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

Ver: **V130**

⊕1.About the manual and the features of the ACX series

==Congratulations and thank you for choosing this series of drives which offers the industry-leading motor drive control !==

This manual will provide you with the necessary information about the installation, commissioning and operation of the drive and is suitable for engineers who are designing, installing, commissioning, using and maintaining the drive. This manual contains the quick start guide, basic technical parameters, mechanical and electrical installation, wiring, drive control parameters, typical industry application macro settings, maintenance , and related operating methods and precautions.

In order to ensure that you can use this series of drives correctly, to maximize the performance of your products and to ensure the safety of users and equipment, please read this manual carefully before starting to operate the drive. At the same time, the reader should have basic knowledge of electrical, wiring, electrical components and electrical schematic symbols. Please note that incorrect use may cause the drive to operate abnormally, malfunction, or even equipment damage, personal injury or death!

This manual is a random attachment. Please keep it in a safe place. If the drive is installed in a mechanical or transmission device, please ensure that this manual can be delivered to the end user with the complete set, so that it can obtain product-related features and information at any time during the operation of the drive.

==In order to let you quickly understand and maximize the advantages of the drive, the main features of its performance and function are introduced as follows:==

◎1. With the support of direct torque control technology, it has excellent performance in torque response and torque accuracy in the full speed range which can improve system reliability, or save encoder and reducer investment, or reduce maintenance difficulty and cost in the various types of open-loop drive control applications such as asynchronous and synchronous motors controls and so on.

◎2. For better energy-saving ,emission reduction and user energy cost savings,we realize the effective utilization rate of unit energy to a higher level of development in the exploration of motor drive and control, power electronic energy conversion technology so that it has a better energy saving effect especially in the energy-saving applications of new motors such as driving high-efficiency asynchronous motors, permanent magnet synchronous motors, and synchronous reluctance motors.

◎3.It has a higher level of intelligence, reliability, long life characteristics through the tireless pursuit of product details and quality, and scientific system design and strict lean control under the general trend of cherishing resources ,improving its utilization rate and helping the industry to upgrade to the middle and high-end.

◎4. In order to improve the efficiency of your personnel in installation, configuration, commissioning, using, maintenance, etc., developers make new improvements and more efficient designs in how to be intuitive, flexible, convenient, intelligent, expert and industry experience product embedded and shared.

◎5. It has more flexibility and broad support in the types and compatibility of networking configuration, equipment access, high-speed communication and high-speed motor precision driving, positioning and servo control, etc.under the historical process of industrial 4.0 or intelligent global industry and equipment intelligence.
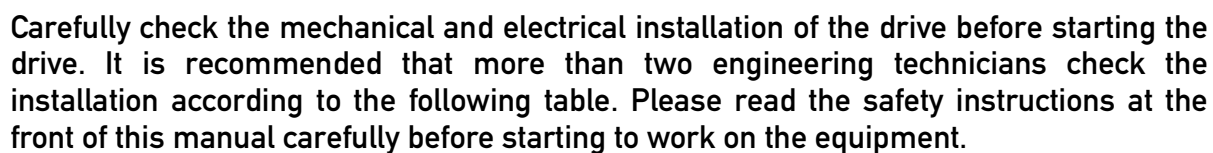
For the simplicity of the text and the abstraction of the technology, if you are interested or want to know more comprehensive features of this product, or want to discuss drive and motor control, or electrical automation and the professional experience, design and application to improve the motor drive system energy efficiency, please feel free to contact us at any time. We will be happy to share and communicate with you with an open mind. Look forward to create more social values and contributions with you together!

==Our Goal:==

**High energy efficiency,   Large torque,   Rapid response,
Precise accuracy,   Stable speed@Open or Closed loop**

✥2. Quick start guide and introduction of general functions with configuration

⟩ **Mechanical and electrical design and installation checking list>>>>>>>>>>>>>**

⚠️ Carefully check the mechanical and electrical installation of the drive before starting the drive. It is recommended that more than two engineering technicians check the installation according to the following table. Please read the safety instructions at the front of this manual carefully before starting to work on the equipment.

> ◆It is strictly forbidden to plug in and out the expansion boards with power, otherwise the drive or connected components may be permanently damaged!

*****Mechanical installation checklist

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

☐ 2. The drive unit is properly secured to the cabinet. (See cabinet installation design and mechanical installation.)

☐3. Whether the cooling air flow is smooth, the hot air has been avoided circulating in the vicinity of the drive body or the cabinet, and whether the air volume of the cabinet is sufficient.

☐ 4. The motor and its actuator are installed. (See Electrical Installation Design, Technical Data: Motor Connections.)

☐ 5. Whether there is sufficient assessment and corresponding countermeasures of dust, dripping water, humid air, corrosive gas.

*****Electrical installation checklist

Please refer to the Electrical Installation Design and Electrical Installation chapter to complete the operations and enter the following key procedures to confirm the inspection.

☐6. If the drive is connected to an IT (floating) grid, the VAR's EMC disconnect, screw should be loose or the jumper disconnected.

☐ 7. If the storage period is more than one year, the capacitor needs to be reformed. (Please refer to the relevant section or professional guidance).

☐8. The driver power terminal, driver chassis, control unit I/O card and signal terminal are all properly grounded (grid-level transformer to ground).

☐9. The power (input power) voltage matches the rated input voltage of the driver, and the loop phase sequence of the synchronous switching function is strictly the same.

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

☐11. Install the appropriate power (input power) fuse protector and circuit-breaker.

☐12. The motor is connected to U/V/W, the terminal is tightened to the specified torque, and the insulation treatment is good.

☐13. The brake resistor (if any) is connected to +/PB and the terminals are tightened to the specified torque.

☐14. The motor cable (and the brake resistor cable, if any) is separated from the other cable traces, and the weak signal line shield is well grounded.

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

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

☐17. There are no conductive dust left by tools, foreign objects and drill holes in the drive.

☐18. The input supply voltage cannot be applied to the input of the drive via the bypass connection.

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

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2. *Quick start guide and introduction of general functions with configuration*

〉 Basic steps and guidelines for quick start:>>>>>>>>>>>>>>>>>>

■1：Check the confirmation one by one according to the above list, especially confirm that the power wiring is correct (listed on the left side of the following table). For the shielding and grounding points of the weak electric signal control line, please refer to page about EMC grounding

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

■→ 3: LOC local debugging using the control keyboard.

■→ 4: REM remote start and debug, configuration.

1. Common wiring and terminal introduction (Check the wiring according to the label for correctness. If the wrong connection may cause permanent damage to the machine without warranty)

R、S、T ； PE	Grid power supply, protective ground terminal	DI1	REM remote forward start
U、V、W	Output to Motor	DI2	REM remote reverse start
+(P)、-(N)	DC common bus terminal	COM	Common terminal
+(P)、PB	Brake resistor terminal	AI1	Analog speed regulation
Note: Please refer to the standard wiring diagram for more details		GND	Common terminal

*****Motor Parameter Identification

◆It is strictly forbidden to plug in and out the expansion boards with power, otherwise the drive or connected components may be permanently damaged!

Confirm that it is in LOC local mode, press [5]LO/RE to switch quickly. The upper left corner shows LOC is local mode, start/stop and speed control are only controlled by the control panel; display REM means remote mode, start / stop and speed control are controlled by external terminals or communication. In the case that the drive has not been modified, the drive can be restored to the factory value and then debugged: Set 16.03 value to 2 (restore the factory value, including the motor parameters)

2.1. Correctly Set the Motor Rated Parameters, input the motor nameplate parameters into 63 sets of parameters, and set the 63.05 motor type (the default is asynchronous motor)

Enter the following parameters according to the motor nameplate:： (3.7KW/100HZ/1500rpm/7.4A/380v for example)

Parameter	Name	Setting range	Parameter example	My motors setting
63.05	Motor type selection	0. Three-phase asynchronous motor 1. Permanent magnet synchronous motor	1 （according to motor type）	
63.00	Motor Rated Power	according to the actual motor nameplate	3.7KW	
63.01	Motor Rated Voltage	according to the actual motor nameplate	380v	
63.02	Motor Rated Current	according to the actual motor nameplate	7.4A	
63.03	Motor Rated Speed	according to the actual motor nameplate	1500RPM	
63.04	Motor Rated Frequency	according to the actual motor nameplate	100hz	

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

2.2.Motor Parameter Identification and Introduction of Motor Internal Basic Principles and Working Mechanism

**** 2.2.1. Rated power, voltage and current are mutually constrained. If there is no match, the current is automatically corrected according to power and voltage.

2. *Quick start guide and introduction of general functions with configuration*

****2.2.2. The rated speed n and the frequency f are mutually constrained. The drive automatically calculates the pole pair 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=2000 rpm, f=133 Hz, then p=4, n is corrected to 1995 rpm.

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

****2.2.3. Constraint relationship between rated voltage U and rated frequency f.

For permanent magnet synchronous motors, the counter electromotive force corresponding to the rated frequency should be close to the rated voltage. Excessive deviation caused the parameter identification to fail, and even an overcurrent alarm occurred.

For asynchronous induction motors. The driver obtains the core saturation coefficient by rotating identification to determine the adjustment direction of the rated frequency. The ideal interval is around 80%.

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

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

The rest is adjusted according to needs. 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 is controlled as much as possible within 50% of the rated current to reduce motor heating.

****2.2.4. 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 simplest method is to short circuit the three wires of the motor. If the motor shaft can be easily rotated, it is an asynchronous motor. Otherwise, it is Permanent magnet synchronous motor.

2.3. Motor Parameter Identification, Parameter Recording and Calculation >>>>>>>>>>>>>>>>>>>>>>

The following two modes are available: static identification, and rotary identification.

2.3.1 Static identification: Select parameter 63.06 choose 2 (static identification), press [3] Start green button to run, and it will end in about 10 seconds. In this mode, the motor will not rotate, and the motor no-load current 62.01 needs manual trimming, which is generally 30%-50% of the rated current.

The identified parameters are:

2.3.1.1. Asynchronous motor: 62.02 stator phase resistance; 62.03 rotor phase resistance; 62.05 leakage inductance coefficient

2.3.1.2. Synchronous motor: 62.02 stator phase resistance; 62.06 straight shaft inductance; 62.07 cross shaft inductance; 62.10 core saturation coefficient;

2.3.1.3.PM phase identification, only identify the parameter of electrical angle offset of 61.01 Z signal, only applicable to synchronous motor and Z signal has been received, for occasions where rotation identification is not possible, such as holding brake. If the Z signal has not yet appeared, it should be rotated manually until the Z signal is received (01.16 Z pulse capture value changes). Executed multiple times, if the obtained 61.01 consistency is good, it means success. If the discreteness is too large, it is necessary to check the 09.07 angle to search whether the signal-to-noise ratio of can be greater than 2.00 times, and if necessary, increase 60.11 the searching current to improve the recognition accuracy.

2.3.1.4. If the driver has encoder access, you need to manually input the encoder resolution (61.00), then change 63.07 to 0 (open loop), the panel runs 300RPM, check whether the parameter 1.24 encoder feedback speed is around at 300 rpm. Up and down fluctuations (+/-5RPM)

If the feedback speed fluctuates greatly (>5RPM), please check if the encoder shield is grounded and the encoder is coaxial, if there is any shaking

If the speed difference is large, please check if the encoder resolution is true or not.

2. 3.2 Rotation Identification: Select parameter 63.06 to select 1 (rotation identification), press [3] Start green button to run, the driver will start static recognition then rotate recognition then automatically stop. Before the identification is performed,safe and controllable of the motor rotation should be fully evaluated. this mode is suitable for the case where the load is disconnected from the motor shaft, and the motor no-load current can be correctly identified.

2.3.2.1. Asynchronous motor: 62.01 no-load current; 62.04 stator total inductance; 62.09 core saturation coefficient;

2.3.2.2. Synchronous motor: 62.08 back EMF coefficient

2.3.2.3. Encoder: If the driver has encoder access and Z phase signal exists, rotary self-learning can automatically identify the encoder resolution and rotation direction without manual input; you can check whether the encoder resolution is correct by 61.00. If the test run has an abnormal alarm or the speed fluctuation is large, please follow the static self-learning encoder setting procedure to check the operation (no

encoder ignores this step). Specifically, 61.00 the original resolution ; 61.01 the electrical angular offset of Z signal; 61.02 AB phase type; if the original resolution setting is incorrectly corrected, it needs to be recognized again to obtain the correct electrical angular offset. If the speed deviation is small but the feedback speed is negative,set 61.02 the direction of the encoder is reversed.

Finally, set 63.07 to 1 (direct torque control) to enter the closed loop state and test run.

◆If there is an emergency, press [4] STOP red button to stop learning urgently.◆

2.4. Calculation of the optimal range of motor parameters >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

****2.4.1. Asynchronous induction motors, the no-load current is between 25% and 50% of the rated current; the leakage inductance is between 5% and 10%.

****2.4.2. Permanent magnet synchronous motor,

4.2.2.1. DQ axis inductance, L = U / (2π * f * In * 1.732) * 0.3, such as U = 380V, f = 300Hz, In = 40A, then L = 380 / (6.28 * 300 * 40 * 1.732) *0.3=0.87mH. It is unreasonable to deviate less than half or more than twice.

4.2.2.2. Saturation factor. The inductances identified by the different rated currents are different and can be reflected from the saturation factor. Less than 70%, indicating that the motor is uncomfortable at this rated current, it is necessary to reduce the rated current. Long-term over-saturation can cause the motor core to heat up.

2.4.3. Back EMF coefficient. The back electromotive force corresponding to the rated frequency should be above 90% of the rated voltage.

3. Local LOC debugging

operation >> >>>>>>>>>>>

3.1. Press [1], select menu "Local Reference", then set the speed to 150-1000.0rpm, then press OK to save, press [1] to exit to the main interface. Press [3] Start button to start, observe current, speed, frequency, check motor steering, if reverse can be changed by two ways: 1 turn off and exchange any two of the motor wires, 2 adjust 63.08 to 1 (motor phase sequence reverse phase). The parameter name of the main interface of the panel can be displayed by pressing the OK button. Press the left and right buttons to switch between different pages. There are 8 page cycles. Press the right arrow to switch to the second interface, which can display the output voltage, motor flux, and motor torque, which is the most critical state of the motor. The left arrow returns.

3.2. If rotation direction of the motor is opposite to the operation direction of the equipment, phase sequence exchange is carried out by adjusting parameter 63.08. If there is an encoder, the phase of encoder must be reversed (the synchronous motor needs to change 63.05 to 3 for PM identification again).

3.3. For permanent magnet motors, the output voltage during operation can be recorded and then divided by the speed, which is the back EMF coefficient. Please manually set to parameter 62.08. If you output 250.0Vrms at 1000rpm, set 62.08 to 250.0mV/rpm.

4. Remote REM

operation >>

Difference with local mode: Start/speed control via an external signal such as the DI1/AI1 terminal. The control panel is only used for monitoring and does not participate in start-stop and speed control. By default, DI1 is used as the start and stop signal of forward , DI2 is used as start and stop signal of reverse , and AI1 is used as the speed control signal. Confirm that it is in REM remote mode (external control, panel startup is invalid), press [5]LO/RE to switch quickly. The upper left corner shows REM for remote mode

1. The LOC is local control, which is controlled by the keyboard.

2. REM is remote control, the default DI1 forward rotation, DI2 reverse rotation, the default is set by the 02.03 AI1 conversion value.

3. Change the startup mode: the parameter is 10.00 (Note: optional external terminal startup, communication startup, control panel startup)

4. Change the speed reference source: The parameter is 21.00 (Note: optional analog reference, control keyboard reference, communication reference, multi-speed reference, potentiometer UP/DOWN reference, PID reference)

5. Basic introduction of user I/O interface function >>>

5.1. Digital input DI1-DI6

5.1.1. Filter settings. The valid and invalid delay times can be set independently, see parameters 14.00 to 14.11.

5.1.2. Real-time status. Parameter 02.00, the available bit pointer points to BIT0-5 of this register corresponding to DI1-DI6.

5.1.3. Default connection relationship.

2. Quick start guide and introduction of general functions with configuration

DI1 is start and stop of forward, and DI2 is start and stop of reverse to . See parameters 10.00, 10.01 and 10.02. DI3, DI4, DI5 are not connected. DI6 fault reset, see parameter 10.11.

5.2. Digital input/output or high-speed pulse interface, DIO1/DIO2 >>>>>>>>>>>>>>>>>>>>>>

5.2.1. Function selection of DIO1 and DIO2. See parameters 14.31 and 14.32. [0], general purpose output, default. [1], universal input. [2], high-speed pulse train, DIO1 can only be used for high-speed input, DIO2 can only be used for high-speed output.

5.2.2. Filter time setting for general purpose input or output. See parameters 14.12 to 14.15.

5.2.3. Real-time status of the general-purpose input, see parameter 02.00, the available bit pointer points to BIT6 and BIT7 of this register corresponding to the input of DIO1 and DIO2.

5.2.4. The real-time status of the general-purpose output, see parameter 02.01, is only used to confirm whether the output of DIO is active.

5.2.5. Signal source selection for general purpose outputs, see parameters 14.27 and 14.28, which can point to any address and bit. The default DIO1 points to the run signal and DIO2 points to the fault signal.

5.2.6. When DIO1 is a high-speed pulse input, the measured value is 02.08, and the converted value is 02.09.

5.2.7. The real-time value of the high-speed pulse output of DIO2 is 02.10.

5.3. Relay output RO1, RO2 >>

5.3.1. The meaning of the terminal symbol abbreviation, NO (normal open), NC (normal closed), CM (common).

5.3.2. Output filter time setting, see parameters 14.16 to 14.19, the default filter time is 0ms.

5.3.3. Signal source settings. See 14.29 and 14.30. The default RO1 is running and RO2 is fault.

5.4. Analog input AI1, AI2 >>>

5.4.1. Real-time detection values. 02.02 AI1 measured value and 02.04 AI2 measured value.

5.4.2. Real-time conversion values. 02.03 AI1 converted value and 02.05 AI2 converted value.

5.4.3. Conversion relationship. The mapping of input ranges and output ranges.

13.00	AI1 input maximum	13.08	AI2 input maximum
13.01	AI1 input minimum	13.09	AI2 input minimum
13.02	AI1 maximum conversion value	13.10	AI2 maximum conversion value
13.03	AI1 minimum conversion value	13.11	AI2 minimum conversion value

5.4.4. Filter time setting. 13.07 and 13.15 correspond to the filtering time of AI1 and AI2 respectively.

5.4.5. Mode selection, parameters 13.04 and 13.12.

5.4.5.1 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]

5.4.5.2. For voltage and current type selection, you need to unplug the SLOT1 board and set the jumper of AI1 or AI2 to the corresponding position. The factory default is voltage type.

5.4.5.3. Selection of unipolar and bipolar. Unipolar refers to [0, 10V] or [0, 20mA], bipolar refers to [-10V, +10V] or [-20mA, +20mA], no need jumper , hardware electronic switch automatically switches,

◆ Note: AI1 and AI2 will be both unipolar or both bipolar at this time. ◆

5.4.6. Error correction method.

5.4.6.1. Gain error. 32.10 and 32.12. The reference value is 4096. When the maximum range input, the detected value is larger than the actual value, the gain is reduced, or the gain is increased.

5.4.6.2. Offset error. 32.11 and 32.13. The reference is 0. At zero input, the offset is increased when the detected value is larger than the actual value, or the offset is decreased.

◆Note: This parameter system has protection rights and is not affected by parameter reset.

5.5. Analog output AO1, AO2 >>

5.5.1 Actual output value. See parameters 02.06 and 02.07.

5.5.2. Signal source connection. 15.00 and 15.10. The default AO1 corresponds to 01.00 the actual motor speed , and AO2 corresponds to 01.22 the actual torque of motor.

5.5.3.Conversion relationship.

15.01	AO1 output maximum	15.11	AO2 input maximum
15.02	AO1 output minimum	15.12	AO2 input minimum
15.03	AO1 signal source maximum	15.13	AO2 signal source maximum
15.04	AO1 signal source minimum	15.14	AO2 signal source minimum

5.5.4. Filter. The filtering time corresponds to 15.09 and 15.19. The default is 0.010 seconds.

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2. *Quick start guide and introduction of general functions with configuration*

5.5.5. Mode setting, parameters 15.08 and 15.18. Note that only unipolar is supported and bipolar is not supported. The voltage-current type is switched by the jumper of the SLOT1 board.

5.5.6. Enter the absolute value. Parameters 15.07 and 15.17. For situations where symbols are not considered, the absolute value function needs to be enabled. For example, both forward and reverse speeds are mapped to analog outputs [0, 10V].

5.5.7. Error correction.

Gain error. 32.14 and 32.16. The reference value is 3801. When the output value near the maximum range output ,panel display output value is larger than the actual detection value, the gain increases, or the gain decreases.

Offset error. 32.15 and 32.17. The reference is 0. When the output value near the zero ,panel display output value is larger than the actual detection value, the offset is reduced, or the offset is increased.

◆Note: This parameter system has protection rights and is not affected by parameter reset.

5.6. High Speed Pulse Input>>

5.6.1. Pulse frequency value detected in real time, parameter 02.08

5.6.2. The converted value, parameter 02.09, the user can point the speed reference source to this parameter.

5.6.3. Conversion relationship. Parameters 13.16 to 13.19 correspond to the input and output range endpoints.

5.6.4. Filter time. Parameter 13.20, default 0.010 seconds.

5.7. High Speed Pulse Output >>>

5.7.1. Actual output pulse frequency value, parameter 02.10.

5.7.2. Signal source connection. Parameter 15.20, default is 01.00 actual motor speed.

5.7.3. Conversion relationship. Parameters 15.21 to 15.24 correspond to the output and the endpoints of signal source input ranges.

5.7.4. Filter time. Parameter 15.27, default 0.010 seconds.

5.8. Motor temperature detection PT+/PT- >>

5.8.1. The following four temperature sensor types are supported, corresponding to parameter 31.01.
KTY84 (recommended)
PT1000, PT100
PTC (only temperature switch, no actual temperature. Trigger fault according to resistance value comparison. 31.05 PTC fault trigger resistance value)

5.8.2. Jumper settings, which are applicable to KTY84, PT1000 and PTC by default. If PT100 is used, the jumper position needs to be changed.

5.8.3. Temperature measured value. 01.23 The measured temperature of the motor.

5.8.4. Temperature sensor resistance value measured value. 31.02, this parameter can be used to determine the sensor type and fault diagnosis.

5.8.5. Overheat protection action type, parameter 31.00, default fault, you can choose no action or warning.

5.8.6. Overheat protection point setting, 31.03 and 31.04 correspond to the temperature point of warning and fault respectively.

5.9. Start and stop mode of remote control, parameters 10.00 and 10.04. >>>>>>>>>>>>>>>>>>>>>>

5.9.1. 2-wire or 3-wire control. The default 2-wire control, DI1 forward rotation start, DI2 reverse rotation start.
Forward /Reverse
Start / Direction
Forward/Reverse/Stop
Run/Stop/Direction

5.9.2. Bus Communication Control
Can come from various types of buses, such as MODBUS, CANopen, PROFIBUS-DP, etc.

5.9.3. Panel Control
In remote mode, you can also use the panel to start the shutdown, the upper left corner shows (L)

5.9.4. Start stop mode selection, 11.00, can choose free stop or deceleration stop.

5.9.5. Speed given for remote control

Signal Source Selection. Parameters 21.00 and 21.01 specify two input sources. The common source lists are:
02.03 Conversion value of AI1.
02.05 Conversion value of AI2
02.09 High-speed pulse input conversion value

2. *Quick start guide and introduction of general functions with configuration*

02.11 control panel given 1
02.12 control panel given 2
02.13 Fieldbus given 1
02.14 Fieldbus given 2
02.15 Orthogonal pulse given speed

Synthetic calculation. Parameter 21.02 selects the operation type, and the operation data is the corresponding parameter value of signal source 1 and signal source 2.

1. Only use signal source 1
2. Addition, that is, signal source 1 and signal source 2 are added
3. Subtraction
4. Multiplication
5. Take the minimum
6. Take the maximum value
7. Take the absolute value
8. Division

5.9.6. Remote control torque given

Signal source selection. Parameters 24.00 and 24.01 correspond to two source selections. The list of common signals is the same as the list of speed given sources.

Synthetic calculation. Parameter 24.02 selects the type of operation. The most common ones are addition and subtraction.

5.9.7. Types and switching of control modes

5.9.7.1. Switching mode, only for remote control (REM).

Parameters 11.05 and 11.06 specify two control modes respectively;

Parameter 11.07 is used to dynamically select one of these two modes. The default is always 0, which is 11.05.

5.9.7.2. The control mode in local mode (LOC) is specified by parameter 11.04.

5.9.7.3. Mode list

Speed mode. Parameters 20.06 and 20.07 specify the torque limit range.

Torque mode. The parameters 20.00 and 20.01 specify the speed limit range.

Torque mode speed limit. Torque control, speed limit depends on the speed reference, ie torque priority.

DC voltage source mode. It is used to control the motor to generate electricity, so that the DC voltage is constant at a specified value and is powered by DC. Often used in ships. The speed given value is taken as the actual voltage given value.

Speed mode limits torque. For speed control, the torque limit depends on the torque reference, ie speed priority.

5.9.8. Speed Control

For ramp control, 22.00 and 22.01 specify the acceleration and deceleration time respectively. In addition, there are two sets of ramp times that can be switched, and the S-curve ramp time can also be selected.

Digital potentiometer function, ie speed UP/DOWN. The actual value is parameter 03.01.

Save mode. There are three types of parameters 21.07: 0, power-on then clear; 1, always save; 2, stop then clear.

Increase or decrease the signal source. Parameters 21.08 and 21.09 specify the source of the increase and decrease respectively.

Limits of speed range. Parameters 21.10 and 21.11 specify the two endpoints of the speed range respectively.

Rate of change. Parameter 21.12 specifies the time required for the speed to change the entire range. The default is 10 seconds.

Multi-speed control

Actual value, parameter 03.02

Multi-speed selection input signal source, parameters 26.18 to 26.21, a total of 4 channels.

Multi-speed mode, parameter 26.16, defaults to split mapping mode.

Separate the mapping mode. The four input signals correspond to 26.01 to 26.04, and when all signals are invalid, 26.00 is selected.

Combined mapping mode. The four input signals combine 16 choices, corresponding to 26.00 to 26.15 respectively.

Jog control, support 2 jog input signals, corresponding to parameters 10.08 and 10.09. The speed corresponding to the jog is specified by parameters 21.05 and 21.06.

2. *Quick start guide and introduction of general functions with configuration*

5.9.9. Limiting control

Maximum speed limit, parameters 20.00 and 20.01;

Maximum torque limit, parameters 20.06 and 20.07;

Maximum power limit, parameters 20.04 and 20.05;

5.9.10. System Settings

Local control is prohibited. After parameter 16.00 is activated, it is forced into remote mode.

Parameter lock. After parameter 16.01 selects lock, all parameters will not be modified.

The parameter is restored to the factory value. Parameter 16.03 selects 2 to clear all.

5.10. Introduction to default parameter tabulation: >>

In 5.10.1.REM mode, the default DI1 forward rotation, DI2 reverse rotation, speed given source is AI1 (voltage channel, potentiometer or voltage signal can be connected)

Terminals	Default meaning	Associated parameter
DI1	Remote forward rotation	10.01
DI2	Remote reverse start	10.02
COM	DI common, R1 model is GND for DI common	
10V	Analog 10V power supply	
AI1	Analog voltage input channel	21.00/13.00-13.04
GND	Analog signal common	
AO1	Speed output	15.00-15.04
AO2	Torque output	15.10-15.14
DIO1	Collector output [run output] / support high speed pulse input, need to set 14.31 DIO1 configuration	14.27/14.31/13.16-13.19
DIO2	Collector output [fault output] / support high speed pulse output need to set 14.32 DIO2 configuration	14.28/14.32/15.20-15.24

NC1	Relay normally closed point [running off]	14.29 Default runtime action
COM1	Common point	
NO1	Relay normally open point [running closed]	

NC2	Relay normally closed point [fault disconnection]	14.30 Default fault action
COM2	Common point	
NO2	Relay normally open point [fault closed]	

Change startup method: parameter 10.00: default external terminal optional fieldbus/panel

Change speed given source: parameter 21.00 default AI1 analog quantity given optional AI2 (voltage / current signal optional) given, control keyboard given, communication given, multi-speed given, digital potentiometer given (UP/ DOWN), PID given, pulse given (DI01)

5.10.2. Common parameter configuration table

10.00	Remote start mode		21.00	Speed given source selection
10.08	Jog 1 signal input		21.04	Speed given scaling
10.11	Fault clear input		21.05	Jog 1 speed given value
10.13	Emergency stop input			
10.14	Emergency stop mode		22.00	Acceleration time 1
			22.01	Deceleration time 1
11.00	Stop mode selection			
11.02	Remote control mode		24.00	Torque given source selection
11.07	Torque prohibition selection			
			26 groups are set for multi-speed parameter group	
13.00	AI1 maximum voltage			
13.01	AI1 minimum voltage (equivalent to offset)		27 groups are controlled by PID parameter group	
13.02	AI1 maximum conversion value (equivalent to gain)		27.01	PID given source selection

2. *Quick start guide and introduction of general functions with configuration*

13.03	AI1 minimum conversion value		27.06	PID feedback source selection
13.04	AI1 signal type selection		27.15	PID proportional gain
13.08-13.12 for AI2 settings			27.16	PID integration time
14.31	DIO1 port type selection		30 sets of parameters are fault protection function groups	
13.16	DIO1 high speed pulse input maximum frequency		47 groups are multi-stage cycles, it is recommended to timing control	
13.17	DIO1 high speed pulse input minimum frequency			
13.18	The value corresponding to the highest frequency		51.01	Modbus communication node address
13.19	The value corresponding to the lowest frequency		51.02	Serial port baud rate
			51.03	Serial frame format, inspection selection
15.00	AO1 signal source selection		60.00	Carrier frequency
15.01	AO1 maximum voltage		60.05	Pre-excitation time
15.02	AO1 minimum voltage		60.06	Motor control mode
15.03	AO1 signal source maximum		60.07	Bus voltage control
15.04	AO1 signal source minimum		60.11	Synchronous motor rotor receiving current
15.07	AO1 output mode			
14.32	DIO2 port type selection		61.00	Encoder resolution
15.20	DIO2 high speed pulse output signal source selection		61.01	Electrical angular offset
15.21-15.24 high speed pulse output parameters			61.02	Encoder signal phase
16.00	Local control lock		62.01	Motor no-load current
16.01	Parameter lock		62.06	Synchronous motor D-axis inductance
16.03	Restore factory value		62.07	Synchronous motor Q-axis inductance
			62.08	Synchronous motor back electromotive force
20.00	Maximum speed			
20.01	Minimum speed		63 group	Motor parameter group
20.03	Reverse enable		63.08	Motor phase sequence switching

5.10.3. Common monitoring parameters

Parameter number	MODBUS communication address	Parameter explanation
01.00	100H	Motor speed
01.01	101H	Motor frequency
01.03	103H	Motor current
01.21	115H	Motor voltage
01.22	116H	Motor torque
01.24	118H	Encoder speed value
01.28	11CH	Output Power
06.05	1H	Communication control word
02.13	2H	Communication speed given

Parameter number	Parameter explanation
02.00	DI input status
02.01	DO output status
02.02	AI1 actual value
02.03	AI1 conversion value
02.04	AI2 actual value
02.05	AI2 converted value
02.06	AO1 actual value
02.08	High speed pulse actual value
02.09	High speed pulse output conversion value

2. *Quick start guide and introduction of general functions with configuration*

02.14	3H	Communication torque given		

6. Parameter copy and fast backup>>

 When you want to copy the parameters to another machine, first upload the parameters of the original machine that needs to be copied to the control panel. Then carry the panel to the new machine and select Download for parameter copying.

   The upload step is: [Menu] -> [Parameter Backup] -> [Upload to Local], the drive's change parameters will be stored in the memory of the control panel.

    The download steps are: 》 》 》 [Menu]->[Parameter Backup]->[Download to Drive]. After the upload and download are completed, the interface will display the total number of parameters transmitted.

Note: At the end of 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.

7, Configuration and application level and other common settings>>>>>>>>>>>>>>>>>>>>>>>>>

1. Jog frequency setting:

   10.08 (Jog 1 start) activates the relevant DI terminal, eg DI3

      ◆ Note: DI input status parameter is 02.00, ie P.02.00.02 stands for DI3

   21.05 (speed given value for jog 1): default 15.0RPM (negative number is reverse)

   22.05 and 22.06 are jog acceleration/deceleration time

2. The potentiometer speed is regulated by the AI1 channel, and the rated speed is 1500 rpm. The motor needs to run at 1800 rpm and the minimum is 60 rpm.

   20.00 is adjusted to 1800.0 (maximum speed), 20.01 is adjusted to -1800.0 (reverse maximum speed)

   13.02 is adjusted to 18000 (AI1 conversion output maximum value), 13.06 is adjusted to 600 (AI1 conversion output minimum value)

      ◆ Note. Because the speed is accurate to 0.1 rpm, the converted value is accurate to 1 decimal place, 600 represents 60.0RPM

3. A given speed through the AI2 (4-20MA) current signal

   Unplug the I/O card of card slot 1 and dial the corresponding DIP switch (J13) on the card to the current I position.

   21.00 adjust to AI2 conversion value, 13.12 AI2 signal type select current, 13.08 adjust to 20mA (AI2 input maximum signal), 13.09 adjust to 4mA (AI2 input minimum signal), set 13.10 and 13.11 to the required value

4. By the high speed pulse input DIO1 given speed, the rated speed is 1500 rpm motor needs to run at 1800 rpm

   21.00 found user define adjust to 2.09 (pulse input conversion value)

   14.31 DIO1 port is configured as 2 (frequency), 13.16 frequency input maximum value, corresponding to the highest frequency

   13.17 frequency input minimum value, 13.18 frequency input maximum conversion value can be changed 15000 to 18000

      ◆ Note: This pulse input defaults to 24V voltage and supports collector NPN input. If the user PLC is PNP input (such as Siemens S200, 300 series), you need to jump the plug in the card slot 2 from SINK (NPN) to SOURCE (PNP), the DI terminal is also a PNP input at this situation.

5. Through multi-speed speed regulation

   21.00 Adjust to multi-speed speed given

   26.18 is adjusted to DI3 (speed of the first stage), 26.19 is adjusted to DI4 (speed of the second stage), and 26.20 is adjusted to DI5 (the speed of the third stage)

That is, if DI1 is closed it is speed of the 0th stage, if DI1 and DI3 are closed it is speed of the first stage.

 If DI1, DI4 or DI1, DI3, DI4 are closed ,it is speed of the second stage,

  If DI1, DI5 or DI1, DI3, DI4, DI5 are closed ,it is the speed of third stage.

Set four stages of speeds at 26.00-26.03

      ◆ Note: The default is to support the four stages of speed independently. If you want to select more speeds, please check the 26 groups of parameters.

6. Set AO1 output motor current / motor speed, connect to the meter, 15.00 adjust to motor current absolute value / motor speed

The driver output current is compared with the meter display current and is adjusted by 15.03 to make it same.

      ◆ Note: When the motor output is negative at the reverse rotation, the absolute value of the 15.07 parameter AO output mode needs to be taken.

8. Frequently Asked Questions Quick Handling >>

1. External terminal starts without response

   1 Check if the drive works in REM mode (see the top left corner)

   2. *Quick start guide and introduction of general functions with configuration*

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

3 Check the 02.00 parameter, whether the DI status has an input signal, and whether it corresponds to the start signal terminal.

2. Unable to adjust speed properly

1 Check if the drive works in REM mode (see the top left corner)

2 Check if the given channel corresponds to 21.00

3 Check whether the conversion value (voltage or current signal) corresponding to the 02 group changes with the adjustment of the given end.

3.Shutdown time differs from setting time

Check if the bus voltage is higher than 700V when stopping. If you want to get a short shutdown time, please connect the braking resistor and set 60.07 BIT0 to 0 (prohibited).

4. Run Report 02 (OC)

1The acceleration/deceleration time is too short, extend the deceleration time.

Check if the 63 group motor rated parameters are consistent with the motor nameplate

5. Run report 05 (ground leakage)

Check the drive output whether has a series contactor and, if so, ensure that the contactor is absolutely closed during operation of the drive. Check whether the cable at the output of the driver is broken or the environment is wet and insulation is not good. In this case, need check by the insulation test instrument to make confirmation. If no abnormality is found, change 30.02 (selection of fault action to ground) to no action then see whether it is running normally.

6. Run report 17 (output phase loss) / input phase loss

◆Description：The drive will report the output phase loss when the motor is not connected. This is the normal working state. At this point should:

Check whether the motor/power cable is really out of phase. Change the 30.04/30.03 phase loss protection to no action to observe whether it is running normally. If it is normal, it is a false alarm. For more details, please refer to the relevant chapters on fault and maintenance in this manual.

9. Advanced control functions and introductions >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

9.1. Position Control >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Position control mode selection, parameter 40.00

Positioning mode, multi-point position automatic control and feed control, no external controller to send pulses or external commands.

In servo mode, the controller needs to send a pulse or send a position speed command via the bus.

Forced to zero control, parameter 40.31, used for home position return or spindle stop, usually the origin is the Z pulse of the encoder. The positioning speed for the first time of power-on is specified by parameter 40.05. It should not be too high. The default is 60rpm. The origin offset is specified by parameter 40.19.

Position control enabled, parameter 40.01

The system pulse is given speed control. At this time, although the system gives the pulse but performs the speed control and the speed given value is pulse equivalent speed, see parameter 02.15.

9.2. Encoder feedback >>>

9.2.1. Ordinary encoder crossover output, only need to set the gear ratio denominator, see parameter 61.05.

9.2.2. Normal cosine encoder multiplier output, only need to set the gear ratio molecule, see parameter 61.06.

The two sets of parameter settings are completed and need to be powered off and restarted to take effect.

9.3. Speed and position stiffness adjustment >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

9.3.1. Speed loop gain and integration time, see parameters 23.00 and 23.01. Adjust as needed, more depending on the load inertia and the torque factor of the unit current of the motor. The manual step of quickly adjusting the speed loop gain is

a. Set the deceleration time 22.01 to 0.00 seconds and the zero speed delay time 19.02 to 0.5 seconds；

b. Set a lower speed, such as 5% rated speed, start and then stop；

c. Observe whether the shutdown process has a reversal, if any, gradually increase the speed loop gain, then repeat steps 2 and 3 until the reversal phenomenon disappears.

9.3.2. Position loop gain, see parameter 40.07. Adjust as needed, more depending on the encoder feedback performance, using a sine and cosine encoder or a higher than 17-bit high-resolution encoder, the position loop gain can be increased to 150 to 200 Hz； using a common resolution encoder, the position loop gain At 60-120Hz. Under the same conditions, the rigidity of the synchronous motor can be slightly improved compared to the asynchronous motor.

9.4. EMERGENCY STOP ，parameter 10.13

a. If the signal is invalid, it will trigger a shutdown. The default is CONST.TRUE

b. Stop mode 10.14 can choose deceleration stop or free stop

2. *Quick start guide and introduction of general functions with configuration*

c. The stop deceleration time is set by parameter 22.04

9.5. Shieldable fault control >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

a. Input phase loss or DC voltage ripple is too large, parameter 30.03

b. Output phase loss, parameter 30.04

c. Earth leakage fault, parameter 30.02.

d. Fault automatic reset, parameter 30.06

9.6. Fault reset >>

a. External terminal input reset, see parameter 10.11

b. Control keyboard panel reset

c. Bus communication reset

9.7. Motor Thermal Protection >>>

The temperature sensor supports common sensor types and can independently set temperature protection points and fault actions.

Temperature estimation based on thermal model overheat protection requires the user to provide the following information to improve temperature estimation accuracy.

a. Ambient temperature, 31.06, default 40 ° C b. rated temperature rise, 31.07, default 60 ° C

c. Thermal time constant, 31.08, default 300 seconds, ie 5 minutes.

9.8. Carrier frequency control

Carrier frequency setting, 60.00, the recommended value is about 16 times the rated frequency of the motor. For example 500Hz * 16 = 8kHz. When it is greater than 8 kHz, please set it to 8 kHz, and the motor frequency will automatically increase the carrier frequency during the rising process.

9.9. Pre-excitation control

Pre-excitation time, 60.05, default 500ms. Extending the pre-excitation time allows the asynchronous motor to be pre-excited more fully.

9.10. Speed tracking

Speed tracking is enabled by default. If it needs to be turned off, BIT0 of 60.06 should be set to 1 to disable its function. Whether it is a permanent magnet synchronous or asynchronous induction motor, the drive automatically recognizes its status while it is running.

9.11. Flux optimization

See BIT2 of parameter 60.06, which is only applicable to the low speed control case of asynchronous motor without encoder feedback. Flux optimization can significantly improve the torque accuracy of zero speed or low speed.

9.12. Weak magnetic control

Limitation of maximum weak magnetic current of permanent magnet synchronous motor, parameter 60.03, default 70%. This function is used to prevent the motor from entering deep demagnetization and causing a risk of demagnetization of the motor. It is suggested not to exceed 100% of the rated motor current.

