CT3000-G SERIES

AC MOTOR SPEED CONTROLLER DRIVER

OPERATION USER MANUAL

NWT DRIVE

Ver No.: EN-017-01

NWT
Since - 1991

Preface

Firstly, thanks for your choice of CT3000-G series Frequency Inverter!

CT3000-G series Frequency Inverter, as a general current vector Frequency Inverter with high performance, can control asynchronous motor and permanent magnet synchronous motor and support various PG cards and its functions are powerful. CT3000-G series Frequency Inverter can be used as drive for spinning, paper making, wire drawing, machine tool, package, food, fan, water pump and various automation production equipments.

This manual introduces the functions and operation of CT3000-G series Frequency Inverter, involving in product selection, parameter setting, operation, debugging, maintenance, inspection and so son. Please understand this manual well before operation. The equipment supporting manufacturer should deliver the equipment with this manual to the end user to provide references for subsequent operation.

Notes
♦ To introduce detailed parts of the product, the legend in this manual sometimes shows the state of the product without outer cover or safety housing. When the product is used, please make sure that the outer cover or housing has been installed well. The machine is operated according to the manual. ♦ The legend in this manual is only for illustration and may be different from the real product that you order. ♦ We are committed to continuous improvement of the product, continuous upgrading of product functions. This document is subject to change without notice. ♦ If there is any failure in your operation, please contact any regional managers of the company in different regions or directly contact customer service center of the company.

Introduction

Compared with previous Frequency Inverters, CT3000-G series Frequency Inverter is mainly improved in the following aspects:

Rich control methods

- Torque control
- Sensorless flux vector control (SFVC)
- Closed-loop vector control (CLVC)
- Voltage/Frequency (V/F) control

Various encoders

Support differential encoder, open collector encoder, rotary transformer, etc.

The vector control algorithm of brand new non-speed sensor

Compared with brand new SVC (vector control of non-speed sensor), CT3000-G Frequency Inverter can bring better low-speed stability and stronger low-frequency load capacity. SVC torque control is also supported. There are further rich functions and the additional functions of CT3000-G on the basis of previous version re listed as follows.

Function	Description
Motor protection against overheat	After IO expansion card is selected, AI3 can receive the input from motor temperature sensor (PT100, PT1000) to achieve motor overheat protection.
Rapid current limit	Prevent the Frequency Inverter from frequency overcurrent
Multi-motor switch	There are four sets of motor parameters and four motor switching can be controlled
Recover user parameter	This function supports that the customer saves the parameters or recovers parameters.
AIAO with higher accuracy	Based on delivery calibration (or field calibration), AIAO accuracy range is within 20mv
User customized parameter display	The user can customize functional parameter to be displayed

User change parameter display	The user can check the modified functional parameters
Optional troubleshooting method	After specific failure occurs, the user may determine the actions of Frequency Inverter: free stop, deceleration stop and continuous operation. The frequency for continuous running can be also selected.
PID parameter switch	Two sets of PID parameters are available and can be switched by the terminal or freely switched according to deviation
PID feedback loss detection	Set PID feedback loss detection value and realize the protection during PID running
DIDO positive and negative logic	The user can set the positive and negative logic for DIDO
DIDO response delay	The user can set DIDO response delay time
Timing run	Support timing run in maximum range of 6,500 minutes

Unpacking inspection:

Please confirm the following items carefully when unpacking:

Confirm whether the type and the rated value as noted on the nameplate are consistent with the goods you order. The container contains your ordered product, product certificate, user manual and warranty.

Check whether the product is damaged in transportation. In case of any leakage or damage, please contact us or your supplier immediately.

First use:

The user who uses this product for the first time should read this manual carefully. If you have any doubt about the functions and performance, please consult our technical supporters to get support. It is helpful for the correct operation of this product.

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12	How to save the set value of current function code	See Section 4.18
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33	Software filter time setting of DI port signal	See function code F4-10
34	Response delay setting of DI signal	See Section 4.10 for the setting of function codes F4-35, F4-36 and F4-37
35	Whether DI signal logic can be changed or not	See function codes F4-38 and F4-39
36	How to set the count of high-speed pulse input	See the setting of function code F4-04 and DI5 port
37	How to set external fault stop	Define the function of DI terminal as “11” or “33”
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40	Attentions in the long-wire application between the motor and the Frequency Inverter	The electric reactor can be set at the output end of Frequency Inverter, as shown in Section 7.3
41	Analog AI signal calibration	See AI calibration of function code AC group
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43	The dimension of AI internal read	The hundred-mark system % is taken as the unit internally and invisible for the user
44	How to achieve PID closed-loop control	See Section 4.8.4
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46	When is PG card used?	See Section 4.14
48	The communication protocol supported by the Frequency Inverter	See Section 4.15
49	Can multiple function codes or parameters be read through in communication	Not allowed, only one function code value or running parameter can be read in one time
50	Definition of MODBUS communication access address of function code of the Frequency Inverter	See Appendix C.1
51	Running parameters of Frequency Inverter for communication inquiry	See Appendix C.2
52	Start and stop of Frequency Inverter for communication control	See Appendix C.2
53	Operation frequency of the Frequency Inverter for communication control	See Appendix C.2
54	The dimension of operation frequency transmitted to the Frequency Inverter	It is the percentage with respect to maximum frequency (F0-10), 0 corresponds to 0% and 10000 corresponds to 100.00%

Chapter 1 Safety Information and Precautions

The safety is defined as below:

In this manual, the safety precautions are classified into two kinds:

 Danger: The danger resulting from illegal operation may result in serious injury and even death;

 Attentions: The danger resulting from illegal operation may result in moderate injury or minor injury as well as equipment damage;

Please understand this chapter well and make sure to comply with safety precautions as required hereof in the installation, debugging and maintenance of this system. Or else, any injury or loss resulting from illegal operation is not related to our company.

1.1 Safety matters

Service stage	Safety level	Matters
Before installation	 Danger	◆ When water in control system, missing component or damaged component occurs in unpacking, please never begin installation! ◆ If the packing list is not in line with the name of real object, please never begin installation!
	 Warning	◆ Please handle the equipment gently in transport, otherwise, the equipment may be damaged! ◆ Please never use the damaged driver or the Frequency Inverter with missing parts, otherwise, there may be an injury! ◆ Please never touch or control the components of system with your hands, or the static damage may occur!
During installation	 Danger	◆ Please install the equipment on the metal or other flame retardants; keep the equipment away from the combustibles, or else, the fire alarm may occur! ◆ Please never screw the set bolt for equipment component arbitrarily, especially the bolt with red mark!
	 Warning	◆ Please prevent lead end or the screw from falling into the Frequency Inverter, or else, the Frequency Inverter may be damaged! ◆ Please install the Frequency Inverter in a place with low vibration and free

Service stage	Safety level	Matters
		from direct sunshine. ◆ When two or more Frequency Inverters are set in the same cabinet, please pay attention to the installation site and guarantee heat dissipation.
At wiring	 Danger	◆ The construction must be implemented by the professional electric engineering personnel, or else, the unexpected danger may occur! ◆ The Frequency Inverter and the power supply must be separated by the circuit breaker, or else, the fire alarm may occur! ◆ Please ensure that the power supply is in zero energy state before wiring, or else, the electric shock may occur! ◆ The Frequency Inverter shall grounded appropriately according to the standard, or else, the electric shock may occur!
	 Warning	◆ Please never connect the power supply to the output terminal (U, V, W) of the Frequency Inverter. Pay attention to the mark on the terminal block to avoid inappropriate wiring, or else, the driver may be damaged! ◆ Please never directly connect the brake resistance between (+) terminal of DC bus and (-) terminal of DC bus, or else, the fire alarm may occur! ◆ Please see the manual for the diameter of lead wire, or else, there may be an accident ! ◆ The encoder must be set with the shielded wire and it is required to ensure that the single end of shield is grounded stably!
Before power-on	 Danger	◆ Please confirm whether the voltage class of power supply is in line with the rated voltage class of Frequency Inverter; confirm whether wiring position on the input terminal (R, S, T) and output terminal (U, V, W) is correct; inspect whether there is short circuit in the peripheral circuit connected to the Frequency Inverter and whether the circuit is reliable, or else, the Frequency Inverter may be damaged! ◆ It is not necessary to conduct the withstand voltage test on any parts of the Frequency Inverter, because the Frequency Inverter has passed this test before delivery. Or else, there may be an accident!
	 Warning	◆ The Frequency Inverter must be covered well before power supply, or else, the electric shock may occur! ◆ The wiring of all peripherals must be in line with this manual and shall be implemented in the method given in the manual, or else, there may be an accident!

Service stage	Safety level	Matters
After power-on	 Danger	◆ Please never open the cover after power supply, or else, the electric shock may occur! ◆ Please never touch any input/output terminal of the Frequency Inverter, or else, the electric shock may occur!
	 Warning	◆ If parameter identification is required, please prevent the danger of personal injury when the motor is operated, or else, there may be an accident! ◆ Please never change the default parameters of Frequency Inverter arbitrarily, or else, the equipment may be damaged!
During operation	 Danger	◆ The non-professional technicians shall not test the signal when the machine is in operation, or else, personal injury or equipment damage may be caused! ◆ Please never touch cooling fan or discharge resistance to measure temperature, or else, the burn may be caused!
	 Warning	◆ Keep the Frequency Inverter in operation away from any impurities, or else, the equipment may be damaged! ◆ Please never start or stop the Frequency Inverter by making the contactor on or off, or else, the equipment may be damaged!
During maintenance	 Danger	◆ The person who does not accept professional training shall not provide the maintenance of Frequency Inverter, or else, the personal injury or equipment damage may be caused! ◆ It is not allowed to conduct equipment repair or maintenance when the power is on, or else, the electric shock may occur! ◆ Please ensure that power supply for the frequency convertor has been off for 10 minutes before the driver is maintained or repaired, or else, residual electric charge on the capacitor may result in personal injury! ◆ Prior to the maintenance of Frequency Inverter, please ensure that the power supply for the Frequency Inverter has been disconnected completely and safely. ◆ All detachable plug-ins must be detached under condition that the power is off! ◆ Parameter setting and inspection must be implemented after the Frequency Inverter is replaced.

Service stage	Safety level	Matters
	Warning	◆ The rotating motor will feed power supply to the Frequency Inverter so that the Frequency Inverter will be electrified even if the motor is stopped and the power supply is cut off. Prior to the maintenance of Frequency Inverter, please ensure that the motor and the Frequency Inverter are disconnected safely.

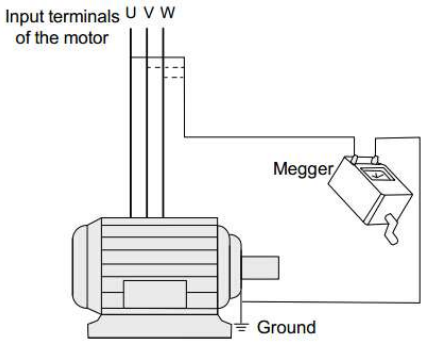
1.2 Precautions

1) The requirements for leakage protector RCD

The equipment may bring the large leakage current which flows through the protective grounding conductor. Please install Type B leakage protector (RCD) in the primary side of the power supply. In selection of leakage protector (RCD), transient and steady earth leakage current that may occur shall be taken into account when the equipment is started and operated. Please select the exclusive RCD which can restrain the higher harmonic or the general RCD with large residual current.

2) Insulation inspection of the motor

The insulation inspection for the motor is required in regular inspection, before reuse after a long time or for the first use in order to prevent that the Frequency Inverter is damaged due to insulation failure of motor windings. The motor must be disconnected from the Frequency Inverter in insulation inspection. It is recommended to adopt 500V mega meter and the measured insulation resistance shall not be less than 5MΩ.



3) Thermal protection of the motor

If the motor in use is not matched with the rated capacity of Frequency Inverter, especially when the rated power of Frequency Inverter is more than the rated power of motor, make sure to adjust the parameters for motor protection in the Frequency Inverter or additionally mount the thermo relay in front of the motor to protect the motor.

4) Operation above power frequency

This Frequency Inverter will provide the output power which ranges from 0Hz to 3200Hz. If the user requires operation above 50Hz, please consider the bearing capacity of mechanical device.

5) Vibration of mechanical device

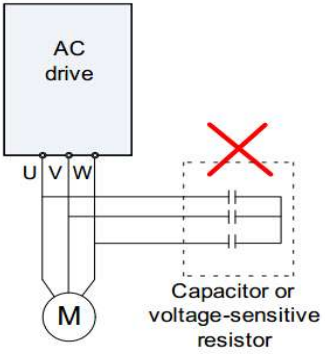
The Frequency Inverter may meet the mechanical resonance point of load device at the point of some output frequency, which may be avoided by setting the hopping frequency parameter in Frequency Inverter.

6) Heat emission and noise of the motor

The output voltage of frequency convertor is PWM wave which contains certain harmonic, therefore, the temperature rise, noise and vibration of the motor will be slightly increased if compared with the operation in power frequency.

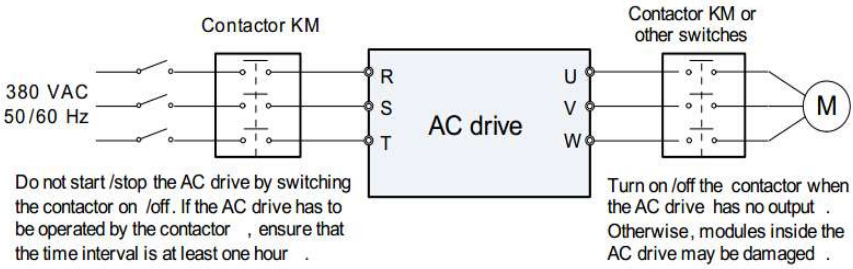
7) Pressure sensing device set in output side or the capacitor with improved power factor

The output of Frequency Inverter is PWM wave. If the capacitor with improved power factor or the pressure sensing device for lightning protection is mounted in the output side, the transient overcurrent of Frequency Inverter or any damage to the Frequency Inverter may occur. Please never use.



8) The contactor and other switching devices used for input/output terminal of Frequency Inverter

If the contactor is installed between power supply and the Frequency Inverter, it is not allowed to start or stop the Frequency Inverter by this contactor. If the Frequency Inverter must be started or stopped by the contactor, the interval shall be at least one hour. The frequent charging and discharging may reduce the service life of the capacitor in the Frequency Inverter. If the contactor and other switching devices are installed between the output terminal and the motor, the Frequency Inverter shall be started or stopped when there is no output, or else, the module in the Frequency Inverter may be damaged.



9) Service beyond the rated voltage

The Frequency Inverter shall not be beyond the allowable working voltage, the components of the Frequency Inverter may be damaged. If necessary, the related boost device or dropping device shall be used for the voltage transformation of power supply before input into the Frequency Inverter.

10) Change three-phase input into two-phase input

It is not allowed to change three-phase Frequency Inverter into two-phase service, or else, the failure or any damage to the Frequency Inverter may occur.

11) Lightning impulse protection

The lightning overcurrent protection device is set in the Frequency Inverter so that the Frequency Inverter has certain self-lightning protection capability, but the user shall set a lightning protection device in front of the Frequency Inverter at the point with much lightning.

12) Altitude and de-rating

In a region with altitude more than 1,000m, the Frequency Inverter will have bad heat dissipation effect resulting from thin air. The de-rating will be required if necessary. Please contact use for technical consultation in respect of this situation.

13) Some special purposes

If the user has to use the method beyond the wiring diagram as specified in this manual, e.g. DC bus, please contact us for consulting.

14) Notes in the scrapping of Frequency Inverter

Electrolytic capacitor in the main loop and electrolytic capacitor on the printed board may result in explosion in case of burning. The plastic parts in burning may generate poisonous gas. Please dispose the plastic parts as industrial reuse.

15) About adaptive motor

- The standard adaptive motor is four-pole cage asynchronous induction motor. If it is not the said motor, please select the Frequency Inverter according to the rated current of the motor.
- For non-variable frequency motor, cooling fan and rotor spindle are in coaxial connection. The cooling effect of fan will be weakened as the rotating speed is reduced, as a result, the exhaust fan

shall be mounted additionally or the variable frequency motor shall be used if the motor is overheated.

- The standard parameter of adaptive motor has been built in the Frequency Inverter. It is necessary to identify motor parameter or modify the default value to get close to actual value as much as possible according to actual situations, or else, the running effect and protection performance may be affected;
- The short circuit in the cable or in the motor may result in alarm by the Frequency Inverter and even explosion, therefore, the insulation short-circuit test on the motor or the cable installed for the first time shall be conducted and such test is also often required in routine maintenance. It is noted that the Frequency Inverter must be completely separated from the tested part in the said test.

Chapter 2 Product Information

2.1 Naming and nameplate identification

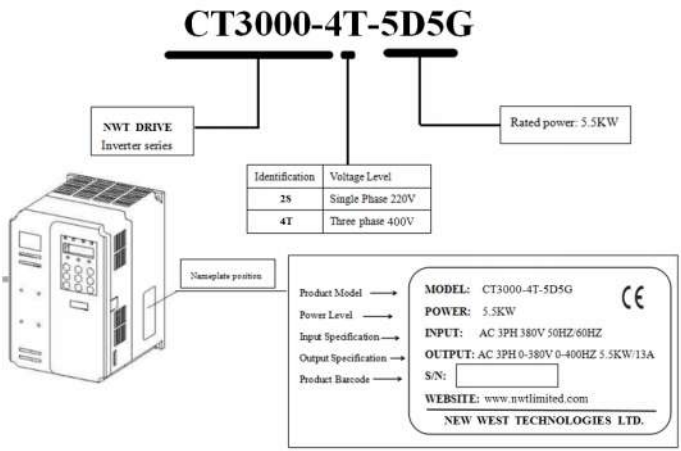


Fig. 2-1 Naming and nameplate identification

2.2 All the components of CT3000-G series Frequency Inverter

According to voltage class and power level, CT3000-G series Frequency Inverter can be generally classified into two structure types, namely, plastic structure and sheet metal structure.

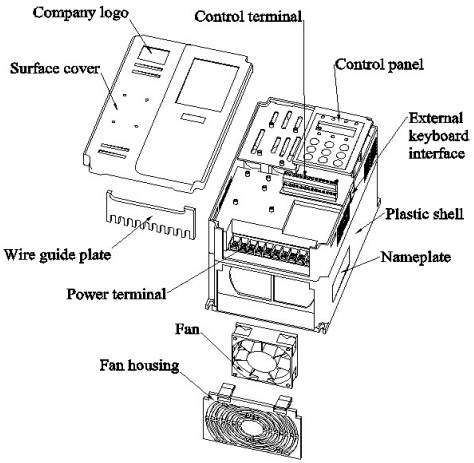


Fig. 2-2 The outline drawing of plastic structure of CT3000-G series Frequency Inverter

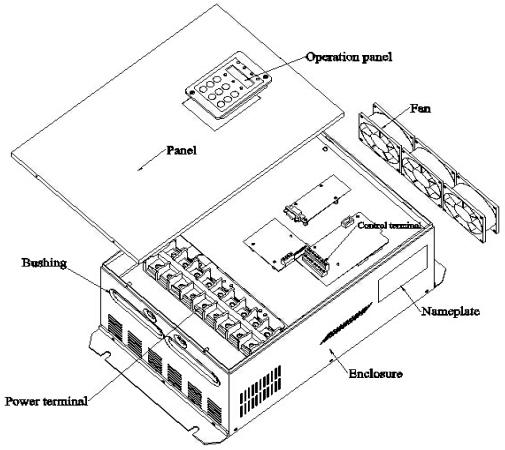


Fig. 2-3 The outline drawing of sheet metal structure of CT3000-G series Frequency Inverter

According to voltage class and power level, CT3000-G enclosure structure types are listed as the following table:

Voltage & Power Class	Housing Type
Single-phase 220V	
0.4kW ～2.2kW	Plastic housing
Three-phase 380V	
0.75kW ～15kW	Plastic housing
18.5kW ～400kW	Sheet metal housing

2.3 Basic technical specification

Table 2-1 Technical specification of CT3000-G series Frequency Inverter

Item		Specification
Standard functions	Maximum frequency	Vector control: 0～300Hz; V/F control: 0～3200Hz
	Carrier frequency	0.5kHz～16kHz The carrier frequency is automatically adjusted based on the load features.
	Input frequency resolution	Digital setting: 0.01Hz Analog setting: maximum frequency x 0.025%
	Control mode	• Sensorless flux vector control (SFVC) • Closed-loop vector control (CLVC) • Voltage/Frequency (V/F) control
	Starting torque	• G type: 0.5 Hz/150% (SFVC); 0 Hz/180% (CLVC)

Item		Specification	
		• P type: 0.5 Hz/100%	
Basic functions	Speed range	1:100 (SFVC)	1:1000 (CLVC)
	Constant-speed accuracy	± 0.5% (SFVC)	± 0.02% (CLVC)
	Torque control accuracy	± 5% (CLVC)	
	Overload capacity	• G type: 60s for 150% of the rated current, 3s for 180% of the rated current • P type: 60s for 120% of the rated current, 3s for 150% of the rated current	
	Torque boost	• Fixed boost • Customized boost 0.1%–30.0%	
	V/F curve	• Straight-line V/F curve • Multi-point V/F curve • N-power V/F curve (1.2-power, 1.4-power, 1.6-power, 、1.8-power, square)	
	V/F separation	Two types: complete separation; half separation	
	Acceleration /deceleration curve	• Straight-line ramp • S-curve ramp Four groups of acceleration/deceleration time with the range of 0.0–6500.0s	
	DC braking	DC braking frequency: 0.00Hz~maximum frequency Braking time: 0.0s~36.0s Braking action current value: 0.0%–100.0%	
	JOG control	JOG frequency range: 0.00–50.00 Hz JOG acceleration/deceleration time: 0.0–6500.0s	
	Simple PLC and multi-speed operation	It implements up to 16 speeds via the simple PLC function or combination of DI terminal states.	
	Onboard PID	It realizes process-controlled closed loop control system easily.	
	Automatic 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.	
	Quick current limiting	Maximize overcurrent failure and protect the Frequency Inverter in normal operation	
	Torque limit and control	It can limit the torque automatically and prevent frequent over current tripping during the running process.	

Item		Specification
		Torque control can be implemented in the CLVC mode.
Individualized functions	High performance	Control of asynchronous motor and synchronous motor are implemented through the high-performance current vector control technology.
	Power dip ride through	The load feedback energy compensates the voltage reduction so that the AC drive can continue to run for a short time.
	Rapid current limit	It helps to avoid frequent overcurrent faults of the AC drive.
	Timing control	Time range: 0.0–6500.0 minutes
	Multi-motor switchover	Four motors can be switched over via four groups of motor parameters.
	Bus support	Support field bus: Modbus
	Motor overheat protection	The optional I/O extension card enables AI3 to receive the motor temperature sensor input (PT100, PT1000) so as to realize motor overheat protection.
	Multiple encoder types	Support difference, open collector and rotary transformer
Operation	Command source	Operation panel, control terminal and serial communication port are given Switch in various methods
	Frequency source	Various frequency sources: digital reference, analog voltage reference, analog current reference, pulse reference and serial port reference. The switching can be conducted in various methods
	Auxiliary frequency source	10 kinds of auxiliary frequency source. The auxiliary frequency jog and frequency synthesis can be achieved flexibly
	Input terminal	Standards: 7 digital input terminals, among which one support maximum high-speed pulse input of 100kHz 2 analog input terminals, among which one only supports voltage input of 0 ～10V and the other supports voltage input of 0 ～10V or current input of 4 ～20mA Expansion capability: 3 digital input terminals 1 analog input terminal, which supports voltage input of -10V ～10V and supports PT100/PT1000
Operation	Output terminal	Standards: 1 high-speed pulse output terminal (The open collector type is optional), supporting 0~100kHz square signal output 1 digital output terminal 1 relay output terminal

Item		Specification
		1 analog output terminal, supporting current output of 0~20mA or voltage output of 0~10V Expansion capability: 1 digital output terminal 1 relay output terminal 1 analog output terminal, supporting current output of 0~20mA or voltage output of 0~10V
Display and keyboard operation	LED display	Display the parameter
	Key lock and function selection	Realize partial or all key lock and define the action range of some keys to prevent misoperation
	Protection function	Short circuit test of electrified motor, input/output default phase protection, overcurrent protection, overvoltage protection, under voltage protection, overheat protection, overload protection, etc.
	Options	IO expansion card, differential input PG card, OC input PG card and rotary transformer PG card.
Environment	Service site	Indoor, free from direct sunshine, no dust, corrosive gas, combustible gas, oil fog, water vapor, drip or salt, etc.
	Altitude	Less than 1,000m
	Ambient temperature	－10℃～ ＋40℃ (Please use the equipment by de-rating at ambient temperature of 40℃~50 ℃)
	Humidity	Less than 95%RH, no water condensation
	Vibration	Less than 5.9m/s^2(0.6g)
	Storage temperature	－20℃～ ＋60℃
	IP grade	IP20
	Pollution level	PD2
	Power distribution system	TN , TT

2.4 Peripheral electrical elements and system composition

When CT3000-G series Frequency Inverter is used to control synchronous or asynchronous motor so as to form the control system, it is required to install various electrical elements in input/output side of Frequency Inverter to guarantee safe and stable system. In addition, CT3000-G series Frequency Inverter is provided with multiple options and expansion cards to realize various functions. The system composition of three-phase 220V/380V series with the power above 3.7kW is as shown in the following figure:

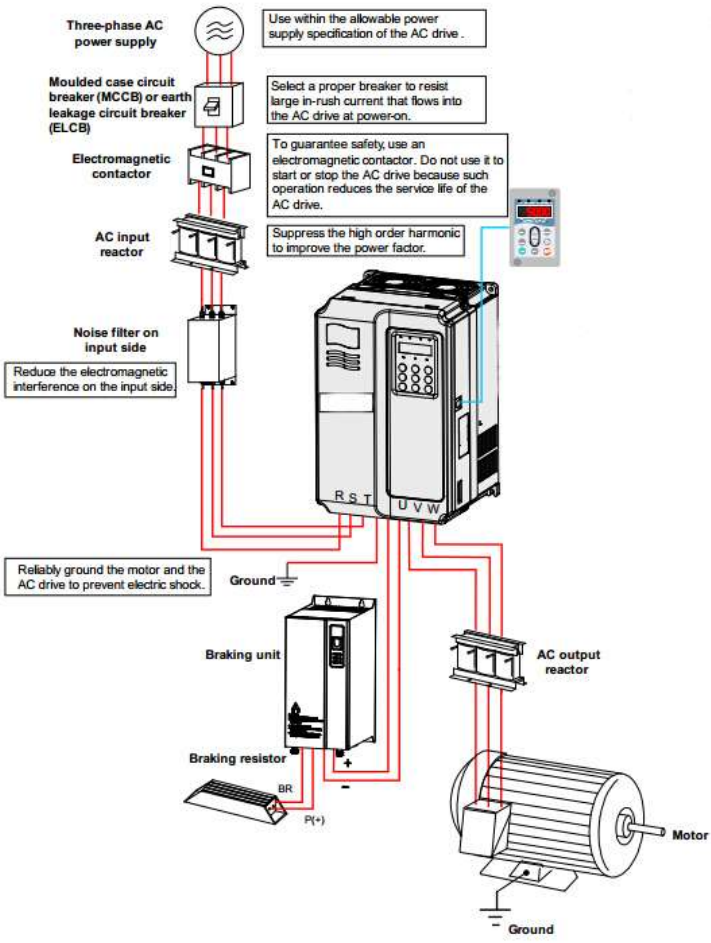


Fig. 2-4 380V series system composition

2.4.1 Operating instructions of peripheral electrical elements

Table 2-2 The operating instructions for peripheral electrical elements of CT3000-G Frequency Inverter

Accessories	Installation site	Functions
Air switch	The front end of input loop	Break current when the downstream equipment is in overcurrent
Contactor	Between input side of air switch and input side of Frequency Inverter	For power on/off of Frequency Inverter, it is not allowed to use the contactor to power on or power off the Frequency Inverter (Less than twice per minutes) or to start the Frequency Inverter directly.

AC input electric reactor	Input side of Frequency Inverter	Increase the power factor of input side; Eliminate higher harmonic in the input side and prevent that the equipment is damaged due to wave distortion of voltage; Eliminate input current imbalance resulting from phase imbalance of power supply.
EMC input filter	Input side of Frequency Inverter	Reduce external conduction and radiated interference of the Frequency Inverter; Reduce the conducted interference from power supply to the Frequency Inverter and improve the anti-interference capacity of Frequency Inverter.
DC reactor		Increase power factor in the input side; Improve the efficiency and thermal stability of the whole Frequency Inverter Effectively eliminate the influence of higher harmonic in the input side on the Frequency Inverter and reduce external conduction and radiated interference.
AC output reactor	Between output side of Frequency Inverter and the motor. Installation nearby the Frequency Inverter	The output side of Frequency Inverter generally contains many higher harmonics. When the motor is far from the Frequency Inverter, there is high capacitance distributed in the circuit. Therein, some harmonic may result in resonance in the loop and has an influence on two aspects: ◆ Damage insulation performance of the motor and damage the motor in a long time. ◆ Generate large leakage current and cause the frequent protection of Frequency Inverter. When the Frequency Inverter is 100m away from the motor, the output AC electric reactor shall be installed additionally.

1) It is not allowed to install the capacitor or the surge suppressor in the output side of Frequency Inverter, or else, the Frequency Inverter may be in failure or the capacitor and the surge suppressor will be damaged.
2) The input/output of Frequency Inverter (main loop) contains harmonic and may disturb communication equipment attached to the Frequency Inverter. The interference filter is thus installed to minimize interference.
3) See Chapter 8 Selection of peripheral equipment for the detailed information of peripheral equipment and options.

2.4.2 CT3000-G peripheral options list

The peripheral parts include braking unit, various function expansion cards, external manipulator and other equipment as listed in the following table. See the operating instructions of the accessories for specific usage. If the following accessories are selected, please note the related information in goods order.

Table 2-3 List of accessories for CT3000-G Frequency Inverter

Name	Model	Function	Remarks
Built-in braking unit		Single unit of 0.4kW ～ 2.2kW, three phases of 0.75kW～15kW, the built-in braking unit is standard configuration	
External braking unit		18.5kW and above external braking unit	
I/O expansion card	IO	3 digital inputs can be added and one analog voltage input AI3 is isolated analog which may be connected to PT 100 and PT1000; a relay output, a digital output and an analog output.	Suitable for 3.7kW and above model
Differential encoder	PG1	Interface card of differential rotary encoder, suitable for power supply of 5V	Suitable for the whole series
Rotary transformer	PG4	Suitable for the rotary transformer, excitation frequency of 10kHz and DB9 interface	Suitable for the whole series
Open collector encoder	PG5	Interface card of open collector encoder, with 1:1 frequency dividing output, suitable for power supply of 15V	Suitable for the whole series
External LED operation panel	EKEY	External LED display and the keyboard	General RJ45 interface for the whole series
Extended cable	ELINE	Standard 8-core network cable	1.5 m for standard configuration

Chapter 3 Mechanical and Electrical Installation

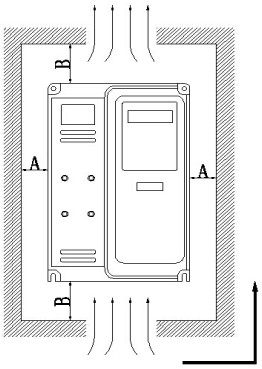
3.1 Mechanical installation

3.1.1 Installation conditions

1) Ambient temperature: The surrounding ambient temperature has a high influence on the service life of Frequency Inverter so that the working temperature of Frequency Inverter shall not exceed the allowable temperature range (-10 □～50□).
2) Mount the Frequency Inverter on the surface of flame retardant and keep enough space around for heat dissipation. The work of Frequency Inverter may bring lots of heat. Then use the screw to mount the Frequency Inverter vertically on the erection support.
3) Please install the Frequency Inverter in the place almost free from vibration. The vibration shall not be more than 0.6G. Particularly keep the Frequency Inverter away from the punch and other equipments.
4) Keep away from the place with direct sunshine, moisture and water drips.
5) Keep away from the site with corrective, combustible and explosive gas in the air.
6) Keep away from the site with oil dirt, much dust and much metal dust.
7) CT3000-G series plastic-shell product is a built-in product which must be installed in the final system. The final system shall be set with fireproof shell, electrical protective enclosure and mechanical protective enclosure according to local law and regulations as well as IEC standard requirements.

3.1.2 Installation space requirements

The installation space reserved for CT3000-G series Frequency Inverter will be different in requirements due to different power levels and the detailed information is as shown in the following figure:



Power level	Dimensional requirement	
0.4-15kW	A≥10mm	B≥100mm
18.5-22kW	A≥10mm	B≥200mm
22-30kW	A≥50mm	B≥200mm
37−315 kW	A≥50mm	B≥300mm

Fig. 3-1 Installation space requirements of CT3000-G Frequency Inverter of different power levels

The heat dissipation of CT3000-G series Frequency Inverter is bottom-up. When many Frequency Inverter are working, the parallel installation will be generally required. On the occasion that upper layer-lower layer

parallel installation is required, the heat of Frequency Inverter in lower layer may make the temperature of the equipment in upper layer rise so as to cause failure, and therefore, it is necessary to take measures e.g. installation of thermal insulation guide board.

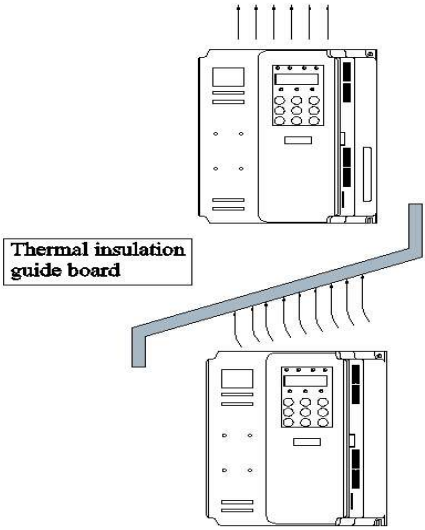


Fig. 3-2 Upper and lower installation drawing of thermal insulation guide board

3.1.3 Mechanical installation method and procedure

CT3000-G series can be classified into plastic structure and sheet metal structure according to voltage class and power level. There are two installation methods including wall-mounted type and embedded type (Installation outside the radiator cabinet) according to different installation and application occasions.

1. Wall-mounted type installation of plastic structure

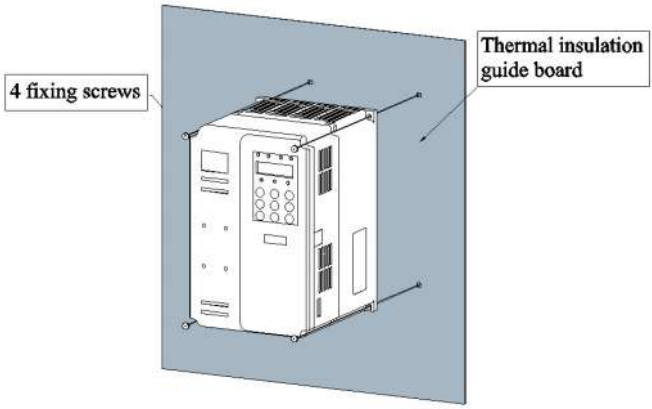


Fig. 3-3 Wall-mounted type installation diagram of plastic structure

2. The embedded type installation of plastic structure

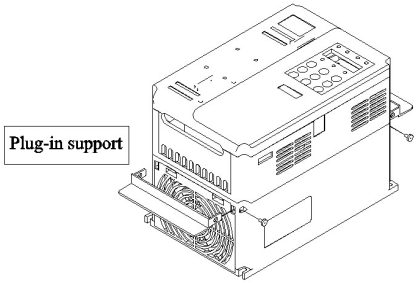


Fig. 3-4 Plug-in support diagram of plastic structure installation

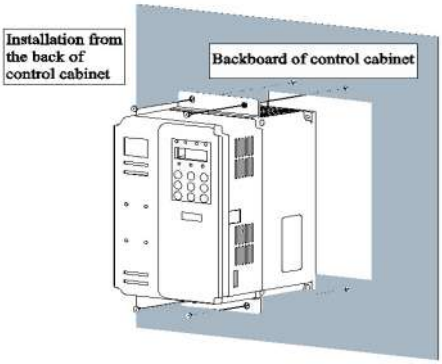


Fig. 3-5 The diagram of embedded Installation of plastic structure

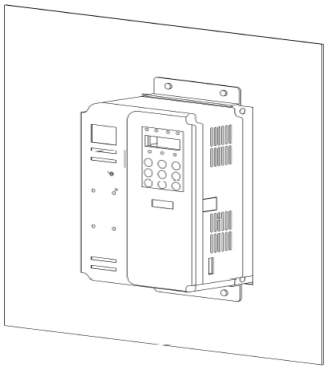


Fig. 3-6 Embedded installation effect chart of plastic structure

3. The wall-mounted installation of sheet metal structure

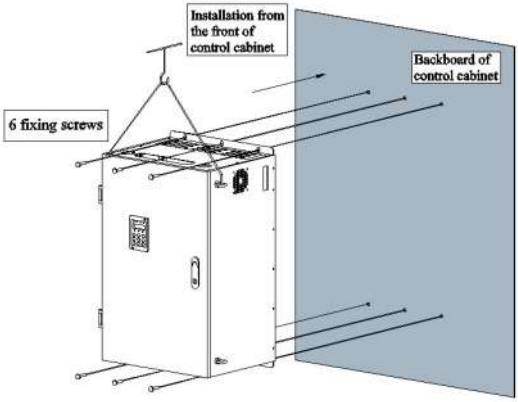


Fig. 3-7 The wall-mounted installation diagram of sheet metal structure

3.1.4 Precautions in mechanical installation

Please note the following points in the installation of J CT3000-G series Frequency Inverter:

1) The installation space is as shown in Fig. 3-1 and enough heat dissipation space shall be kept for the Frequency Inverter. Please consider the heat dissipation of other devices in the cabinet when the space is reserved.
2) Please conduct vertical installation of Frequency Inverter to help heat dissipation upwards. If there are many frequency converts in the cabinet, please install them in parallel. For the occasion where upper and lower installation is required, please see Fig. 3-2 and install thermal insulation guide board.
3) Make sure to adopt flame retardants as mounting bracket.
4) For application site with metal dust, it is recommended to install the radiator outside the cabinet. The space in the fully closed cabinet shall be maximized as much as possible.

3.1.5 Disassembly method of cover plate for Frequency Inverter

The cover plate for CT3000-G series Frequency Inverter shall be dismounted before wiring of main loop and control loop. See Fig. 3-12 for the cover plate with plastic shell and push out the hook of lower cover plate inwards by the tool and with the force.

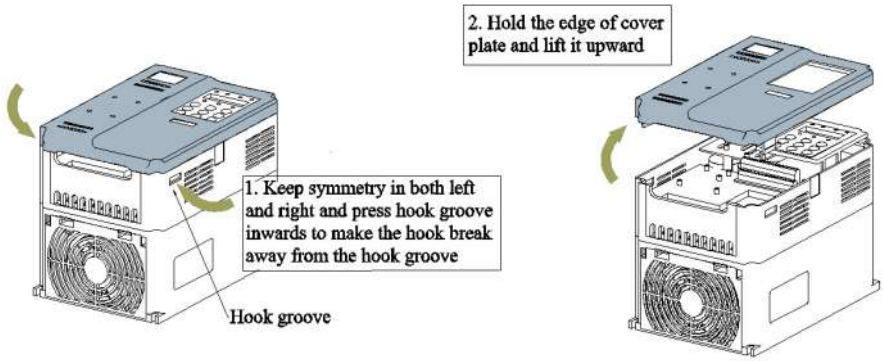


Fig. 3-8 Disassembly drawing of cover plate with plastic shell

The lower cover plate with sheet metal shell shall be disassembled, as shown in Fig. 3-13. Release the screw of lower cover plate with the tool directly.

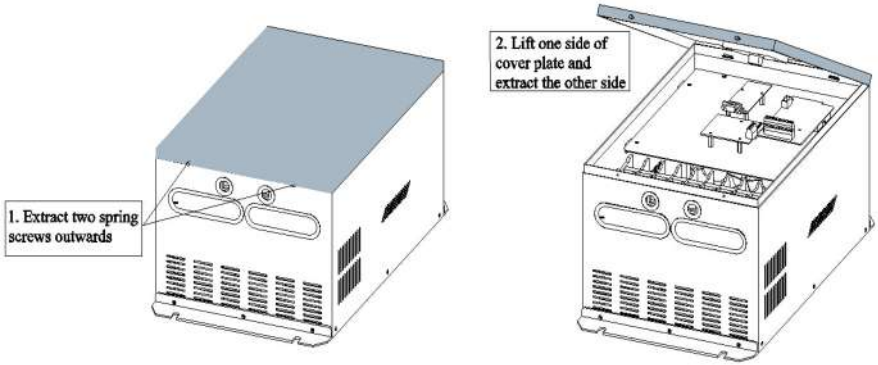


Fig. 3-9 Disassembly drawing of cover plate with sheet metal shell

Attentions: When the cover plate is disassembled, the falling of cover plate shall be prevented, or else, the equipment damage and personal injury may occur.

3.2 Electrical installation

3.2.1 Specification of main circuit terminal

Specification of main circuit terminal for Frequency Inverter:

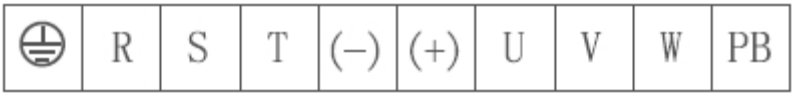


Fig. 0.75kW-7.5kW (Type 5010, 5020) main loop terminal

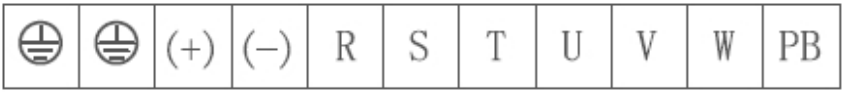


Fig. 11kW-15kW (Type 5030) main loop terminal

Fig. 3-12 18.5kW-30kW (Type 1040) main loop terminal

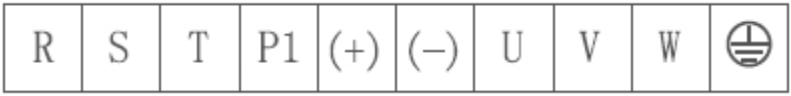


Fig. 3-13 37kW-55kW (Type 1050) main loop terminal.

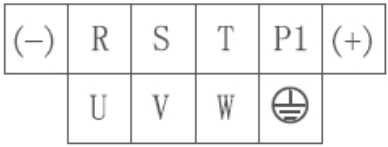


Fig. 3-14 75kW-90kW (Type 1050) main loop terminal (Upper incoming line and lower incoming line)

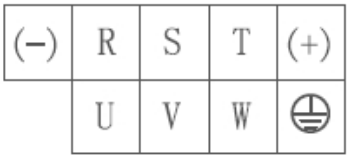


Fig. 3-15 110kW-132kW (Type 1060, 1070,1080) main loop terminal. (Upper incoming line and lower incoming line)

See Table 3-1 for the specification of main loop terminal for Frequency Inverter

Table 3-1 Specification of main loop terminal for Frequency Inverter

Terminal mark	Name	Description
R、S、T/L1、L2	Input terminal of three-phase power supply	Connections of DC input three-phase power supply, the single phase Frequency Inverter can be connected to any two lines among Line R, Line S and Line T
（+）、（-）	Positive and negative terminals of DC bus	Input point of common DC bus, connections of outlaid braking unit above 380V/18.5kW
（+）、PB	Terminal block of brake resistance	Connections of brake resistance below 380V/18.5kW
P1、（+）	Terminal block of outlaid reactor	Connections of the outlaid reactor
U、V、W	Terminal block of Frequency Inverter	Connect three-phase motor
⏚	Ground terminal	Ground terminal

3.2.2 The wiring of main loop of Frequency Inverter

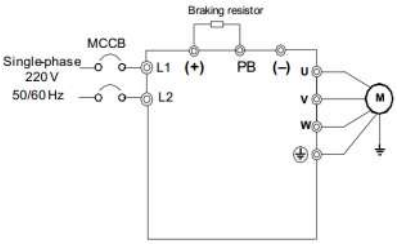


Fig. 3-16 Single 0.75-2.2kW wiring standard

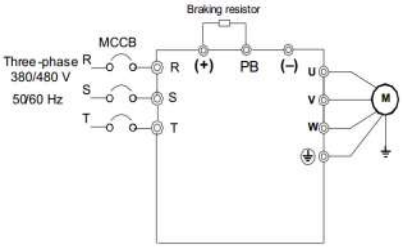


Fig. 3.17 Three-phase 0.75-15kW wiring standard

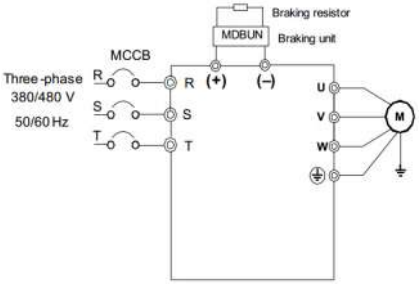


Fig. 3.18 Three-phase 18.5kW-30kW and 110KW above wiring standard

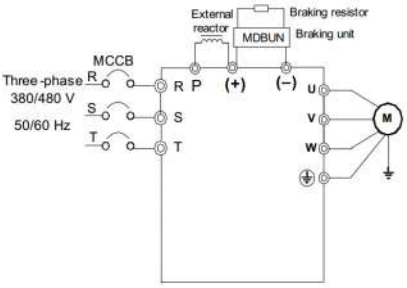


Fig. 3.19 Three-phase 37-90KW

Attentions in wiring:

1) Input power L1 and L 2 (Any two lines among Line R, Line S and Line T) or R, S and T:

- For input side wiring of Frequency Inverter, there is phase sequence requirement.
- External power wiring specification and installation mode shall conform to local law and regulations as well as IEC standard requirements.
- The standard input reactor is set in the Frequency Inverter above 110KW, thus, there is no DC reactor port.

2) DC bus (+), (-):

- There is residual voltage at Terminal (+) and Terminal (-) of DC bus when the power is off. Please make sure that the wiring is started after the power is off for 10 minutes, or else, the electric shock may occur.
- When outlaid braking subassembly is selected for 18.5kW, it is required that positive electrode or negative electrode shall not be connected in an inappropriate way, or else, the Frequency Inverter may be damaged or the fire may occur.

- The wiring length of braking unit shall not be more than 10m and it is required to use the twisted pair or compact double lines.
- It is not allowed to connect the brake resistance to DC bus directly, or else, the Frequency Inverter may be damaged and even the fire may occur.

3) The terminal block (+), PB of brake resistance

- Only when the model is below 18.5kW and the built-in braking unit of the model has been confirmed, the terminal block of braking unit will be effective.
- The brake resistance shall be selected according to the recommended value and its wiring distance shall be less than 5m, or else, the Frequency Inverter may be damaged.

4) Terminal block P1 and (+) of the outlaid reactor:

- If 37kW Frequency Inverter and the electric reactor are outlaid, the connection plate between Terminal P1 and Terminal (+) shall be removed in assembly and the electric reactor shall be connected between two terminals.

5) Output side U, V, W of Frequency Inverter:

- The external power wiring and installation mode shall conform to local law and regulations as well as relevant IEC standard requirements.
- The output side of Frequency Inverter shall not be connected to the capacitor or the surge absorber, or else, the frequent protection and even damage of the Frequency Inverter may be caused.
- When the motor cable is too long, the electrical resonance may be caused due to the influence of distributed capacitance so that the dielectric breakdown of motor may occur or there will be large leakage current to make Frequency Inverter in overcurrent protection. When the motor cable is longer than 100m, DC output reactor shall be additionally installed nearby the Frequency Inverter.

6) Ground terminal  PE:

- The terminal must be grounded reliably and the resistance of ground wire must be less than 0.1Ω, or else, the equipment may be in failure and even damaged.
- It is not allowed to use ground terminal  with the Terminal of null line of power supply together.
- The resistance of protective grounding conductor shall bear the possible large short-circuited current when there is a failure.
- The size of protective grounding conductor shall be selected according to the following table.

Sectional area of a phase line (S)	Minimum sectional area of the protective lead (Sp)
$S \leqslant 16mm^2$	S
$16mm^2 < S \leqslant 35mm^2$	$16mm^2$
$35mm^2 < S$	S/2

- The protective grounding conductor must be the cable in yellow and green.

7) The requirements for preceding protective device

- An appropriate protective device shall be installed on the input distribution circuit additionally and the protective device shall provide overcurrent protection, short-circuit protection, insulation blocking and other functions.
- The current capacity of power cable, overload capacity requirement of the system, short-circuit capacity of preceding power distribution for the equipment and other functions shall be considered when the protective device is selected. Please select the recommended value according to the recommendation table in Section 8.4.

3.2.3 Control terminal specification

The distribution diagram of control loop terminal is as follows:

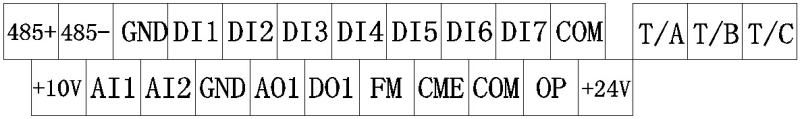


Fig. 3-20 The distribution diagram of control loop terminal

The function description of control terminal

Table 3-2 The function description of control terminal for CT3000-G series Frequency Inverter

Category	Terminal symbol	Terminal name	Function description
Power supply	+10V-GND	External connection of ＋10V power supply	Provide power supply of +10V externally, with maximize output current: 10mA It is generally used as working power supply for external potentiometer and the resistance range of potentiometer is 1kΩ~5k Ω
	+24V-COM	External connection of ＋24V power supply	+24V power supply is provided outwards and generally used as the working power supply for digital input/output terminal and the power supply for external sensor Maximum output current: 200mA
	OP	Input terminal of external power supply	The factory default is connection to＋24V When an external signal is used to drive DI1~DI7, OP shall be connected to external power supply and disconnected from＋24V power supply terminal
Analog input	AI1-GND	Analog Input Terminal 1	1. Input voltage range: DC 0V~10V 2. Input resistance: 22k Ω
	AI2-GND	Analog Input Terminal 2	1. Input range: DC 0V~10V/4mA~20mA, as determined by Jumper J8 on the control panel 2. Input resistance: 22kΩ for voltage input and 500Ω for current input.

Category	Terminal symbol	Terminal name	Function description
Digital input	DI1- OP	Digital Input 1	1. Optical coupler isolation, with bipolar input 2. Input resistance: 2.4kΩ 3. Voltage range in input level: 9V~30V
	DI2- OP	Digital Input 2	
	DI3- OP	Digital Input 3	
	DI4- OP	Digital Input 4	
	DI6- OP	Digital Input 6	
	DI7- OP	Digital Input 7	
	DI5- OP	High-speed pulse input terminal	Apart from the characteristics of DI1~DI7, it may be used as high-speed pulse input channel. Maximum input frequency: 100kHz
Analog output	AO1-GND	Analog Output 1	Jumper J5 on the control panel shall determine voltage or current output. Output voltage range: 0V~10V Output current range: 0mA~20mA
Digital output	DO1-CME	Digital Output 1	Optical coupler isolation, bipolar open collector output Output voltage range: 0V~24V Output current range: 0mA~50mA Note: Digital output CME is internally separated from digital input COM, but CME and COM have been short-circuited externally in delivery (At this moment, DO1 default is ＋24V drive). When DO1 is driven by external power supply, it is necessary to cut off the external short circuit between CME and COM
	FM- COM	High-speed pulse output	Function code F5-00 “FM terminal output mode” can be used as high-speed pulse output and maximum frequency can reach 100kHz; the high-speed pulse output can be used as pen collector output and is identical with DO1 specification.
Relay output	T/A-T/B	Closed terminal	Contact drive capacity: 25V ac，3A，COSØ=0.4 。 30Vdc ，1A
	T/A-T/C	Open terminal	
Secondary interface	J12	Interface for IO expansion card	28-core terminal, the interface for optional I/O expansion card
	J3	Interface for PG card	Options: OC, difference, rotary conversion and other interfaces

Category	Terminal symbol	Terminal name	Function description
	J7	External keyboard interface	External keyboard
Communication interface	485+, 485-	Modbus	Modbus communication interface, non-isolated output

3.2.4 Wiring mode of control loop of Frequency Inverter

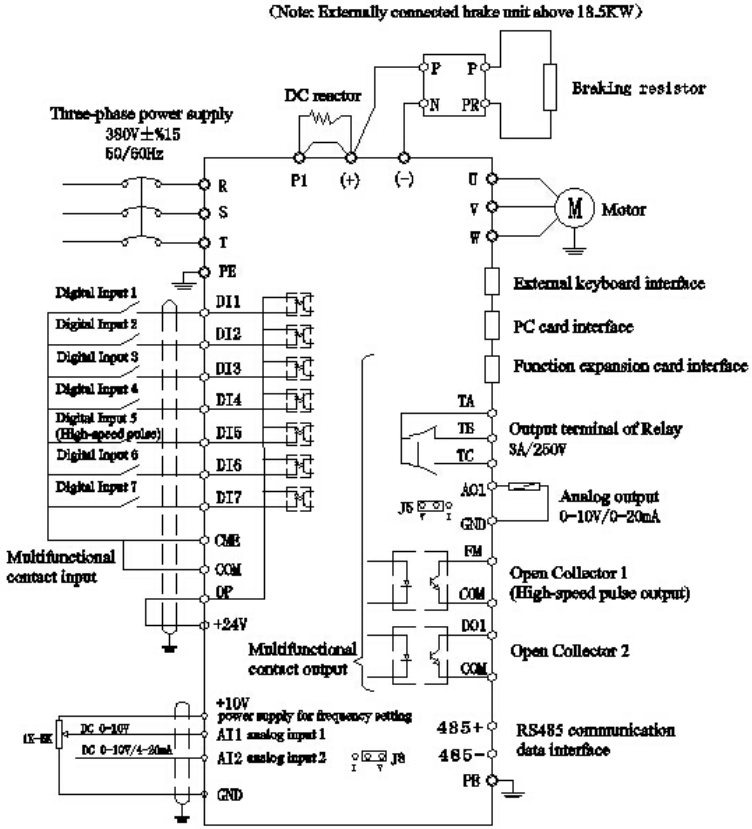


Fig. 3-21Control loop wiring mode of Frequency Inverter

Note: All CT3000-G series Frequency Inverters have the same control loop wiring mode. The said figure is a wiring diagram of three-phase 380V Frequency Inverter. Terminal ◎ indicates main loop terminal and Terminal ○ indicates control loop terminal.

1) AI analog input terminal:

The weak analog voltage signal is easily influenced by external factors, therefore, the shield cable is generally required and the wiring distance shall be as short as possible and no more than 20m, as shown in Fig. 3-22. In some situation where the analog signal is severely disturbed, it is required to set an additional filter capacitor or ferrite core in the analog signal source side, as shown in Fig. 3-23.

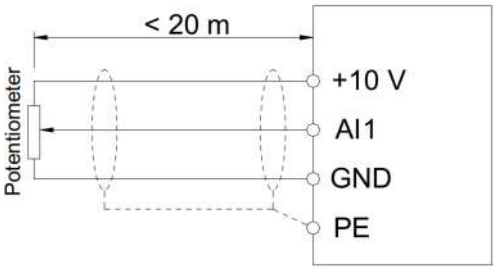


Fig. 3-22 The wiring diagram of analog input terminal

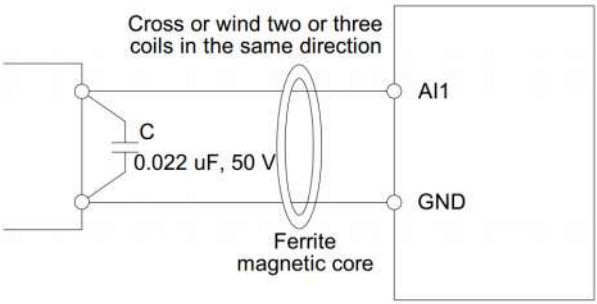


Fig. 3-23 The wiring diagram of analog input terminal processing

2) DI digital input terminal:

The shield cable is generally required and the wiring distance shall be as short as possible and no more than 20m. When active mode is used for drive, the necessary filtering measures shall be taken for the crosstalk of power supply. It is recommended to use contact control mode.

◆ Leakage-type wiring mode (NPN)

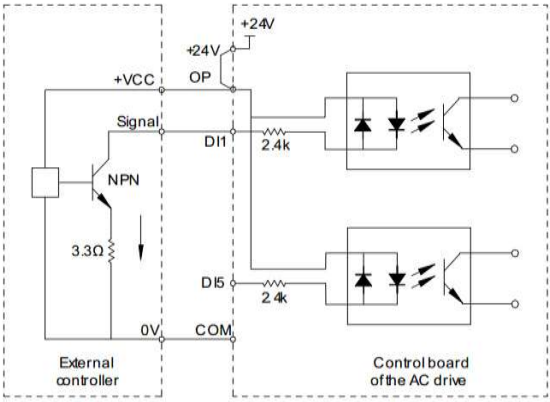


Fig. 3-24 Leakage-type wiring mode

This is the most common wiring mode. If external power supply is used, the short circuit chip between +24V and OP as well as the short circuit chip between COM and CME must be removed, the positive electrode of external power supply is connected to OP and the negative electrode of external power supply is connected to CME.

Note: In this wiring mode, DI terminals of different Frequency Inverters cannot be spliced, or else, DI misoperation may occur; If DI terminals are spliced (Among different Frequency Inverters), the diode (The positive electrode shall be connected to DI) shall be connected in serial at DI terminal and meet the following requirements: IF>10mA, UF<1V, as shown in the following figure.

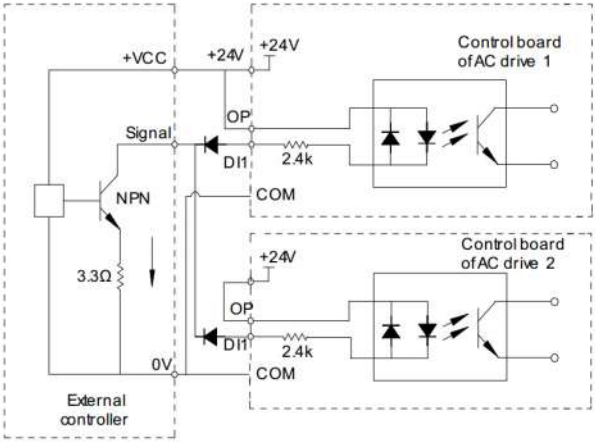


Fig. 3-25 Leakage-type wiring mode of DI terminals of multiple Frequency Inverters

◆ Active wiring mode (PNP)

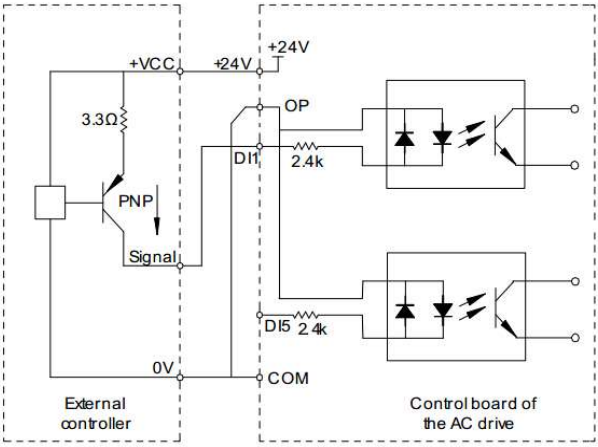


Fig. 3-26 Active wiring mode

In this wiring mode, the short circuit chip between +24V and OP must be removed, +24V is connected to the common terminal of external controller and OP shall be connected to COM. If external power supply is used, it is necessary to remove the short circuit chip between CME and COM.

The wiring of control signal output terminal

3) DO digital output terminal:

When digital output terminal is used to drive the relay, the absorber diode shall be installed additionally on both sides of the relay coil, or else, DC 24V power supply may be damaged. The drive capacity shall not be more than 50mA.

