

|FC1000 series|

Speed Door-specific Inverter User Manual

Thank you for choosing the FC1000 series door-specific Inverter.
The illustrations in this manual are for explanatory purposes and may differ slightly from the actual product. Due to product upgrades, there may also be slight differences. Please refer to the actual product.
Please make sure to deliver this user manual to the end user and keep it properly for use during future inspection and maintenance.
If you have any questions, please promptly contact our company or our company's agent, and we will be wholeheartedly at your service.

1 Safety Precautions

Carefully read this manual before installation, operation, maintenance, or inspection.

The safety precautions for operation in the manual are classified as 'Warning' or 'Caution'.



Point out potential dangerous situations that may lead to personal injury or death if not avoided.



Indicate potential hazard situations, which, if not avoided, may cause minor or moderate personal injury and equipment damage. This can also be used to warn against unsafe operations.

In some cases, even the content described in the **当心** can lead to serious accidents. Therefore, these important precautions must be followed in all circumstances.

★Attention Steps taken to ensure correct operation.

Warning labels are displayed on the front cover of the drive.

Follow these guidelines when using the drive.

Warning sign

DANGER
·Risk of injury and electric shock. ·Read the manual and follow the safety instruction before use. ·Isolate from supply and wait 10minutes before removing his cover. ·Ensure proper earth connection. ·Mount the inverter on a non-combustible surface.

2 Unboxing inspection

·Do not install or operate any drives that are already damaged or have defective parts, otherwise there is a risk of injury.

After unpacking the drive, please check the following items

- ① Confirm that the drive has no damage during transportation (no damage or gaps on the body).
- ② Confirm that the instruction manual and warranty card are in the packaging box.
- ③ Check the drive nameplate and confirm that it is the product you ordered.
- ④ If you have ordered optional accessories for the drive, please confirm that the accessories you received are what you need. If you find that the drive or accessories are damaged, please contact your local dealer immediately.

3 Disassembly and Installation Safety Warning



·The design, installation, commissioning, and operation of the equipment must be carried out by trained and qualified professionals; during work, all provisions in the 'warning' must be followed, otherwise serious personal injury or significant property damage may occur.

·The input power cord is only allowed to be permanently fastened, and the equipment must be reliably grounded.

·Even when the drive is not operating, the following terminals may still carry dangerous voltage:

-Power terminal R、S、T

-Motor terminals U、V、W

·After the power switch is turned off, you must wait more than 10 minutes and ensure the driver is fully discharged before starting the installation work.

·The minimum cross-sectional area of the grounding conductor shall be at least 10 mm², or correspond to the data in the table below, requiring the larger of the two to be chosen as the cross-sectional area of the grounding conductor::

Power cord conductor cross-sectional area S mm ²	Cross-sectional area of the grounding conductor
S ≤ 6	S
16 < S ≤ 35	16
35 < S	S/2



·Lift the cabinet from the base support. Do not lift it by grabbing the panel when moving the drive, otherwise the main unit may fall and may cause personal injury.

·The driver should be installed on metal or other flame-retardant materials, away from heat sources and flammable objects, to prevent fire.

·When installing more than two drives in a cabinet, cooling fans must be installed and the air temperature must be kept below 40°C, otherwise overheating may cause fire or equipment damage.

Chapter 1 Overview

1-1 Comprehensive technical characteristics of the frequency converter

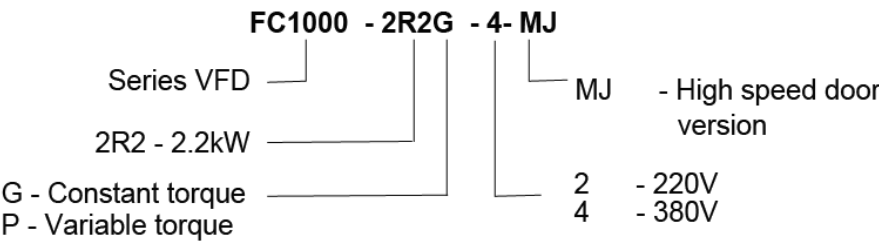
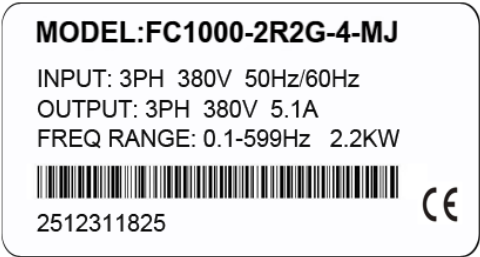
Project		Specification
basic	Maximum frequency	0~599Hz
	Carrier frequency	0.5kHz~16kHz The carrier frequency can be automatically adjusted according to the load characteristics.
	Input frequency resolution	Digital Setting: 0.01Hz Simulation setting: maximum frequency×0.025%
	Control method	Open-loop vector control (without PG) V/F control
	Starting torque	G-type machine: 0.5Hz/150% (without PG); P-type machine: 0.5Hz/100%
	Speed range	1: 100 (without PG)
	Steady speed accuracy	±0.5% (without PG)
	Torque control accuracy	±5% (FVC)
	Overload capacity	G-type machine: 150% of rated current for 60s; 180% of rated current for 3s. P-type machine: 120% of rated current for 60s; 150% of rated current for 3s.
	Torque Improvement	Automatic torque boost; manual torque boost 0.1%~30.0%
	V/F curve	Three methods: linear type; multi-point type; Nth power type V/F curve (1.2 power, 1.4 power, 1.6 power, 1.8 power, 2 power)
	V/F separation	Two methods: fully separated, partially separated
	Acceleration and Deceleration Curve	Linear or S-curve acceleration and deceleration methods. Four types of acceleration and deceleration times, with a time range of 0.0~6500.0s

Function	DC braking	DC braking frequency: 0.00Hz~maximum frequency; Braking time: 0.0s~100.0s; Braking operation current value: 0.0%~100.0%
	Jog control	Jog frequency range: 0.00Hz~50.00Hz. Jog acceleration/deceleration time: 0.0s~6500.0s.
	Simple PLC, multi-speed operation	Achieve up to 16-speed operation through the built-in PLC or control terminals
	Built-in PID	It can conveniently achieve a process control closed-loop control system
	Automatic Voltage Regulation (AVR)	When the grid voltage changes, it can automatically maintain a constant output voltage
	Over voltage, Over current, and Stall Control	Automatically limits current and voltage during operation to prevent frequent over current and over voltage trips
	Fast rate limiting feature	Minimize over current faults to protect the normal operation of the inverter
	Torque Limitation and Control	The 'excavator' feature automatically limits torque during operation to prevent frequent over current trips.

Personalized features	Outstanding performance	Realize asynchronous motors with high-performance current vector control technology
	Momentary stop without stopping	During an instantaneous power outage, the voltage drop is compensated by feeding energy back through the load, allowing the inverter to continue operating for a short period.
	Quick Rate Limiting	Avoid frequent over current faults in the inverter
	Timed control	Timer control function: Set time range 0.0 Min~6500.0 Min
	Communication methods supported	RS - 485
	Command Source	Operation panel provided, control terminals provided, serial communication port provided. Can be switched in multiple ways.

Operate	Frequency source	10 types of frequency sources: digital setting, analog voltage setting, analog current setting, pulse setting, serial port setting. Can be switched in multiple ways
	Auxiliary frequency source	10 types of auxiliary frequency sources. Can flexibly achieve auxiliary frequency fine-tuning and frequency synthesis
	Input terminal	5 digital input terminals, one of which supports high-speed pulse input up to 100kHz; 1 analog input terminal supports 0~10V voltage input or 4~20mA current input
	Output terminal	1 collector output terminal 1 relay output terminal 1 analog output terminal, supporting 0~20mA current output or 0~10V voltage output
Display and keyboard operation	LED display	Display parameters
	Button Lock and Function Selection	Implement partial or full locking of keys, define the functional scope of certain keys, to prevent accidental operation
	Protective function	Power-on motor short-circuit detection, input and output phase-loss protection, over current protection, over voltage protection, under voltage protection, overheat protection, overload protection, etc.
Environment	Place of use	Indoors, not exposed to direct sunlight, free from dust, corrosive gases, flammable gases, oil mist, water vapor, dripping water, or salt.
	Altitude	Below 1000m (need to downshift when above 1000m)
	Ambient temperature	-10°C to +40°C (When the ambient temperature is between 40°C and 50°C, please use a lower setting)
	Humidity	Less than 95% RH, no water droplet condensation
	Vibration	Less than 5.9 m/s ² (0.6 g)
	Storage Temperature	-20°C~+60°C

1-2 Inverter Nameplate Description



1-3 Variable Frequency Drive Series Models

Inverter Model	Input voltage	Rated output power (KW)	Rated input current(A)	Rated output current(A)	Applicable motor (KW)
FC1000-0R4G-2	1PH AC 220V±15%	0.4	5.4	2.5	0.4
FC1000-0R75G-2		0.75	7.2	5.0	0.75
FC1000-1R5G-2		1.5	10.0	7.0	1.5
FC1000-2R2G-2		2.2	16	11	2.2
FC1000-0R4G-4	3PH AC 380V±15%	0.4	3.4	1.2	0.4
FC1000-0R75G-4		0.75	3.8	2.5	0.75
FC1000-1R5G-4		1.5	5.0	3.7	1.5
FC1000-2R2G-4		2.2	5.8	5.0	2.2
FC1000-3R0G-4		3.0	6.5	6.0	3.0

