on the knife fusion switch. |
| 8 | Miniature circuit breaker, precharge module secondary circuit main switch |
| 9 | 10P spring-type 5.08 pitch terminal block, 220Vac auxiliary power access position + inter-module linkage control signal terminal |
| 10 | Voltage detection unit MU21 |

## 6.11 Explanation of hardware working principle of SMM inverter module

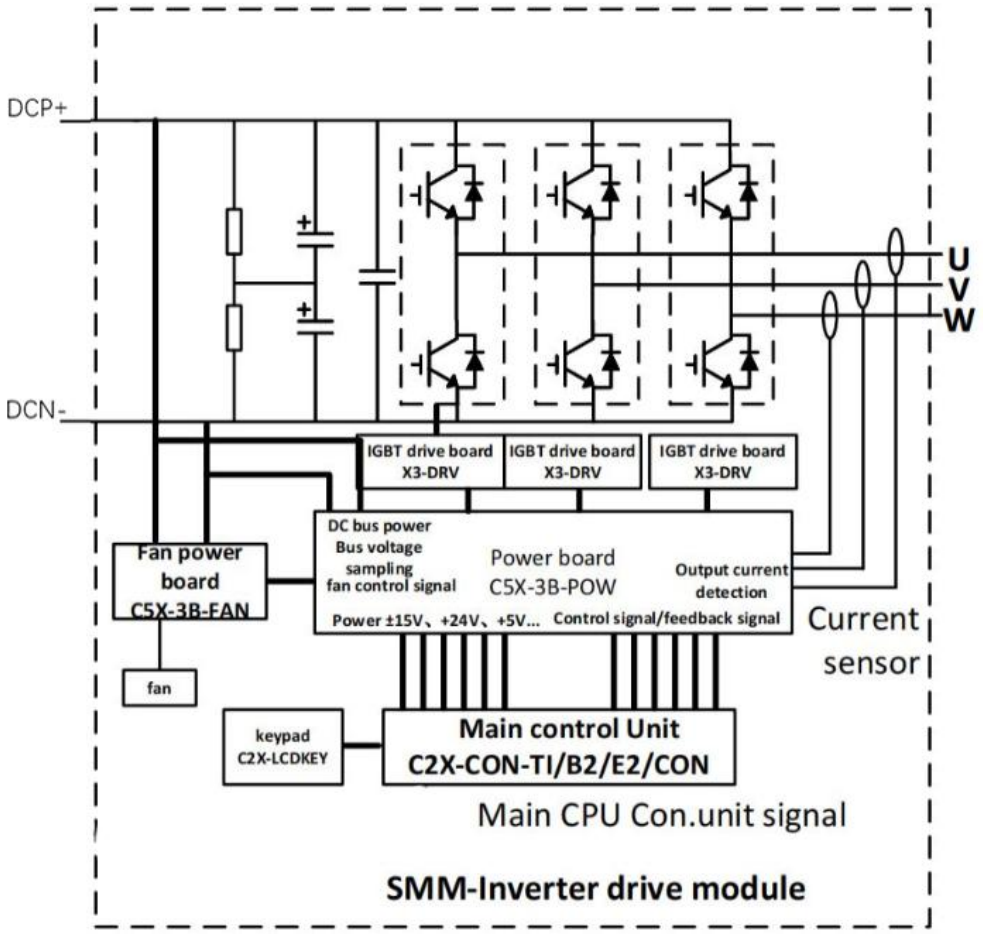
The inverter contains the components required to control the motor, as well as one or more inverter modules connected in parallel, and contains the necessary ancillary equipment such as control electronics, fuses, cables and switchgear. Its operation enablement meets the following conditions: the ready signal of the front power supply module (such as BLM/ALM, etc.) arrives. A single inverter module is controlled by a separate control unit. Multiple inverter modules can be controlled by a parallel PCU control unit. Each control unit contains basic I/O standard modules and optional encoder communication modules. , for details, please refer to the E series control unit system standard wiring diagram (example) and the introduction of each functional port of the optional encoder in this manual.

Some optional configurations are equipped with a DC input soft-start charging module (such as MC55/56). The charging circuit design of the inverter module consists of a charging controller, a resistor, a charging switch and other devices. When the inverter is connected to a live DC When connecting to the bus, the charging switch will be closed first. After charging is completed, the DC main switch or isolation switch is closed again, and the charging switch is opened. If the charging switch is closed, the inverter will not start.

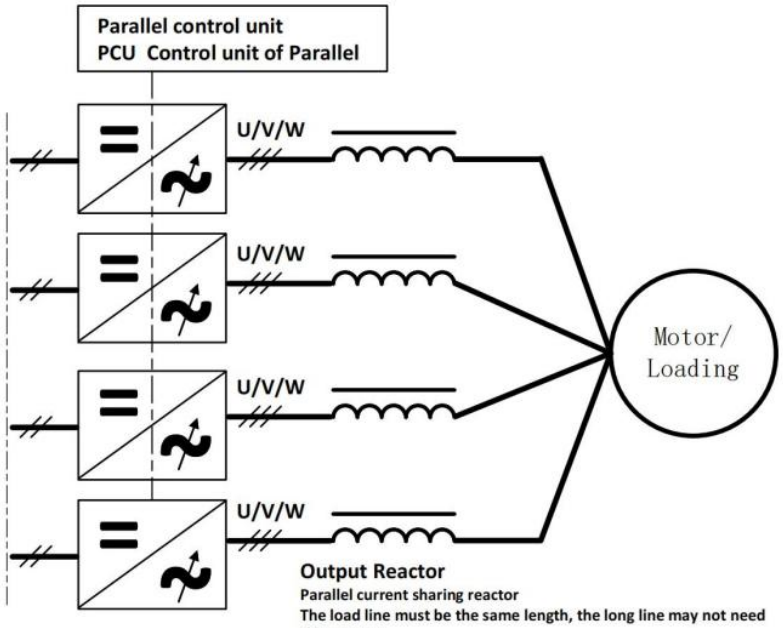



Note 1: The auxiliary power access port in the figure is a 12P 5.08 pluggable spring-type terminal. Some models are 2+2=4P 5.08 dual-channel bridgeable terminals, and their bridge current capacity is 15A.

SMM inverter module electrical schematic diagram:



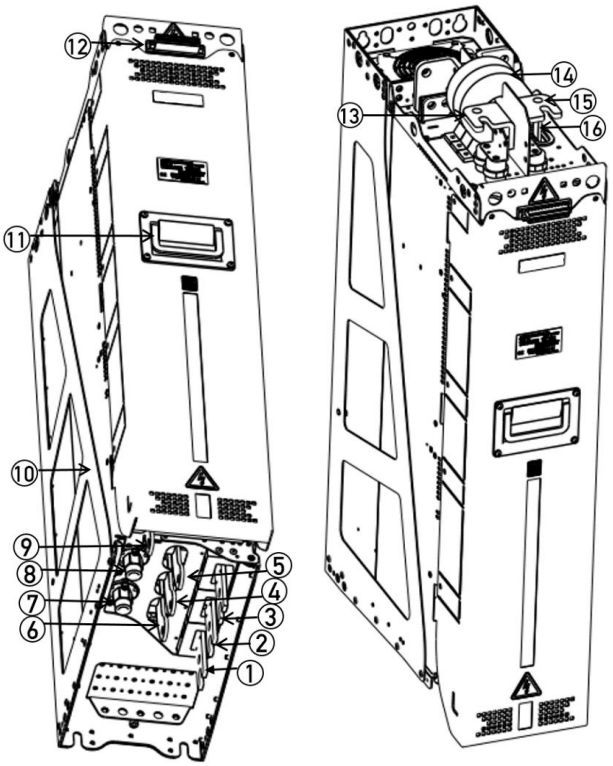

Electrical schematic diagram of power parallel PSMM inverter module:




**DC-AC inverter modules in parallel**

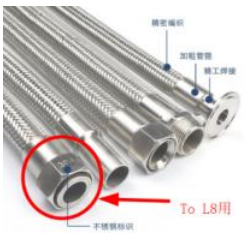
Optional basic/AFE rectification, R/L8MxN (N=2.3...4)
DC-AC=SMM/PSMM Max.=1MW/Moulde
For the schematic diagram of the module represented by N, please refer to the SMM diagram

## 6.12 L8 series medium and high power liquid-cooled multi-Drive hardware and function introduction

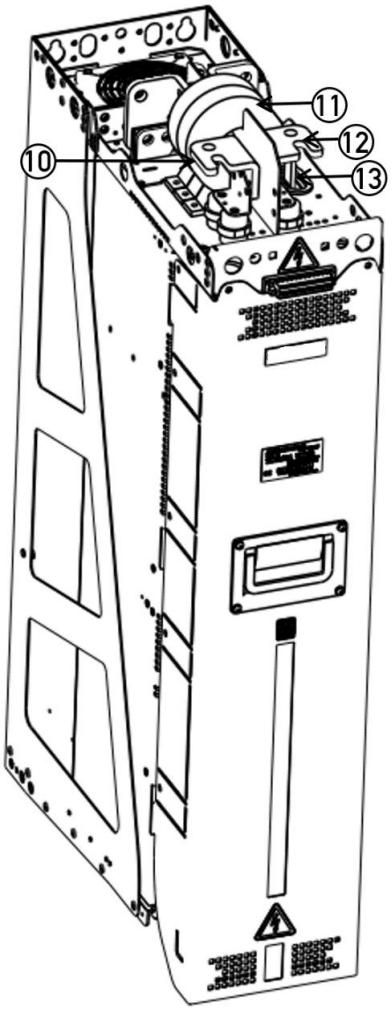



L8 Frame

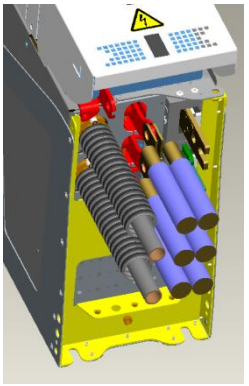


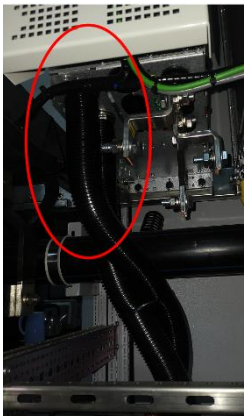


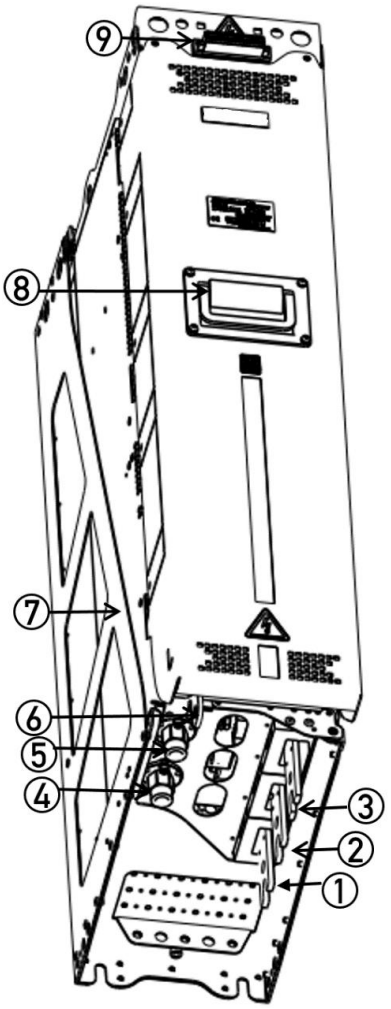

| No | Description (L8 series VFD single machine, ALM feedback rectifier module, SMM inverter drive) |
|---|---|
| 1 | **Output W phase terminal connection position, 2xM12 copper bar wiring hole position** |
| 2 | **Output V phase terminal connection position, 2xM12 copper bar wiring hole position** |
| 3 | **Output U-phase terminal connection position, 2xM12 copper bar wiring hole position** |
| 4 | **Input S phase terminal connection position, 1xM10 copper bar wiring hole position** |
| 5 | **Input R phase terminal connection position, 1xM10 copper bar wiring hole position** |
| 6 | **Input T phase terminal connection position, 1xM10 copper bar wiring hole position** |
| 7 | **The INLET inlet of the liquid cooling channel, G1/2 external thread, can be sealed with single or simultaneous sealing rings on the inner and outer end faces (matched with appropriate adapters). The joint has a stop that is easy to fix the conventional anti-drip + insulating isolation bellows. pendant. Note 1: When screwing in the end-face sealed pipe joint, pay attention to properly releasing the spiral torque of the pipe body to prevent the joint from rotating and causing dripping.** |
| 8 | **Liquid cooling channel OUTLET, G1/2 external thread, sealing and anti-drip design are the same as above, the bellows body can be installed or removed by pinching, suitable bellows specifications: nylon flame retardant type, pipe inner diameter 36, outer diameter 42.5mm** |
| 9 | **PE ground (1xM12 screw)** |
| 10 | **The back clamp box drawer is used for quick installation of finished cabinets and convenient module disassembly. L8 can be pulled out of the box drawer and lifted down.** |
| 11 | **Machine handle, used to assist in controlling balance during installation and for portable use when removing the front cover.** |
| 12 | **12P spring-loaded 5.08 pitch pluggable terminal block, 220Vac auxiliary power access position + inter-module linkage control signal terminal, some models of auxiliary power are 24Vdc2A, at this time the function is 2P terminal moved to the right side of the internal control component.** |
| 13 | **DC DCN-connection position, 1xM12 copper bar wiring hole position** |
| 14 | **DC side common mode filter, used to suppress motor bearing current and improve EMC performance** |
| 15 | **DC DCP+ connection position, 1xM12 copper bus wiring hole position** |
| 16 | **Optional built-in brake PB/R-connection position, 1xM10 copper bar wiring hole position** |




## L8A/B Frame



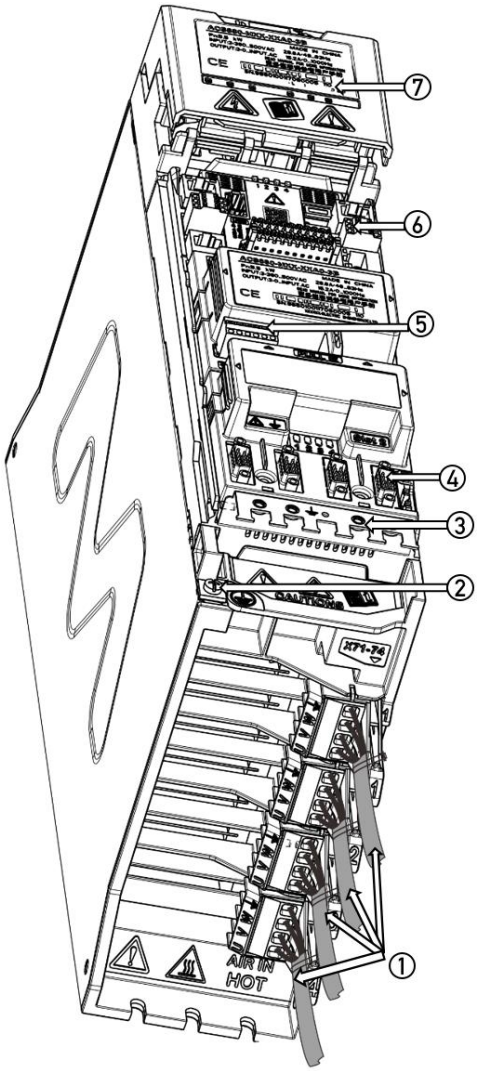





| No | Description (BLM basic rectifier, ALM feedback rectifier module, SMM inverter drive for L8A and L8B) |
|---|---|
| 1 | **Output W phase terminal connection position, 2xM12 copper bar wiring hole position** |
| 2 | **Output V phase terminal connection position, 2xM12 copper bar wiring hole position** |
| 3 | **Output U-phase terminal connection position, 2xM12 copper bar wiring hole position** |
| 4 | **The INLET inlet of the liquid cooling channel, G1/2 external thread, can be sealed with single or simultaneous sealing rings on the inner and outer end faces (matched with appropriate adapters). The joint has a stop that is easy to fix the conventional anti-drip + insulating isolation bellows. pendant. Note 1: When screwing in the end-face sealed pipe joint, pay attention to properly releasing the spiral torque of the pipe body to prevent the joint from rotating and causing dripping.** |
| 5 | **Liquid cooling channel OUTLET, G1/2 external thread, sealing and anti-drip design are the same as above, the bellows body can be installed or removed by pinching, suitable bellows specifications: nylon flame retardant type, pipe inner diameter 36, outer diameter 42.5mm** |
| 6 | **PE ground (1xM12 screw)** |
| 7 | **The back clamp box drawer is used for quick installation of finished cabinets and convenient module disassembly. L8 can be pulled out of the box drawer and lifted down.** |
| 8 | **Machine handle, used to assist in controlling balance during installation and for portable use when removing the front cover.** |
| 9 | **12P spring-loaded 5.08 pitch pluggable terminal block, 220Vac auxiliary power access position + inter-module linkage control signal terminal, some models of auxiliary power are 24Vdc2A, at this time the function is 2P terminal moved to the right side of the internal control component.** |
| 10 | **DC DCN-connection position, 1xM12 copper bar wiring hole position** |
| 11 | **DC side common mode filter, used to suppress motor bearing current and improve EMC performance** |
| 12 | **DC DCP+ connection position, 1xM12 copper bus wiring hole position** |
| 13 | **Optional built-in brake PB/R-connection position, 1xM10 copper bar wiring hole position** |

## 6,13 MX (Multi-axis driver) hardware appearance and terminal function introduction

M4 Frame



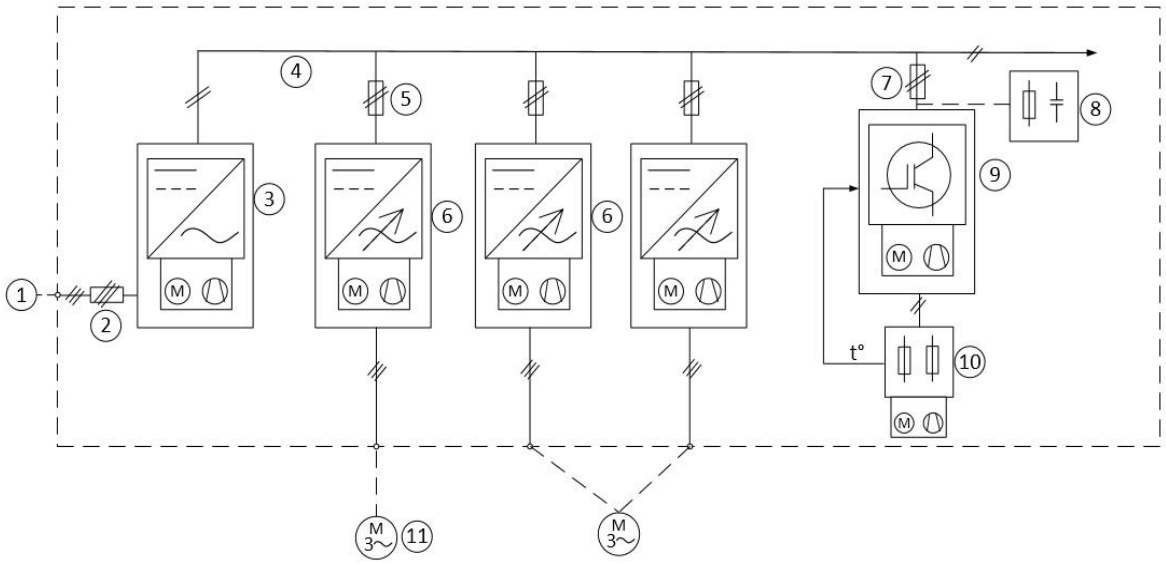

| No | Component function description |
|---|---|
| 1 | Four-axis U/V/W/ground output, use a tie to fix the cable on the right terminal cover to prevent the cable from loosening |
| 2 | PE, shell ground connection |
| 3 | At the ground connection point of the EMC electrical shielding function of the control part, use a tie to fix the cable to the metal frame |
| 4 | Optional various encoder connections |
| 5 | Factory standard configuration I/O input and output expansion card ET11 |
| 6 | For the connection of the control part, please refer to this manual "Control Unit System Standard Wiring Diagram" for detailed instructions. |
| 7 | Shared bus structure, detailed description please refer to the multi-machine drive busbar component connection and 24V auxiliary power supply wiring diagram. |

## 6.14 BRK Instructions on the working principle of brake chopper module connection

BRK braking part is explained in terms of words in this manual

1. Brake chopper: When the motor connected to the output line on the inverter side decelerates sharply, it will usually cause the loop voltage to rise. When the loop DC voltage exceeds a certain maximum limit, the chopper will operate, reducing the The residual electric energy generated by the deceleration of the large inertia motor is led from the intermediate circuit of the transmission system to the braking resistor.
2. Brake chopper module: Brake chopper installed inside the machine or inside the metal frame housing
3. Brake chopper unit: the collective name for the brake chopper module controlled by the control board and its related accessories and control board parts
4. Braking resistor: The basic component of the braking resistor is used to absorb the remaining braking energy of the transmission executed by the braking chopper, and ultimately convert the electrical energy into heat consumption
5. Braking device: usually refers to brake chopper and resistor

**Schematic diagram of the connection of the brake chopper in the transmission system:**



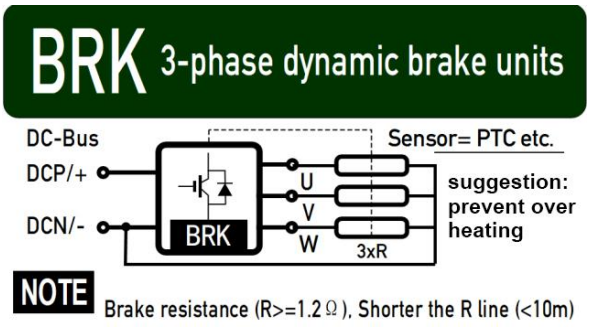

| No | Explanation |
|---|---|
| 1 | AC power |
| 2 | Input AC fuse |
| 3 | Power supply unit (power supply module) |
| 4 | DC link |
| 5 | Inverter DC fuse |
| 6 | Inverter module, parallel inverter module |
| 7 | Brake chopper DC fuse |
| 8 | LC attenuator (if necessary, used to suppress BRK when it is far away from the energy output module) |
| 9 | brake chopper |
| 10 | Braking resistor |
| 11 | motor |

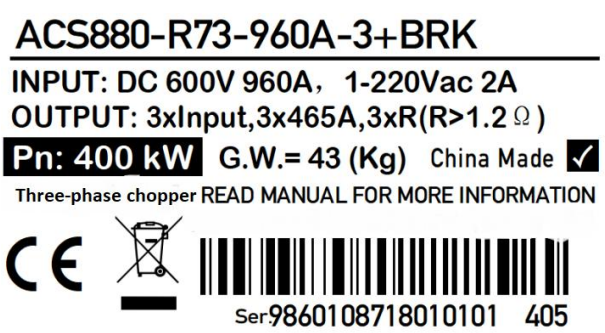
**+BRK brake chopper R7 hardware appearance and function introduction**

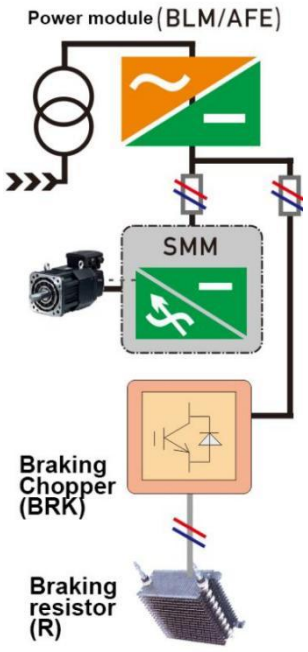
For U1, E2-8 and other series standard single-machine transmission drives, the brake chopper is a standard configuration before leaving the factory (some medium and high-power machines are optional, please see each selection table for details). This design will It achieves better integration in functions such as adjustable braking voltage, braking response, and braking power control to simplify and save your software and hardware configuration time. The independent brake chopper braking system mainly includes a brake chopper module, an external braking resistor (box) and its temperature monitoring and cooling system. A larger power braking system can be composed of multiple brake chopper modules. It is obtained by connecting in parallel and is responsible for processing the energy generated by the motor deceleration. The basic principle is that when the energy recovered by the motor deceleration causes the DC link voltage in the middle of the driver to exceed the limit set by the control program, the brake chopper will be turned on. The external braking resistor is connected to the intermediate DC loop. The power consumption of the resistor will continue to reduce the voltage on the intermediate DC loop until it is lower than the program set value. When selecting the main parameters of the external braking resistor, you need to focus on it. And match the minimum resistor value that the chopper you choose can withstand, and the maximum braking power/duration of the mechanical device where it is located. At the same time, pay attention to: handle the huge heat generated by the resistor during long-term braking, and have fire prevention measures. Temperature monitoring or response measures. The heating loss of the brake chopper is 1% of the total braking power.

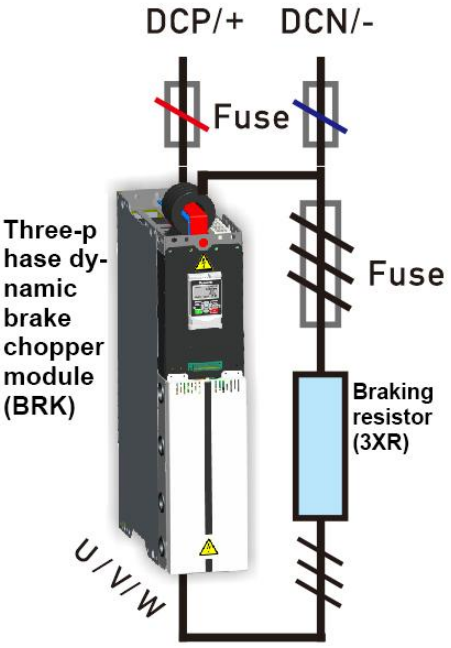
The three-phase braking unit is dynamically controlled and specially designed for common DC bus drive systems. It is flexible to install and the overall braking function has higher system reliability. It supports users to press the diagram in the U/V/W three-phase When connecting 1/2/3 groups of resistors, the configuration of 3 groups of resistors should be preferred.

Pay attention to the minimum resistance value that the brake chopper can accept, which is located on the machine body/or in the sample booklet. The resistance value of the configured resistor in actual use must not be less than the minimum resistance value Rmin. Braking power design and then select appropriate resistors.



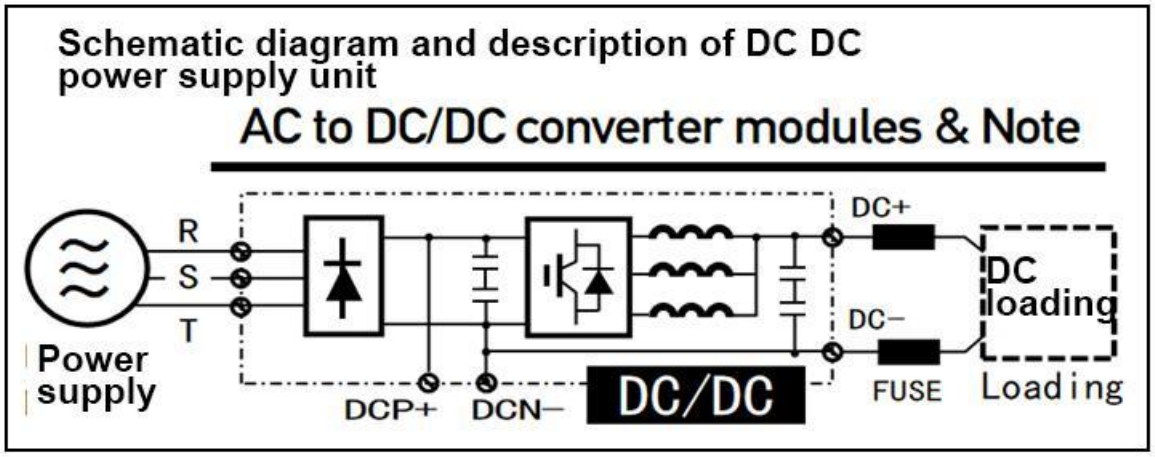



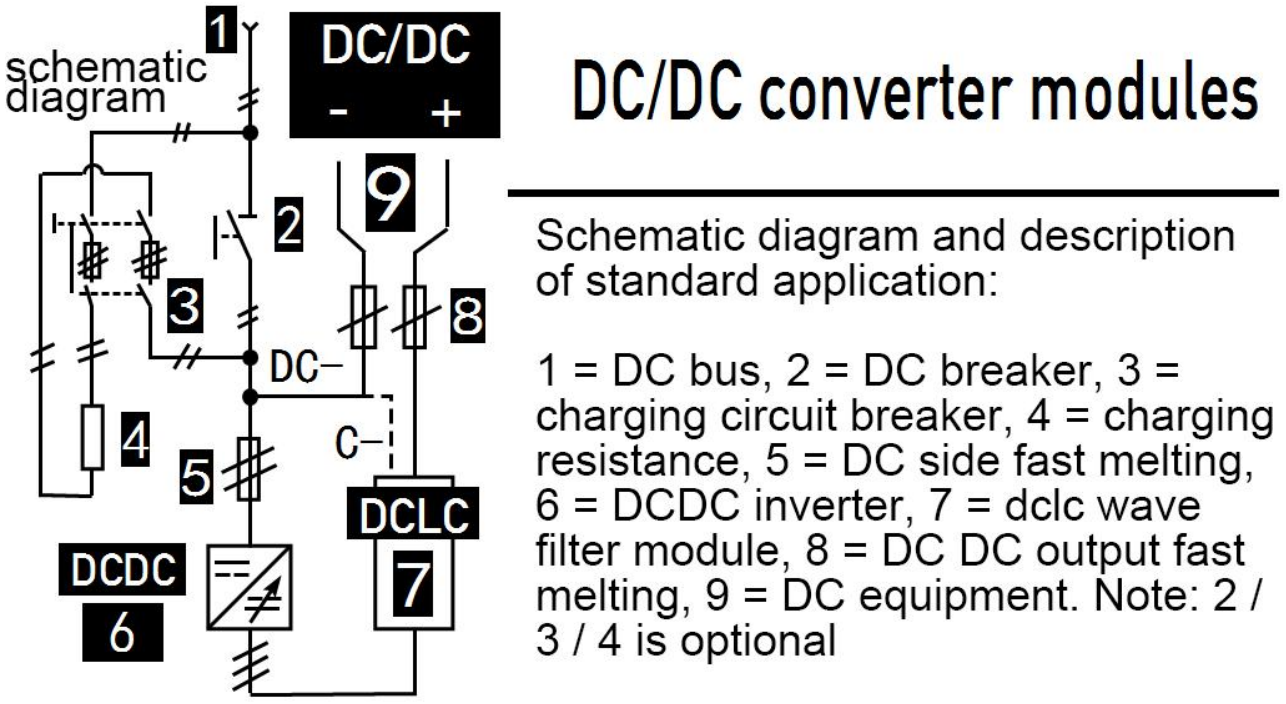



## 6.15 DC/DC Description of the principle and conversion module hardware

Small and medium-power DCDC， DC power supply devices are usually used to power smaller batteries or DC equipment with DC24-400V. The core principle is to realize the conversion of DC energy through Buck-boost circuits, usually as shown in the figure below from left to right. Bidirectional flow and control of energy for buck and boost from right to left.



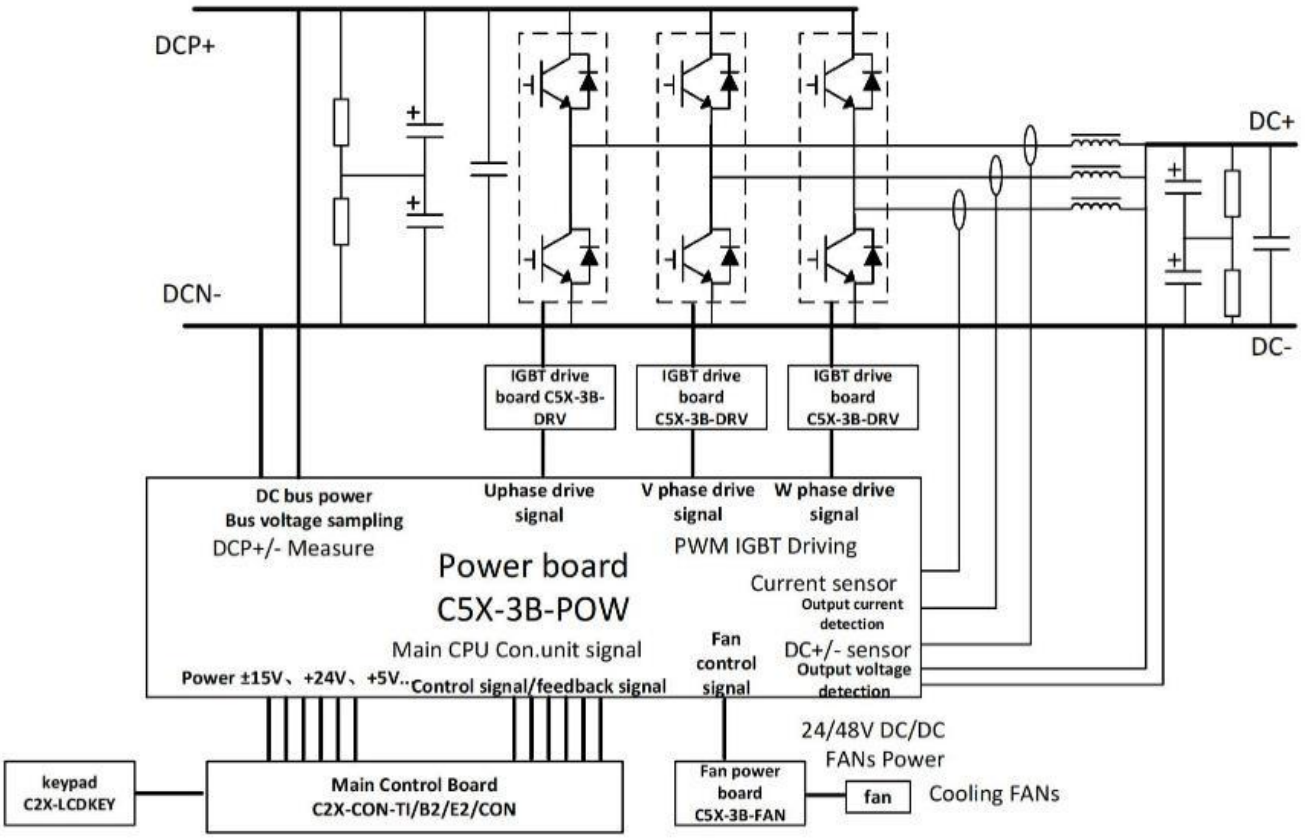

Medium and high-power DCDC， DC power supply devices are usually used to power larger batteries or DC equipment with DC24-1200V. The core principle is to realize the conversion of DC energy through Buck-boost circuits, usually as shown in the figure below from left to right. Bidirectional flow and control of energy from right to left for buck, and boost. At this time, DCDC is mainly composed of DCDC conversion + DCLC filter module.



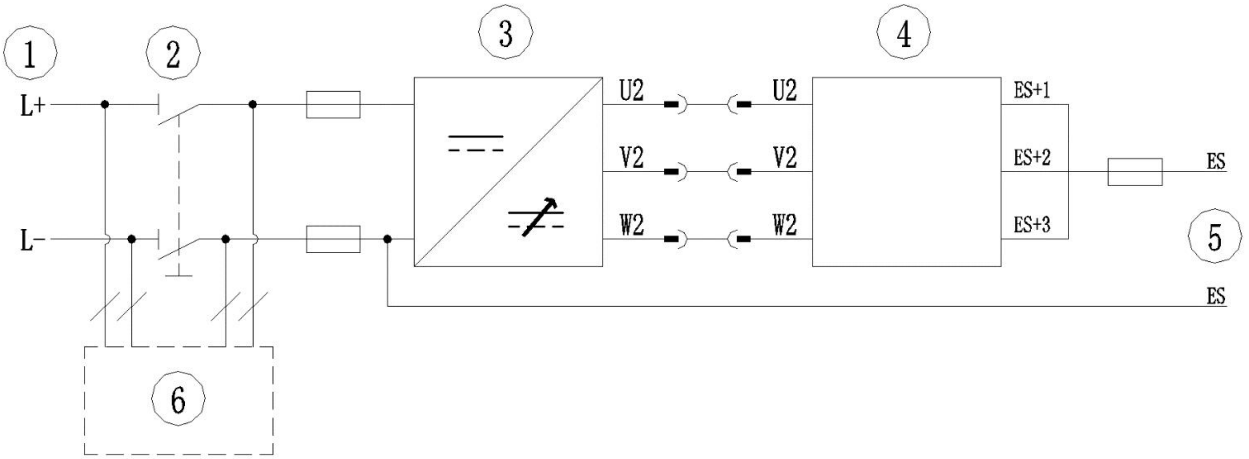

The usual working modes of DC/DC modules include: constant current, constant voltage, constant power and other energy multi-dimensional limiting

In practical applications, it is usually necessary to equip the input side of the AC power supply with measures such as an isolation transformer to achieve electromagnetic noise isolation and suppression of common/differential mode circulating energy in complex and multiple power conversion device systems, thereby achieving better System accuracy, reliability and electrical safety.

**DC-DC Electrical schematic diagram of DC power conversion module:**

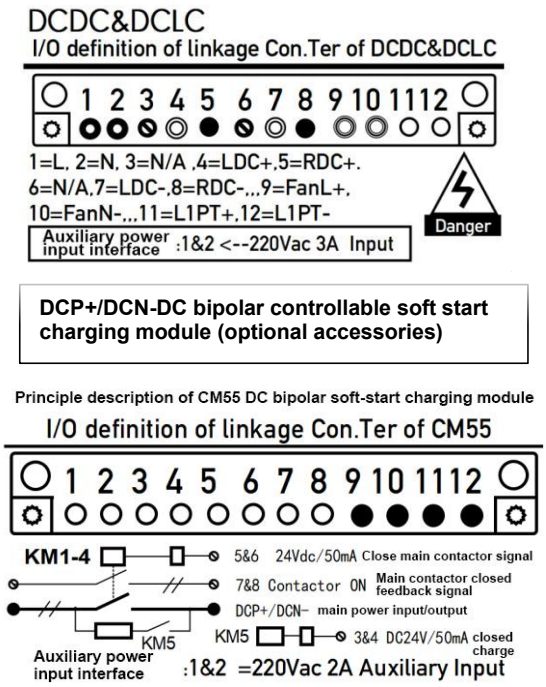


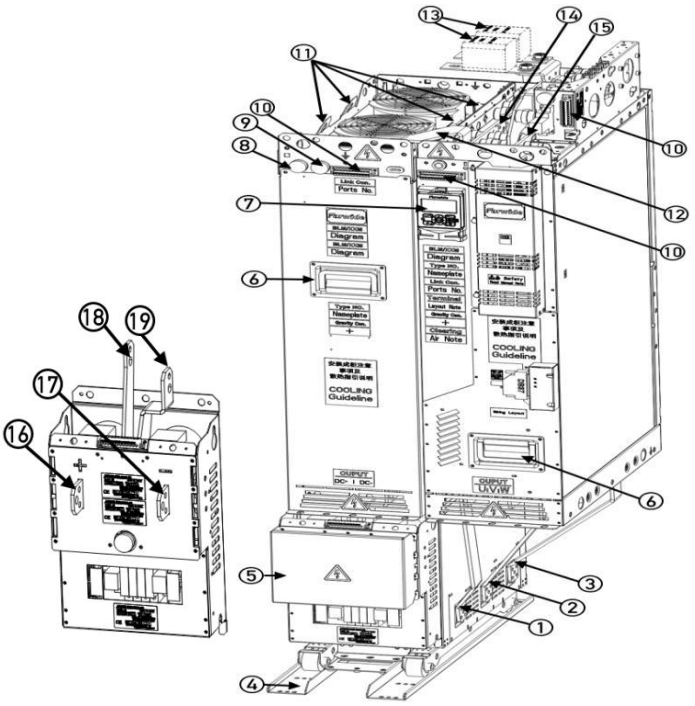

## DC-DC DC power conversion main circuit diagram:




| No | Explanation |
|---|---|
| 1 | DC bus |
| 2 | Isolating switch |
| 3 | DC converter (DCDC module) |
| 4 | Filter (DCLC module) |
| 5 | Output side soft-start charging device (MC55), or energy storage component or system (such as battery pack), optional |
| 6 | Charging components |

**DC/DC Introduction to the hardware and function of DC chopper conversion bidirectional DC power supply**



| No | Description (R8-DC/DC, DCLC on the left in the right picture, DCDC on the right in the right picture, soft start charging module option) |
|---|---|
| 1 | U-phase copper bar connecting DC-DC and DC-LC |
| 2 | V-phase copper bar connecting DC-DC and DC-LC |
| 3 | W-phase copper bar connecting DC-DC and DC-LC |
| 4 | Machine mounting wheel optional slide rail |
| 5 | Soft start charging module with protective cover (optional accessory) |
| 6 | Machine handle, used to assist in controlling balance during installation |
| 7 | Human-computer interactive keyboard |
| 8 | Auxiliary power on indicator light |
| 9 | Spare hole |
| 10 | DC output side soft-start charging device (MC55/56), 220Vac auxiliary power access position + inter-module linkage control signal terminal |
| 11 | Hanging hook position |
| 12 | Bidirectional flow between DC-DC and DC-LC N-pole copper bar |
| 13 | DC-DC DC fuse (this piece is prepared by the customer) |
| 14 | DC-DC DC input N-pole copper bar |
| 15 | DC-DC DC input L pole copper bar |
| 16/ | Soft start charging module (optional MC55) outputs L and N poles |
| 18 | The input L terminal of the soft start charging module (optional accessory) is connected to the DC-LC output L terminal. |
| 19 | Soft start charging module (optional accessory) input N terminal, connect to DC-LC output N terminal |

# 7.Cabinet and mechanical installation design

## Contents of this chapter

This chapter provides guidance on planning the installation of drive modules into user-defined enclosures. The issues discussed are necessary for safe and trouble-free operation of the drive system.

Note: The installation examples in this manual are provided to assist the installer in installation design only. Please note that the installation design of the drive must comply with the relevant laws and regulations of the installation location. Our company does not assume any responsibility if the drive is installed in violation of local laws/regulations.

## Cabinet structure

The cabinet frame must be strong enough to support the weight of the drive components, control circuitry, and other equipment installed inside. The enclosure must protect the drive modules against touch and meet the requirements for dust and humidity protection (see chapter Technical data).
Equipment layout: To facilitate installation and maintenance, a spatial layout is recommended. Space is required for adequate cooling air flow, mandatory spacing, cables and cable support structures. For layout examples, see the cabinet preparation guide at the front of the manual and the Cooling and Protection Levels chapters below.

## Grounding of the mounting structure:

Verify that all connections or racks on which drive system components are mounted are properly grounded and that the connecting surfaces are not painted.

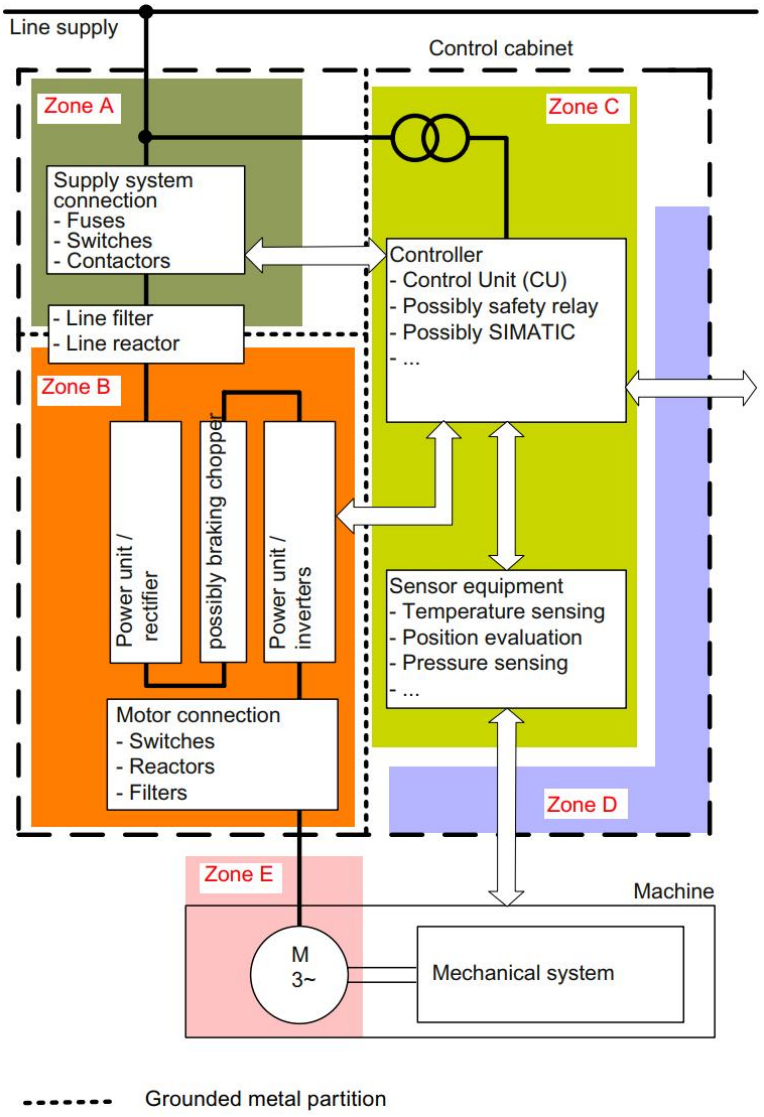
NOTE: Make sure that all components are properly grounded via the fastening points on the base and the screw studs of the control unit (below).
It is recommended to mount the EMC filter (if present) and the drive module on the same mounting plate.
In order to ensure that the system has good and reliable performance, all I/O boards on the control unit must be reliably connected to the protective earth (PE)

## 7.1 A concise guide to converting drives into cabinets

1) It is recommended that the driver is placed in the upper part of the cabinet, the adjustment control unit is placed in the center of the cabinet, and the main switch, contactor, relay, etc. are arranged in the lower part of the cabinet. Or the driver is arranged on the left side, the control unit is arranged on the right side, and the contactors, relays, etc. are arranged in the lower part of the cabinet.

**Warning: If the cabinet is airtight and airtight under direct sunlight, heat + exposure will cause overheating!**

2) Zoning principle: Areas are separated by well-grounded steel plates.
Area A is the power supply including the filter wiring section, where the emitted noise should be kept within specific limits.
Area B includes line reactor and noise source driver braking unit contactor
Area C is equipped with control transformers and noise receiver control systems and sensor systems
Area D The parts forming the interface between signal and control cables and their surroundings require a certain level of immunity.
Zone E consists of three-phase motors and their power cables
Areas should be spatially isolated to facilitate electromagnetic decoupling, with a minimum distance of 20cm between areas.
It is better to use grounded partitions for decoupling. Do not allow cables from different areas to be placed in the same cable duct.
If a filter is required, it should be installed at the interface between areas.
Unshielded cables can be used in one area. All bus cables (such as RS 485, RS 232, CANopen, etc.) and signal cables leading out from the cabinet must be shielded.
3) When arranging components, space should be left for wiring, wiring, maintenance and adjustment operations.
4) Arrangement of braking resistor heating elements:
The braking resistor is installed parallel to the ground, and the wires are made of heat-resistant wires or covered with ceramic beads. It is recommended that the braking resistor be placed outside the cabinet. The braking resistor is covered with a metal shell and installed 1.5M above the ground. At the same time, please note that the physical distance between the braking resistor and other devices is greater than 10cm.
4) About ventilation and heat dissipation
General empirical temperature rise calculation formula for frequency **conversion cabinets:**




1) Temperature rise calculation for frequency conversion cabinet seal (cabinet door closed, no fan):
Trise = Ploss/(5.5 x A)
In the formula, A: cabinet surface area, unit m2
Ploss: Driver heat loss power, usually estimated to be 3% of the driver power, unit W.
2) Calculation of temperature rise of drive with fan cooling:
Trise = (0.053 x Ploss)/F
In the formula, F: fan flow rate, unit m3/minute
Calculation of air volume required for frequency conversion cabinet:

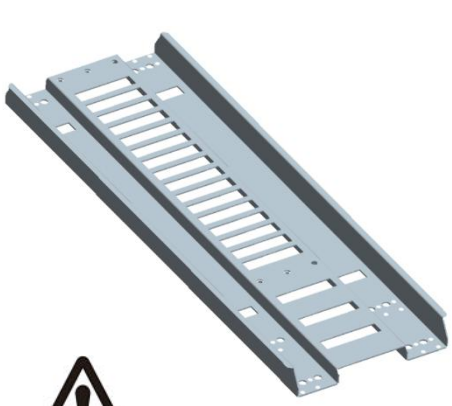
V= (Ploss/Trise) X 3.1

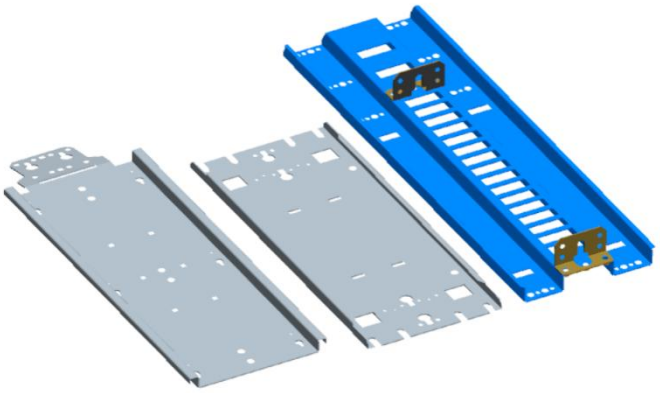
In the formula: V: the air volume required for the driver to maintain the allowable temperature rise, unit m3/hour, Ploss: driver heat loss power, usually estimated to be 3% of the driver power, unit w.
Trise: The drive enclosure is allowed temperature rise.
3.1: Sea level operating heat
Example: Calculate the internal temperature rise of two 15kW cabinets (without fans):
TRISE = PLOSS/(5.5 X A)
PLOSS = 450W (per 15kW drive)
A: Cabinet top = 0.4 x 0.4, cabinet side = 0.4 x 2, cabinet surface = 0.4 x 2, A=1.76m2, estimated 2m2
Then: TRISE = 900/5.5 X 2 = 80℃
Example: The total drive capacity in the drive cabinet is 55kW
The ambient temperature is 35 degrees, and the maximum operating temperature of the drive is 50 degrees.
Trise=15 degrees
Ploss=55000 X0.03=1650W
The drive cabinet needs to be equipped with a fan air volume
V=1650 X3.1/15=333m3/h
Note: Information such as the designed ventilation volume of a single driver and the fan power of the driver can be obtained in subsequent chapters such as technical data for design reference!

## 7.2 Typical cabinet design guidelines for high-power drives (example)

Design instructions and reference for cabinet bottom pallet

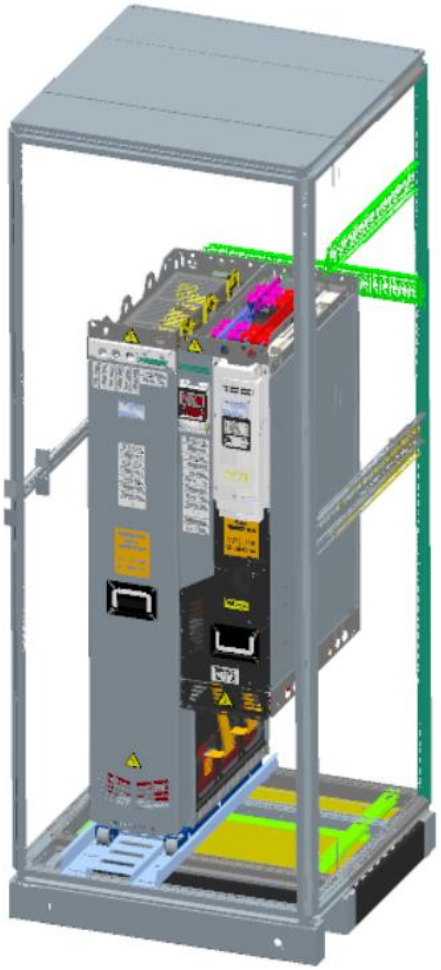
Examples of conventional cabinet bottom pallets:



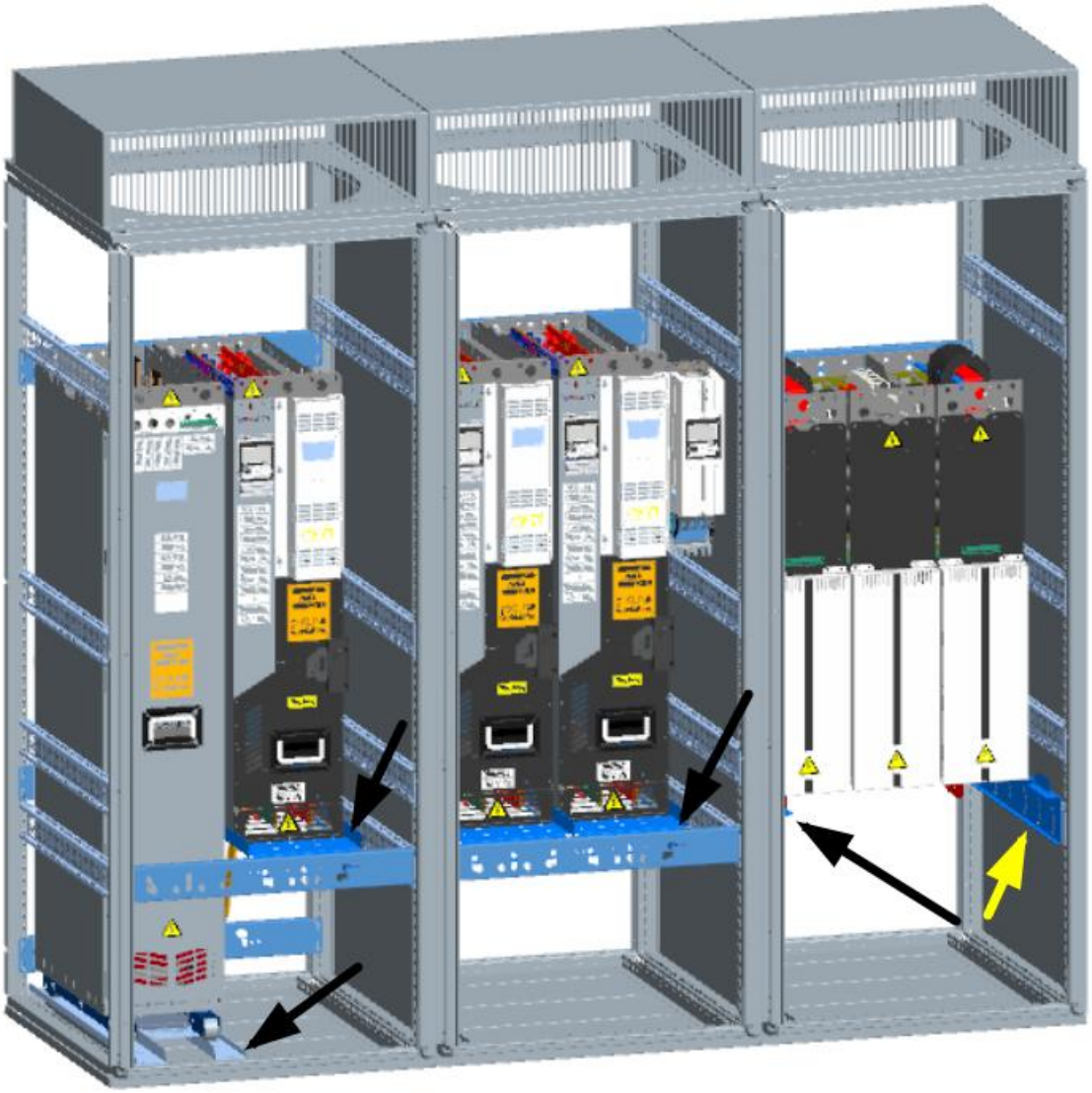


WARNING! Ignoring the following safety instructions may result in personal injury or death or equipment damage.
Only qualified electrical engineers are allowed to install and maintain the equipment!

**Safety warning:**



1. Related products of this series include:
AFE-AIM feedback rectification interface module
DCLC-DC power filter module
2. This module has a high center of gravity and is prone to tipping. It must be operated by qualified mechanical installers. Measures should be taken to prevent tipping, secure ropes, etc., and be installed and constructed with care.
3. This description mainly describes the third-party design, processing, installation, and use of the cabinet bottom bracket of the filter module on the left side of the picture on the right.
4. The pallet in this picture is designed for a common cabinet with a depth of 800mm.
If you use 700mm or other non-standard cabinets, please check and Modify the pallet as appropriate before use.
5. The specific implementation steps and methods are introduced as follows:
- Fix the pallet at the appropriate position on the bottom of the cabinet
- Lift the module into the cabinet and place it slowly on the pallet, if possible
You can use the slope push method (you need to prepare a Ramp with appropriate strength)
- Fix the top of the module on the upper crossbeam on the rear side of the cabinet
- Fix the front bottom of the module on this pallet. If the vibration is strong
For applications where back maintenance is possible, the L-shaped piece on the back of the locking module can be added on this pallet



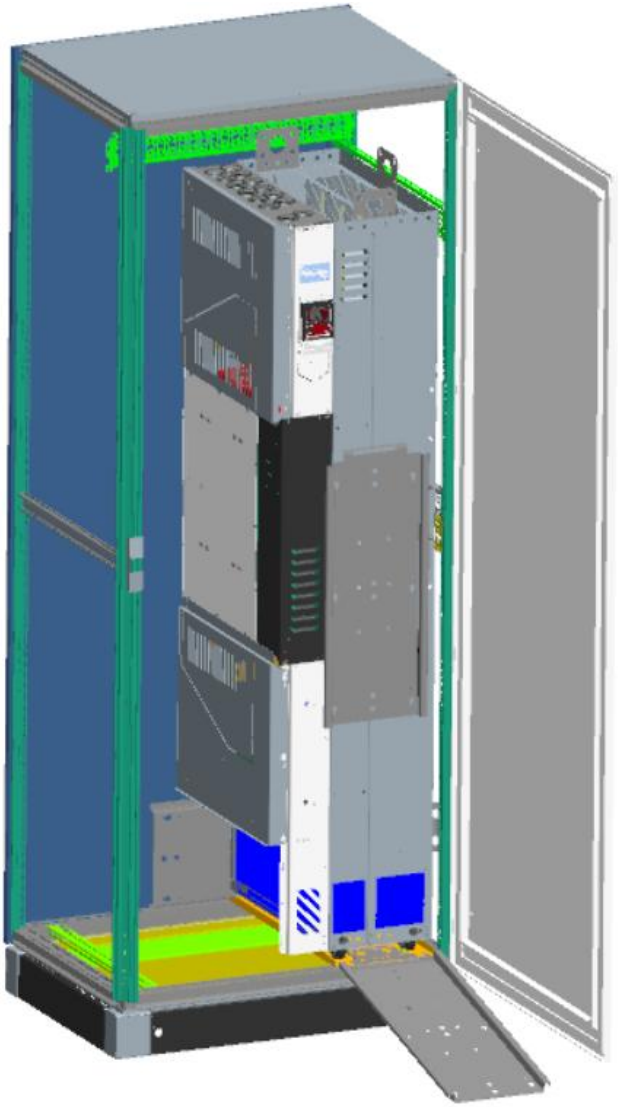
Cabinet diagram: This picture contains 3 cabinets, from left to right: R8-AFE active rectifier cabinet, dual inverter/PSMM+PCU inverter cabinet, single inverter cabinet
The main points of the cabinet are:
1. Each inverter module is equipped with a bottom pallet at the bottom to facilitate cabinet assembly and maintenance during daily operation.
2. Each pallet in the picture above is a reference design drawing. If necessary, please contact the relevant representatives of our company.

E8 stand-alone drive cabinet installation:

Safety warning:
1. Related products of this series include:
E8 standard stand-alone VFD driver

2. This type of module has a high center of gravity and is prone to tipping. It must be operated by qualified mechanical installers. Measures such as anti-tipping and safety ropes should be installed on site, and installation and construction must be done carefully.

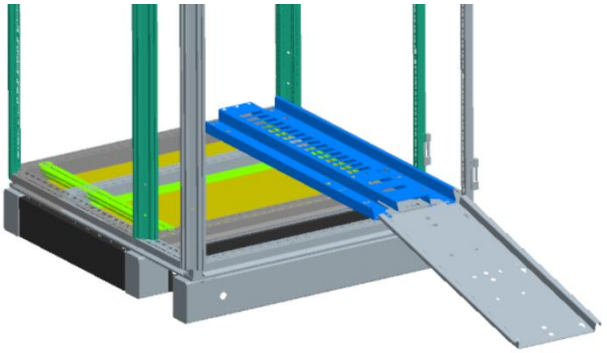
3. This description mainly describes the third-party design, processing, installation, and use of the cabinet bottom bracket of the filter module on the left side of the picture on the right.



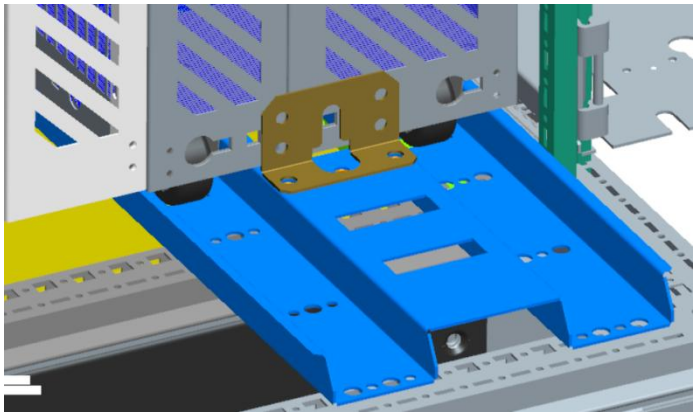
4. The pallet in this picture is for the common TS8 series with a depth of 600mm.
Cabinets are provided. If you use 700mm or other non-standard cabinets,
Please check and modify the pallet as appropriate before use.

5. The specific implementation steps and methods are introduced as follows:
- Fix the pallet at the appropriate position on the bottom of the cabinet
- Lift the module into the cabinet and place it slowly on the pallet.
If conditions permit, the slope push method can be used
(This method requires you to prepare a strength suitable ramp)
- Fix the top of the module to the beam on the back of the cabinet
- Because the front bottom of the module is on this pallet,
If the vibration is strong, the back can be maintained.
L-shaped piece on the back of the locking module can be added
On this pallet.

5.1. E8 type drive standard (recommended) cabinet (600mm deep cabinet) bottom bracket structure diagram. Note: At this time, the bottom bracket + front ramp plate in the picture are factory gift accessories.



5.2. Schematic diagram of the bottom bracket structure of the E8 drive cabinet (7/800mm deep cabinet). Note: The front ramp plates in the picture are all factory-provided accessories. The blue bottom bracket in the picture + the fixed driver and bottom plate in the picture below The L small fixing piece of the pallet needs to be made according to the reference design drawing of the cabinet and made on demand.



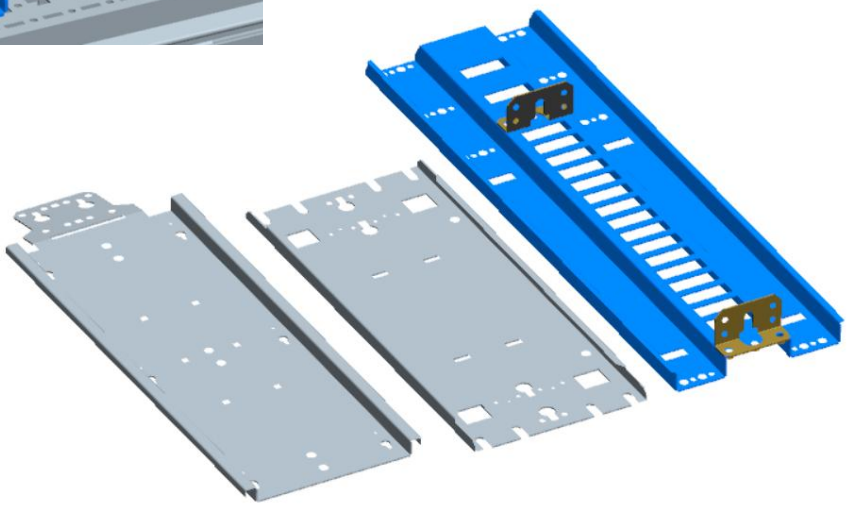
Ramp plate [left] +600mm

Deep cabinet pallet【medium】 +800mm

Deep cabinet bottom pallet and L fixing piece

(The kit on the far right needs to be in a cabinet

Fang Yijian (made by himself)



## 〉7.3 Reference examples of cabinet design and planning

Brief key points of cabinet design planning examples

①. The main types of cabinets include incoming cabinets, rectifier feedback cabinets, inverter cabinets, parallel current sharing reactor cabinets (du/dt cabinets), DC power supply cabinets, and brake chopper cabinets.

②. The incoming line cabinet usually mainly contains incoming line circuit breaker (manual or electric), incoming line fuse, isolation auxiliary 220Vac power transformer (3-5kVA) for the cabinet, incoming line current detection transformer, lightning protection and wave protection Surge protector, etc. There are display and indication components such as incoming current, voltage, power status, etc. on the cabinet door.

③ The rectifier feedback cabinet usually contains BLM basic thyristor rectifier or AFE IGBT rectifier transmission module. The cabinet door has its operation display keyboard. The top of the cabinet is a DC bus copper bar. The cabinet door has an appropriate IP grade air inlet network. The cabinet There is a suitable cabinet top exhaust fan (220Vac@2-3A axial flow fan is recommended)

④. The inverter cabinet usually contains an SMM/PSMM motor drive module. The cabinet door has its operation display keyboard. The top of the cabinet is a DC bus copper bar. The cabinet door has a suitable IP-level air inlet net, and the cabinet top has a suitable Cabinet top exhaust fan (220Vac@2-3A axial flow fan recommended)

⑤. The parallel current sharing reactor cabinet (du/dt cabinet), DC power supply cabinet, and brake chopper cabinet are all similar to the aforementioned module cabinet structure.

⑥. Each DC input and output module (BLM, ALM, SMM, PSMM, DCDC, BRK) is connected to the common DC bus copper bar on the top of the cabinet through an aR-type fast fuse of appropriate rating.

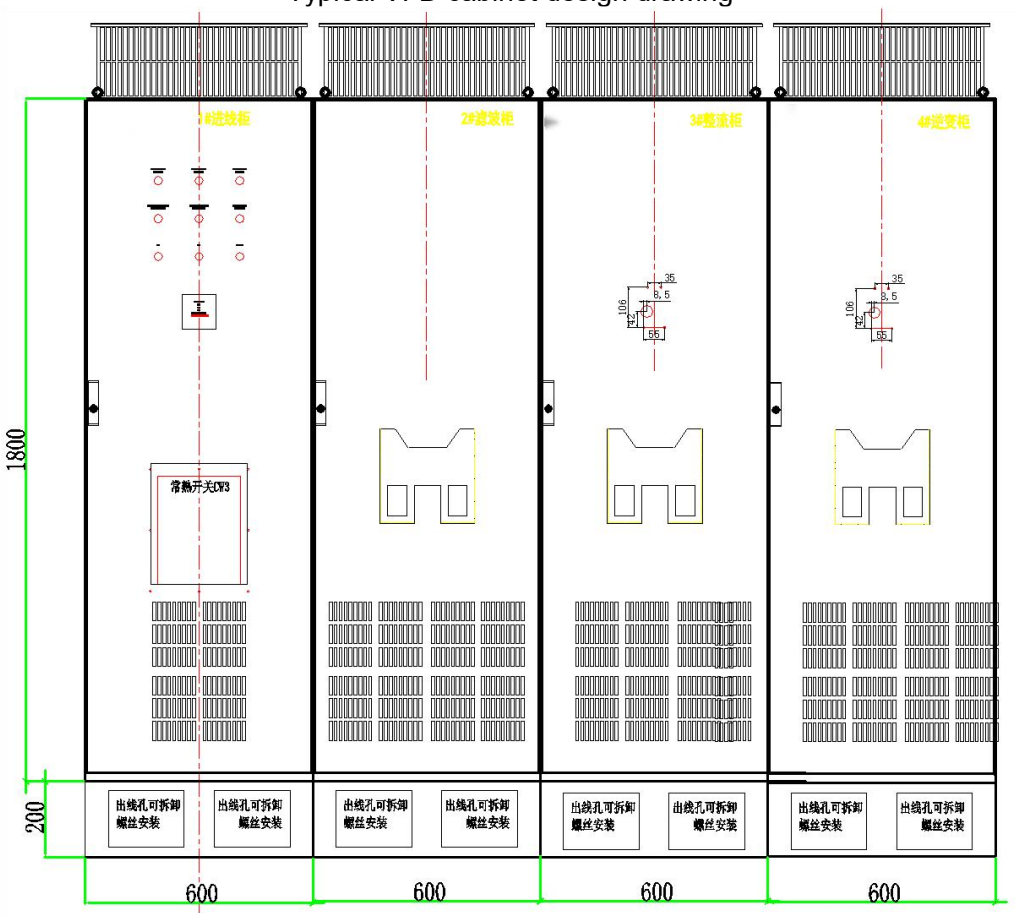
⑦. The ventilation area of the air inlet and outlet of all cabinets and the ventilation capacity of the exhaust fan on the top of the cabinet must be calibrated and designed in accordance with the loss and ventilation volume in the product sample manual. If necessary, seek technical support from the manufacturer.

⑧. When fixing the transmission modules in all cabinets, under the premise of being stable and safe, consideration should be given to how to quickly and safely remove the modules during daily maintenance to facilitate the inspection of the busbar quick-fuse and transmission modules.

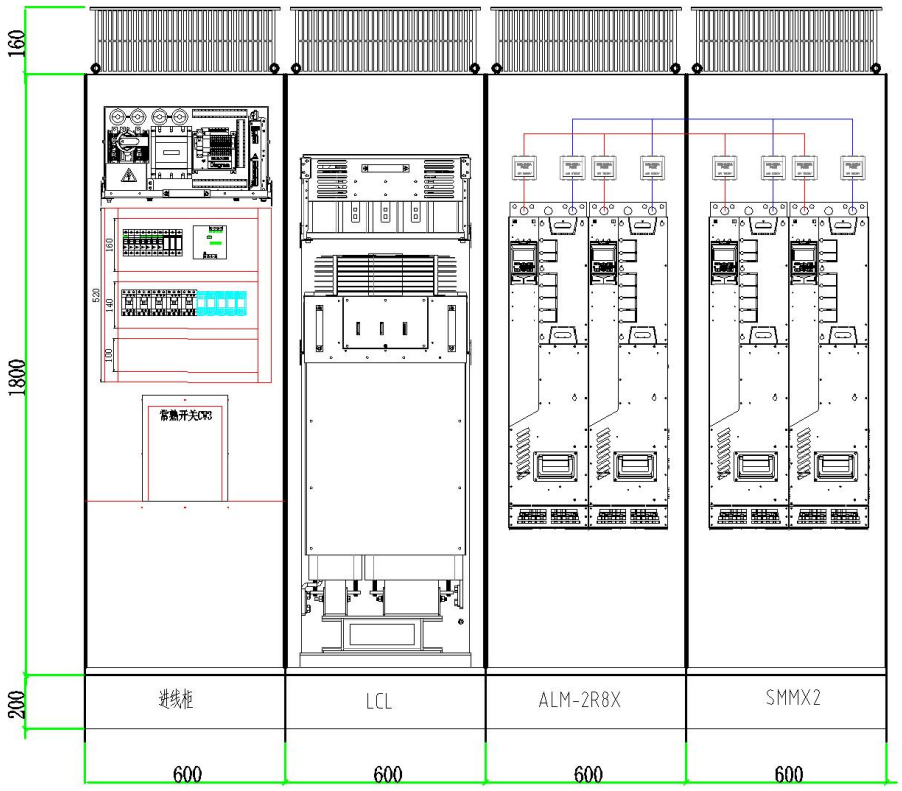
⑨. At the same time, you can also give priority to asking a third party to assist you in designing and assembling the cabinet, that is, delivering the inverter in the form of a cabinet to you. At this time, you only need to connect the power supply, motor, and encoder signal lines to quickly enter. Debugging of variable frequency drive systems.

Multi-drive inside with：R8（AIM+ALM）*2+R8(SMM) *2

Typical VFD cabinet design drawing




## Typical Drive Cabinet design with Inside view




**Multi-drive inside with：2R8（AIM+ALM）*1+R8(PSMM) *2（PCU built-in）**

## 〉7.4 Wall-mounted and floor-standing installation steps

Direct wall mounting
1. Mark the locations of the four holes. Mounting points are shown in the dimensional drawing.
2. Fasten the screws or bolts to the marked positions.
3. Place the drive onto the wall screws or push the drive in.
(NOTE: The drive can only be picked up by the cradle,Otherwise, there is a risk of falling off or falling.)
4.Tighten the screws.

Floor-standing installation (only some models)
1. Drill or bury studs on the target installation ground according to the base installation dimensions.
2. Place the driver on the mounting surface and lock it with the anti-loosening combination nut.

◆◆Note:
1. The selected model is a modular drive such as R8B+R8M. During installation, in order to obtain the most ideal system heat dissipation design, we recommend that you install the R8B or BLM module on the left side and the SMM module on the right side.

At the same time, please check and confirm before powering on:
2. Connect the DC+/- busbars of BLM and SMM with conductors.
3. The linkage control interlock terminals of the two must be well connected before powering on to avoid damage to the driver.

## 7.5 Driver appearance and mechanical installation dimension list

| List of standard specifications appearance and mechanical structure dimensions Unit:mm | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frame | Width W1 | Height H1 | Depth D1 | Hole width W2 | Hole Height H2 | Diameter d2 | Power terminal | Net Weight kg |
| E2 | 100 | 290 | 200 | 55 | 275 | 5.5 | M5 | 3.5 |
| E3 | 145 | 400 | 260 | 200 | 372 | 9 | M6 | 9 |
| E4 | 250 | 400 | 300 | 200 | 372 | 9 | M8 | 18 |
| E5/E6 | 290 | 680 | 340 | 245 | 655 | 11 | M8/M10 | 42 |
| E7 | 425 | 900 | 380 | 370/95 | 878 | 11 | M10 | 80 |
| E8 | 380 | 1660 | 535 | 445/155 | 1588 | 11 | M10 | 160 |
| M1 | 100 | 420 | 320 | 50 | 400 | 6 | pluggable | 5.7 |
| R4A | pending upgrade | | | | | | | |
| R4 | 100 | 500 | 320 | 50 | 486 | 7 | Press frame type | 8 |
| R5A | pending upgrade | | | | | | | |
| R5 | 200 | 500 | 320 | 50/150 | 486 | 7 | Press frame type | 19 |
| R6A | pending upgrade | | | | | | | |
| R6 | 300 | 500 | 320 | 50/150/250 | 486 | 7 | M8 | 37 |
| R7A | 230 | 1300 | 535 | 100 | Put it on the bottom of the cabinet | 11 | M10 | 200 |
| R7 | 190 | 900 | 535 | 100 | 770 | 11 | M10 | 50 |
| R8A/D | 240 | 1395 | 577 | 150 | Put it on the bottom of the cabinet | 12 | M12 | 220 |
| R8 | 240 | 977/1395 | 600 | 150 | 900 | 12 | M10 | 65/90 |
| L8C | 510 | 1200 | 510 | 320 | 440 (depth ) | 12 | M10/12 | 500-750 |
| L8 | 200 | 1000 | 535 | 150 | 860 | 11 | M10 | 65-87 |

The drive can be mounted vertically (this should be preferred for better cooling of the drive) or horizontally on a wall or on the back panel of a control cabinet. In order to ensure adequate cooling of the drive, there should be enough space around it, and note that the mounting plate should be relatively flat. If you need to lift the drive with volume specification E6 and above out of the packaging box, you should use a lifter crane. Please ask the factory or local seller how to lift the drive out safely. Wall-mounted type is the main application and installation form, and its installation dimensions are shown in the table above: (If you need detailed mechanical dimension 2D & 3D drawings, please contact our representative to obtain them)

The operation keyboard can be installed directly in the opening of the cabinet door. After opening 4 round holes and 1 RJ45 avoidance hole on the cabinet door as shown in the figure, the keyboard can be fixed from the back of the door panel with PT2.6*8.

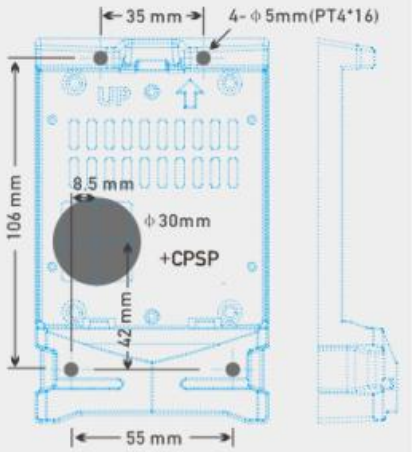



Figure 1: The appearance of the keyboard cabinet door mounting bracket and the front opening diagram during installation.

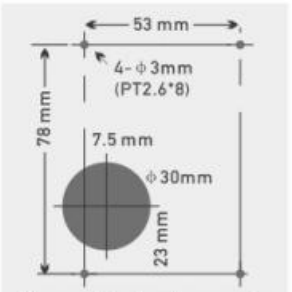
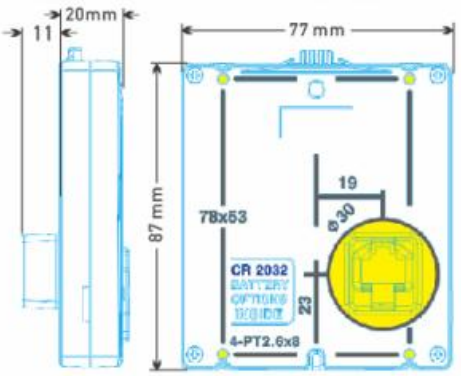



Figure 2: Front opening diagram when installing the keyboard cabinet door




side view

Note 1: The extension signal line of this operation keyboard is based on the common 568B format ordinary 8-core network cable. Drives with power >=55kW (shape code >=E5/R5) will come with a 3-meter-long network cable (please order). (Confirm beforehand). For other power machines, if you need to extend the operation keyboard, please bring your own quality-assured ordinary network cable.

