Preface

Thank you for purchasing the FC110 series AC drive developed by our company.

FC110 series AC drive is a compact small power AC drive. It is an economic model specialized for the small automation equipments, especially for electronic equipments, food packaging, woodworking and other applications.

FC110 Series AC Drive Features

Advanced Vector Control Algorithm:

✦ Vector mode 0 control is more stable at low speed, high torque output at low frequency and better dynamic performance.

Multiple Functions:

✦ Multi-stage speed control, simple PLC, PID and pulse counting control.

Stable and Reliable Anti-trip Function:

✦ Stable and reliable overvoltage/overcurrent stalling control algorithm, non-stop control function to prevent frequent trip in complex applications.

This manual describes the functions and features and correct use of FC110 series AC drive, including product selection, parameter setting, running commissioning, troubleshooting and routine maintenance and other related matters. Please read this manual carefully to make sure the correct installation and operation and maintenance to achieve the high performance of this AC drive. Please hand this manual to the users and keepers of this AC drive.

Unpacking Inspection Cautions

Every AC drive have been tested strictly in factory prior to shipment. Upon unpacking, check:

✦ Whether the product is damaged;

✦ Whether the nameplate model and AC drive ratings are consistent with your order.

✦ Whether the box contains the AC drive, certificate of conformity, user manual and warranty card. If you find any omission or damage, contact our company or your supplier immediately.

First-time Use:

For the users who use this product for the first time, read the manual carefully.

If in doubt concerning some functions or performances, please contact the technical support personnel of our company to ensure correct use.

FC110 series AC drives have passed CE test and also meet the requirements of following International Standard.

✦ IEC/EN 61800-5-1:2003 safety requirements for adjustable speed electric drive systems.
✦ IEC/EN 61800-3:2004 adjustable speed electric drive systems: The third part: the electromagnetic compatibility standard of the product and its specific test method.
✦ IEC/EN 61000-2-1,2-2,3-2,3-3,4-2,4-3,4-4,4-5,4-6:EMC International and EU Standard.

The instructions are subject to change, without notice, due to product upgrade, specification modification as well as efforts to increase the accuracy and convenience of the manual.

Contents

Chapter 1

Safety and Cautions

Safety and Cautions Definition

Read this manual carefully so that you have a thorough understanding. Installation, commissioning or maintenance may be performed in conjunction with this chapter. Our company will assume no ability and responsibility for any injury or loss caused by improper operation.

Danger

Indicates that failure to comply with the notice will result in severe personal injury or even death.

Note

Indicates that failure to comply with the notice will result in personal injury or property damage.

1.1 Safety Cautions

Use Stage	Safety Grade	Precautions
Before Installation	Danger	✦ Do not install the equipment if you find water seepage, component missing or damage upon unpacking. ✦ Do not install the equipment if the packing list does not conform to the product you received.
	Danger	✦ Handle the equipment with care during transportation to prevent damage to the equipment. ✦ Do not use the equipment if any component is damaged or missing. Failure to comply will result in personal injury. ✦ Do not touch the components with your hands. Failure to comply will result in static electricity damage.
During Installation	Danger	✦ Install the equipment on incombustible objects such as metal, and keep it away from combustible materials. Failures to comply may result in a fire. ✦ Do not loosen the fixed screws of the components, especially the screws withe red marks.
	Note	✦ Do not drop wire end or screw into the AC drive. Failure it will result in damage to the AC drive. ✦ Install the AC drive in places free of vibration and direct sunlight. ✦ When two AC drives are laid in the same cabinet , ✦ arrange the installation positions properly to ensure the cooling effect.

Use Stage	Safety Grade	Precautions
At wiring	Danger	✦ A circuit breaker must be used to isolate the power supply and the AC drive. Failure to comply may result a fire. ✦ Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock. ✦ Never connect the power cables to the output terminals(U,V,W) of the AC drive. Pay attention to the marks of the wiring terminals and ensure correct wiring. Failure to comply may result in damage to the AC drive. ✦ Ensure that the main cable line comply with the standard, the line meets the EMC requirements and the area safety standard. Failure to comply may result in risk or accident. ✦ Never connect the power cables the braking resistor between the DC bus terminals P+, P-. Failure to comply may result in a fire. ✦ Use a shielded cable for the encoder, and ensure that the shielding layer is reliably grounded.
Before Power-on	Danger	✦ Please confirm the peripheral equipment and cable converter is configured in this manual of the recommended model, all the configuration line in accordance with the connection method of the manual provides the correct wiring. Failure to comply will result in accidents. ✦ Check that the voltage class of the power supply is consistent with the rated voltage class of the AC drive.

Use Stage	Safety Grade	Precautions
After Power-on	Danger	✦ Do not open the AC drive's cover after power-on. Failure to comply may result in electric shock. ✦ Do not touch the operation of AC drive during the hands is wet. Failure to comply will result in accident. ✦ Do not touch any I/O terminal of the AC drive. Failure to comply may result in electric shock. ✦ Do not change the default settings of the AC drive. Failure to comply will result in damage to the AC drive. ✦ Do not touch the rotating part of the motor during the motor auto-tuning or running. Failure to comply will result in accident.
During Operation	Danger	✦ Signal detection must be performed only by qualified personnel during operation. Failure to comply will result in personal injury or damage to the AC drive. ✦ Do not touch the fan or the discharging resistor to check the temperature. Failure to comply will result in personal burnt.
	Danger	✦ Avoid objects falling into the AC drive when it is running. Failure to comply will result in damage to the AC drive. ✦ Do not start or stop the AC drive by turning the contactor ON/OFF. Failure to comply will result in damage to the AC drive.
During Maint-enance	Danger	✦ Do not repair or maintain the AC drive at power-on. Failure to comply will result in electric shock. ✦ Ensure that the AC drive is disconnected from all power suppliers before staring repair or maintenance on the AC drive.

Use Stage	Safety Grade	Precautions
During Maint-enance	Danger	✦ Repair or maintenance of the AC drive may be performed only by qualified personnel. Failure to comply will result in personal injury or damage to the AC drive. ✦ Set and check the parameters again after the AC drive is replaced.

1.2 Cautions

1.2.1 Motor Insulation Test

Perform the insulation test when the motor is used for the first time, or when it is reused after being stored for a long time, or in a regular check-up, in order to prevent the poor insulation of motor windings from damaging the AC drive during the insulation test. A 500-V mega-Ohm meter is recommended for the test. The insulation resistance must not be less than 5MΩ.

1.2.2 Thermal Protection of Motor

If the selected AC drive does not match the rated capacity of the motor , especially when the rated power of the AC drive is higher than that of the motor, adjust the parameters for motor protection in the AC drive or to install thermal relay to protect the motor .

1.2.3 Running Below and Above Rated Frequency

The AC drive provides frequency output of 0 to 600.00Hz. When the users use the frequency converter for a long time, please pay attention to the motor cooling or use of variable frequency motor. If the AC drive is required to run at over 50Hz, consider the capacity of the machine.

1.2.4 Motor heat and noise

The output of the AC drive is pulse width modulation (PWM) wave with certain harmonic frequencies, and therefore, the motor temperature, noise, and vibration are slightly greater than those when the AC drive runs at power frequency (50Hz).

1.2.5 Voltage-sensitive device or capacitor on output side of the AC drive

Do not install the capacitor for improving power factor or lightning protection voltage sensitive resistor on the output side of the AC drive because the output of the AC drive is PWM wave. Otherwise, the AC drive may suffer transient overcurrent or even be damaged.

1.2.6 Contactor at the I/O terminal of the AC drive

When a contactor is installed between the input side of the AC drive and the power supply, the AC drive must not be started or stopped by switching the contactor on or off. If the AC drive has to be operated by the contactor, ensure that the time interval between switching is at least one hour since frequent charge and discharge will shorten the service life of the capacitor inside the AC drive.

When a contactor is installed between the output side of the AC drive and the motor,do not turn off the contactor when the AC drive is active. Otherwise, modules inside theAC drive may be damaged.

1.2.7 When External Voltage is Out of Rated Voltage Range

The AC drive must not be used outside the allowable voltage range specified in this manual. Otherwise, the AC drive may be damaged . If required, use a corresponding voltage step-up or step-down device.

1.2.8 The Derating of the AC Drive

Different power grade frequency converter has its default carrier frequency, when to run at a higher carrier.frequency, the AC Drive must to reduce the amount when running.

1.2.9 Prohibition of Three-Phase Input Change into Two-Phase Input

Do not change the three-phase input of the AC drive into two-phase input. Otherwise, a fault will result or the AC drive will be damaged.

1.2.10 Surge Suppressor

The AC drive has a built-in over-voltage, over-current device for suppressing the surge voltage generated when the inductive loads around the AC drive are switched on or off. If the inductive loads generate a very high surge voltage, use a surge suppressor for the inductive load to prolong the service life of the AC drive.

1.2.11 Ambient Temperature and De-rating

The normal use of the frequency converter ambient temperature is -10℃~40℃. Temperature exceeds 40℃,the equipment need to reduce the amount of use. The ambient temperature of each increase is reduced by 1.5%,the maximum use of the ambient temperature is 50℃.

1.2.12 Altitude and De-rating

In places where the altitude is above 1000m and the cooling effect reduces due to thin air, it is necessary to de-rate the AC drive. Contact our company for technical support.

1.2.13 Disposal

The electrolytic capacitors, plastic parts and other devices may explode when they are burnt. Poisonous gas is generated when they are burnt. Treat them as ordinary industrial waste according to relevant national laws and regulations.

1.2.14 Adaptable Motor

- The standard adaptable motor is adaptable four-polo squirrel-cage AC asynchronous induction motor or PMSM. For other types of motor, select a proper AC drive according to the rated motor current.
- The cooling fan and rotor shaft of general motor are coaxial, which results in reduced cooling effect when the rotational speed declines. If variable speed is required, add a more powerful fan or replace it with variable-frequency motor in applications where the motor runs at low frequency for a long time.
- The standard parameters of the adaptable motor have been configured inside the AC drive. It is still necessary to perform motor auto-tuning or modify the default values based on actual conditions. Otherwise, the running effect and protection performance will be affected.
- The AC drive may alarm or even be damaged when short-circuit exists on cables or inside the motor. Therefore, perform insulation short-circuit test when the motor and cables are newly installed or during routine maintenance. During the test, make sure that the AC drive is disconnected from the tested parts.

Chapter 2

Product Information

This Chapter Content

This chapter briefly introduces the operation principle, product performance, layout, nameplate, and type of instructions.

2.1 Naming Rules

Model code contains product information. Users can find the code on the model designation label attached to the AC drive or the simple nameplate.

FC110 – 2S 0.7 G C

❶ ❷ ❸ ❹ ❺

2

Name	Mark	Description	Detail
AC drive series	❶	FC110 series	Series Name
Voltage level	❷	Voltage level	2S: Single-phase 220V Range:-15%~20% 2T: Three-phase 220V Range:-15%~20% 4T: Three-phase 380V Range:-15%~20%
Adaptable power	❸	Adaptable motor power(KW)	0.4KW~4.0KW
Load type	❹	Load type	G: General type
Braking unit mark	❺	Braking unit	Null: None C: With a brake unit

Fig. 2-1 Name Designation Rules

2.2 Nameplate

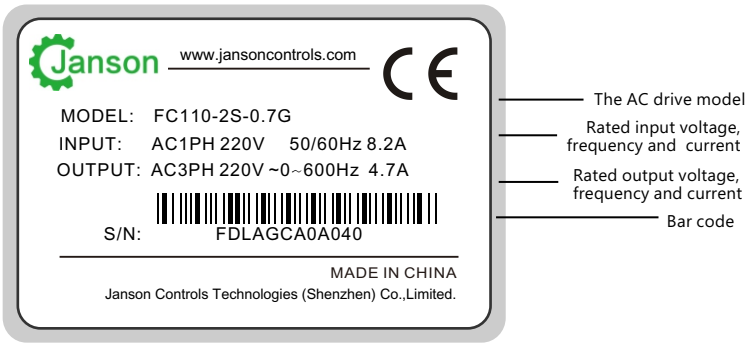


Fig. 2-2 Product nameplate

2.3 FC110 Series AC Drive

Table 2-1 FC110 series model

AC Drive Model	Power Capacity (KVA)	Rated Input Current (A)	Rated Output Current (A)	Adaptable Motor (KW)
Input voltage: single-phase 220V Range : -15%~20%				
FC110-2S-0.4G	1.0	5.4	2.3	0.4
FC110-2S-0.7G	1.5	8.2	4.7	0.75
FC110-2S-1.5G	3.0	14.0	7.5	1.5
FC110-2S-2.2G	4.0	23.0	10.0	2.2
Input voltage: three-phase 380V Range: -15%~20%				
FC110-4T-0.7G	1.5	3.4	2.3	0.75
FC110-4T-1.5G	3.0	5.0	3.7	1.5
FC110-4T-2.2G	4.0	5.8	5.1	2.2
FC110-4T-4.0G	5.9	10.5	8.5	4.0

2.4 Technical Specifications

Table 2-2 Technical specifications of FC110

Item		Specifications			
Basic specifications	Maximum frequency	0~600Hz			
	Carrier frequency	0.5kHz~16.0kHz The carrier frequency is automatically adjusted based on the load features.			
	Input frequency resolution	Digital setting: 0.01Hz		Analog setting: Max frequency×0.025%	
	Control mode	0:Vector mode control ; 2:V/F control			
	Startup torque	0.5Hz/150%			
	Speed range	1:100 (Vector mode 0)			
	Overload capability	15 overload capability 60m for 120%; 60s for 150% f rated current; 4s for 180% of rated current			
	Torque boost	Auto torque boost		Manual torque boost 0.1% to 30%	
	V/F curve	Line	Multi-point	Square V/F curve	V / F separation
	Acc/Dec curve	Linear Acc/Dec mode; Four kinds of Acc/Dec time; Range of Acc/Dec Time: 0.0 ~ 6500H			

Table 2-2 Technical specifications of FC110 (Continued)