Chapter 2 Installation and Wiring of the Inverter

2-1 Installation Environment and Requirements

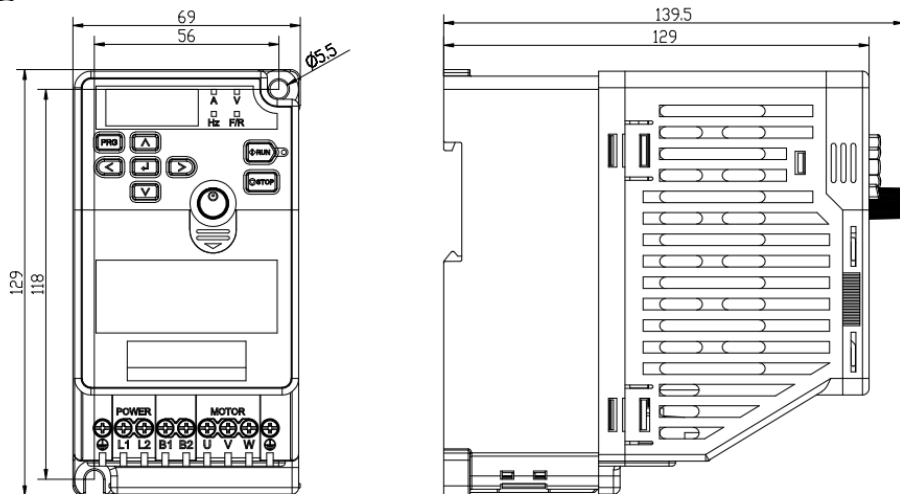
The installation environment of the frequency converter has a direct impact on its service life and normal functionality. Using the frequency converter in an environment that does not comply with the permissible range specified in the user manual may cause the frequency converter to activate protection or malfunction. The FC1000 series inverters are wall-mounted inverters. Please install them vertically to facilitate air convection and achieve better heat dissipation.

Please make sure that the installation environment of the inverter meets the following requirements:

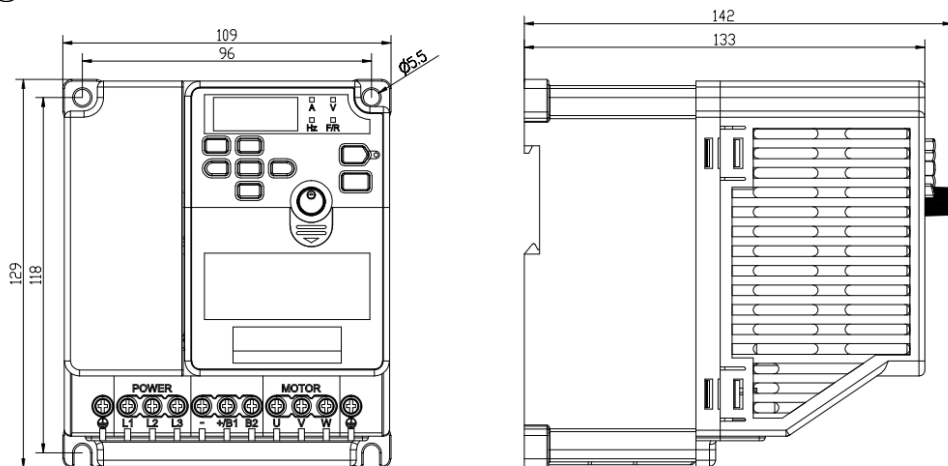
- (01) Ambient temperature -10°C to 40°C
- (02) Ambient humidity 0–95% with no condensation
- (03) Avoid direct sunlight
- (04) No corrosive gases or liquids in the environment
- (05) No dust, floating fibers, lint, or metal particles in the environment
- (06) Keep away from radioactive substances and combustible materials
- (07) Keep away from electromagnetic interference sources (such as welding machines, large power machines)
- (08) Install on a sturdy, vibration-free surface; if vibration cannot be avoided, add anti-vibration pads to reduce vibration
- (09) Install the inverter in a well-ventilated area that is easy to inspect and maintain, on a sturdy, non-combustible surface, and away from heat sources (such as braking resistors)
- (10) Leave sufficient space for inverter installation, especially when installing multiple inverters; pay attention to their placement and provide cooling fans to keep the ambient temperature below 45°C.

2-1-1 Inverter Appearance and Installation Dimensions

① AC220V 0.4--1.5KW



② AC220V 2.2KW & AC380V 0.4--3.0KW



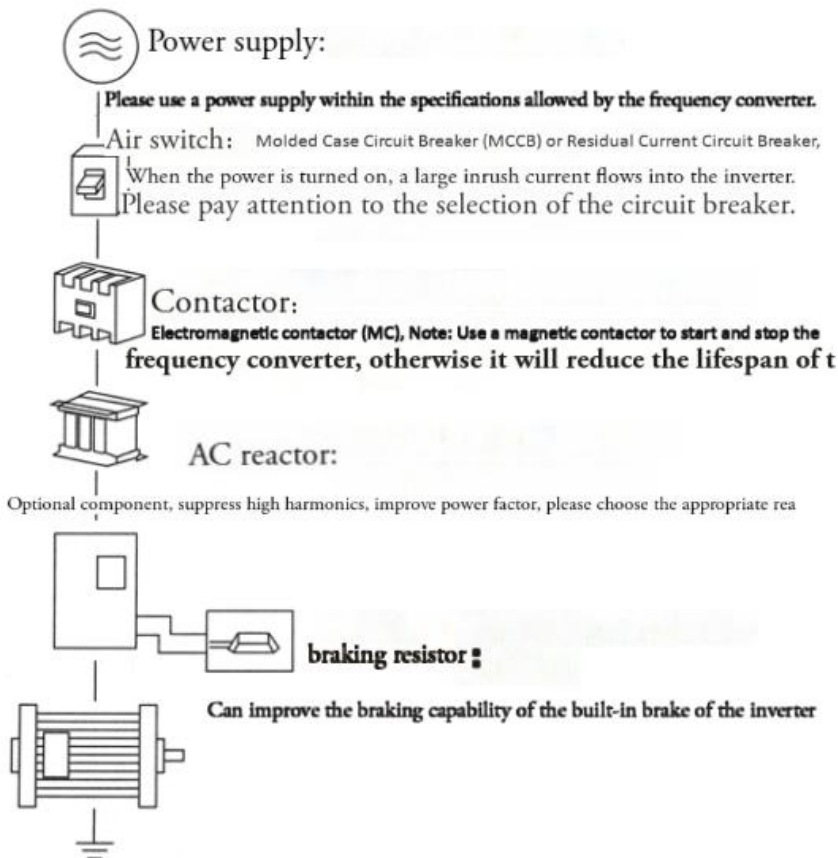
2-2 Keyboard pull-out tray opening dimensions:

(1) 0.4--3.0KW

2-3 Inverter wiring

The wiring of the inverter is divided into the main circuit part and the control part.

2-3-1 Main circuit wiring



2-3-2 Peripheral Device Description

(1) AC power

Please power it according to the power specifications specified in the user manual.

(2) Molded Case Circuit Breaker (MCCB)

When the power supply voltage is too low or there is a short circuit on the input side, the circuit breaker can provide protection. During inspection, maintenance, or when it is not operating, the circuit breaker can be turned off to isolate the inverter from the power supply.

(3) Electromagnetic Contactor (MC)

Convenient for controlling the power on and off of the inverter, ensuring safety.

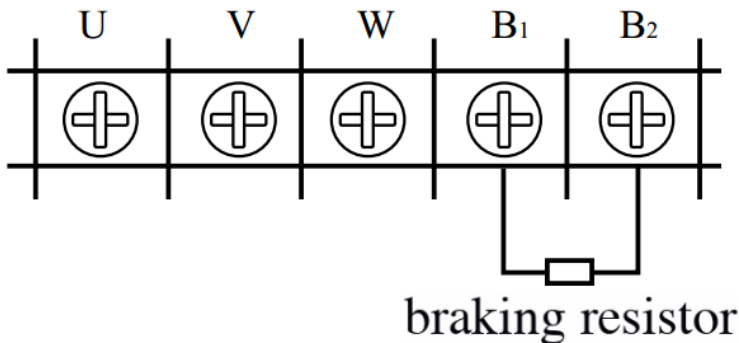
(4) AC Reactor

a: Suppresses high harmonics and protects the inverter

b: Improves power factor

(5) Braking Resistor

When the motor is braking, it prevents excessively high voltage in the inverter DC circuit and enhances the braking capability of the built-in braking unit. The connection method of the braking resistor for the FC1000 series inverter is as follows:



2-3-3 Main Circuit Wiring Precautions

(1) Wiring specifications: Please carry out wiring in accordance with electrical regulations;

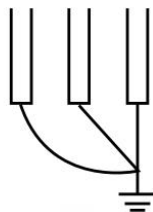
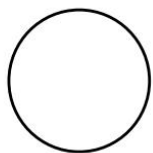
(2) Do not connect AC power to the inverter output terminals (U, V, W), otherwise it will cause damage to the inverter;

(3) For power wiring, try to use insulated wires and conduits, and ground both ends of the insulated wire or conduit;

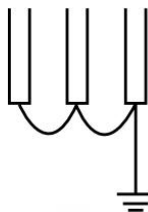
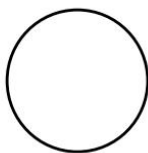
(4) The inverter grounding wire must not share a ground with welding machines, high-power motors, or high-current loads. It should be grounded separately;