## 7.6 Control keyboard cabinet door installation accessory CPSP extension and representative model appearance diagram

Based on the electrical installation and on-site operation requirements of general drive transmission cabinets, we followed the usage habits of most users and designed the accessory CPSP that can extend the control operation keyboard to the inside or outside of the electrical cabinet door. Its related appearance and machine See the previous page for mechanical installation dimensions:





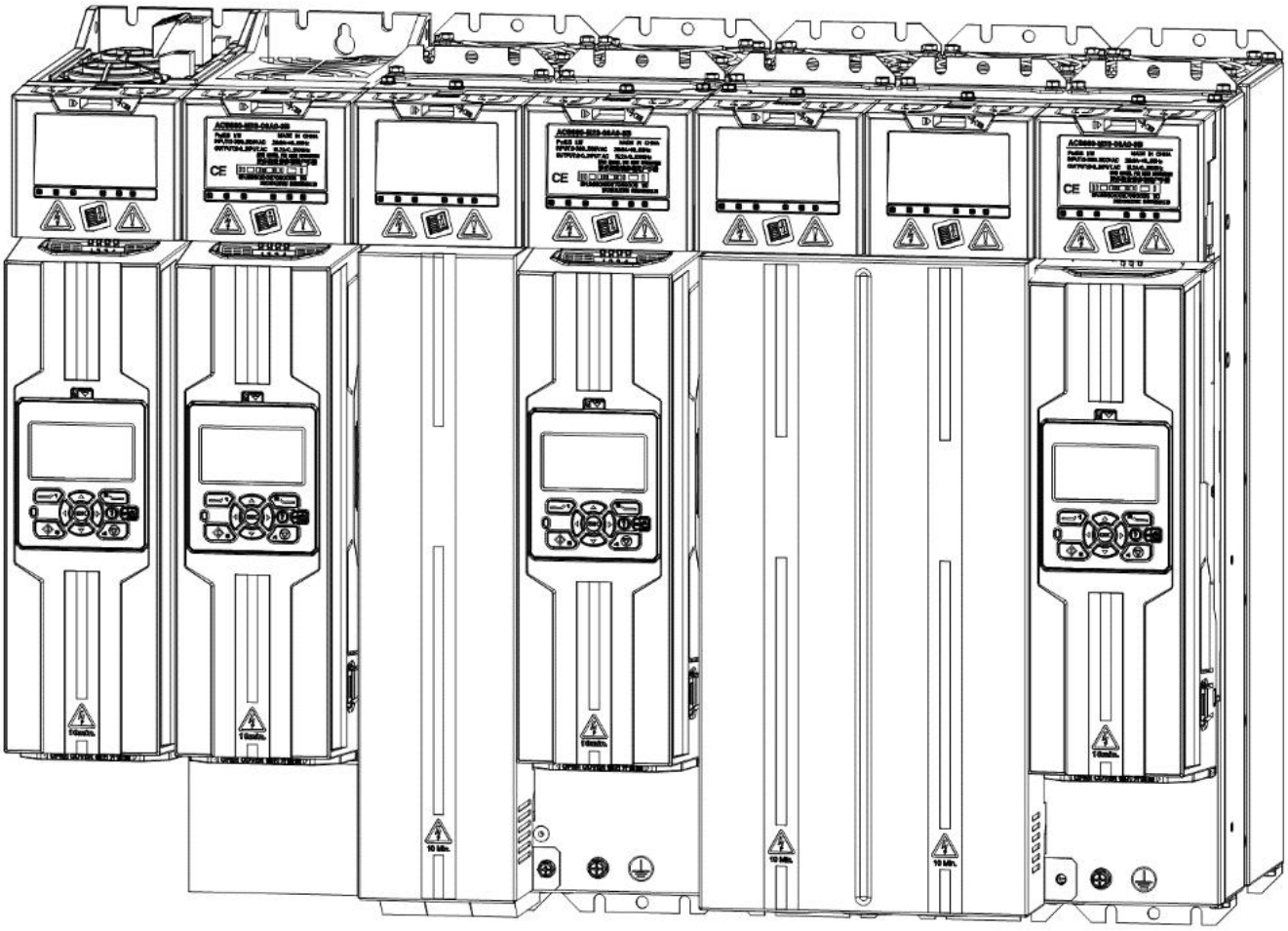



## 7.7 Cooling and protection

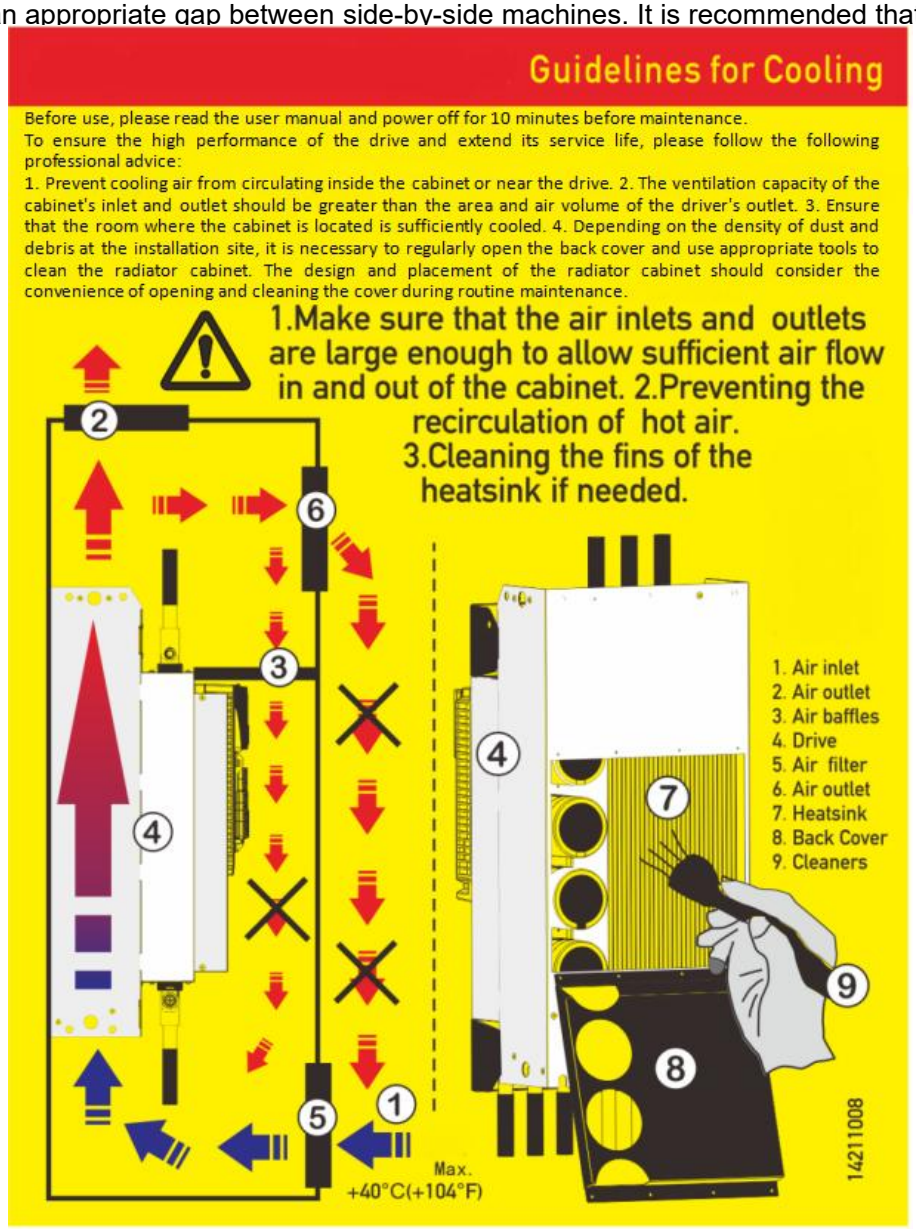
The cabinet must provide enough free space for the components to ensure natural air flow or smooth forced flow by fans for adequate cooling.

1. Natural cooling especially requires making full use of the natural physical principle of heat rising (commonly known as the chimney effect)
2. For forced air cooling, special attention must be paid to avoid that the air flow formed by the exhaust fan cannot or only a small part flows through the target cooling object (drive) or other components. This is called cooling air duct bypass, or the air inlet and outlet of the cabinet is very small. Recently, the airflow of the fan is self-circulated (this is called air duct short circuit). These two items usually need to be designed and considered when the cabinet is built. The position of the air inlet in the cabinet and the size of the ventilation area of the air inlet are required.
3. Regarding lint prevention, when used in related industries such as cotton textile printing and dyeing, catkins in the air, etc., electrical cabinets should fully consider how to prevent lint from entering the driver cooling air duct, thereby blocking the air duct or fan and causing shutdown or damage to the driver. . Hidden dangers are usually eliminated by adding a special filter to the electrical cabinet and cleaning it regularly, keeping the cabinet door normally closed, selecting a driver without a fan, or selecting an air inlet filter for a driver with a fan.

For M1 and R-type series drives, side-by-side installation is preferred to obtain the best cooling effect. Because, in order to reduce the cabinet space, these models have specially designed their system thermal layout to support their side-by-side installation, thereby reducing the installation space of the cabinet. The basic principle is that the left side of the machine is the forced air cooling surface (cold side), and the right side is the forced air cooling surface. In order to control the cavity (hot surface), the alternation of hot and cold can be fully realized through side-by-side installation on the left and right. The installation instructions are as follows:



For E3 and above series drives, read and follow the following guidelines to obtain the best cooling effect.
It is recommended to maintain an appropriate gap between side-by-side machines. It is recommended that the distance between machines be at least 20mm to ensure smooth air circulation.
The air inlets and outlets of the cabinet must be equipped with grilles for
• Direct airflow direction
• Avoid touching
• Avoid water droplets from splashing into the cabinet.




For the specific cooling air volume required after the cabinet is completed, please refer to the corresponding values in the specification model table of rated power and technical data and the total installed capacity in the cabinet to determine.
Cabinet systems should have measures to prevent hot air circulation by guiding hot air away from the air inlet area to prevent hot air from circulating outside the cabinet. Here are possible solutions:
• Use grilles to direct air flow at air inlets and outlets
• Air inlet and outlet placed on different sides of the cabinet
• The cold air inlet is located in the lower half of the front door and an additional exhaust fan is installed on the top of the cabinet.
Leak-proof windshields can be used inside the cabinet to prevent hot air from circulating inside the cabinet.
If there is a risk of condensation inside the cabinet, use a cabinet heater. Although the main function of a heater is to keep the air dry, it may also be needed to heat it at low temperatures. When positioning the heater, follow the instructions provided by the manufacturer.
The space reserved around the drive ensures proper circulation of cooling air and maintenance of the drive. If multiple drives need to be installed one above the other, the spacing between them should be appropriate. And the outlet airflow of the lower device cannot face the air inlet of the upper device. And it should be ensured that the temperature of the cooling air does not exceed the maximum ambient temperature limit of the drive.
[Key points of this section]:
1. Ensure that the inlet air temperature is lower than +40℃. 2. Regularly check and ensure that the drive's inlet and outlet ventilation is smooth
3. Prevent hot air from circulating around.

Practical statistics show:
The user's standardized heat dissipation design, installation, matching and integration will effectively reduce the failure rate of this driver as a typical power electronic product and greatly extend its service life. Frequently asked questions that require your attention include:

1. The air inlet holes of the drive cabinet are smaller than the number and total area of the air outlet holes of the drive (determined by visual inspection).
2. The power of the forced ventilation fan on the top of the driver cabinet is smaller than the power of the fan on the driver [Check the nameplate power (shown at the bottom of this page) on the two fans on the cabinet top and the driver for comparison].
3. After the driver has been working for a long time, hot air accumulates around it (this problem can be alleviated by forced ventilation of the installation environment or the establishment of independent air ducts, air ducts, air exchange facilities, cooling air conditioners, etc.).

## 〉About liquid cooling and protection levels

**The cabinet must provide enough free space for the components to ensure natural air flow or smooth forced flow by fans for adequate cooling.**

**Among them, natural cooling especially needs to make full use of the natural physical principle of heat rising (commonly known as the chimney effect).**

**This series of liquid-cooled drives does not use air for cooling, but liquid for cooling. The liquid circuit of the frequency converter is usually connected to a heat exchanger (liquid-liquid/liquid-air), which cools the liquid circulating in the cooling element of the frequency converter. Since the cooling elements are made of aluminum, the permitted coolants are potable water, demineralized water or a mixture of water and glycol.**

**There are two types of circulatory systems: open systems and closed systems. Open systems have no pressure and allow free contact with air. In a closed system, the pipes are completely airtight and pressure exists within the pipes. The tube must be made of metal or a specific plastic or rubber material that contains an oxygen barrier. Preventing the diffusion of oxygen in the coolant eliminates the risk of galvanic corrosion of metal components and the creation of dust buildup. Always use a closed system with this series of liquid-cooled drives.**

**If there is no alternative to an open system, several precautions must be taken.**
**1. Use glycol and preservative in coolant.**
**2. Check water quality regularly and add preservatives accordingly.**
**3. Check once a year that the coolant characteristics meet the specifications stated in this manual.**
**In closed circulation systems, the following figures are recommended reference values. To avoid galvanic corrosion, a corrosion inhibitor (such as Cortec VpCI-649) must be added to the coolant.**

**Add anti-corrosion agent to the coolant every 2 years and change the coolant in the 6th year.**
Each addition of 0.05% VpCI-649 to the coolant increases conductivity by 75-100 μS. The maximum value depends on the dose rate added. Some manufacturers offer heat exchangers made of stainless steel. The good corrosion resistance properties of stainless steel in district water systems are exploited without the disadvantages of dissimilar filler metals. However, some precautions must be taken to mitigate the risk of corrosion of stainless steel in high chloride waters, see Table 18. We recommend using a high quality heat exchanger where possible.

Notice! If a heat exchanger is not used, measures must be taken to avoid galvanic corrosion. In particular, brass or copper components must not be used in the fluid circuit of the frequency converter.
The table below gives the chemical requirements for drinking water provided by typical international social affairs and ministries of health. These values are for reference only.

| chemical composition | mass unit | value |
|---|---|---|
| Acrylamide | μg/l | 0.10 |
| A ntimony | μg/l | 5.0 |
| Arsenic | μg/l | 10 |
| Benzene | μg/l | 1.0 |
| Benzopyrene | μg/l | 0.010 |
| Boron | mg/l | 1.0 |
| Bromate | μg/l | 10 |
| Cadmium | μg/l | 5.0 |
| Chromium | μg/l | 50 |
| Copper | mg/l | 2.0 |
| Cyanide | μg/l | 50 |
| 1,2-Dichloroethane | μg/l | 3.0 |
| Epichlorohydrin | μg/l | 0.10 |
| Fluoride | mg/l | 1.5 |
| Lead | μg/l | 10 |
| HG | μg/l | 1.0 |
| Nickel | μg/l | 20 |
| Nitrate (NO3 -) | mg/l | 50 |

| | | |
|---|---|---|
| Nitrate nitrogen (NO3-N) | mg/l | 11.0 |
| Nitrite (NO2 -) | mg/l | 0.5 |
| Nitrite Nitrogen (NO2-N) | mg/l | 0.15 |
| Fungicide | μg/l | 0.10 |
| Fungicides, total | μg/l | 0.50 |
| Polynuclear aromatic hydrocarbons | μg/l | 0.10 |
| Selenium | μg/l | 10 |
| Total amount of tetrachlorethylene and trichlorethylene | μg/l | 10 |
| Total amount of trihalomethanes | μg/l | 100 |
| Vinyl chloride | μg/l | 0.50 |
| Total amount of chlorophenols | μg/l | 10 |

Table 16. Drinking Water Chemical Specifications

| mass unit | max | value |
|---|---|---|
| Aluminum | μg/l | 200 |
| Ammonium (NH4 +) | mg/l | 0.50 |
| Ammonium (NH4-N) | mg/l | 0.40 |
| Chloride 1] | mg/l | <100 |
| Manganese | μg/l | 50 |
| Iron | μg/l | <0.5 |
| Sulfate 1] 2] | mg/l | 250 |
| Sodium | mg/l | 200 |
| Oxide (CODMn-02) | mg/l | 5.0 |
| mass unit | expected value | |
| Clostridium perfringens (contains spores) | pmy/100 ml | 0 |
| E. coli | pmy/100 ml | 0 |
| Bacteria count (22 ° C) | | No abnormal changes |
| pH1] | pH | 6…8 |
| Conductivity 1] | μS/cm | <100 |
| Turbidity | | User approval and no abnormal changes |
| color | | No abnormal changes |
| smell and taste | | No abnormal changes |
| Total organic carbon (TOC) | | No abnormal changes |
| tritium | beq/l | 100 |
| Total dose indicated | mSv/year | 0.10 |

Table 17. Drinking Water Quality Recommendations

Notice:

1) The use of aggressive water is not allowed.

2) To avoid pipeline corrosion, the sulfate content must not exceed 150 mg/l. The cleanliness of the heat exchanger depends on the purity of the circulating water, which in turn affects the heat exchange capacity. The unclean the circulating water, the heat exchanger needs

The higher the frequency of cleaning. The following figures are reference values for cooling circulating water:

Specifications: circulating water

Table 18. Circulating water specifications

| | mass unit | value |
|---|---|---|
| pH | | 6…9 |
| water hardness | °dH | <20 |
| Conductivity | µS/cm | <100 |
| Chloride (Cl) * | mg/l | <100 |
| Iron (Fe) | mg/l | <0.5 |

Permissible chloride ion (Cl–) concentration: < 1000 ppm at 20 °C, < 300 ppm at 50 °C, < 100 ppm at 80 °C; the values given are guidelines and are intended to reduce the risk of corrosion of stainless steel. These values are valid at pH=7. Lower pH increases this risk.
The design temperature of the coolant entering the frequency converter module is 35 °C. As the liquid circulates within the cooling element, it removes the heat generated by the power semiconductors (and capacitors). The coolant is designed to have a temperature rise of no more than 5 °C during cycling. Typically, 95% of power loss is dissipated in the liquid. We recommend equipping the coolant circulation system with a temperature monitoring device.

The heat exchange equipment can be installed outside the electric control room where the AC frequency converter is located. The connection between the two is made on site. To minimize pressure drop, the piping must be as straight as possible. We also recommend installing a regulating valve equipped with a measuring point. This allows the liquid circulation to be measured and regulated during the commissioning phase.
In order to prevent impurity particles from depositing at the joints of the pipeline and gradually reducing the cooling effect, it is also recommended to install a filter in the pipeline. The highest point of the pipeline must be equipped with an automatic or manual draining device. The material of the piping must comply with at least AISI 304 (AISI 316 is recommended). Before the actual pipe connection is made, the drilled area must be thoroughly cleaned. Water is recommended for cleaning, if water is not available, compressed air must be used to remove all loose particles and dust.

# 8.Electrical installation design planning

## Contents of this chapter

This chapter introduces the principles that must be followed when selecting motors, cables, protection devices, cable routing, and the operation methods of the drive. If the user does not follow these recommendations, the drive may experience malfunctions that are not covered by the warranty.

Note: The installation design of the driver must comply with the relevant laws and regulations of the installation location. If the installation of the drive violates the requirements of local laws and regulations, our company will not assume any responsibility.

## 8.1 Motor selection

Select the (three-phase AC induction) motor according to the rating table in chapter ***Technical data***. The motor power ratings for each drive type are listed in the table.
Only one permanent magnet synchronous motor can be connected to the drive. It is recommended to install a safety switch between the permanent magnet motor and the drive output. During the maintenance of the driver, the permanent magnet synchronous motor can be disconnected from the driver through this switch.

## 8.2 Power connection

Use fixed connections to AC power lines.
WARNING! Because the leakage current of the device may exceed 3.5 mA, fixed installation should be used and the device and the unit shell should be reliably grounded according to the requirements of IEC 61800-5-1.

## 8.3 Power disconnecting equipment

A manually operated input isolation device (isolation means) needs to be installed between the AC power supply and the drive. The disconnecting device must be able to be locked in the open position to facilitate installation and maintenance.

Europe If the drive used in the application must comply with the requirements of standard EN/GB/IEC 60204-1 "Safety of machinery and equipment"
"EU Machinery Safety Directive", the circuit-breaking device must be one of the following types:
• AC-23B (EN 60947-3) type load switch
• A circuit breaker with an auxiliary contact that opens the load circuit before the main contact of the circuit breaker opens
(EN/GB/IEC 60947-3)
• Circuit breakers suitable for isolation in compliance with EN/GB/IEC 60947-2.
other areas
The circuit-breaking measures must meet the requirements of safety regulations.

## 8.4 Ground fault protection

The drive has internal ground fault protection to protect the equipment from ground faults in the motor and motor cable. This is not a personal safety or fire protection feature. The ground fault protection function can be disabled via parameters.
The optional EMC filter consists of capacitors connected between the main circuit and the driver. These capacitors and long motor cables increase ground leakage current and may cause the circuit breaker to trip incorrectly.

## 8.5 About grounding

**Warn! Ignoring the following guidance can result in personal injury or death, as well as increased electromagnetic interference and equipment damage:**

**• Ground the driver, motor and connected devices such as encoders under any circumstances to ensure personal safety and reduce electromagnetic radiation and electromagnetic interference.**

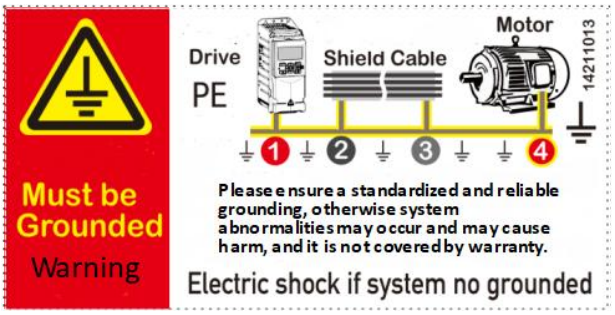
• It is necessary to ensure that the size of the grounding conductor complies with the requirements of local safety regulations, and the resistance of the grounding wire must be less than 10Ω. Otherwise, the equipment may malfunction or even be damaged. .

• In multi-drive installations, provide separate protective earthing (PE) for each drive.

• In order to suppress electromagnetic interference, EMC radiation must be minimized. When cables enter and exit the cabinet, 360° high-frequency grounding is required. In addition, to meet safety regulations, the cable shield needs to be connected to earth ground (PE).

• Do not install EMC filters with strong leakage current in power systems with floating ground or high ground resistance (greater than 30 ohms)

• Do not install the drive on a corner-grounded TN system.




◆ Notice:

• Only if the size of the power cable shield meets the requirements of safety regulations

Only when required can the power cable shield be used as the grounding conductor of the equipment.

• Standard GB/IEC/EN 61800-5-1 requirements: If the drive's

If the contact current is greater than 3.5mA (AC) or 10 mA (DC), then

A fixed protective earth conductor and a cross-section of at least

Protective earth conductor of 10 mm 2 copper or 16 mm 2 aluminum wire, or

When the protective grounding conductor is disconnected, the power supply or the second protective grounding conductor is automatically cut off.

The cross-sectional area of the conductor is the same as that of the original protective earth conductor.

## 〉8.6 Emergency parking equipment

For safety reasons, emergency stopping devices need to be installed at each operating station and other workstations that require emergency stopping.

NOTE: Pressing the STOP key on the drive control keypad will not cause an emergency stop of the motor, nor will it disconnect the drive from hazardous voltages.

## 〉8.7 Safe torque off

The Safe Torque Off function cuts off the control voltage to the drive's power semiconductors, thus preventing the inverter from generating the voltage required to rotate the motor. This feature makes it possible to carry out short-term operations (e.g. cleaning) and/or maintenance work on non-electrical components without removing the power supply to the drive.

This function is suitable for some series of drives with this function. Please consult with our representative before ordering.

**Note:** The contacts of the activation switch must open/close within 200 ms. The maximum cable length between the drive and activation switch is 25 m (82 ft).

**WARNING!** The safe torque off function does not disconnect the voltage of the main and auxiliary circuits from the drive. Therefore, maintenance work on the electrical components of the drive or motor must only be carried out after isolating the drive system from the mains supply.

NOTE: If a running drive is stopped via the Safe Torque Off function, the drive will cut off the motor supply voltage and the motor will coast to a stop

Continuous motor cable shield or equipment housing attached to the motor cable

If safety switches, contactors, junction boxes or similar devices are installed on the motor cable between the drive and the motor, to minimize radiation levels the following requirements should be observed:

• European Union: When installing equipment with metal enclosures, ground the shields of its input and output cables 360 degrees, or tie the cable shields together.

• USA: When installing equipment with metal enclosures, the bridge or motor cable shield from the drive to the motor must be continuous without breaks.

## 〉8.8 Thermal overload and short circuit protection

**8.8.1 Thermal overload protection:** If the cable is selected according to the rated current of the drive, the drive can protect itself and protect the motor cable from thermal overload. No additional thermal overload protection equipment is required.

WARNING! If the drive is connected to more than one motor, a separate thermal overload switch or circuit breaker must be used to protect the cables and motors. These devices may require the use of fuses to interrupt the short-circuit current.

**8.8.2 Motor cable short-circuit protection:** When the motor cable is selected according to the rated current of the driver, the driver can protect the motor cable and motor in the event of a short circuit. No other protective equipment is required.

**8.8.3 Short-circuit protection in power cables or drives:** Use fuses or circuit breakers to protect power supply cables. Recommended fuse values are given in chapter Technical data. Standard IEC gG or UL Type T fuses, when located on the electrical panel, will protect the input cables during short circuit conditions, reducing damage to the drive and avoiding damage to adjacent equipment if a short circuit occurs within the drive.

If the cables are selected based on the current rating of the drive, the drive protects itself, the supply cable, the motor cable and the motor in the event of overheating. No other thermal protection equipment is required.

**8.8.4 Warn!** If the drive is connected to several motors, a thermal overload protective circuit breaker or fuse should be installed in each circuit to protect each motor cable and each motor in the event of overheating. The drive's overload protection is set according to the total motor load. The protection may also be triggered when only one motor's circuit is overloaded.

**8.8.5 Operating time of fuses and circuit breakers:** Check whether the operating time of the fuse is less than 0.5 seconds. The operating time depends on the type, the impedance of the grid, and the cross-section, material and length of the cable. US fuses must be of the "no time delay" type.
Circuit Breakers: The protective characteristics of a circuit breaker depend on the supply voltage and the type and construction of the circuit breaker. There are also restrictions related to the short-circuit capacity of the grid. Your local our representative can help you select the circuit breaker type given the grid characteristics.

**8.8.6 Motor thermal protection:** According to regulations, the motor must be protected against thermal overload and the current must be cut off when an overload is detected. The driver has a motor thermal overload protection function that protects the motor and cuts off the current when necessary. Depending on the drive parameter value, this function monitors a calculated temperature value (based on the thermal model of the motor) or monitors the actual temperature indication provided by the motor temperature sensor. The user can fine-tune the thermal model by inputting additional motor and load data. PTC sensors can be connected directly to this drive. Please refer to the corresponding PARA LIST and instruction manual for parameter settings related to motor thermal protection.
Short-circuit protection of drives and power cables

**8.8.7 Protect the drive and input cables with fuses:**
Please follow the instructions in chapter Technical data when selecting fuses for the switchboard. The fuse will protect the input cable in the event of a short circuit. In the event of an internal short circuit within the drive, the fuse will limit damage to the drive and avoid damage to adjacent equipment.

**8.8.8 Ground fault protection of drives**

The drive has a built-in ground fault protection function that protects the drive when a ground fault occurs in the motor or motor cable. However, this feature is not intended for personal safety or fire protection. The sensitivity of the ground fault protection function can be reduced by adjusting the parameter value "Ground fault".

**8.8.9 Leakage protection device compatibility**

The drive unit can use a type B earth leakage protection device.

Note: The drive's EMC filter consists of a capacitor connected between the main circuit and the enclosure. These capacitors combined with long motor cables increase ground leakage currents and may trigger fault current circuit breakers.

**8.8.10 Deploy emergency shutdown capabilities**

For safety reasons, install emergency shutdown equipment at each operator control station or operating station that requires an emergency shutdown. Please design emergency shutdown according to relevant standards.

Note: Pressing the stop button on the drive control panel will not function as an emergency stop, nor will it remove the drive from potential danger.

**8.8.11 Use a safety switch between the drive and motor**

It is recommended to install a safety switch between the permanent magnet motor and the drive output. This is used when servicing the drive and isolating the motor from the drive.

**8.8.12 Use a contactor between the drive and motor**

Depending on the selected drive operating mode, control of the output contactor is deployed.

If selected

• In vector/direct torque control mode and motor ramp stop,

Open the contactor as follows:

1. Send a stop command to the driver and wait for the driver to decelerate the motor to zero. 2. Open the contactor.

If selected

• Vector/direct torque control mode and motor coast-to-stop; or scalar VF control mode,

Open the contactor as follows:

1. Send a shutdown command to the drive. 2. Open the contactor.

warn! When using vector/direct torque control mode, never open the output contactor while the drive is controlling the motor. Vector/direct torque control operates very fast, much faster than the contactor can open. If the contactor is activated while the drive is controlling the motor, vector control will immediately increase the drive output voltage to its maximum value in an attempt to maintain load current. This will damage or even completely burn out the contactor.

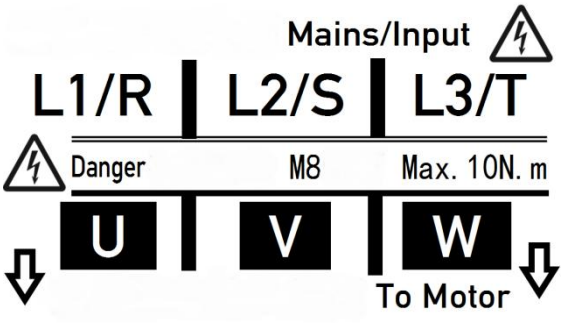
Deploy bypass connections

If bypass is often required, install a mechanical or electrical interlock contactor between the motor and the driver, or between the motor and the power line. Use interlocking devices to ensure they do not close at the same time.

Note: Bypass connections are not available for permanent magnet motors.

Warning & Reminder**!**

*Do not intentionally or unintentionally connect the output end of the driver to the power grid, otherwise the driver will be damaged. For E2 models, European-style left-in and right-out type, and those with input and output relay terminals or connections, please pay attention to the markings and distinctions to confirm that they are correct. Then power on again.




*For some models with anti-reverse wiring function, if the input and output wires of the driver are connected reversely, a fault message such as power supply abnormality will appear.

# 9.Power cable selection

General principles: The specifications of the grid side and motor cables must comply with the requirements of local regulations:
• The cable must be able to carry the drive load current. See chapter Technical data for rated current. At the same time, general recommended power cable size specifications are given.
• Cables must be rated for a maximum allowable continuous use temperature of not less than 70 °C (US: 75 °C [167 °F]).
• The impedance of the PE conductor/cable (ground wire) must be such that it can withstand the contact voltage that may occur in the event of a fault (to ensure that the voltage at the fault point does not rise sharply in the event of a ground fault).
• 600 VAC cable is suitable for systems up to 500 VAC.
• See chapter Technical data for EMC requirements.

To meet the CE and C-tick marking EMC requirements, symmetrically screened motor cables must be used (see figure below). For the input cable, a four-core cable can be used, but shielded symmetrical cable is recommended. When the protective conductor is made of the same metal as the phase conductor, to function as a protective conductor, the shielding conductivity must meet the following requirements:

| Cross-sectional area of a phase line (S) | Minimum cross-sectional area of protective conductors (Sp) |
|---|---|
| $S \leq 16\ mm^2$ | S |
| $16\ mm^2 < S \leq 35\ mm^2$ | $16\ mm^2$ |
| $35\ mm^2 < S$ | S/2 |

Compared to a four-wire system, the use of symmetrically shielded cables reduces electromagnetic radiation and motor bearing currents emitted by the entire system. The motor cable and its PE shielded conductors (stranded shield) should be kept as short as possible to reduce electromagnetic radiation and stray and capacitive currents outside the cable.

## 9.1 Available power cable types

The types of power cables available for the drive are described below.

**①.Symmetrically shielded cable**

three phase conductors and one concentric or symmetrical PE conductor, and shield

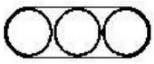
Note: If the electrical conductivity of the motor cable shield does not meet the requirements, a separate PE conductor must be used. See the General Principles section above.

**②.Permitted power cables**

Four-conductor system: three phase conductors and one protective conductor.

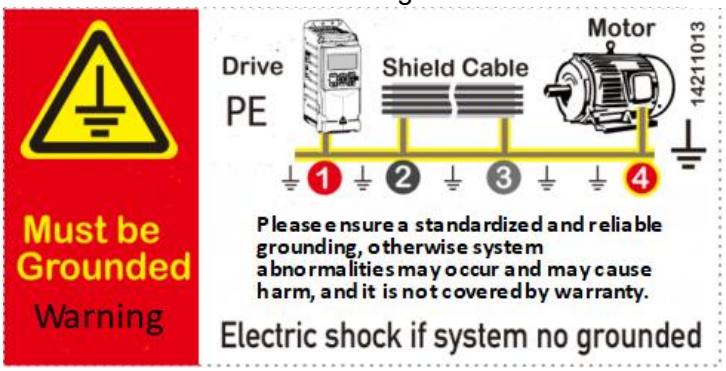
◆ Industry experience and recommendations

Based on industry and practical experience, the following table gives relevant characteristics for selection reference.

| No | Schematic diagram of cable structure | Structural features | Shield | EMC Performance evaluation |
|---|---|---|---|---|
| 1 |  | Symmetrical, 3+3 cores | With fine copper wire braided shield | Best performance |
| 2 |  | The Chinese standard model is: BPYJVP1-2 cross-linked polyethylene frequency conversion cable | With fine copper wire braided shield | Good |
| 3 |  | Symmetrical, 3-core | With fine copper wire braided shield | Good |
| 4 |  | Asymmetrical, 4 cores | None | Fairly good |
| 5 |  | Symmetrical, 3+3 cores | None | Medium |
| 6 |  | Asymmetrical, 4 cores | With copper braided shield | Medium |
| 7 |  | Asymmetrical, 3-core, parallel core or flat cable | None | Poor |

### ③.Motor cable shielding, speed feedback encoder cable

In order to protect the conductor, when the shielding wire and the phase conductor are made of the same material, the cross-sectional area of the shielding wire must be the same as that of the phase conductor. In order to effectively suppress the emission and conduction of radio frequency interference, the conductive performance of the shielded wire must be at least 1/10 of the conductivity of the phase conductor. For copper or aluminum shields, this requirement is very easy to meet. The minimum requirements for drive motor cables are shown below. Composed of coaxial copper braid. The tighter the shield, the smaller the electromagnetic interference emitted and the current flowing.




## 9.2 Introduction to the basic typical principles of interference, anti-interference shielding, and grounding in electromechanical systems

The following figure shows a typical frequency conversion speed regulation electromechanical system topology. From left to right are the power supply, driver (inverter), shielded power (or signal cable), and motor. This figure mainly illustrates the distributed capacitance during long lines. The formation of noise, the flow and processing of noise, etc. The core points to understand and understand this section are:

◆ 1. Find out where the interference source comes from? This usually comes from the motor windings themselves, and the motor cables.

◆ 2. Find out which objects are susceptible to interference? This is usually a weak current control analog signal less than 36V, such as AI, AO, encoder feedback signal, etc.

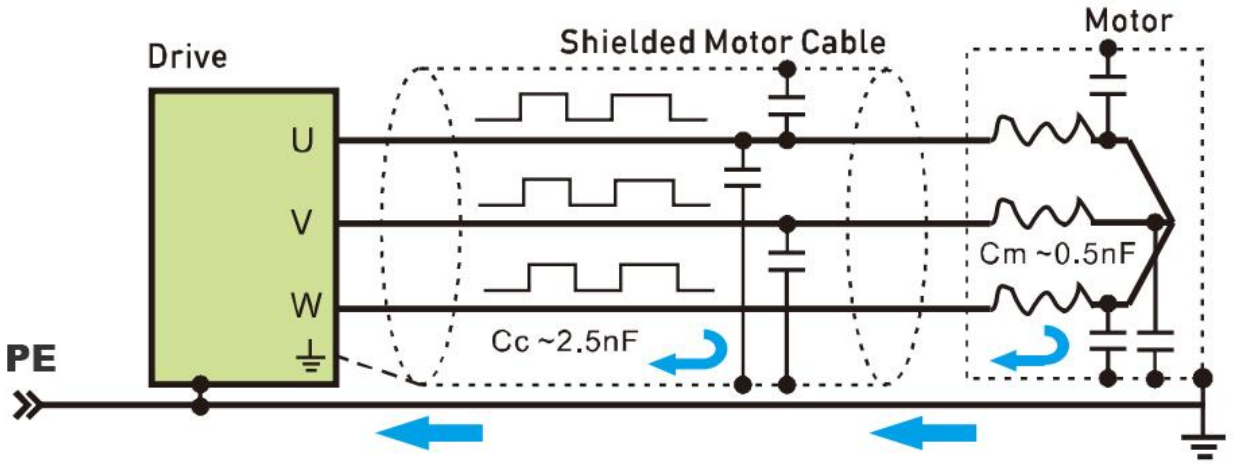
◆ 3. How to deal with interference and interference in a standardized and efficient manner? Understand the relevant knowledge in principle, and regulate electrical wiring according to general electrical specifications and manual instructions. The specific points are:

◆ a. Use shielded cables for motor wires and connect the motor casing to the ground wire from the power grid transformer.

◆ b. Use shielded wires for weak signal wires and cables that may be interfered with, and try to separate the motor wires and power wires at a certain distance, and connect the shielding layers of these weak wires to the ground wires from the power grid transformer. . In this way, while the shielding layer obtains the shielding effect, it also has a path for discharging interference charges.

◆ c. Connect the motor casing, encoder casing (or signal line shielding layer), driver casing, etc. to the same ground wire for common potential processing. This is a processing method in special environments with poor grounding conditions. At this time, you should ensure that the connection of the connected ground wire is absolutely firm and reliable, and keep the ground pile at low ground impedance and well

grounded. Otherwise, the induced electricity from the motor will risk injuring people and equipment.




◆ **Note:** Do not connect both ends of the shielding layer of the cable connecting the motor temperature sensor to the driver directly to the ground wire. If one end cannot add a 3.3nF capacitor between the shielding layer and the ground, only one end should be connected to the ground.

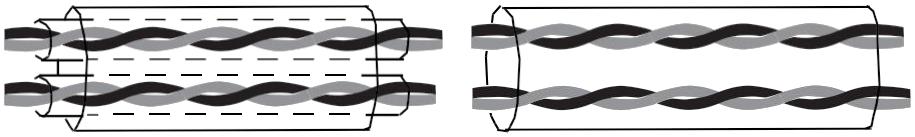
### Protect relay output contacts and suppress interference caused by inductive loads

When inductive loads (relays, contactors, motors) are disconnected, voltage mutations will occur. The relay outputs on the driver are protected by varistors (250 V) against the effects of overvoltage peaks. In addition, in order to minimize the electromagnetic radiation generated by inductive loads during power outage, it is recommended to use an electromagnetic noise attenuation circuit [varistor, RC filter (AC) or diode (DC)]. If this electromagnetic interference is not suppressed, it may be transmitted through control cable compatibility or inductively to other conductors, causing functional failure of other components in the system. Install protective components as close to the inductive load as possible, rather than close to the relay output.
Consider PELV requirements at sites above 2000 m (6562 ft)
At installation locations above 4000 m (13123 ft), the drive's relay outputs do not meet Protective Extra Low Voltage (PELV) requirements if voltages greater than 48 V are used. At installation locations between 2000 m (6562 ft) and 4000 m (13123 ft), PELV requirements are not met if one or two relay outputs use a voltage greater than 48 V and the remaining relay outputs use a voltage less than 48 V.

## 〉9.3 Control system cable selection

### 9.3.1 It is recommended that all control cables be shielded.

For analog signals, it is recommended to use double-shielded twisted pair cable. For pulse encoder wiring, follow the instructions provided by the encoder manufacturer. Each signal uses a separate shielded twisted pair. Do not share return lines for different analog signals. For low-voltage digital signals, it is best to use double-shielded cables (picture below, left), but single-layer shielded multi-pair cables can also be used (picture below, right)



Analog and digital signals are routed separately using different cables.For relay-controlled signals, the relay cable and the digital input signal cable can be routed in the same cable if their voltage does not exceed 48 V. It is recommended to use twisted pair wires for relay control signals. It is not allowed to route 24 VDC and 115 / 230/380 VAC signals in the same cable.

### 9.3.2 Speed feedback encoder cable, relay cable

It is necessary to use cables with a braided metal shield (such as LFLEX from Lapp Kabel, Germany) that have been tested and approved by the industry.

### 9.3.3 control keyboard cable

The control keyboard port uses an RJ45 interface, and the extension cable is an ordinary standard straight-through network cable (the plug connector complies with the EIA/TIA568B standard). The length of the cable connecting the control keyboard and the driver should not be longer than 3m. If Category 5e or above wires are used and there is a good electromagnetic environment, the extension cable can be up to 15m.

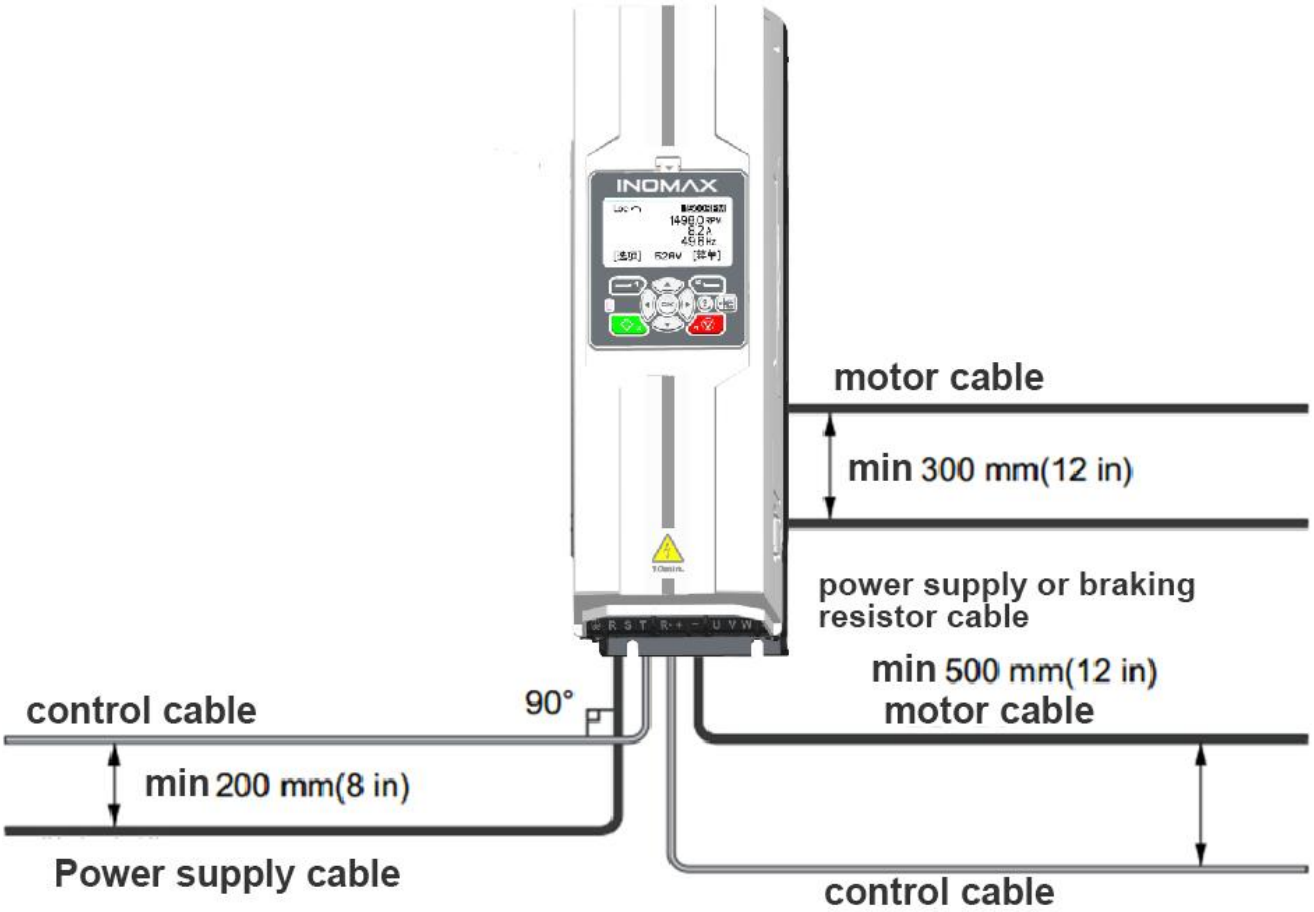
### 9.3.4 Communication shielded cable

It is necessary to use cables with a braided metal shield (such as LFLEX from Lapp Kabel, Germany) that have been tested and approved by the industry.

◆ **Note:** Do not connect both ends of the shielding layer of the cable connecting the motor temperature sensor to the driver directly to the ground wire. If one end cannot add a 3.3nF capacitor between the shielding layer and the ground, only one end should be connected to the ground.

### 9.3.5 Cable routing

The motor cable must be routed away from other cables. The motor cables of several drives can be routed side by side. It is recommended to route the motor cables, input power cables and control cables in different wire troughs. To avoid electromagnetic interference due to rapid changes in the drive output voltage, long side-by-side routing of motor cables and other cables should be avoided.
When control cables must pass through power cables, ensure that the angle between the two cables is maintained at 90 degrees as much as possible. Do not route other cables through the drive.




### 9.3.6 Control cable trunking

The power distribution installation panel or board and cable trough must be well connected and well grounded. Aluminum trunking can be used to improve equipotentiality.

If the weak current 24 V and the strong current 220/380 V are not well grounded and shielded and insulated or the strong current 220/380 V is not insulated and shielded by a metal sleeve, it is not allowed to connect the weak current 24 V cable and the strong current 220/380 V Cables are laid side by side in a conduit.

Please arrange weak current 24 V and strong current 220/380 V control or power cables in different wire troughs in the cabinet or run them closely together over long distances, especially motor, power, brake and other cables with strong current changes. , otherwise the drive and control system will be difficult to obtain reliable operating status or control accuracy due to strong and weak current coupling interference, or system-level insulation failure will cause electric shock hazards to weak current circuits. In terms of control performance, especially when using various types of resistors When performing closed-loop control on an encoder with weak dry winding capability, special attention should be paid to this instruction.

# 10.Electrical installation and Wiring

Contents of this chapter

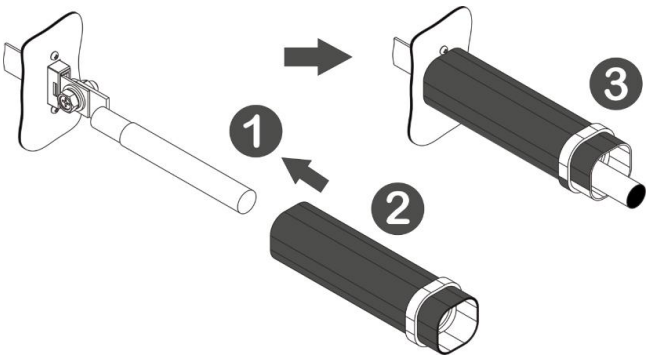
This chapter describes the electrical installation procedure for the drive.

WARNING! Only qualified electrical engineers should perform the work described in this chapter. Please follow the safety instructions on the first page of this manual. Ignoring these safety instructions may result in personal injury, death, or equipment damage.

During the installation process, make sure that the power supply (input power) of the drive is disconnected. If the drive is powered, wait at least 10 minutes after removing power.

## 〉10.1 The drive casings of this series are structurally designed with high protection capabilities:

1. Pry off or open the power terminal cover or cover, and tighten the wires with appropriate wire lug to each connecting power screw with screws. The corresponding PE earth wire needs to be connected to the driver chassis and each terminal of the control unit. On the grounding post on the lower part of the I/O board (to obtain good EMC characteristics).




2. Check and confirm that each wire connection point is firmly and reliably connected, and the insulation distance meets the requirements and specifications. Cover the terminal cover or cover.
3. Reverse the steps above to reinstall the cover.
4. For some models (E7) with the following copper bar lead-out terminals, it is recommended to install the insulation reinforcement accessories as shown below (Cable Accessories for connector insulation Reinforced) for the incoming and outgoing wire terminals. For the inlet type with rubber ring hole type It may be necessary to cut the rubber ring appropriately when threading. The specific operation diagram is as follows:

installation steps:

4.1. Put the casing into the cable or thread the cable through the cut
Cut appropriate holes in the rubber ring.
4.2. Connect the cable to the terminal, arrange and lock the cable
4.3. Put the sleeve back to the bottom of the terminal.
Tie the end of the insulating sleeve to the cable with an insulating tie
4.4. Organize cables and handle and connect them according to specifications.
Power and ground cable connectors.

## 10.2 Basic electrical safety precautions

WARNING! Ignoring the following safety instructions may result in personal injury or death or equipment damage.
Only qualified electrical engineers are allowed to install and maintain the drive.

1. Clear signs must be posted or hung in conspicuous places at the work construction site.
2. The circuit to be used must be completely disconnected and wait at least 10 minutes for the internal capacitance of the driver to be fully discharged after the power is turned off.
3. Lock the isolating switch and mark it with a conspicuous sign that it is prohibited to close or is in operation to ensure that the circuit will not be reconnected or misoperated.
4. If there are live parts nearby, special protection or guardrail isolation is required.
5. Measure again before operation to ensure that there is no voltage.
6. In special cases, grounding and short circuit are required to ensure safety.
7. After confirming that the environment is safe, request a work permit, and only qualified electrical engineers are allowed to operate.

Warn! Wear an electrostatic grounding strap when handling or touching circuit boards to ensure you do not accidentally damage components that are sensitive to electrostatic discharge (ESD). Do not touch circuit boards unless necessary.

## 10.3 Wiring procedure

Carry out wiring work according to the wiring diagram and the tightening torques given in the following table:
1. Open the wiring cover according to the dimensional construction example for each frame below.
2. In IT (ungrounded) systems and corner-grounded TN systems, remove the following screws to disconnect the internal varistor and EMC filter: • VAR (frame E3, located on the upper left side of the power terminals) • EMC (4-9 located on Inside the whole machine structure, its logo can be seen after removing the front cover)

**WARNING!** If the drive is installed into an IT system (ungrounded power supply system or power supply system with high impedance grounding (more than 30 ohms)) without disconnecting the varistor/filter, the system will pass through the drive's varistor/filter. Connect to the earth. This may cause drive damage.
If the drive is connected to a corner-grounded TN system without disconnecting the varistor/filter, the drive will be damaged.

3. Cut or slit the over-the-wire protection ring on the terminal. Some models need to clean up the protective net.
4. Strip the cable and remove the shield from the cable clamp.
5. Twist the ends of the cable shield into a braid. Strip the ends of the phase cables.
6. Connect the phase wires of the power cable to the R, S and T or L1, L2 terminals of the driver. Connect the motor cable phases to the U, V and W terminals. Connect the leads of the resistor cable (if present) to the + and PB terminals. The corresponding PE earth wire needs to be connected to the driver chassis and the grounding post at the bottom of each I/O board of the control unit (to obtain good EMC characteristics)
7. Arrange the exposed cable shields and connect them to the passing metal plate.
8. Secure the cable shield to the ground terminal. Note: Keep the length of the stripped shielding layer and the stripped phase conductor as short as possible.
9. Please cover the visible exposed shielding layer and braided wires with insulating tape.
10. Mechanically secure the cables outside the device.
11. Ground the other end of the power cable shield or PE conductor at the distribution board. If a mains choke or EMC filter is installed, ensure continuity of the PE conductor from the distribution board to the drive.

### Ground the motor cable shield at the motor end

To minimize RF interference, ground the cable shield 360 degrees at the through hole in the motor terminal box or ground the cable by twisting the shield so that the flattened shield is wider than 1/5 of its length.

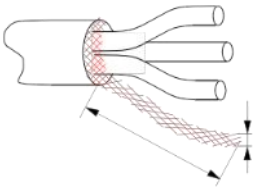


Table 5-1 Terminal form and tightening torque

| Frame | Terminal screw size | Tightening torque [Nm] | Terminal structure | Terminal symbol identification | Wiring capability |
|---|---|---|---|---|---|
| E/PCU | M3 | 0.8-1.2 | square hole crimp terminal | See wiring diagram shown | 30-14AWG |
| E2 | M5 | 1.5—1.8 | Barrier press terminal | PE、R、S、T、PB、+、-、U、V、W | 20-6AWG |
| E3 | M6 | 3.0—3.5 | Barrier press terminal | PE、R、S、T、PB、+、-、U、V、W | 22-6AWG |
| E4 | M8 | 4.0-5.0 | Fence screw terminals | PE、R、S、T、PB、+、-、U、V、W | 10-22mm² |
| E5/6 | M8 | 9.0-10.0 | Fence screw terminals | PE、R、S、T、PB、+、-、U、V、W | 25-75mm² |
| E7/R7 | M10 | 17.0-22.0* | Copper bar with holes | R、S、T、+、-、U、V、W、PE | 36-90mm² |
| E8/R8 | M12 | 35.0-55.0* | Copper bar with holes | R、S、T、+、-、U、V、W、PE | - |
| LC8 | M12 | 35.0-55.0* | Copper bar with holes | R、S、T、+、-、U、V、W、PE | - |

Remarks: 1. For European-style square hole crimp terminals on the main power, the bare wires can be stripped about 8-10 mm and then directly inserted and locked. For fence-type terminals, the lug terminals need to be crimped and then locked. 2. Some models do not have built-in brake chopper function and no PB terminal. 3. Refer to the previous page for the schematic diagram of terminal physical location distribution. 4. For models not listed in this table, please refer to the detailed mechanical dimensions, or consult the relevant personnel.

## 〉10.4 Check insulation

**①.Drive**

There is no need to perform any withstand voltage or insulation resistance tests on the driver and its components (such as high-voltage insulation testing or insulation resistance testing with a megger). Before leaving the factory, each driver has been tested for the insulation of the main circuit to the chassis. Moreover, the driver's internal voltage limiting circuit can automatically cut off the test voltage. Therefore, there is no need to perform any withstand voltage or insulation resistance tests on the driver and its components (such as high-voltage insulation tests or insulation resistance tests with a megger).

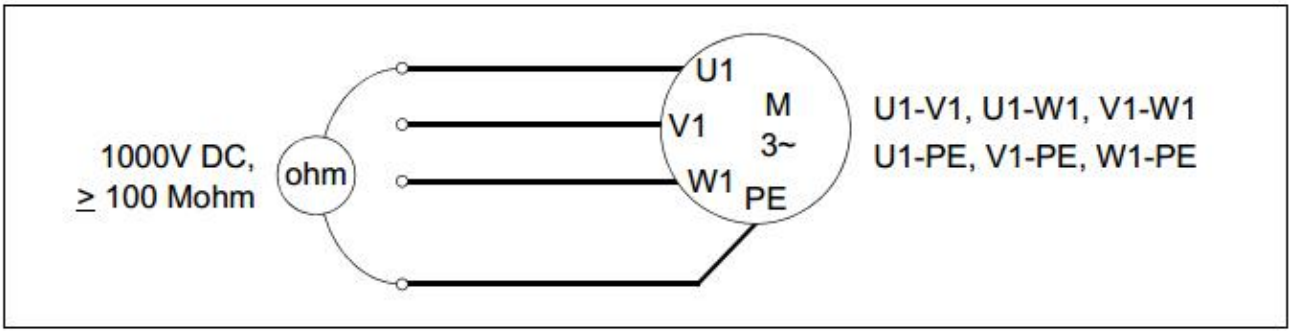
**②.Power cables and motors**

Before connecting the drive's input power cables, check the insulation of the power (input) cables in accordance with local regulations.

Motor and motor cables The steps for checking the insulation of motors and motor cables are as follows:

1. Make sure the motor cable has been connected to the motor, and then remove the motor cable from the output terminals U(U1), V(V1) and W(W1) of the driver.
2. Use a 1000 V DC megger to measure the insulation resistance between each phase conductor and the protective earth conductor. The insulation resistance of a typical motor must exceed 100 Mohm (given at 25 °C or 77 °F). For other motor-specific insulation resistances, please refer to the manufacturer's instructions.

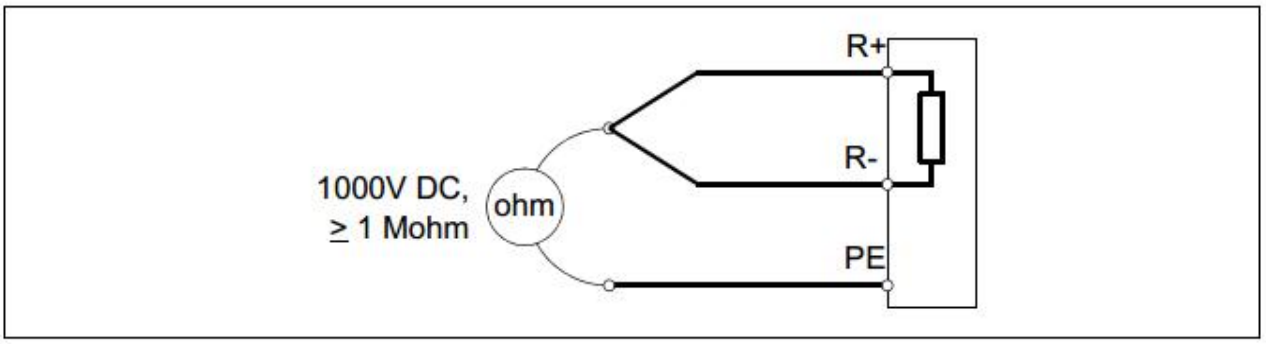
NOTE: If there is moisture inside the motor, the insulation resistance will decrease. If moisture is suspected, the motor should be dried and measured again.



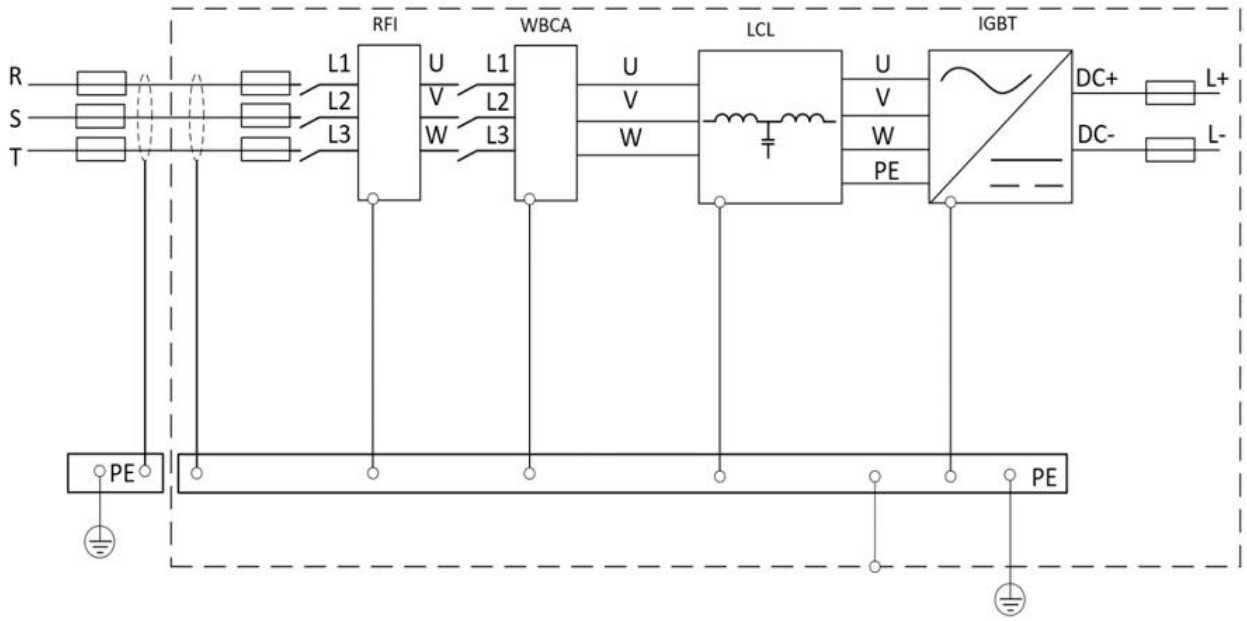

**③.Braking resistor device**

Check the insulation of the braking resistor assembly (if present) as follows:

1. Check that the resistor cable is connected to the resistor and disconnected from the drive output terminals DCP/+ and PB.
2. At the driver end, connect the + (R+) and PB (R-) wires of the resistor cable together. Measure the insulation between the connected conductor and the PE conductor using a measuring voltage of 1 kV DC. The insulation resistance value must be higher than 1 Mohm.



④.Input power cable




After confirming that the insulation condition of the power supply unit (input) has been checked according to local regulations, connect it to the drive.

Ensure that each module has a grounding connection, and ensure that the chassis is grounded. If the conduction of the incoming line shielding layer does not meet the requirements of the PE grounding conductor, another PE conductor must be used for grounding connection.

## 〉10.5 Multi-drives with Common DC bus

The UDC+ and UDC- terminals in DC-Link are suitable for common DC configurations across the entire range of drives, allowing regenerative energy to be generated in one drive and supplied to other drives in motoring mode.

Depending on the power requirements, one or more drives can be connected to the AC power source.

If only one or a few drives are connected to the power supply, it is necessary to evaluate whether the soft-start module and rectifier module have the ability to support the entire DC bus capacitor charging and output power rectification capabilities of all drives in the common DC bus network, otherwise they will be damaged. Standard design E2 models, M1 models and R model series with the same input voltage level can share the DC bus.

Evaluated from the perspectives of soft-start power carrying capacity, soft-start loop charging speed, etc., when machines of different shapes are used together with a common DC bus, the model with the highest power in the connected network must be connected to the grid. For more information, please consult a professional Please call our representative.

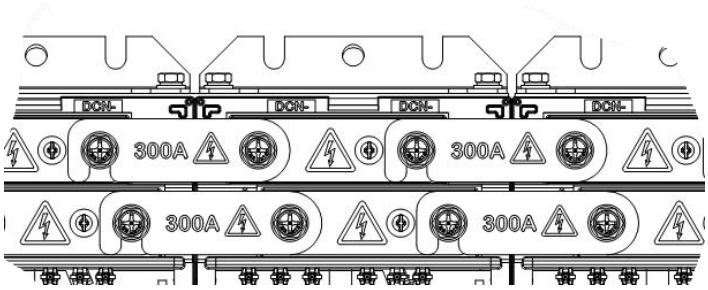
If two or more drives are connected to the AC mains, an input reactor must be installed on each AC connection to ensure balanced current distribution between the rectifier bridges.

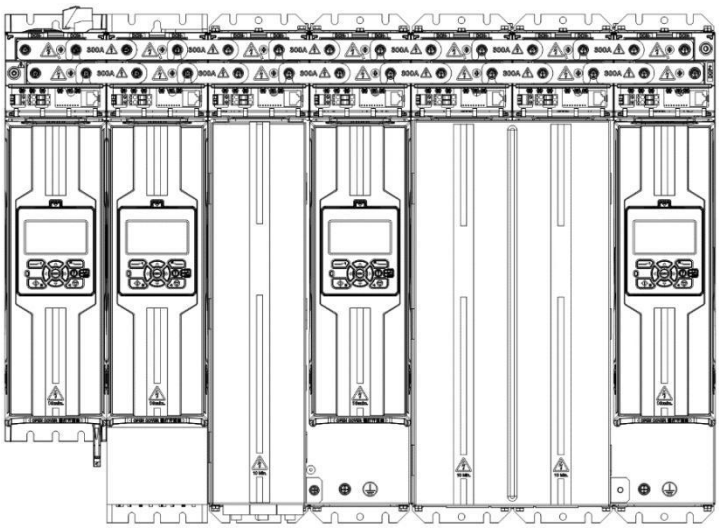
The figure below is a common electrical connection reference diagram for DC-Link parallel processing. For more information, please consult a professional or call our representative.

For the hardware form of the M/R series products designed with a common DC bus copper box, please refer to the M1 busbar component connection and 24V auxiliary power wiring diagram for detailed operations on the DC copper hook rotation and parallel connection.

For the overlapping current carrying capacity, please refer to the current carrying list. After the busbar overlapping is completed, be sure to close the busbar cover before powering on!

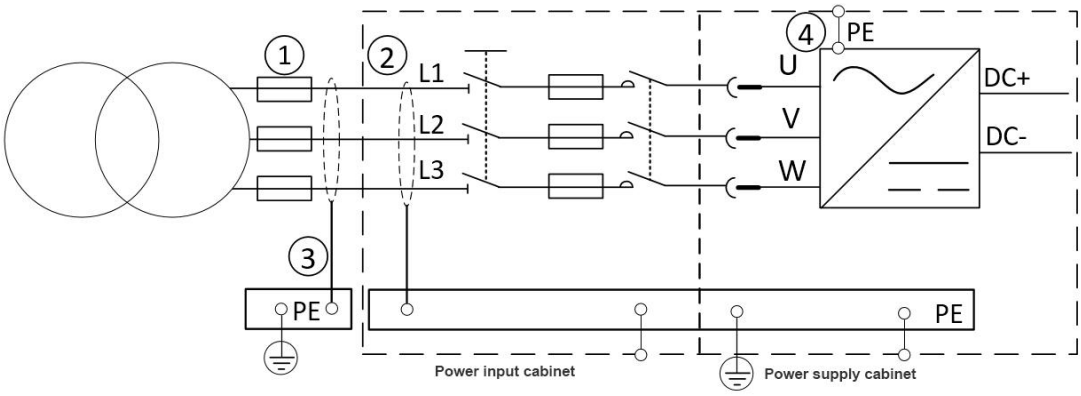
Partial enlargement



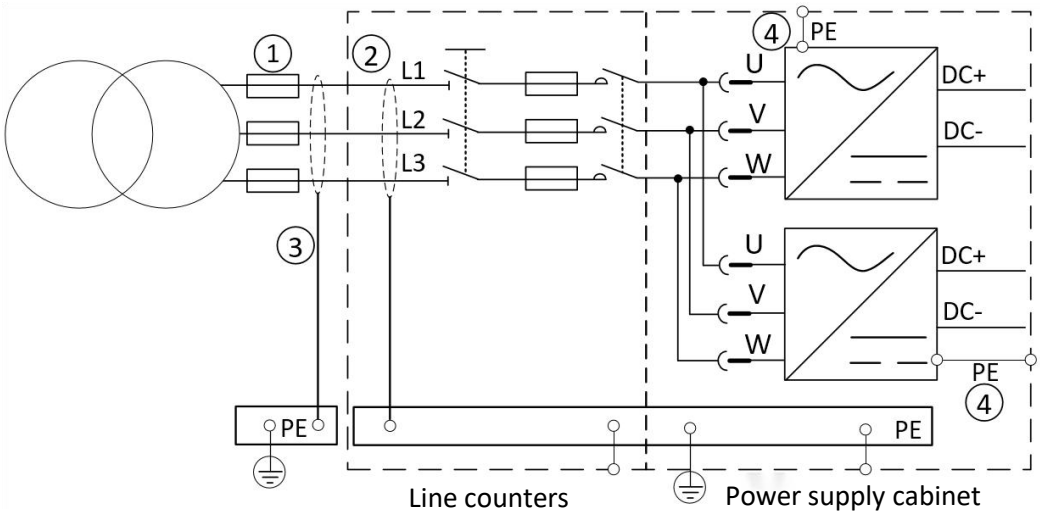



## 〉10.6 Electrical cable connection diagram of BLM thyristor rectifier module

Thyristor rectifier single drive cable connection diagram:



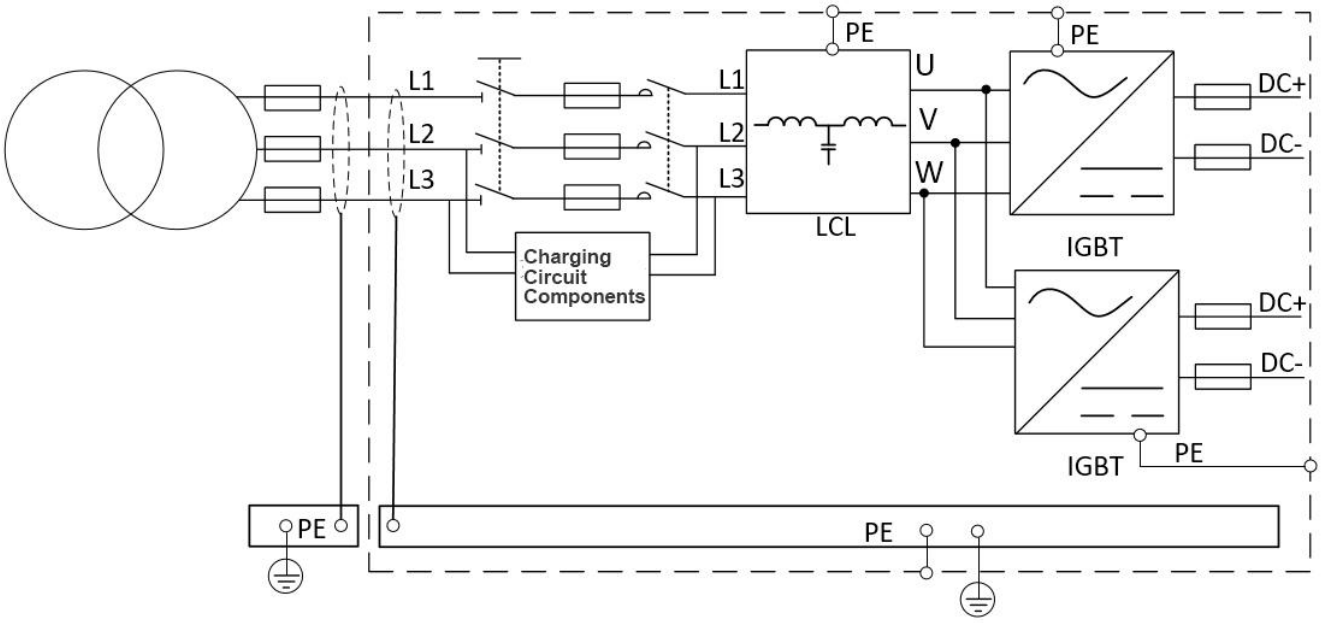

Thyristor rectifier parallel cable connection diagram:



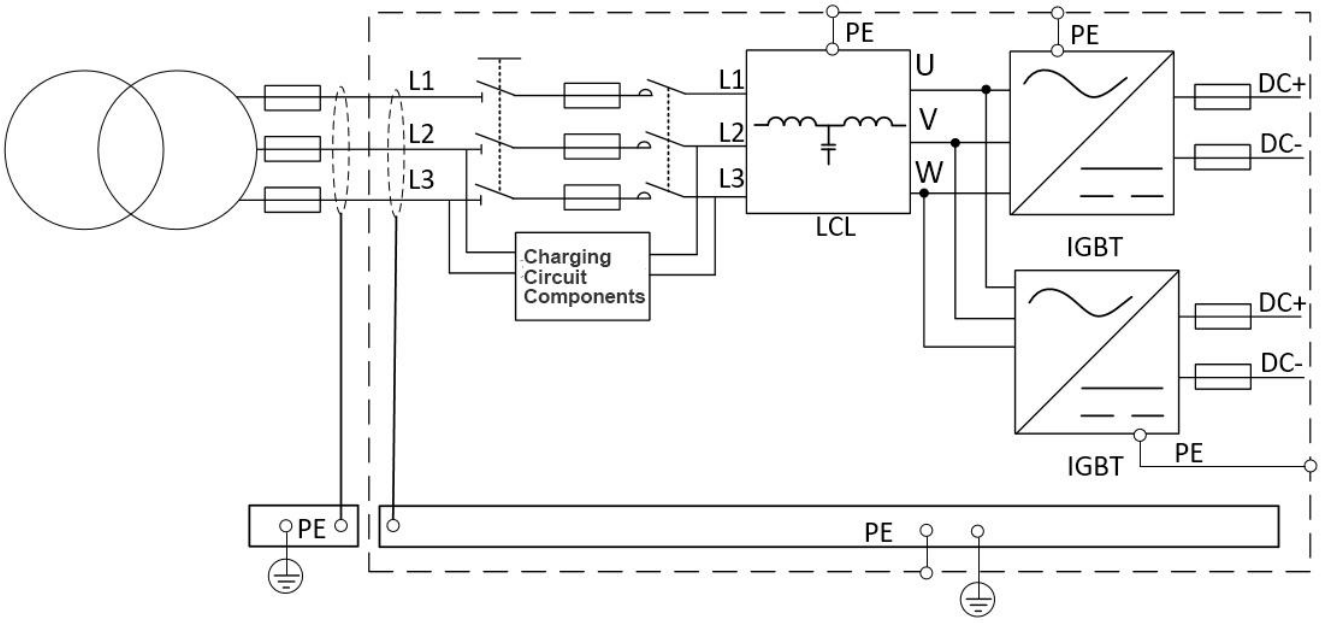

| No | Explanation |
|---|---|
| 1 | AC input fuse |
| 2 | Ground the cable shield 360 degrees |
| 3 | If the conductivity of the cable shield cannot meet the requirements of the PE conductor, a separate PE conductor must be used for connection. |
| 4 | The thyristor power supply module and the cabinet must be grounded through a separate PE wire to ensure a good connection. |

## 〉10.7 AFE active rectifier feedback module electrical installation connection diagram

Single IGBT feedback rectification connection diagram:



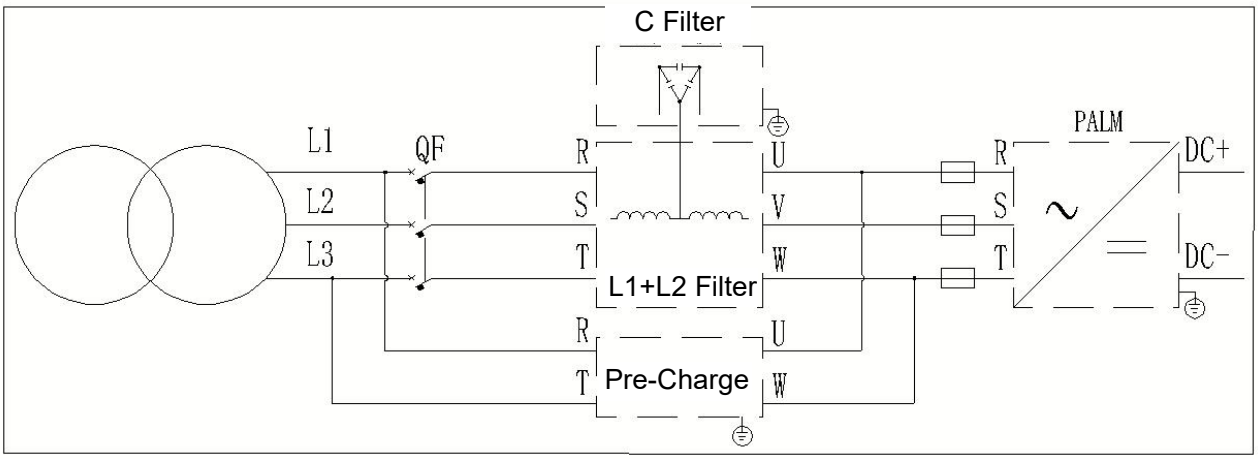

Two or more IGBT feedback rectification connection diagram:



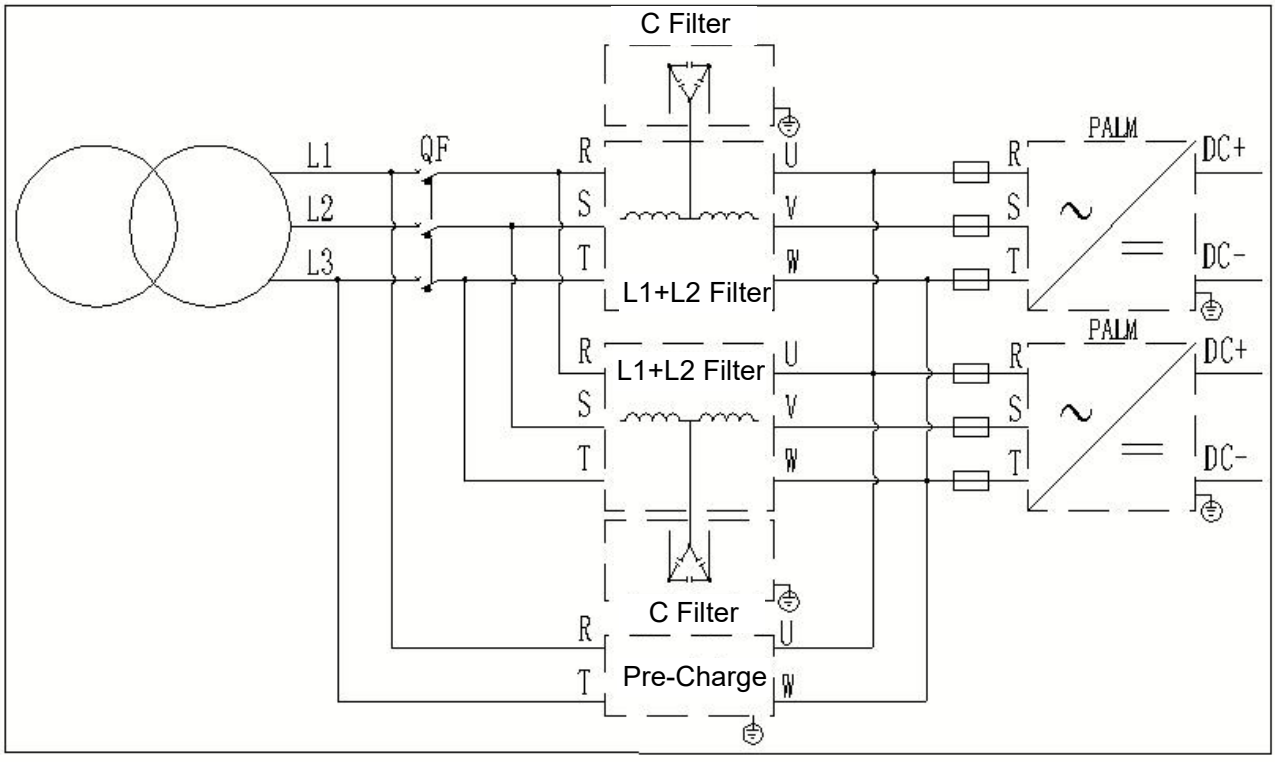

Ensure that each module has a grounding connection, and ensure that the chassis is grounded. If the conduction of the incoming line shielding layer does not meet the requirements of the PE grounding conductor, another PE conductor must be used for grounding connection to suppress common mode noise and enhance electromagnetic interference. Compatible with EMC performance.