Item		Specifications
Basic specifications	DC braking	DC braking frequency: 0.00Hz~Maximum frequency Braking time: 0.0 ~ 120.0s Braking action current value: 0.0~100%
	Jog control	Jog frequency range: 0.00Hz~50.00Hz
	Onboard PID	It realizes process-controlled closed loop PID control system easily
	Simple PLC, Multi-stage	16-speed operating through built-in PLC or control terminal
	Auto voltage regulation (AVR)	It can keep constant output voltage automatically when the mains voltage changes.
	Overvoltage/ Overcurrent stall control	The current and voltage are limited automatically during the running process so as to avoid frequent tripping due to overvoltage/overcurrent.
	Rapid current limit function	It helps to avoid frequent over- current faults of the AC drive.
Individualized	High performance	High-performance current vector control technology to achieve a three-phase ACinduction motor control.
	Instantaneous non-stop	Load feedback energy compensates the voltage reduction so that the AC drive cancontinue to run in a short time in case of power interruption.
	Rapid current limit	Rapid software and hardware current limiting technology helps to avoid frequentover-current fault.
Running	Bus support	In accordance with international standard MODBUScommunication
	Command source	Given the control panel, control terminal, serial communication port given. Itcan be switched by a variety of ways.
	Frequency source	9 frequency sources : digital setting, analog voltage setting, analog current setting, pulse setting, 485 communication setting, etc. It can be switched by a variety of ways
	Auxiliary frequency source	9 auxiliary frequency source. Flexible implementation of auxiliary frequencytuning, frequency synthesis.
	Input terminal	Five digital input terminals (X1~X5). Two analog input terminal (Ai1/AI2) that supports 0~10V voltage input or 0~20mA current input. .
	Output terminal	One digital output terminal. One relay output terminal. One analog output terminal AO that supports 0~20mA current output or 0~10V voltage output

Table 2-2 Technical specifications of FC110 (Continued)

Item		Specifications
Running	Key Locking and function selection	Achieve some or all of the keys locked and define the scope of partialkeys to prevent misuse.
	Protection function	Powered motor short circuit test; Input/output phase failure protection; Over current protection; voltage protection; Under voltage protection; Over heat protection ; Overload protection; braking resistor fault protection.
Environment	Installation location	In-door, free from direct sunlight, dust, corrosive gas, combu-stiblega , oil mist, steam , water drop and salt .
	Altitude	Lower than 1000m (1000m-3000m for derated use)
	Ambient temperature	-10 +40 (derated use in the ambient temperature of40℃ and 50℃)
	Humidity	Less than 95%RH, without condensing
	Vibration	Less than 5.9m/s2(0.6g)
	Storage temperature	- 20℃ to + 60℃

2.5 Product Outline and Installation Hole Size

2.5.1 Product Outline

Fig. 2-3 The outline of AC drive

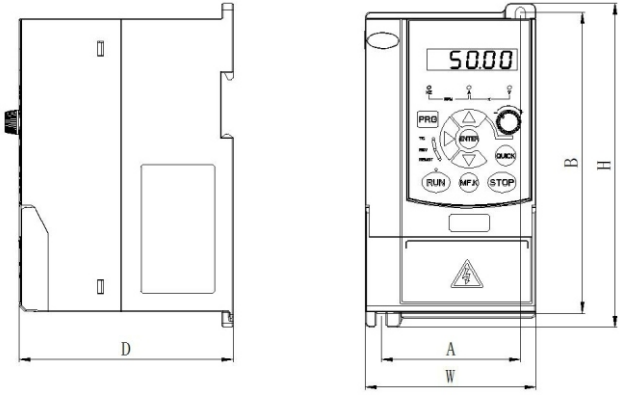


Fig. 2-4 Outline dimension and installation size

2.5.2 Installation Hole Size of the AC Drive

Table 2-3 FC110 AC drive's outline dimensions and installation sizes

Model	H(mm)	W(mm)	D(mm)	H1(mm)	A(mm)	B(mm)	Diameter (mm)	GW(kg)
Single-phase 220V series								
FC110-2S-0.2G	177	93	117	/	76	164	Ø5.5	0.95
FC110-2S-0.4G								
FC110-2S-0.7G								
FC110-2S-1.5G								
FC110-2S-2.2G	221	125	136	/	103	*	Ø6	1.98
Three-phase 380V series								
FC110-4T-0.4G	177	93	117	/	76	164	Ø5.5	0.95
FC110-4T-0.7G								
FC110-4T-1.5G								
FC110-4T-2.2G								
FC110-4T-4.0G	221	125	136		103	*	Ø6	1.98

2.5.3 External Kevboard Dimension

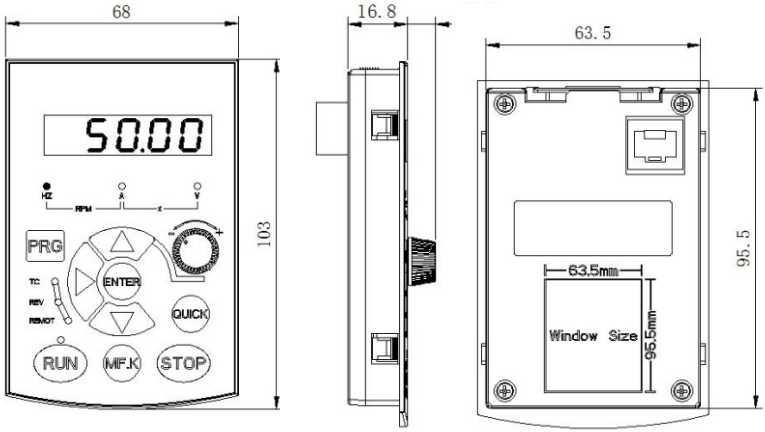


Fig. 2-5 External Keyboard dimension

2.6 Selection Braking Unit

The section recommend braking assembly is instructional data. Users can select different resistance value and power according to actual situation (Resistance value can not be lower than the recommended ones, the power can be higher than recommended ones). Brake resistance can be selected according to the power of motor in actual applied system. They are also related to system inertia, deceleration time and potential energy load, etc. Customs should select the AC drive according to actual situation. The bigger of the system inertia, the shorter of the deceleration time, the more frequent of the braking, and the braking resistence should select larger power and smaller resistance .

2.6.1 The Selection of Resistance Value

When braking, almost all renewable energy consumption of the motor is on the braking resistor. According to the formula:

U*U/R=Pb

• U Braking voltage at stable braking system. (System selections differs in braking voltages. The AC380V system usually selects DC 700V braking voltage.).

• Pb Braking power.

2.6.2 The Selection of Brake Resistor Power

Theoretically braking resistance is in the same power as brake's, but considering the derating 70%. According to the formula::

$$0.7*Pr=Pb*D$$

• Pr Resistor power.

• D Braking frequency (The reproduction process accounts for the proportion of the entire working process)

Elevator-20%~30% Centrifuge-50%~60%
Accidental braking load-5% Commonly take 10%

Table 2-4 Selecting brake unit

Model	Power	Resistance	Brake unit	Notes
Single-phase 220V series				
FC110-2S-0.4G	80W	≥200Ω	Built-in as standard	None
FC110-2S-0.7G	80W	≥150Ω		
FC110-2S-1.5G	100W	≥100Ω		
FC110-2S-2.2G	100W	≥70Ω		
Three-phase 220V series				
FC110-2T-0.4G	150W	≥150Ω	Built-in as standard	None
FC110-2T-0.7G	150W	≥110Ω		
FC110-2T-1.5G	250W	≥100Ω		
Three-phase 380V series				
FC110-4T-0.4G	150W	≥300Ω	Built-in as standard	None
FC110-4T-0.7G	150W	≥300Ω		
FC110-4T-1.5G	150W	≥220Ω		
FC110-4T-2.2G	300W	≥220Ω		
FC110-4T-4.0G	300W	≥130Ω		

Chapter 3

Mechanical and Electrical Installation

⚠ Danger

- Only qualified electricians are allowed to carry out what described in this chapter.Please operate according to the section of "pay attention to security matters", failure to these may cause personal injury or damage to equip
- Input power line is only allowed permanent fastening connection, and the equipment must be reliable grounding.
- Even if the inverter is in non-working state, the following terminal may still have dangerous voltage:
  -Power supply terminals:R, S, T, P, Pb.
  -Terminals for connecting motor: U, V, and W.
- Waiting for 10 minutes after the power switch is off. And then you allow to install when the AC drive discharges completely.
- The minimum cross-sectional area of the grounding conductor must be equal to or greater than that of the power supply cable.

⚠ Note

- Install the AC drive on incombustible objects such as metal. Failure to comply will result in a fire.
- If install two or more AC drives in a cabinet body, you should install cooling fan first and the air temperature is less than 45℃. Overheating will cause a fire or damage to equipment.
- The installation and design of the AC drive must comply with relevant laws and regulations of the installation region. If the installation of the AC drive violates the requirements of local laws and regulations, We our company does not assume any legal responsibility. In addition, if user are not comply with the recommendations, the AC drive may appear some faults not covered by the warranty.

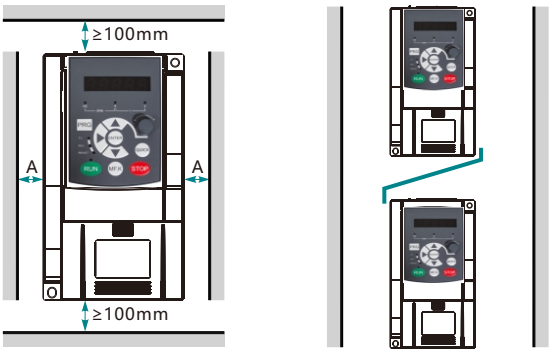
3.1 Mechanical Installation

3.1.1 Installation Environment

① Ambient temperature: Ambient temperature has great influence on the service life of AC drives, so the ambient temperature should be within the range of -10℃ to 50℃.
② Install the AC drive on the surface of an incombustible object, and ensure that there is sufficient space around for heat dissipation. Install the AC drive vertically on the support with screws.
③ Install in the place where is not easy to vibrate and far away from the punching machine, etc. Vibration is equal to or less than 0.6G.
④ Free from direct sunlight, high humidity and condensation.
⑤ Free from corrosive, explosive and combustible gas.
⑥ Free from oil dirt, dust and metal powder.

3.1.2 Installation Location Tips

Ensure that there is sufficient space around for heat dissipation when installed FC110 series AC drives. Space reserved requirements as shown below:



Single installation Upper row and lower row installation

Fig. 3-1 Installation Diagram

Note:
install a insulation guide plate for upper row and lower row installation of the AC drive.

3.1.3 Installation Precautions

When you install FC110 series AC drive, pay attention to the following:

① Reserve the installation clearances as specified in Figure 3-1 to ensure sufficient space for heat dissipation. Take heat dissipation of the other parts in the cabinet into consideration.

② Install the AC drives upright to facilitate heat dissipation. If multiple AC drive are installed in the cabinet, install them side by side. If one row of AC drives need to be installed above another row, install an insulation guide plate, as shown in Figure 3-1.

③ Use incombustible installation support.

④ In the applications where there are metal powder, install the heatsink outside the cabinet and ensure that the room inside the fully-sealed cabinet is as large as possible.

3.1.4 Install and Remove the Cover

FC110 series AC drives use plastic housing, please refer to following3-2 figure for the dismantle of open cover.Remove the upper cover by pushing the hook of the front cover inward, so as to eject the upper cover.

Fig.3-2 Remove the plastic lower cover

Note:

Remove the lower cover by pushing the hook of the lower cover inward symmetrically, so as to eject the cover .

3.2 Electrical Installation

3.2.1 Selection of Peripheral Electrical Components

AC Drive Model	MCCB (A)	Contactor (A)	Input Side Main Circuit Wire (mm2)	Output Side Main Circuit Wire (mm2)	Control Circuit Wire (mm2)
Single-phase 220V series					
FC110-2S-0.7G	16	10	2.5	2.5	0.75
FC110-2S-1.5G	20	16	4.0	2.5	1.5
FC110-2S-2.2G	32	20	6.0	4.0	1.5
Three-phase 380V series					
FC110-4T-0.7G	10	10	2.5	2.5	0.75
FC110-4T-1.5G	16	10	2.5	2.5	0.75
FC110-4T-2.2G	16	10	2.5	2.5	0.75
FC110-4T-4.0G	25	16	4.0	4.0	1.5

3.2.2 Description of Peripheral Electrical Components

Part	Mounting Location	Function Description
MCCB	Power receiving side	✦ Interrupt the power supply when overcurrent occurs on the downstream devices.
Contactor	AC drive input side	✦ Start and stop the AC drive. Do not start and stop the AC drive frequently by switching the contactor on and off (less than twice per minute) nor use it to directly start the AC drive.
EMC input filter	Between MCCB and the AC drive input side	✦ Reduce the external conduction and radiation interference of the AC drive. ✦ Decrease the conduction interference flowing from the power end to the AC drive and improve the anti-interference capacity of the AC drive.
AC output reactor	Between the AC drive output side and motor, close to the AC drive.	✦ Generally, the output side of the AC drive has much higher harmonics. When the motor is far from the AC drive, there is much distributed capacitance in the circuit and certain harmonics may cause resonance in the circuit, bringing about the following two impacts: ✦ a) Degrade the motor insulation performance and damage the motor in the long run.

Part	Mounting Location	Function Description
AC output reactor	Between the AC drive output side and motor, close to the AC drive.	b) Generate large leakage current and cause frequent AC drive protection trips. ✦ If the distance between the AC drive and the motor exceeds 100m, instal an AC output reactor.