Note: The polarity of absorber diode must be installed appropriately, as shown in the following figure. Otherwise, when there is output of digital terminal, DC 24V power supply may be damaged immediately.

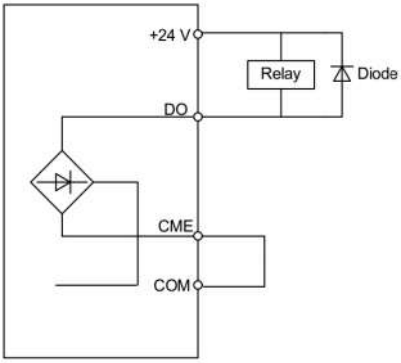


Fig. 3-27 The wiring diagram of digital output terminal

Chapter 4 Operation Display and Applications

4.1 Introduction of operation and display interface

The function parameter modification, working condition monitoring of Frequency Inverter, operational control of Frequency Inverter (start and stop) and other operations of the Frequency Inverter can be finished by means of operation panel. Its appearance and function area are as shown in the following figure:

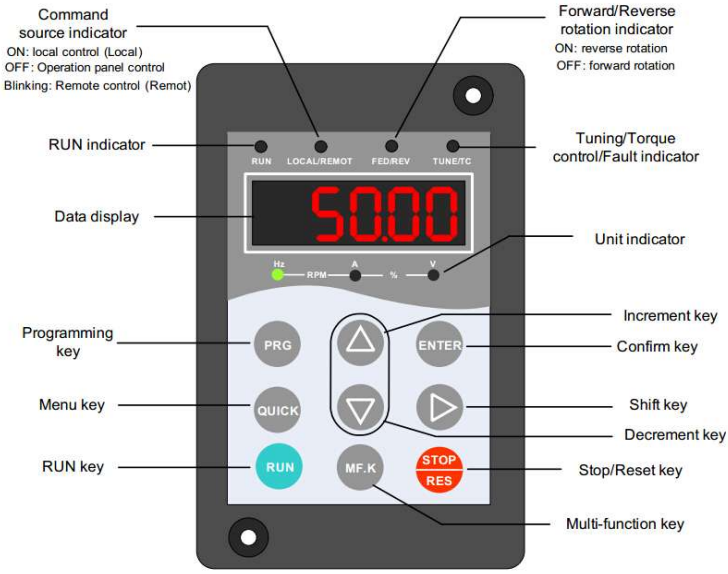


Fig. 4-1 Operation panel diagram

The function indicator lights are described as follows:

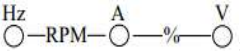
● RUN: When the light is on, the Frequency Inverter is in running; when the light is off, the Frequency Inverter is in stop.

● LOCAL/REMOT: Indicator lights for keyboard operation, terminal operation and remote operation (communication control):

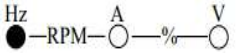
○ LOCAL/REMOT: OFF	Start and stop control mode of the panel
● LOCAL/REMOT: ON	Start and stop control mode of the terminal
◑ LOCAL/REMOT: Flash	Communication start and stop control mode

● FWD/REV: For FWD/REV indicator light, it is in reverse running when the light is on.

● TUNE/TC: For tuning/torque control/ failure indicator light, when the light is on, it is in torque control mode; when the light flashes slowly, it is in tuning state; when the light flashes quickly, it is in failure state.

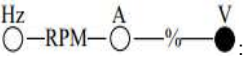


: Unit indicator light is used to indicate the unit of current data displayed and cover the following units: (○ means that the light is OFF; ● means the light is ON)



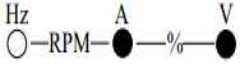
: Frequency unit: Hz

: Current unit: A



: Voltage unit: V

: Rotating speed unit: RMP



: Percentage %

Digital display area:

There are 5 digits in LED display, including set frequency, output frequency, various monitoring data, alarm code, etc.

Keyboard button specification

Table 4-1 Keyboard function list

Key	Name	Function
	Programming key	Enter or exit the primary menu
	ENTER key	Gradually enter menu picture and confirm setup parameter
	Increment key	Progressive increase of data or function code
	Decrement key	Progressive decrease of data or function code
	Shift key	The display parameter can be selected in cycle in stop display interface and in running display interface; the modified bit of parameter can be selected when the parameter is modified.
	RUN key	The run key is used for running in keyboard operation

STOP RES	STOP/RESET	In running state, this key can be used to stop running; when there is fault alarm, this key shall be used for resetting. The features of this key are restrained by Function Code F7-02.
MF.K	Multifunctional key	The function shall be switched according to F7-01 and it is possible to define this multifunction key as command source or direction
QUICK	Menu mode selection key	Switch to different menu modes (The default is one menu) according to the value in FP-03

4.2 Checking and modification of function code

Three-level menu structure is used by the operation panel of CT3000-G Frequency Inverter for parameter setting and other operations.

Three-level menus comprise: Function parameter set (Level I menu) →Function code (Level II menu) → Set value of function code (Level III menu). The operation flow chart is as shown in Fig. 4-2.

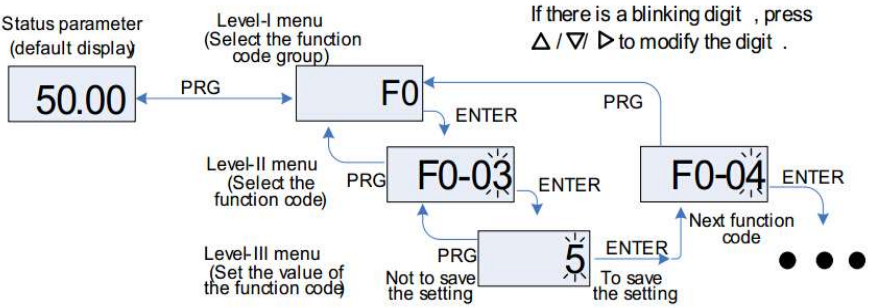
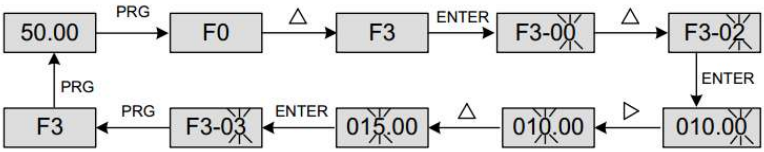


Fig. 4-2 The operation flow chart of three-level menus

Note: Level III menu can be returned to Level II menu by means of PRG key or ENTER key. The difference between two keys is as follows: Press ENTER key to save the set parameter, return to Level II menu and transfer to the next function code; press PRG key to cancel current parameter modification and directly return to Level II menu of current function code.

For example: Function code F3-02 is changed from 10.00Hz to 15.00Hz.



In Level III menu, if the parameter does not have flicker bit, this situation indicates that the function code cannot be modified, for which the possible reasons are as follows:

1) This function code is an unchangeable parameter, e.g. Frequency Inverter type, actual detecting parameter, running record parameter, etc.
2) This function code cannot be modified in the running state, but shall be modified after the equipment is stopped.

4.3 Organization mode of function code of Frequency Inverter

Table 4-2 The organization mode of function code of Frequency Inverter

Function code block	Function description	Description
F0～FP	Function code of general-purpose Frequency Inverter	
A0～AC	Enhanced function code block	Multi-motor parameters, AI/AO characteristic calibration and optimal control
U0～U3	Running state parameter set	The display and reference of basic characteristic parameter of Frequency Inverter

In the browse of function code, select the function code block No. expected for reference by means of Key △ or Key ▽, as shown in the following figure:

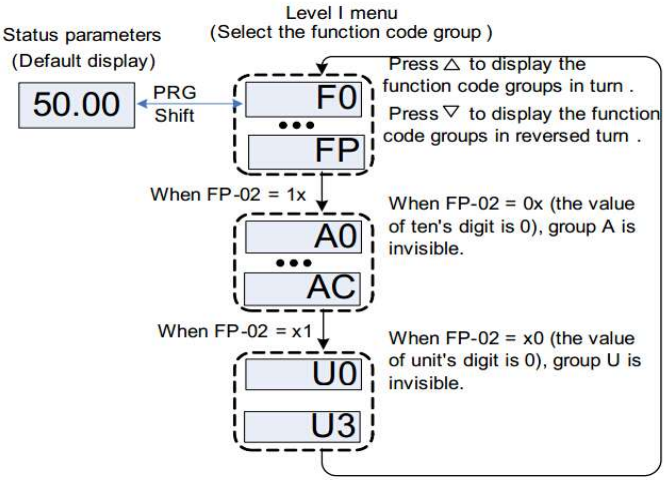


Fig. 4-3 The browse of function code block No.

Therein, Function Code FP-02 is used to control the display of Function Code Block A, U.

	Default value: 11		
FP-02	Set value	Tens place	Ones place
	Function	A group display selection	U group display selection
	Set range	0: Not displayed; 1: Displayed	0: Not displayed; 1: Displayed

4.4 Two quick scanning modes of function code

CT3000-G series has many function codes. To help the user for quick scanning, the Frequency Inverter is further provided with two quick scanning modes of function code:

1) The user can select and customize at most 30 common function codes to form a function code set defined by the user; the user will determine the function parameter to be displayed by Group FE
2) The Frequency Inverter will arrange the frequency code that is different from default value for quick scanning by the user.

For three kinds of function code scanning modes, the display code of all parameter display modes is as follows:

Parameter display mode	Display
Function parameter mode	-bASE
User customized parameter mode	-USEr
User modified parameter mode	--C--

Three kinds of function code display modes can be switched by QUICK key. The scanning or modification method of all function codes is the same as previous keyboard operation:

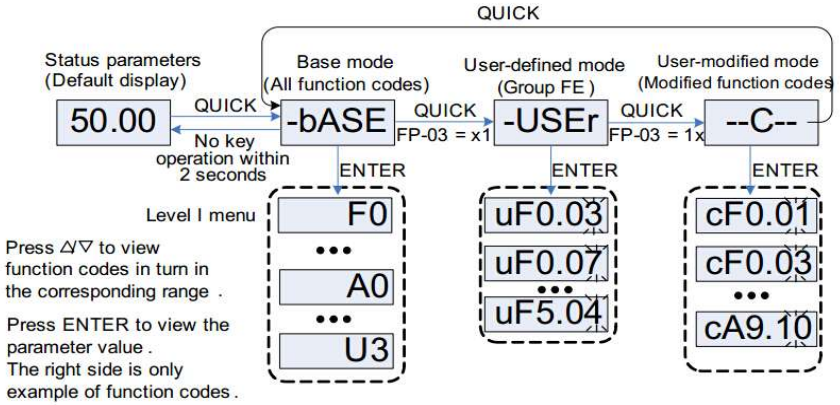


Fig. 4-4 Scanning mode of function code parameter

Therein, Function Code FP-03 is used to control user customized group and user modification parameter group.

FP-03	Default value: 11		
	Set value	Tens place	Ones place
	Function	--C-- group display election	-USEr group display selection
	Set range	0: Not displayed; 1: displayed	0: Not displayed; 1: displayed

-bASE basic function code block

The basic function code block, namely, the whole function code of Frequency Inverter, is Level I menu after entry. Only inquiry or modification is available according to previous operation mode.

-USEr user customized function code block

The setup of user customized menu is mainly used to help the user for quick inquiry and modification of commonly-used function parameters. The parameter is displayed as “uF3.02” in the user customized menu and this form indicates function parameter F3-02. The parameter modification in the user customized menu has the same effect as the parameter modification in common programming state. It is Level II menu after entry.

The function parameter of user customized menu is from Group FE. Group FE selects function parameter and set as F0.00 which indicates no selection and totally 30 function parameters can be set; the “NULL” displayed in menu indicates that the user customized menu is null.

In initialization, 16 commonly-used parameters have been stored in the user customized menu to facilitate the user in operation:

Table 4-3 Commonly-used parameters of the user customized menu

Function code	Name	Function code	Name
F0-01	Control mode	F0-02	Command source selection
F0-03	Selection of main frequency source	F0-07	Command source selection
F0-08	Preset frequency	F0-17	Acceleration time
F0-18	Deceleration time	F3-00	V/F curve setting
F3-01	Torque boost	F4-00	DI1 terminal function selection
F4-01	DI2 terminal function selection	F4-02	DI3 terminal function selection
F5-04	DO1 output selection	F5-07	AO1 output selection
F6-00	Start mode	F6-10	Stop mode

The user can edit the user customization according to their specific demand.

--C-- the user has modified the composition of function code

Current set value is different from the default value and the function code has been modified by the user in the function code block modified by the user. This is a list generated by the Frequency Inverter automatically to help the user quickly access the modified function code. It is Level II menu after entry.

4.5 Definition and operation of multifunctional key

The function of MF.K key can be defined by Function Code F7-01 and used to switch command source or change the rotation direction of Frequency Inverter. See the interpretation of Function Code F7-01 for the specific setting method.

4.6 Consulting of state parameter

In stop or in running state, various state parameters can be displayed by shift key "▷" on the panel of Frequency Inverter. Function F7-03 (operating parameter 1), F7-04 (operating parameter 2) and F7-05 (stop parameter) can select whether the parameter is displayed according to the binary digit. In stop state, 16 down state parameters in total are available to determine display or no display, respectively including:

F7-05	LED stop display parameter	Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: DI input state Bit03: DO output state Bit04: AI1 voltage (V) Bit05: AI2 voltage (V) Bit06: AI3 voltage (V)	Bit07: Count value Bit08: Length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12:PULSE input pulse frequency	33	☆

Switch and display the parameters selected according to key sequence.

In running state, five running state parameters, including operation frequency, set frequency, bus voltage, output voltage and output current, are displayed in default. The display of other parameters is determined by Function Code F7-03 and F7-04:

F7-03	LED running display parameter 1	Bit00: Operation frequency 1(Hz) Bit01: Set frequency (Hz) Bit02: Bus voltage Bit03: Output voltage Bit04: Output current (A) Bit05: Output power (kW) Bit06: Output torque (%) Bit07: DI input state	Bit08: DO output state Bit09: AI1 voltage (V) Bit10: AI2 voltage (V) Bit11: AI3 voltage (V) Bit12: Count value Bit13: Length value Bit14: Load speed display Bit15: PID setting	1F	☆

F7-04	LED running display parameter 2	Bit00: PID feedback Bit01: PLC stage Bit02: PULSE input frequency Bit03: Operation frequency 2 (Hz) Bit04: Residual running time Bit05: Voltage before AI1 calibration Bit06: Voltage before AI2 calibration Bit07: Voltage before AI3 calibration	Bit08: Linear velocity Bit09: Current power-on time Bit10: Current running time Bit11: PULSE input frequency Bit12: Communication set value Bit13: Encoder feedback speed Bit14: Main frequency X display (Hz) Bit15: Auxiliary frequency Y display (Hz)	33	☆

If the Frequency Inverter of which the power supply is cut off is powered on, the displayed parameter will be taken as the parameter selected before the power supply of Frequency Inverter is off.

Switch and display the parameters selected according to the key sequence. The parameter setting mode is as follows:

For example, the user sets the parameters to be switched and displayed as: Operation frequency, bus voltage, output voltage, output current, output power, output torque, PID feedback and encoder feedback speed. The binary data shall be set according to the corresponding place of actual display data:

F7-03 is 0000 0000 0111 1101B

F7-04 is 0010 0000 0000 0001B

Converting into hexadecimal data:

F7-03 is 007DH

F7-04 is 2001H

The set value of keyboard is displayed as: F7-03 : H.1043, F7-04 : H.2001

4.7 Start and stop control of Frequency Inverter

4.7.1 Source selection of start and stop signal

The start and stop command of Frequency Inverter is from 3 sources including panel control, terminal control and communication control and shall be selected by function parameter F0-02.

F0-02	Command source selection		Default value: 0	
	Set range	0	Operation panel command channel (LED OFF)	Press RUN key or STOP key to start or stop the machine
		1	Terminal command channel (LED ON)	Define DI terminal to the start and stop command terminal
		2	Communication command channel (LED flashes)	Adopt MODBUS-RTU protocol

4.7.1.1 Start and stop control of the panel

Through keyboard operation, the function code F0-02=0, namely, the start and stop control mode of the panel is available. Press RUN key on the keyboard, the Frequency Inverter will be operated (RUN indicator light will be on); when the Frequency Inverter is in running state, press STOP key on the keyboard, the Frequency Inverter will stop running (RUN indicator light will be off).

4.7.1.2 Start and stop control of the terminal

If toggle switch and solenoid switch are suitable for the start and stop of application system in respect of the start and stop control of terminal and also suitable for the electrical design in which the controller controls the operation of Frequency Inverter by means of dry contact signal.

CT3000-G Frequency Inverter has provided various terminal control modes, determined switch signal mode by function code F4-11 and determined the input port of start and stop control signal by Function Code F4-00～F4-09. Please see the detailed description of F4-11, F4-00 ～F4-09 and other function codes for the specific setting methods.

Example 1: The toggle switch is used for the Frequency Inverter as the start and stop switch for the Frequency Inverter, the forward running switch signal is connected to DI2 port, reverse running switch signal is connected to DI4 port, and the usage and setting method are as shown in the following figure:

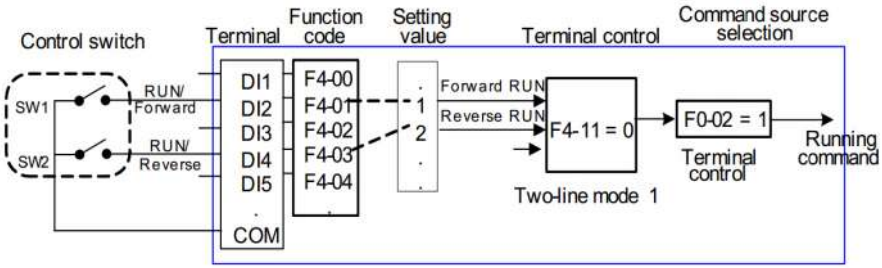


Fig. 4-5 The examples of start and stop control mode of the terminal

In the control mode above, when SW1 command switch is closed, the Frequency Inverter will start forward running; when SW1 command switch is open, the Frequency Inverter will be stopped. However, when SW2 command switch is closed, the Frequency Inverter will start reverse running; when SW2 command switch is open, the Frequency Inverter will be stopped; when SW1 and SW2 are closed or open at the same time, the Frequency Inverter will be stopped.

Example 2: The key electromagnet is used for the Frequency Inverter as the start and stop switch for Frequency Inverter, the start button signal is connected to DI2 port, stop button signal is connected to DI3 port and the reverse running button signal is connected to DI4 port. The usage and setting method are as shown in the following figure:

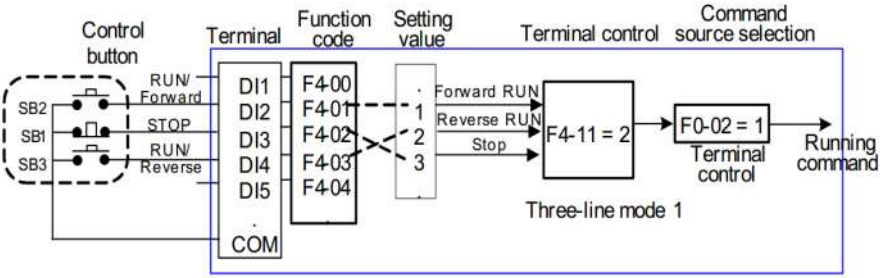


Fig. 4-6 The example of start and stop control mode of the terminal

For control mode in the figure above, SB1 button must be closed in normal start and running, or else, the Frequency Inverter will be stopped immediately; the command of SB2/ SB3 button will take effect in closing and the running state of Frequency Inverter shall be based on the final key action of three buttons.

4.7.1.3 Start and stop control of the communication

The application in where the operation of Frequency Inverter is controlled by the upper computer via communication mode gets more and more increased, for instance, the communication is available by means of RS485 and Frequency Inverter. The function code of Communication reference is shown as the following figure:

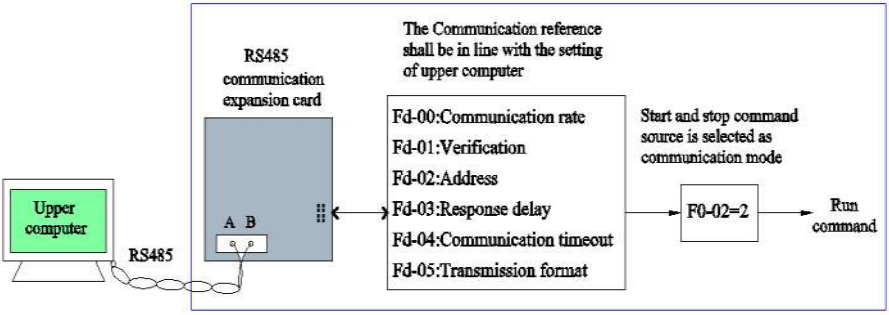


Fig. 4-7 The example of start and stop control mode of the communication

In the figure above, the function code (Fd-04) of communication time out is set to a nonzero value, that is to say, the automatic stop of Frequency Inverter due to communication timeout failure is enabled so as to prevent that the Frequency Inverter is out of control due to communication cable failure or the failure of upper computer. This function can be enabled in some application situations. MODBUS-RTU slave station protocol is built in the communication port of Frequency Inverter and the upper computer must make use of MODBUS-RTU master station protocol for relevant communication. See the appendixes in the manual and RS485 communication expansion card for the specific definition of communication protocol.

4.7.2 Start mode

The Frequency Inverter is provided with 3 kinds of start modes including direct start, speed tracking restart and pre-excitation start of asynchronous motor. Select F6-00=0 by means of function parameter F6-00, namely, direct start mode which is suitable for most low inertial load. The frequency curve of such start process is shown as the following figure. “DC braking” function is suitable for driving the elevator and heavy-type load before start; “startup frequency” is suitable for the equipment for which the starting torque impact is required in startup, e.g. cement mixer.

Figure 4-9 Frequency curve of direct start

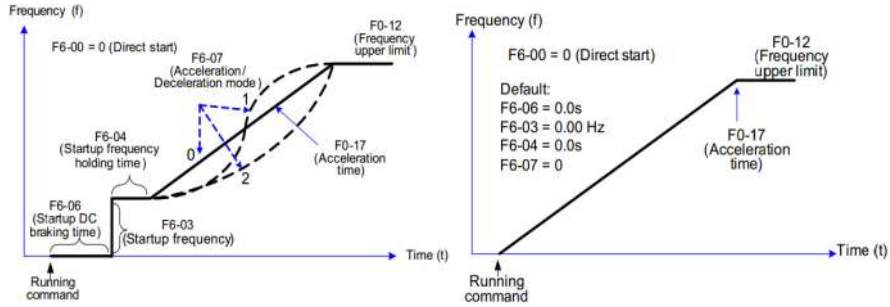


Fig. 4-8 Direct start mode

F6-00=1, namely, speed tracking restart mode is suitable for driving mechanical load with high inertia and the frequency curve of start process is shown as the following figure. If load motor is still operated upon inertia when the Frequency Inverter is started, the speed tracking restart mode shall be taken in order to avoid starting overcurrent.

Figure 4-10 Frequency curve of rotational speed tracking restart

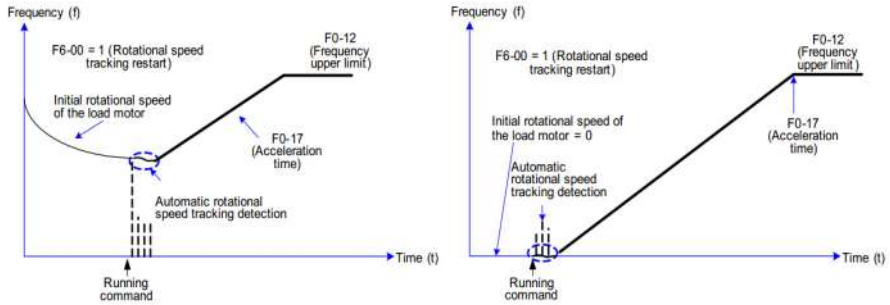


Fig. 4-9 Speed tracking restart mode

F6-00=2, namely, pre-excitation start mode is only suitable for the load of induction asynchronous motor. The pre-excitation for the motor shall be conducted before start to improve quick response characteristics of

the asynchronous motor and meet the requirement of short acceleration time. The frequency curve of start process is shown as follows:

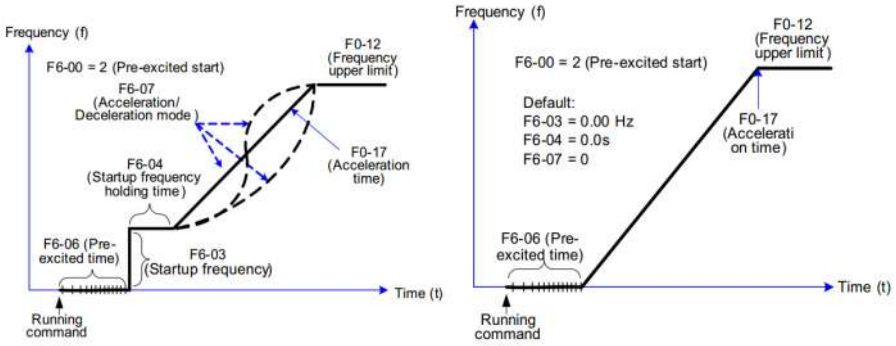


Fig. 4-10 Pre-excitation start mode

4.7.3 Start mode

There are 2 kinds of stop modes for the Frequency Inverter, including deceleration stop and free stop. These modes are selected by Function Code F6-10.

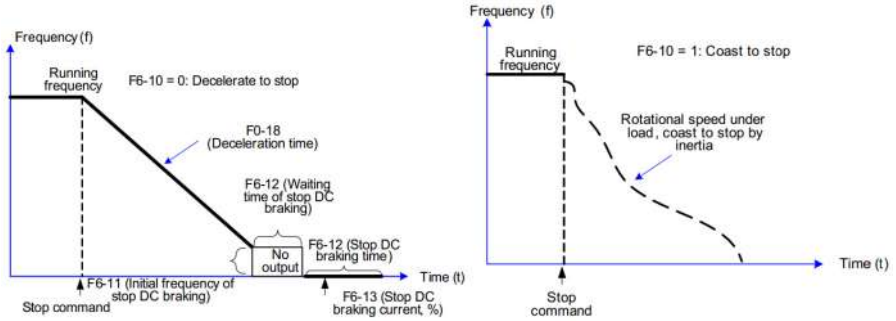


Fig. 4-11 Stop mode

4.7.4 Timing stop function

The Frequency Inverter supports the timing stop function which will take effect by means of F8-42, and the timing time is determined by F8-43 and F8-44.

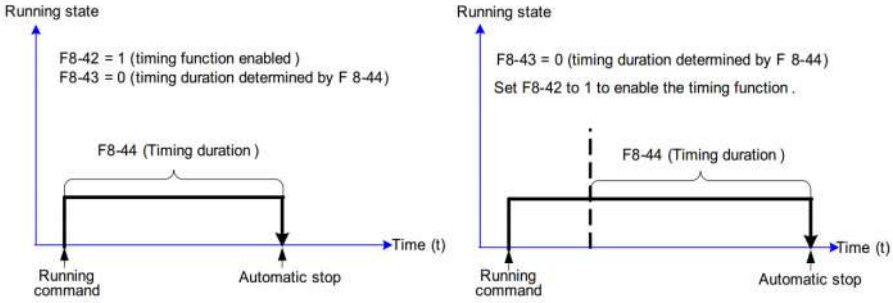


Fig. 4-12 Timing stop function

For timing time span, the available analog (e.g. potentiometer signal) is provided to the user for setting. Please see the detailed description of Function Code F8-43.

4.7.5 Jog operation

In many applications, the Frequency Inverter needs to be operated in low speed for a short time to test the equipment state or conduct debugging. The jog is quite appropriate in this case.

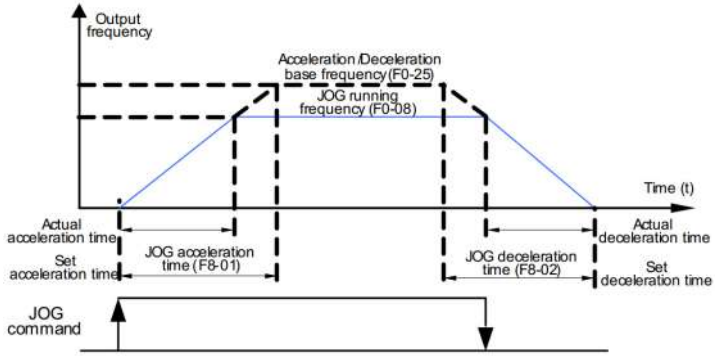


Fig. 4-13 Jog mode

4.7.5.1 Parameter setting and operation through the jog of operation panel

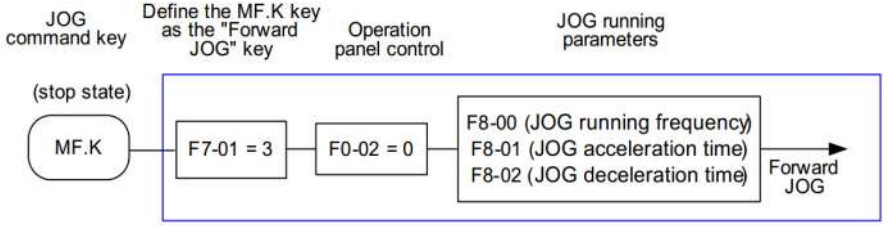


Fig. 4-14 Jog of operation panel

After the relevant function code is set as the figure above, press MF.K key when the Frequency Inverter is stopped. The Frequency Inverter will start forward running in low speed. If MF.K key is released, the Frequency Inverter will be slowed down and stopped.

If the reverse jog is needed, it is required to set F7-01 =4 and F8-13=0, that is to say, the reverse jog is allowed. Then press MF.K key.

4.7.5.2 Jog parameter setting and operation through DI terminal

In respect of some production equipments e.g. textile machinery, for which the jog operation is frequently required, it is convenient to control jog with the key or the button. The relevant function code is set as the following figure:

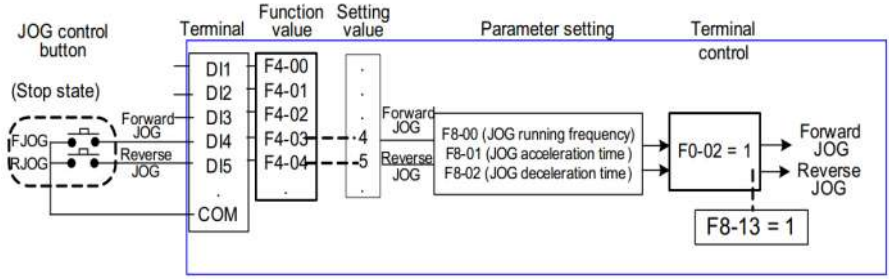


Fig. 4-15 Jog through DI port

After the relevant function code is set as the figure above, press FJOG button when the Frequency Inverter is stopped, the Frequency Inverter will start forward running in low speed. If FJOG button is released, the Frequency Inverter will be slowed down and stopped. In addition, if RJOG buttion is pressed, the reserver jog will be available.

4.8 Operation frequency control of Frequency Inverter

The Frequency Inverter is set with 2 frequency reference channels respectively named main frequency source X and auxiliary frequency source Y. The Frequency Inverter can work by single channel or its channels are switched at any time, even the superposition is available by setting the computing method so as to meet different control requirements in application field.

4.8.1 Selection of main frequency source

The Frequency Inverter is provided with 9 kinds of main frequency source including digital setting (UP/DN no power-down memory), digital setting (UP/DN power-down memory), AI1, AI2, AI3 and PULSE input, multi-stage instruction, simple PLC, PID, communication reference, etc. It is possible to set and select one of them by means of F0-03.

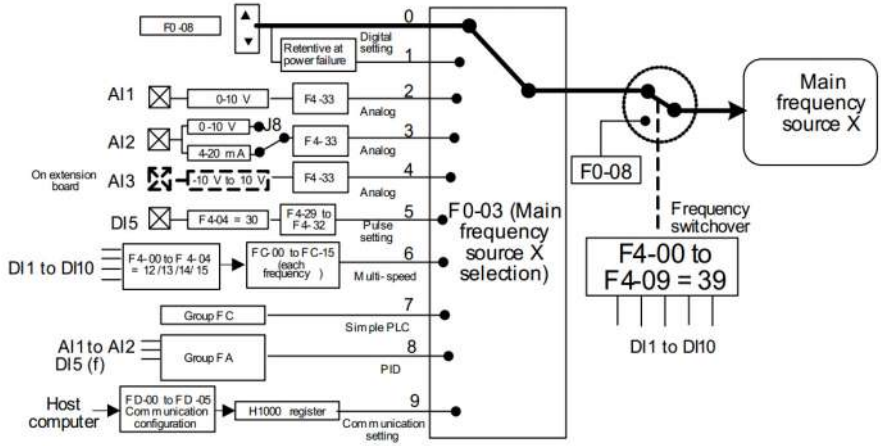


Fig. 4-16 Selection of given main frequency source

Seen from different frequency sources in the figure, the operation frequency of Frequency Inverter is determined by function code, in manual adjustment immediately, given by the analog, given by the multi-speed terminal command and in closed-loop regulation by the built-in PID regulator through external feedback signal; the operation frequency can be also controlled by communication of upper computer.

The function code No. for setting each frequency source reference has been given in the figure above. Please see the detailed description of corresponding function codes in setting.

4.8.2 The usage with auxiliary frequency reference

The source of auxiliary frequency source Y is in line with main frequency source, set and selected by means of F0-04.

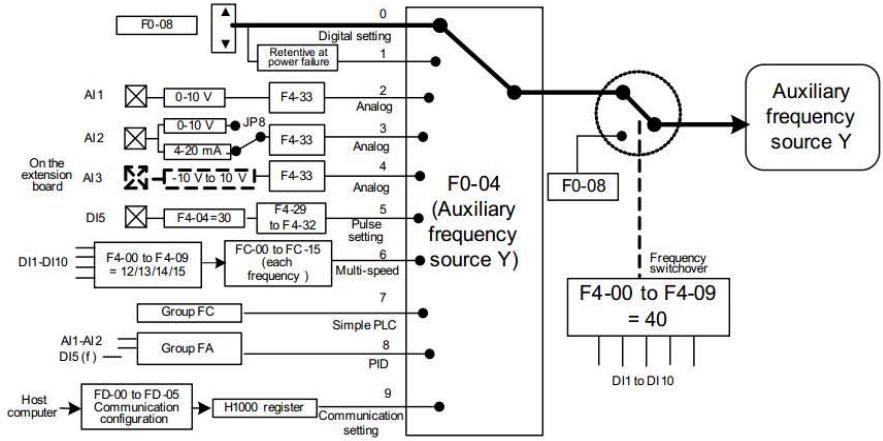


Fig. 4-17 Selection of given auxiliary frequency source

The relationship between target frequency and main/auxiliary frequency source shall be set through F0-07 in actual application.

There are three kinds of relationship in total:

1. Main frequency source X: The main frequency source is directly given as the target frequency

2. Auxiliary frequency source Y: The auxiliary frequency source is directly given as the target frequency

3. Main/auxiliary operation XY: Main/auxiliary operation has 4 situations including main frequency + auxiliary frequency, main frequency-auxiliary frequency, main frequency + high auxiliary frequency, main frequency + low auxiliary frequency

4. Frequency switch: The said 3 kinds of frequency shall be selected or switched by means of DI terminal.

The selection, switching and others of the said frequency source shall be defined by means of Function Code F0-07, as shown in the following figure. The thick segment in the figure indicates default parameter setting. For specific setting method, please see the detailed description of function code marked in the figure.

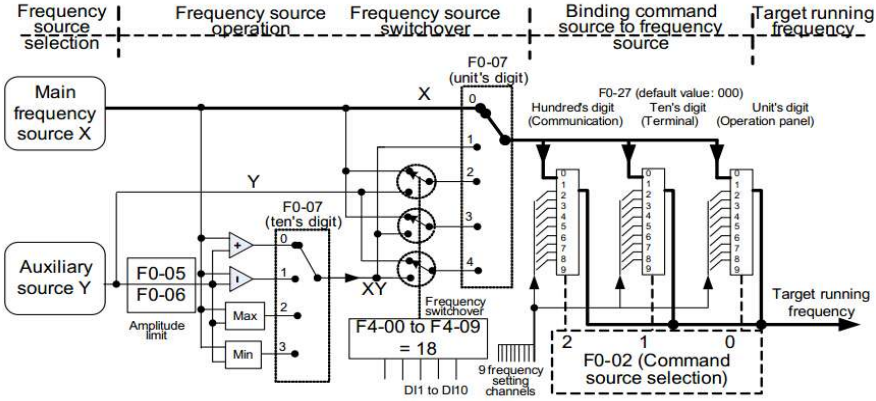


Fig. 4-18 Selection of the given mixed source of main/auxiliary frequency

The superposition of main/auxiliary frequency source can be used for the closed-loop control field with speed, for example, take main frequency channel as the primary, employ auxiliary frequency channel for automatic tuning and cooperate with the switching of external DI terminal signal to reach the closed-loop control.

4.8.3 Run command switching and frequency reference binding

Through F0-27 setting, the three command sources of Frequency Inverter can set their respective frequency source, as shown in the figure above. After the frequency binding channel (corresponding to F0-27) is set for the designated command channel (F0-02), main frequency source X or auxiliary frequency source Y will not take effect, but the given frequency channel defined by F0-27 will be used for determination.

4.8.4 The usage of frequency source given by A1 analog

The frequency source of CT3000-G is given by analog input terminal. CT3000-G control panel is set with 2 analog imputer terminals (AI1, AI2) and the optional I/O expansion card will provide an additional analog input terminal (AI3).

The following examples are given to introduce the specific usage.

1. AI1 voltage input connecting to the potentiometer as frequency source (2V-10V corresponds to 10 Hz -40Hz)

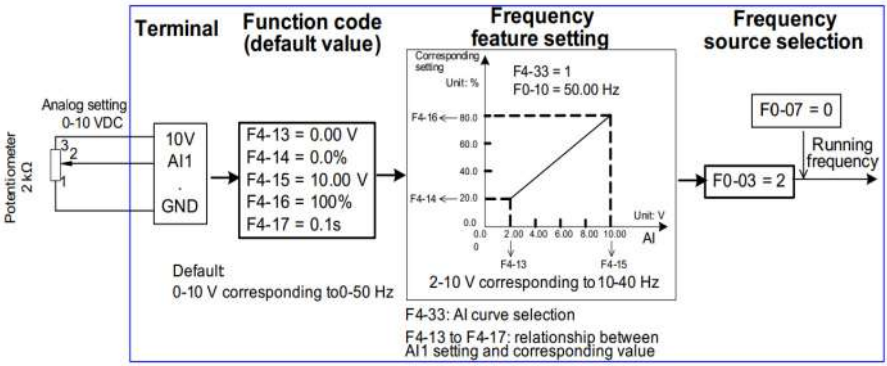


Fig. 4-19 Function code setting of AI1 voltage input frequency reference

2. AI2 current type input connecting to 4DA module of PLC as the frequency source (4-20mA corresponds to 0 Hz -50Hz)

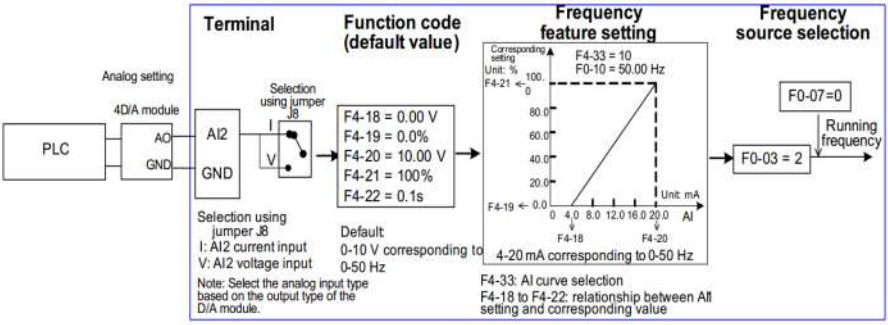


Fig. 4-20 Function code setting of AI2 current type input frequency reference

Notes:

1) CT3000-G control panel is set with 2 analog input terminals (AI1, AI2) and the optional expansion card is set with an additional analog input terminal (AI3).
2) AI1 is 0V～10V voltage type input; AI2 is 0V～10Vvoltage input or 4mA～20mA current input, selected by Jumper J8 on the control panel; AI3 is -10V～10V bipolar voltage signal input.
3) When AI is given as frequency, voltage/current input corresponds to 100.0% setting, which means the

percentage of maximum frequency F0-10.

4) The temperature transmitter used for the given analog shall be connected to AI3 terminal of I/O expansion card.

5) Five groups of correspondence curve can be preset for CT3000-G and freely selected by F4-33. The input value and target frequency in each group of curve shall be set by means of function code F4-13 ～F4-27 as well as function code in Group A6.

4.8.5 The usage of frequency source given by the pulse

The frequency is given by terminal pulse signal in many applications. The specification of pulse signal is as follows: Voltage range of 9V~30V and frequency range of 0 kHz~100kHz. The pulse reference shall be only input from multifunctional input terminal DI5. The relationship between input pulse frequency of DI5 terminal and the corresponding setting shall be set by means of F4-28~F4-31. This corresponding relation is 2-point straight corresponding relation. The pulse input corresponds to 100.0% in setting, which means the percentage of relative maximum frequency F0-10. The specific setting is as shown in the following figure:

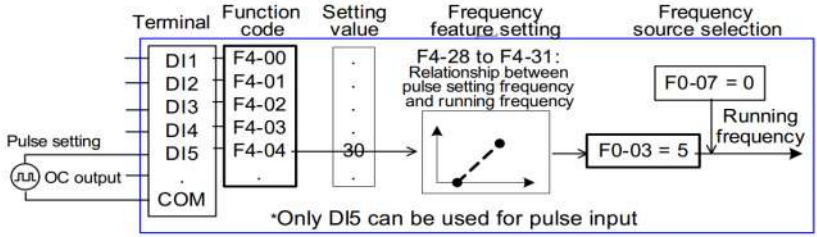


Fig. 4-21 Function code setting of frequency given by the pulse

4.8.6 The usage of frequency source given by the pulse

CT3000-G is set with a built-in PID regulator to coordinate with frequency channel selection. The user can realize automatic regulation of process control and the control application including constant temperature, constant pressure, tension, etc.

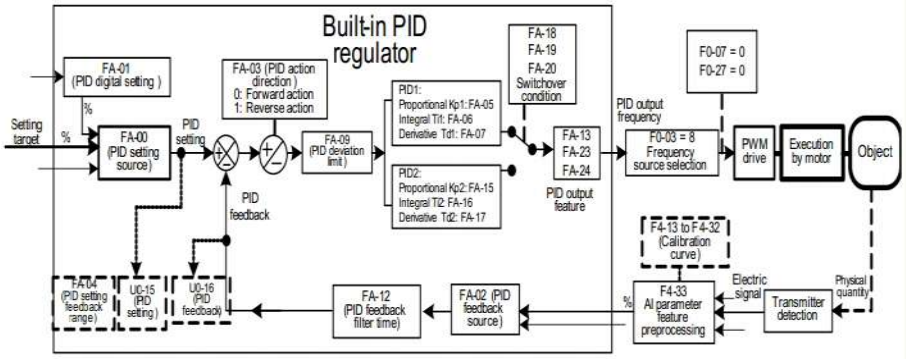


Fig. 4-22 The closed-loop control of frequency of process control

When the closed-loop control of PID frequency is used, it is required to select frequency source F0-03=8: namely, PID output frequency. The relevant parameter of PID is included in the function parameters of Group FA and the relevant PID function code relation is as shown in the figure above. CT3000-G Frequency Inverter is set with 2 built-in equivalent PID computing elements of which the characteristic parameters can be set respectively, they are suitable for different PID regulating characteristics according to working conditions and respectively emphasize PID regulating speed and accuracy, their switching may be automatic or controlled by external DI terminal signal.

4.8.7 Setting the swing work mode

In respect of textile and chemical fiber processing equipments, the swing function in use can improve uniformity and density of spinning windings, as shown in the following figure. It is available by setting function code Fb-00 ~ Fb-04. See the detailed description of corresponding function code for the specific methods.

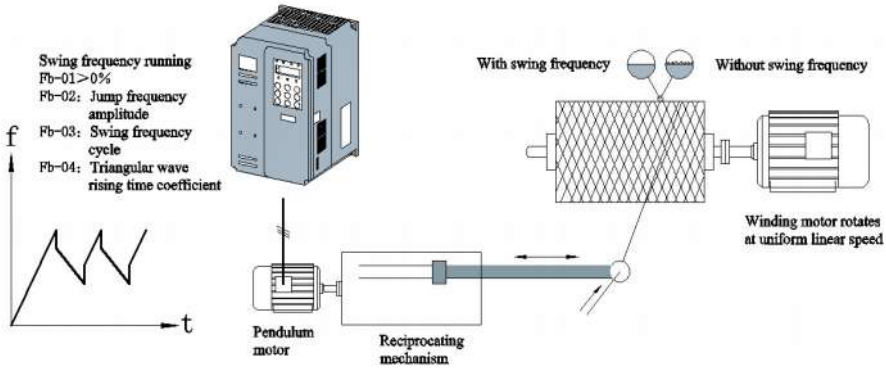


Fig. 4-23 Swing work mode

4.8.8 Setting multi-speed mode

If it is not required to regulate the operation frequency of Frequency Inverter continuously, the application field with several frequency values shall be only used. When multi-speed control is available, CT3000-G can be set with at most 16-stage operation frequency and selected by the combination of 4 DI input signals. Set function code corresponding to DI port to the function value of 12~15, which means that multi-stage frequency instruction input port is designated. The multi-stage frequency shall be set by multi-stage frequency of Group FC and the “frequency source selection” is designated to the multi-stage frequency setting method, as shown in the following figure:

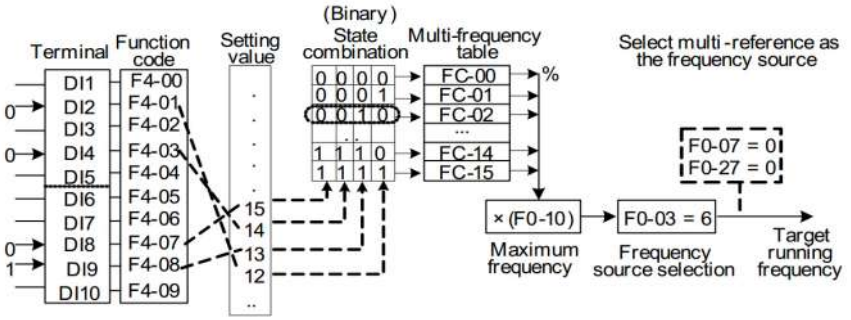


Fig. 4-24 Multi-speed mode setting

In the said figure, DI8, DI4, DI9 and DI2 are selected as the designated signal input terminals of multi-stage frequency and form 4-digit binary number in order and the multi-stage frequency is selected according to the state combination value. In case of (DI8, DI4, DI9, DI2)=(0, 0, 1, 0), the state combination value is 2, the frequency value set by function code FC-02 will be selected and (FC-02) * (F0-10) is calculated to get target operation frequency. CT3000-G can be set with at most 4 DI ports as multi-stage frequency instruction input terminals and it is allowed that less than 4 DI ports when multi-stage frequency is given. The setting place in deficiency shall be always calculated according to state 0.

4.8.9 Setting the operation direction of motor

After the Frequency Inverter restores the delivery parameter, press RUN key, the Frequency Inverter will drive the motor for running, called forward direction. If rotating direction is opposite to the running direction as required by the equipment, please power off, change any two of UVW output lines of Frequency Inverter and solve the problem in rotating direction. If there is the field in which forward running and reverse running are required in some driving systems, the “reverse control prohibition” shall be set to the state in which reverse running is allowed, namely, function code F8-13=0. In addition, the “running direction” shall be set to reverse running, namely, F0-09=1. Press RUN key so that the motor will be rotated in reverse direction, as shown in the following logic in the figure:

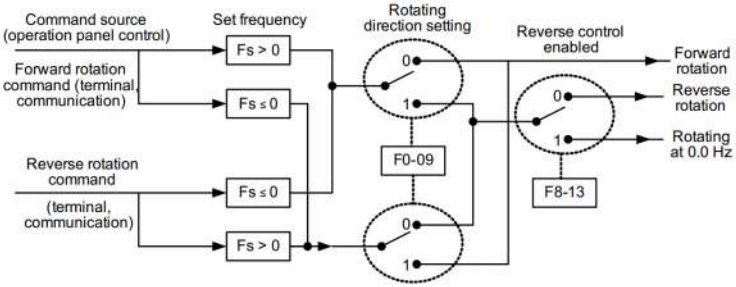


Fig. 4-25 Setting the running direction of motor

When the terminal run command is used for control, if reverse running is needed, the function code F8-13=0 shall be essential and the reverse control function is allowed. Seen from the figure above, if the reverse running (F8-13=0) is allowed and the operation frequency of Frequency Inverter (F0-03=9) is given in communication mode, when the given frequency Fs is negative, the Frequency Inverter will be in reverse running; when the reverse running command is given externally or the given frequency is negative, but the Frequency Inverter is set to the state in which the reverse running is not forbidden (F8-13=1), the Frequency Inverter will be operated with 0Hz and there is no output. For the application in which the reverse running of motor is not allowed, please never change the rotating direction by the change of function code because the said two function codes will be reset after the default value is restored.

4.8.10 Setting the fixed length control mode

CT3000-G is set with the fixed length control function, the length pulse is collected by DI (DI function is set to 27) terminal, the pulse number sampled by the terminal shall be divided by pulse number per meter FB-07 to get actual length FB-06. When actual length is more than the set length FB-05, “the length” of multifunctional digital DO output reaches ON signal.

In the fixed length control process, the length can be reset (DI function is set to 28) through multifunctional DI terminal. The specific setting is as shown in the following figure.

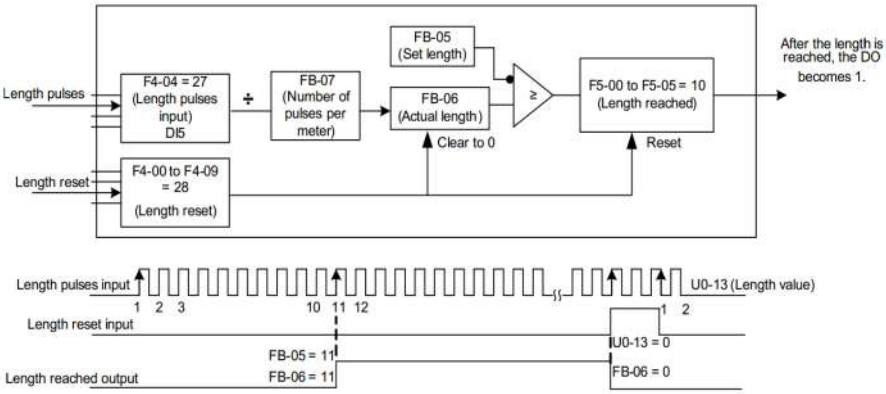


Fig. 4-26 Function code setting of the fixed length control mode

Notes: 1) It is impossible to identify the direction in the fixed length control mode, but the length shall be only calculated according to the pulse number.

2) DI5 terminal shall be only used as “length count input” terminal

3) Report DO output signal that the length reaches to the stop input terminal of Frequency Inverter as automatic stop system.

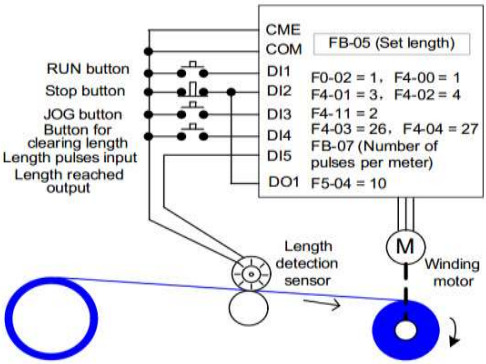


Fig. 4-27 Common application example of the fixed length control function

4.8.11 The usage of counting function of Frequency Inverter

The count value shall be collected by DI (DI function is set to 25) terminal. When count value is up to the set count value FB-08, "set count value" of multifunctional digital DO output is up to ON signal and then the counter will stop counting. When count value reaches the designated count value FB-09, the "designated count value" of multifunctional digital DO output reaches ON signal, the counter will continue counting until the counter will stop when "set count value" is reached.

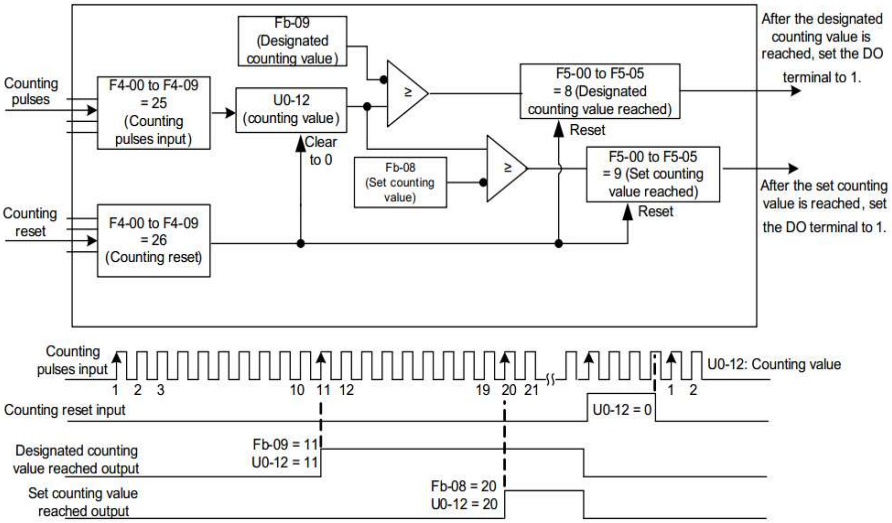


Fig. 4-28 Function code setting of count mode

Notes: 1) The designated count value FB-09 shall not be more than the set count value FB-08.

2) DI5 port must be used when pulse frequency is high.

3) DO port of "set count reaching" or of "designated count reaching" shall not be reused.

4) When the Frequency Inverter is in RUN/STOP state, the counter will always keep counting until "set count value" is reached.

5) The count value can be in power-down retention.

6) The count up to DO output signal will be reported to the stop input terminal of Frequency Inverter so that there will be an automatic stop system.

4.9 Characteristic parameter setting and automatic tuning of the motor

4.9.1 Motor parameter to be set

When the Frequency Inverter is operated in "vector control" (F0-01=0 or 1) mode, the dependence on accurate motor parameters is quite high, which is an important difference from "VF control" (F0-01=2) mode. For good driving performance and operating efficiency, the Frequency Inverter must get accurate parameter of the controlled motor.

The required motor parameters include (The function code of Motor 1 is in default):

Parameter of Motor 1	Parameter description	Remarks
F1-00	Motor type	Asynchronous, frequency asynchronous, synchronous
F1-01～F1-05	Rated power/voltage/current/ frequency/speed of the motor	Model parameter, manual input
F1-06～F1-20	Equivalent stator resistance, inductive reactance, rotor inductance and others in the motor	Tuning parameter
F1-27～F1-34	Encoder parameter, the setting is required if sensor vector mode is available	Encoder parameter

For the complex application system of multiple motors, the corresponding parameters of Motor 2/Motor 3/Motor 4 shall include:

Parameter of Motor 2	Parameter of Motor 3	Parameter of Motor 4	Remarks
A2-00	A3-00	A4-00	Asynchronous, frequency asynchronous, synchronous
A2-01～A2-05	A3-01～A3-05	A4-01～A4-05	Model parameter, manual input
A2-06 ～A2-20	A3-06 ～A3-20	A4-06 ～A4-20	Tuning parameter
A2-27 ～A2-34	A3-27 ～A3-34	A4-27 ～A4-34	Encoder parameter

4.9.2 Automatic tuning and identification of motor parameter

The methods in which the Frequency Inverter can get the electrical parameter of the controlled motor include: dynamic identification, static identification, manual input of motor parameter and other methods.

Identification mode	Application	Identification effect
No-load dynamic identification	Suitable for synchronous motor and asynchronous motor; the situation in which it is easy for the motor and application system to break away	The best
Load dynamic identification	Suitable for synchronous motor and asynchronous motor; the situation in which it is not easy for the motor or application system to break away	Ok
Static identification	Only suitable for asynchronous motor and the situation in which the motor is quite difficultly broken away from the load and the dynamic identification is not allowed	Bad
Manually input parameter	Only suitable for asynchronous motor and the situation in which it is not easy for the motor or application system to break away. The parameters of motor in the same type, which are identified successfully before, are input to corresponding function codes F1-00~F1-10	Ok

The automatic tuning of motor parameter shall be finished in the following steps:

The parameter identification method of Motor 1 in default is taken as an example for explanation and the identification method of Motor 2/3/4 is the same with identification method of Motor 1, but function code No. shall be changed accordingly.

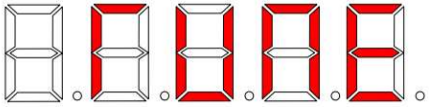
Step 1: If the motor can be fully separated from load, the motor shall be separated from load mechanically after the power is cut off to make the motor in free rotation with no load.

Step 2: After the power is on, the command source (F0-02) of Frequency Inverter is firstly selected to be the command channel of operation panel.

Step 3: Accurately input motor parameter on the nameplate (e.g. F1-00 ～F1-05). Please input the following parameters according to actual parameters of the motor (Selected according to current motor):

Motor selection	Parameters
Motor 1	F1-00: motor type selection F1-01: rated power of motor F1-02: rated voltage of motor F1-03: rated current of motor F1-04: rated power of motor F1-05: rated speed of motor
Motor 2	A2-00 ~ A2-05: The same as defined above
Motor 3	A3-00 ~A3-05: The same as defined above
Motor 4	A4-00 ~ A4-05: The same as defined above

Step 4: In case of asynchronous motor, F1-37 (For tuning selection, the Motor 2/3/4 corresponds to Function Code A2/A3/A4-37) will be available. Please select 2 (The asynchronous motor is completely tuned) and press ENTER key for confirmation. At this moment, the keyboard will display TUNE, as shown in the following figure:



Then press RUN key on the keyboard, the Frequency Inverter will drive the motor for acceleration, deceleration, forward running and reverse running. The running indicator light will be on and identification will be continued for about 2 minutes. When the said display disappears, the machine will return to normal parameter display state, which indicates that tuning is finished.

Upon complete tuning, the Frequency Inverter will calculate the following motor parameters automatically:

Motor selection	Parameters
Motor 1	F1-06: stator resistance of asynchronous motor F1-07: rotor resistance of asynchronous motor F1-08: Leakage inductive reactance of asynchronous motor F1-09: Interaction inductive reactance of asynchronous motor F1-10: No-load current of asynchronous motor
Motor 2	A2-06 ~ A2-10: The same definition as above
Motor 3	A3-06 ~ A3-10: The same definition as above
Motor 4	A4-06 ~ A4-10: The same definition as above

If the motor can not be separated from load completely, please set F1-37 (Motor 2\3\4 corresponds to A2\A3\A4-37) to 1 (The tuning of asynchronous motor will be stopped), then press RUN key on the keyboard panel and start the identification of motor parameters.

About the identification of synchronous motor:

The synchronous motor system driven by CT3000-G needs encoder feedback signal and the encoder parameter shall be set correctly before identification; there must be rotation in the identification of synchronous motor system, the best identification mode is no-load dynamic identification, but the load dynamic identification can be also used if the conditions are not available;

4.9.3 Setting and switching of multi-motor parameters

The Frequency Inverter supports switching four motor parameter sets. The parameters of Motor 1, parameters of coding disc and others constitute Groups F1 and F2; Motor 2, Motor 3 and Motor 4 correspond to the parameter set of Function Code A2, A3 and A4. Select current valid motor parameter set through designation by Function Code F0-24 or through Function 41, 42 of digital input terminal. However, when Function 41, 42 of digital input terminal is valid, the priority will be available and F0-24 setting will

be invalid in this case.