Safety measures of weak magnetic zone counter electromotive force. If the permanent magnet spindle has a back EMF corresponding to a maximum speed which is greater than 560 Vrms, a braking resistor must be connected in order to release energy.

9.13. Overvoltage stall and energy brake

When using the braking resistor, please set the maximum voltage control of BIT0 of 60.06 to 0 or turn off the overvoltage stall.

If you need to power down to keep running automatically, please set the minimum voltage control of BIT3 of 60.06 to 1.

In the case of reciprocating motion, such as stone data or oil field boring machine, the non-deceleration prohibition power generation of BIT1 of 60.06 can be set to 1, which can avoid overvoltage and improve energy efficiency. At this time, the DC bus voltage does not rise, and the system energy efficiency reaches the theoretical optimal value.

9.14. Initial phase search of permanent magnet motor

There are two situations in which an initial phase angle needs to be obtained.

a. Run on power for the first time with an encoder.

b. Run every time without an encoder.

The parameters influencing the detection precision of the initial phase Angle are as follows

a. The types of motor are positive polarity and reverse polarity. Most of them are positive polarity, while some manufacturers use reverse polarity.

b. Search current, the default value of motor rated current is 30%.If the signal intensity searched is less than 2.0, it is suggested to increase the search current

9.15. On-line switching of power frequency and frequency conversion >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

a. The function module is enabled. If parameter 48.02 is set to 1, the function module is activated.

b. Phase compensation, parameter 48.03, adjusted as needed to compensate for phase drops that occur during switching

2. *Quick start guide and introduction of general functions with configuration*

c. Two-way switching control, parameter 48.05, the default is always 1, that is, switch to the power frequency mode. When the frequency conversion needs to be switched back, only the parameter pointer value needs to be 0.

d. Phase synchronization rate, parameter 48.06, default is 2.5Hz, that is, the maximum speed adjustment is performed at this frequency until it is synchronized with the grid. In the case of large inertia, it is necessary to reduce this frequency, otherwise overvoltage will occur when braking quickly after phase synchronization.

e. Contactor disconnection delay, parameter 48.07, for the delay time of switching back to the variable frequency drive from the power frequency. The larger the delay time required for a larger contactor, the typical value is around 80ms.

f. Relay signal connection, point the signal source of RO1 or RO2 to 48.00.00, pay attention to the normally open normally closed point. Usually, the power frequency contactor is connected to normally open point, and the contact output of the driver is normally closed point.

9.16. Mechanical brake logic

a. Brake logic enable. Parameter 42.00 is used to activate this logic, requiring direct torque control;

b. Brake delay setting, correctly set the opening and closing delay of the brake, 42.02 and 42.03;

c. Relay signal connection, point the signal source of RO1 or RO2 to 06.02.13

10. Fieldbus communication>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
10.1.Modbus 485 communication

10.1.1. Parameter address calculation, 16-bit address = group number * 256 + index number. For example, the communication address of parameter 22.01 is 256*22+01=5633, or 1601h. The internal address of the Siemens PLC must plus 40001 to get the correct value.

10.1.2. Communication format configuration

Slave address 51.01, baud rate 51.02, frame format 51.03

10.1.3. Reading data

Host sending:

BYTE0	1	2	3	4	5	6	7
Slave address	03	Address high byte	Address low byte	0	Number of bytes	Low CRC	High CRC

Slave response

BYTE0	1	2	3	4	6	7
Slave address	03	Number of bytes	Data high byte	Data low byte	Low CRC	High CRC

Example: Read #01 drive real-time DC voltage value 01.02

Host sending: 01 03 01 02 00 01 24 36 Slave response: 01 03 02 0C 96 3D 2A

10.1.4. Writing data

The host sends the same response as the following:

BYTE0	1	2	3	4	5	6	7
Slave address	06	High address	Low address	High data	Low data	Low CRC	High CRC

Example: Writing #01 drive parameter deceleration time 22.01 needs 1.00 second

The host sends and responds: 01 06 16 01 00 64 DD A9

10.1.5. Start and stop control

Write control word to register address 0001h

a. The forward start command is 0882h, Communication write: 01 06 00 01 08 82 5F AB

b. The stop command is 0881h, Communication write: 01 06 00 01 08 81 1F AA

c. Reverse start command is 8882h

d. The fault reset command is 0980h

Control word definition

Bit number	Definition of content	8	Fault reset
0	Stop request	9	Jog 1
1	Start request	10	Jog 2
2	Emergency stop(Free stop)	11	Remote command must be valid
3	Emergency stop(Deceleration stop)	12，13, 14	Reserved

2. *Quick start guide and introduction of general functions with configuration*

4, 5, 6	Reserved	15	Running direction
7	Run enable must be valid		

10.1.6. Speed torque control

Write speed reference to register address 0002h, 0003h writes torque reference.

a. For example, if the set speed is 1500.0 rpm, the communication is written 01 06 00 02 3A 98 3B 00

b. For example, if the torque bit is set to 30.0%, the communication is written 01 06 00 03 01 2C 79 87

10.2.CANopen communication

10.2.1 Communication parameter configuration. Only the following two parameters need to be configured, and the rest are executed according to the standard Cia402, DS301.

a. Node address, Parameter 52.00, default 1

b. Baud rate, parameter 52.01, default 1Mbps

10.2.2. After installing the specified EDS file, the PLC can automatically scan to the drive online.

10.2.3. The initialization steps of a typical PLC with CANOPEN after scanning to the drive are as follows:

a. Read device type, address 0x1000 in object dictionary, return 0x00010192

b. Read the manufacturer ID, address 0x1018, sub01 in the object dictionary, return 0x02001024

c. Configure the communication cycle through SDO, as well as the parameters of each PDO

d. Preconfigured parameter list via SUDO

e. Start synchronous triggering PDO transmission and reception

10.2.4 Case list

10.2.4.1 Start with RPDO4 (control word 0x080F) and set the speed to 300rpm (0x012C) and torque is set to 10.0% (0x0064)

Send，ID = 0x0501，DAT = 0F 08 2C 01 64 00 01 00

Response: NO

10.2.4.2 Query by TPDO4 (for example, status word 0x0627, actual speed 300.0rpm (0x0BB8), actual torque 1.0% (0x000A), actual mode torque control (0x0001)

Send: ID = 0x0481，DAT = 00 (Any value and any length)

Response: ID = 0x0481，DAT = 27 06 B8 0B 0A 00 01 00

10.2.4.3. Downloading service through the SDO and modifying the drive deceleration time parameter 22.01 (corresponding to 0x4016, sub01) needs15.00 seconds (0x05DC)

Send: ID = 0x0601，DAT = 22 16 40 01 DC 05 00 00

Response: ID = 0x0601，DAT = 62 16 40 01 00 00 00 00

10.2.4.4. Uploading service through the SDO and reading the actual drive speed of 01.00, assuming 300.0rpm (0x0BB8)

Send: ID = 0x0581，DAT = 40 01 40 00

Response: ID = 0x0581，DAT = 4B 01 40 00 B8 0B 00 00

10.3. PROFIBUS-DP Communication

10.3.1. Parameter configuration, Only the node address and PZD mapping are configured, while the rest are detected automatically.

a. Node address, 50.00, default 3

b. The baud rate and PPO type are automatically set by the master station without editing.

c. PZD mapping

50.15 to 50.26 corresponds to the mapping of PZD1 to PZD12. The default PZD1 corresponds to the status word, PZD2 corresponds to the actual value 1, and PZD3 corresponds to the actual value 2.

50.27 to 50.38 corresponds to the mapping of PZD1 to PZD12. The default PZD1 corresponds to the control word, PZD2 corresponds to the bus given 1 and PZD3 corresponds to the bus given 2

10.3.2. Calibration relationship between given and actual values

Calibration of the given value, parameters 50.05 and 50.06 correspond to the given calibration type

a. Speed given mode, 20000 corresponds to the speed calibration value of 19.00;

b. Torque given mode, 10000 corresponds to 100.0% motor rated torque;

c. Transparent given mode is not converted and can be used directly.

Calibration of actual values, parameters 50.07 and 50.08 correspond to actual value calibration type

a. Speed given mode, the speed value of 19.00 corresponds to 20000;

2. *Quick start guide and introduction of general functions with configuration*

   b. Torque given mode, 100.0% motor rated torque corresponds to 10000;

   c. Transparent given mode is not converted and can be used directly.

The definition of the control word, in accordance with the standard, the typical command value is as follows

  a. Start: 0x047F (1151)

  b. Stop: 0x0477 (1143)

  c. Fault reset: 0x04F7 (1271)

10.3.3 After installing the GSD file, you can scan to the drive online via TIA software.

ACX is a drive for controlling asynchronous AC induction motors and permanent magnet synchronous motors.

The figure below shows the simplified main circuit diagram of the drive.

1	Rectifier. Converts alternating current and voltage to direct current and voltage.
2	DC link. DC circuit between rectifier and inverter.
3	Inverter. Converts direct current and voltage to alternating current and voltage.
4	Brake chopper (R-, R+). Conducts the surplus energy from the intermediate DC circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor. The user obtains and installs the brake resistor when needed. Brake chopper is as standard in frames 0... 3.
5	DC connection (UDC+, UDC-), as standard for 5... 9.

************************** Quick start guide postscript **************************

    For more professional or flexible application of configuration technology, industry application experience settings, etc. please read the relevant sections in details. At the same time, you can also actively contact or participate in the online and offline technical communication and network support communication related to this equipment. In order to obtain the best, fast and efficient response, we suggest that you handle or contact from top to bottom as follows.

  1. Read the Quick Start Guide of this instruction manual and the detailed description of each relevant section.

  2. Manufacturer technical support for the device where the drive is located

  3. Support from our agent, distribution intermediary staff of the driver sold

  4. Technical support from drive manufacturer

  5. The drive is linked to Internet websites, WeChat and other communication platforms to obtain the latest relevant information

2. Quick start guide and introduction of general functions with configuration

› **EMC-zone concept, a quickly guide to cabinet design**

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

2) Area principle: separated by well-grounded steel plates

Area A is the power supply including the filter wiring section where the emission noise should be kept at a specific limit

Area B comprises line reactor and noise source driver brake unit contactor

Area C is equipped with control transformer and noise receiver control system and sensor system

Area D forms the signal and control cable with the surrounding interface portion where a certain level of immunity is required

Area E consists of a three-phase motor and its power cable

The area should be isolated in space to facilitate electromagnetic decoupling

Minimum spacing between areas is 20cm

Decoupling with a grounded baffle is better. Cables in different areas are not allowed to be placed in the same cable line

If the filter is required to be installed at the inter-area interface location, the unshielded cable can be used in one area. All bus cables (such as RS 485, RS 232, CANopen, etc.) and signal cables from the cabinet must be shielded.

3) The space between wiring, wiring, maintenance and adjustment operations should be left when arranging components.

4) About ventilation and heat dissipation

General empirical formula for calculating temperature rise of frequency conversion cabinet

Calculation of sealed temperature rise of frequency converter cabinet(Door closed, no fan)

$Trise = Ploss/(5.5 \times A)$

A: surface area cabinet, unit m2

Ploss: Driver heat loss power, usually estimated to be 3% of the driver power, unit w

Calculation of temperature rise of fan cooling drive

$Trise = (0.053 \times Ploss)/F$

F: Fan flow, unit m3/min

Calculation of air volume required for frequency conversion cabinet

$V = (Ploss/Trise) \times 3.1$

V: The drive maintains the required air volume for the temperature rise, unit m3/hour, Ploss: Driver heat loss power, usually estimated to be 3% of the driver power, unit w

Trise: Drive cabinet allows temperature rise

3.1: Sea level heat

Example: calculate the internal temperature rise of 2 piece of 15kW cabinets (no fan)

$TRISE = PLOSS/(5.5 \times A)$

PLOSS = 450W (every 15 kw driver)

A: The top of the cabinet = 0.4x 0.4, side of the cabinet = 0.4x 2, cabinet = 0.4x 2, A=1.76m2 estimated at 2m2

Then: $TRISE = 900/5.5 \times 2 = 80℃$

Example: The total drive capacity of the drive cabinet is 55kW

The ambient temperature is 35 degree, and the maximum operating temperature of the drive is 50 degree.

Trise=15 degree

Ploss=55000 X0.03=1650W

Frequency conversion cabinet needs to be equipped with fan air volume

V=1650 X3.1/15=333m3/h

Note: the information of single actuator design ventilation volume, and the fan power of the actuator are available in the following technical data chapters for design reference.

Line supply

Control cabinet

Zone A

Supply system connection
- Fuses
- Switches
- Contactors

- Line filter
- Line reactor

Zone B

Power unit / rectifier

possibly braking chopper

Power unit / inverters

Motor connection
- Switches
- Reactors
- Filters

Zone C

Controller
- Control Unit (CU)
- Possibly safety relay
- Possibly SIMATIC
- ...

Sensor equipment
- Temperature sensing
- Position evaluation
- Pressure sensing
- ...

Zone D

Zone E

M 3~

Machine

Mechanical system

- - - - - - Grounded metal partition

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2. *Quick start guide and introduction of general functions with configuration*

⊕3.Safety instructions

This chapter describes the safety instructions you must follow when installing, operating, and maintaining the drive. Ignoring these safety instructions may cause personal injury or damage to drivers, motors and their drive equipment。 Please read the safety instructions before doing anything with the equipment

Instructions for warnings and cautions, this manual contains 5 types of safety instructions (from left to right)

Hazardous voltage warning: To warn the presence of high voltage, which may cause personal injury and/or equipment damage

Hazardous Voltage Warning: To warn that the device will continue to have high voltage within 10 minutes after the main power is cut off, which may cause personal injury and/or equipment damage.

General Warning: To warn non-electrical factors that could cause personal injury and/or equipment damage.

Electrostatic Discharge Warning:To warn the electrostatic discharge that can cause equipment damage.

Surface high temperature warning: To warn the surface of the parts to be hot, which can cause burns when in touch.

Electrical installation must be done by a professional

〉 **Safety precautions during installation, operation, and maintenance**

The following warnings can be applied to those who need to install and maintain drives, motor cables, or motors.

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

The drive, motor cable or motor cannot be repaired when the input power is connected. After disconnecting the power supply, you must wait at least 10 minutes before operating the drive, motor or motor cable so that the intermediate DC link capacitor is discharged.

Confirm with a multimeter measurement (resistance is at least 1 MΩ)

1. There is no voltage between the inputs R, S and T or (L1/L2/L3) of the actuator and the ground.
2. Dc bus UDC+ and UDC- ground - to - ground voltage is zero.
3. PB, + and - to - ground voltage is zero.

These instructions are for all personnel that install the drive and do maintenance work on it.

WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

Handle the drive carefully.Picture below for your reference

• Use safety shoes with a metal toe cap to avoid foot injury.

• Frames C4···C9: Lift the drive with a lifting device. Use the lifting eyes of the drive.

• Frames C6···C9: Do not tilt the drive. The drive is heavy and its center of gravity is high. An overturning drive can cause physical injury.
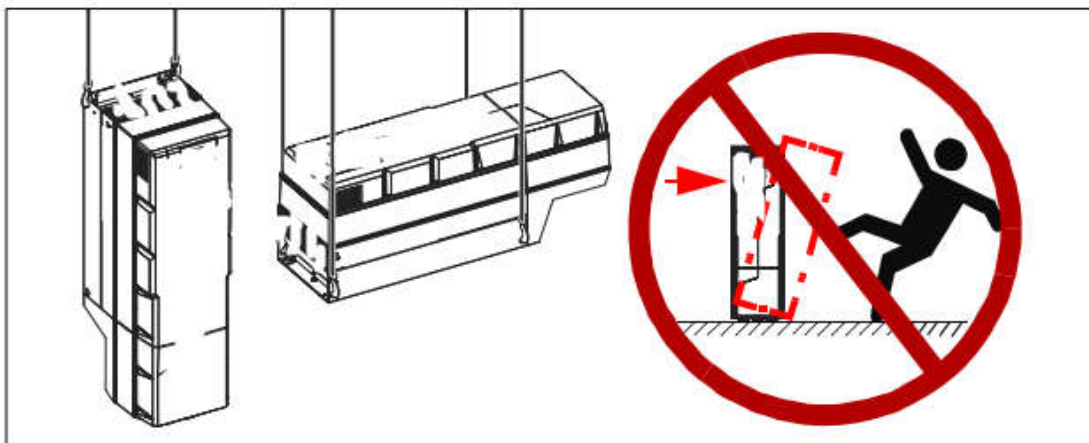
==Beware of hot surfaces. Some parts, such as heatsinks of power semiconductors,remain hot for a while after disconnection of the electrical supply.==

• Make sure that debris from borings and grindings does not enter the drive during the installation. Electrically conductive debris inside the drive may cause damage or malfunction.

• Make sure that there is sufficient cooling. See sections Checking the installation site on and Losses, cooling data and noise for more information.

• Before you connect voltage to the drive, make sure that the drive covers are on.Keep the covers on during the operation.

• Before you adjust the drive operation limits, make sure that the motor and all driven equipment can operate throughout the set operation limits.

• Before you activate automatic fault reset functions of the drive control program,make sure that no dangerous situations can occur. These functions reset the drive automatically and continue operation after a fault.

• The maximum number of drive power-ups is five in ten minutes. Too frequent power-ups can damage the charging circuit of the DC capacitors. Safety instructions

• If you have connected safety circuits to the drive (for example, emergency stop and Safe torque off), validate them at the start up. For the validation of the Safe torque off, see chapter about Start-up, control with I/O and ID run. For the validation of other safety circuits, see the instructions provided with them

• When the control location is not set to Local, the stop key on the control panel will not stop the drive.

Control the drive of the permanent magnet motor

The rotating permanent magnet motor feeds the drive so that the drive is charged even when the motor stops and the power is cut off. Before starting maintenance on the drive, please

  Disconnect the motor from the drive via a safety switch
  Prevent starting of any other motor in the same mechanical system
 Lock the motor spindle

The measuring motor confirms that it is not charged, and then connects the U, V and W terminals of the drive to each other and to the PE.

Do not operate on the control cable when the drive or external control circuit is powered. Even if the power to the drive has been cut, the control circuit powered by the external power supply will introduce dangerous voltage into the drive.

Do not perform any insulation or voltage withstand tests on the drive or drive module.

For drivers installed on IT power systems (ungrounded power systems or power systems grounded in high resistance (over 30 ohms) mode), if the varistor or internal EMC filter is not disconnected, the driver will be grounded through the varistor / filter. This may cause damage to the drive.

For drives mounted on a corner-grounded TN system, the drive will be damaged if its varistor or internal EMC filter is not disconnected.

⟩ **Attention to dangerous voltage**

==WARNING! Ignoring the following safety instructions may cause personal injury or equipment damage.==

Dangerous voltages may still be present on circuit terminals R/L1, S/L2, T/L3 and U, V, W and UDC+, UDC-, PB even if the motor has stopped.

Depending on the external wiring, dangerous voltages (115V, 220 V or 230 V) may be present at the relay output terminals on the drive control unit.

Repairing the drive on site is not allowed. Don't try to fix a faulty drive on site. Please contact your local representative office or an authorized service center for replacement.

During installation, it is necessary to ensure that the conductive dust generated by drilling does not enter the drive. Conductive dust inside the cabinet may cause damage or malfunction to the drive.

  Ensure that the drive is fully cooled

==WARNING! The printed circuit board contains components that are sensitive to electrostatic discharge. Please wear a grounded wrist strap when handling the board to avoid unnecessary touch with the circuit board==

〉 **Start and run**

These warnings apply to the design of the drive's operating procedures, the engineering technician who starts or operates the drive.

WARNING! Ignoring the following safety instructions can cause personal injury or equipment damage.

Before debugging the drive, you must ensure that the motor and its dragging device can operate within the speed range provided by the drive. The drive can be adjusted so that the drive motor runs above or below the speed obtained when the motor is directly connected to the power grid.

Do not activate the automatic fault reset function of the standard application if a dangerous situation occurs. This function is activated after a fault and the drive will reset and resume operation.

Do not use AC contactors or circuit devices (circuit breaker) to control the motor. Instead,drive is controlled by using the control panel or via the control commands of the drive I/O board or the fieldbus adapter. The maximum allowable charge cycle (i.e., started by adding power) for a DC capacitor is every two minutes. For the R1-C2-C3 series, the total maximum charge times are100,000, and for the C4 and above models, it is 50,000.

Control the drive of the permanent magnet motor: Do not run the motor above the rated speed. Overspeeding the motor can cause overvoltage, which can permanently damage the driver.

Caution：

If the external signal source of the start command is selected and the signal source is in the ON (start) state, the drive will start immediately after the fault reset unless the driver is configured with a 3-wire (pulse) macro start/stop.

When the drive control position is not set locally, the stop button on the control keyboard will not stop the drive.

〉 **About grounding**

WARNING! Ignoring the following instructions can cause personal injury and death, and increase electromagnetic interference and equipment damage.

In any case, the driver, motor and its connecting equipment shall be grounded to ensure personal safety and reduce electromagnetic radiation and electromagnetic interference.

。

The size of the ground conductor must meet the requirements of the local safety regulations. Ground wire resistance value must be less than 10 Ω. Otherwise, the equipment will be abnormal or even damaged.

When multiple drives are installed, ground protection (PE) is carried out for each drive separately.

In order to suppress electromagnetic interference, EMC radiation must be minimized. When the cable enters and exits the cabinet, 360° high-frequency grounding is required. In addition, in order to meet safety regulations, it is also necessary to connect the cable shield to the ground (PE).

Do not install an EMC filter with a strong leakage current in a floating-ground or high-resistance grounding resistance (more than 30 ohms) power system

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

Note:

Only when the size of the power cable shield meets the requirements of safety specifications 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 rated contact current is more than 3.5 mA (AC) or 10 mA (DC), a fixed protective earth conductor and a protective earth conductor with a cross-section of at least 10 mm 2 copper or 16 mm 2 aluminum shall be used. Or when the protective earthing conductor is disconnected, the power supply is automatically cut off or the cross-sectional area of the second protective earthing conductor and the original protective earthing conductor are the same.

⚠ WARNING ! The surface of the drive system (eg.: exposed radiator, metal case, input reactor and braking resistor in use) will generate high temperatures when
the system is in use. Do not touch, or there is a risk of burns!

Note: It is strictly prohibited to plug and dial each extension board card with electric charge, otherwise it may cause permanent damage to the driver or connected parts.

Table of Contents

4. *Table of Contents*

⊕5. Operation principle and hardware / control panel description
Introduction to all functional and control unit of complete machine

> ⚠ 🖐 **Is strictly prohibited to plug and dial each extension board card with electric charge, otherwise it may cause permanent damage to the drive or connecting parts!**
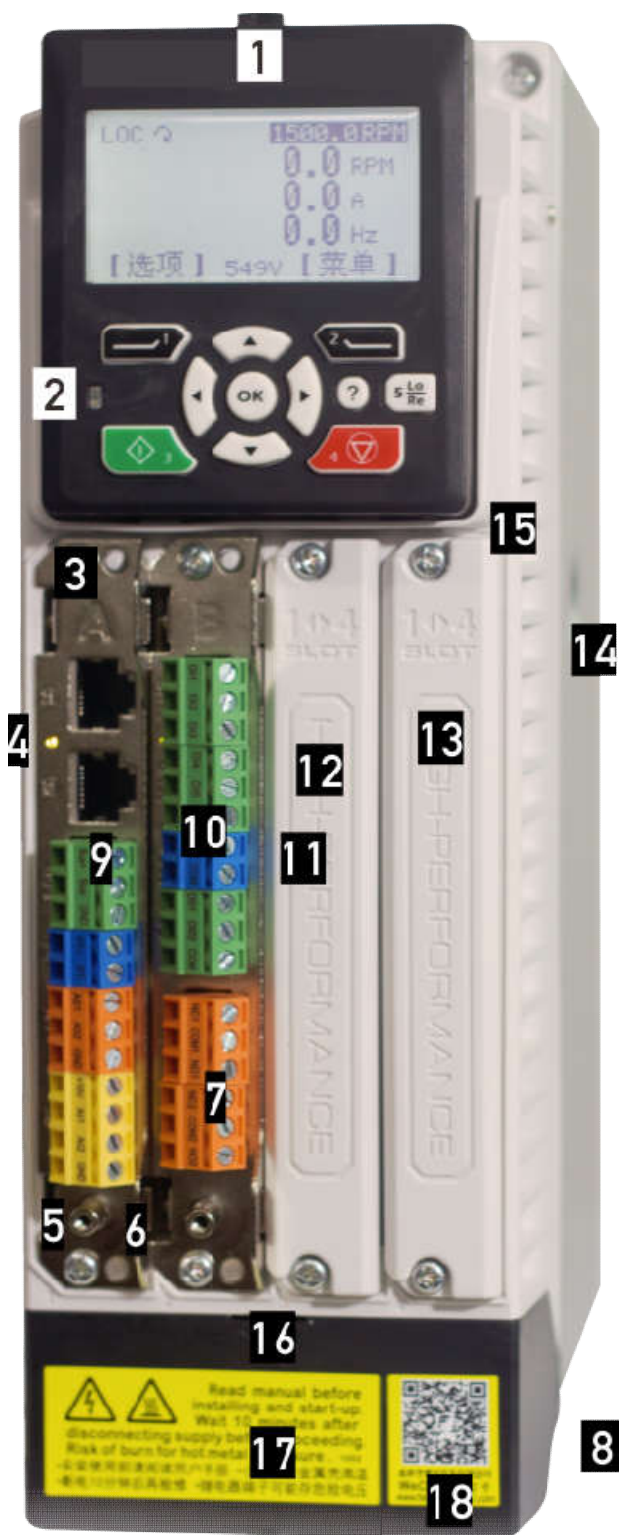
1. Pluggable operation controls the keyboard and the position where the release key is located to operate the keyboard extension using EIA/TIA568B standard line sequence
2. The current state of the main drive is LED color indicator
   The following description is mainly for: function cards such as interfaces and communication.
3. Locking and removing screws
4. Power Indicator
5. Signal ground stud, drive built-in control unit I/O board ambient temperature detection NTC probe location
6. The signal cable is bundled and fixed, and the external ground wire of the I/O board is controlled to be connected to the fixing screw column or bracket (M3).
7. Relay output and its protective cover
8. Air inlet
9. Standard analog input and output interface card (including CAN, 485 communication network port and terminal motor temperature monitoring analog input and output each 2 channels)
10. Standard digital input and output interface card (including 6 digital, 1 +24V 2 input and output bidirectional DIO terminals 2 relay outputs)
11. Below is the location of the X92 standard memory card
12. SLOT3-card slot for various speed feedback interface cards
13. SLOT4-card slot for various high-speed communication interface cards
14. Driver main power and base
15. C2 and above shape standard common control unit
16. C2X power terminal cover and its release gap
17. Safety alert and instructions label
18. Data update link QR code
    （not for all models）

〉 **Drive system function hardware composition and instructions for use**

When using this series of drive integrated into the drive system, due to the inherent physical characteristics of the use of power electronics products, and the requirements of electrical design and safety regulations, all kinds of related components should be installed on the input and output side of the drive to ensure that your drive system has a scientific and reasonable drive complete system with standardized, safe, reliable, environmentally friendly and relevant international or industry standards.
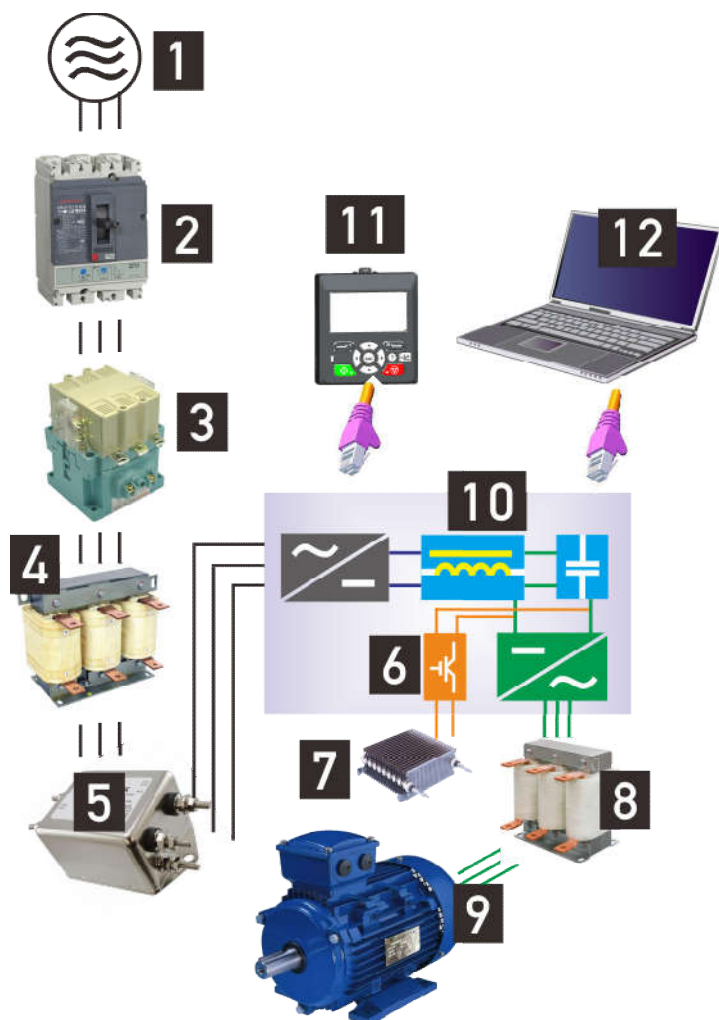
1. power supply,Please use a power supply that meets the specifications.

2.MCCBFuseless circuit breaker Or leakage circuit breaker (The driver will have a certain inrush current when it 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.Input side AC reactor
   Harmonic suppression, improved power factor, and some models with built-in DC reactors are also reduced.

5.Input side noise filter
   Reduce input side electromagnetic conduction interference

6.Drive built-in energy brake chopper

7.Energy consumption braking resistor

8.AC output reactor,To improve the motor line length and leakage flow problems

9.Motor,Please pay attention to regular inspection of motor heat dissipation and insulation

10.Drive

11. Extendable drive operation control keyboard

12.Drive debugging, configuration and monitoring software platform

Technical description and recommendation

>>>>1. Please note that the drive allows the power supply within the specifications (voltage level, single or three phase, voltage fluctuations, voltage imbalance, etc.)

>>>>2. Due to the driver input and high-speed switching electronic inverter characteristics, please select the circuit breaker or leakage protection switch that meets the electrical specifications.

>>>>3. Appropriate output side AC reactor can effectively suppress the input side higher harmonics and improve the power factor (the model with DC reactor can reduce this requirement, depending on the use or industry experience)

>>>>4. Noise filters on the input and output side and common mode inductors (magnetic rings) can effectively reduce the transmission and radiation effects between the drive system and external electrical components, and can be designed to improve the stability and reliability of the system in different application scenarios

>>>>5. AC output reactor (Du/Dt) measures, etc., are used to suppress the resonance spike voltage generated on the motor side when the motor cable is too long (for example, more than 100 meters) to protect the motor coil, and drive the coil winding insulation performance. In particular, this should be carefully evaluated when it is degraded or unfavorable. This measure can also help to reduce the leakage of the motor-to-ground due to the distributed sensing capacitance.

>>>>6.Standardized strong and weak power separate wiring, well-standardized grounding, weak control signal line GND follow-up and twisted pair, power contactor coil with suction and arc-extinguishing elements will effectively improve the electrical reliability of the drive system.

5. *Operation principle and hardware / control panel description*

The following figure shows the internal power loop topology of a typical single drive.(Standard transmission series models, some models separate rectification from inverter)
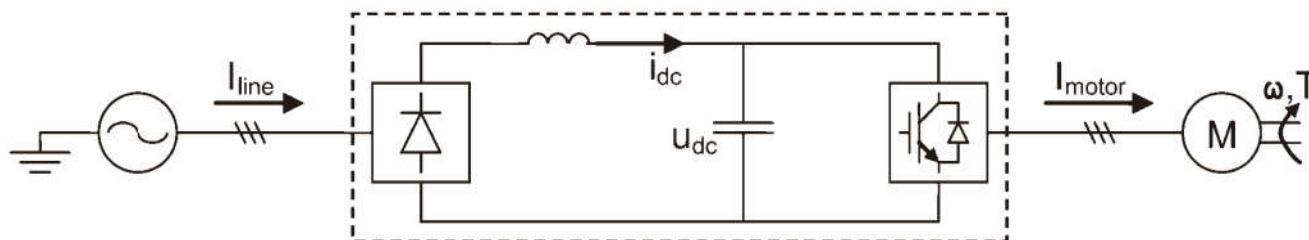
The following figure shows the internal power loop topology of the driver of typical low harmonics with intelligent rectification and feedback.
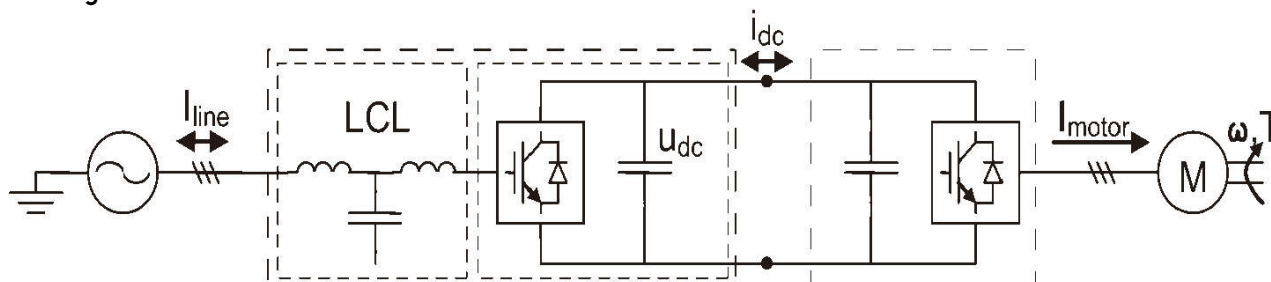
〉 **Control keyboard layout and display interface introduction**

The control panel can be used to control the drive, read status data, and adjust parameters.

Controlled indication.

The icon at the top of the display, where LOC(LOCAL) represents LOCAL control, REM(REMOTE) represents REMOTE control, and (L) represents REMOTE control, but the start command comes from the panel. The LO/RE button allows you to quickly switch to local remote mode. In local mode, all start and stop and speed control are performed by the panel. In remote mode, starting and stopping mode and speed are set according to the user configuration. The default is DI1 forward rotation start and stop, DI2 reverse rotation start and stop, and AI1 speed regulation. See parameter group 10, 11 and parameter group 21 for details.

Current speed given. The data in the upper right corner is the current speed given value, which is used to quickly confirm whether the speed given is consistent with the user's demand.

DC voltage display. The data at the bottom middle position is the real-time value of the DC bus voltage, which is used to quickly confirm the grid condition and so on.

Monitoring content display. The center's three-line large font area is the main monitoring content. There are 8 pages that can be cyclically displayed and switched by pressing the left arrow or the right arrow. Press OK to display the name and parameter address of the monitored content.

Menu directory. The [Option] button is used to enter local speed or torque given editing, forward and reverse switching. The [Menu] button is used to enter the main menu, including browsing the complete parameter list, fault log, parameter change log, parameter upload and download, etc.

About the drive status LCD display panel: The upper left arrow is the main indicator. Specifically, the arrow clockwise is the forward drive, the counterclockwise is the invertion, the solid arrow indicates that the output is equal to the given, and the dotted arrow indicates that the output is different from the given, usually in acceleration or deceleration. The stationary arrow indicates that there is no output in the drive standby. No arrow display indicates that the drive is not allowed to run (such as driver undervoltage, no start enable signal, etc.)

5. *Operation principle and hardware / control panel description*

〉 Key function description

1. [Start], local start button
2. [Stop], local stop button
3. [Lo/Re], local remote mode switch button
4. [Left multi-function button] is used to exit to the previous menu, or cancel editing, or fault reset, etc.
5. [Right multi-function button] is used to enter the next level menu, or performe functions such as selecting or saving edits.
6. [OK], confirmation key,is used to perform functions such as selecting or saving editing, or to display the parameter name and address of the current monitoring content.
7. [←], [→] is used to move the cursor, etc.
8. [↑], [↓] is used to increase or decrease the editing parameters. In the main interface state, the local reference value can be directly modified.
9. [Help] for help and tips
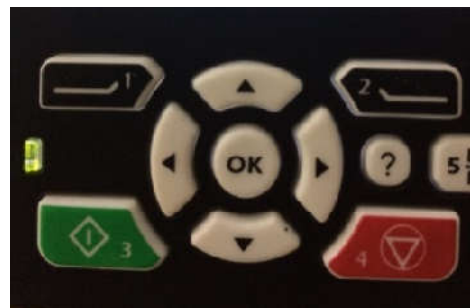
Special operation instructions for the LCD segment pattern display operation keyboard on the upper right
11. The upper left corner of the display window is the parameter group name. The above figure has displayed the full position and each unit name or symbol in full screen. The lower left corner is set to enter, and the lower right corner is the parameter change save and return button.
12.The center position of the display window is the current display or set physical quantity value, and the front '-' indicates the negative value or the reverse direction. Other operations can be found in this chapter.

〉 Local control debugging

Confirm that it is in the LOC state, press [Start] to start, press [Stop] to stop, press [Option] -> [Local Reference] to modify the speed reference.

〉 Parameter reading and editing

In the main interface, press [Menu]->[Parameter List] to enter the parameter group selection. The parameter group number is from 1 to 63. Press the up and down keys to select the parameter group arbitrarily, and press the left and right button to quickly page. 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.
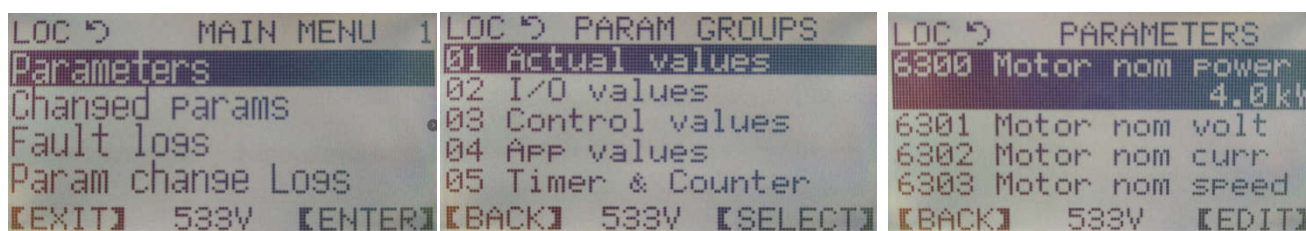
〉 Parameter upload and download

When you need to copy parameters to another machine, first upload the parameters of the source machine that needs to be copied to the control panel. Then carry the panel to the new machine and select Download for parameter copying. The uploading step is [Menu]->[Parameter Backup]->[Upload], and the drive's change parameters will be stored in the memory of the control panel. The download procedure is: [Menu]->[Parameter Backup]->[Download]. After the upload and download are completed, the interface will display the total number of parameters transmitted.
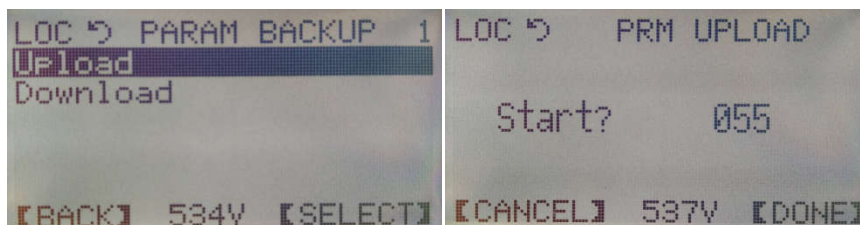
⟩ **Fault record tracking**

[menu]->[fault log] can view the past 100 fault records and contents, where the first one indicates that the time scale is the last fault, and the recorded diagnostic data varies according to the fault category. The principle is only to record the data that is conducive to the diagnosis of the fault.

The main display interface monitors all DI status in real time
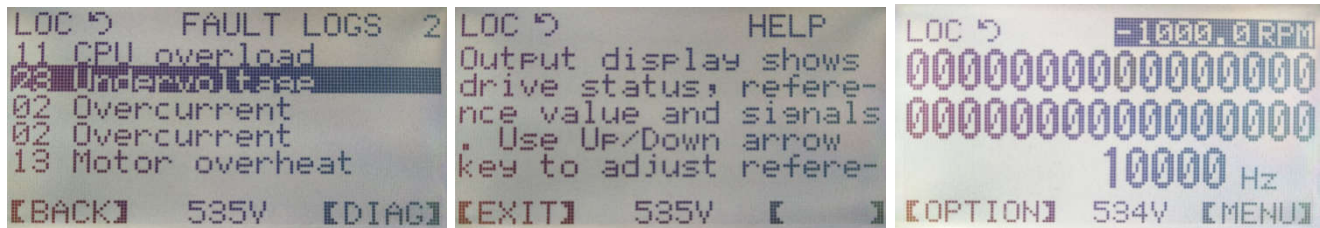
⟩ **Definition and editing of array Pointers**

MSB(Bit8-15)	LSB(Bit0-7)
Group No.	Index

The numerical transfer or connection between functional modules is realized by numerical pointer. The format of pointer is defined as 16-bit variable, where the high 8-bit is the parameter group number and the low 8-bit is the index number. For example, the pointer address of parameter 01.02 is 0102H, the pointer address of parameter 22.01 is 1601H, where the conversion of decimal 22 to hexadecimal is 16H. If you need to give the converted value of AI1 as the speed given, you need to point the speed given source selection parameter 21.00 to the parameter 02.03 AI1 conversion value, ie 21.00 = P.02.03 or 0203H. The constant Zero means that the pointer points to a constant of zero.