3.2.3 Three/Single-phase Input Wiring Mode

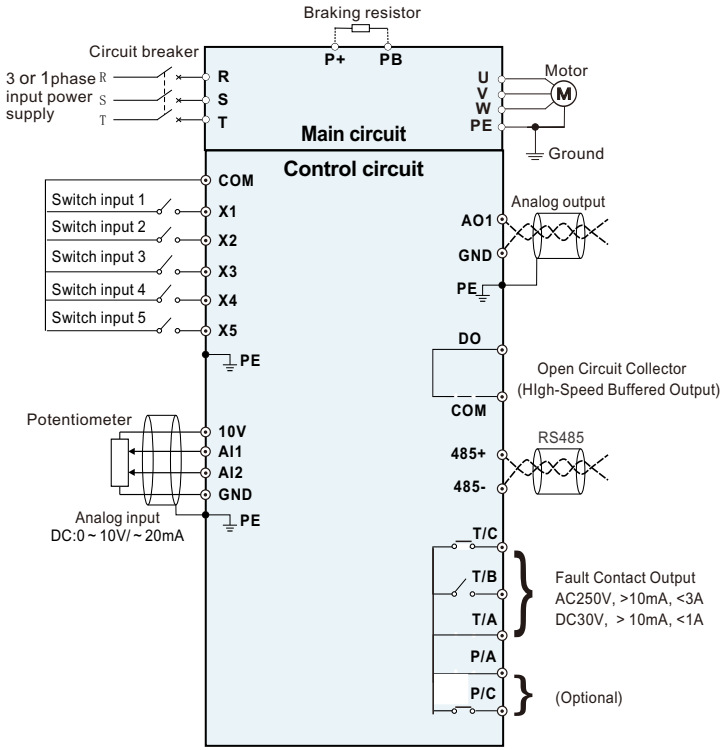


Fig. 3-3 Basic Wiring Schematic Diagram (1)

Precautions on the wiring:

① DC bus have residual voltage after the AC drive is switched off. Ensure voltage is less than 36V before touching the equipment Otherwise, you may get electric shock.

② Braking resistor connecting terminals:

a.The connecting terminals of the braking resistor are effective only for the AC configured with the built-in braking unit.

b.The cable length of the braking resistor shall be less than 5m. Otherwise, it may damage the AC drive.

③ The AC drive output terminals: U, V, W

a. The capacitor or surge absorber cannot be connected to the output side of the AC drive. Otherwise, it may cause frequent AC drive fault or even damage the AC drive.

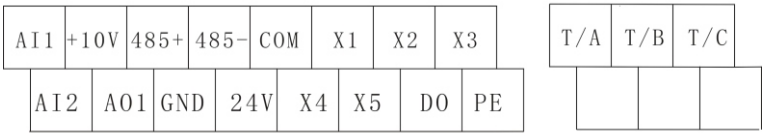
b. If the motor cable is too long, this will damage the motor insulation or generate higher leakage current, causing the AC drive to trip in overcurrent protection. If the motor cable is greater than 30m, need to reduce the carrier to decrease the leakage current; if it is greater than 50 m long, an AC output reactor must be installed close to the AC drive.

④ Protective grounding terminal E: Must be reliably connected to the main grounding conductor. Grounding wire diameter should be greater than 10mm² and the resistance must be less than 5Ω. Otherwise, it may cause electric shock, mal-function or even damage to the AC drive.Do not connect the grounding terminal to the neutral conductor of power supply.

3.2.5 The main circuit terminals and function

Terminal	Terminal Name	Description
R,S,T	Power input terminal	Single-phase 220V/3-phase 380V AC power supply connect point
P, PB	Braking resistor connecting terminal	Braking resistor connecting terminal
U, V, W	AC drive output terminal	Connect 3-phase motor
PE	Ground terminal	Ground terminal

3.2.5 The main circuit terminals and function



3.2.5 Description of control circuit terminals

Category	Terminal Label	Name	Terminal Function Description	Specification
Multiple function input terminal	X1-COM	Multiple-function input terminal 1	Able to be programmed and defined to multiple-function switching value input terminal	optical coupling isolation input Input impedance: R=2KΩ Max. input frequency: 200Hz Able to be programmed and defined to multiple function switching value input terminal
	X2-COM	Multiple-function input terminal 2		
	X3-COM	Multiple-function input terminal 3		
	X4-COM	Multiple-function input terminal 4		
	X5-COM	Multiple-function input terminal 5		
Power supply	+10V-GND	+10V power supply	Externally provide +10V power supply (Negative terminal: GND)	Max. output current: 10mA
	GND	+10V power supply Negative	Analog signal and +10V power supply reference ground	
Analog input	AI1-GND	Analog input 1	Accept analog voltage/current input, voltage and current are selected by jumper J1, factory default voltage. (Reference ground: GND)	Input voltage range: 0~10V (input impedance: 70kΩ); input current range: 4~20mA (input impedance: 250Ω) resolution: 1/1000
	AI2-GND	Analog input 2	Accept analog voltage/current input, voltage and current are selected by jumper J2, factory default voltage. (Reference ground: GND)	
Analog output	AO1-GND	Analog output 1	Provide analog voltage/current output, output voltage and current are selected by jumper J3, factory default voltage. (Reference ground: GND)	Voltage output range: 0~10V Current output range: 4~20mA

Multi-function output terminal	DO-COM	High-speed pulse or open circuit set Electrode output terminal	Able to be programmed and defined to multi-function switching value output terminal (male: COM)	Optical coupling isolation output Working voltage range: 15-30V Max. output current: 50mA
Communication serial port	485+	RS485 serial communication	485 differential signal positive end	Standard RS485 interface Please use the twisted pair or shielded wire, wire, J5 is for terminal resistance matching.
	485-		485 differential signal negative end	
Relay output	TA	Inverter fault output relay	Inverter is normal: TA-TB closed, TA-TC disconnected. Inverter is fault: TA-TB disconnected, TA-TC closed.	TA-TB: Normally closed, TA-TC: Normally open, contact capacity AC250V/2A (COS=1) AC250V/1A (COS=0.4) DC30V/1A
	TB			
	TC			
	PA	Inverter relay 2 output	PA-PC: Normally open	Optional
	PC			Optional

Chapter 4

Operation, Display and Application Examples

This chapter content

This chapter contains the following operations:
Buttons, indicator lights and the screen as well as the methods to inspect, modify and set function codes by keypad.

4.1 Introduction of the keypad

You can modify the parameters, monitor the working status and start or stop the FC110 by operating the operation panel, as shown in the following figure.

Fig 4-1 Keypad

(1)Description of Indicators

1.RUN: ON indicates that the AC drive is in the running state, and OFF indicates that the AC drive is in the stop state.

LOCAL/REMOT: It indicates whether the AC drive is operated by means of operation panel, terminals or communication.

L/R: OFF	Operation panel control
L/R: ON	Terminal control
L/R: Blinking	Communication control

FWD/REV: ON indicates reverse rotation, and OFF indicates forward rotation.
TUNE/TC: Tuning indicator, when on, it indicates tuning status.

(2)Unit Indicators

Hz: unit of frequency, A: unit of current, V: unit of voltage.
RPM (Hz+A): unit of rotational speed, % (A+V): percentage.

(3)Digital display area:

5-digit LED display, could display the set frequency, output frequency, various monitoring data and alarm code etc.

(4)Description of Keys on the Operation Panel

There're 9 keys and one keyboard analog potentiometer set on the operation keyboard of the inverter, and function of each key is defined in table 4-1.

Table 4-1 Description of keys on the operation panel

Key	Name	Function
PRG	Programming	Enter or exit menu.
▶	Shift/Monitor key	On stop interface and run interface, displayed parameters could be selected in a cyclic manner; during parameter modification, you could select modification bit of the parameter.
ENTER	Function/Data key	Enter menu screens level by level, to set parameters and confirm
MF.K	Multi-function selection key	See MF.K key function selection description for detailed operation
RUN	Forward RUN	Start the AC drive in the operation panel control mode.
STOP RESET	Stop/Reset	Under running status, press this key to stop running; under fault alarm status, it could be usedfor reset, and features of this key is restricted by function code F0.05 (STOP/RES key function).
▲	Increment	Increase data or function code.
▼	Decrement	Decrease data or function code.
QUICK	Menu mode selection key	Shift to different menu modes according to value in F0.01(parameter group display selection) (one menu mode is selected by default).

Chapter 5

Function Parameter Table

This chapter content

This chapter lists and describes the function parameter codes.

5.1 Function Parameter Table

If F0.02 is set to a non-zero number, parameter protection is enabled. You must enter the correct user password to enter the menu.

To cancel the password protection function, enter with password and set F0.02 to 0.

Group F and Group A are standard function parameters. Group L includes the monitoring function parameters.

The symbols in the function code table are described as follows:

"☆": The parameter can be modified when the AC drive is in either stop or running state.

"★": The parameter cannot be modified when the AC drive is in the running state.

"●": The parameter is the actually measured value and cannot be modified.

"*": The parameter is factory parameter and can be set only by the manufacturer.

5.2 Function Parameters

Function Code	Parameter Name	Setting Range	Default	Property
F0 system management parameter group				
F0.00	Function parameter group display option	Unit's digit: Group L display option 0: Do not display 1: Display Ten's digit: Group A display option 0: Do not display 1: Display	11	★

F0.01	Individual parameter group display option	Unit's digit: User customized parameter group display option 0: Do not display 1: Display Ten's digit: User changed parameter group display option 0: Do not display 1: Display	00	☆
F0.02	User password	0 ~ 65535	0	☆
F0.03	Parameter protection settings	0: All data is allowed to be rewritten. 1: Except this function code and F0.02, no rewrite is allowed.	0	☆
F0.04	MF.K key function option	0: MF.K invalid 1: Shift between operation panel command channel and remote command channel (terminal command channel or communication command channel) 2: Forward and reverse shift 3: Forward jog 4: Reverse jog	3	★
F0.05	STOP/RES key function	0: Stop function of STOP/RES key is valid only under keyboard operation mode. 1: In any operation mode, stop function of STOP/RES key is valid.	1	☆
F0.06	Parameter initialization	0: No operation 01: Restore factory parameters, not including motor parameters. 02: Clear record information 06: Back up current parameters of the user 888: Restore user backup parameters.	0	★
F0.07	Apply macro instructions	0 ~ 65535 2668: Carving machine application macro	0	★

Group F1: Standard Function Parameters				
F1.00	Motor 1 control mode	1:Reserved 2: Voltage/Frequency (V/F) control	2	★
F1.02	Command source selection	0: Operation panel control (LED off) 1: Terminal control (LED on) 2: Communication control (LED blinking)	0	☆
F1.03	Rotation direction	0: Same direction 1: Reverse direction	0	☆
F1.04	Reverse control	0: Enabled 1: Disabled	0	☆
F1.05	Main frequency source X selection	0: Digital setting (non-retentive at power failure) 1: Digital setting (retentive at power failure) 2: AI1 3: AI2 4: Keyboard analog potentiometer 5: Reserved 6: Multi-reference 7: Simple PLC 8: PID 9: Communication setting	0	★
F1.06	Auxiliary frequency source Y selection	The same as F1.05 (Main frequency source X selection)	0	★
F1.07	Range of auxiliary frequency Y for X and Y operation	0: Relative to maximum frequency 1: Relative to main frequency X	0	☆
F1.08	Range of auxiliary frequency Y for X and Y operation	0%–150%	100%	☆
F1.10	Frequency offset of auxiliary frequency source for X and Y operation	0.00 Hz to maximum frequency (F1.23)	0.00Hz	☆

F1.11	Frequency source selection	Unit's digit (Frequency source selection) 0: Main frequency source X 1: X and Y operation (operation relationship determined by ten's digit) 2: Switchover between X and Y 3: Switchover between X and "X and Y operation" 4: Switchover between Y and "X and Y operation" Ten's digit (X and Y operation relationship) 0: X+Y 1: X -Y 2: Maximum 3: Minimum	00	☆
F1.12	Preset frequency	0.00 to maximum frequency (valid when frequency source is digital setting)	50.00 Hz	☆
F1.13	Run time frequency instruction UP/DOWN reference	0: Running frequency 1: Set frequency	0	★
F1.14	Frequency reference resolution	1: 0.1 2: 0.01 Hz	2	★
F1.15	Retentive of digital setting frequency upon power failure	0: Not retentive 1: Retentive	0	★
F1.16	Acceleration time 1	0.00–6500.0s dependent	Model	☆
F1.17	Deceleration time 1	0.00–6500.0s dependent	Model	☆
F1.18	Acceleration/Deceleration time unit	0:1s 1: 0.1s 2: 0.01 s	1	★
F1.19	Acceleration/Deceleration time base frequency	0: Maximum frequency (F1.23) 1: Set frequency 2: 100 Hz	0	★
F1.20	Acceleration/Deceleration mode	0: Linear acceleration/ deceleration 1: S-curve acceleration/ deceleration A 2: S-curve acceleration/ deceleration B	0	★
F1.21	Time proportion of S curve start segment	0.0% to (100.0% –F1.22)	30.0%	★
F1.22	Time proportion of S curve	0.0% to (100.0% – F1.21)	30.0%	★

F1.23	Maximum frequency	50.00-320.00 Hz	50.00 Hz	★
F1.24	Source of frequency upper limit	0: Set by F1.25 1: AI1 2: AI2 3: Panel potentiometer 4: Reserved 5: Communication setting	0	★
F1.25	Frequency upper limit	Frequency lower limit (F1.27) to maximum frequency (F1.23)	50.00 Hz	☆
F1.26	Frequency upper limit offset	0.00 Hz to maximum frequency (F1.23)	0.00 Hz	☆
F1.27	Frequency lower limit	0.00 Hz to frequency upper limit (F1.25)	0.00 Hz	☆
F1.28	Running mode when set frequency lower than frequency lower limit	0: Run at frequency lower limit 1: Stop 2: Run at zero speed	0	☆
F1.29	Carrier frequency	0.5–16.0 kHz	Model dependent	☆
F1.30	Carrier frequency adjustment with temperature	0: No 1: Yes	1	☆
F1.32	Startup protection	0: No 1: Yes	0	
Group F2: Analog Input and Output				
F2.01	AI1 input signal option	0: Voltage signal (0~10V) 1: Current signal (4~20mA)	0	★
F2.02	AI2 input signal option	0: Voltage signal (0~10V) 1: Current signal (4~20mA)	0	★
F2.03	AI curve 1 minimum input	0.00 V to F2.05	0.00 V	☆
F2.04	Corresponding setting of AI curve 1 minimum input	-100.00%–100.0%	0.0%	☆
F2.05	AI curve 1 maximum input	F2.03 to 10.00 V	10.00 V	☆
F2.06	Corresponding setting of AI curve 1 maximum input	-100.00%–100.0%	100.0%	☆
F2.07	AI1 filter time	0.00–10.00s	0.10s	☆
F2.08	AI curve 2 minimum input	0.00 V to F2.10	0.00 V	☆
F2.09	Corresponding setting of AI curve 2 minimum input	-100.00%-100.0%	0.0%	☆