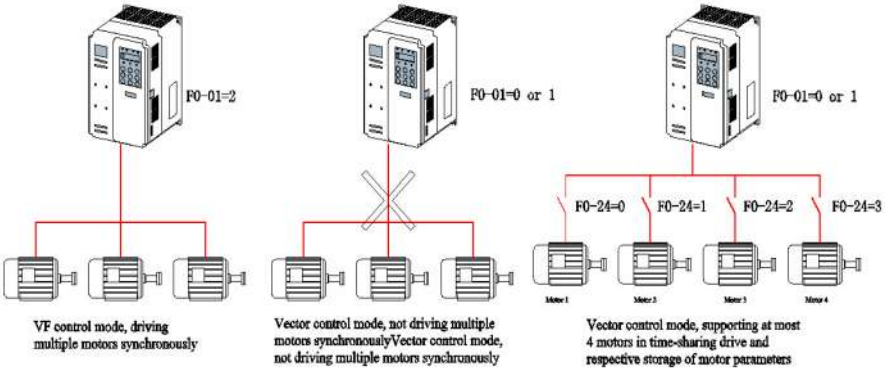


Fig. 4-29 Multi-motor switching

4.10 The usage of DI port of Frequency Inverter

The control panel is set with 7 DI ports which are numbered as DI1 ~DI7. If I/O expansion card is added, 3 additional DI ports shall be increased. DI ports on the expansion card will be numbered as DI8 ~DI10 at this moment.

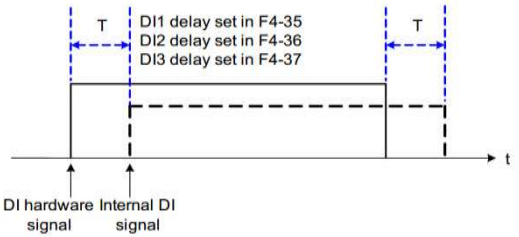
The internal hardware of DI port is equipped with 24Vdc power supply for testing. The user shall only keep DI port in short circuit with COM port so as to input DI signal to the Frequency Inverter.

In case of F4-38=0000 and F4-39=0000 in the default value, the signal is valid (Logic 1) when DI port is short-circuited; when DI port is suspended in the air, DI will be invalid (Logic 0) signal;

The user can change the valid mode of DI port, which means that the signal is invalid (Logic 0) when DI port is short-circuited; when DI port is suspended in the air, Di will be valid (Logic 1) signal. At this moment, the corresponding place to F4-38 or to F4-39 shall be changed to 1 and these two function codes correspond to valid mode setting of DI1~DI5 and DI6 ~DI10.

The Frequency Inverter is also set with software filter time (F4-10) for input signal of DI port to improve anti-interference level.

For DI1 ~DI3 input port, the port signal delay function is particularly provided to help some applications beyond delayed processing:



The functions of 10 DI ports above can be defined in function codes F4-00~F4-09 and each DI can be determined among 50 functions. See the detailed description of function codes F4-00 ~F4-09.

For the design of hardware characteristics, only DI5 can accept high-frequency pulse signal. If high-speed pulse counting is required, please arrange it at DI5 port.

4.11 The usage of DO port of Frequency Inverter

The control panel is set with 3-way DO output, including FM, DO1, TA/TB/TC. Therein, FM and DO1 are transistor type output and can drive 24Vdc low-voltage signal loop; TA/TB/TC is relay output and can drive 250Vac control loop.

2-way output, including DO2 and PA/PB/PC, can be expanded by connection to external expansion card. Therein, DO2 is transistor output and PA/PB/PC is relay output.

The value of function parameters F5-01~F5-05 as set can be used to define the functions of all DO outputs and indicate the working conditions and various alarms of the Frequency Inverter, and there are about 40 functions set in total to help the user meet specific automatic control requirements. Please see the detailed description of function parameters in Group F5 for the specific set value.

Port name	Corresponding function code	Description of output characteristics
FM-CME	When F5-00=0, F5-06	Transistor, used to output high-speed pulse of 10Hz ~100KHz; driving capacity: 24Vdc, 50mA
	When F5-00=1, F5-01	Transistor; driving capacity: 24Vdc, 50mA
TA-TB-TC	F5-02	Relay; driving capacity: 250Vac, 3A
PA-PB-PC	F5-03	Expansion card and relay; driving capacity: 250Vac, 3A
DO1-CME	F5-04	Transistor; driving capacity: 24Vdc, 50mA
DO2-CME	F5-05	Expansion card, transistor; driving capacity: 24Vdc, 50mA

In case of F5-00=0, FM port is in high-speed pulse output mode. The internal operating parameter shall be indicated by output pulse frequency and the output pulse frequency will get increased with the increasing read. The reading of100% corresponds to 100KHz. The attributes of internal parameters shall be defined by Function Code F5-06.

4.12 Characteristics and preprocessing of AI input signal

The Frequency Inverter totally supports 3 ways of AI resource. Therein, AI1 and AI2 are provided by the control panel and it is required to connecting expansion card for AI3.

Port	The characteristics of input signal
AI1-GND	The signal of 0 ~10Vdc can be accepted
AI2-GND	Jumper J8 at “V” home position can accept the signal of 0~10Vdc; Jumper J8 at “I” home position can accept current signal of 4~20mA
AI3-GND	If this port is provided by the expansion board, the signal of -10 ~10Vdc can be accepted

When the Frequency Inverter uses external voltage/current signal, AI shall be used if frequency source, torque, voltage in VF separation, PID or feedback is given. The actual reference or feedback physical quantity relation corresponding to voltage or current value shall be set by means of F4-13~F4-27.

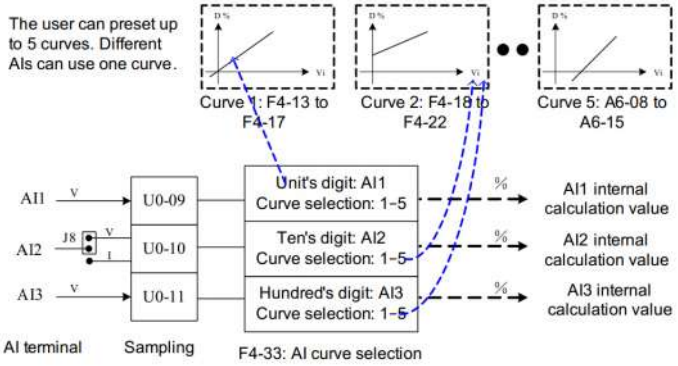


Fig. 4-30 The actual reference corresponding to AI signal

The sampling value at AI port can be read among function codes U0-09~U0-11; the converted value will be used for internal subsequent calculation so that the user cannot read it directly.

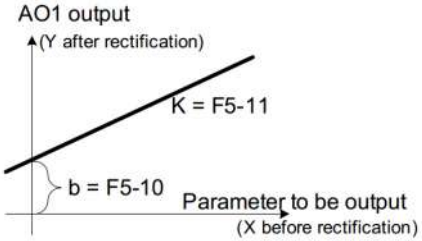
4.13 The usage of AO port of Frequency Inverter

The Frequency Inverter totally supports 2-way AO output. Therein, AO1 is provided by the control panel and IO expansion card must be connected for AO2.

Port	The characteristics of input signal
AO1-GND	The signal of 0~10Vdc can be output at "V" home position with J5 in short circuit
	The current signal of 0~20mA can be output at "I" home position with J5 in short circuit
AO2-GND	This port is provided by the expansion board and can output the signal of 0~10Vdc

AO1 and AO2 can be used as analog mode to indicate internal operating parameters and the parameter attribute can be selected through function codes F5-07 and F5-08.

The specified operating parameter may be changed before output and the change characteristic curve is shown as the diagonal in the following figure, Y＝kX＋b where X is operating parameter to be output, and k and b of AO1 can be set by function codes F5-10 and F5-11.



4.14 The usage of PG port of Frequency Inverter

If the closed-loop vector control (F0-01=1) of sensor is used to improve frequency conversion performance, the encoder shall be mounted on the motor shaft and the signal of encoder will be reported to the Frequency Inverter by PG card (signal interface card of the encoder). CT3000-G series Frequency Inverter is set with total 2 kinds of PG cards with different signal characteristics for the user.

The Frequency Inverter supports 3 kinds of encoders including differential encoder, rotary transformer and open collector encoder.

According to encoder type in service, it is required to set the relevant parameters of different encoders and the motor parameter set 1 is taken for illustration as follows:

For a differential encoder, F1-27 is used to set encoder lines and F1-28 is set to 0: ABZ incremental encoder

For an open collector encoder, F1-27 is used to set encoder lines and F1-28 is set to 0: ABZ incremental encoder

For a rotary transformer, F1-28 is set to 2: rotary transformer

For the specific usage of the encoder, please see the appendixes in this manual: The usage of expansion card for general encoder

4.15 The usage of serial communication of Frequency Inverter

When RS485 communication is used, see the functions of Group Fd for hardware communication parameters of communication port. The normal communication needs the precondition that communication rate and data format conform to the upper computer.

The communication protocol for MODBUS-RTU slave station is built in the serial port of CT3000-G so that the upper computer can inquire or change the function codes of Frequency Inverter, running state parameters, run command transmitted to the Frequency Inverter, operation frequency and others through serial port.

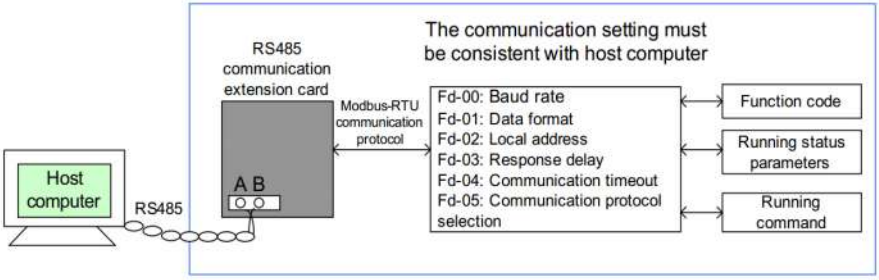


Fig. 4-31 The usage of serial communication of Frequency Inverter

In CT3000-G Frequency Inverter, the function code, running state parameters, running instructions and information are organized in the mode of "register parameter address" and the upper computer can communicate with the Frequency Inverter effectively according to "register parameter address".

4.16 The usage of multifunctional expansion card interface of Frequency Inverter

Accessible expansion card and its functions are as follows:

Table 4-4 Accessible expansion card of Frequency Inverter and its functions

Name	Model	Function	Remarks
I/O expansion card	IO	Three digital inputs and one analog voltage input can be added; AI3 is an isolated analog that can be connected to PT100 and PT1000; one relay output, one digital output and one analog output	Suitable for the model of 3.7kW and above
Interface card of differential encoder	PG1	Interface card of differential rotary encoder, suitable for power supply of 5V	Suitable for the full series
Interface card of rotary transformer	PG4	Suitable for rotary encoder, excitation frequency 10kHz and DB9 interface	Suitable for the full series
Interface card of open collector encoder	PG5	Interface card of open collector encoder, suitable for the power supply of 15V	Suitable for the full series

4.17 Password setting

The Frequency Inverter has provided user password protection function. When FP-00 is set to a nonzero

value, namely, user password, quit function code editing state so that password protection will take effect. Press PRG key again, display "-----" and input correct user password to enter ordinary menu, or else, it is impossible to access. If password protection function is to be canceled, the user shall input the password before entry and set FP-00 to 0.

4.18 Parameter memory characteristics and factory parameter recovery

After the function code of Frequency Inverter is changed by the panel, the changed setup will be stored in the memory of Frequency Inverter and always valid when the power is on next time unless the setup is changed again artificially.

The Frequency Inverter has provided the function that the user can set parameter backup memory and recovery.

The Frequency Inverter has power-down data memory function for warning information, total running time and other information.

To recover the backup value or factory set value of function code of Frequency Inverter or clear running data, FP-01 operation can finish the said setting. See the detailed description of Function Code FP-01.

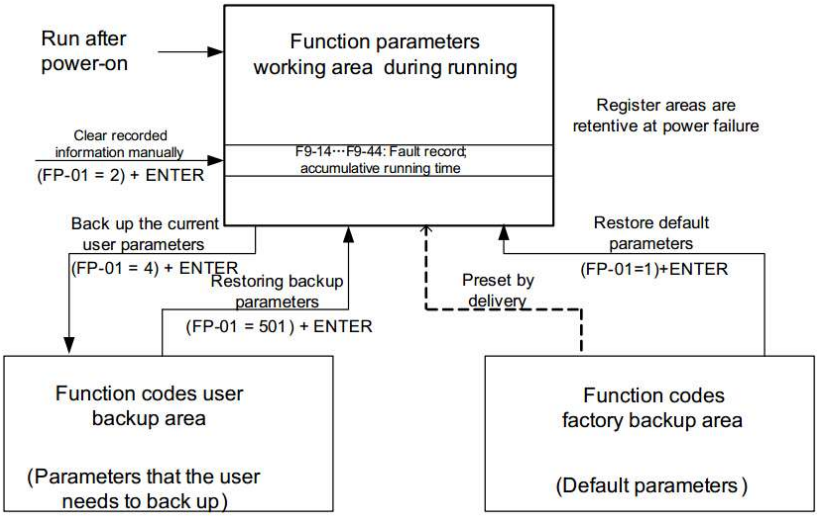


Fig. 4-32 Parameter backup and recovery setting

Chapter 5 Function Parameter List

FP-00 is set to nonzero value, that is to say, parameter protection password is set. Under function parameter mode and user change parameter mode, input correct password, enter the parameter menu, cancel the password and set FP-00 to 0.

The parameter menu is not protected by the password under the user customized parameter mode.

Group F and Group A are basic function parameters and Group U is monitoring function parameter.

The symbols in the function list are described as follows:

"☆" means that the set value of parameter can be changed when the Frequency Inverter is stopped or in running;

"★" means that the set value of parameter cannot be changed when the Frequency Inverter is in running;

"●" means that the parameter value is actual test value and cannot be changed;

"*" means that the parameter is a "factory parameter", can only be set by the manufacturer but can not be operated by the user;

5.1 Basic function parameter list

Table 5-1 Basic function parameter list

Function code	Name	Set range	Default value	Change
F0 Basic function group				
F0-00	GP type display	1: Type G (Constant torque load type) 2: Type P (The load type of fan and water pump)	Model dependent	●
F0-01	Control mode of Motor 1	0: No-speed sensor vector control (SVC) 1: Speed sensor vector control (FVC) 2: V/F control	0	★
F0-02	Command source selection	0: Command channel of operation panel (LED OFF) 1: Command channel of the terminal (LED ON) 2: Communication command channel (LED flashes)	0	☆

Function code	Name	Set range	Default value	Change
F0-03	Selection of main frequency source X	0: Digital setting (Preset frequency F0-08, changeable UP/DOWN, no power-down memory) 1: Digital setting (Preset frequency F0-08, changeable UP/DOWN, power-down memory) 2：AI1 3：AI2 4：AI3 5: PULSE setting (DI5) 6: Multi-stage instruction 7: Simple PLC 8：PID 9: Communication reference	0	★
F0-04	Selection of auxiliary frequency source Y	The same as F0-03 (Selection of main frequency source X)	0	★
F0-05	Selection of auxiliary frequency source Y range in superposition	0: With respect to maximum frequency 1: With respect to frequency source X	0	☆
F0-06	Auxiliary frequency source Y range in superposition	0% ～150%	100%	☆
F0-07	Frequency source superposition selection	Ones place: Frequency source selection 0: Main frequency source X 1: Calculated result of main/auxiliary frequency source (The operation is determined by the tens place) 2: Switch between main frequency source X and auxiliary frequency source Y 3: Switch between main frequency source X and the calculated result of main/auxiliary frequency source 4: Switch between auxiliary frequency source and the calculated result of main/auxiliary frequency source Tens place: The operation relation of main/auxiliary frequency source 0: Main + auxiliary 1: Main- auxiliary 2: Maximum of the two 3: Minimum of the two	00	

Function code	Name	Set range	Default value	Change
F0-08	Preset frequency	0.00Hz ~ maximum frequency (F0 -10)	50.00Hz	☆
F0-09	Operation direction	0: The same direction 1: The opposite direction	0	☆
F0-10	Maximum frequency	50.00Hz ～ 320.00Hz	50.00Hz	★
F0-11	Upper limiting frequency source	0: F0-12 setting 1：AI1 2：AI2 3：AI3 4: PULSE setting 5: Communication reference	0	★
F0-12	Upper limiting frequency	Lower limiting frequency F0-14 ~ maximum frequency F0-10	50.00Hz	☆
F0-13	Upper limiting frequency offset	0.00Hz ~maximum frequency F0-10	0.00Hz	☆
F0-14	Lower limiting frequency	0.00Hz~upper limiting frequency F0-12	0.00Hz	☆
F0-15	Carrier frequency	0.5kHz ～ 16.0kHz	Model dependent	☆
F0-16	Carrier frequency is adjusted with temperature	0: No 1: Yes	1	☆
F0-17	Acceleration time 1	0.00s ～ 650.00s(F0-19=2) 0.0s ～ 6500.0s(F0-19=1) 0s ～ 65000s(F0-19=0)	Model dependent	☆
F0-18	Deceleration time 1	0.00s ～ 650.00s(F0-19=2) 0.0s ～ 6500.0s(F0-19=1) 0s ～ 65000s(F0-19=0)	Model dependent	☆
F0-19	Acceleration/deceleration time unit	0: 1 second 1: 0.1 second 2: 0.01 second	1	☆
F0-21	Offset frequency of auxiliary frequency source in superposition	0.00Hz～maximum frequency F0-10	0.00Hz	☆
F0-22	Frequency instruction resolution	1：0.1Hz 2：0.01Hz	2	★
F0-23	The stop memory of digital set frequency is set to 0	0: No memory 1: Memory	0	☆

Function code	Name	Set range	Default value	Change
F0-24	Selection of motor parameter set	0: Motor parameter set 1 1: Motor parameter set 2 2: Motor parameter set 3 3: Motor parameter set 4	0	★
F0-25	Reference frequency of acceleration/deceleration time	0: Maximum frequency (F0-10) 1: Set frequency 2：100Hz	0	★
F0-26	Frequency instruction UP/DOWN standard in running	0: Operation frequency 1: Set frequency	0	★
F0-27	Command source binding frequency source	Ones place: Operation panel command binding frequency source selection 0: No binding 1: Digital setting frequency 2：AI1 3：AI2 4：AI3 5: PULSE setting (DI5) 6: Multi-speed 7: Simple PLC 8：PID 9: Communication reference Tens place: Terminal command binding frequency source selection Hundreds place: Communication command binding frequency source selection Thousands place: Automatic running binding frequency source selection	0000	☆
F0-28	Selection of serial communication protocol	0: Modbus protocol	0	☆
F1 The first motor group				
F1-00	Selection of motor type	0: Ordinary asynchronous motor 1: Variable frequency asynchronous motor 2: permanent magnet synchronous motor	0	★
F1-01	Rated power of motor	0.1kW ～1000.0kW	Model dependent	★
F1-02	Rated voltage of motor	1V～2000V	Model dependent	★

Function code	Name	Set range	Default value	Change
F1-03	Rated current of motor	0.01A~655.35A (Power of frequency converter <=55kW) 0.1A~6553.5A (Power of Frequency Inverter >55kW)	Model dependent	★
F1-04	Rated frequency of motor	0.01Hz～maximum frequency	Model dependent	★
F1-05	Rated speed of motor	1rpm～65535rpm	Model dependent	★
F1-06	Stator resistance of asynchronous motor	0.001Ω ~ 65.535Ω (Power of Frequency Inverter<=55kW) 0.0001Ω ~ 6.5535Ω (Power of Frequency Inverter>55kW)	Tuning parameter	★
F1-07	Rotor resistance of asynchronous motor	0.001Ω ~ 65.535Ω (Power of Frequency Inverter<=55kW) 0.0001Ω ~ 6.5535Ω (Power of Frequency Inverter>55kW)	Tuning parameter	★
F1-08	Leakage inductive reactance of asynchronous motor	0.01mH~655.35mH (Power of Frequency Inverter<=55kW) 0.001mH~65.535mH (Power of Frequency Inverter >55kW)	Tuning parameter	★
F1-09	Interaction inductive reaction of asynchronous motor	0.1mH~6553.5mH (Power of Frequency Inverter<=55kW) 0.01mH ~ 655.35mH (Power of Frequency Inverter>55kW)	Tuning parameter	★
F1-10	No-load current of asynchronous motor	0.01A ~ F1-03 (Power of Frequency Inverter<=55kW) 0.1A ~ F1-03 (Power of Frequency Inverter>55kW)	Tuning parameter	★
F1-16	Stator resistan ce of synchronous motor	0.001Ω ~ 65.535Ω(Power of Frequency Inverter <=55kW) 0.0001Ω ~ 6.5535Ω(Power of Frequency Inverter >55kW)	Tuning parameter	★
F1-17	D-axis inductance of synchronous motor	0.01mH~655.35mH (Power of Frequency Inverter<=55kW) 0.001mH~65.535mH (Power of Frequency Inverter >55kW)	Tuning parameter	★
F1-18	Q-axis inductance of synchronous motor	0.01mH~655.35mH (Power of Frequency Inverter <=55kW) 0.001mH~65.535mH (Power of Frequency Inverter >55kW)	Tuning parameter	★

Function code	Name	Set range	Default value	Change
F1-20	Counter electromotive force of synchronous motor	0.1V～6553.5V	Tuning parameter	★
F1-27	Encoder line number	1 ～65535	1024	★
F1-28	Encoder type	0: ABZ incremental encoder 2: Rotary transformer	0	★
F1-30	ABZ incremental encoder AB phase sequence	0: Forward direction 1: Reverse direction	0	★
F1-34	Pair of poles of rotary transformer	1 ～65535	1	★
F1-36	Speed feedback PG disconnection detection time	0.0: No action 0.1s ～10.0s	0.0	★
F1-37	Tuning selection	0: No operation 1: Static tuning of asynchronous motor 2: Complete tuning of asynchronous motor 3: Static complete parameter identification 11: Load tuning of synchronous motor 12: No-load tuning of synchronous motor	0	★
Group F2 Vector control parameter of the first motor				
F2-00	Proportional gain 1 of speed loop	1 ～100	30	☆
F2-01	Integral time 1 of speed loop	0.01s ～10.00s	0.50s	☆
F2-02	Switching Frequency 1	0.00 ～F2-05	5.00Hz	☆
F2-03	Proportional gain 2 of speed loop	1 ～100	20	☆
F2-04	Integral time 2 of speed loop	0.01s ～10.00s	1.00s	☆
F2-05	Switching Frequency 2	F2-02 ~maximum frequency	10.00Hz	☆
F2-06	Slip gain of vector control	50%～200%	100%	☆
F2-07	Filtering time constant of speed loop	0.000s～0.100s	0.000s	☆
F2-08	Overexcitation gain of vector control	0 ～200	64	☆

Function code	Name	Set range	Default value	Change
F2-09	Upper limiting source of torque in speed control mode	0: Function code F2-10 setting 1：AI1 2：AI2 3：AI3 4: PULSE setting 5: Communication reference 6：MIN(AI1,AI2) 7：MAX(AI1,AI2) The full range of Option 1-7 corresponds to F2-10	0	☆
F2-10	Digital setting of upper limiting torque in speed control mode	0.0%～200.0%	150.0%	☆
F2-13	Proportional gain of excitation regulation	0 ～60000	2000	☆
F2-14	Integral gain of excitation regulation	0 ～60000	1300	☆
F2-15	Proportional gain of torque regulation	0 ～60000	2000	☆
F2-16	Integral gain of torque regulation	0 ～60000	1300	☆
F2-17	Integral attribute of speed loop	Ones place: Integral separation 0: Invalid 1: Valid	0	☆
F2-18	Flux weakening mode of synchronous motor	0: Flux weakening is invalid 1: Direct calculation mode 2: Automatic regulation mode	1	☆
F2-19	Flux weakening depth of synchronous motor	50%～500%	100%	☆
F2-20	Maximum flux weakening current	1% ～300%	50%	☆
F2-21	Automatic regulation gain of flux weakening	10%～500%	100%	☆
F2-22	Flux weakening integral times	2 ～10	2	☆
F3 V/F control parameters				

Function code	Name	Set range	Default value	Change
F3-00	VF curve setting	0: Linear V/F 1: Multi-point V/F 2: Square V/F 3: 1.2th power V/F 4: 1.4th power V/F 6: 1.6th power V/F 8: 1.8th power V/F 9: Reserved 10: VF complete separation mode 11: VF semi-separation mode	0	★
F3-01	Torque boost	0.0%: (Automatic torque boost) 0.1%～30.0%	Model dependent	☆
F3-02	Cut-off frequency of torque boost	0.00Hz~ maximum frequency	50.00Hz	★
F3-03	Frequency Point 1 of multi-point VF	0.00Hz～F3-05	0.00Hz	★
F3-04	Voltage Point 1 of multi-point VF	0.0%～100.0%	0.0%	★
F3-05	Frequency Point 2 of multi-point VF	F3-03～F3-07	0.00Hz	★
F3-06	Voltage Point 2 of multi-point VF	0.0%～100.0%	0.0%	★
F3-07	Frequency Point 3 of multi-point VF	F3-05 ~rated frequency of motor (F1-04)	0.00Hz	★
F3-08	Voltage Point 3 of multi-point VF	0.0%～100.0%	0.0%	★
F3-09	VF slip compensation gain	0.0%～200.0%	0.0%	☆
F3-10	VF overexcitation gain	0 ～200	64	☆
F3-11	VF oscillation suppression gain	0 ～100	Model dependent	☆
F3-13	Voltage source of VF separation	0: Digital setting (F3-14) 1：AI1 2：AI2 3：AI3 4: PULSE setting (DI5) 5: Multi-stage instruction 6: Simple PLC 7：PID 8: Communication reference Note: Correspond to the rated voltage of motor in 100.0%	0	☆

Function code	Name	Set range	Default value	Change
F3-14	Voltage digital setting of VF separation	0V~the rated voltage of motor	0V	☆
F3-15	Voltage acceleration time of VF separation	0.0s ～1000.0s Note: The above means the time of variation from 0 V to the rated voltage of motor	0.0s	☆
F3-16	Voltage deceleration time of VF separation	0.0s ～1000.0s Note: The above means the time of variation from 0 V to the rated voltage of motor	0.0s	☆
F3-17	Selection of VF separation stop mode	0: Frequency/voltage is independently decreased to 0 1: Frequency will be decreased continually after voltage is decreased to 0	0	☆
Group F4 Input terminals				
F4-00	DI1 terminal function selection	0: No function 1: Forward running FWD or run command 2: Reverse running REV or the direction of forward and reverse running (Note: when the setting is 1,2, it need to use with F4-11) 3: The operational control for the mode of three lines 4: Forward jog(FJOG) 5: Reverse jog(RJOG) 6: Terminal UP 7: Terminal DOWN 8: Free stop 9: Failure reset (RESET) 10: The suspension of operation 11: Normally open input of external failures	1	★
F4-01	DI2 terminal function selection		4	★
F4-02	DI3 terminal function selection	12: Multi-stage instruction terminal 1 13: Multi-stage instruction terminal 1 14: Multi-stage instruction terminal 3 15: Multi-stage instruction terminal 4 16: Acceleration/ deceleration time selection terminal 1 17: Acceleration/ deceleration time selection terminal 2 18: The switching of frequency source	9	★
F4-03	DI4 terminal function selection		12	★

Function code	Name	Set range	Default value	Change
F4-04	DI5 terminal function selection	19: The zero clearing of UP/DOWN setting (terminal, keyboard) 20: The switching terminal 1 of control command 21: The prohibition of acceleration/ deceleration 22: The suspension of PID 23: The state reset of PLC 24: The suspension of swing frequency 25: The counter input 26: The counter reset 27: The count input for length 28: The length reset 29: Torque control prohibition 30: PULSE (pulse) frequency input (Only valid for DI5) 31: Reserved 32: Immediate DC braking 33: Normally closed input of external failures 34: Frequency change enabled 35: Choose the opposite action direction of PID 36: The terminal 1 of external shutdown 37: The switching terminal 2 of control command 38: The suspension of PID integral 39: Switching between frequency source X and preset frequency 40: Switching between frequency source Y and preset frequency 41: motor selection terminal 1 42: motor selection terminal 2 43: PID parameters switching 44: User-defined failure 1 45: User-defined failure 2 46: The switching of speed control / torque control 47: Emergency stop 48: The terminal 2 of external shutdown 49: Deceleration DC braking 50: The zero clearing of the run time 51: The switching of two-line mode / three-line mode 52-59: Reserved	13	★
F4-05	DI6 terminal function selection		0	★
F4-06	DI7 terminal function selection		0	★
F4-07	DI8 terminal function selection		0	★
F4-08	DI9 terminal function selection		0	★
F4-09	DI10 terminal function selection		0	★

Function code	Name	Set range	Default value	Change
F4-10	The filtering time of DI	0.000s～1.000s	0.010s	☆
F4-11	The command mode of terminals	0: The two-line mode 1 1: The two-line mode 2 2: The three-line mode 1 3: The three-line mode 2	0	★
F4-12	The UP/DOWN change rate of terminals	0.001Hz/s ～65.535Hz/s	1.00Hz/s	☆
F4-13	The minimum input of AI curve 1	0.00V ～F4-15	0.00V	☆
F4-14	The corresponding setting of the minimum input for AI curve 1	-100.0% ～+100.0%	0.0%	☆
F4-15	The maximum input of AI curve 1	F4-13 ～+10.00V	10.00V	☆
F4-16	The corresponding setting of the maximum input for AI curve 1	-100.0% ～+100.0%	100.0%	☆
F4-17	The filtering time of AI1	0.00s ～10.00s	0.10s	☆
F4-18	The minimum input of AI curve 2	0.00V ～F4-20	0.00V	☆
F4-19	The corresponding setting of the minimum input for AI curve 2	-100.0% ～+100.0%	0.0%	☆
F4-20	The maximum input of AI curve 2	F4-18 ～+10.00V	10.00V	☆
F4-21	The corresponding setting of the maximum input for AI curve 2	-100.0% ～+100.0%	100.0%	☆
F4-22	The filtering time of AI2	0.00s ～10.00s	0.10s	☆
F4-23	The minimum input of AI curve 3	-10.00V ～F4-25	-10.00V	☆

Function code	Name	Set range	Default value	Change
F4-24	The corresponding setting of the minimum input for AI curve 3	-100.0% ～+100.0%	-100.0%	☆
F4-25	The maximum input of AI curve 3	F4-23 ～+10.00V	10.00V	☆
F4-26	The corresponding setting of the maximum input for AI curve 3	-100.0% ～+100.0%	100.0%	☆
F4-27	The filtering time of AI3	0.00s ～10.00s	0.10s	☆
F4-28	The minimum input of PULSE	0.00kHz ～F4-30	0.00kHz	☆
F4-29	The corresponding setting of the minimum input for PULSE	-100.0% ～100.0%	0.0%	☆
F4-30	The maximum input of PULSE	F4-28 ～100.00kHz	50.00kHz	☆
F4-31	The corresponding setting of the maximum input for PULSE	-100.0% ～100.0%	100.0%	☆
F4-32	The filtering time of PULSE	0.00s ～10.00s	0.10s	☆
F4-33	The curve selection of AI	Ones place: The curve selection of AI 1: Curve 1 (two points, see F4-13 ～ F4-16) 2: Curve 2 (two points, see F4-18 ～ F4-21) 3: Curve 3 (two points, see F4-23 ～ F4-26) 4: Curve 4 (four points, see A6-00 ～ A6-07) 5: Curve 5 (four points, see A6-08 ～ A6-15) Tens place: The curve selection of AI2, ditto Hundreds place: The curve selection of AI3, ditto	321	☆

Function code	Name	Set range	Default value	Change
F4-34	The selection of that AI is lower than the minimum input setting	Ones place: The selection of that AI is lower than the minimum input setting 0: Be corresponding to the minimum input setting 1:0.0% Tens place: The selection of that A2 is lower than the minimum input setting, ditto Hundreds place: The selection of that A3 is lower than the minimum input setting, ditto	000	☆
F4-35	The delay time of DI1	0.0s ～3600.0s	0.0s	★
F4-36	The delay time of DI2	0.0s ～3600.0s	0.0s	★
F4-37	The delay time of DI3	0.0s ～3600.0s	0.0s	★
F4-38	The valid mode selection 1 of DI terminal	0: High electrical level is valid 1: Low electrical level is valid Ones place: DI1 Tens place: DI2 Hundreds place: DI3 Thousands place: DI4 Myriabit: DI5	00000	★
F4-39	The valid mode selection 2 of DI terminal	0: High electrical level is valid 1: Low electrical level is valid Ones place: DI6 Tens place: DI7 Hundreds place: DI8 Thousands place: DI9 Myriabit: DI10	00000	★
F4-40	The selection of AI2 input signal	0: Voltage signal 1: Current signal	0	★
Group F5 Output terminals				
F5-00	The output mode selection of terminal FM	0: Pulse output (FMP) 1: Switching value output (FMR)	0	☆

Function code	Name	Set range	Default value	Change
F5-01	The selection of FMR output function	0: No output 1；During the operation of Frequency Inverter 2: Failure output (Be the failure of free stop) 3: The FDT1 output of detection for frequency levels 4: The arriving of frequency 5: During the zero speed operation 6: The pre-alarm for the overload of motor 7: The pre-alarm for the overload of Frequency Inverter 8: The arriving of the set count value 9；The arriving of the Assigned count value 10: The arriving of length 11: The finish of PLC cycle 12；The arriving of accumulative run time 13: In the frequency limit 14: In the torque limit 15: Ready to run 16：AI1>AI2 17: The arriving of the upper limiting frequency 18: The arriving of the upper limiting frequency (relating to the operation) 19: The output in under voltage condition 20: Communication reference 21: Finish positioning (reserved) 22: Close to positioning (reserved) 23: In the operation of the zero speed (output at the time of shutdown) 24: The arriving of accumulative power-on time 25: The FDT2 output of detection for frequency levels 26: The arriving output of frequency 1 27: The arriving output of frequency 2 28: The arriving output of current 1 29: The arriving output of current 2 30: The output of timing arriving 31: Input over limit of AI1 32: During offload 33: During the forward running 34: The state of zero current 35: The arriving of module temperature 36: The over limit of input current	0	☆
F5-02	The function selection of relay on the control panel (T/A-T/B-T/C)		2	☆
F5-03	The output function selection of relay on the expansion card (P/A-P/B-P/C)		0	☆
F5-04	The selection of DO1 output function		1	☆

Function code	Name	Set range	Default value	Change
F5-05	The output selection of expansion card DO2	37: The arriving of lower limiting frequency (output at the time of shutdown) 38: The alarm output (all failures) 39: The pre-alarm for the over-temperature of motor 40: The arriving of the run time 41: The output of failures (Be the failure of free stop and no output in undervoltage)	4	☆
F5-06	The selection of FMP output function	0: Operation frequency 1：Set frequency 2: Output current 3: Output torque (absolute value of torque) 4: Output power 5: Output voltage 6: PULSE output (100.0% corresponds to 100.0 kHz) 7：AI1 8：AI2 9：AI3 (expansion card) 10： Length 11: Count value 12: Communication reference 13: Motor speed 14: Output current (100.0% corresponds to 1000.0 A) 15: Output voltage (100.0% corresponds to 1000.0 V) 16: Output torque (the actual value of torque)	0	☆
F5-07	The selection of AO1 output function		0	☆
F5-08	The selection of output function for expansion card AO2		1	☆
F5-09	The maximum frequency of FMP output	0.01kHz ～100.00kHz	50.00kHz	☆
F5-10	Zero offset coefficient of AO1	-100.0% ～+100.0%	0.0%	☆
F5-11	AO1 gain	-10.00 ～+10.00	1.00	☆
F5-12	Zero offset coefficient of expansion card AO2	-100.0% ～+100.0%	0.0%	☆
F5-13	The gain of expansion card AO2	-10.00 ～+10.00	1.00	☆
F5-17	The delay time of FMR output	0.0s ～3600.0s	0.0s	☆
F5-18	The delay time of RELAY1output	0.0s ～3600.0s	0.0s	☆

Function code	Name	Set range	Default value	Change
F5-19	The delay time of RELAY2output	0.0s ～3600.0s	0.0s	☆
F5-20	The delay time of DO1 output	0.0s ～3600.0s	0.0s	☆
F5-21	The delay time of DO2 output	0.0s ～3600.0s	0.0s	☆
F5-22	The valid state selection of output terminal DO	0: Positive logic 1: Negtive logic Ones place: FMR Tens place: RELAY1 Hundreds place: RELAY2 Thousands place: DO1 Myriabit: DO2	00000	☆
F5-23	The selection of output signals for AO1	0: Voltage signals 1: Current signals	0	★
Group F6 Start-stop control				
F6-00	The start mode	0: Start directly 1: Restart after the speed tracking 2. Pre-excitation start (asynchronous motor)	0	☆
F6-01	The tracking mode for revolving speed	0: Start from the shutdown frequency 0: Start from zero speed 2: Start from the maximum frequency	0	★
F6-02	Tracking speed of revolving speed	1 ～100	20	☆
F6-03	Start frequency	0.00Hz～10.00Hz	0.00Hz	☆
F6-04	The retention time for start frequency	0.0s ～100.0s	0.0s	★
F6-05	The starting of DC braking current / preliminary field current	0% ～100%	0%	★
F6-06	The starting time of DC braking / preliminary field	0.0s ～100.0s	0.0s	★
F6-07	The mode of Acceleration / deceleration	0: Linear Acceleration / deceleration 1: Acceleration / deceleration A for S curve 2: Acceleration / deceleration B for S curve	0	★

Function code	Name	Set range	Default value	Change
F6-08	The time proportion of start period for S curve	0.0%～(100.0%-F6-09)	30.0%	★
F6-09	The time proportion of end period for S curve	0.0%～(100.0%-F6-08)	30.0%	★
F6-10	The shutdown mode	0: Deceleration stop 1: Free stop	0	☆
F6-11	The start frequency of DC braking for shutdown	0.00 Hz ~ Maximum frequency	0.00Hz	☆
F6-12	The waiting time of DC braking for shutdown	0.0s ～100.0s	0.0s	☆
F6-13	The current of DC braking for shutdown	0% ～100%	0%	☆
F6-14	The time of DC braking for shutdown	0.0s ～100.0s	0.0s	☆
F6-15	The usage rate for braking	0% ～100%	100%	☆
Group F7 The keyboard and display				
F7-01	Function Selection of key MF.K	0: MF.K is invalid 1: The switching of operation panel command channel and remote command channel (Terminal command channel or communications command channel) 2: The switching of forward running and reverse running 3: Jog of forward running 4: Jog of reverse running	0	★
F7-02	The function of key STOP/RESET	0: Only in the keyboard operation mode, the shutdown function of key STOP/RES is valid. 1: The shutdown function of key STOP/RES is valid in any operation mode.	1	☆
F7-03	The running display parameter 1 of LED	0000～FFFF Bit00: Operation frequency 1 (Hz) Bit01: Set frequency (Hz) Bit02: Bus voltage (V) Bit03: Output voltage (V) Bit04: Output current (A) Bit05: Output power (kW) Bit06: Output torque (%)	1F	☆

Function code	Name	Set range	Default value	Change
		Bit07: The input state of DI Bit08: The output state of DO Bit09: AI1 voltage (V) Bit10: AI2 voltage (V) Bit11: AI3 voltage (V) Bit12: Count value Bit13: Length value Bit14: The display of loading speed Bit15: PID setting		
F7-04	The running display parameter 2 of LED	0000～FFFF Bit00: The feedback of PID Bit01: Stage PLC Bit02: PULSE input pulse frequency (kHz) Bit03: Operation frequency 2 (Hz) Bit04: The remaining run time Bit05: AI1 voltage before calibration (V) Bit06: AI2 voltage before calibration (V) Bit07: AI3 voltage before calibration (V) Bit08: Linear speed Bit09: The current power-on time (Hour) Bit10: The current run time (Min) Bit11: PULSE input pulse frequency (kHz) Bit12: The set value of communication Bit13: Feedback speed of encoder (Hz) Bit14: Principal frequency X Display (Hz) Bit15: Auxiliary frequency Y Display (Hz)	0	☆
F7-05	The shutdown display parameter of LED	0000～FFFF Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: The input state of DI Bit03: The output state of DO Bit04: AI1 voltage (V) Bit05: AI2 voltage (V) Bit06: AI3 voltage (V) Bit07: Count value Bit08: Length value Bit09: Stage PLC Bit10: Loading speed Bit11: PID setting Bit12: PULSE input pulse frequency (kHz)	33	☆
F7-06	The display coefficient of loading speed	0.0001～6.5000	1.0000	☆
F7-07	The temperature of inverter module radiator	0.0℃～100.0℃	-	●

Function code	Name	Set range	Default value	Change
F7-08	Version number of temporary software	-	-	●
F7-09	The accumulative run time	0h～65535h	-	●
F7-10	Product numbers	-	-	●
F7-11	Version number of software	-	-	●
F7-12	Loading speed displays decimal places	0: No decimal places 1: One decimal place 2: Two decimal places 3: Three decimal places	1	☆
F7-13	The accumulative power-on time	0 ~ 65535 hours	-	●
F7-14	The accumulative power consumption	0 ~ 65535 degrees	-	●
Group F8 Auxiliary function				
F8-00	Jog operation frequency	0.00 Hz ~ Maximum frequency	2.00Hz	☆
F8-01	Jog acceleration time	0.0s ～6500.0s	20.0s	☆
F8-02	Jog deceleration time	0.0s ～6500.0s	20.0s	☆
F8-03	Acceleration time 2	0.0s ～6500.0s	Model dependent	☆
F8-04	Deceleration time 2	0.0s ～6500.0s	Model dependent	☆
F8-05	Acceleration time 3	0.0s ～6500.0s	Model dependent	☆
F8-06	Deceleration time 3	0.0s ～6500.0s	Model dependent	☆
F8-07	Acceleration time 4	0.0s ～6500.0s	Model dependent	☆
F8-08	Deceleration time 4	0.0s ～6500.0s	Model dependent	☆
F8-09	Hopping Frequency1	0.00 Hz ~ Maximum frequency	0.00Hz	☆
F8-10	Hopping frequency 2	0.00 Hz ~ Maximum frequency	0.00Hz	☆
F8-11	Hopping frequency range	0.00 Hz ~ Maximum frequency	0.01Hz	☆
F8-12	The dead zone time of forward and reverse running	0.0s ～3000.0s	0.0s	☆

Function code	Name	Set range	Default value	Change
F8-13	Reverse running control forbidding	0: Permitted 1: Forbidden	0	☆
F8-14	The operation mode when the set frequency is below the lower limit frequency	0: Run at the lower limiting frequency 1: Shutdown 2: Operation at zero speed	0	☆
F8-15	Droop control	0.00Hz～10.00Hz	0.00Hz	☆
F8-16	Set the arriving time of accumulative power on	0h～65000h	0h	☆
F8-17	Set the arriving time of accumulative running	0h～65000h	0h	☆
F8-18	The selection of starting protection	0: Not protected 1: Protected	0	☆
F8-19	Frequency detection value (FDT1)	0.00Hz～Maximum frequency	50.00Hz	☆
F8-20	The lagged value of frequency detection (FDT1)	0.0%～100.0% (FDT1 electrical level)	5.0%	☆
F8-21	The detected width of frequency arriving	0.0%～100.0% (Maximum frequency)	0.0%	☆
F8-22	Whether the hopping frequency is valid in the process of acceleration/ deceleration	0: Permitted 1: Forbidden	0	☆
F8-25	The switching frequency point between acceleration time 1 and acceleration time 2	0.00Hz～Maximum frequency	0.00Hz	☆
F8-26	The switching frequency point between deceleration time 1 and deceleration time 2	0.00Hz～Maximum frequency	0.00Hz	☆
F8-27	Terminal jog precedence	0: Invalid 1: Valid	0	☆
F8-28	Frequency detection value (FDT2)	0.00Hz～Maximum frequency	50.00Hz	☆

Function code	Name	Set range	Default value	Change
F8-29	The lagged value of frequency detection (FDT1)	0.0%～100.0% (FDT2 electrical level)	5.0%	☆
F8-30	Detection value 1 of arbitrary arriving frequency	0.00Hz～Maximum frequency	50.00Hz	☆
F8-31	The detected width 1 of arbitrary arriving frequency	0.0%～100.0% (Maximum frequency)	0.0%	☆
F8-32	The detection value 2 of arbitrary arriving frequency	0.00Hz～Maximum frequency	50.00Hz	☆
F8-33	The detected width 2 of arbitrary arriving frequency	0.0%～100.0% (Maximum frequency)	0.0%	☆
F8-34	The detection level of zero current	0.0%～300.0% Be 100.0% corresponding to the rated current of motor	5.0%	☆
F8-35	The delayed time of current detection	0.01s ～600.00s	0.10s	☆
F8-36	Output current over-limit	0.0% (Not detected) 0.0% ～ 300.0% (The rated current of motor)	200.0%	☆
F8-37	The delayed time of output current over-limit detection	0.00s ～600.00s	0.00s	☆
F8-38	Arbitrary arriving current 1	0.0% ～ 300.0% (The rated current of motor)	100.0%	☆
F8-39	The width of arbitrary arriving current 1	0.0% ～ 300.0% (The rated current of motor)	0.0%	☆
F8-40	Arbitrary arriving current 2	0.0% ～ 300.0% (The rated current of motor)	100.0%	☆
F8-41	The width arbitrary arriving current 2	0.0% ～ 300.0% (The rated current of motor)	0.0%	☆
F8-42	The selection of timing function	0: Invalid 1: Valid	0	☆
F8-43	The selection of timing running time	0: F8-44 setting 1：AI1 2：AI2 3：AI3 The range of analog input is corresponding to F8-44		☆

Function code	Name	Set range	Default value	Change
F8-44	Timing run time	0.0Min～6500.0Min	0.0Min	☆
F8-45	The lower limit protection value of AI1 input voltage	0.00V ～F8-46	3.10V	☆
F8-46	The upper limiting protection value of AI1 input voltage	F8-45 ～10.00V	6.80V	☆
F8-47	The arriving of modules temperature	0℃～100 ℃	75℃	☆
F8-48	cooling fan	0: The fan is operating when at the run time 1: The fan is operating all the time	0	☆
F8-49	Wakening frequency	Dormant frequency (F8-51) ～Maximum frequency (F0-10)	0.00Hz	☆
F8-50	The waking delay time	0.0s ～6500.0s	0.0s	☆
F8-51	Dormant frequency	0.00Hz～Wakening frequency (F8-49)	0.00Hz	☆
F8-52	Ten dormant delay time	0.0s ～6500.0s	0.0s	☆
F8-53	The arriving time setting for the run	0.0 ~6500.0 minutes	0.0Min	☆
F8-54	The calibration coefficient of output power	0.00% ～200.0%	100.0%	☆
Group F9 Failure and protection				
F9-00	The protection selection of motor overloading	0: Forbidden 1: Permitted	1	☆
F9-01	The protection gain of motor overloading	0.20 ～10.00	1.00	☆
F9-02	The warning coefficient of motor overloading	50%～100%	80%	☆
F9-03	The gain of overpressure stall	0 ～100	0	☆
F9-04	The protective voltage for overvoltage stall	120% ～150%	130%	☆
F9-05	Gain of overcurrent stall	0 ～100	20	☆
F9-06	Protective current for overcurrent stall	100% ～200%	150%	☆
F9-07	The protection	0: Invalid 1: Valid	1	☆

Function code	Name	Set range	Default value	Change
	selection for power-on short circuit to ground			
F9-09	Failure automatic reset times	0 ～20	0	☆
F9-10	Failure DO action selection during failures automatic reset	0: No action 1: Action	0	☆
F9-11	Failure automatic reset interval time	0.1s ～100.0s	1.0s	☆
F9-12	Input default phase\ Contactor pull-in protection selection	Ones place: The protection selection of input default phase Tens place: The protection selection of contactor pull-in 0: Forbidden 1: Permitted	11	☆
F9-13	Output default phase protection selection	0: Forbidden 1: Permitted	1	☆
F9-14	Failure types for the first time	0: No failure 1: Reserved 2: Acceleration overcurrent 3: Deceleration overcurrent 4: Constant speed overcurrent 5: Acceleration overvoltage 6: Deceleration overvoltage 7: Constant speed overvoltage 8: Buffer resistance overloading 9: Under voltage 10: Frequency Inverter overloading 11: Motor overloading 12: Input default phase 13: Output default phase 14: Modules overheating 15: External failure 16: Communication is abnormal 17:The contactor is abnormal 18: Current detection is abnormal 19: Motor tuning is abnormal 20: Encoder/PG card is abnormal 21: The reading and writing of parameters is abnormal 22: Hardware of Frequency Inverter are abnormal	—	●
F9-15	Failure types for the second time		—	●

Function code	Name	Set range	Default value	Change
F9-16	Failure types for the third time (the latest time)	23: Motor short circuit to the ground 24: Reserved 25: Reserved 26: The arriving of the running time 27: User-defined failure 1 28: User-defined failure 2 29: The arriving of power-on time 30: Off load 31: PID feedback is missing at overtime 40: Rapid current-limiting is overtime 41: Switch the motor at overtime 42: Speed deviation is too large 43: The motor is over speed 45: The motor is over-temperature 51: The initial position error	—	●
F9-17	The frequency when failures occur for the third time(the latest time)	—	—	●
F9-18	The current when failures occur for the third time(the latest time)	—	—	●
F9-19	The Bus voltage for when failures occur the third time(the latest time)	—	—	●
F9-20	The state of input terminals when failures occur for the third time(the latest time)	—	—	●
F9-21	The state of output terminals when failures occur for the third time(the latest time)	—	—	●
F9-22	The state of the Frequency Inverter when failures occur for the third time(the latest time)	—	—	●

Function code	Name	Set range	Default value	Change
F9-23	The power-on time when failures occur for the third time(the latest time)	—	—	●
F9-24	The running time when failures occur for the third time(the latest time)	—	—	●
F9-27	The frequency when failures occur for the second time(the latest time)	—	—	●
F9-28	The current when failures occur for the second time(the latest time)	—	—	●
F9-29	The Bus voltage for when failures occur the second time(the latest time)	—	—	●
F9-30	The state of input terminals when failures occur for the second time(the latest time)	—	—	●
F9-31	The state of output terminals when failures occur for the second time(the latest time)	—	—	●
F9-32	The state of the Frequency Inverter when failures occur for the second time(the latest time)	—	—	●
F9-33	The power-on time when failures occur for the second time(the latest time)	—	—	●
F9-34	The running time when failures occur for the second time(the latest time)	—	—	●

Function code	Name	Set range	Default value	Change
F9-37	The frequency when failures occur for the first time(the latest time)	—	—	●
F9-38	The current when failures occur for the first time(the latest time)	—	—	●
F9-39	The Bus voltage for when failures occur the first time(the latest time)	—	—	●
F9-40	The state of input terminals when failures occur for the first time(the latest time)	—	—	●
F9-41	The state of output terminals when failures occur for the first time(the latest time)	—	—	●
F9-42	The state of the Frequency Inverter when failures occur for the first time(the latest time)	—	—	●
F9-43	The power-on time when failures occur for the first time(the latest time)	—	—	●
F9-44	The running time when failures occur for the first time(the latest time)	—	—	●
F9-47	Selection 1 of failure protection action	Ones place: Motor overloading (11) 0: Free stop 1: Shut down according to shutdown modes 2: Continue to run Tens place: Input default phase (12) Hundreds place: Output default phase (13) Thousand's place: External failure (15) Myriabit: Communication is abnormal (16)	00000	☆

Function code	Name	Set range	Default value	Change
F9-48	Selection 2 of failure protection action	Ones place: Encoder/PG card is abnormal (20) 0: Free stop Tens place: The reading and writing of function code is abnormal (21) 0: Free stop 1: Shut down according to shutdown modes Hundreds place: Reserved Thousand's place: Motor overheating (25) Myriabit: The arriving of the running time	00000	☆
F9-49	Selection 3 of failure protection action	Ones place: user-defined failure (27) 0: Free stop 1: Shut down according to shutdown modes 2: Continue to run Tens place: user-defined failure (28) 0: Free stop 1: Shut down according to shutdown modes 2: Continue to run Hundreds place: The arriving of the power-on time 0: Free stop 1: Shut down according to shutdown modes 2: Continue to run Thousand's place: Off load (30) 0: Free stop 1: Deceleration stop 2: Directly jump to the 7% of motor rated frequency to continue running, at the time of no off load automatically recover to the set frequency to run. Myriabit: PID feedback is missing(31) at the time of running 0: Free stop 1: Shut down according to shutdown modes 2: Continue to run	00000	☆
F9-50	Selection 4 of failure protection action	Ones place: Speed deviation is too large (42) 0: Free stop 1: Shut down according to shutdown modes 2: Continue to run Tens place: Motor super speed (43) Hundreds place: Initial position error (51)	00000	☆

Function code	Name	Set range	Default value	Change
F9-54	When failures occur, it continues to run. The frequency selection	0: Run at the current operating frequency 1: Run at the set frequency 2: Run at the upper limiting frequency 3: Run at the lower limit frequency 4: Run at the abnormal standby frequency	0	☆
F9-55	Abnormal standby frequency	0.0%～100.0% (100.0% corresponds to the maximum frequency F0-10)	100.0%	☆
F9-56	Types of motor temperature sensor	0: The sensor with no temperature 1：PT100 2：PT1000	0	☆
F9-57	The protective threshold value for motor overheating	0℃～200 ℃	110℃	☆
F9-58	The pre-alarm threshold value for motor overheating	0℃～200 ℃	90℃	☆
F9-59	The action selection for instantaneous power failure	0: Invalid 1: Slow down 2: Deceleration stop	0	☆
F9-60	Judge the voltage when instantaneous action stops	80.0% ～100.0%	90.0%	☆
F9-61	Judge the time when the voltage recovers during instantaneous power failure	0.00s ～100.00s	0.50s	☆
F9-62	Judge the voltage in the instantaneous power failure action	60.0% ～100.0% (Standard Bus voltage)	80.0%	☆
F9-63	Protection selection of off load	0: Invalid 1: Valid	0	☆
F9-64	Detection level of off load	0.0 ～100.0%	10.0%	☆
F9-65	Detection time of off load	0.0 ～60.0s	1.0s	☆
F9-67	Detection value of over speed	0.0%～50.0 % (Maximum frequency)	20.0%	☆
F9-68	Detection time of over speed	0.0s: No detection 0.1 ～60.0s	1.0s	☆
F9-69	The detection value of too large speed deviation	0.0%～50.0 % (Maximum frequency)	20.0%	☆

Function code	Name	Set range	Default value	Change
F9-70	The detection time of too large speed deviation	0.0s: No detection 0.1 ～60.0s	5.0s	☆
Group FA PID function				
FA-00	PID Given source	0: FA-01 setting 1：AI1 2：AI2 3：AI3 4: PULSE pulse setting (DI5) 5: Communication reference 6: Multi-stage instructions reference	0	☆
FA-01	PID value reference	0.0%～100.0%	50.0%	☆
FA-02	PID feedback source	0：AI1 1：AI2 2：AI3 3：AI1-AI2 4: PULSE pulse setting (DI5) 5: Communication reference 6：AI1+AI2 7：MAX(|AI1|, |AI2|) 8：MIN(|AI1|, |AI2|)	0	☆
FA-03	PID action direction	0: Positive action 1: Negative action	0	☆
FA-04	PID given feedback range	0 ～65535	1000	☆
FA-05	Proportional gain Kp1	0.0 ～100.0	20.0	☆
FA-06	Integral time Ti1	0.01s ～10.00s	2.00s	☆
FA-07	Differential time Td1	0.000s～10.000s	0.000s	☆
FA-08	The reversal cut-off frequency of PID	0.00 ～ Maximum frequency	2.00Hz	☆
FA-09	PID deviation limit	0.0%～100.0%	0.0%	☆
FA-10	PID differential amplitude limiting	0.00% ～100.00%	0.10%	☆
FA-11	Given changed time of PID	0.00 ～650.00s	0.00s	☆
FA-12	Filtering time of PID feedback	0.00 ～60.00s	0.00s	☆
FA-13	Filtering time of PID output	0.00 ～60.00s	0.00s	☆

Function code	Name	Set range	Default value	Change
FA-14	Reserved	-	-	☆
FA-15	Proportional gain Kp2	0.0 ～100.0	20.0	☆
FA-16	Integral time Ti2	0.01s ～10.00s	2.00s	☆
FA-17	Differential time Td2	0.000s～10.000s	0.000s	☆
FA-18	Switching conditions of PID parameters	0: Not switched 1: Switch through DI terminal 2: According to the deviation to switch automatically	0	☆
FA-19	Switching deviation1 of PID parameter	0.0%～FA-20	20.0%	☆
FA-20	Switching deviation2 of PID parameter	FA-19 ～100.0%	80.0%	☆
FA-21	PID initial value	0.0%～100.0%	0.0%	☆
FA-22	Retention time of PID initial value	0.00 ～650.00s	0.00s	☆
FA-23	The forward direction maximum value of two output deviations	0.00% ～100.00%	1.00%	☆
FA-24	The reverse direction maximum value of two output deviations	0.00% ～100.00%	1.00%	☆
FA-25	Integral attribute of PID	Ones place: integral separation 0: Invalid 1: Valid Tens place: Whether to stop the integral after the output arriving at the limit 0: Continue the integral 1: Stop the integral	00	☆
FA-26	Detection value of PID feedback missing	0.0%: no judgment of the feedback missing 0.1%～100.0%	0.0%	☆
FA-27	Detection time of PID feedback missing	0.0s ～20.0s	0.0s	☆
FA-28	Calculation at the time of shutdown for PID	0: No calculation at the time of shutdown 1: Calculation at the time of shutdown	0	☆

Function code	Name	Set range	Default value	Change
Group Fb The swing frequency, fixed-length and count				
Fb-00	The set mode of swing frequency	0: Relative to the center frequency 1: Relative to the maximum frequency	0	☆
Fb-01	The amplitude of swing frequency	0.0%～100.0%	0.0%	☆
Fb-02	The amplitude of kick frequency	0.0%～50.0%	0.0%	☆
Fb-03	The swing frequency cycle	0.1s ～3000.0s	10.0s	☆
Fb-04	The triangular wave risetime of swing frequency	0.1%～100.0%	50.0%	☆
Fb-05	Set length	0m ～65535m	1000m	☆
Fb-06	Actual length	0m ～65535m	0m	☆
Fb-07	Pulse numbers in per meter	0.1 ～6553.5	100.0	☆
Fb-08	Set count value	1 ～65535	1000	☆
Fb-09	Assigned count value	1 ～65535	1000	☆
Group FC Multi-stage instructions, simple PLC				
FC-00	Multi-stage instruction 0	-100.0% ～100.0%	0.0%	☆
FC-01	Multi-stage instruction 1	-100.0% ～100.0%	0.0%	☆
FC-02	Multi-stage instruction 2	-100.0% ～100.0%	0.0%	☆
FC-03	Multi-stage instruction 3	-100.0% ～100.0%	0.0%	☆
FC-04	Multi-stage instruction 4	-100.0% ～100.0%	0.0%	☆
FC-05	Multi-stage instruction 5	-100.0% ～100.0%	0.0%	☆
FC-06	Multi-stage instruction 6	-100.0% ～100.0%	0.0%	☆
FC-07	Multi-stage instruction 7	-100.0% ～100.0%	0.0%	☆
FC-08	Multi-stage instruction 8	-100.0% ～100.0%	0.0%	☆
FC-09	Multi-stage instruction 9	-100.0% ～100.0%	0.0%	☆
FC-10	Multi-stage instruction 10	-100.0% ～100.0%	0.0%	☆
FC-11	Multi-stage instruction 11	-100.0% ～100.0%	0.0%	☆