⟩ **Definition and editing of Bit pointer**

The logic signals are represented in the form of bits, and the connections between the logical units are connected by bit pointers. The format of the pointer is defined as a 16-bit variable, where the upper 6 bits are the group number, the middle 6 bits are the index number, and the lower 4 bits are the bit number. For example, in the state of parameter 02.00 DI, the pointer corresponding to DI2 is p.02.00.01. 02 is the group number, 00 is the index number, and 01 is the bit number. The way to correlate the source of the relay to DI2 is to make parameter 14.29 RO1 source = P.02.00.01 or 0821H or 000010 000010 0001B. The constant const. True means always 1, and the const. False means always 0.

b[15..10]	b[9...4]	bit[3..0]
Group No.	Index	Bit number

〉 **CX Series of standard system wiring diagrams (Typical examples)**

Resistor

Brake Chopper unit

Resistor (R1-C2-4)

V131
18. 4. 2018

Options

Du/dt Rector

EMC Filter

Motor

MCCB MC

L1/R
L2/S
L3/T

(-) (+) PB

R/L1
S/L2
T/L3

Power circuit module

U
V
W

Filter

U
V
W

M

Power supply

SLOT 1

SINK/NPN mode (default)

SINK

+24V/200mA
+24V
COM

SLOT 2

A+/485+
A-/485-
GND
CANH
CANL

1. CANH
2. CANL
3. NC
4. GND
5. GND
6. GND
7. A-
8. A+

RJ45 Port

fieldbus protocols MODBUS 485 CANopen

SOURCE

DI1
DI2
DI3
DI4
DI5
DI6

J8

SINK/NPN
SOURCE PNP

Digital input

CAN Ter_resistor Jumper J15 120Ω

NC NO

J12

CAN RS485

Standard analog input and output module

Bus+
Bus-
GND

M3螺钉 2*2.5口 端子式 通讯口

Motor Temp.PT KTY84 PT100 PT1000

PT+
PT-

Motor Temp. Input (default)

J14

KTY84 PT100

+24V
COM
DIO1
DIO2

Standard digital input and output module

DIO1/DIO2with Digital Input

SINK:COM
SOURCE:+24V

Analog input 3

1KΩ
5KΩ

+10V
PT+/AI3 0~+10V
PT-
GND

Optional function

J17

PT AI3

Digital input output

Max. DC24V/50mA

Max. DC24V/50mA Pulse output 0~50KHZ

DIO1
COM
DIO2
COM

DIO1 support High pulse input

DIO2 support High pulse output

J11 DIO1 DI7

J12 DIO2 DI8

Analog ouput

AO1 0~+10V/0~20mA
AO2 0~+10V/0~20mA
GND

J18

AO1 V I

J16

AO2 V I

NC1
COM1
NO1
NC2
COM2
NO2

RO(Relay):
AC250V >10mA, <3A
DC30V >10mA, <1A

J10 EMC jumper

PE GND

Cap

J4

+10V +24V

Analog input 1-2

1KΩ
5KΩ

+10V
AI1 -10~+10V/-20~20mA
AI2 -10~+10V/-20~20mA
GND

J11

AI1 I V

J13

AI2 I V

J10

PE GND

Cap EMC Jumper

*Updated AIO/DIO design support I/O features:
1.+10V and +24V can be switched
2.PT port use to AI3 with voltage input
3.CAN and RS485 mode change by switch
4.AI1&AI2 with negative V/A input switch by parameter.
5.DIO1/DIO2 support input by SINK and SOURCE mode
*R type drives I/O:2x analog (only positive) input、1x output, Digital (only SINK) output x(5+1)、output x1 RO relay x1, no PT/RJ45 port.

Legend

Shield cable

Twisted Shield cable

Switch

3P jumper

RJ45 Control Panel

Standard with EIA/TIA568B

5. *Operation principle and hardware / control panel description*

〉 RX Series of standard system wiring diagrams (examples)

Before the more updates on this page, because R and C series hardware interfaces are similar, Only some of the ports that are not commonly used are deleted due to the limited size of the physical structure, and the various types of option cards are designed to be incompatible with each other due to the different physical shapes between R1 and C2. The details are described in the wiring diagram below, and the wiring can be implemented in comparison with the physical object..

5. Operation principle and hardware / control panel description
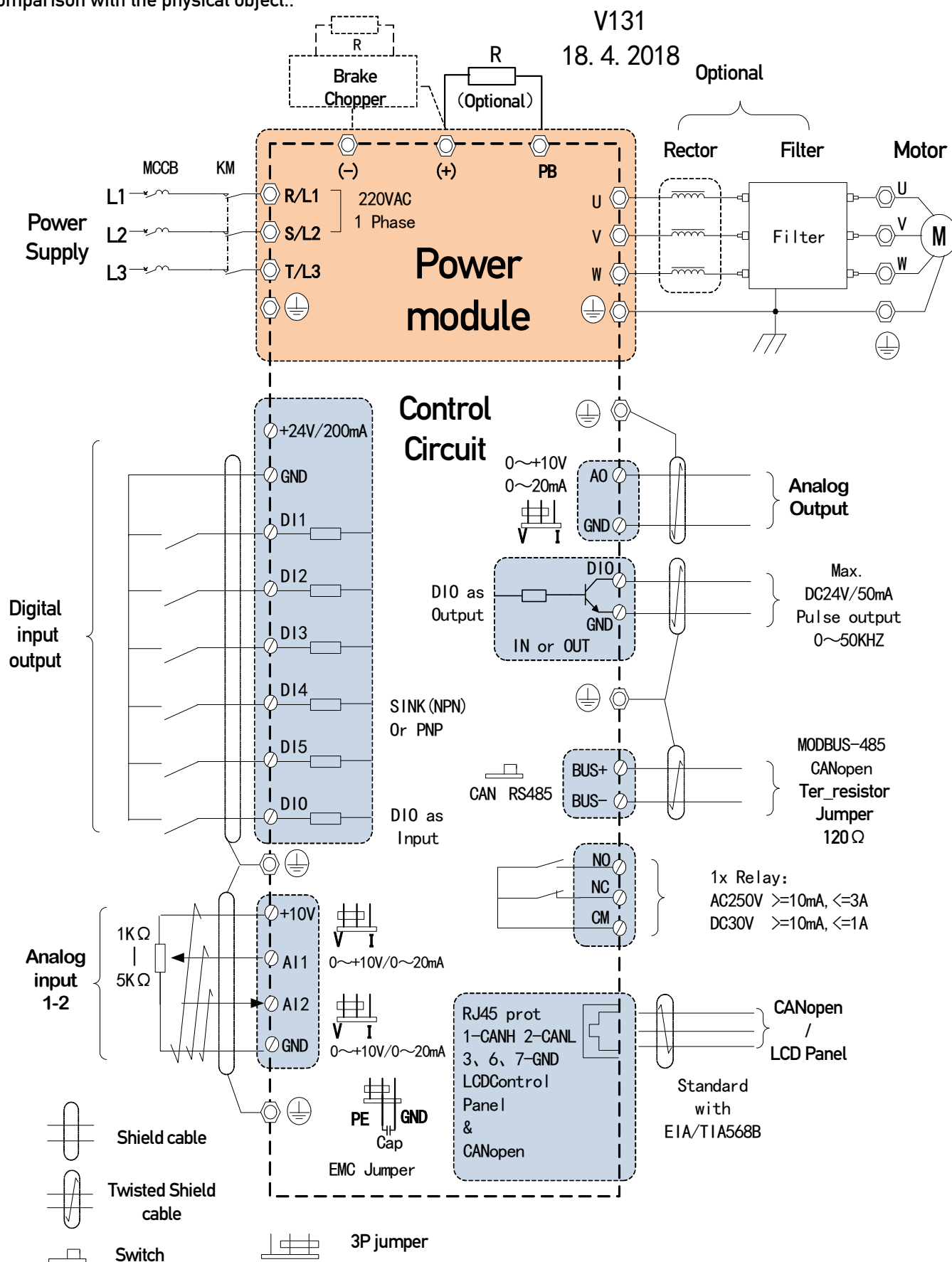
✛6. Mechanical design planning and installation for Cabinet

Content

This chapter will guide you how to install a drive module into a user-defined cabinet. The problems discussed are necessary for safe and trouble-free operation of the drive system.

⚠️ Note: The installation examples in this manual only help the installer with the installation design. Please note that the installation design of the drive must comply with the relevant laws and regulations of the installation site. If the installation of the drive violates the requirements of local laws/regulations, our company shall not take any responsibility.

Cabinet structure

The cabinet frame must be sturdy enough to carry the weight of driver parts, control circuits and other equipment installed internally. The cabinet must provide the driver module with anti-touch protection and meet the requirements of dust and humidity (see technical data chapter).

Equipment layout: Space layout is suggested for for the convenience of installation and maintenance. Space is required for adequate cooling air flow, mandatory spacing, cable and cable support structures. If you need to know the layout example, please refer to the cabinet instructions at the front of the manual and the section on cooling and protection levels below.

Grounding of the mounting structure: Make sure all connections or shelves where actuator system components are installed are properly grounded and the connection surfaces are not painted.

⚠️ Note: make sure that all components are properly grounded through fastening points on the base and screw columns of the control unit (below). It is suggested to mount the EMC filter (if available) and the drive module on the same mounting plate.

For C series models: in order to ensure good and reliable performance of the system, all I/O CARDS on the control unit (the position shown in figure 1 on the lower right) need all reliable access to protect the land (PE).

Grounding mount of Control line EMC

This fixed frame component is designed to allow the user to quickly and reliably ground and fix the control cable (this part may be an optional part for small and medium power models, if necessary, please communicate and confirm before ordering). Its main functions are to realize the fast same potential ground of control unit I/O card (only C series models), the fast ground of control shield wire network, and the fixed cable. The specific installation and use points are as follows

Installation steps:

C series models: After the completion of the connection of the main power part of the c2-3 model, loosen the fixing screw of the lower end of the 4 board clip (as shown in figure 1 on the lower right), and then fasten the fixing frame into the screw. For R series models, only the fixing frame is inserted into the fixing screw of the whole machine and then locked.

 2. Connect the external protection ground wire to the whole machine and the screws on this fixing frame.

3.Finish the control cable (if the shielded cable should be stripped of the proper position), fasten the finished cable from top to bottom with the quick cable tie and fasten it to the fixed frame.
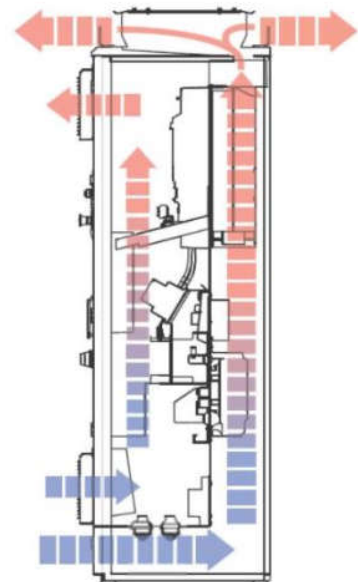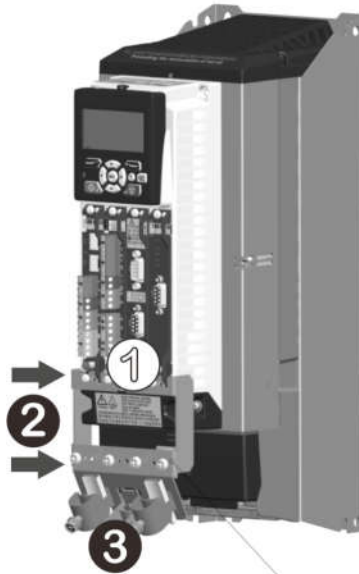
⟩ **Cooling and protection rating**

The cabinet must provide sufficient free space for the components to ensure the natural flow of air or the forced flow of the fan to allow for adequate cooling

1.Natural cooling, in particular, requires the natural physical principle of fully utilizing heat to rise (commonly known as the chimney effect).

2. Forced air cooling is especially needed to avoid air flow which is formed by the exhaust fan and such air flow can't or just a few of them flow through the target cooling (drive) or other parts.This is known as the cooling air passage bypass, or the inlet and outlet air inlets of the cabinet are very close, which causes the self-circulation of the fan airflow (this is called the air passage short circuit). These two items usually require design and consideration of the position of the inlet in the cabinet and the size of the ventilation area.

For R1X and C2X series drivers, side-by-side installation is preferred for optimum cooling effect.

Because the system thermal layout has been specially designed to reduce the space of the cabinet to support its non-row installation, thus reducing the installation space of the cabinet. The basic principle is that the left side of the machine is a forced air-cooled surface (cold surface), and the right side is a control chamber (hot surface). The left and right side-by-side installation methods can fully realize the alternating hot and cold heat and cold. Its installation is shown below:
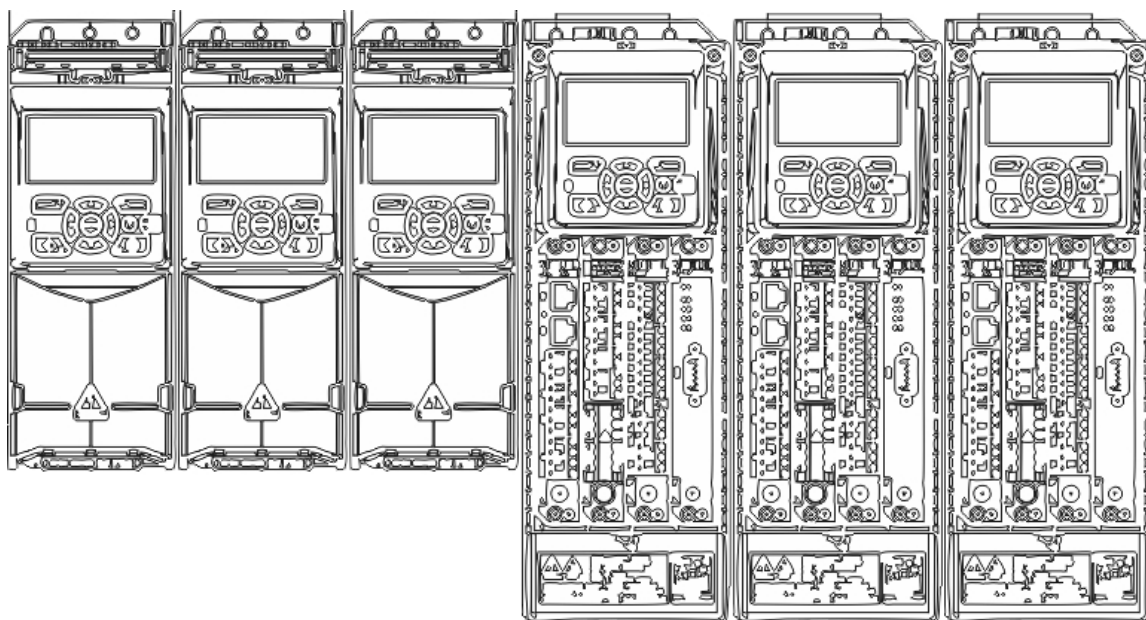
C3X and above series drives, read and follow the guidelines below to get the best cooling results.

It is suggested to maintain proper clearance between each side-by-side machine, and it is suggested to be separated by more than 20mm to ensure smooth air circulation.

The air inlet and outlet of the cabinet must be equipped with a grille for

• Guide airflow direction

• Avoid touching

• Avoid splashing water into the cabinet

Please refer to the corresponding values in the specification and model table of rated power and technical data and the total installed capacity of the cabinet after calculation.

The cabinet system should have measures to prevent hot air circulation, and prevent hot air from circulating outside the cabinet by guiding hot air away from the air inlet area.

A barrier is used to guide air flow at the inlet and outlet

Air inlet and outlet are 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 at the top of the cabinet.

The inside of the cabinet can avoid the circulation of hot air in the cabinet by using the leak-proof windshield.

6. *Mechanical design planning and installation for Cabinet*

If there is a risk of condensation in the cabinet, please use the cabinet heater. Although the main function of the heater is to keep the air dry, it may also be needed for heating at low temperatures. Please follow the manufacturer's instructions when installing the heater.

The reserved space around the drive ensures a proper amount of cooling air circulation and maintenance of the drive. If there are multiple drives that need to be installed up and down, the spacing should be appropriate. And the outlet air flow of the lower device cannot be directed to the inlet of the upper device. The cooling air temperature shall not exceed the maximum ambient temperature limit of the actuator.

Main points of this section：

1.Ensure that the inlet air temperature is below 40℃
2. Regularly check and ensure that the drive is ventilated smoothly in and out
3.Prevent hot air from circulating around.

Practice experience that：

User-defined thermal design, installation, matching and integration will effectively reduce the failure rate of this drive as a typical power electronic product and greatly extend its service life.

Common problems that you need to be aware of are:

1. The air inlet hole of the drive cabinet is smaller than the number of air outlets and the total area of the drive (determined by visual inspection).

The power of the fan that is forcedly ventilated at the top of the drive cabinet is less than that of the fan with the drive.
【View the nameplate power of the 2 fans on the top of the cabinet and the drive (shown at the bottom of this page) for comparison】

3.The driver works for a long time and its hot wind gathers around it (This problem can be alleviated by means of forced ventilation of the installation environment or the establishment of independent air ducts, air ducts, ventilation facilities, cooling air conditioning and other measures).

安装成柜注意事项及散热指引 Guidelines for Cooling

•安装使用前请阅读用户手册，断电10分钟后再检修。
•为保障驱动器的高性能并延长其使用寿命，请遵循如下专业建议：
1. 防止冷却空气在柜体内或驱动器附近循环。2. 柜体进、出风口通风能力需大于驱动器出风口面积及风量。3. 确保柜体所在房间充分冷却。
4. 视安装地尘埃、絮等密集程度需定期打开后盖用合适工具清理散热器，柜体设计、放置需考虑例行维护时能便利的打开后清理盖。

1.Make sure that the air inlets and outlets are large enough to allow sufficient air flow in and out of the cabinet. 2.Preventing the recirculation of hot air.
3.Cleaning the fins of the heatsink if needed.

1. 主进风口
2. 主出风口
3. 空气隔板
4. 驱动器
5. 进风滤器
6. 前出风口
7. 散热器
8. 后清理盖
9. 清理工具

1. Air inlet
2. Air outlet
3. Air baffles
4. Drive
5. Air filter
6. Air outlet
7. Heatsink
8. Back Cover
9. Cleaners

最大 Max.
+40°C(+104°F)

Model / shape	R1	C2	C3	C4	C5	C6	C7	C9M	C9B	C9A
Fan specification	60x25	80x25	120x38 DC24V supply				172x51 DC 48V supply			
Cooling fan power	1x5W	1x8W	1x17W	2x17W	2x40W	2x80W	2x80W	3x80W	3x80W	2x90W

Typical model comes with cooling fan power list

6. *Mechanical design planning and installation for Cabinet*

⟩ **Shape and mechanical mounting dimensions**

The drive can be vertical (for better cooling drives, this should be preferred) or horizontally mounted on the wall or back panel of the control cabinet.

In order to ensure adequate cooling of the drive, there should be sufficient space around it and the mounting plate should be relatively flat.

If you need to lift the drive of size C7 and above out of the box, you should use a tappet crane. Please ask the factory or local distributor how to safely lift the drive out. Wall-mounted as the main application and installation form, the installation dimensions are shown in the following figure:

Dimensions of Control panel surface mounting on the door of cabinet

with panel platform

only control panel

side   back view
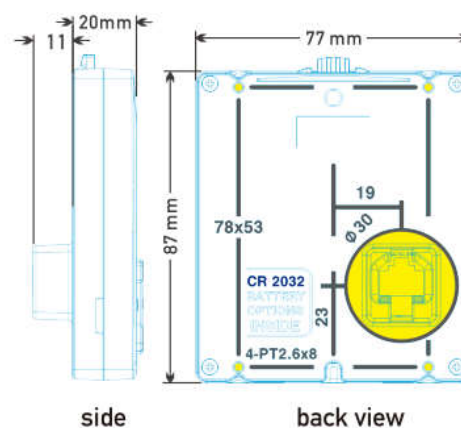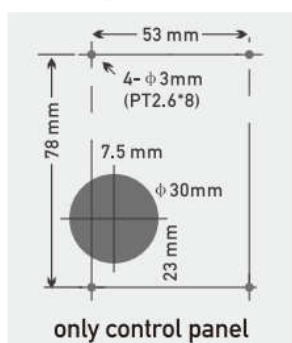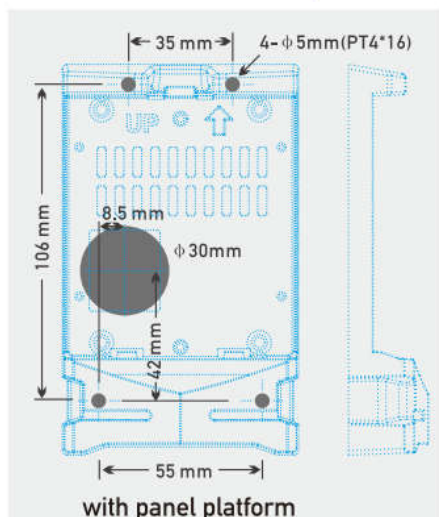
Mechanical Dimensions

Frame Szie	Frame dim.			Mounting holes			Screw	Weight (kg)
	W (mm)	H (mm)	D (mm)	W2 (mm)	H2 (mm)	d2 (mm)		
R1	78	210	145	40	199	5.0	Clip-in	1.2
C2	100	290	200	55	275	5.5	M5	3.5
C3	145	400	230	120	385	7	M6	8
C4	250	400	270	200	372	9	M6	15
C5	290	640	280	245	600	11	M10	30
C6	290	680	305	245	655	11	M10	38
C7	320	885	390	95/330	840	11	M10	59
C7B C7M	236	754 1250[1]	515	170	700	13	M12	55 43
C9B C9M	236	754 1500[1]	670	170	700	13	M12	80 63
C9A	340	1167	555	240	1132	13	M12	210

Remark:
Weight is to approximate value, more information and mechanical structure please refer to the machine drawing, or consult our representatives.
The structure of power in the drive : R1, C2, 3 series models locating at bottom, c4, 5, 6, 7, c9A with Top input and bottom output, c9B&M input/output all on Top.
1) -The height of the machine with the wheel detachable type can accommodate the input/output reactor base

C2   C3   C4/5/6

C7B/M   C9B/M

C9A

6. *Mechanical design planning and installation for Cabinet*
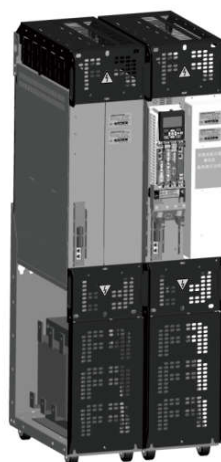
› **Preparation before installation**

Delivery check and drive module identification

Check the delivered product for damage. Before you begin installation and operation, carefully check the model label on the delivered drive module to verify that the delivered product model matches the model you ordered. The placard is located on the top, front, and right side of the drive module. A typical example is as follows:

XXXXX-XXX-032A-3B+FENDF-31

INPUT: 3-380...500VAC 48A / 48...63Hz
OUTPUT: 3-0...INPUT(V) 28A /0...1000Hz

Pn: 15 kW   G.W.= 3.5 (Kg)   Made in China

READ MANUAL FOR MORE INFORMATION
安装运行使用维护前及更多信息请参考使用手册

CE PASSED

Ser. 9580101417070101   200

Typical model description: Model 1.XXX-2.XXX-3.XXXX-4.XX-5.XXXX, where segment 1 is the product series and 2 is the product structure volume shape. Segment 3 is the rated current of the product, segment 4 is the rated input voltage level of the product (B means built-in brake chopper, 1 means single-phase 220V, 3 means three-phase 380V, 6 means three-phase 690V, etc.), and segment 5 is customized model code (For more information or application models, please contact us.)

Installation location requirements

See technical data for information on the operating conditions allowed by the drive. Install in an upright position. The walls of the actuators should be as flat as possible, made of flame retardant material and strong enough to carry the weight of the actuators. The floor under the actuator should be made of flame retardant material

› **installation steps**

Direct wall mounting

1.Mark the location of the four holes. The mounting points are shown in the dimension drawing.
2.Secure the screws or bolts to the marked locations.
3.Put the drive on the screw on the wall. Note: the drive can only be picked up through the base, otherwise there is a risk of falling off or falling off.
4.Tighten the screw.

Floor type installation (only for partial type)

1.Hit or bury the studs on the target installation ground according to the base mounting dimensions.
2.Place the drive on the mounting surface and lock it with the lock nut.

◆◆Note:

1.The selected model is a C7-9B+C7-9M modular drive. In order to obtain the optimal system cooling design during installation, we recommend that you install the C7-9B 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 up:

2.Connect the BLM to the SMM's DC+/- busbar copper bar.
3. The linkage control of the two interlock terminals is good before the operation can be put on the power to avoid the damage of the driver.

BLM | SMM

6. Mechanical design planning and installation for Cabinet
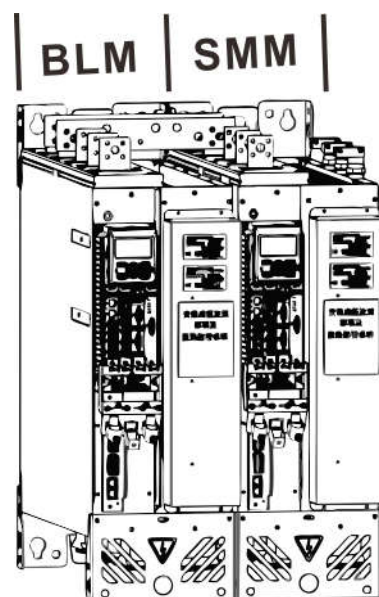
✛7. Electrical design planning and installation

Content of this chapter

This chapter describes the principles that must be followed when selecting motors, cables, protective devices, and cable routing, and how to operate the drive. If the user does not follow these recommendations, there may be some out-of-warranty failures in the drive.

⚠ Note:The driver installation design must comply with the applicable laws and regulations at the installation site. If the installation of the drive violates the requirements of local laws and regulations, our company will not take any responsibility.

The motor selection

Select the (three-phase AC induction) motor according to the rating table in the Technical Data chapter. The motor rated power for each drive type is 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. The switch disconnects the permanent magnet synchronous motor and the drive during maintenance of the drive.

Power connection

Use a fixed connection to the AC power line.

⚡ WARNING! Because the leakage current of the device may exceed 3.5 mA, a fixed installation should be used according to IEC 61800-5-1.

⟩ Power cut-out equipment

A manually operated input isolation device (isolation means) is required between the AC power supply and the drive. The disconnect device must be able to be locked in the disconnected position for easy installation and overhaul.

In Europe, if the drive used in the application must meet the "EU Machinery Safety Directive" required by the standard EN/GB/IEC 60204-1 "Safety of Machinery and Equipment", the circuit breaker must be of the following type：

• Load switches of class ac-23b (EN 60947-3)

• (EN/GB/IEC 60947-3) A circuit breaker with an auxiliary contact that disconnects the load circuit before the main contact of the circuit breaker is disconnected(EN/GB/IEC 60947-3)

• Meet EN/GB/IEC 60947-2 requirements for isolated circuit breakers.

Other areas

Open circuit measures must meet the requirements of safety regulations.

⟩ Thermal overload and short circuit protection

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

WARNING! If the drive is connected to multiple motors, a separate thermal overload switch or circuit breaker must be used to protect the cable and motor. No additional protection equipment required.

Short circuit protection in the power cable or drive: Use a fuse or circuit breaker to protect the power supply cable. The fuse recommended values are given in the Technical Data chapter. When standard IEC gG or UL type T fuses are located on the power distribution board, the input cable can be protected against short circuit conditions, reducing drive damage and avoiding damage to adjacent equipment in the event of a short circuit inside the drive.

Operating time of fuses and circuit breakers: Check if the fuse's operating time is less than 0.5 seconds. The action time depends on the type, the impedance of the grid, and the cut area, material, and length of the cable. American fuses must be of "no time delay" type.

Circuit Breaker: The protection characteristics of the circuit breaker depend on the supply voltage and the type and structure of the circuit breaker. There are also restrictions related to the short-circuit capacity of the grid. In the case of known grid characteristics, your local representative can help you choose the type of breaker.

Motor thermal protection: In accordance with regulations, the motor must be protected against thermal overload, and the current must be cut off when an overload is detected. The drive has a motor thermal overload protection that protects the motor and cuts off current if necessary. Depending on the value of the drive parameter, this function monitors the 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 entering additional motor and load data. The PTC sensor can be connected directly to this drive. Please refer to the corresponding parameter list and instruction manual for the parameter settings related to motor thermal protection.

〉 **Ground fault protection**

The driver has an internal ground fault protection function, which can protect the equipment when the motor and the motor cable are grounded. This is not personal safety or fire protection. Ground fault protection can be disabled by parameter.

The optional EMC filter contains a capacitor connected between the main circuit and the driver. These capacitors and longer motor cables increase the ground leakage current and may cause the circuit breaker to malfunction.

〉 **About grounding**

■ **Warning:Ignoring the following instructions can cause personal injury and death, and can increase electromagnetic interference and equipment damage:**

• In any case, the actuator, the motor and its connected devices such as the encoder shall be grounded to ensure personal safety and to reduce electromagnetic radiation and electromagnetic interference.

• The grounding conductor must be sized to meet local safety regulations and the grounding wire resistance must be less than 10 ohms. Failure to do so may result in abnormal or even damage to the equipment. .

• For multi-drive installations, each drive is individually grounded (PE).

• In order to suppress electromagnetic interference, EMC radiation must be minimized, and 360° high-frequency grounding is required when the cable enters and exits the cabinet. In addition, in order to meet safety regulations, it is also necessary to connect the cable shield to the ground (PE).

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

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

◆ Note

• Only when the size of the power cable shield meets the requirements of safety specifications can the power cable shield be used as the grounding conductor of the equipment.

• Standard GB/IEC/EN 61800-5-1 requirements: If the rated contact current of the drive is more than 3.5 mA (AC) or 10 mA (DC), a fixed protective earthing conductor and a cross section of at least 10 mm 2 must be used. When the protective earthing conductor of copper wire or 16 mm 2 aluminum wire, or the protective earthing conductor is disconnected, the power supply is cut off automatically or the second protective earthing conductor and the original protective earthing conductor have the same cross-sectional area.

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7. *Electrical design planning and installation*

› Emergency parking equipment

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

⚡ Note: Pressing the stop button on the drive control panel does not cause a motor emergency stop and does not separate the drive from dangerous voltages.

› Safe torque interruption

The Safe Torque Off function will cut off the control voltage of the driver power semiconductor device, thereby preventing the inverter from generating the voltage required to rotate the motor. With this feature, short-term operations (such as cleaning) and/or maintenance of non-electrical components can be performed without disconnecting 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 that activate the switch must be opened/closed within 200 ms. The maximum cable length between the drive and the 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 of the drive or motor electrical components can only be performed after the drive system is isolated from the mains.

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

An example of a Safe torque off wiring with internal +24 V DC power supply is shown below.
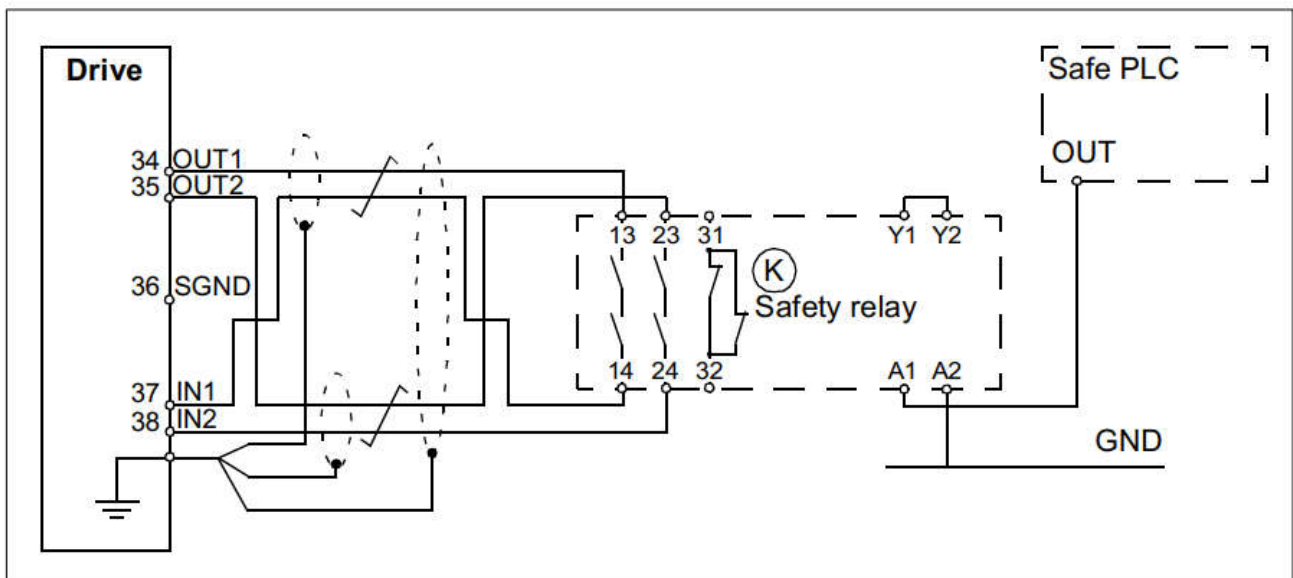
⟩ **Power cable selection**

■**General principles: The specifications of the grid side and motor cable must comply with local regulations:**

• The cable must be able to carry the drive load current. Please refer to the Technical Data chapter for the rated current. At the same time, the general recommended power cable size specification value is given.

• The cable must be rated for a maximum allowable temperature of 70 ° C (US: 75 ° C [167 ° F]) for continuous use.

• The impedance of the PE conductor/cable (ground wire) must meet the requirement of being able to withstand the potential contact voltage in case of failure (ensuring that the voltage at the fault point does not rise sharply in case of ground failure).

• The 600 VAC cable is suitable for systems up to 500 VAC.

• See the Technical Data chapter for EMC requirements.

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

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

Compared with the four-wire system, the use of symmetrical shielded cable can reduce the electromagnetic radiation and motor shaft bearing current of the whole system. The motor cable and its PE shielding wire (hinged shielding wire) should be as short as possible to reduce electromagnetic radiation and stray current and capacitive current outside the cable.

Optional power cable type

The type of power cable available for the driver is described below.

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 wire must be used. See the general principles section above.

Allowable power cable

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

◆ **Industry experience and recommendation**

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

S/N	Cable structure diagram	Structural features	Shield	EMC performance evaluation
1		Symmetrical, 3+3 core	With thin copper wire braided shield	Excellent
2		Symmetrical, 3-core	With thin copper wire braided shield	Good
3		Asymmetrical, 4-core	With thin copper wire braided shield	Good
4		Symmetrical, 3+3 core	no	Still good
5		Asymmetrical, 4-core	no	Medium
6		Asymmetrical, 3-core, parallel core or flat cable	With copper braided shield	Medium
7		Asymmetrical, 3-core, parallel core or flat cable	no	Poor

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7. *Electrical design planning and installation*

⟩ **Motor cable shielding, speed feedback encoder cable**

In order to protect the conductor, when the shield wire and the phase conductor are made of the same material, the cross-sectional area of the shield wire must be the same as the cross-sectional area 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 phase conductor conductivity. This requirement is very easy to meet in copper or aluminum shields. The minimum requirements for the drive motor cable are shown below. It consists of a coaxial copper braid. The tighter the shield, the smaller the electromagnetic interference emitted and the current flowing.
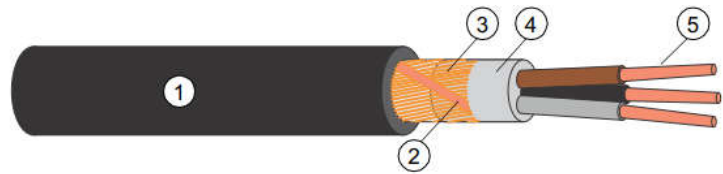
⟩ **Introduction to basic typical principles of interference, anti-interference shielding, and grounding in electromechanical systems**

The following figure shows the topology diagram of a typical variable frequency speed control electromechanical system. From left to right, it is the power supply, the driver (inverter), the shielded power (or signal cable), and the motor. This figure mainly shows the distributed capacitance of the long line,formation, noise flow and processing, etc. The core point of understanding and understanding this section is

◆**1.** Find out where the source of the interference comes from? This is usually from the motor winding itself and the motor cable.

◆**2.** Find out which are the objects that are easily disturbed? Here, it is usually a weak electric control analog signal of less than 36V, such as AI, AO, encoder feedback signal, and the like.

◆**3.** How to regulate and efficiently deal with interference and interference? Understand the relevant knowledge in principle, and standardize the electrical wiring according to the electrical general specifications and manual instructions. The specific points are as follows:

　◆a. Use a shielded cable on the motor cable and connect the motor casing to the ground wire from the power grid transformer.

　◆b. Use shielded wires for weak signal wires that may be disturbed, and keep the electric motor wires and power wires separated by a certain distance, and connect the shields of these weak wires to the ground wire from the power grid transformer. In order to obtain a shielding effect for the shielding layer, it has a path path for discharging the interference charge.

　◆c. Connect the motor casing, encoder casing (or signal wire shielding layer), and drive casing to the same ground wire for common potential treatment. This is a treatment method in a special environment with poor grounding conditions. When making sure that the absolute connection of the connected ground wire is firm and reliable, and the ground pile is at a low grounding impedance, the grounding is good, otherwise the motor induction power will have the risk of injuring personnel and equipment.
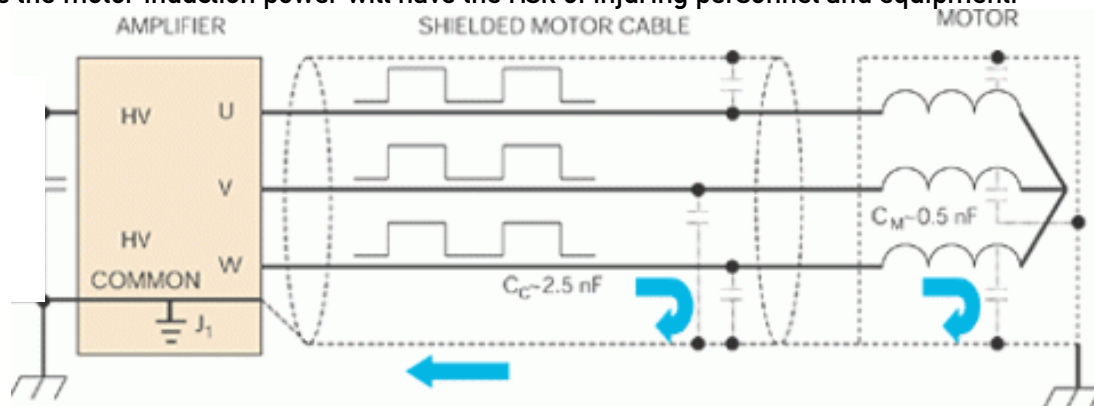
◆Note: Do not connect the motor temperature sensor to the shield of the connected cable of the drive directly to the ground. If one end cannot add a 3.3nF capacitor between the shield and ground, only one end is grounded.

Protect the relay output contacts from interference caused by inductive loads

When the inductive load (relay, contactor, motor) is disconnected, it will cause a sudden voltage change. The relay output on the drive is protected by a varistor (250 V) to eliminate the effects of overvoltage spikes. The relay output on the drive is protected by a varistor (250 V) to eliminate the effects of overvoltage spikes. In addition, in order to minimize the electromagnetic radiation generated by the inductive load during power failure, it is recommended to use an electromagnetic noise attenuation circuit [varistor, RC filter (AC) or diode (DC)]. If this electromagnetic interference is not suppressed, such interference may be transmitted to other conductors by controlling cable compatibility or inductively, causing the function of other components in the system to fail. Install the protective components as close as possible to the inductive load, rather than near the relay output.

PELV requirements should be considered in sites above 2000 m (6562 ft)

At an installation site over 4, 000m (13, 123ft), if the voltage used exceeds 48v, the relay output of the actuator cannot meet the protective ultra-low voltage (PELV) requirement. At installation locations from 2000 m (6562 ft) to 4,000 m (13,123 ft), PELV requirements are not met if one or both relay outputs use more than 48 V and the rest of the relay outputs use less than 48 V.