## 〉10.8 Electrical installation connection diagram of LC8 active rectifier feedback interface module

Simple connection diagram of singe LC8 active rectifier feedback interface modules



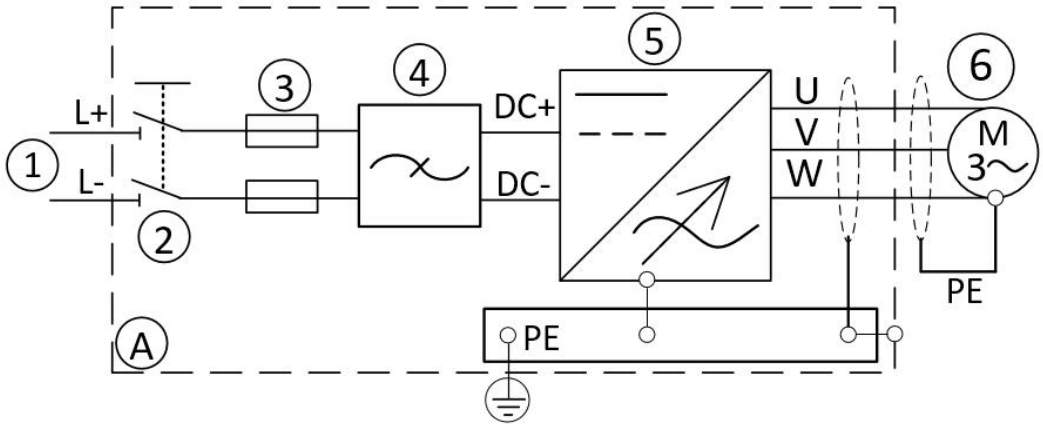

Simple connection diagram of two LC8 active rectifier feedback interface modules



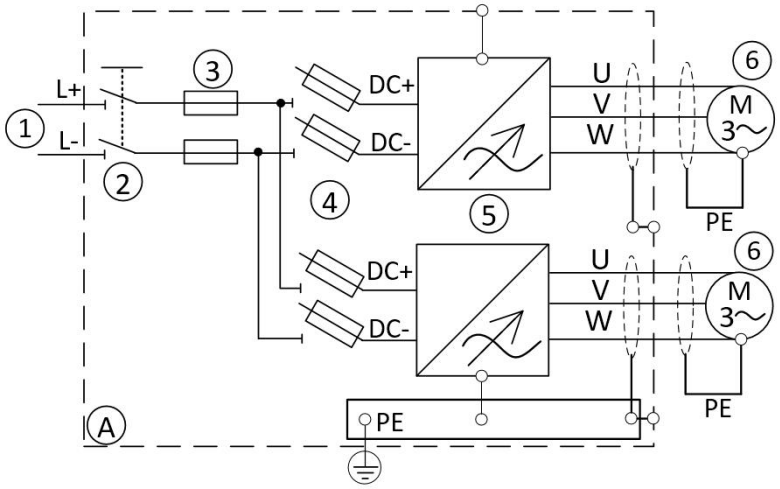

Ensure that each module has a grounding connection, and ensure that the chassis is grounded. If the conduction of the incoming line shielding layer does not meet the requirements of the PE grounding conductor, another PE conductor must be used for grounding connection to suppress common mode noise and enhance electromagnetic interference. Compatible with EMC performance.

## 〉10.9 SMM inverter module connection diagram

Simple connection diagram of single inverter modules:




Simple connection diagram of multiple inverter modules:



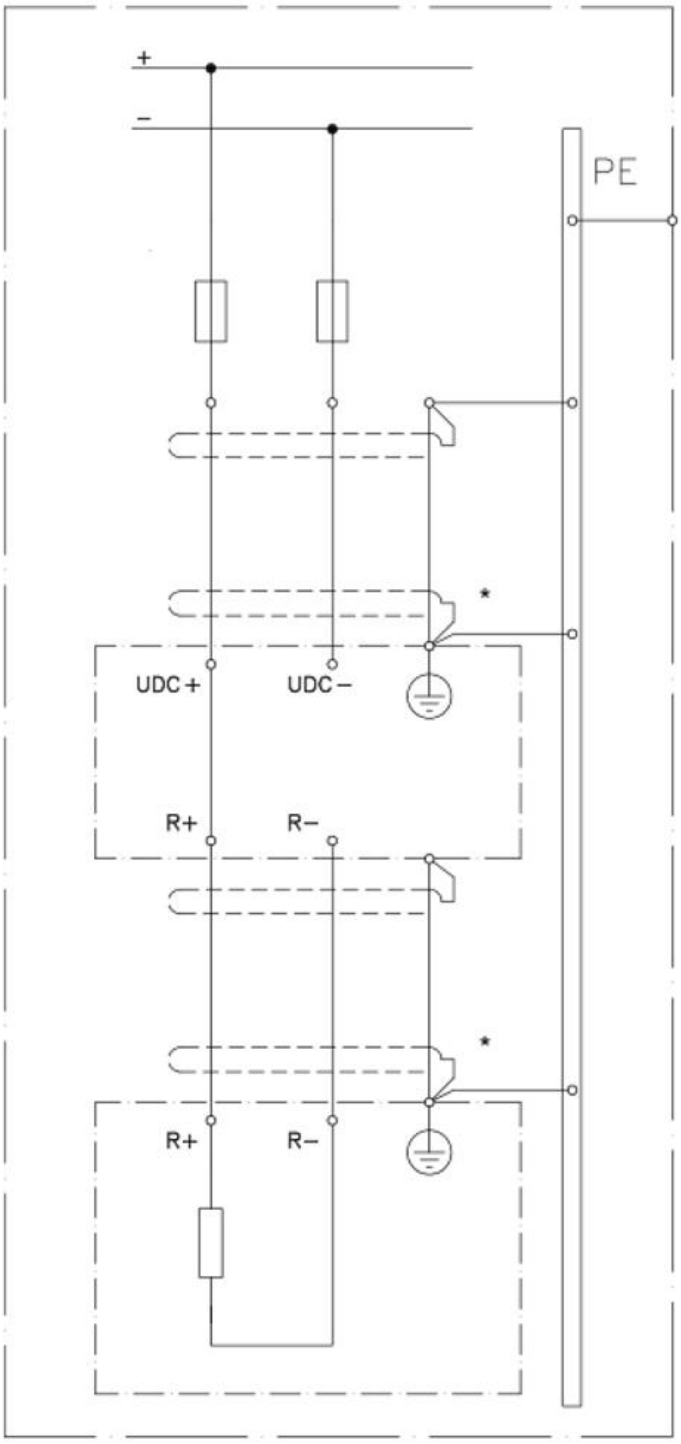

| No | Explanation |
|---|---|
| A | Cabinet |
| 1 | DC power supply |
| 2 | Isolating switch |
| 3 | DC fuse |
| 4 | Common mode filter/single machine, fuse isolating switch/parallel machine |
| 5 | Inverter module |
| 6 | Motor |

## 〉10.10 BRK brake chopper installation connection diagram

When multiple brake choppers are used at the same time, the first chopper is set as the master station, and the choppers after the first one are set as slave stations, and appropriate specific parameter configurations are performed.

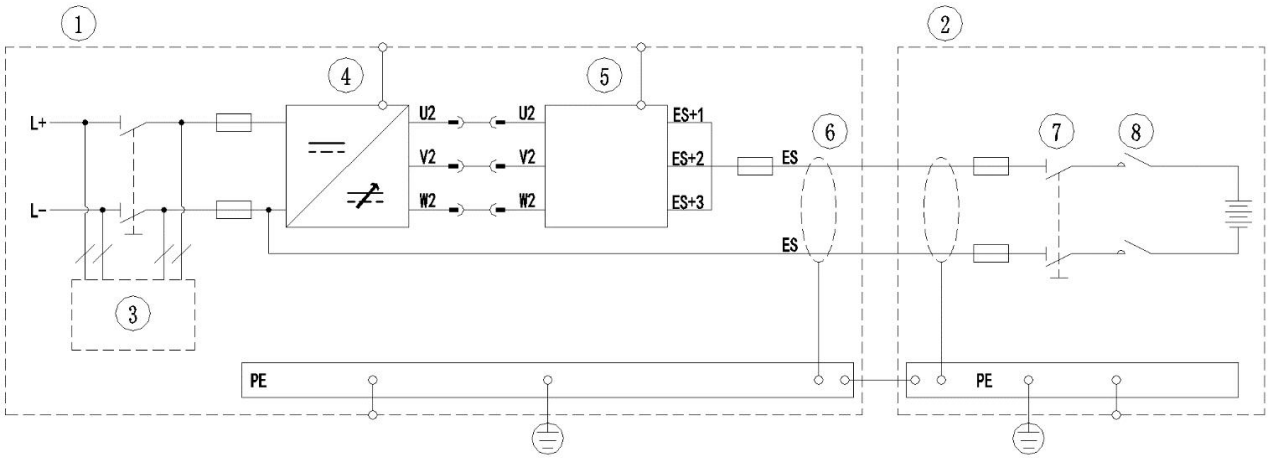
The figure below shows the connection and grounding method when the DC circuit and braking resistor are installed in the same cabinet. If they are not in the same cabinet, they need to be grounded separately.

**Notice!** It is strictly prohibited to connect the output terminals of the brake chopper based on the principle in the above figure together, otherwise it will cause the chopper to malfunction or be damaged!



## 〉10.11 DC/DC conversion installation wiring diagram

The connection diagram of the DC-DC converter module in the main circuit diagram:




| No | Explanation |
|---|---|
| **1** | DC cabinet |
| **2** | Energy storage cabinet |
| **3** | Charging circuit components |
| **4** | DC DC-DC conversion module (DCDC) |
| **5** | Output DC filter (DCLC) |
| **6** | The cable shielding layer needs to be grounded 360 degrees. If the conductivity of the cable shielding layer cannot meet the requirements of the PE wire, a separate PE wire must be used for connection. |
| **7** | Isolating switch |
| **8** | Energy storage protection circuit breaker |

**Notice!** Connecting the DC/DC converter unit with parallel power supply modules: Each module must have a separate output cable. Cable specifications also need to be the same (cable type, cross-sectional area and length)

## 10.12 Liquid-cooled transmission module operating and installation conditions

This series of liquid-cooled drives does not use air for cooling, but liquid for cooling. The liquid circuit of the frequency converter is usually connected to a heat exchanger (liquid-liquid/liquid-air), which cools the liquid circulating in the cooling element of the frequency converter. Since the cooling elements are made of aluminum, the permitted coolants are potable water, demineralized water or a mixture of water and glycol.

There are two types of circulatory systems: open systems and closed systems. Open systems have no pressure and allow free contact with air. In a closed system, the pipes are completely airtight and pressure exists within the pipes. The tube must be made of metal or a specific plastic or rubber material that contains an oxygen barrier. Preventing the diffusion of oxygen in the coolant eliminates the risk of galvanic corrosion of metal components and the creation of dust buildup. Always use a closed system with this series of liquid-cooled drives.

If there is no alternative to an open system, several precautions must be taken.
1. Use glycol and preservative in coolant.
2. Check water quality regularly and add preservatives accordingly.
3. Check once a year that the coolant characteristics meet the specifications stated in this manual.
In closed circulation systems, the following figures are recommended reference values. To avoid galvanic corrosion, a corrosion inhibitor (such as Cortec VpCI-649) must be added to the coolant.

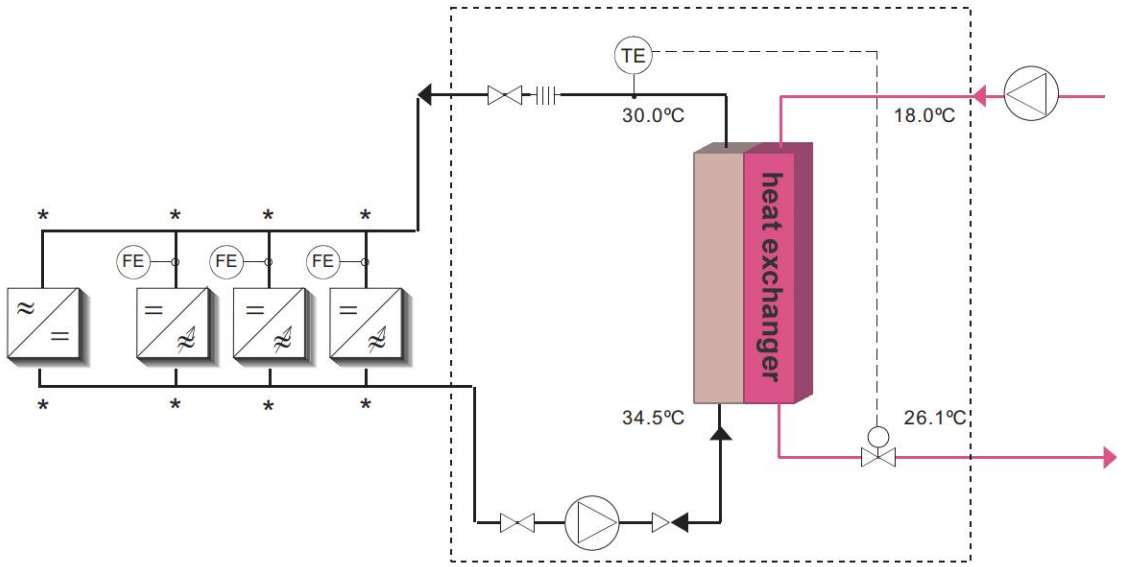
Add anti-corrosion agent to the coolant every 2 years and change the coolant in the 6th year.
Each addition of 0.05% VpCI-649 to the coolant increases conductivity by 75-100 µS. The maximum value depends on the dose rate added. Some manufacturers offer heat exchangers made of stainless steel. The good corrosion resistance properties of stainless steel in district water systems are exploited without the disadvantages of dissimilar filler metals. However, some precautions must be taken to mitigate the risk of corrosion of stainless steel in high chloride waters, see Table 18. We recommend using a high quality heat exchanger where possible.

Notice! If a heat exchanger is not used, measures must be taken to avoid galvanic corrosion. In particular, brass or copper components must not be used in the fluid circuit of the frequency converter.

To facilitate cleaning and draining during coolant circulation, it is recommended to install a bypass valve in the main line and install a valve at the inlet of each AC drive. When cleaning and purging the system, open the bypass valve and close the valve to the AC drive. During system debugging, the bypass valve must be closed and the valve leading to the AC drive must be opened.
Below you can see a simple example of a cooling system and an example of the connection between the AC drive and the cooling system.

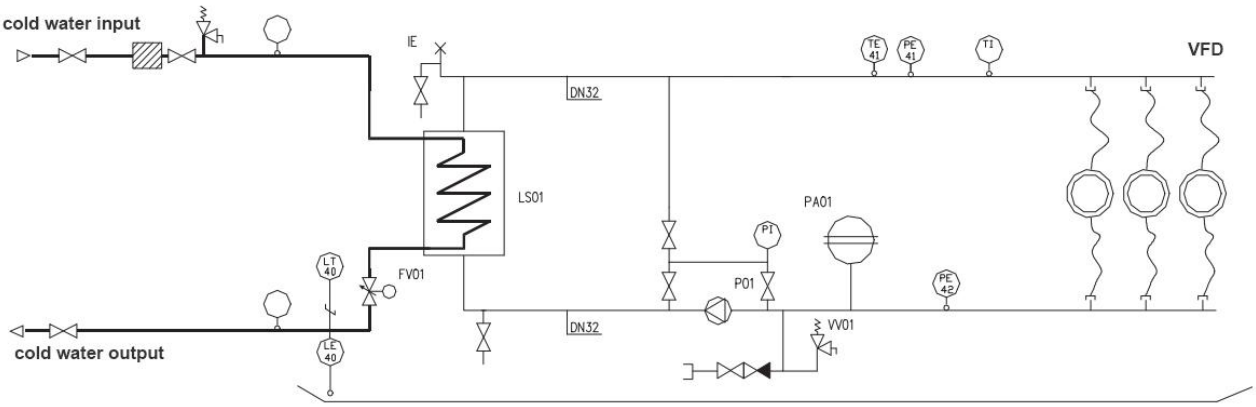
The schematic diagram of a typical cooling system is as follows:

PI diagram and connection recommendations for cooling systems



**We recommend to equip the cooling system with pressure and flow monitoring (FE). Flow monitoring can be connected with digital input function external fault. If the cooling water flow rate is detected to be too low, the frequency converter will stop running.**

**Flow monitoring devices and other actuators such as constant flow valves are available as options. These options must be installed at the junction of the element main and branch lines, marked with an asterisk * in the diagram above.**




Specifications related to coolant and its circulation are listed in the table below.

Information about coolant and its circulation:

| Module size specifications | Minimum liquid flow [dm3/min] / L | Rated liquid flow【 L 】 | | | Maximum liquid flow [l] | liquid capacity / [ L ] |
|---|---|---|---|---|---|---|
| | A | A | B | C | A | A |
| L2X | 8 (8) | 10 (10) | 11 (11) | 12 (12) | 20 (20) | 0.3 |
| L3X | 10 (10) | 15 (15) | 16 (16) | 17 (17) | 40 (40) | 0.4 |
| L4X | 15 (15) | 25 (25) | 27 (27) | 29 (29) | 40 (40) | 0.5 |
| L5X | 15 (15) | 25 (25) | 27 (27) | 29 (29) | 40 (40) | 0.8 |
| L6X | 15 (15) | 25 (25) | 27 (27) | 29 (29) | 40 (40) | 1.2 |
| L7X | 15 (30) | 25 (50) | 27 (54) | 29 (58) | 40 (80) | 1.38 |
| L80-4 | 15 (45) | 25 (75) | 27 (80) | 29 (86) | 40 (120) | 2.58 |
| L85-A | 20 (20) | 35 (35) | 37 (37) | 40 (40) | 40 (40) | 2.58 |
| L9X | 20 (60) | 35 (105) | 37 (112) | 40 (121) | 40 (120) | 2.58 |

A = 100% water; B = water/glycol mixture 80:20; C = water/glycol mixture (60:40)
Minimum liquid flow rate = minimum flow rate to ensure complete emptying of the cooling element
Definition:

Enter liquid reference temperature: 30 ºC
Maximum temperature rise during cycle: 5 ºC
Rated liquid flow = flow rate that allows the frequency converter to operate at Ith
Maximum liquid flow rate = If the flow rate exceeds the maximum liquid flow rate, there is an increased risk of corrosion of the cooling elements
Notice! Unless minimum liquid flow rates are ensured, bubbles may form in the cooling element. It must also be ensured that the cooling system is capable of automatic or manual venting. The following table helps you determine the appropriate coolant flow rate (l/min) for a given power loss.
Coolant flow rate (l/min) corresponding to power loss at a specific glycol/water mixing ratio

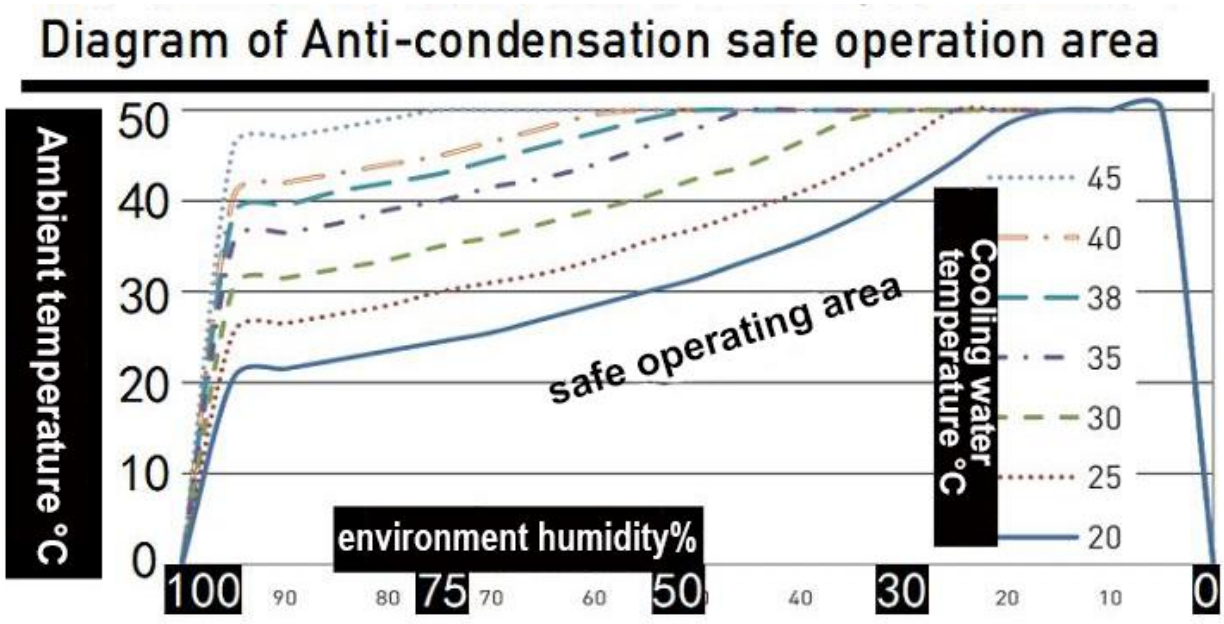
The power loss value can be determined based on 2% of the driver's power. For applications where the carrier wave is higher than the rated value, the corresponding loss value will increase significantly.

| Power loss[kW] | Ethylene glycol/water ratio | | | | | |
|---|---|---|---|---|---|---|
| | 100/0 0/100 | 80/20 | 60/40 | 40/60 | 20/80 | |
| 1 | 4.41 | 3.94 | 3.58 | 3.29 | 3.06 | 2.87 |
| 2 | 8.82 | 7.88 | 7.15 | 6.58 | 6.12 | 5.74 |
| 3 | 13.23 | 11.82 | 10.73 | 9.87 | 9.18 | 8.61 |
| 4 | 17.64 | 15.75 | 14.31 | 13.16 | 12.24 | 11.48 |
| 5 | 22.05 | 19.69 | 17.88 | 16.45 | 15.30 | 14.35 |
| 6 | 26.46 | 23.63 | 21.46 | 19.74 | 18.36 | 17.22 |
| 7 | 30.86 | 27.57 | 25.03 | 23.03 | 21.42 | 20.10 |
| 8 | 35.27 | 31.51 | 28.61 | 26.32 | 24.48 | 22.97 |
| 9 | 39.68 | 35.45 | 32.19 | 29.61 | 27.54 | 25.84 |
| 10 | 44.09 | 39.38 | 35.76 | 32.90 | 30.60 | 28.71 |

About condensation

Condensation on the cooling plates of this series of liquid-cooled drives must be avoided. Therefore, the coolant temperature must be kept higher than the temperature of the electronic control room. Use the diagram below to determine if the operating conditions of the frequency converter (combined with control room temperature, humidity and coolant temperature) are safe, or to select an allowable temperature for the coolant.

Conditions are safe when the operating points lie below the respective curves. Otherwise, appropriate precautions should be taken, such as lowering the room temperature and/or relative humidity, or increasing the coolant temperature. Please note that increasing the coolant temperature above the number shown in the load capacity diagram will reduce the rated output current of the frequency converter. The curve below is valid at sea level (1013 mbar).




Examples of safe operating conditions related to condensation:

The frequency converter operating conditions are safe if the temperature in the electrical control room is 30 °C, the relative humidity is 40% and the coolant temperature is 20 °C (lowest curve in the figure above).

However, if the electrical control room temperature rises to 35 °C and the relative humidity rises to 60%, the operating conditions of the frequency converter are no longer safe. In this case, to achieve safe operating conditions, the air temperature should be cooled to 28 °C or lower. If the room temperature cannot be lowered, the coolant temperature should be increased to at least 25 °C.

Cooling system connection

An external cooling system must be connected to each cooling element of the inverter or AC drive. Notice! Do not connect cooling elements in series.
These hoses have screw-on connectors with internal threads. The hose is connected to the aluminum adapter (male thread) on the cooling element. The customer-end thread of the cooling hose is a G1/2" male fixed thread and includes a sealing washer. When connecting the line hose, avoid any twisting of the hose on the element.

In systems without protective earthing of the housing, hoses carrying coolant from the pipe network to the cooling elements of the frequency converter must not be electrically conductive. Beware of electric shock and equipment damage! To avoid galvanic corrosion, a corrosion inhibitor (e.g. Cortec VpCI-649l) must be added to the coolant.
The following main line hose materials are permitted for water-cooled drives (including aluminum heat sinks):
• Plastic (PVC) • Aluminum
• Rubber (EPDM and NBR only) • Other rust and acid resistant materials
• Metal • Stainless steel bellows

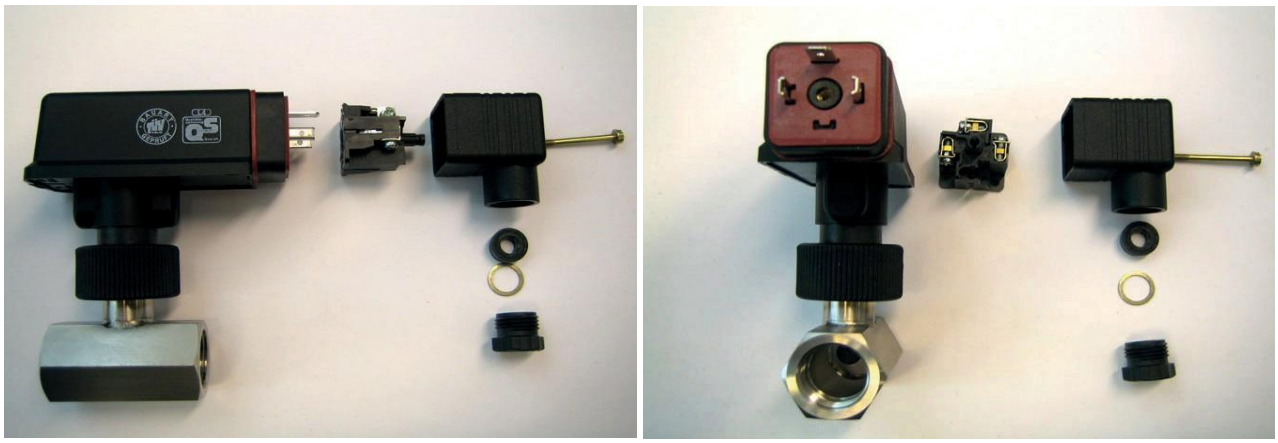
Water-cooled frequency converters (including nickel-plated aluminum heat sinks) allow the following main line hose materials:
• Plastic (PVC) • Aluminum
• Rubber (EPDM and NBR only) • Brass
• Copper • Other rust and acid resistant materials
The hose must be able to withstand a peak pressure of 30 Bar.

Connect the line hose to the corresponding point on the cooling element of the AC drive/inverter (threaded connector or quick connector). The coolant inlet connector is the connector close to the mounting plate, while the outlet connector is the connector close to the end face of the frequency converter. Due to the high pressure present in the hose, it is recommended to equip the liquid line with a shut-off valve, which will make connection easier. To prevent water splashing in the installation room, we also recommend wrapping items such as cotton lint around the joints during installation. We also recommend installing valves for the branch pipes connecting the cooling elements.

Installation of flow switch

We recommend installing a flow monitoring device on the liquid cooling system. You can order the flow switch as an option. The specifications of the flow switch and the precautions for its installation are explained below.

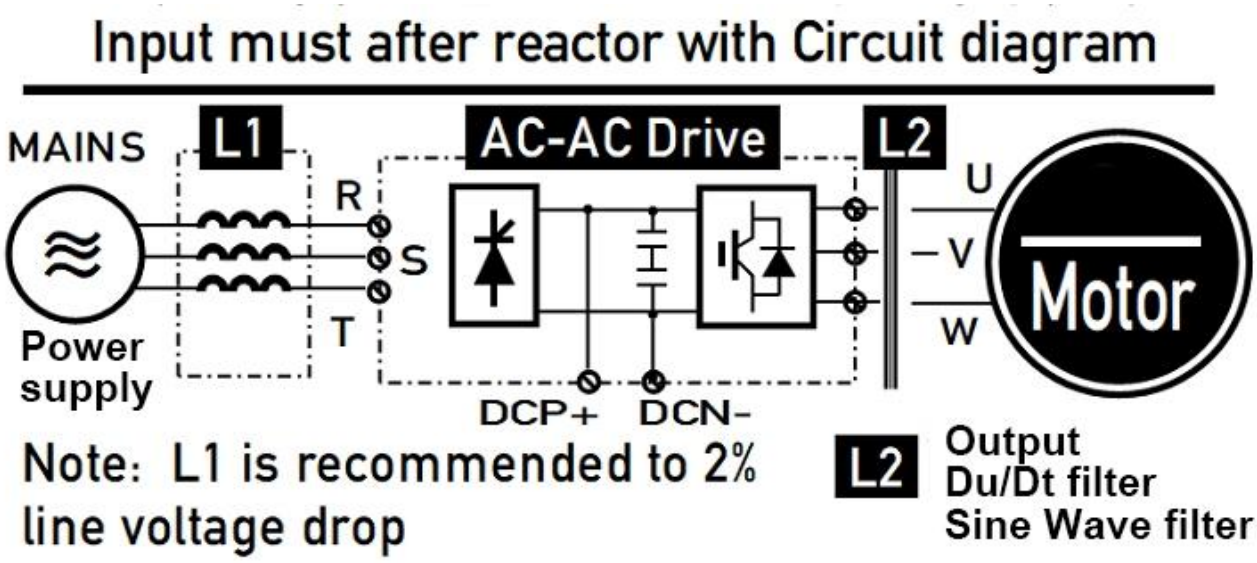
About installation
We recommend installing a flow switch on the inflow side of the system. Pay attention to the direction of flow. The switch is most accurate when mounted in a horizontal position. If mounted vertically, its mechanical sensor will be affected by the Earth's gravity and therefore its accuracy will be reduced.



Illustration, flow switch: hose connection, quick connector (electrical), quick connector locking screw, cable gland and clamp

## 10.13 Instructions for configuring input AC reactor for liquid-cooled modules

The input AC reactor serves multiple functions in L-Series liquid-cooled drives. The input AC reactor must be connected unless there is a component in the system that performs the same function (such as a transformer). The input AC reactor is a necessary component for motor control. It is used to protect the input and DC loop components, avoid sudden changes in current and voltage, and has anti-harmonic protection function.
The hardware main topology diagram of the liquid-cooled stand-alone drive is as follows:




We recommend that two overheating protection sensors be installed in the main part in the middle of the input AC reactor. These contacts are normally closed (normally closed switch). A warning occurs when the temperature exceeds 140ºC and a fault occurs when the temperature exceeds 150ºC.

Example of water-cooled input AC reactor
If you have ordered an input reactor separately for this series of liquid-cooled drives, please note the following instructions:

1. Prevent water from dripping into the input AC reactor/choker. Plexiglas may even be required for protection, as water spray may occur when pipe connections are made.
2. Appearance and mechanical installation dimensions

The drive can be mounted vertically (this should be preferred for better cooling of the drive) or horizontally on a wall or on the back panel of a control cabinet.
In order to ensure adequate cooling of the drive, there should be enough space around it, and note that the mounting plate should be relatively flat. If you need to lift the drive with size L5 and above out of the packaging box, you should use a lifter crane. Please ask the factory or local seller how to lift the drive out safely. Wall-mounted type is the main application and installation form. Its installation dimensions are shown in the separate mechanical dimension drawings:
(If you need detailed 2D & 3D drawings of mechanical dimensions, please contact our representative to obtain them)

# 11.Function and PARA LIST

## General introduction to the address space distribution of system control and status parameter sets

| P.No | Subrange | Functional attribution |
|---|---|---|
| P100 – P999 Public resource | P100 ~ P139 | DC voltage status, CPU load, etc. |
| | P140 ~ P159 | DI, DO, AI, AO status |
| | P160 ~ P179 | Carrier setting, undervoltage point, chopper braking, cooling fan control |
| | P200 ~ P249 | DI, DO configuration |
| | P250 ~ P299 | AI, AO configuration |
| | P300 ~ P370 | System control, parameter storage, system restart, menu content switching |
| | P400 ~ P419 | Encoder 1 status |
| | P420 ~ P439 | Encoder 2 status |
| | P440 ~ P459 | Encoder 3 status |
| | P460 ~ P479 | Encoder 4 status |
| | P480 ~ P489 | Pulse feedback status |
| | P500 ~ P549 | Encoder 1 configuration |
| | P550 ~ P599 | Encoder 2 configuration |
| | P600 ~ P649 | Encoder 3 configuration |
| | P650 ~ P699 | Encoder 4 configuration |
| | P700 ~ P709 | Pulse feedback configuration |
| | P720 ~ P744 | Process PID control |
| | P750 ~ P799 | Software oscilloscope configuration |
| | P800 ~ P899 | Factory hardware configuration (topology configuration, model information) |
| | P900 ~ P915 | User data (8 integers + 8 floating point numbers) |
| | P916 ~ P949 | LCD panel display content definition |
| P1000 ~ P1999 Motor shaft 1 | P1000 ~P1099 | Motor 1 running status |
| | P1100 ~ P1129 | Current motor parameters |
| | P1130 ~ P1159 | Motor 1 parameters |
| | P1160 ~ P1189 | Motor 2 parameters |
| | P1190 ~ P1219 | Motor 3 parameters |
| | P1220 ~ P1249 | Motor 4 parameters |
| | P1250 ~ P1269 | Global control parameters |
| | P1270 ~ P1299 | Loop control parameters |
| | P1300 ~ P1349 | Performance control parameters |
| | P1350 ~ P1369 | Start and stop logic |
| | P1370 ~ P1389 | Start and stop signal source |
| | P1390 ~ P1409 | Speed given |
| | P1410 ~ P1429 | speed ramp |
| | P1430 ~ P1449 | Torque given |
| | P1450 ~ P1471 | Multi-stage speed setting |
| | P1480 ~ P1509 | Auxiliary functions (potentiometer, comparator) |
| | P1510 ~ P1519 | Motor thermal protection |

| P.No | Subrange | Functional attribution |
|---|---|---|
| | P1520 ~ P1529 | VF separation control |
| | P1530 ~ P1549 | Communication data interface |
| | P1550 ~ P1579 | DS402 status |
| | P1580 ~ P1599 | DS402 configuration |
| | P1600 ~ P1619 | Pulse servo status |
| | P1620 ~ P1649 | Pulse servo configuration |
| | P1650 ~ P1669 | Electronic cam status |
| | P1670 ~ P1724 | Electronic cam configuration |
| P2000 ~ P2999 Motor shaft2 | Reference motor axis 1 | Reference motor axis 1 |
| P3000 ~ P3999 Motor shaft3 | Address offset 1000 | Reference motor axis 1 |
| P4000 ~ P4999 Motor shaft4 | Reference motor axis 1 | Reference motor axis 1 |
| P5000 ~ P5999 Bus commun ication | P5000 ~ P5019 | EtherCAT and CANopen status |
| | P5020 ~P5039 | DS301 status |
| | P5040 ~ 5059 | MODBUS status |
| | P5080 ~ P5099 | PROFINET status |
| | P5100 ~ P5109 | EtherCAT configuration |
| | P5110 ~ P5119 | CANopen configuration |
| | P5120 ~ P5149 | DS301 configuration |
| | P5150 ~ P5169 | MODBUS configuration |
| | P5200 ~ P5219 | PROFINET configuration |
| | P5250 ~ P5269 | Correspondence address customization |
| | P5270 ~ P5293 | Master-slave communication |
| | P5300 ~ P5409 | Ethernet communication |

## 〉P0100 ~ P0130 Basic status of the drive

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0100 DC voltage average | The value of the DC link voltage after filtering and smoothing, the filtering time is 25ms | 0.0V |
| P0101 DC voltage real-time value | Real-time value of DC link voltage without smoothing filter. | 0.0V |
| P0102 DC current value | Actual overvoltage alarm detection level, 380V power supply is generally 820VDC | 0.0A |
| P0103 DC voltage range | Maximum measurable DC voltage value<br>P0103[0] DC voltage range;<br>P0103[1] DC voltage overvoltage level | 1V |
| P0104 DC ripple voltage value | The DC link voltage pulsation amplitude is used to analyze the power supply quality of the power grid and whether the bus capacitance is sufficient. | 0.0V |
| P0105 CPU temperature value | The temperature value of the built-in temperature sensor of the CPU is used to monitor whether the temperature of the internal cavity of the drive is abnormal. | 0.0℃ |
| P0106 Ambient temperature | The actual measured value of the inlet air temperature is the ambient temperature. It is used to monitor the real-time cooling and ventilation status of the cabinet. When abnormal, check whether the fan and air duct are blocked by foreign matter, or the hot air circulates inside the cabinet. | 0.0℃ |
| P0107 Radiator temperature 1 | Module 1 radiator temperature | 0.0℃ |
| P0108 Radiator temperature 2 | Module 2 radiator temperature | 0.0℃ |
| P0109 Radiator temperature 3 | Module 3 radiator temperature | 0.0℃ |
| P0110 Radiator temperature 4 | Module 4 radiator temperature | 0.0℃ |
| P0111 Heat dissipation temperature change rate | ℃/min, radiator change per minute, used to analyze whether to enter thermal balance. There are 4 values in total, corresponding to the fan status of up to 4 power units. | 0.0℃ |
| P0112 Fan operating status | 1=Fan running, 0=Fan stopped; there are 4 values in total, corresponding to the fan status of up to 4 power units. | 0 |
| P0113 Fan on flag | Reserved for some models | |
| P0114 Fan speed feedback 1 | Reserved for some models | |
| P0115 Fan speed feedback 2 | Reserved for some models | |
| P0116 Grid voltage value | Grid voltage effective value, all-in-one/E2/E3 does not have built-in input voltage detection | 0.0V |
| P0117 Grid frequency value | Actual grid frequency value, all-in-one/E2/E3 does not have built-in input voltage detection | 0.00HZ |
| P0118 Grid phase angle value | Real-time power grid phase angle, range 1 corresponds to 360 degrees | |
| P0121 Power grid phase lock flag | 0=Phase lock failed; 1=Phase lock completed | 0 |
| P0124 Actual value of carrier frequency | The actual operating carrier frequency of the driver | kHz |
| P0125 CPU usage | If the actual load rate of the CPU exceeds 0.99, it will cause real-time abnormalities. | 0.0% |

| | | |
|---|---|---|
| P0130 This power-on time | The timer starts when the power is turned on and resets to zero when the power is turned off. | 0.00h |

## 〉P0140 ~ P0155 Digital DI, DO and analog AI, AO status

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0140 DI status | DI status after delay, from right (Bit0) to left, in order DI1~DI8 | BOOL |
| P0141 DI status inversion | P140 logical inversion display | BOOL |
| P0144 DO status | The status of digital output, including filtering delay. Bit0=RO1, Bit1=RO2, Bit2=RO3, Bit3=DO1, Bit4=DO2, Bit5=DO3, Bit6=DO4 | BOOL |
| P0146 AI1 actual value | Real-time voltage or current value of analog input port AI1 | 0.000V/ mA |
| P0147 AI1 conversion value | The output value of AI1 after linear conversion, the unit depends on the parameter P0260 AI1 output unit type | 0.0rpm/ %/… |
| P0148 AI2 actual value | Real-time voltage or current value of analog input port AI2 | 0.000V/ mA |
| P0149 AI2 conversion value | The output value of AI2 after linear conversion, the unit depends on the parameter P0274 AI2 output unit type | 0.0rpm/ %/… |
| P0150 AI1 over range flag | If the AI1 input exceeds the set input range (P250 and P251), it is set to 1, otherwise it is 0 | Bool |
| P0151 AI2 over range flag | If the AI2 input exceeds the set input range (P264 and P265), it is set to 1, otherwise it is 0 | Bool |
| P0152 AO1 actual value | Actual voltage or current value of analog output AO1 | 0.000V/ mA |
| P0153 AO1 signal source value | The actual value of the signal source associated with AO1, the unit depends on parameter P0278 AO1 signal source selection | 0.0RPM |
| P0154 AO2 actual value | Actual voltage or current value of analog output AO2 | 0.000V/ mA |
| P0155 AO2 signal source value | The actual value of the signal source associated with AO2, the unit depends on parameter P0289 AO2 signal source selection | 0.0RPM |

## 〉P0160 ~ P0179 Drive control basic settings

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0160 Carrier frequency setting** | **Typical values: 2, 4, 8, 16. When using a resolver, the carrier must be the typical value. For the actual carrier frequency, see P0124. The default value is based on the model (2-16)** | **4kHz** |
| **P0161 Carrier frequency upper limit** | **Used to limit the upper limit of carrier frequency adaptive adjustment, typical values: 4 or 8 or 16, used to prevent excessively high carrier frequency** | **8kHz** |
| **P0162 Carrier frequency lower limit** | **Used to limit the lower limit of carrier frequency adaptive adjustment, typical value: 2** | **2kHz** |
| **P0163 Soft start voltage point** | **When the DC link voltage is greater than P163, the closing soft state is set to 1 and the soft starting circuit is closed. During operation, if the DC voltage is lower than P163, an undervoltage alarm is triggered. The default undervoltage point for 380V is 400V, and the default undervoltage point for 690V DC is 700.** | **1V** |
| **P0164 Chopping braking voltage point** | **If a chopper brake is installed, the chopper brake will work when the DC link voltage is greater than P164. The default brake for the 380V model is 750VDC.** | **1V** |
| **P0165 DC voltage correction gain** | **Used to correct the DC voltage display, usually no adjustment is required** | **1.000** |
| **P0166 DC voltage correction bias** | **Used to correct the DC voltage display, usually no adjustment is required** | **1.000V** |
| **P0167 Input phase loss protection enable** | **1: Enable: When the DC link voltage ripple is too large, the input phase loss alarm will be triggered.** | **1** |
| **P0168 Chopper brake enable** | **1: Enable chopper brake, 0: Disable, models with braking unit need to be set to 1** | **0** |
| **P0169 Encoder 8V auxiliary power supply enable** | **1: Encoder auxiliary output power +8V is enabled. Some encoders require more than 5V power supply, such as SICK encoders. The power needs to be turned on manually. Otherwise, the encoder will have no feedback and communication errors.** | **0** |
| **P0170 Radiator hot spot bias** | **Used to adjust the overheat protection point of the radiator. Setting +10℃ means the overheating point increases by 10℃. Setting it at -10℃ means that the overheating point decreases by 10℃.** | **0℃** |
| **P0172 Fan control mode** | **0=Intelligent control based on temperature, 1=Turn on the fan during operation, 2=Always turn on the fan, 3=Always turn off the fan (reserved)** | **0** |
| **P0173 Fan start temperature** | **When the radiator temperature reaches P173, the fan is automatically enabled.** | **50.0℃** |
| **P0174 Fan off temperature** | **When the radiator temperature drops to P174, the fan will automatically turn off after a delay.** | **40.0℃** |

| | | |
|---|---|---|
| P0175 Fan shutdown delay time | After the motor stops, the fan will stop after a delay. | 30s |
| P0178 Chopper brake status | 0: Initializing, 1: Not enabled, 2: Faulty, 3: Idle and ready, 4: Braking | 1 |
| P0179 Real-time braking duty cycle | Used to monitor the braking load rate. The larger the value, the greater the braking load. | 0.000 |
| P0180 Braking carrier frequency | 500 | 500HZ |
| P0181 Brake control gain | 0.5 | 0.5 |
| SCR settings: | | |
| P0185 soft start status word | Bit0=soft start is closed, Bit1=fault occurred, Bit2=precharging, Bit3=external fault, Bit4=precharge failed, Bit5=undervoltage protection, Bit6=power grid is phase-locked | BOOL |
| P0188 control mode | 0=automatic closing, 1=bus controlled closing (for rectifier unit) | 0 |
| P0189 topology type | 0=resistor precharge, 1=thyristor precharge (for rectifier unit) | 0 |
| P0190 precharge mode | 0=disabled, 1=enabled (for rectifier unit) | 0 |
| P0191 Charging voltage check level | During the precharging process, the main circuit can only be closed when the set voltage is reached within a limited time. | 500V |
| P0192 Precharge completion voltage slope limit | Only used in resistance charging mode. When the voltage change rate is less than the setting, the main circuit can be closed. | 10.0V |
| P0193 Precharge time limit | During the precharging process, if the DC voltage cannot reach P191 within the limited time, the precharging will stop and a fault alarm will be issued. | 1.00S |
| P0194 precharge starting phase | The default is 120deg, based on the R phase. The same applies to the following. | |
| P0195 precharge end phase | Default15deg | |
| P0196 normal working starting phase | Default -70deg | |
| P0197 normal operation end phase | Default 20deg | |
| P0198 SCR modulation frequency | Default10KHz | |
| P0199 SCR modulation duty cycle | Default 10% | |

## 〉P0200 ~ P0249 Digital DI/DO configuration

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0200 DI1 closing delay | Digital input DI1 closing delay, default 0.00s | 0.01s |
| P0201 DI1 disconnection delay | Digital input DI1 off delay | 0.01s |
| P0202 DI2 closing delay | Digital input DI2 closing delay | 0.01s |
| P0203 DI2 disconnection delay | Digital input DI2 disconnection delay | 0.01s |
| P0204 DI3 closing delay | Digital input DI3 closing delay | 0.01 |
| P0205 DI3 disconnection delay | Digital input DI3 disconnection delay | 0.01s |
| P0206 DI4 closing delay | Digital input DI4 closing delay | 0.01s |
| P0207 DI4 disconnection delay | Digital input DI4 off delay | 0.01s |
| P0208 DI5 closing delay | Digital input DI5 closing delay | 0.01s |
| P0209 DI5 disconnection delay | Digital input DI5 off delay | 0.01s |
| P0210 DI6 closing delay | Digital input DI6 closing delay | 0.01s |
| P0211 DI6 disconnection delay | Digital input DI6 off delay | 0.01s |
| P0212 DI7 closing delay | Digital input DI7 closing delay | 0.01s |
| P0213 DI7 disconnection delay | Digital input DI7 off delay | 0.01s |
| P0214 DI8 closing delay | Digital input DI8 closing delay | 0.01s |
| P0215 DI8 disconnection delay | Digital input DI8 off delay | 0.01s |
| P0216 DO1 closing delay | Digital output DO1 closing delay | 0s |
| P0217 DO1 disconnection delay | Digital output DO1 off delay | 0s |
| P0218 DO2 closing delay | Digital output DO2 closing delay | 0s |
| P0219 DO2 disconnection delay | Digital output DO2 off delay | 0s |
| P0220 DO3 closing delay | Digital output DO3 closing delay | 0s |
| P0221 DO3 disconnection delay | Digital output DO3 off delay | 0s |
| P0222 DO4 closing delay | Digital output DO4 closing delay | 0s |
| P0223 DO4 disconnection delay | Digital output DO4 off delay | 0s |
| P0224 RO1 closing delay | Digital output RO1 closing delay | 0s |
| P0225 RO1 disconnection delay | Digital output RO1 off delay | 0s |
| P0226 RO2 closing delay | Digital output RO2 closing delay | 0s |
| P0227 RO2 disconnection delay | Digital output RO2 off delay | 0s |
| P0228 RO3 closing delay | Digital output RO3 closing delay | 0s |
| P0229 RO3 disconnection delay | Digital output RO3 off delay | 0s |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0230 DO1 signal source** | **Pointer. Can point to the bit corresponding to any parameter.**<br>**0. No output 1. Always output**<br>**For example: running output is set to P1031.04**<br><br>**P1030 speed control status word**<br>**Bit0: Zero speed**<br>**Bit1: Reverse**<br>**Bit2: Ramp acceleration (invalid)**<br>**Bit3: Slope deceleration (invalid)**<br>**Bit4: Speed reached**<br>**Bit6: There is encoder closed loop (invalid)**<br>**Bit7: There is an encoder (invalid)**<br>**Bit13: Torque comparator output**<br>**Bit14: Speed comparator output**<br><br>**Bit description of P1031 drive control status word 1**<br><br>**Bit0: Ready**<br>**Bit1: Fault**<br>**Bit2: Warning**<br>**Bit3: Limiting**<br>**Bit4: Running**<br>**Bit5: Reverse request**<br>**Bit6: Start request**<br>**Bit7: Shutdown request**<br>**Bit8: Click to activate**<br>**Bit9: Internal shutdown request**<br>**Bit10: External operation enable**<br>**Bit11: Start 2**<br>**Bit12: Modulation output activated**<br>**Bit13: Servo enable**<br>**Bit14: External control location 2**<br>**Bit15: Local control**<br>**Bit16: OFF1 (deceleration to stop)**<br>**Bit17: OFF2 (emergency stop free stop)**<br>**Bit18: OFF3 (emergency stop deceleration stop)**<br>**Bit19:**<br>**Bit20: Ramp input is 0**<br>**Bit21: Ramp output is 0**<br>**Bit22: Soft start closed**<br>**Bit23:**<br>**Bit24:**<br>**Bit25: Remote mode REM**<br>**Bit26: Hoisting brake is open**<br>**Bit27:**<br>**Bit28:**<br>**Bit29: Zero speed state**<br>**Bit30: Accelerating (invalid)**<br>**Bit31: Decelerating (invalid)** | **Default 0** |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0231 DO2 signal source** | **Set the signal source of digital output DO2, same as above** | **-Default 0** |
| **P0232 DO3 signal source** | **Set the signal source of digital output DO3, same as above (reserved for expansion)** | **-Default 0** |
| **P0233 DO4 signal source** | **Set the signal source of digital output DO4, same as above (reserved for expansion)** | **-Default 0** |
| **P0234 RO1 signal source** | **Set the signal source of digital output RO1, same as above** | **P1545.02** |
| **P0235 RO2 signal source** | **Set the signal source of digital output RO2, same as above** | **P1545.03** |
| **P0236 RO3 signal source** | **Set the signal source of digital output RO3, same as above (reserved for expansion)** | **P1545.00** |
| **P0237 DI level type** | **0=NPN (low effective), 1=PNP (high effective)** | **1** |
| **P0238 DO level type** | **Reserved, always PNP output, active high level** | **0** |
| **P0239 DI level logic** | **0 = normal, 1 = negated, from right (Bit0) to left: DI1~DI8** | **BOOL** |
| **P0240 DI simulation enable** | **0=Turn off simulation, 1=Turn on simulation, same as above** | **BOOL** |
| **P0241 DI simulation data** | **Used with P240 DI emulation enable** | **BOOL** |
| **P0242 DO level logic** | **0=normal, 1=inverted, from right (Bit0) to left: RO1, RO2, RO3, DO1, DO2, DO3, DO4** | **BOOL** |
| **P0243 DO simulation enable** | **0=Normal, 1=Simulation mode** | **BOOL** |
| **P0244 DO simulation data** | **Used in conjunction with P243 DO simulation enable** | **BOOL** |

## 〉P0250 ~ P0299 Analog AI/AO configuration

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0250 AI1 input maximum value | Maximum value of analog input AI1, V or mA, typical 10V or 20mA, default 10.0000V | V/mA |
| P0251 AI1 input minimum value | Minimum value of analog input AI1, V or mA, typical 0V or 0mA or 2V or 4Ma, default 0.000V | V/mA |
| P0252 AI1 output maximum value | The converted maximum value of analog input AI1, the unit depends on P260 (AI1), the default is 1500.0rpm (the default value is linked to the motor parameters) | RPM/%/… |
| P0253 AI1 output minimum value | The converted minimum value of analog input AI1, default 0.0RPM | RPM/%/… |
| P0254 AI1 input mode | 0=0~10V, 1=0~20mA, 2=-10V~+10V, 3=-20mA~+20mA | 0 |
| P0255 AI1 simulation data | Simulation data of analog quantity AI1. Used in simulation mode. When AI enables simulation output, the output value switches to the simulation value. The default is 0.0RPM. | 0.0RPM |
| P0256 AI1 simulation enable | 1=Simulation is enabled, the conversion output at this time is simulation data, 0. Close | 0 |
| P0257 AI1 filter time | Set the filter time constant of analog AI1 | 100ms |
| P0258 AI1 correction gain | When the accuracy of analog input needs to be improved to 1‰, the gain needs to be manually corrected (high voltage correction) | 1.013% |
| P0259 AI1 correction offset | When the accuracy of analog input needs to be improved to 1‰, the offset needs to be manually corrected (low voltage correction) | 0.000V |
| P0260 AI1 output unit | The unit type selection of AI1 converted output value is only valid when using the LCD panel. 0=none, 7=mm, 8=rpm, 9=Hz, 10=percent | 8.RPM |
| P0261 AI1 zero-crossing dead zone amplitude | In bipolar mode, when the absolute value of AI1 input is lower than this value, zero processing is used to prevent back and forth adjustment during PLC control. The percentage of the maximum speed | 0.0% |
| P0262 AI1 dead zone delay | Delay time for zero processing after the AI1 input in bipolar mode is lower than the dead zone amplitude | 1.00s |
| P0263 AI1 bipolar correction bias | Used to correct the level of the AI1 input in bipolar mode | 0.000V |
| P0264 AI2 input maximum value | The maximum value of analog input AI2, the same as AI1 | V/mA |
| P0265 AI2 input minimum value | Minimum value of analog input AI2 | V/mA |
| P0266 AI2 output maximum value | The maximum converted value of analog AI2 is the default value. | 100% |
| P0267 AI2 output minimum value | The converted minimum value of analog AI2 defaults to | 0.0%… |
| P0268 AI2 input mode | 0=0~10V, 1=0~20mA, 2=-10V~+10V, 3=-20mA~+20mA | 0 |
| P0269 AI2 simulation data | The simulation data of analog quantity AI2 is the same as AI1 | 0.0% |
| P0270 AI2 simulation enable | For debugging or other applications, users can enable the simulation function of AI2 through this parameter. | 0 |
| P0271 AI2 filter time | Set the filter time constant of analog AI2 | 100ms |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0272 AI2 correction gain | When the accuracy of analog input needs to be improved to 1‰, the gain needs to be manually corrected (high voltage correction) | 1.013 |
| P0273 AI2 correction offset | When the accuracy of analog input needs to be improved to 1‰, the offset needs to be manually corrected (low voltage correction) | 0.000V |
| P0274 AI2 output unit | Unit type selection for AI2 conversion output value, typical values are as follows: 8=RPM, 10=% | 10.% |
| P0275 AI2 zero-crossing dead zone amplitude | In bipolar mode, when the absolute value of AI1 input is lower than this value, it will be processed as zero. | 0.0% |
| P0276 AI2 dead zone delay | Delay time for zero processing after the AI1 input in bipolar mode is lower than the dead zone amplitude | 1.00S |
| P0277 AI2 bipolar correction bias | Used to correct the level of the AI1 input in bipolar mode | 0.000V |
| P0278 AO1 signal source selection | Select the signal source and pointer of analog output AO1. It can point to any parameter output.<br>Such as setting the output speed<br>  <br>0: zero (default)<br>P100: DC bus voltage<br>P1000: Motor speed (axis 1)<br>P1001: Output frequency<br>P1002: Motor actual current<br>P1003: Output voltage<br>P1008: Output torque<br>P1004: Output power | P1000 motor speed |
| P0279 AO1 output maximum value | Set the maximum value of analog output AO1 output V or mA, typical 10V or 20mA | 10.000V |
| P0280 AO1 output minimum value | Set the minimum value of analog output AO1 output, same as above | 0.000V |
| P0281 AO1 input maximum value | Set the converted maximum value of analog output AO1 to 1500.0RPM (related to motor parameters) | dynamic 1500.0RPM |
| P0282 AO1 input minimum value | Set the converted minimum value of analog output AO1 | dynamic 0.0rpm |
| P0283 AO1 simulation data | When P284 simulation is enabled, the actual output voltage or current is determined by the simulation value. | 0.000V |
| P0284 AO1 simulation enable | Debugging or other applications, 1: simulation enabled, 0: closed | 0 |
| P0285 AO1 input takes absolute value | Select whether the AO1 signal source takes the absolute value and then convert 1: absolute value | 1.absolute value |
| P0286 AO1 mode selection | When selecting the AO1 output type, the corresponding jumper status must be consistent.<br>0: Voltage type output 0~10V<br>1: Current type output 0~20mA | 0 |
| P0287 AO1 correction gain | When the accuracy of analog output needs to be improved to 1‰, the gain needs to be manually corrected (high voltage correction) | 96.60% |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0288 AO1 correction offset** | **When the accuracy of analog output needs to be improved to 1‰, the offset needs to be manually corrected (low voltage correction), range: -10.00%-10.00%** | **0.00%** |
| **P0289 AO2 signal source selection** | **Select the signal source of analog output AO2<br>The following is the same as P278 AO1** | **P1000** |
| **P0290 AO2 output maximum value** | **Set the maximum value of analog output AO2 output** | **10.000V** |
| **P0291 AO2 output minimum value** | **Set the minimum value of analog output AO2 output** | **0.000V** |
| **P0292 AO2 input maximum value** | **Set the converted maximum value of analog output AO2,** | **dynamic 1500.0RPM** |
| **P0293 AO2 input minimum value** | **Set the converted minimum value of analog output AO2** | **dynamic 0.0RPM** |
| **P0294 AO2 simulation data** | **The actual output voltage or current of the simulation data of analog quantity AO2 is determined by the simulation value.** | **0.000V** |
| **P0295 AO2 simulation enable** | **Debugging or other applications, 1: simulation enabled, 0: closed** | **0** |
| **P0296 AO2 input takes absolute value** | **Select whether the AO2 signal source takes the absolute value and then converts it.** | **1.absolute value** |
| **P0297 AO2 mode selection** | **When selecting the AO2 output type, the corresponding jumper status must be consistent.<br>0: Voltage type output 0~10V<br>1: Current type output 0~20mA** | **0** |
| **P0298 AO2 correction gain** | **When the accuracy of analog output needs to be improved to 1‰, the gain needs to be manually corrected (high voltage correction)** | **96.60%** |
| **P0299 AO2 correction offset** | **When the accuracy of analog output needs to be improved to 1‰, the offset needs to be manually corrected (low voltage correction)** | **0.00%** |

## 〉P0300 ~ P0369 System status (setting) information (parameter storage control)

| No. Parameter name | Description | Unit Default |
|---|---|---|
| system status: | | |
| **P0300 Firmware version** | **The firmware (software) version number of the drive, such as: 8.200** | **-** |
| **P0301 CPU firmware date** | **The date the driver software was released, for example: 221007** | **-** |
| **P0302 Dynamic verification code** | | |
| **P0303 FPGA firmware date** | **FPGA firmware release date such as: 20220504** | |
| **P0304 FPGA firmware type** | **For example: FPGA firmware type 1000** | |
| **P0305 CM firmware date** | **CM firmware date 20230727** | **h** |
| **P0350 Time-Seconds** | **Such as: 1** | |
| **P0351 Time-minutes** | **Such as: 1** | |
| **P0352 Time-Hour** | **Such as: 1** | |
| **P0353 date-day** | **Such as: 1** | |
| **P0354 Date-Month** | **Such as: 1** | |
| **P0355 Date-Year** | **Such as: 2022** | |
| **P0356** | **reserve** | |
| **P0357** | **reserve** | |
| **P0358** | **reserve** | |
| **P0359 Manually save parameters** | **1=Save parameters immediately. When using 24V independent power supply, parameters need to be saved manually, otherwise they will not be remembered when the power is turned off.** | **0** |
| **P0360 Permission password input** | **Enter different passwords to obtain different levels of parameter access** | **0** |
| **P0361 Parameter recovery request** | **2=all restored, 3=manufacturer reserved** | **0** |
| **P0362 System restart** | **1=system restart, set to 1 to restart with CPU** | **0** |
| **P0365 Parameter lock control** | **(reserved, function to be determined)** | **0** |
| **P0366 Language selection** | **0=English, 1=Simplified Chinese, the panel needs to be re-plugged and unplugged after setting to take effect.** | **1** |
| **P0367 Running time limit** | **(reserved, function to be determined)** | **0h** |
| **P0368 Parameter set control** | **(reserved, function to be determined)** | **0** |
| **P0369 Sector requested to be loaded** | **for computer data access** | **0** |
| **P0370 FLASH erasing and writing times** | **Statistics of the actual number of erase and write times of FLASH. The typical life of FLASH is 1 million times.** | **0** |

## 〉P0400 ~ P0419 Encoder feedback port #1 status

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0400 Comprehensive position value | Square wave encoder: position after quadruple frequency<br>Sine wave encoder: position after 16-bit subdivision<br>Resolver: Position after 16-bit decoding<br>Absolute encoder: The actual value read by communication. If P525 is set to convert the output resolution, the value will be accumulated after one revolution. | 0p |
| P0401 Communication position value | The position value read by bus communication only has data when the bus encoder is used | 0p |
| P0402 Incremental position value | The position value after four times the frequency of the incremental quadrature pulse. It is only valid when the encoder contains a square wave or sinusoidal incremental signal. | 0p |
| P0403 Z pulse capture value | Incremental encoder, Z signal captures value all the time. As sine and cosine signals, it only captures once and then no longer updates. If this value is always 0, it means there is no Z signal. | 0p |
| P0403[01] Z pulse capture value | The Z-phase signal pulse interval value is refreshed every time the motor rotates, which is convenient for judging the Z-phase signal. | |
| P0404 mechanical angle value | Mechanical angle of the encoder, with zero point or Z signal as reference, forward rotation 0-1.00 | 0.0000 |
| P0405 mechanical frequency value | The number of pulses the encoder rotor rotates per second (including quadruple frequency) | 0.00Hz |
| P0406 Mechanical speed value | Encoder feedback speed, the number of rotor rotations per minute | 0rpm |
| P0407 Mechanical speed pulsation value | Mechanical speed fluctuation amplitude, used to diagnose the installation accuracy of the encoder | 0.0rpm |
| P0408 Sine wave Va voltage value | Corrected sine-cosine encoder input voltage signal Va real-time value, SinCos.Va | 0.000V |
| P0408[01] Sine wave Vb voltage value | Corrected sine and cosine encoder input voltage signal Vb real-time value, SinCos.Vb | 0.000V |
| P0409 Resolver Va voltage value | Corrected resolver input voltage signal Va real-time value, Resolver.Va | 0.000V |
| P0409[01] Resolver Vb voltage value | Corrected resolver input voltage signal Vb real-time value, Resolver.Vb | |
| P0410 Sine wave voltage phase value | Real-time alternating phase of the input voltage signal of the sine and cosine encoder (Q16 format) | 0 |
| P0411 Encoder single-turn position value | P400 is the remaining single lap position value after removing the multi-lap position. | 0 |
| P0412 Encoder error counter | Used to reflect signal interference analysis. Typical error factors include: bus communication CRC check failure, abnormal pulse interval between two adjacent Z signals, invalid sine, cosine and resolver encoders. | 0 |
| P0413 PosRawValue | Original position value, without electronic gear transformation, absolute encoder is internal underlying data | 0 |
| Encoder original position value | Not involved in the calculation, monitoring parameters, [00] When the HTL port is set to 0x1056, the encoder position value captured when DI5 is closed, [01] When the HTL port is set to 0x1056, the encoder captured when DI6 is closed position value | 0 |
| P0414[01] | | |

## 〉P420 ~ P439 Encoder feedback port #2 status

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0420 Comprehensive position value** | **Square wave encoder: position after quadruple frequency<br>Sine wave encoder: position after 16-bit subdivision<br>Resolver: Position after 16-bit decoding<br>Absolute encoder: The actual value read by communication.<br>If P525 is set to convert the output resolution, the value will be accumulated after one revolution.** | 1p |
| **P0421 Communication position value** | **The position value read by bus communication only has data when the bus encoder is used** | 1p |
| **P0422 Incremental position value** | **The position value after four times the frequency of the incremental quadrature pulse. It is only valid when the encoder contains a square wave or sinusoidal incremental signal.** | 1p |
| **P0423 Z pulse capture value** | **Incremental encoder, Z signal captures value all the time. As sine and cosine signals, it only captures once and then no longer updates. If this value is always 0, it means there is no Z signal.** | 1p |
| **P0423[01] Z pulse capture value** | **The Z-phase signal pulse interval value is refreshed every time the motor rotates, which is convenient for judging the Z-phase signal.** | |
| **P0424 mechanical angle value** | **Mechanical angle of the encoder, with zero point or Z signal as reference, forward rotation 0-1.00** | 0.0000 |
| **P0425 mechanical frequency value** | **The number of pulses the encoder rotor rotates per second (including quadruple frequency)** | 1Hz |
| **P0426 Mechanical speed value** | **Encoder feedback speed, the number of rotor rotations per minute** | 1rpm |
| **P0427 Mechanical speed pulsation value** | **Mechanical speed fluctuation amplitude, used to diagnose the installation accuracy of the encoder** | 0.1rpm |
| **P0428 Sine wave Va voltage value** | **Corrected sine-cosine encoder input voltage signal Va real-time value, SinCos.Va** | V |
| **P0428[01] Sine wave Vb voltage value** | **Corrected sine and cosine encoder input voltage signal Vb real-time value, SinCos.Vb** | V |
| **P0429 Resolver Va voltage value** | **Corrected resolver input voltage signal Va real-time value, Resolver.Va** | V |
| **P0429[01] Resolver Vb voltage value** | **Corrected resolver input voltage signal Vb real-time value, Resolver.Vb** | V |
| **P0430 Sine wave voltage phase value** | **Real-time alternating phase of the input voltage signal of the sine and cosine encoder (Q16 format)** | - |
| **P0431 Encoder single-turn position value** | **P400 is the remaining single lap position value after removing the multi-lap position.** | - |
| **P0432 Encoder error counter** | **Used to reflect signal interference analysis. Typical error factors include: bus communication CRC check failure, abnormal pulse interval between two adjacent Z signals, invalid sine, cosine and resolver encoders.** | - |
| **P0433 Encoder original position value** | **Original position value, without electronic gear transformation, absolute encoder is internal underlying data** | - |
| **P0434 Encoder position capture value** | **Not involved in the calculation, monitoring parameters, [00] When the HTL port is set to 0x1056, the encoder position value captured when DI5 is closed, [01] When the HTL port is set to 0x1056, the encoder captured when DI6 is closed position value** | |
| **P0434[01]** | | |

## P440 ~ P459Encoder feedback port #3 status

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0440 Comprehensive position value** | **Square wave encoder: position after quadruple frequency<br>Sine wave encoder: position after 16-bit subdivision<br>Resolver: Position after 16-bit decoding<br>Absolute encoder: The actual value read by communication. If P525 is set to convert the output resolution, the value will be accumulated after one revolution.** | 1p |
| **P0441 Communication position value** | **The position value read by bus communication only has data when the bus encoder is used** | 1p |
| **P0442 Incremental position value** | **The position value after four times the frequency of the incremental quadrature pulse. It is only valid when the encoder contains a square wave or sinusoidal incremental signal.** | 1p |
| **P0443 Z pulse capture value** | **Incremental encoder, Z signal captures value all the time. As sine and cosine signals, it only captures once and then no longer updates. If this value is always 0, it means there is no Z signal.** | 1p |
| **P0443[01] Z pulse capture value** | **The Z-phase signal pulse interval value is refreshed every time the motor rotates, which is convenient for judging the Z-phase signal.** | |
| **P0444 mechanical angle value** | **Mechanical angle of the encoder, with zero point or Z signal as reference, forward rotation 0-1.00** | 0.0000 |
| **P0445 mechanical frequency value** | **The number of pulses the encoder rotor rotates per second (including quadruple frequency)** | 1Hz |
| **P0446 Mechanical speed value** | **Encoder feedback speed, the number of rotor rotations per minute** | 1rpm |
| **P0447 Mechanical speed pulsation value** | **Mechanical speed fluctuation amplitude, used to diagnose the installation accuracy of the encoder** | 0.1rpm |
| **P0448 Sine wave Va voltage value** | **Corrected sine-cosine encoder input voltage signal Va real-time value, SinCos.Va** | V |
| **P0448[01] Sine wave Vb voltage value** | **Corrected sine and cosine encoder input voltage signal Vb real-time value, SinCos.Vb** | V |
| **P0449 Resolver Va voltage value** | **Corrected resolver input voltage signal Va real-time value, Resolver.Va** | V |
| **P0449[01] Resolver Vb voltage value** | **Corrected resolver input voltage signal Vb real-time value, Resolver.Vb** | V |
| **P0450 Sine wave voltage phase value** | **Real-time alternating phase of the input voltage signal of the sine and cosine encoder (Q16 format)** | 0 |
| **P0451 Encoder single-turn position value** | **P400 is the remaining single lap position value after removing the multi-lap position.** | 0 |
| **P0452 Encoder error counter** | **Used to reflect signal interference analysis. Typical error factors include: bus communication CRC check failure, abnormal pulse interval between two adjacent Z signals, invalid sine, cosine and resolver encoders.** | 0 |
| **P0453 Encoder original position value** | **Original position value, without electronic gear transformation, absolute encoder is internal underlying data** | 0 |
| **P0454 Encoder position capture value** | **Not involved in the calculation, monitoring parameters, [00] When the HTL port is set to 0x1056, the encoder position value captured when DI5 is closed, [01] When the HTL port is set to 0x1056, the encoder captured when DI6 is closed position value** | |
| **P0454[01]** | | |

## 〉P460 ~ P479Encoder feedback port #4 status

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0460 Comprehensive position value | **Square wave encoder: position after quadruple frequency<br>Sine wave encoder: position after 16-bit subdivision<br>Resolver: Position after 16-bit decoding<br>Absolute encoder: The actual value read by communication. If P525 is set to convert the output resolution, the value will be accumulated after one revolution.** | 1p |
| P0461 Communication | **The position value read by bus communication only has data when the bus encoder is used** | 1p |
| P0462 Incremental position value | **The position value after four times the frequency of the incremental quadrature pulse. It is only valid when the encoder contains a square wave or sinusoidal incremental signal.** | 1p |
| P0463 Z pulse capture value | **Incremental encoder, Z signal captures value all the time. As sine and cosine signals, it only captures once and then no longer updates. If this value is always 0, it means there is no Z signal.** | 1p |
| P0463[01] Z pulse capture value | **The Z-phase signal pulse interval value is refreshed every time the motor rotates, which is convenient for judging the Z-phase signal.** | |
| P0464 Mechanical angle value | **Mechanical angle of the encoder, with zero point or Z signal as reference, forward rotation 0-1.00** | 0.0000 |
| P0465 mechanical frequency value | **The number of pulses the encoder rotor rotates per second (including quadruple frequency)** | 1Hz |
| P0466 Mechanical speed value | **Encoder feedback speed, the number of rotor rotations per minute** | 1rpm |
| P0467 Mechanical speed pulsation value | **Mechanical speed fluctuation amplitude, used to diagnose the installation accuracy of the encoder** | 0.1rpm |
| P0468 Sine wave Va voltage value | **Corrected sine-cosine encoder input voltage signal Va real-time value, SinCos.Va** | V |
| P0468[01] Sine wave Vb voltage value | **Corrected sine and cosine encoder input voltage signal Vb real-time value, SinCos.Vb** | V |
| P0469 Resolver Va voltage value | **Corrected resolver input voltage signal Va real-time value, Resolver.Va** | V |
| P0469[01] Resolver Vb voltage value | **Corrected resolver input voltage signal Vb real-time value, Resolver.Vb** | V |
| P0470 Sine wave voltage phase value | **Real-time alternating phase of the input voltage signal of the sine and cosine encoder (Q16 format)** | - |
| P0471 Encoder single-turn position | **P400 is the remaining single lap position value after removing the multi-lap position.** | - |
| P0472 Encoder error counter | **Used to reflect signal interference analysis. Typical error factors include: bus communication CRC check failure, abnormal pulse interval between two adjacent Z signals, invalid sine, cosine and resolver encoders.** | - |
| P0473 Encoder original position value | **Original position value, without electronic gear transformation, absolute encoder is internal underlying data** | - |
| P0474 Encoder position capture value | **Not involved in the calculation, monitoring parameters, [00] When the HTL port is set to 0x1056, the encoder position value captured when DI5 is closed, [01] When the HTL port is set to 0x1056, the encoder captured when DI6 is closed position value** | |
| P0474[01] | | |

## 〉P0480 ~ P0499 Pulse feedback status

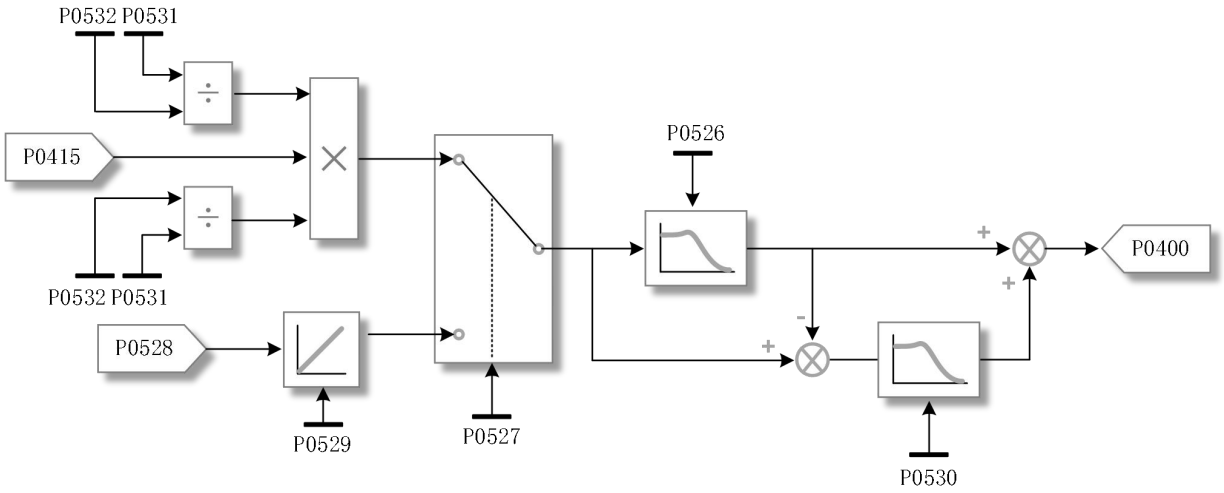
| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0480 Pulse feedback 1 count value | Cumulative number of feedback pulses | 0 |
| P0481 Pulse feedback 1 frequency value | Number of pulses fed back per second | 0.000KHZ |
| P0485 Pulse feedback 2 count value | Reference P0480 | - |
| P0486 Pulse feedback 2 frequency value | Reference P0481 | - |

## 〉P0500 ~ P0549 Encoder feedback port #1 configuration

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0500 Encoder main type | **0=None,<br>1=incremental square wave (TTL/HTL)<br>2=Resolver (resolver); the resolver must be configured at port 2 of the encoder<br>3=SineCos(1VPP)<br>4=Absolute value (mainstream communication type)** | 0 |
| P0501 Incremental resolution | **Set the resolution of the incremental square wave encoder (excluding 4 times the frequency)** | 1024P |
| P0502 Speed measurement filter time | **Low-pass filter time constant for speed measurement, typically 0.5~2.0ms. A low filter time can improve dynamic response performance but the speed pulsation will increase, and vice versa.** | 1.0MS |
| P0503 Rotation direction selection | **Set the phase relationship between encoder A and B signals, and the motor dynamic self-learning can automatically identify** | 0 |
| P0504 Incremental Z signal enable | **0: normal** | 1 |
| P0505 Absolute value sine wave subdivision | **1: Negation** | 0 |
| P0506 Use DI input | **1. = 0x00xy,<br>x = [0] orthogonal, [1] pulse + direction<br>y = [0] differential pulse, [1] DI single-ended collector pulse<br>Suitable for incremental square wave signals:<br>0X01 = Open collector given: quadrature pulse (DI input), can be connected to a single-ended encoder<br>0X11 = Open collector given: Pulse + direction (DI input)<br>0X00 = Differential Given: Quadrature Pulse<br>0X10 = Differential Given: Pulse + Direction** | 0 |
| P0507 Number of resolver pole pairs | **Used when P500=4, select whether the absolute encoder contains sine wave subdivision, 1: contains sine and cosine incremental signals, that is, 0: EnDat 1: EnDat+SinCos** | 1 |
| P0508 Power off position memory enable | **Applicable to incremental square wave encoder, 1=At this time, the ABZ signal is connected through the DI port, (collector or emitter open circuit encoder) 2=On the basis of 1, add activation pulse + direction control** | 0 |
| P0509 Absolute value main type | **Select the main type of absolute encoder<br>0: None,<br>1: EnDat<br>2: Hiperface<br>3: Tamagawa<br>4: BiSS or SSI** | 0 |
| P0510 Absolute value subtype | **Select the subtype under the main type of absolute encoder<br>If P509 selects main type 3, then P510 is defined as follows:<br>0: Tamagawa,<br>1: Innovation,<br>2: Nikon,<br>3: Delta,<br>4: Tamagawa FA-CODER<br>If P509 selects main type 4, then P510 is defined as follows:<br>0: BiSS-C<br>1: BiSS-B<br>2: SSI Gray code<br>3: SSI binary code** | 0 |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0511 Communication clock rate** | **Set the signal transmission rate of different types of absolute encoders<br>EnDat/BiSS/SSI: 1.0~3.0MHz. The longer the cable, the lower the allowed upper limit. If P414 communication errors accumulate, the baud rate needs to be reduced.<br>Tamagawa: 2.5MHz (fixed value)<br>Hiperface: Internally fixed 9600bps (no setting required)** | **2.5** |
| **P0512 Multi-turn digits** | **Typical values: 0 or 12 or 16, must be set correctly** | **16** |
| **P0513 Single lap digits** | **Typical value: 13~32 or 42, must be set correctly** | **23** |
| **P0514 Power-off position memory value** | **Record the position value that will be locked after power off, excluding sine wave subdivision, P508 needs to be enabled** | **0** |
| **P0515 sine and cosine voltage gain** | **Contains 2 sub-indexes, corresponding to the voltage gain and offset of Va and Vb respectively.<br>Calibration is automatically completed at the appropriate motor operating speed** | **100.0%** |
| **P0516 sine and cosine voltage offset** | | **0.0%** |
| **P0517 Resolver voltage gain** | **Contains 2 sub-indexes, corresponding to the voltage gain and offset of COS and SIN respectively.<br>Calibration is automatically completed at the appropriate motor operating speed** | **100.0%** |
| **P0518 Resolver voltage bias** | | **0.0%** |
| **P0519 Sin and cosine inversion enable** | **When the absolute value encoder contains sine and cosine subdivision, when the direction of sine and cosine is inconsistent with the direction of the absolute value, it needs to be set to 1, otherwise the line sequence of sine and cosine needs to be exchanged.** | **0** |
| **P0520 Encoder disconnection detection shield** | **1=Shield disconnection detection, 0=Enable disconnection detection, only for TTL models with disconnection alarm** | **0** |
| **P0521 Linear scale mode enable** | **1: Enable. Used when P500=4, after enabling the grating ruler mode, you need to set P522** | **0** |
| **P0522 Equivalent resolution of grating ruler** | **The number of pulses of the grating ruler corresponding to one revolution of the motor** | **0** |
| **P0523 HTL port selection** | **Used when P506=1, used to connect the designated DI port to the incremental encoder interface ABZ<br>Typical value: 0x0065, which means Z=None, B=DI6, A=DI5, using hexadecimal, 0x0465, which means DI5->HTL.A, DI6->HTL.B, DI4->HTL.Z, 1~8 Corresponds to DI1~DI8** | **0X065** |
| **P0524 Mechanical transmission ratio** | **One revolution of the encoder corresponds to the speed of the motor, typical value: 1.0** | **1.000** |
| **P0525 Conversion output resolution** | **The output resolution after electronic gear conversion is set to 0 and converted according to 1:1. If it is set to non-zero, the internal calculation will be based on this value. For example, if 1048578 is set, the motor will rotate once, and 4.00 will be increased by 1048576.** | **0** |
| **P0526 Position smoothing filter time** | **When used for motor speed feedback: 0~2.0ms, P530=100Hz<br>When used for pulse given control: 0~250ms, P530=0** | **1.000MS** |
| **P0527 Position simulation enable** | **It is prohibited to be used for motor speed feedback and is mostly used for pulse given virtual automatic synthetic output.** | **0** |
| **P0528 Simulation speed signal source** | **Pointer, pointing to zero or target speed variable address, such as speed given ramp output** | **0** |
| **P0529 Actual value of simulation speed** | **When P528 is undefined (always zero), it can be written by the user through the bus or panel.<br>When P528 is defined, P529=P528 pointer object value** | **0RPM** |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0530 position following gain | **Used in conjunction with P526 position smoothing filter, Used to correct the static position error caused by the phase lag of the position smoothing filter; Typical value is 50~250Hz. The larger the value, the smaller the dynamic error, but the filtering effect is weakened. It is mostly used for setting the meter wheel's fixed length measurement.** | **1000.0Hz** |
| P0531 Electronic gear molecule | **Used for handwheel pulse magnification. It is forbidden to be used for motor speed measurement feedback (must be 1)** | **1** |
| P0532 Electronic gear denominator | **Used to reduce the handwheel pulse magnification. It is forbidden to be used for motor speed measurement feedback (must be 1)** | **1** |
| P0533 Position correction offset | **Used for position offset to realize any position as zero point, [0]: position offset value, [1]: Z phase or virtual origin offset value, usually operated by DS402/pulse command, the user does not need to change it** | **0** |