Function code	Name	Set range	Default value	Change
FC-12	Multi-stage instruction 12	-100.0% ～100.0%	0.0%	☆
FC-13	Multi-stage instruction 13	-100.0% ～100.0%	0.0%	☆
FC-14	Multi-stage instruction 14	-100.0% ～100.0%	0.0%	☆
FC-15	Multi-stage instruction 15	-100.0% ～100.0%	0.0%	☆
FC-16	Operation mode of Simple PLC	0: Shut down at the end of single running 1: Keep the final value at the end of single running 2: Circulating all the time	0	☆
FC-17	Operation mode of Simple PLC	Ones place: The selection of power-down memory 0: No power-down memory 1: Power-down memory Tens place: The selection of stop memory 0: No stop memory 1: Stop memory	00	☆
FC-18	Run time for stage 0 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-19	The time selection of acceleration and deceleration for stage 0 of simple PLC	0 ～3	0	☆
FC-20	Run time for stage 1 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-21	The time selection of acceleration and deceleration for stage 1 of simple PLC	0 ～3	0	☆
FC-22	Run time for stage 2 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-23	The time selection of acceleration and deceleration for stage 2 of simple PLC	0 ～3	0	☆
FC-24	Run time for stage 3 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-25	The time selection of acceleration and deceleration for stage 3 of simple PLC	0 ～3	0	☆

Function code	Name	Set range	Default value	Change
FC-26	Run time for stage 4 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-27	The time selection of acceleration and deceleration for stage 4 of simple PLC	0 ～3	0	☆
FC-28	Run time for stage 5 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-29	The time selection of acceleration and deceleration for stage 5 of simple PLC	0 ～3	0	☆
FC-30	Run time for stage 6 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-31	The time selection of acceleration and deceleration for stage 6 of simple PLC	0 ～3	0	☆
FC-32	Run time for stage 7 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-33	The time selection of acceleration and deceleration for stage 7 of simple PLC	0 ～3	0	☆
FC-34	Run time for stage 8 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-35	The time selection of acceleration and deceleration for stage 8 of simple PLC	0 ～3	0	☆
FC-36	Run time for stage 9 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-37	The time selection of acceleration and deceleration for stage 9 of simple PLC	0 ～3	0	☆
FC-38	Run time for stage 10 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-39	The time selection of acceleration and deceleration for stage 10 of simple PLC	0 ～3	0	☆

Function code	Name	Set range	Default value	Change
FC-40	Run time for stage 11 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-41	The time selection of acceleration and deceleration for stage 11 of simple PLC	0 ～3	0	☆
FC-42	Run time for stage 12 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-43	The time selection of acceleration and deceleration for stage 12 of simple PLC	0 ～3	0	☆
FC-44	Run time for stage 13 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-45	The time selection of acceleration and deceleration for stage 13 of simple PLC	0 ～3	0	☆
FC-46	Run time for stage 14 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-47	The time selection of acceleration and deceleration for stage 14 of simple PLC	0 ～3	0	☆
FC-48	Run time for stage 15 of simple PLC	0.0s(h)～6553.5s(h)	0.0s(h)	☆
FC-49	The time selection of acceleration and deceleration for stage 15 of simple PLC	0 ～3	0	☆
FC-50	The run time unit of simple PLC	0: s (second) 1: h (hour)	0	☆
FC-51	Multi-stage instruction 0 given mode	0: Function code FC-00 reference 1：AI1 2：AI2 3：AI3 4: PULSE pulse 5：PID 6: The preset frequency (F0-08) reference, UP/DOWN can be modified	0	☆

Function code	Name	Set range	Default value	Change
Group Fd Communication parameter				
Fd-00	Baud rate of Communication	Ones place: MODBUS 0：300BPS 1：600BPS 2：1200BPS 3：2400BPS 4：4800BPS 5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS	6005	☆
Fd-01	MODBUS data format	0: No parity check (8-N-2) 1: Even parity check (8-E-1) 2: Odd Parity Check (8-E-1) 3: No parity check (8-N-1) (Valid for Modbus)	0	☆
Fd-02	Local address	0: Broadcast address 1 ～247 Valid for Modbus, PROFIBUS-DP and CANlink	1	☆
Fd-03	Response delay	0 ～20ms 1～247 （Valid for Modbus）	2	☆
Fd-04	Communication timeout	0.0: Invalid 0.1 ～60.0s	0.0	☆
Fd-05	Modbus protocol selection and PROFIBUS-DP data format	Ones place: MODBUS 0: Non-standard MODBUS protocol 1: Standard MODBUS protocol	30	☆
Fd-06	Communication reading current resolution	0：0.01A 1：0.1A	0	☆
Group FE Users make function code				
FE-00	User function code 0	F0-00 ～FP-xx A0-00 ～Ax-xx U0-xx ～U0-xx	F0.10	☆
FE-01	User function code 1		F0.02	☆
FE-02	User function code 2		F0.03	☆
FE-03	User function code 3		F0.07	☆
FE-04	User function code 4		F0.08	☆
FE-05	User function code 5		F0.17	☆
FE-06	User function code 6		F0.18	☆
FE-07	User function code 7		F3.00	☆
FE-08	User function code 8		F3.01	☆

Function code	Name	Set range	Default value	Change
FE-09	User function code 9		F4.00	☆
FE-10	User function code 10		F4.01	☆
FE-11	User function code 11		F4.02	☆
FE-12	User function code 12		F5.04	☆
FE-13	User function code 13	F0-00 ～FP-xx A0-00 ～Ax-xx U0-xx ～U0-xx	F5.07	☆
FE-14	User function code 14		F6.00	☆
FE-15	User function code 15		F6.10	☆
FE-16	User function code 16		F0.00	☆
FE-17	User function code 17		F0.00	☆
FE-18	User function code 18		F0.00	☆
FE-19	User function code 19		F0.00	☆
FE-20	User function code 20		F0.00	☆
FE-21	User function code 21		F0.00	☆
FE-22	User function code 22		F0.00	☆
FE-23	User function code 23		F0.00	☆
FE-24	User function code 24		F0.00	☆
FE-25	User function code 25		F0.00	☆
FE-26	User function code 26		F0.00	☆
FE-27	User function code 27		F0.00	☆
FE-28	User function code 28		F0.00	☆
FE-29	User function code 29		F0.00	☆
Group FP Management of Function code				
FP-00	User password	0 ～65535	0	☆

Function code	Name	Set range	Default value	Change
FP-01	Parameter initialization	0: No operation 01: Restore default parameter, not including motor parameter 02: Eliminate record information 04: Backup user current parameters 501: Restore user backup parameters	0	★
FP-02	Display selections of function parameter set	Ones place: group U display selection 0: No display 1: Display Tens place: group A display selection 0: No display 1: Display	11	☆
FP-04	Display selections of unique parameter set	Ones place: Users customize the display selection of parameter set 0: No display 1: Display Tens place: Users change the display selection of parameter set 0: No display 1: Display	00	☆
Group A0 Control parameters of torque				
A0-00	The selection of speed/torque control mode	0: Speed control 1: Torque control	0	★
A0-01	The selection of torque setting source under torque control mode	0: Digital setting 1 (A0-03) 1: AI1 2：AI2 3：AI3 4: PULSE pulse 5: Communication reference 6：MIN(AI1,AI2) 7：MAX(AI1,AI2) (The full range of 1-7 options corresponds to A0-03 digital settings)	0	★
A0-03	The digital setting of torque under torque control mode	-200.0% ～200.0%	150.0%	☆
A0-05	The maximum frequency of forward direction for torque control	0.00Hz ~ Maximum frequency	50.00Hz	☆
A0-06	The maximum frequency of reverse direction for torque control	0.00Hz ~ Maximum frequency	50.00Hz	☆

Function code	Name	Set range	Default value	Change
A0-07	Acceleration time of torque control	0.00s ～65000s	0.00s	☆
A0-08	Deceleration time of Torque control	0.00s ～65000s	0.00s	☆
Group A2 The second motor control				
A2-00	The type selection	0: General asynchronous motor 1: Asynchronous motor with frequency conversion 2: Synchronous motor with permanent magnet	0	★
A2-01	Rated power of Motor	0.1kW ～1000.0kW	Model dependent	★
A2-02	Rated voltage of motor	1V～2000V	Model dependent	★
A2-03	Rated current of motor	0.01A ～ 655.35A (The power of Frequency Inverter≤55Kw) 0.1A～6553.5A (The power of Frequency Inverter >55kW)	Model dependent	★
A2-04	Rated frequency of motor	0.01 Hz ~ Maximum frequency	Model dependent	★
A2-05	Rated rotating speed motor	1rpm～65535rpm	Model dependent	★
A2-06	Stator resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-07	Rotor resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-08	Leakage inductive reactance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-09	Interaction inductive reactance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-10	No-load current of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★

Function code	Name	Set range	Default value	Change
A2-16	Stator resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-17	D axis inductance of the synchronous machine	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-18	Q axis inductance of the synchronous machine	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A2-20	Counter electromotive force of synchronous motor	0.1V～6553.5V	Model dependent	★
A2-27	The line number of encoder	1 ～65535	1024	★
A2-28	The type of encoder	0: ABZ incremental encoder 2: Rotary transformer	0	★
A2-29	PG selection from speed feedback	0: Local PG 1: Extending PG 2: PULSE pulse input (DI5)	0	★
A2-30	ABZ incremental encoder AB phase sequence	0: Forward direction 1: Reverse direction	0	★
A2-34	Polar logarithm of rotary transformer	1 ～65535	1	★
A2-36	Detection time of PG disconnection from speed feedback	0.0: no action 0.1s ～10.0s 0.1s ～10.0s	0.0	★
A2-37	Tuning selection	0: No operation 1: Static tuning of the asynchronous machine 2: Complete tuning of the asynchronous machine 11: Static tuning of the synchronous machine 12: Complete tuning of of the synchronous machine	0	★
A2-38	The proportional gain 1 of speed loop	1 ～100	30	☆

Function code	Name	Set range	Default value	Change
A2-39	The integral time 1 of speed loop	0.01s ～10.00s	0.50s	☆
A2-40	Switching frequency 1	0.00 ～A2-43	5.00Hz	☆
A2-41	The proportional gain 2 of speed loop	1 ～100	20	☆
A2-42	The integral time 2 of speed loop	0.01s ～10.00s	1.00s	☆
A2-43	Switching frequency 2	A2-40 ~ Maximum frequency	10.00Hz	☆
A2-44	Vector control slip gain	50%～200%	100%	☆
A2-45	The filtering time constant of speed loop	0.000s～0.100s	0.000s	☆
A2-46	Vector control over excitation gain	0 ～200	64	☆
A2-47	Upper limiting source under the speed control mode	0: A3-48 setting 1: AI1 2: AI2 3: AI3 4: PULSE pulse 5: Communication reference 6：MIN(AI1,AI2) 7：MAX(AI1,AI2) The full range of 1-7 options, correspond A2-48 digital settings	0	☆
A2-48	Upper limiting digital setting of torque under the speed control mode	0.0%～200.0%	150.0%	☆
A2-51	The proportional gain of excitation regulation	0 ～20000	2000	☆
A2-52	The integral gain of excitation regulation	0 ～20000	1300	☆
A2-53	The proportional gain of torque adjustment	0 ～20000	2000	☆
A2-54	The integral gain of torque adjustment	0 ～20000	1300	☆
A2-55	lntegral attribute of speed loop	Ones place: integral separation 0: Invalid 1: Valid	0	☆

Function code	Name	Set range	Default value	Change
A2-56	Flux weakening mode of the synchronous machine	0: Not flux weakening 1: Direct calculation mode 2: Automatic adjustment mode	1	☆
A2-57	Flux weakening depth of the synchronous machine	50%～500%	100%	☆
A2-58	The maximum flux weakening current	1% ～300%	50%	☆
A2-59	Flux weakening automatic adjustment gain	10%～500%	100%	☆
A2-60	Flux weakening integral multiples	2 ～10	2	☆
A2-61	The control mode of the second motor	0: Vector control of non-speed sensor (SVC) 1: Vector control of speed sensor (FVC) 2: V/F control	0	☆
A2-62	The time selection of the second motor acceleration or deceleration	0: Be in the same with the first motor 1: Acceleration/deceleration time 1 2: Acceleration/deceleration time 2 3: Acceleration/deceleration time 3 4: Acceleration/deceleration time 4	0	☆
A2-63	The torque boost of the second motor	0.0%: (Automatic torque boost) 0.1%～30.0%	Model dependent	☆
A2-65	The oscillation suppression gain of second motor	0 ～100	Model dependent	☆
Group A3 The third motor control				
A3-00	The type selection	0: General asynchronous motor 1: Asynchronous motor with frequency conversion 2: Synchronous motor with permanent magnet	0	★
A3-01	Rated power of motor	0.1kW ～1000.0kW	Model dependent	★
A3-02	Rated voltage of motor	1V～2000V	Model dependent	★
A3-03	Rated current of motor	0.01A ～ 655.35A (The power of Frequency Inverter≤55Kw) 0.1A～6553.5A (The power of Frequency Inverter >55kW)	Model dependent	★

Function code	Name	Set range	Default value	Change
A3-04	Rated frequency of motor	0.01 Hz ~ Maximum frequency	Model dependent	★
A3-05	Rated rotating speed of motor	1rpm～65535rpm	Model dependent	★
A3-06	Stator resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A3-07	Rotor resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A3-08	Leakage inductive reactance of the asynchronous motor	0.01mH ～ 655.35mH (The power of Frequency Inverter≤55kW) 0.001mH ～ 65.535mH (The power of Frequency Inverter >55kW)	Model dependent	★
A3-09	Interaction inductive reactance of the asynchronous motor	0.1mH ～ 6553.5mH (The power of Frequency Inverter≤55kW) 0.01mH ～ 655.35mH (The power of Frequency Inverter >55kW)	Model dependent	★
A3-10	No-load current of the asynchronous motor	0.01A ～ A3-03 (The power of Frequency Inverter≤55Kw) 0.1A～A3-03(The power of Frequency Inverter>55kW) 0.1A～A3-03 (The power of Frequency Inverter>55Kw)	Model dependent	★
A3-16	Stator resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A3-17	D axis inductance of the synchronous machine	0.01mH ～ 655.35mH (The power of Frequency Inverter≤55kW) 0.001mH ～ 65.535mH (The power of Frequency Inverter >55kW)	Model dependent	★
A3-18	Q axis inductance of the synchronous machine	0.1mH ～ 6553.5mH (The power of Frequency Inverter≤55kW) 0.01mH ～ 655.35mH (The power of Frequency Inverter >55kW)	Model dependent	★
A3-20	Counter electromotive force of synchronous	0.1V～6553.5V	Model dependent	★

Function code	Name	Set range	Default value	Change
	motor			
A3-27	The encoder line number	1 ～65535	1024	★
A3-28	The type of encoder	0: ABZ incremental encoder 2: Rotary transformer	0	★
A3-29	PG selection from speed feedback	0: Local PG 1: Extending PG 2: PULSE pulse input (DI5)	0	★
A3-30	A, B phase sequence of ABZ incremental encoder	0: Forward direction 1: Reverse direction	0	★
A3-34	Number of pole pairs of resolver	1 ～65535	1	★
A3-36	Encoder wire-break fault detection time	0.0: no action 0.1s ～10.0s	0.0	★
A3-37	Auto-tuning selection	0: No operation 1: Static tuning of the asynchronous machine 2: Complete tuning of the asynchronous machine 11: Static tuning of the synchronous machine 12: Complete tuning of of the synchronous machine	0	★
A3-38	Speed loop proportional gain 1	1 ～100	30	☆
A3-39	Speed loop integral time 1	0.01s ～10.00s	0.50s	☆
A3-40	Switchover frequency 1	0.00 ～A3-43	5.00Hz	☆
A3-41	Speed loop proportional gain 2	1 ～100	20	☆
A3-42	Speed loop integral time 2	0.01s ～10.00s	1.00s	☆
A3-43	Switchover frequency 2	A3-40 ～ Maximum frequency	10.00Hz	☆
A3-44	Vector control slip gain	50%～200%	100%	☆
A3-45	Time constant of speed loop filter	0.000s～0.100s	0.000s	☆
A3-46	Vector control over-excitation gain	0 ～200	64	☆
A3-47	Torque upper limit source in speed	0: A3-48 setting 1: AI1	0	☆

Function code	Name	Set range	Default value	Change
	control mode	2: AI2 3: AI3 4: PULSE pulse 5: Communication reference 6：MIN(AI1,AI2) 7：MAX(AI1,AI2) The full range of 1-7 options corresponds to A4-48 digital settings		
A3-48	Digital setting of torque upper limit in speed control mode	0.0%～200.0%	150.0%	☆
A3-51	Excitation adjustment proportional gain	0 ～20000	2000	☆
A3-52	Excitation adjustment integral gain	0 ～20000	1300	☆
A3-53	Torque adjustment proportional gain	0 ～20000	2000	☆
A3-54	Torque adjustment integral gain	0 ～20000	1300	☆
A3-55	Speed loop integral property	Ones place: integral separation 0: Invalid 1: Valid	0	☆
A3-56	Field weakening mode of synchronous motor	0: Not flux weakening 1: Direct calculation mode 2: Automatic adjustment mode	1	☆
A3-57	Field weakening degree of synchronous motor	50%～500%	100%	☆
A3-58	Maximum field weakening current	1% ～300%	50%	☆
A3-59	Field weakening automatic adjustment gain	10%～500%	100%	☆
A3-60	Field weakening integral multiple	2 ～10	2	☆
A3-61	The control mode of the third motor	0: Non-speed sensor vector control(SVC) 1: Speed sensor vector control (FVC) 2: V/F control	0	★
A3-62	The time selection of the third motor acceleration or decelaration	0: Be in the same with the first motor 1: Acceleration/decelaration time 1 2: Acceleration/decelaration time 2 3: Acceleration/decelaration time 3	0	☆

Function code	Name	Set range	Default value	Change
		4: Acceleration/deceleration time 4		
A3-63	The torque boost of the third motor	0.0%: (Automatic torque boost) 0.1%～30.0%	Model dependent	☆
A3-65	The oscillation suppression gain of the third motor	0 ～100	Model dependent	☆
Group A4 The fourth motor control				
A4-00	The type selection	0: General asynchronous motor 1: Asynchronous motor with frequency conversion 2: Synchronous motor with permanent magnet	0	★
A4-01	Rated power of motor	0.1kW ～1000.0Kw	Model dependent	★
A4-02	Rated voltage of motor	1V～2000V	Model dependent	★
A4-03	Rated current of motor	0.01A ～ 655.35A (The power of Frequency Inverter<=55kW) 0.1A～6553.5A (The power of Frequency Inverter>55kW)	Model dependent	★
A4-04	Rated frequency of motor	0.01 Hz ~ Maximum frequency	Model dependent	★
A4-05	Rated rotating speed of motor	1rpm～65535rpm	Model dependent	★
A4-06	Stator resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55Kw) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter>55Kw)	Model dependent	★
A4-07	Rotor resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter>55kW)	Model dependent	★
A4-08	Leakage inductive reactance of the asynchronous motor	0.01mH ～ 655.35mH (The power of Frequency Inverter≤55kW) 0.001mH ～ 65.535mH (The power of Frequency Inverter >55kW)	Model dependent	★
A4-09	Interaction inductive reactance of the asynchronous motor	0.01mH ～ 655.35mH (The power of Frequency Inverter≤55kW) 0.001mH ～ 65.535mH (The power of Frequency Inverter >55kW)	Model dependent	★
A4-10	No-load current of the asynchronous	0.01A ～F1-03 (The power of Frequency Inverter≤55kW)	Model dependent	★

Function code	Name	Set range	Default value	Change
	motor	0.1A～F1-03 (The power of Frequency Inverter >55kW)		
A4-16	Stator resistance of the asynchronous motor	0.001Ω ～ 65.535Ω (The power of Frequency Inverter≤55kW) 0.0001Ω ～ 6.5535Ω (The power of Frequency Inverter >55kW)	Model dependent	★
A4-17	D axis inductance of the synchronous machine	0.01mH ～ 655.35mH (The power of Frequency Inverter≤55kW) 0.001mH ～ 65.535mH (The power of Frequency Inverter >55kW)	Model dependent	★
A4-18	Q axis inductance of the synchronous machine	0.01mH ～ 655.35mH (The power of Frequency Inverter≤55kW) 0.001mH ～ 65.535mH (The power of Frequency Inverter >55kW)	Model dependent	★
A4-20	Counter electromotive force of synchronous motor	0.1V～6553.5V	Model dependent	★
A4-27	The line number of encoder	1 ～65535	1024	★
A4-28	The type of encoder	0: ABZ incremental encoder 2: Rotary transformer	0	★
A4-29	PG selection from speed feedback	0: Local PG 1: Extending PG 2: PULSE pulse input (DI5)	0	★
A4-30	ABZ incremental encoder AB phase sequence	0: Forward direction 1: Reverse direction	0	★
A4-34	The number of pole-pairs for rotary transformer	1 ～65535	1	★
A4-36	The testing time of PG disconnection from speed feedback	0.0: no action 0.1s ～10.0	0.0	★
A4-37	Tuning selection	0: No operation 1: Static tuning of the asynchronous machine 2: Complete tuning of the asynchronous machine 11: Static tuning of the synchronous machine 12: Complete tuning of of the synchronous machine	0	★
A4-38	The proportional	1 ～100	30	☆

Function code	Name	Set range	Default value	Change
	gain 1 of speed loop			
A4-39	The integral time 1 of speed loop	0.01s ～10.00s	0.50s	☆
A4-40	Switching frequency 1	0.00 ～A4-43	5.00Hz	☆
A4-41	The proportional gain 2 of speed loop	1 ～100	20	☆
A4-42	The integral time 2 of speed loop	0.01s ～10.00s	1.00s	☆
A4-43	Switching frequency 2	A4-40 ~ Maximum frequency	10.00Hz	☆
A4-44	Slip gain of vector control	50%～200%	100%	☆
A4-45	The filtering time constant of speed loop	0.000s～0.100s	0.000s	☆
A4-46	The over excitation gain of vector control	0 ～200	64	☆
A4-47	Upper limiting source of torque under the speed control mode	0: A4-48 setting 1：AI1 1: A4-48 setting 2：AI2 3：AI3 4: PULSE pulse 5: Communication reference 6：MIN(AI1,AI2) 7：MAX(AI1,AI2) The full range of 1-7 options corresponds to A4-48 digital settings	0	☆
A4-48	Upper limiting digital setting of torque under the speed control mode	0.0%～200.0%	150.0%	☆
A4-51	The proportional gain of excitation regulation	0 ～20000	2000	☆
A4-52	The integral gain of excitation regulation	0 ～20000	1300	☆
A4-53	The proportion gain of torque adjustment	0 ～20000	2000	☆
A4-54	The integral gain of	0 ～20000	1300	☆

Function code	Name	Set range	Default value	Change
	torque adjustment			
A4-55	Integral attribute of speed loop	Ones place: integral separation 0: Invalid 1: Valid	0	☆
A4-56	Flux weakening mode of synchronous machine	0: Not flux weakening 1: Direct calculation mode 2: Automatic adjustment mode	1	☆
A4-57	The flux weakening depth of synchronous machine	50%～500%	100%	☆
A4-58	The maximum flux weakening current	1% ～300%	50%	☆
A4-59	The automatic adjustment gain of flux weakening	10%～500%	100%	☆
A4-60	Integral multiples of flux weakening	2 ～10	2	☆
A4-61	The control mode of Motor 4	0: Non-speed sensor vector control(SVC) 1:Speed sensor vector control (FVC) 2: V/F control	0	☆
A4-62	Acceleration/deceleration time selection of Motor 4	0: Be in the same with Motor 1 1: Acceleration/deceleration time 1 2: Acceleration/deceleration time 2 3: Acceleration/deceleration time 3 4: Acceleration/deceleration time 4	0	☆
A4-63	Torque boost of Motor 4	0.0%: (Automatic torque boost) 0.1%～30.0%	Model dependent	☆
A4-65	The oscillation suppression gain of Motor 4	0 ～100	Model dependent	☆
Group A5 Parameters of control optimization				
A5-00	Upper limiting frequency of DPWM switching	0.00Hz～15.00Hz	12.00Hz	☆
A5-01	PWM modulation mode	0: Asynchronous modulation 1: Synchronizing modulation	0	☆
A5-02	The selection of compensation mode in dead zone	0: No compensation 1: Compensation mode 1 2: Compensation mode 2	1	☆
A5-03	The depth of the random PWM	0: Random PWM is invalid 1 ～10: The random depth of PWM carrier frequency	0	☆
A5-04	Rapid current	0: Not enabled	1	☆

Function code	Name	Set range	Default value	Change
	limiting enabled	1: Enabled		
A5-05	Compensation of current detection	0 ～100	5	☆
A5-06	Setting for under-voltage points	60.0% ～140.0%	100.0%	☆
A5-07	The selection of SVC optimization mode	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	☆
A5-08	Time adjustment in dead zone	100% ～200%	150%	☆
A5-09	Setting of over-voltage points	200.0V～2500.0V	Model dependent	★
Group A6 The curve setting of AI				
A6-00	The minimum input of AI curve 4	-10.00V ～A6-02	0.00V	☆
A6-01	The corresponding setting of the minimum input for AI curve 4	-100.0% ～+100.0%	0.0%	☆
A6-02	Inflection point 1 input of AI curve 4	A6-00 ～A6-04	3.00V	☆
A6-03	The corresponding setting of inflection point 1 input for AI curve 4	-100.0% ～+100.0%	30.0%	☆
A6-04	The inflection point 2 input of AI curve 4	A6-02 ～A6-06	6.00V	☆
A6-05	The corresponding setting of inflection point 2 input for AI curve 4	-100.0% ～+100.0%	60.0%	☆
A6-06	The maximum input of AI curve 4	A6-06 ～+10.00V	10.00V	☆
A6-07	The corresponding setting of the maximum input for AI curve 4	-100.0% ～+100.0%	100.0%	☆
A6-08	The minimum input of AI curve 4	-10.00V ～A6-10	-10.00V	☆
A6-09	The corresponding setting of the minimum input for AI curve 4	-100.0% ～+100.0%	-100.0%	☆
A6-10	Inflection point 1	A6-08 ～A6-12	-3.00V	☆

Function code	Name	Set range	Default value	Change
	input of AI curve 4			
A6-11	The corresponding setting of inflection point 1 input for AI curve 5	-100.0% ～+100.0%	-30.0%	☆
A6-12	The inflection point 2 input of AI curve 5	A6-10 ～A6-14	3.00V	☆
A6-13	The corresponding setting of inflection point 2 input for AI curve 5	-100.0% ～+100.0%	30.0%	☆
A6-14	The maximum input of AI curve 5	A6-12 ～+10.00V	10.00V	☆
A6-15	The corresponding setting of the maximum input for AI curve 5	-100.0% ～+100.0%	100.0%	☆
A6-24	Set jumping point of AI1	-100.0% ～100.0%	0.0%	☆
A6-25	Set jumping amplitude of AI1	0.0%～100.0%	0.5%	☆
A6-26	Set jumping point of AI2	-100.0% ～100.0%	0.0%	☆
A6-27	Set jumping amplitude of AI2	0.0%～100.0%	0.5%	☆
A6-28	Set jumping point of AI3	-100.0% ～100.0%	0.0%	☆
A6-29	Set jumping amplitude of AI3	0.0%～100.0%	0.5%	☆
Group AC AIAO calibration				
AC-00	Actually measured voltage 1 of AI1	0.500V～4.000V	The factory calibration	☆
AC-01	Display voltage 1 of AI1	0.500V～4.000V	The factory calibration	☆
AC-02	Actually measured voltage 2 of AI1	6.000V～9.999V	The factory calibration	☆
AC-03	Display voltage 2 of AI1	6.000V～9.999V	The factory calibration	☆
AC-04	Actually measured voltage 1 of AI2	0.500V～4.000V	The factory	☆

Function code	Name	Set range	Default value	Change
			calibration	
AC-05	Display voltage 1 of AI2	0.500V～4.000V	The factory calibration	☆
AC-06	Actually measured voltage2 of AI2	6.000V～9.999V	The factory calibration	☆
AC-07	Display voltage 2 of AI2	6.000V～9.999V	The factory calibration	☆
AC-08	Actually measured voltage 1 of AI3	-9.999V ～10.000V	The factory calibration	☆
AC-09	Display voltage 1 of AI3	-9.999V ～10.000V	The factory calibration	☆
AC-10	Actually measured voltage 3 of AI3	-9.999V ～10.000V	The factory calibration	☆
AC-11	Display voltage 3 of AI3	-9.999V ～10.000V	The factory calibration	☆
AC-12	Target voltage 1 of AO1	0.500V～4.000V	The factory calibration	☆
AC-13	Actually measured voltage 1 of AO1	0.500V～4.000V	The factory calibration	☆
AC-14	Target voltage 2 of AO1	6.000V～9.999V	The factory calibration	☆
AC-15	Actually measured voltage 2 of AO1	6.000V～9.999V	The factory calibration	☆
AC-16	Target voltage 1 of AO2	0.500V～4.000V	The factory calibration	☆
AC-17	Actually measured voltage 1 of AO2	0.500V～4.000V	The factory calibration	☆
AC-18	Target voltage 25 of AO2	6.000V～9.999V	The factory calibration	☆
AC-19	Actually measured voltage 2 of AO2	6.000V～9.999V	The factory	☆

Function code	Name	Set range	Default value	Change
			calibration	
AC-20	Actually measured current 1 of AI2	0.000mA～20.000mA	The factory calibration	☆
AC-21	Sampling current 1 of AI2	0.000mA～20.000mA	The factory calibration	☆
AC-22	Actually measured current 2 of AI2	0.000mA～20.000mA	The factory calibration	☆
AC-23	Sampling current 2 of AI2	0.000mA～20.000mA	The factory calibration	☆
AC-24	Ideal current 1 of AO1	0.000mA～20.000mA	The factory calibration	☆
AC-25	Actually measured current 1 of AO1	0.000mA～20.000mA	The factory calibration	☆
AC-26	Ideal current 2 of AO1	0.000mA～20.000mA	The factory calibration	☆
AC-27	Actually measured current 2 of AO1	0.000mA～20.000mA	The factory calibration	☆

5.2 Monitoring parameter list

Table 5-2 The monitoring parameter list

Function code	Name	The minimum unit	Address
Group U0 Basic Monitoring Parameters			
U0-00	Operation frequency (Hz))	0.01Hz	7000H
U0-01	Set frequency (Hz))	0.01Hz	7001H
U0-02	Bus voltage (V)	0.1V	7002H
U0-03	Output voltage (V)	1V	7003H
U0-04	Output current (A)	0.01A	7004H
U0-05	Output power (kW)	0.1kW	7005H
U0-06	Output torque (%)	0.1%	7006H
U0-07	DI Input state	1	7007H
U0-08	DO Output state	1	7008H

Function code	Name	The minimum unit	Address
U0-09	AI1 Voltage (V)	0.01V	7009H
U0-10	AI2 Voltage (V) / Current (mA)	0.01V/0.01mA	700AH
U0-11	AI3 Voltage (V)	0.01V	700BH
U0-12	Count value	1	700CH
U0-13	Length value	1	700DH
U0-14	Display of loading speed	1	700EH
U0-15	PID Setting	1	700FH
U0-16	PID Feedback	1	7010H
U0-17	Stage PLC	1	7011H
U0-18	PULSE Input pulse frequency (Hz)	0.01kHz	7012H
U0-19	Feedback speed (Hz)	0.01Hz	7013H
U0-20	The remaining run time	0.1Min	7014H
U0-21	AI1 Voltage before calibration	0.001V	7015H
U0-22	AI2 Voltage (V) / Current (mA) before calibration	0.001V/0.01Ma	7016H
U0-23	AI3 Voltage before calibration	0.001V	7017H
U0-24	Linear speed	1m/Min	7018H
U0-25	The current power-on time	1Min	7019H
U0-26	The current run time	0.1Min	701AH
U0-27	PULSE Input pulse frequency	1Hz	701BH
U0-28	Set value of communication	0.01%	701CH
U0-29	Feedback speed of encoder	0.01Hz	701DH
U0-30	Principal frequency	0.01Hz	701EH
U0-31	Auxiliary frequency Y Display	0.01Hz	701FH
U0-32	Examine the address value of arbitrary memory	1	7020H
U0-33	The rotor position of synchronous machine	0.1°	7021H
U0-34	Temperature value of the motor	1℃	7022H
U0-35	Target torque (%)	0.1%	7023H
U0-36	Rotary position	1	7024H
U0-37	Angle of power factor	0.1°	7025H
U0-38	ABZ Position	1	7026H
U0-39	Voltage of VF separation target	1V	7027H
U0-40	Voltage of VF separation output	1V	7028H

Function code	Name	The minimum unit	Address
U0-41	Visual display in DI input state	1	7029H
U0-42	Visual display in DO input state	1	702AH
U0-43	Visual display 1 in DI functional state (Function 01-Function 40)	1	702BH
U0-44	Visual display 2 in DI functional state (Function 41-Function 80)	1	702CH
U0-45	Failure Message	1	702DH
U0-58	Z Signal counter	1	703AH
U0-59	Set frequency (%)	0.01%	703BH
U0-60	Operation frequency (%)	0.01%	703CH
U0-61	The state of Frequency Inverter	1	703DH
U0-62	The current failure code	1	703EH
U0-65	The upper limit of torque	0.1%	7041H

Chapter 6 Parameter Description

Group F0 Basic functional groups

F0-00	GP Type display		Default value	Relating to the type
	Set range	1	Type G (Type of constant torque load)	
		2	Type P (Type of load such as fan, water pump)	

This parameter is only used for users to see the factory type and it cannot be changed.

1: It is applicable to specified constant torque load with a rated parameter.

2: It is applicable to specified variable torque load with a rated parameter (Fan load and water pump load)

F0-01	The control mode of the first motor		Default value	0
	Set range	0	Vector control with non-speed sensor (SVC)	
		1	Vector control with speed sensor (FVC)	
		2	V/F Control	

0: Vector control with non-speed sensor

It refers to the vector control of open-loop and is usually suitable in high-performance control conditions. A Frequency Inverter can only drive a motor, such as machine tool, centrifuge machine, wire drawing machine, injection molding machine and so on load.

1: Vector control with speed sensor

It refers to vector control of the closed-loop. The motor end must be equipped with encoder. The Frequency Inverter must choose PG cards of the same type with the encoder. It is applicable to the occasion of high-precision speed control or torque control. A Frequency Inverter can only drive a motor, such as paper manufacturing machinery with high speed, hoisting machinery elevator and so on load.

2: V/F Control

It is applicable to the condition that has a lower load demand or that a Frequency Inverter drives more than one motors, such as fan load and pump load. It can be used in the condition that a Frequency Inverter drives more than one motor.

Tip: When choosing the vector control mode, the process of motor parameter identification must be done. Only accurate motor parameters can give a full play to the superiority of the vector control mode. It can obtain better performance by adjusting the function code of group F2 for parameters of speed regulator (the second, third and fourth motor are respectively group A2, A3 and A4,)

For the synchronous motor with permanent magnet, generally choose the vector control with speed sensor. It can also choose VF control in some conditions for the application of small power motor. CT3000-G does

not support the vector control with non-speed sensor for the synchronous motor with permanent magnet

F0-02	Selection of command source		Default value	0
	Set range	0	Command channel for operation panel (LED is out)	
		1	Command channel for Terminal (LED is on)	
		2	Command channel for communication (LED flickers)	

Choose the input channel of control command for Frequency Inverter.

The control command of Frequency Inverter includes: start, stop, forward, reverse, jog and so on.

Press keys of RUN and the STOP/RES on the operation panel to conduct the control of operation command.

1: Command channel for terminal ("LOCAL/REMOT" light is on)

Conduct the control of operation command through multi-function input terminals of FWD , REV, JOGF, JOGR and so on.

2: Command channel for Communication ("LOCAL/REMOT" light flickers)

Upper computer gives the operation command through communication mode. See appendix 1 for definition of control command: CT3000-G address defines the supplementary description of communication card.

F0-03	Principle frequency source X Selection		Default value	0
	Set range	0	Digital Setting (The preset frequency is F0-08, the UP/DOWN can be modified, no power-down memory)	
		1	Digital Setting (The preset frequency is F0-08, the UP/DOWN can be modified, power-down memory)	
		2	AI1	
		3	AI2	
		4	AI3	
		5	Pulse setting (DI5)	
		6	Multi-stage instruction	
		7	PLC	
		8	PID	
		9	Communication reference	

Choose the input channel of the main given frequency of Frequency Inverter. There are a total of 10 main given frequency channels.

0: Digital Setting (No power-down memory)

Set the initial value at the value of F0-08 "preset frequency ". It can change the set frequency value of the Frequency Inverter through the key▲ and the key▼ on the keyboard (or the UP and DOWN of multi-function input terminals)

When power on again after the power down of the Frequency Inverter, the set frequency value reverts to the value of F0-08 “digital setting preset frequencies”

1: Digital Setting (power-down memory)

Set the initial value at the value of F0-08 “preset frequency”. It can change the set frequency value of the Frequency Inverter through the key▲ and the key▼ on the keyboard (or the UP and DOWN of multi-function input terminals)

When power on again after the power down of the Frequency Inverter, the set frequency value is the last time preset frequency at the time of power-down. It was memorized by the calibration amount of the key▲ and the key▼ on the keyboard or the UP and DOWN terminals.

What need to be reminded is that F0-23 is “the selection of shutdown memory for digital set frequency” and F0-23 is used to choose whether the frequency calibration amount is memorized or is reseted when the Frequency Inverter stops.

2：AI1

3：AI2

4：AI3

It refers to that the frequency is determined by terminals of analog input. CT3000-G control panel provides two terminals of analog input (AI1, AI2), and the I/O expansion card can provide another terminal of analog input (AI3).

Among them:

AI1 is 0V～10V voltage input.

AI2 can be 0V～10V voltage input and also can be 4mA～20mA current input. It is chosen by the J8 jumper wire on the control panel.

AI3 is -10V ～10V voltage input.

Users are free to choose the values of input voltage for AI1, AI2 and AI3 and the corresponding curves with the target frequency.

CT3000-G provides five groups of corresponding curves, among them three groups of curves are straight line relationship (two points corresponding relationship) and two groups of curves are arbitrary curves belongs to 4 points corresponding relationship. Users can set it through F4-13 ~ F4-27 functional code and group A6 functional code.

Functional code F4-33 is used to set the analog input of AI1~AI3. Which group among the five groups of curves to respectively select.

When the AI acts as the given frequency, the corresponding setting of 100.0% of voltage/current input

refers to the percentage of relative maximum frequency F0-10.

5. Pulse reference (DI5)

The frequency is given through the high-speed pulse of terminal DI5.

The specifications of the pulse reference signal: voltage range is 9V～30V, frequency range is 0kHz～100kHz. Only through multi-functional input of terminal DI5 to input pulse reference.

The relationship between input pulse frequency and the corresponding setting of DI5 terminal can be settled by F4-28~F4-31. It is the corresponding relationship 2 points straight line and the corresponding setting of 100.0% of pulse input refers to the percentage of relative maximum frequency F0-10.

6. Multi-stage instruction

When choosing the operation mode of the multi-stage instruction, it needs different combination state of digital input for DI terminal corresponding to different set frequency values.

CT3000-G can set more than four terminals of multi-stage instruction (terminal function 12 ~ 15) and 16 kinds of state of 4 terminals and it can corresponds to 16 kinds of arbitrary “multi-stage instruction” through the function code of group FC. “Multi-stage instruction” is the percentage of relative maximum frequency F0-10.

When the DI terminal of digital input acts as the terminal function of multi-stage instruction, it needs to set accordingly in group F4. Please refer to relevant descriptions of function parameters in group F4 for details.

7. Simple PLC

When the frequency source is the simple PLC, the operation frequency source of Frequency Inverter can switch between the 1~16 arbitrary frequency instructions. Users can also set the retention time and their respective deceleration time of 1 ~ 16 frequency instruction. Please refer to relevant descriptions in group F4 for details.

8、PID

Select the output controlled by process PID as operation frequency. it is generally used in the control of technology closed-loop on site, such as closed-loop control with constant pressure, closed-loop control with constant tension and so on occasions.

When the PID application acts as frequency source, it needs to set the relevant parameters of "PID function" in group FA.

9. Communication reference

It refers that the frequency is given by the Modbus communication mode.

Upper computer gives date through the address 0 x1000 and that the data format is 100.00% ~ 100.00% refers to the percentage of relative maximum frequency F0-10.

F0-04	Auxiliary frequency source Y Selection		Default value	0
	Set range	0	Digital Setting (The preset frequency is F0-08, the UP/DOWN can be modified, no power-down memory)	
		1	Digital Setting (The preset frequency is F0-08, the UP/DOWN can be modified, power-down memory)	
		2	AI1	
		3	AI2	
		4	AI3	
		5	Pulse setting (DI5)	
		6	Multi-stage instruction	
		7	PLC	
		8	PID	
		9	Communication reference	

When the source of auxiliary frequency acts as the independent channel of frequency reference (namely the selection of frequency source is the switch from X to Y) and refer to the relevant descriptions of F0-03 for operation method.

When the source of auxiliary frequency acts as superposition reference (namely the combinations of principle frequency source X and auxiliary frequency source Y achieves the frequency reference), pay attention to:

1. When the source of auxiliary frequency is digital reference, the preset frequency (F0-08) doesn't work. Users conduct frequency adjustment through the key▲ and the key▼ on the keyboard (or the UP and DOWN of multi-function input terminals) to adjust the frequency. Adjust directly on the basis of the main given frequency.

2. When the source of auxiliary frequency is analog input reference (AI1、AI2、AI3) or pulse input reference, that the 100% of input setting corresponds to the range of auxiliary frequency source can be settled through F0-05 and F0-06.

3. When the frequency source is pulse input reference, it is similar to analog reference.

Tip: The selections of auxiliary frequency source X and principle frequency source Y can't be settled in the same channel, namely F0-03 and F0-04 can’t be settled at the same value, and otherwise it is easy to cause confusion.

F0-05	The selection of the range of auxiliary frequency source Y when it is in superposition.	Default Value	0 0

F0-06	Set range	0	Relative Maximum Frequency	
		1	Relative Principle Frequency Source X	
	The range of auxiliary frequency source Y when it is in superposition.		Default Value	0 0
	Set range		0% ～150% 0% ～150%	

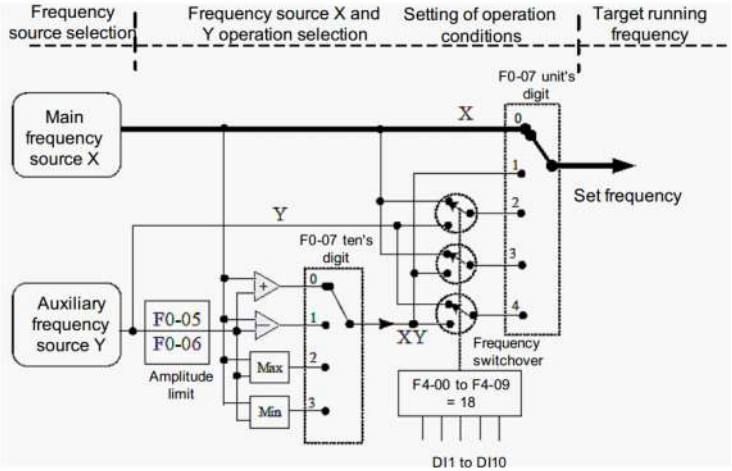
When the selection of frequency source is “frequency superposition”, these two parameters is used to determine the adjustment range of the auxiliary frequency source.

F0-05 is used to determine the corresponding object in the range of auxiliary frequency source. It can choose the relative maximum frequency or the relative principle frequency source X. If choosing the relative principle frequency source, the range of auxiliary frequency source will change according to the change of principle frequency X.

F0-07	The selection of superposition for frequency source		Default value	0
	Set range	Ones Place	The selection of frequency source	
		0	Principle frequency source X	
		1	The results of Main / auxiliary calculations (The calculation relationship is determined by the tens place)	
		2	The switch between the principle frequency source X and the auxiliary frequency source Y	
		3	The switch between the principle frequency source X and the results of main /auxiliary calculations	
		4	The switch between the auxiliary frequency source Y and the results of main /auxiliary calculations	
		Tens Place	The relationship of Main / auxiliary calculation for frequency source	
		0	Main + Auxiliary	
		1	Main - Auxiliary	
		2	The maximum value between the two	
		3	The minimum value between the two	

Select frequency given channel by this parameter. Realize frequency reference through the recombination of

main frequency source X and quenching frequency source Y.



When make frequency source as main and auxiliary operation, can set offset frequency by F0-21. Superimpose offset frequency base on the result of main and auxiliary operation to cope with various demand.

F0-08	Preset frequency	Default value	50.00Hz
	Set range	0.00-maximum frequency (the selector mode for frequency source is valid by figure setting)	

When select “figure setting” or “terminal UP/DOWN” for frequency source, this function code is the frequency figure setting initial value of Frequency Inverter.

F0-09	Operation direction		Default value	0
	Set range	0	Same direction	
		1	Opposite direction	

You can change the direction of rotation of motor without changing motor wiring by changing this function code. Means that you can adjust the any two wires of motor (U, V, W) to change the direction of rotation of motor.

Note: the operation direction of motor will restore original state after parameter initialization. After system debugging, shall be cautious at the situation that forbid changing the direction of rotation of motor.

F0-10	Maximum frequency	Default value	50.00Hz

	Set range	50.00Hz ～320.00Hz

When the analog input, impulse input (DI5), multistage instruction etc. of CT3000-G is frequency source, and respective 100.0 % is calibrated as F0-10.

Output-maximum frequency of CT3000-G can reach 3200Hz. You can select decimal places of frequency instruction by F0-22 for giving consideration to two indexes that are frequency instruction resolution and frequent input range.

When select F0-22 as 1, the frequency resolution is 0.1Hz and the set range of F0-10 is 50.0Hz-3200.0Hz; when select F0-22 as 2, the frequency resolution is 0.01Hz and the set range of F0-10 is 50.0Hz-320.00Hz;

Note:

Modifying F0-22 can change the frequency resolution of all relative function parameter about frequency.

F0-11	Upper limiting frequency source		Default value	0
	Set range	0	F0-12 setting	
		1	AI1	
		2	AI2	
		3	AI3	
		4	PULSE setting (DI5)	
		5	Communication reference	

Define the source of upper limiting frequency. Upper limiting frequency can come from figure setting (F0-12), analog input, PULSE setting or communication reference.

When use analog AI1、AI2、AI3 setting, PULSE setting (DI5) or Communication reference, it is similar with main frequency source. See the introduction of F0-03.

For example when use torque control method at winding control site, you can set upper limiting frequency by analogue for preventing from material breaking and “galloping” phenomenon. When the Frequency Inverter operates to upper limiting frequency, Frequency Inverter will keep operating at upper limiting frequency.

F0-12	Upper limiting frequency	Default value	50.00Hz
	Set range	Lower limiting frequency F0-14-maximum frequency F0-10	

Set upper limiting frequency and the set range is F0-14 -F0-10.

F0-13	Upper limiting frequency offset	Default value	0.00Hz
	Set range	0.00Hz-maximum frequency F0-10	

When set the upper limiting frequency source as analogue or PULSE setting, F0-13 is the offset of set value. The superposition of offset frequency and upper limiting frequency set by F0-11 is taken as the ultimate set

value of upper limiting frequency.

F0-14	Lower limiting frequency	Default value	0.00Hz
	Set range	0.00Hz- upper limiting frequency F0-12	

When the frequency instruction is lower than the lower limiting frequency set by F0-14, the Frequency Inverter can stop, operate as lower limiting frequency or operate as zero speed. You can set operation mode by F8-14 (set frequency of operation mode shall be lower than lower limiting frequency).

F0-15	Carrier frequency	Default value	Related to the type
	Set range	0.5kHz～16.0kHz	

This function can adjust the carrier frequency of Frequency Inverter. You can reduce the motor noise, avoid the resonance point of mechanical system, and reduce the leak electricity of circuit for the ground (reduce the disturbance that Frequency Inverter produce) by adjusting carrier frequency. When the carrier frequency is lower, higher harmonic component of output current is increased, loss of motor is increased, and temperature rise in motor is increased. When the carrier frequency is higher, loss of motor is reduced, temperature rise in motor is reduced, but loss of Frequency Inverter is increased, temperature rise in Frequency Inverter is increased and disturbance is increased.

Adjusting carrier frequency can affect the following performances:

Carrier frequency	Low → high
Motor noise	Big → small
Output current waveform	Bad → good
Temperature rise in motor	High →Low
Temperature rise in Frequency Inverter	Low → high
Leak current	Small → big
Radiated interference for outside	Small → big

The default value of carrier frequency is different for the Frequency Inverter with different power. Although the user can modify according to demand, but need notice: if carrier frequency is higher than default value, it can increase the temperature rise in the radiator of Frequency Inverter. At this time the user need reduce the power of Frequency Inverter, otherwise the Frequency Inverter will appear temperature alarm.

F0-16	Carrier frequency is adjusted as temperature	Default value	1
	Set range	0：no；1：yes	

Carrier frequency is adjusted as temperature means that when the Frequency Inverter test that its radiator's temperature is higher, it will reduce carrier frequency automatically to reduce the temperature rise in Frequency Inverter. When the radiator's temperature is lower, carrier frequency will restore to set value step by step. This function can reduce the opportunity of temperature alarm of Frequency Inverter.

F0-17	Acceleration time 1	Default value	Model dependent
	Set range	0.00s ～650.00s(F0-19=2) 0.0s ～6500.0s(F0-19=1) 0s～65000s(F0-19=0)	
F0-18	Deceleration time 1	Default value	Model dependent
	Set range	0.00s ～650.00s(F0-19=2) 0.0s ～6500.0s(F0-19=1) 0s～65000s(F0-19=0)	

Acceleration time means the time that Frequency Inverter accelerates to acceleration/deceleration reference frequency (F0-25 confirms) from frequency zero. See the t1 of Fig. 6-1.

Deceleration time means the time that Frequency Inverter decelerates to frequency zero from acceleration/deceleration reference frequency (F0-25 confirms). See the t2 of Fig. 6-1.

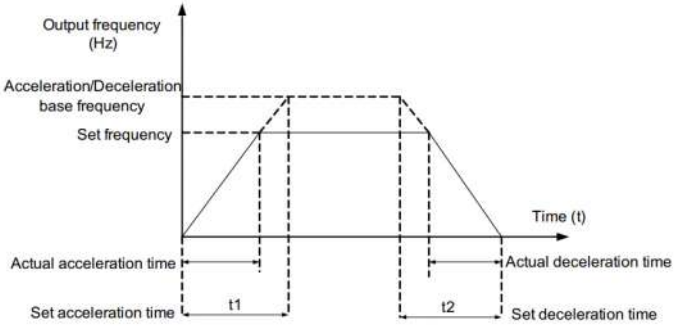


Fig. 6-1 Acceleration/deceleration time diagram

CT3000-G provides 4 groups of acceleration/deceleration time. The user can select by digital value input terminal DI switch. 4 groups of acceleration/deceleration time are set by the following function code:

Group 1: F0-1, F0-18;

Group 2: F8-03, F8-04;

Group 3: F8-05l, F8-06;

Group 4: F8-07, F8-08.

F0-19	The unit of acceleration/deceleration time	Default value	1
	Set range: 0	1 second	
	Set range: 1	0.1 second	
	Set range: 2	0.01 second	

CT3000-G provides 3 kinds of the unit of acceleration/deceleration time for meeting the requirement of all

kinds of site, and they are 1 second, 0.1 second and 0.01 second.

Note:

When modify the function parameter, the decimal places which are displayed by 4 groups of acceleration/deceleration time will be changed, and the corresponding acceleration/deceleration time will be changed too. You shall watch particularly during using it.

F0-21	Offset frequency of auxiliary frequency source when superposition	Default value	0.00Hz
	Set range	0.00Hz-maximum frequency F0-10	

This function code is valid when the frequency source is main/auxiliary operation.

When make frequency source as main and auxiliary operation, can set offset frequency as F0-21. Superimpositions of offset frequency and the result of main and auxiliary operation are taken as the ultimate frequency setting value. Make the frequency setting is more flexible.

F0-22	Frequency instruction resolution		Default value	2
	Set range	1	0.1Hz	
		2	0.01Hz	

This parameter is used to confirm the all resolution about frequency.

When the frequency resolution is 0.1Hz, the maximum output frequency of CT3000-G can reach 3200Hz.

When the frequency resolution is 0.01Hz, the maximum output frequency of CT3000-G is 600.00Hz.

Note:

When modify the function parameter, the all decimal places about frequency will be changed, and the corresponding frequency value will be changed too. You shall watch particularly during using it.

This parameter is restored, but default value will not be restored.

F0-23	Stop memory selection of figure set frequency		Default value	0
	Set range	0	No memory	
		1	Memory	

This function is valid only when the frequency source is figure setting.

The “no memory” means figure set frequency value is restored to F0-08(preset frequency) after Frequency Inverter stopping. The frequency modification of key ▲, ▼ or the terminal UP, DOWN will be reset.

The “memory” means figure set frequency value is kept to the set frequency of the last stopping after Frequency Inverter stopping. The frequency modification of key ▲, ▼ or the terminal UP, DOWN will be valid.

F0-24	The selection of motor parameter		Default value	0
	Set range	0	Motor parameter set 1	
		1	Motor parameter set 2	
		2	Motor parameter set 3	
		3	Motor parameter set 4	

CT3000-G supports that Frequency Inverter drive 4 motors at different time. 4 motors can respectively set motor nameplate parameter, independent parameter tune, and respectively select the parameter about different control mode, setting in independence and operation performance etc.

Corresponding function parameter set of motor parameter set 1 is F1 and F2. Motor parameter set 2, motor parameter set 3, and motor parameter set 4 respectively corresponds to the function parameter set A2, A3 and A4.

The user selects motor parameter set by function code F0-24 and also by input terminal of digital quantity DI switch. When the function selection is contradictory with terminal selection, we are subject to terminal selection.

F0-25	The reference frequency of acceleration/deceleration time		Default value	0
	Set range	0	Maximum frequency(F0-10)	
		1	Set frequency	
		2	100Hz	

The acceleration/deceleration time means the acceleration/deceleration time from frequency zero to the frequency set by F0-25. Fig. 6-1 is the acceleration/deceleration time diagram.

When select F0-25 as 1, acceleration/deceleration time is related with set frequency. If set frequency change continually, the accelerated speed of motor is changing, and you should be carefully during using it.

F0-26	Frequency instruction UP/DOWN standard in operation		Default value	0
	Set range	0	Operation frequency	
		1	Set frequency	

This parameter is valid only when the frequency source is figure setting.

This parameter is used to confirm the way of modifying set frequency when the key ▲, ▼ is operating.

Means confirm that target frequency is increased/reduced base on operation frequency or set frequency.

The difference between two kinds of set is obvious when the Frequency Inverter is in the process of acceleration/deceleration. Mean that if the operation frequency of Frequency Inverter is different with set frequency, the difference is obvious for this parameter's different selection.

F0-27	Command source bind frequency source		Default value	000
	Set range	Ones place	Select of operation panel command binding frequency source	
		0	Without binding	
		1	The frequency source of digital setting	
		2	AI1	
		3	AI2	
		4	AI3	
		5	PULSE setting (DI5)	
		6	Multi-stage instruction	
		7	Simple PLC	
		8	PID	
		9	Communication reference	
		Tens place	The selection of terminal command binding frequency source (0-9, same with ones place)	
		Hundreds place	The selection of communication command binding frequency source (0-9, same with ones place)	

Define the binding combination among 3 kinds of operation commands and 9 frequencies given channel to implement synchronous switch.

Above the meaning of frequency given channels is same with frequency source X selection F0-03. Please see Function code description F0-03..

Different operation command can bind same frequency given channel.

When command source has binding frequency source, the frequency source set by F0-03-F0-07 is invalid in the valid term of command source.

F0-28	Serial communication protocol selection		Default value	0
	Set range	0	MODBUS protocol	

CT3000-G uses the serial port to realize MODBUS.

Group F1 The first motor parameter

F1-00	Motor type selection		Default value	0
	Set range	0	Common asynchronous motor	
		1	Frequency conversion asynchronous motor	
		2	Permanent magnet synchronous motor	
F1-01	Rated power		Default value	Model dependent
	Set range		0.1kW ～1000.0kW	
F1-02	Rated voltage		Default value	Model dependent
	Set range		1V～2000V	
F1-03	Rated current		Default value	Model dependent
	Set range		0.01A ～655.35A(Frequency Inverter power<=55kW) 0.1A～6553.5A(Frequency Inverter power >55kW)	
F1-04	Rated frequency		Default value	Model dependent
	Set range		0.01Hz-maximum frequency	
F1-05	Rated speed		Default value	Model dependent
	Set range		1rpm～65535rpm	

Above function code is motor nameplate parameter. Whatever you choose VF control or vector control you both need set relevant parameter according to motor nameplate.

For getting better VF or vector control performance, we need adjust motor parameter, and the accuracy of adjusting result is related with setting correctly motor nameplate parameter.

F1-06	Stator resistance of asynchronous motor	Default value	Model dependent
	Set range	0.001Ω -65.535Ω(the power of Frequency Inverter≤55kW) 0.0001Ω -6.5535Ω(the power of Frequency Inverter >55kW)	
F1-07	Rotor resistance of asynchronous motor	Default value	Model dependent
	Set range	0.001Ω -65.535Ω(the power of Frequency Inverter≤55kW) 0.0001Ω -6.5535Ω(the power of Frequency Inverter >55kW)	
F1-08	Leakage inductive reactance of asynchronous motor	Default value	Model dependent

	Set range	0.01mH -655.35mH(the power of Frequency Inverter ≤55kW) 0.001mH-65.535mH(the power of Frequency Inverter >55kW)	
F1-09	Interaction inductive reactance of asynchronous motor	Default value	Model dependent
	Set range	0.1mH -6553.5mH(the power of Frequency Inverter ≤55kW) 0.01mH -655.35mH(the power of Frequency Inverter >55kW)	
F1-10	No-load current of asynchronous motor	Default value	Model dependent
	Set range	0.01A -F1-03(the power of Frequency Inverter ≤55kW) 0.1A-F1-03(the power of Frequency Inverter >55kW)	

F1-06-F1-10 is the parameter of asynchronous motor. The motor nameplate usually doesn't have these parameters. You can get them through the self-tuning of Frequency Inverter. Where, "static tuning of asynchronous motor" only can get three parameters from F1-06 to F1-08, and but "complete tuning of asynchronous motor" not only can get 5 parameters in here, also can get phase sequence of encoder, parameter PI of current loop etc.

When change motor rated power (F1-01) or motor rated voltage (F1-02), the Frequency Inverter will modify the value from F1-06-F1-10 and restore 5 parameters to the common standard Y serial motor parameter.

If you cannot tune for asynchronous motor at field, you can input above corresponding function code according to the parameter provided by manufacturers.

F1-16	Stator resistance of synchronous motor	Default value	Model dependent
	Set range	0.001Ω -65.535Ω(the power of Frequency Inverter ≤55kW) 0.0001Ω -6.5535Ω(the power of Frequency Inverter >55kW)	
F1-17	D axle inductance of synchronous motor	Default value	Model dependent
	Set range	0.001mH-65.535mH(the power of Frequency Inverter >55kW)	
F1-18	Q axle inductance of synchronous motor	Default value	Model dependent

	Set range	0.001mH-65.535mH(the power of Frequency Inverter >55kW)	
F1-20	Counter electromotive force of synchronous motor	Default value	Model dependent
	Set range	0.1V～6553.5V	

F1-16-F1-20 is the parameter of synchronous motor, and the nameplate of some synchronous motors provide part parameters, but most motor nameplate doesn't provide above parameter. You need get them through Frequency Inverter self-tuning and you have to choose "no-load tuning of synchronous motor". Because "no-load tuning of synchronous motor" can get 4 parameters F1-16, F1-17, F1-18, F1-20, but "load tuning of synchronous motor" only can get the phase sequence of synchronous motor encoder, angle of installation and other parameters.