(5) The grounding terminal E should be grounded using the third method, with a grounding impedance of less than 100Ω;

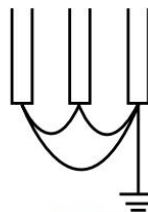
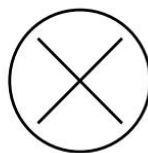
- (6) The use of grounding wires should follow the specifications of electrical equipment technical standards, and the shorter the grounding wire, the better;
- (7) When grounding multiple inverters, be careful not to create a grounding loop, as shown in the figure below;



Recommended

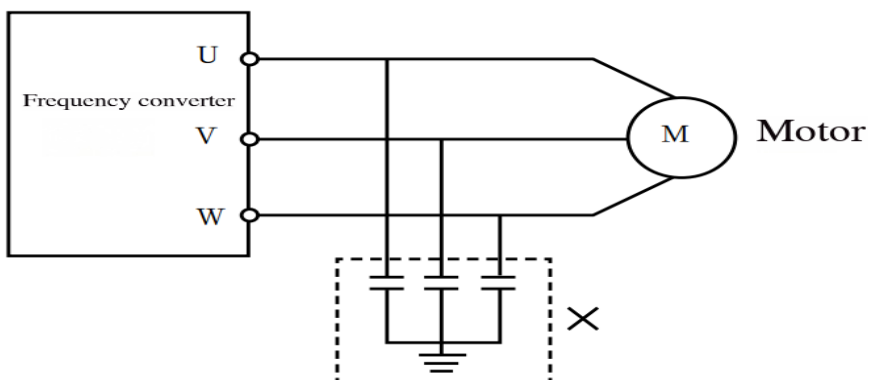


Recommend



Not Recommend

- (8) The main circuit power lines and control lines must be routed separately. Parallel routing should have a spacing of more than 10cm, and crossing lines should be perpendicular to each other. Do not place control lines and power lines in the same cable tray, as this may cause interference;
- (9) Generally, the distance between the inverter and the motor should be less than 30 meters. If the distance is too long, the surge current caused by parasitic capacitance may trigger over current protection or cause malfunction, potentially leading to inverter failure or abnormal equipment operation. The maximum distance between the inverter and the motor should not exceed 100 meters. For longer distances, please select an output-side filter and reduce the carrier frequency;
- (10) No absorption capacitance or other resistive-capacitive absorption devices should be added on the inverter output side (U, V, W)



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- (11) Please confirm that all main circuit terminals are securely tightened, and that the wires are making good contact with the terminals, to prevent loosening due to vibration, which could produce sparks and cause short circuits;
- (12) To reduce interference, it is recommended to connect surge suppressors to the coils of electromagnetic contactors, relays, and other devices in the circuits around the frequency converter.

2-3-4 Recommended device specifications

Inverter Model	Input voltage	Matched motor (KW)	Main return route (mm ²)	Air Circuit Breaker (A)	Electromagnetic Contactor (A)
FC1000-0R4G-2	220V±1% 1PH	0.4	0.75	10	9
FC1000-0R75G-2		0.75	0.75	16	12
FC1000-1R5G-2		1.5	1.5	25	18
FC1000-2R2G-2		2.2	2.5	32	25
FC1000-0R4G-4	380V±15% 3PH	0.4	0.75	6	9
FC1000-0R75G-4		0.75	0.75	6	9
FC1000-1R5G-4		1.5	0.75	10	9
FC1000-2R2G-4		2.2	0.75	10	9
FC1000-3R0G-4		3.0	1.5	16	12

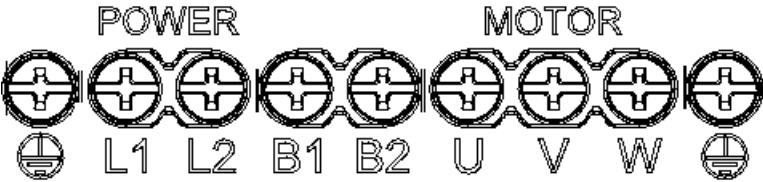
*The data in the table is for reference only

2-3-5 Main Circuit Terminals and Description

When the user opens the cover of the inverter, the main circuit terminals can be seen.

1. The main circuit terminal arrangement of the FC1000 series inverters is as follows:

a. 1PH AC 220V 0.4-1.5KW



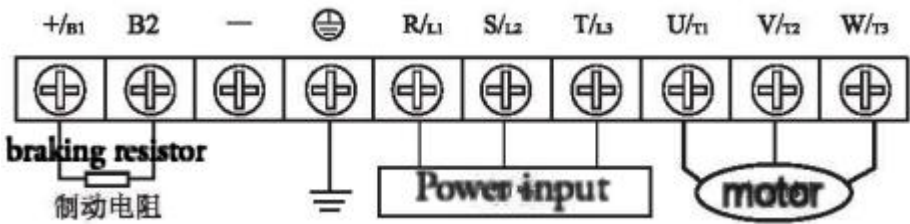
b. 3PH AC 380V 0.4-3.0KW & 1PH AC 220V 2.2KW



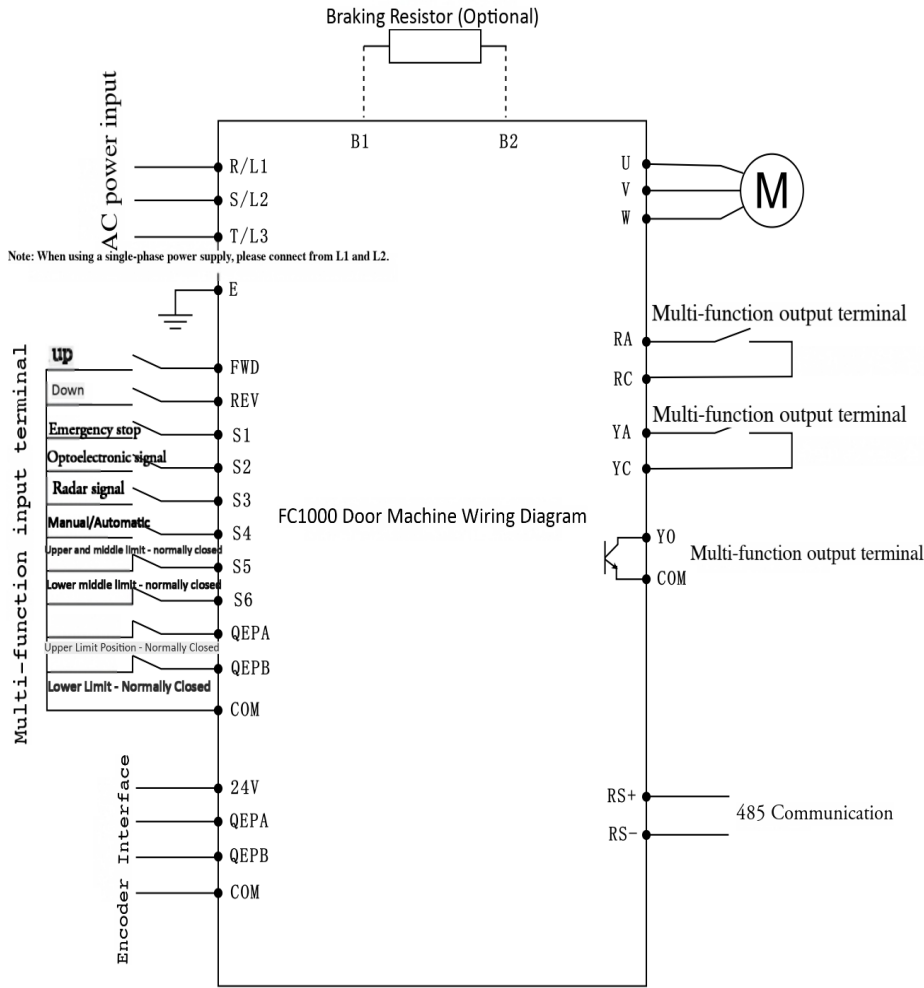
2. Main Circuit Terminal Description

Name	Function Description
	Ground terminal
R/L1 S/L2 T/L3	Power input terminal
U/T1、V/T2、W/T3	Connecting a three-phase alternating current motor
+B1、B2	Brake resistor terminal
+B1、-	DC bus terminal, can be externally connected to a braking unit

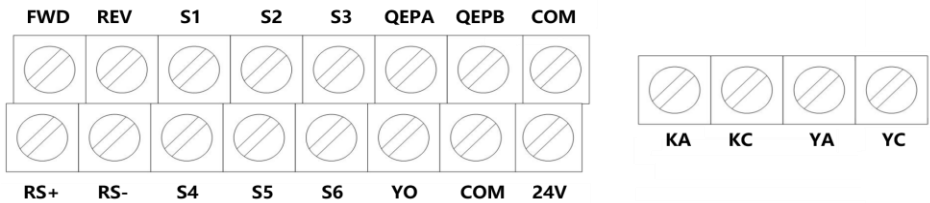
3.接线示例:



4. Basic Wiring Diagram



2-4 Control terminal



2-4-1 Control Terminal Description

Function	Function Description
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Chapter 2 Installation and Wiring of the Inverter

FWD	Turn-on
REV	Turn-off
S1	Emergency stop
S2	Infrared photoelectric signal: when the door is closing, if this signal is valid, the door will automatically open.
S3	Radar signal, effective in automatic mode; if this signal is valid, the door will open automatically
S4	C9.21 0: Manual/Jog switch 1: Manual/Automatic switch
S5	Upper limit normally closed signal
S6	Lower limit normally closed signal
COM	Public terminal
QEPA,QEPB	Connect incremental encoder
RS+,RS-	485 Communication
RA,RC	Multi-function output relay Normally open
KA,KC	Multi-function output relay Normally open
YO	Transistor output