> **Control cable selection**

It is recommended that all control cables be shielded. Double shielded twisted pairs are recommended for analog signals. For pulse encoder routing, follow the instructions provided by the encoder manufacturer. Each signal uses a pair of separate shielded twisted pair pairs. Do not share the return line for different analog signals. For low-voltage digital signals, it is best to use a double-shielded cable (bottom left), but a single-layer shielded multi-strand can also be used (bottom right)

Analog and digital signals are separated by different cables.
For relay-controlled signals, if the voltage does not exceed 48 V, the relay cable and digital input signal cable can be placed in the same cable. It is recommended that the relay control signal use a twisted pair. It is not permissible to place the 24 VDC and 115 / 230/380 VAC signals in the same cable.

Speed feedback encoder cable, relay cable

Cables with braided metal shields (such as LFLEX from Lapp Kabel, Germany) have been tested and approved by the industry.

> **Control keyboard cable**

The control keyboard port adopts RJ45 interface, and the extension cable is an ordinary standard straight-through cable (the plug connector performs EIA/TIA568B standard). The cable length between the control keyboard and the drive should not be longer than 3m. For example, if more than five types of wires are used and there is a good electromagnetic environment, the extension cord can reach up to 15m.

Communication shielded cable

Refer to the following table and figure for the definition of the communication RJ45 terminal that comes with the unit. For the other communication port, please refer to the respective manuals of the corresponding expansion cards.

No.	ports	field type
1	CANH	CANopen
2	CANL	
3	NC	
4	GND	CANopen
5	GND	
6	GND	MODBUS 485
7	A -	
8	A+	
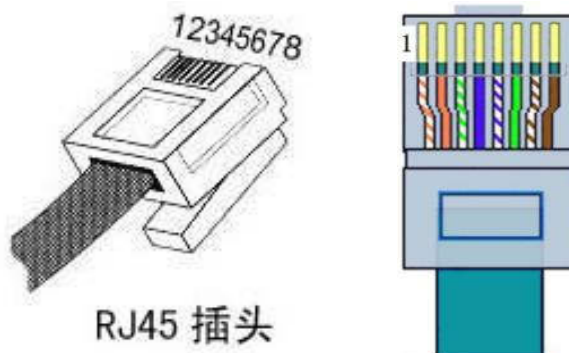
Cables with braided metal shields (such as LFLEX from Lapp Kabel, Germany) have been tested and approved by the industry.

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7. Electrical design planning and installation

◆Note: Do not connect the motor temperature sensor to the shield of the connected cable of the drive directly to the ground. If one end cannot add a 3.3nF capacitor between the shield and ground, only one end is grounded.

〉 Cable routing

The motor cable must be far away from other cables. The motor cables of several actuators can be wired side by side. It is recommended that the motor cable, the input power cable and the control cable are respectively arranged in different grooves. In order to avoid the electromagnetic interference caused by the rapid change of the output voltage of the driver, the motor cable and other cables should be avoided for a long distance side-by-side.

When the control cable must pass through the power cable, ensure that the angle between the two cables is as close as possible to 90 degrees. Do not route other cables through the drive.

A diagram of the cable routing is shown below.
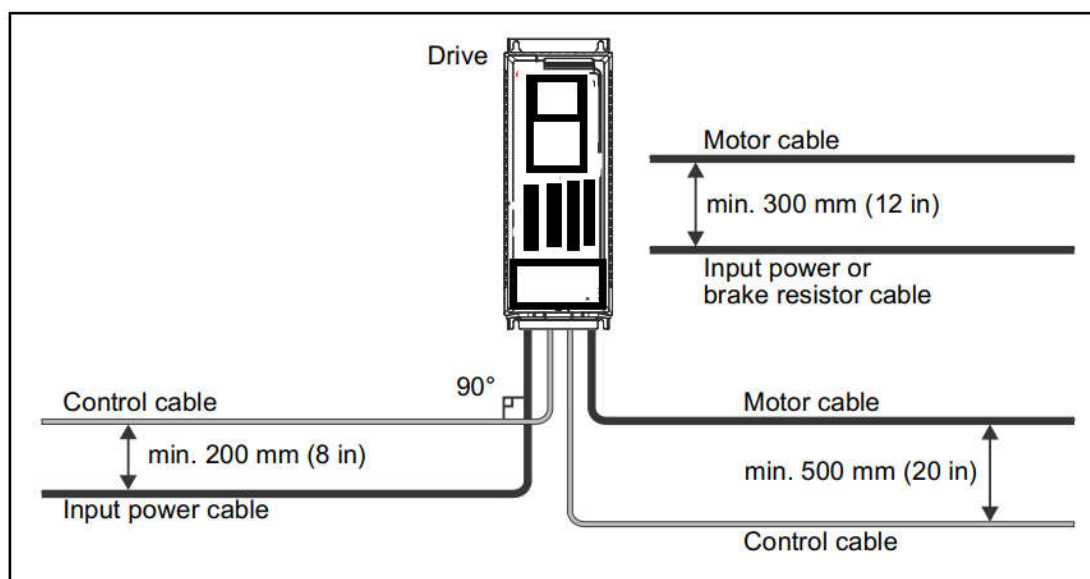
Control cable trunking

If the weak current 24 V is not insulated for the high voltage 220/380 V or is not insulated by the insulating sleeve for the strong 220 / 380V, it is not allowed to discharge the weak current 24 V cable and the strong 220/380 V cable in one conduit

Place the weak 24 V and high-voltage 220/380 V control cables in different slots in the cabinet.

7. *Electrical design planning and installation*
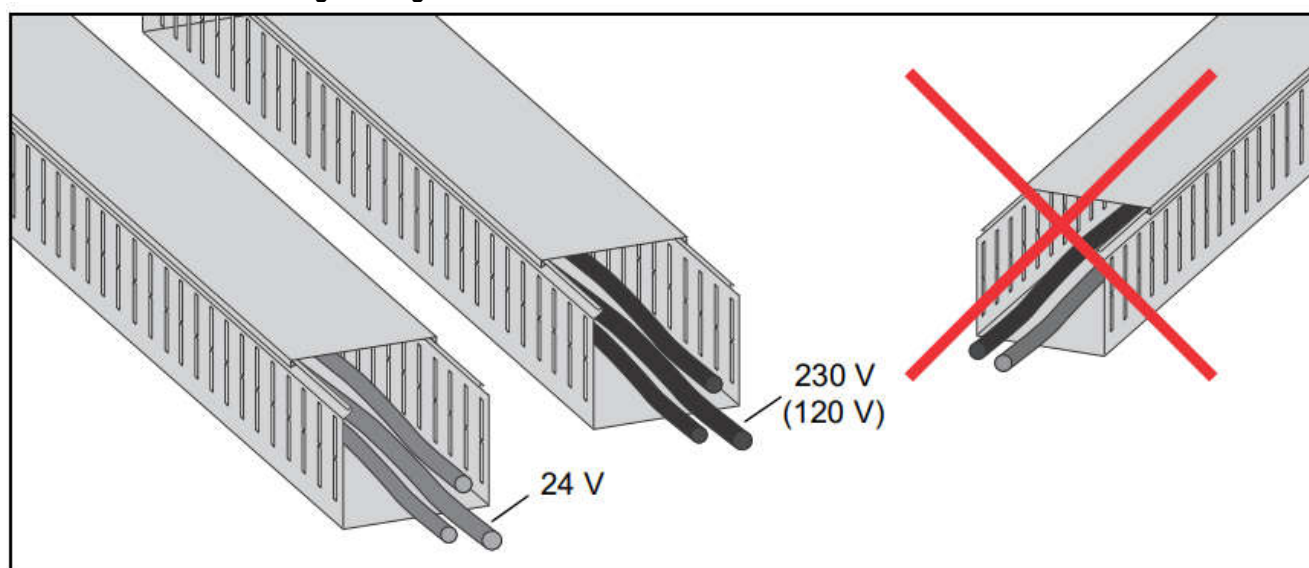
⊕8. Electrical installation

The content of this chapter

This chapter describes the electrical installation process for the drive.

■WARNING! Only qualified electrical engineers can perform the tasks described in this chapter. Please follow the instructions on the first page of the safety instructions in this manual. Ignoring these safety instructions can result in personal injury or equipment damage.

The drive's power supply (input power) must be disconnected during installation. If the drive is already powered, wait at least 10 minutes after the power is turned off.

Required tools

To perform the electrical installation, you need the following tools:

• wire stripper

• screwdriver and/or wrench with a set of suitable bits

This typical series of drive enclosures and power calbe strip guideline:

For Input and motor cable treatment advise:

Prepare the ends of the cable as illustrated in the figure. Note: The bare shield will be grounded 360 degrees. Mark the pigtail made from the shield as a PE conductor with yellow-and-green color.

1. Pry down or open the power terminal cover or cover, lock the wires that have been properly pressed into the proper wire nose with screws at the connection power screws, and the corresponding PE ground wire shall be connected to the drive housing and the ground column at the lower part of each I/O board card of the control unit (to obtain good EMC characteristics).

2. Check and confirm that the connection points of each wire are secure and reliable, and the insulation distance meets the requirements and specifications to cover the terminal cover.

3. Reinstall the cover according to the reverse steps above

4. For C4-C7 series models, it is recommended to install the (Cable Accessories for connector insulation Reinforced)at the inlet and outlet terminals. The specific operation diagram is as follows:

Installation and wiring steps:

4.1. Casing the bushing into the cable

4.2. Connect the cable to the terminal to tidy and lock the cable

4.3. Return the sleeve to the bottom of the terminal and tie the end of the insulated sleeve to the cable with an insulated tie
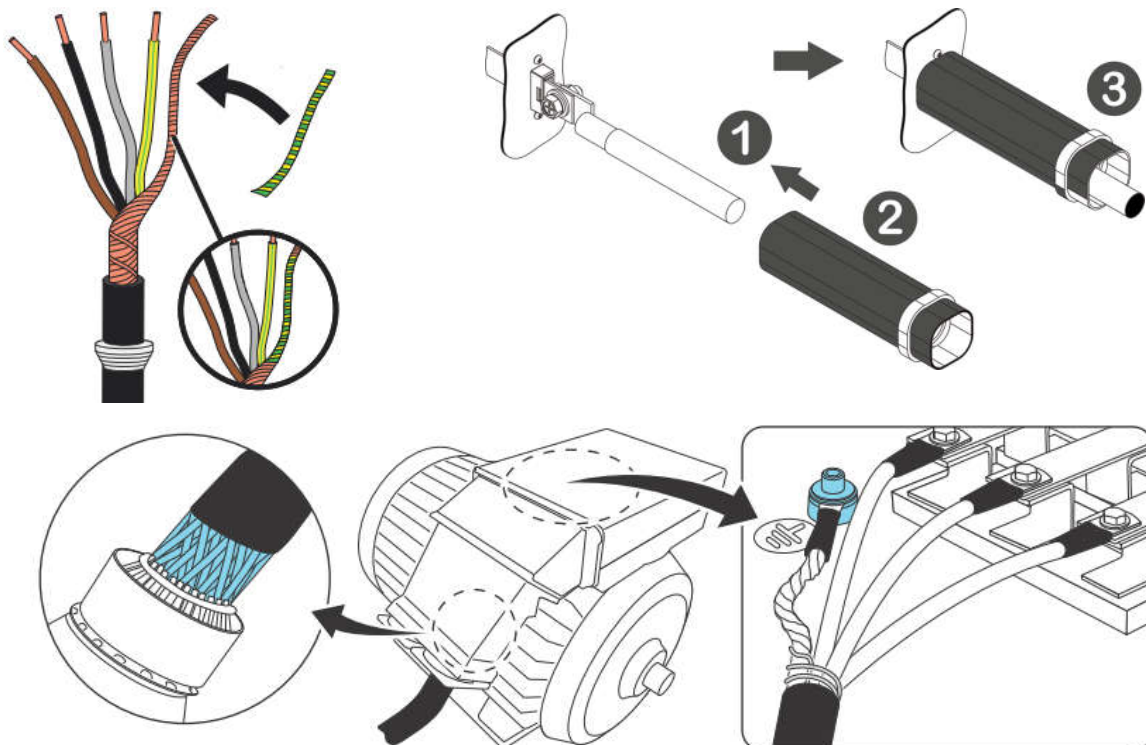
⟩ Check insulation

Drive

There is no need to perform any withstand voltage or insulation resistance test on the drive and its components (such as high voltage insulation test or insulation resistance test with megohmmeter). Before leaving the factory, each drive has been tested for insulation of the housing by the main circuit. Moreover, the internal finite voltage circuit of the actuator can automatically cut off the test voltage. Therefore, it is not necessary to perform any withstand voltage or insulation resistance test on the driver and its components (such as high voltage insulation test or insulation resistance test with megger)

Power cable

Check the insulation of the power (input) cable in accordance with local regulations before connecting the input power cable to the drive.

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

1.Make sure that the motor cable is connected to the motor and then remove the motor cable from the drive's output terminals U, V and W.

Connection Diagram as below for reference,L1/L2/L3 or R/S/T was Power supply side.
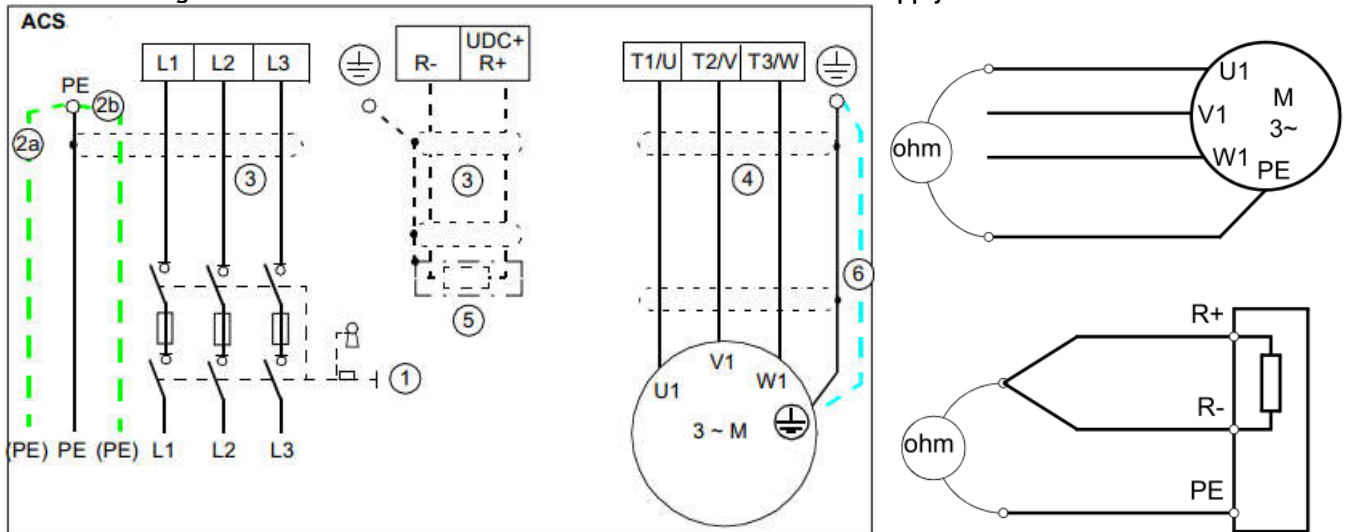
1. The insulation resistance between each phase conductor and the protective earth conductor is measured with a 500 V DC megger. The insulation resistance of a typical motor must exceed 10 megohms (a given value at 25 °C or 77 °F). Refer to manufacturer's instructions for insulation resistance of other specific motors. Note: if the motor is moist inside, the insulation resistance will decrease. If moisture is suspected, the motor should be dried and remeasured.

Brake resistor device

Check the insulation of the brake resistor assembly (if any) as follows:

1.Check that the resistor cable is connected to the resistor and disconnected from the drive's output terminals + and PB.

2. On the driver side, connect the +(R+) and PB(R-) wires of the resistor cable together. Use the measured voltage 1 kV DC to measure the insulation between the connected wire and the PE wire. The insulation resistance must be higher than 1 Mohm.digram as above

Checking the compatibility with IT (ungrounded) and corner-grounded TN systems

The internal EMC filter is not suitable for use on an IT (ungrounded) system or on a corner-grounded TN system. Disconnect the EMC filter before connecting the drive to the supply network. For instructions on how to do this,

WARNING! Do not install the drive with the internal EMC filter connected on an IT system (an ungrounded power system or a high-resistance-grounded [over 30 ohms] power system), otherwise the system will be connected to ground potential through the EMC filter capacitors of the drive. This can cause danger, or damage the drive.

Do not install the drive with the internal EMC filter connected on a corner-grounded TN system, otherwise the drive will be damaged.

Note: When the internal EMC filter is disconnected, the drive EMC compatibility is considerably reduced.

〉 **Power terminal physical position indication and description**

1.The following figures show the physical position of the terminal block of the medium and small power models and their relative position of distribution, so as to quickly and accurately identify the wiring positions of the power points under poor lighting conditions.

◆The wrong power connection is likely to cause permanent damage to the machine. While accurately identifying the position of each power terminal of the driver, it is also very important to be careful about the name of the wire you hold to be connected to, because in a more complex wiring cabinet.In practice, it often occurs that the power cord held in the hand is regarded as the motor cable connected to the drive, and the machine is seriously damaged. Please pay attention to prevention and inspection.

1.For the most convenience, we remind you of the accurate access to the distribution line of the drive terminals. At the time of shipment, some models have the motor cable terminal prompt label (as shown in the figure below, and the small and medium power Schematic diagram of the physical relative position of the power terminal of the model). It is recommended that you properly dispose of this label before and after wiring to complete the wiring and future maintenance without errors.
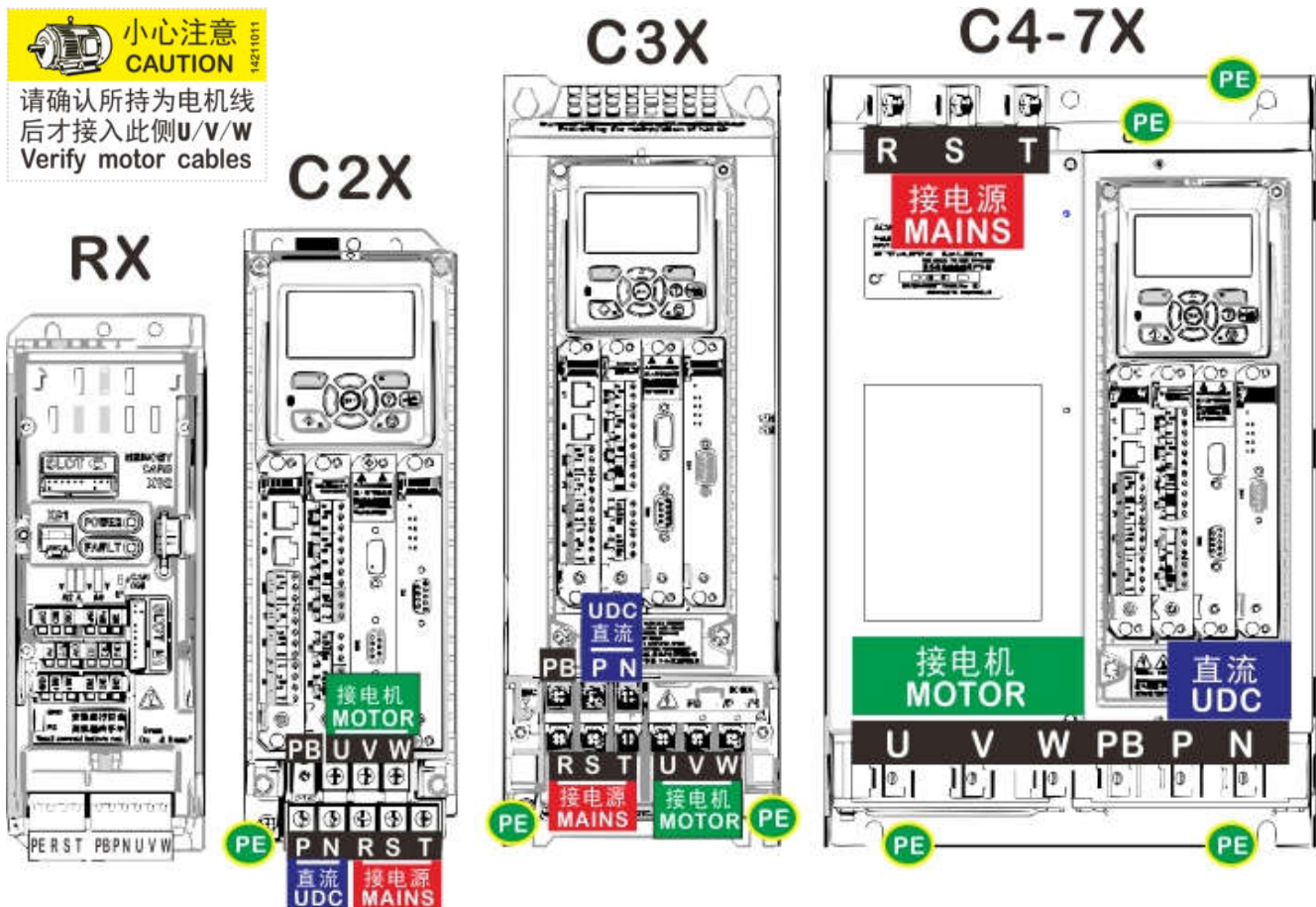
Left figure1: R1 series models, the power terminals are distributed in the lower part of the whole machine as spring pluggable standard terminals

>>>>Distribution: (4P)： PE、R(220V-L)、 S、T(220V-N)，(6P)：PB、P、 N、U、V、W

Left figure2: C2 series models, the power terminals are fence type standard terminals, and the fence width is 12mm with M5 combination screw

>>>>Distribution: (upper layer): PB, U, V, W, (middle layer): P, N, R, S, T, (bottom layer): PE

Left figure 3: C3 series models, the power terminals are fence type standard terminals, and the fence width is 15mm with M6 combination screws.

>>>>Distribution: (upper layer): PB, P, N, (middle layer): R, S, T, U, V, W, (bottom layer): PE, PE

Left figure 4: C4-7 series models, the power terminals are copper row lock bolt terminals, and the C4 fence is 19mm wide with M6 combination bolts.

>>>>Distribution: (top layer): R, S, T, (bottom layer): U, V, W, PB, P, N, (top and bottom mounting feet): PE, PE

>>>>Other models (such as C8/C9, etc.): The grounding point of the driver PE is located at the indicated position, or defaults to the mounting hole of the whole machine.

8. *Electrical installation*

> **Wiring procedure**

Operate according to the wiring diagram and the fastening moment given in the table below:

1. Open the wiring cover according to the following example of size and structure of each shape.
2. In the IT (floatation) system and angular ground TN system, remove the following screws to disconnect the internal pressure-sensitive resistance and EMC filter:

⚠️ ■ **warning!** If the drive is installed into an IT system (either a non-grounded power system or a high-resistance grounded power system (over 30 ohms) without disconnecting the voltage-sensitive resistance/filter, the system will be connected to the ground through the the voltage - sensitive resistance of the actuator/filter. This can cause damage to drive.
If the driver is connected to the angular ground TN system without disconnecting the voltage - sensitive resistance /filter, the driver will be damaged.

3. Cut or cut the over-wire protection ring on the terminal. Some models need to be equipped with a protective net.
4. Strip the cable and remove the shield from the cable clamp.
5. Twist the ends of the cable shield into the strands. Strip the end of the phase cable.
6. Connect the phase cable of the power cable to the R, S and T or L1, L2 terminals of the drive. Connect the phase cable of the motor cable to the U, V and W terminals. Connect the wires of the resistor cable (if any) to the + and PB terminals. The corresponding PE ground wire needs to be connected to the drive chassis and the grounding post on the lower part of each I/O board of the control unit (for good EMC characteristics).
7. Arrange the exposed cable shield layer and connect it to the wire metal plate.
8. Fix the cable shield to the ground terminal. Note: Make the length of the stripped shield and the stripped phase conductor as short as possible.
9. Please cover the visible exposed shielding layer and braid with insulating tape
10. Mechanically secure the cable outside the device
11. Ground the power cable shield or the other end of the PE conductor at the power distribution board. If an input choke or EMC filter is installed, ensure that the PE conductors from the distribution board to the drive are continuous.

Ground the motor cable shield at the motor end

To minimize RF interference, ground the cable shield 360 degrees at the through hole of the motor junction 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

Shape volume	Terminal Screw Size	Tightening torque[Nm]	Terminal structure	Terminal symbol identification	Wiring ability
CON/relay terminals	M3	0.8-1.2	European square hole crimping terminal	See the wiring diagram	30-14AWG
R1	Spring	0.8-1.2	Spring quick connect terminal	PE、R、S、T、PB、+、-、U、V、W	30-10AWG
C2	M5	1.5—1.8	Fence tablet terminal	PE、R、S、T、PB、+、-、U、V、W	20-6AWG
C3	M6	3.0—3.5		PE、R、S、T、PB、+、-、U、V、W	22-6AWG
C4	M6	4.0-5.0	Perforated copper row	PE、R、S、T、PB、+、-、U、V、W	10-22mm²
C5	M10	9.0-10.0		PE、R、S、T、PB、+、-、U、V、W	25-75mm²
C6，C7	M10	17.0-22.0*		R、S、T、+、-、U、V、W、PE	36-90mm²
C8	M12	35.0-55.0*		R、S、T、+、-、U、V、W、PE	-
C9	M12	35.0-55.0*		R、S、T、+、-、U、V、W、PE	-

Remarks: 1. For the main power, the European square hole crimp terminal can be barely stripped by about 8-10 mm and then directly inserted into the lock. The fence terminal needs to be pressed after the terminal is tightened.2. Some models have no PB terminal without built-in brake chopper function. 3. The schematic diagram of physical location distribution of terminals shall refer to the previous page

> **Multi-machine common DC bus connection**

The UDC+ and UDC- terminals in DC-Link are suitable for the common DC configuration of a full range of drives, allowing regenerative energy from one drive to be supplied to other drives in electric mode.
Depending on the power requirements, one or more drives can be connected to the AC power source.

Note: Multiple drives have a common DC bus for energy sharing. Please read the following carefully before implementation and get the technical confirmation from the driver manufacturer or its representative. Otherwise, it may cause irreparable damage to the drive.

If only one or a few drivers are connected to the power supply, it is necessary to evaluate whether the power soft-start module and the rectifier module have the ability to support the entire DC bus capacitor charging and output power rectification capability of all the drivers of the common DC bus network, otherwise it will cause damage. It is designed to be a common DC bus between R1-C2-C3 and C4-C9 with the input voltage level.

From the perspective of the soft start power carrying capacity and the soft start loop charging speed, when the common DC bus is used in different shape machines, it must be connected to the power grid from the most powerful model in the connected network (see Figure 1 below). For more information, please consult a professional or call our representative.

If two or more drives are connected to the AC mains, an input choke must be installed for each AC connection to ensure a balanced current distribution between the bridges. Figure 2 below is a reference diagram of the common DC-Link parallel processing electrical connection. For more information, please consult a professional or call our representative.

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8. *Electrical installation*
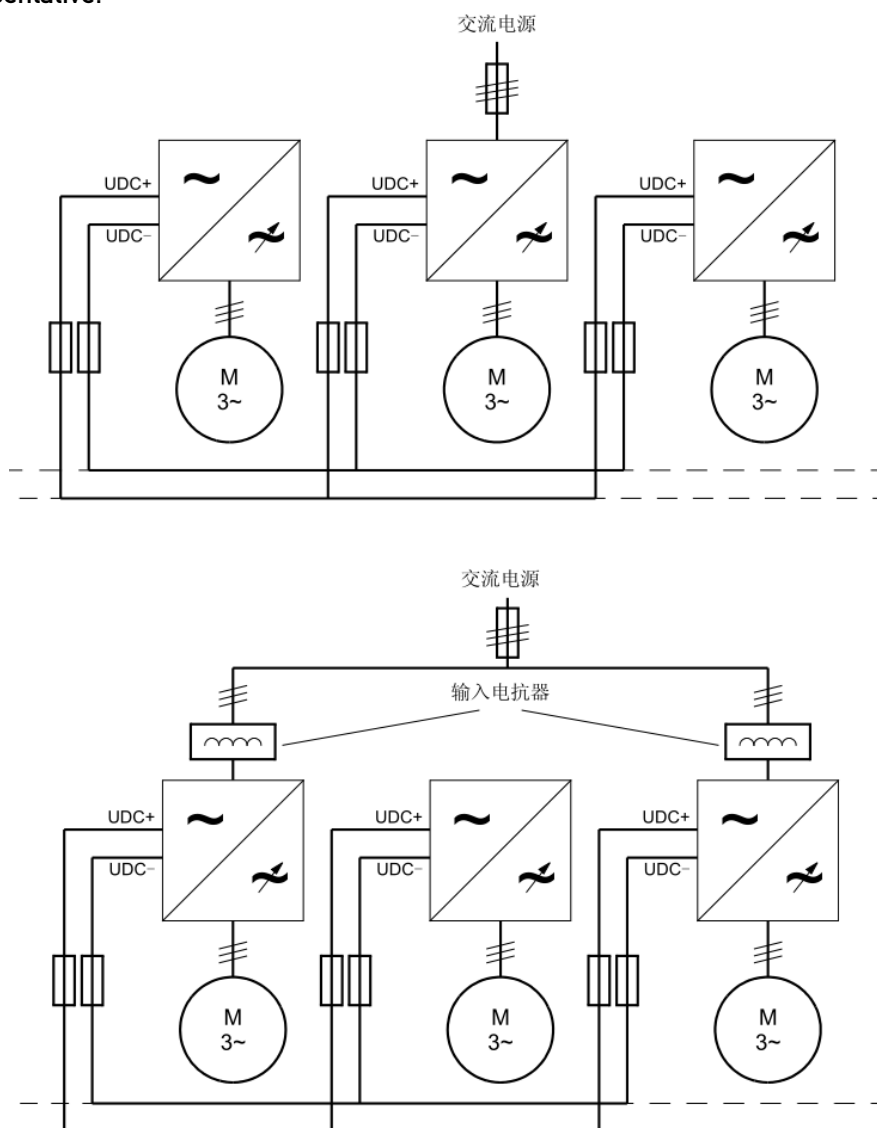
9. Parameters List and features description

⟩ **01 Actual values**

01 Actual values	Basic signals monitored by the drive (current, voltage, motor control, drive status, etc.)	Unit /Precision
01.00 Motor speed	Motor speed display value. When there is no encoder control, it is the real-time estimated speed of the motor; when the encoder is closed-loop controlled, it is the measured speed of the encoder.	0.1 rpm
01.01 Output frequency	The actual value of the drive output sync frequency.	0.1Hz
01.02 DC bus voltage	DC capacitor voltage measurement.	0.1 V
01.03 Motor current	Motor current measurement.	0.1 A
01.04 Motor current %	Motor current expressed as a percentage of the rated motor current.	0.1 %
01.05 Heat sink temp	The measured temperature of the radiator.	0.1 ℃
01.06 Ambient temp	The measured value of the inlet air temperature, that is, the ambient temperature index.NTC Temp. sensor locating bottom of Control unit.	0.1 ℃
01.07 CPU temperature	The measured temperature of the CPU.	0.1 ℃
01.09 IGBT Tj	IGBT chip temperature.	0.1 ℃
01.10 IGBT power loss	The power loss of the IGBT.	0.001 kW
01.11 CPU usage	The actual load rate of the CPU.	0.1 %
01.12 Motor slip est	Estimated motor slip frequency.	0.01 Hz
01.13 Motor flux est	Estimated value of motor flux, relative to rated flux.	0.1 %
01.14 Encoder counter	The cumulative value of the encoder's pulse counter.	1
01.15 Pulse counter	The count value of the count given by the pulse for position control.	1
01.16 Z mark latch	The counter value of the encoder Z pulse latch.	1
01.17 Position ref raw	The original value given by the pulse when position control.	1
01.18 Actual position	The actual position value for position control.	1
01.19 Grid freq	Measured value of grid frequency	0.1 Hz
01.20 Grid volt	Measured value of grid voltage	0.1 Vrms

01 Actual values	Basic signals monitored by the drive (current, voltage, motor control, drive status, etc.)	Unit /Precision
01.21 Output voltage	The actual output voltage value of the drive.	0.1 Vrms
01.22 Motor torque	The relative rated torque of the motor in percent.	0.1 %
01.23 Motor temperature	The temperature value of the motor. It can be the measured value of the temperature sensor or it can be an estimated value.	0.1 ℃
01.24 Encoder speed	The actual motor speed measured by the encoder.	0.1 rpm
01.25 Udc ripple	The peak-to-peak value of the bus voltage ripple, the DC bus capacitance decreases, or the grid imbalance, the ripple peak-to-peak value increases. Usually no more than 40V at full load	0.1 V
01.26 PM init phase	The initial phase value found when the encoderless PM motor is started is indicated by Q16.	1
01.27 Power factor	Indicates the real-time motor power factor.	0.001
01.28 Output power	Indicates real-time motor active power.	0.1 kW
01.29 Temp slew rate	Indicates the rate at which the heat sink temperature rises.	0.1 ℃
01.30 Modulation depth	Indicates the PWM modulation ratio.	0.1 %
01.31 LOS cnt	Indicates the number of LOS anomalies in the resolver.	1
01.32 DOS cnt	Indicates the number of DOS anomalies for the resolver.	1
01.33 LOT cnt	Indicates the number of LOT anomalies in the resolver.	1
01.34 PM elect angle err	Indicates the deviation of the electrical angle measured by the encoder from the estimated electrical angle when the synchronous motor is in closed loop control of the encoder.	0.1 deg

> **02 I/O values**

02 I/O values	I/O Input and Output Signals	Unit/Precision
02.00 DI status	Digital input DI1, DI2...DI6, DIO1, DIO2 input status.	-
02.01 DO status	Digital output DIO1, DIO2 and relay output RO1, RO2 output status.	-
02.02 AI1 actual	Actual value of analog input AI1	0.001 V or 0.001 mA
02.03 AI1 scaled	Analog input AI1 converted value.	-
02.04 AI2 actual	Analog input The actual value of AI2.	0.001 V or 0.001 mA
02.05 AI2 scaled	Analog input AI2 converted value.	-

9. *Parameters List and features description*

02 I/O values	I/O Input and Output Signals	Unit/Precision
02.06　AO1 actual	Analog output The actual value of AO1.	0.001 V or 0.001 mA
02.07　AO2 actual	Analog output The actual value of AO2.	0.001 V or 0.001 mA
02.08　Freq in actual	DIO1 as the actual value of the frequency of the high speed pulse input. Note: DIO1 needs to be configured as input. See parameter 14.31 for details.	1 Hz
02.09　Freq in scaled	DIO1 is the converted value of the high speed pulse input.	-
02.10　Freq out actual	DIO2 is the actual value of the frequency of the high-speed pulse output. Note: DIO2 needs to be configured as a frequency output. See parameter 14.32 for details. Note: The R1 series does not support high speed pulse output.	1 Hz
02.11　Control panel ref1	Given 1 of the control panel.	1 rpm
02.12　Control panel ref2	Given 2 of the control panel.	0.1 %
02.13　Fieldbus ref1	The fieldbus is given a value of 1.	1 rpm
02.14　Fieldbus ref2	The fieldbus is given a value of 2.	0.1 %
02.15　Speed ffwd	The speed feed forward reference corresponding to the pulse train. This pulse is derived from the pulse input signals PA, PB of the PG card.	1 rpm
02.16　FB pos ref	The location of the fieldbus is given.	-
02.17　AI3 actual	The actual value of the analog input AI3 (PT+/PT-). Only 0-10V voltage mode is supported.	-
02.18　AI3 output	The converted value of the analog input AI3. The maximum conversion value is parameter 13.18, which is the same as the high speed pulse input conversion.	-

› **03 Control values**

03 Control values	Speed control, torque control and other control values	Unit
03.00　Speed ref output	Speed The output value of the given module.	1 rpm
03.01　Motor potent out	The speed reference of the digital potentiometer can be used to increase or decrease the speed given by the terminal.	1 rpm
03.02　Const speed out	The output setpoint of the multi-speed function module.	1 rpm
03.03　Speed ref unramp	Use the speed reference before the ramp and forming speed.	1 rpm
03.04　Speed ref ramped	The slope and forming speed are given.	1 rpm
03.05　Control mode used	Actually executed control mode	-

9. *Parameters List and features description*

03 Control values	Speed control, torque control and other control values	Unit
03.06 Torque ref unramp	The torque reference before the ramp input is the percentage of the relative maximum torque.	0.1 %
03.07 Torque ref ramped）	The torque reference value through the ramp is a percentage.	0.1 %
03.08 ASR speed ref	The actual setpoint of the speed control loop.	-
03.09 ACR torque ref	The actual setpoint of the torque control loop.	0.1 %

〉 **04 App values**

04 App values	Application values such as procedures and counters	Unit
04.00 Process fbk1	Feedback of the process PID 1.	-
04.01 Process fbk2	Feedback of the process PID 2.	-
04.02 Process PID fbk	The actual feedback value of the process PID.	-
04.03 Process PID err	The deviation of the process PID.	-
04.04 Process PID out	Process PID output.	-
04.05 Line spd act	Curl control line speed actual value.	0.1m/min
04.06 Trq out Nm	The amount of torque control for the curl control, in Nm.	0.1Nm
04.07 Trq out percent	The amount of torque control for the curl control, in %.	0.1%
04.08 Tense ref	The tension control of the curl control.	0.1N
04.09 Tense ref taped	Tension setpoint corrected by tension taper.	0.1N
04.10 Roll dia est	Curl controlled drum diameter estimate.	1mm
04.11 Pulse counter	A few rounds of signal counts used to measure the diameter of the drum.	1

9. Parameters List and features description

⟩ **05 Timer & counter**

05 Timer & counter	Timer and counter values	Unit
05.00 Run time: sec	The current running time, less than an hour.	1 s
05.01 Run time: hour	The current running time, which reaches or exceeds an hour.	1 h
05.02 Poweron time: s	The current power-on time, less than an hour. This parameter is automatically reset to zero after reaching 3600.	1 s
05.03 Poweron time: h	The current power-on time, which reaches or exceeds an hour. When parameter 05.02 accumulates to 3600, this	1 h
05.04 Total run time: s	Accumulated running time, less than one hour. This parameter is automatically reset to zero after reaching 3600.	1 s
05.05 Total run time: h	Accumulated running time, reaching or exceeding one hour. This parameter is incremented by 1 when parameter 05.04	1 h
05.06 Total power on: s	Accumulated power-on time, less than one hour. This parameter is automatically reset to zero after reaching 3600.	1 s
05.07 Total power on: h	Accumulated power-on time, reaching or exceeding one hour. This parameter is incremented by 1 when the cumulative	1 h
05.08 Fan on time:	Fan cumulative running time.	1 s
05.09 EEPROM wr tick	The total number of writes to EEPROM memory.	-
05.10 Max udc	The highest recorded value of the bus voltage.	0.1 V
05.11 Max Imag	The highest recorded value of the output current.	0.1 A
05.12 Max Tj	The highest recorded value of the IGBT chip temperature.	0.1 ℃
05.13 Max T_heatsink	The highest recorded value of the heat sink temperature.	0.1 ℃
05.14 Max T_cpu	The highest recorded value of the CPU temperature.	0.1 ℃
05.15 IGBT usage sec	IGBT equivalent use time.	1 s
05.16 P_Mot_kWh	The electric power of the built-in energy meter.	0.1 kWh
05.17 P_Reg_KWh	Built-in energy meter for generating power.	0.1 kWh

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9. *Parameters List and features description*

⟩ **06 Drive status**

06 Drive status	Drive status word
06.00 Status word1	**Drive status word 1 .** Bit · Name 0 · Ready 1 · Fault 2 · Alarm 3 · Limiting 4 · Running 5 · Rev req 6 · Start req 7 · Stop req 8 · JOG active） 9 · Int stop req 10 · Ext run enable 11 · JOG2 12 · DC charged 13 · Chg rly closed 14 · Ext2 15 · Loc ctrl
06.01 Status word2	**Drive status word 2 .** Bit · Name 0 · Data log rdy 1 · OFF1 2 · OFF2 3 · OFF3 4 · Motor Brk 5 · Ramp in zero 6 · Ramp out zero 7 · Ramp hold 8 · Modulating 9 · Modbus active 10 · CANopen active 11 · Profibus-DP active 12 · Fan on 13 · Start block 14 · ID run req 15 · Main power on

9. Parameters List and features description

06 Drive status	Drive status word
06.02 Status word3	Drive status word 3 .

Bit	Name
0	AC src active
1	DC src active
2	Start inhibit
3	Spdref limit
4	Trqref limit
5	Rem in local
6	Imax limit
7	Volt limit
8	PM auto phasing rqst
9	PM flux boost
10	Zero freq
11	Brk check success
12	Mech brake open
13	Brake opened
14	Brake checking
15	Crane active

06.03 Speed ctrl stat	Speed control status word.

Bit	Name
0	Zero speed
1	Reverse
2	Ramp up
3	Ramp down
4	At setpoint
5	Reserved
6	Regen active
7	Reserved
8	Pos ctrl
9	ACIM active
10	PMSM active
11	SynRM active
12	ID run
13	Torque limit
14	Speed limit
15	Exc active