When change motor rated power (F1-01) or motor rated voltage (F1-02), Frequency Inverter will change the parameters from F1-16 to F1-20. You shall be carefully during using it.

Above synchronous motor parameter, you can directly set the corresponding function parameter according to the data provided by manufacturers.

F1-27	The line number of encoder	Default value	1024
	Set range	1 ～65535	

Set the pulse count in every turn of ABZ or UVW incremental encoder.

Under the sensor vector control you have to set encoder pulse count correctly, otherwise motor running is not normal.

F1-28	Encoder type		Default value	0
	Set range	0	ABZ incremental encoder	
		1	UVW incremental encoder	
		2	Resolver	
		3	SIN/COS encoder	
		4	Wire-saving UVW encoder	

CT3000-G support a variety of encoder types, and different encoder need be matched with different PG card. You shall purchase PG card correctly during using it. Where, synchronous motor, asynchronous motor both can choose ABZ incremental encoder and rotary transformer.

After installing PG card, you shall set F1-28 correctly according to practical situation. Otherwise the Frequency Inverter running may not be normal.

F1-30	AB phase sequence of incremental encoder		Default value	0
	Set range	0	Forward	
		1	Reverse	

This function is only valid for ABZ incremental encoder, and means only when F1-28=0, it is valid. The

phase sequence is used to set the AB signal of ABZ incremental encoder.

This function code is both valid for asynchronous motor and synchronous motor. When the asynchronous motor is in “complete tuning” or synchronous motor is in “no-load tuning”, you can get the AB phase sequence of ABZ incremental encoder.

F1-34	The pole-pairs of rotary transformer	Default value	1
	Set range	1 ～65535	

Rotary transformer has pole-pairs, so you have to set pole-pairs parameter correctly when you are using this encoder.

F1-36	Disconnection detection time from speed feedback PG	Default value	1
	Set range	1 ～65535	

When set the detection time of encoder wire break failure as 0.0s, Frequency Inverter doesn’t the wire break failure of encoder.

When the Frequency Inverter detected the wire break failure, and the time exceeds the time set by F1-36, Frequency Inverter will warn as ERR20.

F1-37	Tuning selection		Default value 0
	Set range	0	No-operation
		1	Static tuning for asynchronous motor
		2	Complete tuning for asynchronous motor
		3	Static and complete parameter identification
		11	Load tuning for synchronous motor
		12	No-load tuning for synchronous motor

0: No-operation means forbid to tune.

1: Static tuning for asynchronous motor is suitable for that kind of condition that asynchronous motor is not easy to separate with load, but can not do complete tuning.

Before static tuning for asynchronous motor, have to set motor type and motor nameplate parameter from F1-00 to F1-05. For the static tuning of asynchronous motor, Frequency Inverter can get 3 parameters from F1-06 to F1-08.

Description of the operation: set this function code as 1, then press RUN key, and the Frequency Inverter shall do static tuning.

2: complete tuning for asynchronous motor.

For ensuring the dynamic control performance, please choose the complete tuning. At this time motor have

to separate with load to keep the motor is in no-load state.

Frequency Inverter do the static tuning first, then accelerate to 80% of motor rated frequency as acceleration time F0-17 and keep it for some time and do deceleration stop as deceleration time F0-18 and at last finishing tuning during the process of complete tuning.

Before doing the complete tuning of asynchronous motor, except for need set motor type and motor nameplate parameters from F1-00 to F1-05, need set encoder type and the pulse count of encoder F1-27, F1-28 correctly.

For complete tuning of asynchronous motor, Frequency Inverter can get 5 motor parameters from F1-06 to F1-10 and AB phase sequence F1-30 of encoder, current loop with vector control PI parameters from F2-13 to F2-16.

Description of the operation: set this function code as 2, and then press RUN key and the Frequency Inverter shall do complete tuning.

3: static and complete parameter identification

It is suitable for that without encoder learn for the motor parameter when motor is in static state (at this time motor may shake slightly, need be careful)

Before doing the static and complete tuning of asynchronous motor, have to set motor type and motor nameplate parameters from F1-00 to F1-05 correctly. For the static and complete tuning of asynchronous motor, Frequency Inverter shall get 5 parameters from F1-06 to F1-10.

11: load tuning of synchronous motor

When the motor cannot separate with load, you have to select load tuning of synchronous motor. In this process motor turn as 10RPM. Before doing the load tuning of synchronous motor, need set motor type and motor nameplate parameters from F1-00 to F1-05.

For load tuning of synchronous motor, Frequency Inverter can get initial position angle. This is the requirement of which synchronous motor operate normally. So have to tune before that you use it in the first time after finishing install synchronous motor.

Description of the operation: set this function code as 11, then press RUN key, and the Frequency Inverter shall do load tuning.

12: no-load tuning of synchronous motor

If motor can separate from load, recommend choosing no-load tuning of synchronous motor, and you can get the better operation performance than load tuning of synchronous motor.

During the process of no-load tuning, Frequency Inverter finish load tuning firstly, then accelerate to F0-08 motor rated frequency as acceleration time F0-17, and keep it for some time and do deceleration stop as deceleration time F0-18 and at last finishing tuning.

Before doing no-load tuning for synchronous motor, except for setting motor type and motor nameplate parameters from F1-00 to F1-05, you also need set pulse count of encoder F1-27, encoder type F1-28, the

pole-pairs of encoder F1-34.

For no-load tuning of synchronous motor, except Frequency Inverter can get the motor parameters from F1-16 to F1-20, you also can get the relevant information F1-30, F1-31, F1-32 and F1-33 about encoder and can get vector control current loop PI parameter from F2-13 to F2-16.

Description of the operation: set this function code as 12, and then press RUN key Frequency Inverter will do no-load tuning.

Note: tuning only can be conducted under the keyboard operation mode, and cannot conduct motor tuning under terminal operation mode and communication operation mode.

Group F2 Vector control parameter

Group F2 function code is only valid for vector control, and it is invalid for VF.

F2-00	Proportional gain of speed loop 1	Default value	30
	Set range	1 ～100	
F2-01	Integral time of speed loop 1	Default value	0.50s
	Set range	0.01s ～10.00s	
F2-02	Switching frequency 1	Default value	5.00Hz
	Set range	0.00 ～F2-05	
F2-03	Proportional gain of speed loop 2	Default value	20
	Set range	0 ～100	
F2-04	Integral time of speed loop 2	Default value	1.00s
	Set range	0.01s ～10.00s	
F2-05	Switching frequency 2	Default value	10.00Hz
	Set range	F2-02 to maximum output frequency	

When Frequency Inverter operates under the different frequency, you can choose different speed loop PI parameter. When the operation frequency is smaller than switching frequency 1 (F2-02) the speed loop parameter is F2-00 and F2-01. When operation frequency is bigger than switching frequency 2, speed loop PI adjustable parameter is F2-03 and F3-04. Speed loop PI parameter between switching frequency 1 and switching frequency 2 is linear switching for two groups of PI parameters. As shown in the Fig. 6-2:

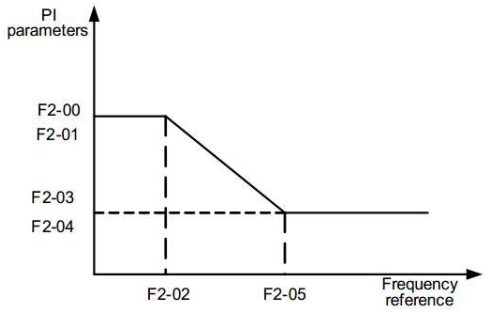


Fig. 6-2 PI parameter diagram

You can adjust speed dynamic response characteristic of vector control through setting the proportionality coefficient and integral time of speed regulator.

Increasing the proportional gain and reducing integral time both can accelerate the dynamic response of speed loop. But proportional gain is too big and integral time is too small both can make system to be vibrated. Recommend the adjusting method:

If default parameter can not meet requirement, you shall fine adjust base on default parameter, and increase big proportional gain firstly to ensure the system is stable; decrease the integral time to make system to be with faster response characteristics, and its overshoot is smaller.

Note: if the PI parameter is not suitable, may cause speed overshoot is bigger. Even Appear over voltage failure when the overshoot fall back.

F2-06	Vector control slip gain	Default value	100%
	Set range	50%～200%	

For the vector control of sensor without speed, this parameter is used to adjust stable speed precision: when the motor is with load, if speed is lower will increase this parameter, vice versa.

For the vector control of sensor with speed, this parameter can adjust output current of Frequency Inverter under the same load.

F2-07	The filter time of SVC speed feedback	Default value	0.050s
	Set range	0.000s～1.000s	

Under the vector control mode the output of speed loop regulator is momentary current command, and this parameter is used to filter for momental command. Generally this parameter need not be adjusted, you can increase this filter time properly when the speed fluctuation is bigger; if motor vibrate, need reduce this parameter properly. If the filter time constant of speed loop is small, the fluctuation of output torque may be bigger, but response of speed is fast.

F2-08	Over excite gain of vector control	Default value	64
	Set range	0 ～200	

Excitation control can control the bus voltage rise to avoid over voltage failure under the process of Frequency Inverter decelerating. The over excite gain is bigger, the result of control is better.

For the situation that it is easy to appear over voltage warning during the process of Frequency Inverter decelerating, you need increase over excite gain. But if over excite gain is bigger, and the output current is easy to be increased. You need trade-off in application.

For the small inertial situation, will not appear voltage rise during motor decelerating. We recommend to set over excite gain as 0; for the situation with brake resistor, we also recommend to set over excite gain as 0.

F2-09	Torque upper limiting source under speed control mode		Default value	0
	Set range	0	F2-10	
		1	AI1	
		2	AI2	
		3	AI3	
		4	PULSE (DI5)	
		5	Communication reference	
F2-10	Figure setting of torque upper limit under speed control mode		Default value	150.0%
	Set range		0.0%～200.0%	

Under the speed control mode, the maximum value of Frequency Inverter output is controlled by torque upper limiting source.

F2-09 is used to choose the set source of torque upper limit. When set through analogue, PULSE and communication, 100% of corresponding setting correspond F2-10, but 100% of F2-10 is rated torque of Frequency Inverter.

AI1, AI2, AI3 setting see the relevant introduction of group F4 curve A1 (select each curve through F4-33)

PULSE sees the introduction in F4-28-F4-32.

Select it as Communication reference, write in data from -100.00% to 100.00% through address by upper computer, where, 100.00% correspond F2-10.

F2-13	Proportional gain of excitation adjustment	Default value	2000
	Set range	0 ～20000	
F2-14	Integral gain of excitation adjustment	Default value	1300
	Set range	0 ～20000	

F2-15	Integral gain of torque adjustment	Default value	2000
	Set range	0 ～20000	
F2-16	Integral gain of torque adjustment	Default value	1300
	Set range	0 ～20000	

Parameter of vector control current loop PI adjustment, this parameter can be got automatically after complete tuning of asynchronous motor or no-load tuning of synchronous motor, and need not be modified.

Note: integral controller of current loop doesn't adopt integral time as dimension, but set integral gain directly. If the set for current loop PI gain is oversize, and can make the whole control loop to be vibrated. So if current vibration or torque fluctuation is bigger, you can reduce the PI proportional gain or integral gain by hand.

F2-18	Flux weakening mode of synchronous motor	Default value	0
	Set range 0	Not flux weakening	
	Set range 1	Direct calculation mode	
	Set range 2	Automatic adjusting mode	
F2-19	Flux weakening depth of synchronous motor	Default value	100%
	Set range	50%～500%	
F2-20	Flux weakening depth of synchronous motor	Default value	50.0%
	Set range	1% ～300%	
F2-21	Flux weakening depth of synchronous motor	Default value	100%
	Set range	10%～500%	
F2-22	Flux weakening depth of synchronous motor	Default value	2
	Set range	2 ～10	

This group of parameter is used to set flux weakening control of synchronous motor.

When F2-18 is 0, the synchronous motor will not involve in flux weakening control and the maximum of rotating speed clicked in this case is associated with bus voltage of Frequency Inverter. When maximum rotating speed cannot meet the user requirements, flux weakening function of synchronous motor shall be enabled to accelerate flux weakening.

CT3000-G provides two flux weakening modes: direct calculation mode and automatic adjustment mode.

In direct calculation mode, calculate demagnetizing current required according to the target speed and adjust demagnetizing current manually by means of F2-19. Demagnetizing current will be decreased as total output current is decreased, but the required flux weakening effect may not be reached.

If flux weakening mode is set to automatic adjustment, the optimal demagnetizing current will be selected automatically, but the dynamic performance of the system will not be influenced or get unstable.

Change F2-21 and F2-22 to change the adjusting speed of demagnetizing current, but quick adjustment of demagnetizing current may result in instability and the manual change is not required in generation situation;

Group F3 V/F Control parameter

This group of function code is only valid for V/F control but not valid for vector control.

V/F control is suitable for in the field with universal load such as fan and water pump or one Frequency Inverter with multiple motors or when the power of Frequency Inverter is much different from the motor power.

F3-00	V/F curve setting		Default value	0
	Set range	0	Linear V/F	
		1	Multi-point V/F	
		2	Square V/F	
		3	1.2th power V/F	
		4	1.4th power V/F	
		6	1.6th power V/F	
		8	1.8th V/F	
		9	Reserved	
		10	VF complete separation mode	
		11	VF semi-separation mode	

0: Linear V/F, suitable for general constant torque load.

1: Multi-point V/F, suitable for the special load such as dewatering machine and centrifugal machine. In this case, it is possible to get any VF relation curve by setting F3-03~F3-08 parameters.

2: Square V/F, suitable for centrifugal load such as fan and water pump.

3~8: VF relation curve between straight line VF and square VF.

10: VF complete separation mode. In this case, the output frequency of Frequency Inverter is independent of output voltage, output frequency is determined by frequency source and output voltage is determined by F3-13 (VF separation voltage source).

VF complete separation mode, generally used for such fields as induction heating, inverter power supply and torque motor control.

11: VF semi-separation mode

In this situation, V and F are in proportion, but proportional relation is set by power supply F3-13 and the relation between V and F is also associated with the rated voltage and rated frequency of the motor in Group F1.

If voltage source input is X (X means a value within 0~100%), the relation between Output Voltage V and Frequency F of Frequency Inverter is as follows:

V/F=2 * X * (Rated voltage of motor)/ (Rated frequency of motor)

F3-01	Torque boost	Default value	Model dependent
	Set range	0.0%～30%	
F3-02	Cut-off frequency of torque boost	Default value	50.00Hz
	Set range	0.00Hz~maximum output frequency	

To compensate V/F control low-frequency torque characteristic, the boosting compensation is made for output voltage of Frequency Inverter in low frequency. However, if torque boost is set to a high value, the motor may be too hot and the overcurrent of Frequency Inverter may occur.

When load is high but there is not enough starting torque of motor, it is recommended to increase this parameter. The torque boost may be decreased when load is low.

The Frequency Inverter will be in automatic torque boost when the torque boost is set to 0.0. In this situation, the Frequency Inverter will calculate torque boost automatically according to stator resistance of motor and other parameters.

Cut-off frequency for torque boost: With this frequency, the torque boost will be valid. If the frequency exceeds the set frequency, the torque boost will be invalid. See Fig. 6-3 for more information.

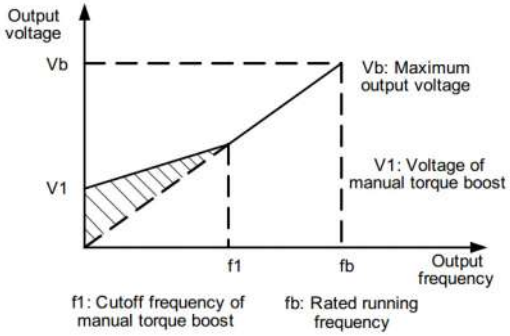


Fig. 6-3 Manual torque boost diagram

F3-03	Frequency Point F1 of multi-point VF	Default value	0.00Hz
	Set range	0.00Hz～F3-05	
F3-04	Voltage Point V1 of multi-point VF	Default value	0.0%
	Set range	0.0%～100.0%	
F3-05	Frequency Point F2 of multi-point VF	Default value	0.00Hz
	Set range	F3-03 ～F3-07	
F3-06	Voltage Point V2 of multi-point VF	Default value	0.0%
	Set range	0.0%～100.0%	
F3-07	Frequency Point F3 of multi-point VF	Default value	0.00Hz
	Set range	F3-05 ~ Rated frequency of the motor (F1-04) Note: The rated frequency of Motor 2\3\4 is A2-04\A3-04\A4-04	
F3-08	Voltage Point V3 of multi-point VF	Default value	0.0%
	Set range	0.0%～100.0%	

Six parameters of F3-03~ F3-08 define multi-stage V/F curve.

The multi-point V/F curve shall be set according to load characteristics of the motor. It is noted that three voltage points and three frequency points must be in the following relations: V1＜V2＜V3, F1＜F2＜F3. The multi-point VF curve setting diagram is as shown in Fig. 6-4.

Too high voltage in low frequency may result in motor overheat and even damage due to overheat and the Frequency Inverter may get involved in over-current speed loss or over-current protection.

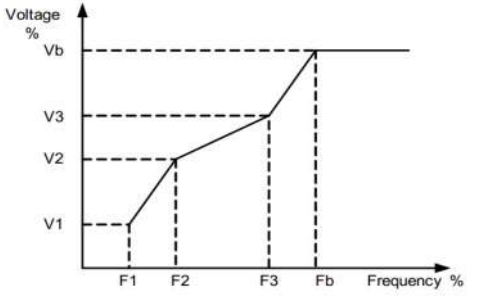


Fig. 6-4 Multi-point V/F curve setting diagram

F3-09	VF slip compensation gain	Default value	0.0%
	Set range	0% ～200.0%	

This parameter only takes effect for the asynchronous motor.

VF slip compensation can compensate motor speed deviation when the load of asynchronous motor is increased so that motor speed can be stable in load change.

VF slip compensation gain set in 100.0% means that the compensated slip is motor rated slip frequency when the motor has rated load. The Frequency Inverter will calculate motor rated slip through motor rated frequency and rated speed in Group F1 automatically.

When VF slip compensation gain is adjusted, the principle is that motor speed is basically the same as target speed in rated load. When motor speed is different from target speed, it is required to conduct the fine adjustment of this gain appropriately.

F3-10	VF over excitation gain	Default value	64
	Set range	0 ～200	

When the Frequency Inverter is in deceleration, the over excitation control will suppress bus voltage rise to prevent overvoltage failure. The suppression effect will be heightened as over excitation gain gets increases. Over excitation gain shall be enhanced in the field where overvoltage alarm may occur when the Frequency Inverter is in deceleration. However, too high over excitation gain may result in increasing output current so the balance is required in application.

For the field with quite low inertia, the voltage rise will not occur when the motor is in deceleration, thus, it is recommended that over excitation gain be set to 0; for the field with brake resistance, it is recommended that over excitation gain be also set to 0.

F3-11	VF oscillation suppression gain	Default value	Model dependent
	Set range	0 ～100	

The selection method of this gain is to take as small amount as possible on the premise that the oscillation is suppressed efficiently, so as to avoid negative effect on VF operation. The gain should be chosen 0 when the electrical machine is free from oscillation. Only when the machine is subject to obvious oscillation, can the gain be increased to a proper extent. The larger the gain is, the more apparent the oscillation suppression.

To use the oscillation suppression function, accurate parameters of the related and non-load current of the electrical machine is required, otherwise the VF oscillation suppression will not be efficient enough.

F3-13	Voltage source separated by VF		Default value	0
	Set range	0	Digital setting (F3-14)	
		1	AI1	
		2	AI2	

		3	AI3
		4	Pulse (DI5)
		5	Multistage command
		6	Simple PLC
		7	PID
		8	To give communication
		100.0% nominal voltage of the corresponding electrical machine	
F3-14	To set the voltage digital separated by VF	Default value	0V
	Set range	OV～nominal voltage of the electrical machine	

VF separation is generally applied to induction-heating, inverter and torque motor control, etc.

To choose VF separation control, the output voltage can be set either through function code F3-14 or analog quantity, multistage command, PLC, PID or communication. When doing non-numeric setting, 100%of each setting should be correspondent with the nominal voltage of the electrical machine. When the percentage set by analog quantity and other outputs is negative, then the absolute value of the setting should be considered as the valid set value.

0: Digital setting (F3-14)

The voltage is set directly by F3-14.

1：AI1　　2：AI2　　3 ：AI3

The voltage is determined by analog input terminal.

4. Pulse setting (DI5)

The voltage is given by terminal pulse.

The sign specification of given pulse: voltage range 9V～30V, frequency range 0kHz～100kHz.

5. Multistage command

The correspondence between the given signal and the given voltage should be determined by setting the parameters of F4 and FC group if the voltage source is multistage command. The given 100.0% by multistage command of FC group parameter refers to the percentage compared to the nominal voltage of the electrical machine.

6. Simple PLC

The given output voltage should be determined through setting Group FA parameter if the voltage source is simple PLC.

7. PID

The output voltage is produced on the basis of PID closed loop. Please refer to the introduction of PID in Group FA for details.

8. Communication reference

The communication reference means that voltage is set by upper computer through communication mode.

The usage mode of VF separation voltage source is similar to that of frequency source. See the introduction of the selection of F0-03 main frequency source. Where, various selections correspond to the given 100.0% which is the rated voltage of motor (the corresponding set value is absolute value).

F3-15	Voltage acceleration time of the VF separation	Default value	0.0s
	Set range	0.0s ～1000.0s	
F3-16	Voltage deceleration time of the VF separation	Default value	0.0s
	Set range	0.0s ～1000.0s	

Voltage acceleration time of the VF separation refers to the time which the output voltage accelerates from 0 to the rated voltage of motor. See the t1 in the figure.

Voltage deceleration time of the VF separation refers to the time which the output voltage accelerates from rated voltage of motor to 0. See the t2 in the figure.

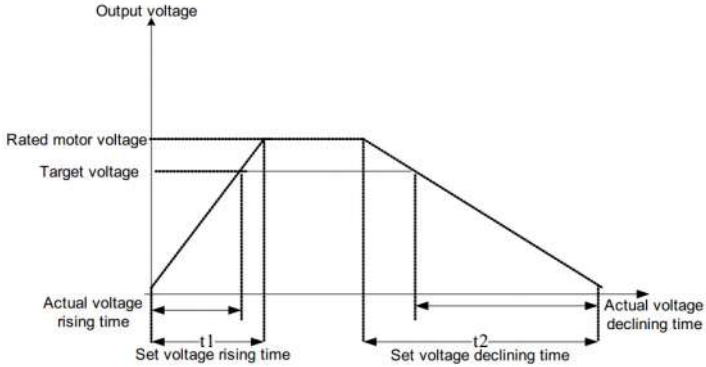


Fig. 6-5 Separation diagram

Group F4 Input terminal

CT3000-G series Frequency Inverter standard equips 7 multifunctional digital input terminals (where, DI5 can be regarded as high-speed pulse input terminal) and 2 analog input terminals. If the system needs more input/output terminals, the multifunctional input/output expansion cards can be selected, Multifunctional input/output expansion cards have 3 multifunctional digital input terminals(DI8~DI10） and 1 analog input terminal(AI3).

Function code	Name	Default value	Remark
F4-00	DI1 terminal function selection	1 (Forward running)	Standard
F4-01	DI2 terminal function selection	4 (Forward jog)	Standard

F4-02	DI3 terminal function selection	9 (Failure reset)	Standard
F4-03	DI4 terminal function selection	12 (multi-speed 1)	Standard
F4-04	DI5 terminal function selection	13 (multi-speed 2)	Standard
F4-05	DI6 terminal function selection	0	Standard
F4-06	DI7 terminal function selection	0	Standard
F4-07	DI8 terminal function selection	0	Expansion
F4-08	DI9 terminal function selection	0	Expansion
F4-09	DI10 terminal function selection	0	Expansion

Those parameters are used to set the functions of digital multifunctional input terminal. The selected functions are as follows:

Set value	Function	Description
0	No function	The terminals which are not used can be set to “No function”, in order to prevent malfunction.
1	Forward running (FWD)	The forward and reverse of the converter is controlled by external terminal.
2	Reverse running (REV)	
3	Three-line operation control	The operation mode of converter is three-line control mode through the determination of this terminal. The detailed information refers to the illustration of function code F4-11 (“Terminal command function”).
4	Forward jog (FJOG)	FJOG is jog forward running and RJOG is jog reverse running. For jog operation frequency and jog acceleration /deceleration time, see the illustration of function code F8-00, F8-01, F8-02.
5	Reverse jog (RJOG)	
6	Terminal UP	The increasing and decreasing instructions of the frequency can be modified when the external terminal sets the frequency. When the frequency is set as digital setting, the setting frequency can be adjusted up and down.
7	Terminal DOWN	
8	Free stop	Converter blocks output, the stop of the motor is not controlled by the converter at this moment. The meaning of the free stop of this mode is identical to which is described by F6-10.
9	Failure reset (RESET)	The failure replacement function which is identical to the RESET function on the keyboard can be conducted by terminal. The usage of this function can realize remote failure replacement.
10	Operation suspending	Converter decelerated to a stop, but all of the operation parameters can be remembered, such as PLC parameter, swing parameter and PID parameter. After disappearance of the signal of the terminal, the converter reverts to the operation state before the stop.

Set value	Function	Description
11	Normal input of outer failure	After the signal is sent to the converter, the converter reports the failure ERR15. According to the execution mode of failure protection, the converter will conduct failure processing. (See function code F9-47 for more details).
12	Multi-stage instruction terminal 1	Through the 16 kinds of states of the four terminals, the setting of 16-stage speed or 16 kinds of other instructions can be implemented. See the attached Table 1 for more details.
13	Multi-stage instruction terminal 2	
14	Multi-stage instruction terminal 3	
15	Multi-stage instruction terminal 4	
16	Time of acceleration /deceleration selects terminal 1	The selection 4 kinds of time of acceleration /deceleration can be implemented by 4 kinds of states of two terminals. See Table 2 for more details.
17	Time of acceleration /deceleration selects terminal 2	
18	Switch of frequency source	Switch of frequency source is used to switch and select different frequency source. According to the setting of the function code (F0-07) of frequency source selection, when the switch between two frequency sources is regarded as frequency source, the terminal implements switch in the two frequency sources.
19	UP/DOWN setting and reset(terminal, keyboard)	When frequency setting is digital frequency setting, the terminal can eliminate the value of the frequency changed by terminal UP/DOWN or keyboard UP/DOWN, and make the given frequency return to the value set by F0-08.
20	Control command switch terminal 1	When command source is set to terminal control (F0-02=1), the terminal can conduct the switch between terminal control and keyboard control. When command source is set to communication control (F0-02=2), the terminal can conduct the switch between communication control and keyboard control.
21	Prohibition of acceleration /deceleration	Ensure that the converter is not influenced by the external signal (excluding stop command) and maintains current output frequency.

Set value	Function	Description
22	PID suspending	PID suspends temporarily. Converter maintains the current output frequency and no longer conducts PID adjustment of frequency source.
23	PLC state reset	PLC suspends during the execution process. When operating again, the converter can return to the original state of simple PLC through the terminal.
24	Swing frequency suspending	Converter output by center frequency. Swing frequency function suspends temporarily.
25	Counter input	The input terminal of pulse count.
26	Counter resetting	Register state conducts reset processing.
27	Length count input	The input terminal of length count.
28	Length reset	Length reset
29	Torque control prohibition	The converter is forbidden to conduct torque control. Converter assesses into speed control mode.
30	PULSE (pulse) frequency input (only effective to DI5)	DI5 is treated as the function of pulse input terminal.
31	Reserved	Reserved
32	Immediate DC braking	When the terminal is valid, the converter switches directly into DC braking state.
33	External failure normally closed input	When external failure normally closed signal was sent into the converter, the converter sends Failure ERR15 and stop.
34	Frequency modification prohibition	If the function is set to be valid, when the frequency changes, converter will not respond the modification of the frequency, until the state of the terminal is valid.
35	PID effect direction reverse	When the terminal is valid, the direction of the effect of the PID is opposite to the direction which is set by FA-03.
36	External stop terminal 1	When the keyboard is controlled, the terminal can be used to stop converter, which can be treated as the function of STOP key in the keyboard.
37	Control command switch terminal 2	Control command switch terminal 2 is used in the switch between the terminal control and communication control. If the command source selects to be controlled by the terminal, the system switches into communication control when the terminal is valid. Vice versa.
38	PID integration suspending	When terminal is valid, adjust function of the integration of PID suspends, while the proportion adjusting of PID and differential adjusting function are still valid.

Set value	Function	Description
39	The switch between frequency source X and preset frequency	If the terminal is valid, the frequency source X will be instead by presetting frequency (F0-08).
40	The switch between frequency source Y and preset frequency	If the terminal is valid, the frequency source Y will be instead by presetting frequency (F0-08).
41	Motor selection terminal 1	Through 4 kinds of states of the two terminals, the parameter switch of 4 groups of motors can be implemented. See the attached Table 3 for the details.
42	Motor selection terminal 2	
43	PID parameter switch	When switch condition of PID parameter is DI terminal (FA-18=1), if the terminal is invalid, the parameter of PID uses FA-05~FA-07; if the terminal is valid, the parameter of PID uses FA-15~FA-17;
44	User-defined Failure 1	When user-defined failure 1 and 2 are valid, converter is divided into Alarm ERR27 and ERR28. According to the action mode selected by failure protection action selection F9-49, converter shall conduct processing.
45	User-defined Failure 2	
46	Speed control/ torque control switch	Converter shall switch between torque control and speed control. When the terminal is invalid, the converter operates in the mode which A0-00 (speed/torque control mode) defines. If the terminal is valid, the converter will switch another mode.
47	Emergency stop	When the terminal is valid, converter shall stop in the fastest speed. During the process of the stop, the current is the given upper limit frequency. This function is used to meet the requirement which the converter needs to stop as quickly as possible when the system is under emergency.
48	External stop terminal 2	Under any control modes (panel control, terminal control and communication control), the terminal can be used to make the converter stop; at this moment, the deceleration time is fixed to deceleration time 4.
49	Deceleration DC braking	When the terminal is valid, converter decelerates to the starting frequency of stop DC braking, then, switches into the state of DC braking.
50	Resetting the running time	When the terminal is valid, timekeeping time of converter during this operation shall be reset. This function needs to be used cooperatively between the time of timing operation (F8-42) and this operation (F8-53).
51	Two-line/three-line switch	Two-line/three-line switch is used to switch between two-line/three-line control. If F4-11 is two-line 1, the valid time switch of terminal function is three-line 1 and so on.

Four multi-stage instruction terminals can be combined into 16 states. These 16 states correspond to 16 instruction set values respectively. Details are shown in Table 1:

Attached Table 1 Description of the functions of multi-stage instructions

K4	K3	K2	K1	Instruction set	Corresponding parameter
OFF	OFF	OFF	OFF	Multi-stage instruction 0	FC-00
OFF	OFF	OFF	ON	Multi-stage instruction 1	FC-01
OFF	OFF	ON	OFF	Multi-stage instruction 2	FC-02
OFF	OFF	ON	ON	Multi-stage instruction 3	FC-03
OFF	ON	OFF	OFF	Multi-stage instruction 4	FC-04
OFF	ON	OFF	ON	Multi-stage instruction 5	FC-05
OFF	ON	ON	OFF	Multi-stage instruction 6	FC-06
OFF	ON	ON	ON	Multi-stage instruction 7	FC-07
ON	OFF	OFF	OFF	Multi-stage instruction 8	FC-08
ON	OFF	OFF	ON	Multi-stage instruction 9	FC-09
ON	OFF	ON	OFF	Multi-stage instruction 10	FC-10
ON	OFF	ON	ON	Multi-stage instruction 11	FC-11
ON	ON	OFF	OFF	Multi-stage instruction 12	FC-12
ON	ON	OFF	ON	Multi-stage instruction 13	FC-13
ON	ON	ON	OFF	Multi-stage instruction 14	FC-14
ON	ON	ON	ON	Multi-stage instruction 15	FC-15

When the frequency source is set as multi-speed, the maximum frequency that the 100% function code

FC-00 ~ FC-15 corresponds to is F0-10. Apart from functioning as multi-speed, multi-stage instructions can also act as the given source of PID or the voltage source for VF separation control to meet the demands of switching among different set values.

Attached Table 2 Function description of the selection terminals of the acceleration /deceleration time

Terminal 2	Terminal 1	Selection of acceleration /deceleration time	Corresponding parameter
OFF	OFF	Acceleration time 1	F0-17 、F0-18
OFF	ON	Acceleration time 2	F8-03 、F8-04
ON	OFF	Acceleration time 3	F8-05 、F8-06
ON	ON	Acceleration time 4	F8-07 、F8-08

Attached Table 3 Description of the functions of motor selection terminal

Terminal 2	Terminal 1	Selection of acceleration /deceleration time	Corresponding parameter
OFF	OFF	Motor 1	Group F1, F2
OFF	ON	Motor 2	Group A2
ON	OFF	Motor 3	Group A3
ON	ON	Motor 4	Group A4

F4-10	DI filtering time	Default value	0.010s
	Set range	0.000s～1.000s	

Set the software filtering time of DI terminal state. If the input terminals in application are susceptible to interference and cause malfunction, the parameter can be increased to improve the anti-jamming ability. But the increase of filtering time can slow the response of DI terminal.

F4-11	Terminal command mode		Default value 0
	Set range	0	Two-line type 1
		1	Two-line type 2
		2	Three-line type 1
		3	Three-line type 2

The parameter defines four different operation modes of the Frequency Inverter controlled by external terminals.

Note: For the sake of clarity, randomly select multifunctional input terminals DI1, DI2, and DI3 from DID to DI10 as external terminals. Namely, select the functions of terminals DI1, DI2, and DI3 by setting the values of F4-00 to F4-02. See the set ranges of F4-00 to F4-09 for the detailed function definition.

0: two-line type 1: This is the most frequently used two-line type, and the forward running and reverse running of the motor are decided by terminals DI1, DI2.

The function codes are set as follows:

Function code	Name	Set value	Function description
F4-11	Terminal command mode	0	Two-line type 1
F4-00	DI1 terminal function selection	1	Forward running(FWD)
F4-01	DI2 terminal function selection	2	Reverse running (REV)

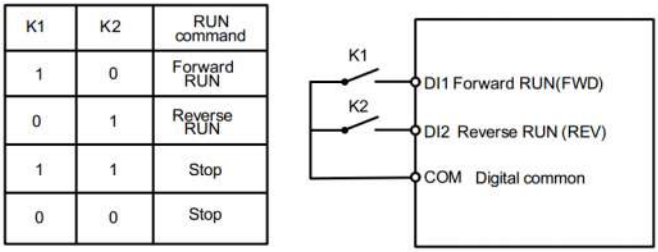


Fig. 6-6 Two-line mode 1

As shown above, in this control mode, when K1 is closed, the Frequency Inverter runs forward. When K2 is closed and runs reversely, and K1 as well as K2 is closed or disconnected simultaneously, the Frequency Inverter stops running.

1: two-line type 2: In this mode, terminal DI1 functions as operation-enabled terminal, while terminal DI2 can define the running direction.

The function codes are set as follows:

Function code	Name	Set value	Function description
F4-11	Terminal command mode	1	Two-line type 2
F4-00	Function selection of terminal DI1	1	Operation-enabled
F4-01	Function selection of terminal DI2	2	Forward and reverse running directions

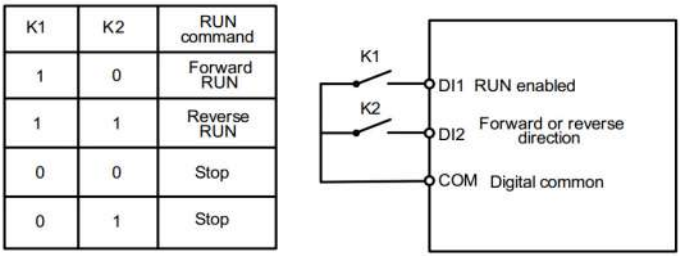


Fig. 6-7 Two-line mode 2

As shown above, in this control mode, when K1 is closed, the Frequency Inverter runs forward with K2 disconnected and runs reversely with K2 closed. When K1 is disconnected, the Frequency Inverter stops running.

2: three-line control mode 1: In this mode, DI3 acts as enabled terminal, while the directions are controlled by DI1 and DI2 respectively.

The function codes are set as follows:

Function code	Name	Set value	Function description
F4-11	Terminal command mode	2	Three- line type 1
F4-00	Function selection of terminal DI1	1	Forward running (FWD)
F4-01	Function selection of terminal DI2	2	Reverse running (REV)
F4-02	Function selection of terminal DI3	3	Three-line operation control

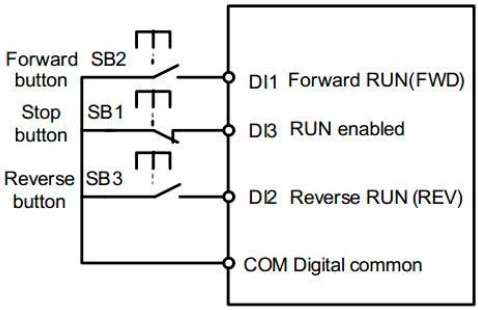


Fig. 6-8 Three-line control mode 1

As shown above, in this control mode, when button SB1 is closed, the Frequency Inverter runs forward with button SB2 pressed and runs reversely with button SB3 pressed. The Frequency Inverter stops as soon as button SB1 is disconnected. In the normal start and operation, button SB1 must be kept closed, while the commands of buttons SB2 and SB3 take effect as soon as they are closed. The running state of the Frequency Inverter is subject to the last action of these three buttons.

3: three-line control mode 2: DI3 in this mode is an operation-enabled terminal, and the operation command is defined by DI1, while the directions are decided by the state of DI2.

The function codes are set as follows:

Function code	Name	Set value	Function description
F4-11	Terminal command mode	3	Three-line type 2
F4-00	Function selection of terminal DI1	1	Operation-enabled
F4-01	Function selection of terminal DI2	2	Forward and reverse running directions
F4-02	Function selection of terminal DI3	3	Three-line operation control

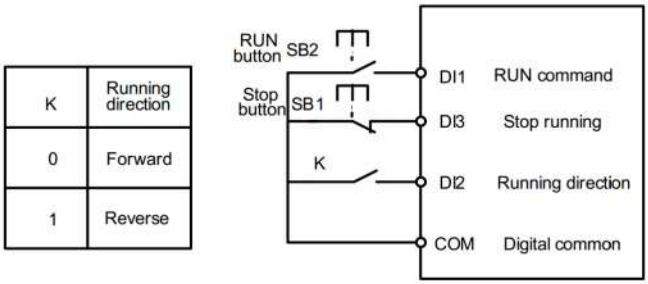


Fig. 6-9 Three-line control mode 2

As shown above, in this control mode, when button SB1 is closed and button SB2 is pressed, the Frequency Inverter runs forward with K disconnected and runs reversely with K closed. The Frequency Inverter stops as soon as button SB1 is disconnected. In the normal start and operation, button SB1 must be kept closed, while the commands of button SB2 take effect as soon as it is closed.

F4-12	UP/DOWN change rate of the terminal	Default value	1.00Hz/s
	Set range	0.01Hz/s ～65.535Hz/s	

It is used to set the frequency change rate, namely, the frequency variation per second, when the set frequency of terminal UP/DOWN is adjusted.

When F0-22(decimal places of frequency) is 2, the range of this value is 0.001Hz/s ~65.535Hz/s.

When F0-22(decimal places of frequency) is 1, the range of this value is 0.01Hz/s ~655.35Hz/s.

F4-13	A1 curve 1 minimum input	Default value	0.00V
	Set range	0.00V ～F4-15	
F4-14	A1 curve 1 corresponding setting of minimum input	Default value	0.0%
	Set range	-100.00% ～100.0%	
F4-15	A1 curve 1 maximum input	Default value	10.00V
	Set range	F4-13 ～10.00V	

F4-16	A1 curve 1 corresponding setting of maximum input	Default value	100.0%
	Set range	-100.00% ～100.0%	
F4-17	AI1 Filtering time	Default value	0.10s
	Set range	0.00s ～10.00s	

The function codes above are used for setting the relations between the analog input voltage and the set value it stands for.

When the analog input voltage is greater than the set “maximum input” (F4-15), the analog input voltage is calculated on the basis of “maximum input”; similarly, when the analog input voltage is less than the set “minimum input” (F4-13), the analog input voltage is calculated on the basis of “minimum input” or as 0.0%, in accordance with the settings subject to “AI is less than the set minimum input” (F4-34).

When the analog input is current input, 1mA of current is equivalent to 0.5V of voltage.

AI1 input filtering time is used for setting the AI1 software filtering time. When the field analog is susceptible to interference, please increase the filtering time to stabilize the analog tested. But longer filtering time will slow down the response speed of the analog tests. How to set depends on practical application.

In different applications, the meanings of nominal value that the set analog of 100% corresponds to can be different. Please refer to the description of each application.

The several legends of two typical settings are as follows:

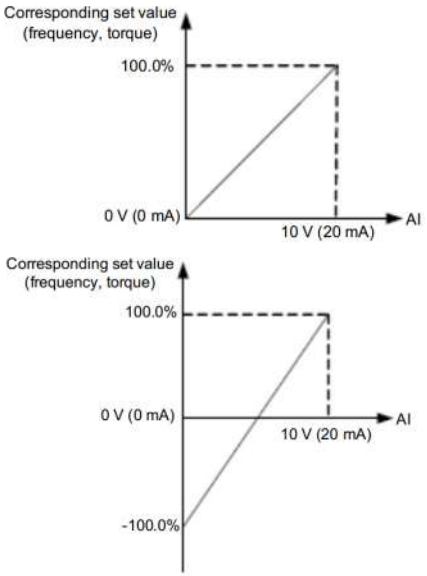


Fig. 6-10 The corresponding relations between analog reference and set values

F4-18	A1 curve 2 minimum input	Default value	0.00V
	Set range	0.00V ～F4-20	
F4-19	A1 curve 2 corresponding setting of minimum input	Default value	0.0%
	Set range	-100.00% ～100.0%	
F4-20	A1 curve 2 maximum input	Default value	10.00V
	Set range	F4-18 ～10.00V	
F4-21	A1 curve 2 corresponding setting of maximum input	Default value	100.0%
	Set range	-100.00% ～100.0%	
F4-22	AI2 Filtering time	Default value	0.10s
	Set range	0.00s ～10.00s	

For the function and usage of curve 2, please refer to the description of curve 1.

F4-23	A1 curve 3 minimum input	Default value	0.00V
	Set range	0.00s ～F4-25	
F4-24	A1 curve 3 corresponding setting of minimum input	Default value	0.0%
	Set range	-100.00% ～100.0%	
F4-25	A1 curve 3 maximum input	Default value	10.00V
	Set range	F4-23 ～10.00V	
F4-26	A1 curve 3 corresponding setting of maximum input	Default value	100.0%
	Set range	-100.00% ～100.0%	
F4-27	AI3 filtering time	Default value	0.10s
	Set range	0.00s ～10.00s	

For the function and usage of curve 3, please refer to the description of curve 1.

F4-28	PULSE minimum input	Default value	0.00kHz
	Set range	0.00kHz ～F4-30	
F4-29	Corresponding setting of PULSE minimum input	Default value	0.0%
	Set range	-100.00% ～100.0%	
F4-30	PULSE maximum input	Default value	50.00kHz
	Set range	F4-28 ～50.00kHz	
F4-31	Corresponding setting of PULSE maximum input	Default value	100.0%
	Set range	-100.00% ～100.0%	
F4-32	PULSE filtering time	Default value	0.10s
	Set range	0.00s ～10.00s	

This group of function codes is used for setting the relations between DI5 pulse frequency and corresponding settings.

Pulse frequency can only be input in Frequency Inverter through channel DI5.

The function application in this group is similar to that of curve 1; please refer to the description of curve 1.

F4-33	A1 curve selection		Default value	321
	Set range	Ones place	AI1 curve selection	
		1	Curve 1(2 points, see F4-13 ~F4-16)	
		2	Curve 2(2 points, see F4-18 ~F4-21)	
		3	Curve 3(2 points, see F4-23 ~F4-26)	
		4	Curve 4(4 points, see F4-23 ~F4-26)	
		5	Curve 5(4 points, see F6-08 ~F6-15)	
		Tens place	AI2 curve selection (1 ~5, the same as above)	
		Hundreds place	AI3 curve selection 6(1 ~5, the same as above)	

The Ones place, Tens place, and Hundreds place of the function code are used for selecting the corresponding set curves of analog inputs AI1, AI2 and AI3 respectively. For each analog input, any of the 5 kinds of curves can be selected.

Curves 1, 2, and 3 are all two-point ones and they are set in the function code of group F4, while curves 4 and 5 are four-point ones and they need to be set in the function code of group A6.

The standard unit of CT3000-G Frequency Inverter provides 2 analog input ports, and the application of AI3 needs the configuration of IO expansion cards.

F4-34	AI less than the minimum input setting selection		Default value	000
	Set range	Ones place	AI1 less than the minimum input setting selection	
		0	Corresponding minimum input setting	
		1	0.0%	
		Tens place	AI2 less than the minimum input setting selection (0 ~1, the same as above)	
		Hundreds place	AI3 less than the minimum input setting selection (0 ~1, the same as above)	

The function code is used for setting how to define the setting that the analog corresponds to, when the analog input voltage is less than the set “minimum input”.

The ones place, tens place, and hundreds place of the function code correspond to analog inputs AI1, AI2 and AI3.

If 0 is selected, the setting that the analog corresponds to is the “minimum input corresponding setting”

(F4-14, F4-19, F4-24) of the curve defined by the function code, when AI input is less than the “minimum input”.

If 1 is selected, the setting that the analog corresponds to is 0.0%, when AI input is less than the minimum input.

F4-35	DI1 delay time	Default value	0.0s
	Set range	0.0s ～3600.0s	
F4-36	DI2 delay time	Default value	0.0s
	Set range	0.0s ～3600.0s	
F4-37	DI3 delay time	Default value	0.0s
	Set range	0.0s ～3600.0s	

It is used for setting the delay time that the Frequency Inverter controls to respond to the state change of terminal DI.

Currently, only DI1, DI2 and DI3 possess the function of setting delay time.

F4-38	Valid mode selection 1 of terminal DI		Default value	00000
	Setting	Ones place	Valid state setting of terminal DI1	
		0	Active-high level	
		1	Active-low level	
		Tens place	Valid state setting of terminal DI2 (0 ~1, the same as above)	
		Hundreds place	Valid state setting of terminal DI3 (0 ~1, the same as above)	
		Thousands place	Valid state setting of terminal DI4 (0 ~1, the same as above)	
		Myriabit	Valid state setting of terminal DI5 (0 ~1, the same as above)	
F4-39	Valid mode selection 2 of terminal DI		Default value	00000
	Set range	Ones place	Valid state setting of terminal DI6	
		0	Active-high level	
		1	Active-low level	
		Tens place	Valid state setting of terminal DI7 (0 ~1, the same as above)	
		Hundreds place	Valid state setting of terminal DI8 (0 ~1, the same as above)	
		Thousands place	Valid state setting of terminal DI9 (0 ~1, the same as above)	
		Myriabit	Valid state setting of terminal DI10 (0 ~1, the same as above)	

It is used for setting the valid state mode of the digital value input terminal.

When active-high level is selected, the corresponding terminal DI is valid when connected with COM. But it's invalid when disconnected.

When active-low level is selected, the corresponding terminal DI is invalid when connected with COM. But it's valid when disconnected.

F4-40	AI2 input signal selection	Default value	0
	Set range	0: Voltage signal 1: Current signal	

AI2 supports voltage/current signal input via jumper selection. When the jumper is selected as voltage or current, F4-40 needs to be set to correspond to it at the same time.

Group F5 Output terminal

The standard configuration of the CT3000-G series Frequency Inverter includes one multifunctional analog output terminal, one multifunctional digital value output terminal, one multifunctional relay output terminal, and one FM terminal (It can be selected as high-speed pulse output terminal or the switching value output of open collector.). If the terminals mentioned above cannot meet the needs of the spot application, the IO expansion card will need to be equipped.

The output terminal of the IO expansion card includes one multifunctional analog output terminal (AO2), one multifunctional relay output terminal (Relay 2), and one multifunctional digital value output terminal (DO2).

F5-00	Output mode selection of terminal FM		Default value	0
	Set range	0	Pulse output (FMP)	
		1	Switching value output (FMR)	

Terminal FM is a programmable multiplex terminal, which can be used as high-speed pulse output terminal (FMP) or the switching value output of open collector (FMR).

When used as pulse output FMP, the maximum frequency of the output pulse is 100kHz. See the description of F5-06 for the related function of FMP.

F5-01	FMR function selection (output terminal of open collector)	Default value	0
F5-02	Relay output function selection (T/A-T/B-T/C)	Default value	2
F5-03	Output function selection of the expansion card relay (P/A-P/B-P/C)	Default value	0
F5-04	DO1 output function selection (output terminal of open collector)	Default value	1
F5-05	Output function selection of expansion card DO2	Default value	4

The five function codes above are used for selecting the output function of the five digital values, of which

T/A-T/B-T/C and P/A-P/B-P/C are the relays on the control panel and the expansion card respectively.

The descriptions of the functions of the multifunctional output terminal are as follows:

Set value	Function	Description
0	No output	The output terminal has no function
1	Frequency Inverter in operation	It denotes that the Frequency Inverter is in operation and has output frequency (which can be 0). Signal ON is output.
2	Malfunction output (malfunction stopping)	When the Frequency Inverter breaks down and stops running because of malfunction signal ON is output.
3	Frequency level detection for FDT1 output	Please refer to the descriptions of function code F8-19 and F8-20.
4	Frequency arrival	Please refer to the descriptions of function code F8-21.
5	Zero-speed running(no output when stopping)	When the Frequency Inverter operates and the output frequency is 0, signal ON is output. When the Frequency Inverter is in a stopping state, signal OFF is output.
6	Pre-alarm for overloaded motor	Before the protective action for the overloaded motor, it is judged according to the threshold value of the overloaded pre-alarm and signal ON is output when it exceeds the threshold value of the pre-alarm. See also the function codes F9-00 to F9-02 for the parameter setting of the overloaded motor.
7	Pre-alarm for overloaded Frequency Inverter	Signal ON is output 10s before the protective action for the overloaded Frequency Inverter.
8	Set count value arrival	When the count value arrives at the one set by FB-08, signal ON is output.
9	Count value reference arrival	When the count value arrives at the one set by FB-09, signal ON is output. Please refer to the function description of Group FB for the counting function.
10	Length arrival	When the actual length tested exceeds the length set by FB-05, signal ON is output.
11	PLC cycle completed	When the simple PLC operation finishes one cycle, a pulse signal with a width of 250ms is output.
12	Accumulated running time arrival	When the accumulated running time of the Frequency Inverter exceeds the time set by F8-17, signal ON is output.
13	Frequency limited	When the set frequency goes beyond the upper frequency or the lower frequency, and the output frequency of the Frequency Inverter reaches the upper frequency or the lower frequency, signal ON is output.

Set value	Function	Description
14	Torque limited	In the speed control mode, when the output torque reaches the limited value, the Frequency Inverter is in the state of under speed protection. At the same time, signal ON is output.
15	Ready for operation	When the primary loop and control loop power of the Frequency Inverter gets stable, and the Frequency Inverter is in a running-able state with no failure detected, signal ON is output.
16	AI1>AI2	When the value of analog input AI1 is greater than that of AI2, signal ON is output.
17	Upper frequency arrival	When the operation frequency reaches the upper frequency, signal ON is output.
18	Lower frequency arrival (no output when stopping)	When the operation frequency reaches the lower frequency, signal ON is output. Signal OFF is output when it stops running.
19	Under voltage state output	When the Frequency Inverter is in an under voltage state, signal ON is output.
20	Communication reference	Please refer to the communication protocol.
21	Reserved	Reserved
22	Reserved	Reserved
23	Zero-speed running 2(also output when stopping)	When the output frequency of the Frequency Inverter is 0, signal ON is output. Signal ON is output also when it stops running.
24	Accumulated power-on time arrival	When the accumulated power-on time (F7-13) exceeds the time set by F8-16, signal ON is output.
25	Frequency level detection for FDT2 output	Please refer to the description of function codes F8-28 and F8-29.
26	Frequency 1 arrival output	Please refer to the description of function codes F8-30 and F8-31.
27	Frequency 2 arrival output	Please refer to the description of function codes F8-32 and F8-33.
28	Current 1 arrival output	Please refer to the description of function codes F8-38 and F8-39.
29	Current 2 arrival output	Please refer to the description of function codes F8-40 and F8-41.
30	Timing arrival output	When timing function selection (F8-42) is valid, signal ON is output after the running time of the Frequency Inverter reaches the set timing time.

Set value	Function	Description
31	AI1 input over limit	When the value of analog input AI1 is greater than that of F8-46(AI1 input protection upper limit) or less than that of F8-45(AI1 input protection lower limit), signal ON is output.
32	Off load	When the Frequency Inverter is in an off-load state, signal ON is output.
33	Reverse running	When the Frequency Inverter is in reverse running, signal ON is output.
34	Zero-current state	Please refer to the description of function codes F8-28 and F8-29.
35	Module temperature arrival	When the radiator temperature (F7-07) of the inverter module reaches the set temperature value (F8-47), signal ON is output.
36	Software current over limit	Please refer to the description of function codes F8-36 and F8-37.
37	Lower frequency arrival ((also output when stopping)	When the operation frequency reaches the lower frequency, signal ON is output. Signal ON is also output when it stops running.
38	Warning output	When the Frequency Inverter breaks down and the processing mode of this malfunction is to keep on running, the Frequency Inverter warning is output.
39	Warning for over-temperature motor	When the motor temperature reaches F9-58 (pre-alarm threshold value of the over-temperature motor), signal ON is output. (See U0-34 for the motor temperature)
40	Running time arrival for this time	When the starting running time of the Frequency Inverter for this time exceeds the time set by F8-53, signal ON is output.

F5-06	FMP output function selection (pulse output terminal)	Default value	0
F5-07	AO1 output function selection	Default value	0
F5-08	AO2 output function selection	Default value	1

The output pulse frequency range of FMP terminal is 0.01kHz~F5-09 (Maximum FMP output frequency), F5-09 shall be set between 0.01kHz~100.00kHz.

The output range of analog output AO1 and AO2 is 0V～10V or 0mA～20mA.

The calibration relation between the pulse output or analog output range and corresponding functions is

shown in the table below.

Set value	Functions	Function range (corresponding to pulse or analog output 0.0%~100.0%)
0	Operation frequency	0 ～Maximum output frequency
1	Set frequency	0 ～Maximum output frequency
2	Output current	0 ～2 times rated current of motor
3	Output torque (absolute value)	0 ～2 times rated torque of motor
4	Output power	0 ～2 times rated power
5	Output voltage	0 ～1.2 times rated voltage of Frequency Inverter
6	Pulse input	0.01kHz ～100.00kHz
7	AI1	0V～10V
8	AI2	0V～10V （or 0 ～20mA ）
9	AI3	0V～10V
10	Length	0 ～Maximum set length
11	Count value	0 ～Maximum count value
12	Communication reference	0.0% ～100.0%
13	Motor speed	0 ～Speed corresponding to maximum output frequency
14	Output current	0.0A～1000.0A
15	Output voltage	0.0V～1000.0V
16	Output torque (practical value)	-2 times rated torque of motor ～2 times rated torque of motor

F5-09	FMP maximum output frequency	Default value	50.00kHz
	Set range	0.01kHz ～100.00kHz	

When FM terminal selection is pulse output, the function code is used to select maximum frequency value of output pulse.

F5-10	A O1 zero bias coefficient	Default value	0.0%
	Set range	-100.0% ～+100.0%	
F5-11	AO1 gain	Default value	1.00
	Set range	-10.00 ～+10.00	
F5-12	Zero bias coefficient of expansion card AO2	Default value	0.0%
	Set range	-100.0% ～+100.0%	
F5-13	Gain of expansion card AO2	Default value	1.00
	Set range	-10.00 ～+10.00	

Generally, above function codes are used to correct the zero drift of analog output and deviation of output amplitude and also can be used to define the AO output curve required.

If zero bias is expressed as “b”, gain is expressed as k, practical output is expressed as Y and standard output is expressed as X, then practical output can be calculated by the equation: Y=kX ＋b

Where, the zero bias coefficients of AO1 and AO2 are 100% corresponding to 10V (or 20mA). Standard output means the quantity expressed by analog output corresponding to output 0V～10V (or 0mA～20mA).

For example: If the analog output is operation frequency, gain shall be set as “-0.50” and zero bias shall be set as “80%” to ensure that the output shall be 8V when frequency is 0 and the output shall be 3V when frequency is the maximum frequency.

F5-17	FMR output delay	Default value	0.0s
	Set range	0.0s ～3600.0s	
F5-18	RELAY1 output delay	Default value	0.0s
	Set range	0.0s ～3600.0s	
F5-19	RELAY2 output delay	Default value	0.0s
	Set range	0.0s ～3600.0s	
F5-20	DO1 output delay	Default value	0.0s
	Set range	0.0s ～3600.0s	
F5-21	DO2 output delay	Default value	0.0s
	Set range	0.0s ～3600.0s	

The delay from state change to practical output change of output terminal FMR, RELAY1, RELAY2, DO1 and DO2 shall be set.

F5-22	Valid state selection for DO output terminal		Default value 00000
	Set range	Ones place	FMR valid state selection
		0	Positive logic
		1	Negative logic
		Tens place	RELAY1 valid state setting (0 ～1, the same as above)
		Hundreds place	RELAY2 terminal valid state setting (0 ～1, the same as above)
		Thousands place	DO1 terminal valid state setting (0 ～1, the same as above)
		Myriabit	DO2 valid state setting (0 ～1, the same as above)

The output logic of output terminal FMR, RELAY1, RELAY2, DO1and DO2 shall be defined.

0：Positive logic. Connection of digital value output terminal with corresponding common terminal shall be valid state and disconnection shall be invalid state.

1：Negative logic. Connection of digital value output terminal with corresponding common terminal shall be

invalid state and disconnection shall be valid state.

F5-23	AO1 output signal selection	Default value	0
	Set range	0: Voltage signal 1: Current signal	

AO1 supports voltage/current signal output which shall be selected through the jumper. If the jumper selection is voltage or current, the F5-23 shall be set correspondingly.

Group F6 Start-stop control

F6-00	Start mode		Default value	0
	Set range	0	Direct start	
		1	Speed tracking restart	
		2	Pre-excitation start (asynchronous motor)	

0: Direct start

If the start DC braking time is set as 0, the Frequency Inverter shall start from starting frequency.

If the start DC braking time is not 0, the Frequency Inverter shall start from DC braking first and then from starting frequency. This start mode is applicable to low inertial load, under certain situation, the motor may rotate when starting.

1: Speed tracking restart

The Frequency Inverter shall judge the speed and direction of motor first, and then start in the motor frequency tracked. For the rotating motor, it shall start in smooth and no impact mode. This start mode is applicable to power interruption restart in high low inertial load. To ensure the performance of speed tracking restart, the motor Group F1 parameters shall be set accurately.

2: Pre-excitation start of asynchronous motor

This start mode is just valid to asynchronous motor and is used to set up the magnetic field before the motor operates.

See the description for Function code F6-05 and F6-06 for pre-excitation current and pre-excitation time.

If the pre-excitation time is set as 0, the Frequency Inverter shall cancel the pre-excitation process and start from starting frequency. If the pre-excitation time is not 0, pre-excitation shall be performed before starting which shall improve the dynamic response performance of motor.

F6-01	Speed tracking restart		Default value	0
	Set range	0	Start from stopping frequency	
		1	Start from zero speed	
		2	Start from maximum frequency	

In order to complete speed tracking process as soon as possible, the mode in which the Frequency Inverter tracks the motor speed shall be selected as follows:

0: Track downward from the frequency from power failure. Generally, this mode shall be selected.