Control Circuit Distribution Precautions:

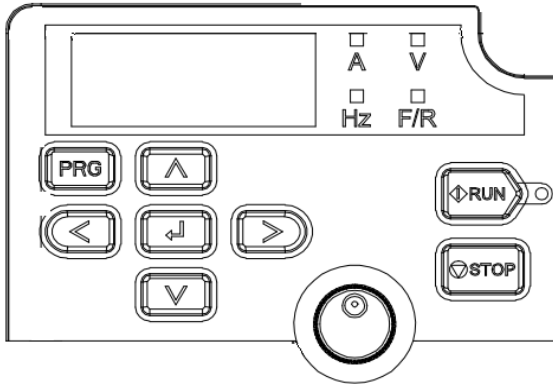
- (1) Please route control signal lines separately from main circuit lines, other power lines, and power supply lines.
- (2) To prevent malfunction caused by interference, please use twisted shielded wires or double-shielded wires, with specifications of 0.5–2mm².
- (3) Please determine the allowable conditions for each terminal, such as power supply, maximum allowable current, etc.
- (4) Terminal E must be correctly grounded, with a grounding resistance of less than 100Ω.
- (5) Wiring requirements for each terminal: correctly select accessories such as potentiometers, voltmeters, input power supply, etc.
- (6) After completing the wiring, please check correctly, and only power on after confirming there are no errors.

Chapter 3 Operation

3-1 Operation Panel Instructions

The control panel is also called a keyboard.

3-1-1 Panel Diagram



3-1-2 Button Function Description

Key symbol	Name	Function Description
PRG	Program key	Enter or exit the primary menu, delete shortcut parameters
	Confirm Key	Enter the menu screen step by step and confirm parameter settings
	UP increment key	Increment of data or function code
	DOWN Decrease Key	Decrement of data or function codes
	Left Shift Key	In the shutdown display interface and the operation display interface, display parameters can be cyclically selected; when modifying parameters, the modification bits of the parameters can be selected.
	Right Arrow Key	In the shutdown display interface and the operation display interface, display parameters can be cyclically selected; when modifying parameters, the modification bits of the parameters can be selected.
RUN	Run Key	In keyboard operation mode, used for running operations
STOP	Stop/Reset Button	In the running state, pressing this key can be used to stop the running operation, subject to the restriction of function code P7.04; in the fault alarm state, this key can be used to reset the fault,

		not restricted by function code P7.04.。
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3-1-3 Indicator Light Instructions:

Symbolic features	Symbol content description
Hz	Frequency Indicator Light
A	Current Indicator Light
V	Voltage Indicator Light
F/R	Forward and reverse indicator light: Light off indicates forward rotation; light on indicates reverse rotation

3-2 Operating procedure

3-2-1 Parameter Settings

The three-level menu is as follows:

1. Function code group number (first-level menu);
2. Function code number (second-level menu);
3. Function code setting value (third-level menu).

Explanation: When operating in the third-level menu, you can press PRG or return to the second-level menu. The distinction between the two is: pressing will save the set parameters to the control board, and then return to the second-level menu, automatically moving to the next function code; pressing PRG will directly return to the second-level menu without saving the parameters, and remain at the current function code.

In the third-level menu, if the parameter does not have a flashing position, it means that this function code cannot be modified. Possible reasons include:

- 1) This function code is an unmodifiableable parameter, such as actual detection parameters, operation record parameters, etc.;
- 2) This function code cannot be modified while in operation and can only be changed after shutdown.

3-2-2 Fault Reset

After a fault occurs in the inverter, the inverter will display the relevant fault information. The user can perform a fault reset through the STOP key on the keyboard or the terminal function (P5 group). After the inverter fault is reset, it will be in standby mode. If the inverter is in a fault state and the user does not perform a fault reset, the inverter will be in operation protection mode and cannot run.

3-2-3 Motor Parameter Self-Learning

1: Full Parameter Self-Learning

When selecting the sensorless vector control mode, the motor nameplate parameters must be entered accurately. The inverter will match standard motor parameters based on these nameplate parameters. To achieve good control performance, it is recommended to perform motor parameter self-learning. The steps for self-learning are as follows:

First, set the running command channel (P0.02) to the keyboard command channel. Then, enter the following parameters according to the actual motor parameters:

P2.01: Motor rated power;

P2.02: Motor rated voltage;

P2.03: Motor rated current;

P2.04: Motor rated frequency;

P2.05: Motor rated speed.

****Note:** During full parameter self-learning, the motor should be disconnected from the load; otherwise, the motor parameters obtained from self-learning may be incorrect.

2: Stationary Parameter Self-Learning

When performing motor stationary parameter self-learning, it is not necessary to disconnect the motor from the load. Before self-learning, the motor nameplate parameters (P2.01–P2.05) must be correctly entered. After self-learning, the stator resistance, rotor resistance, and motor leakage inductance will be detected.

However, mutual inductance and no-load current of the motor cannot be measured, and users can input the corresponding values according to the motor nameplate.

3.3 Operating Status

3-3-1 Power-On Initialization

During the inverter power-on process, the system first performs initialization. The LED displays "2000" and all indicator lights are on. After the initialization is completed, the inverter enters standby mode.

3-3-2 Standby

When stopped or running, various status parameters can be displayed. The display of these parameters can be selected bit by bit using function codes P7.03 and P7.04 (running parameters), and P7.05 (stopped parameters). The definitions of each bit are described in the explanations of function codes P7.03, P7.04, and P7.05.

3-3-3 Motor Parameter Auto-Learning

For details, please refer to the detailed description of function code P2.37.

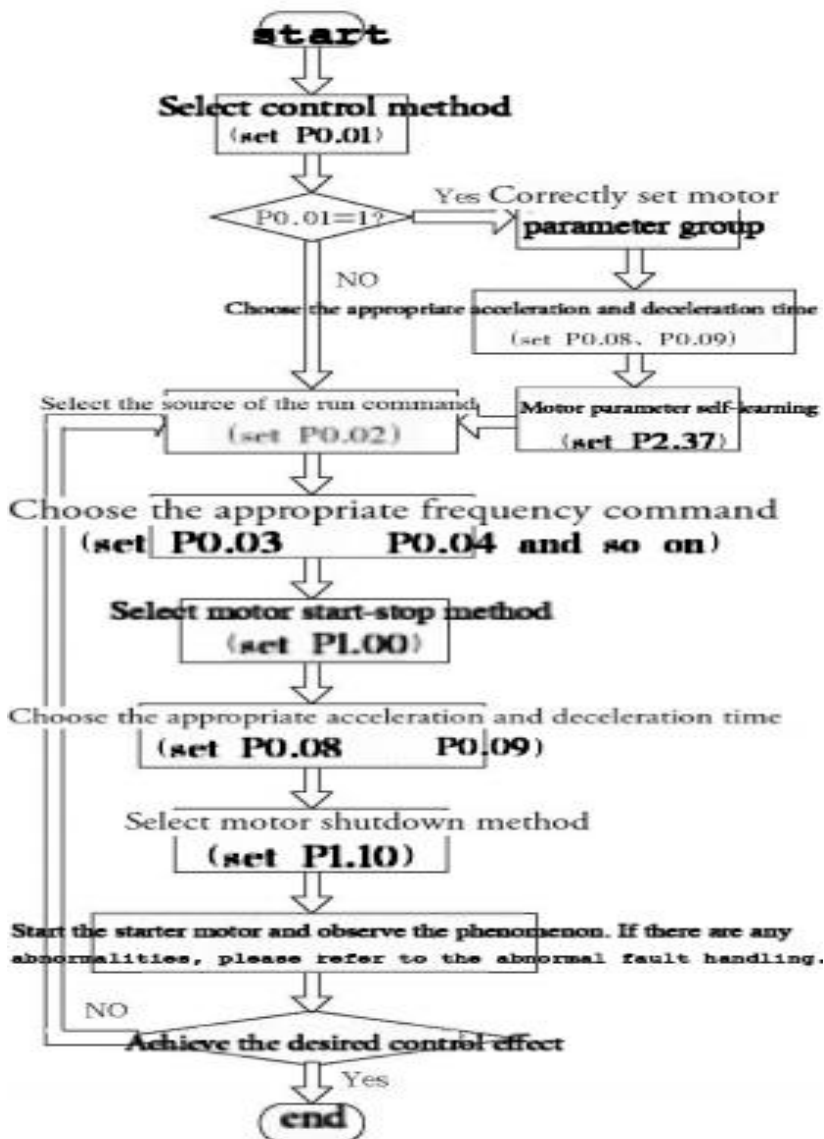
3-3-4 Running

In the running state, there are a total of 29 status parameters that can be selected for display, including: running frequency, set frequency, bus voltage, output voltage, output current, running speed, output power, output torque, etc. Whether to display a parameter is selected bit by bit (converted to binary) using function codes P7.03 and P7.04. Use the left/right shift keys to switch through the selected parameters in sequence.

3-3-5 Fault

The FC1000 series inverters provide various fault information. For details, please refer to the FC1000 series inverter faults and their countermeasures.