06 Drive status	Drive status word
06.05 Fieldbus CW	**Fieldbus Control Word**

Bit	Name
0	Stop
1	Start
2	StopMode OFF2
3	StopMode OFF3
4	Local ctrl
5	StopMode ramp
6	StopMode coast
7	Run enable
8	Reset
9	Jog1
10	Jog2
11	Remote
12	Ramp in zero
13	Ramp hold
14	Ramp out zero
15	RevRqst

06.06 Encoder SW

Encoder Status Word

Bit	Name
0	DOS
1	LOT
2	LOS
3:15	Reserved

06.07 PosCtrl SW

Position Control Status Word

bit	Name
0	Pos sync
1	Pos end
2	Mark rdy
3	Speed limited
4	Mark load
5:15	Reserved

9. *Parameters List and features description*

⟩ **08 Fault & Alarm Log**

08 Fault & Alarm Log	Fault and Alarm logs (see the Troubleshooting and Maintenance section for more details)	
08.00 Alarm Code	The latest alarm code	-
08.01 Fault Code	The latest fault code	-

⟩ **09 System Info**

09 System Info	Drive system configuration information	
09.00 Driver ID	The hardware code of the drive.	-
09.01 Drive type	The category of the drive.	-
09.02 Firmware version	The firmware version of the drive.	-
09.03 Encoder type	The type of encoder recognized by the expansion card slot SLOT3.	-
09.04 PWM freq	The carrier actual frequency implemented by the system.	-
09.06 PM phase CM	Common mode signal strength for initial angle recognition of synchronous motor rotors. It is used to guide the user to adjust the size of the injection current of 60.11 to make the search optimal.	-
09.07 PM phase DIF	The differential mode signal strength of the initial angle of the synchronous motor rotor. Injecting too much current will cause excessive noise. If the current is too small, the signal strength will be insufficient to cause search error.	-

⟩ **10 Start/Stop/Dir**

10 Start/Stop/Dir	Selection and configuration of signal source such as start/stop/direction	Def
10.00 Ext1 start func	Select the signal source of the start and stop commands for external control ground 1 (EXT1).	2
Not selected	Note: This parameter cannot be changed while the drive is running.	0
In1 RUN, In2 DIR	The signal source selected by parameter 10.01 Ext1 start in1 (control ground 1 input 1) is the start signal (0 = stop, 1 = start), and the signal selected by parameter 10.02 Ext1 start in2 (control 2 input 2) is the direction signal (0 = positive, 1 = reverse).	1

9. Parameters List and features description

10 Start/Stop/Dir	Selection and configuration of signal source such as start/stop/direction	Def
In1 FWD, In2 REV	The signal source for the start and stop commands is selected by parameter 10.01 Ext1 start in1 (input 1 of control ground 1) and 10.02 Ext1 start in2 (input 2 of control ground 1). The state transition of the source bit is explained as follows:	2
RUN/STOP/DIR	The signal source for the start and stop commands is selected by parameter 10.01 Ext1 start in1 (input 1 of control ground 1), 10.02 Ext1 start in2 (input 2 of control ground 1) and 10.03 Ext1 start in3 (input 3 of control ground 1). The state transition of the source bit is explained as follows: Control ground 1 input 1 state / Control ground 1 input 2 state / Control ground 1 input 3 state / Command 0◊1 / 0 / 0 / Forward Start 0◊1 / 0 / 1 / Reverse Start X / 1 / X / Stop 0 / 0 / X / Change Direction	3
FWD/REV/STOP	The signal source for the start and stop commands is selected by parameter 10.01 Ext1 start in1 (input 1 of control ground 1), 10.02 Ext1 start in2 (input 2 of control ground 1) and 10.03 Ext1 start in3 (input 3 of control ground 1). The state transition of the source bit is explained as follows: Control ground 1 input 1 state / Control ground 1 input 2 state / Control ground 1 input 3 state / Command 0◊1 / 0 / 0 / Forward Start 0 / 0◊1 / 0 / Reverse Start X / X / 1 / Stop 1 / 1 / 0 / Stop	4
Fieldbus	Fieldbus communication control word decision	5
Control Panel	The stop button control is activated by the control panel.	6
10.01 Ext1 start In1	Select the source of input 1 that controls ground 1. The default DI1 is the forward rotation start signal.	DI1
P.01.00.00	User-defined pointer (01.00.00 is a set of two digits from left to right, which in turn represents the parameter group number, index, and bit number. The actual value is determined by the current value of the parameter.)	-
CONST.FALSE	Always 0	0
CONST.TRUE	Always 1	1
DI1	Digital input DI1 (02.00 DI status, bit 0)	2048 =P02.00.00
DI2	Digital input DI2	2049
DI3	Digital input DI3	2050

9. *Parameters List and features description*

10 Start/Stop/Dir	Selection and configuration of signal source such as start/stop/direction	Def
DI4	Digital input DI4	2051
DI5	Digital input DI5	2052
DI6	Digital input DI6	2053
10.02 Ext1 start In2	Select controls ground 1 input the signal source of 2 See parameter 10.01 Ext start In1 for available options.	DI2
10.03 Ext1 start In3	Select controls ground 1 input the signal source of 3 See parameter 10.01 Ext start In1 for available options.	[0]
10.04 Ext2 start func	Select the signal source of the start and stop commands for external control ground 2 (EXT2). See parameter 10.00 Ext1 start func for the available options.	[0]
10.05 Ext2 start In1	Select controls ground 2 input the signal source of 1 See parameter 10.01 Ext start In1 for available options.	[0]
10.06 Ext2 start In2	Select controls ground 2 input the signal source of 2 See parameter 10.01 Ext start In1 for available options.	[0]
10.07 Ext2 start In3	Select controls ground 2 input the signal source of 3 See parameter 10.01 Ext start In1 for available options.	[0]
10.08 JOG1 start	Select the signal source of the jog 1 start See parameter 10.00 Ext1 start func for the available options.	[0]
10.09 JOG2 start	Select the signal source of the jog 2 start See parameter 10.00 Ext1 start func for the available options.	[0]
10.10 JOG enable	Select the signal source of the jog enable See parameter 10.00 Ext1 start func for the available options.	[0]
10.11 Fault reset sel	Select the signal source of the fault reset command See parameter 10.00 Ext1 start func for the available options.	[0]
10.12 Run enable	Select the signal source of run enable See parameter 10.00 Ext1 start func for the available options.	[1]
10.13 Emergency stop	Select the signal source of emergency stop See parameter 10.00 Ext1 start func for the available options.	[1]
10.14 EM stop mode	Emergency stop mode selection. 0 = OFF1, deceleration stop, deceleration time is acceleration/deceleration time 1 1 = OFF2, free parking 3 = OFF3, deceleration stop, deceleration time is emergency stop time.	[1]
10.15 Start enable	Select signal source of start enable . See parameter 10.00 Ext1 start func for the available options.	[1]
10.16 Upper limit	Select signal source of upper limit. See parameter 10.00 Ext1 start func for the available options.	[1]
10.17 Lower limit	Select signal source of lower limit . See parameter 10.00 Ext1 start func for the available options.	[1]

〉 11 Start/Stop Mode

11 Start/Stop Mode	Drive Start/Stop Mode Setting	Def
11.00 Stop mode	Stop mode. 0 = RAMP, deceleration stop 1 = COAST, free stop	[0]

9. *Parameters List and features description*

11 Start/Stop Mode	Drive Start/Stop Mode Setting	Def
11.01 Ext1/Ext2 sel	Select the signal source of the switching control ground, 0: Select Control Ground 1 (Ext1), 1: Select Control Ground 2 (Ext2). See parameter 10.00 Ext1 start func for the available options.	[0]
11.02 Ext1 ctrl mode	Control mode of motor in ground 1. 0 = Speed, speed mode 1 = Torque, torque mode 2 = Torque and Speed, torque control limit speed 3 = DC source, constant DC voltage control mode 4 = speed mode limited power 5 = speed mode limits braking force	[0]
11.03 Ext2 ctrl mode	Control mode of the motor in ground 2. See parameter 11.02 Ext1 ctrl mode for available options.	[0]
11.04 Local ctrl mode	Control mode of the motor in local control See parameter 11.02 Ext1 ctrl mode for available options.	[0]
11.05 Ext1 trig type	Select the trigger mode that controls ground 1. 0 = Edge, edge triggered 1 = Level, level trigger	[1]
11.06 Ext2 trig type	Select the trigger mode that controls ground 2. See parameter 11.05 Ext1 trig type for available options.	[1]
11.07 Ctrl mode select	Input source for remote control mode switching.	Const.False

> **13 Analog & pulse in**

13 Analog & pulse in	Analog and pulse input @ control unit	Def
13.00 AI1 input max	The maximum value of the analog input AI1.	10.000 V
13.01 AI1 input min	The minimum value of the analog input AI1.	0 V
13.02 AI1 max scale	The maximum value of the analog AI1 after conversion, the minimum unit for the speed and torque timing is 0.1, that is, 15000 represents 1500.0RPM.	15000
13.03 AI1 min scale	The minimum value of the analog AI1 after conversion. Ibid	0
13.04 AI1 mode	The input method of AI1. If the current signal is required, it needs to be jumped according to the wiring diagram. 0 = 0 -10V 1 = 0 -20mA 2 = -10V -10V 3 = -20mA -20mA	[0]
13.05 AI1 sim enable	For debugging or other applications, the user can enable the simulation function of the analog input AI1 with this parameter.	[0]
13.06 AI1 sim data	Simulation data for analog AI1.	0
13.07 AI1 filter time	Define the filter time constant of analog AI1.	0.010 s
13.08 AI2 input max	The maximum value of the analog input AI2.	10.000 V

9. *Parameters List and features description*

13 Analog & pulse in	Analog and pulse input @ control unit	Def
13.09 AI2 input min	The minimum value of the analog input AI2.	0.000 V
13.10 AI2 max scale	The maximum value of the analog AI2 after conversion. Interpretation with AI1	10000
13.11 AI2 min scale	The minimum value of the analog AI2 after conversion.	0
13.12 AI2 mode	**The input method of AI2. If the current signal is required, it needs to be jumped according to the wiring diagram. 0 = 0 -10V** 1 = 0 -20mA 2 = -10V -0V 3 = -20mA -20 mA	[0]
13.13 AI2 sim enable	Simulation of analog AI2 is enabled.	Disable = [0]
13.14 AI2 sim data	Simulation data for analog AI2.	0
13.15 AI2 filter time	Define the filter time constant for analog AI2.	0.010 s
13.16 Freq input max	The maximum frequency of the DIO1 high speed pulse input.	10000 Hz
13.17 Freq input min	The minimum frequency of the DIO1 high speed pulse input.	0 Hz
13.18 Freq in max scale	The maximum output of the frequency input after conversion is the minimum unit of speed and torque timing, which is 0.1, which means 15000 represents 1500.0RPM.	15000
13.19 Freq in min scale	Frequency input has been converted to the minimum output value. Ibid	0
13.20 Freq in sim enable	For debugging or other applications, the user can enable simulation of the frequency input with this parameter.	Disable = [0]
13.21 Freq in sim data	Simulation data for frequency input.	0
13.22 Freq in filter time	**Define the filter time constant for the frequency input。**	0.010 s

> **14 Digital I/O**

14 Digital I/O	Digital input and output @ Control Unit	Def
14.00 DI1 on delay	Digital input DI1 close delay time.	50 ms
14.01 DI1 off delay	Digital input DI1 off delay time	50 ms
14.02 DI2 on delay	Digital input DI2 close delay time.	50 ms
14.03 DI2 off delay	Digital input DI2 off delay time.	50 ms
14.04 DI3 on delay	Digital input DI3 close delay time.	2 ms
14.05 DI3 off delay	Digital input DI3 off delay time.	2 ms
14.06 DI4 on delay	Digital input DI4 close delay time.	2 ms
14.07 DI4 off delay	Digital input DI4 off delay time.	2 ms

9. Parameters List and features description

14 Digital I/O	Digital input and output @ Control Unit	Def
14.08 DI5 on delay	Digital input DI5 close delay time.	2 ms
14.09 DI5 off delay	Digital input DI5 off delay time.	2 ms
14.10 DI6 on delay	Digital input DI6 close delay time.	2 ms
14.11 DI6 off delay	Digital input DI6 off delay time.	2 ms
14.12 DIO1 on delay	DIO1 close delay time. Both input and output are valid.	0 ms
14.13 DIO1 off delay	DIO1 off delay time. Both input and output are valid.	0 ms
14.14 DIO2 on delay	DIO2 close delay time. Both input and output are valid.	0 ms
14.15 DIO2 off delay	DIO2 off delay time. Both input and output are valid.	0 ms
14.16 RO1 on delay	Digital output RO1 close delay time.	0 ms
14.17 RO1 off delay	Digital output RO1 off delay time.	0 ms
14.18 RO2 on delay	Digital output RO2 close delay time.	0 ms
14.19 RO2 off delay	Digital output RO2 off delay time.	0 ms
14.20 DI logic	The logical type of the digital input is 0 = normal, 1 = inverse logic.	0000000b
14.21 DI sim enable	The simulation of the digital input enables 0 = off and 1 = enables.	0000000b
14.22 DI sim data	Simulation data for digital inputs.	0000000b
14.23 DI status undelay	The status before the digital input delay link is read-only.	-
14.24 DO logic	The logical type of the digital output.	0000b
14.25 DO sim enable	Digital output simulation is enabled.	0000b
14.26 DO sim data	Simulation data for digital output.	0000b
14.27 DIO1 source	Set the source of DIO1.	Running
P.01.00.00	User-defined pointer (01.00.00 is a set of two digits from left to right, which in turn represents the parameter group number, index, and bit number. The actual value is determined by the current value of the parameter.	-
CONST.FALSE	Always 0	0
CONST.TRUE	Always 1	1
Ready	Ready (06.00 status word 1, bit 0)	6144
Running	Drive running (06.00 status word 1, bit 4)	6148
Fault	Drive failure (06.00 status word 1, bit 1)	6145
Alarm	Drive alarm (06.00 status word 1, bit 2)	6146

14 Digital I/O	Digital input and output @ Control Unit	Def
Start req	The drive has received a start request (06.00 status word 1, bit 6)	6150
Ext2	The drive is controlled by external control 2 (06.00 status word 1, bit 14)	6158
Loc ctrl	The drive is in local control (06.00 status word 1, bit 15)	6159
Zero speed	The drive output is 0 (06.03 speed control status word, bit 0)	6192
Reverse	Drive output is negative (06.03 speed control status word, bit 1)	6193
At setpoint	The drive output is equal to the setting (06.03 Speed Control Status Word, Bit 4)	6196
Torq limit	Drive torque limit operation (06.03 speed control status word, bit 13)	6205
Speed limit	Drive speed limit operation (06.03 speed control status word, bit 14	6206
14.28 DIO2 source	Set the signal source of DIO2. See parameter 14.27 DIO1 source for available options.	Fault
14.29 RO1 source	Set the signal source of RO1. See parameter 14.27 DIO1 source for available options.。	Running
14.30 RO2 source	Set the signal source of RO2. See parameter 14.27 DIO1 source for available options.。	Fault
14.31 DIO1 config	Set the port type of DIO1. 0 = general purpose output 1 = universal input 2 = high speed pulse input	[0]
14.32 DIO2 config	Set the port type of DIO2. This feature is not supported in the R1 series. 0 = general purpose output 1 = universal input 2 = high speed pulse output	[0]
14.33 DO JOG mask	Set whether the DO output is masked when jogging.	0

⟩ **15 Analog & pulse out**

15 Analog & pulse out	Analog output and pulse output @Control unit	Def
15.00 AO1 source	Select the source of the analog output AO1.	Motor speed = [256]
P.01.00	User-defined pointer (01.00 is a set of two digits from left to right, which in turn represents the parameter group number and index. The actual value is determined by the current value of the parameter.)	-
Zero	Always 0	0

9. *Parameters List and features description*

15 Analog & pulse out	Analog output and pulse output @Control unit	Def
Motor speed	See parameter 01.00 Motor speed.	256
Output frequency	See parameter 01.01 Output frequency.	257
DC bus voltage	See parameter 01.02 DC bus voltage.	258
Motor current	See parameter 01.03 Motor current.	259
Motor current %	See parameter 01.04 Motor current %.	260
Motor slip est	See parameter 01.12 Motor slip est.	268
Output voltage	See parameter 01.21 Output voltage.	277
Motor torque	See parameter 01.22 Motor torque.	278
Motor temperature	See parameter 01.23 Motor temperature.	279
Output power	See parameter 01.28 Output power.	284
15.01 AO1 output max	Define the maximum value of the analog output AO1 output.	10.000 V
15.02 AO1 output min	Define the minimum value of the analog output AO1 output.	0.000 V
15.03 AO1 source max	Defines the maximum value of the signal selected by parameter 15.00 AO1 source.	1500.0
15.04 AO1 source min	Defines the minimum value of the signal selected by parameter 15.00 AO1 source.	0
15.05 AO1 sim data	When AO1 simulation is enabled, set its output voltage or current.	10.000 V
15.06 AO1 sim enable	For debugging or other applications, the user can enable the simulation function of the analog output AO1 with this parameter.	[0]
15.07 AO1 abs mode	Whether the AO1 signal source takes the absolute value and then converts it. 0 = Normal, normal conversion 1 = ABS, absolute value conversion	[1]
15.08 AO1 output type	AO1 output type. The corresponding jumper status must be consistent. 0 = Voltage, voltage output 1 = Current, current output	Voltage = [0]
15.09 AO1 filter time	Define the filter time constant of AO1.	0.010s
15.10 AO2 source	The signal source selection of the analog output AO2. See parameter 15.00 AO1 source for available options.	Motor current % = [260]
15.11 AO2 output max	Define the maximum value of the analog output AO2 output.	10.000 V
15.12 AO2 output min	Define the minimum value of the analog output AO2 output.	0.000 V
15.13 AO2 source max	Define the maximum value of the signal selected by parameter 15.10 AO2 source.	1500.0

9. *Parameters List and features description*

15 Analog & pulse out	Analog output and pulse output @Control unit	Def
15.14 AO2 source min	Defines the minimum value of the signal selected by parameter 15.10 AO2 source.	0
15.15 AO2 sim data	Simulation data of analog AO2.	10.000 V
15.16 AO2 sim enable	Simulation of analog AO2 is enabled.	Disable = [0]
15.17 AO2 abs mode	Whether the AO2 signal source takes the absolute value and then converts it. 0 = Normal, normal conversion 1 = ABS, absolute value conversion	[1]
15.18 AO2 output type	AO2 output type. The corresponding jumper status must be consistent. 0 = Voltage, voltage output 1 = Current, current output	Voltage = [0]
15.19 AO2 filter time	Define the filter time constant of AO2.	0.010s
15.20 Freq out source	DIO2 is selected as the source for high-speed pulse output. Note: The parameter 14.32 DIO2 config must be set to 2 high-speed pulse output first. For the available options, see parameter 15.00 AO1 source. The R1 series is not supported.	0
15.21 Freq out max	The maximum frequency of the DIO2 high speed pulse output.	10000 Hz
15.22 Freq out min	The minimum frequency of the DIO2 high speed pulse output.	0 Hz
15.23 Freq out src max	The actual signal value corresponding to the maximum frequency output value.	15000
15.24 Freq out src min	The actual signal value corresponding to the minimum frequency output value.	0
15.25 Freq out sim enable	For debugging or other applications, the user can enable the simulation function of the frequency output with this parameter.	Disable = [0]
15.26 Freq out sim data	When the frequency output simulation is enabled, set its output frequency.	10000 Hz
15.27 Freq out filter time	Define the filter time constant for the frequency output.	0.1s

〉 **16 System**

16 System	Drive system settings. Parameter lock, parameter recovery, user parameter set, etc.	Def
16.00 Local lock	Select the source that is prohibited by local control. When the pointer value is 1, the drive can only work in remote mode.	CONST.FALSE = [0]
16.01 Parameter lock	Select the state of the parameter lock. This parameter lock prevents the parameters from being modified. 0 = Open, open. Parameter values can be modified 1 = Locked, locked. Parameters cannot be modified	Open = [0]
16.02 Pass code	Enter different passwords to get different parameter access rights.	0

9. *Parameters List and features description*

16 System	Drive system settings. Parameter lock, parameter recovery, user parameter set, etc.	Def
16.03 Param restore	Restore the default value of the parameter. This parameter is automatically restored to 0 after the operation is completed. 0 = Done, no action or parameter recovery completed 1 = Default, restore some parameters, excluding motor and encoder related parameters 2 = Clear all. Restore all parameters 3 = Factory. Factory reserved	Done = [0]
16.04 Param save manual	Save the parameters manually. This parameter is automatically restored to 0 after the operation is completed.	Done = [0]
16.05 Param set sel	Loads the specified parameter set to the current active parameter set or saves the current active parameter set to the specified parameter set. This parameter is automatically restored to 0 after the operation is completed. 0 = No request, no request. 1 = Load by I/O, loaded by I/O 2 = Load set1, load parameter set 1 3 = Load set2, load parameter set 2 4 = Load set3, load parameter set 3 5 = Load set4, load parameter set 4 6 = Save to set1, save to parameter set 1 7 = Save to set2, save to parameter set 2 8 = Save to set3, save to parameter set 3 9 = Save to set4，save to parameter set 4	[0]
16.08 Param set in1	This parameter is valid only when parameter 16.05 Param set sel selects 1 (Load by IO).	[0]
16.09 Param set in2	This parameter is valid only when parameter 16.05 Param set sel selects 1 (Load by IO).	[0]
16.10 Set as default	Set the current value of all parameters to a custom default.	[0]
16.11 Fan on temp	Cooling fan opening temperature value	40.0 ℃
16.12 Fan off temp	Cooling fan off temperature value	30.0 ℃
16.13 Fan off delay	Delay time when the fan is turned off after shutdown using the running signal to control the fan	30.0 s
16.14 Fan ctrl mode	The control mode of the cooling fan. 0 is the preferred way, remember and follow it. 0 = Auto, according to the automatic temperature control, this is the preferred item, no special application, no change 1 = On while run, the run signal is determined 2 = Always on, always running3 = Always off	Auto = [0]
16.15 System reboot	The system manually resets the request.	[0]
16.16 System language 系统语言选择	System language setting. 0 = English (English)英语 1 = Chinese (Chinese)中文	[1]

› **17 Data logger**

17 Data logger	Software(Frimare) oscilloscope, computer online debugging monitor driver settings	Def
17.00 Data log enable	Enable the software oscilloscope function.	Enable = [1]

17 Data logger	Software(Frimare) oscilloscope, computer online debugging monitor driver settings	Def
17.01 Acquire mode	Oscilloscope data acquisition mode. Consistent with the use of physical oscilloscopes. 0 = Auto, auto trigger 1 = Normal, normal trigger 2 = Single, single trigger	Normal = [1]
17.02 Sample rate	Data sampling rate, which is the number of points collected in 1 second. For example, 1000 means that 1000 points are collected every second, that is, one data is collected in 1 ms. If the parameter exceeds 2 times the carrier frequency, the actual sampling rate will drop to twice the carrier frequency.	1000 Hz
17.03 CH1 source	Source selection for oscilloscope channel 1.	Iu
17.04 CH2 source	Source selection for oscilloscope channel 2	Iv
17.05 CH3 source	Source selection for oscilloscope channel 3.	
17.06 CH4 source	Signal source selection for oscilloscope channel 4.	
17.07 CH5 source	Signal source selection for oscilloscope channel 5.	
17.08 CH6 source	Signal source selection for oscilloscope channel 6.	
17.11 Trigger source	The source selection of the oscilloscope trigger channel.	
17.12 Force trig	Force the request to be triggered. 0 = Done 1 = Force trig	Done = [0]
17.13 Trig level	Set the trigger level. This parameter does not work in auto trigger mode.	0
17.14 Event trig source	Select the source of the event trigger, 0: no trigger, 1: trigger.	CONST.FALSE = [0]
17.15 Trig edge sel	Trigger edge setting for the source used for triggering specified by parameter 17.11 Trigger source 0 = Rising, rising edge trigger acquisition 1 = Falling, falling edge trigger acquisition 2 = Both, both rising and falling edges trigger the acquisition	Rising = [0]
17.16 Event edge sel	The edge of the event specified for triggering specified by parameter 17.14 Event trig source. *1715 Trig edge sel。*	Rising = [0]
17.17 Channel num	The number of channels of the oscilloscope is set. When the number of channels is less than 8, the parameters 17.03 to 17.10 do not work, and the former is preferred.	6
17.18 Channel size	The data length per channel. The system automatically calculates it for use by the host computer. Read only.	-

⟩ **19 Speed calculation**

19 Speed calculation	Speed calculation	Def
19.00 Speed scaling	Define the final velocity value at the time of acceleration and the initial velocity value during deceleration. Similar to the maximum frequency of an industry drive.	1500 rpm

9. Parameters List and features description

19 Speed calculation	Speed calculation	Def
19.01 Speed filter time	Define the filter time for speed feedback.	2.0 ms
19.02 Zero speed delay	Define the zero speed hold time when decelerating to stop.	0.5 s
19.03 Zero speed level	Define the initial speed value for zero speed hold	30 rpm
19.04 Speed window	Defines the speed window range at which the speed arrives.	30 rpm
19.05 Speed unit type	Indicates the current speed unit type. Read only. 0 = 1rpm 1 = 0.1rpm 2 = 0.01rpm	-

› 20 Limits

20 Limits	Main drive power characteristic limiting control of speed, forward and reverse, torque, etc.	Def
20.00 Maximum speed	The maximum forward speed allowed by the drive. If you need to obtain a value above the rated speed, please change this parameter.	1500 rpm
20.01 Minimum speed	The maximum reverse speed allowed by the drive. Change this parameter if you need to obtain a value above the rated speed. .	-1500 rpm
20.02 Pos speed enable	Select the source of the forward enable command	CONST.TRUE = [1]
20.03 Neg speed enable	Select the source of the inversion enable command	CONST.TRUE = [1]
20.04 Motor power limit	Electric power limit value. Relative torque of the motor.	150.0%
20.05 Regen power limit	Power generation limit value. Relative torque of the motor.	-150.0%
20.06 Max torque	The maximum torque allowed. Relative torque of the motor.	150.0%
20.07 Min torque	The minimum torque allowed. Relative torque of the motor.	150.0%

› 21 Speed reference

21 Speed reference	Speed reference and defined or configuration	Def
21.00 Speed ref1 src	Select the source for the speed reference Speed ref1.	AI1 scaled = [515]
P.01.00	User-defined pointer (01.00 is a set of two digits from left to right, which in turn represents the parameter group number and index. The actual value is determined by the current value of the parameter.	-
Zero	Always zero	0

21 Speed reference	Speed reference and defined or configuration	Def
AI1 scaled	See parameter 02.03 AI1 scaled (converted value of AI 1).	515
AI2 scaled	See parameter 02.05 AI2 scaled (converted value of AI2.	517
Freq in scaled	See parameter 02.09 Freq in scaled.	521
Control panel ref1	See parameter 02.11 Control panel ref1 (control panel reference 1).	523
Control panel ref2	See parameter 02.12 Control panel ref2 (Control panel reference 2).	524
Fieldbus ref1	See parameter 02.13 Fieldbus ref1 (fieldbus reference 1).	525
Fieldbus ref2	See parameter 02.14 Fieldbus ref2 (fieldbus reference 2).	526
Motor potent out	See parameter 03.01 Motor potent out.	769
Const speed out	See parameter 03.02 Const speed out.	770
Process PID out	See parameter 04.04 Process PID out.	1028
21.01 Speed ref2 src	Select the source for the speed reference Speed ref 2, see parameter 21.00 Speed ref1 src for the available options.	AI2 scaled = [517]
21.02 Speed ref1 func	Speed ref1 and Speed ref2 synthesis operation function selection. 0 = Ref1 1 = Ref1 + Ref2 2 = Ref1 − Ref2 3 = Ref1 * Ref2 4 = MIN(Ref1, Ref2) 5 = MAX(Ref1, Ref2) 6 = ABS(Ref1)	Ref1 = [0]
21.03 Speed ref2 sel	Select the source that switches between speed reference 1 and 2, 0 : Select the speed reference 1 synthesized by parameter 21.02 Speed ref func. 1 : Select the speed reference 2 selected by parameter 21.01 Speed ref2 src (source of speed reference 2).	CONST.FALSE = [0]
21.04 Speed ref share	Defines the scaling factor for the speed reference to zoom in or out on the speed reference.	1.000
21.05 Speed ref JOG1	Define the speed reference for the jog function 1.	15．0 rpm
21.06 Speed ref JOG2	Define the speed reference for jog function 2.	30．0 rpm

9. *Parameters List and features description*

21 Speed reference	Speed reference and defined or configuration	Def
21.07 Pot save mode	Select whether to keep the value of the potentiometer UP/DOWN after the drive is powered off. 0 = Reset, reset. Reset the value of the potentiometer UP/DOWN after power off 1 = Store, store. Save the potentiometer UP/DOWN value after power off 2 = Reset when stopped, stop clear。	
21.08 Pot up source	Select the source of the potentiometer UP/DOWN increment command, the bit pointer. 0: No increment instruction, 1: There is increment instruction.	CONST.FALSE = [0]
21.09 Pot down source	Select the source of the potentiometer UP/DOWN decrement command, the bit pointer. 0: no decrement instruction, 1: decrement instruction.	CONST.FALSE = [0]
21.10 Pot output max	The maximum value of the potentiometer UP/DOWN output.	1500rpm
21.11 Pot output min	The minimum value of the potentiometer UP/DOWN output. If you do not need to reverse, please set 20.03 to 0 to prohibit reverse	-1500rpm
21.12 Pot ramp time	The output of the potentiometer UP/DOWN is from the parameter 21.10 to the acceleration/deceleration ramp time of parameter 21.11.	10.0s
21.13 Pot output	Real-time output of potentiometer UP/DOWN. Read only.	-
21.14 Slow down spd ref	Up or down speed limit.	30rpm
21.15 Up slow rqst	Upstream deceleration request source selection.	CONST TRUE
21.16 Down slow rqst	Downstream deceleration request source selection.	CONST TRUE

⟩ **22 Speed ramp**

22 Speed ramp	Speed reference ramp generator, acceleration and deceleration settings	Def
22.00 Acc time1	The speed is accelerated from zero to the time corresponding to parameter 19.00 Speed scaling.	Model related
22.01 Dec time1	Deceleration time 1	Model related
22.02 Acc time2	Acceleration time 2	Model related
22.03 Dec time2	Deceleration time 2	Model related
22.04 EM stop time	Emergency stop time	1.00 s
22.05 Jog acc time	Jog acceleration time	5.00 s
22.06 Jog dec time	Jog deceleration time	5.00 s
22.07 Shape acc time1	S curve acceleration time 1	0.20 s

9. *Parameters List and features description*

22 Speed ramp	Speed reference ramp generator, acceleration and deceleration settings	Def
22.08 Shape acc time2	S curve acceleration time 2	0.20 s
22.09 Shape dec time1	S curve deceleration time 1	0.20 s
22.10 Shape dec time2	S curve deceleration time 2	0.20 s
22.11 Speed scaling	It is the same parameter as 19.00 Speed scaling.	1500 rpm
22.12 Ramp time sel	Select the source to switch between acceleration/deceleration time 1 and acceleration/deceleration time 2, 0: select acceleration/deceleration time 1,1: select acceleration/deceleration time 2.	CONST.FALSE = [0]

〉 **23 Speed control**

23 Speed control	Speed control, speed loop, current loop and its integral droop settings	Def
23.00 Speed Kp	Define the proportional gain of the speed controller	1.00
23.01 Speed Ti	Set the integration time of the speed loop	100ms
23.02 Torque Kp	Set the proportional gain of the torque loop	2.00
23.03 Droop rate	Speed droop control rate, only used for speed droop control.	0.0%

〉 **24 Torque reference**

24 Torque reference	Torque reference, and related parameter configuration	Def
24.00 Torque ref1 src	**Select the source of the torque reference 1**	AI1 scaled = [515]
P.01.00	User-defined pointer (01.00 is a set of two digits from left to right, which in turn represents the parameter group number and index. The actual value is determined by the current value of the parameter.	-
Zero	Always zero	0
AI1 scaled	See parameter 02.03 AI1 scaled (converted value of AI 1	515
AI2 scaled	See parameter 02.05 AI2 scaled (converted value of AI2.	517
Freq in scaled	See parameter 02.09 Freq in scaled.	521
Control panel ref1	See parameter 02.11 Control panel ref1 (control panel reference 1	523

24 Torque reference	Torque reference, and related parameter configuration	Def
Control panel ref2	See parameter 02.12 Control panel ref2 (Control panel reference 2).	524
Fieldbus ref1	See parameter 02.13 Fieldbus ref1 (fieldbus reference 1).	525
Fieldbus ref2	See parameter 02.14 Fieldbus ref2 (fieldbus reference 2).	526
Motor potent out	See parameter 03.01 Motor potent out.	769
Const speed out	See parameter 03.02 Const speed out.	770
Process PID out	See parameter 04.04 Process PID out.	1028
24.01 Torque ref2 src	Select the source for the torque reference 2, see parameter 24.00 Torque ref1 src for the available options.	AI2 scaled = [517]
24.02 Torque ref func	Synthetic math function for Torque Ref1 and Torque Ref2.0 = Ref1 1 = Ref1 + Ref2 2 = Ref1 − Ref2 3 = Ref1 * Ref2 4 = MIN(Ref1, Ref2) 5 = MAX(Ref1, Ref2) 9= torque and speed direction are same 10=torque and speed direction are opposite	Ref1 = [0]
24.03 Torque ref2 sel	Select the source that switches between torque reference 1 and 2, 0 : Select the torque reference 1 synthesized by parameter 24.02 Torque ref func. 1 : Select the torque reference 2 selected by parameter 24.01 Torque ref2 src (source of torque reference 2).	CONST.FALSE = [0]
24.04 Torque load share	Torque given distribution coefficient, define the torque given final value to enlarge or reduce	1.000
24.05 Torque acc time	The torque is given the acceleration time.	0.10 s
24.06 Torque dec time	The torque is given to the deceleration time.	0.10 s
24.07 Torque filter time	Torque given filter time.	1 ms
24.08 FricTrq static	Static friction compensation coefficient, relative to the rated motor torque.	0.0%
24.09 FricTrq slide	Sliding friction compensation coefficient, relative to the rated motor torque.	0.0%
24.10 Inertial trq	Moment of inertia compensation coefficient, relative to motor rated torque.	0.0%

9. *Parameters List and features description*

› **25 Critical speed**

25 Critical speed	Set the critical speed or the range of speeds to avoid, such as mechanical resonance problems.	Def
Reserved		

› **26 Constant speeds**

26 Constant speeds	Multi-segment speed selection and value	Def
26.00　Const speed0	Define multi-speed 0.	300 rpm
26.01　Const speed1	Define multi-speed 1 .	1500 rpm
26.02　Const speed2	Define multi-speed 2 .	1500 rpm
26.03　Const speed3	Define multi-speed 3 .	1500 rpm
26.04　Const speed4	Define multi-speed 4 .	1500 rpm
26.05　Const speed5	Define multi-speed 5 .	0 rpm
26.06　Const speed6	Define multi-speed 6 .	0 rpm
26.07　Const speed7	Define multi-speed 7 .	0 rpm
26.08　Const speed8	Define multi-speed 8 .	0 rpm
26.09　Const speed9	Define multi-speed 9 .	0 rpm
26.10　Const speed10	Define multi-speed 10 .	0 rpm
26.11　Const speed11	Define multi-speed 11 .	0 rpm
26.12　Const speed12	Define multi-speed 12 .	0 rpm
26.13　Const speed13	Define multi-speed 13 .	0 rpm
26.14　Const speed14	Define multi-speed 14 .	0 rpm
26.15　Const speed15	Define multi-speed 15 .	0 rpm
26.16　　Const speed mode	Define a mode that selects multi-speed 0-15 by a total of 4 signals from parameters 26.18 Const speed sel1 to 26.21 Const speed sel4. 0 = Packed, combined mode. Corresponding to 16-speed 1 = Separate, standalone mode. Corresponding to 5 speed	Packed = [0]
26.16 Const speed mode	Define the mode of multi-speed 0▲ 15 by using a total of 4 signals from parameters 26.18 Const speed sel1 to 26.21 Const speed sel4.	Packed = [0]

9. *Parameters List and features description*

26 Constant speeds	Multi-segment speed selection and value	Def
Packed	Four signal combinations produce 16 choices, corresponding to multi-speed 0▲ 15, the specific <table><tr><td>Multi-speed selection 1</td><td>Multi-speed selection 2</td><td>Multi-speed selection 3</td><td>Multi-speed selection 4</td><td>Multi-speed selection state</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>Multi-speed 0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>Multi-speed 1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>Multi-speed 2</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>Multi-speed 3</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>Multi-speed 4</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>Multi-speed 5</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>Multi-speed 6</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>Multi-speed 7</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>Multi-speed 8</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>Multi-speed 9</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>Multi-speed 10</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>Multi-speed 11</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>Multi-speed 12</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>Multi-speed 13</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>Multi-speed 14</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>Multi-speed 15</td></tr></table> combination is as follows If you need to use multi-speed 0, you need to set the parameter 21.00 spd ref1 src to 03.02 Const speed out.	0
Separate	The four signals are used to select multi-speed 0▲ 4, 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><td>Multi-speed selection 1</td><td>Multi-speed selection 2</td><td>Multi-speed selection 3</td><td>Multi-speed selection 4</td><td>Multi-speed selection state</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>Multi-speed 0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>Multi-speed 1</td></tr><tr><td>X</td><td>1</td><td>0</td><td>0</td><td>Multi-speed 2</td></tr><tr><td>X</td><td>x</td><td>1</td><td>0</td><td>Multi-speed 3</td></tr><tr><td>X</td><td>x</td><td>X</td><td>1</td><td>Multi-speed 4</td></tr></table> If you need to use multi-speed 0, you need to set the parameter 21.00 spd ref1 src to 03.02 Const speed out.	1
26.17 Const speed out	Multi-speed output. Read only	0 rpm
26.18 Const speed sel1	Multi-speed select 1 signal source. Define each terminal For example: DI3=p02.00.02	CONST.FALSE = [0]
26.19 Const speed sel2	*Multi-speed select 2 signal source.Ibid.*	CONST.FALSE = [0]
26.20 Const speed sel3	*Multi-speed select 3 signal source.Ibid.*	CONST.FALSE = [0]
26.21 Const speed sel4	*Multi-speed select 4signal source.Ibid.*	CONST.FALSE = [0]

9. *Parameters List and features description*

⟩ **27 Process PID**

27 Process PID	PID for process control, setting and adjustment parameters and configuration	Def
27.00 PID activate	Process control PID activation control.	Disable = [0]
27.01 Reference source	Select the given source. The default internal given is modified by 27.02	P.27.02 = [6914]
P.01.00	User-defined pointer (01.00 is a set of two digits from left to right, which in turn represents the parameter group number and index. The actual value is determined by the current value of the parameter.)	-
Zero	Always zero	0
AI1 scaled	See parameter 02.03 AI1 scaled (converted value of AI 1).	515
AI2 scaled	See parameter 02.05 AI2 scaled (converted value of AI2).	517
Freq in scaled	See parameter 02.09 Freq in scaled.	521
Control panel ref1	See parameter 02.11 Control panel ref1 (control panel reference 1).	523
Control panel ref2	See parameter 02.12 Control panel ref2 (Control panel reference 2).	524
Fieldbus ref1	See parameter 02.13 Fieldbus ref1 (fieldbus reference 1).	525
Fieldbus ref2	See parameter 02.14 Fieldbus ref2 (fieldbus reference 2).	526
27.02 Ref internal	The internal number of process control is given.	0
27.03 Ref filter time	The given filter time constant.	0.1s
27.04 Reference actual	The actual value given. Read only.	
27.05 Feedback func	The operation mode of the selected feedback signal source 1 and the feedback signal source 2 0 = Fbk1 1 = Add 2 = Sub 3 = MIN 4 = MAX	Fbk1 = [0]
27.06 Feedback 1 source	Select the source of feedback 1.	AI1 scaled = [515]
27.07 Feedback 2 source	Select the source of feedback 2.	AI2 scaled = [517]
27.08 Feedback1 max	Set the maximum value allowed for Feedback 1.	32767

9. *Parameters List and features description*

27 Process PID	PID for process control, setting and adjustment parameters and configuration	Def
27.09 Feedback1 min	Set the minimum allowed for Feedback 1.	0
27.10 Feedback2 max	Set the maximum value allowed for Feedback 2.	32767
27.11 Feedback2 min	Set the minimum allowed for feedback 2.	0
27.12 Feedback gain	The gain factor of the feedback.	1.00
27.13 Fbk filter time	The filter time constant of the feedback.	0.1 s
27.14 Feedback actual	The actual value of the feedback, read only.	
27.15 PID Kp	Proportional gain of PID	1.00
27.16 PID Ti	PID integration time.	2.00 s
27.17 PID Td	The differential time of the PID.	0.00 s
27.18 Deriv filter time	The filtering time of the micro component.	1.00 s
27.19 Error invert sel	Error inversion mode selection.	[0]
27.20 output trim mode	Format the output. 0 = Direct, direct output. The output is not processed by any conversion. 1 = Speed, converted to the dimension of speed. 2 = Torque, converted to the dimension of torque.	[0]
27.21 Out max	The maximum value allowed by the PID output.	32767
27.22 Out min	The minimum value allowed by the PID output.	-32768
27.23 Bal enable sel	Balance control enable signal.	Disable = [0]
27.24 Bal ref	A given amount of balance control.	32767
27.25 Sleep mode	Sleep mode. 0 = No sleep, never sleep 1 = Sleep internal, process control automatically enables sleep internally 2 = Sleep external, external signal enables sleep 3 = Sleep by error, enable sleep by PID error	No sleep = [0]
27.26 Sleep level	The motor speed level of the sleep triggered by the PID.	0
27.27 Sleep delay	PID sleep delay time	2.0 s
27.28 Wakeup level	The error level of PID wake-up. Wake up when the PID error is greater than this value.	0
27.29 Wakeup delay	Wake-up delay time after PID sleep.	2.0 s