1: Track upward from Frequency 0. This mode shall be used when restarting after a long time of power failure.

2: Track downward from maximum frequency. This mode is used in power generation load.

F6-02	Speed of speed tracking	Default value	0
	Set range	1 ～100	

In speed tracking restart, the speed of speed tracking shall be selected.

The greater the parameter is, the faster the tracking speeds is. However, unreliable tracing effect may be generated due to excessive set value.

F6-03	Starting frequency	Default value	0.00Hz
	Set range	0.00Hz～10.00Hz	
F6-04	Retention time of starting frequency	Default value	0.0s
	Set range	0.0s ～100.0s	

Please set appropriate starting frequency to ensure the motor torque when starting. The starting frequency shall be maintained for a certain time to ensure that the flux is set up sufficiently when the motor starts.

The starting frequency F6-03 is not subject to lower limit frequency. However, the Frequency Inverter shall not start but stay in standby state when the set target frequency is lower than starting frequency.

In forward and reverse switching, the retention time of starting frequency function is invalid.

Retention time of starting frequency is included in acceleration time, but included in running time of simple PLC.

Example 1:

F0-03 ＝0 Frequency source is digital reference

F0-08 ＝2.00Hz Digital set frequency is 2.00Hz

F6-03 ＝5.00Hz Starting frequency is 5.00Hz

F6-04 ＝2.0s Retention time of starting frequency is 2.0s

Now, the Frequency Inverter is in standby state and its output frequency is 0.00Hz.

Example 2:

F0-03 ＝0 Frequency source is digital reference

F0-08 ＝10.00Hz Digital set frequency is 10.00Hz

F6-03 ＝5.00Hz Starting frequency is 5.00Hz

F6-04 ＝2.0s The retention time of starting frequency is 2.0s.

Now, the Frequency Inverter has accelerated to 5.00Hz, and shall accelerate again to 10.00Hz after 2.0 s duration.

F6-05	Start DC braking current/ pre-excitation current	Default value	0%
	Set range	0% ～100%	
F6-06	Start DC braking time/ pre-excitation time	Default value	0.0s
	Set range	0.0s ～100.0s	

Generally, start DC braking is used for restart after the running motor is stopped. Pre-excitation is used for restart after magnetic field is set up for the asynchronous motor which can increase response speed.

Start DC braking current is valid only when the start mode is direct start. Now, the Frequency Inverter shall perform DC braking according to the set start DC braking current and then start after start DC braking time. If the DC braking time is set as 0, the Frequency Inverter shall start directly without DC braking.

If the start mode is pre-excitation start of asynchronous motor, the Frequency Inverter shall set up magnetic field first according to the set pre-excitation current and then start after the set pre-excitation time. If the pre-excitation time is set as 0, the Frequency Inverter shall start directly without pre-excitation process.

There are two situations for the relative base value of start DC braking current/ pre-excitation current.

1. The relative base value is the percentage base value relative to rated current of motor when the rated current of motor is less than or equal to 80% of the rated current of the Frequency Inverter.

2. The relative base value is the percentage base value relative to 80% of the rated current of the Frequency Inverter when the rated current of motor is greater than 80% of the rated current of the Frequency Inverter.

F6-07	Acceleration/deceleration mode		Default value	0
	Set range	0	Linear acceleration/deceleration	
		1	S-curve acceleration/deceleration A	
		2	S-curve acceleration/deceleration B	

The frequency variation mode of Frequency Inverter in start/stop process shall be selected.

0: Linear acceleration/deceleration

The output frequency shall increase or decrease progressively according to the straight line. CT3000-G provides 4 kinds of acceleration/deceleration time. Selection can be made through multifunctional digital input terminals (F4-00 ～F4-08).

1: S-curve acceleration/deceleration A

The output frequency shall increase or decrease progressively according to the Curve S. Curve S must be used in places where the start or top is smooth such as elevator and conveyor belts. Function codes of F6-08 and F6-09 define the time ratio of acceleration/deceleration of Curve S in start period and in end period separately.

2: S-curve acceleration/deceleration B

In S-curve acceleration/deceleration B, the rated frequency of motor *f*b is always the inflection point of Curve S, as shown in Fig. 6- 12. It is generally applied to the occasion that needs rapid acceleration/deceleration in high-speed area above the rated frequency.

When the set frequency is higher than rated frequency, the time of acceleration/deceleration is:

$$t = (\frac{4}{9} \times (\frac{f}{f_b})^2 + \frac{5}{9}) \times T$$

Where, f is the set frequency, *f*b is the rated frequency of motor, T is the time required for the acceleration from zero to rated frequency *f*b.

F6-08	Time ratio of Curve S in start period	Default value	30.0%
	Set range	0.0%～(100.0%-F6-09)	
F6-09	Time ratio of Curve S in end period	Default value	30.0%
	Set range	0.0%～(100.0%-F6-08)	

Function codes of F6-08 and F6-09 define the time ratio of acceleration/deceleration A of Curve S in start period and in end period separately and these two function codes shall meet F6-08 + F6-09 ≤ 100.0%.

The t1 in Fig. 6-11 is the parameter defined by Parameter F6-08, and the slope of output frequency variation shall gradually increase in the time period. The t2 is the time defined by Parameter F6-09, and the slope of output frequency variation shall gradually be changed to 0. In the period between t1 and t2, the slope of output frequency variation is constant, i.e. linear acceleration/deceleration shall be conducted in this interval.

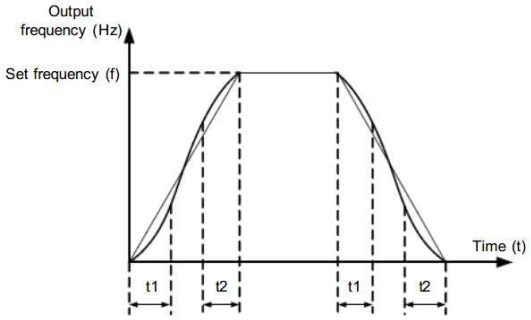


Fig. 6-11 Diagram for S-curve acceleration/deceleration A

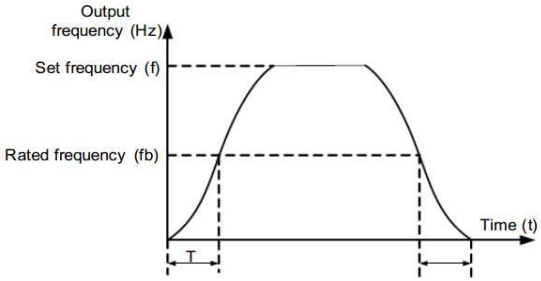


Fig. 6-12 Diagram for S-curve Acceleration/Deceleration B

F6-10	Stop mode	Default value	0
	Set range	0	Deceleration stop
		1	Free stop

0: Deceleration stop

After the stop command is enabled, the Frequency Inverter shall reduce output frequency according to deceleration time and the machine shall be stopped after the frequency is reduced to 0.

1: Free stop

After the stop command is valid, the Frequency Inverter shall terminate the output. Now the motor shall stop freely based on mechanical inertia.

F6-11	Initial frequency of stop DC braking	Default value	30.0%
	Set range	0.00Hz～Maximum frequency	
F6-12	Waiting time of stop DC braking	Default value	0.0s
	Set range	0.0s ～36.0s	
F6-13	Stop DC braking current	Default value	0%
	Set range	0% ～100%	
F6-14	Stop DC braking time	Default value	0.0s
	Set range	0.0s ～36.0s	

Initial frequency of stop DC braking: The DC braking process shall start when the operation frequency is reduced to this frequency during deceleration stop.

Waiting time of stop DC braking: After the operation frequency is reduced to initial frequency of stop DC braking, the Frequency Inverter shall stop output for a period and then the DC braking process shall start. Through this, the failures such as over-current due to the DC braking at a relatively high speed shall be avoided.

Stop DC braking current: There are two situations for the relative base value of stop DC braking current.

1. The relative base value is the percentage base value relative to rated current of motor when the rated current of motor is less than or equal to 80% of the rated current of the Frequency Inverter.

2. The relative base value is the percentage base value relative to 80% of the rated current of the Frequency Inverter when the rated current of motor is greater than 80% of the rated current of the Frequency Inverter.

Stop DC braking time: Retention time of DC restraint quantity. The DC braking process shall be canceled when the value is equal to 0.

The stop DC braking process is shown in Fig. 6-13 diagram.

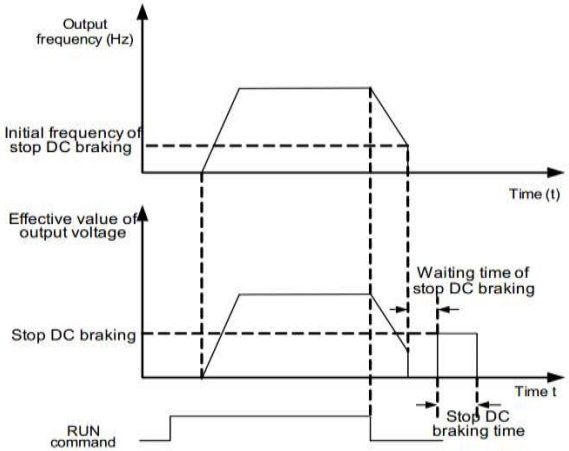


Fig. 6-13 Stop DC braking diagram

F6-15	Use rate of braking	Default value	100%
	Set range	0% ～100%	

It is only applicable to the Frequency Inverter of built-in braking unit.

It is used to adjust the duty cycle of braking unit. If the use rate of braking is high, the braking unit shall have a high duty cycle and good braking effect, but the bus voltage of the Frequency Inverter shall fluctuate largely.

Group F7 Keyboard and display

F7-01	Function selection of Key MF.K		Default value	0
	Set range	0	Key MF.K is invalid	
		1	Switch between operation panel command channel and remote command channel (terminal command channel or communication command channel)	
		2	Forward/reverse switch	
		3	Forward jog	
		4	Reverse jog	

Key MF.K is a multifunction key, the function of which can be set through the function code. Switching

shall be performed through this key during both stop and operation.

0：The key is non-functional. 1：Switch between keyboard command and remote operation.

It means command source switch, i.e. switch between current command source and keyboard control (local operation). If the current command source is keyboard control, the key is invalid.

2：Forward and reverse switch

The direction of frequency instruction shall be switched through Key MF.K. The function shall be only valid when the command source is operation panel command.

3：Forward jog

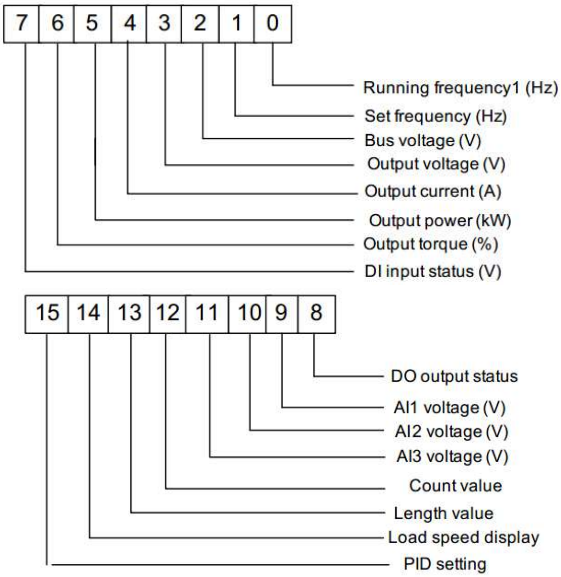
The forward jog (FJOG) shall be implemented through Key MF.K.

4：Reverse jog

The reverse jog (RJOG) shall be implemented through Key MF.K.

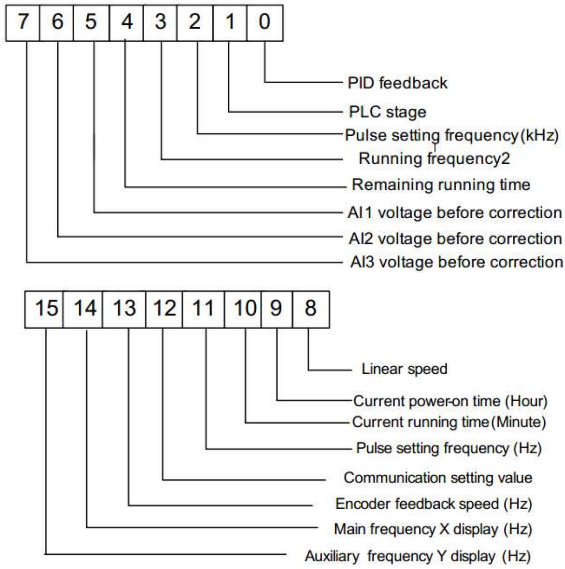
F7-02	Function of Key STOP/RESET		Default value	1
	Set range	0	The key STOP/RES shall only be valid in keyboard operation mode.	
		1	The key STOP/RES shall be valid in any operation mode.	

F7-03	Displayed LED parameter 1 in operation		Default value	1F
	Set range	0000 ～ FFFF		



If above parameters must be displayed during operation, the corresponding position shall be set as 1. The binary number shall be converted to hexadecimal number and then be set to F7-03.

F7-04	Displayed LED parameter 2 in operation		Default value	0
	Set range	0000 ～ FFFF		

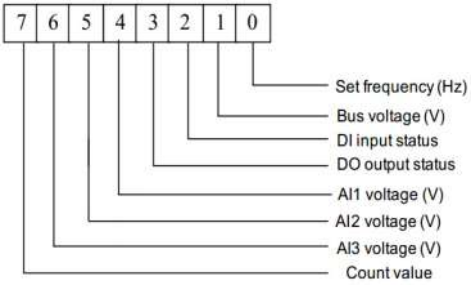


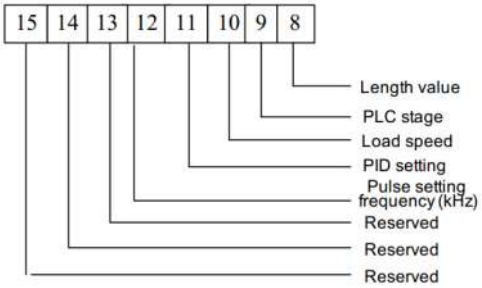
If above parameters must be displayed in operation, the corresponding Position shall be set as 1. The binary number shall be converted to Hexadecimal number and then be set to F7-04.

Displayed parameters in operation shall be used to set the parameters that can be checked when the Frequency Inverter is in operation.

The quantity of state parameters that can be checked at most is 32. The state parameters to be displayed shall be selected according to the binary bit of F7-03 and each F7-04 parameter value. The display order shall start from lowest bit of F7-03.

F7-05	Displayed LED parameters in stop state.		Default value	0
	Set range	0000 ～ FFFF		





If above parameters must be displayed in stop state, the corresponding position shall be set as 1. The binary number shall be converted to hexadecimal number and then be set to F7-05.

F7-06	Displayed load speed parameter	Default value	1.0000
	Set range	0.0001～6.5000	

The corresponding relation between the output frequency of Frequency Inverter and load speed shall be adjusted through the parameter when the load speed must be displayed. See the description for F7-12 for specific corresponding relation.

F7-07	Inverter module radiator temperature	Default value	—
	Set range	0.0℃～100.0℃	

The temperature of inverter module IGBT shall be displayed.

Different types of inverter module IGBT have different overheat protection value.

F7-08	Temporary software version No.	Default value	—
	Set range	-	

The temporary software version No. of the control panel shall be displayed.

F7-09	Accumulated running time	Default value	0 hour 0 hour
	Set range	0h～65535h	

The accumulated running time of the Frequency Inverter shall be displayed. When the running time reaches the set running time F8-17, the multifunctional digital output function (12) shall output ON signal.

F7-10	Product No.	Default value	
	Set range	Product No. of Frequency Inverter	
F7-11	Software version No.	Default value	
	Set range	Version No. of control panel software	

F7-12	Displayed decimal places of load speed		Default value	1
	Set range	0	0 decimal place	
		1	1 decimal place	
		2	2 decimal places	
		3	3 decimal places	

It is used to set the displayed decimal places of load speed. The calculation method of load speed is illustrated below.

If the displayed coefficient F7-06 of load speed is 2.000, and the decimal places F7-12 of load speed are 2 (2 decimal places), when the operation frequency of the Frequency Inverter is 40.00Hz, the load speed shall be: 40.00*2.000 = 80.00 (2 decimal places displayed)

If the Frequency Inverter is in stop state, the displayed load speed shall be the speed corresponding to set frequency, i.e. “set load speed”. For example, if the set frequency is equal to 50.00Hz, the load speed in stop state shall be: 50.00*2.000 = 100.00 (2 decimal places displayed)

F7-13	Accumulated power-on time	Default value	—
	Set range	0 ～65535 h	

The accumulated power-on time of the frequency convertor since it is delivered from the factory shall be displayed.

When this time reaches the set power-on time (F8-17), the multifunctional digital output function (24) shall output ON signal.

F7-14	Accumulated power consumption	Default value	—
	Set range	0 ～65535 kwh	

The accumulated power consumption of the Frequency Inverter by far shall be displayed.

Group F8 Auxiliary functions

F8-00	Jog operation frequency	Default value	2.00Hz
	Set range	0.00Hz～ Maximum frequency	
F8-01	Jog acceleration time	Default value	20.0s
	Set range	0.0s ～6500.0s	
F8-02	Jog deceleration time	Default value	20.0s
	Set range	0.0s ～6500.0s	

The given frequency and acceleration/deceleration time of the Frequency Inverter shall be defined.

In jog operation, the start mode is permanently direct start mode (F6-00=0), and the stop mode is

permanently deceleration stop mode (F6-10=0).

F8-03	Acceleration time 2	Default value	Model dependent
	Set range	0. 0s～6500.0s	
F8-04	Deceleration time 2	Default value	Model dependent
	Set range	0. 0s～6500.0s	
F8-05	Acceleration time 3	Default value	Model dependent
	Set range	0. 0s～6500.0s	
F8-06	Deceleration time 3	Default value	Model dependent
	Set range	0. 0s～6500.0s	
F8-07	Acceleration time 4	Default value	Model dependent
	Set range	0. 0s～6500.0s	
F8-08	Deceleration time 4	Default value	Model dependent
	Set range	0. 0s～6500.0s	

CT3000-G provides 4 groups of acceleration/deceleration time which are F0-17\F0-18 and above 3 groups of acceleration/deceleration time

The definitions of 4 groups of acceleration/deceleration time are the same. Please see the relevant description for F0-17 and F0-18。

The 4 groups of acceleration/deceleration time can be selected alternatively through various combinations of multifunctional digital input terminal DI. See the description for Function code F4-01 ～F4-05.

F8-09	Hopping frequency 1	Default value	0.00Hz
	Set range	0.00Hz～Maximum frequency	
F8-10	Hopping frequency 2	Default value	0.00Hz
	Set range	0.00Hz～Maximum frequency	
F8-11	Hopping frequency amplitude	Default value	0.00Hz
	Set range	0.00 ～Maximum frequency	

When the set frequency is within the range of hopping frequency, actual operation frequency shall operate in the hopping frequency near to the set frequency. Through setting the hopping frequency, the Frequency Inverter shall be kept away from the resonance point of machinery.

CT3000-G can set two hopping frequency points. The hopping frequency function shall be canceled if both hopping frequencies are set to 0.

Please see Fig. 6-14 diagram for the principle for hopping frequency and hopping frequency amplitude

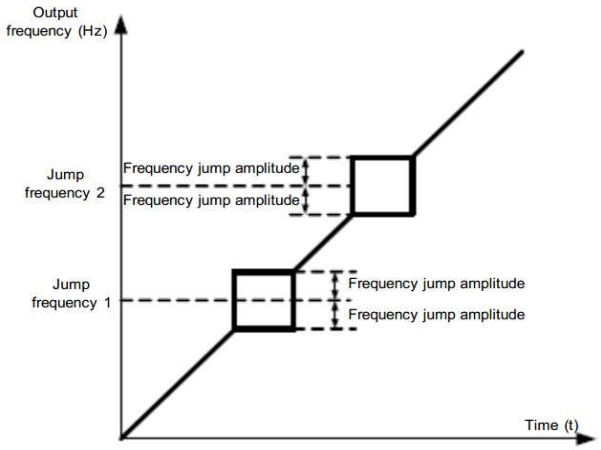


Fig. 6-14 Hopping frequency diagram

F8-12	Forward/reverse running dead time	Default value	0.0s
	Set range	0.0s ～3000.0s	

In forward/reverse running transient process, the transient time at Output 0Hz is shown in Fig. 6-15:

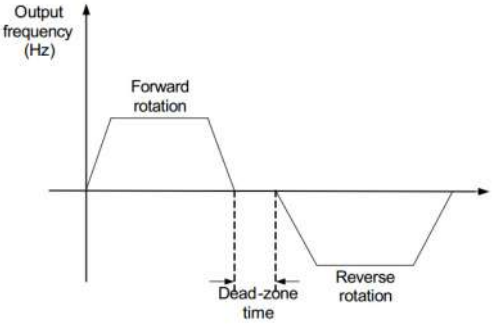


Fig. 6-15 Forward/Reverse Running Dead Time Diagram

F8-13	Reverse control prohibition		Default value: 0
	Set range	0	Allowable
		1	Prohibitive

Whether the Frequency Inverter shall be allowed to operate in reverse running state shall be set through the parameter. At a occasion where the motor reverse running is prohibitive, F8-13=1 shall be set.

F8-14	Set frequency below lower limit frequency mode		Default value	1
	Set range	0	Operate in lower limit frequency	
		1	Stop	
		2	Zero speed operation	

When the set frequency is below the lower limit frequency, the running state of the Frequency Inverter can be selected through the parameter. CT3000-G provides three kinds of operation modes which shall meet various application requirements.

F8-15	Droop control	Default value	0.00Hz
	Set range	0.00Hz～10.00Hz	

The function is used for load distribution when several motors drag the same load.

Droop control means that the output frequency of the Frequency Inverter shall decline with the increase of load, so when several motors drag the same load, the output frequency of motor in load shall decline more, thereby the motor load shall be reduced, and the even load between several motors shall be realized.

The parameter means the decline of output frequency when the Frequency Inverter outputs rated load.

F8-16	Set accumulated power-on time arrival	Default value	0h
	Set range	0h～65000h	

When accumulated power-on time (F7-13) reaches the set power-on time of F8-16, the multifunctional digital DO of the Frequency Inverter shall output ON signal.

F8-17	Set the accumulated operation time arrival	Default value	0h
	Set range	0h～65000h	

It is used to set the running time of the Frequency Inverter.

After accumulated running time (F7-09) reaches the set running time, the multifunctional digital DO of the Frequency Inverter shall output ON signal.

F8-18	Enable protection selection		Default value	0
	Set range	0	Unprotected	
		1	Protected	

The parameter involves the security protection function of the Frequency Inverter.

If the parameter is set as 1 and run command is valid at Frequency Inverter power-on moment (For example, the run command of the terminal is in closed state before power on), the Frequency Inverter shall

not respond to run command until the run command is canceled first and then valid again.

In addition, if the parameter is set as 1, if the run command is valid at Frequency Inverter reset moment, the Frequency Inverter shall also not respond to operation command. The operation protection state shall be not canceled until the run command is canceled first.

The hazard due to the response of motor to run command during power-on or failure reset under informed situation shall be prevented by setting the parameter as 1.

F8-19	Frequency test value (FDT1)	Default value	50.00Hz
	Set range	0.00Hz～Maximum frequency	
F8-20	Lagged test value (FDT1)	Default value	5.0%
	Set range	0.0%～100.0% (FDT1 level)	

When the operation frequency is higher than frequency test value, the multifunctional output DO of the Frequency Inverter shall output ON signal, but when the frequency is a certain frequency value lower than test value, the ON signal output of DO shall be canceled.

Above parameters are used to set the test value of output frequency and lagged value of output action cancellation. One of the parameters F8-20 is the percentage of lagged frequency and frequency test value F8-19. Fig. 6-16 is the FDT function diagram.

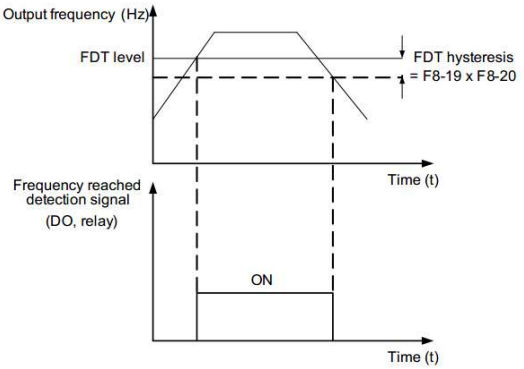


Fig. 6-16 FDT level diagram

F8-21	Detected width of frequency	Default value	0.0%
	Set range	0.00 ～100% (maximum frequency)	

When the operation frequency of the Frequency Inverter is within the range of target frequency, the multifunctional DO of the Frequency Inverter shall output ON signal.

The parameter shall be used to set the frequency test range and is the percentage of the frequency and maximum frequency. Fig. 6-17 is the frequency arrival diagram.

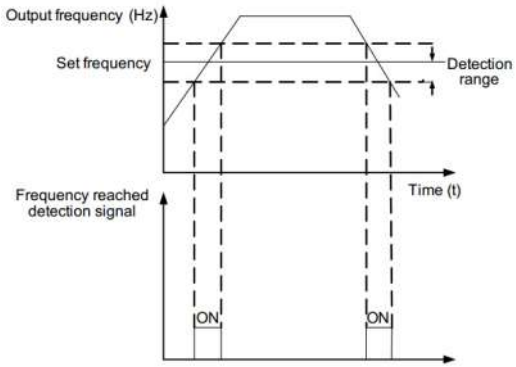


Fig. 6-17 Diagram for detected amplitude of frequency arrival

F8-22	Whether the hopping frequency is valid during acceleration/deceleration	Default value	0
	Set range	0: Invalid; 1: Valid	

The function code is used to set whether the hopping frequency is valid during acceleration/deceleration. When it is set as Valid, the actual operation frequency shall jump the set hopping frequency boundary when operation frequency is within the range of hopping frequency. Fig. 6-18 is the diagram showing that the hopping frequency is valid during acceleration/deceleration.

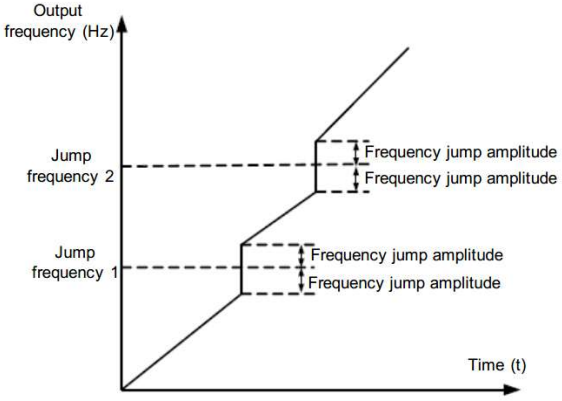


Fig. 6-18 Diagram for valid hopping frequency during acceleration/deceleration

F8-25	Switching frequency point of acceleration 1 and acceleration 2	Default value	0.00Hz
	Set range	0.00Hz～Maximum frequency	

F8-26	Switching frequency point of deceleration 1 and deceleration 2	Default value	0.00Hz
	Set range	0.00Hz～Maximum frequency	

The function is valid only when the motor selection is Motor 1 and the acceleration/deceleration time shall not selected by DI terminal. It is used to select different acceleration/deceleration time automatically according to operation frequency range instead of through DI terminal.

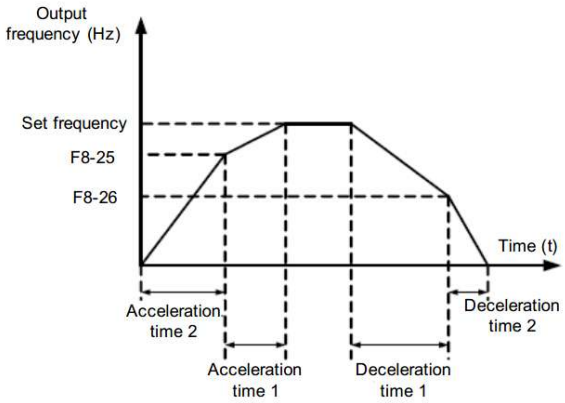


Fig. 6-19 Acceleration/deceleration time switching diagram

Fig. 6-19 is acceleration/deceleration time switching diagram. During acceleration, if operation frequency is less than F8-25, then acceleration time 2 shall be selected; if operation frequency is greater than F8-25, then acceleration time 1 shall be selected.

During deceleration, if operation frequency is greater than F8-26, then acceleration time 1 shall be selected; If operation frequency is less than F8-26, then acceleration time 1 shall be selected.

F8-27	Terminal jog priority	Default value	0
	Set range	0: Invalid; 1: Valid	

The parameter is used to set whether the priority level of terminal jog function is the highest.

When the jog priority of the terminal is valid, if terminal jog command appears in operation, the Frequency Inverter shall be switched to jog running state.

F8-28	Frequency test value (FDT2)	Default value	50.00Hz
	Set range	0.00Hz～Maximum frequency	
F8-29	Lagged frequency test value (FDT2)	Default value	5.0%
	Set range	0.0%～100.0% (FDT2 level)	

The frequency test function and FDT1 function are identical; please see FDT1 description, i.e. the

description for Function code F8-19 and F8-20.

F8-30	Arbitrarily arriving frequency test value 1 1	Default value	50.00Hz
	Set range	0.00Hz～Maximum frequency	
F8-31	Arbitrarily arriving frequency detected width 1	Default value	0.0%
	Set range	0.0%～100.0% (Maximum frequency)	
F8-32	Arbitrarily arriving frequency test value 2	Default value	50.00Hz
	Set range	0.00Hz～Maximum frequency	
F8-33	Arbitrarily arriving frequency detected width 2	Default value	0.0%
	Set range	0.0%～100.0% (Maximum frequency)	

When the output frequency of the Frequency Inverter in within positive/negative detected range of arbitrarily arriving frequency, multifunctional DO shall output ON signal. CT3000-G provides two groups of arbitrarily arriving frequency detected width and sets frequency value and frequency test range separately. Fig. 6-20 is the function diagram.

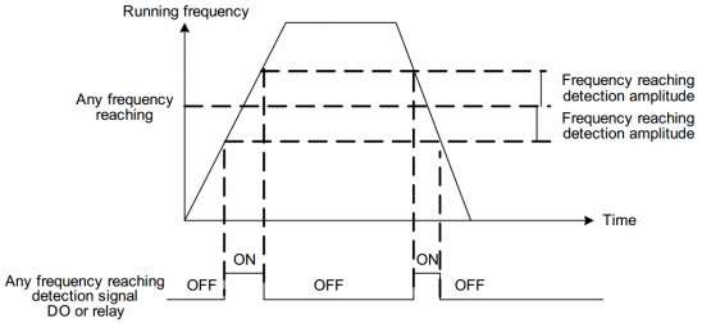


Fig. 6-20 Arbitrarily arriving frequency test diagram

F8-34	Zero current test level	Default value	5.0%
	Set range	0.0%～300.0% (Rated current of motor)	
F8-35	Lagged test time of zero current	Default value	0.10s
	Set range	0.00s ～600.00s	

When the output current of the Frequency Inverter is less than or equal to zero current test level, and the duration exceeds the lagged test time of zero current, the multifunctional DO of the Frequency Inverter shall output ON signal. Fig. 6-21 is the zero current test diagrams.

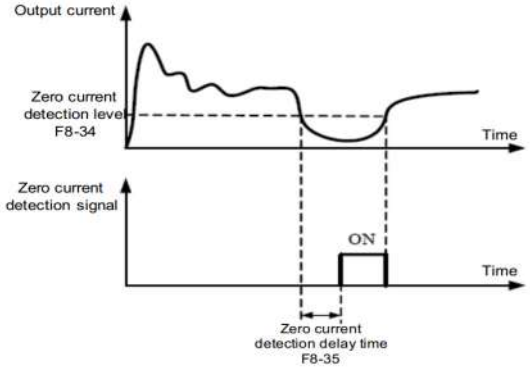


Fig. 6-21 Zero current test diagram

F8-36	Output current over limit value	Default value	200.0%
	Set range	0.0% (Not detected); 0.1%～300.0% (Rated current of motor)	
F8-37	Delay time of over limit test for output current	Default value	0.10s
	Set range	0.00s ～600.00s	

When the output current of the Frequency Inverter is greater than or exceeds test point limit, and the duration exceeds the lagged time of over-current point test, the multifunctional DO of the Frequency Inverter shall output ON signal. Fig. 6-22 is the output current over limit function diagram.

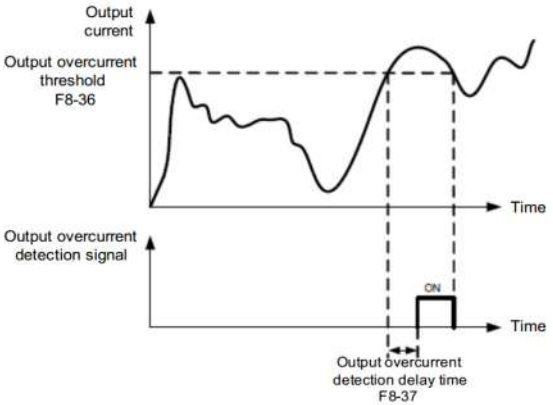


Fig. 6-22 Output current over limit test diagram

F8-38	Arbitrarily arriving current 1	Default value	100.0%
	Set range	0.0%～300.0% (Rated current of motor)	

F8-39	Arbitrarily arriving current 1 width	Default value	0.0%
	Set range	0.0%～300.0% (Rated current of motor)	
F8-40	Arbitrarily arriving current 2	Default value	100.0%
	Set range	0.0%～300.0% (Rated current of motor)	
F8-41	Arbitrarily arriving current 2 width	Default value	0.0%
	Set range	0.0%～300.0% (Rated current of motor)	

When the output frequency of the Frequency Inverter is within positive/negative detected range of arbitrarily arriving current, multifunctional DO shall output ON signal. CT3000-G provides two groups of current arrival at any time and detected width parameter. Fig. 6-23 is the function diagram.

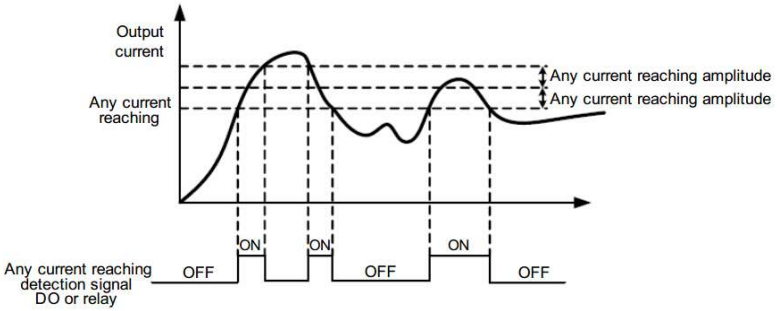


Fig. 6-23 Arbitrarily arriving frequency test diagram

F8-42	Timing function selection		Default value	0
	Set range	0	Invalid	
		1	Valid	
F8-43	Timing running time selection		Default value	0
	Set range	0	F8-44 setting	
		1	AI1	
		2	AI2	
		3	AI3	
			Analog input range 100% corresponding to F8-44	
F8-44	Timing running time selection		Default value	0.0Min
	Set range		0.0Min～6500.0Min	

The parameters group is used to complete the timing operation function of the Frequency Inverter.

When F8-42 timing function selection is valid, Timing shall start when the Frequency Inverter is started. The Frequency Inverter shall stop automatically when set timing running time is reached. Meanwhile, the multifunctional DO shall output ON signal.

Timing shall start from 0 each time when the Frequency Inverter is started, and the residual timing running time can be checked through U0-20.

The timing running time shall be set by F8-43 and F8-44 in minutes.

F8-45	Lower limit of AI1 input voltage protection value	Default value	3.10V
	Set range	0.00V ～F8-46	
F8-46	Upper limit of AI1 input voltage protection value	Default value	6.80V
	Set range	F8-45 ～10.00V	

When the analog input value of AI1 is greater than F8-46 or AI1 input is less than F8-45, the multifunctional DO of Frequency Inverter shall output "AI1 input over limit" ON signal indicating whether the input voltage of AI1 is within the set range.

F8-47	Module temperature arrival	Default value	75℃
	Set range	0.00V ～F8-46	

When the radiator on the inverter reached the temperature, the multifunctional DO of the Frequency Inverter shall output "Module temperature arrival" ON signal.

F8-48	Cooling fan control	Default value	0
	Set range	0：Fan operates when Frequency Inverter is in operation; 1: Fan always operates	

It is used to select the operation mode of cooling fan. When 0 is selected, the fan shall operate when Frequency Inverter is in operation and when Frequency Inverter is stopped but fan temperature is higher than 40 ℃, while the fan shall not operate when Frequency Inverter is stopped and fan temperature is lower than 40 ℃.

When 1 is selected, the fan shall operate after power on.

F8-49	Wakening frequency	Default value	0.00Hz
	Set range	Wakening frequency (F8-51) ～Maximum frequency (F0-10)	
F8-50	Waking delay	Default value	0.0s
	Set range	0.0s ～6500.0s	
F8-51	Dormant frequency	Default value	0.00Hz
	Set range	0.00Hz～Wakening frequency（F8-49）	
F8-52	Dormant delay	Default value	0.0s
	Set range	0.0s ～6500.0s	

The parameter set is used to achieve the dormant and waking function in water supply application.

If the Frequency Inverter is in operation, when the set frequency is less than or equal to F8-51 dormant frequency, Frequency Inverter shall enter dormant state and stop automatically after F8-52 delay.

If the Frequency Inverter is in dormant state and current command is valid, when the set frequency is greater or equal to F8-49 dormant frequency, the Frequency Inverter shall start after F8-50 delay.

Generally, the set Wakening frequency shall be greater than or equal to the dormant frequency. If both the Wakening frequency and dormant frequency are set as 0.00Hz, the dormant and waking function shall be invalid.

When the dormant function is enabled, if the frequency source uses PID, the operation of dormant state PID shall be influenced by Function code FA-28. Now, operating in PID stop state shall be selected.

F8-53	Running time arrival for this time	Default value	0.0Min
	Set range	0.0Min～6500.0Min	

After the running time from start reaches for this time, the multifunctional DO of the Frequency Inverter shall output "running time arrival for this time" ON signal.

F8-54	Calibration coefficient of output power	Default value	100.0%
	Set range	0.0%～200.0%	

Linear calibration to output power can be made through this value when the output power (U0-05) doesn't correspond to expectations.

Group F9 Failure and protection

F9-00	Motor overload protection selection		Default value	1
	Set range	0	Prohibitive	
		1	Allowable	
F9-01	Motor overload protection gain		Default value	1
	Set range		0.20 ～10.00	

F9-00=0: Without motor overload protection function, motor damage risk due to overheat may exist, therefore, the installation of relay between Frequency Inverter and motor shall be suggested.

F9-00=1: Now, the Frequency Inverter shall judge the overload of motor according to inverse-time curve. The inverse-time curve of motor overload protection is: 220% ×(F9-01)×rated current of motor, alarm shall be sounded 1 min after motor overload failure occurs; 150% ×(F9-01)×rated current of motor, alarm shall be sounded 60 min after motor overload failure occurs.

The user shall set the value of F9-01 correctly according to actual overload capacity of motor. If a excessive value is set, alarm may not be sounded when the motor is damaged due to overheat!

F9-02	Early warning coefficient	Default value	80%
	Set range	50%～100%	

This function is used to send a early warning signal to control system through DO before motor overload protection. The early warning coefficient is used to confirm to what extent the early warning shall been sent before motor overload protection. The greater the value is, the less lead the early warning is.

When the output current cumulant of motor is greater than the product of overload inverse-time curve and F9-02, the multifunctional DO of the Frequency Inverter shall output “early warning for motor overload” ON signal.

F9-03	Overvoltage stall gain	Default value	0
	Set range	0 (No overvoltage stall) ～100	
F9-04	Protecting voltage for overvoltage stall	Default value	130%
	Set range	120% ～150%	

During deceleration of the Frequency Inverter, when DC bus voltage exceeds the protecting voltage for overvoltage stall, the Frequency Inverter shall stop decelerating and maintain current operation frequency and shall continue decelerating after the bus voltage is reduced.

Overvoltage stall gain is used to adjust the inhibiting ability of the Frequency Inverter to overvoltage. The greater the value is, the stronger the overvoltage inhibiting ability is. The gain shall be set as little as possible if overvoltage doesn’t happen.

For low inertial load, overvoltage stall gain shall be less; otherwise dynamic response of the system shall become lower. For high inertial load, the value shall be greater; otherwise overvoltage failure may appear due to poor inhibitory effect.

The overvoltage stall function shall be canceled by setting the overvoltage stall gain as 0.

100% corresponding base value of protecting voltage setting for overvoltage stall is shown below:

Voltage level	Base value of protection voltage for overvoltage stall
Single-phase 220V	290V
Three-phase 380V	530V

F9-05	Over-current stall gain	Default value	20
	Set range	0 ～100	
F9-06		Default value	150%
	Set range	100% ～200%	

Over-current stall: If the output current of the Frequency Inverter reaches the set protecting current for over-current stall (F9-06), when the Frequency Inverter is in accelerating operation, the output frequency shall be reduced; when it is in constant-speed operation, the output frequency shall be reduced; when it is in decelerating operation, the decline speed shall be slowed. The operation frequency shall not return to normal until the current is less than protecting current for over-current stall (F9-06). See Fig. 6-24 for more details.

Protecting current for over-current stall: The current protection point of over-current stall function shall be selected. The Frequency Inverter shall perform protection function for over-current stall when this parameter value is exceeded. The value is the percentage relative to rated current of motor.

Over-current stall gain: It is used to adjust the inhibiting ability of the Frequency Inverter to over-current. The greater the value is, the stronger the overvoltage inhibiting ability is. The gain shall be set as little as possible if over-current doesn't happen.

For low inertial load, over-current stall gain shall be less; otherwise dynamic response of the system shall become lower. For high inertial load, the value shall be greater; otherwise over-current failure may appear due to poor inhibitory effect. At occasion where the inertia is very low, setting the over-current inhibiting gain below 20 shall be suggested. The over-current stall function shall be canceled by setting the over-current stall gain as 0.

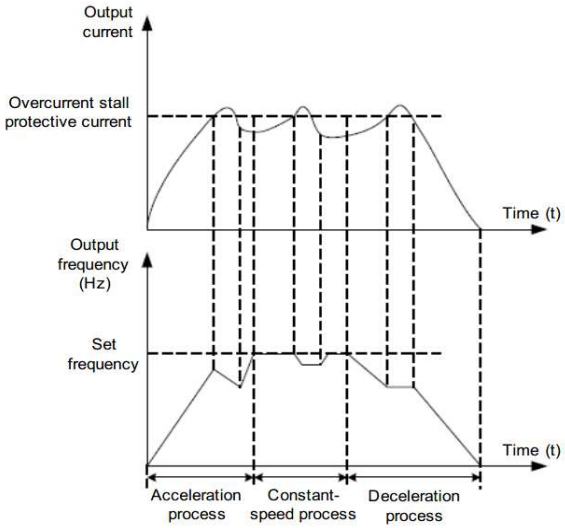


Fig. 6-24 Over-current stall protection diagram

F9-07	To-earth short circuit protection selection when power on	Default value	1
	Set range	0：Invalid; 1：Valid	

Motor-to-ground short circuit test when Frequency Inverter is power on can be selected.

If the function is valid, the UVW terminal of Frequency Inverter shall output voltage within a certain time after the Frequency Inverter is power on.

F9-09	Times of automatic failure reset	Default value	0
	Set range	0 ～20	

Automatic failure reset for the Frequency Inverter is selected to set the allowable times of automatic reset. The Frequency Inverter shall maintain failure state after the times are exceeded.

F9-10	Failure DO action selection during automatic failure reset	Default value	0
	Set range	0：No action; 1：Action	

If the automatic failure reset function for Frequency Inverter is set, whether failure DO action shall be performed can be set through F9-10.

F9-11	Interval of automatic failure reset	Default value	1.0s
	Set range	0.1s ～100.0s	

The waiting time between failure alarm of frequency and automatic failure reset

F9-12	Input default phase\ contactor closing protection selection	Default value	11
	Set range	Ones place: Input default phase protection; Tens place: Contactor closing protection 0: Prohibitive; 1：Allowable	

Whether the input default phase or contactor closing protection shall be enabled shall be selected.

See the table below for initial types of CT3000-G Frequency Inverters with input default phase\ contactor closing protection.

Voltage level	Initial types with input default phase\ contactor closing protection
Single-phase 220V	Without such function in full series
Three-phase 380V	18.5kW G model

Only the CT3000-G Frequency Inverter of various voltage levels with above initial power and types shall possess input default phase protection and contactor closing protection function, and other power range below shall not possess default phase protection and contactor closing protection function regarding regardless that F9-12 is set as 0 or 1.

F9-13	Output default phase selection	Default value	1
	Set range	0: Prohibitive; 1: Allowable	

Choose whether to protect the output default phase or not

F9-14	Failure type for the first time	0 ～99
F9-15	Failure type for the second time	
F9-16	Failure type for the third time (The latest time)	

Record the recent three times of failure types of Frequency Inverter, 0 means failure free. Please refer to the relevant description in chapter eight for the possible cause and solution of each failure code.

F9-17	The frequency for the third time failure	A recent failure frequency
F9-18	The current for the third time failure	A recent failure current
F9-19	Bus voltage for the third time failure	A recent failure bus voltage
F9-20	Input the terminal state in the third time failure	The input terminal state in a recent failure, the sequence: BIT9 BIT8 BIT7 BIT6 BIT5 BIT4 BIT3 BIT2 BIT1 BIT0 DI0 DI9 DI8 DI7 DI6 DI5 DI4 DI3 DI2 DI1 When the input terminal is ON, the corresponding secondary bit shall be 1, OFF shall be 0, and all DI states switch into decimal number display.
F9-21	Input the terminal in the third time failure	The all input terminal state in a recent failure, the sequence: BIT4 BIT3 BIT2 BIT1 BIT0 DO2 DO1 REL2 REL1 FMP When the input terminal is ON, the corresponding secondary bit shall be 1, OFF shall be 0, and all DI states switch into the decimal number display.

F9-22	The Frequency Inverter state in the third time failure	Reserved
F9-23	The power-on time in the third time failure	Reserved
F9-24	The operation time in the third time failure	Reserved
F9-27	The failure frequency in the second time failure	The same as F9-17~ F9-24
F9-28	The current in the second time failure	
F9-29	The bus voltage in the second time failure	
F9-30	The input terminal state in the second time failure	
F9-31	The output terminal in the second time failure	
F9-32	The Frequency Inverter in the second time failure	
F9-33	The power-on time in the second time failure	
F9-34	The operation time in the second time failure	
F9-37	The frequency in the first time failure	The same as F9-17~ F9-24
F9-38	The current in the first time failure	
F9-39	The bus voltage in the first time failure	
F9-40	The input terminal state in the first time failure	
F9-41	The output terminal in the first time failure	
F9-42	The Frequency Inverter state in the first time failure	
F9-43	The power-on time in the first time failure	
F9-44	The operation time in the first failure	Reserved

F9-47	Select 1 for the failure protection action		Default value	00000
	Set range	Ones place	Motor overload (Err11)	
		0	Free stop	
		1	Stop according to stop method	
		2	Continue operation	
		Tens place	Input default phase (Err12) (The same as ones place)	
		Hundreds place	Output default phase (Err13) (The same as ones place)	
		Thousands place	External failure (Err15) (The same as ones place)	
		Myriabit	Communication abnormity (Err16) (The same as ones place)	
F9-48	Select 2 for the failure protection action		Default value	00000
	Set range	Ones place	Encoder failure (Err20)	
		0	Free stop	
		1	Switch into VF, stop according to stop mode	
		2	Switch into VF, continue operation	
		Tens place	Function code read-write abnormity (Err21)	
		0	Free stop	
		1	Stop according to stop mode	
		Hundreds place	Reserved	
		Thousands place	Motor overheating (Err25) (The same as F9-47 ones place)	
		Myriabit	Operation time arrival (Err26) (The same as F9-47 ones place)	
F9-49	Select 3 for the failure protection action		Default value	00000
	Set range	Ones place	User-defined failure 1(Err27) (The same as F9-47 ones place)	
		Tens place	User-defined failure 2(Err28) (The same as F9-47 ones place)	
		Hundreds place	Power-on time arrival (Err29) (The same as F9-47 ones place)	

		Thousands place	Off-load (Err30)
		0	Free stop
		1	Stop according to stop mode
		2	Directly jumps to 7% of the rated frequency of a motor and continues to operate, if there is no Off-load, it shall return to the set frequency and operate automatically
		Myriabit	The PID feedback is missing during operation
F9-50	Select 4 for the failure protection action		Default value: 00000
	Set range	Ones place	Speed deviation is too large (Err42) (The same as F9-47 ones place)
		Tens place	Motor supervelocity (Err43) (The same as F9-47 ones place)
		Hundreds place	Initial position error (Err51) (The same as F9-47 ones place)
		Thousands place	Speed feedback error (Err52) (The same as F9-47 ones place)
		Myriabit	Reserved

When we select “free stop”, the Frequency Inverter shall display Err**, and stop directly.

When we select “stop according to stop mode”: the Frequency Inverter shall display A**, and stop according to stop mode, after stopping, it shall display Err**.

When we select “continue to operate”: the Frequency Inverter shall continue to operate and display A**, and the operation frequency shall be set by F9-54.

F9-54	It shall continue to operate frequency section under the failure		Default value: 0
	Set range	0	It shall operate with current operation frequency
		1	It shall operate with set frequency
		2	It shall operate with upper limit frequency
		3	It shall operate with lower limit frequency
		4	It shall operate with abnormal standby frequency

F9-55	Abnormal standby frequency	Default value	100.0%
	Set range	0.0%～100.0% (the maximum frequency)	

If there is a failure during the operation of Frequency Inverter, and the handling method of this failure

which was set to be operated continually, the Frequency Inverter shall display A**, and operates with frequency determined by F9-54.

When we select abnormal standby frequency for operation, the value set by F9-55 shall be the percentage relative to the maximum frequency.

F9-56	Motor temperature sensor type		Default value	0
	Set range	0	No temperature sensor	
		1	PT100	
		2	PT1000	
F9-57	Motor overheating protection threshold value		Default value	110°C
	Set range		0°C ~200°C	
F9-58	Motor overheating forecast alarm threshold value		Default value	90°C
	Set range		0°C ~200°C	

The temperature signal of motor temperature sensor shall be connected to IO expansion card; the IO expansion card means operational components. The analog value of expansion card shall be input AI3, it can also be input as motor temperature sensor, the signal of motor temperature sensor shall connect to terminal AI3 and PGND.

The AI3 analog input terminal of CT3000-G shall support PT100 and 1000 motor temperature sensors, when putting them into use; we must set the sensor type correctly. The U0-34 shall display motor temperature.

When the motor temperature exceeds motor overheating protection threshold value F9-57, the Frequency Inverter shall alarm the failure, and handle it pursuant to the selected failure protection action method.

When the motor temperature exceeds motor overheating forecast alarm threshold value F9-58, the frequency multi-function digital DO shall input motor overheating forecast alarm ON signal.

F9-59	Selection of instantaneous power failure action		Default value	0
	Set value	0	Invalid	
		1	Deceleration	
		2	Deceleration for stop	
F9-60	The suspension judgment voltage of instantaneous stop action		Default value	90.0%
	Set range		80.0% ～100.0%	
F9-61	Voltage recovery judgment time of instantaneous power failure		Default value	0.50s

	Set range	0.00s ～100.00s	
F9-62	The judgment voltage of instantaneous power failure action	Default value	80.0%
	Set range	60.0% ~100.0% (Standard bus voltage)	

This function means, when the instantaneous power failure or voltage decreases suddenly, the Frequency Inverter shall compensate the decrease of Frequency Inverter DC bus voltage with load feedback energy by reducing input rotational speed, so that the Frequency Inverter can be maintained, and it can operate continually.

If F9-59=1, and the instantaneous power failure or voltage decreases suddenly,, the Frequency Inverter shall slow down, when to bus voltage return to normal, the Frequency Inverter shall normally speed to the set frequency and operates. The judgment of whether bus voltage returns to normal or not is based on the normal bus voltage, and its duration time exceeds the time set by F9-61. If F9-59=2, and the instantaneous power failure or voltage decreases suddenly, the Frequency Inverter shall decelerate till stop.

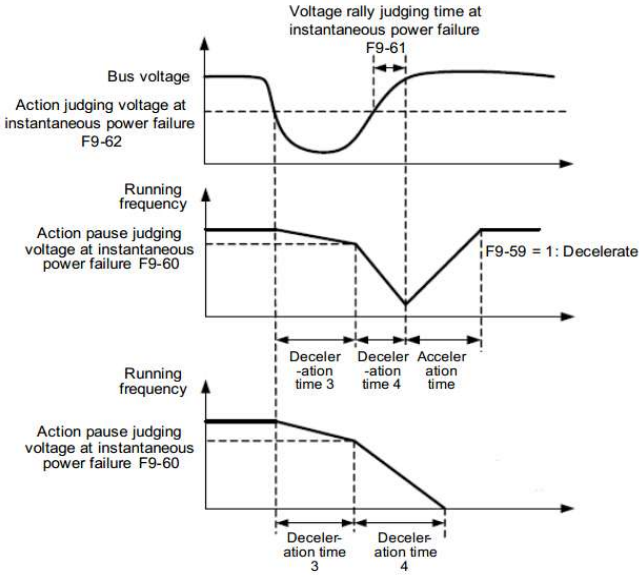


Fig. 6-25 The diagram of instantaneous power failure action

F9-63	Off-load protection selection		Default value	0
	Set range	0	Invalid	
		1	Valid	
F9-64	Off-load test level		Default value	10.0%

	Set range	0.0%～100.0% (the rated current of motor)	
F9-65	Off-load test time	Default value	1.0s
	Set range	0.0s ～60.0s	

If the protection function of Off-load is effective, and the output current of Frequency Inverter is less than test level F9-64, and the duration is longer than Off-load test time F9-65, and the duration is longer than the test time F9-65, the output frequency of Frequency Inverter shall reduce to 7% of the rated frequency. During the Off-load protection period, if the load returns, the Frequency Inverter shall return to the set frequency and operate automatically.

F9-67	Overspeed test value	Default value	20.0%
	Set range	0.0%～50.0% (the maximum frequency)	
F9-68	Overspeed test time	Default value	1.0s
	Set range	0.0s ～60.0s	

This function shall be available when the Frequency Inverter operates in the vector control of a speed sensor.

When the Frequency Inverter tests the actual rotational speed of motor exceeds the maximum frequency, the exceeding value is greater than overspeed test value F9-67, and its duration is longer than overspeed test time F9-68, the Frequency Inverter shall alarm failure Err43, and handle it according to failure protection action method.

When the overspeed test time is 0.0s, please call overspeed failure test.

F9-69	Speed big deviation test value	Default value	20.0%
	Set range	0.0%～50.0% (the maximum frequency)	
F9-70	Speed big deviation test time	Default value	5.0s
	Set range	0.0s ～60.0s	

This function shall be available when the Frequency Inverter operates in the vector control of a speed sensor.

When Frequency Inverter tests there is a deviation between the actual rotational speed and the set frequency, the deviation value is greater than the speed big deviation test value F9-69, and duration is longer than the speed big deviation test time F9-70, the Frequency Inverter shall alarm failure Err42, and handle it according to failure protection action method.

When the speed big deviation test time is 0.0s, please cancel the speed big deviation failure test.

Group FA Process control PID function

PID control is a common process control method; it makes controlled value stable in the target value through performing the proportion, integration, and differential calculation of dispersion, as well as

adjusting the output frequency of Frequency Inverter.

It shall apply to flow control, press control, temperature control and other process control occasions, Fig. 6-26 shows the process PID control principle.

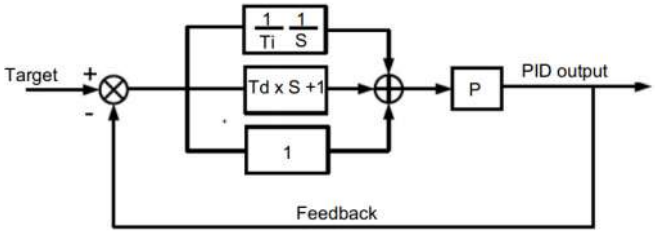


Fig. 6-26 The diagram of process PID principles

FA-00	PID given source		Default value	0
	Set range	0	FA-01 setting	
		1	AI1	
		2	AI2	
		3	AI3	
		4	PULSE (DI5)	
		5	Communication	
		6	Multi-stage instruction	
FA-01	PID given value		Default value	50.0%
	Set range		0.0%～100.0%	

This parameter is used to select the target value of given channel of PID process

The set target value of PID process means relative value, the set range is 0.0%~100.0%. Meanwhile the feedback value of PID is also relative value, and making the two relative values the same is the function of PID.

FA-02	.		Default value	0
	Set range	0	AI1	
		1	AI2	
		2	AI3	
		3	AI1 －AI2	
		4	PULSE （DI5）	
		5	Communication	
		6	AI1+AI2	
		7	MAX(|AI1|,|AI2|)	
		8	MIN (|AI1|,|AI2|)	

This parameter is used to select feedback signal channel of PID process.

The feedback value of process PID is also the relative value, the set range is 0.0%~100.0%.

FA-03	PID function direction		Default value	0
	Set range	0	Positive action	
		1	Reaction	

Positive action: when the feedback information of PID is less than the given value, the output frequency of Frequency Inverter shall go up. For example, the winding tension shall control occasions.

Reaction: when the PID feedback information is less than the given value, the output frequency of Frequency Inverter shall fall. For example, the unwinding tension shall control occasions.

The function shall withstand the negation impact of multifunction terminal PID (Function 35) and we must notice the impact when we put it into use.

FA-04	PID given feedback range	Default value	1000
	Set range	0 ～65535	

PID given feedback measurement value means dimensionless unit and it is used for PID given display U0-15 and the PID feedback display U0-16.

The relative value 100.0% of PID given feedback corresponds to the given feedback measurement range FA-04. For example, if we set the FA-04 for 2000, when the PID gives 100.0%, the PID given display U0-15 shall be 2000.

FA-05	Proportional gain Kp1	Default value	20.0
	Set range	0.0 ～100.0	
FA-06	Integral time Ti1	Default value	2.00s
	Set range	0.01s ～10.00s	
FA-07	Derivative time Td1	Default value	0.000s
	Set range	0.00 ～10.000	

Proportional gain Kp1:

It decides the adjusting strength of whole PID regulator, which is intensified along with the growing of Kp1. when Kp1 is 100.0, it indicates that the adjusting range of PID regulator towards the output frequency instruction reaches its biggest when the feedback value and set value deviation of PID is 100.0%.

Integral time Ti1:

It decides the integral adjusting intensity of PID regulator. The shorter the integral time is, the greater the intensity. Integral time indicates that when feedback value and given value deviation of PID is 100.0%, the adjustment amount of the integral regulator reaches its biggest after stepless regulation in the given time.

Derivative time Td1:

It decides the adjusting intensity of PID regulator towards the deviating rate. The longer the derivative time is, the greater the intensity. Derivative time indicates that the adjusting amount of derivative regulator reaches its biggest when the change of the feedback value is 100.0% at that time.

FA-08	PID reverse cut-off frequency limit	Default value	2.00Hz
	Set range	0.00～maximum frequency	

In some cases, only when the output frequency of PID is negative (ie, the Frequency Inverter is reversed), can it make the given value the same with the feedback value. But excessive reverse frequency is not permitted in some circumstances and it is limited by FA-08.

FA-09	Diviation limit	Default value	0.0%
	Set range	0. 0% ～100.0%	

When deviation between the given value and the feedback value of PID is less than FA-09, the adjusting operation of PID stops, so that the output frequency can remain stable when deviation between the two values is relatively small, which can be very efficient in some Closed-loop control occasions.