3.4 Quick debugging



Picture 3-3 Quick debug flowchart

Chapter 4 Functional Parameter Summary and Debugging Instructions

PP.00 set to a non-zero value, that is, the parameter protection password is set. In both the function parameter mode and the user parameter modification mode, the parameter menu can only be accessed after entering the correct password. To cancel the password, set PP.00 to 0. Group P and Group C are basic function parameters, and Group D is monitoring function parameters. The symbols in the function table are explained as follows:

"☆": Indicates that the parameter value can be changed whether the inverter is in a stopped or running state;

★": Indicates that the parameter value cannot be changed while the inverter is running;

●": Indicates that the parameter value is an actual detected recorded value and cannot be changed;

"*": Indicates that the parameter is a "manufacturer parameter" and is only to be set by the manufacturer; users are prohibited from operating it.

一、Basic Function Parameter Summary Table:

unction Cod	Name	Setting Range	Value
P0 Basic Function Group			
P0.01	Control Mode Selection	0: No PG vector control 1: With PG vector control 2: V/F control	0
P0.02	Run Command Channel Selection	1: Terminal Command Channel	1
P0.10	Maximum frequency	50.00Hz~600.00Hz	60.00Hz
P0.12	Upper limit frequency	Lower limit frequency P0.14 ~ Maximum frequency P0.10	60.00Hz
P0.14	Lower cutoff frequency	0.00Hz~Upper Limit Frequency P0.12	0.00Hz
P0.17	Door opening acceleration time	0.0s~6500.0s	0.6s
P0.18	Door opening deceleration time	0.0s~6500.0s	0.6s
P2 Motor Parameter Set			

Chapter 4 Functional Parameter Summary and Debugging Instructions

P1.00	Motor Type	0: General asynchronous motor	0
P1.01	Motor rated power	0.1kW~1000.0kW	Model confirmed
P1.02	Motor rated voltage	1V~2000V	Model confirmed
P1.03	Motor rated current	0.01A~655.35A (Inverter Power≤55kW)	Model confirmed
P1.04	Motor rated frequency	0.01Hz~Maximum frequency	Model confirmed
P1.05	Motor rated speed	1rpm~65535rpm	Model confirmed
P1.37	Self-learning selection	0: No operation 1: Static self-learning 2: Dynamic self-learning 3: Fully static self-learning	0
P3 Group			
P3.01	Increase in lift torque	P3.01 is upward torque increase C9.15 is downward torque increase	Change
P4 Group Input terminal			
P4.00	FWD terminal function selection	1: Forward rotation 2: Reverse rotation	1
P4.01	REV terminal function selection	8: Emergency stop - (free stop) 51: Photoelectric signal	2
P4.02	S1 terminal function selection	52: Radar signal 53: Mode switch	8
P4.03	S2 terminal function selection	(manual/automatic switch, jog/manual switch)	51
P4.04	S3 terminal function selection	54: Upper limit - normally closed 55: Lower limit - normally closed	52
P4.05	S4 terminal function selection	56: Upper-middle limit - normally closed 57: Lower-middle limit - normally closed	53
P4.06	S5 terminal function selection	58: Upper-upper limit - normally	56

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P4.07	S6 terminal function selection	open, rising in progress, when this switch is activated, stop immediately	57
P4.08	QEPA terminal function selection		54
P4.09	QEPB terminal function selection		55
P4.38	S-terminal effective mode selection 1	0: Active high 1: Active low Units: FWD Tens: REV Hundreds: S1 Thousands: S2 Ten-thousands: S3	00000
P4.39	S-terminal effective mode selection 2	0: Active high 1: Active low Units: S4 Tens: S5 Hundreds: S6 Thousands: QEPA Ten-thousands: QEPB	00000
Other parameters++			
P5.02	RA, RC Relay Output Function Selection	2: Fault 3: Brake output 8: Interlock: During operation or when the door is at the lower limit, the interlock output signal is valid 9: Linkage output: In automatic mode, when the radar signal opens the door, after automatic closing, the linkage output is valid; after maintaining C9.17, the linkage output is invalid 10: Upper limit 11: Lower limit 12: Opening 13: Closing	0
			3
P5.03	KA KC		0
P5.04	YO COM Output Function Selection		
P6.13	DC braking current when the machine is stopped	0%~100%	0.0s

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P6.14	DC braking time when stopped	0.0s~100.0s	0%
P7.09	Cumulative operating time	0h~65535h	
P7.13	Total power-on time	0h~65535h	
P8.16	Set cumulative power-on arrival time	0h~65000h	0h
P8.17	Set cumulative run arrival time	0h~65000h	0h
P8.19	Brake output frequency detection value	0.00Hz~Maximum frequency	1.50Hz
P8.20	Brake output frequency detection lag value	0.0%~100%	5.0%
D0 Group Basic monitoring parameters			
D0.30	Current pulse value		
D0.31	Gate machine working mode		
D0.33	Top stay timing		
D0.34	Low 16 bits of operation count		
D0.35	High 16 bits of operation count		
D0.34	Low 16 bits of maintenance count		
D0.35	High 16 bits of maintenance count		
C8 Group			
C8.00	Lower limit pulse value		
C8.01	Upper limit pulse value		

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C8.04	Automatic operation enable		1
C8.05	Bottom dwell time		10s
C9 Group			
C9.00	Position Source Selection	0: Upper and lower limit switches 1: AB quadrature encoder	0
C9.01	Door Closing Delay Time		8.0S
C9.02	Door Opening Frequency	5.00~ Maximum Frequency (P0.12)	50.00Hz
C9.03	Door Opening Deceleration Frequency		15.00Hz
C9.04	Door Closing Frequency	5.00~ Maximum Frequency (P0.12)	35.00Hz
C9.05	Door Closing Deceleration Frequency		15.00Hz
C9.06	Door Opening Deceleration Position		330
C9.07	Door Closing Deceleration Position		330
C9.08	Button Door Opening Position	0~100%	100%
C9.09	Radar Door Opening Position	0~100%	100%
C9.10	Position Tolerance Pulse	Upper limit, lower limit, allowable position deviation	100
C9.11	Encoder Disconnection Detection	1: Valid; 0: Invalid	1
C9.12	Learning Frequency		15.00Hz
C9.13	Door Opening Position Buffer		5
C9.14	Door Closing		18

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	Position Buffer		
C9.15	Lowering Torque Increase	P3.01 is upward and downward torque increase C9.15 is downward and upward torque increase	Change
C9.16	Limit Switch Rebound Method	0: Stop immediately; 1: Press the switch and then release	1
C9.17	Interlock Signal Hold Time	0.2~10.0s	1.0S
C9.18	Incremental encoder, function to detect over-limit on startup	0: Invalid, 1: Valid	0
C9.19	Timeout	0~300S	0
C9.20	Encoder count direction	Encoder counting direction	0
C9.21	Gantry work mode selection	0: Manual/Jog Switch 1: Manual/Automatic Switch 2: Manual on screen, terminal switch invalid 3: Automatic on screen 4: Jog on screen	0
C9.22	Photoelectric failure distance	0~65535	100
C9.23	Pulse count for encoder disconnection judgment	0~65535 0: Do not judge	5
C9.24	Encoder disconnection detection time		2.0S
C9.25	Reserved		
C9.26	Output automatic voltage regulation	0: Unregulated 1: Automatic regulation 2: Regulation during acceleration, other regulation 3: Unregulated during deceleration	1
C9.27	Limit switch mode, shutdown delay		1.0s

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C9.28	Maintenance frequency setting	0~65535 units are in K times	3000
PP Group User function code			
PP.00	User Password	Factory settings	0
	Set Range	0~65535	

Set PP.00 to any non-zero number to activate the password protection function. The next time you enter the menu, you must enter the correct password, otherwise you cannot view or modify the function parameters. Please remember the user password you set.

Set PP.00 to 00000 to clear the user password you set and disable the password protection function.

PP.01	Parameter Initialization		Factory settings	0
	Strange	0	No operation	
		1	Restore factory settings, excluding motor parameters	
		2	Clear record information	
		21	Set dedicated parameters for the gantry crane	

1、Restore factory settings, excluding motor parameters

After setting PP.01 to 1, most of the inverter's function parameters are restored to the factory default values, but the motor parameters, frequency command decimal point (P0.22), fault record information, accumulated running time (P7.09), accumulated power-on time (P7.13), and accumulated power consumption (P7.14) are not restored.

2. Clear record information

Clear the inverter's fault record information, accumulated running time (P7.09), accumulated power-on time (P7.13), and accumulated power consumption (P7.14).

二、Debugging Instructions

1、PP.01=21 Set as dedicated parameters for the gate machine

P4.00	FWD Terminal Function Selection	1: Forward rotation	1
P4.01	REV Terminal Function Selection	2: Reverse rotation	2
		8: Emergency stop - (free stop)	
P4.02	S1 Terminal Function Selection	51: Photoelectric signal	8
P4.03	S2 Terminal Function	52: Radar signal	51
		53: Mode switch (manual/automatic switch,	

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	Selection	jog/manual switch)	
P4.04	S3 Terminal Function Selection	54: Upper limit - normally closed 55: Lower limit - normally closed	52
P4.05	S4 Terminal Function Selection	56: Upper-middle limit - normally closed	53
P4.06	S5 Terminal Function Selection	57: Lower-middle limit - normally closed	56
P4.07	S6 Terminal Function Selection	58: Upper-upper limit - normally open, rising in progress, when this switch is activated, stop immediately	57
P4.08	QEPA Terminal Function Selection		54
P4.09	QEPB Terminal Function Selection		55
P0.02	Run Command	1: Terminal Command Channel	1
P0.17	Acceleration Time	0.0s~6500.0s	0.6S
P0.18	Deceleration Time	0.0s~6500.0s	0.6S
P3.01	Rising Torque Boost	P3.01 is upward torque increase	Change
C9.15	Falling Torque Boost	C9.15 is downward torque increase	Change
C9.19	Timeout	0~300S	30.0

2. Self-learning of the door position (effective when C9.00=1):

Method: Terminals 'FWD REV Emergency Stop' are effective simultaneously, hold for 2 seconds to enter learning mode; Learning process:

a) Lower limit learning: Press the up and down buttons to move the door to the lower limit, press the manual automatic open button, and the lower limit learning is completed;

b) Upper limit learning: Press the up and down buttons to move the door to the upper limit, press the manual automatic open button, then press the UP button, and the upper limit learning is completed; the upper limit pulse value is automatically recorded.

c) If the upper limit protection is enabled, press the up button to raise the door until it hits the upper limit switch, and the learning is completed. If the upper limit protection is not enabled, switch to manual automatic mode to complete the learning.