Encoder position feedback signal processing flow chart (taking encoder 1 as an example)

## 〉P550 ~ P579 / P600 ~ P629/ P650 ~ P679 Encoder feedback port #2/3/4 configuration

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P550/P600/P650 encoder main type | **0=None, 1=incremental square wave (TTL/HTL) 2=Resolver (Resolver) 3=SineCos(1VPP) 4=Absolute value (mainstream communication type)** | 0 |
| P551/P601/P651 incremental resolution | **Set the resolution of the incremental square wave encoder (excluding 4 times the frequency)** | 1024P |
| P552/P602/P652 speed measurement filter time | **Low-pass filter time constant for speed measurement, typically 0.5~2.0ms. A low filter time can improve dynamic response performance but the speed pulsation will increase, and vice versa.** | 1.0MS |
| P553/P603/P653 rotation direction selection | **Set the phase relationship between encoder A and B signals, and the motor dynamic self-learning can automatically identify 0: normal 1: Negation** | 0 |
| P554/P604/P654 incremental Z signal enable | **Used when P550/P600/P650=1 or 3, 1=encoder contains Z signal** | 1 |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P555/P605/P655 absolute value sine wave subdivision | **Used when P550/P600/P650=4, select whether the absolute encoder contains sine wave subdivision, 1: Contains sine and cosine incremental signals, that is, 0: EnDat 1: EnDat+SinCos** | 0 |
| P556/P606/P656 uses DI input | **1. = 0x00xy,**<br>**x = [0] orthogonal, [1] pulse + direction**<br>**y = [0] differential pulse, [1] DI single-ended collector pulse**<br>**Suitable for incremental square wave signals:**<br>**0X01 = Open collector given: quadrature pulse (DI input), can be connected to a single-ended encoder**<br>**0X11 = Open collector given: Pulse + direction (DI input)**<br>**0X00 = Differential Given: Quadrature Pulse**<br>**0X10 = Differential Given: Pulse + Direction** | 0 |
| P557/P607/P657 Number of resolver pole pairs | **The number of sinusoidal cycles generated by one revolution of the resolver. It is only coded for the resolver. The number of pole pairs of the resolver must be an integer multiple of the number of pole pairs of the associated motor.** | 1 |
| P558/P608/P658 Power-off position memory enable | **After the driver is powered off, the current position of the encoder is recorded and restored when powered on again.** | 0 |
| P559/P609/P659 Absolute value main type | **Select the main type of absolute encoder**<br>**0: None,**<br>**1: EnDat (HEIDENHAIN)**<br>**2: Hiperface (Sick)**<br>**3: Tamagawa (Tama River, etc.)**<br>**4: BiSS or SSI (open protocol)** | 0 |
| P560/P610/P660 absolute value subtype | **Select the subtype under the main type of absolute encoder**<br>**If the absolute value main type is selected as 3, then P560/P610/P660 are defined as follows:**<br>**0: Tamagawa,**<br>**1: Innovation,**<br>**2: Nikon,**<br>**3: Delta,**<br>**4: Tamagawa FA-CODER**<br>**If the absolute value main type is 4, then P560/P610/P660 are defined as follows:**<br>**0: BiSS-C**<br>**1: BiSS-B**<br>**2: SSI Gray code**<br>**3: SSI binary code** | 0 |
| P561/P611/P661 communication clock rate | **Set the signal transmission rate of different types of absolute encoders**<br>**EnDat/BiSS/SSI: 1.0~3.0MHz. The longer the cable, the lower the allowed upper limit. If P432/P452/P472 communication errors accumulate, the baud rate needs to be reduced.**<br>**Tamagawa: 2.5MHz (fixed value)**<br>**Hiperface: Internally fixed 9600bps (no setting required)** | 2.5 |
| P562/P612/P662 Multiple | **Typical values: 0 or 12 or 16, must be set correctly** | 16 |
| P563/P613/P663 Single turn | **Typical value: 13~32 or 42, must be set correctly** | 23 |
| P564/P614/P664 power-off position memory value | **Record the position value that will be locked after power off, excluding sine wave subdivision, P508 needs to be enabled** | 0 |
| P565/P615/P665 sine and cosine voltage gain | **Contains 2 sub-indexes, corresponding to the voltage gain and offset of Va and Vb respectively.**<br>**Calibration is automatically completed at the appropriate motor operating speed** | 100.0% |
| P566/P616/P666 sine and cosine voltage bias | | 0.0% |
| P567/P617/P667 resolver voltage gain | **Contains 2 sub-indexes, corresponding to the voltage gain and offset of COS and SIN respectively.**<br>**Calibration is automatically completed at the appropriate motor** | 100.0% |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P568/P618/P668 resolver voltage bias | | 0.0% |
| **P569/P619/P669 sine and cosine inversion enable** | **When the absolute value encoder contains sine and cosine subdivision, when the direction of sine and cosine is inconsistent with the direction of the absolute value, it needs to be set to 1, otherwise the line sequence of sine and cosine needs to be exchanged.** | 0 |
| **P570/P620/P670 encoder disconnection detection shield** | **1=Shield disconnection detection, 0=Enable disconnection detection, only for TTL models with disconnection alarm** | 0 |
| **P571/P621/P671 Linear scale mode enable** | **1: Enable. Used when P500=4, after enabling the grating ruler mode, you need to set P522** | 0 |
| **P572/P622/P672 grating ruler equivalent resolution** | **The number of pulses of the grating ruler corresponding to one revolution of the motor** | 0 |
| **P573/P623/P673 HTL port selection** | **Used when P556/P606/P656=1, used to connect the designated DI port to the incremental encoder interface ABZ<br>Typical value: 0x0065, which means Z=None, B=DI6, A=DI5, using hexadecimal, 0x0465, which means DI5->HTL.A, DI6->HTL.B, DI4->HTL.Z, 1~8 Corresponds to DI1~DI8** | 0X065 |
| **P574/P624/P674 mechanical transmission ratio** | **One revolution of the encoder corresponds to the speed of the motor, typical value: 1.0** | 1.000 |
| **P575/P625/P675 converted output resolution** | **The output resolution after electronic gear conversion is set to 0 and converted according to 1:1. If it is set to non-zero, the internal calculation will be based on this value. For example, if 1048578 is set, the motor will rotate once, and 4.00 will be increased by 1048576.** | 0 |
| **P576/P626/P676 position smoothing filter time** | **When used for motor speed feedback: 0~2.0ms, P530=100Hz** | 1.000MS |
| **P577/P627/P677 position simulation enable** | **It is prohibited to be used for motor speed feedback and is mostly used for pulse given virtual automatic synthetic output.** | 0 |
| **P578/P628/P678 simulation speed signal source** | **Pointer, pointing to zero or target speed variable address, such as speed given ramp output** | 0 |
| **P579/P629/P679 Actual value of simulation speed** | **When P578/P628/P678 is undefined (always zero), it can be written by the user through the bus or panel.** | 0RPM |
| **P580/P630/P680 position following gain** | **Used in conjunction with P576/P626/P676 position smoothing filter,<br>Used to correct the static position error caused by the phase lag of the position smoothing filter;<br>Typical value is 50~250Hz. The larger the value, the smaller the dynamic error, but the filtering effect is weakened. It is mostly used for setting the meter wheel's fixed length measurement.** | 1000.0Hz |
| **P581/P631/P681 Electronic gear molecule** | **Used for handwheel pulse magnification. It is forbidden to be used for motor speed measurement feedback (must be 1)** | 1 |
| **P582/P632/P682 electronic gear denominator** | **Used to reduce the handwheel pulse magnification. It is forbidden to be used for motor speed measurement feedback (must be 1)** | 1 |
| **P583/P633/P683 position correction offset** | **Used for position offset to realize any position as zero point, [0]: position offset value, [1]: Z phase or virtual origin offset value, usually operated by DS402/pulse command, the user does not need to change it** | 0 |

## P0700 ~ P0714 Pulse feedback configuration

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0700 resolution** | **Frequency division output resolution, excluding 4 times frequency incremental encoder position signal resolution** | 1024P |
| **P0701 DO output enable** | **1=Activate DO1 and DO2 as pulse quadrature output ports** | 0 |
| **P0702 Simulation mode enable** | **Used for simulation test 1: enabled. 0: off** | 0 |
| **P0703 Simulation pulse frequency** | **Used when P702=1, used to set the number of pulses output per second, which is the number of pulses after four times the frequency.** | 0HZ |
| **P0704 Position signal source selection** | **Select the encoder port to be associated, 0 means no output<br>0=none<br>1=encoder 1<br>2=Encoder 2<br>3=encoder 3<br>4=encoder 4** | 0 |
| **P0710 Resolution** | **Frequency division output resolution, excluding 4 times frequency incremental encoder position signal resolution** | **1024P** |
| **P0711 DO output enable** | **1=Activate DO3 and DO4 as pulse quadrature output ports** | **0** |
| **P0712 Simulation mode enable** | **Used for simulation test 1: enabled. 0: off** | **0** |
| **P0713 Simulation pulse frequency** | **Used when P702=1, used to set the number of pulses output per second, which is the number of pulses after four times the frequency.** | **0HZ** |
| **P0714 Position signal source selection** | **Select the encoder port to be associated, 0 means no output<br>0=none<br>1=encoder 1<br>2=Encoder 2<br>3=encoder 3<br>4=encoder 4** | **0** |

## 〉P0720 ~ P0744 Process PID

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0720 output value | PID output, including conversion scaling | 0.00 |
| P0720[01] output value | Feed forward output value | |
| P0721 Regulator status | PID given | 0.000 |
| P0721[01] Regulator status | PID feedback | |
| P0721[02] Regulator status | PID output | |
| P0721[03] Regulator status | PID error value | |
| P0722 feedback display value | Feedback display value, including 250ms smoothing filter | 0.00 |
| P0723 status word | Bit0=Error is greater than 50% of the range; Bit1=Error is greater than 100% of the range; Bit2=Feedback is less than zero; Bit3=Feedback exceeds 100% of the range; Bit4=Feedback is below -100% of the range; Bit5=Integral is saturated | 0X0000 |
| P0725 PID function activation | 1: PID function is on 0: PID function is off | 0 |
| P0726 PID proportional gain 1 | The first set of proportional gains | 1.00 |
| P0726[01] PID proportional gain 2 | The second set of proportional gains | |
| P0727 PID proportional integral 1 | First set of integration time | 1.00s |
| P0727[01] PID proportional integral 2 | Second set of integration time | |
| P0728 sampling time | Sampling time, ms, optional value 0.25ms/1ms/10ms | 1.00ms |
| P0729 Feedforward gain | ,ms, optional value 0.25ms/1ms/10ms | 1.000 |
| P0730 Feedforward automatic adjustment time | The feedforward output value is superimposed to the PID output after being scaled by the feedforward gain. | 3.0s |
| P0731 Feedforward automatic adjustment level | The period during which the feedforward gain is automatically adjusted according to the error of the PID, that is, the response time of the feedforward gain update. | 0.0% |
| P0732 PID maximum output value | The feedforward gain adjustment must satisfy that the feedforward output value is greater than a certain level. If the feedforward input is too low, the feedforward gain | 100.0% |
| P0733 PID minimum output value | Limiting value after PID+feedforward compensation | 0.0% |
| P0734 Reference/feedback reference | Reference/feedback reference, associated with P0738 and P0739 reference and feedback signal sources, generally corresponds to the maximum value of the reference/feedback signal source | 1 |
| P0735 Output reference | PID output reference defines the maximum and minimum reference values for P0732 and P0733. | 1 |
| P0736 Feedforward reference | Main traction reference value, associated with P0740, generally corresponds to the maximum value of the main traction signal source | 1 |
| P0737 PID internal reference | If the given signal source pointer is zero, the given actual value can be set directly | 0.000 |
| P0738 Given signal source | PID given signal source can be freely defined. If the given signal is greater than the feedback, the speed will increase. If the given signal is less than the feedback, the speed will decrease. | 0 |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P0739 PID feedback signal source** | **PID feedback signal source, generally set to AI2:P0149** | **0** |
| **P0740 Feedforward signal source** | **PID main traction signal source, generally set to AI1:P0147** | **0** |
| **P0741 PID gain switching signal source** | **If the pointer value is 0, the first set of proportion and integral is selected, and if it is 1, the second set of proportion and integral is selected, which can be set to the DI terminal.** | **0** |
| **P0742 Feedforward gain initial value** | **Feedforward gain initialization default value** | **1.000** |
| **P0743 Load feedforward gain** | **The rising edge of the pointer value automatically loads the initial value of the feedforward gain, and the associated parameters P0742 and P0729** | **0** |
| **P0744 PID operation enable signal source** | **0=The operation stops, the integral term is cleared, and the given slope is cleared. 1=The operation is enabled, the integral term is enabled, and the given slope is enabled.** | **0** |

## 〉P0800 ~ P0889 Power module topology configuration

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0800 Frame type | Factory settings, related to the model, the parameters on this page need to be restarted to take effect. | - |
| P0801 Inverter unit type 1 | Factory settings from the manufacturer, related to the model | - |
| P0802 Inverter unit type 2 | | |
| P0803 Inverter unit type 3 | | |
| P0804 Inverter unit 4 type | | |
| P0805 Motor axis 1 enable | After the motor shaft enable is changed, the system needs to be restarted to take effect, and the corresponding inverter power unit is bound according to the number of inverter units (P809~P812) and the inverter unit list (P813~P828). | - |
| P0806 Motor axis 2 enable | | |
| P0807 Motor axis 3 enable | | |
| P0808 Motor axis 4 enable | | |
| P0809 Number of axis 1 inverter units | When the number is greater than or equal to 2, it means multiple inverter units are output in parallel. The actual physical wiring must be completely consistent with the definition. | - |
| P0810 Number of axis 2 inverter units | | |
| P0811 Number of axis 3 inverter units | | |
| P0812 Number of axis 4 inverter units | | |
| P0813 Axis 1 inverter unit list 1 | Used when P805=1, used to define the inverter unit used for axis 1.<br>For example, if the number of P809 is 2 and axis 1 uses modules 1 and 2, then P814=1 and P815=2 means that modules 1 and 2 are used at the same time.<br>If the number of P809 is 1 and axis 1 uses module 1, then P814=1 and P815=2, which means that only module 1 is used.<br>If the number of P809 is 1 and axis 1 uses module 2, then P814=2 and P815=0, which means only module 2 is used. | - |
| P0814 Axis 1 inverter unit list 2 | | |
| P0815 Axis 1 inverter unit list 3 | | |
| P0816 Axis 1 inverter unit list 4 | | |
| P0817 Axis 2 inverter unit list 1 | Used when P806=1, used to define the inverter unit used for axis 2, the same as above | - |
| P0818 Axis 2 inverter unit list 2 | | |
| P0819 Axis 2 inverter unit list 3 | | |
| P0820 Axis 2 inverter unit list 4 | | |
| P0821 Axis 3 inverter unit list 1 | Used when P807=1, used to define the inverter unit used by axis 3, the same as above | - |
| P0822 Axis 3 inverter unit list 2 | | |
| P0823 Axis 3 inverter unit list 3 | | |
| P0824 Axis 3 inverter unit list 4 | | |
| P0825 Axis 4 inverter unit list 1 | Used when P808=1, used to define the inverter unit used by axis 4, the same as above | - |
| P0826 Axis 4 inverter unit list 2 | | |
| P0827 Axis 4 inverter unit list 3 | | |
| P0828 Axis 4 inverter unit list 4 | | |
| P0887 Inverter structure type | 1=all-in-one, 2=multi-transmission parallel, 3=single machine, 4=single inverter + filter, 5=basic rectifier, 6=inverter X3+basic rectifier, 7=inverter X3+filter, 8=three Level + filter, 10 = multi-winding mode | Factory configuration |

## P0900 ~ P0915 User data area

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0900 Floating point number 1 | 32-bit single-precision floating point number, mostly used for writing data on the bus or receiving and writing master-slave communication data. When needed, point to the corresponding data address through a pointer. | 0.0 |
| P0901 Floating point number 2 | | |
| P0902 Floating point number 3 | | |
| P0903 Floating point number 4 | | |
| P0904 Floating point number 5 | | |
| P0905 Floating point number 6 | | |
| P0906 Floating point number 7 | | |
| P0907 Floating point number 8 | | |
| P0908 Integer 1 | 32-bit signed integer, mostly used for bus writing data or master-slave communication data receiving and writing | 0 |
| P0909 Integer 2 | | |
| P0910 Integer 3 | | |
| P0911 Integer 4 | | |
| P0912 Integer 5 | | |
| P0913 Integer 6 | | |
| P0914 Integer 7 | | |
| P0915 Integer 8 | | |

## 〉P0916 ~ P0939 Control panel page content definition

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0916 Page 1 data 1 | The display content of page 1 is defined. Press the OK key on the main interface to have Chinese annotations. | P1000=motor speed |
| P0917 Page 1 Data 2 | | P1002=motor current |
| P0918 Page 1 Data 3 | | P1001=motor frequency |
| P0919 Page 2 data 1 | The display content of page 2 is defined. Press the OK key on the main interface to have Chinese annotations. | P1001=Output voltage |
| P0920 Page 2 Data 2 | | P1005=Active power factor |
| P0921 Page 2 Data 3 | | P1001=motor torque |
| P0922 Page 3 Data 1 | The display content of page 3 is defined. Press the OK button on the main interface to have Chinese annotations. | - |
| P0923 Page 3 Data 2 | | - |
| P0924 Page 3 Data 3 | | - |
| P0925 Page 4 Data 1 | The display content of page 4 is defined. Press the OK key on the main interface to have Chinese annotations. | - |
| P0926 Page 4 Data 2 | | - |
| P0927 Page 4 Data 3 | | - |
| P0928 Page 5 Data 1 | The display content of page 5 is defined. Press the OK button on the main interface to have Chinese annotations. | - |
| P0929 Page 5 Data 2 | | - |
| P0930 Page 5 Data 3 | | - |
| P0931 Page 6 Data 1 | The display content definition on page 6. Press the OK key on the main interface to have Chinese annotations. | - |
| P0932 Page 6 Data 2 | | - |
| P0933 Page 6 Data 3 | | - |
| P0934 Page 7 Data 1 | The display content definition on page 7. Press the OK button on the main interface to have Chinese annotations. | - |
| P0935 Page 7 Data 2 | | - |
| P0936 Page 7 Data 3 | | - |
| P0937 Page 8 Data 1 | The display content definition on page 8. Press the OK button on the main interface to have Chinese annotations. | - |
| P0938 Page 8 Data 2 | | - |
| P0939 Page 8 Data 3 | | - |

## 〉P0940 ~ P0957 Others, bit pointers and MOVE instructions

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P0940 Reserved1 | Reserve | |
| P0941 Reserved2 | Display content in the upper right corner | 0 |
| P0942 Reserved3 | Reserve | |
| P0943 Reserved4 | Reserve | |
| P0944 u16LogRecTotal | Total number of log records | |
| P0945 u16ReadRecIndex | The read index for the target log event | |
| P0946 u16LogDatDiskIndex | Disk index corresponding to log data | |
| P0947 u32EventLogIndex | Absolute index of event log | |
| P0950 MOV command 1 | [0] = source pointer, used for data copy, similar to the MOVE instruction. The content of the source pointer can be copied to the content of the target pointer in real time. Both the source and target pointers can be freely defined. It is typically used to summarize different bit information into in the specified integer object.<br>[1]=target pointer<br><br>For example:<br>P950[0] = P140.03 (source pointer DI4)<br>P950[1] = P1647.00 (pulse full-closed loop configuration word Bit0)<br>When DI4 is closed, P1647 parameter BIT0=1 | 0 |
| P0950[01] MOV command 1 | | 0 |
| P0951 MOV command 2 | | 0 |
| P0951[01] MOV command 2 | | 0 |
| P0952 MOV command 3 | | 0 |
| P0952[01] MOV command 3 | | 0 |
| P0953 MOV command 4 | | 0 |
| P0953[01] MOV command 4 | | 0 |
| P0954 MOV command 5 | | 0 |
| P0954[01] MOV command 5 | | 0 |
| P0955 MOV command 6 | | 0 |
| P0955[01] MOV command 6 | | 0 |
| P0956 MOV command 7 | | 0 |
| P0956[01] MOV command 7 | | 0 |
| P0957 MOV command 8 | | 0 |
| P0957[01] MOV command 8 | | 0 |

## 〉P1000 ~ P1053Motor shaft 1 basic status

P1060 ~ P1097 Axis 1 kernel parameters ---------- Used to record and count the basic running status of the CPU where the driver is located. Ordinary users do not need to pay attention, and can only be viewed on the host computer.

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1000 Motor actual speed** | **Axis 1 motor running speed display value<br>The encoderless control mode is the estimated speed of the motor model,<br>The control mode with encoder is the actual measured speed of the encoder.** | **0.0rpm** |
| **P1001 Motor actual frequency** | **The synchronous rotation frequency display value of the stator magnetic field of the axis 1 motor** | **0.00Hz** |
| **P1002 Motor actual** | **Measured display value of axis 1 motor stator current** | **0.0A** |
| **P1003 Output voltage** | **Fundamental effective value of axis 1 motor line voltage** | **0.0V** |
| **P1004 Output active power** | **Axis 1 motor input side fundamental wave active power** | **0.0kW** |
| **P1005 Active power factor** | **Axis 1 motor input side fundamental power factor** | **0.000** |
| **P1006 Second speed feedback** | **For master-slave applications, the feedback value of slave communication to the host** | **0.0rpm** |
| **P1007 Motor flux display** | **The ratio of the estimated stator magnetic flux of the axis 1 motor to the rated magnetic flux<br>Asynchronous motor: 100% corresponding to the rated magnetic flux of the motor<br>Permanent magnet motor: 0% corresponds to no field weakening, a negative number indicates entering field weakening, and 100% corresponds to the rated flux.** | **0.0%** |
| **P1008 Motor torque display** | **The ratio of the estimated output torque of the axis 1 motor to the rated torque** | **0.0%** |
| **P1009 Speed given output** | **The original speed reference signal value of the axis 1 motor without ramp processing,** | **0.0rpm** |
| **P1010 Speed ramp input** | **The original given value is always equal to the given value displayed on the panel and will not be zero due to shutdown.** | **0.0rpm** |
| **P1011 Speed ramp output** | **The actual input value of the axis 1 motor speed ramp generator is always equal to the target setting during operation, and returns to zero value when it stops.** | **0.0rpm** |
| **P1012 Torque ramp input** | **The actual output value of the axis 1 motor speed ramp generator is output after slope conversion and reset to zero after shutdown.** | **0.0%** |
| **P1013 Torque ramp output** | **Actual input value of axis 1 motor torque ramp generator, reset to zero after shutdown** | **0.0%** |
| **P1014 Actual control mode** | **Actual control mode of axis 1 motor<br>0: speed<br>1: Torque<br>2: Torque speed limit<br>6: Speed limit torque** | **0** |
| **P1015 Actual speed reference** | **Actual given value of the axis 1 motor control speed regulator, reset to zero when stopped** | **0.0rpm** |
| **P1016 Actual torque reference** | **The actual value of the axis 1 motor control torque given. Note that the corresponding amplitude is not the effective value.** | **0.00A** |
| **P1017 Actual frequency reference** | **Actual reference of axis 1 motor control frequency, equivalent frequency value of P1015** | **0.00Hz** |

| | | |
|---|---|---|
| **P1018 Encoder speed feedback** | **The speed actual value of the actual associated encoder, specified by the speed feedback port of the motor parameter encoder object** | **0.0rpm** |
| **P1019 Encoder position feedback** | **The actual position value of the associated encoder, specified by the position feedback port of the motor parameter encoder object** | **0p** |
| **P1020 Encoder mechanical angle** | **The mechanical angle of the encoder corresponding to the speed feedback port is based on the Z signal or single-turn absolute zero.** | **0.0000°** |
| **P1021 Encoder electrical angle output** | **Actual encoder electrical angle after interpolation, OUT** | **0.0000°** |
| **P1022 Encoder electrical angle input** | **Original encoder electrical angle, including electrical angle offset compensation and pole-log transformation, IN** | **0.0000°** |
| **P1023 Actual electrical angle** | **The actual electrical angle used,** | **0.000°** |
| **P1024 given value of torque loop** | **Closed loop: encoder measures electrical angle, open loop: motor model estimates angle** | **0.0%** |
| **P1025 Actual torque value Nm** | **The ratio of the actual torque loop's given torque to the rated torque of the motor. 1.0 corresponds to the torque of the motor.** | **0NM** |
| **P1026 Multi-speed given output** | **Output the current torque based on the estimated rated torque, floating point number type** | **0.0rpm** |
| **P1027 Speed up and down unit output** | **Multi-speed unit operation output** | **0.0rpm** |
| **P1028 Temperature sensor resistance** | **Operation output of speed up and down unit** | **1Ω** |
| **P1029 Motor sensor temperature** | **Motor temperature sensor equivalent resistance** | **0.0℃** |
| **P1030 Speed control status word** | **Bit Description of Speed Status Word 1**<br>**Bit0: Zero speed**<br>**Bit1: Reverse**<br>**Bit2: Ramp acceleration (invalid)**<br>**Bit3: Slope deceleration (invalid)**<br>**Bit4: Speed reached**<br>**Bit6: There is encoder closed loop (invalid)**<br>**Bit7: There is an encoder (invalid)**<br>**Bit13: Torque comparator 2 output corresponds to P1505 setting signal source**<br>**Bit14: Speed comparator 1 output corresponding to P1500 setting signal source** | **Bool** |

| | | |
|---|---|---|
| P1031 Drive control status word | Bit0: Ready<br>Bit1: Fault<br>Bit2: Alarm<br>Bit3: Limiting<br>Bit4: Running<br>Bit5: Reverse request<br>Bit6: Start request<br>Bit7: Shutdown request<br>Bit8: Click to activate<br>Bit9: Internal shutdown request<br>Bit10: External operation enable<br>Bit11: Start 2<br>Bit12: Modulation output activated<br>Bit13: Servo enable<br>Bit14: External control location 2<br>Bit15: Local control<br>Bit16: OFF1 (deceleration to stop)<br>Bit17: OFF2 (emergency stop free stop)<br>Bit18: OFF3 (emergency stop deceleration stop)<br>Bit19: Reserved<br>Bit20: Ramp input is 0<br>Bit21: Ramp output is 0<br>Bit22: Soft start closed<br>Bit23: Reserved<br>Bit24: Reserved<br>Bit25: Remote mode REM<br>Bit26: Hoisting brake is open<br>Bit27: Reserved<br>Bit28: Reserved<br>Bit29: Zero speed state<br>Bit30: Accelerating (invalid)<br>Bit31: Decelerating (invalid) | Bool |
| P1032 Speed feedback value | Actual feedback value for speed control | 0.0rpm |
| P1033 Synchronization frequency value | Actual value of motor synchronous frequency | 0.00Hz |
| P1034 Asynchronous slip frequency value | Real-time slip frequency estimates for asynchronous motors | 0.000Hz |
| P1035 Phase difference mode signal-to-noise ratio | For the signal-to-noise ratio of the initial magnetic pole search of the synchronous motor, if it reaches 2.0 or above, the result is reliable. If it is lower than 2, it is recommended to increase the search current value. | 0.00 |
| P1036 Phase-finding common mode signal-to-noise ratio | | 0.00 |
| P1037 Phase search angle output value | The initial phase value searched when starting the PM motor without encoder (Q16 format) | 0.000 |
| P1038 IGBT junction temperature estimate | Estimate the real-time IGBT chip temperature. The theoretical limit of the device is 175℃. | 0.0℃ |
| P1039 Radiator temperature actual value | Depending on the driver model, its operating limit is derated to approximately 125-145°C. | 0.0℃ |
| P1040 This running time | Actual temperature measured by radiator temperature sensor | 0.00h |
| P1041 Last running time | Record the time of this run | 0.00h |
| P1042 fault status | Record the last running time | 0 |
| P1043 Warning status | Current warning status of the drive | 0 |
| P1044 Current fault code | Current drive fault code | 0 |
| P1045 Current warning code | Warning code for current drive | 0 |

| | | |
|---|---|---|
| **P1046[00-03] Load distribution statistics** | **Statistics of the proportions of different load current ranges during operation** | **0.0%** |
| **P1047[00-03] Temperature distribution statistics** | **Intervals 1-4 respectively correspond to: 1 light load, 2 comfort, 3 full load, 4 overload,** | **0.0%** |
| **P1048[00-07] User specified record** | **This parameter enables monitoring of loads based on rapid identification of load characteristics and distribution.** | |
| **P1049[00-07] Current latest fault record** | **Identification, diagnosis and other applications** | |
| **P1050[00-07] Current latest warning record** | **Statistics of the proportion of different temperature ranges of the radiator during operation** | |
| **P1051[00-07] Current latest event record** | **Intervals 1-4 respectively correspond to: 1 low temperature, 2 comfortable, 3 medium temperature, and 4 high temperature.** | |
| **P1052 IGBT power loss** | **This parameter will be used to quickly query and diagnose the installation environment where the drive is located.** | **0.0** |
| **P1053 MTPA phase angle** | | **0.0deg** |

## 〉P1100 ~ P1124 ~P1145 Axis 1 motor parameters

| Axis control object | Motor object | Parameter address range | Switching mechanism (P1253) |
|---|---|---|---|
| Axis 1 | Current motor parameters | P1100 ~ P1124 | Display the currently used motor parameters |
| | Motor parameters 1 | P1130 ~ P1154 | 0: Select motor parameter 1 |
| | Motor parameters 2 | P1160 ~ P1185 | 1: Select motor parameters 2 |
| | Motor parameters 3 | P1190 ~ P1215 | 2: Select motor parameters 3 |
| | Motor parameters 4 | P1220 ~ P1245 | 3: Select motor parameters 4 |

**Axis 1 defines multiple sets of parameters that can be switched online. Motor parameter 1 is used by default. You can select the motor parameters to be used through parameter P1253. It is mostly used for switching between multiple motors, or switching between Δ and Y-shaped connections of a single motor. It only supports shutdown (no voltage output) switching, and the switching time only takes 1ms. It is necessary to write the target motor serial number (0~3) through bus communication to trigger the motor parameter switching. The keyboard has simplified parameters and only displays the current motor parameters. If you need to set multiple sets of parameters, please use the host computer software to set them. For the explanation of other groups of motor parameters, please refer to the current motor parameters and will not be described again.**

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P1100 speed feedback port | The physical port number of the encoder speed measurement feedback signal of the current motor object of axis 1. Select the corresponding port where the encoder is inserted.<br>0: No sensor, no encoder access, no encoder control<br>1: Corresponding to encoder interface 1 (X221)<br>2: Corresponding to encoder interface 2 (X222)<br>3: Corresponding to encoder interface 3 (X223)<br>4: Corresponding to encoder interface 4 (X224) | 0 |
| P1101 position feedback port | The physical port number of the current motor object encoder position measurement feedback signal of axis 1. If it is a single encoder application, please keep it consistent with the P1100 setting.<br>0: No sensor, the encoder is not connected, and position control cannot be performed.<br>1: Corresponding to encoder interface 1 (X221)<br>2: Corresponding to encoder interface 2 (X222)<br>3: Corresponding to encoder interface 3 (X223)<br>4: Corresponding to encoder interface 4 (X224) | 0 |
| P1102 Motor type | Set the type of the current motor object of axis 1<br>0: Three-phase asynchronous motor (squirrel cage rotor)<br>1: Three-phase synchronous motor (sinusoidal magnetic field permanent magnet)/linear permanent magnet motor | 0 |
| P1103 Motor rated frequency | The rated operating frequency of the current motor object in axis 1. The data is provided by the motor nameplate. | 50.0Hz |
| P1104 Motor rated speed | The rated operating speed of the current motor object in axis 1. The data is provided by the motor nameplate. | 1450.0rpm |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1105 Motor rated voltage** | **Axis 1 Stator voltage at rated operation of the current motor object, data provided by the motor nameplate<br>Note:For permanent magnet synchronous motors, the rated voltage of the motor should be close to the back electromotive force value at the rated speed of the motor.** | **380V** |
| **P1106 Motor rated current** | **The rated operating current of the current motor object of axis 1, the data is provided by the motor nameplate;<br>When driving multiple motors, enter the total motor current** | **0.0A** |
| **P1107 Linear motor pole pitch** | **When the current motor object of axis 1 is a linear motor, the length occupied by a pair of magnetic poles is usually the distance between two adjacent magnetic north poles. Generally, a motor with a large thrust has a large pole pitch, which is different from what can be accommodated between a pair of magnetic poles. The number of wire turns is related to the length** | **0.0mm** |
| **P1108 Electrical angle offset** | **Axis 1 is the offset angle between the zero point of the encoder and the zero point of the winding of the current permanent magnet synchronous motor object. This parameter needs to be obtained through motor rotation parameter identification. The angle error of the two resolver identifications must be within 3<br>Note:<br>The value of this parameter is the electrical angle<br>This parameter only applies to permanent magnet synchronous motors** | **0deg** |
| **P1109 Number of motor pole pairs** | **The number of magnetic pole pairs of the current motor object in axis 1.<br>The drive automatically calculates based on the rated frequency and rated speed before running and cannot be set by the user.** | **-** |
| **P1110 Motor no-load current** | **Rated excitation current required for the current asynchronous motor object in axis 1<br>Note:<br>This parameter must be accurately obtained through rotation parameter identification.<br>In static parameter identification mode, the user needs to manually enter the parameter.** | **0.0A** |
| **P1111 Stator phase resistance** | **The single-phase resistance value of the stator winding of the current motor object in axis 1** | **0.000ohm** |
| **P1112 Rotor phase resistance** | **The rotor single-phase resistance value of the current asynchronous motor object in axis 1** | **0.000ohm** |
| **P1113 Stator phase inductance** | **The equivalent single-phase stator inductance of the current asynchronous motor object in axis 1, including leakage inductance and mutual inductance** | **0.0mH** |
| **P1114 Leakage inductance coefficient** | **The leakage inductance coefficient of the current asynchronous motor object in axis 1,** | **0.0%** |
| **P1115 Direct axis inductor Ld** | **That is, the ratio of stator leakage inductance to stator phase inductance.** | **0.00mH** |
| **P1116 Quadrature axis inductor Lq** | **Axis 1 Single-phase magnetic pole axis (d-axis) inductance of the current synchronous motor object** | **0.00mH** |
| **P1117 Back electromotive force coefficient** | **Axis 1 Single-phase interpolar axis (q-axis) inductance of the current synchronous motor object** | **0.0mV/rpm** |
| **P1118 Core saturation coefficient** | **The reduction coefficient of the inductance when the core of the current motor object of axis 1 is saturated** | **0.0%** |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1119 Moment of inertia** | **If it is lower than 70%, it indicates that the motor inductance is obviously nonlinear, and it is recommended to increase the rated frequency of the load motor.** | **0.000Kgm^2** |
| **P1120 Equivalent acceleration time** | **Axis 1 is the effective moment of inertia on the rotation axis of the current synchronous motor object,** | **0.000s** |
| **P1121 Three-phase stator resistance monitoring value** | | **0** |
| | **P1121[01]** | |
| | **P1121[02]** | |
| **P1122 Curve effective length** | **The total number of magnetization curve segment intervals of the current synchronous motor object in axis 1** | **0** |
| **P1123 [00-09] Magnetization curve excitation current** | **The abscissa current point of the magnetization curve of the current synchronous motor object in axis 1 [00]-[09]** | **0.0A** |
| **P1124 [00-09] Magnetization curve excitation flux linkage** | **Axis 1 current synchronous motor object's magnetization curve ordinate flux linkage points [00]-[09]** | **0.000** |
| **P1125 Rated torque estimation** | **Motor rated torque estimate** | **0Nm** |

## 〉P1250 ~ P1260 Motor shaft 1 global control parameters

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1250 User APP type** | **Set the drive application type for axis 1<br>0: DS402, for EtherCAT/CANopen according to driver 402 control protocol<br>1: Pulse servo application, activate pulse reference for servo positioning control<br>2: Electronic cam application,<br>3: Curl Control<br>100: AC voltage source<br>101: DC voltage source, DCDC products need to be set<br>102: AC current source<br>104: Rectification mode<br>105: Three-phase braking unit** | **0** |
| **P1251 Control algorithm type** | **Set the control algorithm type of the axis 1 motor (select the motor drive mode)<br>Among them, 1 is preferred. Note: Depending on the model, the default optimal control method has been set at the factory.<br>0 = Open loop vector control. Motors suitable for fluid loads and extreme special situations.<br>1 = direct torque control. Torque control can be achieved with or without an encoder, and position control can be achieved with an encoder. Note: In this mode, the driver must be connected to the motor, otherwise it will report an output phase failure fault.** | **1** |
| **P1252 Parameter identification type** | **Set the parameter identification method of the axis 1 motor and select the identification method. It will be completed and automatically stopped within about 1 minute after local startup. It will automatically change to 0 after the identification is completed.<br><br>0: Not recognized<br>1: Rotational ; based on static identification, additionally added: asynchronous motor no-load current/stator inductance, synchronous motor back electromotive force coefficient/electrical angle offset, identification of encoder resolution/direction<br>2: Standstill ; asynchronous motor stator resistance/rotor resistance/leakage inductance coefficient, synchronous motor stator resistance/AC/DC axis inductance/core saturation coefficient<br>3: PM autophasing , only for synchronous motors with encoders. To learn the electrical angle measurement, you need to rotate the motor for more than 5 turns before performing PM. Rotate the motor shaft multiple times at different positions for PM comparison and consistency.** | **0** |
| **P1253 Motor object selection** | **Select the index of the axis 1 motor object as the basis for controlling the current motor parameters. Four sets of built-in motor parameter communication can be switched. For detailed explanation, view the motor parameter group.<br>0: Select motor parameter 1<br>1: Select motor parameters 2<br>2: Select motor parameters 3<br>3: Select motor parameters 4** | **0** |
| **P1254 Motor line sequence exchange** | **Changing the phase sequence of the axis 1 motor is equivalent to changing the sequence of any two phases of the motor.<br>0: Normal phase sequence, UVW<br>1: Reverse phase sequence, UWV** | **0** |
| **P1255 Parameter recovery request** | **Request to restore default parameter settings for axis 1** | **0** |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1256 Parameter set selection signal source** | **Set parameter set to select signal source<br>Used for overall switching of all motor control-related parameters, supporting a total of 2 parameter set switching. Only supports offline switching (no voltage output), the switching time takes about 50ms<br>0: Parameter set 1<br>1: Parameter set 2** | **0** |
| **P1257 Parameter set switching status** | **Parameter file toggle switch<br>0: File 1; 1: File 2** | **0** |
| **P1258 Total number of log records** | **Total number of all log records on disk** | **-** |
| **P1259 Log event reading index** | **The read index for the target log event** | **-** |
| **P1260 Log data disk index** | **Disk index corresponding to log data** | **-** |
| **P1261 event record index** | **Absolute index of event log** | **-** |
| **P1262 U-phase current measurement correction gain** | **Gain used to correct the U-phase current feedback value of the axis 1 motor, usually no adjustment is required** | **1.000** |
| **P1263 V phase current measurement correction gain** | **Gain used to correct the V-phase current feedback value of the axis 1 motor, usually no adjustment is required** | **1.000** |
| **P1264 W phase current measurement correction gain** | **Gain used to correct the W-phase current feedback value of the axis 1 motor. Usually no adjustment is required.** | **1.000** |
| **P1265 Distributed charge uC** | **Range 0-1000, used to eliminate low-speed dead zones** | **0.0** |
| **P1266 Multi-phase motor phase difference** | **Used for multi-phase motor phase difference setting** | **0.0deg** |

## P1270 ~ P1285 Motor axis 1 loop control parameters

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P1270 Speed loop proportional gain | Set the axis 1 speed control proportional gain. Increasing it will increase the speed rigidity. Excessive gain will cause motor oscillation. | 1.00 |
| P1271 Speed loop integration time | Set the integration time of the axis 1 speed controller. Decreasing it will increase the speed response. | 0.200s |
| P1272 Position loop proportional gain | Set the proportional gain of the axis 1 position controller. Increasing it will increase the rigidity of the position loop. | 50HZ |
| P1273 Voltage loop proportional gain | Sets the proportional gain of the axis 1 DC bus voltage controller | 4.000 |
| P1274 Torque (current) loop proportional gain | Set the proportional gain of the torque (current) controller | 1.00 |
| P1275 Acceleration compensation gain | Set the gain of speed feedforward compensation. Reasonable setting can reduce the dynamic following error between the actual speed and the given speed during acceleration and deceleration. | 0.00s |
| P1276 Speed loop proportional gain 2 | Set the proportional gain of the second group of speed controllers | 1.00 |
| P1277 Current loop proportional gain 2 | Set the proportional gain of the second group of current controllers | 1.00 |
| P1278 Gain switching signal source | Used for switching between two sets of speed controller and current controller gains<br>0: Gain 1<br>1: Gain 2<br>Pointers can be used for dynamic switching | 0 |
| P1279 Notch center frequency | The center frequency of the axis 1 trap, corresponding to the oscillation frequency that needs to be suppressed | 8000Hz |
| P1280 Notch filter bandwidth ratio | Stopband bandwidth of the notch normalized to axis 1 relative to the center frequency | 0.0% |
| P1281 Notch suppression depth | The attenuation amplitude of the signal at the center frequency of the stop band of the axis 1 notch | 0.0% |
| P1282 Notch filter enable maximum speed | Set the maximum speed value of axis 1 to enable the notch filter, Above this speed the notch is automatically disabled. | 0rpm |
| P1283 Notch filter enable minimum speed | Set the lowest speed value for axis 1 to enable the notch filter, Below this speed the notch is automatically disabled. | 0rpm |
| P1284 Resonant frequency detection amplitude | The amplitude of the acceleration signal in the resonance frequency band of axis 1 is used as the basis for resonance judgment. | 1000rpm/s |
| P1285 Resonant frequency detection quality | The relative strength of the spectrum of the acceleration signal in the axis 1 resonance frequency band, which is used as the basis for resonance judgment. | 90% |
| P1286 Position loop differential time | Position loop differential time | 0.00ms |
| P1287 Output voltage limiter value | If it is set to zero, the limiting will be cancelled. The unit is 1V. If the setting value is less than 25% of the supply voltage, the setting is considered invalid. (Only direct torque control is effective), which facilitates field weakening control testing of the motor under high voltage. | 0 |
| P1290 Torque loop DQ axis cross integral gain | 0 is the weakest ~ 1.0 is the strongest | 0.25 |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P1291 Torque loop cross integral gain Q-axis attenuation coefficient | 0 is completely attenuated ~ 1.0 is completely equivalent to the D-axis. The default value of 0.25 is sufficient for most situations. No adjustment is required unless the rigidity limit is challenged. | 0.25 |

## 〉P1300 ~ P1349 Motor axis 1 performance control parameters

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1300 forward torque limit value** | **The maximum output torque allowed for forward rotation of axis 1 is relative to the rated torque of the motor. Positive value, 100% represents the rated torque. The default value is set ≥100% according to different models.** | **100.0%** |
| **P1301 Reverse torque limit value** | **The maximum output torque allowed for axis 1 reverse rotation, relative to the rated torque of the motor, negative value, -100% represents the rated torque** | **-100.0%** |
| **P1302 Starting initial torque** | **The torque offset set when the axis 1 motor starts, relative to the rated torque of the motor** | **0%** |
| **P1303 Maximum electric power** | **Axis 1 electric power limit value, relative to the rated power of the motor, 100% represents the rated power** | **100.0%** |
| **P1304 Maximum power generation** | **Axis 1 generated power limit value, relative to the rated power of the motor, 100% represents the rated power** | **100.0%** |
| **P1305 Load loss detection level** | **Underload protection level** | **0%** |
| **P1306 Field weakening current limiter** | **The maximum allowable field weakening current of the synchronous motor, relative to the rated current of the motor** | **70%** |
| **P1307 Asynchronous motor slip gain** | **Used to correct the slip estimate of asynchronous motors to improve motor speed accuracy** | **100%** |
| **P1308 MTPA gain** | **Used to control the maximum torque and current ratio of synchronous motors to achieve the reduction of current at the same torque output.** | **100%** |
| **P1309 Overmodulation gain** | **Overmodulation output intensity, 100% - 115%, used for voltage gain output after field weakening** | **105.0%** |
| **P1310 Mechanical transmission ratio coefficient** | **Set the transmission ratio between the motor shaft and the load, that is, the number of rotations of the motor shaft corresponding to one rotation of the load** | **1.0000** |
| **P1311 Torque boost coefficient** | **In scalar mode, the low output voltage of the motor at low speed can easily lead to insufficient output torque;** | **20%** |
| **P1312 Pre-excitation time** | **This parameter can be used to compensate for the low-speed output voltage and thereby increase the low-speed output torque.** | **0.00s** |
| **P1313 Oscillation suppression gain** | **The duration of pre-excitation before starting the motor, used for increasing the starting torque of asynchronous motors and correcting the magnetic pole angle of synchronous motors** | **100.0%** |
| **P1314 Phase search injection current value** | **For oscillation suppression in scalar control mode** | **50%** |
| **P1315 Phase search angle correction value** | **The size of the current injected by the phase search before starting the synchronous motor, relative to the rated current of the motor** | **0** |
| **P1316 Permanent magnet motor polarity** | **The polarity of the permanent magnet pole at the salient pole of the permanent magnet synchronous motor inductor affects the magnetic pole search angle<br>0: Non-standard polarity (positive polarity), the driver magnetic pole search uses a special orientation mode<br>1: Standard polarity (reverse polarity), driver magnetic pole search uses universal orientation mode** | **0** |
| **P1317 Stall frequency level** | **Threshold frequency for motor stall detection, when the detected motor running frequency is lower than this frequency<br>The driver determines that the motor is stalled** | **1.0Hz** |

| | | |
|---|---|---|
| P1318 Stall protection delay | After detecting motor stall, the delay time for activating stall protection | 2000ms |
| P1319 Speed exceeds deviation delay | The delay time for enabling fault protection after the deviation between the actual motor speed and the set speed exceeds this value | 0.50s |
| P1320 Modulation PWM type | Select modulation mode for axis 1 motor control<br>0: Minimum harmonic mode. In this mode, the motor current harmonics and electromagnetic noise are minimal.<br>1: Minimum common mode voltage mode. In this mode, the common mode voltage on the output side of the motor is the smallest. | 1 |
| P1321 Switching loss optimization point | For the motor's high-speed and heavy-load operating conditions, when the output duty cycle is greater than the set value,<br>The modulation mode is switched to discontinuous modulation mode. In this mode, the switching loss is reduced by 1/3.<br>However, the current harmonics and noise increase slightly | 125% |
| P1322 Zero speed level definition | Define the initial speed value for zero speed maintenance | 30.0rpm |
| P1323 Speed arrival window | Define the speed window range for speed arrival | 30.0rpm |
| P1324 Leakage protection enable | Enable the driver's three-phase output leakage protection function | 1 |
| P1325 Disable speed tracking start | Disable speed tracking function | 0 |
| P1326 IF control mode enable | Open-loop operation mode that enables fixed current vector injection, mostly used for starting and speeding up special motors | 0 |
| P1327 AFE voltage droop gain | Voltage droop control gain | 0.0V |
| P1328 DC braking enable | Enable DC current injection based braking mode | 0 |
| P1329 Overvoltage suppression enable | Enable the bus overvoltage suppression function of the axis 1 drive to limit the motor braking torque during the motor braking process to suppress the rising impact of the bus voltage. | 0 |
| P1330 Undervoltage suppression enable | Enable the bus undervoltage suppression function driven by axis 1 to achieve short-term grid voltage low or loss fault ride-through through motor kinetic buffering. | 0 |
| P1331 global configuration word | Bit0=Regenerating disable;<br>Bit4=ESP stop control turns off the encoder, (0X0010) can be pointed by the pointer for open and closed loop switching<br>Bit14=IGBT locked-rotor protection 0.Turn on to avoid damage to IGBT caused by zero-speed high current 1.Turn off and cancel the change function | 0x0000 |
| P1332 Load loss protection delay | Range 0-300s, when the output torque is lower than the set level value of P1305 and the time exceeds the set time, fault code 21 is triggered. | 0.0S |
| P1333 EtherCAT communication disconnection action | 0. Immediate free stop,<br>1. Decelerate to 0 and stop.<br>2. Keep running at zero speed after decelerating to 0<br>3. Maintain current status | 0 |
| P1334 IGBT Low-frequency download ratio set | Enabling this protection during low-speed and heavy-load operation can promptly avoid damage to the IGBT due to excessive junction temperature.<br>If it is set to 0, the carrier reduction function will be disabled, and it will be effective if it is set to be greater than P1346 (lifting load), which is applied to low-speed and high-current scenarios, which can effectively extend the low-speed and high-current running time of the machine and prevent overheating. For example, if the frequency is set to 200, the delay will be switched to 2kHz by 0.5 seconds when the frequency is lower than 10 Hz, and the delay will be switched to the set carrier frequency value by 0.5 seconds when the frequency is higher than 10 Hz | 1 |

| | | |
|---|---|---|
| P1335 Stator resistance adaptive enable | Enabling this protection during low-speed and heavy-load operation can promptly avoid damage to the IGBT due to excessive junction temperature. | 0 |
| P1336 bPhaseType phase alignment type | Alignment of magnetic pole angles during permanent magnet motor magnetic pole search<br>0: Standard alignment; 1: Adaptive alignment | 0 |
| P1337 High frequency injection enable | Enables low-speed operation of synchronous motors based on high-frequency signal injection,<br>Mainly used for encoderless zero-speed or low-speed control of high salient pole permanent magnet motors | 0 |
| P1338 High frequency tracking proportional gain | High frequency injection operation mode phase locked loop tracking bandwidth, typical value 100-500 | 200 |
| P1339 High frequency injection current | The size of the high-frequency current injected in high-frequency injection mode, relative to the rated current of the motor | 0% |
| P1340 Multi-phase motor slave following mode enable | Set axis 1 multi-phase motor slave follow mode enable, 1 = working and following mode, the torque given is determined by Px291 | 0 |
| P1341 Torque reference source | Set the torque reference of the master-slave mode host inside the axis 1 motor, usually pointing to Px092[1] | 0.still=0 |
| P1342 AFE voltage given | DC bus voltage given after enabling active grid front-end mode, typical value 600/750/1000 | 1000.0V |
| P1343 AFE mode enable | Enable switch at the front end of the active power grid, 0: disabled; 1: enabled, this value must be 1 when used for ALM, P1342 sets the given voltage | 0 |
| P1344 Power control reference | When P1345 is enabled, set the power output value | 0.0KW |
| P1345 Power control enable | 0: Disabled; 1: Enabled, associated with P1344 | 0 |
| P1346 Carrier modulation ratio | Automatically upgrade, set the operating frequency and carrier multiplier | 20 |
| P1347 Forced sensorless control enable | 0: Disabled; 1: Enabled, associated with parameters P1348 and P1349 | 0 |
| P1348 Speed level to switch to open loop | Closed loop cutting ring speed | 0RPM |
| P1349 Speed level to switch to closed loop | Open loop and closed loop speed | 0RPM |

## P1350 ~ P1368 Motor axis 1 start and stop logic group

| No. Parameter name | Description | Unit Default |
|---|---|---|
| P1350 Stop mode | Set the motor stop mode,<br>0=Decelerate to stop, set the acceleration and deceleration ramp to stop according to P1410/1411, etc.<br>1=Coast to stop, PWM stops output immediately and coasts freely. | 0 |
| P1351 Emergency stop mode | Set emergency stop mode.<br>0 = OFF1, decelerate to stop, the deceleration time is acceleration and deceleration time 1<br>1 = OFF2, coast to stop<br>3 = OFF3, decelerate to stop, the deceleration time is the emergency stop time | 1 |
| P1352 Run enable signal source | Select the signal source to enable the driver to run. If it is 1, it is allowed to run. The pointer can point to the DI port. If it is 1, it is allowed to run. If it is 0, it is forbidden to run. The preparation completion position is 0. The panel rotation arrow disappears. If it is 0, a fault needs to be reported. P1369 activated,<br>0: Always 0, shutdown state<br>1: Always 1, starting state<br>2:DI1<br>3: DI2<br>4:DI3<br>5: DI4<br>6: DI5<br>7:DI6<br>P0000.00: Pointer, which can be directly defined through the pointer, for example, P140.02 is DI3 | 1. Always 1 |
| P1353 Start enable signal source | Select the drive startup permission signal source. If it is 1, it is allowed to run. The pointer can point to the DI port. If it is 1, it is allowed to run. If it is 0, it is forbidden to run. If it is 0, a fault needs to be reported and P1369 needs to be activated. Others are the same as above. | 1. Always 1 |
| P1354 Emergency stop signal source | Select the signal source of the emergency stop command to be 1 to allow operation. The pointer can point to the DI port. If it is 1 to allow operation, if it is 0 to prohibit operation, the ready position is 0. The panel rotation arrow disappears. Others are the same as above. | 1. Always 1 |
| P1355 Fault reset signal source | Select the signal source of the fault reset command. The pointer can point to the DI point for reset. For example, if DI3 is set, the pointer points to P140.02. The rising edge is valid. Others are the same as above. | 0 |
| P1356 Local control prohibited | Select the signal source where local control is prohibited. When the pointer value is 1, the driver can only work in REM remote mode and LOC mode is locked. | 0 |
| P1357 Local control word value | Control word sent by the control panel to axis 1<br>0X0091 shutdown<br>0X0092 Start<br>0X0081 REM mode status | - |
| P1358 Remote control mode 1 | Motor control mode of remote control mode 1<br>0: Speed mode<br>1: Torque mode<br>2: Torque control speed limit mode<br>3: Reserved<br>4: Speed control limited electric torque mode<br>5: Speed control limited dynamic torque mode<br>6: Speed control torque limit mode | 0. speed |
| P1359 Remote control mode 2 | Motor control mode of remote control mode 2<br>See parameter P1358 | 0. speed |
| P1360 local control mode | Motor control mode in local LOC state<br>See parameter P1358 | 0. speed |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1361 Control mode switching** | **The remote control mode switch can be switched through DI or communication. For example, if DI3 is set, it will be mode 1 when DI3 is disconnected, and vice versa, it will be mode 2.<br>0: Control mode 1 (P1358),<br>1: Control mode 2 (P1359)** | **0** |
| **P1362 Brake opening delay** | **Set the brake opening delay, that is, the delay between the driver receiving the internal brake opening command and the motor speed control taking effect.<br>Corresponding to the brake opening action time, the brake opening process takes time. The setting should be slightly smaller than the actual value. The purpose is to increase the speed immediately after the brake is opened. If the setting is too large, the hook may slip immediately at startup. If an encoder is connected to this The value is insensitive. If the setting is large, the speed will hover at zero speed while accelerating.** | **0.00s** |
| **P1363 Brake closing delay** | **Set the brake closing delay, which is the delay between the brake control output power outage and the driver stopping running. If the setting is too small, a shutdown hook will occur.<br>The setting should be slightly larger than the actual value and should not be too small. If an encoder is connected, this value will not be sensitive. With the zero-speed holding time, the brake can be closed after zero-speed hovering.** | **0.00s** |
| **P1364 Zero speed holding time** | **Set the zero speed holding time when decelerating to stop. For closed-loop lifting applications, it can be set to about 3S. It will automatically hover after stopping.** | **0.00s** |
| **P1365 Alarm output when undervoltage is delayed** | **If the power grid is restored within the set time, it will judge whether it is running according to the operation signal, and if the set time is exceeded, the undervoltage fault will be reported, which is mainly to deal with the unplanned shutdown under the fluctuation of the external main power supply** | **0.01S** |
| **P1366 External fault enable** | **After enabling, the external fault takes effect and is associated with p1367 and p1368 switches.** | **1** |
| **P1367 External fault input 1** | **Select the signal source of external fault 1, which can be defined as a terminal through the pointer<br>0: No fault signal, 1: There is a fault signal. After triggering, 15 is reported (external fault)<br>Used for external signals to trigger driver failure shutdown** | **0** |
| **P1368 External fault input 2** | **Select the signal source of external fault 2, same as above** | **0** |
| **P1369 STO fault enable** | **After enabling, if the P1352/P1353 signal is 0, 14 (STO fault) will be reported and coast to stop.** | **0** |

## 〉P1370 ~ P1389 Motor axis 1 start and stop signal source group

<table>
<tr><th>No. Parameter Name</th><th>Description</th><th>Unit Default</th></tr>
<tr><td>P1370 Remote control 1 start and stop function</td><td>
Select the signal source for start and stop commands of external control location<br>0: Not selected<br>1: Run + direction; P1371 sets the running signal source, P1372 sets the running direction signal source<br>2: Forward rotation + reverse rotation; P1371 sets the forward rotation signal source, and P1372 sets the reverse rotation signal source.
<table>
<tr><th>Status of remote control 1 input signal 1</th><th>Status of remote control 1 input signal 2</th><th>Command</th></tr>
<tr><td>0</td><td>0</td><td>Stop</td></tr>
<tr><td>1</td><td>0</td><td>Forward start</td></tr>
<tr><td>0</td><td>1</td><td>Reverse start</td></tr>
<tr><td>1</td><td>1</td><td>Stop</td></tr>
</table>
3: Run+Stop+Direction<br>The signal source of the run and stop commands is selected by parameters P1371 (remote control 1 input signal 1), P372 (remote control 1 input signal 2) and P1373 (remote control 1 input signal 3). The state transition of the signal source bit is explained as follows:
<table>
<tr><th>Remote 1 input 1 status</th><th>Remote 1 input 2 status</th><th>Remote 1 input 3 status</th><th>Command</th></tr>
<tr><td>0 → 1</td><td>0</td><td>0</td><td>Forward start</td></tr>
<tr><td>0 → 1</td><td>0</td><td>1</td><td>Reverse start</td></tr>
<tr><td>X</td><td>1</td><td>X</td><td>Stop</td></tr>
<tr><td>0</td><td>0</td><td>X</td><td>Change direction</td></tr>
</table>
4：Forward + reverse + stop<br>The signal source of the line and stop commands is selected by parameters P1371 (remote control 1 input signal 1), P372 (remote control 1 input signal 2) and P1373 (remote control 1 input signal 3). The state transition of the signal source bit is explained as follows:
<table>
<tr><th>Remote 1 input 1 status</th><th>Remote 1 input 2 status</th><th>Remote 1 input 3 status</th><th>Command</th></tr>
<tr><td>0 → 1</td><td>0</td><td>0</td><td>Forward start</td></tr>
<tr><td>0</td><td>0 → 1</td><td>0</td><td>Reverse start</td></tr>
<tr><td>X</td><td>X</td><td>1</td><td>Stop</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>Stop</td></tr>
</table>
5: Fieldbus communication, control start and stop through communication control word P1531<br>6: Panel, start and stop controlled by panel keyboard
</td><td>2：Forward + reverse</td></tr>
</table>

| No. Parameter Name | Description | Unit Default |
|---|---|---|
| **P1371 Remote control 1 input signal 1** | **Select the signal source of input 1 of external control place 1<br>0: Always 0, shutdown state<br>1: Always 1, starting state<br>2:DI1<br>3: DI2<br>4:DI3<br>5: DI4<br>6: DI5<br>7:DI6<br>P0000.00: Pointer, which can be directly defined through the pointer, for example, P140.02 is DI3** | **P140.0=DI1** |
| **P1372 Remote control 1 input signal 2** | **Select the signal source of input 2 of external control ground 1, same as above** | **P140.01=DI2** |
| **P1373 Remote control 1 input signal 3** | **Select the signal source of input 3 of external control ground 1, same as above** | **0** |
| **P1374 Remote control 2 start and stop function** | **Select the signal source of start and stop commands of external control location 2, explained with P1370** | **2: Forward + reverse** |
| **P1375 Remote control 2 input signal 1** | **Select the signal source of input 1 of external control ground 2, same as P1371** | **0** |
| **P1376 Remote control 2 input signal 2** | **Select the signal source of input 2 of external control ground 2, the same as P1372** | **0** |
| **P1377 Remote control 2 input signal 3** | **Select the signal source of input 3 of external control ground 2, the same as P1373** | **0** |
| **P1378 Control ground switching source** | **Select the signal source and pointer to switch the control place. You can use the DI terminal to switch<br>0: Select external control location 1, execute P1370 selection<br>1: Select external control location 2 and execute P1374 selection** | **0** |
| **P1379 Control ground 1 trigger type** | **Select the trigger mode for control location 1.<br>0: edge trigger; 1: level trigger** | **1** |
| **P1380 Control ground 2 trigger type** | **Select the trigger mode for control location 2.<br>0: edge trigger; 1: level trigger** | **1** |
| **P1381 Jog enable** | **Select the signal source for jogging enablement. Set to 1 to allow jogging.** | **1** |
| **P1382 Jog 1 signal source** | **Select the signal source and pointer started by jog 1. You can use the DI terminal to switch. If DI3 is set, that is, DI3 is closed to execute jog. P1399 (jog speed reference 1) is the jog speed reference. A positive value indicates forward transmission. , a negative value indicates reversal<br>0: Always 0, shutdown state<br>1: Always 1, starting state<br>2:DI1<br>3: DI2<br>4:DI3<br>5: DI4<br>6: DI5<br>7:DI6<br>P0000.00: Pointer, which can be directly defined through the pointer, for example, P140.02 is DI3** | **0** |
| **P1383 Jog 2 signal source** | **Select the signal source and pointer for jog 2 startup. You can use the DI terminal to switch. P1400 (jog speed reference 2) is the jog speed reference. Others are the same as above.** | **0** |

| No. Parameter Name | Description | Unit Default |
|---|---|---|
| **P1384 fault automatic reset** | **Fault automatic reset enable switch, enabled when set to 1. After enabling, when the alarm code set in P1385-P1389 triggers a fault, if the drive is no longer in a fault state at this time, the fault will be automatically reset. There is no reset when the fault continues to trigger.** | **0** |
| **P1385 fault code 1** | **When P1384=1, the alarm code set here is automatically reset. Example: Set P1384=1, P1385=15 (undervoltage fault). When the driver detects bus undervoltage, it will alarm fault 15 Driver Undervoltage. When the voltage returns to the normal level, the fault status disappears and the driver automatically resets the fault alarm.** | **0** |
| **P1386 Fault code 2** | **When P1384=1, the alarm code set here is automatically reset. Same as P1385** | **0** |
| **P1387 Fault code 3** | **When P1384=1, the alarm code set here is automatically reset. Same as P1385** | **0** |
| **P1388 fault code 4** | **When P1384=1, the alarm code set here is automatically reset. Same as P1385** | **0** |
| **P1389 Fault code 5** | **When P1384=1, the alarm code set here is automatically reset. Same as P1385** | **0** |

## 〉P1390 ~ P1403 Motor shaft 1 speed given

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1390 Speed forward maximum value** | **The maximum allowable forward rotation speed of the axis 1 motor. If you need to obtain a value above the rated speed, please change this parameter. The setting value must be >0** | **Rated rpm** |
| **P1391 Speed reverse maximum value** | **The maximum allowed reverse rotation speed of the axis 1 motor. If you need to obtain a value above the rated speed, please change this parameter. The setting value must be <0** | **Rated rpm** |
| **P1392 Speed reference 1 selection** | **Select the signal source of speed reference 1:<br>0: Always 0. No option, the given value always remains 0<br>1: AI1 conversion value<br>2: AI2 conversion value<br>3: AI3 conversion value (not started)<br>P0000: pointer, which can point to the required register arbitrarily<br>like:<br>Bus (communication) given: P1542 Fb speed given output<br>AI1 conversion refers to given: P147<br>Multi-speed setting: P1026<br>Speed lifting unit output: P1027<br>Control panel setting: P1532 local speed setting value<br>PID output: P0720** | **P0147 (AI1 Conversion value)** |
| **P1393 Speed reference 2 selection** | **Select the signal source of speed given 2, the definition is the same as above, default: AI2 conversion value** | **P149** |
| **P1394 Synthesis function selection** | **Set the function of speed reference 1 and speed reference 2 to synthesize the total speed reference.<br>0: Given 1<br>1: Add given 1 to given 2, and add the output<br>2: Subtract the given 2 from the given 1, and the subtraction output<br>3: Multiply the given 1 by the given 2, and multiply the output<br>4: MIN (given 1, given 2), take the minimum output<br>5: MAX (given 1, given 2), take the maximum output<br>6: ABS (given 1), the given 1 data is output after taking the absolute value.<br>7: Divide the given 1 by the given 2, and divide the output<br>8: Negative output** | **0. Given 1** |
| **P1395 Speed given switching source** | **The switching signal source and pointer of the set speed given signal can be switched through DI:<br>Select the signal source to switch between speed reference 1 and 2,<br>0: Select the speed given value 1 synthesized by parameter P1394 (speed given operation function),<br>1: Select the speed given value 2 selected by the signal source of parameter P1393 speed given 2)<br>0: Always 0, shutdown state<br>1: Always 1, starting state<br>2:DI1<br>3: DI2<br>4:DI3<br>5: DI4<br>6: DI5<br>7:DI6<br>P0000.00: Pointer, which can be directly defined through the pointer, for example, P140.02 is DI3** | **0** |

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1396 Speed given bias** | **The set speed is given with a fixed offset of a certain rotation speed, regardless of direction, and is output after superposition with the given rotation speed. For example, if setting 2, if the given rotation speed is 100, then 102 will be output; if the given rotation speed is -100, then -102 will be output.** | **0rpm** |
| **P1397 Speed given gain** | **Set the speed given scaling factor, define the conversion factor of the speed given value, and enlarge or reduce the speed given value.** | **1.000** |
| **P1398 Droop control gain** | **Set the gain of the droop control and use it in the speed mode to set the droop speed ratio so that the rigidity is not so stiff to achieve a basic balance of torque when multiple machines drive the same load. The maximum droop is 12.50%.** | **0.00%** |
| **P1399 Jog speed reference 1** | **Set the speed given value of jog function 1. Positive speed means forward rotation, and negative number means reverse rotation.** | **300rpm** |
| **P1400 Jog speed reference 2** | **Set the speed given value of jog function 2, same as above** | **-300rpm** |
| **P1401 speed limit speed value** | **Set the speed threshold for the limit action, and run at this value after the forward or reverse direction is limited.** | **0RPM** |
| **P1402 Positive limit signal source** | **Select the signal source of the forward limit. When set to 1, P1401 will be executed to limit the speed. If P1401 is 0, forward rotation is prohibited.<br>0: Always 0, closed state<br>1: Always 1, always enabled<br>2:DI1<br>3: DI2<br>4:DI3<br>5: DI4<br>6: DI5<br>7:DI6<br>P0000.00: Pointer, which can be directly defined through the pointer, for example, P140.02 is DI3** | **0** |
| **P1403 Reverse limit signal source** | **Select the signal source of reverse limit, same as above** | **0** |

## 〉P1410 ~ P1423 Motor shaft 1 speed ramp

| No. Parameter | Description | Unit Default |
|---|---|---|
| **P1410 Ramp acceleration time 1** | **Set the acceleration time 1 for the speed to rise from zero to the speed reference value** | **5.00s** |
| **P1411 Ramp deceleration time 1** | **Set the deceleration time 1 for the speed to drop from the speed reference value to zero.** | **5.00s** |
| **P1412 Ramp acceleration time 2** | **Set the acceleration time 2 for the speed to rise from zero to the speed reference value** | **5.00s** |
| **P1413 Ramp deceleration time 2** | **Set the deceleration time 2 for the speed to drop from the speed reference value to zero.** | **5.00** |
| **P1414 S-curve acceleration time 1** | **Set the acceleration slope of the initial segment of S-curve acceleration. The longer the time, the slower the initial acceleration.** | **0.00s** |
| **P1415 S-curve acceleration time 2** | **Set the acceleration slope at the end of the S-curve acceleration. The longer the time, the slower the acceleration changes at the end.** | **0.00s** |
| **P1416 S curve deceleration time 1** | **Set the deceleration slope of the initial segment of S-curve deceleration. The longer the time, the slower the initial deceleration will be.** | **0.00s** |
| **P1417 S-curve deceleration time 2** | **Set the deceleration slope at the end of S-curve deceleration. The longer the time, the slower the deceleration changes at the end.** | **0.00s** |
| **P1418 Jog acceleration time** | **Set the acceleration time for the speed to rise from zero to the speed reference value in jog mode.** | **5.00s** |
| **P1419 Jog deceleration time** | **Set the deceleration time for the speed to drop from the speed reference value to zero in jog mode.** | **5.00s** |
| **P1420 Emergency stop deceleration time** | **Set emergency stop time** | **1.00s** |
| **P1421 Ramp time switching source** | **Set two sets of switching signal sources and pointers with different acceleration and deceleration ramp times.** | **0** |
| **P1422 Ramp mode selection** | **Set the speed ramp curve type to crane mode:<br>0=Standard, the rated speed is used as the ramp reference, and the ramp time is not<br>Divided into ascending and descending;<br>1=Mode 1, taking the rated speed as the slope reference, when going down the slope<br>exchange with the acceleration and deceleration time of the upward slope;<br>2=Mode 2, taking the maximum speed as the ramp reference, the ramp time does not<br>Divided into uplink and downlink; (default)<br>3=Mode 3, taking the maximum speed as the slope reference, when going down the slope<br>exchange with the acceleration and deceleration time of the upward slope;** | **0** |
| **P1423 Speed ramp reference** | **The speed ramp reference set by the user. The default value is 0, which is based on the rated speed.** | **0rpm** |
| **P1424 Critical point of exponential curve** | **Mostly used for tower crane rotation, specifying the speed width of the exponential curve at the end of the slope, the typical value is 20%** | **0.0%** |
| **P1425 Anti-sway control enable** | **Bit pointer, 1: Anti-sway control enabled** | **0** |
| **P1426 Time constant speed selection** | **Bit pointer, the larger the anti-shake time constant, the slower the system's response speed, but the better the stability; the smaller the anti-shake time constant, the faster the system's response speed, but the stability may be reduced.** | **0** |

| No. Parameter | Description | Unit Default |
|---|---|---|
| **P1427 Swing time constant 1** | **Anti-sway time setting** | **5.00S** |
| **P1428 Swing time constant 2** | **Anti-sway time setting** | **5.00S** |
| **P1429 Emergency stop time constant** | **Emergency stop time setting** | **3.00S** |

## 〉P1430 ~ P1441 Motor shaft 1 torque given

| No. Parameter name | Description | Unit Default |
|---|---|---|
| **P1430 Torque reference 1 selection** | **Select the signal source for torque reference 1<br>0: Always 0. No option, the given value always remains 0<br>1: AI1 conversion value<br>2: AI2 conversion value<br>3: AI3 conversion value (not started)<br>P0000: pointer, which can point to the required register arbitrarily<br>like:<br>Bus (communication) given torque: P1543 Fb torque given output<br>AI2 conversion refers to the given: P149 (unit must be percentage)<br>Control panel given torque: P1533 local torque given value** | **P149<br>AI2<br>Conversions** |
| **P1431 Torque reference 2 selection** | **Select the signal source of torque reference 2, same as above** | **P147** |
| **P1432 Synthesis function selection** | **Synthetic mathematical function of torque reference 1 and torque reference 2<br>0: Given 1<br>1: Add given 1 to given 2, and add the output<br>2: Subtract the given 2 from the given 1, and the subtraction output<br>3: Multiply the given 1 by the given 2, and multiply the output<br>4: MIN (given 1, given 2), take the minimum output<br>5: MAX (given 1, given 2), take the maximum output<br>6: ABS (given 1), the given 1 data is output after taking the absolute value.<br>7: Divide the given 1 by the given 2, and divide the output<br>8: Negative output<br>9: Rewinding, the torque direction is consistent with the starting direction<br>10: Unwinding, the torque direction is opposite to the starting direction.<br>11:** | **0.Given 1** |
| **P1433 Torque reference switching source** | **Select the signal source for switching between torque reference 1 and 2<br>Select the signal source to switch between speed reference 1 and 2,<br>0: Select the torque given value 1 synthesized by parameter P1432 (torque given operation function),<br>1: Select the torque given value 2 selected by the signal source of parameter P1431 torque given 2)** | **0** |
| **P1440 Torque rise time** | **Torque given ramp rise time** | **0.00s** |
| **P1441 Torque drop time** | **Torque given ramp down time** | **0.00s** |

## P1450 ~ P1471Motor shaft 1 multi-speed

| No. Parameter | Description | Unit |
|---|---|---|
| P1450 Multi-speed 1 | Define the value of multi-speed 1 | 0rpm |
| P1451 Multi-speed 2 | Define the value of multi-speed 2 | 0rpm |
| P1452 Multi-speed 3 | Define the value of multi-speed 3 | 0rpm |
| P1453 Multi-speed 4 | Define the value of multi-speed 4 | 0rpm |
| P1454 Multi-speed 5 | Define the value of multi-speed 5 | 0rpm |
| P1455 Multi-speed 6 | Define the value of multi-speed 6 | 0rpm |
| P1456 Multi-speed 7 | Define the value of multi-speed7 | 0rpm |
| P1457 Multi-speed 8 | Define the value of multi-speed8 | 0rpm |
| P1458 Multi-speed 9 | Define the value of multi-speed9 | 0rpm |
| P1459 Multi-speed 10 | Define the value of multi-speed10 | 0rpm |
| P1460 Multi-speed 11 | Define the value of multi-speed11 | 0rpm |
| P1461 Multi-speed 12 | Define the value of multi-speed12 | 0rpm |
| P1462 Multi-speed 13 | Define the value of multi-speed13 | 0rpm |
| P1463 Multi-speed 14 | Define the value of multi-speed14 | 0rpm |
| P1464 Multi-speed 15 | Define the value of multi-speed15 | 0rpm |
| P1465 Multi-speed 16 | Define the value of multi-speed16 | 0rpm |
| P1466 Multi-speed selection 1 | Select the signal source of multi-speed speed 1 and define each terminal, for example DI3=p140.02. One terminal can combine 2 speeds, and up to 4 terminals can be combined with 16 speeds. Pointer | 0 |
| P1467 Multi-speed selection 2 | Signal source for multi-speed selection 2, same as above | 0 |
| P1468 Multi-speed selection 3 | Signal source for multi-speed selection 3, same as above | 0 |
| P1469 Multi-speed selection 4 | Multi-speed selection 4 signal source, same as above | 0 |

<table>
<tr><th>No. Parameter</th><th>Description</th><th>Unit</th></tr>
<tr><td>P1470 Multi-speed combination mode</td><td>
0: Combination mode<br>
4 multi-speed selection signals generate 16 combinations of multi-speed
<table>
<tr><th>Multiple speed selection 1</th><th>Multiple speed selection 2</th><th>Multiple speed selection 3</th><th>Multiple speed selection 4</th><th>Multi-speed selection status</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>Multi-speed 1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>Multi-speed 2</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>Multi-speed 3</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>Multi-speed 4</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>Multi-speed 5</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>Multi-speed 6</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>Multi-speed 7</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>Multi-speed 8</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>Multi-speed 9</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>Multi-speed 10</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>Multi-speed 11</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>Multi-speed 12</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>Multi-speed 13</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>Multi-speed 14</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>Multi-speed 15</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>Multi-speed 16</td></tr>
</table>
1: Separate mode<br>
The four signals are used to select multi-speed 0-4 respectively, among which multi-speed 4 has the highest priority and multi-speed 1 has the lowest priority. The specific correspondence is as follows:
<table>
<tr><th>Speed set 1</th><th>Speed set 2</th><th>Speed set 3</th><th>Speed set 4</th><th>Multi-speed statue</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>Speed 1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>Speed2</td></tr>
<tr><td>X</td><td>1</td><td>0</td><td>0</td><td>Speed 3</td></tr>
<tr><td>X</td><td>x</td><td>1</td><td>0</td><td>Speed 4</td></tr>
<tr><td>X</td><td>x</td><td>X</td><td>1</td><td>Speed 5</td></tr>
</table>
</td><td>1. separate</td></tr>
<tr><td>P1471 Multi-speed priority enable</td><td>Set the multi-speed signal as the priority of the speed given signal<br>1: Multi-speed priority is used as the speed given</td><td>1</td></tr>
</table>

## 〉P1480 ~ P1509 Motor axis 1 auxiliary function module

| No. Parameter name | Description | Unit |
|---|---|---|
| Digital potentiometer | | |
| **P1480 potentiometer boost signal source** | **Select the signal source of the potentiometer increment command. If the bit pointer is set to DI3, it will finally be output through P1027.<br>0: No increment instruction;<br>1: There is an increment instruction<br>2:DI1<br>3: DI2<br>4:DI3<br>5: DI4<br>6: DI5<br>7:DI6<br>P0000.00: Pointer, which can be directly defined through the pointer, for example, P140.02 is DI3** | **0** |
| **P148 Potentiometer minus signal source** | **Select the signal source of the potentiometer decrement command, bit pointer, same as above<br>0: No decrement instruction; 1: There is decrement instruction** | **0** |
| **P1482 Potentiometer ramp time** | **The acceleration and deceleration ramp time of the potentiometer UP/DOWN output from the maximum value to the minimum value<br>slope time. The longer the time, the smaller the increase and decrease value of a single trigger.** | **10.0s** |
| **P1483 potentiometer output upper limit** | **The maximum value of potentiometer UP/DOWN output, the setting value must be ≥0** | **0RPM** |
| **P1484 potentiometer output lower limit** | **The minimum value of potentiometer UP/DOWN output, the setting value must be ≤0** | **0RPM** |
| **P1485 Potentiometer Storage Mode** | **Select the storage mode of the potentiometer UP/DOWN value after the driver is powered off.<br>0 = reset. Reset potentiometer UP/DOWN value after power outage<br>1 = Storage. Save the potentiometer UP/DOWN value after power outage<br>2 = reset after shutdown** | **0** |
| Speed given jump | | |
| **P1490 Resonance suppression speed 1** | **Set the resonance speed point 1 that requires frequency hopping** | **rpm** |
| **P1491 Resonance suppression speed 2** | **Set the resonance speed point 2 that requires frequency hopping** | **rpm** |
| **P1492 Resonance suppression speed 3** | **Set the resonance speed point 3 that requires frequency hopping** | **rpm** |
| **P1493 Resonance frequency width 1** | **Set the frequency hopping width at resonance speed point 1** | **rpm** |
| **P1494 Resonance frequency width 2** | **Set the frequency hopping width at resonance speed point 2** | **rpm** |
| **P1495 Resonance frequency width 3** | **Set frequency hopping width at resonance speed point 3** | **rpm** |
| Comparators | | |