FA-10	Derivative limiting	Default value	0.10%
	Set range	0．00%～100.00%	

Differential plays a sensitive role in PID regulator, which can easily leads to system oscillation, so it is usually restricted in a small realm with the output range set by FA-10.

FA-11	PID given changing time	Default value	0.00s
	Set range	0.00s ～650.00s	

PID given changing time is the time needed for PID given value to change from 0.0% to 100.0%.

When given PID changes, the given value takes on a linear change in accordance with the given time, thus reducing the negative effects it might has on the system.

FA-12	PID feedback filter time	Default value	0.00s
	Set range	0.00s ～60.00s	
FA-13	PID output filter time	Default value	0.00s
	Set range	0.00s ～60.00s	

FA-12 is use to filter PID feedback quantity, which can reduce the chance of feedback quantity being disturbed but may weaken the response performance of the process closed-loop system.

FA-13 is used to filter PID output frequency, which may reduce the sudden change of the output frequency of the converter, but may also weaken the response performance of the process closed-loop system

FA-15	Proportional gain Kp2	Default value	20.0
	Set range	0.0 ～100.0	
FA-16	Integral time Ti2	Default value	2.00s

	Set range		0.01s ～10.00s	
FA-17	Derivative time Td2		Default value	0.000s
	Set range		0.00 ～10.000	
FA-18	PID Feedback source		Default value	0
	Set range	0	Not switched	
		1	Switched through D1 terminal	
		2	Automatically switched according to deviation	
FA-19	PID parameter switching deviation 1		Default value	20.0%
	Set range		0.0%～FA-20	
FA-20	PID parameter switching deviation 2		Default value	80.0%
	Set range		FA-19 ～100.0%	

In some applications, a group of PID parameters can not meet the needs of the whole operation, and different parameters are needed under different circumstances.

This group of function codes are used for the switching of two group of PID parameters, of which the converter parameter FA-15~FA-17 is set in the same way with that of parameter FA-05~FA-07.

The two group of PID parameters can be either switched through multi-functional digital DI terminal or automatically switched according to the deviation of PID.

To switch through multi-functional DI terminal, the function selection of multi-functional terminal should be set to be 43(PID parameter switching terminal). If the terminal is effective, chose parameter group1（FA-05~FA-07）, if not, chose group2（FA-15~FA-17）.

To switch automatically, if the absolute value of deviation between given value and feedback value is lower than PID parameter switching deviation1 FA-19, parameter group1 should be chosen, and if it is higher than PID switching deviation 2 FA-20， parameter group 2 should be chosen. If the given value and feedback value deviation is between switching diviation1 and 2, PID parameter should be the linear interpolation value of the two groups of parameter, as is illustrated by Fig 6-27.

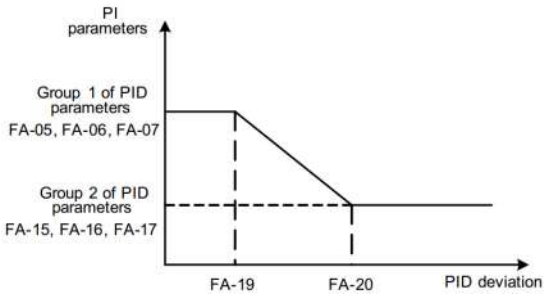


Fig6-27 PID parameter switching

FA-21	PID starter	Default value	0.0%
	Set range	0.0%～100.0%	
FA-22	Retention time of PID starter	Default value	0.00s
	Set range	0.00s ～650.00s	

When the Frequency Inverter is started, only after PID output being fixed to be PID starter FA-21 and the retention time of PID starter being FA-22, can PID start the closed-loop regulating operation. Fig 6-28 illustrates the function of PID starter.

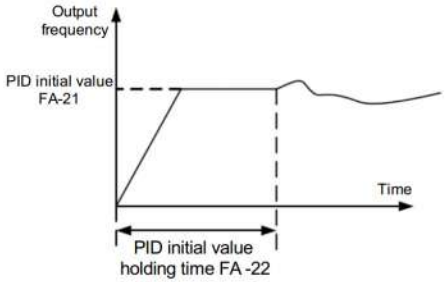


Fig 6-28: The diagram of PID starter function

FA-23	The positive maximum of the two times of output deviation	Default value	1.00%
	Set range	0.00% ～100.00%	
FA-24	The reverse maximum of the two times of output deviation	Default value	1.00%
	Set range	0.00% ～100.00%	

This function is designed to restrict the difference value between the two beats of PID output (2ms/beat), so as to prevent PID output from changing too fast and consequently stabilize the operation of the Frequency Inverter.

FA-23 represents the positive maximum absolute value of the output deviation while FA-24 represents its reverse maximum absolute value.

FA-25	PID integral attribute		Default value	00
	Set range	Ones place	Integral separation	
		0	Invalid	
		1	Valid	
		Tens place	Whether to stop integrating after the input reaches the limiting value	
		0	Continue integrating	
		1	Stop integrating	

Integral separation:

If integral separation is set to be valid, then PID integral will stop operating when multi-functional digital DI integral stops being valid temporarily, at which time only the proportion and differential function of PID remains valid.

When integral separation is set to be invalid, it will remain so without being influenced by the validity of the multi-functional digital DI.

Whether to stop integrating after the input reaches the limiting value:

When PID operation output reaches its maximum or minimum, choices can be made between stoping and continuing integrating. If stop integrating is chosen, then PID integral operation stops, which may lower PID overshoot.

FA-26	The testing value of PID feedback losses	Default value	0.0%
	Set range	0.0%:not judging feedback losses; 0.1%～100.0%	
FA-27	The testing time of PID feedback losses	Default value	0.0s
	Set range	0.0s ～20.0s	

This function code is used to judge whether PID feedback is lost.

When PID feedback quantity is lower than the testing value of feedback losses FA-26 and this sort of situation lasts longer than the testing time of PID feedback losses FA-27, the Frequency Inverter gives a warning of malfunction Err31 and manages it in the chosen way.

FA-28	PID halting operation		Default value	0
	Set range	0	Halting without operation	
		1	Halting operation	

This is used to choose whether to continue operating when PID is in halting state. In general applications, PID should stop operating in halting state.

Group FB Swing frequency, fixed length and count

Swing frequency function can be applied to textile, chemical fiber and other industries as well as occasions in need of traversing and winding functions.

Swing frequency function refers to the output frequency of the Frequency Inverter, which swings up and down centered on the set frequency. The track of the operation frequency long the timeline is illustrated in Fig 6-29, of which the amplitude of swing is set by FB-00 and FB-01. When FB-01 is set to be 0, the amplitude of swing is 0 and the swing frequency doesn't work

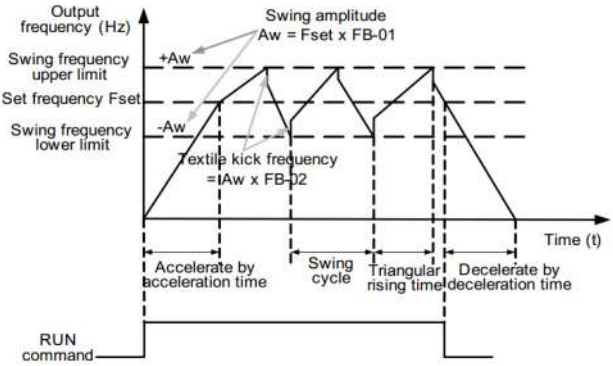


Fig. 6-29 Swing frequency diagram

FB-00	The way of setting the amplitude of swing		Default value	0
	Set range	0	Relative to center frequency	
		1	Relative to maximum frequency	

The datum quantity of the swing amplitude is set by this parameter.

0: the relative center frequency (F0-07 frequency source) is the changing swing amplitude system, of which the swing amplitude changes with the change of the of the center frequency.

1: the relative maximum frequency (F0-10) is the fixed swing amplitude system, of which the swing amplitude is fixed.

FB-01	The amplitude of swing frequency	Default value	0.0%
	Set range	0.0%～100.0%	
FB-02	The amplitude of kick frequency	Default value	0.0%
	Set range	0.0%～50.0%	

The value of the amplitude of swing and the kick frequency is set by this parameter.

When the amplitude of swing is set to be relative to the center frequency (FB-00=0), amplitude AW=frequency source × swing amplitude FB-01. When it is set to be relative to the maximum frequency(FB-00=1), amplitude AW= maximum frequency F0-10 ×swing amplitude FB-01.

When the kick frequency amplitude is set to be swing frequency operation, then the kick frequency will be relative to the frequency percentage of the swing amplitude, ie, kick frequency=amplitude AW ×kick frequency amplitude FB-02. if swing amplitude is set to be relative to center frequency(FB-00=0), then the kick frequency will be a change value, while if it is set to be relative to the maximum frequency(FB-00=1), the kick frequency will be a fixed value.

The operation of swing is restricted by the upper limiting frequency and lower frequency limiting.

FB-03	Swing frequency period	Default value	10.0s
	Set range	0.0s ～3000.0s	
FB-04	The triangular wave risetime factor	Default value	50.0%
	Set range	0.0%～100.0%	

Swing frequency period: the time value of a whole swing frequency period.

The triangular wave risetime factor FB-04 refers to the percentage of time of the triangular wave risetime FB-03.compared to swing frequency period FB-03.

The triangular wave rise time = swing period FB-03×The triangular wave rise time factor FB-04, the unit of which is second.

The triangular wave fall time= swing period FB-03×(1 －The triangular wave rise time factor FB-04), the unit of which is second.

FB-05	Set length	Default value	1000m
	Set range	0m ～ 65535m	
FB-06	Actual length	Default value	0m
	Set range	0m ～ 65535m	
FB-07	Pulse count per meter	Default value	100.0
	Set range	0.1 ～6553.5	

The above function code is used for fixed length control.

The information of length needs to be gathered through multifunctional digital input terminal, with the pulsed count of terminal divided by pulse count per meter FB-07 to get the actual length FB-06.when the actual length is larger than the set length FB-05, multifunctional digital DO will output an ON signal, indicating that the length has reached set level.

During the length-control process, length reset operation can be made through multi-functional DI terminal. Please refer to F4-00~F4-09 for details

The corresponding input terminal should be set as “length count input” (function 27) in application and DI5 must be used when pulse frequency is relatively high.

FB-08	Set count value	Default value	1000
	Set range	1 ～65535	
FB-09	Assigned count value	Default value	1000
	Set range	1 ～65535	

The count value needs to be gathered through multi-functional digital input terminal. The corresponding input terminal should be set as”counter input” (function 25) during application and DI5 must be used when pulse frequency is relatively high.

When count value reaches the set count value FB-08, multifunctional digital DO will output an ON signal

of “having reached the set count value” , after which the counter stops counting.

When count value reaches the Assigned count value FB-09, multifunctional digital DO will output an ON signal of “having reached the Assigned count value”, at which time the counter will continue counting until the “set count value” is reached.

The Assigned count value FB-09 should be no larger than the set value FB-08. The function for the count value to reach the appointed or set value is illustrated in Fig 6-30.

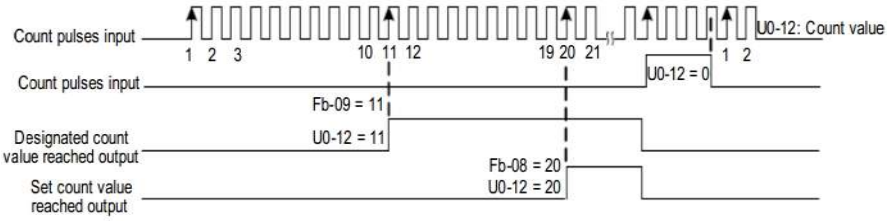


Fig 6-30: The diagram of set count value and Assigned count value as given

Group FC Multi-stage instruction and simple RLC function

The multi-stage instruction of CT3000-G can be used more widely than common multi-speed and except the function of multi-speed; it can be used as the power supply for the multiage-stage of VF and the given source of Process PID. So the dimension is relative value.

Simple PLC can finish the simple combined operation for multi-stage.

FC-00	Multi-stage Instruction 0	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-01	Multi-stage Instruction 1	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-02	Multi-stage Instruction 2	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-03	Multi-stage Instruction 3	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-04	Multi-stage Instruction 4	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-05	Multi-stage Instruction 5	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-06	Multi-stage Instruction 6	Default value	0.0%
	Set range	-100.0% ～100.0%	

FC-07	Multi-stage Instruction 7	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-08	Multi-stage Instruction 8	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-09	Multi-stage Instruction 9	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-10	Multi-stage Instruction 10	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-11	Multi-stage Instruction 11	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-12	Multi-stage Instruction 12	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-13	Multi-stage Instruction 13	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-14	Multi-stage Instruction 14	Default value	0.0%
	Set range	-100.0% ～100.0%	
FC-15	Multi-stage Instruction 15	Default value	0.0%
	Set range	-100.0% ～100.0%	

Multi-stage instruction can be used in three situations: used as frequency source, used as power supply of VF separation and used as the set source of Process PID.

Under the three situations, the dimension of multi-stage is relative value and the range is -100.0%~100.0%. If it is used as frequency source, it is considered as the relative percentage of maximum frequency. If it is used as the power supply of VF separation, it is considered as the relative percentage of rated voltage of motor. Since PID reference is relative value, the multi-stage cannot be handled for dimension transformation as PID set source.

According to various states of multi-functional digital DI, switch selection can be handled and the detailed contents can refer to related instruction in Group F4.

FC-16	The operation mode for simple PLC	Default value	0
	Set range	0	When the single operation ends, it stops.
		1	When the single operation ends, it keeps final value.
		2	Keeping cycling

The function of simple PLC includes two aspects: used as frequency source and used as the power supply of VF separation.

Fig. 6-31 is the diagram of simple PLC as frequency source. When simple PLC is used as frequency source,

the positive and negative values of FC-00 ～FC-15 determine operation mode and if it is negative value, it means that the Frequency Inverter can operate in opposite direction.

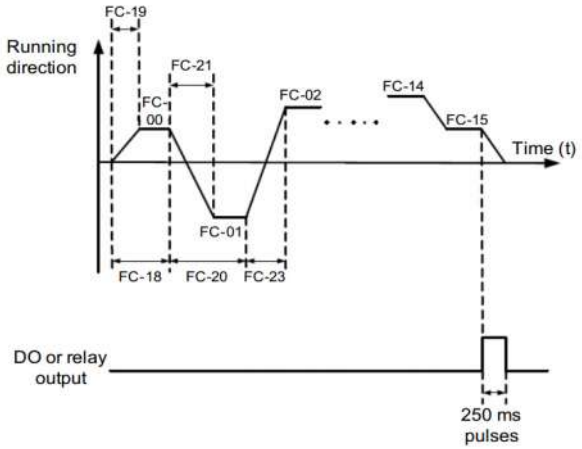


Fig. 6-31 Simple PLC Diagram

As frequency source, PLC has three operation modes which cannot be used if PLC is used as VF separated power supply, including:

0: When the single operation ends, it stops.

After the Frequency Inverter finishes one cycle, it will stop automatically and it can start when the new operation order is given

1 When the single operation ends, it keeps final value.

After the Frequency Inverter finishes one single circulation, it keeps the operation frequency and direction for the last period.

2: Keeping cycling

After the Frequency Inverter finishes one cycle, the next cycle shall be started till stop order is given.

FC-17	The power-down memory selection for simple PLC		Default value	00
	Set range	Ones place	Power-down memory selection	
		0	No power-down memory	
		1	Power-down memory	
		Tens place	Stop memory selection	
		0	No stop memory	
		1	Stop memory	

The power-down memory of PLC refers to the operation stage and operation frequency before the

Frequency Inverter powers down and when it powers on next time, it can be continued to operate from the memory stage. If “No memory” is selected, PLC process shall be restarted when the Frequency Inverter powers-on.

PLC stop memory refers to the last operation stage and operation frequency record before the Frequency Inverter stops and when it operates next time, PLC stop memory can be continued to operate. If “No memory” is selected, PLC shall be restarted when Frequency Inverter starts.

FC-18	Stage 0 operation time of Simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-19	Stage 0 deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-20	Stage 1 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-21	Stage 1 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-00	Stage 2 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-23	Stage 2 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-24	Stage 3 running time of PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-25	Stage 3 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-26	Stage 4 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-27	Stage 4 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-28	Stage 5 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-29	Stage 5 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-30	Stage 6 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	

FC-31	Stage 6 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-32	Stage 7 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-33	Stage 7 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-34	Stage 8 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-35	Stage acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-36	Stage 9 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-37	Stage acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-38	Stage 10 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-39	Stage 10 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-40	Stage 11 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-41	Stage 11 acceleration time and deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-42	Stage 12 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-43	Stage 12 acceleration/ deceleration time of simple PLC	Default value	0
	Set range	0 ～3	
FC-44	Stage 13 running time of simple PLC	Default value	0.0s(h)
	Set range	0.0s(h)～6553.5s(h)	
FC-45	Stage 13 acceleration/ deceleration time of simple PLC	Default value	0
	Set range	0 ～3	

FC-46	Stage 14 running time of simple PLC		Default value	0.0s(h)
	Set range		0.0s(h)～6553.5s(h)	
FC-47	Stage 14 acceleration/ deceleration time of simple PLC		Default value	0
	Set range		0 ～3	
FC-48	Stage 15 running time of simple PLC		Default value	0.0s(h)
	Set range		0.0s(h)～6553.5s(h)	
FC-49	Stage 15 acceleration/ deceleration time of simple PLC		Default value	0
	Set range		0 ～3	
FC-50	PID integral attribute		Default value	0
	Set range	0	S (second)	
		1	h (hour)	

FC-51	Given mode of multi-stage 0	Default value	0
	Set range	0	Function code FC-00 reference
		1	AI1
		2	AI2
		3	AI3
		4	Pulse
		5	PID
		6	Preset frequency (F0-08) reference, UP/DOWN (can be modified)

The parameter determines the given channel of multi-stage Index 0.

Except FC-00, multi-stage can select others and it is convenient to switch between short indexes and other given modes.

If multi-stage or simple PLC is used as frequency source, it is convenient to realize the switch between two frequency sources.

Group FD Communication parameter

See CT3000-G Communication Protocol.

Group FE User customize function code

FE-00	User function code 0	Default value	F0.00
	Set range	F0.00 ～FP.xx, A0.00 ～Ax.xx, U0.xx	
FE-01	User function code 1	Default value	F0.02
	Set range	The same as FE-00	

FE-02	User function code 2	Default value	F0.03
	Set range	The same as FE-00	
FE-03	User function code 3	Default value	F0.07
	Set range	The same as FE-00	
FE-04	User function code 4	Default value	F0.08
	Set range	The same as FE-00	
FE-05	User function code 5	Default value	F0.17
	Set range	The same as FE-00	
FE-06	User function code 6	Default value	F0.18
	Set range	The same as FE-00	
FE-07	User function code 7	Default value	F3.00
	Set range	The same as FE-00	
FE-08	User function code 8	Default value	F3.01
	Set range	The same as FE-00	
FE-09	User function code 9	Default value	F4.00
	Set range	The same as FE-00	
FE-10	User function code 10	Default value	F4.01
	Set range	The same as FE-00	
FE-11	User function code 11	Default value	F4.02
	Set range	The same as FE-00	
FE-12	User function code 12	Default value	F5.04
	Set range	The same as FE-00	
FE-13	User function code 13	Default value	F5.07
	Set range	The same as FE-00	
FE-14	User function code 14	Default value	F6.00
	Set range	The same as FE-00	
FE-15	User function code 15	Default value	F6.10
	Set range	The same as FE-00	
FE-16	User function code 16	Default value	F0.00
	Set range	The same as FE-00	
FE-17	User function code 17	Default value	F0.00
	Set range	The same as FE-00	
FE-18	User function code 18	Default value	F0.00
	Set range	The same as FE-00	
FE-19	User function code 19	Default value	F0.00
	Set range	The same as FE-00	
FE-20	User function code 20	Default value	F0.00
	Set range	The same as FE-00	

FE-21	User function code 21	Default value	F0.00
	Set range	The same as FE-00	
FE-22	User function code 22	Default value	F0.00
	Set range	The same as FE-00	
FE-23	User function code 23	Default value	F0.00
	Set range	The same as FE-00	
FE-24	User function code 24	Default value	F0.00
	Set range	The same as FE-00	
FE-25	User function code 25	Default value	F0.00
	Set range	The same as FE-00	
FE-26	User function code 26	Default value	F0.00
	Set range	The same as FE-00	
FE-27	User function code 27	Default value	F0.00
	Set range	The same as FE-00	
FE-28	User function code 28	Default value	F0.00
	Set range	The same as FE-00	
FE-29	User function code 29	Default value	F0.00
	Set range	The same as FE-00	

The function code in this group is parameter set customized by users.

Users can select the demand parameters in all the CT3000-G function codes and collects them to Group FE as user customized parameter to check and change conveniently.

Group FE can provide 30 user customized parameters at most and if the parameters in Group FE display F0.00, it means that the user function code is empty.

When users customize parameter modes, the display functional mode is defined by FE-00 ～FE-31 and the order accords with Group FE. If the display functional mode is F0-00, is shall be skipped.

Group FP User password

FP-00	User password	Default value	0
	Set range	0 ～65535	

If FP-00 arbitrarily sets one nonzero number, the password can be valid. When the menu is entered next, it needs to input password correctly and otherwise the function parameters can not be checked or modified. Please remember the setting user password.

Set FP-00 as 00000 and clear the set user password to invalidate password protection function.

FP-01	Parameter initialization		Default value	0
	Set range	0	No-operation	
		1	Restoring default parameter, excluding motor parameter	

		2	Clearing record information
		4	Backup the current parameters of users
		501	Restoring user backup parameters

1. Restore to default value, excluding motor parameters.

After FP-01 is set as 1, the function parameters of Frequency Inverter are mostly restored as default values meanwhile motor parameter, frequency indexed decimal point (F0-22), failure record information, integral operation information (F7-09), integral power-on time (F7-1) and integral power consumption can not be restored.

2. Clear record information

Clear failure record information of Frequency Inverter, integral running time (F7-09), integral power-on time (F7-13) and integral power consumption (F7-14).

4. Back-up the current parameters of users.

Back-up the current parameters set by users and all the set value of current function parameters to restore parameters after users fail to make an adjustment.

501. Restore user backup parameter

Restore the user parameters for back-ups previously, that is, restore the backup parameter for 4 by setting FP-01.

FP-02	The display attribute for function parameter mode		Default value	11
	Set range	Ones place	The displayed selection of Group U	
		0	Not displayed	
		1	Displayed	
		Tens place	The displayed selection of Group A	
		0	Not displayed	
		1	Displayed	
FP-03	The selection is displayed by individual parameter mode		Default value	00
	Set range	Ones place	The display selection of user customized parameters	
		0	Not displayed	
		1	Displayed	
		Tens place	The displayed selection for user changed parameters	
		0	Not displayed	
		1	Displayed	

The parameter display mode is set for users to conveniently check the function parameters in different orders according to practical requirements and it provides three parameter display mode.

Name	Description
Function parameter mode	The order displays the function parameter of Frequency Inverters, including function parameter set F0~FF, A0~AF and U0~UF.
User customized parameter mode	Users customize displayed individual function parameter (32 at most) and determine displayed function parameters by Group FE.
User changed parameter mode	The function parameters not according with default value

When individual parameter mode displays selection (FP-03) and at this time various parameters display mode can be entered by QUICK key. The default value can be displayed by the way of sole function parameters.

The display codes of display mode for every parameter are displayed as follows:

Parameter display mode	
Function parameter mode	-bASE
User customized mode	-USEr
User changed parameter mode	--C--

CT3000-G Frequency Inverter provides two groups of individual parameter display modes: user customized parameter mode and user changed parameter mode.

User customized parameter set refers to the parameter set to Group FE by users and the maximum number of parameters can be 32. When the parameters are collected together, they are convenient for users to adjust. Under user customized parameter mode, a sign u shall be defaulted to add before the function code customized by users.

For example, F1-00 of which the display effect is uF1-00 under customized parameter mode. It is considered as user changed parameter mode for users to change parameters which are different from those of default value. User changed parameter group is convenient for users to check the collection of changed parameters and search for problems in field.

Under user changed parameter mode, a sign c shall be added before the function code customized by users.

For example: the display effect is cF1-00 under user changed parameter mode.

FP-04	The modified attribute of function code		Default value	0
	Set range	0	Modified	
		1	Unmodified	

The parameters of user set function code can be modified to prevent function parameters from being

changed by mistake.

If the functional is set as 0, all the function codes may be changed while if it is set as 1, all the function codes can only be checked but not modified.

Group A0 Torque control and qualifying parameter

A0-00	The selection for speed/ torque control mode		Default value	0
	Set range	0	Speech control	
		1	Torque control	

They are used for selecting Frequency Inverter control mode: speed control and torque control.

CT3000-G multifunctional digital DI terminal has two functions related with torque control: the torque control prohibition (function 29) and speed control/ torque control switch (function 46). The two terminals shall be used with A0-00 to switch between speed and torque control. The control mode is the opposite of A0-00 value.

Regardless of other factors, the Frequency Inverter is fixed as speed control mode when the torque control prohibition is efficient.

A0-01	The selection for torque set source under torque control code		Default value	0
	Set range	0	Digital setting (A0-03)	
		1	AI1	
		2	AI2	
		3	AI3	
		4	PULSE (DI5)	
		5	Communication reference	
		6	MIN(AI1,AI2)	
		7	MIN(AI1,AI2)	
A0-03	Torque digital setting under torque control mode		Default value	150.0%
	Set range		-200.0% ～200.0%	

A0-01 is used for selecting torque setting source among which there are 8 setting modes.

Relative value is used by torque, corresponding to the related torque of motor and if the setting range is -200.0%~200.0%, it displays that the maximum torque of Frequency Inverter is 2 times of the related torque of Frequency Inverter.

When the torque reference is positive, the Frequency Inverter is in forward running.

When the torque reference is negative, the Frequency Inverter is in reverse running.

The description for the set source of every torque is displayed as follows:

0: digital setting (A0-03)

Target torque can use A0-03 set value directly.

1: AI1

2: AI2

3: AI3

Target torque can be determined by analog input terminal. CT3000-G control panel can provide 2 analog input terminals (AI1, AI2) and the expansion card of option I/O can provide another analog input terminal (AI3).

Whereby,

AI1 is 0V～10V voltage input.

AI2 can be 0V～10V voltage input or 4mA～20mA current input and they can be selected by J8 jumper on control board.

AI3 is -10V ～10V voltage input.

Users can freely select the input voltage value of AI1, AI2 and AI3 and the curve corresponding to target torque.

CT3000-G provides 5 groups of corresponding curves among which 3 groups are straight relation (2-point corresponding relation) and any curve of 4-point corresponding relation. Users can set by F4-13 ～F4-27 function code and Group A6 function code.

Function code F4-33 is used to set AI1~AI3, three-way analog input to separately select each one in the 5 groups of curves.

When AI is as frequency reference, current input corresponds to 100.0% of the set one and refers to the percentage of torque digital set A0-03.

4. PULSE (DI5)

Target torque reference can be given by means of high-speed pulse of terminal DI5.

The sign specification of given pulse: voltage range 9V～30V, frequency range 0kHz～100kHz. The pulse reference can only be input by multifunctional input terminal DI5.

The relationship between input frequency of DI5 terminal input and corresponding setting and it can be adjusted by F4-28~F4-31. The corresponding relation is 2-point straight corresponding relation and set 100.0% corresponding by pulse input is the percentage of torque digital set A0-03.

5. Communication reference

Referring to the target torque given by communication modes.

By communication address 0x1000, data can be given by upper computer and data format is -100.00% ～ 100.00% which is the percentage of relative torque digital set A0-03. CT3000-G supports Modbus communication protocol. The related serial port communication protocol can be selected by F0-28.

A0-05	The positive maximum frequency of torque control	Default value	50.00Hz
	Set range	0.00Hz～maximum frequency (F0-10)	
A0-06	The reversed maximum frequency rate of torque control	Default value	50.00Hz
	Set range	0.00Hz～maximum frequency (F0-10)	

It is used for the positive and negative maximum operation frequency for Frequency Inverter under the mode of set torque control.

When the frequency is controlled by torque, if the load torque is lower than the torque output by motor, the rotating speed can keep rising gradually and the highest rotating speed when the torque is controlled to prevent galloping or other accidents from happening.

If it is necessary to realize the maximum frequency controlled by dynamic continuous changed torque, it can be realized by controlling upper limit frequency.

A0-07	Acceleration time of torque control	Default value	0.00s
	Set range	0.00s ～65000s	
A0-08	Acceleration time of torque control	Default value	0.00s
	Set range	0.00s ～65000s	

Under torque control mode, the difference between motor output torque and load torque determines the change rate for the speed of motor and load. So, the rotating speed of motors can change rapidly to cause the problem that noise and mechanical stress are oversized. By setting the acceleration/ deceleration time for torque control, the rotating speed of motor can be changed steadily.

However, for the occasion when torque corresponds rapidly, the acceleration/ deceleration time of torque control can be set as 0.00s.

For example, two motors drag the same load together. A frequency is set as the master machine by means of speed control mode to make sure that the load can be bore while the Frequency Inverter is set as slave machine and uses torque control. The actual output torque of master machine is the torque index of slave computer. At this time, the torque of slave machine should follow master machine so the acceleration/ deceleration time for torque control of slave machine is 0.00s.

Group A2～A4 The motor parameter of Motor 2 ~ Motor 4

CT3000-G can operate by switching between 4 motors which can set motor nameplate parameter, coordinating motor parameter, separately selecting VF control or vector control, separately controlling the related parameters of encoder and separately setting the related parameter between VF performance and parameter performance.

The three function code (A2, A3 and A4) separately correspond to Motor 2, Motor 3 and Motor 4 and the three parameters accord with each other in the aspect of function code. Hereby the detailed instruction for the parameters in Group A2 is listed while the parameters in Group A3 and Group A4 shall not be listed. Meanwhile, the definition and using method for all the parameters in Group A2 shall accord with that of related parameters in Motor 1. Hereby it is not listed. Users can not read the related parameter instruction for Motor 1.

A2-00	The selection for the type of motor		Default value	0
	Set range	0	Common asynchronous motor	
		1	Asynchronous motor for variable frequency	
		2	Asynchronous motor of permanent magnet	
A2-01	Rate power		Default value	Model dependent
	Set range		0.1kW ～1000.0kW	
A2-02	Rated voltage		Default value	Model dependent
	Set range		1V～2000V	
A2-03	Rated current		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-04	Rated frequency		Default value	Model dependent
	Set range		0.01Hz～maximum frequency	
A2-05	Rated rotating speed		Default value	Model dependent
	Set range		1rpm～65535rpm	
A2-06	Stator resistance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-07	Rotor resistance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	

A2-08	Leakage inductive reactance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-09	Interaction inductive reactance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-10	Un-load current of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-16	Stator resistance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-17	D axle inductance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-18	Q axle inductance of asynchronous motor		Default value	Model dependent
	Set range		(the power of Frequency Inverter <=55kW) (the power of Frequency Inverter >55kW)	
A2-19	Counter electromotive force of asynchronous motor		Default value	Model dependent
	Set range		0.1V～6553.5V	
A2-27	The line number of encoder		Default value	1024
	Set range		1 ～65535	
A1-28	Type of encoder		Default value	0
	Set range	0	ABZ increment encoder	
		2	Rotary transformer	
A1-29	Speed feedback for speed selection		Default value	0
	Set range	0	Local RG	
		1	Extending PG	
		2	PULSE input (DI5)	
A1-30	AB phase sequence of ABZ incremental encoder		Default value	0
	Set range	0	Forward	
		1	Reverse	

A2-34	Pole-pairs of rotary transformer		Default value	1
	Set range		1 ～65535	
A2-36	The test time of speed feedback for PG disconnection		Default value	0.0s
	Set range		Failure to actuate 0.1s ～10.0s	
A1-37	Selection for tuning		Default value	0
	Set range	0	No-operation	
		1	The static tuning of asynchronous motor	
		2	The integral tuning of asynchronous motor	
		11	The load tuning of synchronous motor	
		12	The no-load tuning of synchronous	
A2-38	The proportional gain 1 of speed loop		Default value	30
	Set range		1 ～100	
A2-39	The integral time 1 for speed ring		Default value	0.50s
	Set range		0.01s ～10.00s	
A2-40	Switching frequency 1		Default value	5.00Hz
	Set range		0.00 ～A2-43	
A2-41	The proportional gain 2 of speed loop		Default value	15
	Set range		1 ～100	
A2-42	The integral time 2 for speed ring		Default value	1.00s
	Set range		0.01s ～10.00s	
A2-43	Switching frequency 2		Default value	10.00Hz
	Set range		A2-40 ～Maximum output frequency	
A2-44	Slip gain of vector control		Default value	100%
	Set range		50%～200%	
A2-45	Time constant speed ring filter		Default value	0.000s
	Set range		0.000s～0.100s	
A2-46	Over-excitation gain of vector control		Default value	64
	Set range		0 ～200	
A2-47	The upper limit source of torque under speed control mode		Default value	0
	Set range	0	A2-48 setting	
		1	AI1	
		2	AI2	
		3	AI3	

		4	PULSE setting	
		5	Communication reference	
		6	MIN(AI1,AI2)	
		7	MIN(AI1,AI2)	
A2-48	The up digital set of torque under speed control mode		Default value	150.0%
	Set range		0.0%～200.0%	
A2-51	Proportional gain of excitation adjustment		Default value	2000
	Set range		0 ～20000	
A2-52	Integral gain of excitation adjustment		Default value	1300
	Set range		0 ～20000	
A2-53	Proportional gain of torque adjustment		Default value	2000
	Set range		0 ～20000	
A2-54	Integral gain of torque adjustment		Default value	1300
	Set range		0 ～20000	
A2-55	Integral attribute of speed ring		Default value	0
	Set range		Ones place: integral separation 0: invalid; 1: valid	
A2-56	The flux weakening mode of asynchronous motor		Default value	0
	Set range	0	Not flux weakening	
		1	Direct calculating mode	
		2	Automatic mode	
A2-57	The flux weakening depth of asynchronous motor		Default value	100%
	Set range		50%～500%	
A2-58	Maximum flux weakening current		Default value	50%
	Set range		1% ～300%	
A2-59	Flux weakening automatic adjustment gain		Default value	100%
	Set range		10%～500%	
A2-60	Flux weakening integral times		Default value	2
	Set range		2 ～10	
A2-61	The control mode of Motor 2		Default value	0
	Set range	0	The vector control for non-speed sensor (SVC)	

		1	The vector control for speed sensor (FVC)	
		2	V/F control	
A2-62	Acceleration/ deceleration time selection of Motor 2		Default value	0
	Set range	0	The same as Motor 1	
		1	Acceleration/ deceleration time 1	
		2	Acceleration/ deceleration time 2	
		3	Acceleration/ deceleration time 3	
		4	Acceleration/ deceleration time 4	
A2-63	Torque boost of Motor 2		Default value	Model dependent
	Set range		0.0%: automatic torque boost 0.1%～30.0%	
A2-65	Oscillation suppression gain of Motor 2		Default value	Model dependent
	Set range		0 ～100	

Group A5 Control optimization parameter

A5-00	DPWM switching upper limit frequency	Default value	12.00Hz
	Set range	0.00Hz～15Hz	

It is valid only for VF control.

The wave sending mode is determinable when an asynchronous motor operates and the value lower than this number belongs to 7-period continuous modulation mode and otherwise it belongs to 5-period continuous modulation mode.

The switch consumption of Frequency Inverter is quite large when 7-period is adjusted continuously while the current ripple brought is quite small. The switch consumption of Frequency Inverter is quite large when 5-period is adjusted continuously while the current ripple brought is quite large. However, the high frequency can cause the instability for motor operation and it does not need to modify generally.

For the instability of VF operation, please refer to function code F3-11 and for the consumption of frequency consumption, please refer to function code F0-15.

A5-01	PWM modulation mode		Default value	0
	Set range	0	Asynchronous modulation	
		1	Synchronous modulation	

It is valid only for VF control.

Synchronous modulation refers to the linear change of carrier frequency along with the change of frequency

to make sure that the specific value (carrier ratio) can not be changed. Generally it is used when the output frequency is quite high and it is convenient to output the quality of voltage.

When the output frequency is quite low (lower than 100HZ), synchronous modulation is not required for the specific value between carrier frequency because output frequency is quite high and synchronous modulation shall be more convenient.

When operation frequency is higher than 85Hz, asynchronous modulation can be invalid and under the frequency, immobilization is synchronous modulation mode.

A5-02	Compensation mode selection for dead zone		Default value	1
	Set range	0	No compensation	
		1	Compensation mode 1	
		2	Compensation mode 2	

The parameters hereby do not need to modify and they only have special requirements for the quality of voltage output waveform and otherwise when the motor works abnormally, such as vibration, various compensation modes shall be switched tentatively. The machines with superpower are advised to use Compensation mode 2.

A5-03	Random PWM depth		Default value	0
	Set range	0	Random PWM invalid	
		1 ～10	PWM carrier random depth	

Set random PWM and it can change monotonous and has motor sound into soft sound. Besides, it is useful for reducing external electromagnetic interference.

When the depth of random PWM is set as 0, random PWM is invalid. Various effects can be gained by adjusting the depth of random PWM.

A5-04	Quick current limit enabled		Default value	1
	Set range	0	Not enabled	
		1	Enabled	

Start quick current limit function and it can reduce over-current failure at most to ensure the continuous operation of Frequency Inverter.

If the Frequency Inverter can keep quick current limit state for a long time, the Frequency Inverter may appear overheat or other damages which are not permitted so Failure Err40 shall be alarmed when the Frequency Inverter keeps quick current limit for a long time to express that the frequency is overloaded and it shall stop.

A5-05	Current detection compensation	Default value	5
	Set range	0 ～100	

If the current detection compensation used for setting Frequency Inverter is set too large, it may cause the control performance to decrease and generally it does not need to modify.

A5-06	Under-voltage point setting	Default value	100.0%
	Set range	60.0% ～140.0%	

It is used for setting the voltage under-voltage failure Err09 of Frequency Inverter and the Frequency Inverters under various voltage classes correspond to different voltage point, including:

Voltage class	The basic value for under voltage point
Single-phase 220 V	200V
Three-phase 380V	350V

A5-07	SVC optimization mode selection		Default value 1
	Set range	0	Not optimized
		1	Optimization mode 1
		2	Optimization mode 2

Optimization mode 1: It is used under higher linear requirements for torque control.

Optimization mode 2: It is used under the requirements for higher speed stability.

A5-08	Time adjustment in dead zone	Default value	150%
	Set range	100% ～200%	

It is valid for 1140V voltage class.

By adjusting the value, the efficient use rate of voltage can be improved and if the adjustment is too limited, the system can not operate stably. So users are not advised to modify it. Besides, it is not useful for current Frequency Inverters.

A5-09	Overvoltage setting	Default value	2000.0V
	Set range	200.0V～2500.0V	

The voltage value is used for setting overvoltage failure of Frequency Inverter and the default value for various voltage value is displayed as follows:

Voltage class	Basic value for overvoltage
Single-phase 220V	400.0V
Three-phase 380V	810.0V

Note: The default value is the upper limit value for internal overvoltage protection of Frequency Inverter. When A5-09 value is lower than the default value of every voltage class, the parameter setting can be valid while if it is higher, the parameter setting subjects to default value.

Group A6 AI Curve setting

A6-00	Minimum input for AI Curve 4	Default value	0.00V
	Set range	-10.00V ～A6-02	
A6-01	Minimum input corresponding setting for AI Curve 4	Default value	0.0%
	Set range	-100.0% ～100.0%	
A6-02	Input Point 1 of AI Curve 4	Default value	3.00V
	Set range	A6-00 ～A6-04	
A6-03	Input corresponding setting for Inflection Point 1 of AI Curve 4	Default value	30.0%
	Set range	-100.0% ～100.0%	
A6-04	Input Point 2 of AI Curve 4	Default value	6.00V
	Set range	A6-00 ～A6-04	
A6-05	Input corresponding setting for Inflection Point 2 of AI Curve 4	Default value	60.0%
	Set range	-100.0% ～100.0%	
A6-06	Maximum input for AI Curve 4	Default value	10.00V
	Set range	A6-06 ～10.00V	
A6-07	Minimum input corresponding setting for AI Curve 4	Default value	100.0%
	Set range	-100.0% ～100.0%	
A6-08	Minimum input for AI Curve 5	Default value	0.00V
	Set range	-10.00V ～A6-10	
A6-09	Input corresponding setting for AI Curve 5	Default value	0.0%
	Set range	-100.0% ～100.0%	
A6-10	Input Inflection Point 1 for AI Curve 5	Default value	3.00V
	Set range	A6-08 ～A6-12	
A6-11	Input corresponding setting for Inflection Point 1 in AI Curve 5	Default value	30.0%
	Set range	-100.0% ～100.0%	
A6-12	Input Inflection Point 2 in AI Curve 5	Default value	6.00V
	Set range	A6-10 ～A6-14	
A6-13	Input corresponding setting for Inflection Point 2 in AI Curve 5	Default value	60.0%
	Set range	-100.0% ～100.0%	
A6-14	Maximum input for AI Curve 5	Default value	10.00V
	Set range	A6-14 ～10.00V	

A6-15	Minimum input corresponding setting for AI Curve 5	Default value	100.0%
	Set range	-100.0% ～100.0%	

The functions of Curve 4 and Curve 5 are similar to those of Curve 1~ Curve 3. However, Curve 1~ Curve 3 are straight lines while Curve 4 and Curve 5 are 4-point curves, practicing more flexibly relation. Fig. 6-33 is the diagram of Curve 4~ Curve 5.

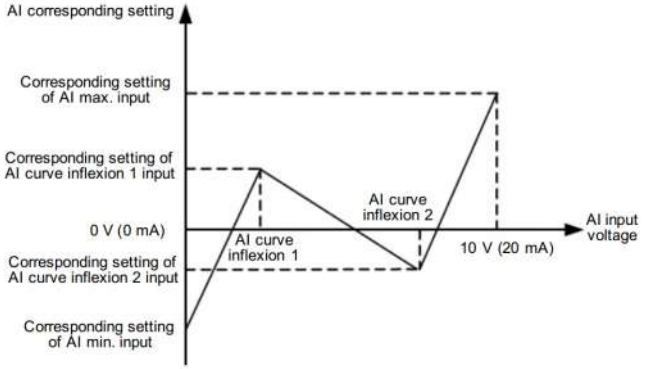


Fig. 6-33 Diagram of Curve 4 and Curve 5

When Curve 4 and Curve 5 are set, notice that the Minimum input voltage of curve, voltage of Inflection Point 1, voltage of Inflection Point 2 and the maximum should increase gradually.

AI Curve selection F4-33 is used for determining how analog input AI1~AI3 can be selected among the 5 curves.

A6-24	AI1 set hooping point	Default value	0.0%
	Set range	-100.0% ～100.0%	
A6-25	AI1 set hooping amplitude	Default value	0.5%
	Set range	0.0%～100.0%	
A6-26	AI2 set hooping point	Default value	0.0%
	Set range	-100.0% ～100.0%	
A6-27	AI2 set hooping amplitude	Default value	0.5%
	Set range	0.0%～100.0%	
A6-28	AI3 set hooping point	Default value	0.0%
	Set range	-100.0% ～100.0%	
A6-29	AI3 hooping amplitude	Default value	0.5%
	Set range	0.0%～100.0%	

CT3000-G analog input AI1~AI3 has set hooping function.

Hooping function means that the analog corresponding set value exists as the value of hooping point when

analog value corresponds to the change of upper zone and down zone of hooping point.

For example:

If the voltage of analog input AI1 fluctuates near 5.00V and the fluctuation range 4.90V~5.10V, the Minimum input 0.00V corresponds to 0.0% and the maximum input 10.00V corresponds to 100.%. The tested AI1 is set in the range of 49.0%~51.0%. Set the hooping point A6-24 of AI1 as 50.0% and AI1 set hooping amplitude A6-25 as 1.0% and when AI1 above is input, after the hooping function is handled, the gained AI1 input corresponds to set fixed 50.0%. AI1 is transformed to a stable input and fluctuation is avoided.

Group AC AIAO calibration

AC-00	AI1 measured voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-01	AI1 displayed voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-02	AI1 measured voltage 2	Default value	Delivery calibration
	Set range	6.000V～9.999V	
AC-03	AI1 displayed voltage 2	Default value	Delivery calibration
	Set range	6.000V～9.999V	
AC-04	AI2 measured voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-05	AI2 displayed voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-06	AI2 measured voltage 2	Default value	Delivery calibration
	Set range	6.000V～9.999V	
AC-07	AI2 displayed voltage 2	Default value	Delivery calibration
	Set range	-9.999V ～10.000V	
AC-08	AI3 measured voltage 1	Default value	Delivery calibration
	Set range	-9.999V ～10.000V	
AC-09	AI3 displayed voltage 1	Default value	Delivery calibration
	Set range	-9.999V ～10.000V	
AC-10	AI3 measured voltage 2	Default value	Delivery calibration
	Set range	-9.999V ～10.000V	
AC-11	AI3 displayed voltage 2	Default value	Delivery calibration
	Set range	-9.999V ～10.000V	

This group of function code is used for correcting analog input AI to clear the effect of AI input port zero

bias and gain.

This group of function parameter has been corrected before they are delivered and when the default value is recovered, they shall recover to the calibration value before delivered. Generally, they do not need to be corrected in field.

Measured voltage refers to the practical voltage measured by universal meter or other measuring instruments to display while displayed voltage refers to the voltage displayed value sampled by Frequency Inverter, referring to the voltage (U0-21, U0-22, U0-23) displayed before AI in Group U0 is corrected.

During calibration, input two voltage value in AI input port and by exactly inputting the value measured by universal meter and the value read in Group U0, the Frequency Inverter shall automatically correct the zero bias and gain for AI.

For the situation that user given voltage does not match with the practical sampling voltage of Frequency Inverter, field calibration mode shall be used to make sure that sampling value of Frequency Inverter accord with the expected given value. Set AI1 as an example and field calibration mode is displayed as follows:

Given AI1 voltage signal (about 2V)

Practically measure AI1 voltage value and store function parameter AC-00.

Check U0-21 displayed value and store function parameter AC-01.

Given AI1 voltage signal (about 8 V)

Practically measure AI1 voltage value and store function parameter AC-02.

Check U0-21 displayed value and store function parameter AC-03.

When AI2 and AI3 are corrected, the checking position for practical sampling voltage is U0-22 and U0-23.

For AI1 and AI2, 2V and 8V are correct points.

For AI3, -8V and 8V are advised to be the correct points.

AC-12	A01 target voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-13	A01 measured voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-14	A01 target voltage 2	Default value	Delivery calibration
	Set range	6.000V～9.999V	
AC-15	A01 measured voltage 2	Default value	Delivery calibration
	Set range	6.000V～9.999V	
AC-16	A02 target voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-17	A02 measured voltage 1	Default value	Delivery calibration
	Set range	0.500V～4.000V	
AC-18	A02 target voltage 2	Default value	Delivery calibration

	Set range	6.000V～9.999V	
AC-19	A02 measured voltage 2	Default value	Delivery calibration
	Set range	6.000V～9.999V	
AC-20	AI2 measured current 1	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-21	AI2 sampling current 1	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-22	AI2 measured current 2	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-23	AI2 sampling current 2	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-24	AO1 ideal current 1	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-25	AO1 measured current 1	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-26	AO1 ideal current 2	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	
AC-27	AO1 measured current 2	Default value	Delivery calibration
	Set range	0.000mA～20.000mA	

This group of codes is used for correcting analog output AO.

This group of function parameters has been corrected before they are delivered and when the default value is recovered, they shall recover to the calibration value before delivered. Generally, they do not need to be corrected in field.

Target voltage refers to theory output voltage value while measured voltage refers to the practical output voltage value measured by universal meter or other instruments.

Group U0 Monitoring parameter group

Parameter set U0 is used for supervising running state information of Frequency Inverter which can be checked by clients to adjust in field conveniently. By communication, the value of parameter set can be read, which can be used for upper machine to monitor. The communication address is 0x7000~0x7044.

Whereby, U0-00～U0-31 is the operation and stop monitoring parameters defined in F7-03 and F7-04.

The specific parameter function code, parameter name and Minimum unit is listed in Table 6-1.

U0-00	Operation frequency	Display range	0.00～320.00Hz(F0-22=2)
U0-01	Set frequency		

Display absolute value for theory operation frequency of Frequency Inverter and set frequency.

The practical output frequency for Frequency Inverter is listed in U0-19.

U0-02	Bus voltage	Display range	0.0V～3000.0V

Display bus voltage for Frequency Inverter.

U0-03	Output voltage	Display range	0V～1140V

Display output voltage for Frequency Inverter during operation.

U0-04	Output current	Display range	0.00A～655.35A (the power of Frequency Inverter <=55kW) 0.0A～6553.5A (the power of Frequency Inverter >55kW)

Display output current for Frequency Inverter during operation.

U0-05	Input power	Display range	0～32767

Display output power for Frequency Inverter during operation.

U0-06	Output torque	Display range	-200.0%～200.0%

Display output torque for Frequency Inverter during operation.

U0-07	DI input state	Display range	0～32767

Display input state value of current DI terminal. After the data are transformed into binary system, every bit corresponds to a DI input signal. If the digital is 1, the input is high level signal while if the digital is 0, the input is low level signal. The corresponding relation between every bit and input terminal is displayed as follows:

Bit0	Bit1	Bit2	Bit3
DI1	DI2	DI3	DI4
Bit4	Bit5	Bit6	Bit7
DI5	DI6	DI7	DI8
Bit8	Bit9		
DI9	DI10		

U0-08	DO output state	Display range	0～1023

Display output state value of current DO terminal. After the data are transformed into binary system, every bit corresponds to a DO input signal. If the digital is 1, the input is high level signal while if the digital is 0, the input is low level signal. The corresponding relation between every bit and input terminal is displayed as follows:

Bit0	Bit1	Bit2	Bit3
DO3	Relay 1	Relay 2	DO1
Bit4			
DO2			

U0-10	AI2 voltage (V) / current (mA)	Display range	0.00V～10.57V 0.00mA～20.00mA

When F4-40 is set as 0, the unit displayed for AI2 sampling data is voltage (V).

When F4-40 is set as 1, the unit displayed for AI2 sampling data is current (mA).

U0-14	Load speed display	Display range	0～65535

The display value refers to the description of F7-12.

U0-15	PID setting	Display range	0～65535
U0-16	PID feedback	Display range	0～65535

The PID set value and feedback value are displayed and the format is displayed as follows:

PID setting =PID setting (percentage) *FA-04

PID feedback =PID feedback (percentage) *FA-04

U0-18	Input pulse frequency	Display range	0.00kHz～100.00KHz

Display DI5 high-speed pulse sampling frequency. The Minimum unit is 0.01KHz.

U0-19	Feedback speed	Display range	-320.00Hz～320.00Hz

Display practical output frequency for Frequency Inverter.

When F0-22 (frequency instruction resolution) is 1, the display range is -3200.0Hz ～3200.0Hz.

When F0-22 (frequency instruction resolution) is 2, the display range is -320.00Hz ～320.00Hz.

U0-20	Residual running time	Display range	0.0～6500.0 分钟 0.0～6500.0 minutes

Display residual running time when timed operation is displayed.

Timed operation refers to the introduction for Parameter F8-42 ～F8-44.

U0-21	The voltage of AI1 before calibration	Display range	0.000V～10.570V
U0-22	The voltage/ current of AI2 before calibration	Display range	0.000V～10.570V 0.000mA～20.000mA
U0-23	The voltage of AI3 before calibration	Display range	-10.570V～10.570V

Display the practical value for analog input sampling voltage/ current.

The practically used voltage/ current is corrected linearly to reduce the deviation between voltage/ current and practically input voltage / current.

The practically used corrected voltage/ current refers to U0-09 , U0-10 , U0-11 and the calibration mode refers to the introduction for Group AC.

U0-24	linear velocity	Display range	0～65535m/min

Display the linear velocity of DI5 high-speed pulse sample. The unit is m/min

According to the number of practical sampling pulses every minute and FB-07 (the number of pulses for every meter), calculate the linear velocity.

U0-27	Input pulse frequency	Display range	0～65535Hz

Display DI5 high-speed pulse sampling frequency. The unit is 1HZ. The data are the same as U0-18 and the only difference is that of units.

U0-28	Communication set value	Display range	-100.00%～100.00%

Display the data written by communication address 0x1000.

U0-29	The feedback speed of encoder	Display range	-320.00Hz～320.00Hz

Display the motor operation frequency practically measured by an encoder.

When F0-22 (frequency instruction resolution) is 1, the display range is -3200.0Hz ～3200.0Hz.

When F0-22 (frequency instruction resolution) is 2, the display range is -320.0Hz ～320.0Hz.

U0-30	Main frequency X display	Display range	0.00Hz～320.00Hz 0.0Hz～3200.0Hz

Display main frequency source X frequency setting.

When F0-22 (frequency instruction resolution) is 1, the display range is -3200.0Hz ～3200.0Hz.

When F0-22 (frequency instruction resolution) is 2, the display range is -320.0Hz ～320.0Hz.

U0-31	Auxiliary frequency Y display	Display range	0.00Hz～320.00Hz 0.0Hz～3200.0Hz

Display auxiliary frequency Y frequency setting.

When F0-22 (frequency instruction resolution) is 1, the display range is -3200.0Hz ～3200.0Hz.

When F0-22 (frequency instruction resolution) is 2, the display range is -320.0Hz ～320.0Hz.

U0-33	Rotor position of synchronous machine	Display range	0.0°～359.9°

Display the rotor position of synchronous machine.

U0-34	Motor temperature	Display range	0□～200 □

Display the motor temperature sampled by AI3.

Test for motor temperature refers to the introduction for F9-56.

U0-35	Target torque	Display range	-200.0% ～200.0%

Display the upper limit value of current torque.

U0-36	Rotating position	Display range	0 ～4095

Display current signal of rotating position.

U0-37	Power factor angle	Display range	

Display the current operated power factor angle.

U0-38	ABZ position	Display range	0 ～65535

Display the counting of current ABZ pulse.

The value is 4 times of the number of pulse after frequency. For example, if 4000 is displayed, the number of pluses practically passed by an encoder is 4000/4=1000. When the encoder is in forward running, the value increases while the value decreases when the encoder is in reverse running. If the value increases to 65535, it shall be recounted from 0 while the value shall recounted from 65535 if it is decreases to 0.

Check that this value can judge whether the encoder can be installed normally.

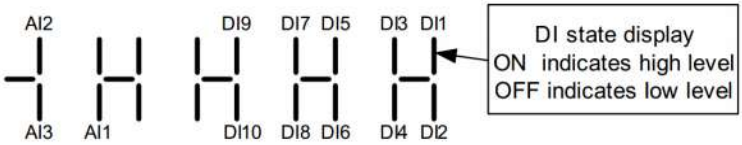
U0-39	VP separated target voltage	Display range	0V～motor rated voltage
U0-40	VF separated output voltage	Display range	0V～motor rated voltage

Display target output voltage and current practical output voltage when VF is in separated state.

VF separation refers to the related introduction for Group F3.

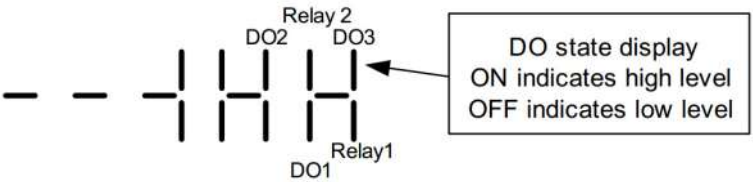
U0-41	DI input state visual display	Display range	-

Visually display DI terminal state and the display format is shown as follows:



U0-42	DO output state visual display	Display range	-

Visually display DO terminal output state and the display format is shown as follows:

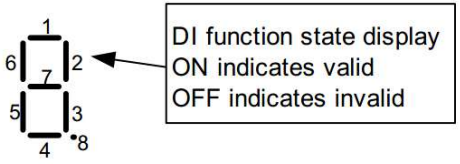


U0-43	DI function state visual display 1	Display range	-

Visually display whether terminal function 1 ～40 are invalid.

The keyboard mainly has 5 nixie tubes and every tube can stand for 8 functional selections.

The definition for nixie tube is shown as follows:



From right to left, the nixie tubs separately stand for 1 ～8, 9 ～16, 17～24, 25～32 and 33～40.

U0-44	DI function state visual display 2	Display range	-

Visually display whether Terminal Function 41～59 are valid.

The display mode is similar to that of U0-43.

From right to left, the nixie tubs separately stand for 41～48, 49～56 and 57～59.

U0-58	Z signal counter	Display range	0 ～65535

Display Z pulse counting of current ABZ pulse.

When the encoder runs a round by forward running or backward running, the value shall be added or reduced by 1. Check that the value can test whether the encode can be installed normally.

U0-59	Set frequency	Display range	-100.00% ～100.00%
U0-60	Operation frequency	Display range	-100.00% ～100.00%

Display current set frequency and operation frequency, 100.00%, corresponding to the maximum frequency (F0-10) of the Frequency Inverter.

U0-61	The running state of Frequency Inverter	Display range	0 ～65535

Display the operation state information of Frequency Inverter.

The format for data definition is shown as follows:

U0-61	Bit0	0: Stop; 1: Forward running; 2: Backward running
	Bit1	
	Bit2	0: Constant speed; 1: Acceleration; 2: Deceleration
	Bit3	
	Bit4	0: The bus voltage is normal; 1: Overvoltage

U0-62	The code for current failure	Display range	0 ～99

Display the code for current failure.

U0-65	Torque upper limit	Display range	-200.00% ～200.00%

Display current given torque upper limit.

Chapter 7 EMC (Electro Magnetic Compatibility)

7.1 Definitions for related terms

1) EMC: EMC (Electro Magnetic Compatibility) refers to the ability for electrical equipments and electronic equipments to work normally under the environment of electro magnetic interference and the ability to avoid releasing other equipments or systems in local area to prevent other equipments from realizing their functions. So, EMC includes two aspects of requirements: One refers to that the electro magnetic interference created during operation can not exceed a limited value and the other one refers to that the equipment shall have a degree of noise immunity for electro magnetic interference, namely electro magnetic sensitivity.

2) Environment I: Environment I includes civil facility and it also includes low voltage power gird directly connected to civil buildings without intermediate transformer.

3) Environment II: Environment includes other facilities except the low voltage power grin directly connected to civil buildings.

4) Equipment C1: The rated power supply for power drive system used in Environment I is lower than 1000V.

5) Equipment C2: The rated power supply for power drive system used in Environment I is lower than 1000V and it does not belong to plug-in equipments or movable equipments. When it is used in Environment I, it can only be installed and adjusted by professionals.

6） Equipment C3: The rated voltage of power drive system is lower than 1000V which is appropriate for Environment II instead of Environment I.

7) Equipment C4: The rated voltage of power drive system is not lower than 1000V or the rated current is not less than 400A. The power drive system may be appropriate for the complex system of Environment II

7.2 An introduction for EMC standard

7.2.1 EMC standard

CT3000-G Frequency Inverter meet the requirement of EN 61800-3: 2004 C2 and it is appropriate for Environment I and Environment II.

7.2.2 EMC requirement for installation environment

The system manufacture for installing Frequency Inverter is responsible for the requirements which accord with European EMC instruction to make sure that the system meets the requirements of EN 61800-3: 2004 C2, C3 or C4.

The system (mechanics or equipment) with Frequency Inverter shall be marked by CE and clients shall be responsible for final assembly system. So clients have to confirm whether the system (mechanics or equipment) accords with European instruction to meet the requirements of standard EN 61800-3: 2004 C.

Warning!
If used in Environment I, the Frequency Inverter may cause the interference of wireless. Except CE conformity, (if necessary) users shall take other measures to prevent interference.