Chapter 5 Fault code

5-1 Fault Alarm and Countermeasures

The FC1000 inverter has multiple warning messages and protective functions. Once a fault occurs, the protective function is triggered, the inverter stops output, the inverter fault relay contacts operate, and the fault code is displayed on the inverter display panel. Before seeking service, users can first perform a self-check as prompted in this section, analyze the cause of the fault, and find a solution. If the cause falls within the reasons described inside the dashed box, please seek service by contacting the distributor from whom you purchased the inverter or directly contacting our company.

In the fault information, OUOC indicates a hardware over current or over voltage signal. In most cases, OUOC alarms are caused by hardware over voltage faults.

Fault 1 Name	Inverter Unit Protection
Operation Panel Display	OC
Fault Cause Investigation	1. Inverter output circuit short-circuit 2. Motor and inverter wiring too long 3. Module overheating 4. Loose internal inverter wiring 5. Main control board malfunction 6. Drive board malfunction 7. Inverter module malfunction
Fault Handling Measures	1. Eliminate external faults 2. Install a reactor or output filter 3. Check whether the air duct is blocked, whether the fan is working properly, and resolve any problems 4. Properly connect all cables 5. Seek technical support 6. Seek technical support 7. Seek technical support
Fault 2 Name	Accelerated over current
Operation Panel Display	OC1

Fault Cause Investigation	1. There is grounding or short circuit in the inverter output circuit 2. The control mode is vector control and parameter identification has not been performed 3. Acceleration time is too short 4. Manual torque boost or V/F curve is not suitable 5. Voltage is too low 6. Starting the motor while it is rotating 7. Sudden load applied during acceleration 8. Inverter is undersized
Fault Handling Measures	1. Eliminate external faults 2. Perform motor parameter identification 3. Increase acceleration time 4. Adjust manual lifting torque or V/F curve 5. Set the voltage to the normal range 6. Choose speed tracking start or start after the motor has stopped 7. Cancel sudden load addition 8. Select an inverter with a higher power rating
Fault 3 Name	Deceleration over current
Control panel display	OC2
Fault Cause Investigation	1. There is a ground or short circuit in the output loop of the inverter 2. The control method is vector control and no parameter identification has been conducted 3. Deceleration time is too short 4. Voltage is too low 5. Sudden load is applied during deceleration 6. No braking unit or braking resistor is installed
Fault Handling Measures	1. Eliminate peripheral faults 2. Perform motor parameter identification 3. Increase deceleration time 4. Adjust the voltage to the normal range 5. Cancel sudden load application 6. Install a braking unit and resistor
Fault 4 Name	Constant-speed over current
Control panel display	OC3

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Fault Cause Investigation	1. There is grounding or short circuit in the inverter output circuit 2. The control mode is vector control and parameter identification has not been performed 3. Voltage is low 4. Whether an abrupt load is applied during operation 5. The inverter is undersized
Fault Handling Countermeasures	1. Eliminate external faults 2. Perform motor parameter identification 3. Adjust the voltage to the normal range 4. Cancel sudden load 5. Select a frequency converter with a higher power rating
Fault 5 Name	Accelerated over voltage
Control panel display	OU1
Troubleshooting the Cause of the Fault	1. Input voltage is too high 2. External force drives the motor during acceleration 3. Acceleration time is too short 4. No braking unit and braking resistor installed
Fault Handling Measures	1. Adjust the voltage to the normal range 2. Cancel this additional power or install a braking resistor 3. Increase the acceleration time 4. Install a braking unit and resistor
Fault 6 Name	Deceleration over voltage
Control panel display	OU2
Fault Cause Investigation	1. Input voltage is too high 2. External force drives the motor during deceleration 3. Deceleration time is too short 4. Brake unit and braking resistor are not installed
Fault Handling Measures	1. Adjust the voltage to the normal range 2. Cancel this additional power or install a braking resistor 3. Increase deceleration time 4. Install a braking unit and resistor
Fault 7 Name	Constant-speed over voltage
Operation panel display	OU3

Troubleshooting causes of malfunction	1. Input voltage is too high 2. External force is causing the motor to run during operation
Malfunction handling countermeasures	1. Adjust the voltage to the normal range 2. Either cancel this additional power or install a braking resistor

Fault 8 Name	Control power failure
Operation Panel Display	POF
Fault Cause Investigation	1. The input voltage is not within the range specified by the standards
Fault Handling Measures	1. Adjust the voltage to within the specified range
Fault 9 Name	Under voltage Fault
Operation Panel Display	LU
Fault Cause Investigation	1. Instantaneous power outage 2. Inverter input voltage not within the specified range 3. Abnormal bus voltage 4. Rectifier bridge and buffer resistor abnormal 5. Drive board abnormal 6. Control board abnormal
Fault Handling Measures	1. Reset fault 2. Adjust voltage to normal range 3. Seek technical support 4. Seek technical support 5. Seek technical support 6. Seek technical support
Fault 10 Name	Inverter overload
Operation Panel Display	OL2

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Fault Cause Investigation	1. Whether the load is too large or the motor is stalled 2. The frequency converter is undersized
Fault Handling Measures	1. Reduce the load and check the motor and mechanical condition. 2. Choose a frequency converter with a higher power rating.
Fault 11 Name	Motor overload
Operation Panel Display	OL1
Fault Cause Investigation	1. Whether the motor protection parameter P9.01 is set appropriately 2. Whether the load is too heavy or the motor is blocked 3. The frequency converter is undersized
Fault Handling Measures	1. Set this parameter correctly 2. Reduce the load and check the motor and mechanical condition 3. Choose a variable frequency drive with a higher power rating

Fault 12 Name	Input Phase Loss (Retained)
Operation Panel Display	LI
Fault Cause Investigation	1. Three-phase input power is abnormal 2. Drive board is abnormal 3. Surge protection board is abnormal 4. Main control board is abnormal
Fault Handling Countermeasures	1. Check and eliminate any issues in the peripheral circuits 2. Seek technical support 3. Seek technical support 4. Seek technical support
Fault 13 Name	Output phase loss
Control panel display	LO
Fault Cause Investigation	1. The lead from the inverter to the motor is abnormal 2. The inverter's three-phase output is unbalanced when the motor is running 3. Drive board abnormal 4. Module abnormal

Fault Handling Measures	1. Eliminate external faults 2. Check whether the three-phase motor winding is normal and eliminate faults 3. Seek technical support 4. Seek technical support
Fault 14 Name	Module overheating
Control panel display	OH
Fault Cause Investigation	1. Ambient temperature is too high 2. Air duct blockage 3. Fan malfunction 4. Module thermistor failure 5. Inverter module failure
Fault Handling Countermeasures	1. Lower the ambient temperature 2. Clean the air duct 3. Replace the fan 4. Replace the thermistor 5. Replace the inverter module

Fault 15 Name	External fault
Operation Panel Display	EF
Fault Cause Investigation	1. Input external fault signals through the multi function terminal S
Fault Handling Measures	1. Reset operation
Fault 16 Name	Communication failure
Operation Panel Display	CE
Troubleshooting the Cause of the Fault	1. The host computer is not working properly 2. The communication cable is not functioning properly 3. The communication parameters PD group settings are incorrect
Fault Handling Measures	1. Check the host computer wiring 2. Check the communication connection cable 3. Correctly set the communication parameters
Fault 17 Name	Contactor Fault
Operation panel display	rAy
Fault cause investigation	1. The driver board and power supply are not functioning properly 2. The contactor is not functioning properly
Fault handling countermeasures	1. Replace the driver board or power supply board 2. Replace the contactor Current detection fault
Fault 18 name	Current detection fault
Operation panel display	IE
Fault cause investigation	1. Check for abnormalities in the Hall device 2. Driver board fault
Fault handling countermeasures	1. Replace the Hall device 2. Replace the driver board

Fault 19 Name	Motor self-learning fault
Operation Panel Display	TE
Fault Cause Investigation	1. Motor parameters are not set according to the nameplate 2. Parameter identification process timed out
Fault Handling Measures	1. Set motor parameters correctly according to the nameplate
Fault 20 Name	2. Check the wires from the inverter to the motor
Operation Panel Display	Reserved
Fault Cause Investigation	Reserved
Fault Handling Measures	Reserved
Fault 21 Name	EEPROM Read/Write Failure
Operation Panel Display	EEP
Fault Cause Investigation	1. EEPROM Chip Damage
Fault Handling Measures	1. Replace the Main Control Board
Fault 22 Name	Inverter Hardware Failure
Operation Panel Display	OUOC
Fault Cause Investigation	1. Over voltage exists 2. Over current exists
Fault Handling Measures	1. Handle according to over voltage fault 2. Handle according to over current fault
Fault 23 Name	Ground short-circuit fault
Operation Panel Display	GND
Fault Cause Investigation	1. Motor short circuit to ground
Fault Handling Measures	1. Replace the cable or motor
Fault 26 Name	Cumulative operating time has reached a fault