27 Process PID	PID for process control, setting and adjustment parameters and configuration	Def
27.30 Sleep enable sel	The sleep external enable of the PID enables the source selection. Bit pointer.	[0]
27.31 Calc enable sel	Select the source of the PID operation enable.	Running
27.32 Feedback loss mode	PID feedback disconnection detection method 0 = Disable, no detection 1 = External, detected by external terminal input 2 = Internal, through PID error detection	[2]
27.33 Fbk loss min speed	The minimum speed of the PID feedback disconnection detection.	30.0rpm
27.34 Fbk loss src	Select the input terminal for the external feedback loss signal.	False
27.35 Fbk loss level	The error judgment level of the PID feedback disconnection.	3000
27.36 Fbk loss delay	PID feedback disconnection fault delay	2.0s

⟩ **29 Timer function**

29 Timer function	Timer function setting	Def
29.00 Timer enable	Activate the timer.	Disable = [0]
29.01 Timer status	The status word of the timer. The parameter can be pointed to by the pointer to achieve a specific timing function. Bit Name Description 0 Timer1 compare Timer 1 comparison trigger 1 Timer2 compare Timer 2 compare trigger 2 Timer3 compare Timer 3 comparison trigger 3 Timer1 period Timer 1 cycle trigger 4 Timer2 period Timer 2 cycle trigger 5 Timer3 period Timer 3 cycle trigger	
29.02 Timer1 period	The period of timer 1, in minutes.	1.0 min
29.03 Timer1 duty	The duty cycle of Timer 1, in percent.	50.0 %
29.04 Timer2 period	The period of timer 2, in minutes.	1.0 min
29.05 Timer2 duty	The duty cycle of Timer 2, in percent.	50.0 %
29.06 Timer3 period	The period of timer 3, in minutes.	1.0 min
29.07 Timer3 duty	The duty cycle of Timer 3, in percent.	50.0%

29 Timer function	Timer function setting	Def
29.08 long period	In the long-cycle mode, the unit of the timer period is minutes, the short-cycle mode, and the unit of the timer period is seconds. 0 = second, in seconds 1 = minute, in minutes	Disable

〉 **30 Fault function**

30 Fault function	Fault protection function setting	Def
30.00 Ext fault 1 src	Select the source of external fault 1, the bit pointer. 0: no fault signal, 1: fault signal. Can also be defined as a terminal by a pointer	CONST.FALSE = [0]
30.01 Ext fault 2 src	Select the source of external fault 2, the bit pointer. Ibid	CONST.FALSE = [0]
30.02 Groud fault act	Select the action that the drive performs when it detects a ground fault. 0 = No action 1 = Fault 2 = Alarm	Fault = [1]
30.03 Input phase loss	Select the action that the drive performs when it detects an input phase loss fault. 0 = No action 1 = Fault 2 = Alarm	Fault = [1]
30.04 Motor phase loss	Select the action to be performed when the drive detects a motor phase loss fault. 0 = No action 1 = Fault 2 = Alarm	Fault = [1]
30.05 OH alarm level	IGBT radiator overheat warning point setting. When the set overheat warning point exceeds the temperature allowed by the drive, the drive will ignore this parameter and automatically issue a warning 5 °C before overheating.	110.0 ℃
30.06 Fault auto reset	Use this parameter to activate or deactivate the automatic fault reset function.	Disable = [0]
30.07 Fault trial num	The number of attempts allowed by the fault reset	5
30.08 Fault trial wait	The interval between fault resets.	1.00 s
30.09 Trial cnt reset	Interval at which the fault reset attempt counter is cleared	60.00 s
30.10 ChopIGBT fault act	The action performed when the brake IGBT fails 0 = No action 1 = Fault 2 = Alarm	None
30.11 Rb est	The estimated resistance of the system. Read only.	-

› **31 Motor therm protection**

31 Motor therm prot	Motor temperature measurement and overheat protection settings	Def
31.00 Protect action	Select the action that the drive performs when the motor thermal protection detects that the motor is over temperature. 0 = No action 1 = Fault 2 = Alarm	Fault = [1]
31.01 Temperature src	Select the temperature measurement method for motor thermal protection. 0 = Estimated 1 = KTY84 2 = PTC 3 = PT100 X1 4 = PT100 X2 5 = PT100 X3	Estimated = [0]
31.02 Resistance	The measured resistance of the temperature sensor. Read only.	-
31.03 Alarm limit	Set the motor temperature warning point.	120.0℃
31.04 Fault limit	Set the motor temperature fault point.	130.0℃
31.05 PTC Fault res	Set the fault resistance point when the sensor is PTC.	4000.0
31.06 Ambient temp	Set the actual motor working environment temperature.	40.0℃
31.07 Motor nom temp rise	When the load of the motor reaches the rated current, the temperature rise of the motor is defined. Refer to the motor manufacturer's recommendations.	60.0 ℃
31.08 Therm time const	Define the thermal time constant of the motor thermal protection model (ie, the time when the temperature rise reaches 63% of the rated temperature rise). Refer to the motor manufacturer's recommendations.	1800.0 s

› **32 Factory setting（parameters for manufacturer to calibration）**

32 Factory setting	Factory optimized configuration for drive manufacturing, kernel factory optimized configuration (default)	Def
32.04 Kp_vdc_max	Proportional gain of overvoltage stall controller, Q12	4096
32.05 Ki_vdc_max	Integral gain of overvoltage stall controller, Q16	1638
32.06 Kp_vdc_max_f	Proportional gain of overvoltage stall frequency controller, Q12	4096
32.07 Ki_vdc_max_f	Integral gain of overvoltage stall frequency controller, Q16	1638
32.08 Kp_fctrl	Proportional gain of open loop frequency controller, Q12	2048

9. Parameters List and features description

32 Factory setting	Factory optimized configuration for drive manufacturing, kernel factory optimized configuration (default)	Def
32.09 Kp_vctrl	Proportional gain of open-loop voltage controller, Q12	2048
32.10 AI1 gain	Analog input AI1 correction gain, Q12	4096
32.11 AI1 offset	Analog input AI1 correction offset, 1mV or 1mA	0
32.12 AI2 gain	Analog input AI2 correction gain, Q12	4096
32.13 AI2 offset	Analog input AI2 correction offset, 1mV or 1mA	0
32.14 AO1 gain	Analog output AO1 correction gain, Q12	3805
32.15 AO1 offset	Analog output AO1 correction offset, 1mV or 1mA	45mV
32.16 AO2 gain	Analog output AO2 correction gain, Q12	3805
32.17 AO2 offset	Analog output AO2 correction offset, 1mV or 1mA	45mV

⟩ **34 Logic function**

34 Logic function	Programmable Comparator, Combination Logic Unit Settings	Def
34.00 Logic status	Any bit of the status word can be connected via a bit pointer. BIT0: Comp1 BIT1: Comp2 BIT2: Comp3 BIT3: Logic1 BIT4: Logic2 BIT5: Logic3	
34.01 CMP1 actual value	The actual value of the signal of comparator 1 of the programmable logic. Read only.	0
34.02 CMP1 A src	Compare the source of input A with the same phase.	Zero
34.03 CMP1 B val	Inverting compares the comparison level value of input B.	120
34.04 CMP1 hysteresis	The hysteresis width of the comparator.	20
34.05 CMP1 in abs	Enable or disable the absolute value of the comparator input.	Disable
34.06 CMP1 out inv	Enable or disable the negation of the comparator output.	Disable
34.07 CMP1 win	Enable or disable the window comparison mode.	Disable
...	…	…
34.22 Logic1 A src	Input signal source A of programmable logic unit 1.	CONST.FALSE = [0]
34.44 Logic1 B src	Input signal source B of programmable logic unit 1.	CONST.FALSE = [0]
34.45 Logic1 C src	Input signal source C of programmable logic unit 1.	CONST.FALSE = [0]

9. Parameters List and features description

34 Logic function	Programmable Comparator, Combination Logic Unit Settings	Def
34.46 Logic1 func	The operator of the programmable logic unit 1. The three input signals A, B, and C form the combinational logic according to the specified logical operators. 0 = AND 1 = OR 2 = NOT 3 = XOR 4 = Toggle 5 = NAND	AND = [0]
…	…	…

〉 **35 Math function**

35 Math function	Linear scaling, arithmetic expressions, integrators, filters, etc.	Def
35.00 Linear1 x src	Select the source of the scaled input x.	Zero
35.01 Linear1 y	The scaled output value y, read only. This parameter can be connected via a pointer.	0
35.02 Linear1 x max	Scale the maximum value of the input x.	32767
35.03 Linear1 x min	The scale conversion enters the minimum value of x.	0
35.04 Linear1 y max	The maximum value of the scale conversion output y.	32767
35.05 Linear1 y min	The minimum value of the scale conversion output y.	0
35.06 Linear1 x abs	Enable or disable the proportional conversion input x to take the absolute value. 0 = Disable 1 = Enable	Disable
35.07 Linear1 y dec	Set the scale of the scale 1 output y.	0
35.08 Linear1 y unit	Select the unit for scaling 1 output Y. 0 = – 8 = rpm 16 = mH 24 = Min 1 = V 9 = Hz 17 = Vrms 25 = m 2 = mA 10 = % 18 = Arms 26 = m/min 3 = ℃ 11 = kW 19 = KHz 27 = kg 4 = A 12 = kWh 20 = deg 28 = m3 5 = s 13 = h 21 = N 29 = pulse 6 = ms 14 = Nm 22 = – 30 = rev 7 = mm 15 = Ω 23 = mV 31 = –	
… …	…	…
35.27 Math1 x src	Select the source of the arithmetic input x.	Zero
35.28 Math1 y src	Select the source of the arithmetic input y.	Zero

35 Math function	Linear scaling, arithmetic expressions, integrators, filters, etc.	Def
35.29 Math1 func	Select the arithmetic operator. 0 = Add 1 = Sub 2 = Min 3 = Max 4 = Abs 5 = Mul 6 = Div	Add
35.30 Math1 factor	When the operation conforms to the selection multiplication or division, the arithmetic scaling factor k is set.	1
35.31 Math1 output	The output of a programmable arithmetic unit. Read only. This parameter can be connected via a pointer.	-
... …	…	
35.42 Integrator1 src	The input source of the programmable integrator.	Zero
35.43 Integrator1 output	The integral output of the integrator. Read only. This parameter can be connected via a pointer.	0
35.44 Integrator1 scaling	The scaling factor.	0
… …	…	
35.51 Filter1 input src	Input source for a programmable low-pass filter.	Zero
35.52 Filter1 output	The output of the filter. Read only. This parameter can be connected via a pointer.	0
35.53 Filter1 timeconst	The filter time constant of the filter.	1.00 s
… …	…	…

⟩ **40 Pos control**

40 Pos control	Position control, positioning control	Def
40.00 Pos ctrl mode	Position control mode 0 = POS CTRL. Positioning control, including trajectory planning, support fixed length and fixed angle control, etc. 1 = SERVO CTRL. Servo control, support for regular servo functions. 2 = ZERO SERVO. Zero servo control	0
40.01 Pos ctrl enable	Position control enable source selection, similar to servo excitation mode, defined as a terminal by pointer eg：DI3=P2.00.02	CONST.FALSE
40.02 Pos mark type	Location reference signal type. 0 = Zmark, with Z signal as the origin reference 1 = DI, with external terminal input signal as the origin reference	Zmark
40.03 Pos mark src	External reference source selection.	CONST.FALSE

9. *Parameters List and features description*

40 Pos control	Position control, positioning control	Def
40.04 Orient dir	The orientation direction of the spindle. 0 = Auto 1 = FWD 2 = REV	0
40.05 Pos spd set	Spindle positioning speed	300rpm
40.06 Pos ref src	Position given source selection 0 = PULSE, position reference source is pulse train input 1 = FIELD BUS, position reference source is fieldbus given	PULSE
40.07 Pos ctrl gain	Position loop gain	40Hz
40.08 Pos ffwd filter	Position feedforward filtering time	2.0ms
40.09 Pos sel in1	Multi-segment position selection signal source 1	CONST.FALSE
40.10 Pos sel in2	Multi-segment position selection signal source 2	CONST.FALSE
40.11 Inc pos sel in1	Incremental position selection source 1	CONST.FALSE
40.12 Inc pos sel in2	Incremental position selection source 2	CONST.FALSE
40.13 Inc pos sel in3	Incremental position selection signal source 3	CONST.FALSE
40.14 Feed fwd rqst	Forward feed request source selection	CONST.FALSE
40.15 Feed rev rqst	Reverse feed request source selection	CONST.FALSE
40.16 Pos rpt rqst	Repeat positioning request source selection	CONST.FALSE
40.17 Pos err lim	Positioning allows the allowed position error	100
40.18 Step unit	Position step value	1
40.19 Pos preset1_rev	Multi-segment position 1 set value / in forced zero return mode, taking into account the origin offset, accuracy 0.0001 circle=0.036°	0.0000
40.20 Pos preset2	Multi-segment position 2 set value laps	0.0000
40.21 Pos preset3	Multi-segment position 3 set value	0.0000
40.22 Pos preset4_rev	Multi-segment position 4 set value	0.0000
40.23 Inc pos preset1	Incremental position 1 set value	0.0000
40.24 Inc pos preset2	Incremental position 2 set value	0.0000
40.25 Inc pos preset3	Incremental position 3 set value	0.0000
40.26 Inc pos preset4	Incremental position 4 set value	0.0000

9. *Parameters List and features description*

40 Pos control	Position control, positioning control	Def
40.27 Inc pos preset5	Incremental position 5 set value	0.0000
40.28 Inc pos preset6	Incremental position 6 set value	0.0000
40.29 Inc pos preset7	Incremental position 7 set value	0.0000
40.30 Inc pos preset8	Incremental position 8 set value	0.0000
40.31 Force home rqst	Force zero return request source. Defined as a terminal by a pointer For example: DI3=P2.00.02	CONST.FALSE

〉 42 Mech brake

42 Mech brake	Mechanical brake control in lifting equipment	Def
42.00 Mech brake enable	Mechanical brake enable control 0 = Disable, not enabled, the brake output signal is always off. 1 = Enable, enable, no brake response. 2 = Enable with ack, enable, with brake acknowledge. When the response is abnormal, the system will generate a protection action.	Disable
42.01 Mech ack src	The mechanical brake response signal source is valid only when the value of parameter 42.00 Mech brake enable is Enable with ack.	False
42.02 Brake open delay	The time required for the mechanical brake open command to be issued until the brake is fully opened. Please set according to the specifications of the brake brake.	800ms
42.03 Brake close delay	The time required for the mechanical brake close command to be issued until the brake is fully closed. Please set according to the specifications of the brake brake.	800ms
42.04 Brake open torque	At the time of starting, the mechanical brake brakes the torque output of the drive before the command is issued.	100.0%
42.05 Brake check rqst src	Brake check request source. The drive checks this signal before each run, and when it is active, the drive runs the brake check procedure. A normal lifting control program is run when it is invalid.	False
42.06 Brake check torque	When the mechanical brake check is performed, the torque output from the drive is set. Once the drive detects that the motor is slipping after the preset inspection time, a fault indication is issued.	100.0%
42.07 Brake check time	When the mechanical brake is checked, the torque of the drive is maintained.	2.0s
42.08 Brake slip limit	When checking the brake, judge whether the speed of the slip is high.	30rpm

9. *Parameters List and features description*

42 Mech brake	Mechanical brake control in lifting equipment	Def
42.09 Brake open trq mem	After the brake is fully opened, the motor torque measured by the drive is used for diagnosis and read-only.	-
42.10 Brake close trq mem	When the brake is about to close, the motor torque measured by the drive is used for diagnosis and read-only.	-

⟩ **43 Winder**

43 Winder	Used for sheet, film, wire control, etc. for winding, unwinding, constant tension,	Def
43.00 Winder mode	Winder and unwinder mode。 0 = Winder 1 = Unwinder	Winder
43.01 Gear ratio	Mechanical transmission ratio	1.000
43.02 Thickness	Material thickness	0.100mm
43.03 Web width	Ribbon width	1000mm
43.04 Density	Material density	1000kg/m3
43.05 Line spd max	Maximum line speed	300.0m/min
43.06 Line spd src	Line speed input source selection	AI1 scaled
43.07 Dia calc mode	Roller diameter calculation method 0 = LINE SPEED, based on line speed 1 = ENCODER, based on motor shaft encoder 2 = ROLL PULSE, based on the drum pulse 3 = EXT FDBK, external direct detection	LINESPEED
43.08 Roll dia src	Source selection for externally calculated coil diameter	AI1 scaled
43.09 Roll pulse src	Roller pulse source selection	CONST.FALSE
43.10 Roll pulse scaling	Roller pulse multiplier, that is, the number of pulses generated by one roll	1
43.11 Core diameter	Empty disk diameter	100mm
43.12 Full roll dia	Full disk diameter	1
43.13 Dia reset rqst	Roll diameter reset request source selection	CONST.FALSE
43.14 Dia preset rqst	Roll diameter preset request source selection	CONST.FALSE
43.15 Dia preset data	Roll diameter preset value	100mm
43.16 Min spd dia calc	The maximum speed value allowed by the diameter calculation	30rpm
43.17 Tense src	Tension given source selection	AI2 scaled

43 Winder	**Used for sheet, film, wire control, etc. for winding, unwinding, constant tension,**	Def
43.18 Tmax	Maximum tension setting	30.0N
43.20 Max tape	Maximum gain of tension taper control under full coil diameter	0.0%

⟩ **47 Multi step ctrl**

47 Multi step ctrl	**It is used for simple multi-speed cycle control to save control equipment such as PLC. Supports 16-segment speed and time definitions.**	Def
47.00 Speed out	Module speed output, read only. The speed reference pointer achieves the connection of the control signal by pointing to parameter 48.00.	-
47.01 Run enable src	Multi-speed operation enable signal source, bit pointer. The default is controlled by the motor run signal.	P.06.00.04
47.02 Mode	Select the multi-speed cycle control method. 0 = Single, single cycle, and keep the final value 1 = Repeat, loop mode 2 = Single & Stop, single cycle and automatic shutdown. Before starting again, you need to issue a stop command and then send a start command.	0
47.03 Save mode	Whether it is memorized when the power is turned off or powered down. 0 = no memory, stop zero, start again from zero 1 = memory, stop memory operation phase, start again from memory state	0
47.04 Stage	The current phase of the multi-speed cycle, the user can edit as the initial phase.	0
47.05 Timer	The clock corresponding to the current cycle phase can be edited by the user as the initial time.	0.0min
47.06 TimeSet0	**The duration of the 0th paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.**	0.0min
47.07 TimeSet1	The duration of the first paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.08 TimeSet2	The duration of the second paragraph is set. Set to 0 to indicate that the segment is ignored and automatically	0.0min
47.09 TimeSet3	The duration of the third paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.10 TimeSet4	The duration of the fourth paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.11 TimeSet5	The duration of the fifth paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.12 TimeSet6	The duration of the sixth paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.13 TimeSet7	The duration of the seventh paragraph is set. Set to 0 to indicate that the segment is ignored and automatically	0.0min
47.14 TimeSet8	The duration of the eighth paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min

9. *Parameters List and features description*

47 Multi step ctrl	It is used for simple multi-speed cycle control to save control equipment such as PLC. Supports 16-segment speed and time definitions.	Def
47.15 TimeSet9	The duration of the ninth paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.16 TimeSet10	The tenth continuous time setting. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.17 TimeSet11	The duration of the 11th paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.18 TimeSet12	The duration of the 12th paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.19 TimeSet13	The duration of the 13th paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.20 TimeSet14	The duration of the 14th paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.21 TimeSet15	The duration of the 15th paragraph is set. Set to 0 to indicate that the segment is ignored and automatically skipped.	0.0min
47.22 SpeedSet0	The speed setting corresponding to the 0th paragraph.	0
47.23 SpeedSet1	The speed setting corresponding to the first paragraph.	0
47.24 SpeedSet2	The speed setting corresponding to the second paragraph.	0
47.25 SpeedSet3	The speed setting corresponding to the third paragraph.	0
47.26 SpeedSet4	The speed setting corresponding to the fourth paragraph.	0
47.27 SpeedSet5	The speed setting corresponding to the fifth paragraph.	0
47.28 SpeedSet6	The speed setting corresponding to the sixth paragraph.	0
47.29 SpeedSet7	The speed setting corresponding to the seventh paragraph.	0
47.30 SpeedSet8	The speed setting corresponding to the eighth paragraph.	0
47.31 SpeedSet9	The speed setting corresponding to the 9th paragraph.	0
47.32 SpeedSet10	The speed setting corresponding to the 10th paragraph.	0
47.33 SpeedSet11	The speed setting corresponding to the 11th paragraph.	0
47.34 SpeedSet12	The speed setting corresponding to the 12th paragraph.	0
47.35 SpeedSet13	The speed setting corresponding to the 13th paragraph.	0
47.36 SpeedSet14	The speed setting corresponding to the 14th paragraph.	0
47.37 SpeedSet15	The speed setting corresponding to the 15th paragraph.	0

⟩ **48 Switch Sync**

9. Parameters List and features description

48 Switch sync	Soft start, power frequency synchronization switching, etc. for synchronous or asynchronous AC motors. The motor is connected to the grid without impact. This function requires that the phase sequence of each part of the system must be the same.	Def
48.00 status	The status word of the controller is switched during the same period. The source of the relay output signal should point to the relevant bit of the parameter. BIT0: synchronous switching output signal, the signal is directly contactor controlled BIT1: Synchronous switch ready, waiting for the switch enable command	0
48.01 Phase err	Phase error value of the motor and the grid, read only.	0.0deg
48.02 Switch nable	Enable synchronous switching 0 = Disable 1 = Enable	Disable
48.03 Phase comp	The phase compensation size of the synchronous switching control is used to compensate for the phase lag caused by the contactor delay and the load.	6deg
48.04 Freq comp	Before the synchronous switching, the phase of the motor needs to be corrected to synchronize with the grid, and the frequency compensation amount is automatically superimposed to the speed reference. Read only.	0
48.05 Sync output enable	The user switches the enable switch at the same time. Bit pointer. The pointer value has the following meaning: 0 = Synchronous switching is prohibited, or the conversion from the power frequency to the variable frequency drive state is forced. 1 = Allows synchronous switching, which automatically switches to the power frequency when the motor is synchronized with the grid.	Const.True.
48.06 Adj freq max	The maximum frequency compensation value. The larger the phase, the shorter the time required for phase synchronization, but for large inertia situations, overvoltage may occur due to excessive deceleration.	2.5Hz
48.07 Relay delay	Switching to the frequency conversion control for the power frequency is determined by the time required for the power frequency control contactor to be disconnected. The drive needs to wait for the contactor to completely break before starting the inverter operation.	85ms

〉 **49 Data storage**

49 Data storage	16-bit data storage parameters that can be written or read using pointer settings for other parameters	Def
49.00 Data storage1	Data storage parameters 1.	0
49.01 Data storage2	Data storage parameters 2.	0
49.02 Data storage3	Data storage parameters 3.	0
49.03 Data storage4	Data storage parameters 4.	0

49 Data storage	16-bit data storage parameters that can be written or read using pointer settings for other parameters	Def
49.04 Data storage5	Data storage parameters 5.	0
49.05 Data storage6	Data storage parameters 6.	0
49.06 Data storage7	Data storage parameters 7.	0
49.07 Data storage8	Data storage parameters 8.	0

〉 **50 Fieldbus**

50 Fieldbus	Fieldbus setup for communication	Def
50.00 Node addr	Fieldbus node address, where the bus refers to PROFIBUS-DP or Ethernet communication, excluding the standard MODBUS-RTU and CANopen.	3
50.01 Baudrate detect	The bus communication baud rate detected by the drive.	-
50.02 PPO type	Detected PPO type	-
50.03 DP State	Status of the PROFIBUS DP bus	-
50.05 Ref1 type	**The bus is given a data conversion type of 1.** 0: transparent mode 1: speed conversion, 20000 corresponds to the parameter 19.00 2: torque conversion, 10000 corresponds to 100.0%	-
50.06 Ref2 type	See parameter 50.05 for details	-
50.07 Act1 type	The actual value of the bus 1 type, see parameter 50.05	-
50.08 Act2 type	The actual value of the bus 2, see parameter 50.05	-
50.09 Fbcw raw	The original value of the bus communication start and stop control word	-
50.10 Fb ref1 raw	Bus communication given the original value of 1	-
50.11 Fb ref2 raw	Bus communication given the original value of 2	-
50.12 Fbsw raw	Bus communication control status word raw value	-
50.13 Fb act1	Raw value of bus communication actual value 1	-
50.14 Fb act2	The original value of the bus communication actual value 2	-
50.15 PZD1 read	The data map that the bus reads from the drive. 50.15 PZD1 to 50.26 PZD12 has the same function. The default PZD1/PZD2/PZD3 maps to the status word/actual value 1/actual value 2.	-

50 Fieldbus	Fieldbus setup for communication	Def
50.27 PZD1 write	The bus is written to the drive's data map. 50.27 PZD1 to 50.38 PZD12 has the same function. The default PZD1/PZD2/PZD3 is mapped to control word/given 1/given 2.	-

⟩ **51 Embedded Modbus 485**

51 Embedded Modbus	Embedded Modbus 485 setting.configuration	Def
51.00 Modbus enable	Disable or enable the built-in Modbus communication function. When not in use, it is forbidden to reduce the CPU load.	Enable = [1]
51.01 Node address	Set the node address of Modbus communication. Where 0 is the broadcast address.	1
51.02 Baudrate	Set the serial port baud rate of Modbus communication in bits per second. 0 = 4800bps 1 = 9600bps 2 = 19200bps 3 = 38400bps 4 = 57600bps 5 = 115200bps 6 = 230200bps 7 = 460800bps 8 = 921600bps	9600bps
51.03 Format	Set the serial frame format of Modbus communication. 0 = 8, N, 1, 8 bits of data, no parity, 1 stop bit 1 = 8, N, 2, 8 bits of data, no parity, 2 stop bits 2 = 8, E, 1, 8 bits of data, even parity, 1 stop bit 3 = 8, O, 1, 8 bits of data, odd parity, 1 stop bit	8, N, 1
51.04 Word order	0 is the lower 16 bits in the front and the upper 16 bits in the back. 1 is the upper 16 bits and the lower 16 bits.	0
51.05 Packet recv count	Count the message frames received by the node from the Modbus bus. Note: This counter only counts the message frames (including broadcast frames) sent to this node.	0
51.06 Packet send count	The message frame sent by the node to the Modbus bus is counted.	0
51.07 Bus message count	Count all message frames detected by the node from the Modbus bus.	0
51.08 UART error count	Counts the number of serial port errors that occur when a node receives a message frame from the Modbus bus.	0
51.09 CRC error count	Counts the number of times the CRC verification error occurs when the node receives a message frame from the Modbus bus.	0
51.10 Frame error count	Statistics other errors that occur when the node receives a message frame from the Modbus bus, such as frame length error, frame timeout, and so on.	0

9. *Parameters List and features description*

51 Embedded Modbus	Embedded Modbus 485 setting.configuration	Def

〉 **52 CANopen**

52 CANopen	CANopen bus communication settings, hardware should be configured with internal jumpers when using terminal wiring	Def
52.00 node address	The node address of the CANopen slave.	1
52.01 Baud rate	CANopen Communication baud rate 0 = 10kbps 1 = 20kbps 2 = 50kbps 3 = 125kbps 4 = 250kbps 5 = 500kbps 6 = 625kbps 7 = 800kbps 8 = 1Mbps	1Mbps
52.02 RX frame counter	The total number of frames received. Read only.	-
52.03 TX frame counter	The total number of frames sent. Read only.	-
52.04 Status	Communication status word. Read only.	-
52.05 Control word	Received a control word. Read only.	-
52.06 Status word	Status word sent to the host computer. Read only.	-

〉 **60 Motor control**

60 Motor control	Motor control optimization adjustment, fine adjustment, etc.	Def
60.00 Carrier freq set	Carrier frequency setting. The actual carrier frequency may vary depending on the drive temperature and motor frequency. See parameter 09.04 Actually implemented smart carrier frequency.	6kHz
60.01 Slip gain	Only for asynchronous motors. Used to correct the slip estimated by the drive. When there is an error in the slip, the speed accuracy will be affected, and the rotor resistance can be re-identified or the slip compensation gain can be adjusted to improve the speed accuracy.	1.00
60.02 Torque boost	Motor torque manual lift. Only suitable for open loop vector control.	0.20
60.03 PM_Id lim	The maximum field weakening current allowed by the synchronous motor, relative to the rated motor current.	70%
60.04 Res damp gain	The oscillation suppression gain is only applicable to open loop vector control.	1.00
60.05 Excitation time	The pre-excitation time of the asynchronous motor increases the starting torque, and the synchronous motor corrects the magnetic pole position.	500ms

60 Motor control	Motor control optimization adjustment, fine adjustment, etc.	Def
60.06 Motor control Mode	Motor control mode enable switch signal, 16-bit binary variable. BIT0: Flyrestart, prohibits speed tracking BIT1: Flux brake, flux brake BIT2: Flux optimize, flux optimization BIT3: MTPA enable, MTPA control BIT4: MRAS, model reference auto-adaptation enable BIT5: Signal inject, permanent magnet motor high frequency injection enable BIT6: DC Brake, zero speed DC braking BIT7: Rs adapt ctrl, stator resistance adaptive control BIT8: Tr adapt ctrl, rotor time constant adaptive BIT9: EMF adapt ctrl, back EMF adaptive BIT10: Motor stall alarm, motor stall detection BIT11: Speed unmatched alarm, speed mismatch detection BIT12: Load loss alarm, load loss detection BIT13: SinCos calibration, automatic correction of sine wave encoder signal BIT14: HSP_VoltMode, high speed motor model switching BIT15: VfStart, the boot process selects the scalar mode	-
60.07 Vdc control mode	DC bus voltage control mode, 4-bit binary variable. BIT0: Vdc max ctrl, maximum voltage control BIT1: Regen disable, acceleration and constant speed prohibition of power generation BIT2: BrakeChop Always on, chopper brake is always enabled BIT3: Vdc min ctrl, minimum voltage control, ie power-down automatic deceleration BIT4: Soft Relay always on, undervoltage control soft start is always closed BIT5: ACSource on, AC voltage source mode active BIT6: Vdc brake set, manually set the brake voltage point, parameter 60.08	-
60.08 Para user	It is only suitable for special occasions with customization, and the parameter function changes dynamically.	[0]
60.09 Auto phase mode	Synchronous motor initial phase finding mode. Only for open loop scalar control. 0 = Auto, auto enable 1 = Always, always enabled 2 = Disable, Always prohibited	[0]
60.10 PM type	The rotor type of the synchronous motor. The search method changes due to the rotor structure. 0 = Non-standard type. The drive uses a special phase finding mode. 1 = standard type. The drive uses a universal phasing mode.	[1]
60.11 Cur inject	The phase of the synchronous motor looks for the amount of current injected. For synchronous motors with damper windings or self-starting windings, and for large horse-drawn carriages, the situation needs to be slightly increased.	30%

9. *Parameters List and features description*

60 Motor control	Motor control optimization adjustment, fine adjustment, etc.	Def
60.12 Phase comp	Applicable only to open-loop scalar control. The phase compensation value of the synchronous motor. The quick start application is 90° best, and the normal start is 30° best.	90deg
60.13 Over modu gain	Overmodulation output strength.	15%
60.16 Current inject ratio	In-line permanent magnet synchronous motor, when using the high frequency injection function, manually set the injection current ratio. The default is 0 for automatic setting.	0%

⟩ **61 Encoder config**

61 Encoder config	Encoder parameters for speed feedback, signal processing optimization settings	Def
61.00 Pulse per rev	The number of pulses per revolution of the encoder. If there is z-phase signal dynamic self-learning, it can be automatically recognized.	2048
61.01 Electric offset	The offset angle of the encoder Z signal from the stationary coordinate system of the motor. Only for permanent magnet synchronous motors. Need 63.06=3 multiple times to perform PM identification learning to ensure accuracy	0
61.02 Encoder phase	The phase relationship of the encoder A and B signals. Dynamic self-learning automatically recognizes 0 = normal. That is, A is ahead of B when it is turning forward. 1 = inverting. That is, when the forward rotation is B, the front is A.	[0]
61.03 Enc counter mode	The counting mode of the encoder. 0 = Quadrate, quadrature count, automatic 4x 1 = Direction, pulse plus direction, automatic 2 times frequency	[0]
61.04 Pulse cnt mode	The counting mode of the pulse input for the position reference. 0 = Quadrate, quadrature count, automatic 4x 1 = Direction, pulse plus direction, automatic 2 times frequency	[0]
61.05 Gear den	The electronic gear denominator of the position pulse input. The multiplication factor of the sine cosine encoder.	1
61.06 Gear num	The electronic gear molecule of the position pulse input. The division factor of the non-sine cosine encoder.	1
61.07 Encoder poles	0 means that the encoder has no Z signal, and 1 and above represents the number of poles of the encoder.	[1]

9. *Parameters List and features description*

61 Encoder config	Encoder parameters for speed feedback, signal processing optimization settings	Def
61.08 Encoder enable	Enable the encoder module.	[1]
61.09 Sin offset	SIN signal offset of the sine wave encoder.	[0]
61.10 Cos offset	The COS signal offset of the sine wave encoder.	[0]
61.11 Sin gain	SIN signal gain of a sine wave encoder. Q12	4096
61.12 Cos gain	The COS signal gain of the sine wave encoder. Q12	4096

⟩ **62 Motor parameter**

62 Motor parameter	Motor parameter initialization settings, optimized adjustment and display	Def
62.00 Pole pairs	The number of pole pairs of the motor. The drive is automatically calculated based on the rated speed and rated frequency before running. Can not be set directly.	-
62.01 No-load current	No-load current, only for asynchronous motors. This parameter can be set manually before performing static identification.	-
62.02 Stator resist	Phase resistance of the motor stator. Suitable for all types of AC motors.	-
62.03 Rotor resist	The phase resistance of the rotor of the motor. Only for asynchronous motors.	-
62.04 Stator induct	The phase inductance of the motor stator. Only for asynchronous motors. For static identification, the driver automatically calculates the stator phase inductance based on the no-load current parameter.	-
62.05 Leak induct coef	The leakage inductance of the motor. Only for asynchronous motors.	-
62.06 D-axis induct	D-axis inductance. Only for synchronous motors.	-
62.07 Q-axis induct	Q-axis inductance. Only for synchronous motors.	-
62.08 Back EMF coef	Back EMF coefficient, only for synchronous motors. Unit 0.1mV/rpm	-
62.09 TM Core sat coef	Core saturation factor. Applicable only to asynchronous motors, below 70% recommended to increase the rated motor frequency. Above 90%, consider reducing the rated frequency appropriately.	80%
62.10 PM sat coef	The core saturation coefficient of the synchronous motor, less than 70% means that the motor core utilization rate is too large, it is recommended to improve the motor.	0

⟩ **63 Startup parameter**

63 Startup parameter	Start related parameter settings, including motor rated parameters	Def

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9. *Parameters List and features description*

63 Startup parameter	Start related parameter settings, including motor rated parameters	Def
63.00 Motor nom power	Motor rated power. If multiple motors are driven, the total motor power is used.	-
63.01 Motor nom volt	Motor rated voltage. For permanent magnet motors, the rated voltage should be close to the counter-electromotive force of the rated speed.	-
63.02 Motor nom current	Motor rated current. When driving multiple motors, it is the total current of the motor.	-
63.03 Motor nom speed	Motor rated speed. It should be proportional to the logarithm of the rated frequency.	-
63.04 Motor nom freq	Motor rated frequency. The corresponding back EMF is required to be close to the rated voltage.	-
63.05 Motor type	Select the motor type. 0 = ACIM, asynchronous motor 1 = PMSM, permanent magnet synchronous motor	[0]
63.06 ID run request	Select the type of motor identification run the drive will start at the next startup. The ID run can only be performed in local control mode. 0 = No request, no request 1 = Normal, rotation identification 2 = Standstill, static identification 3 = Auto-phasing, initial phase identification of permanent magnet motors.	[0]
63.07 Drive mode	Select the motor drive method. Of these, 1 is preferred. Depending on the model, the default optimal control mode has been set at the factory. It is recommended not to change it easily. 0 = open loop vector control. Suitable for fluid loads and motors in extreme cases. 1 = direct torque control. The torque control can be implemented with or without an encoder, and the encoder can achieve position control.	[0]
63.08 Phase inversion	Change the phase sequence of the motor. Equivalent to swap any two wires of the motor line. When performing power frequency switching control, the phase sequence can only be changed by physical switching wiring. This parameter is forbidden to be modified. 0 = Normal, UVW. Normal phase sequence 1 = Invert, UWV. Reverse phase sequence, V and W exchange。	[0]

[Deliberately left blank here]

⊕10.Fieldbus and high speed communication

〉 **Fieldbus general Data Set**

Address	Name
0001	Fieldbus control word (corresponding to monitoring parameter address 06.05)
0002	Fieldbus reference 1 (corresponding to monitoring parameter address 02.15)
0003	Fieldbus reference 2 (corresponding to monitoring parameter address 02.16)
0004	Fieldbus status word
0005	Fieldbus actual value 1
0006	Fieldbus actual value 2
0007-0018	Fieldbus module input 1-12 (parameter 50.05-50.16)
0019-0030	Fieldbus module output 1-12 (parameters 50.17-50.28)

The fieldbus control word can be viewed via parameter 06.05, see the previous section of this manual.

[Fieldbus Status Word Format]

Bit Number	Name	Meaning
0	Ready	1: ready to run
1	Enabled	1: Run enable
2	Modulating	1: There is PWM signal output
3	Following ref	1:
4	Em OFF2	1: Free parking mode
5	Em OFF3	1: emergency stop mode
6	Start inhibit	1: Start prohibition
7	Alarm	1: alarm
8	At setpoint	1: Output is consistent with the setting (speed arrival or torque arrival)
9	Torque limited	1: Torque limit
10	Speed limited	1: speed limit
11	EXT2 active	1: Control ground 2 is valid
12	Local ctrl	1: Local control
13	Zero speed	1: zero speed
14	Direction reverse	1: reverse
15	Fault	1: fault

【Related parameters】

Parameter address	Parameter Name	Parameter value
51.00	Modbus enable	Enable = [1]
51.01	Node address	-
51.02	Baudrate	-
51.03	Format	-

> 【**Communication Example**】

The following is an example where the node address is equal to 1. The last CRC check code is only applicable to this example. After changing any data, the CRC check code should be recalculated and can be automatically generated by software.

>>>>>>>>>>>Read drive status

Request frame: 01 03 06 00 00 01 84 82

Response frame: 01 03 02 B4 81 0F 24

>>>>>>>>>>>Modify the drive given speed (first modify the speed given source for the fieldbus given 1)

Request frame: 01 06 00 02 03 E8 28 B4

Response frame

>>>>>>>>>>>Start the drive (first modify the source of the external control start and stop commands for fieldbus communication)

Request frame: 01 06 00 01 08 82 5F AB

>>>>>>>>>>>(Where 0x0882 is the start command, note that bit 7 and bit 11 should always be 1)

Response frame

Stop the drive

Request frame: 01 06 00 01 08 81 1F AA

>>>>>>>>>>>(Where 0x0881 is the stop command, note that bit 7 and bit 11 should always be 1)

Response frame

Read the attribute of parameter 22.00 Acc time1

Request frame: 01 42 00 00 16 00 77 A5

Response frame: 01 42 00 00 08 AC 7E 78

>>>>>>>>>>>Read the default value of parameter 22.00 Acc time1

Request frame: 01 42 00 01 16 00 26 65

Response frame: 01 42 00 01 01 F4 28 12

>>>>>>>>>>>Read the minimum value of parameter 22.01 Dec time1

Request frame: 01 42 00 02 16 01 17 A5

Response frame: 01 42 00 02 00 01 19 C5

>>>>>>>>>>>Read the maximum value of parameter 22.01 Dec time1

Request frame: 01 42 00 03 16 01 46 65

Response frame: 01 42 00 03 EA 60 C6 8D

>>>>>>>>>>>Read parameter group 01 Actual values (actual value) contains the number of parameters

Request frame: 01 42 00 04 16 01 F7 A4

Response frame: 01 42 00 04 00 0D F9 C1

> **Modbus 485 communication**

For more instructions, please refer to Modbus_Application_Protocol_V1_1b3.pdf, which can be downloaded from <mark>www.modbus.org.</mark>

The local MODBUS communication protocol only supports the RTU slave mode. The communication is initiated by the master station, the slave receives the request and responds, the master station and the slave station address must be consistent, and the broadcast is also supported. At this time, the master station address is 0. MODBUS is built on top of the Universal Asynchronous Receiver Transmitter (UART), and the baud rate and frame format of the master and slave must be the same.