7.3 Installation selection guide for EMC external accessory

7.3.1 The power input terminal with EMC input filter

The external EMC input filter installed between Frequency Inverter and power supply can not only restrain the interference for Frequency Inverter by electro magnetic noise, but also prevent the interference for periphery equipments by Frequency Inverter. A filter shall be connected to input terminal to make sure that CT3000-G Frequency Inverter can meet the requirements for C2 installation. When EMC input filter is installed, the following contents shall be noticed:

1) When a filter is used, it shall comply with rated value. Since the filter belongs to Category I of electrical appliance, most area of the metal shell shall contact with installation cabinet excellently. Besides, fine electric conduction continuity is required and otherwise it may cause electric shock or seriously affects the EMC effect.

2) The filter shall be connected to the same common land with Frequency Inverter PE and otherwise it can affect EMC effect.

3) The filter shall be installed near the power input of Frequency Inverter.

7.3.2 Power input terminal with AC input reactor

AC input reactor is used for decreasing the harmonic input current and as options for extraposition, it shall be outlayed when harmonic requirements for appliance is high. In CT3000-G series, for the Frequency Inverter of which the power is higher than 110kW, AC input reactor is standard confabulated while for the Frequency Inverter of which the power is lower than 110kW, it belongs to optional configuration.

7.3.3 The output side of Frequency Inverter with AC input reactor

The installation of AC INPUT REACTOR on the output side of Frequency Inverter can be determined according to specific situation. The transmission line between Frequency Inverter and motor can not be too long and if the cable is too long, the distributed capacitance shall become large and it can easily cause higher harmonic current.

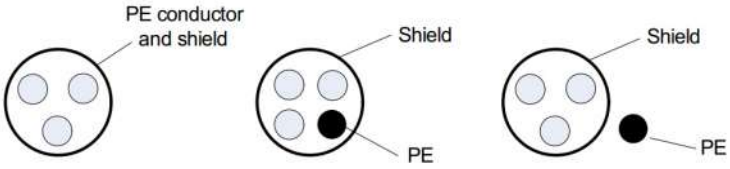
If the output cable is too long, an output electric reactor shall be configured and when the length of cable is larger, AC input reactor shall be installed near the Frequency Inverter.

The power of Frequency Inverter (kw)	Rated voltage (V)	The minimum of cable length when output reactor is selected
4	200 ～500	50
5.5	200 ～500	70
7.5	200 ～500	100
11	200 ～500	110
15	200 ～500	125
18.5	200 ～500	135
22	200 ～500	150
≧30	280 ～690	150

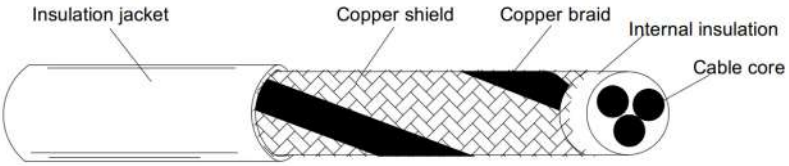
7.4 Shield cable

7.4.1 The requirement for shield cable

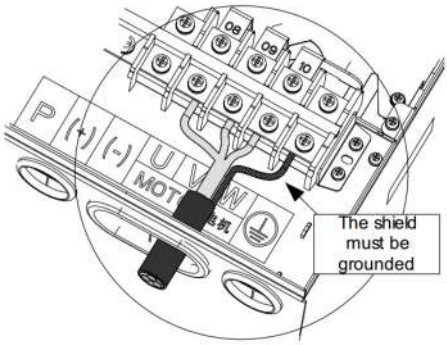
To meet the requirements for EMC marked by CE the shield cable with shielding layer shall be selected. The shield cable has three phase shield cable and four phase shield cable. If the electrical conductivity on shielding layer can not meet the requirements, a single PE line shall be added and otherwise, a four phase shield cable shall be used, among which, one line is PE line. It is shown as follows:



To restrain the emission and transmission of radio-frequency interference, the shielding layer of shield line is formed by coaxial copper braid and to increase shielding effectiveness and conductivity, the knitting tightness should be larger than 90%. It is shown as follows:



The grounding mode for shield cable is shown as follows:



屏蔽层接地	Shield layer grounding

Fig. 7-1 The diagram for shield cable grounding

Installation notes:

1) Shield balanced cables are recommended to use for all shield cables and for input cables, 4-core cable can be selected.

2) The motor cable and PE shielding lead (twisting shield) shall be as short as possible to decrease electromagnetic radiation, stray current outside cable and capacitating current. For the motor cable that is shorter than 100m, an output filter or an electric reactor shall be installed.

3) All control cables are advised to use shield cable.

4) The output power line for Frequency Inverter is advised to use shield cable and shielding layer is required to ground. For the lead of interfered equipments, twisted pair shielding control line shall be selected and the shielding layer shall be properly grounded.

7.4.2 Cabling requirements

1) The routing of motor cable shall be kept away from other cable routing. The motor cables of Frequency Inverters shall be routed side-by-side.

2) Motor cables, input power cables and control cables shall be distributed into different trunking and to avoid the electromagnetic interference caused by the quick change for frequency output voltage, motor cables and other long side-by-side routing of cables shall be avoided.

3) When control cables ass power cables unavoidably, the included angle between two cables shall keep 90° and other cables shall not be allowed to pass the Frequency Inverter.

4) The power input line, power output line and weak signal line (control line) shall be avoided to distribute in parallel and they can be distributed vertically if it is available.

5) Cable trunking shall be connected excellently and the grounding shall be fine. Besides, The trunking of aluminum can be used to equipotent.

6) The filter, Frequency Inverter and motor shall be connected with the system (mechanics and equipment) properly. The parts for installation can be protected by spraying and electric metal shall be contacted sufficiently.

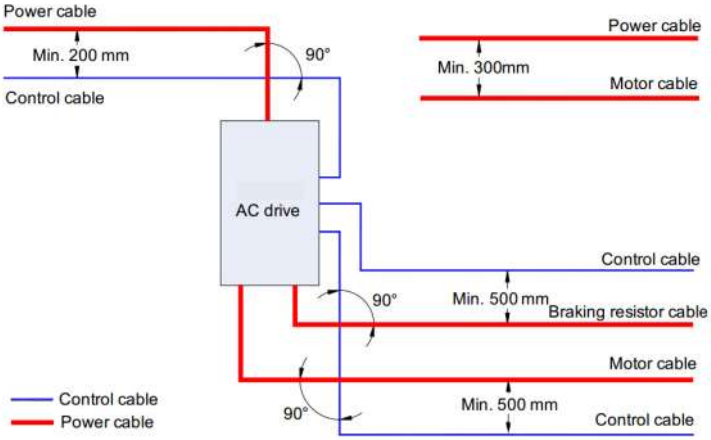


Fig. 7-2 Cables distribution

7.5 Rectification measures for EMC interfered problems

The Frequency Inverter belongs to strong interface equipments and when it is used, interference may still appear because of the existence of distribution and grounding. Besides, the following methods shall be used for rectification.

Table 7-4 Common EMC interference and treatment

Interference type	Rectification method
The trip for leakage circuit breaker	◆The motor shell shall be connected to PE terminals of drivers. ◆PE terminals of drivers shall be connected to Power Grid PE. ◆Input power cords shall be installed by a safety capacitor. ◆Input drive wire shall be rolled by a magnetic ring
The interference caused by the operation of drivers	◆PE terminals of drivers shall be connected to motor shell. ◆PE terminals of drivers shall be connected to Power Grid PE. ◆Input power cords shall be installed by a safety capacitor and rolled by a magnetic ring. ◆Interfered signal ports shall be installed by a capacitor or rolled by a magnetic ring. ◆Common ground connection between equipments

Communication interference	◆Motor shell is connected to PE terminals of drivers. ◆Power Grid PE is connected to PE terminals of drivers. ◆Input power cords shall be installed by a safety capacitor and rolled by a magnetic ring. ◆The matched resistance shall be added to communication line source and load terminal. ◆Communication common ground wire shall be added beyond communication line. ◆Shielding lines are used as communication lines and shielding layer shall be connected to common ground.
I/O interference	◆Capacitor filtering shall be increased by low speed DI and 0.1uF is advised. ◆Capacitor filtering shall be increased by AI and 0.22uF is advised.

Chapter 8 Type Selection and Dimension

8.1 Electrical specification of CT3000-G series Frequency Inverter

Table 8-1 The Type and technical data of CT3000-G Frequency Inverter

Type	Voltage	Phase In/Out	Rated Current	Applicable motor		Dimensions
				kW	HP	
Single phase In & Three-phase Out: 220V, 50/60Hz (1/3)						
CT3000-2S-D04G	220	1/3	2.3	0.4	0.5	265*185*225
CT3000-2S-D75G	220	1/3	4	0.75	1	265*185*225
CT3000-2S-1D5G	220	1/3	7	1.5	2	265*185*225
CT3000-2S-2D2G	220	1/3	9.6	2.2	3	265*185*225
Three phase In & Three-phase Out: 220V, 50/60Hz (3/3)						
CT3000-2T-D04G	220	3/3	2.1	0.4	0.5	265*185*225
CT3000-2T-D75G	220	3/3	3.8	0.75	1	265*185*225
CT3000-2T-1D5G	220	3/3	9	1.5	2	315*230*250
CT3000-2T-2D2G	220	3/3	13	2.2	3	315*230*250
CT3000-2T-004G	220	3/3	17	4	5	315*230*250
Three phase In & Three-phase Out: 400V, 50/60Hz (3/3)						
CT3000-4T-D75G	400	3/3	2.1	0.75	1	265*185*225
CT3000-4T-1D5G	400	3/3	3.8	1.5	2	265*185*225
CT3000-4T-2D2G	400	3/3	5.1	2.2	3	265*185*225
CT3000-4T-004G	400	3/3	9	3.7	5	315*230*250
CT3000-4T-5D5G	400	3/3	13	5.5	7.5	315*230*250
CT3000-4T-7D5G	400	3/3	17	7.5	10	315*230*250
CT3000-4T-011G	400	3/3	25	11	15	395*280*270
CT3000-4T-015G	400	3/3	32	15	20	395*280*270
CT3000-4T-018G	400	3/3	37	18.5	25	540*330*280
CT3000-4T-022G	400	3/3	45	22	30	540*330*280
CT3000-4T-030G	400	3/3	60	30	40	540*330*280
CT3000-4T-037G	400	3/3	75	37	50	696*385*450
CT3000-4T-045G	400	3/3	91	45	60	696*385*450
CT3000-4T-055G	400	3/3	112	55	75	696*385*450

CT3000-4T-075G	400	3/3	150	75	100	800*560*380
CT3000-4T-090G	400	3/3	176	90	125	800*560*380
CT3000-4T-110G	400	3/3	210	110	150	1050*660*460
CT3000-4T-132G	400	3/3	253	132	200	1050*660*460
CT3000-4T-160G	400	3/3	304	160	250	1050*660*460
CT3000-4T-200G	250	3/3	377	200	300	1140*730*460
CT3000-4T-220G	280	3/3	426	220	300	1140*730*460
CT3000-4T-250G	355	3/3	465	250	400	1140*730*460
CT3000-4T-280G	396	3/3	520	280	370	1140*730*460
CT3000-4T-315G	445	3/3	585	315	500	1440*880*460
CT3000-4T-355G	500	3/3	650	355	420	1440*880*460
CT3000-4T-400G	565	3/3	725	400	530	1440*880*460

8.2 The appearance and dimension of CT3000-G series Frequency Inverter

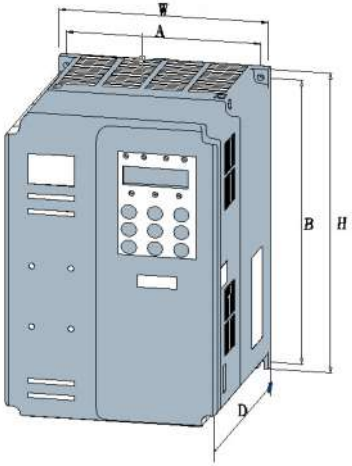


Fig. 8-1 plastic structure appearance dimension and installation dimension of CT3000-G series

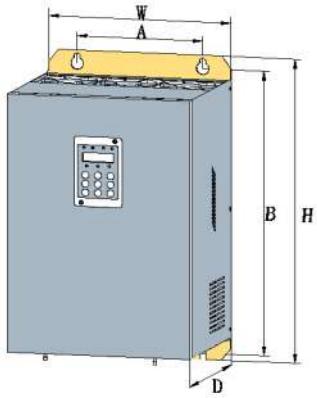


Fig. 8-2 metal plate structure appearance dimension and installation dimension of CT3000-G series

Table 8-2 CT3000-G appearance and the dimension of hole site

Type	Power	A（mm）	B(mm)	H(mm)	W(mm)	D(mm)	mounting aperture(mm)	Weight（kg）
		Installation dimension		Appearance dimension				
CT3000-G	0.75-2.2	113	172	186	126	166	φ5	2.0
CT3000-G	4-7.5	148	234	248	161	185	φ5	3.8
CT3000-G	11-15	190	305	322	208	192	φ6	6.5
CT3000-G	18.5-30	176	446	461	250	200	Φ10	30
CT3000-G	37-55	275	557	582	375	255	Φ10	40
CT3000-G	75-90	343	678	700	473	307	Φ10	91
CT3000-G	110-132	400	802	830	560	360	φ12	135
CT3000-G	160-200	400	1036	1063	650	400	φ13	208
CT3000-G	220-280	660	1173	1205	824	400	φ13	304
CT3000-G	315-400	520	1300	1358	800	400	φ16	350

8.3 The overall dimensions of introduced keyboard

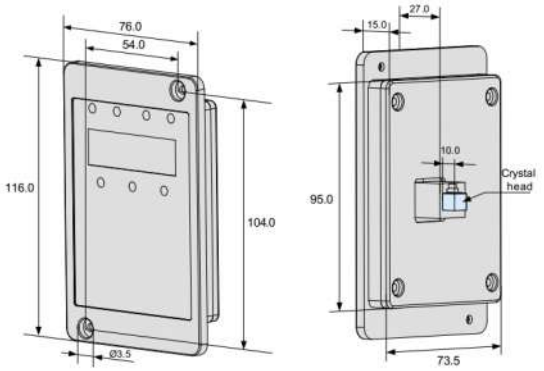


Fig. 8-3 The overall dimensions of introduced keyboard

8.4 Type selection for brake unit and brake resistance

8.4.1 The selection for brake resistance value

During barking, the regenerated energy mostly consumes on brake resistances. The following formula can be used:

$$U \times U/R = Pb$$

U －lock voltage steadily broke by system. (U values for different systems are different and the U value of 380Vac is 700V.)

Pb－brake power

8.4.2 The selection for brake resistance value

In theory, the power of bake resistance accords with brake power. Since the derating is 70%, the following formula can be used:

$$0.7 \times Pr = Pb \times D$$

Pr－resistance power

D －braking frequency, namely the proportion of regenerated process for the whole working process.

Common applications	staircase	Uncoiling and Coiling	Centrifugal machine	Accidental braking load	General situation
The recommended value of brake resistance	20%~30%	20 ~30%	50%~60%	5%	10%

Table 8-7 can be used for guiding data. According to practical situation, users can select different resistance value and power. (The resistance value shall be smaller than that in the table while the power can be larger than that in the table.).The selection for brake resistance shall be determined by the power of dynamo in practical systems, relating with system inertia, deceleration time and the energy loaded by potential energy and users shall make a selection according to practical situation. If the system inertia is larger, the

deceleration time is shorter and the brake is more frequently. So if the power of brake resistance is larger, the resistance is smaller.

Table 8-8 Brake unit selection table for CT3000-G Frequency Inverter

Frequency resistance type	The recommended power of brake resistance	The recommended value of brake resistance	Brake unit	Notes
Single-phase 220V				
CT3000-2S-D04G	80W	≥200 Ω	Standard built-in	Without special instruction
CT3000-2S-D75G	80W	≥150 Ω		
CT3000-2S-1D5G	100W	≥100 Ω		
CT3000-G1-2D2G	100W	≥70Ω		
Three-phase 380V				
CT3000-4T-D75G	150W	≥300	Standard built-in	Without special instruction
CT3000-4T-1D5	150W	≥220		
CT3000-4T-2D2	250W	≥200		
CT3000-4T-004G	300W	≥130		
CT3000-4T-5D5G	400W	≥90Ω		
CT3000-4T-7D5G	500W	≥65Ω		
CT3000-4T-011G	800W	≥43Ω		
CT3000-4T-015G	1000W	≥32Ω		
CT3000-4T-018G	1300W	≥25Ω	Extraposition	
CT3000-4T-022G	1500W	≥22Ω		
CT3000-4T-030G	2500W	≥16Ω		
CT3000-4T-037G	3.7 kW	≥12.6 Ω	Extraposition	
CT3000-4T-045G	4.5 kW	≥9.4Ω	Extraposition	
CT3000-4T-055G	5.5 kW	≥9.4Ω	Extraposition	
CT3000-4T-075G	7.5 kW	≥6.3Ω	Extraposition	
CT3000-4T-090G	4.5 kW×2	≥9.4Ω×2	Extraposition	
CT3000-4T-110G	5.5 kW×2	≥9.4Ω×2	Extraposition	
CT3000-4T-132G	6.5 kW×2	≥6.3Ω×2	Extraposition	
CT3000-4T-160G	16kW	≥6.3Ω×2	Extraposition	
CT3000-4T-200G	20 kW	≥2.5Ω	Extraposition	
CT3000-4T-220G	22 kW	≥2.5Ω	Extraposition	
CT3000-4T-250G	12.5 kW	≥2.5Ω×2	Extraposition	
CT3000-4T-280G	14kW×2	≥2.5Ω×2	Extraposition	
CT3000-4T-315G	16kW×2	≥2.5Ω×2	Extraposition	
CT3000-4T-355G	17kW×2	≥2.5Ω×2	Extraposition	
CT3000-4T-400G	14kW×3	≥2.5Ω×2	Extraposition	

Notes: ×2 means that the brake resistance for two brake units is in parallel and the means of ×3 is the same as that of ×2.

Chapter 9 Maintenance and Failure Diagnosis

9.1 Daily maintenance for Frequency Inverter

9.1.1 Daily maintenance

Due to the influences of temperature, humidity and dust in the environment and the effect of vibration, the internal components of Frequency Inverter are resulted to aging, which causes the potential occurrence of the failure for Frequency Inverter or the decrease of the service life for Frequency Inverter. Therefore, it is necessary to implement the daily and regular maintenance to the Frequency Inverter.

Daily inspection items:

1) Whether the sound changes abnormally when the motor is running

2) Whether vibration occurs when the motor is running

3) Whether the installation environment for Frequency Inverter changes

4) Whether the cooling fan of Frequency Inverter functions normally

5) Whether the Frequency Inverter is overheated

6) Daily cleaning:

7) Always keep the Frequency Inverter in clean state.

8) Effectively remove the dust on the surface of Frequency Inverter, thus preventing the dust enter into the inside of the Frequency Inverter. Especially for the metal dust

9) Effectively eliminate the oil in the cooling fan of Frequency Inverter.

9.1.2 Daily maintenance

Please make regular inspections to the places which are hard to be inspected during running.

Regular inspection items:

1) Inspect the air channel and clean it regularly

2) Inspect whether the screw is loose

3) Inspect whether the Frequency Inverter suffers from corrosion

4) Inspect whether the terminal block has the arc traces

5) Insulation test for major loop

Remind: when using the megameter (use DC 500V megameter please) to measure the insulation resistance, the major loop line needs to be disconnected with the Frequency Inverter. Do not use the insulation resistance meter to measure the insulation of the control loop. No need to conduct the high voltage test (it is already completed in delivery).

9.1.3 Replacement of vulnerable parts for Frequency Inverter

The vulnerable parts for Frequency Inverter mainly include the cooling fan and filter-used electrolytic

capacitor, the service life of which is closely related with the operating environment and the maintenance conditions. The general life time is:

Component name	Life time
Fan	2~3 years
Electrolytic capacitor	4~5 years

Note: The standard replacement time is the time when used in the following conditions, and the user can determine the replacement age based on the running time.

- Environment temperature: the average annual temperature is around 30□
- Load rate: below 80%
- Operation rate: below 20 hours/day

1) Cooling fan

Possible reasons for damage: bearing wear and leaf aging.

Judgment standard: whether the fan blade and others have any cracks, and whether there is any abnormal vibration sound when it starts.

2) Filter electrolytic capacitor

Possible reasons for damage: poor quality input power, high environment temperature, frequent load jumping and aging electrolyte.

Judgment standard: whether the liquid leaks, whether the safety valve protrudes, the measurement of electrostatic capacitance and insulation resistance.

9.1.4 Replacement of vulnerable parts for Frequency Inverter

After the user purchased the Frequency Inverter, the following points must be paid attention to concerning the temporary storage and long-term storage:

1) Upon storage try to put into the company's packing box as per the original package

2) Storage for a long time can lead to the degradation of the electrolytic capacitor, so connecting to the power supply once within 2 years must be ensured, and the conduction time should be at least 5 hours, and also, the input voltage must be slowly raised to the rated value through the voltage regulator.

9.2 Maintenance instruction for Frequency Inverter

1) Free maintenance refers to the Frequency Inverter itself only.

2) Under normal uses, if failure or damage happens, our company is responsible for 18 months maintenance (starting from the date of in delivery, and subject to the body barcode, and also, implement according to the protocol if contractual protocol is available). If it is over 18 months, a reasonable maintenance costs shall be charged;

3) Within 18 months, if the following circumstances happen, a certain amount of maintenance costs shall be charged:

4) Machine damage brought by the user's disobeying of the regulations stipulated in the operating manual;

5) Damage caused by the fire, flood, abnormal voltage, etc;

6) Damages caused since the Frequency Inverter is used in improper functions;

7) Related service fees shall be calculated as per the factory unified standard, if any contract is available, handle it as the principle of contract first.

9.3 Failure alarm and measures

If failure for CT3000-G series Frequency Inverter occurs in running, the Frequency Inverter will immediately protect the motor and stop outputting, meanwhile, there is the contact action for the Frequency Inverter failure relay. The panel of the Frequency Inverter will display the failure code. See the table below for the details concerning the failure type and the common solutions corresponded with the failure code. The examples listed in the table are just for references, please do not repair and modify without permission, if the failure cannot be removed, seek technical support from our company or the product agent.

Table 9-1 Failure List

Fault Name	Display	Failure causes analysis	Failure handling measures
Inverter unit protection	Err01	1. Short circuit for Frequency Inverter output circuit 2. Too long wiring between motor and Frequency Inverter 3. Too hot module 4. Loose internal wiring for Frequency Inverter 5. Abnormal main control panel 6. Abnormal drive board 7. Abnormal inverse module	1. Troubleshoot the external failure 2. Install electric reactor or output filter 3. Inspect if the air channel is blocked, and if fan functions normally and then troubleshoot the existing problems 4. Properly plug in all the connecting lines; 5. Seek technical support; 6. Seek technical support; 7. Seek technical support;
Overcurrent during acceleration	Err02	1. Grounding or short circuit exist in the output circuit of Frequency Inverter 2. The control mode is vector and parameter identification is not conducted 3. Too short acceleration time 4 Improper manual torque lifting or V/F curve 5 Relatively low voltage 6. Start the motor which are rotating 7. Sudden load in the acceleration process 8. Relatively small model selection	1. Troubleshoot the external failure 2. Conduct the motor parameter identification 3. Increase the acceleration time 4. Modify manual lifting torque or V/F curve 5. Adjust the voltage to the normal range 6. Select the rotating tracing start or restart after the motor stops 7. Cancel sudden load 8. Choose Frequency Inverter with bigger power level

Fault Name	Display	Failure causes analysis	Failure handling measures
		for Frequency Inverter	
Overcurrent during deceleration	Err03	1 Grounding or short circuit exit in the output circuit of Frequency Inverter 2. The control mode is vector and parameter identification is not conducted 3. Too short deceleration time 4. Relatively low voltage 5. Sudden load in the deceleration process 6. No installing of brake unit or brake resistance	1. Troubleshoot the external failure 2. Conduct the motor parameter identification 3. Increase deceleration time 4. Adjust the voltage to the normal range 5. Cancel sudden load 6. Install brake unit and resistance
Overcurrent at constant speed	Err04	1. Grounding or short circuit exit in the output circuit of Frequency Inverter 2. The control mode is vector and parameter identification is not conducted 3. Relatively low voltage 4. Sudden load exist in the running 5. Relatively small model selection for	1. Troubleshoot external failure 2. Conduct the motor parameter identification 3. Adjust the voltage to the normal range 4. Cancel sudden load 5. Choose Frequency Inverter with higher power level
Overvoltage during acceleration	Err05	1. Relatively high input voltage 2. External force dragging motor running exist in the acceleration process 3. Too short acceleration time 4. No installing of brake unit and brake resistance	1. Adjust the voltage to the normal range 2. Cancel the external force or install brake resistance 3. Increase acceleration time 4. Install brake unit and resistance
Overvoltage during deceleration	Err06	1. Relatively high input pressure 2. The external force dragging motor running exists in the deceleration process 3. Too short deceleration time 4. No installing brake unit and brake resistance	1. Adjust the voltage to the normal range 2. Cancel the external force or install brake resistance 3. Increase deceleration time 4. Install brake unit and resistance
Overvoltage at constant speed	Err07	1. Relatively high input pressure 2. The external force dragging motor running exists in running	1. Adjust the voltage to the normal range 2. Cancel the external force or install

Fault Name	Display	Failure causes analysis	Failure handling measures
			brake resistance
Control power supply fault	Err08	1. The input pressure is not within the range stipulated by standard	1. Adjust the voltage to the range required by standard
Undervoltage	Err09	1. Momentary power off 2. The terminal voltage of Frequency Inverter is not within the range required by standard 3. Abnormal Bus voltage 4. Abnormal rectifier bridge and buffer resistance 5. Abnormal drive board 6. Abnormal control panel	1. Reset failure 2. Adjust the voltage to the normal range 3. Seek technical support 4. Seek technical support 5. Seek technical support 6. Seek technical support
AC drive overload	Err10	1. Whether the load is too heavy or the motor stalling happens 2. Relatively small model selection for Frequency Inverter	1. Decrease the load and inspect the motor and machinery situations 2. Choose the Frequency Inverter with higher power level
Motor overload	Err11	1. Whether the setting of motor protection parameter F9-01 is appropriate 2. Whether the load is too heavy or motor stalling happens 3. Relatively small model selection for Frequency Inverter	1. Correctly set the parameter 2. Decrease the load and inspect the motor and machinery situation 3. Choose the Frequency Inverter with higher power level
Power input phase loss	Err12	1. Abnormal three-phase input power 2. Abnormal drive board 3. Abnormal lightning protection plate 4. Abnormal main control panel	1. Inspect and troubleshoot the existing problems in the external lines 2. Seek technical support 3. Seek technical support 4. Seek technical support
Power output phase loss	Err13	1. Abnormal wiring from Frequency Inverter to motor 2. Unbalanced Frequency Inverter three-phase when the motor is running 3. Abnormal drive board 4. Abnormal module	1. Troubleshoot external failure 2. Inspect whether motor three-phase winding is normal and troubleshoot the failure 3. Seek technical support 4. Seek technical support
Module overheat	Err14	1. Too high environment temperature	1. Reduce environment temperature 2. Clear air channel

Fault Name	Display	Failure causes analysis	Failure handling measures
		2. Air channel blocks 3. Fan damages 4. Module thermistor damages 5. Inverse module damages	3. Replace fan 4. Replace thermistor 5. Replace inverse module
External equipment fault	Err15	1. Input the signal of external failure through multifunctional terminal DI 2. Input the signal of external failure through virtual IO function	1. Reset running 2. Reset running
Communication fault	Err16	1. Upper computer functions abnormally 2. Abnormal communication line 3. Incorrect setting for communication expansion card F0-28 3. Incorrect setting for communication parameter Group FD	1. Inspect the upper computer wiring 2. Inspect communication connecting line 3. Correctly set the communication expansion card type 4. Correctly set the communication parameter
Contactor fault	Err17	1. The drive board and power source are abnormal 2. Abnormal contactor	1. Replace drive board or power panel 2. Replace the contactor
Current detection fault	Err18	1. Inspect Hall device is abnormal 2. Abnormal drive board	1. Replace Hall device 3. Replace drive board
Motor auto-tuning fault	Err19	1. The motor parameter is not set as per the name board 2. Time-out for parameter identification process	1. Correctly set the motor parameter as per the name board 2. Inspect the down-lead from Frequency Inverter to motor
Encoder fault	Err20	1. Encoder model is not matching 2. Encoder wiring error 3. Encoder manages 4. Abnormal PG card	1. Correctly set the encoder type as per the actual situation 2. Troubleshoot line failure 3. Replace encoder 4. Replace PG card
EEPROM read-write fault	Err21	1. EEPROM chip damages	1. Replace main control panel
AC drive hardware fault	Err22	1. There is overpressure 2. There is overcurrent	1. Handling as per overpressure failure 2. Handling as per overcurrent failure
Short circuit to ground	Err23	1. Motor short circuit to earth	1. Replace cable or motor

Fault Name	Display	Failure causes analysis	Failure handling measures
Accumulative Running time reached	Err26	1. The accumulated running time reaches up to the set value	1. Use parameter initialization function to clear the record information
User-defined fault 1	Err27	1. Input the signal of user-defined Failure 1 through multifunctional terminal DI 2. Input the signal of user-defined Failure 1 through virtual IO function	1. Reset running 2. Reset running
User-defined fault 2	Err28	1. Input the signal of user-defined Failure 2 through multifunctional terminal DI 2. Input the signal of user-defined Failure 2 through virtual IO function	1. Reset operation 2. Reset running
Accumulative power-on time reached	Err29	1. The accumulated power-on time reaches to the set value	1. Use parameter initialization function to clear the record information
Load becoming 0	Err30	1. The running current for Frequency Inverter is lower than F9-64	1. Confirm whether the load is disconnected or the parameter setting of F9-64 and F9-65 meets the real running conditions
PID feedback lost during running	Err31	1. The PID feedback is lower than the set value of FA-26	1. Inspect PID feedback signal or set FA-26 as an appropriate value
Waveband current limit failure	Err40	1. Whether the load is too heavy or motor stalling happens 2. Too small model selection for Frequency Inverter	1. Reduce the load and inspect the motor and machinery conditions 2. Select the Frequency Inverter with higher power level
Motor switchover fault during running	Err41	1. Change the current motor selection through terminal when the Frequency Inverter is running	1. Conduct the operation of motor switching after the Frequency Inverter stops
Too large speed deviation	Err42	1. Incorrect parameter setting for encoder 2. Parameter identification is not conducted	1. Correctly set the encoder parameter 2. Conduct the motor parameter identification 3. Reasonably set the detecting

Fault Name	Display	Failure causes analysis	Failure handling measures
		3. Too large speed deviation, and the detecting parameter F9-69 and F9-70 are not reasonably set	parameter based on the actual conditions
Motor over-speed	Err43	1. Incorrect parameter setting for encoder 2. Parameter identification is not conducted 3. The motor overspeed detecting parameter F9-67 and F9-68 are not unreasonably set	1. Correctly set the encoder parameter 2. Conduct motor parameter identification 3. Reasonably set the detecting parameter based on actual situation
Motor overheat	Err45	1. Loose temperature sensor wiring 2. Motor temperature is too high	1. Inspect temperature sensor wiring and troubleshoot the failure 2. Reduce carrier frequency or adopt other heat emission measures to make thermal management to the motor
Initial position fault	Err51	1. Too large deviation between the motor parameter and the reality	1. Reconfirm whether the motor parameter is correct, and focus on whether the rated current is set too small

9.4 Failure alarm and measures

The following failure conditions may be met when using the Frequency Inverter. Please see the following methods for simple failure analysis:

Table 9-2 Common Failure and Handling Methods

No.	Failure phenomenon	Possible reasons	Solutions
1	No display when power on	No or too low network power; Switching power failure on the drive board of Frequency Inverter; The rectifier bridge damages; The buffer resistance of Frequency Inverter damages; Control panel and keyboard failure; Disconnection among control panel, drive board and keyboard;	Inspect input power; Inspect Bus voltage; Pull and plug 8-core and 28-core flat cable once again; Seek factory service;

No.	Failure phenomenon	Possible reasons	Solutions
2	Display “Err23” alarm when power on	Short circuit to earth for motor or output line; Frequency Inverter damages;	Use megger to measure the insulation of motor and output line; Seek factory service;
3	Frequently report Err14 (module overheating) failure	Too high setting for carrier frequency; Fan damages or air channel is blocked The internal components of Frequency Inverter damage (thermocouple or others)	Reduce carrier frequency (F0-15); Replace fan and clean air channel; Seek factory service;
4	The motor doesn’t rotate after the Frequency Inverter is running.	Motor and motor line; Frequency Inverter setting error (motor parameter); Poor contact wiring between drive board and control panel; Drive board failure ;	Reconfirm the wiring between Frequency Inverter and motor; Replace motor or clear mechanical failure; Inspect and reset motor parameters;
5	Invalid DI terminal	Parameter setting error; External signal error; Loose OP and +24V jumper Control panel failure ;	Inspect and reset Group F4 related parameters; Reconnect the external signal line; Reconfirm OP and +24V jumper; Seek factory service;
6	When it is in closed-loop vector control, the motor speed cannot be raised	Encoder failure ; Encoder misconnection or poor contact; PG card failure ; Drive board failure ;	Replace the coded disk and reconfirm the wiring; Replace PG card; Seek service;
7	Frequency Inverter frequently reporting overcurrent and overpressure failure	Motor parameter setting error; Inappropriate acceleration/ deceleration time; Load vibration;	Reset the motor parameter or tune the motor; Set appropriate acceleration/ deceleration time; Seek factory service;
8	Err17 Err17 reporting when power on (or running)	Soft start contactor not-actuation	Inspect whether contactor cable is loose; Inspect whether contactor has any failure ; Inspect whether contactor 24V

No.	Failure phenomenon	Possible reasons	Solutions
			power supply has any failure ; Seek factory service;
9	Power-on display 88888	Related components on the control panel damage;	Replace control panel;

Appendix A: Multifunctional IO Expansion Card

(Used for 3.7kW and the above machines)

A.1 Overview

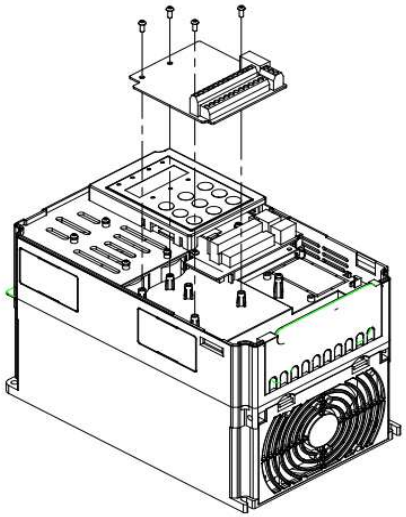
Multifunctional IO card is the I/O expansion card used matching with the CT3000-G series Frequency Inverter. It includes the following resources:

Item	Specification	Description
Input terminal	digital signal input	
	1-route analog voltage signal input	Support -10V ~10V voltage input signal
Output terminal	1-route relay signal output	
	1-route digital signal output	
	1-route analog signal output	

A.2 Mechanical installation and functional description for control terminal

1. The installation method, appearance, control terminal function definition and jumper description are respectively shown in Appendix A Fig. 1, Fig. 2, Table 1 and Table 2. Please install when the Frequency Inverter is completely shut off from the power supply; align the I/O expansion card with the expansion card port and the location hole of the Frequency Inverter control panel; use the screw for fixation.

The installation drawing of large expansion card



Appendix A: Fig. 1 IO Installation Method

Appendix A: Table 1 Function Description of Control Terminal

Item	Terminal symbol	Terminal name	Function description
Power	+24V-COM	External +24V power	Provide with external +24V power, commonly used as digital input/output terminal working power supply and external sensor power supply Maximum output current: 200mA
	OP1	Digital input power terminal	OP1 and "+24V" are already linked together with short splicing in delivery. When the external power supply is needed, OP1 needs to be connected with the external power supply, and the short splicing must be taken away.
Analog input	AI3-PGND	Analog input Terminal 3	1. Opto-isolator input, acceptable to differential voltage input and temperature measurement resistance input 2. Input voltage range: DC -10V~ 10V 3. PT100,PT1000 temperature sensor 4. Use dial switch S1 to determine the input mode, and multiple functions cannot be used together
Function digit input	DI8-OP1	Digital input 8	1. Opto-isolator, compatible with bipolar input 2. Input impedance: 2.4k Ω
	DI9-OP1	Digital input 9	

terminal	DI10-OP1	Digital input 10	3. Voltage range when inputting the electrical level: 9~ 30V
Analog output	AO2-GND	Analog output 2	1. Output voltage Specification : 0 V~ 10V 2. Output current Specification : 0mA~20mA
Digital output	DO2-CME	Digital output 2	Opto-isolator, bipolar open collector output Output voltage range: 0V~24V Output current range: 0mA~50mA Note: DRGND CME1 and DRGND COM are internally isolated, and tacitly connected by short splicing, When DO2 needs to be driven by external power, and the short splicing must be disconnected.
Relay output (RELAY2)	PA- PB	Normally-closed terminal	AC250V ，3A，COSΦ=0.4 。 DC 30V，1A Contact drive capacity: AC250V , 3A, COSφ=0.4. DC 30V, 1A
	PA- PC	Normally-opened terminal	

Appendix A: Table 2 Jumper Description

Jumper Number	Description
J3	AO2 output selection
S1 (left side of terminal block)	A13, PT100, PT1000 function selection

Appendix B: Operating Instructions for Universal Encoder Expansion Card

(Applicable to the Whole Series)

B.1 Overview

CT3000-G is equipped with many kinds of universal encoders expansion card (namely the PG card), which are used as optional components and are the required parts for closed-loop vector control by Frequency Inverter. Select the corresponding PG card based on the output form of the encoders, the specific models are as follows:

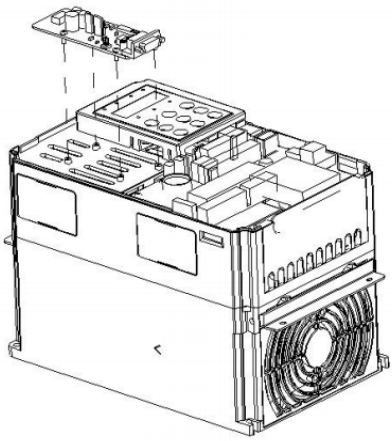
Optional components	Description	Others
PG01	Differential input PG card, and frequency dividing output	Terminal wiring
PG05	OC input PG card, and 1:1 frequency dividing output	Terminal wiring

B.2 Mechanical installation and functional description for control terminal

1. The installation method, appearance, Specification and terminal block signal definition, and jumper description are respectively shown in Appendix E Fig. 1, Fig. 2 and Table 1:

1) Please dismantle the PG card when the Frequency Inverter is completely cut off from the power supply;

2) Connect the J3 of the control panel with the expansion card through 18Pin FFC flexible flat cable (take care to install correctly and snap in place).



Appendix B: Fig. 1 Installation Method for Encoder Expansion Card

See below for the specification of each encoder expansion card and the definition of the terminal block signal:

Appendix B: Table 1 Specification and Signal Definition Instruction of Terminal Block

Difference PG card (PG1)		
PG1 Specification		
User interface	Oblique cutting terminal	
Spacing	3.5mm	
Screw	Straight	
Pull and plug	No	
Wire gauge	16-26AWG	
Maximum rate	500kHz	
Input Difference signal amplitude	≤7V	
PG1 terminal block signal definition		
No.	Label	Description
1	A+	Encoder output A signal positive
2	A-	Encoder output A signal negativity

3	B+	Encoder output B signal positive
4	B-	Encoder output B signal negativity
5	Z+	Encoder output Z signal positive
6	Z-	Encoder output Z signal negativity
7	5V	Provide external 5V/100mA power supply
8	COM	Power ground
9	PE	Shield terminal
1(left-side terminal)	A+	PG card 1:1 feed back output A+ signal
2(left-side terminal)	A-	PG card 1:1 feed back output A- signal
3(left-side terminal)	B+	PG card 1:1 feed back output B+ signal
4(left-side terminal)	B-	PG card 1:1 feed back output B- signal
5(left-side terminal)	Z+	PG card 1:1 feed back output Z+ signal
6(left-side terminal)	Z-	PG card 1:1 feed back output Z- signal
7(left-side terminal)	COM	Power ground
Rotary transformer PG card (PG4)		
PG4 specification		
User interface	DB9 female	
Pull and plug	Yes	
Wire gauge	>22AWG	
Resolution rate	12 bit	
Excitation frequency	10kHz	
VRMS	7V	
VP-P	3.15 ±27%	
PG4 terminal description		
No.	Label	Description
1	EXC1	Rotary transformer excite negativity
2	EXC	Rotary transformer excite positive
3	SIN	Rotary transformer feed back SIN positive
4	SINLO	Rotary transformer feed back SIN negativity
5	COS	Rotary transformer feed back COS positive
6	-	
7	-	
8	-	
9	COSLO	Rotary transformer feed back COS negativity
OC PG card (PG5)		
PG5 Specification		
User interface	Oblique cutting terminal	
Spacing	3.5mm	
Screw	Straight	

Pull and plug	No	
Wire gauge	16-26AWG	
Maximum rate	100kHz	
PG5 terminal description		
No.	Label	Description
1	A	Encoder output A signal
2	B	Encoder output B signal
3	Z	Encoder output Z signal
4	15V	Provide external 15V/100mA power supply
5	COM	Power ground
6	COM	Power ground
7	A1	PG card 1:1 feed back output A signal
8	B1	PG card 1:1 feed back output B signal
9	PE	Shield terminal

Appendix C: CT3000-G Modbus Communication Protocol

CT3000-G series Frequency Inverter provides RS485 communication protocol, and supports Modbus-RTU slave machine communication protocol. THE user can realize the centralized control though station or PLC, and by the communication protocol, the user can set the run command for the Frequency Inverter, modify or read the function code parameters, and read the working condition and failure of Frequency Inverter, etc.

C.1 Protocol content

The serial communication protocol defines the transmission information content and the using format in the serial communication. They include: master polling (or broadcast) format; the coding method for master, and the content includes: the function codes, data transmission and error verification and so on for the requested action, The response of the slave machine also uses the same structure, and its content include: action confirmation, data returning and error checking, etc. Whether error happens when the salve station receives the information, or it cannot complete the actions requested by the master, it shall organize a failure as the response to feed back to the master machine.

C.1.1 Application mode

The Frequency Inverter is accessed into the “single principal line and multiple affiliated lines” PC/PLC control network equipped with RS485 bus and used as a communication salve computer.

C.1.2 Bus structure

(1) Hardware interface

The main board interface labels are 485+ and 485-.

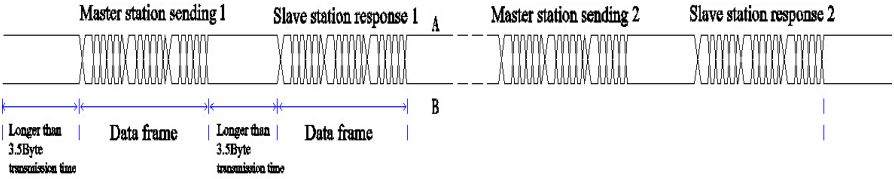
(2) Topological structure

System of single main station and multiple slave machines Each communication equipment in the network has an exclusive slave machine address, among which, one of the equipment, used as the communication master (normally are flat PC upper station, PLC, and HMI, etc.), launch the communication proactively and make read or write operation to the parameters for the slave machine, while the other equipment, used as the communication slave machines, response the inquiry or communication operations against the station by the master. At the same time, only one of the equipment can send the data, while the other equipment is in the accepting state.

The setting arrange for the slave machine is 1~247, and 0 is the broadcast communication address. The slave machine address in the network must be exclusive.

(3) Communication transmission mode

Asynchronous serial and half-duplex transmission mode During the serial asynchronous communication process, the data, in the form of message, send a frame for each time. According to the agreement in the MODBUS-RTU protocol, whether the idle time when there are no data on the communication data line is longer than the transmission time for 3.5Byte, which indicates the start for a new communication frame.



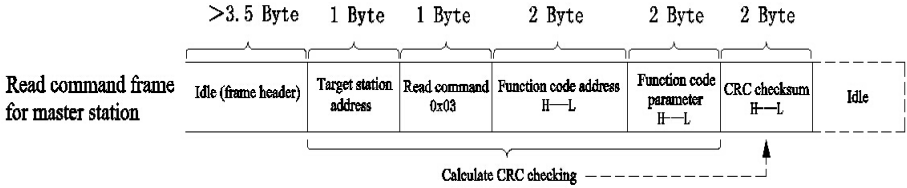
The built-in communication protocol for the CT3000-G series Frequency Inverter is the Modbus-RTU slave machine communication protocol, which can response the “inquiry/command” from the master machine, or make the corresponding actions according to the “inquiry/command” from the master machine, and response to the communication data.

The master machine refers to the personal computer (PC), industrial control equipment or programmable logic controller (PLC), etc. The master machine can not only communicate specially with any slave machine, but it also can issue the broadcast information to all the lower slave machines. As for the individual access “inquiry/command” by the master machine, the accessed slave machine shall return a response frame; as for the broadcast information sent by the master machine, the slave machine has need to feed the response back to the master machine.

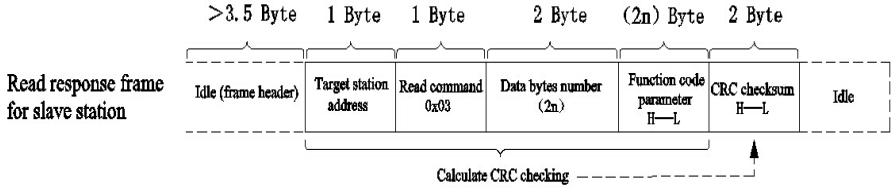
C.2 Communication data structure

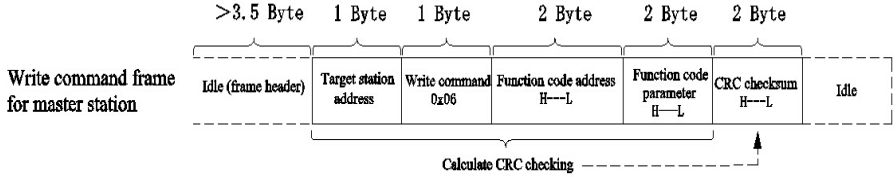
Modbus protocol communication data form for CT3000-G series Frequency Inverter is as bellows. The

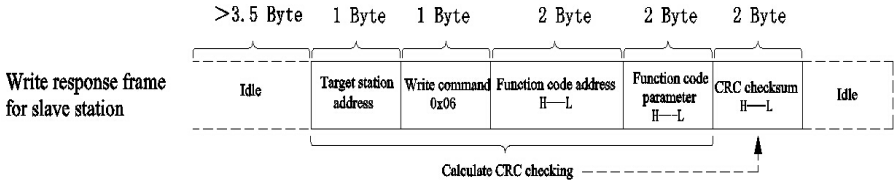
Frequency Inverter supports the reading or writing for only the Word type parameters, and the corresponding communication read command is Ox03; the write command is 0x06, without supporting the read and write commands for byte or bit:



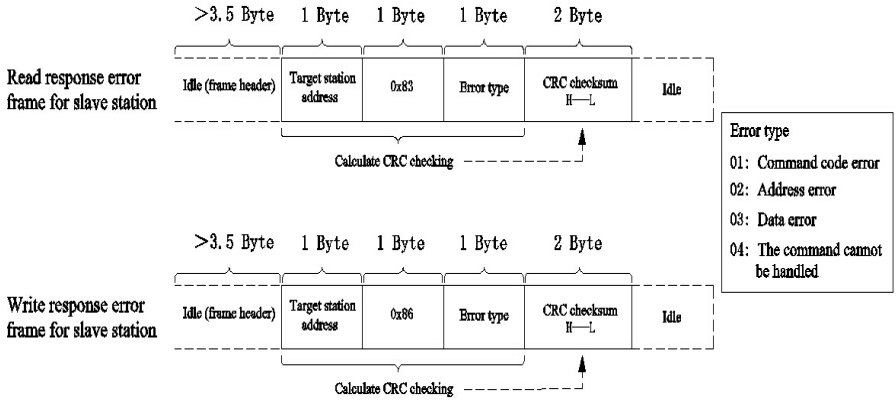
Theoretically, the upper computer can read several continuous function codes at one time (meaning the n can reach the maximum number of 12), but notice that it cannot surpass the last function code in the function code, otherwise error response may happen.







If the salve computer detects the communication frame error, or the other reasons lead to the unsuccessful reading and writing, then it shall response the error frame.



Field description for data frame:

Frame header START	Idle longer than 3.5 characters transmission time
Slave machine ADR	Correspondence address range: 1 ~247 ; 0 =broadcast address
Command code CMD	03: read slave machine parameter; 06: write slave machine parameter
Function code address H	The internal parameter address for the Frequency Inverter, it is shown by hexadecimal; divided into the function code type and non-function code type (such as running parameters, run command, and so on) parameters, etc. See the address definition for more details. When transmitting, the high byte is in front and the low byte is behind.
Function code address L	
Function code number H	Function code number read for the frame, if it is 1, it indicates 1 function code. When transmitting, the high byte is front and the low byte is behind. This protocol can only rewrite 1 function code for one time, and doesn't have this field.
Function code number L	
Data H	Respondent data or waiting-to-be written data, when transmitting, the high byte is front and the low byte is behind.
Data L	
CRC CHK high position	Detection value: CRC16 proof test value. When transmitting, the high byte is front and the low byte is behind. See the instruction of CRC verification in this section for the detailed computing method
CRC CHK low position	
END	When there are 3.5 characters

CRC verification mode:

CRC（Cyclical Redundancy Check）uses the RTU frame format, and the includes the error detection domain based on CRC method. CRC domain detects the contents of the whole messages. CRC domain is two bytes, including 16 digit binary values. It is added into the message after the calculation by the transmission equipment. The receiving equipment recalculates the CRC that receives the message, and makes a comparison to the value in the received CRC domain. Whether the two CRC values are not equal, then it indicates the transmission errors. As for CRC, 0xFFFF is stored first, and then call a procedure to treat the continuous 8-bit bytes in the message and the value in the current register. Only the 8Bit data in each character is valid to CRC, while the start bit and stop bit as well as the parity check bit are all invalid. During the production of CRC, each 8-digit byte alone is different from the content in the register, or (XOR), the result is the action toward the direction of least significant bit, and the most significant bit is filled with 0. LSB is detected by extracting out, whether the LSB is 1, then the separate value and the preset value in the register are different or, whether the LSB is 0, then no operation is conducted. The whole process shall repeat for 8 times. After the last digit (the 8 digit) is completed, the next 8-bit bytes shall be different with the current value in the register. The final value in the register is the CRC value after all the bytes are performed.

When adding the CRC into the message, and the low bytes should be first, and then the high bytes followed. The simple function for CRC is as follows:

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

The address of communication parameter is defined as the reading and writing function code parameter (some function codes cannot be modified, since they are used only by the manufacturer or for monitoring purpose):

C.3 Address marking rules for function code parameter

Make function code group number and mark number as the parameter address marking rules:

High byte: F0~FF(Group F), A0~AF(Group A), 70~7F(Group U)

Low byte: 00~FF

For example: whether the function code is F3-12, then the accessing address for function code is shown as 0xF30C;

Note:

Group FF: neither readable nor changeable to the parameters;

Group U: readable only but not changeable to the parameters.

Some parameters cannot be changed when the Frequency Inverter is under the running state; some parameters cannot be changed whether the Frequency Inverter is in whatever state; when changing the function code parameter, the parameter's range, unit and related explanations should also be paid attention.

Function code group number	Communication accessing address	Communication modified function address in the RAM
Group F0~FE	0xF000 ~0xFEFF	0x0000~0x0EFF
Group A0~AC	0xA000 ~0xACFF	0x4000~0x4CFF
Group U0	0x7000~0x70FF	

Note: since EEPROM is frequently restored, so the service life of EEPROM shall be reduced, therefore, some function codes have no need to be stored under the communication mode, if only the value in the RAM modified.

If it is the Group F parameter, whether only the high position F for the function code address changes to 0, then the function can be achieved.

If it is the Group A parameter, whether only the high position A for the function code address changes to 4, then the function can be achieved.

The corresponding function code address is shown as below:

High byte: 00~0F(Group F)、40~4F(Group A)

Low byte: 00~FF

For example:

If function code F3-12 is not stored in EEPROM, then the address is shown as 030C;

If function code A0-05 is not stored in EEPROM, then the address is shown as 4005;

The address presentation can only act the writing RAM, without acting the reading action. When reading, it

is the invalid address.

As for all the parameters, command code 07H can also be used for realizing the function.

Stop /operating parameter part:

Parameter address	Parameter description	Parameter address	Parameter description
1000H	* Communication set value (decimal) –10000 ~10000	1010H	PID set-up
1001H	Operation frequency	1011H	PID feedback
1002H	Bus voltage	1012H	PLC steps
1003H	Output voltage	1013H	PULSE input pulse frequency, the unit is 0.01kHz
1004H	Output current	1014H	Feedback speed, the unit is 0.1Hz
Parameter address	Parameter description	Parameter address	Parameter description
1005H	Output power	1015H	Remaining running time
1006H	Output torque	1016H	AI1 voltage before calibration
1007H	Running speed	1017H	AI2 voltage before calibration
1008H	DI input flag	1018H	AI3 voltage before calibration
1009H	DO output flag	1019H	Line speed
100AH	AI1 voltage	101AH	Current power-on time
100BH	AI2 voltage	101BH	Current running time
100CH	AI3 voltage	101CH	PULSE input pulse frequency, the unit is 1Hz
100DH	Count value input	101DH	Communication set value
100EH	Length input	101EH	Actual feedback speed
100FH	Loading speed	101FH	Main frequency X display
–	–	1020H	Auxiliary frequency Y display

Note:

The communication set value is the percentage of relative value, 10000 corresponds 100.00%, and -10000 corresponds -100.00%.

As for the frequency dimension data, the percentage is the percentage of relative maximum frequency (F0-10); as for the torque dimension data, this percentage is F2-10, A2-48, A3-48, A4-48 (the torque upper limit digital setting respectively correspond the first, second, third and fourth motor). The control command is input into the Frequency Inverter: (write only)

Command word address	Command function
2000H	0001: forward running
	0002: reverse running
	0003: forward jog
	0004: reverse jog
	0005: free stop
	0006: deceleration stop
	0007: failure reset

Frequency Inverter reading status: (read only)

Status word address	Command function
3000H	0001: forward running
	0002: reverse running
	0003: stop

Parameter locking password checking: (whether it returns 8888H that means the passing of the password checking)

Password address	Input password content
1F00H	*****

Data output terminal control: (write only)

Command address	Command content
2001H	BIT0: DO1 output control BIT1: DO2 input control BIT2: RELAY1 output control BIT3: RELAY2 output control BIT4: FMR output control

Analog output AO1 control: (write only)

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

Analog output AO2 control: (write only)

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

PULSE output control: (write only)

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

Frequency Inverter failure description:

Frequency Inverter failure address	Frequency Inverter failure	
8000H	0000: failure free 0001: reserve 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: Frequency Inverter overload 000B: motor overload 000C: input default phase 000D: output default phase 000E: module overheating 000F: external failure 0010: communication abnormal 0011: contactor abnormal 0012: current detection failure 0013: motor tuning failure 0014: encoder/PG card failure	0015: parameter read-write abnormal 0016: Frequency Inverter hardware failure 0017: motor short circuit to earth failure 0018: reserved 0019: reserved 001A: running time arrival 001B: user defined Failure 1 001C: user defined Failure 2 001D: power-on time arrival 001E: off-loading 001F: PID feedback loss when running 0028: fast current limit timeout failure 0029: motor switching failure in running 002A: excessive speed deviation 002B: motor super-speed 002D: motor over-temperature 005A: encoder line number setting error 005B: without connecting the encoder 005C: initial position error 005E: speed feedback error

C.4 Group FD communication parameter description

Fd-00	Baud rate	Default value	6005
	Set range	Single digits: MODBUS Baud rate	
		0：300BPS	5：9600BPS
		1：600BPS	6：19200BPS
		2：1200BPS	7：38400BPS
		3：2400BPS	8：57600BPS
		4：4800BPS	9：115200BPS

The parameter is used to set the transmission rate between the upper computer and Frequency Inverter. Note, the upper computer must be consistent with the Baud rate set by the Frequency Inverter, otherwise, the communication cannot be conducted. The higher the Baud rate, the faster the communication speed is.

Fd-01	Data format	Default value	0
	Set range	0: no verification: data format<8,N,2> 1: even parity: data format<8,E,1> 2: odd parity: data format<8,O,1> 3: no verification: data format<8-N-1>	

The upper computer must be consistent with the data format set by the Frequency Inverter, otherwise, the communication cannot be conducted.

Fd-02	Local address	Default value	1
	Set range	1~247: 0 is the broadcast address	

When the local address is set as 0, it indicates the broadcast address and shall realize the broadcast function of upper computer. The local address is unique (except the broadcast address), which is the basis for the point-to-point communication between the upper computer and the Frequency Inverter.

Fd-03	Response delay	Default value	2ms
	Set range	0~20ms	

The response delay refers to the interval time ranging from the end of the receipt of the Frequency Inverter data to the sending of the data to the upper computer. Whether the response delay is shorter than the system processing time, then the response delay is subject to the system processing time. Whether the response delay is longer than the system processing time, then after the system processes the data, the delay waiting is needed, and the data shall not be sent to the upper computer until the arrival of the time of response delay.

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

When the function code is set as 0.0 s, then the communication timeout parameter is invalid.

When the function code is set as the effective value, whether the interval time between one communication and the next communication exceeds the communication timeout, then the system shall report the communication failure error (Err16). Under the normal conditions, they are all set as invalid. Whether the sub-parameter is set in the continuous communication system, then it can monitor the communication situation.

Fd-05	Communication	Default value	0

	protocol selection		
	Set range	0: nonstandard Modbus protocol; 1: standard Modbus protocol	

Fd-05=1: choose the standard Modbus protocol.

Fd-05=0: for the read command, the number of bytes returned by slave machine has one more byte than the standard Modbus protocol, and see the details in the part of "5 communication data structure" in the protocol.

Fd-06	Communication reading current resolution	Default value	0
	Set range	0：0.01A ； 1：0.1A	

When used for determining the communication reading output current, the output unit of the current value.

Maintenance Bond

1) The warranty period for the product is eighteen months (subject to the body barcode information). During the warranty period, under the circumstances of normal use in line with the operating instruction, whether failure or damages to the products happens, our company shall be responsible for free maintenance.
2) During the warranty period, a certain amount of maintenance costs shall be collected whether the damages are caused by the following reasons:
   A. Machine breakdown caused by the mistake in using and by the repairing and transformation without permission;
   B. Machine breakdown caused by fire, flood, abnormal voltage, other natural disasters and secondary disasters, etc;
   C. Hardware damages caused by man-caused falling off and transportation;
   D. Machine breakdown caused by the handling without complying with the user's manual provided by our company;
   E. Failure and damages caused by the trouble other than the machine (for instance, the external device factors);
3) In case of failure or damages to the products, please fill in each item in the Product Warranty Card correctly and in detail.
4) The collection of the charges to the maintenance costs shall be in accordance with the latest adjustment Maintenance Price List issued by our company..

5) In general cases, the warranty card shall not be reissued, so please be sure to take care of the card, and show it to the maintenance personnel for warranty repair.

6) Whether there are any questions during the process of service, please contact our agent or us in time.

Product Warranty Card

<table>
<tr><td rowspan="3">Customer information</td><td colspan="2">Address:</td></tr>
<tr><td>Name:</td><td>Contact person:</td></tr>
<tr><td>Postal code:</td><td>Contact number:</td></tr>
<tr><td rowspan="3">Product information</td><td colspan="2">Product model:</td></tr>
<tr><td colspan="2">Label barcode (pasted here):</td></tr>
<tr><td colspan="2">Name of the agent:</td></tr>
<tr><td>Failure information</td><td colspan="2">(maintenance time and content)

maintenance personnel:</td></tr>
</table>

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