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Control panel display	END1
Fault Cause Investigation	1. Cumulative operating time reaches the set value
Fault Handling Countermeasures	1. Use the parameter initialization function to clear record information
Fault 29 Name	Cumulative power-on time reaches fault
Operation Panel Display	END2
Fault Cause Investigation	1. Cumulative power-on time reaches the set value
Fault Handling Countermeasures	1. Use the parameter initialization function to clear record information

Fault 30 Name	Load Shedding Fault
Operation Panel Display	LOAD
Fault Cause Investigation	1. The inverter operating current is less than P9.64
Fault Handling Countermeasures	1. Check whether the load has been disconnected or whether the P9.64 and P9.65 parameters are set according to the actual operating conditions.
Fault 31 Name	PID Feedback Lost During Operation Fault
Operation Panel Display	PIDE
Fault Cause Investigation	1. The PID feedback is less than the set value of PA.26
Fault Handling Countermeasures	1. Check the PID feedback signal or set PA.26 to an appropriate value.
Fault 40 Name	Step Wave Current Limiting Fault
Operation Panel Display	CBC
Fault Cause Investigation	1. Whether the load is too large or the motor is stalled 2. The frequency converter is undersized
Fault Handling Countermeasures	1. Reduce the load and check the motor and mechanical condition. 2. Choose a frequency converter with a higher power rating.

Fault 42 Name	Speed deviation too large fault
Operation Panel Display	ESP
Fault Cause Investigation	1. Parameter identification was not performed 2. The speed deviation is too large, and the detection parameters P9.69 and P9.60 are set improperly
Fault Handling Countermeasures	1. Perform motor parameter identification 2. Set inspection parameters reasonably according to actual conditions
Fault 43 Name	Motor over speed fault
Operation Panel Display	OSP
Fault Cause Investigation	1. Parameter identification has not been performed
Fault Handling Countermeasures	
Fault 51 Name	1. Parameter identification has not been performed
Operation Panel Display	
Fault Cause Investigation	Retain
Fault Handling Countermeasures	Retain
-S	

5.2 Common faults and their handling methods

During the use of the frequency inverter, you may encounter the following fault situations. Please refer to the following methods for simple fault analysis:

Common faults and their handling methods

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Serial Number	Malfunction phenomenon	Possible cause	Solution
1	No display when powered on	No or too low grid voltage; switch power supply failure on the inverter drive board; rectifier bridge damage; inverter buffer resistor damage; control board or keypad failure; disconnection between the control board and the drive board or keypad;	Check the input power; check the bus voltage; seek manufacturer service;
2	Power on displays '2000'	Poor contact in the connection between the driver board and the control board; damage to related components on the control board; motor or motor wires shorted to ground; Hall sensor failure; mains voltage too low;	Seek manufacturer services;
3	Power on display 'GND' alarm	Motor or output line short-circuited to ground; Inverter damaged;	Measure the insulation of the motor and output lines with a megohmmeter; seek manufacturer service;

4	When powered on, the inverter displays 'Normal'. After running, it shows '2000' and immediately stops.	Fan damage or blockage; short circuit in the peripheral control terminal wiring;	Replace the fan; eliminate external short-circuit faults;
5	Frequent OH warnings (IGBT overheating) fault	Carrier frequency is set too high. Fan is damaged or air duct is blocked. Internal components of the inverter are damaged.	Reduce the carrier frequency (P0.17). Replace the fan and clean the air duct. Seek manufacturer service.
6	After the inverter is running, the motor does not rotate.	Motors and motor wires; incorrect inverter parameter settings (motor parameters); poor contact between the drive board and the control board connections; drive board malfunction;	Recheck the wiring between the inverter and the motor; replace the motor or clear mechanical faults; check and reset motor parameters;
7	The S-terminal has failed.	Parameter setting error; external signal error; control board failure;	Check and reset the relevant parameters of the P5 group; reconnect the external signal lines; seek manufacturer service;
8	Reserved		
9	The inverter frequently reports over current and over voltage faults.	Incorrect motor parameter settings; inappropriate acceleration and deceleration time; load fluctuations;	Reset the motor parameters or perform motor self-learning; Set appropriate acceleration and deceleration time; Seek manufacturer service;

10	Power on (or run) reports rAY	The contactor did not engage;	Check if the contactor cables are loose; check if the contactor is faulty; check if the 24V power supply of the contactor is faulty; seek manufacturer service;
----	-------------------------------	-------------------------------	---

5.3 Gantry Crane Inverter Fault Code

Fault code	Description
CS	Run timeout fault
SU	Limit switch abnormal
PG	Encoder disconnected
End	Time up.
POFF	Control power failure
DL1	VCC short circuit or over current
DL2	24V short circuit or over current

Appendix 1 FC1000 Modbus Communication Protocol

The FC1000 series inverters provide an RS485 communication interface and support the Modbus communication protocol. Users can achieve centralized control through a computer or PLC, set inverter operating commands through this communication protocol, modify or read function code parameters, and read the inverter's operating status and fault information, etc.

1. Agreement Content

This serial communication protocol defines the information content and usage format in serial communication. This includes: the master polling (or broadcast) format; the encoding method of the master, including: function codes for the requested actions, transmitted data, and error checking, etc. The slave's response also adopts the same structure, including: action confirmation, returned data, and error checking, etc. If an error occurs when the slave receives information, or it cannot complete the action requested by the master, it will generate a fault message as a response to the master.

2. Application Method

The inverter connects to a "single-master multiple-slave" PC/PLC control network equipped with an RS485 bus.

3. Bus Structure

(1) Interface Method

RS485 hardware interface

(2) Transmission Method

Asynchronous serial, half-duplex transmission mode. At any given time, only one device, either master or slave, can send data while the other can only receive data. During serial asynchronous communication, the data is sent in message format, frame by frame.

(3) Topology

Single-master multiple-slave system. The slave address range is 1~247, with 0 as the broadcast address. Each slave address in the network must be unique.

4. Protocol Description

The FC1000 series inverter communication protocol is an asynchronous serial master-slave Modbus communication protocol. Only one device (the master) in the network can establish the protocol (referred to as "query/command"). Other devices (slaves) can only respond to the master's "query/command" by providing data or taking actions according to the master's "query/command". The master refers to personal computers (PC), industrial control devices, or programmable logic controllers (PLC), while the slave refers to the FC1000 inverter. The master

can communicate with a single slave individually or broadcast information to all slaves. For the master's individual "query/command" access, the slave must return a message (referred to as a response). For broadcasts sent by the master, slaves are not required to feedback a response to the master.

5.Communication Data Structure

The Modbus protocol communication data format of the FC1000 series inverters is as follows: Using RTU mode, message transmission must start with a pause interval of at least 3.5 character times.

At the network baud rate, diverse character timing is the easiest to achieve. The first field transmitted is the device address. The transmissible characters are hexadecimal 0...9, A...F. Network devices continuously monitor the network bus, including during the idle intervals. When the first field (address field) is received, each device decodes it to determine if it is intended for itself. After the last transmitted character, a pause of at least 3.5 character times signifies the end of the message. A new message can begin after this pause.

The entire message frame must be transmitted as a continuous stream. If there is a pause of more than 1.5 character times before the frame is completed, the receiving device will discard the incomplete message and assume that the next byte is the address field of a new message. Similarly, if a new message begins less than 3.5 character times after the previous message, the receiving device will consider it a continuation of the previous message. This will result in an error because the value in the final CRC field cannot be correct.

RTU Frame Format:

Frame Header	3.5 character times
Slave Address ADR	Communication address: 1~247
Command Code	03: Read slave parameters; 06: Write slave
Data Content DATA	Data content: function code parameter addresses, number of function code parameters, values of function code parameters, etc.
Data Content DATA	
.....	
Data Content	
CRC CHK High Byte	Test value: CRC value.
CRC CHK Low Byte	
END	3.5 character times

CMD (Command Instruction) and DATA (Data Word Description)

Command code: 03H, read N words (Word) (can read up to 12 words) For example: continuously read 2 consecutive values from the starting address F105 of the inverter with the slave address 01

Host command information

ADR	01H
CMD	03H
Starting Address High Byte	F1H
Starting Address Low Byte	05H
Number of Registers High	00H
Number of Registers Low	02H
CRC CHK Low Byte	The CRC CHK value needs to be calculated
CRC CHK High Byte	

Slave response information

When PD.05 is set to 0:

ADR	01H
CMD	03H
Number of bytes high byte	00H
Number of bytes low byte	04H
Data F002H high byte	00H
Data F002H low byte	00H
Data F003H high byte	00H
Data F003H high byte	01H
CRC CHK low byte	The CRC CHK value needs to be
CRC CHK high byte	

When PD.05 is set to 1:

ADR	01H
CMD	03H
Number of Bytes	04H
Data F002H High Byte	00H
Data F002H Low Byte	00H
Data F003H High Byte	00H
Data F003H Low Byte	01H
CRC CHK Low Byte	The CRC CHK value needs to be
CRC CHK High Byte	

Command code: 06H Write a word, for example: write 3000 (BB8H) to the F00AH address of the slave at address 05H inverter. Host command information

ADR	05H
CMD	06H
Data Address High Byte	F0H
Data Address Low Byte	0AH
Data Content High Byte	0BH
Data Content Low Byte	B8H
CRC CHK Low Byte	The CRC CHK value needs to be
CRC CHK High Byte	

Slave response information

ADR	02H
CMD	06H
Data Address High Byte	F0H
Data Address Low Byte	0AH
Data Content High Byte	13H
Data Content Low Byte	88H
CRC CHK Low Byte	The CRC CHK value needs to be
CRC CHK High Byte	

Verification Method — CRC Verification Method: CRC (Cyclical Redundancy Check) uses the RTU frame format. The message includes an error detection field based on the CRC method. The CRC field checks the contents of the entire message. The CRC field is two bytes long and contains a 16-bit binary value. It is calculated by the transmitting device and then added to the message. The receiving device recalculates the CRC of the received message and compares it with the value in the received CRC field. If the two CRC values are not equal, it indicates that there was a transmission error.