F2.10	AI curve 2 maximum input	F2.08 to 10.00 V	10.00 V	☆
F2.11	Corresponding setting of AI curve 2 maximum input	-100.00%~100.0%	100.0%	☆
F2.12	AI2 filter time	0.00–10.00s	0.10s	☆
F2.13	Panel potentiometer minimum input	0.00 V to F2.15	-9.50 V	☆
F2.14	Corresponding setting of panel potentiometer minimum input	-100.00% –100.0%	0.0%	☆
F2.15	Panel potentiometer maximum input	F2.13 to 10.00 V	10.00 V	☆
F2.16	Corresponding setting of panel potentiometer maximum input	-100.00%–100.0%	100.0%	☆
F2.17	AI3 or panel potentiometer filtering time	0.00 –10.00s	0.10s	☆
F2.47	Jump point of AI1 input corresponding setting	-100.0%–100.0%	0.0%	☆
F2.48	Jumpamplitude of AI1 input corresponding setting	0.0% –100.0%	0.5%	☆
F2.49	Jump point of AI2 input corresponding setting	-100.0%–100.0%	0.0%	☆
F2.50	Jump amplitude of AI2 input corresponding setting	0.0%–100.0%	0.5%	☆
F2.51	Jump point of panel potentiometer input corresponding setting	-100.0%–100.0%	0.0%	☆
F2.52	Jump amplitude of panel potentiometer input corresponding setting	0.0% –100.0%	0.5%	☆
F2.53	Setting for AI less than minimum input	Unit's digit (Setting for AI1 less than minimum input) 0: Minimumvalue 1: 0.0% Ten's digit (Setting for AI2 less than minimum input) 0, 1 (same as AI1) Hundred's digit (Setting for panel potentiometer less than minimum input) 0, 1 (same as AI1)	000	☆
F2. 54	DO terminal output mode option	0: Pulse output (DOP) 1: Switching value output (DOR)	1	☆

F2.55	DO-P function selection	0: Running frequency 1: Set f 2: Output current 3: Output torque (absolute value) 4: Output power 5: Output voltage 6: Reserved 7: AI1 8: AI2 9: Panel potentiometer 10: Length 11: Count value 12: Communication setting 13: Motor rotational speed 14: Output current 15: Output voltage 16: Reserved	0	☆
F2.56	AO1 function selection	Same as F2.55	0	☆
F2.58	Maximum DO-P output	0.01–100.00 kHz	50.00 kHz	☆
F2.59	AO1 output option	0: 0~10V voltage or 0~20mA 1: 4~20mA	0	☆
F2.60	AO1 offset coefficient	-100.0%-100.0%	0.0%	☆
F2.61	AO1 gain	-10.00-10.00	1.00	☆
Group F3: Motor Parameters				
F3.00	G/P type display	1: G type (constant torque load) 2: P type (variable torque load e.g. fan and pump)	1	★
F3.01	Motor type selection	0: Common asynchronous motor 1: Variable frequency asynchronous motor	1	★
F3.02	Rated motor power	0.1–1000.0 kW	Model dependent	★
F3.03	Rated motor voltage	1–2000 V	Model dependent	★
F3.04	Rated motor current	0.01–655.35 A (AC drive power ≤ 55 kW) 0.1–6553.5 A (AC drive power > 55 kW)	Model dependent	★
F3.05	Rated motor frequency	0.01 Hz to maximum frequency	Model dependent	★

F3.06	Rated motor rotational speed	1–65535 RPM	Model dependent	★
F3.07	Stator resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55 kW)	Tuning parameters	★
F3.08	Rotor resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55 kW)	Tuning parameters	★
F3.09	Leakage inductive reactance (asynchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55 kW)	Tuning parameters	★
F3.10	Mutual inductive reactance (asynchronous motor)	0.1–6553.5 mH (AC drive power ≤ 55 kW) 0.01–655.35 mH (AC drive power > 55 kW)	Tuning parameters	★
F3.11	No-load current (asynchronous motor)	0.01 to F3.04 (AC drive power ≤ 55 kW) 0.1 to F3.04 (AC drive power > 55 kW)	Tuning parameters	★
F3.38	Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor static auto-tuning 2: Asynchronous motor complete auto-tuning	0	★
Group F6: V/F Control Parameters				
F6.00	V/F curve setting	0: Linear V/F 1: Multi-point V/F 2: Square V/F 3: 1.2-power V/F 4: 1.4-power V/F 6: 1.6-power V/F 8: 1.8-power V/F 9: Reserved 10: V/F complete separation 11: V/F half separation	0	★

F6.01	Torque boost	0.0% (fixed torque boost) 0.1%-30.0%	Model dependent	☆
F6.02	Cut-off frequency of torque boost	0.00 Hz to maximum output frequency	50.00 Hz	★
F6.03	Multi-point V/F frequency 1	0.00Hz to F6.05	10.00 Hz	★
F6.04	Multi-point V/F voltage 1	0.0%-100.0%	20.0%	★
F6.05	Multi-point V/F frequency 2	F6.03 to F6.07	20.00 Hz	★
F6.06	Multi-point V/F voltage 2	0.0%-100.0%	40.0%	★
F6.07	Multi-point V/F frequency 3	F6.05 to rated motor frequency (F3.05)	40.00 Hz	★
F6.08	Multi-point V/F voltage 3	0.0%–100.0%	80.0%	★
F6.09	V/F slip compensation gain	0%–200.0%	0.0%	☆
F6.10	V/F over-excitation gain	0–200	64	☆
F6.11	V/F oscillation suppression gain	0–100	Model dependent	☆
F6.12	AVR function	0: Do not act 1: Keep acting 2: Do not act only during deceleration	1	★
F6.14	Voltage source for V/F separation	0: Digital setting (F6.15) 1: AI1 2: AI2 3: Panel potentiometer 4: Reserved 5: Multi-reference 6: Simple PLC 7: PID 8: Communication setting 100.0% corresponds to the rated motor voltage.	0	☆
F6.15	Voltage digital setting for V/F separation	0 V to rated motor voltage	0 V	☆
F6.16	Voltage rise time of V/F separation	0.0–1000.0s It indicates the time for the voltage rising from 0 V to rated motorvoltage.	0.0s	☆

Group F7: Start/Stop Control				
F7.00	Start mode	0: Direct start 1: Rotational speed tracking restart 2: Pre-excited start (asynchronous motor)	0	☆
F7.01	Startup frequency	0.00–10.00 Hz	0.00 Hz	☆
F7.02	Startup frequency holding time	0.0–100.0s	0.0s	★
F7.03	Startup DC braking current/Pre-excited current	0%–100%	0%	★
F7.04	Startup DC braking time/ Pre-excited time	0.0–100.0s	0.0s	★
F7.05	Stop mode	0: Decelerate to stop 1: Coast to stop	0	☆
F7.06	Initial frequency of stop DC braking	0.00 Hz to maximum frequency	0.00 Hz	☆
F7.07	Waiting time of stop DC braking	0.0–100.0s	0.0s	☆
F7.08	Stop DC braking current	0%–100%	0%	☆
F7.09	Stop DC braking time	0.0–100.0s	0.0s	☆
F7.10	Brake use ratio	0%–100%	100%	☆
Group F8: Control Optimization Parameters				
F8.12	DPWM switch over frequency upper limit	0.00–15.00 Hz	12.00Hz	☆
F8.13	PWM modulation mode	0: Asynchronous modulation 1: Synchronous modulation	0	☆
F8.15	Random PWM depth	0: Random PWM invalid 1–10 : PWM carrier frequency random depth	0	☆
F8.18	Under voltage threshold	75.0%~ 140.0%	100.0%	☆
F8.21	Over voltage point setting	200.0-2500.0V	Model dependent	★

Group F9: Digital Input、Output Terminals				
F9.00	X1 function selection	0: No function 1: Forward RUN (FWD) 2: Reverse RUN (REV) 3: Three-line control 4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Terminal UP 7: Terminal DOWN 8: Coast to stop 9: Fault reset (RESET) 10: RUN pause 11: Normally open (NO) input of external fault 12: Multireference terminal 1 13: Multireference terminal 2 14: Multireference terminal 3 15: Multireference terminal 4 16: Terminal 1 for acceleration/deceleration time selection 17: Terminal 2 for acceleration/deceleration time selection 18: Frequency source switchover 19: UP and DOWN setting clear (terminal&operation panel) 20: Command source switchover terminal 1 21: Acceleration/Deceleration prohibited 22: PID pause 23: PLC status reset 24: Swing pause 25: Counter input 26: Counter reset 27: Length count input 28: Length reset 29: Torque control prohibited 30: Reserved 31:Reserved 32: Immediate DC braking 33: Normally closed (NC) input of external fault 34: Frequency modification forbidden	1	★
F9.01	X2 function selection		4	★
F9.02	X3 function selection		9	★
F9.03	X4 function selection		12	★
F9.04	X5 function selection		13	★
F9.05	Reserved			
F9.06	Reserved			
F9.07	Reserved			
F9.08	Reserved			
F9.09	Reserved			

		35: Reverse PID action direction 36: External STOP terminal 1 37: Command source switchover terminal 2 38: PID integral pause 39: Switchover between main frequency source X and preset frequency 40: Switchover between auxiliary frequency source Y and preset frequency 43: PID parameter switchover 44: User-defined fault 1 45: User-defined fault 2 47: Emergency stop 48: External STOP terminal 2 49: Deceleration DC braking 50: Clear the current running time 51- 52: Reserved		
F9.10	Terminal command mode	0: Two-line mode 1 1: Two-line mode 2 2: Three-line mode 1 3: Three-line mode 2	0	★
F9.11	Terminal UP/DOWN rate	0.01–65.535 Hz/s	1.00 Hz/s	☆
F9.12	X terminal filter time	0.000–1.000s	0.010s	☆
F9.13	X1 delay time	0.0–3600.0s	0.0s	★
F9.14	X2 delay time	0.0–3600.0s	0.0s	★
F9.15	X3 delay time	0.0–3600.0s	0.0s	★
F9.16	X valid mode selection 1	Unit's digit (X1 valid mode) 0: High level valid 1: Low level valid Ten's digit (X2 valid mode) 0, 1 (same as X1) Hundred's digit (X3 valid mode) 0, 1 (same as X1) Thousand's digit (X4 valid mode) 0, 1 (same as X1) Ten thousand's digit (X5 valid mode) 0, 1 (same as X1)	00000	★

F9.17	X valid mode selection 2	Unit's digit (Reserved)	00000	★
		0: High level valid 1: Low level valid		
		Ten's digit (Reserved)		
		Hundred's digit (Reserved)		
		Thousand's digit (Reserved)		
		Ten thousand's digit (Reserved)		
F9.18	Function selection for AI1 used as X	0 ~ 59	0	★
F9.19	Function selection for AI2 used as X	0 ~ 59	0	★
F9.20	Function selection for panel potentiometer used as X	0 ~ 59	0	★
F9.21	Valid mode selection for AI used as X	Unit's digit (AI1 valid mode) 0: High level valid 1: Low level valid Ten's digit (AI2 valid mode) 0, 1 (same as AI1) Hundred's digit (panel potentiometer) 0, 1 (same as AI1)	000	★
Output Terminals				
F9.29	DO-R terminal output mode	0: No output 1: AC drive running 2: Fault output (stop) 3: Frequency-level detection FDT1 output 4: Frequency reached 5: Zero-speed running (no output at stop) 6: Motor overload pre-warning 7: AC drive overload pre-warning 8: Set count value reached 9: Designated count value reached 10: Length reached 11: PLC cycle complete 12: Accumulative running time	0	☆
F9.30	Relay function 1 (TA-TB-TC)		2	☆
F9.31	Relay function 2 (P/A-P/C)			

		13: Frequency limited 14: Torque limited 15: Ready for RUN 16: AI1 larger than AI2 17: Frequency upper limit reached 18: Frequency lower limit reached (no output at stop) 19: Under voltage state output 20: Communication setting 21: Reserved 22: Reserved 23: Zero-speed running 2 (having output at stop) 24: Accumulative power-on time reached 25: Frequency level detection FDT2 output 26: Frequency 1 reached 27: Frequency 2 reached 28: Current 1 reached 29: Current 2 reached 30: Timing reached 31: AI1 input limit exceeded 32: Load becoming 0 33: Reverse running 34: Zero current state 35: Module temperature reached 36: Software current limit exceeded 37: Frequency lower limit reached (having output at stop) 38: Alarm output 39: Motor overheat warning 40: Current running time reached 41: Fault output (There is no output if it is the coast to stop fault and under voltage occurs.)		
F9.35	DO-R output delay time	0.0–3600.0s	0.0s	☆
F9.36	Relay 1 output delay time	0.0–3600.0s	0.0s	☆
F9.37	Relay 2 output delay time	0.0–3600.0s	0.0s	☆