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1500 Comparator 1 input source Cmp1 in src** | **Comparator 1 input source, set the comparison parameters by setting the P0000 pointer, and compare with P1503. When >P1503+P1504, the P1030.14 bit is set to 1. After the data is reduced, it will be set to 0 after ≤P1503-P1504 is set. Define the relay output, or read the communication bit as a judgment** | **0** |
| **P1501 Comparator 1 type Cmp1 type** | **Set comparator 1 type**<br>**0: >**<br>**1: <**<br>**2: =**<br>**3: ≠** | **0** |
| **P1502 Absolute value comparison type 1** | **Cmp1 in abs absolute value comparison type, 0: signed comparison, 1: unsigned absolute value comparison** | **1** |
| **P1503 Comparator 1 reference value** | **Cmp1 reference comparator 1 comparison level setting, comparison value. When comparing P1000 speed and P1002 current, the decimal point is invalid, that is, 1000 represents 1000RPM/A** | **1000rpm** |
| **P1504 Comparator 1 hysteresis width** | **Cmp1 hyster level Comparator 1 hysteresis width** | **30rpm** |
| **P1505 Comparator 2 input source** | **Cmp2 in src Comparator 2 input source, set the comparison parameters by setting the P0000 pointer, and compare with P1508. When >P1508+P1509, the P1030.13 bit is set to 1. After the data is reduced, ≤P1508-P1509 will be set to 0.** | **0** |
| **P1506 Comparator 2 type** | **Cmp2 type sets comparator 2 type, same as P1501**<br>**0:>**<br>**1: <**<br>**2: =**<br>**3: ≠** | **0** |
| **P1507 Comparator 2 absolute value comparison** | **Cmp2 type absolute value comparison type, 0: signed comparison, 1: unsigned absolute value comparison** | **1** |
| **P1508 Comparator 2 reference value** | **Cmp2 reference Comparator 2 comparison level setting, comparison value** | **1000rpm** |
| **P1509 Comparator 2 hysteresis width** | **Cmp2 hyster level comparator 2 hysteresis width** | **30rpm** |

## 〉P1510 ~ P1519 Motor shaft 1 motor thermal protection

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1510 Motor protection type** | **Select the action to be performed when the driver detects motor overtemperature.<br>0: No action; 1: Fault; 2: Warning** | **1** |
| **P1511 Temperature sensor type** | **Select the temperature measurement method for motor thermal protection, the temperature is displayed in P1029<br>0 = estimated value<br>1 = KTY84<br>2 = PTC<br>3 = PT100X1<br>4=PT100X2<br>5=PT100X3<br>6 = PT1000<br><br>The typical resistance ranges of different sensors. If there is an abnormality, you can compare it with the resistance measured by the P1028 temperature sensor and the resistance tested by a multimeter to confirm the problem:<br>1. KTY84, [500Ω, 1000Ω]<br>2. PT100, [100Ω, 135Ω]<br>3. PT1000, [1000Ω, 1350Ω]<br>4. PTC, [100Ω, 2000Ω]<br>Note: The injection current of PT100 is 10mA, and the rest is 2mA (default)** | **0** |
| **P1512 PTC overheat trigger point** | **Set the fault resistance point when the sensor is PTC** | **1450Ohm** |
| **P1513 Sensor calibration gain** | **Set the proportional correction coefficient of the sensor detection temperature value** | **100.0%** |
| **P1514 Sensor correction offset** | **Set the offset correction value of the sensor detection temperature value** | **0.0Ohm** |
| **P1515 Overheat warning temperature point** | **Set the temperature point that triggers the generator overheating fault** | **110℃** |
| **P1516 Overheating fault temperature point** | **Set the temperature point that triggers the generator overheat warning** | **120℃** |
| **P1517 Motor rated temperature rise** | **For the temperature rise value when the motor is running with rated current and load, please refer to the data provided by the motor manufacturer.** | **60℃** |
| **P1518 Motor ambient temperature** | **Motor actual working environment temperature** | **40℃** |
| **P1519 Motor thermal time constant** | **Define the motor thermal protection model time constant, which is the time for the temperature rise to reach 63% of the rated temperature.** | **180s** |

## 〉P1520 ~ P1529 Motor axis 1 VF separation control

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1520 Frequency setting (given)** | **When setting the VF separation frequency point, pay attention to ensure that the voltage-to-frequency ratio is normal. If the voltage-to-frequency ratio is too small, it will cause magnetic saturation and cause oscillation. If the voltage-to-frequency ratio is normal and the oscillation is normal, the oscillation can be suppressed and eliminated.** | **0.00HZ** |
| **P1521 voltage setting (given)** | **VF separation voltage point setting** | **0.0V** |
| **P1522 Frequency step size** | **Frequency changes at a time step** | **10.00HZ** |
| **P1523 voltage step size** | **The voltage changes at a time step** | **100.0V** |
| **P1524 time step** | **Define the resolution of acceleration and deceleration time. If the time step is 1S, the frequency step is 50HZ, and the voltage step is 20, then the frequency change in 1S is 50HZ and the voltage change is 20V. The actual frequency and voltage will be based on both. The minimum acceleration time is executed and the set value is reached synchronously.** | **1.00S** |
| **P1525 VF separation enable** | **To use this function, the driver must work in open loop mode, that is, P1251=0, otherwise it will be invalid.<br>0: Not activated<br>1: VF separation, VF can be adjusted and controlled separately<br>2: VF coupling, similar to VF control** | **0** |
| **P1526 minimum frequency** | **Coupling low point frequency, used as the starting point of VF coupling voltage frequency** | **0.0HZ** |
| **P1527 Minimum voltage** | **Coupling low point voltage, used for VF coupling voltage frequency starting point** | **0.0V** |
| **P1528 Maximum frequency** | **Set according to customer requirements, maximum coupling frequency** | **50.0HZ** |
| **P1529 Maximum voltage** | **Set according to customer requirements, coupling maximum voltage** | **380.0V** |

## P1530 ~ P1547 Motor axis 1 communication data interface

<table>
<tr><th>No. Parameter name</th><th>Description</th><th>Unit</th></tr>
<tr><td>P1530 Communication timeout time</td><td>Communication disconnection detection timeout,<br>If no communication data is detected beyond this time, the driver will trigger a communication disconnection fault.<br>The default is 0, which turns off the communication disconnection alarm.<br>If set to non-0, after a communication is established, the driver will monitor whether there is communication data exchange within the set time. If not, it will report a 19 (communication timeout) fault. It is recommended not to set this value too small to prevent malfunction.</td><td>0ms</td></tr>
<tr><td>P1531 FB control word original value</td><td>The original bus control word received by the driver<br>P1531write:<br><table><tr><th>bit sequence number</th><th>Control word meaning</th></tr><tr><td>0</td><td>ON/OFF1 (Switch on)</td></tr><tr><td>1</td><td>OFF2 parking (Enable voltage)</td></tr><tr><td>2</td><td>OFF3 parking (Quick stop)</td></tr><tr><td>3</td><td>Pulse enable (Enable operation)</td></tr><tr><td>4</td><td></td></tr><tr><td>5</td><td></td></tr><tr><td>6</td><td></td></tr><tr><td>7</td><td>Fault response (Fault reset)</td></tr><tr><td>8</td><td></td></tr><tr><td>9</td><td></td></tr><tr><td>10</td><td>Controlled by PLC (REM mode)</td></tr><tr><td>11</td><td>Reverse</td></tr><tr><td>12</td><td></td></tr><tr><td>13</td><td></td></tr><tr><td>14</td><td></td></tr><tr><td>15</td><td></td></tr></table><br>the<br><table><tr><td>Forward rotation start</td><td>0x040F</td></tr><tr><td>reverse start</td><td>0X0C0F</td></tr><tr><td>Parking 0FF1</td><td>0X040E</td></tr><tr><td>Parking 0FF2</td><td>0X040C</td></tr><tr><td>Parking 0FF3</td><td>0X040A</td></tr><tr><td>Parking</td><td>0X0407</td></tr><tr><td>Reset</td><td>0x0487</td></tr></table>Check<br>MODBUS communication manual for details</td><td>0X0000</td></tr>
<tr><td>P1532 Local speed reference value</td><td>The speed value is given in local mode, given by the keyboard, and the minimum unit for communication writing is 0.1RPM.</td><td>0.0rpm</td></tr>
<tr><td>P1533 Local torque reference value</td><td>Torque value given in local mode, keyboard given</td><td>0.0%</td></tr>
<tr><td>P1534 FB speed given original</td><td>Bus communication given speed original value</td><td>0</td></tr>
<tr><td>P1535 FB torque given original</td><td>Bus communication given torque original value, Fb Auxiliary torque<br>[0] Torque reference original 1<br>[1] Torque given original value 2, auxiliary torque given, used for torque two-way limiting</td><td>0</td></tr>
<tr><td>P1536 FB speed conversion input</td><td>Bus communication input speed reference</td><td>1</td></tr>
</table>

<table>
<tr><th>No. Parameter name</th><th>Description</th><th>Unit</th></tr>
<tr><td>P1537 FB speed conversion output</td><td>Bus communication output speed reference</td><td>1.0rpm</td></tr>
<tr><td>P1538 FB torque input reference</td><td>Bus communication input torque reference</td><td>1000.0</td></tr>
<tr><td>P1539 FB control word type</td><td>0: Customization is not activated<br>1: Standard DS402 definition</td><td>1</td></tr>
<tr><td rowspan="5">P1540 status word custom bit</td><td>1545 The signal source setting of the custom bit of the original value of the Fb status word. The pointer can point to the corresponding bit and be read out using the status word.<br>[0] Status word Bit08 signal source</td><td rowspan="5">0</td></tr>
<tr><td>[1] Status word Bit12 signal source</td></tr>
<tr><td>[2] Status word Bit13 signal source</td></tr>
<tr><td>[3] Status word Bit14 signal source</td></tr>
<tr><td>[4] Status word Bit15 signal source</td></tr>
<tr><td>P1542 Fb speed given output</td><td>Communication given speed output value, =P1534 *P1537 /P1536, communication given conversion result, the default P1537/1536 is 1, then writing 1 to P1534 represents 1RPM. If 100RPM is set, directly enter 100.</td><td>0</td></tr>
<tr><td>P1543 Fb torque given output</td><td>=P1535[0] / P1538, communication given conversion result, default 1000=100.0% torque</td><td>0</td></tr>
<tr><td>P1544 Fb auxiliary torque given</td><td>=P1535[1] / P1538, auxiliary torque given conversion</td><td>0</td></tr>
<tr><td>P1545 FB status word</td><td>Fieldbus status words:<br><table><tr><th>bit sequence number</th><th>Status word meaning</th></tr><tr><td>0</td><td>Driver preparation (Ready to switch on)</td></tr><tr><td>1</td><td>Ready to run (Switched on)</td></tr><tr><td>2</td><td>Operation enable</td></tr><tr><td>3</td><td>Fault</td></tr><tr><td>4</td><td>OFF2 activation (Coast stop)</td></tr><tr><td>5</td><td>OFF3 activation (Quick stop)</td></tr><tr><td>6</td><td>Switch on disable</td></tr><tr><td>7</td><td>Warning</td></tr><tr><td>8</td><td>Customized, signal source P1540[0]</td></tr><tr><td>9</td><td>Control request (REM mode)</td></tr><tr><td>10</td><td>Speed reached (Target reached)</td></tr><tr><td>11</td><td>Torque limitation (Limiting)</td></tr><tr><td>12</td><td>Customized, signal source P1540[1]</td></tr><tr><td>13</td><td>Customized, signal source P1540[2]</td></tr><tr><td>14</td><td>Customized, signal source P1540[3]</td></tr><tr><td>15</td><td>Customized, signal source P1540[4]</td></tr></table></td><td>0x0000</td></tr>
<tr><td>P1546 FB actual speed</td><td>Bus communication axis x motor actual speed, =P1000 *P1536 / P1537, the current speed is converted to the bus</td><td>0</td></tr>
<tr><td>P1547 FB actual torque</td><td>Actual torque of bus communication axis x motor, =P1008 * P1538, the current torque is converted to the bus</td><td>0</td></tr>
</table>

## 〉P1550 ~ P1574 Axis 1 DS402 status

<table>
<tr><th>No. Parameter</th><th>Description</th><th>Unit</th></tr>
<tr><td>P1550 StatusWord</td><td>
Uint 16 6041 status word<br>
6041 Status word explanation:
<table>
<tr><td>Bit0</td><td>Ready to switch on :1; ready to start</td></tr>
<tr><td>Bit1</td><td>Switched on :1;waiting to open</td></tr>
<tr><td>Bit2</td><td>Operation enabled:1;servo operation</td></tr>
<tr><td>Bit3</td><td>Fault:1; error report, fault</td></tr>
<tr><td>Bit4</td><td>Enable Voltage:1 Turn on the main power supply (main power supply is powered on)</td></tr>
<tr><td>Bit5</td><td>Quick stop: 0; Quick stop received, 1. Normal 0 quick stop</td></tr>
<tr><td>Bit6</td><td>Switch on disabled :1; start disabled</td></tr>
<tr><td>Bit7</td><td>Warning:1 A warning is occurring</td></tr>
<tr><td>Bit8</td><td>-Zero speed: 1. Zero speed, 0, non-zero speed</td></tr>
<tr><td>Bit9</td><td>Remote:1;remote</td></tr>
<tr><td>Bit10</td><td>Target reached: 1, target speed or position reached;<br>In PP mode, if this bit is 1, it means the position has reached the target position;<br>In PV mode, when this bit is 1, it means the speed is reached;<br>In PT mode, when this bit is 1, it means the torque is reached;<br>CSV, CSP, CST mode, the slave station is set to 1;</td></tr>
<tr><td>Bit11</td><td>Internal limit active; driver software internal limit, 1 is valid</td></tr>
<tr><td>Bit12</td><td>-Related to control mode</td></tr>
<tr><td>Bit13</td><td>-Related to control mode</td></tr>
<tr><td>Bit14-15</td><td>-</td></tr>
</table>
Refer to EtherCAT manual for more detail
</td><td>0x0000</td></tr>
</table>

| No. Parameter | Description | Unit |
|---|---|---|
| **P1551 ErrorCode** | **Uint 16 603F error code**<br>**0: None**<br>**1: Output short circuit**<br>**2: Motor overcurrent**<br>**3: Bus overvoltage**<br>**4: Drive overheated**<br>**5: Leakage to the earth**<br>**6: Current detection failure**<br>**7: Temperature sensor disconnected**<br>**8: Drive overloaded**<br>**9: IGBT stalled**<br>**10: FLASH reading and writing exception**<br>**11: CPU overload**<br>**12: Magnet link abnormality**<br>**13: Motor overheating**<br>**14: Kernel startup failed**<br>**15: User external customization failure**<br>**16: Abnormal power supply of power grid**<br>**17: Output phase loss or unbalance**<br>**18: Motor self-identification error**<br>**19: Communication timeout, bus communication disconnected**<br>**22: Encoder disconnection, encoder disconnection or the absolute value incremental signal is inconsistent with the absolute value reverse direction.**<br>**23: Driver undervoltage**<br>**24: Encoder speed feedback error**<br>**25: Motor overspeed**<br>**For more fault types, see Fault Interpretation.** | **0** |
| **P1552 ModeOperDisp** | **int 16 6061 Modes of operation display driver actual control mode display**<br>**0: null (reserved)**<br>**1: PP (contour position)**<br>**2: VL (speed mode)**<br>**3: PV profile speed)**<br>**4: PT (contour torque)**<br>**8: CSP (Cycle Synchronous Position)**<br>**9: CSV (Cycle Synchronization Speed)**<br>**10: CST (Cyclic Synchronous Torque)** | **0** |
| **P1553 PosActVal** | **int 32 6064: Position actual value bus position feedback value, unit pulse** | **0P** |
| **P1554 VelocityAct** | **int 32 606C: Velocity actual value bus speed feedback, unit: pulse/second**<br>**Actual speed (rpm/min)=P1554/P1575*60** | **0P/S** |
| **P1555 TorqueActVal** | **int 16 6077: Torque actual value bus torque feedback, 1000=100.0%** | **0** |
| **P1556 Probe real-time status** | **60B9, Touch probe status, = 3, indicating that a probe event has been received** | **0** |
| **P1557 Probe1PosVal** | **int 32, Probe1 positive value probe 1 rising edge capture value** | **0p** |
| **P1558 Probe1NegVal** | **int 32, Probe1 negative value probe 1 falling edge capture value** | **0p** |
| **P1559 Internal position actual value** | **int32 6063 encoder internal original position value**<br>**The value is the same as P0400 (first position encoder comprehensive position value);**<br>**1. Square wave encoder=P0400=P0402**<br>**Note: P0400 and P0402 = 4 times of square wave encoder;**<br>**2. Sine and cosine encoder=P0400=P0402*16384**<br>**Note: P0400 = 65536 times the resolution of the sine and cosine encoder, P0402 = 4 times the resolution of the sine and cosine encoder;** | **0** |

| No. Parameter | Description | Unit |
|---|---|---|
| **Control modes supported by P1560** | **Uint32，6502** | **0x0000** |
| **P1561 Digital input status** | **Uint32，60FD Digital inputs with POT、NOT、HOME information** | **0x0000** |
| **P1562 internal position given value** | **int32, 60FC internal position given value, same interpretation as 1560<br>1. Square wave encoder:<br>No matter how much P1575 is set, the given value of P1562 for one rotation = square wave encoder resolution x 4;<br>2. Sine and cosine encoder:<br>No matter how much P1575 is set, the given value of P1562 for one rotation = sine and cosine encoder resolution x 65536;** | **0** |
| **P1563 position command value** | **6062, which is equal to 607Ah=6064h, and the given value for one rotation = the setting value of P1580** | **0** |
| **P1564 control output value** | **Control output value** | **0** |
| **P1565 torque command value** | **int16, Torque demand internal actual torque command** | **0** |
| **P1566 real-time position error** | **int32, 60F4 Following error actual value position following error value** | **0p** |
| **P1567 speed rpm command** | **VL mode target speed** | **0rpm** |
| **P1568 speed rpm** | **int16, VL actual value** | **0rpm** |
| **P1569 internal position given value** | **6063h: Position actual internal value to obtain the actual internal position value of the motor** | **0p** |
| **P1570 position regulator output** | **Position following compensation speed** | **0rpm** |
| **P1571 internal position error value** | **[0]: Semi-closed loop position error value<br>[1]: Full closed loop position error value (before filtering)<br>[2]: Full closed loop position error value (after filtering)** | **0** |
| **P1572 PP mode speed command** | **The speed value of the contour position mode, the position decreases as a negative speed, and the position increases as a positive speed** | **0rpm** |
| **P1573 speed feedforward output** | **Speed curve value planned according to position curve** | **0rpm** |
| **P1574 acceleration feedforward output** | **Acceleration feedforward output speed** | **0rpm** |

## P1575~ P1597Axis 1 DS402 parameters

<table>
<tr><th>No. Parameter</th><th>Description</th><th>Unit</th></tr>
<tr><td>P1575 position resolution</td><td>int32, 608F EtherCAT communication bus position resolution, speed and position are calculated according to this. Set the number of pulses required for the motor to rotate once. After the setting is completed, it needs to be restarted to take effect.<br>The resolution should not be set too low:<br>1.TTL and HTL incremental square waves, four times the original resolution If the encoder has 1024 lines, set it to 4096; if it has 2500 lines, set it to 10000<br>2 Incremental SinCos Encoder<br>The driver software can subdivide the original resolution of the sine and cosine encoder by 16 bits. The total resolution of P1575 is the original resolution of the sine and cosine encoder.<br>*65536 (2 to the 16th power). In principle, the setting value of P1575 can be divisible by the total resolution:<br>a. The resolution of the sine and cosine encoder is a power of 2;<br>For example: the sine and cosine encoder resolution is 256, 128, P1575 can be set to 8388608 or the default resolution;<br>Wiring port and name Usage description<br>b. The resolution of the sine and cosine encoder is not a power of 2, and the setting value must be divisible by the total resolution;<br>For example: The resolution of the sine and cosine encoder is 162, then the set resolution needs to be divisible by 10616832 (162*65536). P1575 can also be set to 331776, 663552 and other values;<br>3 Absolute encoder without sine and cosine subdivision<br>Set according to the single-turn resolution. For example, if the single-turn is 23 bits, then P1575 is set to 8388608;<br>4 The absolute encoder has sine and cosine subdivision, single-turn resolution + 10 bits<br>For example, HEIDENHAIN 1313 or 1325 has 13 digits in a single turn. Take 13+10=23 digits, which is 8388608, then set P1575 to 8388608.<br>For example, SKM36 has 128 sine waves in a single circle, and the frequency multiplication is 9 bits, so it is set to 9+10=19 bits, that is, 524288, then P1575 is set to 524288;<br>5 resolver, divided into 16 bits, that is, 65536;</td><td>10485 76</td></tr>
<tr><td>P1576 6040 Control word</td><td>Uint16， Control word
<table>
<tr><td>Bit0</td><td>Switch On: Servo ready</td><td>1 is valid, 0 is invalid</td></tr>
<tr><td>Bit1</td><td>Enable voltage: Turn on the main circuit</td><td>1 is valid, 0 is invalid</td></tr>
<tr><td>Bit2</td><td>Quick stop: Quick stop,</td><td>0 is valid, 1 is invalid (no quick downtime)</td></tr>
<tr><td>Bit3</td><td>Enable Operation: enable operation</td><td>1 is valid, (servo operation) 0 is invalid</td></tr>
<tr><td>Bit4</td><td>-Related to control mode</td><td rowspan="3"></td></tr>
<tr><td>Bit5</td><td>-Related to control mode</td></tr>
<tr><td>Bit6</td><td>-Related to control mode</td></tr>
<tr><td>Bit7</td><td>Fault reset: Fault reset,</td><td>The rising edge is valid. If it remains 1, other instructions are invalid.</td></tr>
<tr><td>Bit8</td><td>Halt: pause</td><td>Changing the 6060 mode to 0 means pausing, and bit 8 is invalid.</td></tr>
<tr><td>Bit9-15</td><td>-undefined</td><td></td></tr>
</table>
Comply with 402 standard protocol</td><td>0x00 00</td></tr>
</table>

| No. Parameter | Description | | | | Unit |
|---|---|---|---|---|---|
| | **PP mode:** | | | | |
| | | | | | |
| | **Bit4** | **Change on set-point (Position triggered)** | **0<br>-<br>1** | **Trigger for starting positioning action and updating set value.<br>Get new location task (607A/6081)** | |
| | **Bit5** | **Change set immediately (update set now)** | **0** | **Now after the positioning action is completed, start the next positioning action. That is, during the movement, if the target position is changed to 607A, the acceleration is 6083, the deceleration is 6084, and then<br>Sending control instructions will not run according to the new motion parameters. You need to complete the last motion and then send a new command to execute the new motion.** | |
| | | | **1** | **Now after the positioning action is completed, start the next positioning action. That is, during the movement,<br>If you change the target position to 607A, acceleration to 6083, and deceleration to 6084, and then send a control command, it will not run according to the new motion parameters. You need to complete the last motion and then send a new command to execute the new motion.** | |
| | **Bit6** | **Absolute /relative (absolute position/ relative position)** | **0** | **Absolute position, 607A is given as an absolute position** | |
| | | | **1** | **Relative position, 607AH is given as a relative position** | |
| | **Bit9** | **Change on set-point (Change the opposition point)** | | | |

<table>
<tr><th>No. Parameter</th><th>Description</th><th>Unit</th></tr>
<tr><td>P1577 6060 control mode</td><td>int16，Modes of operation<br><br><table><tr><th>No.</th><th>Operation display mode</th><th>Abbr.</th><th>Enable in Local</th></tr><tr><td>0</td><td>No mode change(空)</td><td>-</td><td>-</td></tr><tr><td>1</td><td>Profile position mode(轮廓位置)</td><td>Pp</td><td>Yse</td></tr><tr><td>2</td><td>Velocity mode(速度模式)</td><td>Vl</td><td>Yse</td></tr><tr><td>3</td><td>Profile velocity mode(轮廓速度)</td><td>Pv</td><td>Yse</td></tr><tr><td>4</td><td>Torque profile mode (轮廓转矩)</td><td>Pt</td><td>Yse</td></tr><tr><td>6</td><td>Homing mode(回零)</td><td>Hm</td><td>No</td></tr><tr><td>7</td><td>Interpolated position mode(补偿位置)</td><td>Ip</td><td>No</td></tr><tr><td>8</td><td>Cyclic synchronous position mode(时时位置)</td><td>csp</td><td>Yse</td></tr><tr><td>9</td><td>Cyclic synchronous velocity mode(时时速度)</td><td>csv</td><td>Yse</td></tr><tr><td>10</td><td>Cyclic synchronous torque mode(时时转矩)</td><td>Cst</td><td>Yse</td></tr></table>Due to the limitation of the minimum data width of the CPU to 16 bits, the data width of the object 0x6060 modes of operation needs to be changed from the original 8 bits to 16 bits. If the object is not convenient to change to 16 bits, arrange it at the end of the PDO map!</td><td>8</td></tr>
<tr><td>P1578 60B8 Probe control</td><td>Uint16，Touch probe function，<br><br>BIT&description<br><table><tr><th>Bit</th><th>60B8h</th><th>60B9h</th></tr><tr><td>0</td><td>Probe 1 enable</td><td>Probe 1 enabled</td></tr><tr><td>1</td><td>Probe 1 continuous mode</td><td>Probe 1 positive edge value stored</td></tr><tr><td>2</td><td>Probe 1 zero pulse</td><td>Probe 1 negative edge value stored</td></tr><tr><td>3</td><td>-</td><td>-</td></tr><tr><td>4</td><td>Probe 1 enable latch on positive edge(used also for<br>encode zero signal)</td><td>-</td></tr><tr><td>5</td><td>Probe 1 enable latch on negative edge</td><td>-</td></tr><tr><td>6</td><td>-</td><td>Probe 1 positive edge value stored(continuous<br>mode only,bit toggles if latch status changed)</td></tr><tr><td>7</td><td>-</td><td>Probe 1 negative edge value stored(continuous<br>mode only,bit toggles if latch status changed)</td></tr><tr><td>8</td><td>Probe 2 enable</td><td>Probe 2 enabled</td></tr><tr><td>9</td><td>Probe 2 continuous mode</td><td>Probe 2 positive edge value stored</td></tr><tr><td>10</td><td>Probe 2 zero pulse</td><td>Probe 2 negative edge value stored</td></tr><tr><td>11</td><td>-</td><td>-</td></tr></table></td><td></td></tr>
</table>

<table>
<tr><th>No. Parameter</th><th>Description</th><th>Unit</th></tr>
<tr><td></td><td>
<table>
<tr><td>12</td><td>Probe 2 enable latch on positive edge(used also for<br>encode zero signal)</td><td>-</td></tr>
<tr><td>13</td><td>Probe 2 enable latch on negative edge</td><td>-</td></tr>
<tr><td>14</td><td>-</td><td>Probe 2 positive edge value stored(continuous<br>mode only,bit toggles if latch status changed)</td></tr>
<tr><td>15</td><td>-</td><td></td></tr>
</table>
The HOMING function is implemented in the upper master station. The driver only supports setting the current point to 0.
<table>
<tr><td>System->Drive:</td></tr>
<tr><td>0x60B8 =0X 5, start probe update once, =0X7 update every circle, =0x00, clear Touch probe function acquisition ends</td></tr>
<tr><td>Drive->System:</td></tr>
<tr><td>0x60B9 = 3, indicating that a probe event was received</td></tr>
<tr><td>0x60BA = Probe 1 rising edge captures origin value</td></tr>
</table>
</td><td></td></tr>
<tr><td>P1579 607A target position</td><td>int32, Target position, shared by CSP(8) and PP(1) modes<br>Used for bus control position given<br>When the servo is in the off state, please configure 607Ah (position given) followed by 6064h (position feedback) for host processing. If the motor is moved by external force while the servo is turned off, it will be dangerous because it will return to the input target position the next time the servo is turned on. When switching from a control mode other than the csp control mode to the csp control mode, please also follow the steps.</td><td>0P</td></tr>
<tr><td>P1580 60FF target speed</td><td>int32, Target velocity, shared by CSV(9) and PV(3) modes<br>Used for speed control speed given, the unit is pulse/second. If the given positioning speed needs to be converted into pulses to ensure the given accuracy: 60FF=target speed/60*1575 communication resolution corresponds to 606C speed feedback</td><td>0P/S</td></tr>
<tr><td>P1581 6071 Target torque</td><td>int16, Target Torque, bus target torque value, CST(A) and PT(4) modes share unit 1=0.1%. If you need to improve the torque given accuracy, pass Bit05=1 (0X0020) of the P1595 DS402 global configuration word Activate high resolution unit 0.01%, need to restart after setting. The panel will not display two decimal places,<br>Corresponds to 6077: Torque feedback</td><td>0</td></tr>
<tr><td>P1582 6072 Maximum torque</td><td>Uint16, Max Torque, maximum torque limit, P1300 and P1301 will follow the change after the limit, 60E0 and 60E1 will not change</td><td>3000= 300.0 %</td></tr>
<tr><td>P1583 6042 Target speed</td><td>int16, VL Target velocity (2), unit 1RPM/MIN. Used in scenarios with low accuracy requirements<br>6044h: VL actual value to obtain actual speed feedback P1568</td><td>0RPM</td></tr>
<tr><td>P1584 6081 Contour speed</td><td>int32, Profile velocity, only for PP(1) mode, pulses/second<br>6081=target speed/60*1575 communication resolution</td><td>0P/S</td></tr>
<tr><td rowspan="2">P1585 Contour acceleration and deceleration</td><td>P1585[00] Profile acceleration 6083, defines the number of acceleration pulses per second, default 1048576</td><td></td></tr>
<tr><td>P1585[01] Profile deceleration 6084, defines the number of deceleration pulses per second, default 1048576</td><td></td></tr>
<tr><td>P1586 6087 Torque slope</td><td>Uint32, Torque slope corresponds to slope time P1440, P1441, set to 10 corresponding to 1%/S<br>PT mode takes effect</td><td>32767</td></tr>
</table>

| No. Parameter | Description | Unit |
|---|---|---|
| **P1587 Speed feedforward filter time** | **Speed feedforward filter time** | **0.3ms** |
| **P1588 Torque limiter** | **P1588[00] 60E0 forward torque limiter, related to P1300 forward maximum torque.1500=150.0%** | **1500** |
| | **P1588[01] 60E1 reverse torque limiter, related to P1301 forward maximum torque** | **1500** |
| **P1589 probe port number 1** | **The probe can capture the encoder Z pulse (or the 0 point of the absolute encoder) or the external origin switch, where<br>The assignment of probe capture external input is settable, and probe 1 corresponds to the P1589 parameter editing setting.** | **0** |
| **P1590 60B1 speed offset** | **int32，Velociy offset** | |
| **P1591 60B2 Torque bias** | **int16，Torque offset** | |
| **P1592 Position smoothing filter time ms** | **Position smoothing filter time** | **50.0 ms** |
| **P1593 position dead zone setting** | **Position dead zone setting value** | |
| **P1594 Zero position offset** | **The unit is pulse, the attribute is RW, INT 32-bit data<br>Under the condition of encoder closed loop, the driver control mode (6060H) is in CSV mode.<br>When the control word (6040H) receives the orientation request and the control word is written (0x040F), the actual mode of the object (6061H) switches to 1: PP mode, and the position reference automatically switches to the Z-phase signal<br>position and overlay the P1594 offset.<br>If the Z signal has not been encountered, the search is performed at 10% of the motor's rated speed. If it is a high-speed electric spindle, the fastest speed does not exceed 150 rpm.<br>Adjust the spindle to the desired position, and write the remaining single-turn position value after removing the multi-turn position by checking P0413/P0433/P0453/P0473 (corresponding to different encoder port monitoring addresses) into P1594.** | **0p** |

| No. Parameter | Description | Unit |
|---|---|---|
| **(Z signal offset)** | **Bit0: Full closed loop enables,<br>Bit1: forced semi-closed loop,<br>Bit2: Full closed loop error cleared,<br>Bit4 speed and torque mixed mode; associate the configuration word with the DI port, please refer to the P950~P957 bit pointers and MOVE instructions<br>Bit5: Bit05=1 (0X0020) activates the high resolution unit 0.01%. A restart is required after the setting is completed. The panel will not display two decimal places (23.10.7 update)<br>illustrate:<br>Bit4: Speed and torque mixed mode. The factory default is 0, which is not activated. If it is set to 1, it is activated, and the drive is in high speed. Torque hybrid mode;<br>1 When the 6060h control mode is 9: CSV mode or 3: PV mode, the driver adopts speed priority to limit torque [write 0x60FF (target speed degree) and write 0x6071 (target torque) at the same time];<br>Note: To reverse the direction of the motor, you only need to change the speed to a negative value, and the motor can reverse. There is no need to consider the positive and negative torque, and the positive and negative two-way torque can be limited (such as torque Set 10% or -10%, the torque limit range is ± 10%);<br>2 When the 6060h control mode is 10: CST: mode or 4: PT mode, the driver adopts torque priority speed limit [write 0x6071 (target) Standard torque) needs to be written at the same time as 0x60FF (target speed)].<br><br>Note: To reverse the direction of the motor, you only need to change the torque to a negative value, and the motor can reverse. There is no need to consider the positive and negative speed. Only one-way torque can be limited (for example, if 10% is set,<br>The maximum torque limit is 10%, and the negative torque is not limited by the set value; if -10% is set, the maximum torque limit is -10%, and the positive torque is not limited by the set value);** | **0x0000** |
| **P1595 fully closed loop configuration word** | **Find the minimum value when the load does not jitter. The error between the load encoder and the motor encoder is filtered before subsequent analysis and calculation.** | **50.0 ms** |
| **P1596 fully closed loop error filter time** | **The relative error limit between the load encoder and the motor encoder can prevent overrun when the load encoder feedback is disconnected or the direction is opposite.** | **10000 P** |

## 〉P1600 ~ P1619Axis 1 pulse servo status

| No. Parameter name | Description | Unit |
|---|---|---|
| P1600 speed command output | Servo control speed command output speed value | 0.0rpm |
| P1601 position regulator output | Position regulator output speed value | 0.0rpm |
| P1602 speed feed forward output | The actual operating speed of the slave machine is the speed obtained by converting the master speed through the gear ratio. | 0.0rpm/s |
| P1603 acceleration feed forward output | Acceleration feed forward output | 0.0rpm/s |
| P1604 real-time position error | Real-time position error value | 0P |
| P1605 i32PosRefUsed | Location real-time reference value | 0 |
| Location real-time reference value | Position real-time feedback value | 0 |
| P1607 status word | Bit0 position is close,<br>Bit1 positioning completed,<br>Bit2 receives the reference signal,<br>Bit3 positioning speed limiter,<br>Bit4 reference signal loading | B0OL |
| P1608 position loop enable flag | 1:=Position loop enabled, CSP position synchronization or PP track contour position trigger is 1 | 0 |
| P1609 bPPCtrlEn PP contour enable status flag bit | When PP contour control is enabled, it becomes 1 | 0 |
| P1610 Stage mode control flag | Displays the status of different control modes, 1=CSP position synchronization is enabled, 2=CSV speed synchronization is enabled, 3=PP trajectory profile position is enabled | 0 |
| P1611 Full closed loop error is too large | Full closed loop excessive error sign, excessive error triggers 37 excessive position deviation alarm | 00 |
| P1612 fully closed loop error value | The maximum error value of the fully closed-loop control operation following. If it exceeds this value, the 37 excessive position deviation alarm is triggered. | |
| P1613 i32PPPosRefBase | [00]PP position reference datum,<br>[01] Encoder real-time position,<br>[03] The position amount of walking in encoder position mode,<br>[04] Number of position overflows when walking in position mode | 0 |
| P1614 control word | Fully closed loop stop shearing special control word | 0 |
| P1615 status word | Fully closed-loop stop shearing special status word | 0 |
| P1616 Actual position | Full closed-loop stop shear dedicated actual position (mm)<br>[01] Actual speed (m/min)<br>[02] Currently allowed maximum linear speed (m/min) | 0 |

## P1620 ~ P1649Axis 1 pulse servo configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| P1620 servo control mode | 0=CSP position synchronization, hourly position, given pulse following<br>1=CSV speed synchronization, speed follow all the time<br>2=PP trajectory outline position, internal position | 0 |
| P1621 servo enable signal source | Point to the DI terminal and define it as a terminal through the pointer. For example: set DI4=P0140.03, then DI4 is closed and the servo is enabled. | 0.Always 0 |
| P1622 position given source port | Pulse given port, 0=none, 1~4 correspond to encoder ports 1-4 respectively. | 4.Port No. 4 of the PG card is used as pulse reference |
| P1623 position loop dead zone | The number of pulses in the error dead zone. If the error is within this setting range, the driver will not make adjustments | 0 |
| P1624 acceleration filter time | Acceleration filter time, ms, if the resolution is higher, set it to 0.25ms, if the resolution is lower, set it to 2ms. | 0.25MS |
| P1625 analog command | 0=No port 1=AI1 2=AI2 | 1 |
| P1626 f32AnalogRefPreset | AI actual speed is given. When the CSV speed synchronization mode is enabled, the data will be refreshed. When P1625=0, the target speed can be written in real time through the bus | 0.0RPM |
| P1627 f32AnalogGain | Speed synchronous control in conjunction with the CNC system is used to reduce the range of analog quantities, especially suitable for analog position control of high-speed | 1.000 |
| P1628 LockEnable | Axis lock enable signal source, typically used for turntable control. When reaching the target position, the system issues an axis lock request. If it is a dual encoder fully closed loop, P1310 mechanical transmission ratio needs to be set. | 0.Always 0 |
| P1629 f32PosFiltTime | Position smoothing time, ms, is used for position smoothing when the position is given, which is equivalent to latching the given position and then smoothing the output. | 25MS |
| P1630 HomingRqst | Forced zero return request signal source, often used for spindle orientation, automatic tool change, etc. After zero return, it defaults to Z signal. It can also be offset by 1631 and 1632, pointing to the DI terminal and defined as a terminal by a pointer, for example: DI5=P0140.04 | 0.Always 0 |
| P1631 f32HomeOffset | reserve | 0P |
| P1632 f32HomingPosSet | reserve | 0P |
| P1633 MarkType | Zero point type, 0, = encoder's own zero point (Z pulse or virtual origin), 1 = use external DIO correction, 2 = no origin correction | 0 |
| P1634 f32HomingSpeed | Zeroing speed setting value, unit rpm, this limit is only effective when P1633=1 external DIO correction type | 60rpm |
| P1635 16ProbeInputPort | External zeroing probe input port, 1-6 correspond to DI1-DI6 | 0 |
| P1636 bPosRefDatType | 0=Float32 floating point number, unit is angle,<br>1=Int32 integer, unit is pulse | 0 |

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1637 i32PosRefUsr INT32** | **Used when P1636 is set to 1=int32 integer, set the target positioning position, the unit is pulse, and the set pulse range is the number of pulses per revolution or single-turn resolution after the encoder is subdivided** | **0P** |
| **P1638 PPVelSrc** | **The speed limit command source of the PP contour positioning process is effective when P1633=0 or 2. If the pointer points to P0900 and P0900 is set to 20 rpm, the positioning speed is 20rpm.** | **P1390 Speed forward maximum value** |
| **P1639 f32PPAccSet** | **Contour acceleration, coefficient 0.1, unit Hz/s, the corresponding acceleration of 1 Hz/s is 60rpm/s, related to P1638, effective when P1633=0 or 2** | **20.0HZ** |
| **P1640 PosSelIn[0]** | **It is defined as a DI terminal through a pointer. The combination can generate a total of 8 selection signals (0-7), which are obtained through the combination of three terminals.** | **0.Always 0** |
| **P1641 PosSelIn[1]** | **Define it as DI terminal through pointer, same as above** | **0.Always 0** |
| **P1642 PosSelIn[2]** | **Defined as DI terminal through pointer, same as above** | **0.Always 0** |
| **P1643 f32PosPreset** | **A total of 8 positions can be set. Input the encoder mechanical angle P0404/P0424/P0444/P0464 into P1643[00]. If the P1630 signal source is enabled, position to P1643[00] to set the angle 1.0000, which corresponds to one rotation of the motor. displacement<br>[0]: 1st segment position setting<br>[1]: 2nd segment position setting<br>[2]: 3rd segment position setting<br>[3-7] Nth segment position setting** | **0.0000P** |
| **P1644 bPosTypeInc** | **Incremental position mode (reserved), absolute value can clear the current position (mode 35)** | **35** |
| **P1645 f32RevPerUnit** | **The dimension of the multi-segment position value, that is, the number of revolutions of the motor corresponding to the position value of 1.0 (reserved)** | **1.000** |
| **P1646 StepRqst** | **[0] Positive limiter; set to 0 to turn off the limiter; when the zero point type is 2, the setting value of P1637 exceeds the limiter or when the zero point type is 0, the position value fed back by the encoder exceeds the limiter, and the trigger position deviation exceeds the limiter. Big alarm, angle positioning does not take effect** | **0** |
| **P1646 [1]** | **Same as above** | **0** |
| **P1647 u32CfgData** | **Bit0=fully closed loop mode;<br>Bit1=forced semi-closed loop;<br>Bit2=clear error;<br>Bit4=The current position is used as the zero point (written when the servo is enabled, requires a single trigger, and takes effect after the enable is disconnected);<br>Bit5-bit7 not enabled<br>Bit8=Always forward direction; BIT12: Special for stop shearing** | **0x0000** |

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1648 f32AbsPosFiltTime** | **30-200ms, find the minimum value when the load does not jitter. The error between the load encoder and the motor encoder is filtered before subsequent analysis and calculation.** | **50.0MS** |
| **P1649 FullyPosCtrlErrLimit** | **The relative error limit between the load encoder and the motor encoder. When the load encoder feedback is disconnected or the direction is opposite, it is used to prevent overrun. It is generally set to the number of pulses in one revolution of the external encoder.** | **0** |

## 〉P1915 ~ P1928Axis 1 DC/DC power supply status

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1915 Voltage feedback actual value** | **Corrected and smoothed by filtering** | **0.0v** |
| **P1916 Current feedback actual value** | **Corrected and smoothed by filtering** | **0.0A** |
| **P1917 Voltage given actual** | **The actual given value after voltage limiting** | **0.0v** |
| **P1918 Current given actual** | **The actual given value after current limiting** | **0.0A** |
| **P1919 Output duty cycle** | **Actual PWM duty cycle** | **0.0%** |
| **P1920 output voltage value** | **Estimated output voltage value based on duty cycle** | **0.0v** |
| **P1921 Output power** | **The power value calculated based on voltage feedback and current feedback** | **0.0kw** |
| **P1922 PidVolt.Ref** | **Given voltage loop** | **0.0v** |
| **P1923 PidVolt.Fdb** | **voltage loop feedback** | **0.0v** |
| **P1924 PidVolt.Out** | **voltage loop output** | |
| **P1925 PidCurInd.Ref** | **Given current loop** | |
| **P1926 PidCurInd.Fdb** | **Current loop feedback** | |
| **P1927 PidCurInd.Out** | **Current loop output** | |
| **P1928 u16MFState** | **Master-slave communication status, 0=offline, 1=online** | **0** |

## 〉P1935 ~ P1946 Axis 1 DC/DC power supply configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| P1935 Voltage given | Bus control voltage given | 0.0V |
| P1936 Current given | Bus control current given | 0.0A |
| P1937 Voltage loop Kp | Used to adjust the response speed of the voltage loop | 4.00 |
| P1938 Current loop Kp | Usually no adjustment is needed | 1.00 |
| P1939 Voltage loop integration time | Load disturbance immunity for regulating voltage loops | 0.050S |
| P1940 Reserved | reserve | |
| P1941 Filter inductor mH | Factory settings, cannot be modified | 0.75mH |
| P1942 Filter capacitance mF | Factory settings, cannot be modified | 3.00 |
| P1943 Voltage ramp time | The time required to rise from zero to the given upper limit of the voltage | 0.05S |
| P1944 Current ramp time | The time required to rise from zero to the given upper limit of the current | 0.10S |
| P1945 Voltage open loop enable | 0=standard closed loop mode, 1=open loop test mode, 2=mirror mode | 0 |
| P1946 Current given upper limit | Depending on the machine, the manufacturer's factory settings | 1A |
| P1947 Voltage given upper limit | Depending on the machine, the manufacturer's factory settings | 1V |
| P1948 Voltage given lower limit | | 24V |
| P1949 Voltage feedback gain | Used to correct voltage feedback accuracy | 100.0% |
| P1950 voltage feedback bias | | 0.0V |
| P1951 Current feedback gain | Used to correct current display accuracy | 100.0% |
| P1952 Current feedback bias | | 0.0A |
| P1953 Droop gain R | Used to automatically balance the load current of multiple machines in parallel | 0.000Ohm |
| P1954 Accumulated | The amount of electricity from the DC power source to the | |
| P1955 Cumulative discharge power Ah | The amount of electricity from the load to the DC power supply | |
| P1956 Load current range | Factory settings, cannot be modified | 0.0A |
| P1958 f32UdcMin | Mirror transformation, Udc range | 0.0V |
| P1959 f32UdcMax | | 0.0V |
| P1960 f32UoMin | Mirror transformation, Uo range | 0.0V |
| P1961 f32UoMax | | 0.0V |
| P1963 Master-slave control mode | 0=standard mode, 1=master mode, 2=slave mode | 0 |

| No. Parameter name | Description | Unit |
|---|---|---|
| **P1964 Number of master-slave parallel connections** | **Host mode based on master-slave communication control, the number of parallel connections needs to be set** | **1** |
| **P1965 Control frame sequence number** | **Master sends to slave** | |
| **P1966 Control word of control frame** | | |
| **P1967 Control frame voltage reference** | | |
| **P1968 Control frame current given** | | |
| **P1969 Sequence number of status frame 1** | **Slave 1 sends to master** | |
| **P1970 Status word of status frame 1** | | |
| **P1971 Voltage feedback of status frame 1** | | |
| **P1972 Current feedback of status frame 1** | | |
| **P1973 Sequence number of status frame 2** | **Slave 2 sends to master** | |
| **P1974 Status word of status frame 2** | | |
| **P1975 Voltage feedback of status frame 2** | | |
| **P1976 Current feedback of status frame 2** | | |
| **P1977 Sequence number of status frame 3** | **Slave 3 sends to master** | |
| **P1978 Status word of status frame 3** | | |
| **P1979 Voltage feedback of status frame 3** | | |
| **P1980 Current feedback of status frame 3** | | |
| **P1981 Sequence number of status frame 4** | **Slave 4 sends to master** | |
| **P1982 Status word of status frame 4** | | |
| **P1983 Voltage feedback of status frame 4** | | |
| **P1984 Current feedback of status frame 4** | | |

## 〉P5000 ~ P5028 EtherCAT status

<table>
<tr><th>No. Parameter name</th><th>Description</th><th>Unit</th></tr>
<tr><td>P5000 AIControl</td><td>EtherCAT state machine monitoring, application layer control register
<table>
<tr><th>Data</th><th>P5000 Display value meaning</th><th>Explanation</th><th>Remark</th></tr>
<tr><td>1</td><td>Init</td><td>Unable to communicate via email (SDO) Process data communication not possible (PDO)</td><td>17 (11H) Initialization exist error</td></tr>
<tr><td>2</td><td>Pre - Operationl</td><td>Can communicate via email (SDO) Process data communication not possible (PDO)</td><td>18 (12H) Run exist error</td></tr>
<tr><td>4</td><td>Safe - Operationl</td><td>Can read PDO input data (TxPDO) Unable to receive PDO output data (RxPDO)</td><td>20(14H) error exists</td></tr>
<tr><td>8</td><td>Operationl</td><td>Can communicate via email (SDO) Process data communication possible (PDO)</td><td>24 (18H) error exists</td></tr>
</table></td><td>1</td></tr>
<tr><td>P5001 Sync0Cnt</td><td>DC SYNC0 timer count value sync Counter, synchronization counter</td><td>0</td></tr>
<tr><td>P5002 Pdo event</td><td>PDO event count value, PDO data exchange interrupt event count //Monitor the number of 1S interrupts, if it is not increased synchronously, the communication will be disconnected</td><td>0</td></tr>
<tr><td>P5002[01]</td><td>Monitor whether the given data of the host computer is lost. Once lost, 1 will be accumulated.</td><td></td></tr>
<tr><td>P5003 PDI status</td><td>PDI operation/EEPROM normal loading<br>0: EEPROM not loaded or XML file not downloaded<br>Process data RAM cannot be accessed, therefore PDI operations are not possible, IP core loading status,<br>1: EEPROM is loaded normally<br>The PDI of the process data RAM operates normally and EC communication is possible.</td><td>1</td></tr>
<tr><td>P5004</td><td></td><td></td></tr>
<tr><td>P5010 CANopen Reception statistics</td><td>P5010[00] Count of all received frames</td><td></td></tr>
<tr><td></td><td>P5010[01] RPDO1 receive count</td><td></td></tr>
<tr><td></td><td>P5010[02] RPDO2 receive count</td><td></td></tr>
</table>

| No. Parameter name | Description | Unit |
|---|---|---|
| | **P5010[03] RPDO3 receive count** | |
| | **P5010[04] RPDO4 receive count** | |
| | **P5010[05] SDO receive count** | |
| | **P5010[06] SYNC synchronization frame count** | |
| | **P5010[07] NMT network management frame count** | |
| **P5011** | **CANopen sending statistics** | **CAN trans count** |
| | **P5011[01] TPDO1 receive count** | |
| | **P5011[02] TPDO2 receive count** | |
| | **P5011[03] TPDO3 receive count** | |
| | **P5011[04] TPDO4 receive count** | |
| | **P5011[05] SDO sending count** | |
| | **P5011[06] EMC emergency message count** | |
| | **P5011[07] Heartbeat message count** | |
| **5012 CanaErrStatus** | **CAN physical layer status, 0=no error, 1=stuff Error, 2=frame format Error, 3=Ack error, 4=Bit1 error, 5=Bit0 error, 6=CRC error, 7=no new event** | **3** |
| **5013 CanbErrStatus** | | |
| **5020 u32DeviceType** | | **0x00020192** |
| **5021 16ErrorRegister** | | **0x0000** |
| **5022** | **sIdentity ID** | **0x00200000** |
| | **P5022[01]** | **0x000A0880** |
| | **P5022[02]** | **0x00010001** |
| | **P5022[03]** | **0x0000** |
| **5023** | **aSynManType** | **0x0001** |
| | **P5023[01]** | **0x0002** |
| | **P5023[02]** | **0x0003** |
| | **P5023[03]** | **0x0004** |
| **5024 Communication cycle time us** | **f32SyncCycleTime Monitor bus communication synchronization time** | **0us** |
| **5025 Clock synchronization error us** | **f32DcSyncErr，Bus communication synchronization time error value** | **0us** |
| **5026 Clock synchronization control quantity** | **i32ClockAdjOut** | **0** |
| **5027 Receive PDO length** | **u16RxPdoNum，RPDO Number of configurations** | **0** |
| **5028 Send PDO length** | **u16TxPdoNum，TPDO Number of configurations** | **0** |
| | | |

## 〉P5029 ~ P5030 DS301 Data

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5029** | **RPDO1 receives data. The register is 16-bit data. If the configured PDO is 32-bit, it needs to occupy two consecutive addresses. It is used to monitor data writing from time to time to see if it is misplaced.** | **0x0000** |
| **P5029[01]** | **Same as above** | **0x0000** |
| **P5029[02]- [31]** | **Same as above** | **0x0000** |
| **P5030** | **TPDO1 sends data, the register is 16-bit data, if the configured PDO is 32-bit, it needs to occupy two consecutive addresses** | **0x0000** |
| **P5030[01]- [31]** | **Same as above** | **0x0000** |

## 〉P5040 ~ P5044 MODBUS status

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5040 Send packet statistics** | **Count the message frames received by this node from the Modbus bus. Note: This counter only counts message frames (including broadcast frames) sent to this node.** | **0** |
| **P5041 Received packet statistics** | **Count the message frames sent by this node to the Modbus bus** | **0** |
| **P5042 Total number of valid data packets** | **Count all message frames detected by this node from the Modbus bus** | **0** |
| **P5043 CRC error statistics** | **Count the number of CRC verification errors that occur when this node receives messages from the Modbus bus.<br>An increase in this value during operation indicates that there is erroneous data on the bus and interference issues need to be dealt with.** | **0** |
| **P5044 Communication frame error statistics** | **Count the number of serial port errors that occur when this node receives messages from the Modbus bus. If it continues to increase in standby mode, it may be that the positive and negative connections of the 485 lines are reversed. If it increases during operation, it may be interference.** | **0** |

## 〉P5050 ~ P5054 Control operation panel communication status

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5050 Send packet statistics** | **Statistics of message frames sent by the driver to the panel are used to monitor whether the panel communication is correct.** | **-** |
| **P5051 Received packet statistics** | **The statistics driver receives the message frame sent by the panel** | **-** |
| **P5052 Total number of valid data packets** | **Statistics of all message frames communicated between the driver and the panel** | **-** |
| **P5053 CRC error statistics** | **Count the number of CRC verification errors that occur in the communication between the driver and the panel** | **-** |
| **P5054 Communication frame error statistics** | **Count the number of data transmission errors that occur in the communication between the driver and the panel** | **-** |

## 〉P5055 ~ P5058 MODBUS TCP Data

| No. Parameter name | Description | Unit |
|---|---|---|
| P5055 | The definition is waiting to be supplemented and improved. | |
| P5056 | The definition is waiting to be supplemented and improved. | |
| P5057 | The definition is waiting to be supplemented and improved. | |
| | | |
| | | |

## 〉P5080 ~ P5092 PROFINET Status

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5080 protocol stack initialization** | **Protocol stack initialization status, 1=The protocol stack has been started and initialized normally** | **-** |
| **P5081 PN data exchange status** | **PN data exchange status, 1=real-time data exchange is in progress, and the mapping will be automatically refreshed when entering real-time data exchange.** | **-** |
| **P5082 Mapping error indication** | **PN data mapping error message, thousands-digit message serial number: 1=receive message 1, 2=receive message 2, 3=send message 1, 4=send message 2; thousand- and hundred-digit object serial numbers: 1~8 Corresponding objects 1~8; 10. Single digit error types: 0 no error, 1 index invalid, 2 object read-only but not writable, 3 data type conflict, 4 data bit width invalid;** | **-** |
| **P5083 Data exchange counter** | **Count the number of PN data exchanges, the number of real-time data exchanges, which will be continuously accumulated during normal communication for diagnostic analysis.** | **-** |
| **P5084 PN protocol stack version** | **Firmware date version of PN protocol stack** | **-** |
| **P5085 Slot1 message number** | **PN communication message type** | **-** |
| **P5086 Slot2 message number** | **PN communication message type** | **-** |
| **P5087 Slot3 message number** | **PN communication message type** | **-** |
| **P5088 Slot4 message number** | **PN communication message type** | **-** |
| **P5089 Slot1 message number 1** | **PN communication message type** | **-** |
| **P5090 Slot2 message number 1** | **PN communication message type** | **-** |
| **P5091 Slot3 message number 1** | **PN communication message type** | **-** |

## 〉P5100 ~ P5113 ECAT/CAN Configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5100 ECAT station number** | **The node address of the EtherCAT slave station, 0~65535, is used for station number addressing (as opposed to sequential addressing). Physical addressing does not require setting the host computer definition.** | **0** |
| **P5110 CANOpen station number** | **CANopen slave node address, 1~247** | **3** |
| **P5111 CAN baud rate** | **CANopen Communication baud rate，10~1000Kbps**<br>**0 = 10kbps**<br>**1 = 20kbps**<br>**2 = 50kbps**<br>**3 = 125kbps**<br>**4 = 250kbps**<br>**5 = 500kbps**<br>**6 = 625kbps**<br>**7 = 800kbps**<br>**8 = 1Mbps** | **1000 Kbps** |
| **P5112 CAN terminal resistor switch** | **CANopen physical port A terminal matching resistor configuration**<br>**0: closed**<br>**1: Disconnect** | **0** |
| **P5113 D2D terminal resistor switch** | **CANopen D2D master-slave communication terminal resistor configuration**<br>**0: closed**<br>**1: Disconnect** | **0** |

## 〉P5120 ~ P5142 DS301 Configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| P5120 RPDO0 mapping[0] | DS301 protocol receives process data RPDO0 mapping, which is used to monitor the mapping content and sorting of the host computer. | 0X00000 |
| | P5120[0] Number of RPDO0 mapping objects | 0X0000 |
| | P5120[1] RPDO0 mapping content | 0X0000 |
| | P5120[2] RPDO0 mapping content | 0X0000 |
| | P5120[3] RPDO0 mapping content | 0X0000 |
| | P5120[4] RPDO0 mapping content | 0X0000 |
| | P5120[5-15] Same as above | 0X0000 |
| P5121[00-16] RPDO1 mapping[1] | DS301 protocol receiving process data mapping [1]. Same as above | 0X000 |
| P5122[00-16] RPDO2 mapping[2] | DS301 protocol receiving process data mapping [2] Same as above | 0X0000 |
| P5123[00-16] RPDO3 mapping[3] | DS301 protocol receiving process data mapping [3] Same as above | 0X0000 |
| P5124[00-16] TPDO0 mapping[0] | DS301 protocol sending process data mapping [0] Same as above | 0X0000 |
| P5125[00-16] TPDO1 mapping[1] | DS301 protocol sending process data mapping [1] Same as above | 0X0000 |
| P5126[00-16] TPDO2 mapping[2] | DS301 protocol sending process data mapping [2] Same as above | 0X0000 |
| P5127[00-16] TPDO3 mapping[3] | DS301 protocol sending process data mapping [3] Same as above | 0X000 |
| P5128[00-05] RxPDO communication parameters[0] | COB-ID, transmission type, timing cycle and other parameters used to receive process data | 0X0000 |
| P5129[00-05] RxPDO communication parameters[1] | COB-ID, transmission type, timing cycle and other parameters used to receive process data | 0X0000 |
| P5130[00-05] RxPDO communication parameters[2] | COB-ID, transmission type, timing cycle and other parameters used to receive process data | 0X0000 |
| P5131[00-05] RxPDO communication parameters[3] | COB-ID, transmission type, timing cycle and other parameters used to receive process data | 0X0000 |
| P5132[00-05] TxPDO communication parameters[0] | COB-ID, transmission type, timing cycle and other parameters used to send process data | 0X0000 |

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5133[00-05] TxPDO communication parameters[1]** | **COB-ID, transmission type, timing cycle and other parameters used to send process data** | **0X000** |
| **P5134[00-05] TxPDO communication parameters[2]** | **COB-ID, transmission type, timing cycle and other parameters used to send process data** | **0X0000** |
| **P5135[00-05] TxPDO communication parameters[3]** | **COB-ID, transmission type, timing cycle and other parameters used to send process data** | **0X0000** |
| **P5136 Receive PDO mapping data block index** | **Mapping index for receiving process data** | **0X0000** |
| **P5137 Send PDO mapping data block index** | **Mapping index for sending process data** | **0X0000** |
| **P5138 Receiver clock synchronization management parameters** | **Clock synchronization management mode, cycle and other parameters for mailbox reception** | **0X0000** |
| **P5139 Transmitting clock synchronization management parameters** | **Clock synchronization management mode, cycle and other parameters for mailbox sending** | **0X000** |
| **P5140 Synchronization message COB identifier** | **Message frame ID of the communication object** | **0X0000** |
| | **Record communication cycle for diagnostic analysis** | **1000ms** |
| **P5141 Synchronous communication cycle period** | **Enabled periodic heartbeat count value. The heartbeat interval is set by index 0x1017 (or parameter P5142) in ms. After the drive is powered on or restarted, it will automatically send a heartbeat message.** | **0ms** |

## 〉P5150 ~ P5164 MODUBUS RTU Configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5150 MODBUS station number** | **Set the node address for Modbus communication. Among them, 0 is the broadcast address.** | **1** |
| **P5151 MODBUS baud rate** | **Set the serial port baud rate for Modbus communication. The unit is bits per second. Commonly used units are as follows:<br>4.8Kbps<br>9.6Kbps<br>19.2Kbps<br>38.4Kbps<br>57.6Kbps<br>115.2Kbps<br>230.2Kbps<br>460.8Kbps<br>921.6Kbps** | **19.2K** |
| **P5152 MODBUS frame format** | **Set the serial port frame format of Modbus communication.<br>0 = 8, N, 1, 8-bit data, no parity, 1 stop bit<br>1 = 8, N, 2, 8-bit data, no parity, 2 stop bits<br>2 = 8, E, 1, 8-bit data, even parity, 1 stop bit<br>3 = 8, O, 1, 8-bit data, odd parity, 1 stop bit** | **1** |
| **P5153 MODBUS word sequence** | **0 means the lower 16 bits come first and the high 16 bits come last.<br>1 means the high 16 bits come first and the low 16 bits come last.** | **0** |
| **P5154 MODBUS response delay** | **After receiving the request from the master station, it will reply after the specified delay time.<br>Set to 0 to indicate automatic delay** | **0MS** |

## P5200 ~ P5215 PROFINET Configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| **Drive PZD configuration instructions:<br>Message composition: Index (2 bytes) + sub-index (1 byte) + data bit width (1 byte)<br>Index=0x+parameter code H<br>Subindex = parameter code subindex H H: represents hexadecimal.<br>Data bit width: 0x10 represents 16-bit integer, 0x20 represents 32-bit integer, 0xA0 represents 32-bit floating point<br>example:<br>Control word:<br>P1531 parameter (control word): 0X05FB0010 Decimal 1531 converted to hexadecimal = 05FB, conversion method<br>The same applies below and will not be repeated.<br>Speed setting:<br>When the speed given is less than or equal to 32767rpm, configure the following message:<br>P1534 parameter (bus speed given 16-bit integer) PZD: 0X05FE0010<br>When the speed is greater than 32767rpm, configure the following message:<br>P1534 parameter (bus speed given 32-bit integer) PZD: 0X05FE0020** | | |
| **P5200[00-15] Receive message 1 PZD** | **Set the mapping address information of received message 1,<br>P5200[0] is usually set to control word 0x05FB0010=P1531 control word<br>P5200[1] is usually set to 0x05FE0010=P1534 bus speed** | **-** |
| **P5201[00-15] Receive message 2 PZD** | **Same as above** | **-** |
| **P5202[00-15] Receive message 3 PZD** | **Same as above** | **-** |
| **P5203[00-15] Receive message 4 PZD** | **Same as above** | **-** |
| **P5204[00-15] Receive message 5 PZD** | **Same as above** | **-** |
| **P5205[00-15] Send message 1 PZD** | **Set the mapping address information for sending message 1,<br>P5205[0] is usually set to 0x06090010 PZD1=P1545 status word<br>P5205[1] is usually set to 0x060A0010 PZD2=P1546 speed actual value** | **-** |
| **P5206[00-15] Send message 2 PZD** | **Same as above** | **-** |
| **P5207[00-15] Send message 3 PZD** | **Same as above** | **-** |
| **P5208[00-15] Send message 4 PZD** | **Same as above** | **-** |
| **P5209[00-15] Send message 5 PZD** | **Same as above** | **-** |
| **P5210 Number of received message PZD** | **The number of received packets P5210 and the number of sent packets P5211 are filled in according to the actual configured number of PZDs. They can be greater than or equal to the actual number of PZDs but cannot be less. Otherwise, the message mapping will be lost. After the PZD configuration is completed, it needs to be powered off and restarted to take effect.** | **0** |
| **P5211 Number of PZD messages sent** | **Same as above** | **0** |
| **P5212[00-02]PN MAC address** | **Each machine has an independent MAC address. If it is consistent, it will cause configuration abnormalities.** | **-** |
| **P5213 PN station number name** | | **-** |
| **P5214 PN IP address** | | **-** |
| **P5215 PN u16Profile** | | **-** |

Please refer to the FROFINET communication manual for details.

## 〉P5250 ~ P5269 Correspondence address customization

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5250[00] Bus address mapping 0** | **Definition of address block 00~09, Modbus quick custom address: 00~09 (decimal) definition, readable and writable<br>If set: P1531= original value of Fb control word, then address No. 0 is the original value of control word.<br>Note: When the parameter contains a sub-index, it cannot be read directly using the shortcut address. For example, the P1535 parameter contains a sub-index, and there are two parameters, P1535[00] and P1535[01]. The shortcut address reads and writes the parameter of P1535[00] by default. [01] The parameters and subsequent sub-index parameters cannot be read or written directly, and the address range mapping function needs to be adopted, see P5260;** | **0** |
| **P5250[1] Bus address mapping 1** | **For example: P1534, then address No. 1 is the original value of Fb speed given** | **0** |
| **P5250[2] Bus address mapping 2** | **For example: P1535[00], then address No. 2 is Fb torque given original value 1** | **0** |
| **P5250[3] Bus address mapping 3** | **Same as above** | **0** |
| **P5250[4] Bus address mapping 4** | **Same as above** | **0** |
| **P5250[5] Bus address mapping 5** | **Same as above** | **0** |
| **P5250[6] Bus address mapping 6** | **Same as above** | **0** |
| **P5250[7] Bus address mapping 7** | **Same as above** | **0** |
| **P5250[8] Bus address mapping 8** | **Same as above** | **0** |
| **P5250[9] Bus address mapping 9** | **Same as above** | **0** |
| **P5251[00-09] Address 10~19 definition** | **Definition of address blocks 10~19, same as above** | **0** |
| **P5252[00-09] Address 20~29 definition** | **Definition of address blocks 20~29, same as above** | **0** |
| **P5253[00-09] Address 30~39 definition** | **Definition of address block 30~39, same as above** | **0** |
| **P5254[00-09] Address 40~49 definition** | **Definition of address blocks 40~49, same as above** | **0** |
| **P5255[00-09] Address 50~59 definition** | **The definition of address block 50~59, same as above** | **0** |
| **P5256[00-09] Address 60~69 definition** | **Definition of address block 60~69, same as above** | **0** |
| **P5257[00-09] Address 70~79 definition** | **Definition of address blocks 70~79, same as above** | **0** |
| **P5258[00-09] Address 80~89 definition** | **Definition of address block 80~89, same as above** | **0** |
| **P5259[00-09] Address 90~99 definition** | **Definition of address block 90~99, same as above** | **0** |

| No. Parameter name | Description | Unit |
|---|---|---|
| **Address range mapping function;<br>This function is for parameters containing sub-indexes. For example, the P1535 parameter contains sub-indexes, and there are two parameters, P1535[00] and P1535[01]. If you need to read and write these two addresses separately, you need to use the address range mapping function and the index of address block 00~31.** | | |
| **P5260[00] Address mapping: starting address** | **For example, set 6000: 6000 corresponds to the 1535[00] address, 6001 corresponds to the 1535[01] address, and XXX5 corresponds to the XXXX[05] address.** | **0** |
| **P5260[01] Address mapping: Termination address** | **For example, if 6003 is set, the value of P5260[01] minus P5260[00] must be greater than the number of sub-indexes of mapped address P1535.** | **0** |
| **P5260[02] Address mapping: internal address** | **If 1535 is set, it represents P1535.** | **0** |
| **Note: 1. The set values of the address mapping start address and end address must be between 6000-10000 to avoid conflicts with other addresses, resulting in inability to read and write;<br>When reading and writing data, pay attention to whether the address to be read or written is 16-bit data or 32-bit data. The addresses of 16-bit data and 32-bit data are different;** | | |
| **P5261[00-02] Index definition 2** | **Same as above** | **0** |
| **P5262[00-02] Index definition 3** | **Same as above** | **0** |
| **P5263[00-02] Index definition 4** | **Same as above** | **0** |
| **P5264[00-02] Index definition 5** | **Same as above** | **0** |
| **P5265[00-02] Index definition 6** | **Same as above** | **0** |
| **P5266[00-02] Index definition 7** | **Same as above** | **0** |
| **P5267[00-02] Index definition 8** | **Same as above** | **0** |
| **P5268[00-02] Index definition 9** | **Same as above** | **0** |
| **P5269[00-02] Index definition 10** | **Same as above** | **0** |

## P5270 ~ P5285 Master-slave communication control

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5270[0] Master-slave sending list 1. Enable** | **0. Close; 1. Enable, used to activate TCP master-slave communication<br>Updating firmware requires closing master-slave communication** | **-** |
| **P5270 [1] Master-slave sending list 1. Starting object** | **Range 0~31, P5288 sends PZD[00-31] starting object** | |
| **P5270 [2] Master-slave sending list 1. Number of objects** | **Range 0~32, the number of PZD objects sent by master and slave** | |
| **P5270 [3] Master-slave sending list 1. Starting IP index** | **0~31** | |
| **P5270 [4] Master-slave sending list 1. IP quantity** | **The number of IPs sent by the host = total number of modules -1** | |
| **P5270 [5] Master-slave sending list 1. Exchange rate** | **exchanges per second** | |
| **P5271[00-05] Master-slave sending list 2** | **Same as above** | **-** |
| **P5272[00-05] Master-slave sending list 3** | **Same as above** | **-** |
| **P5273[00-05] Master-slave sending list 4** | **Same as above** | **-** |
| **P5274[00-05] Master-slave sending list 5** | **Same as above** | **-** |
| **P5275[00-05] Master-slave sending list 6** | **Same as above** | **-** |
| **P5276[00-05] Master-slave sending list 7** | **Same as above** | **-** |
| **P5277[00-05] Master-slave sending list 8** | **Same as above** | **-** |
| **P5278[0] Master-slave receiving list 1 enable** | **enable reception** | |
| **P5278[1] Master-slave receiving list 1 storage index** | **0~31** | |
| **P5278[2] Number of objects in master-slave receiving list 1** | **Range 0~32, the number of PZD objects sent by master and slave** | |
| **P5278[3] Master-slave receiving list 1 IP selection** | **0~255, corresponding to P5404 IP address 4** | **-** |
| **P5279[00-03] Master-slave receiving list 2** | **Master-slave communication receiving object 2** | **-** |
| **P5280[00-03] Master-slave receiving list 3** | **Master-slave communication receiving object 3** | **-** |
| **P5281[00-03] Master-slave receiving list 4** | **Master-slave communication receiving object 4** | **-** |
| **P5282[00-03] Master-slave receiving list 5** | **Master-slave communication receiving object 5** | **-** |
| **P5283[00-03] Master-slave receiving list 6** | **Master-slave communication receiving object 6** | **-** |
| **P5284[00-03] Master-slave receiving list 7** | **Master-slave communication receiving object 7** | **-** |
| **P5285[00-03] Master-slave receiving list 8** | **Master-slave communication receiving object 8** | **-** |
| **Contact us to Case setting reference, the master gives the controller and actual speed to the slave:** | | |

## 〉P5286 ~ P5290 Master-slave communication mapping

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5286[00-31] Send IP address list** | **Master-slave communication sender IP address, 0~255, corresponds to P5404 IP address, up to 32 slaves can be set, master-slave communication sender IP address, corresponds to P5404 IP address 4, the master sends one to many slaves, and there are multiple slaves Send to a host** | **-** |
| **P5287[0-31] Receive data mapping table** | **Up to 32 data master-slave communication receives data mapping address information, parameter address received by the slave. Such as P0908 integer 1** | **-** |
| **P5288[0] Send PZD mapping table 0** | **Parameter address 0 sent by the host, such as: P1031 drive control status word** | **-** |
| **P5288[1]-[31] Send PZD mapping table 1-31** | **Parameter address sent by the host [1]-[31], same as above** | **-** |
| **P5289[00-31] Actual received data** | **Datagrams received from master-slave communication** | **-** |
| **P5290[00-31] Actual data sent** | **Datagrams sent by master-slave communication** | **-** |

## 〉P5300 ~ P5305 EtherNET Status

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5300 DHCP status** | **Drive Ethernet communication dynamic IP address allocation status; 1 = IP address has been successfully bound** | **-** |
| **P5301 Network connected flag** | **Drive Ethernet communication physical layer connection status; 1=network connection is normal** | **-** |
| **P5302 Receive message mapping error code** | **The driver Ethernet communication receives the message mapping error indication. The hundreds digit is the PZD serial number 1~32 corresponding to P5414[0~31], and the ones digit corresponds to the error code:<br>1=index does not exist;<br>2=Index read-only;<br>3=Illegal data type;<br>4=illegal data width** | |
| **P5303 Sending message mapping error code** | **The driver Ethernet communication sends message mapping error indication; the hundreds digit is the PZD serial number 1~32 corresponding to P5415[0~31], and the ones digit corresponds to the error code:<br>1=index does not exist;<br>2=Index read-only;<br>3=Illegal data type;<br>5=illegal data width** | **-** |
| **P5304 Received message takes up space** | **Effective data packet length received by the drive Ethernet communication, unit word** | **-** |
| **P5305 Sending messages takes up space** | **The effective data packet length sent by the drive Ethernet communication, unit word** | **-** |

## 〉P5400 ~ P5409 EtherNET Configuration

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5400 IP address mode** | **Select the IP address allocation mode for drive Ethernet communication<br>0: Static IP, 1: Dynamic allocation** | **0** |
| **P5401 IP address segment 1** | **Drive Ethernet communication The first segment of the 32-bit IP address, typical value is 192. Ensure that the first segment of the IP address is consistent with the IP address of the computer. After modification, the drive is powered off and restarted.** | **192** |
| **P5402 IP address segment 2** | **The second segment of the drive's Ethernet communication 32-bit IP address, typically 168,** | **168** |
| **P5403 IP address segment 3** | **The third segment of the 32-bit IP address for drive Ethernet communication, typical value 1** | **1** |
| **P5404 IP address segment 4** | **The fourth segment of the 32-bit IP address of the drive's Ethernet communication, ranging from 1 to 255** | **99** |
| **P5405 local IP address** | **Set the local IP address for drive Ethernet communication** | **-** |
| **P5406 local subnet mask** | **Set the local subnet mask for drive Ethernet communications** | **-** |
| **P5407 Gateway IP address** | **Set the gateway IP address for drive Ethernet communication** | **-** |
| **P5408 MAC address[0]** | **Set the MAC address of the drive's Ethernet communication** | **-** |
| **P5409 MAC address[1]** | **Set the MAC address of the drive's Ethernet communication** | **-** |

## 〉P5410 ~ P5415 TCP message mapping definition

| No. Parameter name | Description | Unit |
|---|---|---|
| **P5410 TCP process control port definition** | **Set the created TCP communication control interface, the default is 28000, used for free TCP message control** | **-** |
| **P5411 UDP process control port definition** | **Set the created UDP communication control interface, the default is 28000, used for free UDP message control** | **-** |
| **P5412 Process control received message PZD number** | **The number of messages the driver receives from the upper-layer controller. The number of PZDs contained in the PLC->DRIVE message. Each PZD can be 16 bits or 32 bits.** | **-** |
| **P5413 Number of PZD messages sent by process control** | **The number of messages sent by the driver to the upper controller. The number of PZDs contained in the DRIVE->PLC message. Each PZD can be 16 bits or 32 bits.** | **-** |
| **P5414[00-31] Receive message mapping list** | **The driver receives the message mapping address information from the upper-layer controller** | **-** |
| **P5415[00-31] Send message mapping list** | **The driver sends the message mapping address information to the upper controller** | **-** |

## 〉P5416 ~ P5417 TCP message mapping content

| No. Parameter name | Description | Unit |
|---|---|---|
| P5416[00-63] Receive message content list | The driver receives message data from the upper-layer controller | - |
| P5417[00-63] Send message content list | Message data sent by the driver to the upper controller | - |

# 12. PC Driver Commissioning Assistant V1.0

## 12.1 Brief description

PC Driver Debugging Assistant is an application based on Windows operating system developed by the product R&D team, and is continuously improved and updated. Users can use this program to interactively debug and maintain our driver products. The functions supported by the initial version of this program mainly include：

- ❑Drive parameter setting and online debugging
- ❑ Online monitoring of system variable waveforms
- ❑ Copy tabulation of system variable data
- ❑ Drive firmware upgrade
- ❑ Saving and importing waveform data
- ❑ PARA BACKUP and download

## 12.2 Operating environment requirements

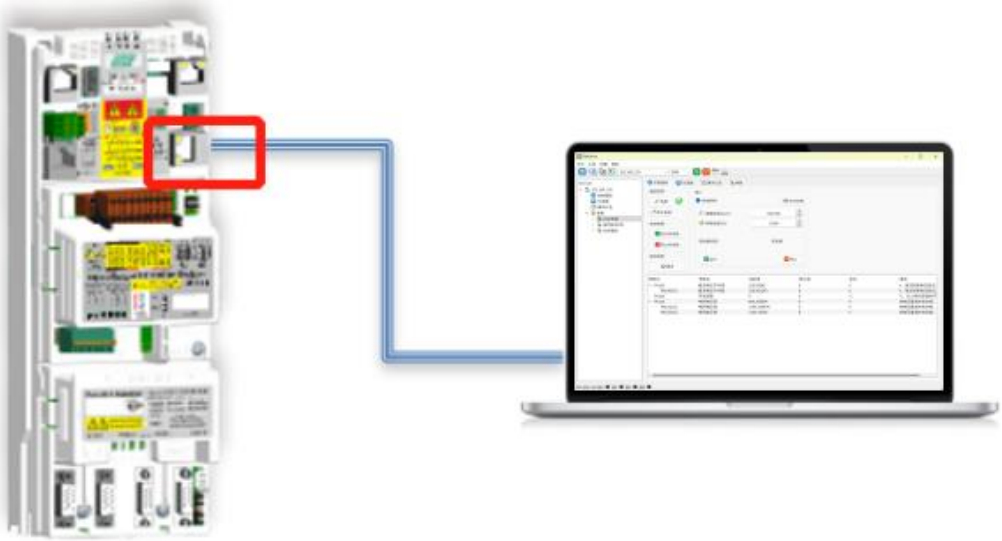
| Hardware Configuration | |
|---|---|
| PC processor | Intel i5 and above |
| PC memory space | ≥1G memory space |
| PC harddisk | ≥4.5G hard disk space |
| PC Network port | Standard Ethernet port |
| cable | Standard RJ45 interface network cable |
| **Software Environment** | |
| Operating system version | Windows 10 and above (32-bit or 64-bit) |
| .NET Framework version | .NET Framework 4.8 and above |

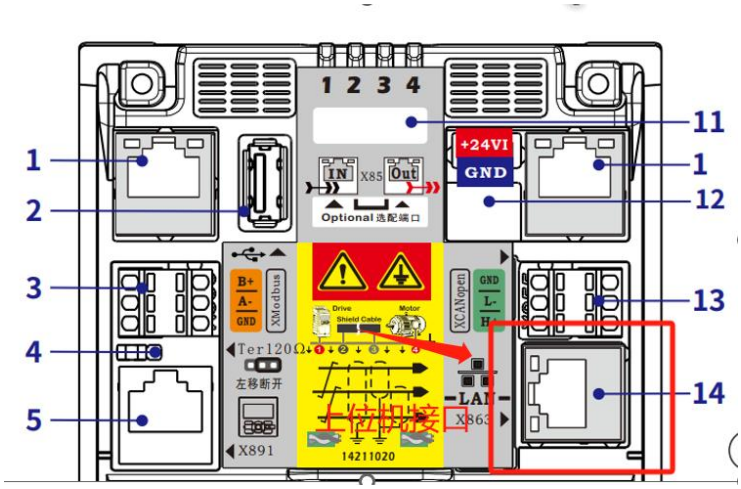
## 12.3 Installation and uninstallation

Place the PC Debugging Assistant folder in the installation path of the PC's local disk, open it and double-click FWDrive.exe to complete the software installation. Delete the PC Debugging Assistant folder on the PC's local disk to complete the software uninstallation.