The basic unit of MODBUS is one byte, and the RTU mode frame format is as follows (the part omitted in the middle is determined by the function code):

Node Address	Function Code	…	CRC Check Code	
1 byte	1 byte	…	Low 8 Bit	High 8 Bit

Note: For 16-bit register addresses, numbers, and data, use big-end format storage, that is, the high byte is first and the low byte is after. However, the CRC check code (polynomial 0xA001) is stored in little endian, that is, the low byte is first and the high byte is after.

Function code and frame format

Currently, only the following function codes are supported (suffix H for hexadecimal and suffix D for decimal)

03H	Read holding register	Read the current value of consecutive N parameters
06H	Write a single	Rewrite the current value of a single parameter

10. Fieldbus and high speed communication

	register	
08H	Diagnosis	Used to test and check the status of the communication link. The following sub-function codes are supported: 0x00 returns query data 0x01 reset communication Initialize and restart the serial line port of the slave device to clear all communication event counters. 0x04 is forced to listen only mode The specified slave is forced to listen-only mode and the slave does not respond to this message.
10H or 16D	Write multiple registers	Rewrite the current value of consecutive N parameters
42H or 66D	Read parameter related information	Information about reading drive parameters, the following sub-function codes are supported: 0x00 read the attribute of the specified parameter 0x01 read the default value of the specified parameter 0x02 reads the minimum value of the specified parameter 0x03 reads the maximum value of the specified parameter 0x04 reads the number of parameters of the specified parameter group 0x05 Read the visibility of the specified parameter group
55H or 85D	Read data log	

03H Request Frame number of registers)

Node Address	03	Register Start Address		Number of Registers	
		High 8 Bit	Low 8 Bit	High 8 Bit	Low 8 Bit

3H Response Frame (the number of bytes is equal to 2 times the

Node Address	03	Number of Bytes	Register Data 1		…
			High 8 Bit	Low 8 Bit	…

06H Request Frame   06H Response Frame （Same as request frame on the left）

Node Address	06	Register Address		Register Data	
		High 8 Bit	Low 8 Bit	High 8 Bit	Low 8 Bit

08H Request Frame

Node Address	08	Sub-function Code		Data	
		High 8 Bit	Low 8 Bit	High 8 Bit	Low 8 Bit

10H Request Frame （the number of bytes is equal to 2 times the number of registers）

Node Address	10	Register Start Address		Number of Registers		Number of Bytes	Register Data 1		…
		High 8 Bit	Low 8 Bit	High 8 Bit	Low 8 Bit		High 8 Bit	Low 8 Bit	…

10H Response Frame （Returns the first 6 bytes of the request frame）

42H Request Frame

Node Address	42	Sub-function Code		Parameter Address	
		High 8 Bit	Low 8 Bit	High 8 Bit	Low 8 Bit

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10. *Fieldbus and high speed communication*

42HRequest Frame

Node Address	42	Sub-function Code		Parameter Information	
		High 8 Bit	Low 8 Bit	High 8 Bit	Low 8 Bit

Parameter Address

The parameter address is 16 bits, the high 8 bits are the parameter group number, and the low 8 bits are the intra-group index.

Group Number	INDEX	Address	
		Hexadecimal	Decimal
00 communication data	01-30 data set	0001-001E	0001-0030
01 Parameter Group 01	00- 255 parameter 01.00-01.255	0100-01FF	256-511
02 parameter group 02	00- 255 parameter 02.00-02.255	0200-02FF	512-767
...	…	…	…
63 parameter group 63	00- 255 parameter 63.00-63.255	3F00-3FFF	16128-16383

Note:

1. Please refer to the previous section of this manual for the number of actual parameters in each group.

2. When using PLC as the master station, the parameter address needs to be added 40001. For example, the communication address of parameter 01.00 is 40257.

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10. *Fieldbus and high speed communication*

❯ **CANopen Communication**

After the corresponding EDS file is installed, the parameter 52.01 baud rate and parameter 52.00 node address are correctly configured. After the drive is powered on, it can be scanned by the host computer.

Case List：

1. Start with RPDO4 (control word 0x080F), set the speed to 300rpm (0x012C), and set the torque to 10.0% (0x0064).
Send, ID = 0x0501, DAT = 0F 08 2C 01 64 00 01 00
Response: None
2. Query through TPDO4 (for example, status word 0x0627, actual speed 300.0rpm (0x0BB8), actual torque 1.0% (0x000A), actual mode torque control (0x0001))
Send: ID = 0x0481, DAT = 00 (any value and any length)
Response: ID = 0x0481, DAT = 27 06 B8 0B 0A 00 01 00
3. Through the SDO download service, modify the drive deceleration time parameter 22.01 (corresponding to 0x4016, sub01) to 15.00 seconds (0x05DC)
Send: ID = 0x0601, DAT = 22 16 40 01 DC 05 00 00
Response: ID = 0x0601, DAT = 62 16 40 01 00 00 00 00
4, through the SDO upload service, read the actual drive speed of 01.00, assuming 300.0rpm (0x0BB8), then
Send: ID = 0x0581, DAT = 40 01 40 00
Response: ID = 0x0581, DAT = 4B 01 40 00 B8 0B 00 00

DS 301 Protocol Definition Parameters

Index	Sub-Index	Name	Type	Attr	Description
1000	0	Equipment type	U32	RO	Fixed to 0x00010192
1001	0	Fault register	U8	RO	
1006	0	Asynchronous trigger interval period	U32	RW	
1014	0	Identifier for EMCY messages	U32	RW	
1017	0	Producer heartbeat time	U16	RW	
1018	0	Identification 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	RPDO2 mapping 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 entry 3	U32	RW	
	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	

Index	Sub-Index	Name	Type	Attr	Description
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	

DSP 402 Defined Parameters

Index	Sub-Index	Name	Type	Attr	Description
6040	0	Control word	S16	RW	
6041	0	Status word	S16	RO	
6042	0	**Bus speed given**	S16	RW	
6043	0	Actual speed given	S16	RO	
6060	0	Target control method	S16	RW	
6061	0	Actual control method	S16	RO	
6071	0	Bus torque reference	S16	RW	
607A	0	Bus position given	S32	RW	
607C	0	Origin offset	S32	RW	

Manufacturer-specific Parameters

All parameters of the driver can be mapped to the object dictionary of CANopen communication. The mapping rule is: index=0x2000+parameter group number, subindex=parameter index number.

Control word

Bit Number	Name	Description
0	Switch On	1: start, 0: stop according to the set mode
1	Disable Voltage	1: keep current state, 0: free stop
2	Quick Stop	1: keep current status, 0: emergency stop
3	Enable Operation	1: Allow work, 0: Work is forbidden
4	Ramp Out 0	1: RFG (ramp function generator) output is forced to 0
5	Ramp Hold	1: RFG (ramp function generator) output hold
6	Ramp In 0	1: RFG (ramp function generator) input is forced to 0
7	Reset Fault	0->1: Fault reset
8	Halt	1: pause
9	Inching 1	1: jog command 1
10	Inching 2	1: jog command 2
11	Remote	1: remote control

10. *Fieldbus and high speed communication*

12	Ext2	0: Select external control ground 1, 1: Select external control ground 2
13-15	Reserved	

Status Word

Bit Number	Name	Description
0	Ready to Switch On	1: ready to start
1	Switched On	1: Started
2	Operation Enabled	1: Work is allowed
3	Fault	1: fault
4	Voltage Disabled	1: Free stop
5	Quick Stop	1: emergency stop
6	Switch On Disabled	1: Start prohibition
7	Warning	1: warning
8	Ref Inverted	1: set to a negative value
9	Remote	1: remote control
10	Target Reached	1: The set speed has been reached
11	Internal Limit Active	1: internal restrictions
12-15	Reserved	

〉 **PROFIBUS-DP Communication**

10.3.1. Parameter configuration, Only the node address and PZD mapping are configured, while the rest are detected automatically.

 a. Node address, 50.00, default 3

 b. The baud rate and PPO type are automatically set by the master station without editing.

 c. PZD mapping

50.15 to 50.26 corresponds to the mapping of PZD1 to PZD12. The default PZD1 corresponds to the status word, PZD2 corresponds to the actual value 1, and PZD3 corresponds to the actual value 2.

50.27 to 50.38 corresponds to the mapping of PZD1 to PZD12. The default PZD1 corresponds to the control word, PZD2 corresponds to the bus given 1 and PZD3 corresponds to the bus given 2

10.3.2. Calibration relationship between given and actual values

 Calibration of the given value, parameters 50.05 and 50.06 correspond to the given calibration type

 d. Speed given mode, 20000 corresponds to the speed calibration value of 19.00;

 e. Torque given mode, 10000 corresponds to 100.0% motor rated torque;

 f. Transparent given mode is not converted and can be used directly.

 Calibration of actual values, parameters 50.07 and 50.08 correspond to actual value calibration type

 d. Speed given mode, the speed value of 19.00 corresponds to 20000;

 e. Torque given mode, 100.0% motor rated torque corresponds to 10000;

 f. Transparent given mode is not converted and can be used directly.

 The definition of the control word, in accordance with the standard, the typical command value is as follows

 d. Start: 0x047F (1151)

 e. Stop: 0x0477 (1143)

 f. Fault reset: 0x04F7 (1271)

10.3.3 After installing the GSD file, you can scan to the drive online via TIA software.

⊕11.Fault Tracking and Diagnostics

Introduction to this chapter

This chapter lists all alarms (warnings) and fault information, including possible causes and corrective actions. The alarm/fault code is displayed on the control panel of the drive (the LED version is displayed in E-XX format). An alarm or fault message 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 you cannot troubleshoot, please contact our representative office.

In this chapter, alarms and faults are sorted by code.

Safety Instructions

⚠️ **WARNING! Only qualified electrical engineers are allowed to perform maintenance on the drive. You must read the safety instructions at the front of this manual before you start working on the drive.**

〉 How to reset

The fault can be reset by pressing the control panel (RESET reset button) or by turning off the power for a period of time. When the fault is removed, the motor can be restarted.

〉 Fault Code and Interpretation

Code	Fault Name	Possible Causes	Solution
01	SC	The output phase is shorted, or the output is shorted to ground, or the output is shorted to the bus.	Check the motor for short circuits, check wiring and cables for short circuits. Check the motor cable for power factor compensation capacitors or surge absorbers.
02	OC	The motor current exceeds the highest level allowed by the hardware.	Check if the motor rated parameters are consistent with the nameplate and check if the acceleration/deceleration time is too fast.
03	OV	The bus voltage exceeds the maximum level allowed by the hardware.	Check if the overvoltage stall is enabled. Check if the braking resistor meets the recommended range.
04	OH	The heat sink inside the driver is too hot, the internal cavity temperature is too high, or the module chip temperature is too high.	Check whether the cooling fan, ventilation and cooling system are normal, whether the radiator is clogged with dust, and whether the ambient temperature is within the allowable range.
05	GF	The sum of the output three-phase currents is not zero and is greater than the allowable value.	Check the wiring for looseness and check the motor cable for leaks. Or the motor output line is too long and no output reactor is installed.
06	ADC	Motor current sensor, or analog-to-digital converter of the control board, or poor signal connection failure.	Re-plug the control unit for the C Series models, or contact your local dealer or manufacturer.

Code	Fault Name	Possible Causes	Solution
07	NTC LOSS	The temperature sensor inside the drive is broken.	Contact your local agent or manufacturer.
08	Over load	The overload fault is triggered after the output current exceeds the allowable current of the drive and reaches a certain time.	Check motor load and motor parameters for properness.
09	ENC ZMARK	The number of pulses between the Z pulses captured by the encoder twice is inconsistent with the set encoder resolution.	Check that the encoder resolution setting is correct. Check the encoder cable for interference.
10	EEPROM	The memory failed and the parameters were not successfully written.	Contact your local agent or manufacturer.
11	CPU OVERLOAD	The CPU load exceeded 100%, and the real-time task could not be completed. Or stack overflow.	Contact your local agent or manufacturer.
12	PARA ERROR	The set motor parameters conflict with each other.	Check that the motor parameters are set correctly.
13	MOTOR OH	The temperature of the motor exceeds the set point of failure.	Check if the motor is overloaded and check if the motor overheat protection setting is correct.
15	EXT FAULT	External user-defined faults.	Check the signal of the external fault.
16	SUPPLY LOSS	The power supply is abnormal. Or lack of phase, or three-phase input is unbalanced, or the capacity is insufficient.	Check for phase loss. Check if the electrolytic capacitor capacity is normal.
17	OUTPUT LOSS	The output current is abnormal. Or output phase loss, or IGBT and peripheral anomalies can not be controlled.	Check if the motor is out of phase and is oscillating. Or contact your local agent or manufacturer.
18	ID RUN	Motor self-identification fault.	Check if the motor is connected. Check that the motor nameplate parameter settings are correct.
22	PAR SET ERR	The backup parameter set inside the memory is incorrect.	The parameter set has not been backed up.
23	UNDER VOLTAGE	The power supply undervoltage occurs while the drive is running.	Check if the power supply is normal. Check if the soft start is normal.
24	SPEED FEEDBACK	Speed feedback failure.	The speed feedback disconnection or speed feedback is inverted to positive feedback.

Code	Fault Name	Possible Causes	Solution
25	OVER SPEED	Overspeed failure.	The motor is overspeeding, check if the encoder settings are correct, and whether the feedback is reversed to positive feedback.
27	RUNTIME LIMITTED	Run time is limited.	Contact your local agent.
28	PID FBK LOSS	The process PID feedback is broken.	Check if the setting of the PID disconnection detection is correct and check if there is any disconnection.
29	BR ERR	The braking resistor is less than the resistance allowed by the drive.	Check if the resistance of the braking resistor is reasonable.
31	BRAKE SLIP	The motor slips during the brake check.	Check if the brakes need to be replaced and check if the brake check settings are correct.
32	BRAKE FLT	The starting torque cannot be reached before the brake is opened.	Check if the brake is normal.
33	BRAKE SAFE CLOSE	In the open loop control, the motor works in the low speed danger zone for a long time, and the brake is forcibly closed.	Check if the speed is given too low.
34	BRAKE OL	After the brake is opened, it actually meets the maximum torque allowed by the drive.	Check if the load is too high and check if the brake control circuit is normal.
35	BRAKE ACK FLT	After the brake is opened, there is no response signal.	Check if the brake response signal is normal.
36	BRAKE SYNC FLT	Lifting control, the motor estimated speed is too large with a given deviation, or the magnetic flux is abnormal.	Check that the motor parameters are set correctly.
40	PM SYNC LOSS	Multiple out-of-steps occur during synchronous motor open-loop startup.	Check if the initial angle recognition parameter setting is correct
41	MOTOR STALL	When the motor is blocked, the rotor can hardly rotate and the torque has reached the maximum torque.	Check the machine for stalls, or the direction of the drive chain and whether there is a backstop.

12. Maintenance and Hardware Diagnostics

⟩ Overview of daily maintenance

This chapter provides instructions for preventive maintenance. Due to changes in the environment in which the drive is used, such as the effects of temperature, humidity, smoke, dust, etc., and the aging of components inside the drive, various faults may occur in the drive. Therefore, the drive must be inspected daily during storage and use, and regular maintenance is required.

　　The drive is transported. Before use, check that the components are intact and the screws are tight.

　　Drives should be regularly cleaned of dust during normal use and checked for loose screws.

　　The driver is not used for a long time. It is recommended to power on every six months during the storage period. The time is half an hour to prevent the electronic device from failing.

　　Drives should be avoided in wet, metal dusty environments. If it is necessary to use it in such an environment, it must be placed in an electrical cabinet with protective measures or in a field protection booth. When the drive is running normally, please confirm the following：

　　There is abnormal sound and vibration of the motor.

　　The drive and motor are abnormally hot.

　　Is the ambient temperature too high?

　　Is the output current value normal?

　　The cooling fan of the drive is working properly.

> ⚠️ **WARNING!** Please read the safety instructions at the front of this manual carefully before performing any maintenance work on the drive. Ignoring these safety instructions can result in personal injury or equipment damage.

⟩ Maintenance Cycle

The table below shows the daily maintenance cycle recommended by our company. For more details, please contact your local service representative.

Maintenance Cycle	Maintenance	Description
Every year (storage)	DC capacitor reforming	See capacitor recharge,
Every 6 to 12 months, depending on the amount of dust in the	Radiator temperature check and cleaning	See the heat sink.
Per year	Power connection tightness check	
	Cooling fan visual inspection	See cooling fan,
Every 3 years, if the ambient temperature is above 40 ° C (104 ° F).Otherwise every 6 years..	Replace the cooling fan	See cooling fan,
Every 6 years, if the ambient temperature is above 40 ° C (104 ° F) or the drive is subjected to periodic heavy loads or continuous rated loads.	DC capacitor replacement	Contact your local service representative.

⟩ **Radiator Maintenance Cleaning**

The fins of the radiator collect dust from the cooling air. If the heat sink is not clean, the drive will overheat warning and malfunction. In a normal environment, the radiator should be inspected once a year, and in a dusty environment, it should be checked more frequently.
Clean the heat sink as follows (when needed):
For R1-C1-C4 models
1. Remove the cooling fan.
2. Blow from the bottom to the top with clean compressed air (dry) and collect the dust with a vacuum cleaner at the air outlet.
Note: If dust can enter adjacent equipment, clean it in another room. There is a clear hole design on the back of the C5-C9 model, which can be cleaned after fine inserting (see the figure on the left below for the schematic).
3. Reinstall the cooling fan.
For C5 and above, specially designed the series with the cleaning window cover on the back. After removing the back or side cleaning window cover, clean the radiator directly with the cleaning equipment.

⟩ **Cooling Fan**

The actual life of the fan depends on the use of the drive and the ambient temperature. Fan failure can be predicted from the noise of the fan bearing and the gradual rise in the temperature of the heat sink (although the heat sink has been cleaned). If the drive is intended for a critical position, replace the fan when the fan first begins to experience unusual noise.
How to disassemble the fan:
For R1-C1-C3: use a small flat-blade screwdriver to pull out the fan from the bottom of the machine, remove the locking screw, etc.
For C4-C9: Remove the fixed wind frame or the fan cover from the top of the machine and the bottom of the machine with a screwdriver, and then take out the wind frame as a whole and then remove the fan directly from the bottom of the machine.

NOTE! The direction of the airflow is from bottom to top. Install the fan with the airflow facing up. Usually, the fan body has two indication arrows for its direction of steering and airflow (the following figure 1 indicates the direction of the airflow of the wind, 2 indicates the direction of rotation of the fan), and the arrow of the direction of installation of the vertical fan indicates the direction of the airflow of the fan. At the same time, pay attention to finishing the fan power cord to avoid the fan extrusion and direct blow to shake the line.
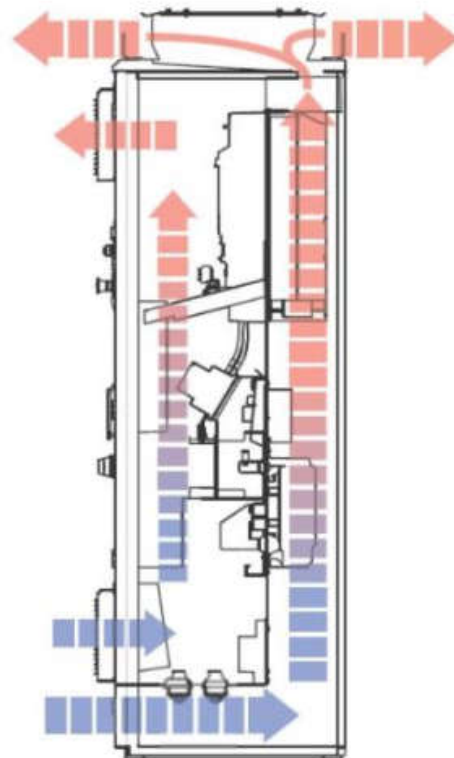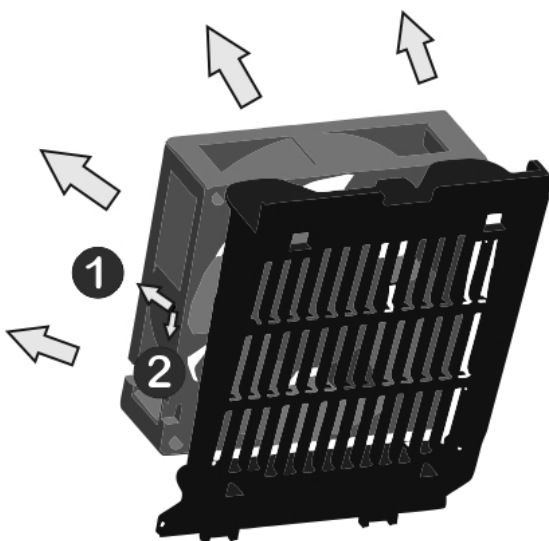
⟩ **Recharger charging**

After a long storage time, the capacitor needs to be charged to avoid capacitor damage. Limit the possibility of high current leakage of the capacitor. The best way to achieve this is to use a DC power supply that regulates the current limit.
1) Set the current limit in the range of 300...800mA depending on the size of the drive.

2) Then connect the DC power supply to the +/- DC of the terminal DC-Link or directly to the capacitor electron. A line model driver in the series does not have a DC-Link +/- terminal and can be connected to a DC power supply between two input phases (R/L1 and S/L2).
3) Then set the DC voltage to charge the rated voltage of the drive (1.35*Un AC) for at least 1 hour.
If the DC voltage is not available, the drive has been stored for more than 12 months without power, and power up needs to be found and followed by professional guidance.
⟩ Other maintenance operations
Transfer user parameter settings to the new drive module (if this feature is available for the selected model)
When replacing a drive module, the parameter copy function of the control keyboard can be used to quickly transfer user parameter settings from the failed drive module to the new drive.
These terminal connections can be quickly transferred by using pluggable terminals or boards without removing the control wires of the original faulty machine.
The X92 pluggable program and the parameter memory card (shown as the shape and its inserted orientation as shown below) can quickly implement the driver's program and parameters, hardware replacement (note that it must be the same model)

⟩ **User parameter data backup and transfer copy**

　　When it is necessary to copy the parameters to another machine, first upload the parameters of the original machine that needs to be copied to the control panel. Then carry the panel to the new machine and select Download for parameter copying.

　　The uploading procedure is: [Menu]->[Parameter Backup]->[Upload to Local], the drive's change parameters will be stored in the memory of the control panel.

　　The download procedure is: [Menu]->[Parameter Backup]->[Download to Drive]. After uploading and downloading, the interface will display the total number of parameters transmitted. At the end of the overall debugging, users are advised to upload parameters to the local to prevent parameter confusion and prepare for subsequent maintenance
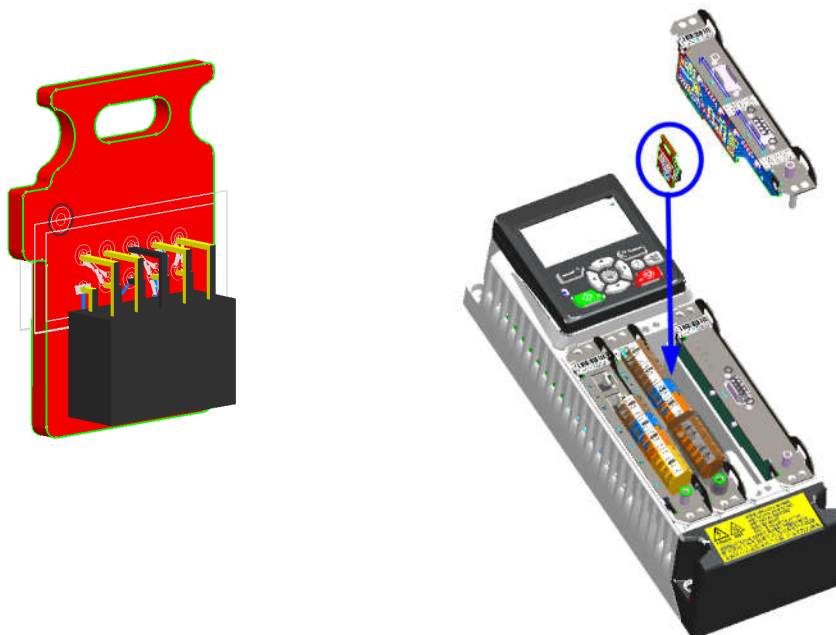
13.Technical Data

In this chapter: Introduction to technical parameters such as ratings, dimensions, technical requirements, and instructions for CE and other markings.

› **Rated/Cooling Air Volume/Noise Level**

Nominal Rating（220V）			Noise Level	Heat Diss.	Air Flow	（220V Series）Type Designation	Frame Size
P_N kW	I_N A	I_{max} A	dBA	W	m³/h		
0.75	4.8	6	40	40	25	XXXXX-R11-04A5-1B	
1.5	7.5	10	40	65	25	XXXXX-R12-07A0-1B	R1
2.2	9	11.5	40	80	25	XXXXX-R13-08A5-1B	
3.7	10	12	40	92	25	XXXXX-R14-09A0-1B	

Nominal Rating（380V）			Noise Level	Heat Diss.	Air Flow	（380V Series）Type Designation	Frame Size
P_N kW	I_N A	I_{max} A	dBA	W	m³/h		
0.75	3.3	4.7	40	25	25	XXXXX-R10-03A3-3B	
1.5	4	5.6	40	40	25	XXXXX-R15-04A0-3B	R1
2.2	5.6	6.8	40	76	25	XXXXX-R16-05A6-3B	
4	8	10	40	97	25	XXXXX-R17-08A0-3B	
2.2	6.3	9	45	76	53	XXXXX- C23-06A0-3B	C2
4	10.5	15	45	97	53	XXXXX- C24-09A8-3B	
5.5	12.9	16	45	172	53	XXXXX- C25-12A9-3B	
7.5	17	21	45	210	53	XXXXX- C26-17A0-3B	C2
11	25	29	45	325	55	XXXXX- C27-025A-3B	
15	30	35	45	420	55	XXXXX- C28-030A-3B	
15	32	45	57	450	145	XXXXX- C32-032A-3B	
18.5	38	54	57	550	145	XXXXX- C33-038A-3B	C3
22	45	64	57	660	145	XXXXX- C34-045A-3B	
30	61	76	57	890	145	XXXXX- C35-061A-3B	
30	65	76	60	890	290	XXXXX- C42-061A-3/B	
37	72	104	60	1114	290	XXXXX- C43-072A-3/B	C4
45	87	122	60	1140	290	XXXXX- C44-087A-3/B	
55	105	148	60	1200	290	XXXXX- C45-105A-3/B	
55	115	148	60	1200	350	XXXXX- C52-105A-3/B	
75	145	178	60	1440	350	XXXXX- C53-145A-3/B	C5
90	169	247	60	1940	350	XXXXX- C54-169A-3/B	
110	206	267	67	2100	570	XXXXX- C55-206A-3/B	
110	206	287	68	220	685	XXXXX- C62-206A-3	
132	246	350	68	3300	685	XXXXX- C63-246A-3	C6
160	293	418	68	3850	685	XXXXX- C64-293A-3	
200	363	498	68	4100	720	XXXXX- C73-363A-3	
220	430	545	68	4600	720	XXXXX- C74-430A-3	C7B+C7M
250	445	584	68	5100	720	XXXXX- C75-487A-3	
280	546	628	68	5782	1200	XXXXX- C83-546A-3	
315	624	718	68	6252	1200	XXXXX- C84-624A-3	C9B+C9M
355	650	789	68	7866	1200	XXXXX- C85-650A-3	
400	760	874	68	9100	1300	XXXXX- C93-760A-3	Rectification + Inverter
450	865	1020	68	9900	1300	XXXXX- C94-865A-3	
500	950	1093	68	10500	1680	XXXXX- C95-950A-3	
560	1100	1265	68	11500	1680	XXXXX- C96-1140A-3	
630	1200	1380	68	12600	1680	XXXXX- C97-1200A-3	

Nominal Rating （690V）			Noise Level	Heat Diss.	Air Flow	（690V Series）Type Designation	Frame Size
P_N KW	I_N A	I_{max} A	dBA	W	m³/h		
55	61	104	60	1200	290	XXXXX-C44-061A-6	C4
75	80	124	60	1440	290	XXXXX-C45-080A-6	C4
90	98	168	60	1940	350	XXXXX-C53-098A-6	C5
110	119	198	67	2200	350	XXXXX-C54-119A-6	C5
132	142	200	68	3300	350	XXXXX-C65-142A-6	C6
160	175	220	68	3850	350	XXXXX-C66-175A-6	C6
200	220	240	68	4100	720	XXXXX-C73-210A-6	C7B+C7M
220	271	320	68	4600	720	XXXXX-C74-271A-6	C7B+C7M
250	290	350	68	5100	720	XXXXX-C75-290A-6	C7B+C7M
280	300	360	68	5782	1000	XXXXX-C83-295A-6	C9B+C9M Rectification + Inverter
315	330	360	68	6252	1000	XXXXX-C84-325A-6	C9B+C9M Rectification + Inverter
355	370	480	68	7866	1000	XXXXX-C85-360A-6	C9B+C9M Rectification + Inverter
400	430	520	68	9100	1300	XXXXX-C93-420A-6	C9B+C9M Rectification + Inverter
450	470	655	68	9900	1300	XXXXX-C94-455A-6	C9B+C9M Rectification + Inverter
500	522	700	68	10500	1300	XXXXX-C95-505A-6	C9B+C9M Rectification + Inverter
560	590	800	68	11500	1300	XXXXX-C96-571A-6	C9B+C9M Rectification + Inverter
630	721	820	68	12600	1300	XXXXX-C97-710A-6	C9B+C9M Rectification + Inverter

Nominal Rating （Multi-machine Sransmission, Power Parallel Modular Series）			Noise Level	Heat Diss.	Air Flow	（380/690V）Multi-machine Transmission Module Type Designation	Frame Size
P_N kW	I_N A	I_{max} A	dBA	W	m³/h		
280	546	628	68	2025	1200	XXXXX- C83-546A-3+BLM	C9B (AC to DC Diode Rectifier)
315	624	718	68	2190	1200	XXXXX- C84-624A-3+BLM	C9B (AC to DC Diode Rectifier)
355	650	789	68	2760	1200	XXXXX- C85-650A-3+BLM	C9B (AC to DC Diode Rectifier)
400	760	874	68	3185	1300	XXXXX- C93-760A-3+BLM	C9B (AC to DC Diode Rectifier)
450	865	1020	68	3465	1300	XXXXX- C94-865A-3+BLM	C9B (AC to DC Diode Rectifier)
500	950	1093	68	3675	1680	XXXXX- C95-950A-3+BLM	C9B (AC to DC Diode Rectifier)
560	1100	1265	68	4025	1680	XXXXX- C96-1140A-3+BLM	C9B (AC to DC Diode Rectifier)
630	1200	1380	68	4450	1680	XXXXX- C97-1200A-3+BLM	C9B (AC to DC Diode Rectifier)
280	546	628	68	5782	1200	XXXXX- C83-546A-3+ASM	C9A+C9M
355	650	730	68	7866	1200	XXXXX- C84-650A-3+ASM	C9A+C9M
280	546	628	68	5782	1200	XXXXX- C83-546A-3+SMM	C9M (DC to AC IGBT Inverter)
315	624	718	68	6252	1200	XXXXX- C84-624A-3+SMM	C9M (DC to AC IGBT Inverter)
355	650	789	68	5900	1200	XXXXX- C85-650A-3+SMM	C9M (DC to AC IGBT Inverter)
400	760	874	68	6825	1300	XXXXX- C93-760A-3+SMM	C9M (DC to AC IGBT Inverter)
450	865	1020	68	7425	1300	XXXXX- C94-865A-3+SMM	C9M (DC to AC IGBT Inverter)
500	950	1093	68	7875	1680	XXXXX- C95-950A-3+SMM	C9M (DC to AC IGBT Inverter)
560	1100	1265	68	8625	1680	XXXXX- C96-1140A-3+SMM	C9M (DC to AC IGBT Inverter)
630	1200	1380	68	9450	1680	XXXXX- C97-1200A-3+SMM	C9M (DC to AC IGBT Inverter)

Remarks: XXXXX in the model column on this page represents the product series, which is subject to the actual product, and the rated power is valid at the rated voltage.

Rating: Continuously available rated current without overload's at IN 40 °C.

The rated current In and the heat generation are valid based on the factory rated carrier (6K for small power machine and 2K for medium and high power machine). Some special occasions such as new synchronous motor need to use higher than rated carrier. The calorific value will increase significantly. At this time, you need to zoom in on the power selection. Please consult our representative for details.

13. *Technical Data*

Imax maximum output current. Ten seconds are allowed at startup, and in other cases, the length of time depends on the temperature. The value of the overload current allowed to reach 1% per minute for every 5 minutes is about 110% of the rated value. In other cases, the length of time depends on the temperature of the driver. In some extreme or special applications, if more current is required, it should be amplified. Drive the model to get a larger output current value.

==About rated current:== Different series of models have slightly different currents (about 3-10%) depending on the control method. The above table is typical model current value. As the specific application, the factory default settings of different series of products shall prevail.
Note: In order to achieve the rated motor power given in the above table, the rated output current of the drive must be greater than or equal to the rated current of the motor.

⟩ **Power Module Multi-machine Drive Driver Overview**
Power modular multi-drive drive is DC/AC multi-machine transmission based on common DC bus system
, which can select rectifier and inverter motor modules of different power levels. according to the number and performance level of the motor to be driven
==The main components include:==

1. Basic Rectifier BLM Module (Basic Line Modules)：
Designed for pure rectification only, the internal consists of a thyristor diode and a DC reactor.

2. Smart feedback rectifier SLM module (Smart Line Module)：
It consists of IGBT and DC smoothing capacitors, which provide DC rectifier power supply for the busbar.At the same time, it is easy to return the energy of the busbar over-voltage to the grid, and it can intelligently control system and maintain the bus voltage. The actual current generated by the SLM module on the power supply side is close to sinusoidal and can suppress harmful harmonics. Must be used when selecting this rectifier module with a matching AIM incoming module.

3. SLM Incoming Interface AIM Module (Active Interface Module)：
The AIM is installed between the grid and the SLM, with integrated filters, pre-charging loops,
the flat wave absorbs the LCL loop and so on.

4. Single motor/inverter (SMM) module (Single Motor Module)：
For a self-converting inverter with IGBTs, it receives energy through a common DC bus to control the drive motor, or transfer the motor power generation energy to the bus.
The following figure shows the internal power loop topology of a modular driver with typical low harmonics with intelligent rectification and feedback.
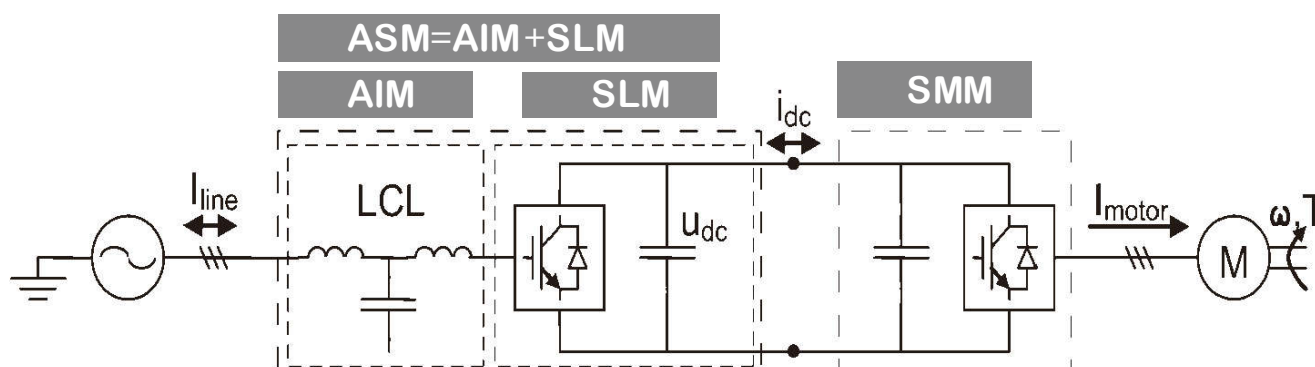
==Note: When install selected modular drive such as C9B+C9M , in order to obtain the optimal system heat dissipation design, we recommend that you install C9B or BLM module on the left side and SMM module on the right side.==

For more information about Power Module Multi-drive,please contact us.

⟩ **Derating**

If any of the following conditions exist, the above continuous output current must be derated (this process should be considered in the design of the design, and the internal intelligent control operation will automatically optimize the operation to ensure the maximum output of the driver). Derating):

• Ambient temperature exceeds +40 °C (+104° F)

• The drive is mounted 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), the rated output current is derated by 1% for every 1 °C (1.8 °F) increase.

Altitude derating: At altitudes between 1,000 and 4,000 m (3300 to 13123 ft), for every 100 m (328 ft) elevation, the derating is 1%.

For more accurate derating, please consult our professional staff.

Note: If the installation is above 2000 m (6600 ft) above sea level, it is not allowed to connect the drive to a floating earth (IT) or corner grounded grid.

⟩ **Implementing a bypass connection**

If frequent bypassing is required, employ mechanically or electrically interlocked contactors between the motor and the drive and between the motor and the power line. Make sure with interlocking that the contactors cannot be closed simultaneously.

<mark>WARNING! Never connect the drive output to the electrical power network.The connection may damage the drive.</mark>

An example bypass connection is shown below

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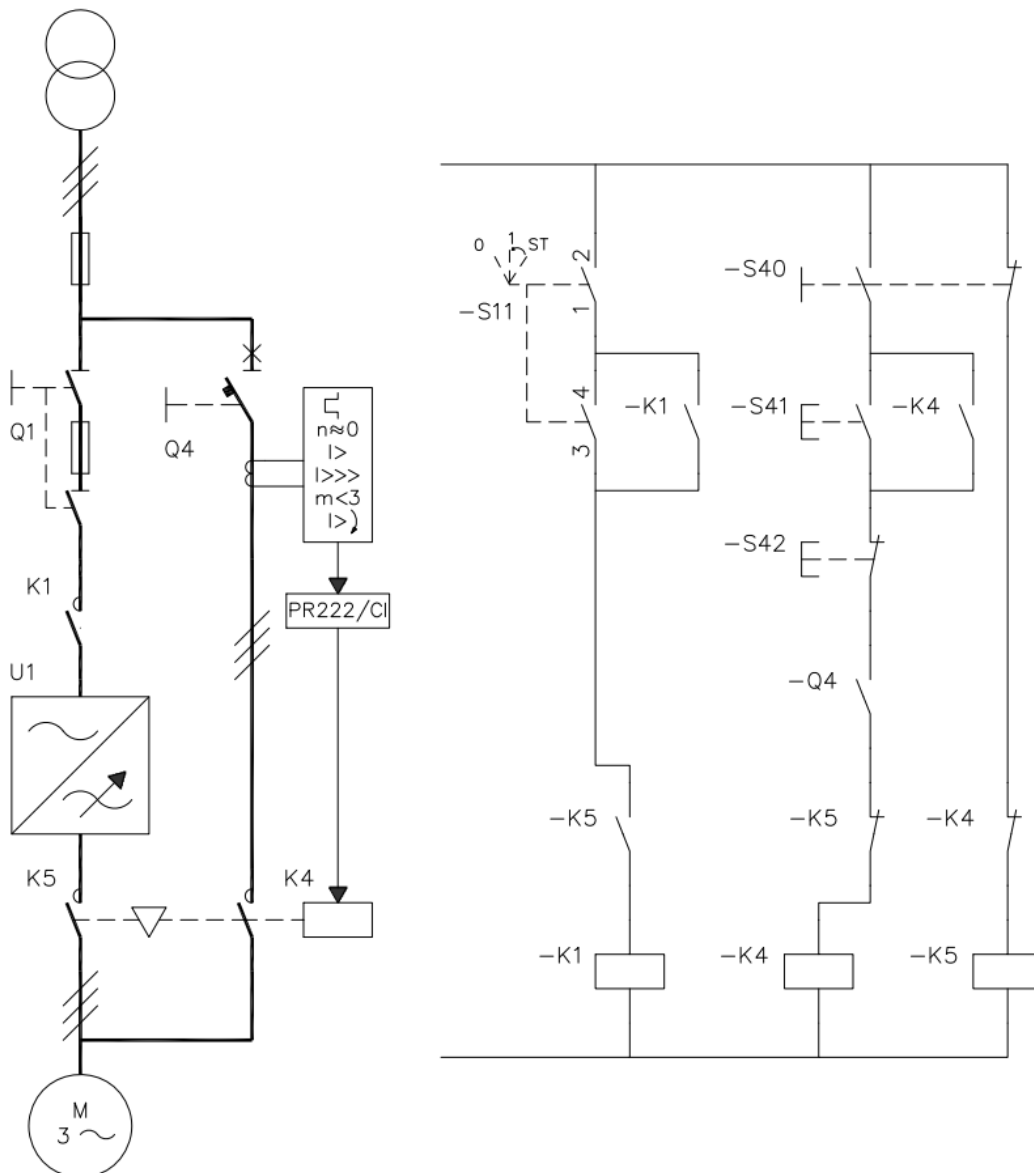
13. *Technical Data*

〉 **Main Technical Data and Specifications**

[Power Requirements]
Voltage (U 1): -1 unit: 208 ... 240 V AC 3-phase +10%...-15%
　　　　　　　　　-3 unit: 380 ... 415 V AC 3-phase +10%...-15%
　　　　　　　-6 unit : 525 ... 690 V AC 3-phase +10%...-15%
Grid type: TN (grounded) and IT (ungrounded) systems.
Rated condition short-circuit current (IEC 61439-1): 65 kA using fuses in the table
Short circuit current protection (UL 508C, CSA C22.2 No. 14-05):
USA and Canada: When the drive uses a fuse as given in the fuse table, the driver unit is suitable for circuits with a symmetrical current of no more than 100kA (rms) at a maximum voltage of 600 V.
Frequency: 47 to 63 Hz, maximum rate of change 17%/s
Voltage imbalance: max. ± 3% rated line voltage
Fundamental power factor (cos phi 1) : 0.98 (at 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- relative, U max is the field weakening point
Frequency: 0...500 Hz (Some models have higher frequency output capability, which is subject to the model setting)
Current: See the rating table.
Switching frequency: 2-12kHz (typical)
Recommended maximum length of motor cable:
For motor drives rated for 17A and below, the maximum length of the motor cable is: 150 m (492 ft)
For motor cables with rated currents of 17A and above, the maximum length is 300 m (984 ft).
Note: If the motor cable exceeds 100 m,the du/dt component mainly containing the reactor is required between the drive and the motor depending on the the insulation capacity according to manufacturing quality of the motor, the old and new, the humidity of the motor environment, etc., . At the same time, if the motor cable exceeds 150 m (492 ft) , EMC requirements are not guaranteed.