F9.41	DO valid mode selection	Unit's digit (DO-R valid mode) 0: Positive logic 1: Negative logic Ten's digit (Relay 1 valid mode) 0, 1 (same as DO-R) Hundred's digit (Relay 2 valid mode) 0, 1 (same as DO-R) Thousand's digit Reserved Ten thousand's digit Reserved	00000	☆
F9.53	Frequency detection value (FDT1)	0.00 Hz to maximum frequency	50.00 Hz	☆
F9.54	Frequency detection hysteresis (FDT hysteresis 1)	0.0%–100.0% (FDT1 level)	5.0%	☆
F9.55	Detection range of frequency reached	0.00–100% (maximum frequency)	0.0%	☆
F9.56	Frequency detection value (FDT2)	0.00 to maximum frequency	50.00 Hz	☆
F9.57	Frequency detection hysteresis (FDT hysteresis 2)	0.0%–100.0% (FDT2 level)	5.0%	☆
F9.58	Any frequency reaching detection value 1	0.00 Hz to maximum frequency	50.00 Hz	☆
F9.59	Any frequency reaching detection amplitude 1	0.0%–100.0% (maximum frequency)	0.0%	☆
F9.60	Any frequency reaching detection value 2	0.00 Hz to maximum frequency	50.00 Hz	☆
F9.61	Any frequency reaching detection amplitude 2	0.0%–100.0% (maximum frequency)	0.0%	☆
F9.62	Zero current detection level	0.0%–300.0% (rated motor current)	5.0%	☆
F9.63	Zero current detection delay time	0.00–600.00s	0.10s	☆
F9.64	Any current reaching 1	0.0%–300.0% (rated motor current)	100.0%	☆
F9.65	Any current reaching 1 amplitude	0.0%–300.0% (rated motor current)	0.0%	☆
F9.66	Any current reaching 2	0.0%–300.0% (rated motor current)	100.0%	☆
F9.67	Any current reaching 2 amplitude	0.0%–300.0% (rated motor current)	0.0%	☆
F9.68	AI1 input voltage lower limit	0.00 V to F9.69	3.10 V	☆

F9.69	AI1 input voltage upper limit	F9.68 to 10.00 V	6.80 V	☆
F9.70	Module temperature threshold	0–100°C	75°C	☆
Group FA: Auxiliary Functions, Monitoring function Parameters				
FA.00	Forward/Reverse rotation dead-zone time	0.0–3000.0s	0.0s	☆
FA.01	Droop control	0.00–10.00 Hz	0.00 Hz	☆
FA.02	Terminal JOG preferred	0: Disabled1: Enabled	0	☆
FA.03	JOG running frequency	0.00 Hz to maximum frequency	6.00 Hz	☆
FA.04	JOG acceleration time	0.0–6500.0s	20.0s	☆
FA.05	JOG deceleration time	0.0–6500.0s	20.0s	☆
FA.06	Acceleration time 2	0.0–6500.0s	Model dependent	☆
FA.07	Deceleration time 2	0.0–6500.0s	Model dependent	☆
FA.08	Acceleration time 3	0.0–6500.0s	Model dependent	☆
FA.09	Deceleration time 3	0.0–6500.0s	Model dependent	☆
FA.10	Acceleration time 4	0.0–500.0s	Model dependent	☆
FA.11	Deceleration time 4	0.0–6500.0s	Model dependent	☆
FA.12	Frequency switchover point between acceleration time 1 and acceleration time 2	0.00 Hz to maximum frequency	0.00 Hz	☆
FA.13	Frequency switchover point between deceleration time 1 and deceleration time 2	0.00 to maximum frequency	0.00 Hz	☆
FA.14	Jump frequency 1	0.00 Hz to maximum frequency	0.00 Hz	☆
FA.15	Jump frequency 2	0.00 Hz to maximum frequency	0.00 Hz	☆
FA.16	Frequency jump amplitude	0.00 Hz to maximum frequency	0.00 Hz	☆
FA.17	Jump frequency during acceleration/deceleration	0: Disabled1: Enabled	0	☆
FA.18	Cooling fan control	0: Fan working during running 1: Fan working continuously	0	☆
FA.19	Timing function	0: Disabled 1: Enabled	0	☆

FA.20	Timing duration source	0: FA-21 1: AI1 2: AI2 3: panel potentiometer (100% ofanalog input corresponds to the value of FA-21)	0	☆
FA.21	Timing duration	0.0–6500.0 min	0.0 min	☆
FA. 22	This run arrival time setting	0.0Min~ 6500.0Min	0.0Min	☆
FA.30	Set accumulative power-on time threshold	0–65000 h	0 h	☆
FA.31	Set accumulative run arrival time	0h ~ 65000h	0h	☆
FA.32	Accumulative power-on time	0–65535 h	0 h	●
FA.33	Accumulative power consumption	0–65535 kWh	/	☆
FA.34	Heat sink temperature of inverter module	0.0–100.0°C	-	●
FA.35	Rectifier bridge radiator temperature	0℃ ~ 100℃	-	●
FA.36	Accumulative running time	0–65535 h	-	●
FA.37	Product number	-	-	●
FA.38	Software version	-	-	●
FA.39	Load speed display coefficient	0.0001-6.5000	0.3000	☆
FA.40	Number of decimal places for load speed display	0: 0 decimal place 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1	☆
FA.44	LED run monitoring parameter display option 1	0000~ 1111 Unit's digit: L0.00 - running frequency 1 (Hz) Ten's digit: L0.01-set frequency (Hz) Hundred's digit: L0.02- bus voltage Thousand's digit: L0.03- output voltage 0: Do not display 1: Display	1111	☆

FA.45	LED run monitoring parameter display option 2	0000~ 1111 Unit's digit: L0.04 output current (A) Ten's digit: L0.05 output power (kW) Hundred's digit: L0.06 - output torque (%) Thousand's digit: L0.07- X input status 0: Do not display 1: Display	0001	☆
FA.46	LED run monitoring parameter display option 3	0000~ 1111 Unit's digit: L0.08-output status Ten's digit: L0.09-AI1 voltage (V) Hundred's digit: L0.10-AI2 voltage (V) Thousand's digit: L0.11- panel potentiometer voltage (V) 0: Do not display 1: Display	0000	☆
FA.47	LED run monitoring parameter display option 4	0000~ 1111 Unit's digit: L0.12-count value Ten's digit: L0.13-length value Hundred's digit: L0.14- load speed display Thousand's digit: L0.15- PID setting 0: Do not display 1: Display	0000	☆
FA.48	LED run monitoring parameter display option 5	0000~ 1111 Unit's digit: L0.16 -PID feedback Ten's digit: L0.17-PLC stage Hundred's digit: L0.18-PULSE input pulse Frequency (kHz) Thousand's digit: L0.19-running frequency (Hz) 0: Do not display 1: Display	0000	☆

FA.49	LED run monitoring parameter display option 6	0000~ 1111 Unit's digit: L0.20-remained running time Ten's digit: L0.21-AI1 voltage before calibration (V) Hundred's digit: L0.22-AI2 voltage before calibration (V) Thousand's digit: L0.23-voltage before calibration of panel potentiometer (V) 0: Do not display 1: Display	0000	☆
FA.50	LED run monitoring parameter display option 7	0000~ 1111 Unit's digit: L0.24-linear speed Ten's digit: L0.25-current power on Time (Hour) Hundred's digit: L0.26-current running time (Min) Thousand's digit: L0.27-PULSE input Pulse frequency (Hz) 0: Do not display 1: Display	0000	☆
FA.51	LED run monitoring parameter display option 8	0000~ 1111 Unit's digit: L0.28-communication set value Ten's digit: L0.29-encoder Feedback speed (Hz) Hundred's digit: L0.30-main frequency X display (Hz) Thousand's digit: L0.31-auxiliary frequency Y display (Hz) 0: Do not display 1: Display	0000	☆
FA.52	Reserved			
FA.53	Reserved			
FA.54	LED stop parameter display option 1	0000~ 1111 Unit's digit: L0.01 - set frequency (Hz) Ten's digit: L0.02-bus voltage (V) Hundred's digit: L0.07- X input status Thousand's digit: L0.08- output status 0: Do not display 1: Display	0011	☆

FA.55	LED stop parameter display option 2	0000~ 1111 Digit's digit: L0.09 - AI1 voltage (V) Ten's digit: L0.10 - AI2 voltage(V) Hundred's digit: L0.11 - panel potentiometer voltage (V) Thousand's digit: L0.12- count value 0: Do not display 1: Display	0011	☆
FA.56	LED stop parameter display option 3	0000~ 1111 Unit's digit: L0.13-length value Ten's digit: L0.17- PLC stage Hundred's digit: L0.14- load speed Thousand's digit: L0.15 - PID setting 0: Do not display 1: Display	0000	☆
FA.57	LED stop parameter display option 4	0000~ 1111 Digit's digit: L0.18 - PULSE input pulse Frequency (kHz) Ten's digit: L0.16 - PID feedback Hundred's digit: Reserved Thousand's digit: Reserved 0: Do not display 1: Display	0000	☆
FA.58	Reserved			
FA.59	The second digital tube running displays initial monitoring parameters.	0~65, among which 0 corresponds to L0.00, 65 corresponds to L0.65, and so on.	4	☆
FA.60	The second digital tube stop displays initial monitoring parameters.	0~65, among which 0 corresponds to L0.00, 65 corresponds to L0.65, and so on.	2	☆

Group Fb: Fault and Protection		
Fb.08	Overvoltage stall gain	0 (no stall overvoltage) – 100
Fb.09	Overvoltage stall protective voltage	120% – 150%
Fb.13	Action selection at in stantaneous power failure	0: Invalid 1: Decelerate 2: Decelerate to stop
Fb.14	Action pause judging voltage at instantaneous power failure	80.0% – 100.0%
Fb.15	Voltage rally judging time at instantaneous power failure	0.00 – 100.00s
Fb. 16	Action judging voltage at instantaneous power failure	60.0% – 100.0% (standard bus voltage)
Fb.17	Fault auto reset times	0 – 20
Fb.18	Y action during fault auto reset	0: Not act 1: Act
Fb.19	Time interval of fault auto reset	0.1s –100.0s
Fb.20	Reserved	
Fb.21	Reserved	
Fb.22	Fault protection action selection 1	Unit's digit (Motor overload, 11) 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Ten's digit (Reserved) Hundred's digit (Power output phase loss , 13)

		Same as unit's digit Thousand's digit (External equipment fault, 15) Same as unit's digit Ten thousand's digit (Communication fault, 16) Same as unit's digit		
Fb.23	Fault protection action selection 2	Unit's digit (Reserved) Ten's digit (EEPROM read-write fault, 21) 0: Coast to stop 1: Stop according to the stop mode Hundred's digit: reserved Thousand's digit (reserved) Ten thousand's digit (Accumulative running time reached, 26) Same as unit's digit in Fb-22	00000	☆
F9.24	Fault protection action selection 3	Unit's digit (User-defined fault1, 27) Same as unit's digit in Fb-22 Ten's digit (User-defined fault 2, 28) Same as unit's digit in Fb-22 Hundred's digit (Accumulative power-on time reached, 29) Same as unit's digit in Fb-22 Thousand's digit (Load becoming 0, 30) 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run at 7% of rated motor frequency and resume to the set frequency if the load recovers Ten thousand's digit (PID feedback lost during running, 31) Same as unit's digit in Fb-22	00000	☆
Fb.25~ Fb.28	Reserved			

Fb.29	Frequency selection for continuing to run upon fault	0: Current running frequency 1: Set frequency 2: Frequency upper limit 3: Frequency lower limit 4: Backup frequency upon abnormality	0	☆
Fb.30	Backup frequency upon abnormality	0.0%–100.0% (maximum frequency)	100.0%	☆
Fb.31 Fb.38	Reserved			
Fb.39	1st fault type	0: No fault 1: Reserved 2: Overcurrent during acceleration 3: Overcurrent during deceleration 4: Overcurrent at constant speed 5: Overvoltage during acceleration 6: Overvoltage during deceleration 7: Overvoltage at constant speed 8: Buffer resistance overload 9: Undervoltage 10: AC drive overload 11: Motor overload 12:Power input phase loss 13: Power output phase loss 14: Module overheat 15: External equipment fault 16: Communication fault 17: Contactor fault 18: Current detection fault 19: Motor auto-tuning fault 20: Encoder/PG card fault 21: EEPROM read-write fault 22: AC drive hardware fault 23: Short circuit to ground 24: Reserved 25: Reserved 26: running time reached 27: User-defined fault 1 28: User-defined fault 2 29: Accumulative power-on time reached	-	•

		30: Load becoming 0 31: PID feedback lost during running	-	●
Fb.40	2nd fault type	40: Wave current limit fault	-	●
Fb.41	3rd (latest) fault type	41: Motor switchover fault during running 42: Too large speed deviation 43: Motor overspeed 45: Motor overheat	-	●
Fb.42	Frequency upon 3rd fault	-	-	●
Fb.43	Current upon 3rd fault	-	-	●
Fb.44	Bus voltage upon 3rd fault	-	-	●
Fb.45	Input terminal status upon 3rd fault	-	-	●
Fb.46	Output terminal status upon 3rd fault	-	-	●
Fb.47	AC drive status upon 3rd fault	-	-	●
Fb.48	Power-on time upon 3rd fault	-	-	●
Fb.49	Running time upon 3rd fault	-	-	●
Fb.52	Frequency upon 2nd fault	-	-	●
Fb.53	Current upon 2nd fault	-	-	●
Fb.54	Bus voltage upon 2nd fault	-	-	●
Fb.55	Input Terminal status upon 2nd fault	-	-	●
Fb.56	Output terminal status upon 2nd fault	-	-	●
Fb.57	AC drive status upon 2nd fault	-	-	●
Fb.58	Power-on time upon 2nd fault	-	-	●
Fb.59	Running time upon 2nd fault	-	-	●
Fb.62	Frequency upon 1st fault	-	-	●
Fb.63	Current upon 1st fault	-	-	●
Fb.64	Bus voltage upon 3rd fault	-	-	●
Fb.65	Input terminal status upon 1st fault	-	-	●

Fb.66	Output terminal status upon 1st fault	-	-	●
Fb.67	AC drive status upon 1st fault	-	-	●
Fb.68	Power-on time upon 1st fault	-	-	●
Fb.69	Running time upon 1st fault	-	-	●
Group FC: Multi - Reference and Simple PLC Function and Swing Parameter				
FC.00	Simple PLC running mode	0: Stop after the AC drive runs one cycle 1: Keep final values after the AC drive runs one cycle 2: Repeat after the AC drive runs one cycle	0	☆
FC.01	Simple PLC retentive selection	Unit's digit (Retentive upon power failure) 0: No 1: Yes Ten's digit (Retentive upon stop) 0: No 1: Yes	00	☆
FC.02	Running time of simple PLC reference 0	0.0–6553.5s (h)	0.0s (h)	☆
FC.03	Acceleration/deceleration time of simple PLC reference 0	0–3	0	☆
FC.04	Running time of simple PLC reference 1	0.0–6553.5s (h)	0.0s (h)	☆
FC.05	Acceleration/deceleration time of simple PLC reference 1	0–3	0	☆
FC.06	Running time of simple PLC reference 2	0.0–6553.5s (h)	0.0s (h)	☆
FC.07	Acceleration/deceleration time of simple PLC reference 2	0–3	0	☆
FC.08	Running time of simple PLC reference 3	0.0–6553.5s (h)	0.0s (h)	☆
FC.09	Acceleration/deceleration time of simple PLC reference 3	0–3	0	☆
FC.10	Running time of simple PLC reference 4	0.0–6553.5s (h)	0.0s (h)	☆
FC.11	Acceleration/deceleration time of simple PLC reference 4	0–3	0	☆