## 12.4 Debug assistant connection

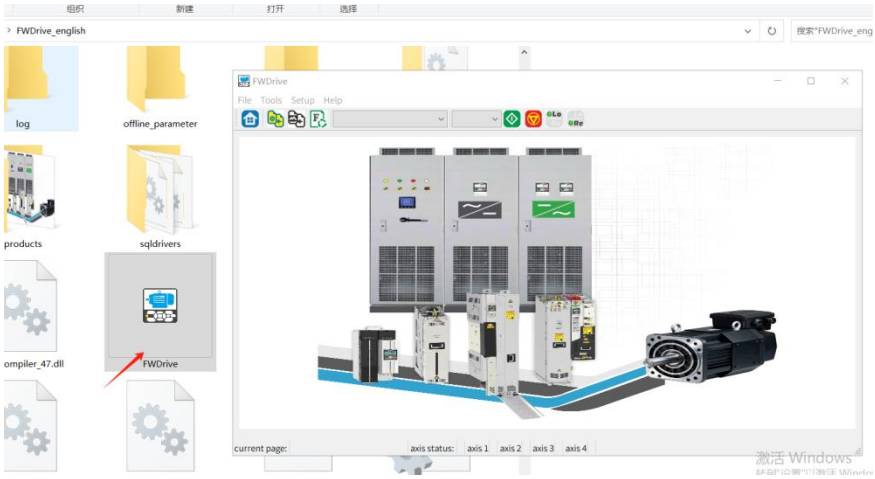
1. Connect the PC Ethernet port and the drive's X863 network port through a network cable



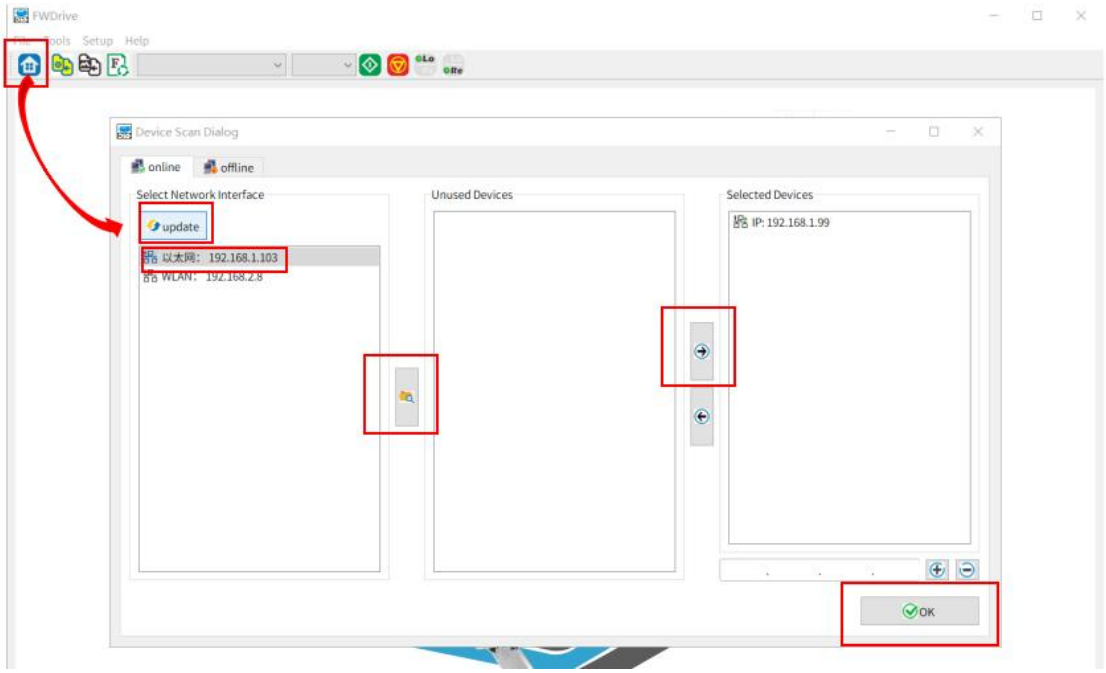



Set the computer's Ethernet IP address, which must be on the same network segment: 192.168.1.X

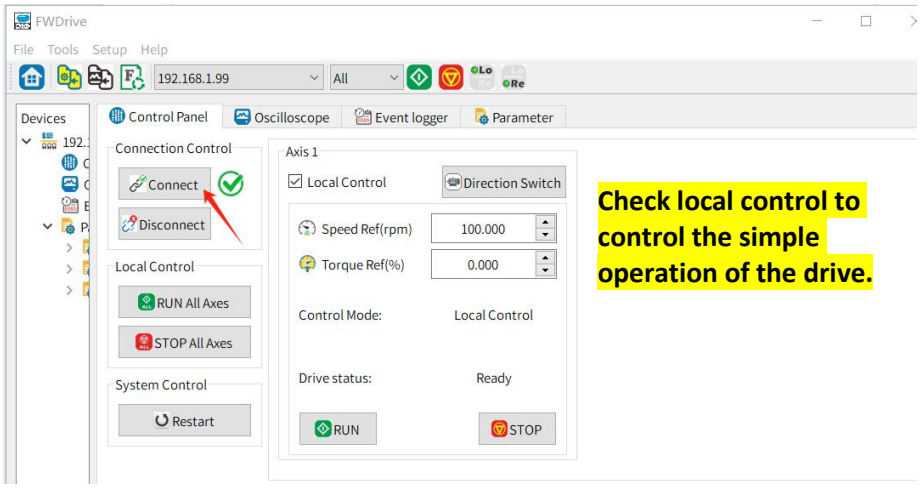

2. In the driver assistant installation path, double-click the FWDrive.exe application icon to start the debugging assistant program.



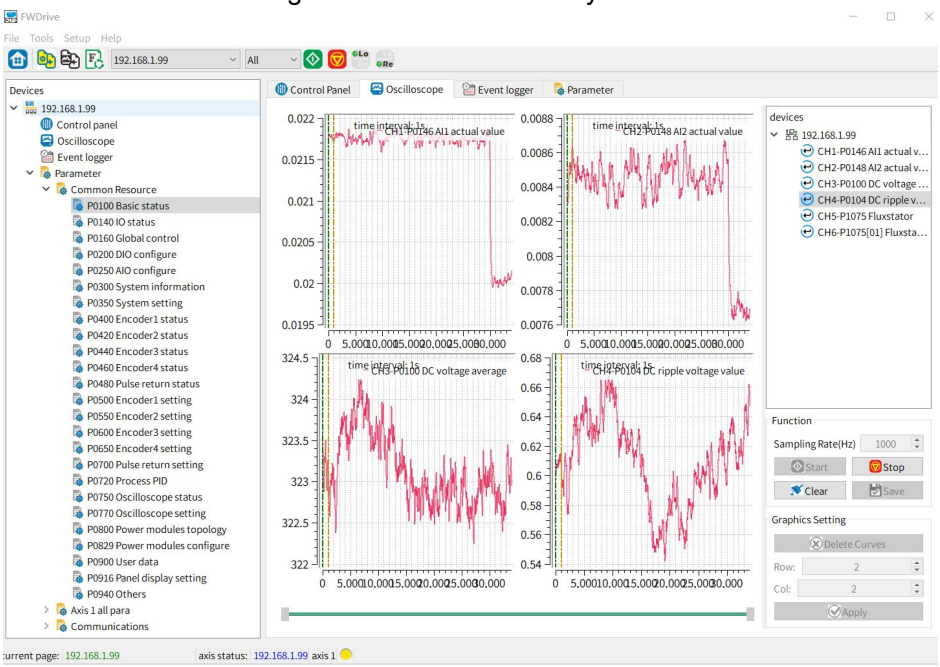
**3. New Project**。Select "File - New Device" in the menu bar or click the corresponding button in the toolbar to create a new online or offline project. In online mode, the software will automatically scan the network card. If the corresponding network card is not currently detected, the user can click the "Refresh" button. Select the network card and click the "Scan" button. The software will detect the online devices in the current network segment and select all by default. Users can select the device independently (multiple selection: ctrl + left mouse button or hold down the left mouse button and slide) and click the "Move Right" button to move to the list on the right. In addition, the user can select a device in the list on the right and click the "Move Left" button to move to the middle list. In addition, a single device can be moved by "double-clicking" the left mouse button. It also supports users to manually add the IP address of the device. Finally, the user clicks the "OK" button to create the project. In offline mode, users can import parameter files and waveform files. The status bar will display the current project name to help users identify it.



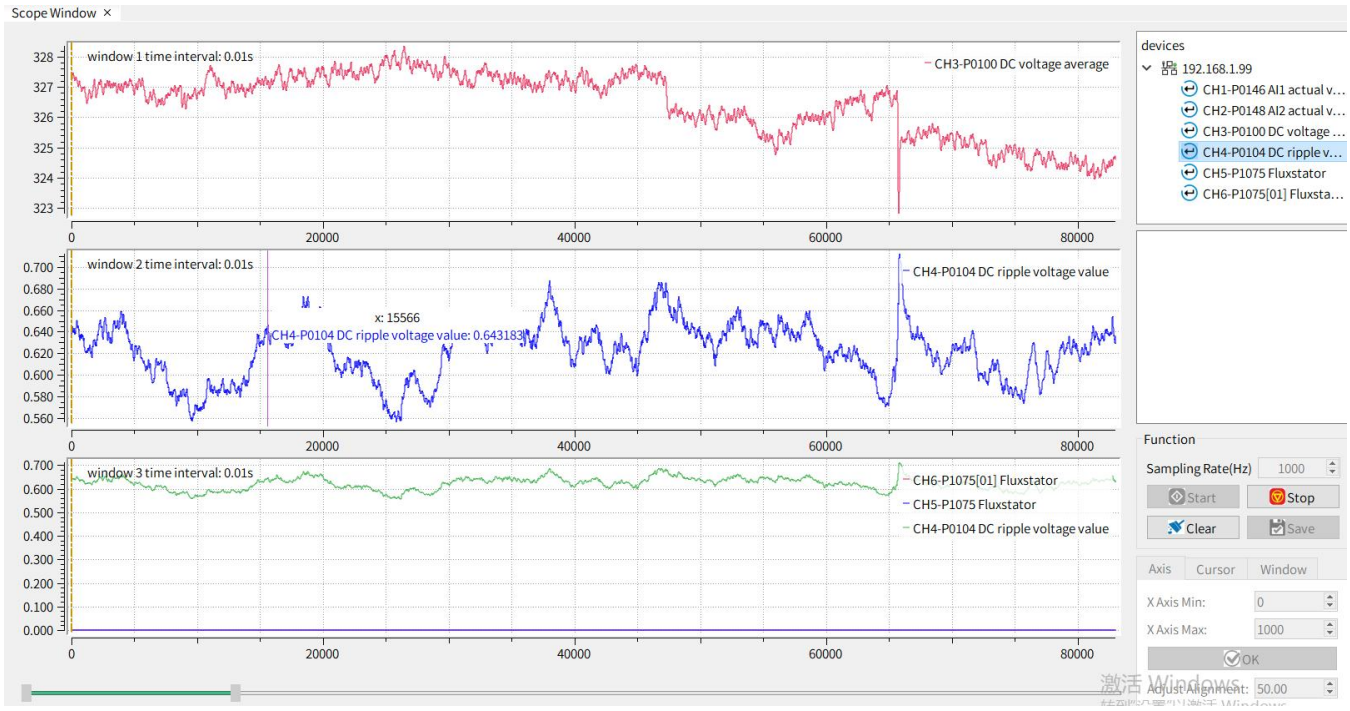

**4. Control Panel**。The control panel is not available in offline mode. In online mode, the user first needs to click the "Connect" button, at which time the interface will update the connection status and axis information. The toolbar will also update the axis information of the corresponding device. The user can select Axis 1-Axis 4 (if activated) or all axes in the toolbar, and click the Run (shortcut key F5)/Stop (shortcut key F6) button to control; click Local Control (shortcut key F9)/remote control (shortcut key F10) check box to switch status. At the same time, users can click the relevant buttons in the control panel interface. In addition, the control panel also includes functions such as restart and user-defined parameter table. The user-defined parameter table requires the user to select parameters to add in the parameter page. The software will automatically save the customized parameters so that they can be automatically displayed the next time the software is opened. Users can right-click the mouse in the custom parameter table to delete unnecessary parameters.



**5. Oscilloscope**。In offline mode, users can import waveform data (suffix .wf) for viewing. After importing the file, hold down the left mouse button and drag the corresponding channel item in the device list, and then release the mouse button in the drawing window. A drawing window supports displaying multiple curves. Users can set the number of windows displayed by changing the values of "rows" and "columns" in the interface and clicking the "Apply" button. "Delete Curve" button can delete all curves in the current drawing window. The slide bar at the bottom of the drawing window can set the data range displayed in the window. The user can choose to hold down the left button of the mouse and slide, or press the left arrow "←" and right arrow "→" on the keyboard to control.

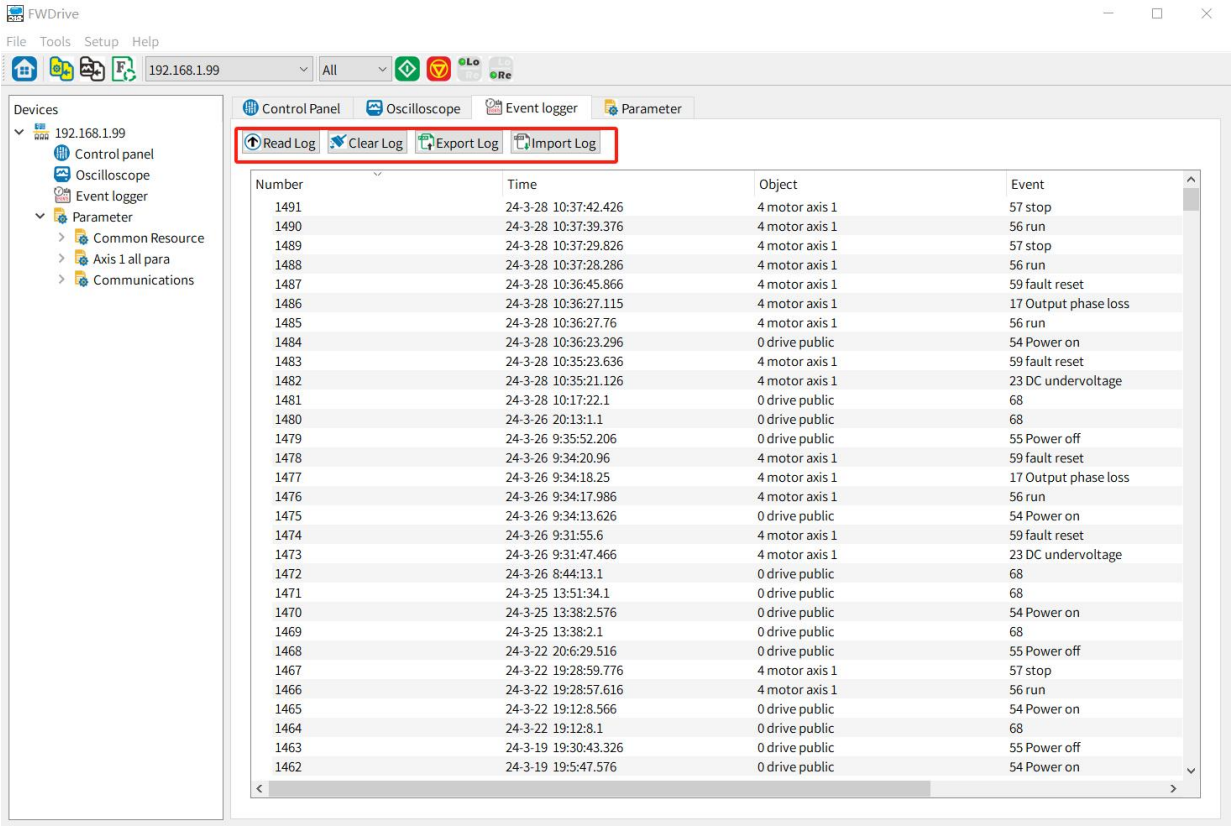



The "Slide Cursor Area" is the abscissa position of each drawing window, and the user can click the left mouse button and slide left and right. The Cursor Information Area displays the cursor abscissa difference x1-x2 and the corresponding ordinate difference y(x1)-y(x2) for each drawing window.

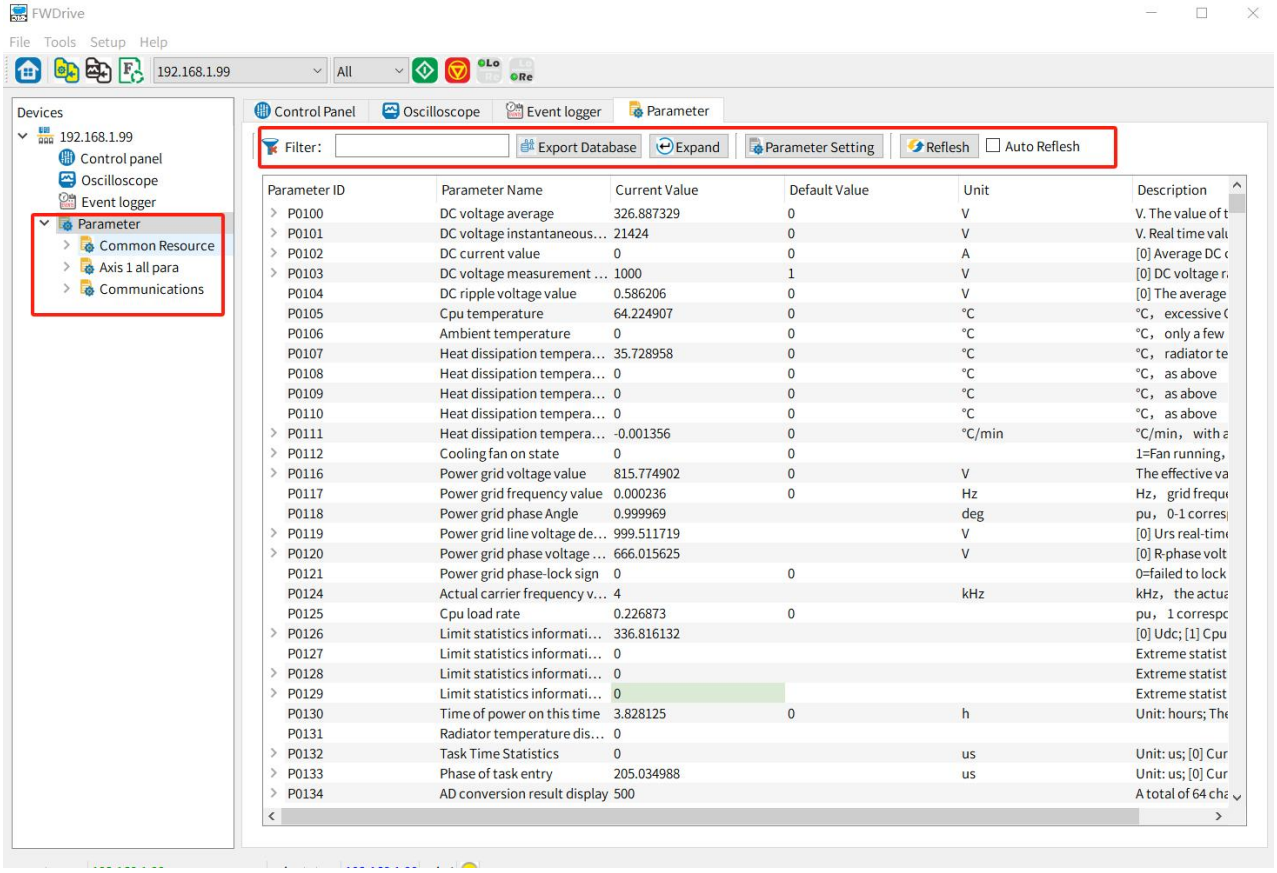


Users can also set the data range and cursor position displayed in the drawing window in a unified manner, which can be set in the "Axes" and "Cursor" subwindows respectively. For curves that you don't want to display in the drawing window, you can right-click in the window and select the deleted curve. After clicking Delete, the data will not be lost, and the user can still display it by dragging.
The online mode has most of the same functions as the offline mode, requiring the user to drag the channel items in the channel list of the device to display them in the drawing window. Users click the "Start" button to start the waveform recording, and click the "Stop" button to stop the waveform recording. The user can click the "Save" button to save the current data of the drawing window (which the user can choose by using the slider) to the specified location. In addition, users can use functions such as setting the sample rate and clearing data. The software automatically saves the window settings, after which opening the software restores the current number of windows and the drawing channels in the window.

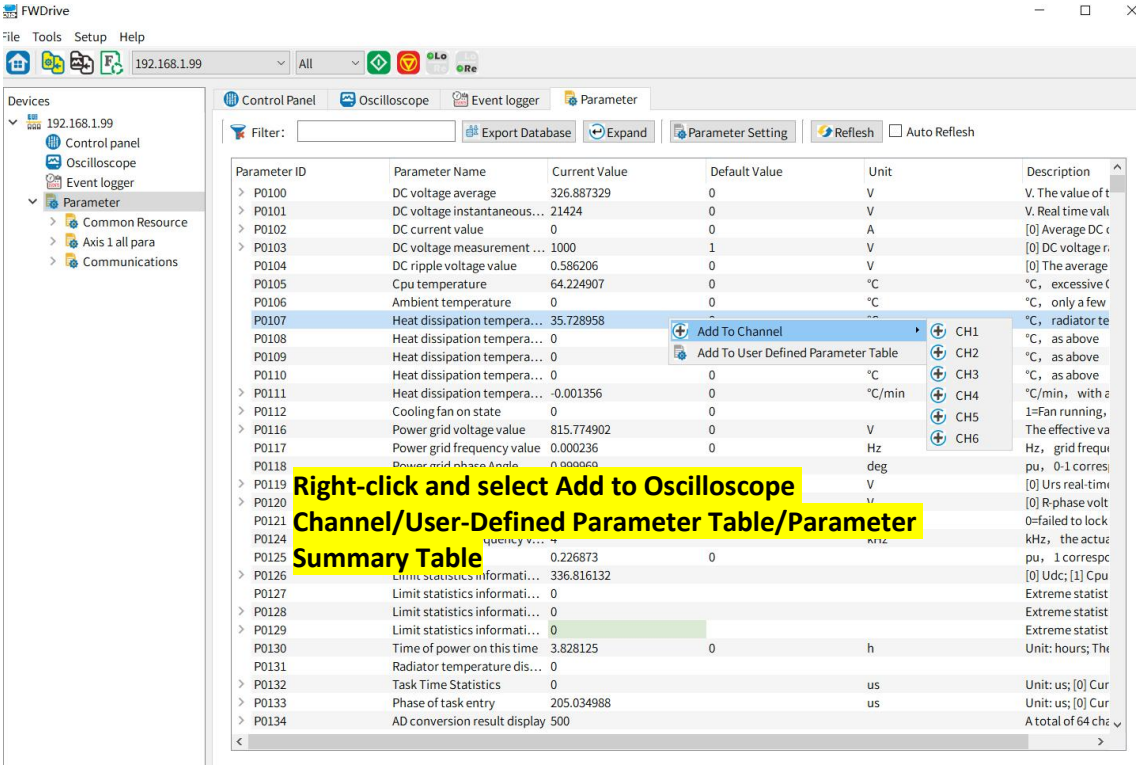
6. Event Logs. In offline mode, the event log is not available. In online mode, users can read, clear, export, and import logs. By default, logs are sorted by serial number columns, and users can click on each header to sort them.



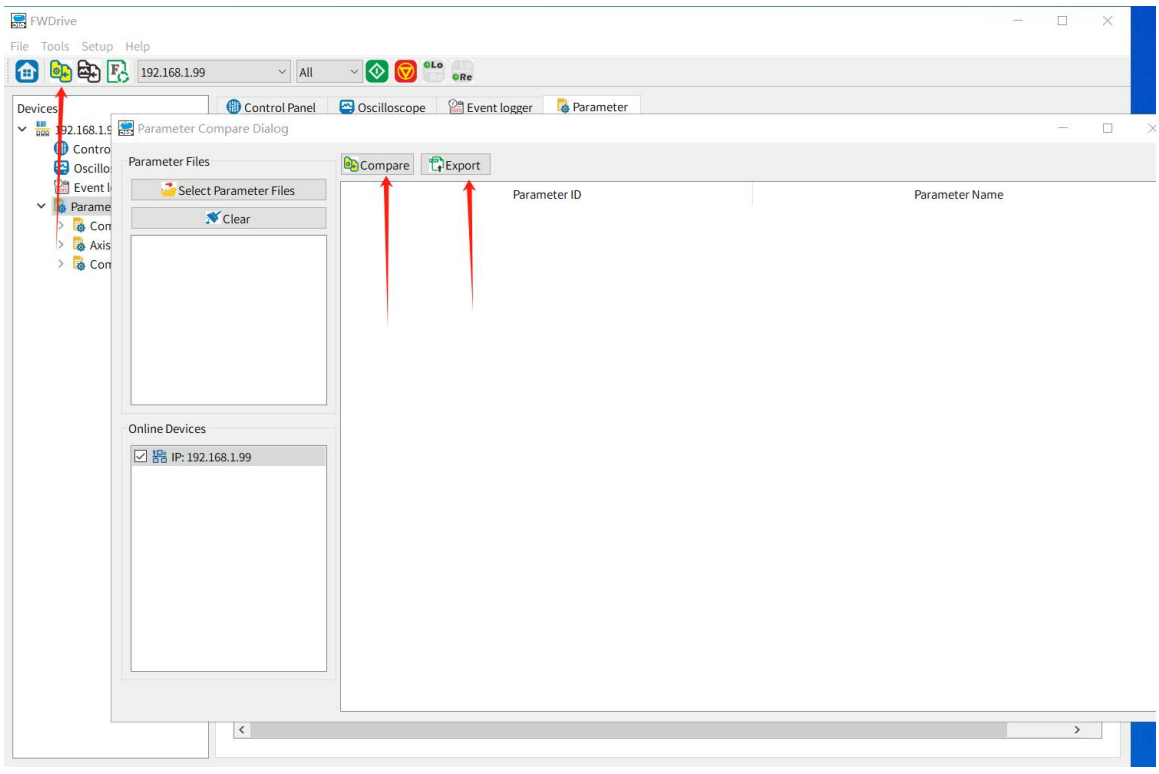

7. Parameters. Different types of parameters are color-coded to facilitate parameter reading and writing. In offline mode, users can import database files (suffix .db) and click on the parameter directory to display the relevant parameters. Parameter filtering filters parameters based on the values entered by the user.



In online mode, users can click the "Auto-Refresh" button to refresh the parameters in real time. Click the "Refresh" button to refresh only once. The user can click the "Export Database" button to export the current parameter database (suffix .db). Right-click in the parameter row and select Add to Channel X to add the parameter to the oscilloscope channel. Optionally, you can add to a user-defined parameter table or a parameter summary table.

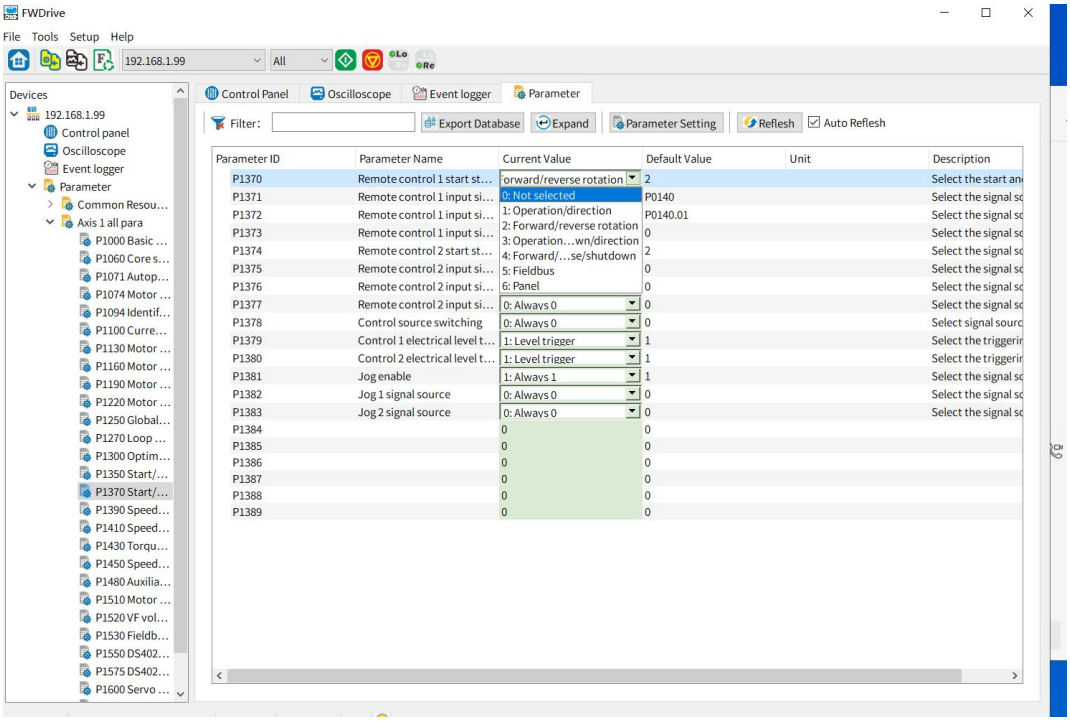



8. Parameter comparison. The parameter comparison feature supports comparisons between multiple file-file, file-online device, and online device-online device. The user clicks the "Select Profile" button to import multiple profiles, and the "Clear" button clears the list of profiles. Users click the "Compare" button to start the comparison, and click the "Export" button to save the comparison results. Users can double-click to modify the parameters of the online device.

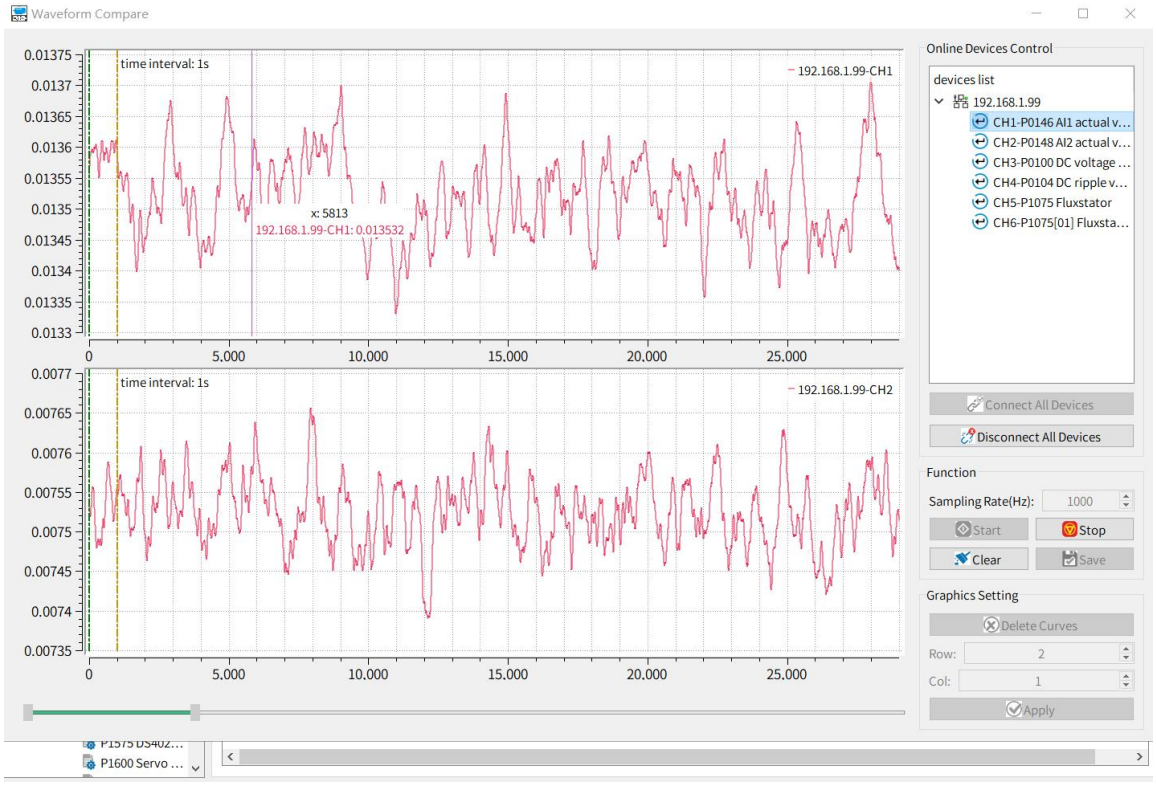


9. Parameter writing. **For the parameters that can be written in the debugging software, the user can set them through the drop-down box or in a custom way.**

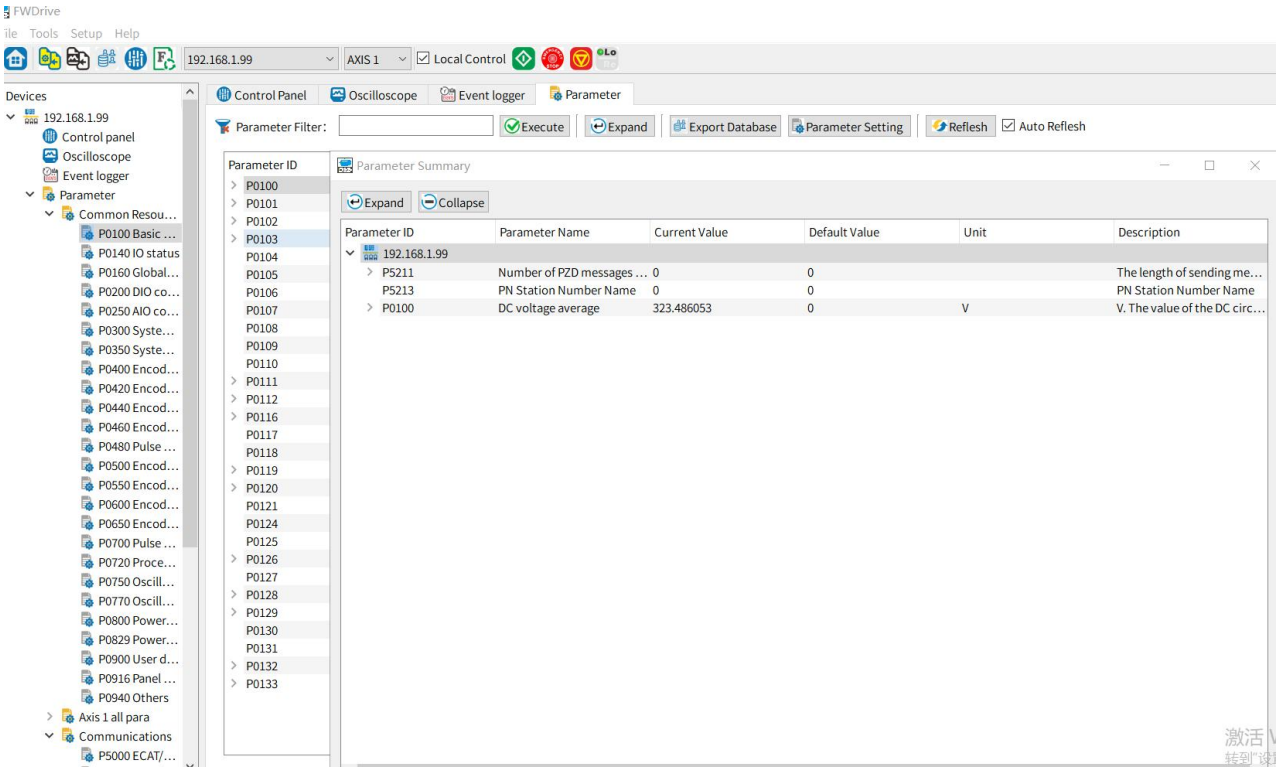
**(1) Drop-down box option (2) Custom input**



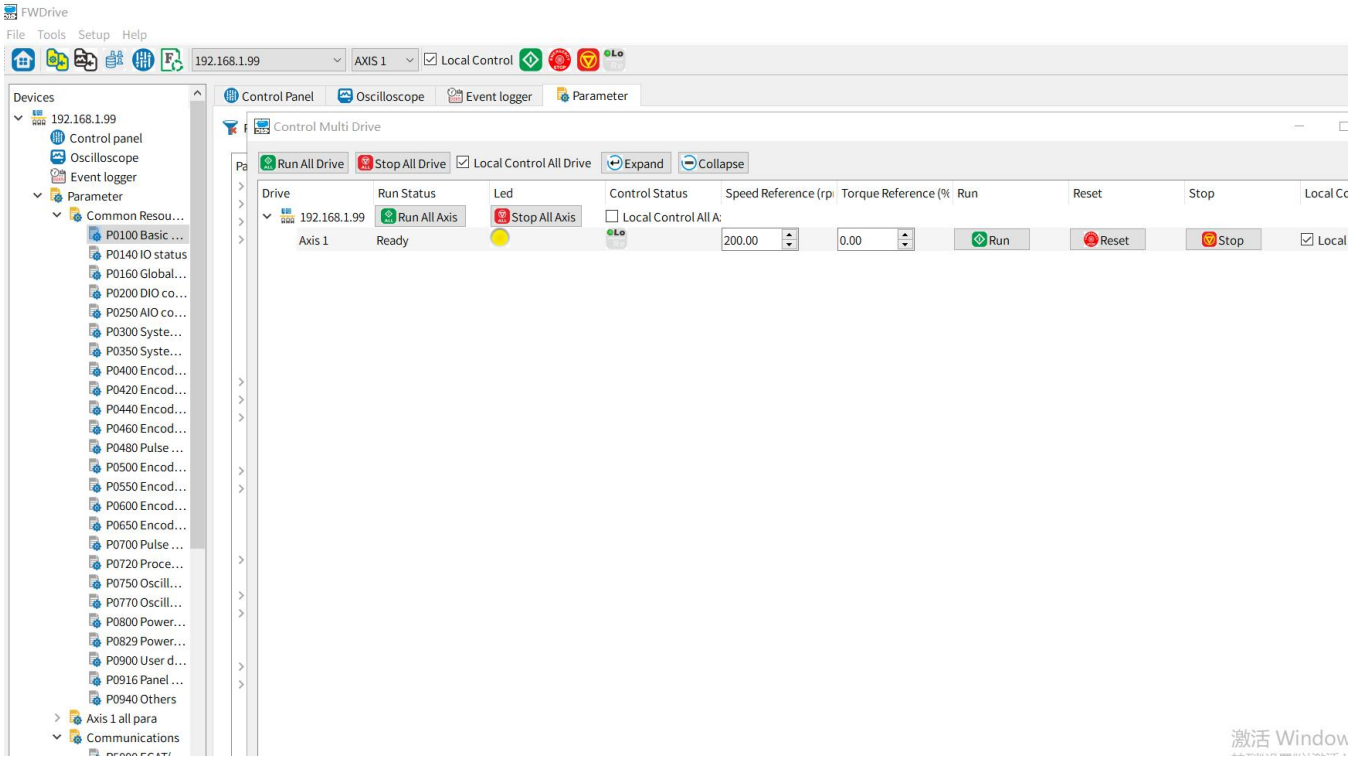

10. Waveform comparison. The waveform comparison feature allows waveform comparison between multiple online devices, and the interface operation is similar to that in the oscilloscope section above. The user first needs to click the "Connect" button to update the channel data, and then the corresponding channel in the device list can be dragged to the drawing window for display.



11. Parameter Summary. The parameter summary function is used to display the parameters of multiple online devices in real time, and the parameters need to be right-clicked in the corresponding device parameter table to add to the parameter summary table. You can also right-click to delete the parameters corresponding to the device.




12. Multi-machine joint control. The multi-machine joint control function can realize the simultaneous operation, stop and local control of all axes of multiple drives/single drives, and support the speed and torque control of a single axis of a single drive. At the same time, the interface displays the operation and control status of all axes in real time.



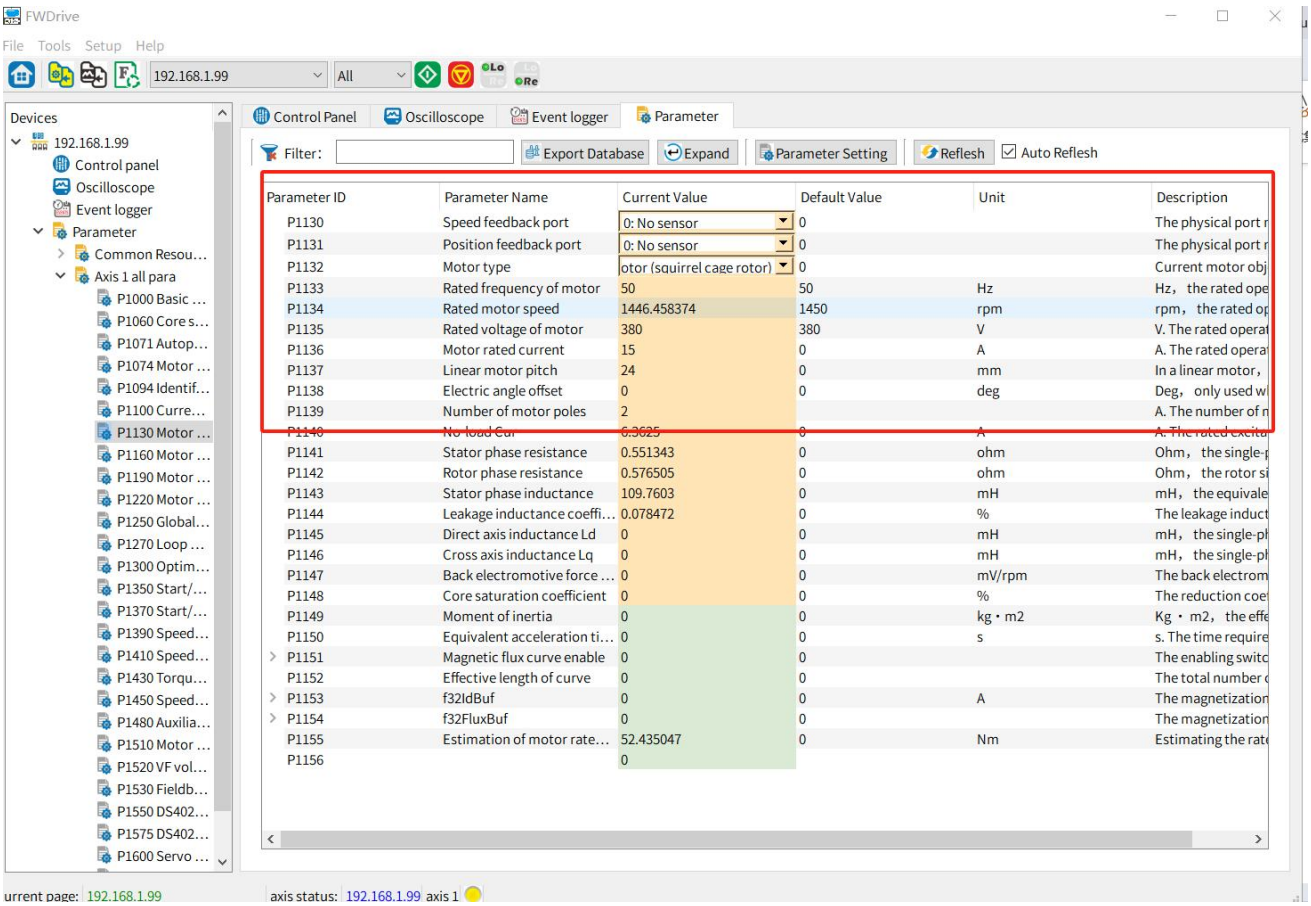
## 12.5 Drive debugging

After the debugging assistant is successfully connected to the drive, the drive can be debugged and run in local mode. A typical debugging step is as follows:

### 1. Enter the basic parameters of the drive shaft load

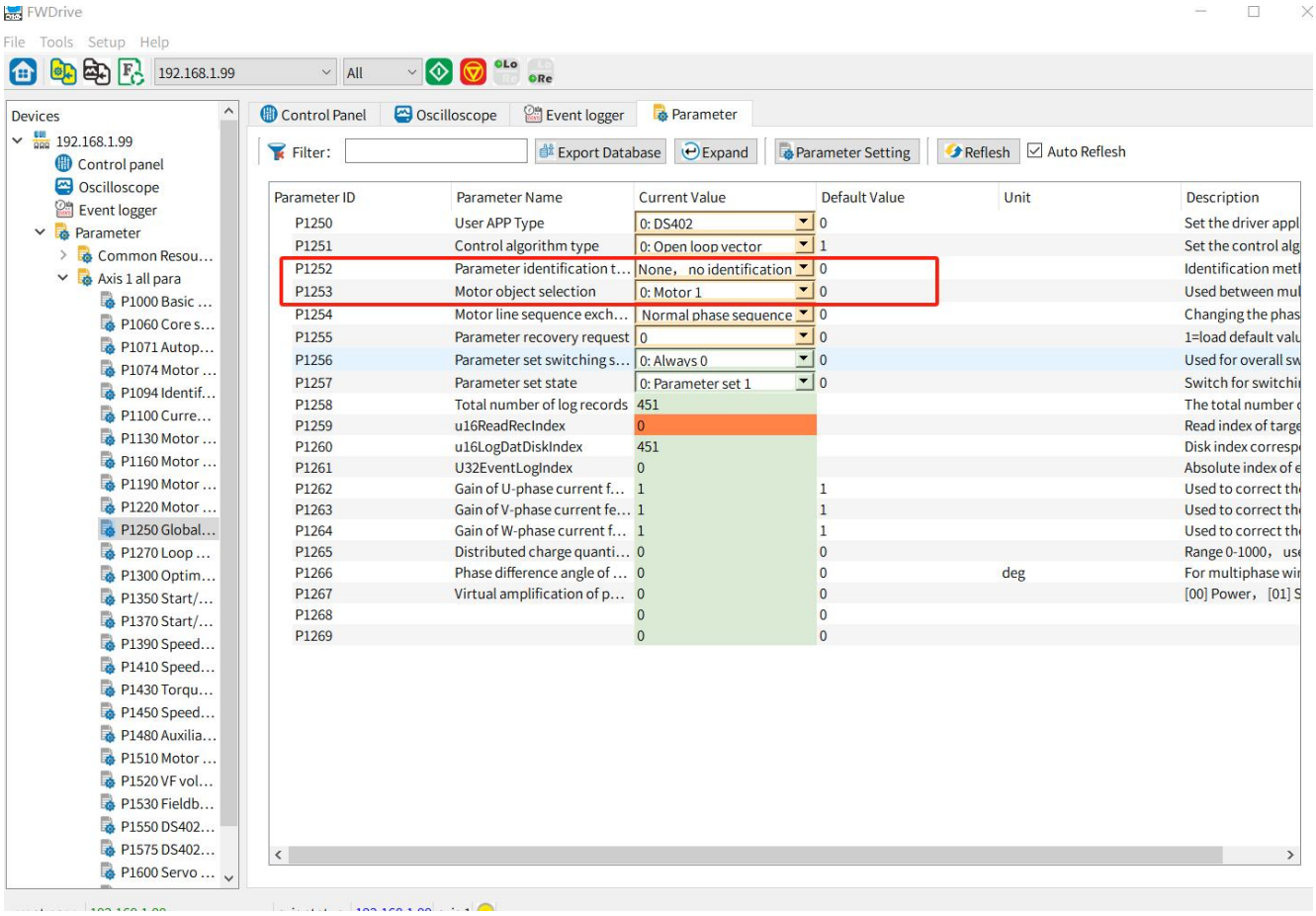
Taking a standard motor drive application (P1250=0) as an example, enter the basic information of the motor nameplate data

1) Open the PARA LIST window -> 2) Select the corresponding parameter subset according to the enabled shaft code (all motor shafts 1 in the legend) -> 3) Select the current motor parameters Group -> 4) Enter the mechanical status feedback type, motor type, rated frequency, rated current and other data of the motor



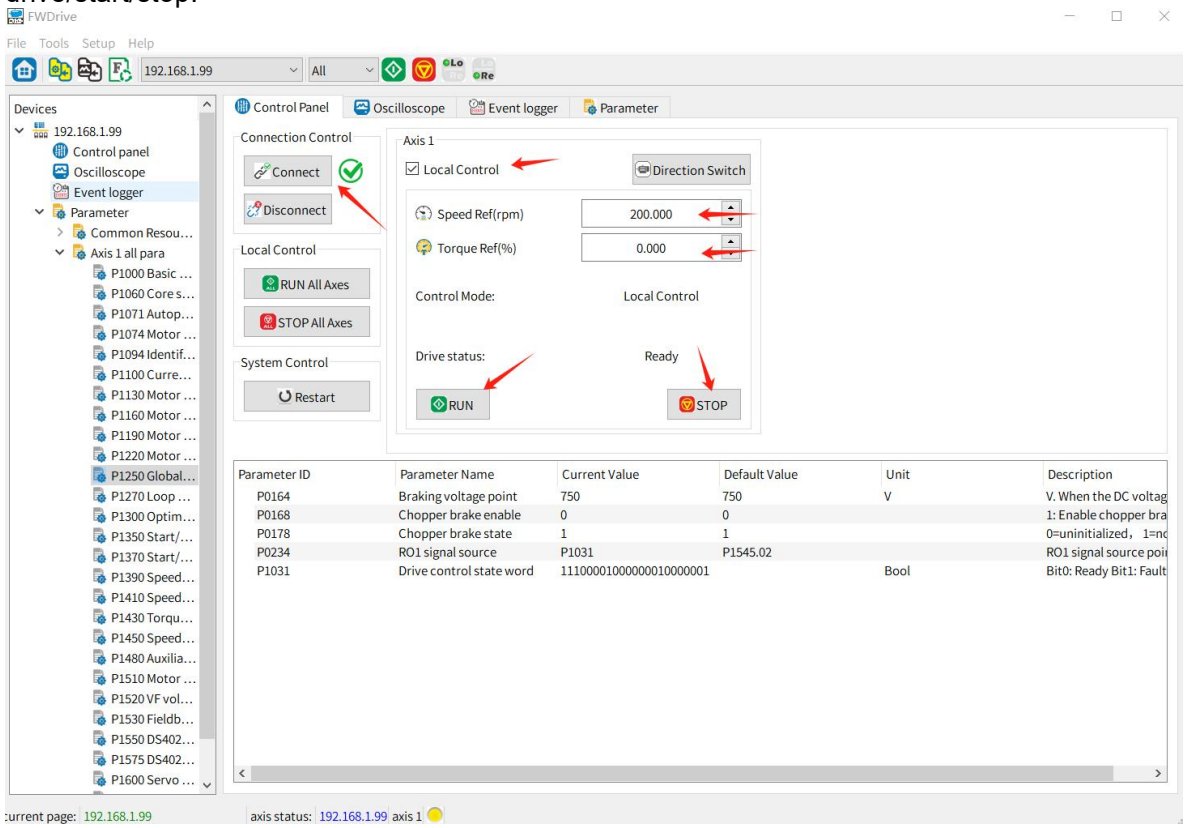

### 2.Drive control parameter settings

Enter the type of parameter identification, the type of motor control algorithm

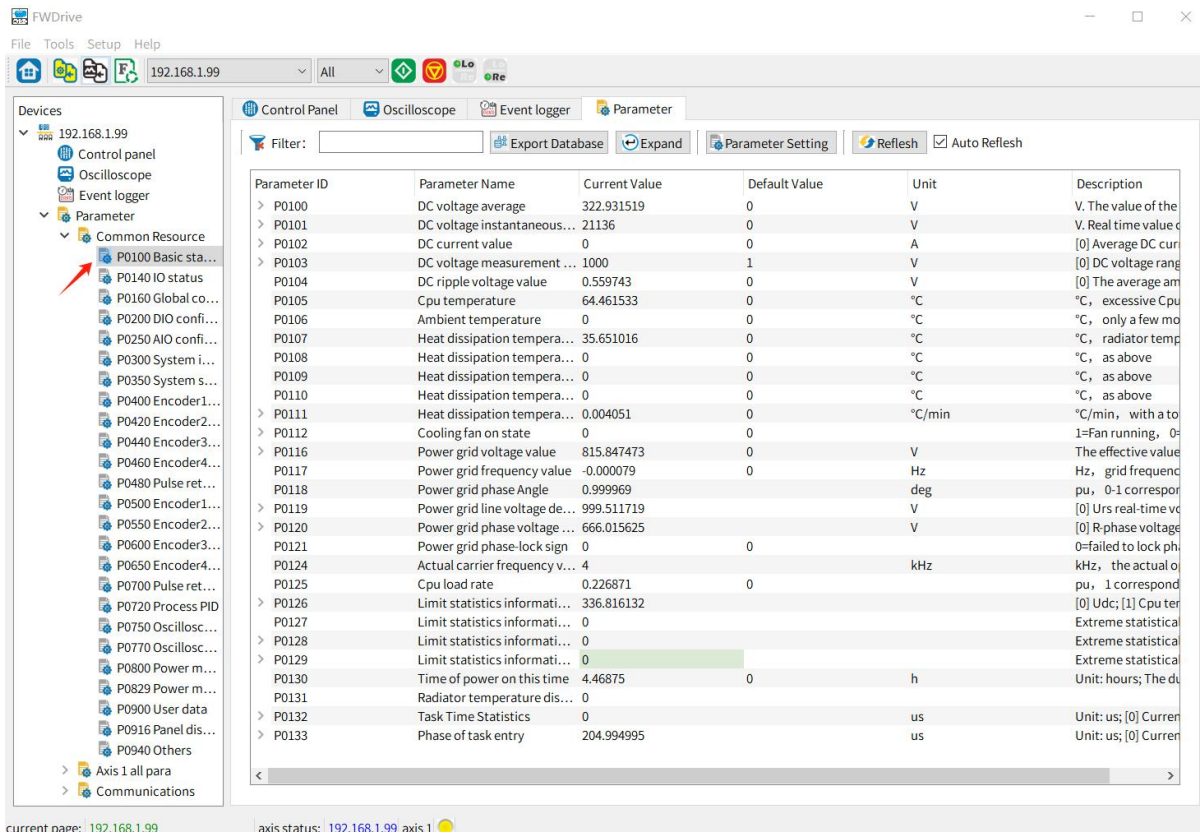

FWDrive
File Tools Setup Help
192.168.1.99
All
Devices
192.168.1.99
Control panel
Oscilloscope
Event logger
Parameter
Common Resou...
Axis 1 all para
P1000 Basic ...
P1060 Core s...
P1071 Autop...
P1074 Motor ...
P1094 Identif...
P1100 Curre...
P1130 Motor ...
P1160 Motor ...
P1190 Motor ...
P1220 Motor ...
P1250 Global...
P1270 Loop ...
P1300 Optim...
P1350 Start/...
P1370 Start/...
P1390 Speed...
P1410 Speed...
P1430 Torqu...
P1450 Speed...
P1480 Auxilia...
P1510 Motor ...
P1520 VF vol...
P1530 Fieldb...
P1550 DS402...
P1575 DS402...
P1600 Servo ...
Control Panel
Oscilloscope
Event logger
Parameter
Filter:
Export Database
Expand
Parameter Setting
Reflesh
Auto Reflesh
Parameter ID
Parameter Name
Current Value
Default Value
Unit
Description
P1250 User APP Type 0: DS402 0 Set the driver appl
P1251 Control algorithm type 0: Open loop vector 1 Set the control alg
P1252 Parameter identification t... None, no identification 0 Identification met
P1253 Motor object selection 0: Motor 1 0 Used between mul
P1254 Motor line sequence exch... Normal phase sequence 0 Changing the phas
P1255 Parameter recovery request 0 0 1=load default valu
P1256 Parameter set switching s... 0: Always 0 0 Used for overall sw
P1257 Parameter set state 0: Parameter set 1 0 Switch for switchi
P1258 Total number of log records 451 The total number
P1259 u16ReadRecIndex 0 Read index of targe
P1260 u16LogDatDiskIndex 451 Disk index corresp
P1261 U32EventLogIndex 0 Absolute index of e
P1262 Gain of U-phase current f... 1 1 Used to correct th
P1263 Gain of V-phase current fe... 1 1 Used to correct th
P1264 Gain of W-phase current f... 1 1 Used to correct th
P1265 Distributed charge quanti... 0 0 Range 0-1000, us
P1266 Phase difference angle of ... 0 0 deg For multiphase wi
P1267 Virtual amplification of p... 0 0 [00] Power, [01] S
P1268 0 0
P1269 0 0

## 3. Running

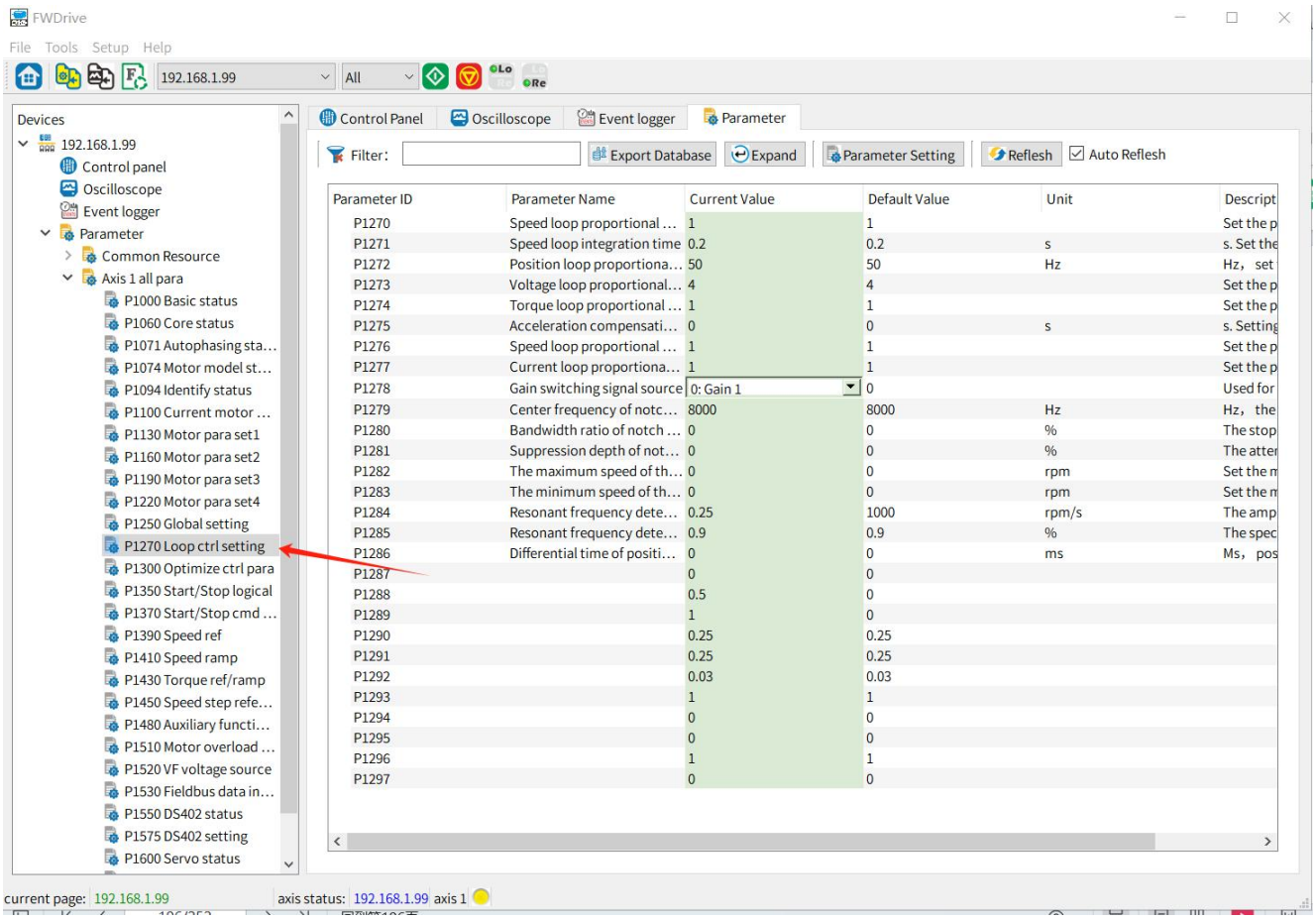
1) Check the local control mode of the drive shaft with enabled -> 2) Enter the value of the given signal -> 3) When the drive status is ready, press the start/stop button to realize the drive/start/stop.




The real-time status of the drive shaft during drive operation, including faults, can be viewed via the Basic Status group under the drive shaft parameter set



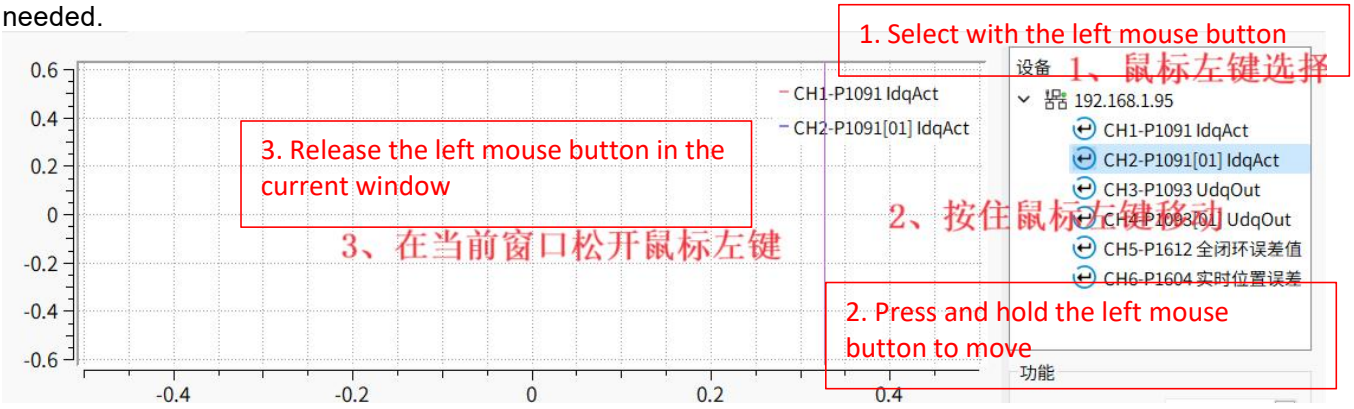
During the operation, the motor control effect can be optimized by adjusting the parameters of the loop control parameters and the performance control parameter group according to the needs




## 4. Drives the recording of signal waveforms that control each value

1) Click the Start Recording button to start the waveform scrolling to refresh the recording -> 2) Click the Stop Recording button to stop recording

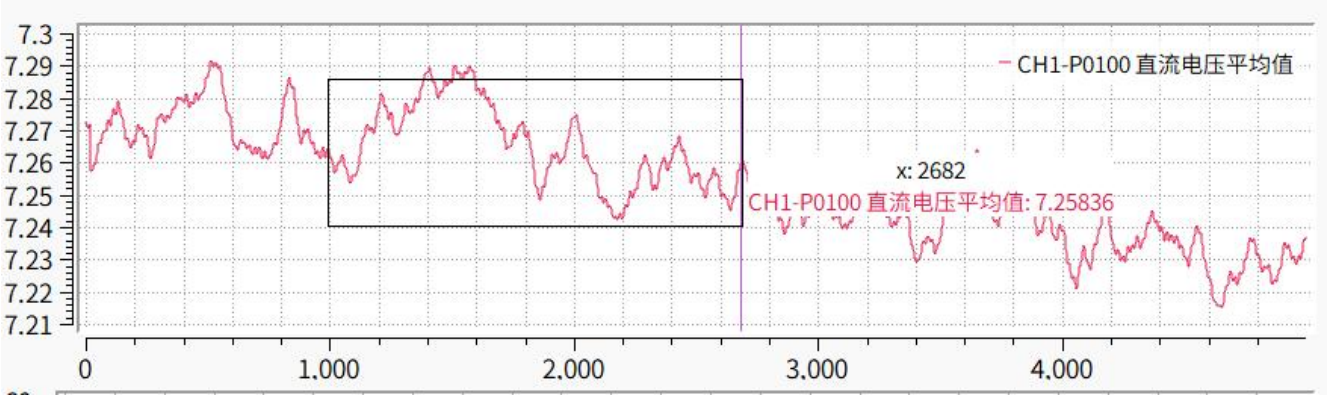
One plot window supports drawing multiple curves, and users can drag the corresponding channels into the plot window as
needed.

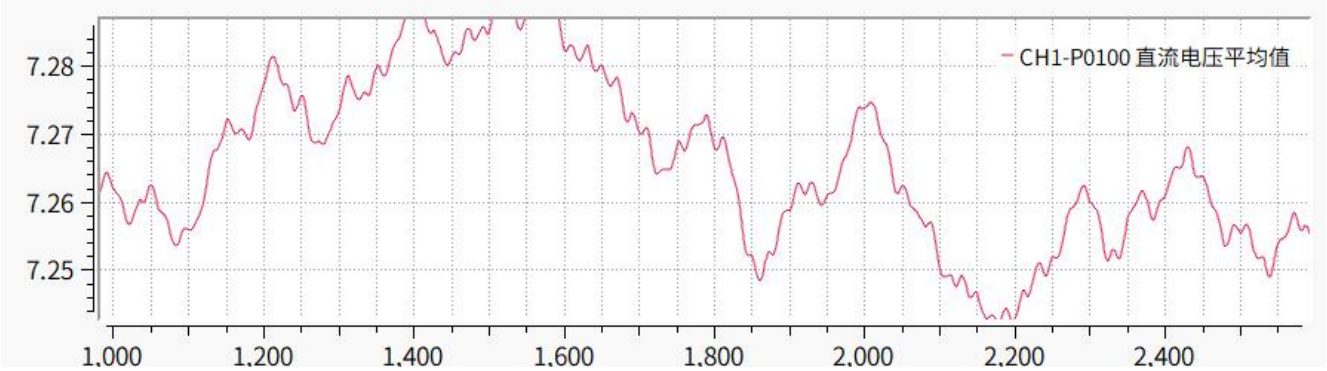



## 5. Waveform display adjustment and local scaling

After the waveform is recorded, the waveform display can be adjusted as needed to facilitate further observation of the waveform details.

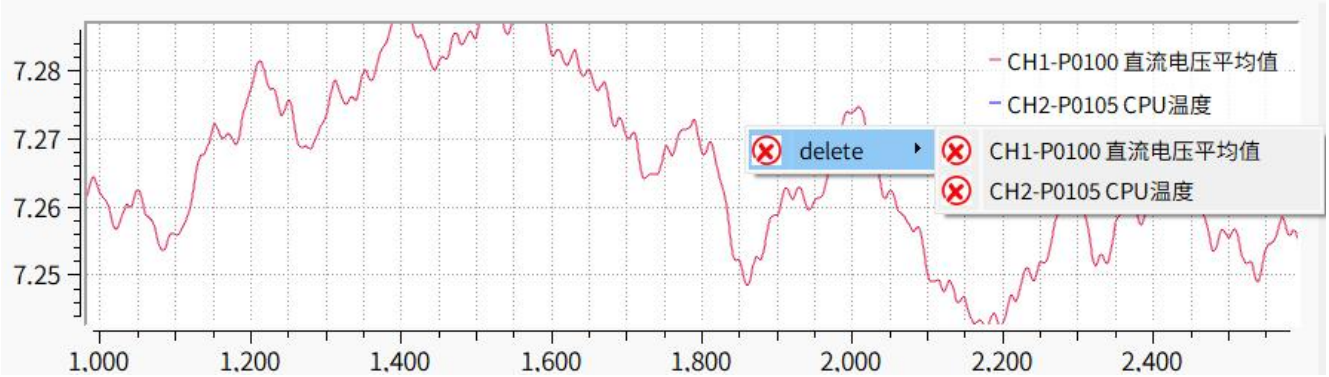
1) Press the left mouse button to press the selected target area and pull it from left to right to zoom in on the target
area




2) Double-click the left mouse button in the drawing window to cancel and restore the local magnification

3) Right-click to delete the
curve




4) Use the mouse wheel to zoom in/out of the graph

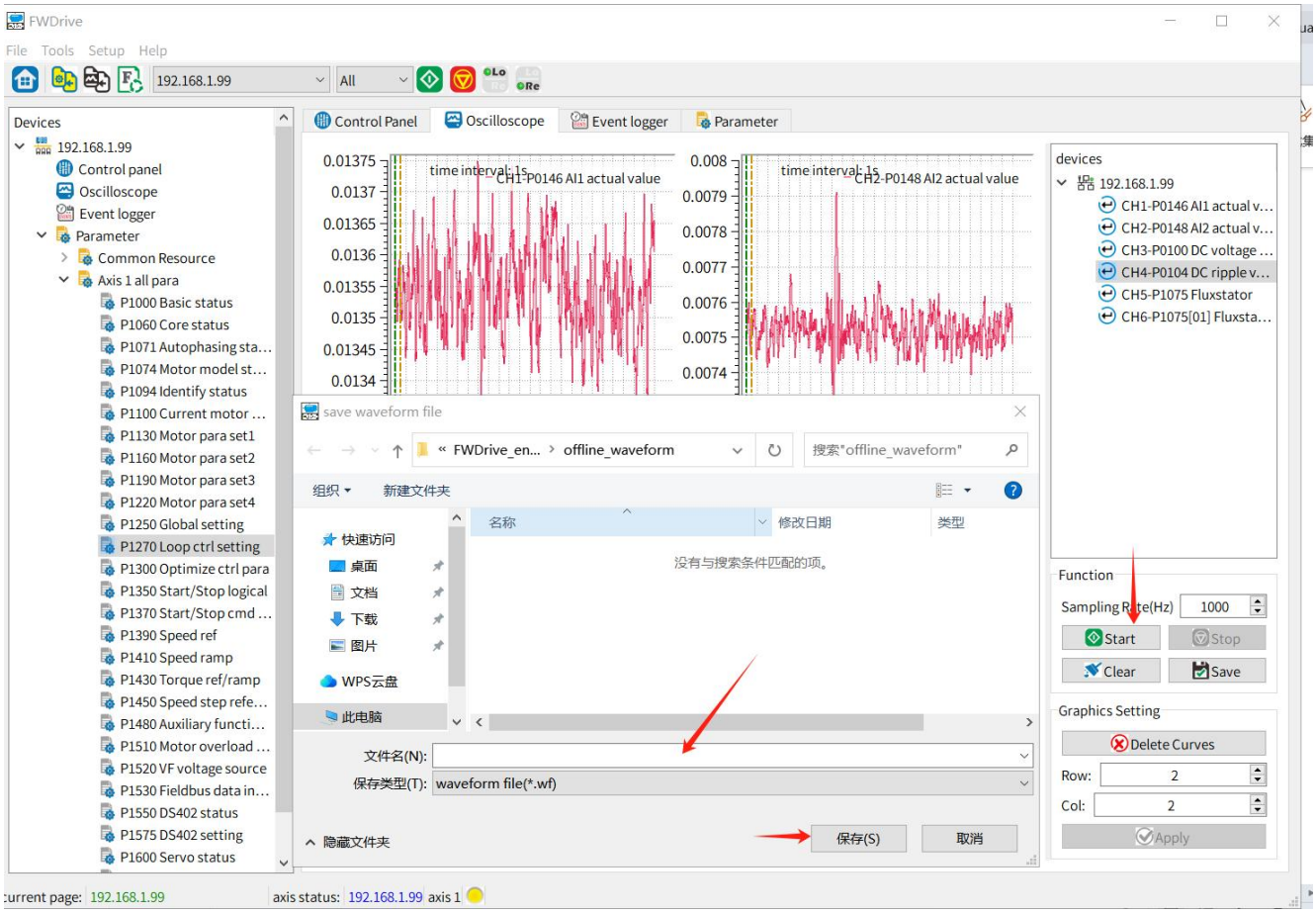
5) Hold down the middle mouse button to move the graphic

## 6. Subsequent quantitative analysis of waveform data

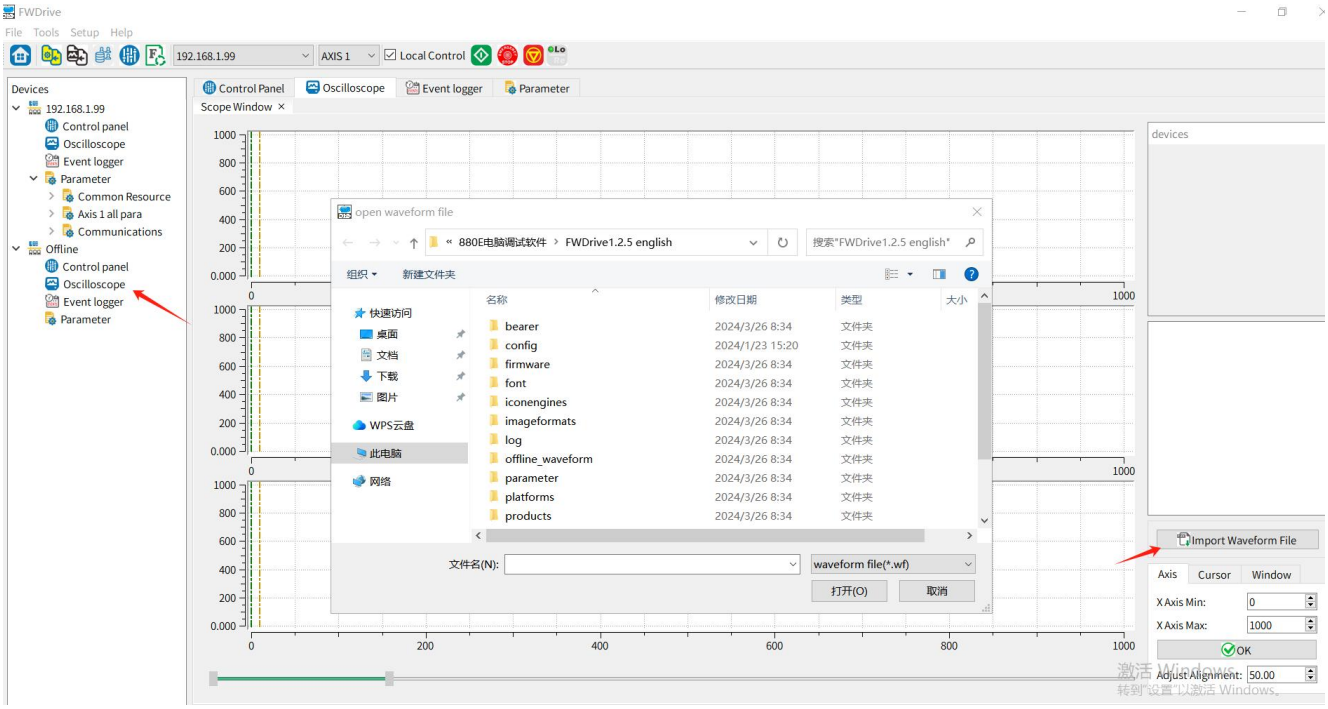
THE DEBUGGING ASSISTANT PROVIDES A COPY FUNCTION FOR RECORDING WAVEFORM DATA, WHICH ALLOWS YOU TO COPY SPECIFIC WAVEFORM DATA VALUES IN THE FORM OF COLUMN-COLUMN MATRICES TO EXCEL SHEETS. Right-click on the parent node to copy all channel data. If you right-click on a child node, only the corresponding channel data is copied. COPY-BASED WAVEFORM DATA TABLES ALLOW USERS TO PERFORM MORE COMPLEX QUANTITATIVE ANALYSES WITH THE HELP OF EXCEL OR OTHER DATA ANALYSIS SOFTWARE. This feature supports both offline and online modes.


## 12.6 Waveform data saving and importing

**1.** If you select "Save Data", you can save the monitoring variable data, which is convenient for waveform data analysis in the offline state.