[Control unit connection]
Terminal form : Box type screw compression terminal, terminal spacing 5.08mm, maximum wiring capacity 2.5mm2.
Control keyboard/PC connection: The connection interface is: RJ45 (EIA/TIA568B standard line sequence). Cable length: less than 3 meters (with better electromagnetic environment or appropriate growth)
Each terminal on the control unit meets the requirements for ultra low voltage protection (PELV). If a voltage higher than 48 V is connected to the output of relay, it does not meet the PELV requirements of the relay output.
Note: Please refer to the standard wiring diagram R1, C2 series for the electrical connection capability and configuration of each terminal.
　【Effectiveness】
Approx. 98% of rated power (slightly up and down depending on the power level and the type of motor)
[Protection Level]
Degree of protection (IEC/EN 60529): R1-C2-C3: IP40 on the left and right, top, bottom and front, IP10 on the bottom entry side (with front protection)
C4-C9: IP20 on the left and right, bottom and front, IP20 on the top and bottom in and out of the line (with front protection + terminal protection sleeve)
Enclosure Type (UL508C): UL Type1. For indoor use only.
Overvoltage category (IEC 60664-1): Category 3.
Protection level (IEC/EN 61800-5-1): Category 1.

[Environmental Conditions]
Altitude of the Installation Location:
1. Operation (fixed installation): 1. Altitude 0 to 4000m (13123 ft), for TN, TT neutral ground grid system and IT non-angular grounding system
　　　　　　　　　　　　　2. Altitude 0 to 2000m (6561 ft) (for TN, TT, IT corner grounding systems)
　　　　　　　　　　　　　3. Above 1000 m [3281 ft]), refer to the previous derating process.

Temperature:
1. Operation (fixed installation): -15 to +55 °C (5 to 131 °F). No frosting is allowed. See the rating for the temperature specification.
2. Storage (in protective packaging): -40 to +70 °C (-40 to +158 °F)
3. Transportation (in protective packaging): -40 to +70 °C (-40 to +158 °F)

Relative Humidity:

1. Operation (fixed installation), 2. Storage (in protective packaging), 3. Transportation (in protective packaging):
a. 5 to 95%, condensation is not allowed. In a space 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. Transportation (in protective packaging):
a. Conductive dust is not allowed to exist
b. Chemical Gas: grade 3C2, Solid Particles: grade 3S2.

Atmospheric Pressure:

1. Operation (fixed installation), 2. Storage (in protective packaging), 3. Transportation (in protective packaging):
a. 70 to 106 kPa 0.7 to 1.05 atmosphere

Vibration (IEC 60068-2):

1. Operation (fixed installation): 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

 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. Transportation (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. Run (fixed installation): not allowed

 2. Storage (in protective packaging): up to 100 m/s 2 (330 ft./s 2), 11 ms

3. Transportation (in protective packaging): up to 100 m/s 2 (330 ft./s 2), 11 ms

Free Fall:

1. Run (fixed installation): not allowed

 2. Storage (in protective packaging): 500 mm for models weighing less than 12kg, 100 mm (4 in.) for weights greater than or equal to 12kg

3. Transportation (in protective packaging): 500 mm for models weighing less than 12kg, 100 mm (4 in.) for weights greater than or equal to 12kg

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【Industry Standard】

The drive industry and product design follow the following standards.
According to the standard EN/GB/IEC 61800-5-1, the drive unit complies with the European Low Voltage Directive.
EN/GB/IEC 60204-1:2006 + A1 2009: Mechanical safety. Mechanical and electrical equipment. Part I: General provisions. Compliance: The final assembler of the machine is responsible for the installation - emergency parking equipment. - Power circuit breaker.
IEC/EN 60529:1992: Degree of protection (IP code) for enclosures.
IEC 60664-1:2007: Insulation requirements for low voltage system equipment. Part 1: Principles, requirements, and testing.
EN/GB/IEC 61800-3:2004: Adjustable speed electric power transmission system. Part III: EMC requirements and specified test methods.
EN/GB/IEC 61800-5-1:2007: Adjustable speed electric power transmission system. Section 5-1: Safety requirements － Electrical, thermal and energy
EN/GB/IEC 61800-5-2:2007: Adjustable speed electric power transmission system. Section 5-2: Security Requirements － Features
UL 508C:2002 UL: Safety Standards, Power Conversion Equipment, Second Edition
NEMA 250:2008: Electrical equipment protection (up to 1000 V)
CSA C22.2 No. 14-10: Industrial Control Equipment
GOST R 51321-1:2007: Low voltage switchgear and control gear assembly. Part 1 - Requirements for Model Testing and Partial Model Test Components - General Technical Requirements and Test Methods

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[CE Mark]

The CE mark is affixed to the drive unit, indicating that the drive meets the EU Low Voltage Directive, EMC and RoHS specifications. For its safety function (eg with a safe torque interruption), the CE mark also indicates that the drive complies with the safety component mechanical standard.

Meets the EU Low Voltage Directive in accordance with the standards EN/GB/IEC 60204-1 and EN/GB/IEC 61800-5-1, in line with the EU Low Voltage Directive.

 Examples of related certificates are as follows:

〉 Power Cable Size and Fuse

The fuses used for short-circuit protection of the power supply cable are shown in the table below. In the event of a short circuit, the fuse also protects the adjacent equipment of the drive. Check if the fuse action time is less than 0.5 seconds. The operating time depends on the impedance of the power supply grid and the cross-sectional area and length of the power supply cable. See also chapter Electrical installation design.

◆ **Note: It is strictly forbidden to use fuses with higher current rating.** The fuse current and recommended cable size are to comply with national and international electrical and electrical codes that are applicable to the industry. The final choice should be based on actual field application and fuse or cable installation conditions.

〉 Material Introduction

Drive enclosure

• PC+ABS/PA66, color RAL 9002 (light grey) / RAL9004 (black)

• Hot dip galvanized steel sheet / cold rolled steel plate + spray

• Stamped aluminum Al/6063

• Copper T2

• PC sheet / epoxy glass cloth / high performance PP sheet

Packaging Corrugated Box / Glued Wooden Box, EPE Cushion, PP Strap / Tape

Disposal The raw materials used are recyclable, which saves energy and natural resources. The packaging material is degradable and recyclable. All metal parts can be recycled. Plastic parts can also be recycled or burned in a controlled environment in accordance with local regulations. Most recyclable parts come with recyclable markings.

If recycling is not possible, all components except electrolytic capacitors and printed circuit boards can be handled by landfill. The electrolyte is contained in the DC capacitor and is classified as hazardous waste in the EU standard. Electrolytic capacitors and printed circuit boards must be disposed of in accordance with local regulations.

To find out more about environmental conditions and waste recycling, please contact your local representative office.

⊕14.EMC Electromagnetic Compatibility Guidance and CE Marking

If a CE mark is attached to the drive, the drive complies with the European Low Voltage and EMC Directive. Compliance with EMC international standards: The cabinet manufacturer is responsible for the drive system in accordance with the requirements of the European EMC Directive. For items to be considered, please refer to: Standard EN/GB/IEC 61800-3 (2004), Category C2, Meets the requirements EN/GB/IEC 61800-3 (2004), Category C3 and meets the requirements EN/GB/IEC 61800 -3 (2004), section C4.

Electromagnetic compatibility definition

Electromagnetic compatibility is the coexistence of electrical equipment under limited time, space and spectrum resources without causing performance degradation. Equipment, sub-systems, and systems shall not produce electromagnetic emission requirements exceeding those specified in the specifications or standards, and may meet the requirements for immunity. EMC stands for electromagnetic compatibility. Electromagnetic compatibility is used to indicate the ability of electrical and electronic equipment to function properly in an electromagnetic environment. In turn, the device should not release electromagnetic interference from other local devices or systems.

The first environment includes civilian facilities. It also includes facilities that are not directly connected to a low-voltage grid that supplies power to civilian buildings through intermediate transformers. The second environment includes facilities other than a low voltage grid that is directly connected to power a residential building.

Class C2 drive. The electric drive system is rated below 1000 V and can be plug-in or mobile. It can only be installed and commissioned by a professional when used in the first environment.

C3 class drive. The electric drive system is rated for voltages below 1000 V and is suitable for use in the second environment and not for the first environment.

Class C4 drive. The electric drive system is rated at not less than 1000 V, or rated current not less than 400 A, or in a complex system for the second environment

China EMC Standard Introduction

According to the requirements of Chinese national standard GB/T12668.3, the driver needs to meet the requirements of electromagnetic interference and anti-electromagnetic interference.

Our current products are implemented in 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 the national standard GB/T12668.3.

IEC/EN61800-3 mainly examines the driver from two aspects of electromagnetic interference and anti-electromagnetic interference. The electromagnetic interference mainly tests the radiation interference, conducted interference and harmonic interference of the driver (corresponding to the driver for civil use) . Anti-electromagnetic interference mainly affects the drive's conducted immunity, radiated immunity, surge immunity, fast abrupt pulse group immunity, ESD immunity and power supply low-frequency end immunity (specific test items are: Input voltage sag, interruption and change immunity test; 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) to test. Tested in accordance with the strict requirements of IEC/EN61800-3 above, our products are installed and used according to the instructions shown below, and will have good electromagnetic compatibility in general industrial environments.

〉 EMC Guidance

Harmonic influence

The higher 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 a current harmonic filter.

Due to the influence of harmonics, the selection of the input leakage circuit breaker refers to the relevant description of the input side wiring of the main circuit.

The current of the driver motor power cable contains higher harmonics, so the thermal relay may malfunction due to resonance, and it is necessary to reduce the carrier frequency or install an output reactor. It is recommended that you do not install a thermal relay in front of the motor when using the drive, but use the overcurrent protection of the drive.

Electromagnetic interference and installation precautions

1. The ground wire of the driver and other electrical products should be well grounded. When using EMC filters, permanent fixed grounding connections must be used, which are not transferred through the connector.
2. The input of the drive and the motor power cable and the weak signal line (such as the control signal cable) should be placed as far apart as possible. If possible, the weak signal lines are individually routed using metal wireways.

3. Shielded cables or armored cables are recommended for the input and motor power cables of the drive. The shield or armor at both ends of the cable needs to be reliably grounded. It is recommended to use shielded twisted pair for weakly susceptible signal lines and reliably ground the shield.
4. For motor cable lengths exceeding 100m, an output filter or reactor is required.

Wiring requirements and shielding grounding methods
Ground
1. Drives and other equipment are recommended to be grounded separately; if a common ground point is required, a single point of grounding is required. The way the common ground wire is not recommended.
2. Large cross-section grounding cables should be used as much as possible to ensure that the grounding impedance is as low as possible. Since the high-frequency impedance of the flat conductor is smaller than that of the circular conductor due to the cable having the same cross-sectional area, it is preferable to use the flat cable. The grounding cable should be as short as possible and the grounding point should be as close as possible to the drive.
3. If the motor power cable is a 4-core cable, the ground wire in the 4-core cable must be grounded on the driver side and the other side connected to the ground of the motor. If the motor and driver each have a dedicated grounding point, the best is obtained. Grounding effect.
4. If the ground terminals of the various components in the control system are connected together, the noise source formed by the ground leakage current will affect other peripheral devices outside the drive in the control system. Therefore, in the same control system, the grounding of the drive and the weak electrical equipment such as computer, sensor or audio should be separated and cannot be connected together.
5. In order to obtain low high-frequency impedance, the fixing bolts of each device can be used as the high-frequency terminal connected to the rear panel of the cabinet. Please pay attention to remove the insulating paint from the fixed point when installing.
6. Lay the grounding cable away from the wiring of the I/O part of the noise sensitive equipment, and keep the grounding wire as short as possible.

The treatment of electromagnetic interference generated by peripheral electrical equipment on the drive
Relays, contactors, electromagnetic brakes, etc. in the environment surrounding the drive may cause electromagnetic interference. When the driver is subjected to electromagnetic interference, the following method is recommended:
1. Install a surge suppressor on the device that generates interference;
2. Add an EMC filter to the driver input power cable;
3. The driver control signal and detection circuit are shielded or twisted. For the shield of the shield, it needs to be grounded reliably (360 degree loop).

The driver's treatment of electromagnetic interference to peripheral equipment
The driver can cause electromagnetic interference to peripheral devices, which can be divided into two types, one is conducted interference and the other is radiated interference. For different interference situations, refer to the following methods:
1. The signals used for measuring instruments, meters, receivers and sensors are generally weak signals. If they are close to the driver or are in the same control cabinet, they are susceptible to interference and malfunction. It is recommended that the weak current signal be as far away as possible from the interference source; do not bundle the weak electrical signal line with the power cable; the signal line is shielded or twisted, and the shield of the shield needs to be well grounded (as much as possible 360 degrees); Oxygen magnetic ring (nickel-zinc magnetic ring, suppressing interference with frequency above 30MHz) and winding around 2▲ 3 circle, EMC filter can also be used for better effect.
2. When the interfered device and 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. The peripheral devices are grounded separately to reduce common mode interference caused by common ground impedance.

## Leakage Current and Processing
There is a distributed capacitance between the power cable and the earth. The longer the power cable is, the larger the distributed capacitance between the ground and the earth is, and the larger the leakage current is. The higher the carrier frequency is, the larger the leakage current is. Leakage current can be reduced by shortening the power cable length and reducing the carrier frequency. However, reducing the carrier frequency results in increased motor noise and requires a balance between the two.

14. *EMC Electromagnetic Compatibility Guidance and CE Marking*

Precautions for installing EMC filter on the power input

1. When using the filter, please use it strictly according to the rated value; since the filter belongs to Class I electrical appliances, the metal casing must have good contact with the metal of the installation cabinet in a large area, and it is required to have good grounding continuity, otherwise there is danger of electric shock and serious impact. EMC effect.

2. The filter ground must be connected to the same public ground as the driver PE, otherwise the EMC effect will be seriously affected.

3. In the cabinet, the filter should be installed close to the input end 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 and output lines of the filter are placed too close together, the high-frequency interference bypasses the filter and directly couples the input and output lines of the filter directly, rendering the power supply filter inoperative.

5. The filter housing usually has a dedicated ground terminal. However, if a filter is used to connect the filter to the control cabinet housing, the high frequency interference is equal to the dummy. This is because the high-frequency impedance of the long wires is too large to provide an effective bypass. The correct installation method is to attach a large area of the filter housing to the conductive plane of the metal casing. Please pay attention to remove the insulating varnish during installation to ensure reliable connection.

As a good application from SIEMENS as your reference below:
Grounding and high-frequency equipotential-bonding measures for equipotential bonding in the drive system via ground
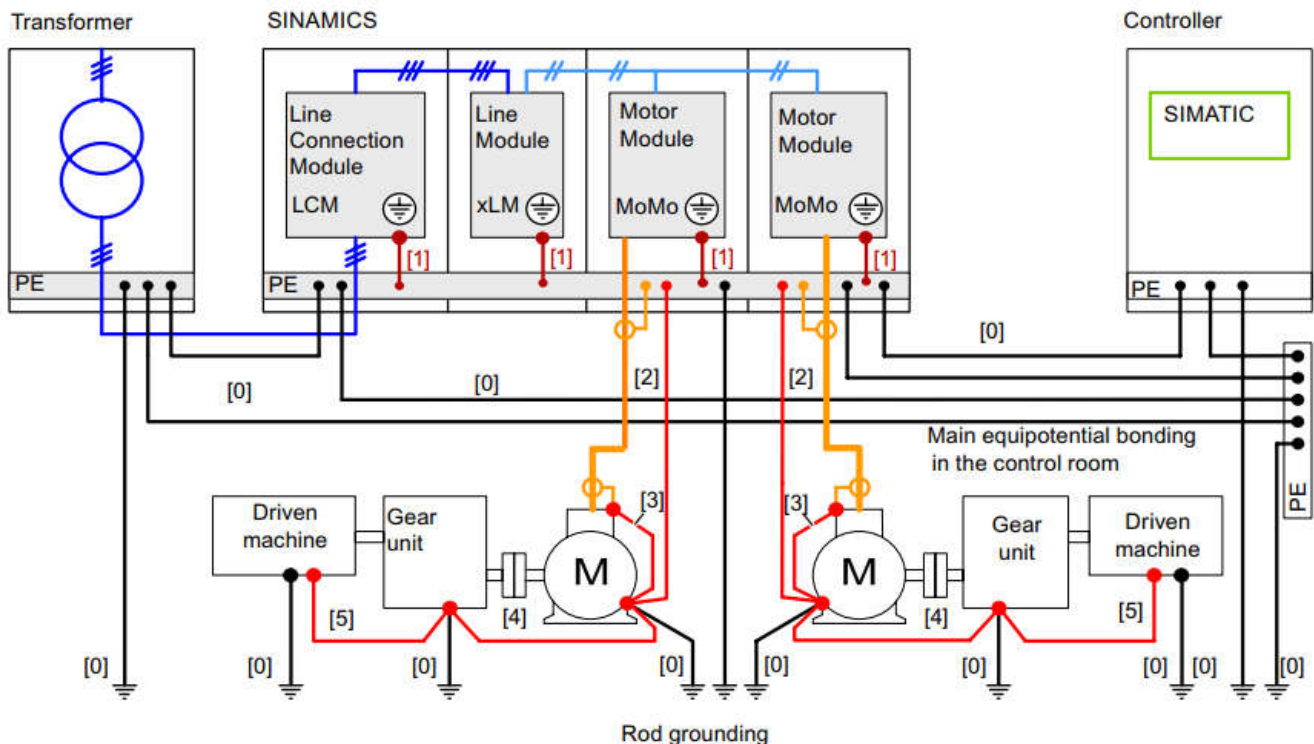
Rod grounding

The ground connections shown black form the conventional grounding system for the drive components. They are made with standard, heavy-duty PE conductors without special high-frequency properties and ensure low-frequency equipotential bonding as well as protection against injury.

The connections shown dark red inside the control cabinets provide good conductivity for highfrequency protection between the metal housings of the integrated converter components and the PE bar and EMC shield bus of the cabinet. These internal connections can be established over the greatest possible surface area using the metallic construction of the cabinet unit, whereby the contact surfaces must be bare metal and have a minimum cross-section of several cm2 at each contact point. Alternatively, these connections can be established by means of short, finely-stranded, braided copper wires with a large cross-section (> 95 mm2).

14. *EMC Electromagnetic Compatibility Guidance and CE Marking*

〉 **EMC filter**

When do I need an EMC filter?

The EMC product standard (EN/GB/IEC 61800-3 + Revised (2000)) covers the specific EMC requirements for drives (tested with motors and cables) within the EU. 61800-3 (2004) A new version of the 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 civil equipment and systems that contain drive components internally. Drive devices complying with EN/GB/IEC 61800-3 always comply with the same requirements as in EN/GB/IEC 55011 and EN/GB/IEC 61000-6-3/4, but not necessarily the opposite. EN/GB/IEC 55011 and EN/GB/IEC 61000-6-3/4 neither specify the cable length nor connect the motor as a load. The table below compares the standard radiation limits.

EMC General Standard		
EN/GB/IEC 61800-3/A11 (2000), Product Standards	EN/GB/IEC 61800-3 (2004), Product Standards	EN/GB/IEC 55011, Product line standards for industrial, scientific, and medical (ISM) equipment
First environment, unrestricted sales	Class C1	Group 1 Category B
First environment, restricted sales	Class C2	Group 1 Category A
Second environment, unrestricted sales	Class C3	Group 2 Category A
Second environment, restrictive sales	Class C4	Not applicable

⚡ **WARNING!** If the drive is connected to an IT system (ie, a power system that is not grounded or has a high impedance ground (more than 30 ohms), then the EMC filter is not allowed to be installed.

EMC Filter Installation Guide

• The filter is connected directly to the input terminals of the drive.

• For optimum filter performance, the driver and filter must be mounted on the same conductive surface.

How to disconnect the internal EMC filter ground screw

When the system needs to reduce the EMC protection level or reduce the leakage current to the ground,

You can choose to disconnect the grounding screw of the built-in EMC filter. The specific method is:

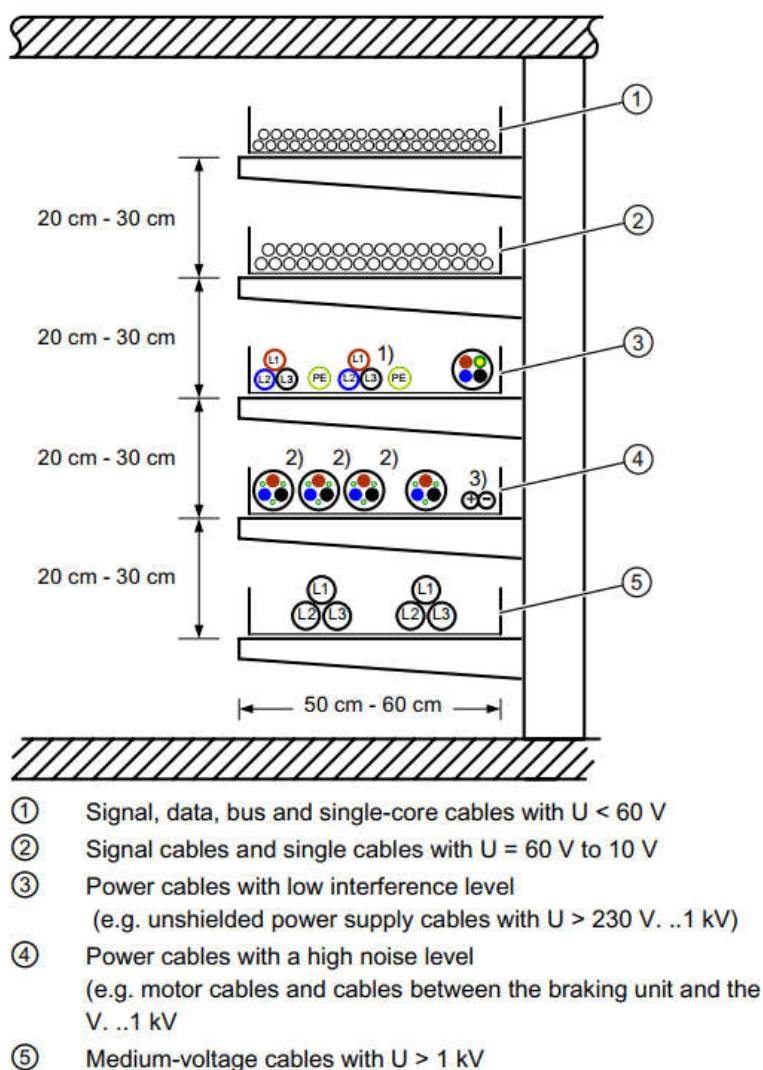C3 series models: Loosen the EMC position shown on the drive body Set the screws.

Model C4 and above: Disassemble the EMC capacitor grounding point mark Chassis, remove the grounding shorting cap.

Note! After changing the EMC rating, mark it on the body of the drive with a sticker. And record the date. The label is suggested to be placed next to the nameplate.

Note! C4 and above models change the EMC protection level of the drive because some parts need to be disassembled, so please consult our representative or professional service personnel before implementation.

① Signal, data, bus and single-core cables with U < 60 V
② Signal cables and single cables with U = 60 V to 10 V
③ Power cables with low interference level
  (e.g. unshielded power supply cables with U > 230 V. ..1 kV)
④ Power cables with a high noise level
  (e.g. motor cables and cables between the braking unit and the V. ..1 kV
⑤ Medium-voltage cables with U > 1 kV

14. *EMC Electromagnetic Compatibility Guidance and CE Marking*

⊕15.Reactor / Choke on Input side

Content of this chapter

This chapter describes how to select and install an input reactor.

When do I need to input a reactor?

The drive module with frame size C3-C9 has a built-in input reactor. For external dimensions C1 and C2, the need for external reactors should be analyzed on a case-by-case basis. Input reactor is mainly used

• Reduce harmonics in the input current

• Reduce rms input current

• Reduce power and low frequency interference

• Increase the allowable DC bus continuous power

• Ensure the average current distribution in the common DC bus.

Refer to the table data in the next section [du/dt or common mode filtering] for recommended values for input reactor selection.

Installation Guide

• If you need to install EMC at the same time, the input reactor should be connected between the power supply and the EMC filter. See the figure below.

• For optimum reactor work, the drive and reactor must be mounted on the same conductive backplane.

• Ensure that the reactor does not obstruct airflow through the drive and that the hot air generated by the reactor is offset from the air inlet of the drive module

• Keep the cable between the drive and the reactor as short as possible.

⚠ WARNING! The surface of the reactor will be hot with high temperature when in use.

Below as a brief about harmonica and reactor for your reference,the picture from Siemens

Regarding the harmonic behavior, the DC reactor behaves just like an AC reactor with 3%, i.e., for applications where a 3% AC reactor is specified, in addition to the existing DC reactor, no additional AC reactor must be installed.

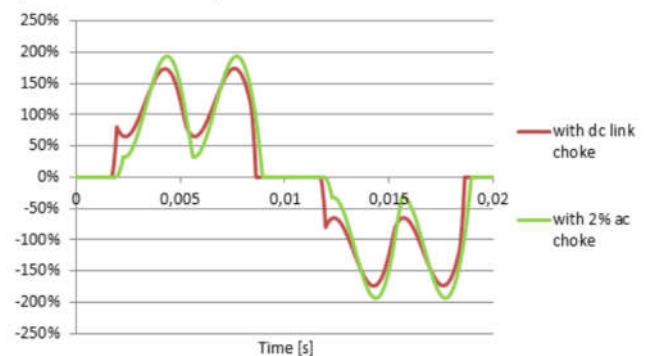Figure 2-7 DC link voltage referred to the ideal DC link voltage $U_{di} = 1.35 * U_{line}$
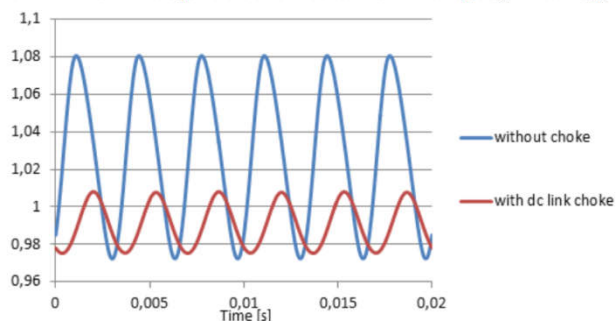
Figure 3-1 Referred input current with AC reactor/with DC reactor

⊕16.Output du/dt and Common Mode Filtering

〉 **When do I need du/dt or common mode filtering?**
Regardless of the output frequency, the output of the driver contains pulses with a very short rise time of approximately 1.35 times the equivalent supply voltage. This is a feature of all drives that use 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 puts higher demands on the insulation of the motor and its cables.

Current pulses generated by modern drive speed control units characterized by rapidly rising voltage pulses and high switching frequencies flow through the bearings of the motor, which can gradually damage the bearing rings and rotating components. The use of a du/dt filter reduces the need for motor insulation. The du/dt filter also reduces the bearing current. Common mode filtering is mainly used to reduce the bearing current. The input reactor suppresses the higher harmonics of the input current of the driver, significantly improves the driver power factor, reduces the rms input current, and reduces power supply interference and low frequency interference. The output reactor can improve the output high-frequency impedance, reduce the high-frequency leakage current, protect the driver, effectively reduce the high du/dt of the IGBT output, extend the life of the motor, suppress the harmonic current of the driver output, and compensate for the influence of the 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 (power range can be adjusted 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

⊕17.Resistor Braking

Content of this chapter
This chapter describes how to choose the brake chopper and resistor

〉 **Brake chopper**

This series (frame size R1-C2-C5) has a built-in standard or optional brake chopper to dissipate the energy generated by the motor during deceleration.
When the brake chopper is activated and connected to the resistor, the brake chopper will start to action when the DC link voltage of the drive reaches the brake voltage.

〉 **Braking resistor selection:**

1. Calculate the maximum power generated during braking of the motor.
2. Calculate the continuous braking power according to the duty ratio.
3. Calculate the braking energy generated during the work cycle.
4. Customized resistors can be selected, but with some restrictions imposed by the built-in brake chopper.

The rules are as follows:
> The following table is only the guidance data. The user can select different resistance values and power according to the working conditions in the field (but the resistance value cannot be less than the recommended resistance value shown in the table, the power can be large), and the selection of the braking resistor is basically according to that the larger the inertia of the system, the shorter the deceleration time and the higher the braking rate, the smaller the resistance value should be, and the power should be larger.

Selection of Resistance

According to the formula: R = U2 / P
U: is the braking action voltage point, U value can be configured in parameter list:
380/400VAC system defaults to 750VDC.
220VAC system default setting 375VDC
P: for braking power
Resistance power selection
To ensure safe use of the braking resistor, 70% derating is required
According to the formula: Pr=P*D/0.7
D: Braking rate (the ratio of braking process to the entire system working cycle)
Reference selection of D value
General working conditions: 10%-15%
Elevator: 25%-35%
Lifting or centrifuging: 50%-60%

⚠️	WARNING! Never use a braking resistor that is less than the specified resistance for a particular drive type. Drivers and choppers cannot protect against overcurrent caused by small resistors.

• Braking energy must not exceed the energy dissipation capacity of the selected resistor

• It is strongly recommended that you protect the resistor from thermal overload by installing an associated overload protection device before the resistor.

⟩ **Chopper data / resistance selection guide data sheet,**

Rated value for ambient temperature 40 ° C (104 ° F).
For models and applications not listed in this table, please consult a professional or our representative.

Drive Model	Recommended braking resistor resistance (Ω) for braking frequency 20% .General application.	Recommended braking resistor power (W) for braking frequency 20%.General application.	Connection resistance wire diameter(mm^2)
0.4/0.75KW-1B	≥200	≥100	1
0.7/1.5KW-1B	≥150	≥200	1.5
1.5/2.2KW-1B	≥100	≥400	1.5
2.2/4.0KW-1B	≥75	≥500	2.5

Drive Model	Recommended braking resistor resistance (Ω) for braking frequency 20%.General application.	Recommended braking resistor power (W) for braking frequency 20%.General application.	Recommended braking resistor power and resistance (W / Ω) for braking frequency 50%, heavy load such as lifting applications	Connection resistance wire diameter(mm^2)
0.7/1.5KW-3B	≥300	≥200		1
1.5/2.2KW-3B	≥150	≥400		1.5
2.2/4.0KW-3B	≥150	≥400		1.5
4.0/5.5KW-3B	≥100	≥800	2000W/100Ω	2.5
5.5/7.5KW-3B	≥75	≥800	3000W/75Ω	4
7.5/011KW-3B	≥75	≥1000	4000W/75Ω	4
011/015KW-3B	≥40	≥1000	6KW/50Ω	6
015/018KW-3B	≥40	≥1500	7.5KW/40Ω	6
018/022KW-3B	≥30	≥1500	9KW/30Ω	6
022/030KW-3B	≥25	≥1500	11KW/30Ω	10
030/037KW-3/B	≥22	≥3000	15KW/14Ω	10
037/045KW-3/B	≥14	≥4000	18KW/14Ω	16
045/055KW-3/B	≥14	≥5500	22KW/7Ω	16
055/075KW-3/B	≥8	≥8000	28KW/4.8Ω	35
075/090KW-3/B	≥8	≥12000	38KW/4.8Ω	35
090/110KW-3/B	≥8	≥16000	46KW/4.8Ω	35

17. *Resistor Braking*

Determine the required maximum braking power PRmax for the application. PRmax must be smaller than PBRmax,to be refer to the data sheet above,

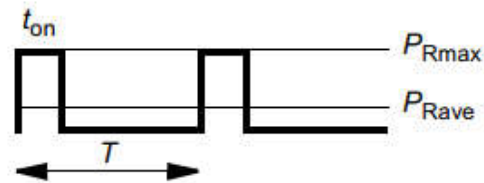general ,as our design rules,

PBRmax=0.6*rated power of ac drive

Equations for selecting the resistor:

Eq. 1. $U_N = 400$ V: $R = \dfrac{450000}{P_{Rmax}}$

$\qquad U_N = 460$ V: $R = \dfrac{615000}{P_{Rmax}}$

Eq. 2. $E_{Rpulse} = P_{Rmax} \cdot t_{on}$

Eq. 3. $P_{Rave} = P_{Rmax} \cdot \dfrac{t_{on}}{T}$

For conversion, use 1 hp = 746 W.

where R= selected brake resistor value (ohm)

P_{Rmax} = maximum power during the braking cycle (W)

P_{Rave} = average power during the braking cycle (W)

E_{Rpulse} = energy conducted into the resistor during a single braking pulse (J)

t_{on} = length of the braking pulse (s)

T = length of the braking cycle (s).

〉 Resistor installation and connection

All resistors must be mounted outside the drive module in such a way that they are adequately cooled, do not obstruct airflow from other equipment, and do not allow hot air to escape into the air inlets of other equipment. .

⚠ **WARNING!** The material near the brake resistor must be a flame retardant material. The surface temperature of the resistor may rise above 200 ° C (400 ° F) and the temperature of the gas flowing through the resistor can reach hundreds of degrees Celsius. The material must be protected from electrical contact.

The maximum length of the brake resistor cable is 20 meters (65 ft).

〉 Driver contactor protection

For safety reasons, it is highly recommended to install a main contactor for the drive. The contactor is wired so that it can be disengaged when the resistor overheats. This is very important for safety because if the chopper is still conducting in the event of a fault, the drive cannot be disconnected from the mains by other means.

〉 Brake circuit debugging

See the corresponding parameter list and description for more information.

• Enable the brake chopper function (60.07 Bus Voltage Control in the parameter list). Please note that the brake resistor must be connected after the chopper is enabled.

• Turn off the drive's overvoltage control

⚠ **WARNING!** If the drive is equipped with a brake chopper but the chopper is not enabled via the parameter settings, the brake resistor must be disconnected because the overheat protection of the resistor is not used at this time.

⊕18. Product technology and Manufacturing Related Information

〉 **Warranty Card and Note**

Warranty Card

User Info.	User Add:	
	User Name:	Contact Person:
	Phone:	Post Code:

Product info.	Product Type Number:
	Product Code:
	Dealer:

Fault Info.	Fault Description: Prepared by: Date:

Service Quality Evaluation	☐Excellent ☐Good ☐General ☐Poor More Details: Prepared by: Date:

NOTE

1. The product warranty period is 18 months from the factory's product delivery, or 12 months from the product commissioning, whichever comes first. The product warranty period specified by the seller's location may differ from the above terms and is detailed in its sales and warranty terms. We do not assume any responsibility beyond the terms of the warranty.

Second, the body bar code is the only basis for determining the warranty period.

3. During the warranty period, if the user fails to use the manual according to the normal use of the manual, our company is responsible for free maintenance. It is not responsible for drive damage caused by transportation, unpacking, installation, commissioning and use. Our company does not assume any responsibility for the joint loss.

 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) Incorrect wiring, use, improper installation or unauthorized repair.

2) Earthquakes, lightning, voltage anomalies, fires, floods and other natural disasters or secondary disasters.

3) After the purchase arrives, the person is dropped or transported and damaged.

4) Obstacles other than the product itself, such as external equipment factors.

5) Application in harsh environmental conditions beyond the product specifications specified in the manual or its rated range, such as excessive ambient temperature, corrosion, dust pollution, floc, etc.

5. In the event of product failure or damage, please fill in the contents of the Product Warranty Card correctly. This order can be void when you cannot return to the end user of this product.

6. The service fee is calculated based on the actual cost. If there is another contract, it shall be handled according to the principle of contract priority.

7. Please be sure to keep this card and present it to the maintenance unit at the time of warranty.

8. If you have any questions about this agreement, please contact your dealer first. The company reserves the right of final interpretation of the above terms.

Shenzhen Farwide Electric Co.,Ltd.

Nikola Tesla (Serbian-American scientist)

Nikola Tesla (July 10, 1856 - January 7, 1943), a Serbian-American inventor, mechanical engineer, electrical engineer. He is considered to be one of the key promoters of commercialization of electricity and is best known for hosting modern AC systems. Based on the electromagnetic field theory discovered by Michael Faraday, Tesla has several revolutionary inventions in the field of electromagnetic fields. His many related patents and theoretical research work in electromagnetics are the cornerstone of modern wireless communications and radio.

For more information on Nikola Tesla's life and legend, scientific achievements and contributions, please visit the Internet.

The picture below shows the most classic Nikola Tesla's description of the cheats of his life full of infinite innovation, listed here for you who are constantly innovating!
And take this as a total!
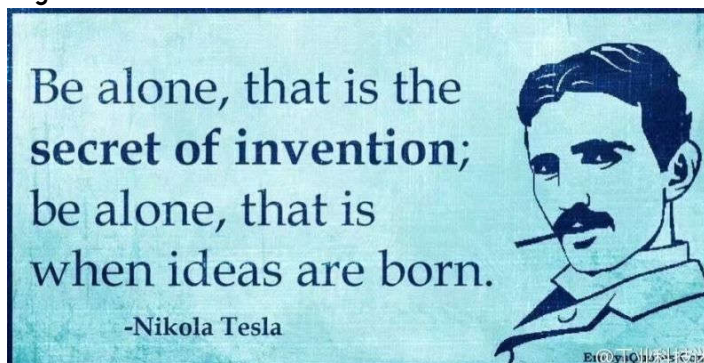
> **OQC Card and More information about Routine Test Report**

Routine Tests list 出厂检验项目及其结论		
1.	一般检查、目视外观检查 Visual inspection	■ OK □
2	绝缘、电气间隙和爬电距离检查 Insulation inspection or tests	■ OK □
3	接地保护完整及连续性检查 Grounding Check or tests	■ OK □
4	上电前主功率功能检查 Pretests，DC-Voltage increase	■ OK □
5	软件版本检查 Software versions check	■ OK □
6	各数字量、模拟量 I/O 等端子功能测试 I/O Ports tests	■ OK □
7	标配通讯端口功能测试 Communication Ports tests	■ OK □
8	PT+/-温度检测功能测试 PT ports of Temp. tests （仅对有此功能机型）	■ OK □
9	操作键盘按键功能及显示测试 Control panel tests	■ OK □
10	制动功能测试 Brake unit tests （仅对有此功能机型）	■ OK □
11	带载运行及功率压力测试 Loading and Stress screening	■ OK □
12	保护功能检查 Protection tests	■ OK □
13	随机资料版本、语言符合性检查 STD or Customized Manual check	■ OK □
14	客户订制与特别说明一致性检查 Customized instructions check	■ OK □

出厂检验标准及依据：
GB 12668、IEC 61800、设计制造所属企业规范、客户订制特定要求与说明(如果有)

Tests Result and OQC Card 出厂检验总结论及合格证明

本产品经过检验合格，现准许出厂。
This product is qualified according to the delivery inspection.

深圳弘远电气有限公司
Shenzhen Farwide Electric Co.,Ltd.

检验员/确认人 Inspected & Approval by		日期 Date	

⊕19.More information

〉 Product and service consulting

If you want to know more about this product, you can contact our local representative office. Please provide the model number of the product and the serial number of the product to be consulted.

〉 Provide feedback on this manual

You are welcome to give us valuable comments on our manual. You can contact our local representative office or call our customer service number directly.

⏀20.User parameter setting convenient record and memo table

Parameter Name	Paramere No.	My Set Value	Configuration Setting Date	Remarks1	Remarks2