FC.12	Running time of simple PLC reference 5	0.0–6553.5s (h)	0.0s (h)	☆
FC.13	Acceleration/deceleration time of simple PLC reference 5	0–3	0	☆
FC.14	Running time of simple PLC reference 6	0.0–6553.5s(h)	0.0s (h)	☆
FC.15	Acceleration/deceleration time of simple PLC reference 6	0–3	0	☆
FC.16	Running time of simple PLC reference 7	0.0–6553.5s (h)	0.0s (h)	☆
FC.17	Acceleration/deceleration time of simple PLC reference 7	0–3	0	☆
FC.18	Running time of simple PLC reference 8	0.0–6553.5s (h)	0.0s (h)	☆
FC.19	Acceleration/deceleration time of simple PLC reference 8	0–3	0	☆
FC.20	Running time of simple PLC reference 9	0.0–6553.5s (h)	0.0s (h)	☆
FC.21	Acceleration/deceleration time of simple PLC reference 9	0–3	0	☆
FC.22	Running time of simple PLC reference 10	0.0–6553.5s (h)	0.0s (h)	☆
FC.23	Acceleration/deceleration time of simple PLC reference 10	0–3	0	☆
FC.24	Running time of simple PLC reference 11	0.0–6553.5s (h)	0.0s (h)	☆
FC.25	Acceleration/deceleration time of simple PLC reference 11	0–3	0	☆
FC.26	Running time of simple PLC reference 12	0.0–6553.5s (h)	0.0s (h)	☆
FC.27	Acceleration/deceleration time of simple PLC reference 12	0–3	0	☆
FC.28	Running time of simple PLC reference 13	0.0–6553.5s (h)	0.0s (h)	☆
FC.29	Acceleration/deceleration time of simple PLC reference 13	0–3	0	☆
FC.30	Running time of simple PLC reference 14	0.0–6553.5s (h)	0.0s (h)	☆

FC.31	Acceleration/deceleration time of simple PLC reference 14	0–3	0	☆
FC.32	Running time of simple PLC reference 15	0.0-6553.5s (h)	0.0s (h)	☆
FC.33	Acceleration/deceleration time of simple PLC reference 15	0–3	0	☆
FC.34	Time unit of simple PLC running	0: s (second)1:h (hour)	0	☆
FC.35	Reference 0 source	0: Set by FG36 1: AI1 2:AI2 3: Panelpotentiometer 4: Reserved 5: PID 6: Set by preset frequency (F1.12), modified via terminal UP/ DOWN	0	☆
FC.36	Reference 0	-100.0%–100.0%	0.0%	☆
FC.37	Reference 1	-100.0%–100.0%	0.0%	☆
FC.38	Reference 2	-100.0%–100.0%	0.0%	☆
FC.39	Reference 3	-100.0%–100.0%	0.0%	☆
FC.40	Reference 4	-100.0%–100.0%	0.0%	☆
FC.41	Reference 5	-100.0%–100.0%	0.0%	☆
FC.42	Reference 6	-100.0%–100.0%	0.0%	☆
FC.43	Reference 7	-100.0%–100.0%	0.0%	☆
FC.44	Reference 8	-100.0%–100.0%	0.0%	☆
FC.45	Reference 9	-100.0%–100.0%	0.0%	☆
FC.46	Reference 10	-100.0%–100.0%	0.0%	☆
FC.47	Reference 11	-100.0%–100.0%	0.0%	☆
FC.48	Reference 12	-100.0%–100.0%	0.0%	☆
FC.49	Reference 13	-100.0%–100.0%	0.0%	☆
FC.50	Reference 14	-100.0%–100.0%	0.0%	☆

FC.51	Reference 15	-100.0%–100.0%	0.0%	☆
FC.52	Swing frequency setting mode	0: Relative to the central frequency 1: Relative to the maximum frequency	0	☆
FC.53	Swing frequency amplitude	0.0%–100.0%	0.0%	☆
FC.54	Jump frequency amplitude	0.0% –50.0%	0.0%	☆
FC.55	Swing frequency cycle	0.0–3000.0s	10.0s	☆
FC.56	Triangular wave rising time coefficient	0.0%–100.0%	50.0%	☆
FC.57	Set length	0–65535 m	1000 m	☆
FC.58	Actual length	0–65535 m	0 m	☆
FC.59	Number of pulses per meter	0.1–6553.5	100.0	☆
FC.60	Set count value	1–65535	1000	☆
FC.61	Designated count value	1–65535	1000	☆
Group FD: Communication Parameters				
FD.00	Baud rate	Unit's digit (Modbus baud rate) 0: 300 BPs 1: 600 BPs 2: 1200 BPs 3: 2400 BPs 4: 4800 BPs 5: 9600 BPs 6: 19200 BPs 7: 38400 BPs 8: 57600 BPs 9: 115200 BPs	6005	☆
FD.01	Data format	0: No check, data format <8,N,2> 1: Even parity check, data format <8,E,1> 2: Odd Parity check, data format <8,O,1> 3: No check, data format <8,N,1> Valid for Modbus	0	☆
FD.02	Local address	1–247	1	☆
FD.03	Response delay	0–20 ms Valid forModbus	2 ms	☆

Group FE: User-defined Parameters				
FE.00	User-defined function code 0	F0.00 to FP-xx A0.00 to Ax.xx U0.xx to U0.xx	F1.00	☆
FE.01	User-defined function code 1		F1.02	☆
FE.02	User-defined function code 2		F1.05	☆
FE.03	User-defined function code 3		F1.16	☆
FE.04	User-defined function code 4		F1.17	☆
FE.05	User-defined function code 5		F1.23	☆
FE.06	User-defined function code 6		F1.25	☆
FE.07	User-defined function code 7		F2.56	☆
FE.08	User-defined function code 8		F2.57	☆
FE.09	User-defined function code 9		F6.00	☆
FE.10	User-defined function code 10		F6.01	☆
FE.11	User-defined function code 11		F6.11	☆
FE.12	User-defined function code 12		F7.00	☆
FE.13	User-defined function code 13		F7.05	☆
FE.14	User-defined function code 14		F9.00	☆
FE.15	User-defined function code 15		F9.01	☆
FE.16	User-defined function code 16		F9.02	☆
FE.17	User-defined function code 17		F9.03	☆
FE.18	User-defined function code 18		F9.04	☆
FE.19	User-defined function code 19		F9.05	☆
FE.20	User-defined function code 20		F9.29	☆
FE.21	User-defined function code 21		F9.30	☆
FE.22	User-defined function code 22		F9.31	☆
FE.23	User-defined function code 23		FA.38	☆
FE.24	User-defined function code 24		A3.04	☆
FE.25	User-defined function code 25		A3.21	☆
FE26	User-defined function code 26		A3.36	☆
FE.27	User-defined function code 27		A3.37	☆
FE.28	User-defined function code 28		A3.38	☆
FE.29	User-defined function code 29		A3.39	☆
FE.30	User-defined function code 30		F0.06	☆

Group A3: Special parameter group for close loop PID, and constant pressure water supply				
A3.00	PID setting source	0: A3b-01 1: AI1 2: AI2 3 :Panel potentiometer 4: Reserved 5: Communication setting 6: Multi-reference	0	☆
A3.01	PID digital setting	0.0%–100.0%	50.0%	☆
A3.02	PID feedback source	0:AI1 1: AI2 2: Panel potentiometer 3: AI1-AI2 4: Eeserved 5: Communication setting 6: AI1+AI2 7: MAX (|AI1|, |AI2|) 8: MIN(|AI1|, |AI2|)	0	☆
A3.03	PID action direction	0: Forward action 1: Reverse action	0	☆
A3.04	PID setting feedback range	0–65535	1000	☆
A3.05	Proportional gain Kp1	0.0–100.0	35.0	☆
A3.06	Integral time Ti1	0.01–10.00s	2.00s	☆
A3.07	Differential time Td1	0.00–10.000	0.000s	☆
A3.08	Cut-off frequency of PID reverse rotation	0.00 to maximum frequency	2.00 Hz	☆
A3.09	PID deviation limit	0.0%-100.0%	0.0%	☆
A3.10	PID differential limit	0.00%-100.00%	0.10%	☆
A3.11	PID setting change time	0.00-650.00s	0.00s	☆
A3.12	PID feedback filter time	0.00-60.00s	0.00s	☆
A3.13	PID output filtertime	0.00-60.00s	0.00s	☆
A3.15	Proportional gain Kp2	0.0–100.0	20.0	☆
A3.16	Integral time Ti2	0.01–10.00s	2.00s	☆
A3.17	Differential time Td2	0.000-10.000s	0.000s	☆
A3.18	PID parameter switchover condition	0: No switchover 1: Switchover via X 2: Automatic switchover based on deviation	0	☆

A3.19	PID parameter switchover deviation 1	0.0% to A3.20	20.0%	☆
A3.20	PID parameter switchover deviation 2	A3.19to 100.0%	80.0%	☆
A3.21	PID initial value	0.0%-100.0%	0.0%	☆
A3.22	PID initial value holding time	0.00-650.00s	0.00s	☆
A3.23	Maximum deviation between two PID outputs in forward direction	0.00%-100.00%	1.00%	☆
A3.24	Maximum deviation between two PID outputs in reverse direction	0.00%-100.00%	1.00%	☆
A3.25	PID integral property	Unit's digit (Integral separated) 0: Invalid 1: Valid Ten's digit (Whether to stop integral operation when the output reaches the limit) 0: Continue integral operation 1: Stop integral operation	00	☆
A3.26	Detection value of PID feedback loss	0.0%: Not judging feedback loss 0.1%-100.0%	0.0%	☆
A3.27	Detection time of PID feedback loss	0.0-20.0s	0.0s	☆
A3.28	PID operation at stop	0: No PID operation at stop 1: PID operation at stop	0	☆
A3.29	Multiple closed- loop given 1	0.0%~ 100.0%	0.0%	☆
A3.30	Multiple closed- loop given 2	0.0%~ 100.0%	0.0%	☆
A3.31	Multiple closed-loop given 3	0.0%~ 100.0%	0.0%	☆
A3.32	Multiple closed-loop given 4	0.0%~ 100.0%	0.0%	☆
A3.33	Multiple closed-loop given 5	0.0%~ 100.0%	0.0%	☆
A3.34	Multiple closed-loop given 6	0.0%~ 100.0%	0.0%	☆
A3.35	Multiple closed -loop given 7	0.0%~ 100.0%	0.0%	☆
A3.36	Coefficient of awakening	0.0%~ 100.0% (percentage relative to the target given pressure) according to pressure awakening calculated by multiplying A3.36 with A3.01.	75.0%	☆
A3.37	Awakening delay time	0.0s~ 6500.0s	0.0s	☆
A3.38	Sleep frequency	0.00Hz~ Max. frequency	30.00Hz	☆
A3.39	Sleep delay time	0.0s~ 6500.0s	0.0s	☆

A3.40	Keyboard UP/DOWN function option in monitoring mode of closed-loop PID.	In closed-loop PID mode, this function is valid, in non-closed-loop PID mode, this function code is invalid. 0: Adjust via keyboard frequency given 1: Adjust via PID digital given	1	☆

5.3 Monitoring Parameters

Function Code	Parameter Name	Min. Unit	Communication Address
Group L0: Standard Monitoring Parameters			
L0.00	Running frequency (Hz)	0.01Hz	7000H
L0.01	Set frequency (Hz)	0.01Hz	7001H
L0.02	Bus voltage	0.1V	7002H
L0.03	Output voltage	1V	7003H
L0.04	Output current	0.01A	7004H
L0.05	Output power	0.1kW	7005H
L0.06	Output torque	0.1%	7006H
L0.07	X input state	1	7007H
L0.08	Y output state	1	7008H
L0.09	AI1 voltage (V)	0.01V	7009H
L0.10	AI2 voltage (V)	0.01V	700AH
L0.11	Panel potentiometer voltage (V)	0.01V	700BH
L0.12	Count value	1	700CH
L0.13	Length value	1	700DH
L0.14	Load speed	1	700EH
L0.15	PID setting	0.01Mpa	700FH
L0.16	PID feedback	0.01Mpa	7010H
L0.17	PLC stage	1	7011H
L0.18	Reserved		
L0.19	Feedback speed	0.1Hz	7013H

L0.20	Remaining running time	0.1Min	7014H
L0.21	AI1 voltage before correction	0.001V	7015H
L0.22	AI2 voltage (V) before correction	0.01V	7016H
L0.23	Panel potentiometer voltage before correction	0.001V	7017H
L0.24	Linear speed	1m/Min	7018H
L0.25	Accumulative power -on time	1Min	7019H
L0.26	Accumulative running time	0.1Min	701AH
L0.27	Reserved		
L0.28	Communication setting value	0.01%	701CH
L0.30	Main frequency X	0.01Hz	701EH
L0.31	Auxiliary frequency Y	0.01Hz	701FH
L0.32	Viewing any register address value	1	7020H
L0.35	Reserved		
L0.37	Power factor angle	0.1°	7025H
L0.39	Target voltage upon V/F separation	1V	7027H
L0.40	Output voltage upon V/F separation	1V	7028H
L0.41	X state visual display	1	7029H
L0.42	Y state visual display	1	702AH
L0.43	X function state visual display 1	1	702BH
L0.44	X function state visual display 2	1	702CH
L0.45	Fault information	1	702DH
L0.59	Current set frequency	0.01%	703BH
L0.60	Current running frequency	0.01%	703CH
L0.61	AC drive running state	1	703DH
L0.65	Torque upper limit	0.1%	7041H

Chapter 6

Maintenance and Troubleshooting

6.1 Routine Repair and Maintenance of the FC110

6.1.1 Routine Maintenance

The influence of the ambient temperature, humidity, dust and vibration will cause the aging of the devices in the AC drive, which may cause potential faults or reduce the service life of the AC drive. Therefore, it is necessary to carry out routine and periodic maintenance.