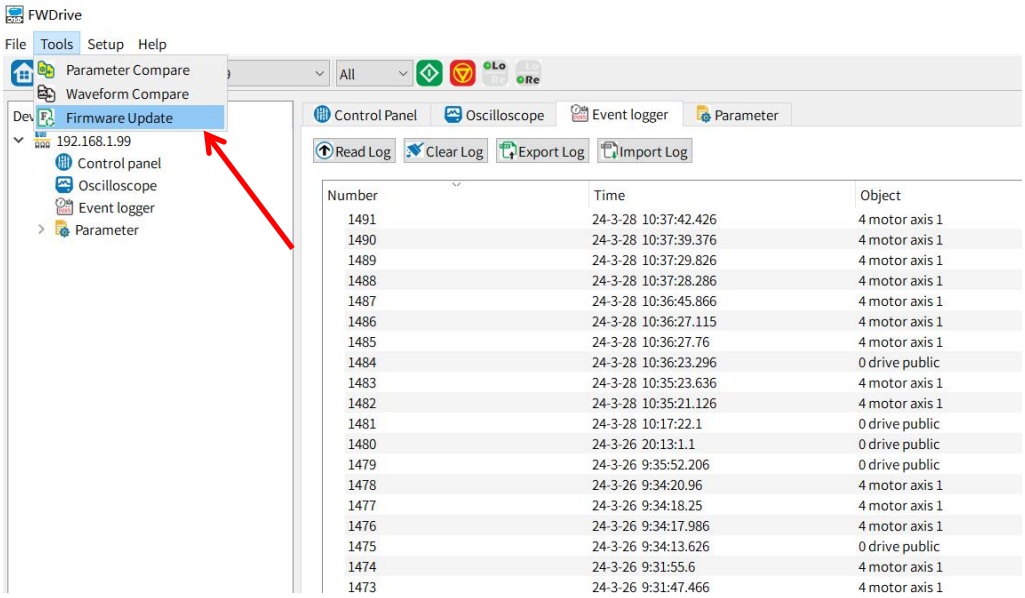


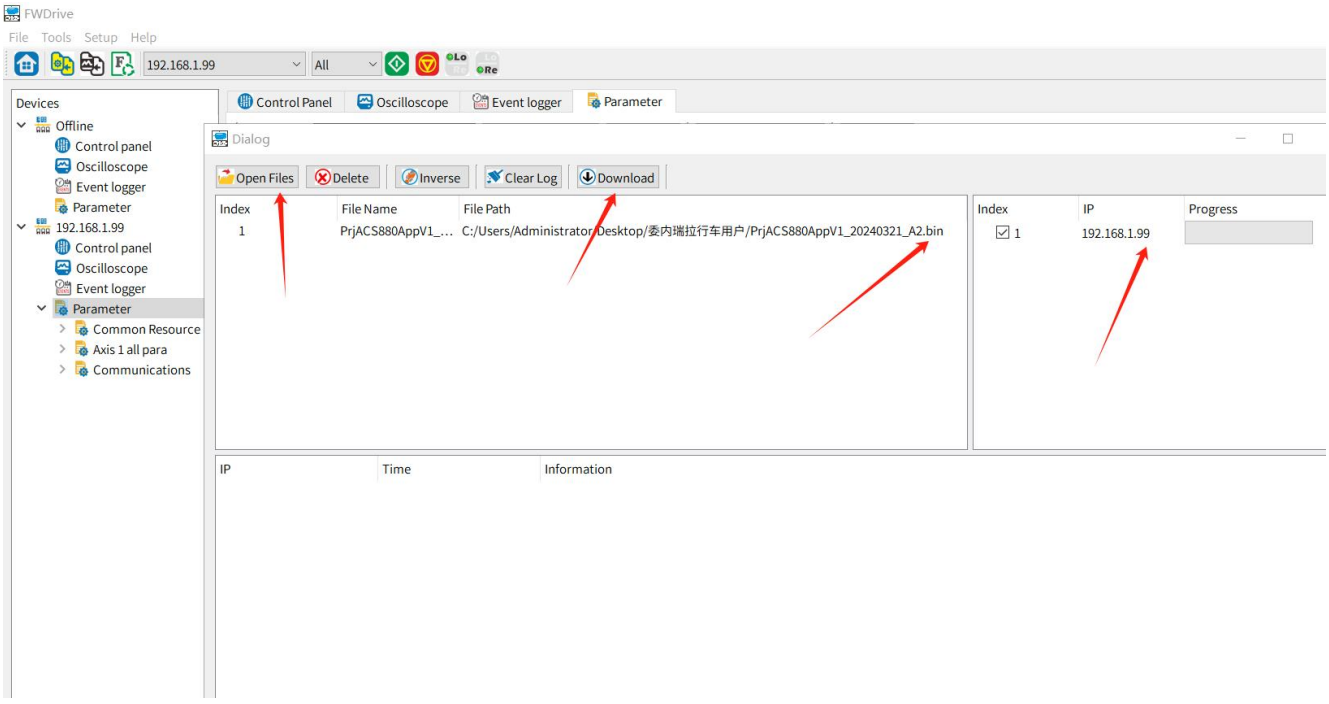
**2.** Correspondingly, saved recorded waveforms can be analyzed offline using the data import function.



## 12.7 Firmware upgrade

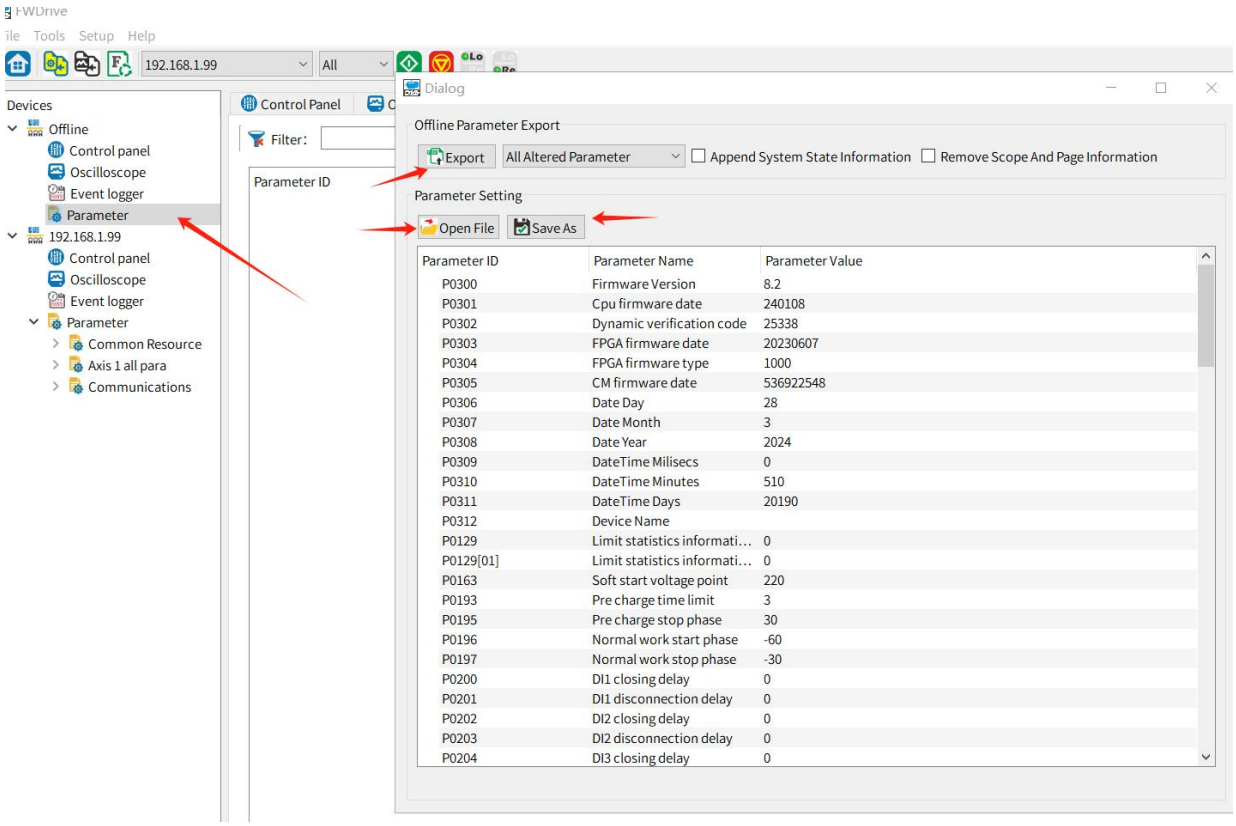
This debugging assistant supports fast firmware upgrade based on Ethernet communication, and the upgrade steps are as follows:1. Refer to the connection instructions of the Debugging Assistant to connect the PC to the target drive2. Click the "Open File" button, select the firmware burning file (.hex, .bin) on the local side of the PC, and then click the "Download" button.



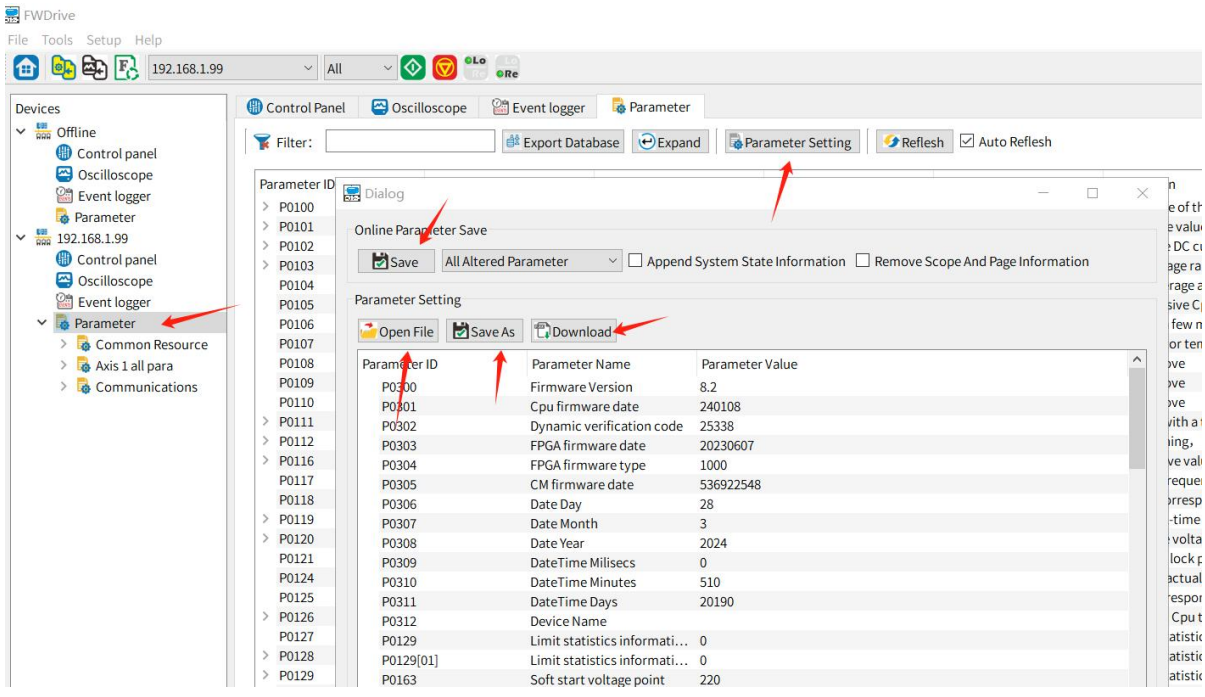



## 12.8 Parameter upload, download and function description

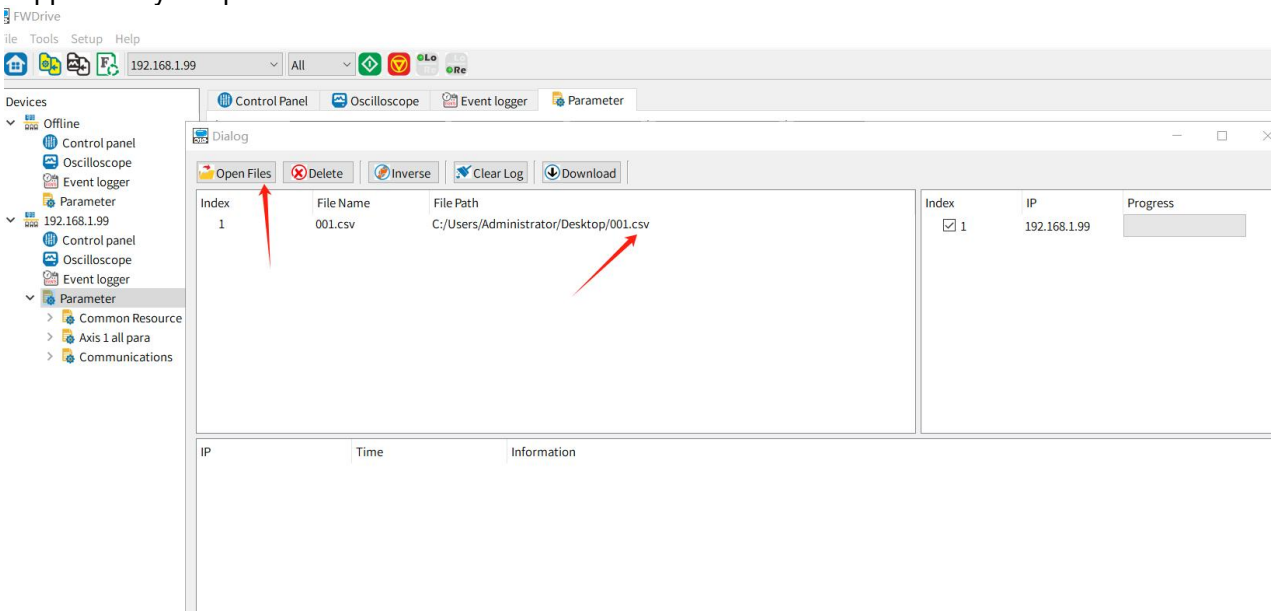
In offline mode, the user can import the parameter database (suffix .db). Click the "Parameter Settings" button to save and view the relevant parameters, and the user can directly modify the parameters and save them when viewing the parameters.




In online mode. Users can click the "Parameter Settings" button on the parameter page to save, view, and download the parameters. When viewing parameters, users can directly modify the parameters and save them.



In addition, users can download parameters for multiple devices at the same time. The file formats supported by the parameter download include .csv and .db.




System Restart: Restart and refresh the drive CPU.

# 13.Basic configuration and description of fieldbus

## 13.1Modbus-RTU/485 Fieldbus communication

**For more instructions, please refer to Modbus_Application_Protocol_V1_1b3.pdf. Users can download this document from www.modbus.org.**
**The MODBUS communication protocol of this machine only supports RTU slave mode. Communication is initiated by the master station, and the slave station receives the request and responds. The addresses of the master station and the slave station must be consistent. Broadcasting is also supported. At this time, the master station address is 0. MODBUS is built on the Universal Asynchronous Receiver Transmitter (UART), and the baud rate and frame format of the master station and slave station must also be consistent.**
**The basic unit of MODBUS is one byte, and the RTU mode frame format is as follows (the omitted part in the middle is determined by the function code):**

| Node address | function code | … | CRC Check code | |
|---|---|---|---|---|
| 1 byte | 1 byte | … | Low 8 bits | High 8 bits |

**Note: 16-bit register addresses, numbers and data are stored in big-endian format, that is, the high byte is first and the low byte is last. However, the CRC check code (polynomial 0xA001) is stored in little endian, that is, the low byte is first and the high byte is last.**
**Function code and frame format**
**Currently, only the following function codes are supported (suffix H represents hexadecimal, suffix D represents decimal)**

| | | |
|---|---|---|
| 03H | Read holding register | Read the current values of N consecutive parameters |
| 06H | Write to a single register | Overwrite the current value of a single parameter |
| 08H | Diagnosis | Used to test and check communication link status, supports the following sub-function codes:<br>0x00 Return query data<br>0x01 Reset communication<br>Initialize and restart the slave device's serial line port, clearing all communication event counters.<br>0x04Force listen-only mode<br>Force the specified slave into listen-only mode. The slave will not respond to this message.。 |
| 10H or 16D | Write multiple registers | Rewrite the current values of N consecutive parameters |
| 42H or 66D | Read parameter related information | Used to read relevant information about drive parameters and supports the following sub-function codes:<br>0x00Read the properties of the specified parameter<br>0x01 Read the default value of the specified parameter<br>0x02 Read the minimum value of the specified parameter<br>0x03 Read the maximum value of the specified parameter<br>0x04 Read the number of parameters in the specified parameter group<br>0x05 Read the visibility of the specified parameter group |
| 55H or 85D | Read data log | |

**03H request frame** **3H Response frame (the number of bytes is equal to 2 times the number of registers)**

| Node address | 03 | Register starting address | | Number of registers | |
|---|---|---|---|---|---|
| | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits |

**06H request frame→** **06H response frame (Same as request detection on the left)**

| Node address | 06 | Register address | | Register data | |
|---|---|---|---|---|---|
| | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits |

| Node address | 03 | number of bytes | Register data 1 | | … |
|---|---|---|---|---|---|
| | | | High 8 bits | Low 8 bits | … |

**08H request frame**

| Node address | 08 | Sub function code | | data | |
|---|---|---|---|---|---|
| | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits |

**10H request frame (The number of bytes is equal to 2 times the number of registers)**

| Node address | 10 | Register starting address | | Number of registers | | Number of bytes | Register data 1 | | … |
|---|---|---|---|---|---|---|---|---|---|
| | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits | | High 8 bits | Low 8 bits | … |

**10H Response frames ignored (Returns the first 6 bytes of the request frame)**

**42H Request frame**

| Node address | 42 | Sub function code | | Parameter address | |
|---|---|---|---|---|---|
| | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits |

**42H Response frame**

| Node address | 42 | Sub function code | | Parameter information | |
|---|---|---|---|---|---|
| | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits |

**Bus address space: (X refers to parameter code, Y refers to communication access address)**

| Access interface | Address space definition | Conversion rules | Example |
|---|---|---|---|
| MODBUS RTU or TCP | 16-bit data access: 0000 ~ 9999 | Y = X | P1000 motor speed, 16-bit data address is 1000 |
| | 32-bit data access: 10000 ~29998 | Y = X * 2 + 10000 | P1000 motor speed, 32-bit data address is 12000 |

**MODBUS TCP Register address space calculation method:**

**A. The address of the 16-bit register, directly take the parameter address, for example, P900, directly take 900 (decimal)**

**B. The address of the 32-bit register, parameter address *2+10000, for example, P900, then take 900*2+10000=11800 (decimal)**

**Note: All parameters can be read and written in 16-bit or 32-bit mode, of which 32-bit access, control words and status words are consistent with Profinet communication.**
**For details, please refer to the MODBUS RTU special communication manual.**

## 13.2Modbus TCP High-speed Ethernet communications

The MODBUS TCP communication protocol of this driver fully complies with international standards. For protocol details, please refer to MODBUS MESSAGING ON TCP/IP IMPLEMENTATION GUIDE V1.0a
This driver implements a MODBUS TCP server, using port 502. The maximum number of clients accessed at the same time is 16, and the response time to client access requests is about 0.5ms. The IP address configuration parameters of the server are: P5401~P5404. Note that the IP addresses of the server and the client must be in the same network segment before they can be accessed.
Compared with MODBUS RTU, the differences between MODBUS TCP and MODBUS RTU messages are:

1. There is no CRC check code at the end of the data
2. More than the first 7 bytes of data header (MBAP)
3. Bus address space: (X refers to the parameter code, Y refers to the communication access address)

| Access interface | Address space definition | Conversion rules | Example |
|---|---|---|---|
| MODBUS RTU or TCP | 16-bit data access: 0000 ~ 9999 | Y = X | P1000 motor speed, 16-bit data address is 1000 |
| | 32-bit data access: 10000 ~29998 | Y = X * 2 + 10000 | P1000 motor speed, 32-bit data address is 12000 |

MODBUS TCP Message structure:

| category | MBAP | | | | FUN CODE | DATA |
|---|---|---|---|---|---|---|
| name length | Identifier 2 Byte | Protocol code 2 Byte | Data length 2 Byte | Device address 1 Byte | Function code 1 Byte | Data content 4~240 Byte |
| Explanation | Defined by the client, Server-side automatic replication | | Refers to the length of the next data | Server automatically replicates client | 03 read 06 write 10Write multiple | Depends on function code |

Definition of request message for client to read single or multiple registers: (Read parameter P100 DC bus voltage (0x0064), number 0x0001)

| function code 1 Byte | Starting register address 2 Byte | Number of registers 2 Byte |
|---|---|---|
| 03 | 00 64 | 00 01 |

Server response message: (Return data 560.0V (0x15E0), Length 2 Byte)

| function code 1 Byte | Data byte length 1 Byte | Data content 2 Byte |
|---|---|---|
| 03 | 02 | 15 E0 |

The client writes the request message definition of a single register: (Write parameter P900 floating point number 1 (0x0384), data 100.0 (0x03E8))

| Function code 1 Byte | Register address 2 Byte | Data 2 Byte |
|---|---|---|
| 06 | 03 84 | 03 E8 |

Server response message:

| Function code 1 Byte | Register address 2 Byte | Data 2 Byte |
|---|---|---|
| 06 | 03 84 | 03 E8 |

The client writes request message definitions for multiple registers: (write parameter P900 (0x0384) =100.0, P901=200.0)

| Function code 1 Byte | Register address 2 Byte | Number of registers 2Byte | Data length 1Byte | Data |
|---|---|---|---|---|
| 10 | 03 84 | 00 02 | 04 | 03 E8 07 D0 |

Server response message:

| Function code 1 Byte | Register address 2 Byte | Number of registers 2Byte |
|---|---|---|
| 10 | 03 84 | 00 02 |

MODBUS TCP Register address space calculation method:

A. The address of the 16-bit register, directly take the parameter address, for example, P900, directly take 900 (decimal)

B. The address of the 32-bit register, parameter address *2+10000, for example, P900, then take 900*2+10000=11800 (decimal)

Note: All parameters can be read and written in 16-bit or 32-bit mode. When accessing 32-bit, they are divided into floating point numbers and integers, which are determined by the parameter type. The arrangement of high and low words of 32-bit data follows the principle of "lower 16 bits first, high 16 bits last".

The following is a 32-bit access case:
Example 1: 32-bit floating point number reading (read P900 (32-bit address 11800, hexadecimal 0x2E18), return 0x42C80000 (floating point number 100.0))
Send: 03 2E 18 00 02
Return: 03 04 00 00 42 C8

Example 2: 32-bit integer reading (read P908 (32-bit address 11816, hexadecimal 0x2E28), return 0x000F4240 (integer 1000000))
Send: 03 2E 28 00 02
Return: 03 04 42 40 00 0F

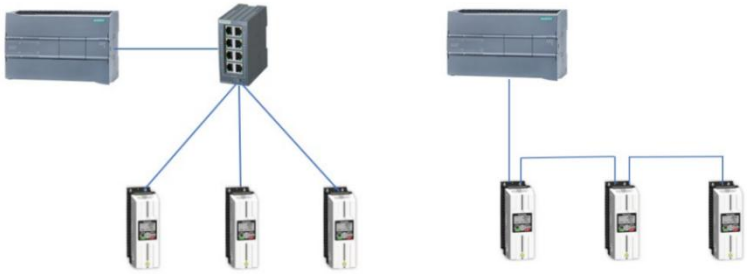
Example 3: Writing 32-bit floating point number (write P900=100.0)
Send: 10 2E 18 00 02 04 10 00 42 c8
Return: 10 2E 18 00 02
Example 4: 32-bit integer writing (write P908=1000000)
Send: 10 2E 28 00 02 04 42 40 00 0F
Return: 10 2E 28 00 02

Access error code description:
01: Function code is not supported
02: Register address error
03: Data value is out of range
04: Data length error
05: No access rights
06: Other errors
The control word and status word are consistent with Profinet communication
Please refer to the MODBUS communication manual for details.

## 〉13.3ProfiNET Professional High-Speed Ethernet Communications【+E3PN】

1. PROFINET, launched by PROFIBUS International, is a new generation of industrial automation communication standard based on industrial Ethernet technology. PROFINET solutions include real-time network, motion control, distributed automation, fail-safe and network security.
2. PROFINET supports three communication methods: TCP/IP standard communication, real-time (RT) communication and isochronous real-time (IRT) communication. Therefore, PROFINET, as an industrial Ethernet bus with very good real-time performance, has been widely used in applications such as remote I/O station expansion, frequency converters, and servo drives.
3. ACS880 integrates PROFINET communication, the corresponding model suffix +E3PN, no external communication card

For the situation where multiple frequency converters are connected to the main station PLC, the user can use the traditional star network topology a, or use the X85 IN and OUT ports on the option to form a ring topology b to reduce the requirements for PROFINNET switch ports and increase wiring. Topological flexibility.



(a) (b)

To ensure the reliability of profinet communication, it is recommended to use shielded twisted pair network cables or dedicated profinet communication lines. It is recommended to use the original Siemens Profinet 4-core communication network cable and its special RJ45 plug.

2.Drive configuration instructions：

Message composition: Index (2 bytes) + sub-index (1 byte) + data bit width (1 byte)
Index=0x+parameter code H
Subindex = parameter code subindex H H: represents hexadecimal.
Data bit width: 0x10 represents 16-bit integer, 0x20 represents 32-bit integer, 0xA0 represents 32-bit floating point

Example：

Control word：

P1531 parameter (control word)： 0X05FB0010 Decimal 1531 converted to hexadecimal = 05FB

Speed setting:

When the speed given is less than or equal to 32767rpm, configure the following message：

P1534 parameter (bus speed given 16-bit integer) PZD： 0X05FE0010

When the speed is greater than 32767rpm, configure the following message：

P1534 parameter (bus speed given 32-bit integer) PZD： 0X05FE0020

Drive start and stop, speed and torque， monitor drive operating status

| Parameter code | Parameter name | Parameter value | Explanation |
|---|---|---|---|
| P1539 | Fb control word type | 1=Industry Standard | 1=Industry Standard |

| | | | |
|---|---|---|---|
| P1370 | Remote control 1 start and stop function | 5，fieldbus | 5=Bus communication control |
| P1392 | Speed given 1 choice | P1542 | Numeric pointer, pointing to P1542 Fb speed given output |
| P1430 | Torque given 1 selection | P1543 | Numeric pointer, pointing to P1543 Fb torque given output |
| P1358 | Remote control mode 1 | Set according to needs | 0: Speed mode, 1: Torque mode, 2: Torque control speed limit mode, 6: Speed control torque limit mode |

Control word description：

| Bit sequence number | Control word meaning |
|---|---|
| 0 | ON/OFF1（Switch on） |
| 1 | OFF2 stop（Enable voltage） |
| 2 | OFF3 stop（Quick stop） |
| 3 | Pulse enable（Enable operation） |
| 4 | |
| 5 | |
| 6 | |
| 7 | Fault response（Fault reset） |
| 8 | |
| 9 | |
| 10 | Controlled by PLC (REM mode) |
| 11 | reverse |
| 12 | |
| 13 | |
| 14 | |
| 15 | |

| | |
|---|---|
| Forward start | 0x040F |
| Reverse start | 0X0C0F |
| Stop 0FF1 | 0X040E |
| Stop 0FF2 | 0X040C |
| Stop 0FF3 | 0X040A |
| Stop | 0X0407 |
| Reset | 0x0487 |

Status word description：

| Bit sequence number | Status word meaning |
|---|---|
| 0 | Driver preparation（Ready to switch on） |
| 1 | Ready to run（Switched on） |
| 2 | Run（Operation enable） |
| 3 | Fault（Fault） |
| 4 | OFF2 Activation（Coast stop） |
| 5 | OFF3 Activation（Quick stop） |
| 6 | It is forbidden to close the switch（Switch on disable） |
| 7 | Warnning（Warning） |
| 8 | Customized, signal source P1540[0] |
| 9 | Control request (REM mode) |
| 10 | Speed reached（Target reached） |
| 11 | Torque limited（Limiting） |
| 12 | Custom, signal sourceP1540[1] |
| 13 | Custom, signal sourceP1540[2] |
| 14 | Custom, signal sourceP1540[3] |
| 15 | Custom, signal sourceP1540[4] |

1. Boot drive
When starting the inverter for the first time, you need to stop 16#0407 and write the original value of the drive P1531 Fb control word;
When the operation is ready, then start 16#040F and write the original value of the P1531 Fb control word of the drive to start the drive.;
2. Stop the drive
Write 16#0407 into the drive P1531 Fb control word original value and stop the drive;
3. Given motor speed
Write the speed setting value 1000 into P1534 Fb speed given original value, and set the motor speed to 1000rpm;
Write the speed setting value -1000 into P1534 Fb speed given original value, and set the motor speed to -1000rpm;
4. Read drive operating status
Reading the Fb status word can view the P1545 drive status word parameters. The actual motor speed, actual motor torque, motor speed, motor current, DC bus voltage, output active power and other information can also be read through the corresponding address;
5. Set the motor speed and motor torque at the same time (for example: speed limit torque mode P1358 is set to 6)
Write the speed setting value 1000 into P1534 Fb speed given original value, and set the motor speed to 1000rpm. Write the torque setting value 500 into P1535 Fb torque given original value 1, and set the motor torque to 50%. Write 16#0407 into the Fb control word to start the driver. At this time, the motor runs at 1000 speed and maximum torque of 50%, and the motor decelerates when the limited torque is reached.
See profinet communication manual for details

## 13.4CANopenHigh-speed fieldbus communication【+E3CP】

1. The communication protocol is an international standard protocol, mainly including the physical layer (CAN 2.0b), transmission layer (DS 301 protocol), and application layer (DS 402 protocol). Since the drive's built-in CANopen communication and EtherCAT communication share the DS301 and DS402 protocols, the two physical layers cannot be used at the same time.

After installing the corresponding EDS file and correctly configuring the parameter P5110 CANopen station number, parameter P5111 CANopen baud rate and P5112 terminal resistance, it can be scanned by the host computer and the required PDO configuration can be performed. For specific DS402 driver control, refer to the EtherCAT communication case

Bus address space: (X refers to parameter code, Y refers to communication access address)

| Access interface | Address space definition | Conversion rules | Example |
|---|---|---|---|
| CANOPEN | 0000 ~ 9999 | Y =10000+X | P1000 Motor speed CANOPEN address 11000 Hexadecimal: 2AF8 |

2. Transmission distance:

CANopen The transmission distance of bus communication is directly related to the baud rate and communication cable. The relationship between the maximum bus line length and the baud rate is as shown in the following table.

| Baud rate kbps | 1000 | 500 | 250 | 125 | 100 | 50 | 20 |
|---|---|---|---|---|---|---|---|
| Length（m） | 25 | 100 | 250 | 500 | 500 | 1000 | 1000 |

3. Status monitoring parameters

| Parameter number | Parameter name | Explanation |
|---|---|---|
| P5010 | SDO receive counter | |
| P5011 | Sync frame counter | |
| P5012 | CAN Physical layer status | 0=No Error<br>1=Stuff Error<br>2=Form Error<br>3=Ack Error<br>4=Bit1 Error<br>5=Bit0 Error<br>6=CRC Error<br>7=No Event |

4. CANopen Supported functions

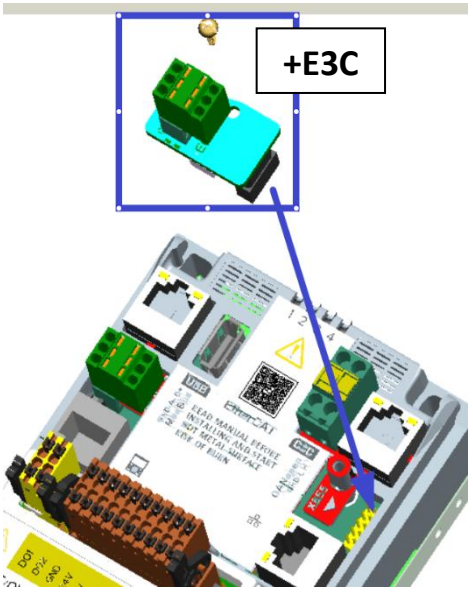
Supports Heartbeat heartbeat protocol, the slave station regularly reports the current status to the master station

Support SDO, transmitting 1 parameter or 1 object dictionary each time

Supports 4 TPDOs and 4 RPDOs

Support emergency objects

Support synchronous trigger mode




5. Communication message ID convention

NMT network management: 0x000

SYNC: 0x080

Receive SDO: 0x600 (referring to the master station sending and the slave station receiving)

Send SDO: 0x580 (referring to the slave station sending and the master station receiving)

RPDO1: 0x200+node ID (sent by master station, received by slave station)

RPDO2: 0x300+node ID

RPDO3: 0x400+node ID

RPDO4: 0x500+node ID

TPDO1: 0x180+node ID (sent from slave, received by master)

TPDO2: 0x280+node ID

TPDO3: 0x380+node ID

TPDO4: 0x480+node ID

EMCY emergency message: 0x080+node ID

6. Parameter address and access

| Parameter address range | Explanation |
|---|---|
| 0x1000~0x1FFF | DS 301 exclusive |
| 0x6000~0x7FFF | DS 402 exclusive |
| 10000 ~ 19999 | Vendor custom |

Description of the conversion relationship between manufacturer-defined parameter code X and communication address Y: Y = X + 10000

Example 1: The position value of the first encoder is P400, and the corresponding communication address is:
index = 400+10000=10400 (or 0x28A0), subid=0

Example 2: DC bus voltage real-time value P0100[01], the corresponding communication address is index=100+10000 = 10100 (or 0x2774), subid=1

7. SDO messages and examples

The data frame of SDO read (driver->controller) is defined as follows:

| Frame ID | 0x600+node ID |
|---|---|
| BYTE0 | 0x40 Read data<br>0x23 (32 bit) Write 4 bytes of data<br>0x2B (16 bit) Write 2 bytes of data<br>0x2F (8 bit) Write 1 byte of data<br>0x80 Stop current SDO command<br>0x83/0x8B/0x8F (failure) |
| BYTE1 | Index low byte |
| BYTE2 | Index high byte |
| BYTE3 | subindex |
| BYTE4-7 | Data (data return or exception code) |

The data frame of SDO write (controller->driver) is defined as follows:

| Frame ID | 0x580+node ID |
|---|---|
| BYTE0 | 0x43 (32 bits) read 4 bytes of data<br>0x4B (16 bits) read 2 bytes of data<br>0x4F (8 bits) reads 1 byte of data<br>0x60 Write 1/2/4 bytes of data<br>0x80 Terminate SDO command<br>0x83/0x8B/0x8F (failure) |
| BYTE1 | Index low byte |
| BYTE2 | Index high byte |
| BYTE3 | subindex |
| BYTE4-7 | Data (target data or exception code) |

Assume node ID=1
Example 1: Read the 32-bit value at index 0x607A:00 (assuming the return value is 0xDDCCBBAA)
Request: ID=0x0601, DAT=40 7A 60 00 00 00 00 00
Response: ID=0x0581, DAT = 43 7A 60 00 AA BB CC DD

Example 2: Write index 0x607A:00, target value is 0xDDCCBBAA
Request: ID=0x0601, DAT=23 7A 60 00 AA BB CC DD
Response: ID=0x0581, DAT = 60 7A 60 00 00 00 00 00

Error code definition for read and write exceptions:

| Error code | Description |
|---|---|
| 0x0609_0011 | Subindex does not exist |
| 0x0800_0000 | General errors |

8. PDO Mapping configuration

| module name | DS301 Index | Parameter address | Configuration instructions |
|---|---|---|---|
| RPDO1 | 0x1600 | P5120 | The index or parameter contains 5 sub-indexes, and the meaning is described as follows:<br><br>[0] Number of objects<br>[1] First object definition<br>[2] Second object definition<br>[3] The third object definition<br>[4] The fourth object definition |
| RPDO2 | 0x1601 | P5121 | |
| RPDO3 | 0x1602 | P5122 | |
| RPDO4 | 0x1603 | P5123 | |
| TPDO1 | 0x1A00 | P5124 | |
| TPDO2 | 0x1A01 | P5125 | |
| TPDO3 | 0x1A02 | P5126 | |
| TPDO4 | 0x1A03 | P5127 | |

PDO configuration content description: index (16bit) + sub-index (8bit) + bit width (8bit)

Example: 0x607A0020, meaning: index 0x607A, sub-index 0x00, bit width 0x20

Each PDO can be associated with a maximum of 4 objects, and the cumulative bit width of each object does not exceed 64 bits.

The above configuration must be completed before starting the node.

9. PDO communication configuration

| object name | DS301 index | Parameter address | Configuration instructions |
|---|---|---|---|
| RPDO1 | 0x1400 | P5128 | The index or parameter contains 6 sub-indexes, and the meaning is described as follows:<br>[0] Number of sub-indexes<br>[1] COB-ID<br>[2] Transmission type<br>[3] Inhibit time, 0.1ms<br>[4] Reserved<br>[5] Timing time, ms |
| RPDO2 | 0x1401 | P5129 | |
| RPDO3 | 0x1402 | P5130 | |
| RPDO4 | 0x1403 | P5131 | |
| TPDO1 | 0x1800 | P5132 | |
| TPDO2 | 0x1801 | P5133 | |
| TPDO3 | 0x1802 | P5134 | |
| TPDO4 | 0x1803 | P5135 | |

10. Transmission type description: 0xFF (255) is asynchronous transmission, the rest are synchronous transmission

When using DBC files to implement the J1939 standard, you only need to correctly configure the sub-index [1] COB-ID, and [5] timing time, and [2] the transmission type is fixed to 0x00FF. After the COB-ID is changed, it needs to be restarted to take effect.

The unit of prohibition time is 0.1ms. Each PDO can specify a prohibition time, which defines the minimum interval time between two consecutive PDO transmissions to avoid the high-priority information always occupying the bus due to the large amount of data. Data with lower priority cannot compete for the bus. If set to 0, the function will not take effect

During asynchronous transmission, when the data changes, if the interval from the last PDO sending time point is greater than the set prohibition time, PDO transmission is automatically triggered; otherwise, until the interval time is greater than the timing time, the network management message is triggered to be sent.

| message ID | BYTE0 | BYTE1 |
|---|---|---|
| 0x00 | order | Node ID |

Message command:
0x01: Start node
0x02: Stop node
0x80: pre-run
0x81: Reset node
0x82: Reset communication
When executing the startup node, the mapping definition of PDO is automatically loaded.

11.Heartbeat message

| Message ID | BYTE0 |
|---|---|
| 0x700+node ID | Node status |

After the drive is powered on or restarted, it automatically sends a heartbeat message.

The heartbeat interval is set by index 0x1017 (or parameter P5142) in ms

12.Emergency message

| Message ID | BYTE0 | BYTE1 | BYTE2 | BYTE3 |
|---|---|---|---|---|
| 0x80+node ID | 0x00 | 0x10 | 0x81 | Error code |

When a fault is triggered and the fault is reset, emergency message sending will be automatically triggered.

13.Synchronization message
The synchronization trigger message has only ID=0x80 and no data content. It is broadcast by the master station to all slave stations.

14. Communication disconnection protection
When the node is running, if no data packet is received for 1 second continuously, the disconnection protection will be triggered and the node will stop immediately.

15. Debugging and diagnostics
Receive frame count register table:

| Name | Parameter address |
|---|---|
| Count of all received frames | P5010[0] |
| RPDO1 receive count | P5010[1] |
| RPDO2 receive count | P5010[2] |
| RPDO3 receive count | P5010[3] |
| RPDO4 receive count | P5010[4] |
| SDO receive count | P5010[5] |
| SYNC sync frame count | P5010[6] |
| NMT Network management frame count | P5010[7] |

Transmit frame count register table：

| Name | Parameter address |
|---|---|
| TPDO1 send count | P5011[1] |
| TPDO2 send count | P5011[2] |
| TPDO3 send count | P5011[3] |
| TPDO4 send count | P5011[4] |

| | |
|---|---|
| SDO send count | P5011[5] |
| EMC Emergency message count | P5011[6] |
| Heartbeat packet count | P5011[7] |

Content register table of received frame:

| Name | Parameter address |
|---|---|
| RPDO1 Receive data | P5029[ 0..3 ] |
| RPDO2 Receive data | P5029[ 4..7 ] |
| RPDO3 Receive data | P5029[ 8..11] |
| RPDO4 Receive data | P5029[12..15] |
| SDO Receive data | P5029[16..19] |
| NMT Network management frame data | P5029[20..23] |

Content register table of transmit frame:

| Name | Parameter address |
|---|---|
| TPDO1 send data | P5030 [0..3] |
| TPDO2 send data | P5030 [4..7] |
| TPDO3 send data | P5030 [8..11] |
| TPDO4 send data | P5030 [12..15] |
| SDO send data | P5030[16..19] |
| Emergency message sending data | P5030[20..23] |

DS 301Protocol definition parameters

| Index | Sub-Index | Name | Type | Attr | Explanation |
|---|---|---|---|---|---|
| 1000 | 0 | Equipment type | U32 | RO | Fixed to 0x00020192 |
| 1001 | 0 | fault register | U8 | RO | |
| 1006 | 0 | Asynchronous trigger interval period | U32 | RW | |
| 1014 | 0 | EMCY message identifier | U32 | RW | |
| 1017 | 0 | Producer heartbeat time | U16 | RW | |
| 1018 | 0 | Identity object | U8 | | |
| | 1 | Vendor identification | U32 | RO | |
| | 2 | Product Code | U32 | RO | |
| 1600 | 0 | RPDO1 Mapping parameters | U8 | RO | |
| | 1 | RPDO1 Mapping entry 1 | U32 | RO | |
| 1601 | 0 | RPDO2 Mapping parameters | U8 | RO | |
| | 1 | RPDO2Mapping entry 1 | U32 | RO | |
| | 2 | RPDO2 mapping entry 2 | U32 | RO | |
| 1602 | 0 | RPDO3 Mapping parameters | U8 | RO | |
| | 1 | RPDO3 Mapping entry 1 | U32 | RW | |
| | 2 | RPDO3 Mapping entry 2 | U32 | RW | |
| | 3 | RPDO3 Mapping | U32 | RW | |

| Index | Sub-Index | Name | Type | Attr | Explanation |
|---|---|---|---|---|---|
| | | entry 3 | | | |
| | 4 | RPDO3 Mapping entry 4 | U32 | RW | |
| 1603 | 0 | RPDO4 Mapping parameters | U8 | RO | |
| | 1 | RPDO4 Mapping entry 1 | U32 | RW | |
| | 2 | RPDO4 Mapping entry 2 | U32 | RW | |
| | 3 | RPDO4 Mapping entry 3 | U32 | RW | |
| | 4 | RPDO4 Mapping entry 4 | U32 | RW | |
| 1800 | 2 | TPDO1 Transmission type | U8 | RW | |
| 1801 | 2 | TPDO2 Transmission type | U8 | RW | |
| 1802 | 2 | TPDO3 Transmission type | U8 | RW | |
| 1803 | 2 | TPDO4 Transmission type | U8 | RW | |
| 1A00 | 0 | TPDO1 Mapping parameters | U8 | RO | |
| | 1 | TPDO1 Mapping entry 1 | U32 | RO | |
| 1A01 | 0 | TPDO2 Mapping parameters | U8 | RO | |
| | 1 | TPDO2 Mapping entry 1 | U32 | RO | |
| | 2 | TPDO2 Mapping entry 2 | U32 | RO | |
| 1A02 | 0 | TPDO3 Mapping parameters | U8 | RO | |
| | 1 | TPDO3 Mapping entry 1 | U32 | RW | |
| | 2 | TPDO3 Mapping entry 2 | U32 | RW | |
| | 3 | TPDO3 Mapping entry 3 | U32 | RW | |
| | 4 | TPDO3 Mapping entry 4 | U32 | RW | |
| 1A03 | 0 | TPDO4 Mapping parameters | U8 | RO | |
| | 1 | TPDO4 Mapping entry 1 | U32 | RW | |
| | 2 | TPDO4 Mapping entry 2 | U32 | RW | |
| | 3 | TPDO4 Mapping entry 3 | U32 | RW | |
| | 4 | TPDO4 Mapping entry 4 | U32 | RW | |

Hardware and mechanical description of the CANopen option card [+E3CP]

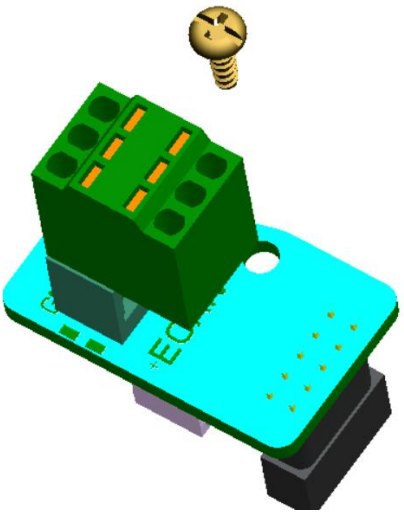
This optional small card is in the form of an option and can be flexibly configured by the user as needed. Its electrical characteristics are:

Isolated signal reception/transmission to enhance communication anti-interference in complex electrical environments

Relevant electromagnetic compatibility performance.

The mechanical structure is connected to the main control board through standard pins and 1xPT3*8

Use plastic self-tapping screws to fix the option to the control unit body.



**Note:** This option is an electrostatically sensitive component. During installation, maintenance and related

When operating, please pay attention to the necessary electrostatic protection in accordance with electrical specifications.

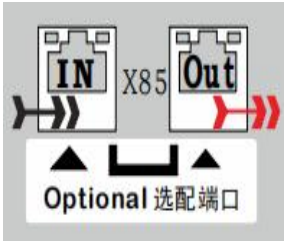
## 13.5EtherCAT professional high-speed Ethernet communications【+E3EC】

**Hardware Configuration**

**1.1 EtherCAT Communication network port**

**X85：EtherCAT communication port**

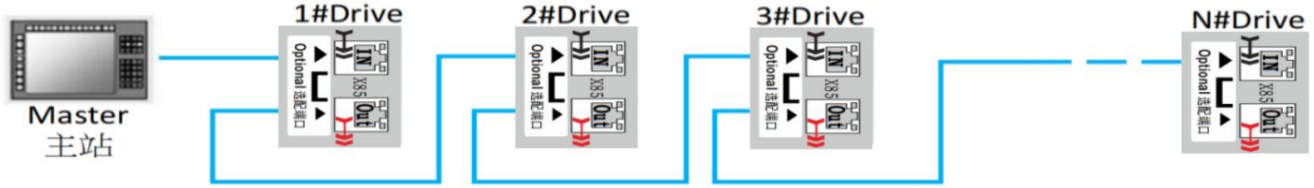
**The driver provides two network ports, X85 In and X85 Out, for communication between the driver and the master station (or previous slave station) and next slave station (if any). Models with EtherCAT models prefabricated at the factory have the suffix +E3EC.**




| Wiring port and name | Instructions for use |
|---|---|
| X85: EtherCAT IN | EtherCAT Communication input port |
| X85: EtherCAT OUT | EtherCAT Communication output port |

**1.2 EtherCAT connection topology**

**The EtherCAT network usually consists of a master station and multiple slave stations. Each EtherCAT slave station has two standard Ethernet interfaces. The bus connection topology is shown in the figure below.**




**Software configuration**

**2.1Driver basic parameter settings**

**Before using the servo driver for EtherCAT communication, the driver needs to configure the following parameters using the LCD control panel or debugging software:**

**（P1250 / P1100 / P1101 / P1575 / P5100 / P1310）**

**2.1.1 Set parameters P1250 [User APP Type] to 0: [DS402 Application]. After setting, you need to re-plug and unplug the drive keyboard or power off and restart;**

**2.1.2 P1100 [Speed Feedback Port] and P1101 [Position Feedback Port] have been set to their corresponding encoder ports. If connected to the encoder port 1, set it to 1, and switch to remote after the trial run is normal in local mode. model;**

**2.1.3 Position resolution command convention**

**Object P1575 [Position Resolution] sets the resolution of one revolution of the motor. The default is 1048576. It needs to be the same as the system-side resolution setting. If it is a low-resolution encoder, it is directly determined by the encoder. In case of high resolution, the drive internally scales automatically. The following configuration is recommended:**

**TTL and HTL incremental square waves**

**If the encoder has 1024 lines, set P1575 to 4096; if the encoder has 2500 lines, set it to 10000. The setting value needs to be enlarged by 4 times the original resolution of the encoder;**

**Incremental sine and cosine encoder**

**The driver software can subdivide the original resolution of the sine and cosine encoder by 16 bits. The total resolution of P1575 is the original resolution of the sine and cosine encoder * 65536 (2 to the 16th power). In principle, the setting value of P1575 meets the requirements of the total resolution. The resolution can be divisible or can be set to other resolutions:**

**When the sine and cosine encoder resolution is a power of 2;**

**For example: if the resolution of sine and cosine encoder is 256 or 128, P1575 can be set to 8388608;**

**The resolution of the sine and cosine encoder is not a power of 2, and the setting value needs to be divisible by the total resolution after subdivision;**

**For example: the resolution of sine and cosine encoder is 162, then the set resolution needs to be divisible by 10616832 (resolution after 162*65536 subdivision). P1575 can also be set to 331776, 663552 and other values;**

**The absolute encoder has no sine and cosine subdivision and is set according to the single-turn resolution. For example, if the single-turn is 23 bits, then P1575 is set to 8388608;**

**Absolute encoder with sine and cosine subdivision, single-turn resolution +10 bits**

**For example, HEIDENHAIN 1313 or 1325 has 13 digits in a single circle. Take 13+10=23 digits, which is 8388608, then set P1575 to 8388608;**

**For example, SKM36 has 128 sine waves in a single circle, and the 4 times frequency is 9 bits, so it is set to 9+10=19 bits, that is, 524288, then P1575 is set to 524288;**

**Resolver, set in 16 bits, that is, 65536;**

**2.1.4 Set the drive node address. The following two methods are supported. Choose one:**

**Physical addressing (address is determined by the order of network cables);**

**Drive P5100 [EtherCAT station number]; address range 0~65535, needs to be set manually, 0 means the address is automatically assigned by the master station;**

**2.1.5 Set P1310 [Mechanical transmission ratio coefficient] (only for dual encoder fully closed-loop applications, single closed-loop encoder control does not need to be set. It refers to the transmission ratio of the motor shaft and the load, that is, the motor shaft rotation circle corresponding to one rotation of the load number, can be accurately set to four decimal places)**

**Mechanical transmission ratio coefficient calculation: For example, the on-site motor side encoder is connected to the X241 port, the load side encoder is connected to the X243 port, and the local setting is 200 rpm, ensuring that the motor side speed fluctuation (P0407 corresponds to the X241 port) and the spindle side speed fluctuation (P0447 parameter corresponds X242 port) and the fluctuation is less than 2, record the motor side encoder feedback speed (P0406 corresponds to the X241 port) and the spindle side encoder feedback speed (P0446 corresponds to the X242 port), and divide the motor side encoder feedback speed by the remote side The encoder feedback speed gives the mechanical transmission ratio.**
**Note: After the above configuration parameters are set, the drive needs to be powered off and restarted before proceeding to the next step.**
**2.2 Import and configure slave station information**
**2.2.1 The EtherCAT slave information file (XML file) is used to read the master station and build the configuration of the master station and slave stations. The XML file contains the information necessary for EtherCAT communication settings. According to the drive model, the manufacturer provides the corresponding XML file for the master station to import the XML file.**

**2.3 EtherCAT state machine**
**2.3.1 The EtherCAT state machine is used to describe the status and status changes of the slave application. Status change requests are usually initiated by the master station and responded by the slave station.**
**The status change request is executed by the master station. The master station makes a control request to the application layer service, which generates an application layer control event in the slave station. After the status change request succeeds or fails, the slave station writes the request through the local application layer status writing service. Respond to application layer control services. If the status change fails, the slave maintains the status and indicates an error flag.**
**Init: initialization state;**
**Pre-Operational: pre-operational state;**
**Safe-Operational: safe operating state;**
**Operational: operating status;**

**The specific status jump method is as follows::**

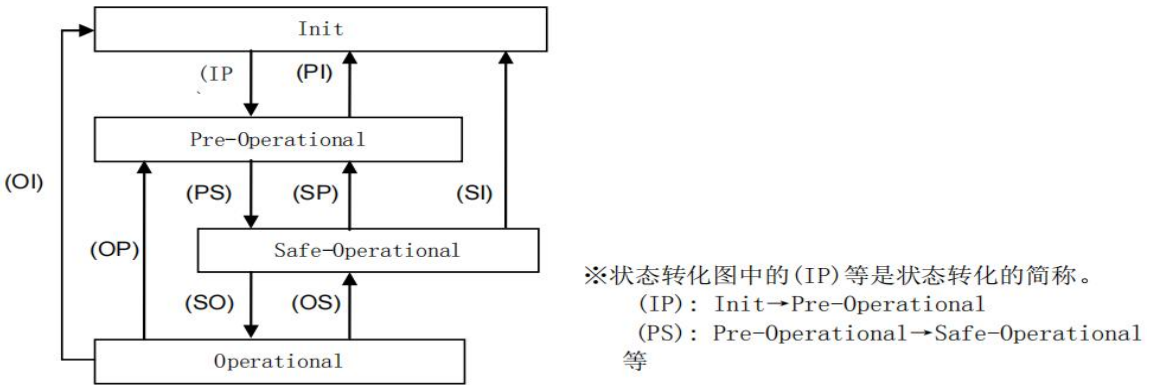



**Figure 2-3 EtherCAT Application layer state transition diagram**

2.3.2 Communication status driver monitoring parameters
P5000： AI Control，State machine monitoring

| Data | P5000 Display value meaning | Explanation | Remark |
|---|---|---|---|
| 1 | Init（initialization） | Unable to communicate via email（SDO）<br>Process data communication is not possible（PDO） | 17 (11H) There is an error in initialization |
| 2 | Pre - Operationl（pre-run mode） | Can communicate via email（SDO）<br>Process data communication is not possible（PDO） | There is an error in running 18(12H) |
| 4 | Safe -Operationl（safe operating mode） | Can read PDO input data（TxPDO）<br>Unable to receive PDO output data（RxPDO） | |
| 8 | Operationl（operating mode） | Can communicate via email（SDO）<br>Process data communication possible（PDO） | |

Note：
PDO (Process Data Object) process data object is used to transmit periodic communication data.
SDO (Service Data Object) service data object is used to transmit aperiodic communication data.
ESM Performing instructions or interface operations during status switching may cause communication abnormality and error reporting.

P5001: i32 sync Counter, DCSYNC0 interrupt count
P5002: i32PdoEvCounter, SM2 interrupt count, that is, statistics of PDO data reception times (monitoring the number of interrupts in 1S)
P5024: Bus cycle μs, EtherCAT communication synchronization cycle time
P5027: u16RxPdoNum, configure the number of PDOs received by the driver
P5028: u16TxPdoNum, configure the number of PDOs sent by the driver

For more configuration instructions, see the EtherCAT communication manual.

# 14.[Optional accessories] Encoder Feedback Modules

The figure below takes various multi-function encoder feedback access [optional accessories] suitable for E-type control units as an example to illustrate.

## 14.1 EN21 Encoder signal feedback access card

**Applicable to E series drives, supports multiple encoder types: absolute value, sine and cosine, TTL encoder**

X211-X214：4 ports with the same function, each port can be connected to an encoder independently, and they are all multi-function ports.

Absolute value：support Endata、Hiperface、Biss、RS485。

Sine&cosine：1Vp-p sine wave signal

TTL： differential pulse signal, non-isolated, frequency ≤1MHZ

Indicator light: When the light is on, it indicates that the output power of each port is normal. If the light is flashing or not on, check whether the wiring is correct.

| X211-X214 multi-function port | | | |
|---|---|---|---|
| serial number | absolute value | sine cosine | square wave(TTL) |
| 1 | SINA+ | A+ | / |
| 2 | COSB+ | B+ | / |
| 3 | CLOCK+ | / | A+ |
| 4 | GND(0V) | GND(0V) | GND(0V) |
| 5 | 5V | 5V | 5V |
| 6 | SINA- | A- | / |
| 7 | COSB- | B- | / |
| 8 | CLOCK- | / | A- |
| 9 | / | Z+ | Z+ |
| 10 | / | Z- | Z- |
| 11 | / | / | / |
| 12 | 8V | / | / |
| 13 | DATA+ | / | B+ |
| 14 | DATA- | / | B- |
| 15 | GND(0V) | GND(0V) | GND(0V) |

## 14.2 EN22A Encoder signal feedback access card

**Applicable to E series drives, supports TTL differential encoder**

X221-X224： 4 ports with the same function, each port can be connected to an encoder independently and supports disconnection detection.

TTL：5V differential pulse signal, isolated type, frequency ≤700KHZ

Indicator light: When the light is on, it indicates that the output power of each port is normal. If the light is flashing or not on, check whether the wiring is correct.

| X221-X224 Port. | |
|---|---|
| No. | TTL |
| 1 | A+ |
| 2 | A- |
| 3 | B+ |
| 4 | B- |
| 5 | Z+ |
| 6 | Z- |
| 7 | 5V |
| 8 | COM(0V) |
| 9 | PE |

## 14.3 EN22B Encoder signal feedback access card

**Applicable to E series drives, supports HTL encoder**

X221-X224： 4 ports with the same function, each port can be connected to an encoder independently and supports disconnection detection.

HTL push-pull differential: 12V differential pulse signal, isolated type, frequency ≤700KHZ

HTL open collector: When used for open collector, the A+/B+/Z+ port needs to be shorted to the power 12V port, and A-/B-/Z- is connected as the encoder signal.

Indicator light: When the light is on, it indicates that the output power of each port is normal. If the light is flashing or not on, check whether the wiring is correct.

| X221-X224 port | | |
|---|---|---|
| serial number | HTL push-pull differential | HTL open collector |
| 1 | A+ | Connect to 12V |
| 2 | A- | A- |
| 3 | B+ | Connect to 12V |
| 4 | B- | B- |
| 5 | Z+ | Connect to 12V |
| 6 | Z- | Z- |
| 7 | 12V | 12V |
| 8 | COM(0V) | COM(0V) |
| 9 | PE | PE |

+EN23 card 1 (X231) and 2 (X232) ports support three communication models: Absolute/SinCos/TTL, 3 (X233) port supports Resolver communication, and 4 (X234) port supports TTL/HTL two types of communication.

Note: The TTL port line sequences supported by ports 1 (X231), 2 (X232) and 4 (X234) are different.

## 14.4 EN24 Encoder signal feedback access card

**It is suitable for E series drives and supports multiple encoder types: absolute value, sine and cosine, resolver, TTL encoder, push-pull differential, with frequency division output, pulse given and encoder disconnection detection.**

X241-Supports absolute value (Endat, Biss, Hiperface, Rs485), sine and cosine (1Vp-p), square wave TTL adapted 5V differential encoder, non-isolated type, pulse frequency ≤1MHZ.

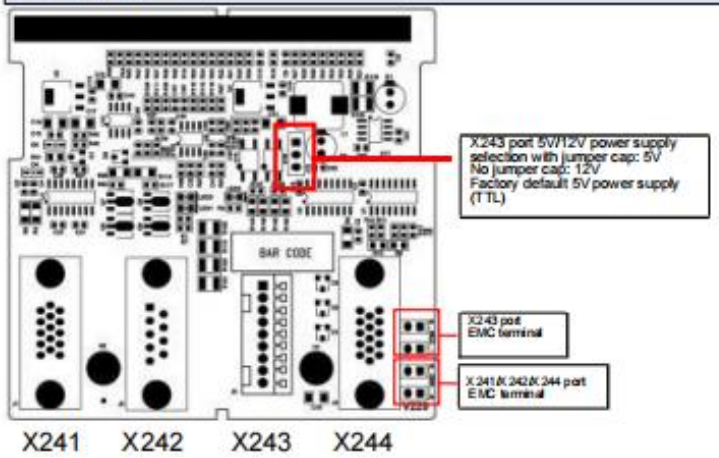
242-Resolver, adaptive transformation ratio of 0.5 and 0.286 and other types of resolvers.

X243-supports TTL isolation type. You can select the power supply voltage 5V or 8V by removing the jumper on the rear panel of the housing. 8V is used for push-pull differential, and the pulse frequency is ≤700KHZ.

X244-Feedback port, A0±/BO±/ZO±/GND differential 5V signal frequency division output, AO/BO/ZO/GND open collector signal frequency division output 5-24V, PA±/PB± pulse given only Accepts 5V differential signals and supports hand-operated 5V power supply.

Indicator light - When the light is on, it indicates that the output power of each port is normal. If the light flashes or does not light up, check whether the wiring is correct. There is no power indicator light on the X242 resolver port.

Port definition




| X241 multi-function port | | | |
|---|---|---|---|
| Ser no | absolute value | sine cosine | square wave(TTL) |
| 1 | SINA+ | A+ | / |
| 2 | COSB+ | B+ | / |
| 3 | CLOCK+ | / | A+ |
| 4 | GND(0V) | GND(0V) | GND(0V) |
| 5 | 5V | 5V | 5V |
| 6 | SINA- | A- | / |
| 7 | COSB- | B- | / |
| 8 | CLOCK- | / | A- |
| 9 | / | Z+ | Z+ |
| 10 | / | Z- | Z- |
| 11 | / | / | / |
| 12 | 8V | / | / |
| 13 | DATA+ | / | B+ |
| 14 | DATA- | / | B- |
| 15 | GND(0V) | GND(0V) | GND(0V) |

| X242 port | |
|---|---|
| Ser no | resolver |
| 1 | / |
| 2 | EXC- |
| 3 | SIN- |
| 4 | COS+ |
| 5 | GND(0V) |
| 6 | EXC+ |
| 7 | SIN+ |
| 8 | COS- |
| 9 | GND(0V) |

| X243 port | | |
|---|---|---|
| Ser no | TTL | HTL |
| 1 | A+ | / |
| 2 | A- | A- |
| 3 | B+ | / |
| 4 | B- | B- |
| 5 | Z+ | / |
| 6 | Z- | Z- |
| 7 | VCC-5V | VCC-12V |
| 8 | COM(0V) | COM(0V) |
| 9 | PE | PE |

| X244 port | | | |
|---|---|---|---|
| Ser no | Frequency division output/pulse given | | |
| 1 | AO+ | 10 | GND(0V) |
| 2 | AO- | 11 | PA+ |
| 3 | BO+ | 12 | PA- |
| 4 | BO- | 13 | PB+ |
| 5 | ZO+ | 14 | PB- |
| 6 | ZO- | 15 | 5V |
| 7 | AO | | |
| 8 | BO | | |
| 9 | ZO | | |

## 15.5 EN27 supports ProfiBUS-DP encoder signal feedback access card

**Applicable to E series drives, supports DP communication, and supports multiple encoder types: absolute value, HTL encoder, push-pull differential.**

X271-DP communication standard interface, the hardware wiring follows the Siemens DB9 socket standard distribution of 3 pins (data line positive) and 8 pins (data line negative).
Siemens A1/B1 is the incoming line color corresponding to green-red, the outgoing line is A2/B2, the terminal resistor is turned to "ON" and the resistor is connected. When it is turned to "OFF", the resistor is disconnected. The first and last ends need to be turned to "ON". Single terminal The resistor value is 220Ω, and the end-to-end connection measurement is 110Ω. This terminal resistor and switch are usually on the dedicated DB9 plug body of ProfiBUS-DP.

X272-Absolute encoder interface supports Endat, Biss-C, Hiperface, Rs485; supports power supply 8V or 24V.
X273-power selection jumper: J11 (left VCC1) is the power selection for the X271 absolute encoder, providing 8V and 24V, the default is 8V; J10 (right VCC2)
Select the power supply for the X274-HTL encoder, providing 15V and 24V, the default is 15V.
X274-HTL encoder interface supports push-pull differential encoder and collector encoder, and supports power supply of 15V or 24V.
Indicator light - If the light is on, it indicates that the output power of each port is normal. If the light is flashing or not on, check whether the wiring is correct.
EMC jumper - When the encoder ports X274 and X272 are interfered with, try switching the jumper position of the corresponding port to solve the problem.

| X274 Ports | | |
|---|---|---|
| No. | HTL | Push-Pull |
| 1 | A+ to VCC2 | A+ |
| 2 | A− | A− |
| 3 | B+ to VCC2 | B+ |
| 4 | B− | B− |
| 5 | Z+ to VCC2 | Z+ |
| 6 | Z− | Z− |
| 7 | VCC2 | VCC2 |
| 8 | COM (0V) | COM (0V) |
| 9 | PE | PE |

Note: For more detailed function wiring ports regarding safety, mechanical, and electrical characteristics, please refer to the special manual provided with each option card.

### Common absolute encoder pin wiring reference (adapted to two-row DB15 port):

| No. | General absolute Encoder | | | |
|---|---|---|---|---|
| | 海德汉（EnDat） | 西克（Hiperface） | Tamagawa（RS485） | 雷尼绍（BiSS-C）/SSI |
| 1 | A+/C0S+ | A+/COS+ | / | / |
| 2 | B+/SIN+ | B+/SIN+ | / | / |
| 3 | CL0CK+ | / | / | CLOCK+(MA+) |
| 4 | GND(0V) | GND(0V) | GND(0V) | GND(0V) |
| 5 | 5V | / | 5V | 5V |
| 6 | A-/C0S- | A-/COS- | / | / |
| 7 | B-/SIN- | B-/SIN- | / | / |
| 8 | CLOCK- | / | / | CLOCK-(MA-) |
| 12 | / | +8V | / | / |
| 13 | DATA+ | DATA+ | DATA+(SD+) | DATA+(SLO+) |
| 14 | DATA- | DATA- | DATA-(SD-) | DATA-(SLO-) |
| 15 | GND(0V) | GND(0V) | GND(0V) | GND(0V) |

# 15.Fault tracking and handling

## Introduction of this chapter

This chapter lists all alarm (warning) and fault messages, including possible causes and corrective measures.
Alarm/fault codes are displayed on the control keyboard of the driver (LED segment code display format is E-XX). Alarm or fault information is used to indicate that the drive is in an abnormal state. Most alarms and faults can be identified and corrected using the information in this chapter. If the fault cannot be rectified, please contact our representative office.
In this chapter, alarms and faults are sorted by code.

## Safety instructions

Warn! Only qualified electrical engineers are allowed to perform maintenance on the drive. Before starting work on the drive, you must read the safety instructions at the front of this manual.

## How to reset?

Fault reset can be performed by pressing the control keyboard (RESET key) or cutting off the power supply for a period of time. When the fault is eliminated, the motor can be restarted.

## Fault codes and explanations

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 01 | SC<br>output short circuit | 1. The output is short-circuited between phases, or the output is short-circuited to the ground, or the output is short-circuited to the busbar.<br>2. For machines with error-proofing functions, the input and output lines are connected reversely.<br>3. IGBT and other inverter circuits are damaged. Judgment method: At this time, change the P1100 speed feedback port and P1101 position feedback port to 0 at the same time to switch to open-loop vector mode, remove the motor wire, and then run the driver. If the SC fault still reports, that is There is a high probability that the IGBT hardware is faulty. | 1. Check whether the motor is short-circuited, and whether the wiring and cables are short-circuited. Check for power factor compensation capacitors or surge absorbing devices in the motor cables.<br>2. Check and correct the wiring sequence and position.<br>3. Contact the relevant business personnel for support. Common causes of failure include: occasional arc discharge and ignition in the connection of the motor and its cables, incorrect welding operations nearby, damage to the drive hardware, or premature termination of the IGBT due to physical reasons. longevity and other reasons. |
| 02 | OC<br>motor overcurrent | 1. The motor current exceeds the maximum level allowed by the hardware.<br>2. The distributed capacitance of a specific motor winding and motor cable to ground is too large, and there is a large peak current when charging this capacitor during startup.<br>3. The motor is blocked during operation, typically when the brake device on the load or motor side opens or closes abnormally in time.<br>4. The connecting cable/terminal between the driver UVW and the motor winding has poor insulation or loose connection. | 1. Check whether the rated parameters of the motor are consistent with the nameplate, check whether the acceleration and deceleration time is too fast, check whether the configuration of the encoder (if any) and whether the speed measurement is accurate.<br>2. Configure an output reactor and a magnetic ring type common mode filter on the output side of the driver to suppress this peak current and protect the motor and driver.<br>3. Measure and confirm the delay time of setting the brake to open and close, usually 0.2-2 seconds<br>4. Please carefully check whether |
| 03 | OV<br>bus overvoltage | The bus voltage exceeds the maximum level allowed by the hardware,<br>Additional data: DC link voltage values | Check whether overvoltage stall is enabled. Check whether the braking resistor meets the recommended range. |

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 04 | OH1<br>drive overheating | 1. The temperature of the radiator inside the driver is too high, or the internal cavity temperature is too high.<br>2. Excessive operating loss of the driver causes the IGBT temperature to be too high<br>3. The core temperature of the driver control board is too high<br>Detailed code:<br>1=Power unit heat sink overheated<br>2=CPU overheated<br>3=Ambient temperature is too high<br>5=IGBT junction temperature is too high<br>6=IGBT junction-to-case temperature difference is too | 1. Check whether the cooling fan and ventilation and cooling system are normal, whether the radiator is blocked by dust, and whether the ambient temperature is within the allowable range. Common reasons include whether the drive cabinet is exposed to the sun, hot air is not discharged smoothly and circulates in the cabinet, etc.<br>2. Reduce the modulation carrier to an appropriate value (lower to 2K). |
| 05 | GF<br>leakage to earth | The sum of the output three-phase currents exceeds the allowable range for a long time.<br>Possible Causes:<br>1 Output single phase short circuit to ground<br>2 The driver output has a leakage point<br>Additional data: Wire number for abnormal current flow<br>1~3 corresponds to U/V/W | Check whether the wiring is loose and whether there is leakage in the motor cable. Or the motor output line is too long without measures such as installing an output reactor. Especially for armored cables with shields, the leakage current caused by the coupling capacitance to ground is usually greater. |
| 06 | Cur<br>current detection failure | The motor current sensor, or the analog-to-digital converter of the control board, or the signal connection is faulty.<br>Additional data: Unusual power module number<br>1~4 corresponds to power unit 1~4 | Contact your local agent or manufacturer. |
| 07 | NTC_LOSS<br>temperature sensor disconnected | The temperature sensor inside the driver is disconnected or the signal contact is poor due to environmental influences.<br>1=sensor short circuit<br>2=Sensor open circuit | You can try to replug and unplug the control unit components (if possible), and evaluate the impact of the environment on the signal connector, or contact your local agent or manufacturer. |
| 08 | Overload<br>drive overload | Only applicable to open-loop vector mode, it triggers when the output current exceeds the allowable current of the driver and reaches about 10 seconds. | 1. Check whether the motor load and motor parameters are reasonable.<br>2. Unknown motors must be parameterized. |

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 09 | IGBT_OL<br>IGBT overload | When the frequency is less than 1Hz and the current and carrier wave are large, there is a risk that the local temperature difference of the IGBT will be too large. Need to reduce the operating current or carrier frequency. | Check whether the motor is stalled. If the brake is not opened or the load is abnormal, check whether the carrier is set too high. |
| 10 | Disk<br>memory write failure | Additional data: 1=SPI communication abnormality<br>2=Insufficient memory capacity | Contact your local agent or manufacturer. |
| 11 | CurUnBalan<br>Parallel current imbalance | Additional data: Unbalanced phase numbers<br>1~3 corresponds to U/V/W | 1 Check whether the motor wiring is correct<br>2 Check whether the parallel connection cable is normal |
| 12 | Flux_Err<br>Motor model Magnetic link observation anomaly | Abnormal magnetic linkage observation in encoderless operation mode causes the motor to lose synchronization. | 1. Re-carry out complete motor parameter identification<br>2. Check control parameter settings<br>3. Contact local agents or manufacturers |
| 13 | EMCTrip<br>Electromagnetic interference fault | The driver accidentally triggered a fault due to strong electromagnetic interference. | Check the grounding and shielding of system wiring |
| 15 | EXT<br>external customization failure | External user-defined fault. | Check for signs of external faults.<br>P1367/P1368 setting |
| 16 | Input_Loss<br>abnormal power supply | The power supply is abnormal. Either a phase is missing or the three-phase input is unbalanced. Currently, medium and high-power models of drives are equipped with intelligent real-time monitoring and response processing functions for the power grid.<br><br>The driver's own capacitance is insufficient. | 1. 1. Check whether there is a lack of phase. This common cause is usually intermittent phase loss on the input power supply side or instantaneous grid collapse. Common troubleshooting methods include changing the power supply line point, online monitoring of the grid, etc.<br>2. Check whether the capacitance of the electrolytic capacitor is normal. For rare reasons, if the machine has been used for many years (5-10 years), you can consider replacing the capacitor or the entire machine. |

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 17 | Out_Loss<br>Output phase loss<br>[When the machine is in direct torque control mode, special attention needs to be paid to this point] | 1. Whether a suitable motor is connected. When the drive is in direct torque control mode, the motor must be connected before it can run.<br>2. The output current is abnormal. Or the output phase is missing, or the IGBT and peripheral abnormalities cannot be controlled.<br><br>Additional data: Detection of missing phases<br>0=In DC excitation phase<br>1=In normal operation<br>2=During the stator resistance identification process<br>3=Same as 2, but there are different phases of current and voltage | 1. Direct torque control mode can only be selected after connecting a suitable motor (some models are the default setting). If you need to test run or confirm whether the drive is normal or for other considerations, please switch the control mode to open-loop vector or scalar.<br>2. Check whether there are lines and connection points between the driver and the motor and the motor itself that may be continuously or intermittently disconnected, resulting in phase loss, or whether the motor is oscillating. Finally, contact the local agent or manufacturer. |
| 18 | Id_Run_Err<br>motor identification failure | 1. The ratio of motor setting current and voltage is wrong, or the rated current learning is reduced | Check whether the motor is connected. Check whether the motor nameplate parameter settings are correct. |
| 19 | Com<br>Bus communication disconnected | The drive communication bus cable is disconnected, or no data exchange is detected during operation. | Check the communication cable quality and correct wiring |
| 22 | EncLoss<br>Encoder disconnection | The driver does not receive a valid encoder feedback signal, or the absolute encoder incremental signal is inconsistent with the absolute value signal. | Check the wiring between the encoder and the driver, and check whether the P0412 encoder error calculator increases<br>If it is determined that there is a false alarm, it can be shielded by P0520 shielding terminal line detection parameter (only TTL/HTL disconnection detection is shielded) |
| 23 | UnderVolt<br>DC bus undervoltage | Additional data: 0=low DC voltage occurred during operation,<br>1=during the minimum voltage suppression process, the motor has reached zero speed and can no longer generate electricity. | Check whether the power supply is normal. Check whether the soft start is normal. |
| 24 | EncFbk<br>Encoder feedback abnormality | During the parameter identification process, the encoder speed feedback may be abnormal. | The speed feedback is disconnected or the speed feedback is inverted to become positive feedback. Check whether the encoder is missing phase, differential input, any abnormality in any line can trigger this fault. |

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 25 | OVSpeed<br>Motor overspeed fault | The running speed of the motor exceeds the limit value plus the rated speed by more than 10% | The motor is overspeeding. 1. Check whether the encoder setting is correct and whether the encoder feedback is normal. 2. Whether it is pulled beyond the maximum speed by external force. |
| 26 | SpdUnmatch<br>Speed deviation is too large | The speed fails to reach the given value, the torque is limited, and the duration reaches the limit value | Check whether the rotor is blocked and whether the direction of the motor and the encoder match when there is an encoder closed loop; whether the starting inertia is large, the P1319 alarm time can be extended, the default is 0.5S |
| 28 | reserve | | |
| 29 | BrErr<br>Abnormal braking resistor | 1 The resistance value of the braking resistor is smaller than the allowable value of the driver. resistance value;<br>2 There is a gap between the braking resistor or cable poles or to the ground.<br>Occasional short circuit or insufficient insulation;<br>3 The brake IGBT is turned on for a long time. | 1. Check whether the resistance value of the braking resistor is reasonable.<br>2. Remove the wiring of the braking resistor and connect it with a megger.<br>Suitable tool to detect external resistance status. If it is powered on<br>The front resistor and wire are grounded. At this time, the driver's upper<br>The charging circuit is most likely damaged.<br>3. Check whether the grid voltage is abnormally high. |
| 30 | OH2<br>Motor overheated | The driver detects that the motor temperature exceeds the allowable value.<br>0=temperature reaches protection level<br>1=PTC resistance value is greater than the limit value | 1 Check whether the motor load is too heavy<br>2 Check whether the motor is blocked<br>3 Check the sensor resistance and whether the settings are correct |
| 32 | EncPhase<br>Encoder electrical angle abnormality | In the closed-loop operation of a synchronous motor, there is a large error between the electrical angle measured by the encoder and the estimated motor magnetic field phase. Please check the encoder | Be sure to perform multiple rotation identifications to ensure that the electrical angle offset of the encoder is a constant value. Check the encoder installation for slippage. If the wiring is re-wired, including motor wires or encoder wires, the rotation identification must be re-rotated due to phase changes. |

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 37 | OverPosErr<br>Position deviation is too large | The position following error in position control mode exceeds the allowable value. DS402 position closed-loop control, excessive position deviation is detected | Check whether the torque reaches the limited value and whether the rigidity of the speed loop and current loop is normal. |
| 39 | DcFbkLoss<br>DC Power feedback disconnected | There is no valid measurement value for the DC power supply output voltage. The difference between the feedback voltage and the estimated voltage is too large | Check output voltage sensor wiring |
| 46 | FileCrcErr<br>Firmware file verification error | File loss detected during firmware file burning process<br>or error | Check whether the network cable interface is loose<br>Check whether the network cable is normal |
| 47 | OH<br>Drive overheating | Drive temperature starts to reach warning point | 1. Check whether the cooling fan and ventilation and cooling system are normal, whether the radiator is blocked by dust, and whether the ambient temperature is within the allowable range. Common reasons include whether the drive cabinet is exposed to the sun, hot air is not discharged smoothly and circulates in the cabinet, etc.<br>2. Reduce the modulated carrier wave to an appropriate value. |
| 48 | OH2<br>Motor overheated | The motor temperature begins to reach the warning point | 1 Check whether the motor load is too heavy<br>2 Check whether the motor is blocked<br>3 Check whether there is a backstop on the mechanical transmission chain |
| 49 | OL<br>Drive overload | The drive is overloaded and reaches the warning point | 1. Check whether the motor parameters are properly input and identified<br>2. Check whether the mechanical load of the motor is too heavy |
| 50 | UpdateReject<br>Firmware upgrade rejected | The verification code and other information for installing the firmware failed, and the firmware cannot be successfully upgraded. | Contact your local agent or manufacturer |
| 51 | IntError<br>Trigger exception interrupt | The system program executes abnormally and triggers an illegal interrupt. | Contact your local agent or manufacturer. |

| Code | Fault name | Possible Causes | Solution |
|---|---|---|---|
| 52 | EncAssign<br>Encoder connection error | Encoder feedback port specified but no valid encoder configuration | Check assigned encoder ports and corresponding encoder configuration |
| 60 | PortAssign<br>Parallel port assignment error | The parallel module port assignment is incorrect when the drive is set to parallel mode. | Check the parallel module physical port and drive configuration<br>Does the parallel port number match? |
| **Note 1:** For industry-specific series models such as lifting, curling, hydraulic, AFE, power generation, etc., for more and richer driver configurations, fault guides and other information, please refer to the corresponding special manuals and customized debugging guides. Description (if have). | | | |
| 991 | Black screen with<br>No display<br>Splash screen<br>Smoke<br>Internal explosion<br>Abnormal noise | The internal hardware circuit is physically abnormal or failed.<br>***The common causes are listed below in descending order of probability::<br>1. The resistance of the external braking resistor is abnormal or the insulation to the ground fails, or the relevant equipment to which the DC terminal is output is abnormal (short circuit or grounded), a virtual connection occurs on the input and output sides and arcing occurs, the welding operation is improper, the resistance of the braking resistor Too small, external control type weak current has short circuit or strong current intrusion, etc.<br>2. Improper model series or power selection, high-frequency load impacts, etc. can cause excessive hardware stress and lead to premature failure due to physical fatigue. Due to physical or man-made reasons related to other materials and manufacturing.<br>3. Working for a long time in harsh environments such as input phase failure, artificial hard shielding, high temperature, humidity, corrosiveness, metal dust, etc. will cause electronic devices to fail.<br>4. Internal water intrusion or external physical conditions that are inconsistent with the use of electronic products, or various abnormal applications that exceed the parameters specified in the manual.<br>5. Please pay attention to troubleshooting and recording fault characteristics, and seek technical analysis and support. | |

# 16.Maintenance

## 16.1 Overview of daily care and maintenance

This chapter provides instructions on preventive maintenance. Due to changes in the environment in which the drive is used, such as temperature, humidity, smoke, dust, etc., as well as factors such as the aging of the internal components of the drive, various failures may occur in the drive. Therefore, the drive must be inspected daily during storage and use, and regular maintenance must be performed.