CRC is initially set to 0xFFFF, and then a procedure is called to process each continuous 8-bit byte of the message with the current value in the register. Only the 8-bit data of each character is effective for the CRC; the start bit, stop bit, and parity bit are invalid.

During the CRC generation process, each 8-bit character is separately XORed with the contents of the register, and the result is shifted toward the least significant bit, with the most significant bit filled with 0. The LSB is extracted for checking; if the LSB is 1, the register is XORed separately with a preset value; if the LSB is 0, no operation is performed. This process is repeated 8 times. After the last bit (the 8th bit) is completed, the next 8-bit byte is separately XORed with the current value of the register. The final value in the register is the CRC value after all the bytes in the message have been processed.

When adding CRC to a message, the low byte is added first, followed by the high byte. The simple CRC function is as follows:

```

unsigned int crc_cal_value(unsigned char *data_value,unsigned char data_length)
{
int i;
unsigned int crc_value=0xffff;
while(data_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 section pertains to communication content used to control the operation of the inverter, inverter status, and related parameter settings. Read and write function code parameters (some function codes cannot be changed and are only for manufacturer use or monitoring use): Function code parameter address marking rules:

The parameter address is represented using the function code group number and number:

High byte: F0~FF (P group), A0~AF (C group), 70~7F (D group)

Low byte: 00~FF

For example: P3.12 is represented as F30C in address notation.

Note: PF group: parameters cannot be read or changed; D group: parameters can only be read, not changed.

Some parameters cannot be changed while the inverter is running; some parameters cannot be changed regardless of the inverter's status. When changing function code parameters, attention must also be paid to the parameter range, unit, and related instructions.

Additionally, since frequent storing of EEPROM reduces its lifespan, some function codes do not need to be stored in communication mode, and changing the

value in RAM is sufficient.

If it is a P group parameter, to achieve this function, simply change the high byte F of the function code address to 0. If it is a C group parameter, changing the high byte A of the function code address to 4 achieves the same function. The corresponding function code address notation is as follows:

High byte: 00~0F (P group), 40~4F (C group)

Low byte: 00~FF

For example: function code P3.12, not stored in EEPROM, is represented as 030C; function code C0.05, not stored in EEPROM, is represented as 4005. This address representation can only perform RAM write operations and cannot be read; when read, it is an invalid address.

Shutdown/Operation Parameters Section:

Parameter address	Parameter Description
1000	*Communication settings (-10000~10000) (decimal)
1001	Operating frequency
1002	Bus voltage
1003	Output voltage
1004	Output current
1005	Output power
1006	Output torque
1007	Operating speed
1008	S input flag
1009	MO1 output flag
100A	FIV voltage
100B	FIC voltage
100C	Reserved
100D	Counter value input
100E	Length value input
100F	Load speed
1010	PID settings
1011	PID feedback
1012	PLC step
1013	PULSE input pulse frequency, unit 0.01kHz
1014	Reserved
1015	Remaining running time
1016	FIV voltage before calibration
1017	FIC voltage before calibration
1018	Reserved

1019	Linear speed
101A	Current power-on time
101B	Current running time
101C	PULSE input pulse frequency, unit 1Hz
101D	Communication set value
101E	Reserved
101F	Main frequency X display
1020	Auxiliary frequency Y display

****Note:**

The communication settings are percentages of relative values, with 10000 corresponding to 100.00% and -10000 corresponding to -100.00%. For data with frequency dimension, this percentage is relative to the maximum frequency (P0.12); for data with torque dimension, this percentage is P2.10.

Control commands are input to the inverter: (write only)

Command word address	Command Functions
2000	0001: Forward Operation
	0002: Reverse Operation
	0003: Forward Jog
	0004: Reverse Jog
	0005: Free Stop
	0006: Deceleration Stop
	0007: Fault Reset

Read inverter status: (Read-only)

Command word address	Status Word Functions
3000	0001: Forward Rotation
	0002: Reverse Rotation
	0003: Stop

Parameter lock password verification: (if the return is 8888H, it indicates that the password verification is successful)

Command word	Enter password content
1F00	*****

Command Address	Command Functions
2001	BIT0: (Reserved)
	BIT1: (Reserved)
	BIT2: YA-YB-YC Output Control
	BIT3: Reserved
	BIT4: YOR Output Control

Simulated output FOV control: (write only)

Command Address	Order content
2002	0~7FFF represents 0%~100%

Simulated output FOC control: (write only)

Command Address	Order content
2003	0～7FFF represents 0%～100%

Pulse (PULSE) Output Control: (Write Only)

Command Address	Order content
2004	0～7FFF represents 0%～100%

Inverter Fault Description:

Inverter Fault Address	Inverter Fault Information
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8000	No Fault 0001: Inverter Unit Protection 0002: Acceleration Over current 0003: Deceleration Over current 0004: Constant Speed Over current 0005: Acceleration Over voltage 0006: Deceleration Over voltage 0007: Constant Speed Over voltage 0008: Control Power Failure 0009: Under voltage Fault 000A: Inverter Overload 000B: Motor Overload 000C: Reserved 000D: Output Phase Loss 000E: Module Overheating 000F: External Fault 0010: Communication Abnormality 0011: Contactor Abnormality 0012: Current Detection Fault 0013: Motor Self-Learning Fault 0014: Reserved 0015: Parameter Read/Write Abnormality 0016: Inverter Hardware Fault 0017: Motor Ground Short Circuit Fault 0018: Reserved 0019: Reserved 001A: Runtime Reached 001B: Reserved 001C: Reserved 001D: Power-On Time Reached 001E: Load Loss 001F: PID Feedback Loss During Operation 0028: Fast Current Limiting Timeout Fault 0029: Motor Switching Fault During Operation 002A: Excessive Speed Deviation 002B: Motor Over speed 002D: Motor Over temperature 005A: Encoder Line Count Setting Error 005B: Encoder Not Connected 005C: Initial Position Error 005E: Speed Feedback Error
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Communication Fault Address	Fault Function Description
8001	0000: No fault 0001: Password error 0002: Command code error 0003: CRC check error 0004: Invalid address 0005: Invalid parameter 0006: Parameter change invalid 0007: System locked 0008: EEPROM operation in progress

PD Group Communication Parameter Description

PD.00	Baud rate	Factory settings	0005
	Set Range	Units 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 the data transmission rate between the host computer and the frequency converter. Note that the baud rate set on the host computer and the frequency converter must be the same; otherwise, communication cannot occur. The higher the baud rate, the faster the communication speed.。

PD.01	Data format	Factory settings	0
	Set Range	0: No parity: data format <8,N,2> 1: Even parity: data format <8,E,1> 2: Odd parity: data format <8,O,1> 3: No parity: data format <8,N,1>	

The data format set by the host computer and the frequency converter must be consistent; otherwise, communication cannot take place.

PD.02	Local Address	Factory settings	1
	Set Range	1~247, 0 is the broadcast address	

When the local address is set to 0, it is the broadcast address, enabling the master computer broadcast function. The local address is unique (except for the broadcast address), which is the basis for achieving point-to-point communication between the master computer and the inverter.

PD.03	Response delay	Factory settings	2ms
	Set Range	0~20ms	

Response delay: refers to the intermediate interval between the completion of data reception by the frequency converter and the sending of data to the host computer. If the response delay is shorter than the system processing time, the response delay is based on the system processing time. If the response delay is longer than the system processing time, after the system finishes processing the data, it must wait until the response delay time is reached before sending the data to the host computer.

PD.04	Communication timeout	Factory settings	0.0 s
	Set Range	0.0 s (Invalid) 0.1~60.0s	

When this function code is set to 0.0 s, the communication timeout parameter is invalid. When this function code is set to a valid value, if the interval between one communication and the next exceeds the communication timeout, the system will report a communication fault error (CE). Under normal circumstances, it is usually set to invalid. In systems with continuous communication, setting this parameter allows monitoring of the communication status.

PD.05	Communication Protocol Selection	Factory settings	0
	Set Range	0: Non-standard Modbus protocol 1: Standard Modbus protocol	

PD.05=1: Select the standard Modbus protocol.

PD.05=0: When issuing a read command, the slave returns one more byte than the standard Modbus protocol. For details, refer to the "Communication Data Structure" section of this protocol.

PD.06	Communication Read Current Resolution	Factory settings	0
	Set Range	0: 0.01A 1: 0.1A	

Used to determine the output unit of the current value when reading communication output current.