Routine maintenance involves checking:

1) Whether the motor sounds abnormally during running;
2) Whether the motor vibrates excessively during running;
3) Whether the installation environment of the AC drive changes ;
4) Whether the AC drive's cooling fan works normally;
5) Whether the AC drive overheats.

Routine cleaning involves:

1) Keep the AC drive clean all the time;

2) Remove the dust, especially mental powder on the surface of the AC drive, to prevent the dust from entering the AC drive;

3) Clear the oil stain on the cooling fan of the AC drive.

6.1.2 Periodic Inspection

Perform periodic inspection in places where inspection is difficult.

Periodic inspection involves:

1) Check and clean the air duct periodically;

2) Check whether the screws become loose;

3) Check whether the AC drive is corroded;

4) Check whether the wiring terminals show signs of arcing;

5) Main circuit insulation test.

Note:

Before measuring the insulating resistance with megameter 500VDC megameter recommended), disconnect the main circuit from the AC drive. Do not use the insulating resistance meter to test the insulation of the control circuit. The high voltage test is unnecessary to perform again because it has been completed before delivery.

6.1.3 Replacement of Vulnerable Components

The vulnerable components of the AC drive are cooling fan and filter electrolytic capacitor. Their service life is related to the operating environment and maintenance status. Generally, the service life is shown as follows:

Component	Service life
Cooling fan	2 to 3 years
Electrolytic capacitor	4 to 5 years

7

Note:

Standard replacement time is the time under the following conditions, the user can determines the replacement life according to the running time.

- Ambient temperature: the annual average temperature is about 30 ℃.
- Load rate: under 80%.
- Running rate: under 20 hours per day.

1) Cooling fan

- Possible damage reason: Bearing worn and blade aging;

• Judging criteria: whether there is crack on the blade; Whether there is abnormal vibration noise upon startup.

2) Filter electrolytic capacitor

• Possible damage reason: Input power supply in poor quality; High ambient temperature; Frequent load jumping; and electrolyte aging.

• Judging criteria: Whether there is liquid leakage; Whether the safe value has projected; Measure the static capacitance; Measure the insulating resistance.

6.1.4 Storage of the AC drive

For storage of the AC drive, pay attention to the following two aspects:

1) Pack the AC drive with the original packing box provided by company

2) Long-term storage degrades the electrolytic capacitor. Thus, the AC drive must be energized once every two years, each time lasting at least 5 hours. The input voltage must be increased slowly to the rated value with the regulator.

6.2 Warranty Agreement

1) Free warranty only applies to the AC drive itself.

2) The company will provide 18-month warranty (Starting from the leave-factory date as indicated on the barcode) for the failure or damage under normal use conditions. If the equipment has been used for over 18 months, reasonable repair expenses will be charged.

3) Reasonable repair expenses will be charged for the damages due to the following causes:

a) Improper operation without following the instructions;

b) Cause damage by fire, flood or abnormal voltage, etc.

4) Using the AC drive for non-recommended function.

5) The maintenance fee is charged according to the manufacturer's uniform standard. If there is an agreement, the agreement prevails.

6.3 This chapter Content

This chapter describes how to reset faults and view fault history. It also lists all alarm and fault messages including the possible cause and corrective actions.

Danger

✦ Only qualified professionals are allowed to maintain the AC drive. Read the safety instructions in chapter Safety precautions before working on the drive.

6.4 Alarm and Fault Indications

The fault code displays on the keypad indicates AC drive in a abnormal status. Using the information given in this chapter, most alarm and fault causes can be identified and corrected. If not, please contact the manufacturer.

6.5 Fault Reset

The AC drive can be reset By pressing the key STOP / RESET on the keypad, through digital input, or by switching the power supply, etc. When the fault has been removed, the motor can be restarted.

6.6 Fault History

Function codes F06.18 ~ F06.20 record three recent faults. Function codes F06.21 ~ F06.36 show drive operation data at the time the latest two faults occurred.

6.7 AC Drive Fault Instructions and Solutions

Do as the following after the AC drive fault:

1: Ensure there is nothing wrong with keypad. If not, please contact with the company and local offices.

2: If there is nothing wrong, please check F06 and ensure the corresponding recorded fault parameters to confirm the real state when the current fault occurs by all parameters.

3: See the following table for detailed solution and check the corresponding abnormal state.

4: Eliminate the fault or ask for relative help.

5: Check to eliminate the fault and carry out fault reset to run the AC drive.

Fault Name	Display	Possible Causes	Solutions
Inverter unit protection	E001	1: The output circuit is grounded or short circuited. 2: The connecting cable of the motor is too long. 3: The module overheats. 4: The internal connections become loose. 5: The main control board is faulty. 6: The drive board is faulty. 7: The inverter module is faulty.	1: Eliminate external faults. 2: Install a reactor or an output filter. 3: Check the air filter and the cooling fan. 4: Connect all cables properly. 5: Contact the agent or Inovance.
Overcurrent during acceleration	E002	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The acceleration time is too short. 4: Manual torque boost or V/F curve is not appropriate. 5: The voltage is too low. 6: The startup operation is performed on the rotating motor. 7: A sudden load is added during acceleration. 8: The AC drive model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the acceleration time. 4: Adjust the manual torque boost or V/F curve. 5: Adjust the voltage to normal range. 6: Select rotational speed tracking restart or start the motor after it stops. 7: Remove the added load. 8: Select an AC drive of higher power class.
Overcurrent during deceleration	E003	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The deceleration time is too short. 4: The voltage is too low. 5: A sudden load is added during deceleration. 6: The braking unit and braking resistor are not installed.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the deceleration time. 4: Adjust the voltage to normal range. 5: Remove the added load. 6: Install the braking unit and braking resistor.
Overcurrent at constant speed	E004	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The voltage is too low. 4: A sudden load is added during operation. 5: The AC drive model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Adjust the voltage to normal range. 4: Remove the added load. 5: Select an AC drive of higher power class.

Overvoltage during acceleration	E005	1: The input voltage is too high. 2: An external force drives the motor during acceleration. 3: The acceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install a braking resistor. 3: Increase the acceleration time. 4: Install the braking unit and braking resistor.
Overvoltage during deceleration	E006	1: The input voltage is too high. 2: An external force drives the motor during deceleration. 3: The deceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor. 3: Increase the deceleration time. 4: Install the braking unit and braking resistor.
Overvoltage at constant speed	E007	1: The input voltage is too high. 2: An external force drives the motor during deceleration.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor.
Control power supply fault	E008	The input voltage is not within the allowable range.	Adjust the input voltage to the allowable range.
Under voltage	E009	1: Instantaneous power failure occurs on the input power supply. 2: The AC drive's input voltage is not within the allowable range. 3: The bus voltage is abnormal. 4: The rectifier bridge and buffer resistor are faulty. 5: The drive board is faulty. 6: The main control board is faulty.	1: Reset the fault. 2: Adjust the voltage to normal range. 3: Contact the agent or Inovance.
AC drive overload	E010	1: The load is too heavy or locked-rotor occurs on the motor. 2: The AC drive model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an AC drive of higher power class.
Motor overload	E011	1: Fb-11 is set improperly. 2: The load is too heavy or locked rotor occurs on the motor. 3: The AC drive model is of too small power class.	1: Set Fb-11 correctly. 2: Reduce the load and check the motor and the mechanical condition. 3: Select an AC drive of higher power class.
Power input phase loss	E012	1: The three-phase power input is abnormal. 2: The drive board is faulty. 3: The lightening board is faulty. 4: The main control board is faulty.	1: Eliminate external faults. 2: Contact the agent or Inovance.

Power output phase loss	E013	1: The cable connecting the AC drive and the motor is faulty. 2: The AC drive's three-phase outputs are unbalanced when motor is running. 3: The drive board is faulty. 4: The module is faulty.	1: Eliminate external faults. 2: Check whether the motor three-phase winding is normal. 3: Contact the agent or Inovance.
Module overheat	E014	1: The ambient temperature is too high. 2: The air filter is blocked. 3: The fan is damaged. 4: The thermally sensitive resistor of the module is damaged. 5:The inverter module is damaged.	1: Lower the ambient temperature. 2: Clean the air filter. 3: Replace the damaged fan. 4: Replace the damaged thermally sensitive resistor. 5: Replace the inverter module.
External equipment fault	E015	1: External fault signal is input via DI. 2: External fault signal is input via virtual I/O.	Reset the operation.
Communication fault	E016	1: The host computer is in abnormal state. 2: The communication cable is faulty. 3: F0.28 is set improperly. 4: The communication parameters in group FD are set improperly.	1: Check the cabling of host computer. 2: Check the communication cabling. 3: Set F0.28 correctly. 4: Set the communication parameters properly.
Contactor fault	E017	1:Power grid flashover 2: The drive board and power supply are faulty. 3: The contactor is faulty.	1: Setting Fb-01=00 2: Replace the faulty drive board or power supply board. 3: Replace the faulty contactor.
Current detection fault	E018	1: The HALL device is faulty. 2: The drive board is faulty.	1: Replace the faulty HALL device. 2: Replace the faulty drive board.
Motor auto-tuning fault	E019	1:The motor parameters are not set according to the nameplate. 2: The motor auto-tuning times out.	1: Set the motor parameters according to the nameplate properly. 2: Check the cable connecting the AC drive and the motor.
EEPROM read-write fault	E021	The EEPROM chip is damaged.	Replace the main control board.
AC drive hardware fault	E022	1: Overvoltage exists. 2: Overcurrent exists.	1: Handle based on overvoltage. 2: Handle based on overcurrent.
Short circuit to ground	E023	The motor is short circuited to the ground.	Replace the cable or motor.
User-defined fault 1	E027	1: The user-defined fault 1 signal is input via X. 2: User-defined fault 1 signal is input via virtual I/O.	Reset the operation.

User-defined fault 2	E028	1: The user-defined fault 2 signal is input via X. 2: The user-defined fault 2 signal is input via virtual I/O.	Reset the operation.
Accumulative power-on time reached	E029	The accumulative power-on time reaches the setting value.	Clear the record through the parameter initialization function.
Load becoming 0	E030	The AC drive running current is lower than Fb-04.	Check that the load is disconnected or the setting of Fb-04 and Fb-05 is correct.
PID feedback lost during running	E031	The PID feedback is lower than the setting of A3.26.	Check the PID feedback signal or set A3.26 to aproper value.
Pulse-by-pulse current limit fault	E040	1: The load is too heavy or locked rotor occurs on the motor. 2: The AC drive model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an AC drive of higher power class.
Motor switchover fault during running	E041	Change the selection of the motor via terminal during running of the AC drive.	Perform motor switchover after AC drive stops.

Chapter 7

Communication protocol

FC110 series AC drives provide Rs485 communication interface and adopt MODBUS communication protocol. The users can realize centralized con-trol (set the control command, modify and read function code parameters, read the operating state and fault messages of the AC drive and so on) through taking the PC or PLC as the host computer.

There are kinds of networking modes : single host / single slave mode and single host/multiple slaves mode.

7.1 Networking Mode

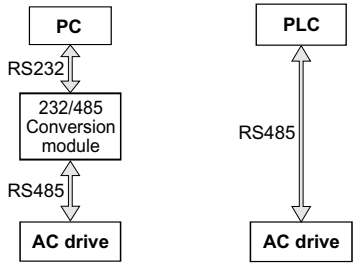


Fig. 7-1 Single host / single slave mode

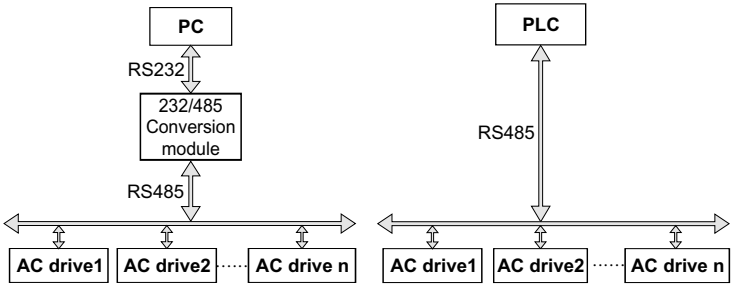


Fig. 7-2 Single host / multiple slaves mode

7.2 Interface mode

Rs485: Asynchronous, half duplex.
The default data format: E-8-1(Even check, 8 data bits, 1 end bit), 19200 BPS. The settings of communication parameters see F0B functional group.

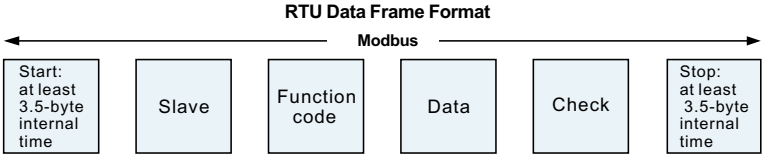
7.3 Protocol Frame Format

MODBUS protocol includes two kinds of transmission modes (RTU mode and ASCII mode). FC110 drives only support TRU mode, the corresponding date format such as the followings.

Communication of bytes: 1 start bit,8 data bits, check bit, and end bit. When check bit, 1 even/odd check bit and 1 end bit. When no check bit, 2 end bits are existent.

Start bit	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	Check bit	Stop bit

In the RTU mode, a new frame is always at least 3.5 bytes transmission time interval as a start. Transmission of the data fields in the order: Slave address, operation command code, date and CRC check . Transmission of each byte is hexadecimal. The data frame format as follows:



(1) The head of frame and tail frame through the bus free time greater than or equal to 3.5- byte time to defined frame.