- After the drive is transported, check whether the components are intact and whether the screws are tight before use.
- During normal use of the drive, dust should be cleaned regularly and screws should be checked for looseness.
- If the drive is not used for a long time, it is recommended to power it on every six months during storage, preferably for half an hour, to prevent electronic components from failing.
- The driver should be avoided from use in humid and metal dusty environments. If it really needs to be used in such an environment, it must be placed in an electrical cabinet with protective measures or an on-site protective cabinet/room.

**When the drive is running normally, please confirm the following:**
- Is there any abnormal sound or vibration in the motor?
- Check whether the driver and motor are overheating?
- Is the ambient temperature too high?
- Is the output current value normal?
- Is the drive's cooling fan operating normally?


**Warn!** Before performing any maintenance work on the drive, please carefully read the safety instructions at the front of this manual. Ignoring these safety instructions may result in personal injury, death, or equipment damage。

## 16.2 Maintenance cycle

The following table gives the daily maintenance intervals recommended by our company. For more details, please contact your local service representative.

| Maintenance cycle | Maintain | Directions |
|---|---|---|
| Per year(storage) | DC capacitor reforming | **See Capacitor Recharging,** |
| Every 6 to 12 months, depending on ambient dust content | Radiator temperature check and cleaning | See Radiator. |
| Per year | Check the tightness of power connection | |
| | Cooling fan visual inspection | See Cooling Fan, |
| Every 3 years, if the ambient temperature is higher than 40 °C (104 °F) or the environment is dusty, moist, corrosive, etc. Otherwise every 6 years. | Replace cooling fan | See Cooling Fan, |
| Every 6 years, if the ambient temperature is above 40 °C (104 °F) or the drive is subjected to cyclic heavy loads or continuous rated loads. Otherwise every 9 years. | DC capacitor replacement | Contact our local service representative office. |

## 〉16.3 Radiator maintenance and cleaning

The fins of the radiator will accumulate dust in the cooling air, short/filament piles used outside the specifications, etc. If the heatsink is not clean, the drive will display an overheating warning and fail. In normal environments, radiators should be inspected annually, and more frequently in dusty environments. Clean the radiator as follows. The drive must be powered off before cleaning for safety reasons (when needed):

For M1/B1/B4/E2 models

1. Remove the cooling fan.
2.For B4 or models with similar structures, cut/open the special cleaning windows on one or two sides of the driver to check and clean foreign matter on the radiator.。
3. Blow clean compressed air (dry) from bottom to top while using a vacuum cleaner at the air outlet to collect dust。

NOTE: Clean in another room if there is a risk of dust getting into adjacent equipment. There is a cleaning hole design on the back of the B/U model, which can be cleaned by inserting a fine drill.

4. Reinstall the cooling fan.

Designed with a cleaning window cover structure on the back for E5 and above parts
For series models, you can remove the back or side window cover for cleaning.
Use cleaning equipment to clean the radiator directly, and some models have air intake
There is a filter everywhere, please refer to the attached picture for guidance or contact our after-sales service.

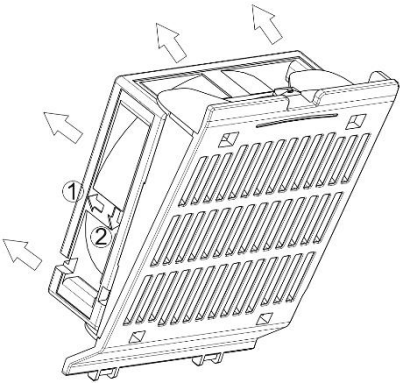
## 〉16.4 Cooling fan

Actual fan life depends on drive usage and ambient temperature. Fan failure can be predicted by noise in the fan bearings and a gradual increase in radiator temperature (despite the radiator being cleaned). If the drive is used in critical positions, please replace the fan when it first starts to make abnormal noise.

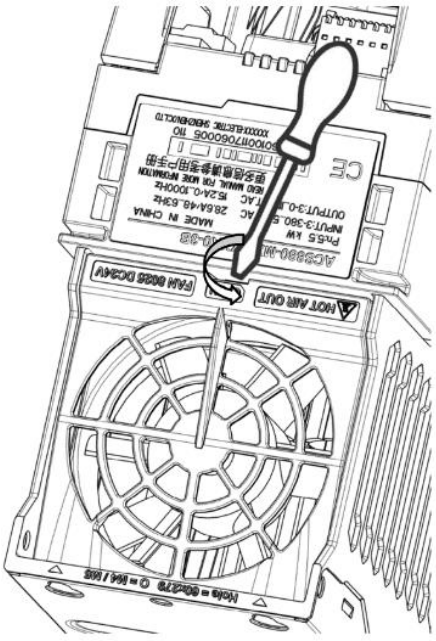
How to disassemble the fan：

For E2-M1: Use a small flat-blade screwdriver to pry it out from the bottom and top of the machine, remove the locking screws, etc. and then take out the fan cover after the fan cover.
For B4-B9: Use a screwdriver to remove the fixed fan frame or fan compartment cover from the top or bottom of the machine, then take out the fan frame as a whole and remove the fan or directly remove it from the bottom of the machine.

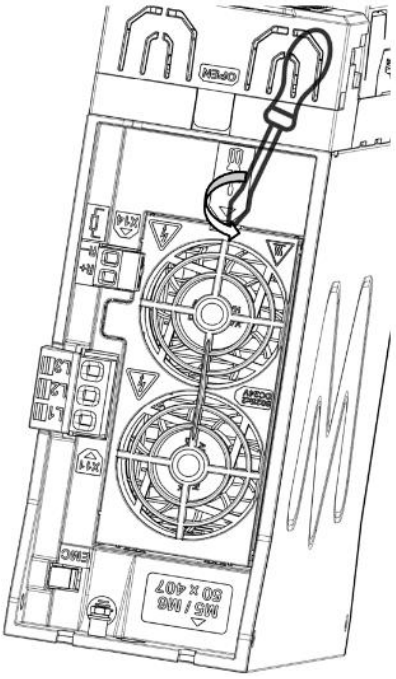
Notice! The airflow direction is from bottom to top. Install the fan so that the airflow direction is upward.Usually there are two indicator arrows on the fan body to indicate the direction of rotation and air flow (1 in the figure below indicates the direction of the wind flow, 2 indicates the direction of rotation of the fan). The arrow vertical to the direction of the fan installation is the direction of the fan air flow.Also pay attention to arrange the fan power cord to avoid being squeezed by the fan and shaken by direct blowing. When removing the fan cover of the E2/M1 type, use a tool to pry it out in the direction of the arrow as shown.




E2 type



M1 type



## 〉16.5 Capacitor recharging

After a long storage time, the capacitor needs to be charged to avoid capacitor damage. Limit the possibility of high current leakage from the capacitor. The best way to achieve this is to use a DC power supply with an adjustable current limit.

1) Set the current limit in the 300…800mA range, depending on the driver size.
2) Then connect the DC power supply to terminals +/- of the DC-Link, or directly to the capacitor electronics. A certain line model driver in the series does not have DC-Link +/- terminals, which can be connected to the DC power supply between the 2 input phases (R/L1 and S/L2).
3) Then set the DC voltage to the rated voltage of the drive (1.35*Un AC) and charge for at least 1 hour.

If DC voltage is not available and the drive has been stored without power for more than 12 months, it will need to be activated and tested according to professional instructions.

## 〉16.6 Other maintenance operations

Transfer user parameter settings to the new drive module (if the selected model has this function)

When replacing the drive module, the parameter copy function of the control keyboard can be used to quickly transfer the user parameter settings from the failed drive module to the new drive.

By using pluggable terminals or boards, these terminal connections can be quickly transferred without removing the control connections of the original faulty machine.

User parameter data backup and transfer copy

When you need to copy parameters to another machine, first upload the parameters of the original machine that need to be copied to the control panel. Then take the panel to the new machine and select Download to copy the parameters.

The upload steps are: [Menu]->[PARA BACKUP]->[Upload to Local], then the changed parameters of the drive will be stored in the memory of the control panel.

The download steps are: [Menu]->[PARA BACKUP]->[Download to Drive]. After the upload and download are completed, the interface will display the total number of parameters transferred.

After the overall debugging is completed, it is recommended that the user upload the parameters locally to prevent parameter confusion due to unexpected operations and to prepare for subsequent maintenance work.

# 17.Technical data

**Contents of this chapter:** Introduces technical parameters such as ratings, dimensions, technical requirements, instructions for meeting CE and other markings

| Rated value（220V） | | | Noise grade | Heat dissipation | Cooling air volume | （220V series） Type designation | Frame size |
|---|---|---|---|---|---|---|---|
| $P_N$ kW | $I_N$ A | $I_{max}$ A | dBA | W | $m^3/h$ | | |
| **0.75** | 4.8 | 6 | 40 | 40 | 25 | 【A】-【B】-04A5-1B+【C】 | E/U/M/R/L1 |
| **1.5** | 7.5 | 10 | 40 | 65 | 25 | 【A】-【B】-07A0-1B+【C】 | |
| **2.2** | 9 | 11.5 | 40 | 80 | 25 | 【A】-【B】-08A5-1B+【C】 | |
| **3.7** | 10 | 12 | 40 | 92 | 25 | 【A】-【B】-09A0-1B+【C】 | |

## 17.1Rating value/cooling air volume/noise level

| Rated value（380V） | | | Noise grade | Heat dissipation | Cooling air volume | （380V series） Type designation | Frame size Single/Module |
|---|---|---|---|---|---|---|---|
| $P_N$ kW | $I_N$ A | $I_{max}$ A | dBA | W | $m^3/h$ | | |
| **0.75** | 3.3 | 4.7 | 40 | 25 | 25 | 【A】-【B】-03A3-3B+【C】 | E/U/M/R/L1 |
| **1.5** | 4 | 5.6 | 40 | 40 | 25 | 【A】-【B】-04A0-3B+【C】 | |
| **2.2** | 5.6 | 6.8 | 40 | 76 | 25 | 【A】-【B】-05A6-3B+【C】 | |
| **4** | 8 | 10 | 40 | 97 | 25 | 【A】-【B】-08A0-3B+【C】 | |
| **2.2** | 6.3 | 9 | 45 | 76 | 53 | 【A】-【B】-06A0-3B+【C】 | E/U/M/R/L2 |
| **4** | 10.5 | 15 | 45 | 97 | 53 | 【A】-【B】-12A9-3B+【C】 | |
| **5.5** | 12.9 | 16 | 45 | 172 | 53 | 【A】-【B】-17A0-3B+【C】 | E/U/M/R/L2 |
| **7.5** | 17 | 21 | 45 | 210 | 53 | 【A】-【B】-025A-3B+【C】 | |
| **11** | 25 | 29 | 45 | 325 | 55 | 【A】-【B】-030A-3B+【C】 | |
| **15** | 30 | 35 | 45 | 420 | 55 | 【A】-【B】-03A3-3B+【C】 | |
| **15** | 32 | 45 | 57 | 450 | 145 | 【A】-【B】-032A-3B+【C】 | E/U/M/R/L3 |
| **18.5** | 38 | 54 | 57 | 550 | 145 | 【A】-【B】-038A-3B+【C】 | |
| **22** | 45 | 64 | 57 | 660 | 145 | 【A】-【B】-045A-3B+【C】 | |
| **30** | 61 | 76 | 57 | 890 | 145 | 【A】-【B】-061A-3B+【C】 | |
| **30** | 65 | 76 | 60 | 890 | 290 | 【A】-【B】-061A-3/B+【C】 | E/U/M/R/L4 |
| **37** | 72 | 104 | 60 | 1114 | 290 | 【A】-【B】-072A-3/B+【C】 | |
| **45** | 87 | 122 | 60 | 1140 | 290 | 【A】-【B】-087A-3/B+【C】 | |
| **55** | 105 | 148 | 60 | 1200 | 290 | 【A】-【B】-105A-3/B+【C】 | |
| **55** | 115 | 148 | 60 | 1200 | 350 | 【A】-【B】-105A-3/B+【C】 | E/U/M/R/L5 |
| **75** | 145 | 178 | 60 | 1440 | 350 | 【A】-【B】-145A-3/B+【C】 | |
| **90** | 169 | 247 | 60 | 1940 | 350 | 【A】-【B】-169A-3/B+【C】 | |
| **110** | 206 | 267 | 67 | 2100 | 570 | 【A】-【B】-206A-3/B+【C】 | |
| **110** | 206 | 287 | 68 | 220 | 685 | 【A】-【B】-206A-3/B+【C】 | E/U/M/R/L6 |
| **132** | 246 | 350 | 68 | 3300 | 685 | 【A】-【B】-246A-3/B+【C】 | |
| **160** | 293 | 418 | 68 | 3850 | 685 | 【A】-【B】-246A-3/B+【C】 | E/U/M/R/L7 |
| **200** | 363 | 498 | 68 | 4100 | 720 | 【A】-【B】-293A-3/B+【C】 | |
| **220** | 430 | 545 | 68 | 4600 | 720 | 【A】-【B】-363A-3/B+【C】 | |
| **250** | 487 | 584 | 68 | 5100 | 720 | 【A】-【B】-430A-3/B+【C】 | |
| **280** | 546 | 628 | 68 | 5782 | 1200 | 【A】-【B】-546A-3/B+【C】 | E/U/M/R/L |

| Rated value（380V） | | | Noise grade | Heat dissipation | Cooling air volume | （380V series） Type designation | Frame size Single/Module |
|---|---|---|---|---|---|---|---|
| $P_N$ kW | $I_N$ A | $I_{max}$ A | dBA | W | $m^3/h$ | | |
| **315** | 624 | 718 | 68 | 6252 | 1200 | 【A】-【B】-624A-3/B+【C】 | 8 |
| **355** | 650 | 789 | 68 | 7866 | 1200 | 【A】-【B】-650A-3/B+【C】 | |
| **400** | 760 | 874 | 68 | 9100 | 1300 | 【A】-【B】-760A-3/B+【C】 | |
| **450** | 865 | 1020 | 68 | 9900 | 1300 | 【A】-【B】-865A-3/B+【C】 | |
| **560** | 950 | 1093 | 68 | 10500 | 1680 | 【A】-【B】-950A-3/B+【C】 | |
| **630** | 1100 | 1265 | 68 | 11500 | 1680 | 【A】-【B】-1140A-3/B+【C】 | |
| **710** | 1200 | 1380 | 68 | 12600 | 1680 | 【A】-【B】-1250A-3/B+【C】 | |
| **800** | 1480 | 1930 | 72 | 14800 | 3800 | 【A】-【B】-1480A-3/B+【C】 | E/U/M/R/L 8*n(n=2/3/4) |
| **1000** | 1760 | 2120 | 74 | 17500 | 4200 | 【A】-【B】-1760A-3/B+【C】 | |
| **1200** | 2210 | 2880 | 75 | 17500 | 5200 | 【A】-【B】-2210A-3/B+【C】 | |
| **1400** | 2610 | 3140 | 76 | 35000 | 5200 | 【A】-【B】-2610A-3/B+【C】 | |
| **1800** | 3450 | 4140 | 76 | 37000 | 6100 | 【A】-【B】-3450A-3/B+【C】 | |
| **2400** | 4290 | 5150 | 77 | 4600 | 6200 | 【A】-【B】-4290A-3/B+【C】 | |
| **2800** | 5130 | 6160 | 78 | 5700 | 7300 | 【A】-【B】-5130A-3/B+【C】 | |
| **Rated value （690V）** | | | Noise Grade | Heat dissipation | Cooling air volume | （690V series） Type designation | Frame size Single/Module |
| $P_N$ KW | $I_N$ A | $I_{max}$ A | dBA | W | $m^3/h$ | | |
| **45** | 49 | 71 | 59 | 1120 | 290 | 【A】-【B】-049A-6/B+【C】 | E/U/M/R/L 3/4/5/6 |
| **55** | 61 | 104 | 59 | 1200 | 290 | 【A】-【B】-061A-6/B+【C】 | |
| **75** | 80 | 124 | 59 | 1440 | 290 | 【A】-【B】-080A-6/B+【C】 | |
| **90** | 98 | 168 | 60 | 1940 | 350 | 【A】-【B】-098A-6/B+【C】 | |
| **110** | 119 | 198 | 67 | 2200 | 350 | 【A】-【B】-119A-6/B+【C】 | |
| **132** | 142 | 200 | 68 | 3300 | 350 | 【A】-【B】-142A-6/B+【C】 | E/U/M/R/L 6/7 |
| **160** | 175 | 220 | 68 | 3850 | 350 | 【A】-【B】-175A-6/B+【C】 | |
| **200** | 220 | 240 | 68 | 4100 | 720 | 【A】-【B】-210A-6/B+【C】 | |
| **250** | 271 | 320 | 68 | 4600 | 720 | 【A】-【B】-271A-6/B+【C】 | |
| **280** | 300 | 360 | 68 | 5782 | 1000 | 【A】-【B】-295A-6/B+【C】 | E/U/M/R/L 8 |
| **315** | 330 | 360 | 68 | 6252 | 1000 | 【A】-【B】-325A-6/B+【C】 | |
| **355** | 370 | 480 | 68 | 7866 | 1000 | 【A】-【B】-360A-6/B+【C】 | |
| **400** | 430 | 520 | 68 | 9100 | 1300 | 【A】-【B】-420A-6/B+【C】 | |
| **450** | 470 | 655 | 68 | 9900 | 1300 | 【A】-【B】-450A-6/B+【C】 | |
| **500** | 522 | 700 | 68 | 10500 | 1300 | 【A】-【B】-505A-6/B+【C】 | |
| **560** | 590 | 800 | 68 | 11500 | 1300 | 【A】-【B】-571A-6/B+【C】 | |
| **800** | 800 | 1200 | 75 | 11500 | 1670 | 【A】-【B】-721A-6/B+【C】 | E/U/M/R/L 8*n(n=2/3/4) |
| **1000** | 1030 | 1550 | 75 | 14200 | 1850 | 【A】-【B】-900A-6/B+【C】 | |
| **1100** | 1170 | 1760 | 75 | 16500 | 1960 | 【A】-【B】-1160A-6/B+【C】 | |
| **1400** | 1540 | 2310 | 76 | 19500 | 2150 | 【A】-【B】-1540A-6/B+【C】 | |
| **1600** | 1740 | 2610 | 76 | 23400 | 2340 | 【A】-【B】-1740A-6/B+【C】 | |
| **2000** | 2300 | 3450 | 77 | 32100 | 2870 | 【A】-【B】-2300A-6/B+【C】 | |
| **2800** | 2860 | 4290 | 77 | 40800 | 3150 | 【A】-【B】-2860A-6/B+【C】 | |
| **3200** | 3420 | 5130 | 77 | 48700 | 3850 | 【A】-【B】-3420A-6/B+【C】 | |
| **4000** | 4100 | 6200 | 78 | 53600 | 4680 | 【A】-【B】-4160A-6/B+【C】 | |

**Rated value：** It is the continuously available rated current when driving a general-purpose 50Hz asynchronous motor under IN 40 ℃, no overload, rated modulated carrier wave.
The rated current In and calorific value are valid based on the factory rated carrier (6-4K for small power machines, 2K for medium and large power machines). In some special occasions such as new synchronous motors, higher than the rated carrier is required, or exceeds When the general frequency is 500Hz, in order to ensure good output characteristics of the driver, the heat generated by the whole machine will increase significantly. At this time, it is necessary to down-amplify the power selection. Please consult our representative for details.

Imax maximum output current. Allow ten seconds at start-up, otherwise the length of time depends on the temperature. Its overload current value is allowed to reach a value of approximately 110% of the rating for 1 minute every 5 minutes. In other cases, the length of time depends on the temperature of the drive. In some extreme or special applications, if a larger current is required, an amplification should be used. driver models to obtain larger output current values.
**Regarding current**: Due to differences in control methods, different series of models will have slightly different output currents at different operating points (about 3-10%). The above tables are all current values of typical models. Because in specific applications, the factory default settings of different series of products shall prevail.
**Note:** In order to achieve the motor rated power given in the table above, the drive's rated output current must be greater than or equal to the motor's rated current.
Remarks: 1. [A] in the model represents the product series, and the hardware topology and main power loop are the same between different code numbers.

Derivative models【A】=ACS/DCC/PTi/PTo/ACC/ACW/ACP/ACD/ACF/580/860/880 etd。

2.[B] in the model number represents the product hardware structure code, which reflects the structural form. The hardware topology and main power loop are the same between the same code numbers. In the derivative model, [B] = R/C/B/E/M/U/LXX, the letters R/C/B/E/M/U/L represent the series, XX represents the code number, etc.
3.[C] in the model number represents the product hardware functional form code, which reflects the topological position and form in the AC-DC-AC power conversion process. The hardware topology and main power loop are the same between the same code numbers. In the derivative model, [C] = BLM-represents basic thyristor rectification, SMM-represents DC-AC inverter function module, AIM-represents AC-DC active rectifier feedback interface module, ALM-represents AC-DC active rectifier feedback module, DCDC-represents DC-DC bidirectional DC conversion module, BRK-represents brake chopper module, PCU-represents parallel main control module, PL-represents reactance module for parallel output current sharing or high-frequency output harmonic suppression. PN/EC-represents high-speed communication modules, SN/TTL/HTL, etc.-represents various types of specific motor speed feedback interface modules, etc.
5.-1/-3/-6 in the model indicates the voltage level of the AC input side in the applicable AC-DC-AC, among which -1 (=220V)/-3 (=380V)/-6 (=690V), /B in -XB indicates the optional built-in brake chopper function.

## 〉17.2Regarding general derating

If any of the following conditions exist, the above-mentioned continuous output current must be derated (this process needs to be considered during selection and design. At the same time, during operation, it will be automatically optimized through internal intelligent control calculations to ensure that the driver provides the maximum output. Derating):
• Ambient temperature exceeds +40°C (+104°F)
• The drive is installed at a height above 1000 m above sea level. NOTE: The final derating factor is the product of all applicable derating factors.

**Ambient temperature derating：** If the temperature range is +40…55 °C (+104…131 °F), derate the rated output current by 1% for each additional 1 °C (1.8 °F)
**Altitude derating:** 1% for every 100 m (328 ft) above sea level between 1,000 and 4,000 m (3300 and 13123 ft).
To know more accurate derating, please consult our professionals.

**Note:** If the installation is more than 2000 m (6600 ft) above sea level, it is not allowed to connect the drive to a floating (IT) or corner-grounded power grid.

## 17.3High-speed operation above power frequency (>50Hz) and PWM modulated carrier

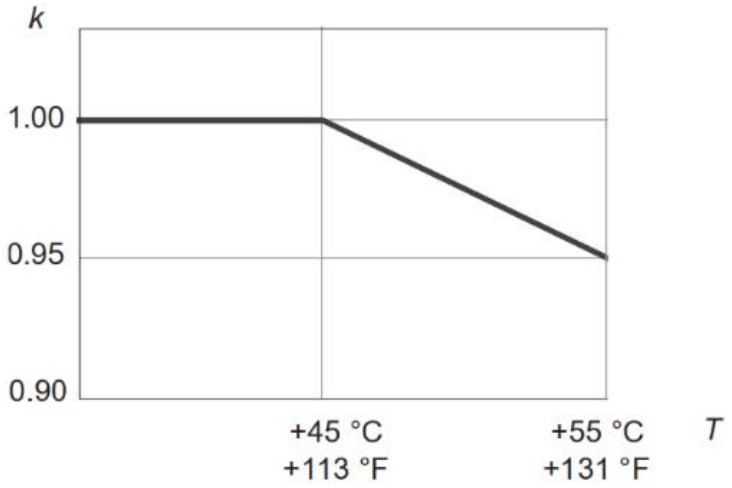
The universal type of this driver provides an output frequency of 0Hz-500Hz, and the subdivision-specific model can provide an output driving capability of 500-1333Hz, and >1333Hz. If customers need to operate above 50Hz, please consider the endurance of the driven motor and related mechanical devices. At the same time, a higher output frequency will require a higher modulation carrier wave of the driver, resulting in greater heat loss of the driver. At this time, it is necessary to derate the driver, cool the driver well, and select a dedicated series of drivers and motors to meet the demand. Different shapes of The factory default configuration of the driver modulated PWM carrier is usually, 8K@<=25A, 4K@25A-363/400A, 2K@>=430A. For the selection of the adaptive driver for non-50Hz motors, you can refer to the above information and professional If you still have questions after calculation, please contact the relevant technical personnel for support and the specific derating factors of each model.

## 17.4Derating of liquid-cooled drives

Ambient temperature derating
At +45...55 °C (+113...131 °F), the rated output current is reduced by 0.5 percentage point for each 1 °C (1.8 °F) increase. The output current can be calculated by multiplying the current given in the rating table by the derating factor (K)

Altitude derating
Derate output current by 1 percentage point for every 100 meters (328 feet) above sea level between 1000 and 4000 meters (3281 and 13123 feet). For example, 1500 meters (4921 feet) has a derating factor of 0.95
PWM Modulation carrier derating
The output current decreases by 8 percent per kHz over the switching frequency range of 3.0 to 7.5 kHz. For example, the derating factor for 5 kHz is 0.84.

High output frequency derating
Below an output frequency of 12 Hz, the output current decreases by 3.5 percent per Hz. For example, the derating factor for 9 Hz is 0.895.
Above an output frequency of 150 Hz, the output current is reduced by 1 percentage point every 10 Hz. For example, the derating factor for 175 Hz is 0.975



## 〉17.5Main technical data and specifications

【Power requirements】 [Overvoltage may damage the internal circuit of the machine]

**Voltage** (U 1 ): -1 type : AC 1/3-208(range-15% or +10% )… Maximum allowed 260 V input
-3 type : AC 3-380(range-15% or +10% )… 415 V…Maximum allowed 490V input
-6type : AC 3-525(range-15% or +10% )…660V… 690 V…Maximum allowed 750V input
**Grid type:** TN (grounded) and IT (ungrounded) systems.
**Rated condition short circuit current** (IEC 61439-1) : Using the fuse in the table is 65 kA

**Short circuit current protection** (UL 508C，CSA C22.2 No. 14-05):

USA and Canada: The drive unit is suitable for use on circuits with a symmetrical current not exceeding 100kA (rms) at a maximum voltage of 600 V when the drive is fused as given in the fuse table.

**Frequency:** 47 to 63 Hz, maximum change rate 17%/s

**Voltage imbalance:** Maximum ±3% of rated line voltage

**Fundamental power factor** (cos phi $_1$ ) **:** 0.98 ( Under rated load )

【Motor connection data】

**Motor type :** AC asynchronous motor, permanent magnet synchronous motor and AC servo motor

**Voltage** (U 2 ) : 0 to U 1 , 3- relatively symmetrical, U max is the magnetic field weakening point

**Frequency:** 0…500 Hz (Some models have higher frequency output capabilities. At this time, power and heat dissipation must be considered when selecting models. The specific settings are subject to the model settings.)

**Current:** See rating table。

**Switching frequency:** 2-12kHz ( Typical value)

Recommended maximum motor cable length:

For drives with a rated current of 17A and below, the maximum length of the motor cable is : 150 m (492 ft)
For motor cables rated current 17A and above the maximum length is : 300 m(984 ft).
Note: If the motor cable exceeds 100 m, depending on the actual motor manufacturing quality, newness, humidity of the motor environment, etc., du/dt components, mainly including reactors, need to be installed between the drive and the motor. Also, with motor cables exceeding 150 m (492 ft), EMC requirements are not guaranteed.

【Control unit connection】

**Terminal form :** Square-type screw compression terminals, terminal spacing 5.08mm, maximum wiring capacity 2.5mm$^2$.

Control keyboard/PC connection: The connection interface is: RJ45 (EIA/TIA568B standard line sequence) 。Network cable length: less than 3 meters (or appropriately longer in a better electromagnetic environment)
Each terminal on the control unit meets the requirements of extra-low voltage protection (PELV). If a voltage higher than 48 V is connected to the relay output, the PELV requirement for the relay output is not met.

【Efficiency】

About 98% at rated power (it may vary slightly depending on the power and type of motor connected)

【Protection level】

**Protection level** (IEC/EN 60529) : E/M/B3: The left and right sides, top, bottom and front are IP40, and the bottom cable entry side is IP10 (with front protection)
R/B: IP20 on the left, right, bottom and front, IP20 on the top and bottom entry and exit sides (with front protection + terminal protective sleeve)

Outer shell type (UL508C) : UL Type1。For indoor use only

**Overvoltage category** (IEC 60664-1) class 3。

**Protection level** (IEC/EN 61800-5-1) : class 1。

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【Environmental conditions】

Altitude of the installation site：

**1.Operation** (fixed installation)：1. Altitude 0 to 4000m (13123 ft), for TN, TT neutral grounded grid systems and IT non-angle grounded systems
2. Altitude 0 to 2000m (6561 ft) (for TN, TT, IT corner ground systems)
3.Above 1000 m [3281 ft]), derating is required as described above.

Temperature：

1.**Operation** (fixed installation)：-15 to +55 °C (5 to 131 °F). No frost allowed. See the stated expression of ratings with respect to temperature.
2.**Storage** (in protective packaging): -40 to +70 °C (-40 to +158 °F)
3.**Shipping** (in protective packaging): -40 to +70 °C (-40 to +158 °F)

Relative humidity：

1.**Operation** (fixed installation)、 2.**Storage** (in protective packaging)、3.**Shipping** (in protective packaging)：

a. 5 to 95%，no frost allowed。In spaces where corrosive gases are present, the maximum relative humidity cannot exceed 60%.

**Pollution level**(IEC 60721-3-3,IEC 60721-3-2, IEC 60721-3-1)：

1.**Operation** (fixed installation)、 2.**Storage** (in protective packaging)、3.**Shipping** (in protective packaging)：

a.No conductive dust is allowed
b. Chemical gas: 3C2 grade, solid particles: 3S2 grade.

Atmospheric pressure：

1.**Operation** (fixed installation)、 2.**Storage** (in protective packaging)、3.**Shipping** (in protective packaging)：

a. 70 to 106 kPa0.7 to 1.05 atmosphere

**Vibration**(IEC 60068-2)：

1.**Operation** (fixed installation)：Maximum 1mm(0.04 in.)(5 to 13.2 Hz),maximum 7 m/s 2(23 ft/s 2 )(13.2 to 100 Hz)sine
2.**Storage** (in protective packaging): Maximum 1 mm(0.04 in.)(5 to 13.2 Hz),maximum 7 m/s 2(23 ft/s 2 )(13.2 to 100 Hz)sine
3.**Shipping** (in protective packaging)：Maximum 3.5 mm(0.14 in.)(2 to 9 Hz),maximum 15 m/s 2(49 ft/s 2 )(9 to 200 Hz)sine

**Impact** (IEC 60068-2-27)：

1. **Operation** (fixed installation)：not allowed
2. **Storage** (in protective packaging)：maximum 100 m/s 2(330 ft./s 2 ), 11 ms
3.**Shipping** (in protective packaging)：maximum 100 m/s 2(330 ft./s 2 ), 11 ms

Free fall：

3. 1.**Operation** (fixed installation)：not allowed
2.**Storage** (in protective packaging): 500 mm for models weighing less than 12kg, 100 mm (4 in.) for models weighing 12kg or more
3.**Shipping** (in protective packaging)：500 mm for models weighing less than 12kg, 100 mm (4 in.) for models weighing 12kg or more500 mm

## 〉17.6 Introduction to industry standards and related mandatory specifications

This product industry specification and product design apply and comply with the following standards:

According to standards EN/GB/IEC 61800-5-1, drive unit complies with EU low voltage directives (European Low Voltage Directive)。

EN/GB/IEC 60204-1:2006 + A1 2009: Machinery safety. Mechanical and electrical equipment. Part One: General Provisions. Compliance: The final assembler of the machine is responsible for installing - the emergency shutdown equipment. - Mains circuit breaker.

IEC/EN 60529:1992 : Degree of protection of the enclosure (IP code) 。

IEC 60664-1:2007: Insulation requirements for low voltage system equipment. Part 1: Principles, Requirements and Tests

EN/GB/IEC 61800-3:2004 : Adjustable speed electrical power transmission system. Part 3: EMC requirements and specified test methods.

EN/GB/IEC 61800-5-1:2007: Adjustable speed electrical power transmission system. Part 5-1: Safety Requirements – Electrical, Thermal and Energy

EN/GB/IEC 61800-5-2:2007: Adjustable speed electrical power transmission system. Part 5-2: Security Requirements – Functionality

UL 508C:2002 UL: Safety Standard, Power Conversion Equipment, Second Edition

NEMA 250:2008 : Protection of electrical equipment (max. 1000 V)

CSA C22.2 No. 14-10: Industrial control equipment

GOST R 51321-1:2007 : Low voltage switchgear and control gear assemblies. Part 1 - Requirements for type testing and selected type testing components - General technical requirements and test methods

The following are China's mandatory/recommended certification standards or specifications that the product has passed:

1. China Classification Society CCS 《Rules for Classification of Sea-Going Steel Ships》 2022 and its change notices, Part 4, Chapter 1, Part 4, Chapter 3;
2. 2.China Classification Society CCS 《Guidelines for Type Approval Testing of Electrical and Electronic Products》GD22-2015
3. 3.Chinese National Standard《GB/T 30844.1-2014 General Frequency Conversion Speed Regulation Equipment of 1kV and Below》 Part 1: Technical Conditions
4. Chinese National Standard 《GB/T12668.2-2002 Speed-regulated Electrical Drive System》 Part 2: General Requirements, Regulations on Ratings of Low-voltage AC Variable Frequency Electric Drive Systems.

## 〉17.7 Power cable dimensions and fuses

Fuses for short-circuit protection of supply cables are shown in the table below. Fuses also protect equipment adjacent to the drive in the event of a short circuit. Check whether the operating time of the fuse is less than 0.5 seconds. The operating time depends on the impedance of the power supply network and the cross-sectional area and length of the power supply cable. See also chapter Planning the electrical installation.

◆ **NOTE: The use of higher current rating fuses is strictly prohibited.** The fuse current and recommended cable size must comply with the national and international electrotechnical and electrical codes prevailing in the corresponding industry. Final selection should be based on actual field application and fuse or cable installation conditions.

## 〉17.8 Material introduction

**Drive structure**

- PC+ABS/PA66，color RAL 9002（light gray） / RAL9004（black）
- Al-zinc coated steel plate/hot-dip galvanized steel plate/cold-rolled steel plate+sprayed
- Stamped aluminum Al/6063
- Copper T2
- PC sheet/epoxy glass cloth board/high performance PP sheet

**Packaging** Corrugated carton/glued wood box, EPE cushioning pad, PP straps/tape

**Dispose** The raw materials used are recyclable, which saves energy and natural resources. Packaging materials are degradable and recyclable. All metal parts can be recycled. Plastic parts can also be recycled or burned in a controlled environment according to local regulations. Most recyclable parts are marked as recyclable.。

If recycling is not possible, all components except electrolytic capacitors and printed circuit boards can be disposed of by landfill. DC capacitors contain electrolytes, which are classified as hazardous waste according to EU standards. Electrolytic capacitors and printed circuit boards must be disposed of in accordance with local regulations.

For more information on environmental conditions and waste recycling, please contact your local representative.

## 17.9 Product Certification and Certificate CE Marking

The CE mark is usually found on the machine's nameplate and indicates that the drive meets EU low voltage directives, EMC and RoHS regulations. For its safety functions (e.g. with safe torque interruption), the CE marking also indicates that the drive complies with the safety element machinery standard. Meets EU Low Voltage Directives Complies with EU Low Voltage Directives according to standards EN/GB/IEC 60204-1 and EN/GB/IEC 61800-5-1.

Examples of relevant certificates are as follows:

Shenzhen NTC Co., Ltd.
South, No. 1, Building 10, Maqueling Industrial Zone,
Nanshan Shenzhen, Guangdong, 518057, China
Tel : 0755-33953355 Fax : 0755-23004002
www.ntc-c.com

**CERTIFICATE OF CONFORMITY**

**Low Voltage Directive 2014/35/EU**

**Registration No.: NTC1711653S** Page 1 of 2

| | | |
|---|---|---|
| Applicant | : | Shenzhen Inomax Technology Co.Ltd |
| Address | : | Building 9,Ideal Science and Technology Park, Guanlan Avenue, Longhua District,Shenzhen, Guangdong ,China |
| Manufacturer | : | Shenzhen Inomax Technology Co.Ltd |
| Address | : | Building 9,Ideal Science and Technology Park, Guanlan Avenue, Longhua District,Shenzhen, Guangdong ,China |
| Factory | : | Shenzhen Inomax Technology Co.Ltd |
| Address | : | Building 9,Ideal Science and Technology Park, Guanlan Avenue, Longhua District,Shenzhen, Guangdong ,China |
| Product Name | : | AC Drive for Motor |
| Brand Name | : | INOMAX |
| Identification | : | Model No. : |
| | | ACS860-C28-030A-3B(Additional models are shown below) |
| | | Rating : Refer to the report |
| Standard | : | EN 61800-5-1: 2007/A1: 2017 |
| Test report No | : | NTC1711653S |

Han Song
March 13, 2018

The certificate of conformity is based on an evaluation of a sample of the above-mentioned product. Technical report and documentation are at the applicant's disposal. This is to certify that the tested sample is in conformity with all provisions of Annex I of Council Directive 2014/35/EU, referred to the Low Voltage Directive. The certificate does not imply assessment of the production and does not permit the use of Lab's logo.

Shenzhen NTC Co., Ltd.
South, No. 1, Building 10, Maqueling Industrial Zone,
Nanshan Shenzhen, Guangdong, 518057, China
Tel : 0755-33953355 Fax : 0755-23004002
www.ntc-c.com

**CERTIFICATE OF CONFORMITY**

**EC Council Directive 2014/30/EU**
**Electromagnetic Compatibility**

**Registration No.: NTC1711652E** Page 1 of 2

| | | |
|---|---|---|
| Applicant | : | Shenzhen Inomax Technology Co.Ltd |
| Address | : | Building 9,Ideal Science and Technology Park, Guanlan Avenue, Longhua District,Shenzhen, Guangdong ,China |
| Manufacturer | : | Shenzhen Inomax Technology Co.Ltd |
| Address | : | Building 9,Ideal Science and Technology Park, Guanlan Avenue, Longhua District,Shenzhen, Guangdong ,China |
| Factory | : | Shenzhen Inomax Technology Co.Ltd |
| Address | : | Building 9,Ideal Science and Technology Park, Guanlan Avenue, Longhua District,Shenzhen, Guangdong ,China |
| E.U.T. | : | AC Drive for Motor |
| Brand Name | : | INOMAX |
| Model No. | : | ACS880-C28-030A-3B(Additional models are shown below) |
| Test Report | : | NTC1711652E |
| Standard | : | EN 61800-3: 2004+A1: 2012 |

Charles Liu
March 23, 2018

The certificate of conformity is based on an evaluation of a sample of the above mentioned product. Technical report and documentation are at the applicant's disposal. This is to certify that the tested sample is in conformity with all provisions of Annex I of Council Directive 2014/30/EU, in its latest amended version, referred to EMC Directive. The certificate does not imply assessment of the production and does not permit the use of Lab's logo.

**Remark: Product Description**

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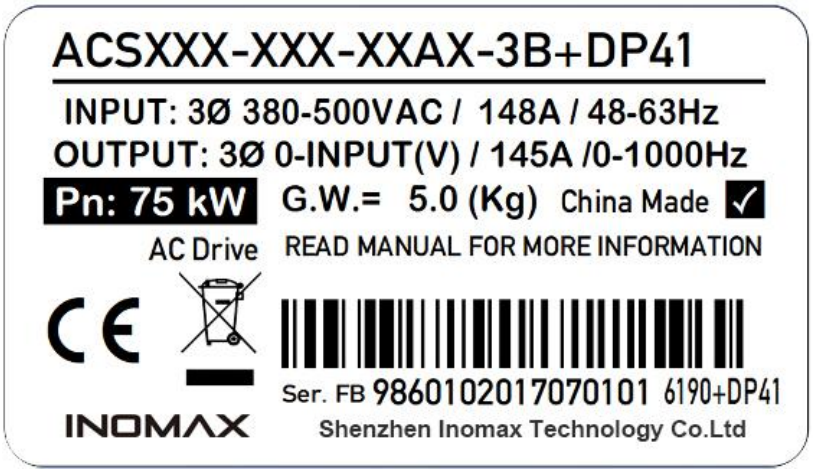
**Appendix I**

Table 1: **Product Description of Power Conversion Device (Frequency Converter)**

| | | |
|---|---|---|
| 型号/Type | ACS 系列及其衍生型号/ACS serial and Variants | |
| 功率/Power | ≤4000 | kW |
| 频率/Frequency | 额定输入频率/Rated Frequency(Supply)：47～63； | Hz |
| 额定输入电压 / Rated Input Voltage | 主电源/Mains: AC 380～480; 500～690;<br>控制电源/Auxiliary power supply: AC 220 / DC 24; | V |
| 额定输出电压 / Rated output Voltage | 0～主电源输入电压/Voltage of Supply | V |
| 冷却方式 / Cooling Method | 液冷 Liquid Cooled|/空冷 Air Cooled | |

# 18.EMC Guidance and related certification Markings

If a CE mark is affixed to the drive, it indicates that the drive complies with the European Low Voltage and EMC Directives.




Compliance with EMC international standards: The cabinet manufacturer is responsible for the drive system's compliance with the requirements of the European EMC directive. For items to consider, see: Standard EN/GB/IEC 61800-3 (2004), Category C2, Meets standard EN/GB/IEC 61800-3 (2004), Category C3 and Meets standard EN/GB/IEC 61800 -3 (2004), subsection C4.

Electromagnetic compatibility definition

Electromagnetic compatibility means that electrical equipment can coexist under limited time, space and spectrum resources without causing performance degradation. Equipment, subsystems, and systems should not produce electromagnetic emissions that exceed the requirements stipulated in specifications or standards, and should meet immunity requirements. EMC stands for electromagnetic compatibility. Electromagnetic compatibility performance is used to indicate the ability of electrical and electronic equipment to work normally in an electromagnetic environment. In turn, the device should not release electromagnetic interference to other local devices or systems.

The first environment includes civil facilities. Also included are installations that are directly connected without an intermediate transformer to the low-voltage grid supplying domestic buildings. Second environment includes facilities other than those directly connected to the low-voltage power grid that supplies buildings used for domestic purposes.

Introduction to China EMC standards

According to the requirements of China's national standard GB/T12668.3, the driver needs to meet the requirements of electromagnetic interference and anti-electromagnetic interference.

Our existing products comply with the latest international standards:: IEC/EN/GB/IEC 61800-3: 2004 (Adjustable speed electrical power drive systems part 3:EMC requirements and specific test methods)Equivalent to national standards GB/T12668.3。

IEC/EN61800-3 The driver is mainly inspected from two aspects: electromagnetic interference and anti-electromagnetic interference. Electromagnetic interference mainly tests the driver's radiated interference, conductive interference and harmonic interference (this requirement is required for drivers used in civilian applications). Anti-electromagnetic interference mainly affects the conduction immunity, radiation immunity, surge immunity, rapid mutation pulse group immunity, ESD immunity and power supply low-frequency end immunity of the driver (specific test items are: 1. Immunity test for input voltage sag, interruption and change; 2. Commutation notch immunity test; 3. Harmonic input immunity test;
4. Input frequency change test; 5. Input voltage imbalance test; 6. Input voltage fluctuation test) for testing. Tested in accordance with the above-mentioned strict requirements of IEC/EN61800-3, our products will have good electromagnetic compatibility in general industrial environments.

## 〉18.1 General guidance on EMC electromagnetic compatibility

Effect of harmonics

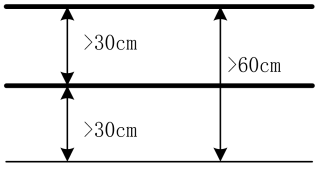
High-order harmonics of the power supply may cause damage to the driver and its surrounding electrical equipment. In places with poor power quality, it is recommended to install an AC input reactor or current harmonic filter.

Due to the influence of harmonics, the selection of the input leakage circuit breaker refers to the relevant description of the main circuit input side wiring.

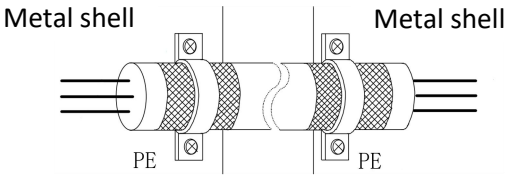
The current of the driver motor power cable contains high-order harmonics, so the thermal relay may malfunction due to resonance, and the carrier frequency needs to be reduced or an output reactor needs to be installed. It is recommended not to install a thermal relay in front of the motor when using the driver, but to use the overcurrent protection function of the driver.

Electromagnetic interference and installation precautions

1. The ground wire of the driver and other electrical products should be well grounded. When using an EMC filter, a permanently fixed ground connection must be used and this type of connection is not transferred through a connector.
2. The input and motor power cables of the driver and weak current signal lines (such as control signal cables) should be arranged as separately as possible. If possible, weak current signal lines should be routed separately using metal wiring troughs.
3. It is recommended that the input and motor power cables of the driver use shielded cables or armored cables. The shielding layer or armor at both ends of the cable needs to be reliably grounded. For weak current signal lines that are susceptible to interference, it is recommended to use shielded twisted pairs and ground the shield reliably.
4. If the motor cable length exceeds 100m, it is required to install an output filter or reactor.
5. The distance between the control signal cable, motor attack rate cable and input power cable should be installed as shown in the figure below.



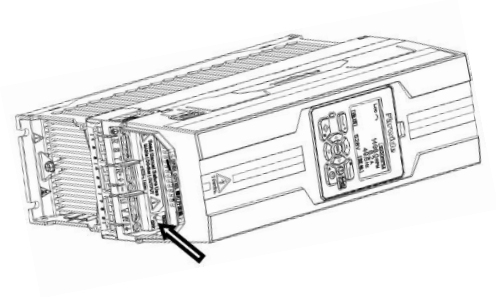

Motor power cable
Input power cable
Control signal



## 18.2 Control EMC operating parts

This component is for users to quickly and reliably control the EMC of the machine. Its main function is to realize the rapid grounding of some internal lines to the same potential and control the rapid grounding of the shielded wire network. The specific operation is as follows, E series model (pictured below left) ), turn the screw counterclockwise at the arrow mark position to disconnect the EMC, just loosen it (it does not need to be completely unscrewed). At this time, the leakage energy of the driver to the ground is reduced, and part of the coupling path is cut off to achieve a balance and change in electrical safety protection performance, electromagnetic coupling and discharge paths.

For models not listed, please refer to the machine label or contact our local after-sales or technical personnel.

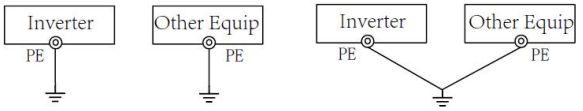


## 〉18.3 Wiring requirements and shielding grounding methods related to EMC performance

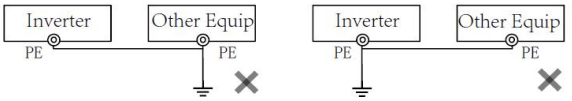
Ground:

1. It is recommended that the driver and other equipment be grounded separately; if a common grounding point is required, single-point grounding is required. The common ground wire method is not recommended.
2. A grounding cable with a large cross-section should be used as much as possible to ensure that the grounding impedance is as low as possible. Since the high-frequency impedance of flat conductors is smaller than that of circular conductors for cables with the same cross-sectional area, it is better to use flat cables. The ground cable should be as short as possible and the ground point should be as close to the driver as possible.
3. If the motor power cable uses a 4-core cable, the ground wire in the 4-core cable must be grounded on the driver side, and the other side is connected to the ground terminal of the motor; if the motor and driver each have dedicated grounding points, the best The grounding effect.
4. If the ground terminals of various components in the control system are connected together, the noise source formed by the ground leakage current will affect other peripheral devices in the control system except the driver. Therefore, in the same control system, the grounding of the driver and weak current equipment such as computers, sensors or audio equipment must be separated and cannot be connected together.
5. In order to obtain lower high-frequency impedance, the fixing bolts of each device can be used as high-frequency terminals connected to the rear panel of the cabinet. During installation, please be careful to remove the insulating paint from the fixing points.
6. The grounding cable should be laid away from the wiring of the I/O part of the noise-sensitive equipment, and the grounding wire should be kept as short as possible.

Correct grounding method for drives (inverters) and other equipment




Unrecommended grounding methods for drives (inverters) and other equipment

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How to deal with electromagnetic interference caused by peripheral electrical equipment to the driver
Relays, contactors, electromagnetic brakes, etc. in the surrounding environment of the driver may cause electromagnetic interference. When the driver malfunctions due to electromagnetic interference, the following methods are recommended:

1. Install surge suppressors on devices that cause interference;
2. Add an EMC filter to the driver input power cable;
3. The driver control signal and detection lines use shielded wires or twisted pairs. The shielding layer of the shielded wires needs to be reliably grounded (360-degree loop connection).

How to deal with electromagnetic interference caused by the driver to peripheral equipment
The electromagnetic interference caused by the driver to peripheral equipment can be divided into two categories, one is conductive interference and the other is radiated interference. For different interference situations, refer to the following methods:

1.The signals of instruments, meters, receivers and sensors used for measurement are generally weak current signals. If they are close to the driver or are in the same control cabinet, they may be easily interfered and cause malfunctions. It is recommended that weak current signals be kept as far away from interference sources as possible; do not bundle weak current signal lines and power cables together; use shielded wires or twisted pairs for signal wires, and the shielding layer of the shielded wires needs to be well grounded (try to connect 360-degree loops); add iron to the power cables. The oxygen magnetic ring (nickel-zinc magnetic ring, suppresses interference with frequencies above 30MHz) is wound around 2 to 3 turns. In order to obtain better results, an EMC filter can also be used.
2. When the interfered equipment and the driver are powered by the same power supply, it is easy to cause conducted interference. It is recommended to add an EMC filter to the input port of the driver;
3. Separate grounding of peripheral equipment can reduce common-mode interference caused by common ground impedance.

Leakage current and treatment
There is distributed capacitance between the power cable and the earth. The longer the power cable, the greater the distributed capacitance between the power cable and the earth, and the greater the leakage current; the higher the carrier frequency, the greater the leakage current. Leakage current can be reduced by shortening the power cable length and lowering the carrier frequency. However, reducing the carrier frequency will lead to an increase in motor noise, and a balance needs to be found between the two.
Things to note when installing an EMC filter at the power input end
1. When using the filter, please use it strictly according to the rated value; since the filter belongs to Class I electrical appliances, its metal shell must be in good contact with the metal ground of the installation cabinet over a large area, and it is required to have good grounding continuity, otherwise there is a risk of electric shock and the EMC effect will be seriously affected. .
2. The filter ground must be connected to the same common ground as the driver PE terminal, otherwise the EMC effect will be seriously affected.
3. In the cabinet, the filter should be installed as close as possible to the entrance of the input power cable, and the power input line of the filter should be as short as possible in the control cabinet.
4. If the input line and output line of the filter are laid too close, high-frequency interference will bypass the filter and couple directly through the input line and output line of the filter, making the power filter ineffective.
5. The filter housing usually has a dedicated ground terminal. However, if a wire is used to connect the filter to the control cabinet shell, it will be useless for high-frequency interference. This is because the high-frequency impedance of long wires is very large and cannot effectively bypass. The correct installation method is to attach the filter housing to the conductive plane of the metal chassis over a large area. Please pay attention to removing the insulating paint during installation to ensure a reliable connection.

## 18.4 Use of EMC filters

When are EMC filters needed?

The EMC product standard (EN/GB/IEC 61800-3 + all revisions (2000)) covers the specific EMC requirements introduced within the European Union for drives (tested with motors and cables). The new version of the 61800-3 (2004) product standard is available from now on, but at least from October 1, 2007. EMC standards such as EN/GB/IEC 55011 or EN/GB/IEC 61000-6-3/4 apply to industrial and domestic equipment and systems that contain drive components inside. Drive devices that comply with the requirements of EN/GB/IEC 61800-3 always comply with the equivalent requirements in EN/GB/IEC 55011 and EN/GB/IEC 61000-6-3/4, but not necessarily vice versa. EN/GB/IEC 55011 and EN/GB/IEC 61000-6-3/4 neither specify cable length nor require the motor to be connected as a load. The table below shows a comparison of the radiation limits of each standard.

| EMC common standards | | |
|---|---|---|
| EN/GB/IEC 61800-3/A11 (2000), Product Standards | EN/GB/IEC 61800-3 (2004), Product Standards | EN/GB/IEC 55011, product family standards for industrial, scientific and medical (ISM) equipment |
| First environment, unrestricted sale | class C1 | Group 1 Category B |
| First environment, restricted sales | class C2 | Group 1 Category A |
| Second environment, unrestricted | class C3 | Group 2 Category A |
| Second environment, restricted sales | class C4 | Not applicable |

**WARNING!** It is prohibited to install an EMC filter if the drive is connected to an IT system (i.e. a power supply system that is not grounded, or has a high impedance ground (more than 30 ohms))

EMC filter installation guide

- The filter is connected directly to the input terminals of the driver.
- For the filter to work optimally, the driver and filter must be mounted on the same conductive surface.

How to disconnect the built-in EMC filter ground screw?

When the system needs to lower the EMC protection level or reduce leakage current to the ground, you can choose to disconnect the grounding screw of the built-in EMC filter. The specific method is:

**E series models:** Loosen the EMC position screw shown on the driver body.

**M series models:** After finding the EMC capacitor grounding point mark, remove the grounding shorting cap.

**Notice!** After changing the EMC level, please mark it with a sticker on the drive body and record the date. It is recommended that the label be affixed next to the nameplate.

**Notice!** Changing the EMC protection level of the driver on some models requires dismantling part of the casing, so it is recommended that you consult our representatives or have it completed by professional service personnel before implementation.

# 19.Input reactor

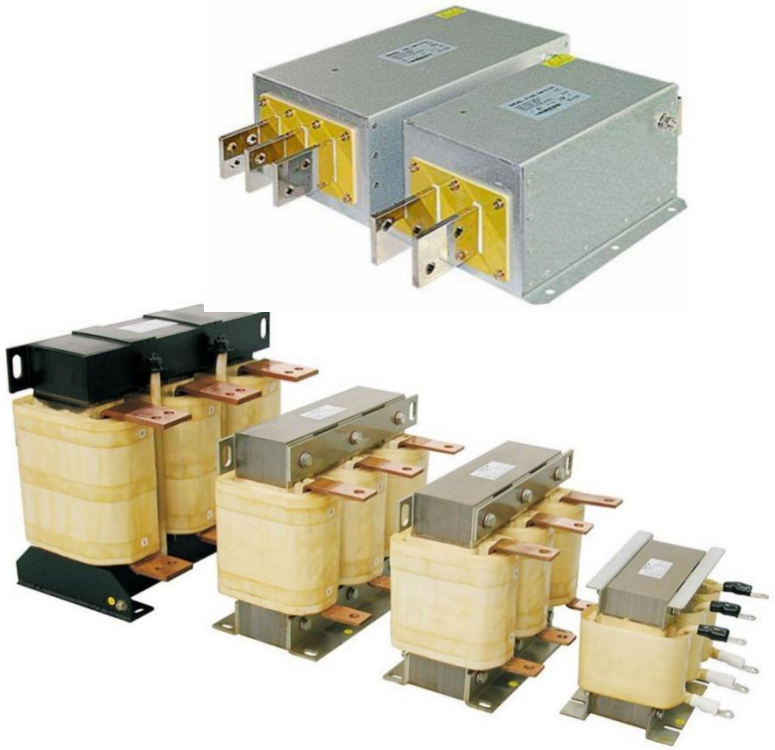
Contents of this chapter
This chapter explains how to select and install an input reactor
When is an input reactor needed?
Drive modules with frame sizes B2/B/C3-B/R/C9 have built-in input reactors. For frame sizes R/C1 and C2, the need for an external reactor should be analyzed on a case-by-case basis. The input reactor is mainly used for:
- Reduce harmonics in input current
- Reduce rms input current
- Reduce power supply interference and low frequency interference
- Increase the allowed DC bus continuous power
- Ensure average current distribution in the common DC bus.

For recommended input reactor selection values, please refer to the table data in the next section [du/dt or common mode filtering]。

Installation guide
- If EMC is required at the same time, the mains reactor must be connected between the power supply and the EMC filter. See image below.
- In order for the reactor to work optimally, the driver and reactor must be installed on the same conductive base plate.
- Ensure that the reactor does not impede airflow through the drive and that the hot air generated by the reactor is deflected away from the drive module air inlet
- Keep the cables between the driver and the reactor as short as possible.

Warnning !

1.During use, the surface of the reactor will become hot and have high temperatures.
2.At the same time, it is recommended that you pay attention to and confirm whether the reactor is under high load for a long time.
When the temperature performance is abnormal, proper cooling and ventilation must be provided, otherwise
There is a risk of fire!



# 20.Output du/dt and common mode filtering

When is du/dt or common mode filtering required?
Regardless of the output frequency, the driver's output contains pulses with very short rise times, approximately 1.35 times the equivalent supply voltage. This is a characteristic of all drives with IGBT inverter technology.The pulse voltage is essentially twice the voltage at the motor terminals and is related to the attenuation and reflection characteristics of the motor cable and terminals. This places higher demands on the insulation of the motor and its cables.
Modern drive speed control units, which are characterized by rapidly rising voltage pulses and high switching frequencies, generate current pulses that flow through the bearings of the motor and gradually damage the bearing rings and rotating parts. Using du/dt filters reduces the requirements on motor insulation. du/dt filters also reduce bearing currents. Common mode filtering is mainly used to reduce bearing current. The input reactor can suppress the high-order harmonics of the driver input current, significantly improve the driver power factor, reduce the root mean square input current, and reduce power supply interference and low-frequency interference. The output reactor can increase the output high-frequency impedance, reduce high-frequency leakage current, protect the driver, effectively reduce the high du/dt of IGBT output, extend the life of the motor, suppress the harmonic current of the driver output, and compensate for the influence of long-line distributed capacitance. Extend the output distance and reduce the noise of the motor.

The following is a recommended selection table for AC input/output reactors (the power range can be adjusted appropriately according to actual working conditions):

| Drive model | AC input reactor | | AC output reactor | |
|---|---|---|---|---|
| | Current(A) | Inductance(mH) | Current(A) | Inductance(mH) |
| 0.7/1.5KW-3B | 4.8 | 4.8 | 6 | 3.4 |
| 1.5/2.2KW-3B | 6.2 | 3.2 | 6 | 3.4 |
| 2.2/4.0KW-3B | 9.6 | 2 | 10 | 1.2 |
| 4.0/5.5KW-3B | 14 | 1.5 | 18 | 0.5 |
| 5.5/7.5KW-3B | 18 | 1.2 | 18 | 0.5 |
| 7.5/011KW-3B | 27 | 0.8 | 26 | 0.35 |
| 011/015KW-3B | 34 | 0.6 | 34 | 0.25 |
| 015/018KW-3B | 41 | 0.5 | 47 | 0.2 |
| 018/022KW-3B | 52 | 0.42 | 47 | 0.2 |
| 022/030KW-3B | 65 | 0.32 | 60 | 0.25 |
| 030/037KW-3/B | 80 | 0.26 | 75 | 0.23 |
| 037/045KW-3/B | 96 | 0.21 | 90 | 0.16 |
| 045/055KW-3/B | 128 | 0.18 | 112 | 0.16 |
| 055/075KW-3/B | 165 | 0.13 | 150 | 0.11 |
| 075/090KW-3/B | 195 | 0.11 | 176 | 0.01 |
| 090/110KW-3/B | 224 | 0.09 | 210 | 0.01 |
| 110/132KW-3 | 262 | 0.08 | 250 | 0.08 |
| 132/160KW-3 | 302 | 0.06 | 305 | 0.07 |
| 160/200KW-3 | 340 | 0.06 | 377 | 0.056 |
| 200/220KW-3 | 420 | 0.05 | 415 | 0.053 |
| 220/250KW-3 | 470 | 0.04 | 520 | 0.038 |
| 250/280KW-3 | 530 | 0.04 | 520 | 0.038 |
| 280/315KW-3 | 605 | 0.04 | 630 | 0.031 |
| 315/355KW-3 | 660 | 0.03 | 800 | 0.03 |
| 355/400KW-3 | 750 | 0.03 | 800 | 0.03 |
| 400/450KW-3 | 1000 | 0.025 | 1000 | 0.025 |
| 450/500KW-3 | 1000 | 0.025 | 1000 | 0.025 |
| 500/560KW-3 | 1200 | 0.011 | 1200 | 0.011 |
| 560/630KW-3 | 1200 | 0.011 | 1200 | 0.011 |

# 21.Resistor braking design and selection guide

Contents of this chapter This chapter explains how to select brake choppers and resistors

## 21.1 Brake chopper

This series of drives all have built-in standard or optional brake choppers to consume the energy generated when the motor decelerates.

When the brake chopper is activated and connected to the resistor, the brake chopper will start to operate when the DC link voltage of the drive reaches the braking voltage.

Braking resistor selection :

1. Calculate the maximum power produced by the motor during braking.
2. The continuous power is calculated based on the braking duty cycle.
3. The continuous power is calculated based on the braking duty cycle.
4.Custom resistors are available, subject to some limitations imposed by the built-in brake chopper. The rules are as follows:

The following table is only for guidance data. Users can choose different resistor values and powers according to on-site working conditions (but the resistance value cannot be less than the recommended resistance value shown in the table, and the power can be larger). The selection of braking resistor is basically The basis is that the greater the inertia of the system, the shorter the deceleration time, and the greater the braking rate, the resistance value of the resistor should be smaller and the power should be larger.

For the selection of resistance value, please refer to the following text or the picture below.

According to formula： $R=U^2/P$ U:is the braking action voltage point：

380/400VAC System default settings 750VDC,
220VACSystem default settings 375VDC

P：is the braking power

For the selection of resistor power, in order to ensure the safe use of the braking resistor, it needs to be derated by 70%.

According to formula：Pr=P*D/0.7

D:Braking rate (the proportion of the braking process in the entire system working cycle), reference selection of D value

General working conditions:10%-15% elevator：25%-35%,Lift or centrifuge:50%-60%

**Warnning!** Never use a braking resistor smaller than the specified resistance value for a specific drive power.
Drivers and choppers cannot be protected against overcurrent caused by small resistors, which may cause damage.

- The braking energy must not exceed the energy dissipation capacity of the selected resistor
- It is strongly recommended that users implement thermal overload protection for resistors by installing relevant overload protection devices before the resistors.

**Chopper Data / Resistor Selection Guide Data Sheet**,ratings apply at ambient temperature 40°C (104°F).
For models and applications not listed in the table below, please consult professionals or our representatives.

| Drive power and model (core information) | Typical shape code corresponding to the model | Minimum external resistor value supported by driver hardware of each form factor(Ω) | When the braking frequency is 20%, the recommended braking resistor resistance (Ω) and power (W) are suitable for general applications. | Braking frequency 50% recommended braking resistor power and resistance (W/Ω), suitable for heavy-duty applications such as lifting | Connecting resistor wire diameter($mm^2$) |
|---|---|---|---|---|---|
| 0.4/0.75KW-1B | **R11-14** | 40 | ≥200，≥100 | | 1 |
| 0.7/1.5KW-1B | | 40 | ≥150，≥200 | | 1.5 |
| 1.5/2.2KW-1B | | 40 | ≥100，≥400 | | 1.5 |
| 2.2/4.0KW-1B | | 40 | ≥75，≥500 | | 2.5 |
| 0.7/1.5KW-3B | E24 | 72 | ≥300，≥200 | | 1 |
| 1.5/2.2KW-3B | | 72 | ≥150，≥400 | | 1.5 |
| 2.2/4.0KW-3B | | 72 | ≥150，≥400 | | 1.5 |
| 4.0/5.5KW-3B | E25-26 | 72 | ≥100，≥800 | 2000W/100Ω | 2.5 |
| 5.5/7.5KW-3B | | 72 | ≥75，≥800 | 3000W/75Ω | 4 |
| 7.5/011KW-3B | E27-28 | 39 | ≥75，≥1000 | 4000W/75Ω | 4 |
| 011/015KW-3B | | 39 | ≥40，≥1000 | 6KW/50Ω | 6 |
| 015/018KW-3B | E32-35 | 20 | ≥40，≥1500 | 7.5KW/40Ω | 6 |
| 018/022KW-3B | | 20 | ≥30，≥1500 | 9KW/30Ω | 6 |
| 022/030KW-3B | | 20 | ≥25，≥1500 | 11KW/30Ω | 10 |
| 030/037KW-3/B | E42-45 | 10 | ≥22，≥3000 | 15KW/14Ω | 10 |
| 037/045KW-3/B | | 8 | ≥14，≥4000 | 18KW/14Ω | 16 |
| 045/055KW-3/B | | 8 | ≥14，≥5500 | 22KW/7Ω | 16 |
| 055/075KW-3/B | E52-55 | 5.2 | ≥8，≥8000 | 28KW/4.8Ω | 35 |
| 075/090KW-3/B | | 3.3 | ≥8，≥12000 | 38KW/4.8Ω | 35 |
| 090/110KW-3/B | | 3.3 | ≥8，≥16000 | 46KW/4.8Ω | 35 |
| 110/132KW-3/B | E62-63 | 2.3 | For the minimum resistance corresponding to other more models, please refer to the latest selection manual or consult our representative | | |

**Braking current minimizes electromagnetic interference response**
**In order to minimize electromagnetic interference caused by rapid changes in current in resistive cables, the following regulations should be observed:**

**》 The braking resistor cable should be installed away from other cables**

**》 Avoid running long distances alongside other cables. The minimum separation between side-by-side traces is 0.3 meters.**

**》 Use right angles when crossing other cables.**

**》 To reduce electromagnetic radiation and stress on the chopper IGBT, the cables should be kept as short as possible.**

**The longer the cable, the greater the electromagnetic radiation, the greater the inductive load and the higher the voltage spikes on the brake chopper IGBT semiconductor**

**Maximum cable length of the braking resistor: The maximum length of the resistor cable is 10m (33ft)。**

**EMC compliance of the entire unit with braked drive**
**Note: Our company has not verified whether the user's own braking resistor and cable wiring meet EMC requirements. The EMC compliance of the entire device must be considered by the user. When building a cabinet, it is recommended to focus on strong and weak decoupling, low-impedance continuous grounding, and cabinet-level Faraday cage principle shielding.**

## 〉21.2 Resistor installation and connection

All resistors must be installed on the outside of the driver module in a location that allows adequate cooling, does not block the airflow of other devices, and does not allow hot air to dissipate into the air inlets of other devices.

---

**WARNING!** The material in the vicinity of the braking resistor must be flame-retardant. The surface temperature of the resistor can rise to over 200°C (400°F), and the air flow through the resistor can reach temperatures of hundreds of degrees Celsius. The material must be prevented from coming into contact with the resistor.

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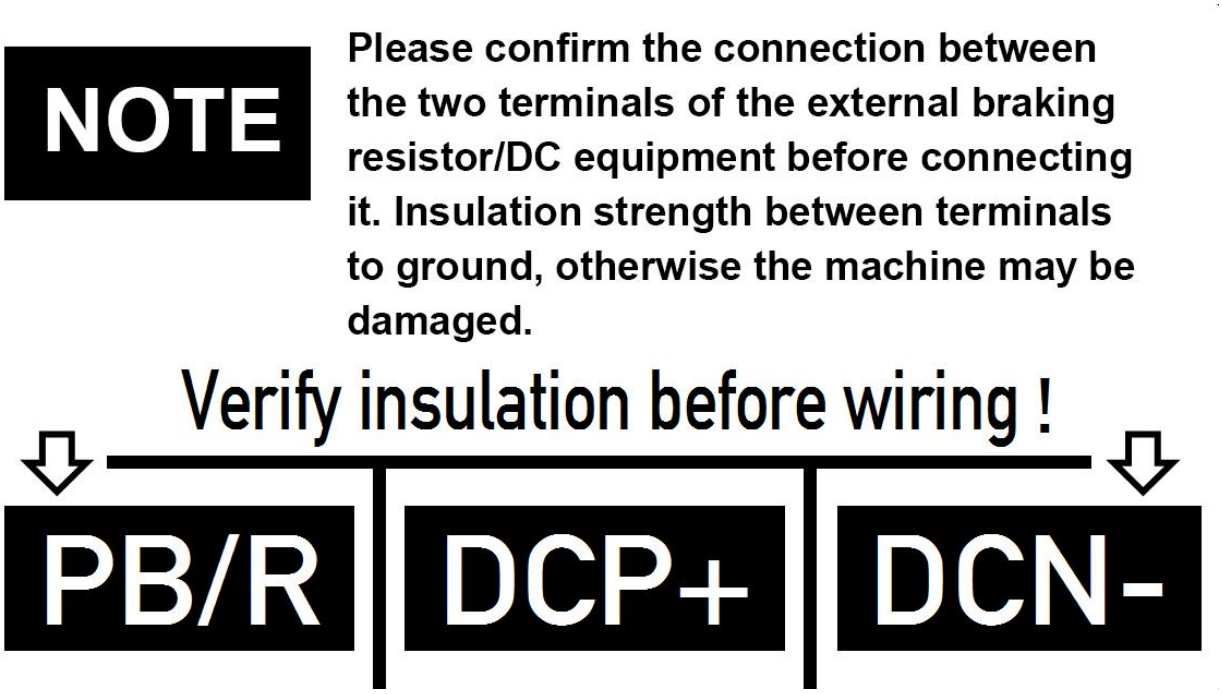
The maximum length of the braking resistor cable is 20 meters(65 ft)。



## 21.3 Contactor protection for drives

For safety reasons, it is strongly recommended to install a main contactor for the drive. The contactor is wired so that it can disengage if the resistor overheats. This is very important for safety because if the chopper remains conductive in the event of a fault, the drive cannot disconnect from the mains supply by other means.

## 21.4 Brake circuit debugging

For more information, see the corresponding PARA LIST and description.

- Enable the brake chopper function (60.07 bus voltage control in PARA LIST). Please note that after the chopper is enabled, a braking resistor must be connected
- Turn off overvoltage control for the driver

**WARNING!** If the drive is equipped with a brake chopper but the chopper is not enabled via parameter settings, the braking resistor must be disconnected, since no overheating protection of the resistor is used.

# 22.Product technology and manufacturing related information

## 22.1 Factory test items, test items, certificates of conformity

In accordance with relevant standards and specifications, this product has completed the following inspection/test items before leaving the factory. Verifications completed:

| Seq.No | Type | 检验/试验内容 / Content of Test | Result |
|---|---|---|---|
| RT1 | V | 一般检查、目视外观检查 Visual inspection | P |
| RT2 | V/T | 电气间隙和爬电距离 Clearance and creepage distances,最小值 Min.Value | P |
| RT3 | T | 接地保护连续性 Protective impedance（接地电阻值<=0.1Ω） | P |
| RT4 | T | 轻载运行 ac. or dc. voltage with Light load operation | P |
| RT5 | T | 保护功能(过流、过载、过压、过热、欠压、短路等)Protective bonding | P |
| RT6 | T | 不均流值 (若有功率模块并联,测定实际不均流特性) difference of Current sharing (Power modules paralleling) （if have） | P |
| RT7 | T | 绝缘电阻测量，验证设备的绝缘电阻在规定的范围内 Insulation resistance measurement，Minimum insulation resistance value>=1( MΩ ) | P |
| RT8 | T | 耐电压试验，验证设备的各独立电路之间和所有电路相对于机壳之间的绝缘特性。 Impulse voltage | P |
| RT9 | V/T | 液冷系统静态耐压测试(若有)，验证冷却系统密闭性能和强度 Hydrostatic pressure to Liquid system（if have） | P |
| ☹ The above items (RT…) are listed according to the relevant standards and specifications of the quality certificate, and the following items are additional inspection items (AT…) for enterprise quality control. | | | |
| AT21 | T | I/O Ports(DI/AI/AO/24V/Relay/Sensor etc.) tests | P |
| AT22 | T | 速度/位置等编码器/传感器所属的反馈接口/功能测试 Feedback functions and performance test of Encoder or other measure devices if have | P |
| AT23 | T | 通讯端口功能测试 ,验证目标通信配置及硬件 Communication Ports tests | P |
| AT24 | V/T | 操作控制键盘按键功能及显示测试 Control panel(Button/Display etc.) tests | P |
| AT25 | T | 非轻载（默认 100-120%额定负载,满载）运行及功率压力测试 Loading and Stress screening for Power circuit | P |
| AT26 | V/T | 固件和应用宏（如果有）适用性检查 Firmware versions check | P |
| AT27 | V/T | 随机资料版本、语言符合性检查 Standard or Customized Manual check | P |
| AT28 | V/T | 客户非标订制与特别说明一致性检查 Customized instructions check | P |
| 。Additional information: According to the requirements of the relevant standards and specifications for marine and electrical products listed in this certificate, this product has passed all relevant type tests, and the specific test items (TT…performance and environmental tests) are listed below. | | | |
| TT31 | V/T | Output rated capacity, output capability in operating frequency range, efficiency, temperature rise, frequency resolution, output voltage asymmetry | P |
| TT32 | V/T | Energy fluctuation test, vibration test, alternating damp heat test, shell protection test, stagflation test, electromagnetic compatibility test | P |

**注 Note:**

**V = 目视检验 Visual inspection, T = 通过机械或电气方法检测/试验试验 Testing with mechanical or electrical testing test devices**

**结果表示 Result Guide: 合格 Pass – P, 不合格 Fail – F, 不适用 Not Applicable – NA, 没有检测 Not Tested – NT.**

**本表中企业增强检验/试验项目和内容会在不作相关通知下而按需调整 Subject to technical changes without notice • Version:V22B 版本**

## 〉22.2 Product warranty instructions and precautions, warranty card

First of all, thank you users for choosing this product, according to the Chinese national standard GB/T 14436-93 "Industrial Product Guarantee Document General Provisions", with reference to the "Product Quality Law of the People's Republic of China", "Consumer Rights Protection Law of the People's Republic of China" and relevant provisions to formulate this warranty card, this card please keep it properly for the user as a warranty certificate, lost will not be reissued.

Product warranty card / warranty description and precautions

| | | |
|---|---|---|
| Model Type | | |
| SN. | | |
| Dealer/OEM | | |
| User | | |
| Contact | | |
| Fault Infor. | | |
| Warranty Infor. | | |
| Feedback | | |

☞1. The product warranty period is 18 months from the factory product leaving the factory, or 12 months from the product debugging, whichever expires first. The warranty period prescribed by the seller at the customer's location may differ from the above terms, which are detailed in its terms of sale and warranty. We do not assume any liability other than the terms of this warranty card.
☞ 2. The physical SN. Code of the fuselage or the electronic bar code in the machine is the only basis for determining the warranty period.
☞ 3. During the warranty period, if the user uses the product normally according to the manual, the product is faulty or damaged, and our company is responsible for free maintenance. We are not responsible for drive damage caused by transportation, unpacking, installation, commissioning and use. Our company shall not be liable for joint and several losses.
☞ 4. During the warranty period, if the product is faulty or damaged due to the following reasons, the maintenance fee will be charged according to the regulations.
1) Wrong wiring, use, improper installation or unauthorized maintenance and transformation.
2) Earthquakes, lightning, abnormal voltages, fires, floods and other natural disasters or secondary disasters.
3) Damage to man-made drops or handling after purchase.
4) Obstacles other than the product itself, such as external equipment factors, etc.
5) Application under harsh environmental conditions beyond the product technical indicators specified in the manual or its rated range, such as ambient temperature exceeding standards, corrosion, dust, damp, condensation, pollution, flocs, etc.
☞ 5. When the product fails or is damaged, please fill in the contents of the "Product Warranty Card" correctly, and this list can be voided when the end user of the product cannot be returned.
☞ 6. The service fee shall be calculated according to the actual cost, and if there is another contract, it shall be handled in accordance with the principle of contract priority.
☞ 7. Please be sure to keep this card and show it to the maintenance unit when you warrant it.
☞ 8. If you have any questions about this agreement, please contact your seller first.
☞ 9. Farwide reserves the right of final interpretation of the above terms.

INOMAX Technology Co.,Ltd

## 产品合格证 / 产品质量证明书 Certification and Routine Verification Report

**兹证明本证书所列产品经制造厂检验，符合本证书注明标准的要求，现准予出厂。**
This is to certify that the following products have been inspected and are found to comply with the requirements of the specified standards.

电气产品遵循标准信息
Standards of Conformity

| | |
|---|---|
| 产品行业标准 Product Inspection Standard | IEC 61800-5-1：Low Voltage Directive 国际电工相关产品标准之电气安全、热、能量<br>IEC 61800-5-3: EC Council Directive ,Electromagnetic Compatibility 国际电工相关产品标准之电磁兼容性检查 |
| 中国国家标准 China Standard | 《GB/T 30844.1-2014 1kV 及以下通用变频调速设备》第 1 部分：技术条件；<br>《GB/T12668.2-2002 调速电气传动系统》：一般要求，低压交流变频电气传动系统额定值的规定 |

## 质量承诺书 Declaration of Quality Conformity

We declare on our sole responsibility that the product of this certificate, Designation, type, catalog or order no. to which this declaration refers, conforms to and has been built according to the following assessment process and standard(s).
a) Products are manufactured in accordance with CCS specifications, conventions, and drawings approved by CCS, and in accordance with relevant national and international standards for products （if complied）；
B) The manufacturing process of the product is consistent with the approved conditions.
C) The product is qualified according to the acceptance technical conditions approved and/or accepted by CCS, and the test items and test data are true and valid.
D) The manufacturer is responsible for the quality of the product

-X----------X----------X-----

# 【合 格 证 OQC Card】

**Tests Result and OQC Card here 出厂检查测试结论及合格证明**

This product is qualified according to the delivery inspection and test. 检验结论：本产品经过检验合格，现准许出厂。

Shenzhen INOMAX Technology Co., Ltd.

| | | | |
|---|---|---|---|
| Inspected & Approval by 检验员： | FW92136 OQC | Date 日期 | Refer to the fuselage serial number or fill it in here |

## 〉22.3Product and service consultation

If you want to know any more information about this product, you can contact our local representative office. When consulting, please provide the product model and the serial bar code number of the product you want to consult.

## 〉22.4 Provide feedback about this manual

We welcome your valuable comments on our manual. You can contact our local representative office or call our customer service hotline directly.

## 〉22.5 Convenient record and memo sheet for user parameter setting

| parameter name | Parameter No. | My settings | Configure setting date | Remak 1 | Remark 2 |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
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