(2) The idle time between bits must be smaller than 1.5 character communication time. Otherwise, the new receiving characters will be treat as the new frame head.

(3) Data check adopts CRC-16 and the information of the frame participate in checking. The high-low byte of checksum needs to exchange before sending.

(4) Bus idle time between frames keeps at least 3.5 bytes. The idle time between frames is unnecessary to accumulative start and end idle time.

7.4 CMD (command instruction) and DATA (information word description)

Command code: 03H, read N words (Word) (up to 12 words can be read)
For example: Read two function code parameters F0.08 and F0.09, and the start address of inverter with slave address 01 is F008H, read 2 values consecutively.

Master command information

ADR	01H
CMD	03H
Start address high bit	F0H
Start address low bit	08H

Register number high bit	00H
Register number low bit	02H
CRC CHK low bit	76H
CRC CHK high bit	C9H

(2) Write a single data (0x06)

ADR	01H
CMD	03H
Number of bytes	04H
Data F002H high bit	13H
Data F002H low bit	88H
Data F003H high bit	00H
Data F003H low bit	00H
CRC CHK low bit	7EH
CRC CHK high bit	9DH

Command code: 06H, write a word (Word)
For example: Set F0.10 to 300.00Hz, which is to write 30000 (7530H) to slave address 06H inverter's F00AH address.

Master command information

ADR	08H
CMD	06H
Data address high bit	F0H
Data address low bit	0AH
Data content high bit	75H
Data content low bit	30H
CRC CHK low bit	BCH
CRC CHK high bit	D5H

Slave response information

ADR	08H
CMD	06H
Data address high bit	F0H
Data address low bit	0AH
Data content high bit	75H
Data content low bit	30H
CRC CHK low bit	BCH
CRC CHK high bit	D5H

Check mode - CRC check mode (Cyclical Redundancy Check)

Using RTU frame format, message includes error detection domain based on CRC method. CRC domain tests the content of the entire message. CRC domain is two bytes, which is a binary value including 16 bits. It is added into the message after being calculated by transmission device. The receiving device recalculates CRC of received message, and compares with value in CRC domain received, if the two CRC values are not equal, it indicates transmission is error.

CRC is saved into 0xFFFF first, and then handle continuous 8 bits in the message with values in the current register by calling a process. Only 8Bit in each character is valid to CRC, while start bit and end bit as well as parity bit are invalid.

During CRC generation, each 8-bit character XOR with register content separately (XOR), and the result moves towards the lowest valid bit, while the highest valid bit is filled with 0. LSB is extracted for testing, if LSB is 1, the register XOR with preset value separately, if LSB is 0, no XOR is conducted. The entire process should be repeated for 8 times. After the last bit (the 8th bit) is completed, the next 8-bit byte will XOR with the current value of the register separately. The final value in the register, is the CRC value after all bytes in the message are executed.

When CRC is added into the message, low bytes will be added first, and then high bytes. CRC simple function is as follows:

```
unsigned int crc_chk_value(unsigned cF0r *data_value,unsigned cF0r length)
{unsigned int crc_value=0xFFFF;int i;while(length--){crc_value^=*data_value++;
for(i=0;i<8;i++){if(crc_value&0x0001){crc_value=(crc_value>>1)^0xa001;}else{crc_value=crc_value>>1;}}}return(crc_value);}
```

Address definition of communication parameters

This part is the content of communication, used to control inverter operation, inverter status and related parameter settings.
Read and write function code parameters (some function codes could not be modified, only for use of manufacturer):
Labeling rules with function code group number and label number as parameter address:
High bytes: F0~FF (group F), A0~AF (group A), 70~7F (group L)
Low bytes: 00~FF
For example: For range function code F3.12, function code access address is 0×F30C;

Note:

Group FF: Cannot read parameters nor change parameters; Group L: Can only read but cannot change parameters.
Some parameters cannot be changed when inverter is running; some parameters cannot be changed no matter the inverter is running or not; it is also required to note the range, unit and related description of parameters when changing function code parameters.

Function code group number	Communication access addres	Communication changes function code address in RAM
Group F0~FE	0×F000~0×FEFF	0×0000~0×0EFF
Group A0~AC	0×A000~0×ACFF	0×4000~0×4CFF
Grou L0	0×7000~0×70FF	

Note: For frequent saving of EEPROM, it will reduce service life of EEPROM, so some function codes need not to be saved in communication mode, only changing values in RAM is ok.
For group F parameters, in order to realize this function, change high bit F to 0 of this function code address.
For group A parameters, in order to realize this function, change high bit A to 4 of this function code address. Corresponding function code address is shown in the following:
High bytes: 00~0F (group P), 40~4F (group A)
Low bytes: 00~FF

For example:
Function code F3.12 cannot be saved into EEPROM, and address is indicated as 030C;
Function code A0.05 cannot be saved into EEPROM, and address is indicated as 4005;
This address indicates to write RAM rather than read, for reading, it is an invalid address.
For all parameters, command code 07H could also be used to realize this function.
Group F1: Can only read parameters rather than change parameters; some parameters cannot be changed when inverter is running; some parameters cannot be changed no matter the inverter is running or not; it is also required to note the range, unit and related description of parameters when changing function code parameters.

Stop/Run parameters:

Parameter address	Parameter description	Parameter address	Parameter description
1000 H	* Communication set value (decimal) -10000~10000	1010H	PID settings
1001 H	Running frequency	1011 H	PID feedback
1002 H	Bus voltage	1012 H	PLC steps
1003 H	Output voltage	1013 H	PULSE input pulse frequency, unit 0.01kHz
1004 H	Output current	1014 H	Feedback speed, unit 0.1Hz
1005 H	Output power	1015 H	Remaining run time
1006 H	Output torque	1016 H	Voltage before AI1 correction
1007 H	Running speed	1017 H	Voltage before AI2 correction

1008 H	X input symbol	1018 H	Voltage before AI3 correction
1009 H	Y output symbol	1019 H	Linear velocity
100A H	AVI voltage	101A H	Current power-on time
100B H	ACI voltage	101B H	Current run time
100C H	AI3 voltage	101C H	PULSE input pluse frequency, unit 1Hz
100D H	Count value input	101D H	Communication set value
100E H	Length value input	101E H	Actual feedback speed
100F H	Load speed	101F H	Main frequency X display
-	-	1020 H	Auxiliary frequency Y display

Note:

The communication set value is a relative percentage, and 10000 corresponds to 100.00%, -10000 corresponds to -100.00%.

For frequency dimension data, this percentage is the one relative to max. frequency (F0.10); for torque dimension data, this frequency is F2.10, A2.48, A3.48 and A4.48 (torque upper limit digital settings, corresponding to the first, second, third and fourth motors respectively).

Example 1: Read 2 continuous values from the start address 1002 of inverter with slave address 01 (FD.02=001) (read two parameters of bus voltage and output voltage).

Master command information

ADR	01H
CMD	03H
Start address high bit	10H
Start address low bit	02H

Register number high bit	00H
Register number low bit	02H
CRC CHK low bit	61H
CRC CHK high bit	0BH

Slave response information

ADR	01H
CMD	03H
Number of bytes	04H
Data F002H high bit	11H
Data F002H low bit	B2H
Data F003H high bit	00H
Data F003H low bit	00H
CRC CHK low bit	5FH
CRC CHK high bit	28H

Example 1: Write a value 10000 to the start address 1000 of inverter with slave address 01 (FD.02=001) (set the communication given frequency as the max. output frequency).

Master command information

ADR	01H
CMD	06H
Start address high bit	10H
Start address low bit	00H

Register number high bit	27H
Register number low bit	10H
CRC CHK low bit	97H
CRC CHK high bit	36H

Slave response information

ADR	01H
CMD	06H
Data address high bit	10H
Data address low bit	00H
Data content high bit	27H
Data content low bit	10H
CRC CHK low bit	97H
CRC CHK high bit	36H

Control command input to inverter: (write only)

Command word address	Command function
2000	0001: Forward run
	0002: Reverse run
	0003: Forward jog
	0004: Reverse jog
	0005: Free stop
	0006: Deceleration stop
	0007: Fault reset

For example: Inverter with slave address 01 conducts forward run (run command channel is given by communication)

Master command information

ADR	01H
CMD	06H
Start address high bit	20H
Start address low bit	00H
Register number high bit	00H
Register number low bit	01H
CRC CHK low bit	43H
CRC CHK high bit	CAH

Read inverter status: (Read only)

Status word address	Status word function
3000	0001: Forward run
	0002: Reverse run
	0003: Stop

Parameter locking password check: (If returns 8888H, it indicates password check is successful)

Password address	Input password content
1F00	****

Digital output terminal control: (Write only)

Command address	Command content
2001 H	BIT0: Y1 output control BIT1: Y2 output control BIT2: RELAY1 output control BIT3: RELAY 2 output control BIT4: DOR output control BIT5: VY1 BIT6: VY2 BIT7: VY3 BIT8: VY4 BIT9: VY5

Analog output AO1 control: (Write only)

Command address	Locking password command content
2002 H	0～7FFF indicates 0% ～100%

Analog output AO2 control: (Write only)

Command address	Locking password command content
2003 H	0～7FFF indicates 0% ～100%

High-speed pulse (DO) output control: (Write only)

Command address	Locking password command content
2004 H	0～7FFF indicates 0% ～100%

Inverter failure description:

Inverter failure address	Inverter failure information	
8000 H	0000: No failure 0001: Reserved 0002: Acceleration overcurrent 0003: Deceleration overcurrent 0004: Constant speed overcurrent 0005: Acceleration overvoltage 0006: Deceleration overvoltage 0007: Constant speed overvoltage 0008: Buffer resistance overload failure 0009: Undervoltage failure 000A: Inverter overload 000B: Motor overload 000C: Input phase failure 000D: Output phase failure 000E: Module overheated 000F: External failure 0010: Communication exception 0011: Contactor exception 0012: Current detection failure 0013: Motor tuning failure 0014: Encoder/PG card failure	0015: Parameter read and write exception 0016: Inverter hardware failure 0017: Motor short circuit failure to ground 0018: Reserved 0019: Reserved 001A: Reserved 001B: User defined failure 1 001C: User defined failure 2 001D: Power-on time arrival 001E: Off-load 001F: PID feedback lost during running 0028: Fast current limiting time out failure 0029: Motor switching failure during running 002A: Overlarge speed deviation 002B: Motor overspeed 002D: Motor over temperature 005A: Encoder wire number setting error 005B: Encoder not connected 005C: Initial position error 005E: Speed feedback error

Communication failure information description data (failure code):

Communication failure address	Failure function description
8001	0000: No failure 0001: Password error 0002: Command code error 0003: CRC check error 0004: Invalid address 0005: Invalid parameters 0006: Parameter change invalid 0007: System locked

Group Fd communication parameter description

Fd.00	Baudrate	Factory value	6005	
	Set range	Unit's digit: MODUBS baud rate		
		0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS	5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS	

This parameter is used to set data transmission rate between upper computer and inverter. Note the set baud rate of upper computer must be the same with that of inverter, otherwise, communication could not be conducted. Larger baud rate will lead to higher communication speed.

Fd.01	Data format	Factory value	0
	Set range	0: No check: Data format <8 ,N, 2> 1: Even parity check: Data format <8,E,1> 2: Odd parity check: Data format <8,O,1> 3: No check: Data format <8-N-1>	

The set data format of upper computer must be the same with that of inverter, otherwise, communication could not be conducted.

Fd.02	Local address	Factory value	1
	Set range	1~247, 0 is broadcast address	

When local address is set to 0, it is a broadcast address, which realizes upper computer broadcast function.

Local address possesses uniqueness (except broadcast address), and it is the basis to realize point-point communication between upper computer and inverter.

Fd.03	Response delay	Factory value	2ms
	Set range	0~20ms	

Response delay: It refers to the interval between the inverter receiving data and sending data to the upper computer. If response delay is smaller than system handling time, response delay should be subject to system handling time, if response delay is longer than system handling time, after system handling data, wait till response delay time, after that, send data to the upper computer.

Fd.04	Communication timeout	Factory value	0.0s
	Set range	0.0s (invalid); 0.1~60.0s	

When this function code is set to 0.0s, communication timeout parameter is invalid.

When this function code is set to valid, if the interval between one communication and the next communication exceeds communication timeout, system will report a communication failure (E016). Usually, it is set to invalid. In a system with continuous communication, set secondary parameters to monitor communication status.

Fd.05	Communication protocol selection	Factory value	1
	Set range	0: Non-standard Modbus protocol; 1: Standard Modbus protocol	

Fd.05=1: Select standard Modbus protocol.

Fd.05=0: When reading command, the bytes returned by slave is one more than standard Modbus protocol, see details in "5 Communication Data Structure" of this protocol.

Fd.06	Communication read current resolution	Factory value	0
	Set range	0: 0.01A; 1: 0.1A	

It is used to confirm output unit of current value, when communication reads output current.

Warranty Agreement

① The warranty period of the product is 18 months (refer to the bar code on the equipment body). During the warranty period , if the product fails or damaged under the condition of normal use by following the instruction, we will be responsible for free maintenance.

② Within the warranty period , maintenance will be charged for the damages caused by the following reasons :

✧ The damage caused by improper use or repair/modification without prior permission.

✧ The damage caused by fire , flood , abnormal voltage , other natural disasters and second disaster.

✧ The hardware damage caused by artificial falling or transportation after purchase.

✧ The damage caused by the improper operation.

✧ The damage or failure caused by the trouble out of the equipment (e.g. : External device)

③ If there is any failure or damage to the product, please fill in the information of the Product Warranty Card in details correctly.

④ The maintenance fee is charged according to the newly adjusted Maintenance Price List of our company .

⑤ In general , the warranty card will not be re-issued. Please keep the card and present it to the maintenance personnel when asking for maintenance .

⑥ If there is any problem during the service , please contact the agent of our company or our company directly .

Product Warranty Card

Customer information	**Add. of corporation** :	
	Name of corporation :	**Contact person** :
	P.C. :	**Tel.** :
Product information	**Product model** :	
	Body bar code :	
	Name of agent :	
Failure information	(**maintenance time and content)** : **Maintenance personnel** :	